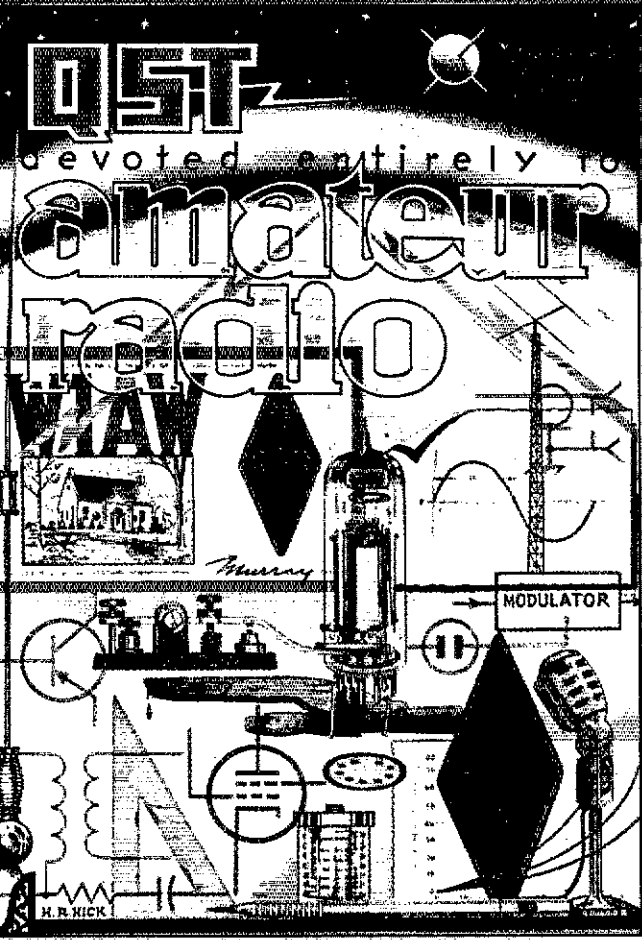


# QST



Amateur Radio

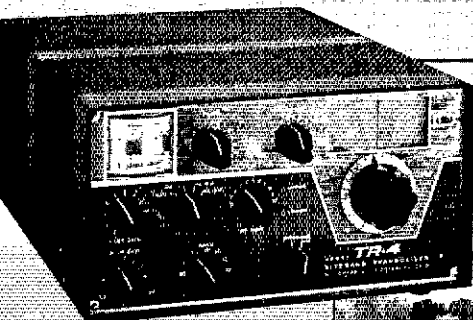


50th Anniversary of the American Radio Relay League

COMMEMORATING AMATEUR RADIO OPERATORS AMERICA



HIRAM PERCY MAXIM  
CO-FOUNDER AND FIRST A.R.R.L. PRESIDENT  
NEW A.R.R.L. HEADQUARTERS  
NEWINGTON, CONN.

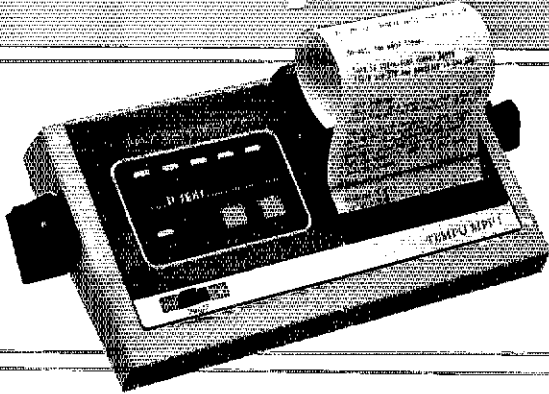


## THE '60s

FIRST DAY OF ISSUE



# HENRY RADIO IS THE PLACE ... THE BEST PLACE to fill all your data communications needs

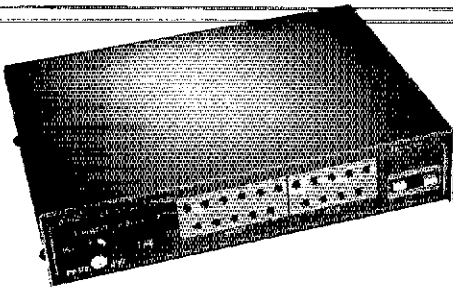
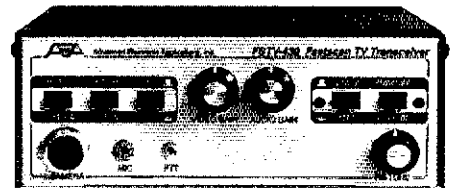


## The TEMPO MPP1

...a unique new mobile data printer, includes a packet controller and a 13.6 VDC printer that interfaces with any mobile radio. In a recent user test it proved to have about twice as much audio level range tolerance as other TNCs. It is also an ideal unit for emergency work and a commercial version is perfect for dispatching service, emergency and police vehicles.

## The FSTV-430, AEA's newest

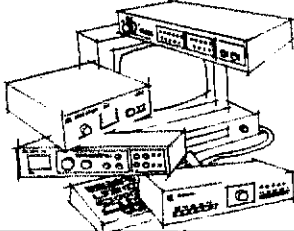
The exciting FSTV-430 fast scan television transceiver makes getting on ATV easy and inexpensive...live or taped. Almost any video camera can be used. Simply plug it into the FSTV-430, connect to your 70 cm antenna and you're on the air. Use a standard TV for receiving signals and, of course, an amplifier will extend your range. It's reliable, portable and light weight and can be used in-station or mobile from any 12 VDC source. The only license required is a technician or higher.



## The PK-232 by AEA

...the only controller offering Morse Code, Baudot, ASCII, AMTOR, Packet, and facsimile Transmission & Reception plus the ability to monitor the new Navtex marine weather and navigational system...7 modes in one controller. The PK-232 makes any RS-232 compatible computer or terminal the complete amateur digital operating position. All decoding, signal processing and protocol software is on ROM. Only a simple terminal program (like those used with telephone modems) is required to interface the PK-232 with your computer.

*Obviously, we can fill in a system that you have already started. Or we can furnish a complete system to fit your needs and budget. For example, here's some suggestions for the amateur just entering the exciting field of data communications, or: for the amateur who wants the best available.*



**NO. 1** For the fun (and very affordable) mode, VHF Packet, AEA PK-88 with personal mailbox, 8K programmable memory and TCP-1P compatibility. For serious 20 M world-wide DXing on Packet, 200 or 600 Hz shift...add the superb HAL ST-7000.

**NO. 2...top of the line!** The HAL ST-8000 or HAL ST-6000 and AEA's PK-232...the winning combination. You can't do better for all-mode, all-band enjoyment of hi-speed data communications.

**If you have any questions concerning these units, or would like to discuss your requirements with a knowledgeable specialist, please call and ask for George Sanso, AB6A. We also carry a large selection of excellent commercial products for data communications and emergency systems as well as a complete inventory of amateur equipment and linear power amplifiers.**



# Henry Radio

2050 S. BUNDY DR. • LOS ANGELES, CA 90025 • (213) 820-1234  
Toll free order number: (800) 877-7979 TELEX: 67-3625(Henradio) FAX (213) 826-7790

# KENWOOD

...pacesetter in Amateur Radio

NEW!

## Affordable DX-ing!

### TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. (Receiver specifications guaranteed from 500 kHz to 30 MHz.) Modifiable for HF MARS operation. (Permit required).
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.



- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

#### Optional Accessories:

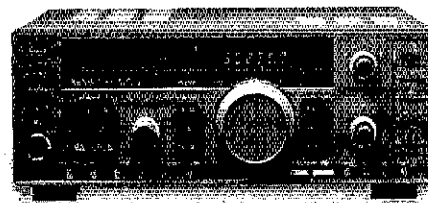
- **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands)
- **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** desk mics.
- **PG-2S** extra DC cable • **PS-430** power supply
- **SP-41/SP-50B** mobile speakers • **SP-430** external speaker • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit
- **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.



### TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamp for 6 and 10 meter band.



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

## KENWOOD

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

ICOM

IC-901 FM Mobile

**SPEAKER**  
May be mounted on sun visor.

**REMOTE CONTROL HEAD**  
May be mounted on dash and can be taken when you leave your car. Large LCD readout displays main and sub band frequencies, S/Rf units, volume and squelch settings.

**OPTION 1**

**BAND UNITS**  
Can be installed in your trunk.  
Optional Band Units include:  
• 10 W/10 meters • 25 W/220MHz  
• 10 W/6 meters • 10 W/1.2GHz  
• 2 meter/SSB/CW • 440MHz/SSB/CW • Broadband Receiver  
Select band units according to your interests. Even work OSCAR satellite mobiles!

**INTERFACE UNIT A**  
Installs under seat.

# THE WORLD'S MOST VERSATILE MOBILE

## ICOM'S NEW IC-901 OFFERS THREE EASY-TO-OPERATE TRANSCEIVER CONFIGURATIONS

The IC-901 can be (1) field-combined as a fully separated and fiber optic-linked system with multiple trunk-located band units, (2) a single-cabinet transceiver for dashmounting or (3) a remote-controlled unit for underseat installation.

### OPTION 2

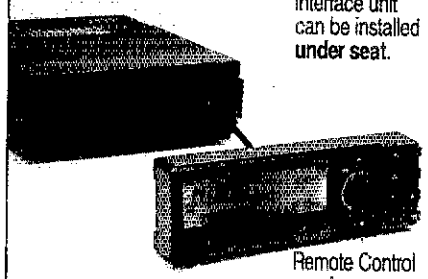
Control head is installed directly to the interface unit, making one compact unit.



Entire unit may be mounted in dash.

### OPTION 3

Dual band and interface unit can be installed under seat.



Remote Control on visor.

The IC-901 is supplied with 50 watts 2-meter and 35 watts 440MHz FM band units covering 138-174MHz Rx and 140-150MHz Tx plus 440-450MHz Rx/Tx. Adding more band units is a snap. They install easily out-of-sight in your trunk for security!

**Outstanding Features Include:** Full duplex operation, simultaneous dual band reception, ten memories per band, program-

mable band and memory scanning with skip function, any Tx offset, and much more.

The IC-901 also features a clever new **DTMF Calling System** which silently monitors a busy frequency or repeater for stations calling you. Squelch automatically opens when a signal with the same DTMF code you present is received.

**Optional Pager Function.** When activated, your IC-901 transmits a six-digit DTMF code to call others. Its last three digits identify you as the calling station.

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004  
Customer Service Hotline (206) 454-7619  
3150 Premier Drive, Suite 128, Irving, TX 75063  
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349  
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ICOM  
First in Communications

# QST

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## OUR COVER

This month's cover celebrates the sixties. The December 1960 cover was done by Harry Hick, who produced League artwork and circuit diagrams for six decades; OSCAR I sent HI on 2 meters; the Life Membership program began in 1967; ham radio was honored on a postage stamp; members' contributions built a new HQ building; and SSB transceivers became the rage.

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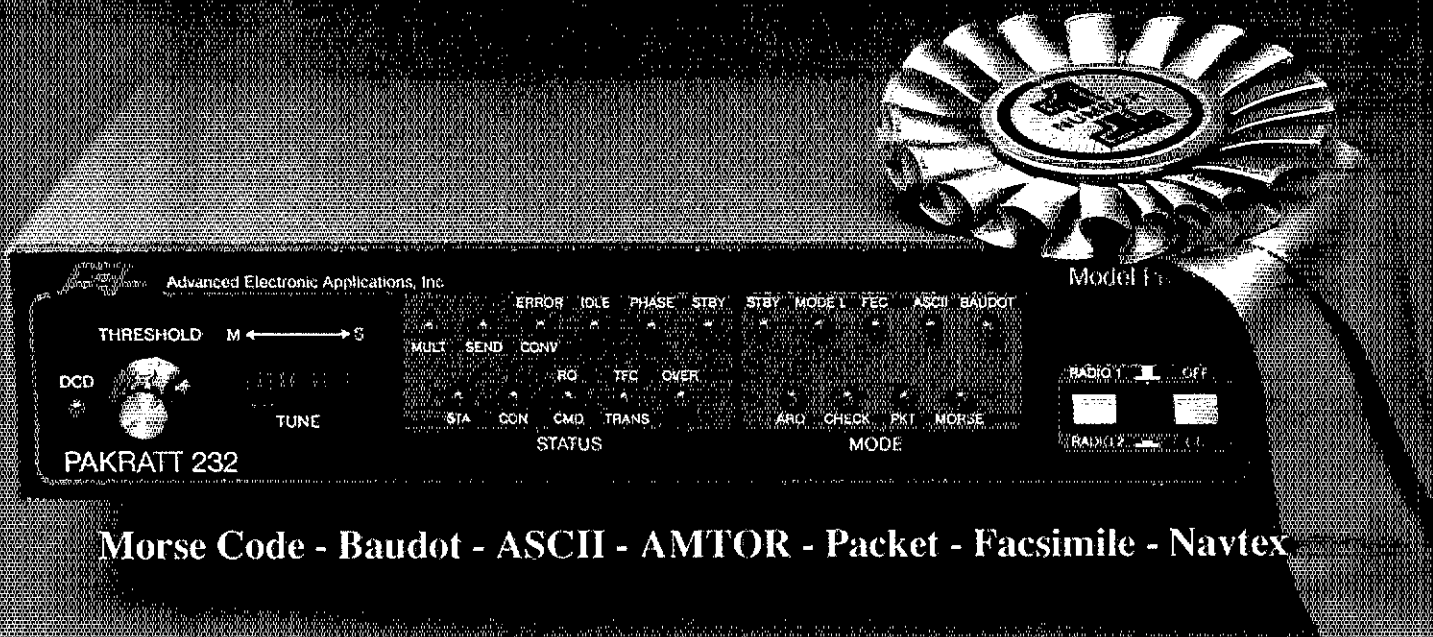
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Others May Try to Imitate, But...

# Only One Can Be The Best



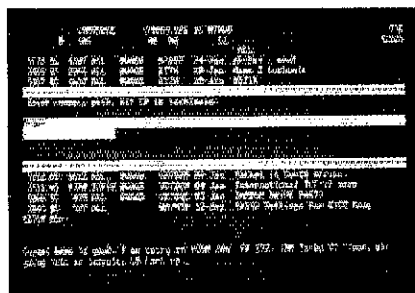
Morse Code - Baudot - ASCII - AMTOR - Packet - Facsimile - Navtex

It's a lesson you learn very early in life. Many can be good, some may be better, but only one can be the best. The PK-232 is the best multi-mode data controller you can buy.

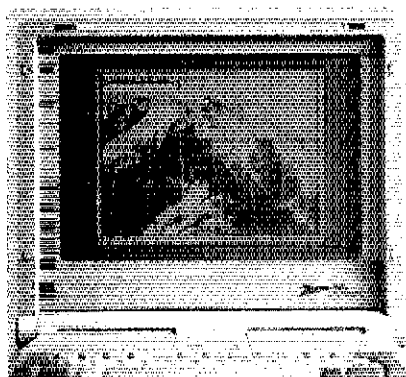
## 1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can receive seven digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM<sup>tm</sup>) feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

## 2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5 1/4" disk and the Commodore programs are plug-in ROM cartridges.

## 3 Proven Winner

No matter what computer or terminal you plan to use, the PK-232 is the best choice for a multi-mode data controller. Over 20,000 amateurs around the world have on-air tested the PK-232 for you. They, along with most major U.S. amateur magazines, have reviewed the PK-232 and found it to be a good value and excellent addition to the ham station.

No other multi-mode controller offers the features and performance of the PK-232. Don't be fooled by imitations. Ask your friends, or call the local amateur radio store. We're confident the PK-232 reputation will convince you that it's time to order your very own PK-232.

Call an authorized AEA dealer today. You deserve the best you can buy, you deserve the PK-232.

**Advanced Electronic Applications, Inc.**

P.O. Box C-2160  
Lynnwood, WA 98036  
206-775-7373

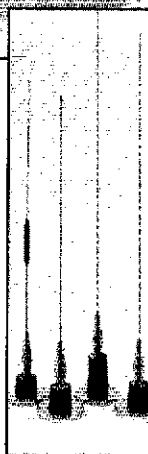
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# Tuned To The New World Of Amateur Radio

**From Novice to Extra Class  
Cushcraft has the antenna  
you need.**

Cushcraft offers high performance antennas to make every phase of your ham radio activity more satisfying. We have been creating innovative and exciting new products for more than 35 years. Call or write for a free copy of our full line antenna and accessory catalog or see your local dealer.



**HF TRIBAND BEAM A3.** The most popular compact 10, 15, 20 meter beam. A4S. A high performance 18' long wide-band beam with all stainless steel hardware. 40 meter add on kits for each



**CUSHCRAFT/SIGNALS.** magnetic mount mobile for 10 meters. An ideal companion to the new 10 meter multi mode rigs. Model CS28M.

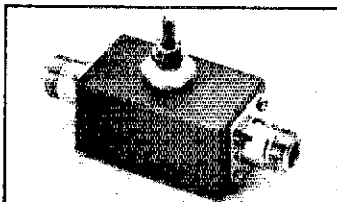
**APS VERTICAL.** Covering 10, 12, 15, 17, 20, 30, 40, 80 meters. Great choice for Novice to Extra class.

**BOOMERS.** The contest winners and distance record holders. Computer enhanced design for better gain, pattern and strength. VHF and UHF models for SSB, FM and other activities.

**RINGO HANGER II.** Still the world's favorite 2 meter, 70 cm or 220 MHz omni antenna. with more gain. A must for your FM or packet station.

**FAST ACTION GAS TUBE LIGHTNING ARRESTERS.** Protect your valuable radio equipment. High and low power models with SO-239 or N connectors.

**NEW 10, 15, 20 MHz ROTATABLE DIPOLE.** Mounts easily on the same mast as your tribander or other antennas. Bi-directional pattern gives excellent performance. Model D3W.



**NEW 10 METER 3 ELEMENT** for the novice, technician or any ham who wants more gain with a good front to back ratio. Model TEN-3



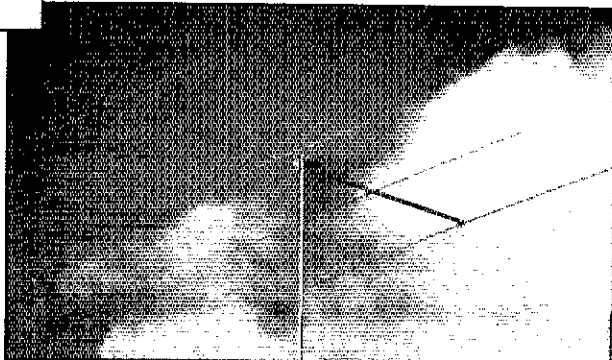
**NEW 10 HALF WAVE 10, 12, 15, 17, 20 METER VERTICAL.** Amazing DX performance in a small space without ground radials. Includes a solid state broadband impedance matching network. Model R5.

**SKYWALKER MONOBAND.** 10, 12, 15 and 20 meter Yagls for more contacts, less waiting and a better signal. Preferred by contesters and DX-Peditors.

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AVAILABLE THROUGH DEALERS WORLDWIDE

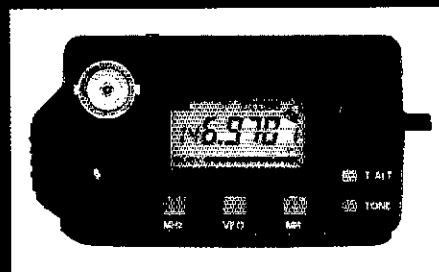


# KENWOOD

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TH-55AT  
1200 MHz  
Here Now!

## Compact Breakthrough!



### TH-25AT/45AT

#### New Pocket Portable Transceivers

The all-new TH-25 Series of pocket transceivers is here! Wide-band frequency coverage, LCD display, 5 watt option, plus...

- Frequency coverage: **TH-25AT:** 141-163 MHz (Rx); 144-148 MHz (Tx). (Modifiable for MARS/CAP Permits required.)  
**TH-45AT:** 438-450 MHz.
- Automatic Power Control (APC) circuit for reliable RF output and final protection.
- 14 memories: two for **any** "odd split" (5 kHz steps).
- Automatic offset selection (TH-25AT).
- 5 Watts from 12 VDC or PB-8 battery pack.
- Large multi-function LCD display.
- Rotary dial selects memory, frequency, CTCSS and scan direction.
- T-ALERT for quiet monitoring. Tone Alert beeps when squelch is opened.
- Band scan and memory scan.
- Automatic "power off" circuit.
- Water resistant.
- CTCSS encoder / decoder optional (TSU-6).
- **Supplied accessories:** StubbyDuk, PB-6 battery pack for 2.5 watts output, wall charger, belt hook, wrist strap, water resistant dust caps.



#### Optional accessories:

- PB-5 7.2 V, 200 mAh NiCd pack for 2.5 W output • PB-6 7.2 V, 600 mAh NiCd pack • PB-7 7.2 V, 1100 mAh NiCd pack • PB-8 12 V, 600 mAh NiCd for 5 W output • PB-9 7.2 V, 600 mAh NiCd with built-in charger • BC-10 Compact charger • BC-11 Rapid charger • BT-6 AAA battery case • DC-1/PG-2V DC adapter • HMC-2 Headset with VOX and PTT • SC-14, 15, 16 Soft cases • SMC-30/31 Speaker mics. • TSU-6 CTCSS decode unit • WR-1 Water resistant bag

# KENWOOD

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

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



# KENWOOD

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3 Choices  
6 W/45 W/25 W

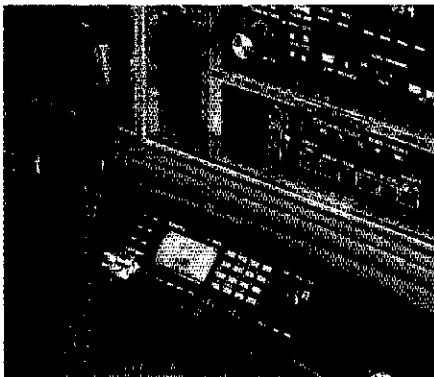
## Three Choices for 2m!

### TM-2570A/2550A/2530A

#### Feature-packed 2m FM transceivers

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

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



- New 5-way adjustable mounting system
- Automatic repeater offset selection—**another Kenwood exclusive!**
- Direct keyboard frequency entry
- Front panel programmable 38-tone CTCSS encoder **includes** 97.4 Hz (optional)

- Big multi-color LCD and back-lit controls for excellent visibility

- The TM-3530A is a 25 watt version covering 220-225 MHz. The first full featured 220 MHz rig!

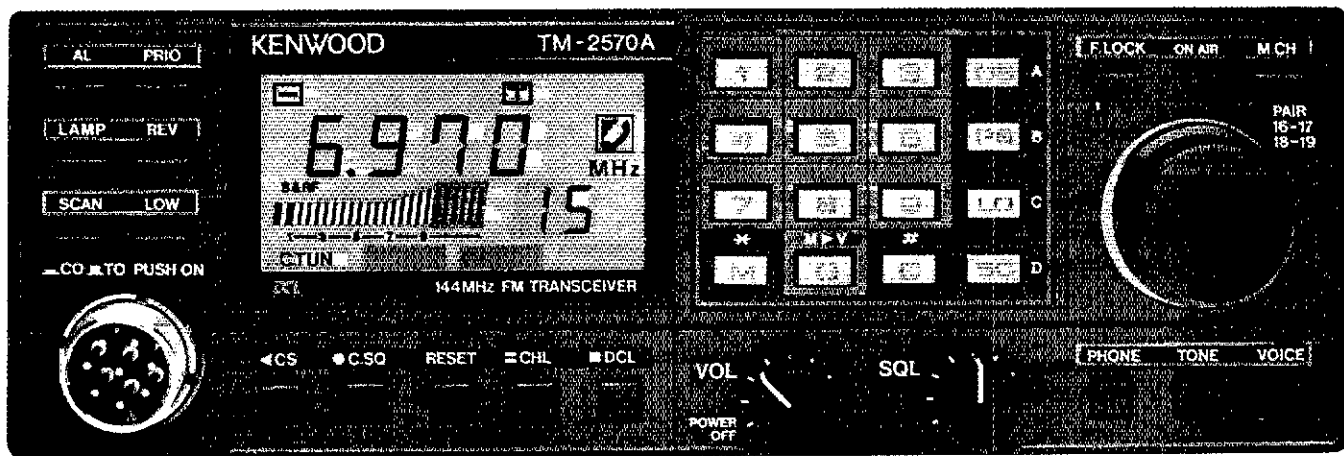


#### Introducing... Digital Channel Link

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

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

#### Actual size front panel



#### Optional Accessories

- TU-7 38-tone CTCSS encoder
- MU-1 DCL modem unit
- VS-1 voice synthesizer
- PG-2N extra DC cable
- PG-3B DC line noise filter
- MB-10 extra mobile bracket
- CD-10 call sign display
- PS-430 DC power supply for TM-2550A/2530A/3530A

- PS-50 DC power supply for TM-2570A
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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 1986. 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.

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## "It Seems to Us ..."

### Disappointed, but Not Surprised

Following the FCC 220-MHz reallocation decision of last August 4, ARRL and some 700 individual amateurs and organizations filed petitions asking that the Commission reconsider its action. The League requested the opportunity for oral argument before the Commissioners *en banc* so they could, as a group, hear the case for maintaining the amateur allocation—something that had never occurred during the entire history of the proceeding. Dozens of members of Congress expressed to the FCC their concern that the reallocation would hurt the nation's volunteer emergency and public-service communications capabilities. A Congressional subcommittee even conducted a hearing, on May 11, to delve into the process used by the Commission in its decision-making on this issue. The subcommittee heard criticism of the Commission's processes not only from League representatives, but also from a representative of the Secretary of Defense.

On June 7, the Subcommittee Chairman, Rep Bob Wise of West Virginia, wrote to FCC Chairman Dennis Patrick to urge the Commission to consider four possible scenarios for 216-225 MHz that would protect the essential interests of all parties and to express his desire "that the Commission make sure that every possible compromise solution is considered before it takes action on the pending petitions for reconsideration."

On June 15, a scant five weeks after the hearing, the FCC met to announce what effect all of this had had.

The answer: none whatever.

None whatever, despite evidence that came out at the hearing that the FCC had no reliable data on amateur occupancy of the 220-MHz band; that it had ignored what information it did have on land-mobile channel loading in other bands; that it misunderstood the relationship between the Amateur Radio Service and the National Communications System; and that it had underestimated the cost to amateurs of having to relocate to new frequencies.

At the hearing, FCC Chief Engineer Thomas Stanley had admitted that of the three petitions the Commission had used to initiate the Docket 87-14 proceeding, only one had sought 220-222 MHz for land mobile and another had specifically requested that 220-222 MHz *not* be reallocated. He had acknowledged that the amateur allocation would be substantially reduced by going from 5 MHz to 3 MHz in width, even if the 3 MHz were primary and exclusive instead of secondary, because of the favorable sharing arrangement that has existed with the military radars that are primary in the band. And, he had further acknowledged that prior to the introduction of these radars for national defense, the full 5 MHz had been a primary amateur allocation.

The only acknowledgment by the Commission of the impact of its decision on radio amateurs was the suggestion that we might wish to ask for a separate, future proceeding to find some way of accommodating amateurs somewhere in the 216-220 MHz band on a secondary basis. But the burden of proof clearly would be upon us not only to demonstrate need (which shouldn't be

difficult), but also to demonstrate feasibility—that is, to show that our use of 216-220 MHz would be compatible with present and future uses of the band, and with the adjacent television channel 13. The obvious question is: If the FCC really did consider "every possible compromise solution," why was it unwilling to consider this one in the context of Docket 87-14, which deals with the entire band from 216 to 225 MHz? If the record of the proceeding is sufficient to justify the reallocation, why is it insufficient to deal with the issue of reaccommodation?

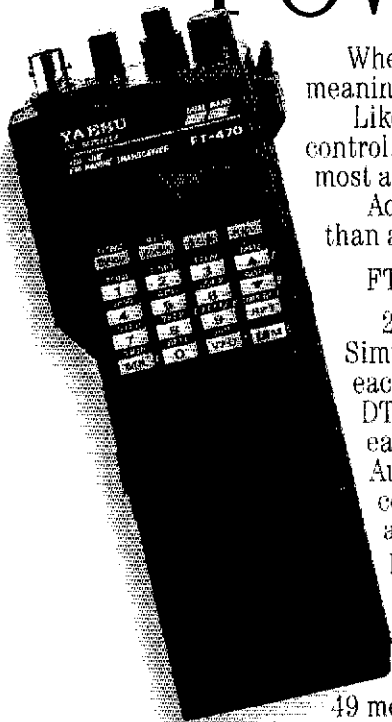
We are, of course, disappointed at the outcome. But we're not surprised. From the very start of Docket 87-14, it's been apparent that the present FCC has a fundamentally different view of the public interest than does the segment of that public that the League represents. Our best hope for favorable action on reconsideration had been that new Commissioners would be in place before the matter was revisited, but that was not to be.

With the denial of our petition for reconsideration, we have, in judicial jargon, "exhausted our administrative remedies." There is nothing more that can be done with the FCC on this matter. The next step is to petition the US Court of Appeals for the District of Columbia Circuit and request that the Court review the evidence of prejudicial FCC error. Demonstrating prejudicial error by an administrative agency isn't easy; the agency is presumed to be the expert, and you can't prevail unless you can show that the agency decision was arbitrary, capricious, or an abuse of its discretion—in other words, either based upon a faulty record or not supported by evidence in the record. (The agency is not obliged to act consistent with preponderance of the evidence in the record; however, the record must contain sufficient evidence to support the decision, and it must show that contrary evidence was given adequate consideration.) The Court will not substitute its judgment for that of the Commission. We believe there is ample evidence of prejudicial error in the record of Docket 87-14, particularly in that the Commission clearly did not consider all the evidence it had available, but it remains to be seen whether the Court of Appeals will agree. The petition for review will be filed in the next 60 days, but it may be several months, or even longer, before the Court rules.

In the meantime, the FCC will be developing new rules to implement the 220-222 MHz land mobile allocation. This in itself may be a lengthy proceeding, for there are a number of different ideas in the land mobile community as to how to put its 2-MHz windfall to best use. There is no reason for amateur operations at 220-222 MHz to be affected until land mobile assignments are made, so there is as yet no deadline by which we must move.

Thus concludes an unhappy chapter in FCC relations with its amateur licensees. We hope that the next chapter, which will be written with three and possibly four new Commissioners on board, will have a happier ending.—David Sumner, K1ZZ

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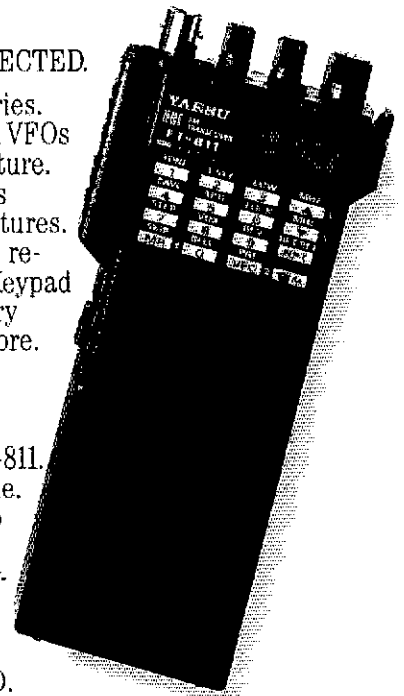
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**Unique casing:** The Southern Sierra Amateur Radio Society's 220-MHz repeater is housed in a culvert pipe which also serves as its tower. This installation has many innovative features, including an elevator for access to the equipment. Read more about this super-tough machine in this month's FM/RPT column on page 72.

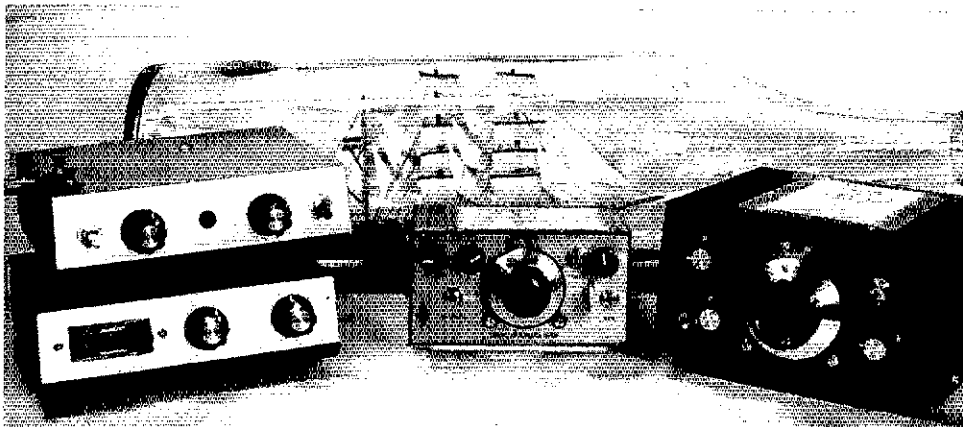


**Split that audio:** Doug Santoli, a cooperative education student from the University of Hartford, does final testing to an audio-splitting module for the new W1AW. The module, designed and built in the ARRL Lab, will take an audio signal and distribute it to as many as 16 transmitters. (photo KC1MP)

## Attention Photographers

Have a news item of an interesting twist concerning Amateur Radio, with a good color photograph? It just may be the ticket for inclusion in a future edition of Up Front. Here are some hints to improve your chances of getting that item in print.

- 1) Be sure the item is of interest to most hams.
- 2) Photographs must be in color. Transparencies reproduce best, and print enlargements should be at least 4 x 6. No Polaroids™, please.
- 3) Include all pertinent information and identify everyone in the photograph. Don't forget to include a photo credit.
- 4) Send all material to ARRL, Up Front Editor, 225 Main St, Newington, CT 06111.



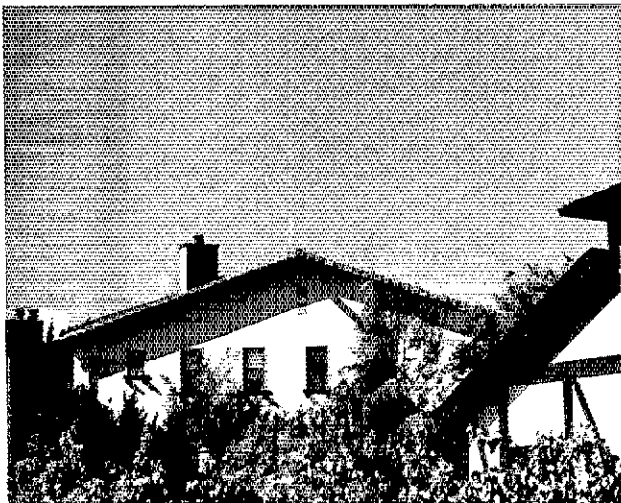
**Nimble fingers:** Doug Stivison, NR1A, of Upper Montclair, New Jersey, is used to building in tight spaces. Here, he's gathered some of his neat home-brew packaging: an antenna tuner, keyer, W7EL Optimized 40-Meter Transceiver (August 1980 QST) and 80-Meter Neophyte Receiver (February 1988 QST) with a built-in audio filter. In the background is one of NR1A's homemade ships in a bottle. (photo NR1A)



**Clowning around:** The '88 Field Day crew of the Northern Colorado Amateur Radio Club and Weld (County) Amateur Radio Society had fun raising this tower. (l-r) Dorothy Selders; Carey Bryan, NYØL; Dan Kuettel, KBØDTE; and George Lair, WDØGNE, dressed up, to the delight of the rest of the crew. If you have a shutterbug in your Field Day group, be sure to include a couple of photographs with your results.



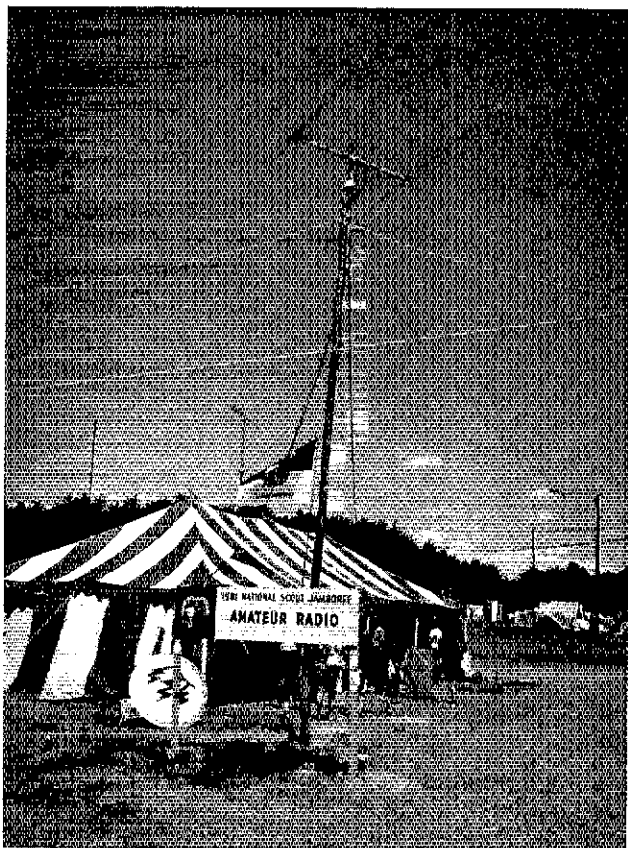
**Olympic operation:** These Korean Amateur Radio League members deserve a gold medal for their Olympian around-the-clock operation of 6K24SO. Located on the fourth floor of the Religious Center building in the Olympic Center, 6K24SO made special-event contacts and handled third-party traffic on behalf of the Olympic teams, totaling 18,328 QSOs. Rear (l-r) HL1AYE, HL1IRS, HL1ATL, HL1WP, HL2IFS, HL1LW, HL1IXS, HL1EJ, HL1IE. Front (l-r) HL1AAP, HL1AUX, HL1IY, HL9EP, HL1ACW. For more on Amateur Radio at the 24th Olympiad, see page 50.



**Can you spot the antenna in this picture?** Hint: It's directional, covers seven HF ham bands, provides gain over a dipole from 20 through 10 meters, and was designed and built by Dennis Monticelli, AE6C, of Fremont, California, who characterizes it as "the best antenna I've ever had." Still can't spot the antenna in this picture? Guess you'll just have to *build* the Versa Loop! The story begins on page 22. (photo AE6C)



**Fishing for counties:** Bill Parker, NG4W, reports that his first week of HF mobiling was "exhilarating" as he picked up a new country—Kuwait. He also interrupted his fishing trip on the county line of Tyrrell and Hyde Counties (North Carolina) long enough to give county hunters a crack at working those two rare ones. Bill uses a Yaesu FT-757GX into a Bugcatcher antenna. (photo Joyce Parker)



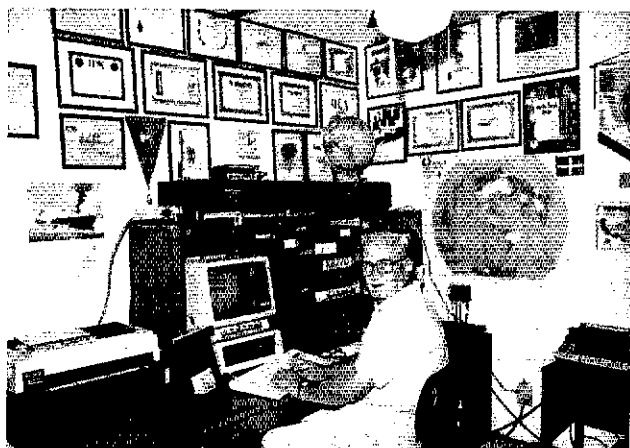
**Radio Scouting gets its week in the sun:** K2BSA/4 will operate on all bands and modes at the 1989 National Scout Jamboree at Fort A. P. Hill, Virginia, August 2-8. To find out how you can help K2BSA's mission to show off Amateur Radio to Scouts and visitors, check out K2NA's article beginning on page 47. (1981 Jamboree photo courtesy K2NA)



**Amateur TV?** You're dozing off as Reno, Nevada's KOLO TV-8 11 PM news credits roll by. You ask yourself, "Did I just see some call signs?" You sure did. KB7VT is Lawrence Vosper, active on all bands from Storey County, Nevada, and N6ECS is Harold Fisk, active on 2 meters, 1296 and above. Both are long-time employees of the station.

### Keep Up with the Sun

Have you ever pored over the QST propagation charts and asked yourself, "I wonder what the conditions are, *right now?*" Well, *now* you can—using the SEL BBS. What's that? Read the article by Dave Rosenthal, N6TST, starting on page 15.



**First ARRL RTTY Roundup:** George Wesley, KB2VO/4 pounded away at his keyboard to secure the first-place high-power spot in the Southern Florida Section. George had a score of 28,026, representing 346 QSOs and 81 multipliers. The January 1989 debut of the RTTY Roundup netted over 300 logs from 39 countries and 49 states and shows every indication of continuing as a popular event. The results will appear in next month's QST.



**Golden QCWA:** Chuck Dorian, W3JPT (r), receives his Quarter Century Wireless Association 50-year certificate from QCWA National President Leland Smith, W5KL, at the Association's annual banquet in Bethesda, Maryland. Chuck is the League's Associate Washington Area Coordinator. (photo K4EUX)

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# League Lines

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President Bush has nominated *Alfred Sikes, Sherrie Marshall and Andrew Barrett* to be Federal Communications Commissioners. Sikes will be FCC Chairman, taking the place of Dennis Patrick. They must now be confirmed by the Senate. More information on the new Commissioners will appear in the next month's Happenings column.

The first annual *Amateur Radio Public Awareness Day* will be held September 16. To make the general public more aware of the existence, purposes and benefits of Amateur Radio, clubs and individuals will set up and operate public displays across the nation in schools, libraries, town halls, parks, fairs and anywhere else an imaginative club can think of. Start planning your club's public exhibit now. League HQ can help. For tips on setting up your exhibit, check out the ARRL *Special Events Communications Manual*, available from ARRL HQ for \$5.00, plus \$2.50 shipping/handling. Upon request, HQ will also provide you with promotional brochures for distribution at your booth.

*Pekka Tarjanne* of Finland has been elected Secretary General of the International Telecommunication Union at the plenipotentiary conference held in Nice, France. On November 1, he will succeed Richard Butler who did not seek reelection. *Jean Jipguep* of Cameroon was reelected Deputy Secretary General. *Richard Kirby, WØLCT*, was reelected director of the CCIR (International Radio Consultative Committee).

To our readers with a discerning eye: You may notice a slight format change on your address label of next month's issue of *QST*. Our new computer system is expected to be fully operational, so printing of labels will be accomplished in half the time. During the coming months, we will explore the many cost-cutting and time-saving features our new system offers.

The *ARRL/VEC* has reached an all time high of 12,000 accredited Volunteer Examiners.

The *8th ARRL Computer Networking Conference* will be held in Colorado Springs, Colorado, at the Air Force Academy on Saturday, October 7. If you plan on presenting a paper, please contact Lori Weinberg at ARRL HQ for an author's package. Deadline for camera-ready papers is August 28, 1989.

We have been advised by Trans National Financial Services that, effective July 1, holders of the *ARRL MBNA MasterCard*® card who obtain cash advances or use access checks will be assessed a fee.

The FCC released the Report and Order completing the reorganization of *Part 97* of the FCC rules governing the Amateur Radio and Amateur-Satellite Services on June 9. The new rules will become effective September 1, 1989. Copies of the League's new edition of *The FCC Rule Book*, based on the reorganized rules, are expected to be available in August. The new edition will include the new Part 97 plus detailed information on rule interpretations. In the meantime, if you would like to obtain a copy of only the 36-page FCC Report and Order, one can be obtained by sending \$3.00 to Dept SR at HQ.

The *1988 ARRL Annual Report* is available from HQ for \$1.

With the recent station renovation, *WIAW QSL cards* also have a new look. ARRL staff members make an effort to see that WIAW is activated most weekend afternoons and some evenings. Check 28.480, 21.030, 18.130, 14.030 and 14.250 MHz.

*Vacationing in Canada?* If you're going to Canada this summer and want to take your rig, don't forget that the US and Canada share an automatic reciprocal operating agreement. This means that your FCC-issued license is good in Canada (and vice versa) without having to obtain a permit, as is the case with countries other than Canada. Carry your original FCC license and use your US call followed by a slant and the proper Canadian prefix, for example, KA4ABW/VE3...

Job opening at HQ! HQ has an immediate opening for the *Assistant Contest Manager*. The Assistant Contest Manager works with the Contest Manager in administering the League's contest program, including the scoring of logs, preparing results for *QST* and conducting the Special Events and Contest Corral columns in *QST*. Applicants should be thoroughly interested and knowledgeable in the League's varied contest program. An amateur license, PC familiarity and some writing skills preferred. Accuracy is a must. The starting salary \$16,042. For further information, contact Billy Lunt, KR1R at HQ.

*Job opening at ARRL HQ* for an Assistant Technical Editor. The Technical Department is seeking a licensed, experienced amateur with a BS degree in science or engineering or equivalent experience. Effective written and verbal communications ability required. Starting salary is \$26,000 annually. Contact Paul Pagel, N1FB, or Chuck Hutchinson, K8CH at HQ.



# NOAA's Space Environment Laboratory Public Computer Bulletin Board Service

Here's how you can find out about current radio-propagation conditions—and get a host of other information on what's happening in our surrounding environment.

By David A. Rosenthal, N6TST  
840 East Springer Ave  
Ridgecrest, CA 93555

I'm sure that few radio amateurs who own a home computer (or two—or three) would disagree that there's a significant challenge in trying to keep up with the seemingly infinite ways to put the computer to use. Finding an application that's worth the learning time is rewarding! Tapping into NOAA's Space Environment Laboratory (SEL) Public Computer Bulletin Board System in Boulder, Colorado—just a phone call away—is one such application. On line for more than two years now, this service provides you free access to timely and immediately useful information that can help you determine current global HF radio propagation conditions.

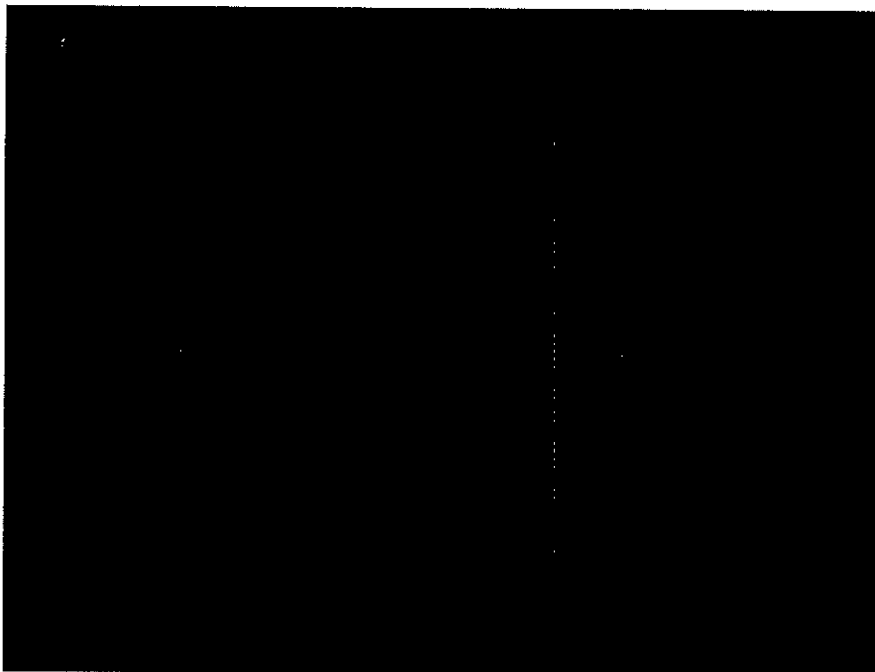
## What is the SEL?

The hub of a worldwide network of sensors based on the earth and in space, the SEL keeps track of conditions in the space environment immediately surrounding our planet. More specifically referred to as the "solar-terrestrial environment," phenomena monitored at the SEL are intimately connected with ionospheric radio propagation. One of the primary functions of the SEL is to report these conditions and make forecasts for the world's long-distance communicators.

In 1984, Howard Sargent, a space scientist with the SEL, came up with the idea of taking advantage of the explosion in the number of home computers in use by making some of his facilities' data available to the public. He and several others worked to determine what types of information would be most valuable to the greatest number of users, then offer it by way of a public BBS. After almost three years of preparation, Howard Sargent became *sysop* Howard Sargent when the BBS came on line on January 15, 1987.

## The SEL BBS HF Radio Propagation Reports

Of all the information available on this



BBS, the regularly updated HF Radio Propagation Reports are likely to be most useful to the greatest number of radio amateurs. Automatically downloaded from the SEL's mainframe system, these

bulletins represent some of the world's most timely indicators of what to expect from the ionosphere.

Filling about one 8½ × 11-inch page each, the HF Radio Propagation Reports

## ABOUT THE PHOTO

This picture was a frame from a 35-mm time-lapse movie taken through the Space Environment Laboratory's Solar Patrol Telescope on December 9, 1968. Whenever the sun is above the horizon, this telescope tracks it, taking regular photographs of solar features using the deep red light of hydrogen-alpha emissions (656.3-nanometer waves). The pictures are then sent to the Space Environment Services Center for evaluation.

Joe Sutorik, Chief Solar Observer, collaborated with student observer and mountaineer Galen McFadyen to carefully chart the sun's position as it set against the rugged Flatiron Mountains three miles west of the observatory. They determined when the sun would be centered in an accessible outcropping of rocks and, on the appropriate date, an exuberant McFadyen positioned himself so his full figure would be silhouetted.

Since then, this photograph has become a symbol of the Space Environment Laboratory and Boulder's contribution to the world's ever-growing knowledge of the sun. A black-and-white version of this picture is used for the SESC's weekly summary of solar-terrestrial activity, *The Preliminary Report and Forecast of Solar Geophysical Data*. (This publication is available for \$26 per year from: NOAA/ERL R/E/SE2, 325 Broadway, Boulder, CO 80303-3328.)—Dave Rosenthal, N6TST

you can access are intended to provide an overview of conditions for a three-day period beginning at 0600 hours on the current UTC day. These reports are based on the current state of the solar-terrestrial environment and *actual operational experience* during the time frame of interest. To date, no one but the SEL has ever publicly offered HF propagation data based on existing conditions and actual, regularly-reported user experience. If you've been using propagation predictions based on month-long projections of solar activity—such as those published in *QST*<sup>1</sup> or other Amateur Radio magazines—contacting the SEL BBS could add *several* new dimensions to your DX-related activities.

### How to Use the Propagation Reports

Table 1 contains a printout of a report downloaded from the BBS. This printout is an example of exactly what appears on your monitor screen: a four-part Primary HF Radio Propagation Report, issued at 0600 UTC that day, followed by a one-part Secondary Radio HF Propagation Report. These Secondary reports are updated at six-hour intervals, and the one you receive is the latest available.

#### Primary HF Radio Propagation Report Part I

See Tables 1 and 2. Contained in both the Primary and Secondary Reports, this portion summarizes HF propagation conditions experienced over a six-hour period, followed by a prediction of conditions for the next six hours. Primarily intended for Northern Hemisphere paths, Part I of the report breaks down this half of the planet into four longitude regions and five latitude zones. Propagation conditions and predictions for each of these 20 subregions are summarized by a two-character code consisting of a letter and a number. The letters correspond to the actual conditions in each subregion, and the numbers to the prediction for the next six hours.

<sup>1</sup>Notes appear on page 18.

Fig 1—Wide-angle view of the Space Environment Services Center (SESC) control room.

Table 1

### Printout of a SEL BBS Download

File iono downloaded at 06:31:35Z 06/19/89

PRIMARY HF RADIO PROPAGATION REPORT ISSUED AT 190600Z JUN 89.  
PART I. SUMMARY 190000Z TO 190600Z JUN 89/  
FORECAST 190600Z TO 191200Z JUN 89.

		QUADRANT							
		I		II		III		IV	
REGION	POLAR	0 TO 90W	90W TO 180	180 TO 90E	90E TO 0				
	POLAR	N5	N5	N5	N5				
	AURORAL	N4/P20	N4	N5	N5				
	MIDDLE	N6/P20	N7	N7	N7				
	LOW	N8	N8	N8	N8				
	EQUATORIAL	N7	N8	N8	N8				

PART II. GENERAL DESCRIPTION OF HF RADIO PROPAGATION CONDITIONS OBSERVED DURING THE 24 HOUR PERIOD ENDING 18/2400Z, AND FORECAST CONDITIONS FOR THE NEXT 24 HOURS. ALL LATITUDES EXPERIENCED GENERALLY NORMAL CONDITIONS. NO SIGNIFICANT AMOUNTS OF FADING, ABSORPTION OR MULTIPATHING WERE REPORTED.

FORECAST: SEVERE GEOMAGNETIC ACTIVITY IS FORECAST TO OCCUR DURING THE NEXT 24 HOURS. HENCE, DEGRADED CONDITIONS SHOULD BE EXPECTED IN AND AROUND THE AURORAL OVAL DURING THE NEXT 24 HOURS. ALL OTHER LATITUDES SHOULD EXPERIENCE GENERALLY NORMAL CONDITIONS. A POLAR CAP ABSORPTION EVENT IS ALSO POSSIBLE DURING THE NEXT 24 HOURS.

PART III. SUMMARY OF SOLAR FLARE INDUCED IONOSPHERIC DISTURBANCES WHICH MAY HAVE CAUSED SHORT WAVE FADES IN THE SUNLIT HEMISPHERE DURING THE 24 HOUR PERIOD ENDING 18/2400Z JUN 89 . . .

START	END	CONFIRMED	FREQS	AFFECTED
1901Z	1918Z	NO		UNKN
2341Z	2350Z	NO		UNKN

PROBABILITY FOR THE NEXT 24 HOURS . . . . STRONG

PART IV. OBSERVED/FORECAST 10.7 CM FLUX AND K/AP. THE OBSERVED 10.7 CM FLUX FOR 18 JUN 89 WAS 260. THE FORECAST 10.7 CM FLUX FOR 19, 20, AND 21 JUN 89 ARE 245, 235, AND 220. THE OBSERVED K/AP VALUE FOR 18 JUN 89 WAS 02/09. THE FORECAST K/AP VALUES FOR 19, 20, AND 21 JUN 89 ARE 06/65, 04/30, AND 04/25.  
EOF EOF EOF EOF EOF

NNNN

File iono downloaded at 12:30:41Z 06/19/89

SECONDARY HF RADIO PROPAGATION REPORT ISSUED AT 191200Z JUN 89.  
PART I. SUMMARY 190600Z TO 191200Z JUN 89/  
FORECAST 191200Z TO 191800Z JUN 89.

		QUADRANT							
		I		II		III		IV	
REGION	POLAR	0 TO 90W	90W TO 180	180 TO 90E	90E TO 0				
	POLAR	N5/P20	N5/P25	N5/P20	N5/P20				
	AURORAL	N5/P25	N4/P30	N4/P25	N5				
	MIDDLE	N8	N7/P20	N7	N8				
	LOW	N8	N8	N8	N8				
	EQUATORIAL	N8	N7	N7	N8				

NNNN



**Table 2**  
**HF Radio Propagation Report Part I Terminology**

Longitude Sector	Latitude Zone
I 0 to 90° West	Polar more than 70°
II 90 to 180° West	Auroral 55 to 70°
III 180 to 90° East	Middle 30 to 55°
IV 90 to 0° East	Low 10 to 30°
	Equatorial 0 to 10°

**Codes for Actual Propagation Conditions Experienced**

Letter Condition	Letter Condition	Letter Condition
N Normal	U Fair	W Poor

**Note:** Actual propagation condition codes indicate conditions relative to those that would normally be experienced in that sector based on latitude, local time and phase of the sunspot cycle.

**Forecast Condition Codes**

1—Useless	4—Poor to Fair	7—Good
2—Very Poor	5—Fair	8—Very Good
3—Poor	6—Fair to Good	9—Excellent

Three letters—N, U and W—represent relative indicators corresponding to that subregion's actual propagation conditions as compared to what is normally experienced during that time of day, latitude, season, and phase of the sunspot cycle. The letters represent normal (N), fair (U) and poor (W) propagation conditions, respectively. Numerical predictive indicators range from 1 through 9, corresponding to "useless" through "excellent." An absolute scale, the prediction numbers given signify expected conditions which take into account maximum usable frequencies (MUFs), lowest usable frequencies (LUFs), and other phenomena like spread F-layer effects and sporadic E-layer propagation. See Table 2 for a summary of specific Part I letter- and numerical-designator meanings.

Sometimes included with the numerical six-hour predictions are any expected MUF deviations, if they are projected to be 20% or more of the seasonal means for the subregion. Appended as either a "/P" or "/M" followed by a number, they represent "Plus" or "Minus" frequency percentages of the MUF corresponding to enhancements or depressions respectively. For example, in Part I of the Primary HF Propagation Report shown, a 20% MUF enhancement (/P20) is predicted in the Middle latitudes of Quadrant I.

Recommended or specific MUFs along a given path are not addressed in these HF Radio Propagation reports. The reports are intended to be used in conjunction with your own data, such as the propagation prediction charts in QST's "How's DX?" column.

**Part II**

This is a plain-language discussion of solar-terrestrial conditions and their effects on propagation. This portion covers conditions observed on the previous UTC day, and contains a forecast for the remainder of the current UTC day.

**Part III**

Contained here is a summary of solar-

flare-caused effects on the ionosphere which have, or might have, caused disruptions of HF communications during the previous UTC day. Known as *short wave fades* (SWFs), this type of disturbance is generally brought about by large outbursts of solar X-rays that cause dramatic increases in HF energy absorption by the ionosphere. Specific SWF data is given, if available, followed by a plain-language forecast for the remainder of the current UTC day. Four standard forecast terms are used that characterize SWF probabilities (see Table 3).

**Part IV**

Data useful to plan communications over the three-day forecast period is summarized here. Included are numerical indexes based on observations and predictions of solar flux (solar radio intensity measurements made by radio telescopes at a frequency of 2800 MHz) as well as indications of the degree of sun-caused disturbances to the earth's magnetic field. Explanations of these indexes, including further details on their role in helping to understand ionospheric radio propagation can be found in the Wave Propagation chapters of *The ARRL Handbook* and *The ARRL Antenna Book*.

**Secondary HF Radio Propagation Report Part I**

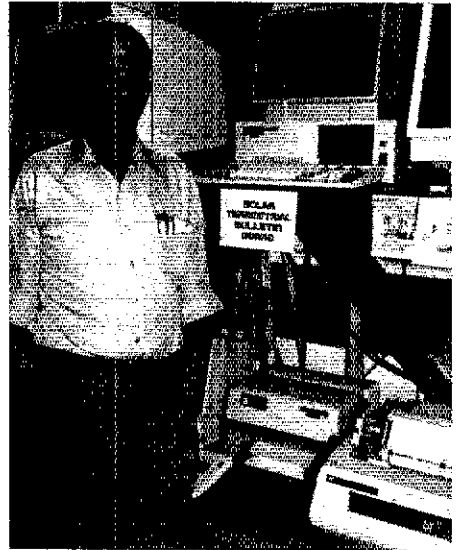
The only part contained in the Secondary Report, these data are identical in format to Part I of the Primary Report except that the information has been updated to reflect more current conditions. Issued at 0000, 0600, 1200, and 1800 UTC, the Secondary HF Radio Propagation Report you receive is automatically downloaded to the SEL BBS about 30 minutes after it is produced.

**More, More and More!**

The HF Propagation Reports are only one aspect of what this BBS can deliver. Users more intimately interested in what the sun is up to can request the Solar

**Table 3**  
**HF Radio Propagation Report Part III Solar Activity Probability Terms**

Probability	Descriptive Word
Less than or equal to 1%	Nil
Between 2 and 20%	Slight
Between 20 and 50%	Moderate
50% or greater	Strong



**Fig 2—**Sysop Howard Sargent and the SEL's BBS computer. The dedicated machine is equipped with a 30-Mbyte hard disk and 256 kbytes of RAM. Howard's locally produced BBS source code occupies less than 100 kbytes, and the user data base (approximately 270 kbytes) is backed up weekly on floppy disks. So far, there are over 2000 registered users with more than 18,000 calls logged on the board. As part of a planned system upgrade, this computer will soon be replaced by two more-capable machines (see text).

**Local Packeteers Needed to Help Distribute BBS Data**

Howard Sargent, sysop of the SEL BBS, is looking for assistance from local radio amateurs to help get bulletin-board information onto packet-radio nets. Volunteers are needed to regularly download files from the SEL mainframe computer and assist in setting up methods to make the data available to as many other amateurs as possible.

If you'd like to help and you live in the Denver area (where it's a local call to the 497 exchange in Boulder), give Howard a call to discuss possibilities. His telephone number is 497-3697. Or, you can drop him a line at the Space Environment Services Center, NOAA/ERL R/E/SE2, 325 Broadway, Boulder, CO 80303.—*Dave Rosenthal, N6TST*

## Getting On Line

The Space Environment Laboratory Public Bulletin Board Service is free and operates 24 hours a day, 7 days a week. The telephone number is 303-497-5000. The board's communications parameters are: 300/1200 bauds, 8 bits per character, no parity, and 1 stop bit. The system uses the Bell modem standard. (If you contact it from outside the US, be sure to check your modem's operations manual first to ensure compatibility.)

The BBS is menu-driven and will lead you to its main feature selection menu with a series of instructions. Initial questions on the screen concerning line feeds, etc, can be answered with a carriage return if you're in doubt on how to respond; the default values are shown and are compatible with most home computers. Once registered, users are allotted 15 minutes on line per call—more than enough time for most operations.

When contacting the board the first couple of times, you may find it useful to download the files of interest under the H)elp Menu and, after reading them, to contact the board again for specific information. The HF Radio Propagation Report, Solar & Geophysical Activity Report, and MINIMUF 3.5 MUF Information Help Files should prove most useful initially. But also try to download the rest of the Help files in subsequent sessions. There is a tremendous amount of useful information available on this BBS and, best of all, it—like the state of the solar-terrestrial environment—is constantly changing.

—Dave Rosenthal, N6TST

Report, a daily summary of solar and geophysical activity plus a forecast for the next three days. Then, there are several other reports that examine solar and geophysical data in far greater detail. If you're looking for trends or keeping individual records, you'll find short-term historical data summaries here. All considered, this data will warm the heart of even the most serious ionospheric propagation enthusiast!

Available, too, is an MUF-prediction routine that takes user-supplied geographical endpoint coordinates and uses prevailing solar data to project a MUF for that specific path every hour for a 24-hour period. This program also calculates great circle distance and heading for you.

Amateur MUF-program enthusiasts might recognize this particular BBS feature as being derived from a public domain program called MINIMUF 3.5 (originally published in *QST*).<sup>2</sup> MINIMUF is an experimental offering by the BBS and will soon be augmented by several other programs as sysop Howard Sargent gets them on line.



Fig 3—Solar Technician Carol Keifert makes an entry in the Geomagnetic Event log in the Space Environment Services Center (SESC) control room. The SESC, the operational arm of the Space Environment Laboratory, is the hub for solar-terrestrial data collection and dissemination for the Western Hemisphere. Over 1000 measurements from all over—and above—the world are continuously routed through the SESC's data-processing system. The monitors in the background can be programmed to display whatever information the SESC's forecasters choose.

Speaking of future plans, this trial of a public BBS has been so successful that substantial expansion plans are underway. The record-breaking solar activity during March of this year broke BBS records for user activity as well as saturating the system with over 120 calls per day.

Upgrade plans begin with two larger, faster, more capable computers replacing the one presently on line. The standby machine will be used for system development and serve as a preprocessor, preparing and formatting data before downloading it to the primary computer. The new system will also possess multitasking capabilities with additional data bases available simultaneously to other users such as solar researchers. Meanwhile, six telephone lines will be installed to serve the 2000-plus registered users.

A number of handy new products for the more serious DXing amateur are also slated to come on line as part of the upgrade. Regularly updated critical frequency information from one (and perhaps more) mid-northern latitude ionospheric sounding stations will be available, as will total-electron-density data. These are two important indicators of the degree of ionization present over a portion of the Earth.

Another soon-to-arrive addition is an artificial intelligence subroutine which, when a user runs the MUF program, evaluates the current solar-terrestrial conditions for the selected path and generates a specific advisory. This is a plain-language summary of how actual conditions such as shortwave fades or geomagnetic storms might affect communications. Other plans include the possibility of making available to users a collection of free public domain MUF-predicting programs. Here, via the XMODEM protocol, you'll be able to download and try as many of the availa-

ble propagation programs as you choose.

For the radio amateur interested in making the most of everchanging ionospheric propagation conditions, the SEL BBS is the way to go. There is probably no better, more efficient method of taking advantage of up-to-date information to enhance the performance of longer-term published propagation projections. All you have to do is dial up the BBS (see the sidebar, "Getting On Line"), look around, and see for yourself.

Give this handy service a try—and don't forget to punch up the "C)omments to Sysop" selection to tell Howard Sargent what you think of it. Also, let him know you read about it in *QST*!

### Notes

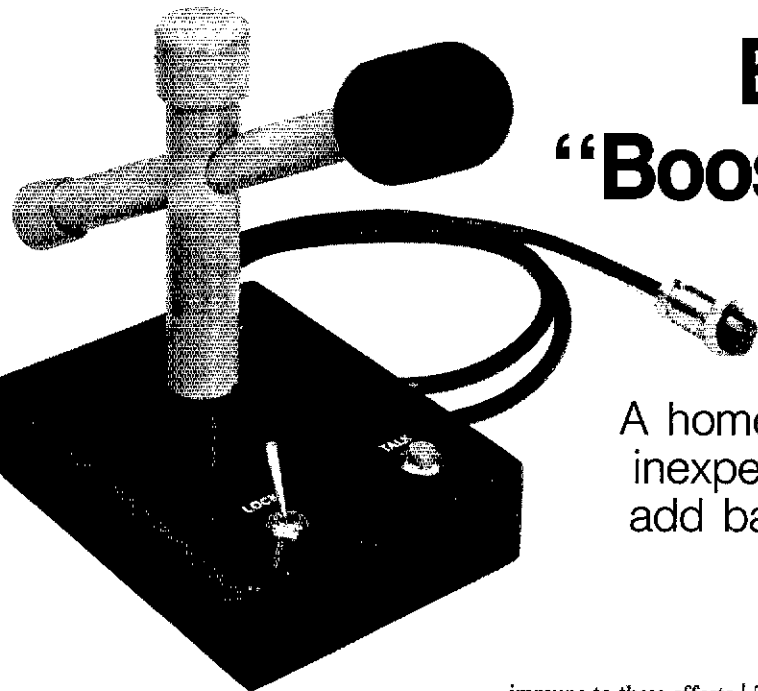
<sup>1</sup>See E. Pocock, "Propagation Forecasting During Solar Cycle 22," *QST*, Jun 1989, pp 18-20.

<sup>2</sup>R. Rose, "MINIMUF: A Simplified MUF-Prediction Program for Microcomputers," *QST*, Dec 1982, pp 36-38.

*Dave Rosenthal, N6TST, earned his Technician license in 1988. In April of this year, he upgraded to Advanced. Dave has been involved in HF-related activities for more than 20 years. Dave holds a BS degree in Physics from California State University; he is an electronics engineer and a military reserve pilot. Dave is also an experienced science broadcast journalist with his material either published or on the air since 1982. He is currently the North American Science Correspondent for the English Service of Radio Netherlands and produces science news for Cable News Network.*

*Recently, Dave visited the NOAA Space Environment Laboratory in Boulder, Colorado, and subsequently produced A User's Guide to the Space Environment Services Center Geophysical Alert Broadcasts. His publication has been adopted for official use by NOAA. (To obtain your free copy of this guide (NOAA Technical Memorandum ERL SEL-79), contact NOAA/ERL/SEL-R/E/SE2, 325 Broadway, Boulder, CO 80303.)*

# Build a Low-Cost "Booster" Microphone



A home-constructed desk microphone is inexpensive and easy to build. You can add bass and treble boost by mounting the electronics in the base.

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

**I**s your voice, like mine, too bassy for effective communications? Or perhaps you have a voice that has lots of highs, but is sorely lacking in low-frequency components. In either event, it is productive to include a bass and treble boost circuit in the transmitter audio channel, or in the home-station mike stand. This article details a mike-stand circuit and shows how to build an entire desk mike from readily available materials.

## The Nature of Human Voices and Microphones

Some commercial mikes aren't suitable for communication-quality audio. They may be too bassy or they may accentuate only the high-frequency voice sounds. The audio channel in your transmitter may not be designed to amplify, equally, the desired voice range from, say, 300 to 2500 Hz. This is the range that has long been considered the ideal for voice communications in terms of effectively breaking through interference and noise during weak-signal QSOs.

A characteristically high or low voice can render an otherwise Q5 signal ineffective when the going gets rough. It is useful, therefore, to have a bass and treble boost circuit in the mike line to roll off or accentuate the lows or highs in our voice signals. A circuit of this type is also useful for mikes with limited frequency response, or if the mike amplifier in the transmitter is suffering from inadequate frequency response. The boost circuits can provide "presence" for your voice signal, and this may enhance the readability of your signal without degrading the speech quality.

## The Boost Circuit

Fig 1 shows the circuit I use in my home-made mike. An important feature is its RF suppression. A number of amplified mikes are subject to RFI and require the addition of RF chokes and bypass capacitors to make them

immune to these effects.<sup>1</sup> The Fig 1 circuit includes these devices (C2, C4, C13, C15, C16 and RFC1). These suppressors help prevent stray RF energy from disrupting the performance of the mike amplifier and booster. They also aid in keeping stray RF energy (picked up by the mike cord) from entering the mike amplifier in the transmitter. These components may be added to commercial mikes if you have a problem with RFI in the audio circuit.

Q1 is an audio preamplifier that is biased for low current. This ensures long life for BT1. Total current drain for the circuit in Fig 1 is 2.25 mA, inclusive of the mike-element current (1 mA). A 9-V transistor-radio battery should last almost as long as its normal shelf life. A low-cost Radio Shack<sup>®</sup> electret mike element is used.

Overall maximum gain for the Fig 1 circuit is 28 dB. Although this is far too much gain for most mikes and rigs, I provided the gain for dealing with low-output mikes. The output level of the system can be set by adjusting R15. I also wanted plenty of available gain to permit the circuit to be integrated into home-made SSB excitors. It can be used in place of a conventional mike amplifier circuit if the boost feature is desired. In many instances, the electret mike element will yield ample output for direct connection to your transceiver. You may want to build this mike and eliminate the electronics if you don't care for the boost feature.

The boost circuit in the center of Fig 1 (R7, R11 and related components) has been around for decades. I used it in hi-fi vacuum-tube audio amplifiers many years ago. It is still being used in some modern stereo amplifiers that don't include graphic equalizers. The potentiometers have no effect at the audio midrange (roughly 500 to 1000 Hz). Fig 2 shows how the circuit boosts frequencies above and below the flat range.

U1 provides additional audio gain and is a part of the boost circuit. A word of caution here: I learned that BIFET op amps, such as

the TL080, tend to self-oscillate in this circuit. Generic 741 op amps (several brands tried) work fine—and there is no sign of instability, provided C15 is used from pin 3 to ground.

An electret mike needs an operating voltage (4.5 V is considered optimum), although any dc voltage from 1.5 to 10 is considered satisfactory. R1 of Fig 1 sets the mike impedance at 1 k $\Omega$  and allows the required dc voltage to reach the mike. R1 isolates the audio energy from the dc supply line.

If you desire less overall channel gain, you can replace C3 with a lower value. However, the lower the C3 value, the less gain there will be at low frequencies. This is a matter of choice, but a value as low as 0.1  $\mu$ F may be used when reducing the stage gain. A good compromise value is 1  $\mu$ F if you have a bassy voice and do not need maximum bass boost.

C4 has the opposite effect of C3—it rolls off the high frequencies. Its value may be chosen to suit your specific needs. The larger the C4 value, the greater the high-frequency attenuation. C1 and C12 may be reduced in capacitance if you want to restrict the passage of very-low-frequency voice energy. Values as low as 0.1  $\mu$ F may be used in those parts of the circuit.

S2 (a momentary switch) and S3 (a toggle switch) are mounted on the base for PTT or carrier-lock use. They are in the OFF position for VOX operation. If you don't like the small button on the PTT momentary switch, consider using epoxy to glue a plastic poker chip or similar object to the switch button.

## Construction Notes

When you look at the photograph, you may judge this project to be an ugly duckling. It definitely lacks the class imparted by a modern commercial desk mike, but it's inexpensive. The boom is made from 1/2-inch PVC pipe. The vertical post is fashioned from 3/4-inch PVC pipe. The boom portion is 6 1/2 inches

<sup>1</sup>Notes appear on page 21.



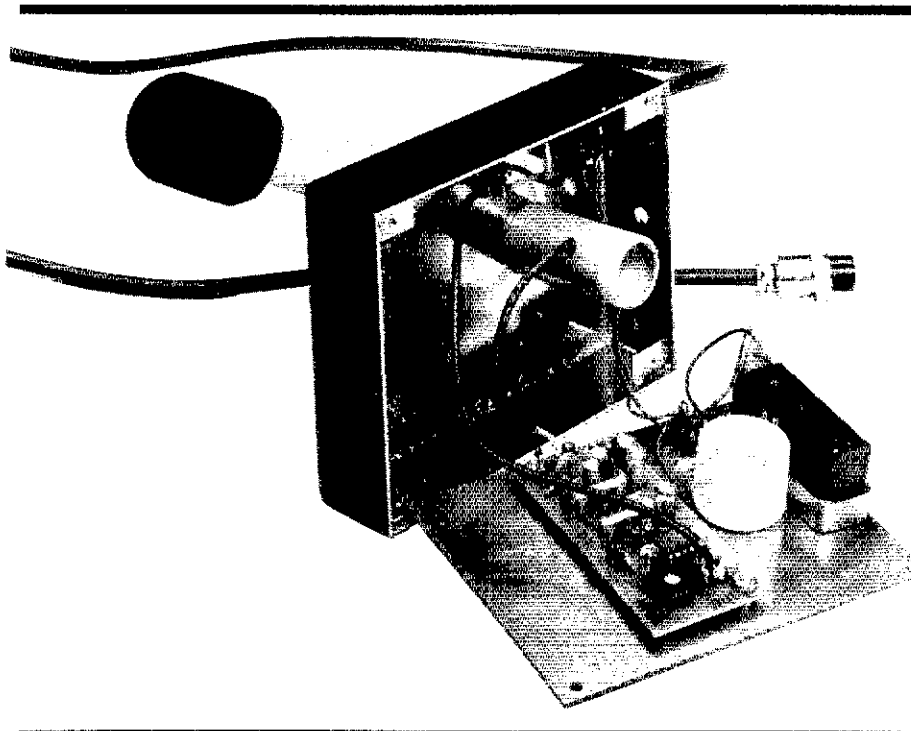


Fig 3—Internal view of the mike. The PC board is elevated above the base plate by means of short metal spacers. Shielded leads (RG-174) are used for the audio lines. The shield braid is grounded at each end of these leads. Shielded two-conductor mike cord is recommended between the mike and the transmitter.

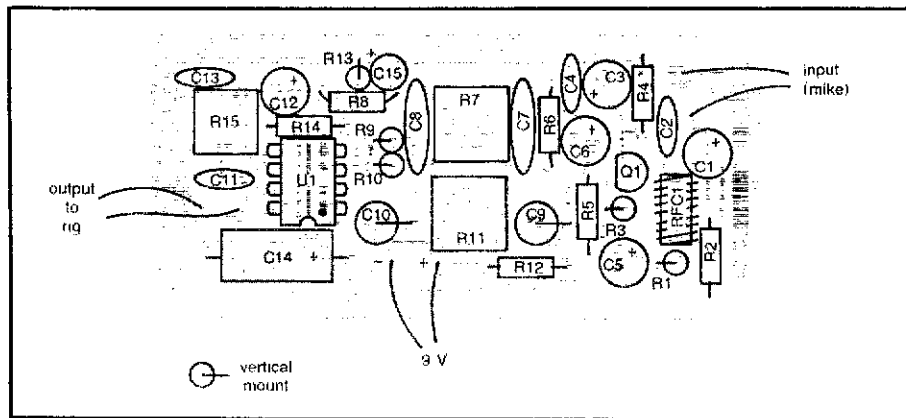


Fig 4—Parts-placement guide for the PC board. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. Component outlines are not necessarily representative of the shapes of the actual parts used. BT1, C16, S1, S2 and S3 are external to the board.

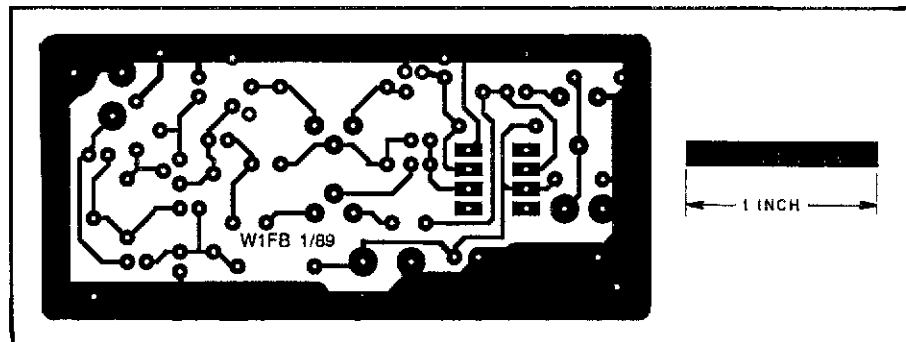


Fig 5—Circuit-board etching pattern, shown full size from the etched side of the board. Black areas represent unetched copper foil.

boards are available for this project.<sup>2</sup> Fig 4 is a parts-placement guide for the board, and Fig 5 is the full-size etching pattern.

Perhaps you have a commercially made mike that needs a bit of bass or treble boost. If so, consider installing the Fig 1 circuit in the base enclosure. If there is insufficient room there, you can build the circuit into a small box and use it between your mike and the rig.

### Proper Adjustment

Be aware of the gain of this mike! I recommend that you adjust your rig for the correct audio level with the stock or existing nonamplified mike. Do this in accordance with the instruction manual and with on-the-air checks. Now, replace that mike with this one. Adjust R15 for the same peak meter readings you obtained with mike number 1. Do not exceed this output level. Too much audio from the mike will overdrive the input circuit of your transmitter and cause distortion. You may now experiment with the settings for R7 and R11.

Operate your rig into a dummy antenna and monitor the signal with a receiver (AGC disabled and RF gain control setting reduced). Tweak the boost controls until you feel that the audio response is suitable for your voice. Final adjustments may be carried out on the air. Try to obtain reports from amateurs who have heard you speak in person. Do not use a speech processor when you make your preliminary tests, as you won't get an accurate picture of your voice range and quality.

### Concluding Remarks

I'm pleased with the performance of my ugly duckling. I have used a commercial desk mike for years, and it has given me the punch and audio range I needed with my deep voice. During on-the-air tests, however, I have been told by friends that I sound more natural with the new mike. There is also plenty of punch. For example, Bud, W8PLC, said, "I no longer have to tune off your frequency to make you sound right." Norm, W8EEF, commented, "It's an improvement. You sound just like you do in person." I should qualify these remarks by saying that I use maximum treble boost and minimum bass boost. These tests were performed while using a Yaesu FT-102 transceiver.

I operated from 1.8 through 29 MHz at 1.5 kW PEP while checking for RFI in the mike. There was no indication of RF-related problems at any frequency within that range. I did not test the mike while using the 12-meter band.

I estimate the cost of this unit (exclusive of the PC board) at \$10. A skilled scrounger should be able to duplicate this unit for as little as \$5. It's a far cry from paying \$75 for a store-bought mike that may not suit my voice! If you can live with the homeliness of this mike, you may want to duplicate it.

### Notes

<sup>1</sup>D. DeMaw, "How to Deal with Audio RFI Problems," *QST*, May 1988, pp 18-20.

<sup>2</sup>A circuit board for this project is available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118, tel 312-426-2431, evenings. Price (as of this writing) is \$4.50 postpaid.

# Build the Versa Loop

Two relay-switchable loops + a 41-foot mast = 360° 7-band coverage and gain over a 1/2-λ dipole at 20 through 10 meters.

By Dennis Monticelli, AE6C  
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Fremont, CA 94539

**D**o you long for a beam and tower, but cringe when you think of how your spouse and neighbors might respond? The easy way out is to just put up a vertical or dipole and keep dreaming. I did that at my last QTH, but this time I longed for something more—an antenna I wouldn't have to apologize for over the air. Somehow, I had to find a way to combine good performance, multiband operation and low visual impact. My goal was an antenna that

- pleases (or is at least nonrepugnant to) the eye
- performs well for DX and stateside contacts
- operates on multiple bands, with top performance between 20 and 10 meters, and useful performance on 40 and 30 meters
- covers 360°—no azimuthal holes allowed
- can survive high winds (it can really blow here)
- can be built at a modest cost

After scouring my antenna books and sifting through magazine articles (see the bibliography), I opted to use a pair of orthogonal wire loops. Because of the versatile way in which this antenna encompasses many bands and several modes of operation, I decided to call it the Versa Loop. Because of the way in which it performs, I decided to share it with you.

## Versa-Loop Basics

The Versa Loop (Fig 1A) consists of two diamond-shaped wire loops that can be closed or opened at their tops by means of a relay (K1 in Fig 1B). Each loop is 1 λ long at 20 meters. One of the two loops is selected at a time by another relay (K2 in Fig 1C); the inactive loop is left open and floating. Because the inactive loop is symmetrically perpendicular to the active loop, the inactive loop does not affect the active loop's pattern. Because the Versa Loop is a balanced antenna and is not worked "against ground," it does not require the presence of a ground screen or radials for proper operation.

The Versa Loop is bottom-fed in its open- and closed-loop modes; thus, one transmission line can be used to feed the antenna through its seven-band operating range. (I currently use a relay [K3 in Fig 1C] to choose between two feed-line options, but this is not mandatory; more on Versa-Loop feeding later.)

Structurally, the two loops are suspended from a single common pole that is made as high as possible without sacrificing wind

survival or rendering the Versa Loop visually unacceptable. (I managed to install a 41-foot pole on my suburban lot; this, mounted on a wooden deck 11 feet above ground, put the midsection of the loops at a height of about 39 feet.) The upper segments of both loops do double duty as part of my system's four guy wires. The fewer antenna lines that slice the sky, the better the sky looks—and the less obtrusive the system will be.

## Constructing the Versa Loop

### Mast

Since the antenna itself is relatively simple, the main challenge in constructing the Versa

Loop is getting the antenna's slender mast (Fig 2) up as high as possible. (In my case, minimizing the visibility of the antenna's wires and guys was also an issue.) Luckily, my house has a wooden deck that serves well as a base for the Versa-Loop mast; the deck puts the mast base 11 feet off the ground and about 15 feet lower than the apex of the roof.

The lower mast section consists of about 24 feet (20 feet + 4 feet + coupler) of 1½-inch (ID) schedule-80 PVC pipe (actually 1-15/16 inches OD, with a ¼-inch-thick wall); machine screws secure the pipe sections to the coupler. The bottom of the mast is secured to the deck with a Radio Shack® no. 15-517

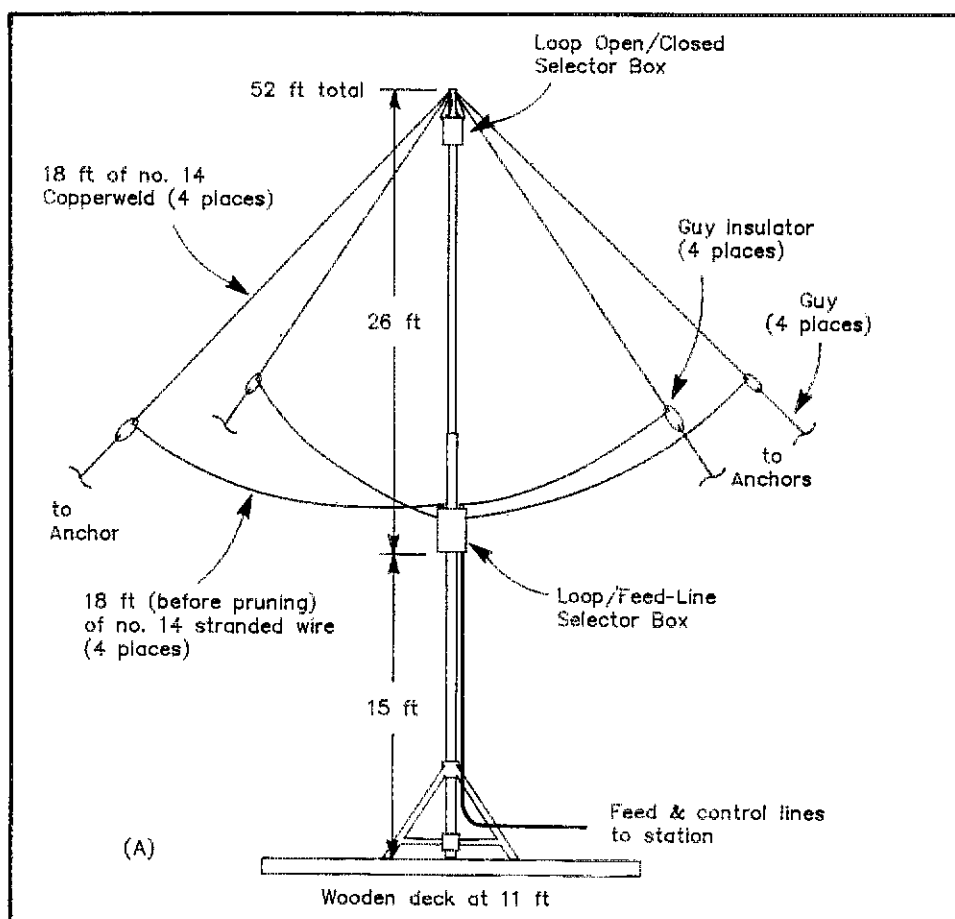


Fig 1—The Versa Loop (A), a simple multiband (40- through 10-meter) antenna, consists of two 14.15-MHz, 1-λ loops that bisect each other at right angles. The loops may be closed or opened at their tops by a remotely controlled relay (K1 at B). Directivity selection is performed by connecting one or the other of the loops to the feed line via another relay (K2 at C). An optional feed-line-selection relay (K3 at C) may also be employed. The upper loop segments consist of no. 14 Copperweld™ copper-clad solid steel wire;



tilt-over, TV-antenna roof mount. Pipe clamps secure the mast to the house where it passes the eaves. If you decide to mount your Versa Loop's support mast on the ground, I recommend using a tilt-over mount to make raising the antenna easier.<sup>1</sup>

Despite the mast support that the house provides, the heavy-wall PVC pipe used for the lower mast section is too wobbly to use without additional stiffening. I solved this problem by strapping a 20-foot-long piece of 1-1/2-by-1/8-inch-thick steel angle stock to the pipe with stainless-steel hose clamps. The channel between the angle stock and the mast forms a convenient conduit for coaxial feed and relay-power lines.

The upper section of the Versa-Loop mast consists of a 20-foot length of 1-1/4-inch-OD, 1/8-inch-wall fiberglass irrigation pipe, 3 feet of which telescopes inside the lower mast section. The upper and lower mast sections

are pinned together by means of a 1/4-inch diameter stainless-steel bolt that passes through matching holes drilled through both sections. Although the fiberglass pipe was relatively expensive—\$30—it worked so well, and is so strong, that in retrospect I almost wish I'd sprung \$90 for larger-diameter fiberglass pipe to use in place of the cheaper PVC-and-steel-angle lower mast section (cost, \$20 in all).

### Loops, Guys and Relay Boxes

The loop-top relay, K1, is housed in a small plastic box that is U-bolted to the mast a few inches below the mast top. Small holes drilled through the mast just above the relay box pass the four 18-foot-long, no. 14 Copperweld™ wires that constitute the top halves of each loop (see Fig 3). The fiberglass serves well as a wire anchor and RF insulator. Short, flexible drop wires connect each piece of Copperweld to K1 through small holes drilled in the box. Small-diameter (0.1-inch) coax, run inside the hollow antenna mast, carries dc for

<sup>1</sup>Notes appear on p 26.

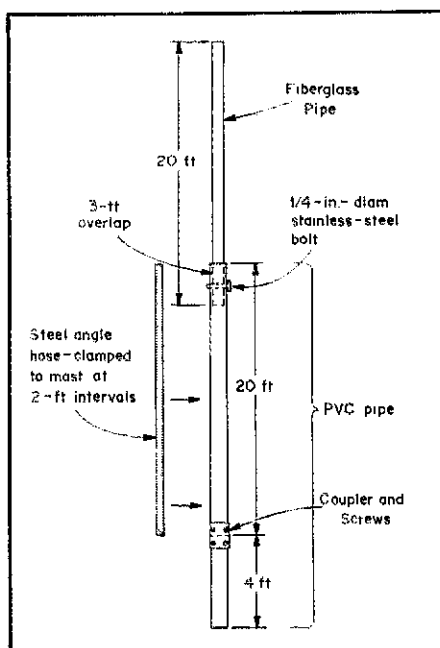
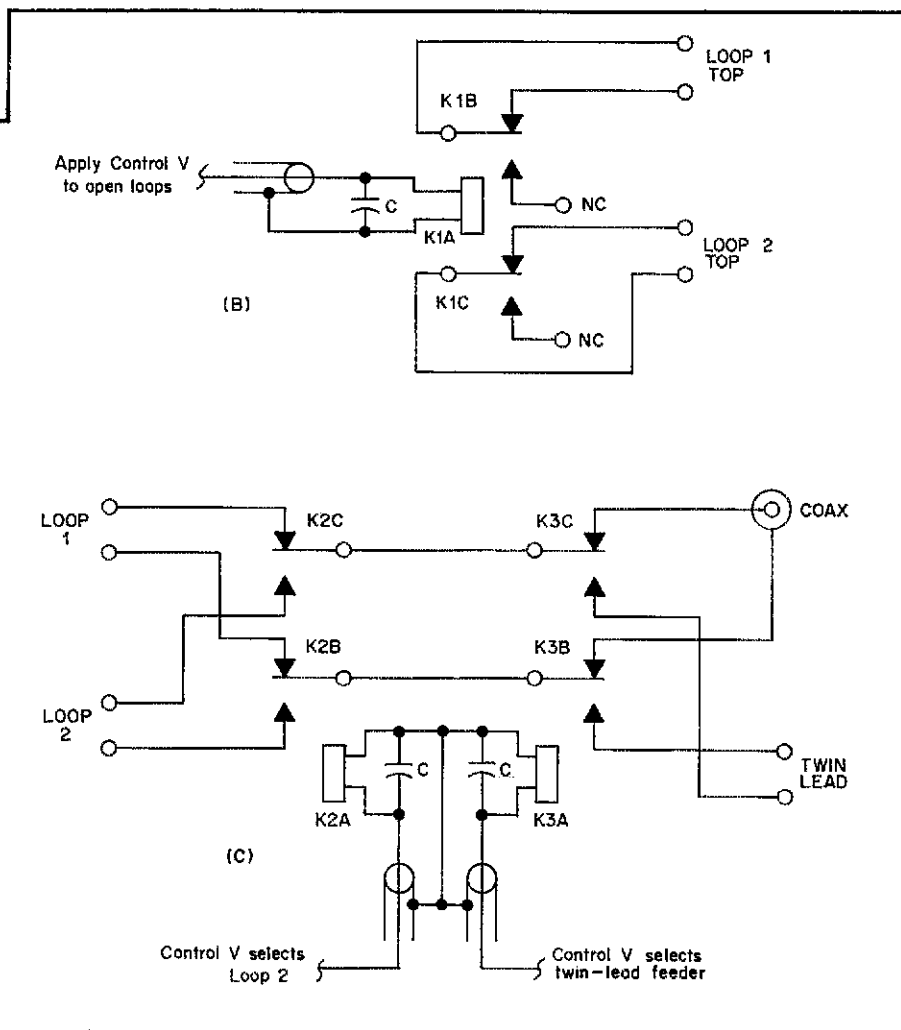


Fig 2—Diagram of AE6C's Versa-Loop mast. The upper mast section consists of 1-1/4-inch-OD, 1/8-inch-wall fiberglass pipe; the lower section is 1-1/2-inch-ID (1/4-inch wall) schedule 80 PVC pipe; the steel angle stiffens the mast. Guys are required; see text.



the lower loop segments are no. 14 stranded copper wire. The solenoid bypass capacitors, C, are 0.01- $\mu$ F ceramic discs rated to handle the relay control voltage; the control voltage necessary depends on the relays used. K1 is a ceramic DPDT relay with wide-spaced contacts capable of handling the high voltages developed under open-loop conditions; K2 and K3 are ceramic DPDT relays. See the text for more on constructing, mounting, feeding and tuning the Versa Loop. Fig 2 details the Versa-Loop mast.

K1A. I used RTV sealant to weatherproof the relay box before installing it on the mast.

At the side corners of the loops, the Copperweld upper loop segments terminate at insulators, and rope completes each of the four Versa-Loop guys between the insulators and the guy anchors. I used polyester rope because of its strength and its resistance to stretching and ultraviolet light. (I intended to dye the rope to decrease its visibility. Unfortunately, I discovered later—after dipping the rope into a pot of hot, blue fabric dye—that polyester rope won't accept dye!) The mast is not guyed between the peak of the house roof and the upper loop-mast junction—a 26-foot stretch of mast. *Don't try this if you don't use heavy-wall fiberglass pipe for your Versa-Loop mast; most other materials will require an additional set of guys.* (An all-metal mast is acceptable; the symmetry of the two loops to the mast should keep a metal mast from radiating.) I've watched my Versa Loop in 60-mi/h winds and, thanks to the steel mast brace and fiberglass mast material, it survived with gusts to spare.

Complete the loops by installing 18 feet of no. 14 stranded wire (with light-blue insulation, if you're striving for minimum visibility) as each of the bottom two segments of each loop. The total length of each loop, including the wires connecting the loop to the relays, will end up close to the theoretical  $1005 \div f$  (MHz)—71.3 feet at 14.15 MHz—after pruning. Leave the bottom loop segments somewhat slack so that guying tension is applied only to the Copperweld top quarters of the loops. This assembly method produces a substantial Versa Loop, provided that the

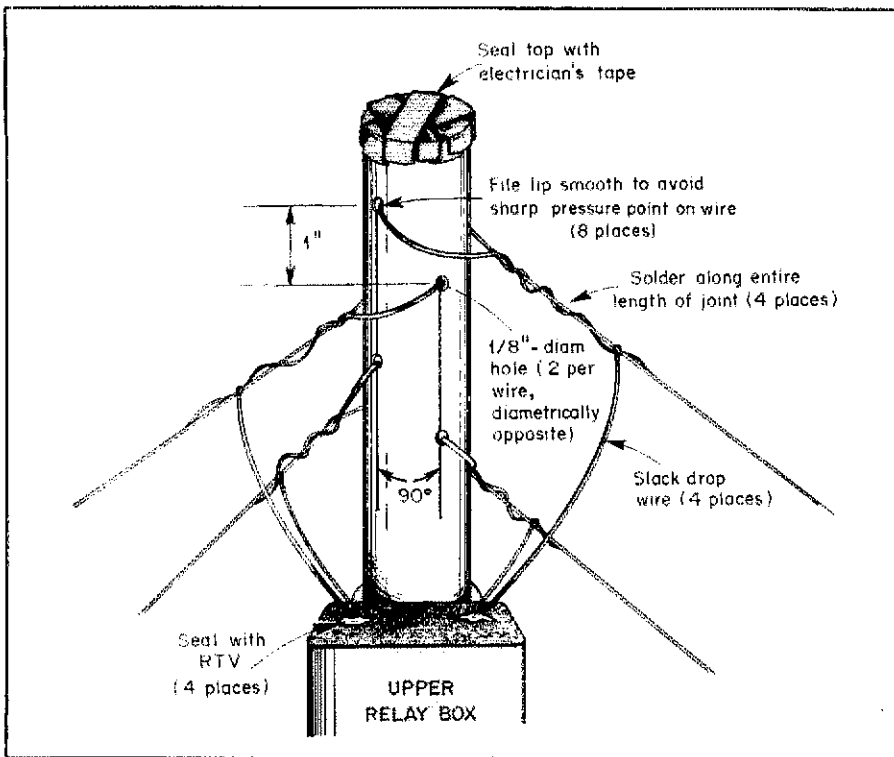


Fig 3—The Versa Loop's Copperweld upper-segment wires (which also serve as part of the antenna's guy system) are anchored to the fiberglass upper mast section as shown here. The mechanical strength of this arrangement should be sufficient for tubing wall thicknesses of at least 1/8 inch. Bend the Copperweld wires by hand to avoid sharp bends and nicks that might expose the Copperweld's steel core. Two drop wires enter the relay box through its top; the other two enter the box through holes on the box back.

stranded loop segments can whip around a bit in the wind without breaking. (To improve the stranded segments' resistance to fatigue, keep flexing at each of the Versa Loop's stranded-wire-to-Copperweld junctions from occurring at a single point. You can do this at the Copperweld side of each joint simply by threading the wire through the insulator eye before soldering it. To distribute flexing strain where the loop wires enter the lower relay box, slip a few inches of snug-fitting, flexible plastic tubing over each of the wire ends as shown in Fig 4.

The lower relay box (Figs 1C and 4), a blue-plastic Radio Shack project case, contains two ceramic DPDT relays (K2 and K3) that handle loop and feed-line selection. Ceramic feed-through insulators bring the wires into the box; the box is weatherproofed and fastened to the mast with U bolts. The Versa Loop's coaxial feed line, and coaxial power lines for K2 and K3, run down the sides of the lower mast section. TV-style standoff insulators hold the Versa Loop's twin-lead feed line away from the mast.

#### Installation

Raising the Versa Loop into position is fairly simple and low-risk because of the antenna's telescoping, tilt-over design. Before you raise the antenna, however, plan exactly where the antenna's four guy ropes will be anchored. Each of the loops is bidirectional, of course, with maximum gain occurring perpendicular to the loop plane. Assuming that

the loops bisect each other orthogonally and that there is no distortion of their patterns by nearby objects, switching between the loops results in a 90° azimuth shift. Considering the response of the antenna's switchable loops as a single, four-lobed pattern, there's about a 3-dB difference between maximum gain (perpendicular to the loops) and minimum gain (along lines 45° between the loops). If possible, position your Versa Loop to aim its pattern maxima in directions of interest.

For a given Versa-Loop height, there is an optimum set of guy-anchor locations for the best Versa-Loop shape. If you're lucky enough to be able to locate your guy anchors optimally, you'll be rewarded with two perfectly planar loops at right angles to each other, and an included angle of 90° at the bottom of each loop. Of course, few locations offer a *perfect* situation for a Versa Loop, but don't let this discourage you. Loops are pretty forgiving creatures, and this antenna is no exception. One of my loops does not lie entirely in one plane, and the top angle of both loops is a little sharper than 90°, yet my Versa Loop works like a champ. If you can allow for a little variation in the final height of your antenna, and vary guy-anchor locations somewhat to achieve the best loop shape, your Versa Loop will perform well.

Assemble and paint the antenna and mast on the ground. (My Versa Loop is the color of my house below roof level and sky-blue above.) Temporarily tape the wires and guys to the collapsed mast. Attach the assembly

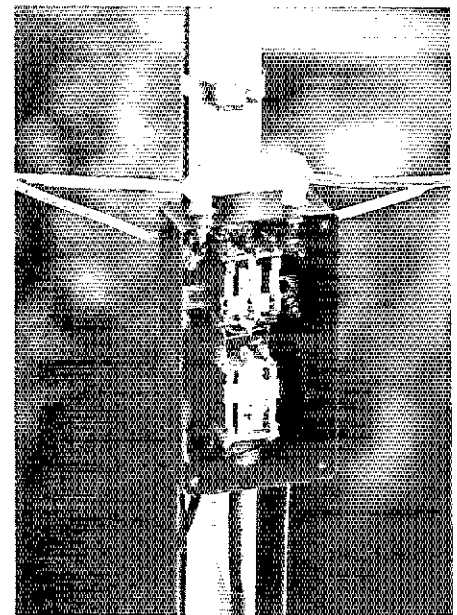


Fig 4—Close-up of the bottom relay box reveals the relays, their respective control wires, loop wires, and both balanced and coaxial feed lines. Below the box, eight ferrite sleeves slipped over the coaxial feed line act as a balun by keeping RF current from flowing on the outside of the coax shield. The lower mast construction and loop wire strain reliefs are also visible.

to the tilt-over base and walk it up against the house. (One person could do the whole job from the roof with a harness, but two people make the job easy—and safer.) Once the antenna is in place, bolt it to the house.

If you can round up some friends for 15 minutes, the antenna-raising phase goes fast. With four people tending guys, you can easily push the lightweight upper mast section up and slip the retaining bolt through the mast lap joint. Let the bottom-loop-segment wires slacken appreciably at this point; they'll sag less after pruning, and you'll be able to adjust their tension later by slightly adjusting the antenna height. Now secure the guys to their anchors and you're ready to prune the loops.

#### Feeding the Versa Loop

There are many ways to feed a loop, but if you want multiband operation with one feed line, the easiest feed method is to use open-wire transmission line in conjunction with a balanced matching network. Such a feed line, known colloquially as a *tuned feeder*, is the simplest and lowest-loss way of driving the Versa Loop in its open- and closed-loop modes with one feed line from 40 through 10 meters.<sup>2</sup> Balanced, high-impedance transmission line of various types works just fine. I used 450-Ω ladder line initially, and then switched to 300-Ω transmitting twin lead for a neater, cleaner look. Add a balun and Transmatch at the end of the feed line, and you're in business.<sup>3</sup> The Station Accessories chapter of *The 1989 ARRL Handbook* describes three suitable balanced-output Transmatches.

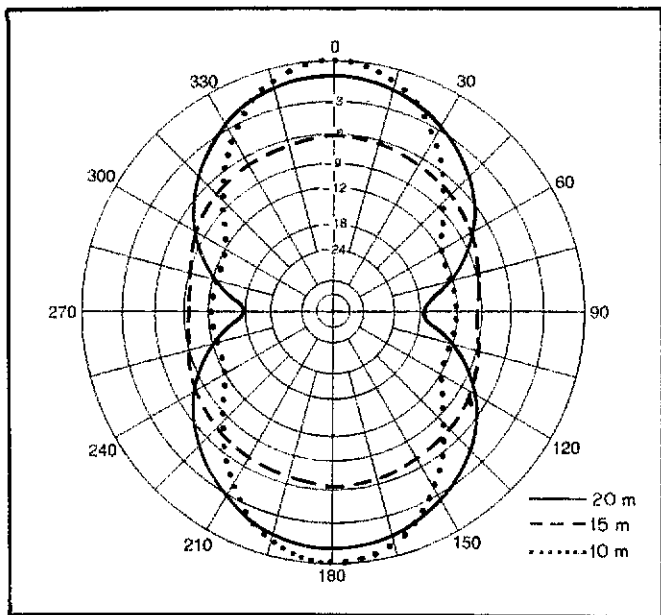


Fig 5—Azimuthal patterns at maximum response for a Versa Loop operating in closed-loop mode and centered at 39 feet above average ground (dielectric constant, 13; conductivity, 5 mS/m). The patterns are scaled to allow direct comparison of the Versa Loop's maximum gain in the closed-loop mode on 20, 15 and 10 meters; to find the actual gain represented by these patterns, add 9.59 dB to all values. Figs 7 through 9 reveal that the elevation angle at which maximum gain occurs varies from band to band. Table 1 lists the Versa Loop's gain at maximum response on 20, 15 and 10 meters.

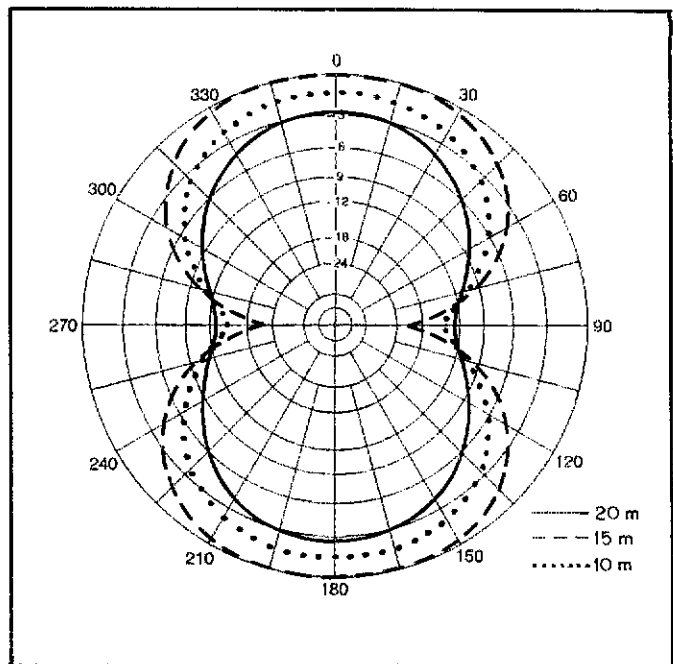


Fig 6—Azimuthal patterns at maximum response for a Versa Loop operating in open-loop mode and centered at 39 feet above average ground. The patterns are scaled to allow direct comparison of the Versa Loop's maximum gain in the closed-loop mode on 20, 15 and 10 meters; to find the actual gain represented by these patterns, add 9.75 dB to all values. Figs 7 through 9 reveal that the elevation angle at which maximum gain occurs varies from band to band.

Table 1

**Versa-Loop Gain (dBi) at Maximum Response as Calculated by MININEC**

Band	Mode	
	Closed	Open
20 m	8.49	7.11
15 m	3.61	9.75
10 m	9.59	8.37

Gains shown are for a Versa Loop 39 ft above real ground (dielectric constant, 13; conductivity 5 mS/m). For gains relative to a dipole (dBd) at the same height over the same ground, subtract 2.14 from the values shown.

If you're interested in using the Versa Loop only on 20 meters with the loop tops closed, you can feed the antenna via coaxial feed line without using an adjustable matching network. According to theory, the radiation resistance of a square 1- $\lambda$  loop is about 120  $\Omega$ ; using an R-X noise bridge, I characterized my Versa Loop as 122  $\Omega$  in parallel with a touch of capacitance (8.5 pF) that I attribute to K2 and K3. The most straightforward way of matching this impedance to 50  $\Omega$  is to insert an electrical- $\frac{1}{4}$ - $\lambda$  section of 75- $\Omega$  cable between the Versa Loop and its 50- $\Omega$  feed line. Such a transformer, known colloquially as a Q section, is a type of series-section transformer.<sup>4,5</sup>

**Pruning the Versa Loop to Size**

Regardless of choice of feed, the pruning strategy is to match the impedance of both loops on 20 meters, with both loops closed. I did this by using RG-62 and my R-X noise

bridge. (An SWR meter in 50- $\Omega$  line would accomplish the same thing.) Prune equal amounts off each stranded segment of Loop 1 until you obtain the desired center frequency (14.15 MHz in my case). Then, prune Loop 2 for an identical match at the same frequency. If you did a reasonably good job of making the loops identical, you'll find that their SWRs track well across the band, and retuning will be unnecessary as you switch between antennas.

If you forgo coax entirely and use a tuned feeder, size Loop 1 to  $1005 \div f$  (MHz) right away and then trim Loop 2 until its SWR roughly matches that of Loop 1 at the same Transmatch settings.

**Versa-Loop Performance**

*20, 17, 15, 12 and 10 Meters*

Compared from band to band in a given mode (loops open or loops closed), the Versa Loop's gain generally increases with frequency. Table 1 lists the Versa Loop's MININEC-calculated gain at 20, 15 and 10 meters; Fig 5 shows a MININEC comparison of the antenna's closed-loop azimuthal patterns at maximum response on these bands; and Fig 6 shows MININEC's comparison of the open-loop azimuthal patterns at maximum response on these bands.<sup>6</sup> The relative sizes of the patterns in Figs 5 and 6 allow direct comparison of the Versa Loop's gain and pattern shape at 20, 15 and 10 meters. Space doesn't allow the publication of Versa-Loop patterns for 20 through 10 meters, inclusive; you can infer the antenna's 17- and 12-meter performance from Figs 5 and 6.

What Figs 5 and 6 *don't* show is that the Versa Loop's maximum gain occurs at different elevation angles on each band, and that opening and closing the loops significantly changes the elevation angle at which maximum gain occurs. Figs 7 through 9 show MININEC's comparison of the Versa Loop's open- and closed-loop modes at 20, 15 and 10 meters; you can use these patterns to infer what goes on at 17 and 12 meters.

Another antenna parameter not shown or implied in Figs 5 through 9 is the Versa Loop's polarization. Operating in its closed-loop mode at 20 meters, the Versa Loop radiates a horizontally polarized wave; operating in its open-loop mode at 28 MHz—as a *bisquare antenna*<sup>7</sup>—the Versa Loop is *vertically* polarized. On other bands and modes, the situation isn't so clear-cut. It's safest to say that the Versa Loop's polarization varies with the band of operation, and with whether its loops are open or closed!

Originally, I had somewhat fixed ideas about which loop mode would be optimum for each band. My experiences show that both Versa-Loop modes are worth trying throughout the antenna's operating range. For instance, I initially used the antenna in its closed-loop mode on 15 meters, but it didn't perform as well as I thought it should. (During the ARRL DX Contest, I actually had to *work* to pick up stations after having nabbed them easily on 20!) Unbeknownst to me, though, the loop-top relay's power supply failed, opening the loops. Other than an SWR increase, which in my haste I naively corrected, I had no idea what had happened. Suddenly, I nailed stations left and right.

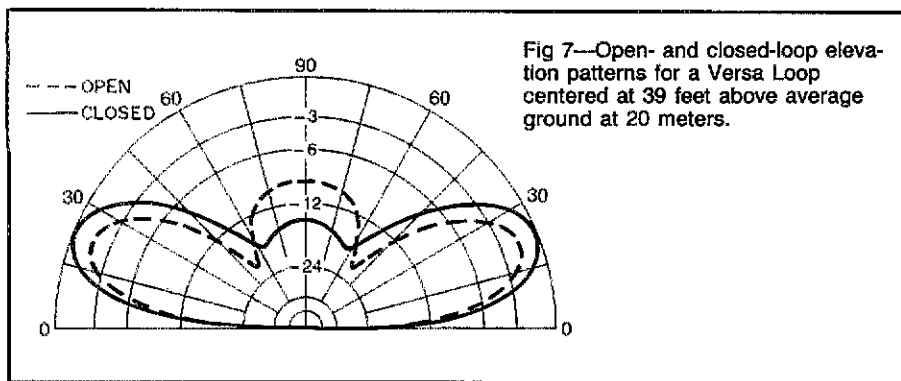


Fig 7—Open- and closed-loop elevation patterns for a Versa Loop centered at 39 feet above average ground at 20 meters.

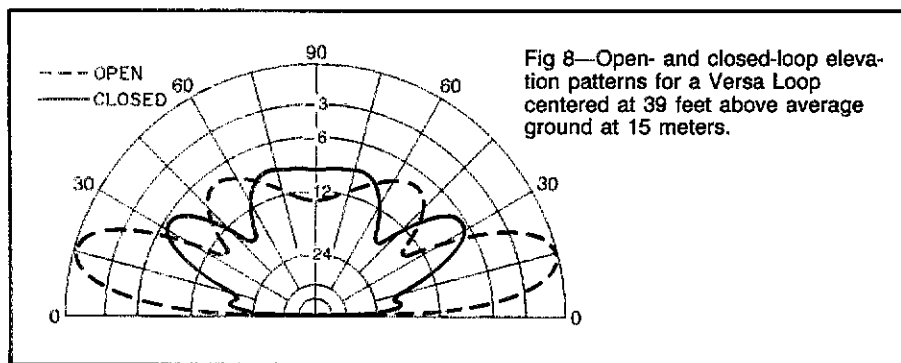


Fig 8—Open- and closed-loop elevation patterns for a Versa Loop centered at 39 feet above average ground at 15 meters.

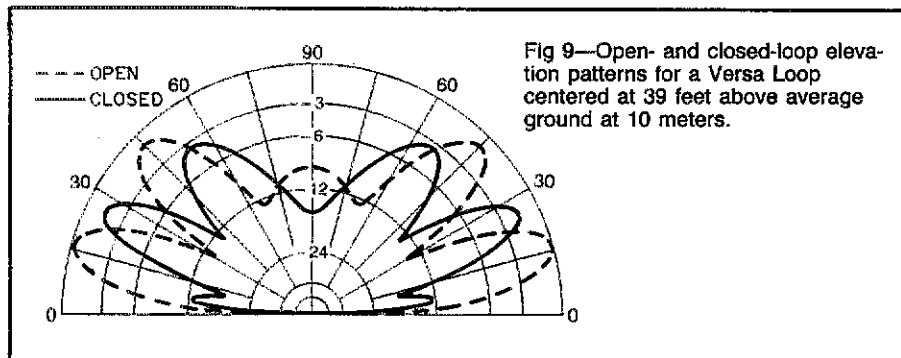


Fig 9—Open- and closed-loop elevation patterns for a Versa Loop centered at 39 feet above average ground at 10 meters.

(Now *this was fun!*) After the feeding frenzy was over, I did some detective work and discovered the relay problem. (Figs 5, 6 and 8, and Table 1, show why the open-loop mode is better on 15!) Moral: It's not called the Versa Loop for nothing! When you build yours, don't slavishly stick with one loop mode per band. Experiment! Remember also that loop selection is important even at the Versa Loop's 3-dB gain minima (where the loop patterns intersect). At these azimuth points, both loops have the same gain, but their null and maximum-gain directions differ greatly. A crafty operator soon learns to take advantage of these characteristics to dodge interference.

#### 40 and 30 Meters

At 40 meters, the Versa Loop's elements are  $\frac{1}{2}\lambda$  loops; at 30 meters, they are square  $0.7\lambda$  loops. According to *The ARRL Antenna Book* (p 5-1), a  $\frac{1}{2}\lambda$  loop exhibits about 1 dB of loss relative to a  $\frac{1}{2}\lambda$  dipole (about 1 dBi gain), with a fairly omnidirectional pattern devoid of pronounced nulls. A square  $0.7\lambda$  loop can be expected to exhibit somewhat less than 3 dBi gain.

In practice, directional effects are hard to detect on 40 and 30 meters when switching between the two loops. I've had no problem working 30-meter DX with the loops closed, but closed-loop 40-meter operation is a struggle on the long haul because of the antenna's low gain and high radiation angle in this mode. Opening the loops made the difference: Contacts into Japan and Europe became routine on 40. (Opening the loops on 30 meters made no appreciable improvement in the antenna's performance.) Stateside contacts come easily on both bands.

#### Summary

I've been delighted with the performance of the Versa Loop on 20 through 10 meters, and its performance on 40 and 30 meters is acceptable. My DXCC total jumped by 50 countries (to 175) in just four months of casual operation with 100 W output. This antenna clearly beats the verticals and dipoles I've tried, and seems to be roughly on par with a low (30-foot) tribander. Compared to the roof-mounted tribander, the Versa Loop draws much less unwanted attention and

covers four more bands. It can change direction instantly, is less expensive than the tribander, and is the quietest receiving antenna I've ever used. All in all, the Versa Loop is the best antenna I've ever had.

I look forward to hearing from other hams who build and test the Versa Loop. Its seven bands and two modes offer plenty of opportunities for experimentation, discovery and just plain fun.

#### Notes

- <sup>1</sup>Fig 46 on p 37-20 of the 1989 *ARRL Handbook* shows a home-buildable mast of this type.—*Ed.*
- <sup>2</sup>It's important to use low-loss feed line in tuned-feeder service because line loss increases with SWR—and because the Versa Loop's tuned feeder operates at a high SWR over much of the antenna's frequency range.—*Ed.*
- <sup>3</sup>Use of a magnetic-core balun between the tuner and the Versa-Loop feed line is not recommended. Such cores generally function poorly in power-handling situations at impedances greater than a few hundred ohms; the impedance at the tuner end of the Versa Loop's open-wire feed line will likely be quite high (a few kilohms) on some bands. A balanced-output tuner is the best solution to this problem.—*Ed.*
- <sup>4</sup>G. Hall, ed, *The ARRL Antenna Book*, 15th ed (Newington: ARRL, 1988), pp 26-14 and 28-15.
- <sup>5</sup>I successfully tried an even simpler method of feeding the closed-top Versa Loop on 20 meters: I used RG-62 coax (93- $\Omega$ , 95  $\Omega$  in its foam-dielectric form) between the antenna and my TS-820 transceiver. The TS-820's adjustable output network matched the RG-62 well; transmitters that include SWR-dependent power-reduction circuitry and are designed for 50- $\Omega$  loads would probably require the use of a Transmatch to achieve full power output in this situation.
- <sup>6</sup>MININEC (Mini-Numerical Electromagnetics Code) calculations for this article were done at ARRL HQ on an IBM® PC.—*Ed.*
- <sup>7</sup>*The ARRL Antenna Book*, p 5-22.

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# Improving and Using R-X Noise Bridges

Here's how to improve your noise bridge's measurement accuracy and capability, and some ways to put your modified noise bridge to work.

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The R-X noise bridge is one of the most useful pieces of test equipment available to radio amateurs. Noise bridges can be used to measure antenna impedances, coaxial-cable losses and characteristic impedances, and impedances of components at different operating frequencies. You can do all of this with commercial R-X noise bridges that cost less than \$60.

Impedance measurements are very important in design and construction of antennas. Knowing the impedance of an antenna can allow you to tune it for a more optimal match than you could with only an SWR bridge. Knowing how an antenna's impedance varies as a function of frequency can allow you to design a matching network that operates over the desired frequency range.

Unfortunately, the noise bridge has not lived up to its potential. Many past and current designs yield inaccurate measurements. Furthermore, I've never seen a good description of a procedure for accurately calibrating the reactance scale of a noise bridge. Finally, published articles on noise-bridge use have stipulated that antenna-impedance measurements must be made either at the antenna, or at the end of a coaxial cable that is a multiple of a half wavelength at the antenna's operating frequency. Cutting such cables is difficult to do, and even perfect-length cables can introduce significant errors into the measurement process. At best, using such cables yields accurate results at only one frequency.

In this article, I'll describe a few simple changes that can be made to existing noise-bridge designs to significantly increase their accuracy. I'll also describe a method for calibrating noise-bridge resistance and reactance scales. In addition, I'll show how to use a noise bridge to measure cable loss, characteristic impedance and electrical length, and to measure the impedance of an antenna—even if it's 100 feet in the air,

at the end of an arbitrary length of coaxial cable.

I modified and calibrated my noise bridge, a Palomar Engineers unit, using the procedures in this article.

## Noise-Bridge Design

The block diagram of a noise bridge is shown in Fig 1. It consists of a noise source that may or may not be modulated, an amplifier, and bridge. An unknown impedance is measured by connecting it to the UNKNOWN connector. A receiver attached at the RECEIVER connector is used to detect bridge balance.

The bridge is balanced when the reactance in the bridge's upper arm equals that in the

lower arm. Bridge balance is achieved by adjusting the variable resistor ( $R_v$ ) and capacitor ( $C_v$ ) until a null is detected in the receiver. Impedance measurements are made at the frequency to which the receiver is tuned. The receiver should be operated in its AM-detection mode, but adequate results can be achieved in CW or SSB modes if AM is not available.

Throughout this article, I'll use the series impedance representation. Impedance is a complex quantity, of which the resistance is the real part and the reactance is the imaginary part. Both of these are given in ohms;  $j$  denotes the imaginary part. The impedance of a circuit that has a resistance of  $R$  and a reactance of  $X$  is represented as

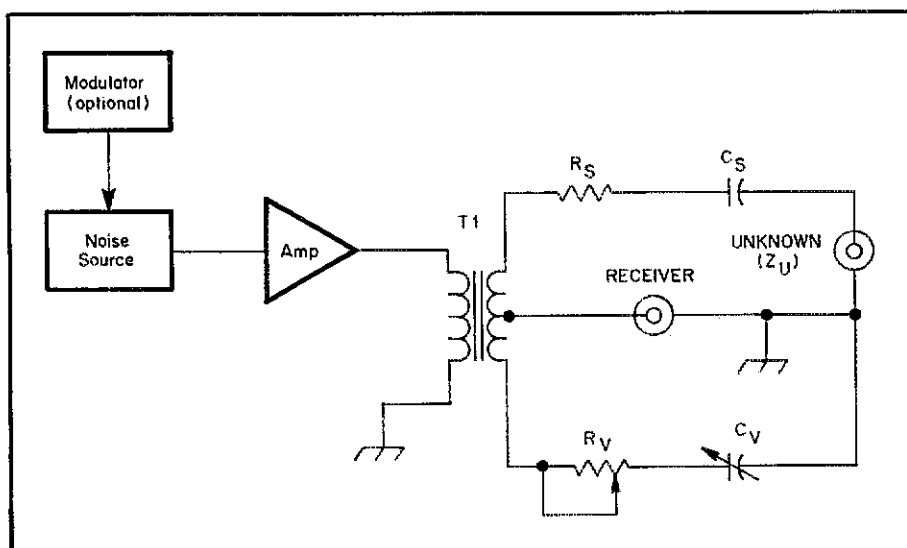


Fig 1—Block diagram of an R-X noise bridge.  $R_v$  and  $C_v$  are the variable resistor and capacitor used to balance the bridge.  $Z_u$  is the unknown impedance, which has resistive ( $R_u$ ) and reactive ( $X_u$ ) components.  $R_s$  and  $C_s$  are in series with the unknown impedance.

$$Z = R + jX \quad (\text{Eq } 1)$$

The bridge is in balance when

$$R_u = R_v - R_s \quad (\text{Eq } 2)$$

and

$$X_u = X_v - X_s \quad (\text{Eq } 3)$$

where

$R_u$  and  $X_u$  represent the resistive and reactive parts, respectively, of the unknown impedance

$R_v$  and  $X_s$  represent the reactances of the bridge capacitors.

More information about impedances is presented in *The ARRL Handbook*<sup>1</sup> and *The ARRL Extra Class License Manual*.<sup>2</sup>

### Checking Noise-Bridge Accuracy

To check the accuracy of a noise bridge, you must use good calibration loads. Those described here consist of a short-circuit load, a 50- $\Omega$  load, a 180- $\Omega$  load, and a variable-resistance load. The short-circuit and fixed-resistance loads are used to check the accuracy of the noise bridge; the variable-resistance load is used in measuring coaxial-cable loss.

Construction details of each of these loads are shown in Fig 2. Each load is constructed inside the body of a UHF plug (PL-259) connector. When building these loads, keep leads as short as possible to minimize parasitic effects. The resistors must be noninductive (*not* wirewound). Quarter-watt, carbon-composition resistors should work fine. The potentiometer in the variable-resistance load is a miniature PC-

mount unit with a maximum resistance of 100  $\Omega$  or less. The potentiometer's wiper and one of the end leads are connected to the center pin of the PL-259; the other lead is connected to ground.

The first step in noise-bridge calibration is making sure that the bridge's measurements do not vary with frequency. Connect a receiver to the bridge's RECEIVER connector, and hook the short-circuit load to the UNKNOWN connector. Tune the receiver to the lowest operating frequency of the bridge, and null the bridge by adjusting the variable resistor and capacitor until a dip in signal strength occurs in the receiver. In this state, a perfectly calibrated bridge will indicate zero ohms on both the resistance and reactance scales.

When a null is reached, increase the receiver frequency by a few megahertz and repeat the measurement. The resistance and reactance readings shouldn't change. Repeat this procedure until you reach the bridge's highest operating frequency.

Check the bridge at a frequency a few megahertz above the bridge's minimum frequency with the 50- and 180- $\Omega$  loads. With these loads, the bridge should indicate the appropriate resistance (50 or 180  $\Omega$ ) and zero reactance. Resistive loads may show some negative reactance at higher frequencies; this results from the capacitance (about 5 pF) of the connector. At 30 MHz, these reactances are about -2  $\Omega$  for the 50- $\Omega$  load and -30  $\Omega$  for the 180- $\Omega$  load.

Reactance readings should remain constant when frequency is varied with the

short-circuit load, as they should at low frequencies with the fixed-resistance loads. With the short-circuit load, resistance readings should remain constant as frequency is varied.

If the noise bridge passes these tests, the design is good, and you can skip the section on improvements. My experience with several commercial noise bridges has shown me that most are deficient; measured resistances or reactances vary with frequency—not a good thing. The modifications described in the next section allow you to vastly improve a suboptimal noise bridge.

### Noise-Bridge Improvements

The improved bridge is shown in Fig 3. I applied these modifications to my noise bridge; these changes should work in other noise bridges as well.

The main cause of frequency variation of the bridge null is the design of the transformer (T1 in Fig 1). The designs that I've seen use a trifilar winding on a ferrite or powdered-iron toroid core. This design introduces phase shift across the transformer secondaries at the higher frequencies, causing the reactance at bridge balance to vary with frequency. Some transformers also have insufficient permeability in the toroidal core; this causes resistance readings to vary at lower frequencies.

Both of these problems can be cured by using a ferrite binocular core wound as shown in Fig 4. This binocular transformer directly replaces the toroidal transformer in the bridge. This design eliminates phase

<sup>1</sup>Notes appear on p 32.

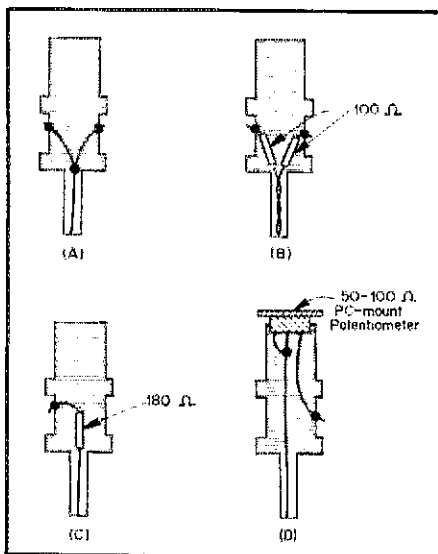


Fig 2—Construction details of the resistive loads used to check and calibrate a noise bridge. Each of the loads is constructed inside a PL-259 connector. (Views shown are cross-sections of the PL-259 bodies only; the sleeves are not shown.) Leads should be kept as short as possible to minimize parasitic inductance. (A) is a short circuit; (B) depicts a 50- $\Omega$  load; (C) is a 180- $\Omega$  load; (D) shows a variable-resistance load used to determine the loss in a coaxial cable.

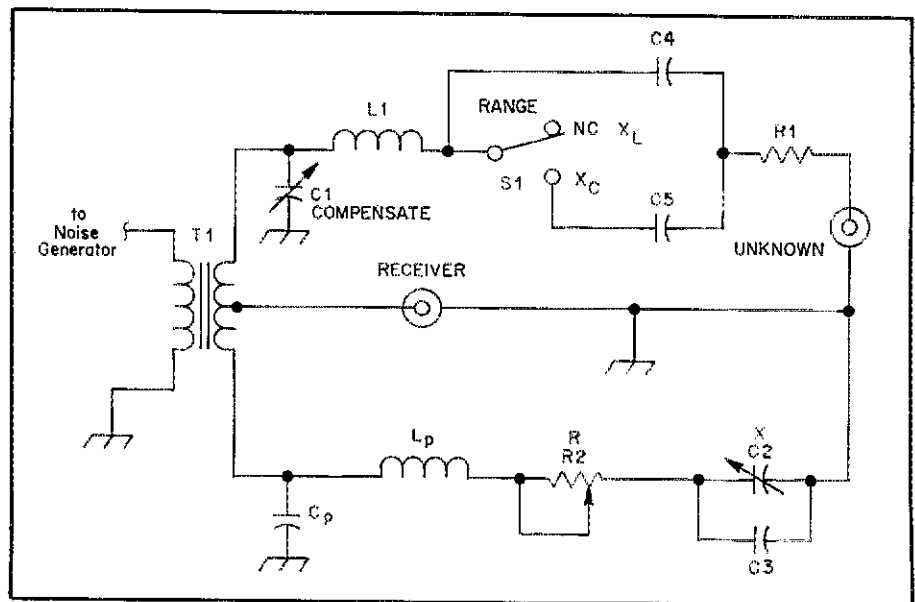


Fig 3—Detailed circuit diagram of the improved noise bridge. This circuit was used to modify my noise bridge. The existing variable resistor (R2) and variable capacitor (C2) are used in the modified circuit. The parasitic capacitance and inductance due primarily to R2 are shown as  $C_p$  and  $L_p$  in the circuit diagram.

#### Parts List

- C1—2- to 8-pF variable; see text.
- C2—15- to 150-pF variable.
- C3—20-pF mica.
- C4—47-pF mica.
- C5—82-pF mica.
- L1—Wire loop; see text.

- R1—10- $\Omega$ , 1/4 W.
- R2—250- $\Omega$ , noninductive potentiometer.
- S1—SPDT toggle, Radio Shack® 275-625.
- T1—Each winding consists of 3 turns of insulated, solid wire on an Amidon BLN-43-2402 ferrite core. See Fig 4 for winding detail.

shift, and the ferrite core has sufficient permeability to eliminate low-frequency resistance shift.

### Stray Capacitance

After I installed the binocular transformer in my noise bridge, I discovered a second problem that was due to stray capacitance. Stray capacitance on the variable-resistor side of the bridge tends to be higher than that on the unknown side, primarily because the parasitic capacitance in the variable resistor,  $R_v$ , is comparatively high. This capacitance is shown by  $C_p$  in Fig 3.

The effect of  $C_p$  is most easily detected using the 180- $\Omega$  load. Connect this load to the UNKNOWN connector, tune the receiver to the lowest operating frequency of the bridge, and null the bridge. Use an ohmmeter to measure the dc resistance of the bridge's variable resistor. If this resistance is greater than the dc resistance of the 180- $\Omega$  load plus series resistor  $R_s$ , the stray capacitance is greater on the variable-resistor side of the bridge. The magnitude of the stray capacitance can be calculated by

$$C_p = C_s \left( \sqrt{\frac{R_v}{R_L + R_s}} - 1 \right) \quad (\text{Eq 4})$$

where

- $R_L$  = load resistance (in this case, 180  $\Omega$ )
- $R_v$  = resistance of the variable resistor
- $C_s$  = series capacitance

This stray capacitance can be compensated for by placing a variable capacitor (C1 in Fig 3) in the unknown side of the bridge. If the required compensating capacitance is only a few picofarads, you can use a gimmick capacitor (made by twisting two short pieces of insulated, solid wire together). To adjust the value of this compensating capacitor, set the dc resistance of the noise-bridge variable resistor,  $R_v$ , equal to the dc resistance of the 180- $\Omega$  load plus the series resistor. Then, adjust the compensating capacitor (by trimming its length) and the bridge's variable capacitor until a null is obtained. Make this adjustment at the bridge's lowest operating frequency. A capacitance of 7.5 pF was required to balance my bridge.

### Stray Inductance

A second undesirable parasitic effect results from stray inductance in the variable resistor, shown as  $L_p$  in Fig 3. You can detect this stray inductance by placing the short-circuit load on the UNKNOWN connector and measuring the reactance at the lowest and highest operating frequencies; the reactance indicated should be the same at both frequencies. If the reactance reading decreases as frequency is increased, there is parasitic inductance in the variable-resistor leg, and a compensating inductance needs to be placed in the unknown leg. If reactance increases with frequency, the extra inductance is in the unknown leg, and the compensating inductance must be placed in

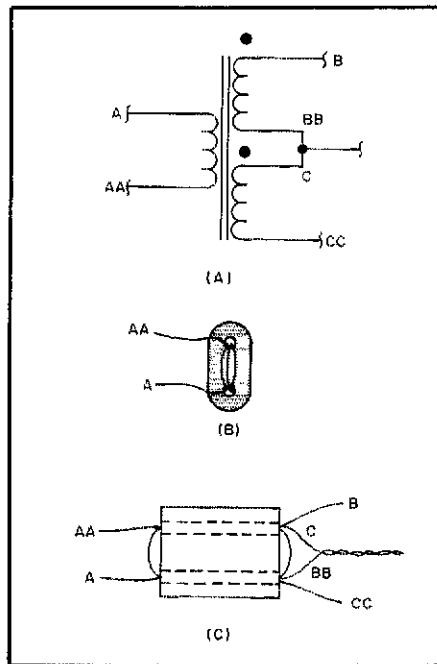


Fig 4—Detail of noise-bridge-transformer construction. At A, the circuit diagram of the transformer. B and C are the end and side views, respectively. The transformer is constructed on an Amidon BLN 43-2402 ferrite core. Each winding is three turns of no. 30 enameled wire. One turn is equal to the wire passing once through both holes in the ferrite core. The primary winding starts on one side of the transformer, and the secondary winding starts on the other side.

the variable-resistance leg.

The parasitic inductance, if present, should be only a few tens of nanohenries. This represents a few ohms of inductive reactance at 30 MHz.

The stray inductance is compensated by placing a single-turn coil, made from a 1- to 2-inch length of solid wire, in the appropriate leg of the bridge. Adjust the size of this coil until the reactance reading remains constant from the lowest to the highest operating frequency. A one-turn loop made from a 1¼-inch length of no. 26 wire, placed in the unknown leg, was required to balance my bridge.

### Reactance-Measurement Range

The reactance range of a noise bridge is dependent on several factors, including operating frequency, value of the series capacitor (C4/C5 in Fig 3), and the range of the variable capacitor ( $C_v$  in Fig 1). For example, at 10 MHz, the reactance range of my unmodified bridge is from -800  $\Omega$  to 130  $\Omega$ . This is clearly biased toward the capacitance side. I've measured similar reactance ranges on other designs.<sup>3</sup>

You can determine the range of reactances that your noise bridge should cover from the magnitude of the SWR that you'll need to measure with the bridge. I wanted my bridge to be capable of measuring an SWR of 5:1, referenced to 50  $\Omega$ , at 30 MHz. To do this, the bridge must cover a resis-

tance range of 5 to 250  $\Omega$  and a reactance range of -120 to 120  $\Omega$ . At 10 MHz, this is equivalent to covering reactances from -360 to 360  $\Omega$ . This measurement range is nearly achieved in the design shown in Fig 3. (The resistance and reactance ranges, after modification, are 0 to 220  $\Omega$  and -400 to 230  $\Omega$ , respectively, at 10 MHz. Measurement error is estimated to be  $\pm 5 \Omega$  [ $\pm 10\%$  of impedance].)

A 20-pF capacitor in parallel with C2 limits C2's range. I added a RANGE switch to select reactance measurements weighted toward either capacitance or inductance. The zero-reactance point occurs when C2 is either nearly fully meshed or fully unmeshed. The RANGE switch nearly doubles the resolution of the reactance readings.

I mounted the switch on the back panel of my bridge, near the UNKNOWN connector. I also added a larger front panel and larger knobs to the bridge to achieve better resolution for the resistance and reactance readings. A template for the front panel is available from me for an SASE.

### Calibration

Good calibration accuracy is necessary for accurate noise-bridge measurements. Calibration of the resistance scale is straightforward. To do this, tune the receiver to a frequency near the center of the bridge's range; generally, this is around 10 MHz. Attach the short-circuit load to the UNKNOWN connector and null the bridge. This is the zero-resistance point, and should be marked on the front-panel resistance scale. The rest of the resistance range is calibrated, using an accurate ohmmeter, by measuring the increase in resistance as variable resistor R2 is adjusted, and then marking these increments on the front panel; I marked the scale at 10- $\Omega$  increments.

How you perform the reactance calibration depends on how you want to read reactances on the bridge. Most of the published calibration methods provide reactance readings in terms of capacitance. My method, however, provides calibration of the reactance scale in *ohms*, at a reference frequency of 10 MHz. The advantage of this method is that it gives an answer in units that are most relevant in impedance measurement. The disadvantage of this method is that the readings must be scaled if the measurement frequency is something other than 10 MHz. The equation for performing this scaling is:

$$X_u(f) = X_{u10} \frac{10}{f} \quad (\text{Eq 5})$$

where

$f$  = frequency in MHz

$X_{u10}$  = unknown reactance at 10 MHz

My reactance-calibration method requires only a shorted piece of coaxial cable to serve as a reactance source. (The

reactance of a shorted, low-loss coaxial cable is dependent only on the cable length, the measurement frequency and the cable's characteristic impedance.) To calibrate my bridge, I used Radio Shack® RG-8M because it is readily available, has relatively low loss, and has an almost purely resistive characteristic impedance.

Follow these steps to calibrate the reactance scale:

1) Cut a length of coaxial cable that is slightly longer than  $\frac{1}{4} \lambda$  ( $246 v_p \div f_{\text{MHz}}$ ; about 20 feet for RG-8M). Attach a PL-259 connector to one end of the cable; leave the other end open-circuited. This cable will be used as the calibration standard for the reactance scale.

2) Connect the short-circuit load to the noise bridge's UNKNOWN connector and set the receiver frequency to 10 MHz. Adjust the noise bridge for a null. Do not adjust the reactance control after the null is found.

3) Connect the calibration cable to the bridge's UNKNOWN terminal. Adjusting only the variable resistor and the receiver frequency, null the bridge. The receiver frequency should be less than 10 MHz; if it is above 10 MHz, the cable is too short, and you'll need to prepare a new one.

4) Gradually cut short lengths from the end of the coaxial cable until you obtain a null at 10 MHz by adjusting only the resistance control. Then connect the cable's center and shield conductors at the far end with a short length of braided cable. Verify that the bridge nulls with zero reactance at 20 MHz. My calibration cable turned out to be 18 feet, 2 inches long.

5) The reactance scale is now ready for calibration. The reactance of the coaxial cable (normalized to 10 MHz) can be calculated from:

$$X_{i10} = R_0 \frac{f}{10} \tan \left( 2\pi \frac{f}{40} \right) \quad (\text{Eq 6})$$

where

$X_{i10}$  = cable reactance at 10 MHz

$R_0$  = characteristic resistance of the coaxial cable

$f$  = frequency in MHz

$R_0$  is 52.5  $\Omega$  for Radio Shack RG-8M.

(Note: all trig functions are in radians.)

The results of Eq 6 have less than 5% error for reactances less than 500  $\Omega$ , as long as the loss in the test cable is less than 0.2 dB. This error becomes significantly less at lower reactances (2% error at 300  $\Omega$  for a 0.2-dB-loss cable). The loss in 18 feet of RG-8M is 0.13 dB at 10 MHz. Data for using Radio Shack RG-8M is given in Table 1.

6) Tune the receiver to the appropriate frequency for the desired reactance (given in Table 1, or found using Eq 6). Adjust the resistance and reactance controls to null the bridge. Mark the reactance reading on the front panel. Repeat this process until all desired reactance values have been marked. The resistance values needed to null the bridge during this calibration

**Table 1**

**Noise-Bridge Calibration Data: Coaxial-Cable Method**

*This data is for Radio Shack RG-8M cable cut to exactly  $\frac{1}{4} \lambda$  at 10 MHz; the reactances (calculated) correspond to this frequency.*

$X_i$ (10 MHz)	Frequency (MHz)	$X_i$ (10 MHz)	Frequency (MHz)
10	3.318	-10	19.376
20	4.484	-20	18.722
30	5.262	-30	18.048
40	5.838	-40	17.368
50	6.286	-50	16.701
60	6.647	-60	16.063
70	6.943	-70	15.472
80	7.192	-80	14.936
90	7.404	-90	14.461
100	7.587	-100	14.045
110	7.746	-110	13.683
120	7.885	-120	13.369
130	8.009	-130	13.097
140	8.119	-140	12.861
150	8.217	-150	12.654
160	8.306	-160	12.473
170	8.387	-170	12.313
180	8.460	-180	12.172
190	8.527	-190	12.045
200	8.588	-200	11.932
210	8.645	-210	11.831
220	8.697	-220	11.739
230	8.746	-230	11.655
240	8.791	-240	11.579
250	8.832	-250	11.510
260	8.872	-260	11.446
270	8.908	-270	11.387
280	8.942	-280	11.333
290	8.975	-290	11.283
300	9.005	-300	11.236
350	9.133	-350	11.045
400	9.232	-400	10.905
450	9.311	-450	10.798
500	9.375	-500	10.713

procedure may be significant (more than 100  $\Omega$ ) at the higher reactances.

This calibration method is much more accurate than using fixed capacitors across the UNKNOWN connector. You can calibrate a noise bridge in less than an hour using this method.

**Measuring Coaxial-Cable Parameters with a Noise Bridge**

Coaxial cables have a number of properties that affect the transmission of signals through them. Generally, radio amateurs are mainly concerned with cable attenuation and characteristic impedance. However, if you plan to use a noise bridge to make antenna-impedance measurements, you need to accurately determine not just cable impedance and attenuation, but also electrical length. Fortunately, all of these parameters are easy to measure with a noise bridge that's been improved as discussed earlier.

The first parameter that you need to measure is the cable's electrical length. There are a number of ways of expressing the electrical length of a cable, the most

common of which is cable length in degrees at a given frequency. We'll express cable length as the frequency at which a cable is one wavelength long. This length will be represented by  $f_\lambda$ . Follow these steps to determine  $f_\lambda$  for a coaxial cable:

1) Tune the receiver to the frequency range of interest. ( $f_\lambda$  varies slightly with frequency, so tune as close as possible to the frequency of interest.) Attach the short-circuit load to the noise bridge's UNKNOWN connector and null the bridge.

2) Disconnect the far end of the coaxial cable from its load (the antenna) and connect the short-circuit load in place of this load. Connect the near end of the cable to the bridge's UNKNOWN connector.

3) Adjust the receiver frequency and the noise-bridge resistance control for a null. *Do not change the noise bridge's reactance-control setting during this procedure.* Note the frequency at which the null is found; call this  $f_n$ . The noise-bridge resistance at the null should be relatively small (less than 20  $\Omega$ ).

4) Tune the receiver upward in frequency until the next null is found. Adjust the resistance control, if necessary, to improve the null; *but do not adjust the reactance control.* Note the frequency at which this second null is found; this is ( $f_{n+2}$ ).

5) We can now find the value of  $n$  and the electrical length of the cable. (Round  $n$  to the nearest even integer after calculation.)

$$n = \frac{2 f_n}{f_{n+2} - f_n} \quad (\text{Eq 7})$$

$$f_\lambda = \frac{4 f_n}{n} \quad (\text{Eq 8})$$

This procedure can also be followed using an open circuit as the termination. However, the end effects on the open-circuit PL-259 increase the effective length of the coaxial cable; this decreases its  $f_\lambda$ . If you use an open-circuit cable following this procedure,  $n$  will be an odd number, *not* an even number.

The characteristic impedance of the coaxial cable is found by measuring its input impedance at two frequencies separated by  $f_\lambda/4$ . This must be done when the cable is terminated in a resistive load. Characteristic impedance changes slowly as a function of frequency, so this measurement must be done near the frequency of interest. The measurement procedure is as follows:

1) Place the 50- $\Omega$  load on the far end of the coaxial cable and connect the near end to the UNKNOWN connector of the noise bridge. (Measurement error is minimized when the load resistance is close to the characteristic impedance of the cable. This is the reason for using the 50- $\Omega$  load.)

2) Tune the receiver approximately  $f_\lambda/8$  below the frequency of interest. Adjust the bridge resistance and reactance controls to obtain a null, and note their readings as  $R(f)$  and  $X(f)$ . Remember, the reactance



measured on the front panel must be scaled to the measurement frequency.

3) Increase the receiver frequency by exactly  $f_\lambda/4$ . Again, null the bridge and note the readings as  $R(f + f_\lambda/4)$  and  $X(f + f_\lambda/4)$ .

4) Calculate the characteristic impedance of the coaxial cable using Eqs 9 through 14. A scientific calculator is helpful for this.

$$R = R(f) \times R(f + f_\lambda/4) - X(f) \times X(f + f_\lambda/4) \quad (\text{Eq 9})$$

$$X = R(f) \times X(f + f_\lambda/4) + X(f) \times R(f + f_\lambda/4) \quad (\text{Eq 10})$$

$$Z = \sqrt{R^2 + X^2} \quad (\text{Eq 11})$$

$$R_0 = \sqrt{Z} \cos\left(\frac{1}{2} \tan^{-1} \left[\frac{X}{R}\right]\right) \quad (\text{Eq 12})$$

$$X_0 = \sqrt{Z} \sin\left(\frac{1}{2} \tan^{-1} \left[\frac{X}{R}\right]\right) \quad (\text{Eq 13})$$

$$Z_0 = R_0 + j X_0 \quad (\text{Eq 14})$$

From taking measurements on a number of types of coaxial cable, I found that nominal 50-Ω cables have characteristic resistances between 45 and 60 Ω, and characteristic reactances between -2 and -10 Ω.

Cable loss can be measured once the cable's electrical length and characteristic resistance are known. The following procedure allows you to measure the cable loss every  $f_\lambda/4$  in frequency. Loss between measurement points can be interpolated with reasonable accuracy. This procedure employs a resistor-substitution method, and provides much better measurement accuracy than that achieved by directly reading the resistance from the noise-bridge scale.

1) Determine the approximate frequency at which you want to make the loss measurement by using

$$f = n \times f_\lambda/4 \quad (\text{Eq 15})$$

where  $n$  is any positive integer.

2) If  $n$  is odd, leave the far end of the coaxial cable open circuited; if it is even, connect the short-circuit load to the far end of the cable. Attach the near end of the cable to the UNKNOWN connector on the noise bridge.

3) Set the noise bridge to zero reactance. Tune the receiver frequency and the noise bridge resistance to find the null.

4) Connect the variable-resistance load to the UNKNOWN terminal on the noise bridge. Without changing the resistance setting on the bridge, adjust the load resistor and the bridge reactance to obtain a null.

5) Remove the variable-resistance load from the bridge's UNKNOWN terminal and measure the load's resistance using an ohmmeter that's accurate at low resistance levels. Refer to this resistance as  $R_i$ .

6) Calculate the cable loss in decibels using

$$\alpha l = 8.69 \frac{R_i}{R_0} \quad (\text{Eq 16})$$

As an example of this method, let's calculate the parameters for a 74-foot length of Columbia 1188 (an RG-58-equivalent cable). We'll make these calculations near the 10-meter band.

With a short-circuit load on the far end of the cable, we measure nulls at 24.412 and 29.353 MHz. This corresponds to an  $n$  of 10, an  $f_\lambda$  of 9.765 MHz at 24.412 MHz, and an  $f_\lambda$  of 9.784 MHz at 29.353 MHz. With a 50-Ω load on the far end of the cable, we then make the following resistance and reactance measurements, centered at 28 MHz:

$$\begin{aligned} f &= 26.777 \text{ MHz} \\ R(f) &= 64 \Omega \\ X(f) &= -22 \Omega \\ f + f_\lambda/4 &= 29.223 \text{ MHz} \\ R(f + f_\lambda/4) &= 50 \Omega \\ X(f + f_\lambda/4) &= -24 \Omega \end{aligned}$$

This corresponds to a characteristic impedance of:

$$\begin{aligned} R_0 &= 56.6 \Omega \\ X_0 &= -8.3 \Omega \\ Z_0 &= 56.6 - j8.3 \Omega \end{aligned}$$

The input resistance of the cable is 12.1 Ω with a short-circuit load on the far end of the cable at 29.353 MHz; this corresponds to a loss of 1.85 dB.

### Using a Noise Bridge to Measure the Impedance of an Antenna

The impedance at the end of a transmission line can be easily measured using a noise bridge. What we really want to measure, though, is the impedance of the antenna—that is, the impedance of the load at the far end of the line. There are several ways to handle this.

1) Measurements can be made with the noise bridge at the antenna. This is usually not practical because the antenna must be in its final position for the measurement to be accurate. Even if it can be done, making such a measurement is certainly not very convenient.

2) Measurements can be made at the end of a coaxial cable—if the cable length is an exact integer multiple of  $\frac{1}{2} \lambda$ . This effectively restricts measurements to a single frequency. Measuring the impedance of an antenna across an entire amateur band using this method results in significant errors.

3) Measurements can be corrected using a Smith chart, as described in *The ARRL Antenna Book*.<sup>4</sup> This graphical method can result in reasonable estimates of antenna impedance—as long as the SWR is not too high and the cable is not too lossy. However, it doesn't compensate for the complex impedance characteristics of real-world coaxial cables. Also, compensation for cable loss can be tricky to apply. These

problems, too, can lead to significant errors.

4) Lastly, measurements can be corrected using the transmission-line equation, as discussed in the Appendix. The transmission-line equation can be solved using only a scientific calculator, but this is rather tedious to do if more than a few data points are taken. A better method is to use a programmable calculator or personal computer to perform the calculations. (I have listings for a BASIC program and an HP-41C calculator program to perform these calculations. These listings are available from me for an SASE.) I feel that this is the best method for calculating antenna impedances from measured parameters. But it has the disadvantage of requiring that you measure some of the antenna's feed-line characteristics beforehand—measurements for which you'll need to have access to both ends of the feed line.

The procedure for determining antenna impedance is to first measure the electrical length, characteristic impedance, and attenuation of the coaxial cable connected to the antenna. After making these measurements, connect the antenna to the coaxial cable and measure the input impedance of the cable at a number of frequencies in the antenna's operating-frequency band. Then, use these measurements in the transmission-line equation to determine the actual antenna impedance at each frequency.

Table 2 and Fig 5 give an example of such a calculation. The antenna used for this example is a 10-meter inverted V about 30 feet above the ground. The legs of the antenna are separated by a 120° angle. Each leg is exactly 8 feet long, and the antenna is made of no. 14 wire. The feed line is the 74-foot length of Columbia 1188 characterized earlier.

See Fig 5A. From this plot of impedance measurements, it is very difficult to determine anything about the antenna. Resistance and reactance vary substantially over this frequency range, and the antenna appears to be resonant at 27.7, 29.0 and 29.8 MHz.

The plot in Fig 5B shows the true antenna impedance. This plot has been corrected for the effects of the cable using the transmission-line equation. This plot shows that the antenna's true resistance and reactance both increase smoothly with frequency. The antenna is resonant at 28.8 MHz, with a radiation resistance at resonance of 47 Ω. This is just about what you'd expect from an inverted V.

When doing these conversions, you must be careful not to make measurement errors. Such errors introduce more errors into the corrected data. This problem is most significant when the transmission line is approximately an odd multiple of a quarter wavelength long and the line SWR and/or attenuation is high. Measurement errors are probably present if small changes in the input impedance or transmission-line characteristics appear as large changes in antenna

**Table 2**  
**Impedance Data for Inverted-V Antenna**

Freq (MHz)	$R_u$ (ohms)	$X_u @ 10$ MHz (ohms)	$X_u$ (ohms)	$R_L$ (ohms)	$X_L$ (ohms)
27.0	44	85	31.5	24	-65
27.2	60	95	34.9	26	-56
27.4	75	85	31.0	30	-51
27.6	90	40	14.5	32	-42
27.8	90	-20	-7.2	35	-34
28.0	75	-58	-20.7	38	-24
28.2	65	-65	-23.0	40	-19
28.4	56	-52	-18.3	44	-12
28.6	50	-40	-14.0	44	-6
28.8	48	-20	-6.9	47	1
29.0	50	0	0.0	52	8
29.2	55	20	6.8	57	15
29.4	64	30	10.2	63	21
29.6	78	20	6.8	75	26
29.8	85	0	0	78	30
30.0	90	-50	-16.7	89	33

impedance. If this effect is present, it can be minimized by making the measurements with a transmission line that is approximately an integer multiple of  $\frac{1}{2} \lambda$  long.

**Conclusions**

In this article, I've showed how to substantially increase the accuracy of an R-X noise bridge and how to use such a bridge to measure the characteristics of coaxial cable and to measure MF, HF and VHF antenna impedances. A number of other useful impedance measurements can be made with noise bridges, including component impedances. For instance, the improved noise-bridge I've presented here is sensitive enough to measure the inductance of a 1-inch length of wire at 30 MHz.

I hope that others will use this information to prepare better articles for *QST*. In particular, it would be valuable for antenna designs published in future issues of *QST* to include *measured* radiation-resistance and reactance curves. The improved noise-bridge design discussed here makes that possible—at relatively low cost.

**Notes**

- <sup>1</sup>B. Hale, ed, *The 1989 ARRL Handbook* (Newington: ARRL, 1988), pp 2-22 through 2-29.
- <sup>2</sup>L. Wolfgang, ed, *The ARRL Extra Class License Manual*, 3rd ed (Newington: ARRL, 1988), Chapter 5.
- <sup>3</sup>J. Belrose, "RX Noise Bridges," *QST*, May 1988, pp 34-35, 39.
- <sup>4</sup>G. Hall, ed, *The ARRL Antenna Book*, 15th ed. (Newington: ARRL, 1988), Chapter 28.
- <sup>5</sup>S. Ramo, J. Whinnery and T. Van Duzer, *Fields and Waves in Communication Electronics*, Jan 1967, Chapter 1.

**APPENDIX**

The impedance transformation that occurs when a signal propagates on a transmission line can be solved either graphically (using a Smith chart) or numerically, (using the transmission-line equation). The transmission line may be either open-wire line or coaxial cable. With the advent of personal computers, calculating impedance transformation in a transmission line is more easily and accurately done by numerically

solving the transmission-line equation than by using the Smith chart. The impedance transformation along a transmission line is given by<sup>5</sup>

$$Z_1 = Z_0 \left( \frac{Z_L \cosh(\gamma \ell) + Z_0 \sinh(\gamma \ell)}{Z_0 \cosh(\gamma \ell) + Z_L \sinh(\gamma \ell)} \right) \quad (\text{Eq 17})$$

where

- $Z_1$  = input impedance of the transmission line
- $Z_0$  = characteristic impedance of the transmission line
- $Z_L$  = load impedance at the end of the transmission line
- $\ell$  = length of the transmission line
- $\gamma$  = complex propagation constant ( $\gamma = \alpha + j\beta$ )
- $\alpha$  = attenuation constant in nepers per unit length (1 neper = 8.69 dB)
- $\beta$  = phase constant in radians per unit length

The impedances and the propagation constant may be complex numbers. The complex hyperbolic sine and cosine may be found by

$$\sinh(\alpha \ell + j\beta \ell) = \cos(\beta \ell) \sinh(\alpha \ell) + j \sin(\beta \ell) \cosh(\alpha \ell) \quad (\text{Eq 18})$$

$$\cosh(\alpha \ell + j\beta \ell) = \cos(\beta \ell) \cosh(\alpha \ell) + j \sin(\beta \ell) \sinh(\alpha \ell) \quad (\text{Eq 19})$$

$$\sinh(\alpha \ell) = \frac{e^{\alpha \ell} - e^{-\alpha \ell}}{2} \quad (\text{Eq 20})$$

$$\cosh(\alpha \ell) = \frac{e^{\alpha \ell} + e^{-\alpha \ell}}{2} \quad (\text{Eq 21})$$

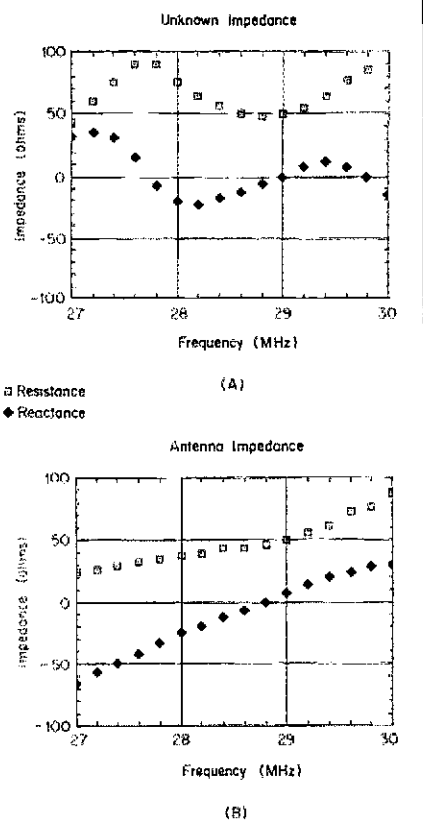
For finding the load impedance (with a known transmission-line input impedance), the transmission-line equation is best written as

$$Z_1 = Z_0 \left( \frac{Z_L \cosh(\gamma \ell) - Z_0 \sinh(\gamma \ell)}{Z_0 \cosh(\gamma \ell) - Z_L \sinh(\gamma \ell)} \right) \quad (\text{Eq 22})$$

Most antenna measurements are made through a fixed length of coaxial cable. Therefore, we'll assume that  $\alpha \ell$  is a single unit that we'll call the attenuation of the cable. This is commonly measured in decibels, but must be converted to nepers for use in the transmission-line equation. The phase constant can be expressed as a function of frequency and the length of the transmission line by:

$$\beta \ell = 2\pi \frac{f}{f_\lambda} \quad (\text{Eq 23})$$

Fig 5—Impedance plot of an inverted-V antenna cut for 29 MHz. At A, a plot of impedances, measured using the noise bridge, at the end of a 74-foot length of Columbia 1188 coaxial cable. At B, the actual antenna-impedance plot (found using the transmission-line equation to remove the effects of the transmission line).



where

- $f$  = frequency of operation
- $f_\lambda$  = frequency at which the transmission line is 1 electrical  $\lambda$  long

A shorted transmission line is used to measure  $f_\lambda$ . To do this, find a frequency at which the transmission line has zero reactance and a low resistance (less than the characteristic resistance of the transmission line). We'll call this frequency  $f_n$ . Increase the frequency until the next zero-reactance, low-resistance point is found. We'll call this  $f_{n+2}$ . (The n indicates the number of quarter wavelengths that are present on the transmission line; n is always an integer.)

$$n = \frac{2 f_n}{f_{n+2} - f_n} \quad (\text{Eq 24})$$

where  $n = 2, 4, 6, \dots$

$$f_\lambda = \frac{4 f_n}{n} \quad (\text{Eq 25})$$

The value of  $f_\lambda$  calculated in Eq 25 assumes that the transmission line has a nonreactive characteristic impedance. This is generally not true, but Eq 25 is accurate nonetheless; it yields an error of less than 2.5% for a transmission line with less than 3 dB loss and a reactive characteristic-impedance component of less than 10  $\Omega$ .

Transmission-line characteristic impedance is almost always complex. Good coaxial cable has a very small reactive characteristic-impedance component (on the order of a few ohms). Cable characteristic impedance is most easily calculated by placing a load at one end of the cable and measuring the impedance at the other end at two frequencies separated by  $f_\lambda/4$ . The input impedance of the cable is then

$$Z_1(f) = Z_0 \left( \frac{Z_L \cosh(\gamma \ell) + Z_0 \sinh(\gamma \ell)}{Z_0 \cosh(\gamma \ell) + Z_L \sinh(\gamma \ell)} \right) \quad (\text{Eq 26})$$

(continued on page 52)

## Yaesu FT-747GX MF/HF Transceiver

Reviewed by David Newkirk, AK7M

The FT-747GX is Yaesu's entry in the field of what I call "tune and talk" ham gear—communications equipment in which secondary features (read: *frills*) and rarely used controls *don't* hide the basic radio performance necessary to communicate effectively from Point A to Point B. Does the FT-747GX succeed in its mission? Yes, and then some.

### FT-747GX Features

The FT-747GX receives from 100 kHz to 29.999975 MHz, has two "VFOs" (actually tunable memories) and 20 lithium-cell-backed memories, and transmits LSB, USB, CW, AM and (optionally) FM at 100 W PEP on all Amateur Radio bands within this range. The FM unit was not tested for this review.

The FT-747GX comes with three IF filters as standard; narrow and wide IF bandwidths are available in the CW and AM modes. The '747's IF filters are applied as follows: SSB, CW wide, AM narrow: 2.2 kHz at -6 dB and 5 kHz at -60 dB; CW narrow: 0.5 kHz at -6 dB and 1.8 kHz at -60 dB; AM wide: 6 kHz at -6 dB and 14 kHz at -50 dB. The '747 does not have an "RF gain" control,<sup>1</sup> IF-shift control, speech processor or provisions for connecting a transverter. Only push-to-talk (PTT) transmit-receive (TR) switching is available during SSB, AM and FM operation; "semi-break-in"<sup>2</sup> and MOX TR switching is available for CW.

The review FT-747GX came with an operating manual, a fused dc power cord, two 20-A fuses and an MH-1B8 hand scanning microphone. I powered the transceiver with a Yaesu FP-757HD power supply.

### Construction

The FT-747GX is amazingly lightweight for its size. As soon as I discovered this, I took off the '747's cover to see what was inside. Most of the '747's electronics are contained on three circuit boards. One board—the Main Unit—is parallel with the rig's bottom cover and does the '747's small-signal amplification, conversion, filtering and detection chores. (Several small daughterboards, including noise blanker and crystal-filter units, are mounted on the Main Unit.) Another board—the Local Unit—contains the '747's signal-generation (LO, BFO and so on) and PLL circuitry; this is mounted along one side of the Main Unit. The third major circuit board, the Display Unit, is mounted on the back of the '747GX's front panel; it contains the FT-747GX's microprocessor, display, display driver and audio-power-amplifier circuitry. Most of the '747GX's front-panel controls are mounted on this board.

<sup>1</sup>Notes appear on p 52.



The FT-747GX's RF-power-amplifier circuitry is contained in a die-cast aluminum module. If you've already ogled an FT-747GX and wondered where its heat-sink fins are, they're *inside* this module! The RF-power-amplifier module includes a squirrel-cage fan that pulls air into the left side of the '747GX, blows the air past (through) the heat-sink fins and out the louvered back end of the module. The fan, which comes on in response to heat-sink heating, is moderately loud.

The FT-747GX's three-piece cabinet is, I think, something new to MF/HF ham radio gear: It's made entirely of metalized *plastic*, and is held together by two black-anodized aluminum extrusions that slide into place along the transceiver's sides.

What continues to amaze me about the FT-747GX is that about one third of its volume is air! Yaesu has packed a lot of radio performance into the FT-747GX's few circuit boards and RF power "brick."

### Controls and Connectors

So intuitive is the FT-747GX's control system that I can combine a tour of the '747's controls and connectors with discussion of the rig's functions.

#### Front Panel

**Meter.** The FT-747GX's illuminated front-panel meter serves as a relative signal-strength (S) meter in receive, and a relative power-output meter in transmit. The S scale is calibrated from 1 to 9 (white) to about  $\frac{2}{3}$  scale; above this level, signal strength is indicated in decibels over S9 (red). The white PO scale is calibrated from linear units from 0 to 10.

Below this, the '747's push on, push off

Table 1

#### FT-747GX Tuning-Step Size v Mode

Mode	FAST On	FAST Off
SSB/CW	2.5 kHz	25 Hz
AM	10 kHz	1 kHz
FM†	12.5 kHz	5 kHz

† with optional FM board.

POWER switch makes and breaks the rig's dc supply connection.

The FT-747GX's eight-pin MIC jack includes connections for microphone audio, chassis common, and push-to-talk (PTT) TR switching, and microphone-mounted UP, DOWN and FST tuning/memory-scan-control buttons.

The FT-747GX's PHONES jack allows connection of stereo or monaural headsets via a  $\frac{1}{4}$ -inch-diameter plug.

Amazingly, there's a tiny *front-panel speaker* between the FT-747GX's PHONES jack and tuning knob. (The FP-757HD power supply contains a larger front-panel speaker that's easily connectable to the '747 by means of the speaker plug at the end of the FP-757's power cable.)

**Tuning knob.** At just under 1-7/8 inches in diameter, the FT-747GX's lightweight, rubber-sided tuning control is easy to grip. The knob action is *detented*; that is, it rotates through a series of gentle hesitations, each of which is accompanied by a soft click—something like a detented rotary switch, but requiring much less torque. I'm about as curmudgeonish as equipment reviewers come, and I can't find fault with the FT-747GX's *detented* tuning feel. It's not *bad*, it's just *different*. (I'd like Yaesu to add a finger hole to the

**Table 2****Yaesu FT-747GX Transceiver, Serial No. 8D040384***Manufacturer's Claimed Specifications*

Frequency coverage: Receiver, 100 kHz to 29.999 MHz; transmitter, 1.5-1.9999, 3.5-3.9999, 7.0-7.4999, 10.0-10.4999, 14.0-14.4999, 18.0-18.4999, 21.0-21.4999, 24.5-24.9999, 28.0-29.9999 MHz.

Modes of operation: LSB, USB, CW, AM, FM†

Frequency display: Not specified.

Frequency resolution: Not specified.

Power requirement: 13.5 V dc  $\pm$  10%,  
19 A at 100 W output

*Transmitter*

Transmitter output power: SSB, CW and FM†:  
100 W PEP/DC; AM: 25 W, carrier.

Spurious signal and harmonic suppression:

Harmonic: better than 50 dB; non-harmonic:  
better than 40 dB.

Third-order intermodulation-distortion products:

Better than -25 dB at 100 W PEP output.

CW-keying waveform: Not specified.

Transmit-receive turnaround time (PTT release  
to 90% audio output with an S9 signal):  
Not specified.

*Receiver*

Receiver sensitivity:

SSB and CW: (CW bandwidth not specified)  
for a 10-dB (S + N)/N ratio, 0.5  $\mu$ V from  
0.5-1.5 MHz (0.1-0.5 MHz not specified) and  
0.25  $\mu$ V above 1.5 MHz.

AM: (bandwidth not specified) for a 10-dB  
(S + N)/N ratio, 2  $\mu$ V from 0.5-1.5 MHz  
(0.1-0.5 MHz not specified) and 1.0  $\mu$ V above  
1.5 MHz.

FM†: 0.7  $\mu$ V for 12 dB SINAD above 28 MHz.

Receiver dynamic range: Not specified.

S-meter sensitivity ( $\mu$ V for S-9 reading):

Not specified.

Squelch sensitivity: SSB/CW/AM: 4.0  $\mu$ V from  
0.5-1.5 MHz, 2.0  $\mu$ V above 1.5 MHz; FM†:  
0.32  $\mu$ V.

Receiver audio output: More than 1.5 W at 10%  
total harmonic distortion (THD) into an 8- $\Omega$  load.

Color: Gray.

Size (height, width, depth):

3.7 x 9.4 x 9.4 inches.

Weight: 7.25 lb.

†Requires installation of optional FM board.

††Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

*Measured in the ARRL Lab*

Receiver, 100 kHz to 29.999975 MHz;  
transmitter, as specified plus an  
additional 75 Hz at the upper end of  
each range.

As specified.

6-digit, amber-backlit LCD.

Display, 100 Hz. Actual tuning resolution  
varies with mode and tuning speed  
as shown in Table 1.

At 13.5 V dc and 14.2 MHz, 17 A for  
95.6 W output and 1.09 A during  
receive at full audio output.

*Transmitter Dynamic Testing*

CW: 90.0 to 97.9 W PEP, depending  
on band; SSB, 98.4 to 105.8 W PEP  
depending on band; AM: as specified;  
FM not tested.

See Fig 1.

See Fig 2.

See Fig 3.

19 ms.

*Receiver Dynamic Testing*

Minimum discernible signal (noise floor)  
with "CW narrow" filter

1.0 MHz: -136 dBm

3.5 MHz: -136 dBm

14 MHz: -136 dBm

"AM wide" filter, with test signal 30%  
modulated with a 1 kHz tone;

1.0 MHz: -120.5 dBm (0.21  $\mu$ V)

3.5 MHz: -118.5 dBm (0.30  $\mu$ V)

14 MHz: -119.5 dBm (0.24  $\mu$ V)

FM not tested.

Blocking dynamic range††:

3.5 MHz: 109.5 dB

14 MHz: 120 dB

Two-tone, third-order intermodulation  
distortion dynamic range††:

3.5 MHz: 90.0 dB; 14 MHz: 92.0 dB

Third-order input intercept:

3.5 MHz: -1 dBm; 14 MHz: +2 dBm

34  $\mu$ V at 1 MHz, 32  $\mu$ V at 14 MHz,

35  $\mu$ V at 28 MHz.

At 14.2 MHz: Min, 1.7  $\mu$ V; max,  
2800  $\mu$ V; FM not tested.

1.76 W into 8  $\Omega$  at 10% THD.

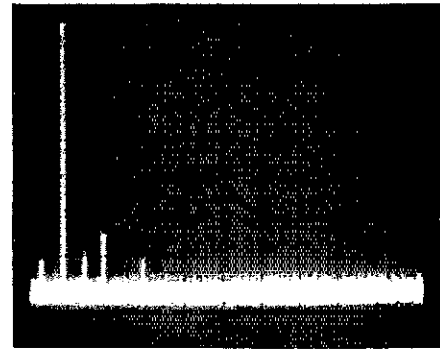


Fig 1—Worst-case spectral display of the Yaesu FT-747GX. Horizontal divisions are each 10 MHz; vertical divisions are each 10 dB. Output power is approximately 100 W at 10.15 MHz. All harmonics and spurious emissions are at least 54 dB below peak fundamental output. The FT-747GX complies with current FCC specifications for spectral purity.

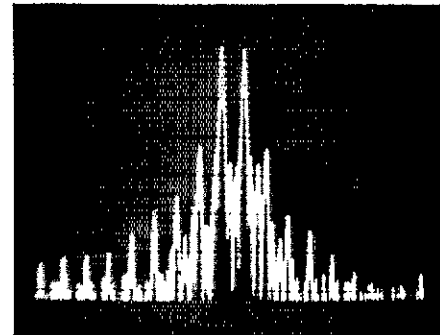


Fig 2—Spectral display of the Yaesu FT-747GX during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 32 dB below PEP output, and fifth-order products are approximately 45 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 100 W PEP output on 14.2 MHz.

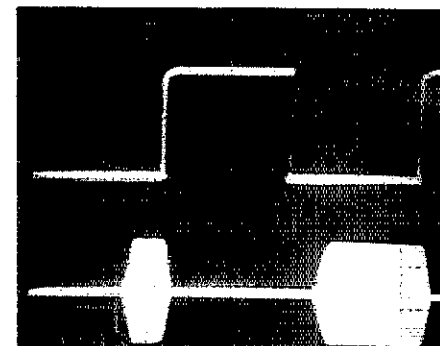


Fig 3—CW-keying waveform for the Yaesu FT-747GX in the semi-break-in mode. The lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 10 ms. Note the shortening of the first dot after key closure.

'747's tuning knob, though.)

**Display.** The FT-747GX's amber-backlit liquid-crystal display (LCD) is easy to read and presents the current operating frequency to the nearest 100 Hz. (In transmit, the frequency displayed is the carrier frequency; in receive, the frequency displayed is the carrier frequency for incoming signals centered in the '747's IFs.) In addition to frequency, the FT-747GX's LCD displays the number of the current memory channel and includes BAND, SCAN, SPLIT, VFO A, VFO B, CLARifier, BUSY (receiver unswitched), dial LOCK, FAST tuning, MR (memory recall), LSB, USB, CW, AM, FM, NARrow filter and PRIority channel annunciators.

**CLARifier.** Pressing this button turns the FT-747GX's tuning knob into a  $\pm 9.975$ -kHz receiver-incremental-tuning (RIT) control that does not change the transceiver's transmitting frequency. The frequency display registers the effect of clarifier tuning as appropriate. Notes: (1) the clarifier tunes in 25-Hz steps regardless of the FT-747's operating mode; (2) during VFO A/B operation, the '747's clarifier circuit "remembers" the clarifier offset after CLAR has been turned off *only if the tuning knob is not touched*; and (3) the clarifier functions during memory recall operation; switching memories with the clarifier turned off does not clear the clarifier offset.

Pressing D LOCK disallows adjustment of the FT-747GX's operating frequency by means of the tuning knob.

>MODE<, a "rocker button," selects the FT-747GX's operating mode. Pressing the < or > end of the button "moves" the mode choice left or right through the LCD's mode annunciators. Depending on the setting of an internal switch (switch S01 on the FT-747GX's Main Unit circuit board), the < MODE > button also selects the FT-747GX's automatic-gain-control (AGC) decay rate: slow in SSB and AM, and fast in CW and FM. Moving S01 from its factory setting sets the '747's AGC decay to slow in all modes.

NAR selects the appropriate "narrow" IF filter during CW and AM reception. The LCD's NAR annunciator darkens when the NAR button is pressed and when FM operating is selected (just in case an FT-747GX user might think that the '747 can do other than *narrowband FM*, I guess!).

VFO MR, another rocker button, actually switches between *three* states: VFO A, VFO B and memory-recall operation. Pressing the VFO end of the switch toggles between VFOs A and B, and allows the microphone UP, DWN and FST buttons to be used for frequency slewing. Pressing the MR end of the switch selects the current memory channel, turns the tuning knob into a memory-channel-select switch and allows the microphone UP, DWN and FST buttons to control memory selection and scanning.

**Memories**—the concept, not a control. The FT-747GX's 20 memories, each of which stores frequency, mode and IF-bandwidth choice in CW and AM, are tunable  $\pm 9.975$  kHz by means of the clarifier function. The '747's operating mode can be altered by means of the < MODE > button; frequency

and mode shifts made during memory-recall operation cannot be written into the memory channel involved, however. The '747's memories can be written to only from VFOs A and B (or via computer control). All but memories 18 and 19 are capable of storing frequency splits (see next item).

**SPLIT.** Pressing this button displays the LCD SPLIT annunciator, activates split-frequency operation (that is, transmission on one VFO and reception on the other) and selects the current VFO as the receive VFO. The FT-747GX's split-frequency feature can operate between any two frequencies covered by the '747GX as long as the transmit frequency falls in one of the rig's "transmit bands" (see Table 2).

VFO > M. Pressing this button during reception on VFO A or B (1) writes the current frequency and mode (and split, if selected, when the current memory channel is not 18 or 19) into the current memory channel during VFO A or VFO B operation; or (2) toggles scanning lockout of the current memory channel during memory recall operation.

M > VFO. Pressing this button during reception on VFO A or B, or during memory-recall reception, transfers the contents of the current memory channel to the current VFO (or to both VFOs, if the recalled memory channel contains a frequency split).

PRI-M. Pressing this button during VFO operation darkens the LCD SPLIT annunciator and causes the FT-747GX to check the current memory channel for activity every 4 seconds or so. For this to work properly, the '747's SQL (squelch) control must be advanced just enough to mute the receiver during reception on the memory channel.

FAST toggles the FT-747GX between fast and slow tuning and band-change rates (that is, between larger and smaller tuning and band-change steps). The tuning rate selected depends on the FT-747GX's operating mode as shown in Table 1. The step sizes shown in Table 1 equate to tuning rate as follows: 25 Hz = 1.25 kHz/rev of the tuning knob; 2.5 kHz = 125 kHz/rev; 1 kHz = 50 kHz/rev; 10 kHz = 500 kHz/rev. That works out to one step for each of the 50 clicks made by the tuning knob through one rotation. Because the review FT-747GX did not contain the optional FM unit, I can only surmise that this step-per-click rate holds for FM tuning with the '747; if this relationship holds, 12.5 kHz = 625 kHz/rev and 5 kHz = 250 kHz/rev. The band-change rate is 500 kHz/click with FAST off and 5 MHz/click with FAST on.

**BAND.** Pressing this button turns the FT-747's tuning knob and mike keys (DWN, FST, UP) into band switches, causes the LCD BAND annunciator to flash and starts a timer that senses tuning knob and mike-key activity. Band-change input from the tuning knob and mike keys changes the '747's frequency display, but the '747 doesn't actually move to the selected frequency until BAND is pressed a second time. This is where the timer comes in: The band-change function times out without effect if band-change input is absent

for more than about 4 seconds.

Aside from its tuning knob, the FT-747GX has four rotary controls; these are arranged in two concentric pairs. The pairs comprise AF gain and SQL, and MIC and DRIVE. MIC adjusts the microphone-input level during SSB and AM operation. (The '747's mike gain is fixed during FM operation.) DRIVE adjusts the carrier level during CW, AM and FM transmission and is nonfunctional during SSB operation. As measured in the ARRL lab, DRIVE reduces the FT-747GX's output from maximum down to about 50 mW.

ATT, NB and MOX are push-on, push-off latching buttons. ATT selects or deselects a 20-dB RF attenuator during receive; a green LED lights behind a window in the ATT button when the attenuator is in use. NB turns the '747's noise blanker on and off. MOX (manually operated switch) puts the FT-747GX into the transmit mode; a red ON AIR LED behind the '747's dial escutcheon (between the meter and LCD) lights when the transceiver is switched into transmit.

### Rear Panel

The FT-747GX's rear-panel connectors and controls include:

**CAT.** This 6-pin DIN jack allows computer control of the FT-747GX by means of Yaesu's CAT (Computer Aided Transceiver) control system. The CAT connector lines carry serial data in and serial data out; PTT and AGC signals; and a ground connection. One pin is unused.

**CAR ADJ.** Despite their accessibility, these three BFO/carrier-oscillator frequency controls (CW, USB, LSB), are not intended for routine adjustment by FT-747GX owners.

+13.5V. According to the '747's *Operating Manual*, this phono jack sources 13.5 V dc at 200 mA "for powering accessories."

EXT SP, a 1/8-inch phone jack, allows connection of a 4- to 16- $\Omega$  speaker.

KEY, a 1/4-inch phone jack, allows connection of a key or keyer. The open-circuit voltage of the FT-747GX's keying circuit is 13, negative ground; 0.7 to 1 mA flows in the keying line when the circuit is closed.

AFOUT, a phono jack, sources fixed-level FT-747GX receiver audio at 50 mV, peak, at an output impedance of 10 k $\Omega$ . This jack is suitable for connection to a digital-communications processor, tape recorder, phone patch, audio equalizer or external audio amplifier.

EXT ALC, a phono jack, accepts automatic-level-control (ALC) voltage (0 to -5, positive ground) from an external power amplifier.

PTT, a phono jack, affords access to the '747's PTT line.

BAND DATA, an 8-pin DIN jack, sources band-data and control signals for Yaesu's FC-757AT and FC-1000 antenna tuners, and the FL-7000 amplifier. Pin 6 of this jack provides access to a transistor capable of switching 150 V dc at 1.5 A, negative ground, for control of an external power amplifier. Amplifiers with switching requirements outside this voltage/current range can be controlled via Yaesu's optional FRB-757 relay box.

DC 13.5V, a chassis-mount, four-prong TRW/Cinch/Jones-style plug, is the FT-747GX's power-input connector. Judging by the speed with which they tarnish, the pins are silver-plated.

GND, a binding post with a knurled, captive nut, allows the FT-747GX to be grounded by a means independent of power-supply and antenna grounds.

ANT, a single-hole-mount SO-239 connector, serves as the '747's RF input/output connector. Check this connector for tightness from time to time if you connect and disconnect antennas often: the ANT jack on the review '747 loosened after a few weeks of multioperator use and had to be retightened several times during the review period.

### Internal Adjustments

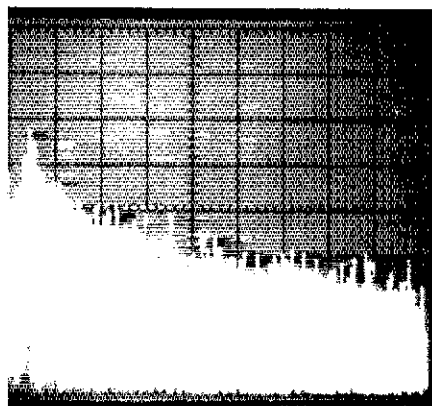
Aside from its AGC switch, the FT-747GX has four internal controls. These are: (1) VR1013, which adjusts the hold-in time of the FT-747GX's keyed TR switching for CW operation (set VR1013 for minimum delay if you want the '747 to return receive instantly on release of the MOX button); (2) S02, which enables inhibition of FT-747GX transmission by an external device via the '747's BAND DATA jack; (3) the sidetone level control (VR08), which is accessible through a hole in the '747's bottom cover; and (4) the memory backup switch (S19, also accessible through a hole in the '747's bottom cover), which disconnects the FT-747GX's lithium memory-backup cell to clear all memories or "if you plan to store the transceiver for a long time without power connected."

### FT-747GX Performance

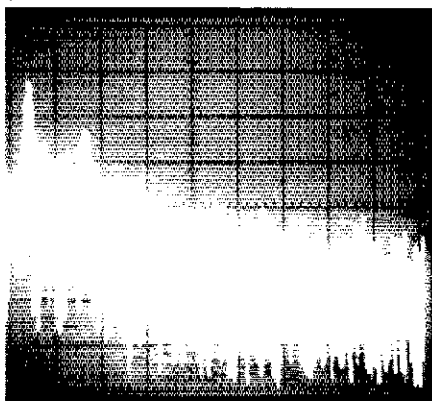
Looking over what I've written so far, I realize that using the FT-747GX is easier done than said! In my opinion, most FT-747GX users will be able to figure out how to use all of the on-board features within half an hour. (If you stoop to opening the FT-747GX *Operating Manual*—which I suggest you do because [1] the manufacturer recommends it and [2] the manual is well-written and accomplishes its mission pleasantly—you'll be up and running that much faster.) Table 2 shows the results of ARRL lab tests on the review FT-747GX.

**CW operation** is straightforward with the FT-747GX: Tune in the station you want to work and press your key! The DRIVE control allows smooth control of the '747GX's output power in this mode; it's easy to set the transceiver's output to the QRP (5 W or less) level by this means, for instance. The FT-747GX's AGC system, though simple, works admirably for CW in its slow and fast decay modes: AGC-attack popping does not occur, even on very strong signals. This is important in the absence of an RF-gain control. My most memorable FT-747GX CW QSO: Working VK9 on 30 meters with my indoor (apartment) antenna!

**SSB performance.** To test the '747GX in this mode, I used the transceiver to put WIAW on the air in the 10-meter Novice/Technician SSB segment. After surviving to QSL the *eighty-odd* contacts that ensued—if



(A)



(B)

Fig 4—Spectral displays of the Yaesu FT-747GX transmitter output during composite-transmitted-noise testing. Power output: 100 W at 14 MHz (at A) and 100 W at 3.5 MHz (at B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated such that the log reference level (the top horizontal line on the scale in the photos) represents  $-60$  dBc/Hz, and the baseline is  $-140$  dBc/Hz. Composite noise levels between  $-60$  and  $-140$  dBc/Hz may be read directly from the photographs. The carrier, which would be off the left edge of the photographs, is not shown. The photographs show noise at frequencies 2 to 20 kHz offset from the carrier.

you've ever heard me work voice, you know why I say *surviving*—I can say that the FT-747GX works well on phone. The rig's AGC works as well on SSB as it does on CW. Every ham I asked for an audio-quality report told me that the '747GX's transmit audio sounds fine. Some rigs "FM" on SSB voice peaks when used in situations where the dc supply voltage drops below the manufacturer-specified range; I heard no trace of FMing in the FT-747GX down to 11 V, the lowest supply voltage I tried.

### Rough Edges

Yaesu's options for powering the FT-747GX, the heavy-duty FP-757GX (price class, \$270) and the light-duty FP-700 (price

class, \$220) are expensive, considering what they provide for their cost. Careful shopping may net you lower-cost alternatives to the Yaesu supplies.

As Fig 3 shows, the FT-747GX's keyed TR switch truncates the first Morse-code element sent. This didn't bother me because my inability to tolerate *any* form of delayed-hold-in, keyed TR switching had me reaching for the '747GX's MOX button every time! For hams who prefer to use delayed-hold-in, keyed TR switching instead of MOX, though, the FT-747GX's "short first dot" may be an annoyance.

The FT-747GX's sidetone cannot be heard without putting the rig into transmit. The FT-747GX *Operating Manual* declares that

To practice sending CW, just set the DRIVE control fully counterclockwise. Now, closing the key will generate the sidetone but no signal will be transmitted.

—but the *second statement in the second sentence of this excerpt is not true*. Turning the FT-747GX's DRIVE control fully counterclockwise reduces the '747's RF output to minimum, but the rig still puts out a signal—about 50 mW of RF, depending on the band. Because of this, *don't assume you can't be heard when you set your FT-747GX's drive to minimum*; QRP enthusiasts work the world at the 50-mW level all the time. If you want to adjust your keyer or practice sending code with the FT-747GX's sidetone *without* transmitting, tune to a frequency outside the transmitter ranges listed in Table 2. When you set the '747 to such a "no-transmit" frequency and press MOX, the '747 emits two audio error beeps and displays .Err.—and allows you to listen to the sidetone without transmitting anything. To simplify this operation, write a no-transmit frequency to one of the '747's memory channels and return to it when you want to adjust your keyer or practice sending.

The FT-747GX's receive-audio chain cuts high audio frequencies to a considerable degree. On CW, such a response is fine; the test FT-747GX exhibits a "CW narrow" audio bandwidth of 490 Hz at  $-6$  dB—a passband width on par with that of the rig's 500-Hz CW filter. SSB is a different story: The overall SSB receive bandwidth of the test FT-747GX is only 1246 Hz at  $-6$  dB—with a 2.2-kHz-wide IF filter in line! On AM, the FT-747GX's receive audio is just plain muddy: The rig's overall AM-receive frequency response was measured in the ARRL Lab as 100 to 1200 Hz at  $-6$  dB with the 6-kHz AM filter selected. Result: Tuning off to one side of a broadcast signal even in "AM wide" doesn't noticeably improve recovery of audio highs. On the test FT-747GX, AM signals are most intelligible when received as LSB or USB.

Good news, though: Chip Margelli, K7JA, Vice President of Marketing for Yaesu USA, reports that the high end of the FT-747GX's receive-audio response can be moved to over 2100 Hz at  $-6$  dB by removing just one capacitor, and that Yaesu will be making a change in the production of new '747s in-

(continued on page 52)

## VARIATIONS ON THE PL-259 THEME—REVISITED

AK7M: The official method of installing UHF-series plugs (referred to for the remainder of this month's column by the generic term PL-259) on coaxial cable can be daunting to newcomers and long-time radio amateurs alike. August 1988 Hints and Kinks sampled alternative PL-259-installation methods developed by hams disenchanted with doing it "the right way." Here's a sampling of your response to that column.

□ I agree with those who report that solderless PL-259s invite trouble: Coax fittings *must* be soldered to give long and reliable service! Another comment concerns the PL-259's center pin: Unless it is correctly aligned, and its outer surface is free of solder and flux, the pin may deform any contact into which it is inserted.

Maybe there would be fewer variations in PL-259 assembly techniques if the PL-259 were better designed! The official method entails soldering temperatures that melt the cable insulation, and this frustrates achieving electrical integrity *and* satisfying appearance of the assembly. Also, it's hard for me to cut insulation without nicking the underlying metal.

My method of attaching PL-259s includes: (1) using wet tissue paper to absorb heat; (2) using a hot wire instead of a blade to cut cable insulation; and (3) soldering the braid to the *outside* of the plug (see Fig 1).—*Marvin J. McGarity, W4WU, 1416 Sutherland Pl, Birmingham, AL 35209*

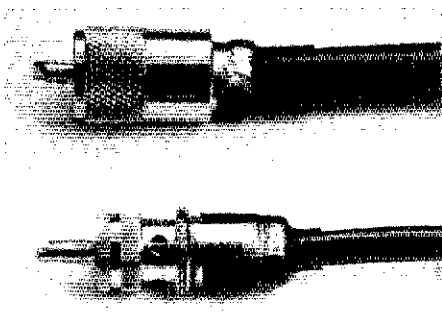


Fig 1—Two coaxial plugs attached using the McGarity method. The heat-shrink tubing is shrunken after the braid has been soldered to the connector and the coupling ring has been moved to its proper position.

□ The method advocated by John Parnell, KQ3E, is a method I have used for nearly 50 years with satisfactory results. I have another method—one that has become my "standard." It is very similar to the method advocated by Ralph Hirsch, K1RH, except that I wrap the braid with tinned copper wire and solder the wire to the braid before screwing the cable into the connector body. This, in itself, makes a very tight joint, but

I add another step by soldering a fillet of solder to the connector. This ensures electrical integrity as well as preserving the shield. I have had absolutely no problems with properly sealed joints made in this fashion.—*I. L. "Mac" McNally, K6WX, 26119 Fairlane Dr, Sun City, CA 92381*

□ My approach to the problem of assembling PL-259s is simple and direct: I don't use them! Instead, I use N connectors (they're designed for 50-Ω operation, and their shield-to-connector connection is clamped, not soldered). In a similar manner, BNC connectors, when used with RG-58 cable, work very well for the numerous short interconnects common in many Amateur Radio stations. N connectors are inherently weatherproof; the bayonet construction of BNC connectors makes them a good choice for situations in which quick connections and disconnections must be made. Unlike UHF connectors, N and BNC connectors can be easily reused and have constant-impedance characteristics.

A complete changeover from UHF connectors to N/BNC connectors would be quite a headache; I recommend a phaseover instead. In my station, I use N or BNC connectors on all new equipment, and use UG-83 UHF-to-N adapters for older gear. (UHF-to-N adapters are available in a number of styles; flea markets are a good place to pick these up.) N connectors may be more expensive than their UHF counterparts, but the added cost is worth it: N connectors are better.—*Peter H. Bliss, W8DTD, 8701 Kings Mill Pl, Raleigh, NC 27614-9150*

□ I found no mention in your August 1988 column as to why many of us probably don't solder our PL-259s: We don't have a hot enough soldering iron, and we can't justify buying one for the number of times we'll use it. Several years ago, while living in Mountain Village, Alaska, I needed to solder a plug. I had some low-temperature solder (probably Wood's metal or a similar bismuth alloy) that's meant to be melted with a match or cigarette lighter, so I just heated the plug on my stove and ran the solder in.

My new soldering iron (75 W) doesn't do much better at soldering PL-259s than my older 30-W iron. So, I found my low-temperature solder, used it with the new iron—and it worked just fine. The lower soldering heat probably didn't damage the cable dielectric much, either.—*David M. Chamberlin, WL7BLV, PO Box 75071, Fairbanks, AK 99707*

AK7M: Yes, 30 W, and even 75 W, is insufficient heating power for proper assembly of a PL-259. I use a trigger-selectable 100/140-W soldering gun—at 140 W—with reasonable success. Our next PL-259-problem-solver improves on the soldering-gun technique. . .

□ Here's my quick, easy and painless soldering-gun method of soldering the cable braid to the connector body during PL-259 assembly. Shape a soldering-gun tip as shown in Fig 2. Prepared in this way, the tip fits into the connector-barrel solder holes to heat the braid and the connector barrel. This reduces the time necessary to solder the braid to the connector, minimizing the likelihood of damage to the cable dielectric.

Several additional precautions can speed connector assembly and assure a good braid-connector solder joint:

- Always tin the braid before assembling the connector.
- Use liquid rosin flux (such as General Cement Liquid Solder Flux, usually available at TV-parts supply houses).
- Never try to solder nickel-plated connectors without first filing the edges of each connector-barrel solder hole to expose the brass connector material.
- Use a soldering iron or gun of sufficient power; 100 W is marginal in still air and insufficient in moving air.
- Solder *all* of the connector-barrel solder holes. They are there to allow complete soldering of the braid (or braid and reducer) to the connector body.

Assembling a PL-259 according to these guidelines takes only a few minutes and produces a dependable connector assembled as its manufacturer intended.—*Bob McKay, N8ADA, 317 Ernst Ave, Dayton, OH 45405*

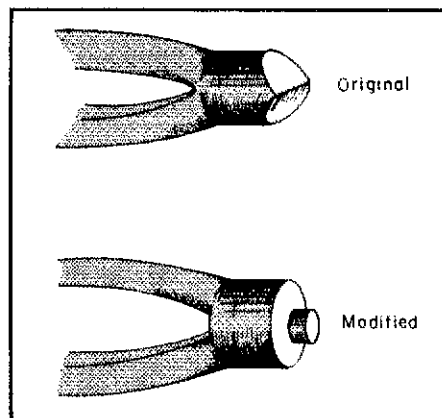


Fig 2—Bob McKay assembles PL-259 connectors with a soldering-gun tip filed to this shape. Be prepared to reshape or replace such a tip every few soldering jobs, though: Soldering-gun tips erode with use, contributing a fraction of their copper to every joint they solder.

□ I've been employed by the engineering department of a major-network TV broadcasting company for over 28 years, and over the course of time, we've used a great

many PL-259 connectors for video distribution. (Now, we mainly use BNCs.) Our biggest UHF-plug headache has not been with connections within the assembled connectors; rather, we were kept busy by PL-259 coupling rings that loosened over time.

To prevent this problem, use "gas" (slip-joint) pliers to tighten UHF-plug coupling rings during their last quarter-turn or so of travel. Of course, pliers are necessary to loosen a connector installed in this way—but that's a small price to pay for the peace of mind pliers-tightened connectors afford!

Another PL-259-assembly point: Don't let solder flow over the outside of the plug center pin during assembly. The center-pin collet in UHF-series jacks is not intended to accept diameters larger than that of the center pin.—*David Miller, NZ9E, 7462 W Lawler Ave, Niles, IL 60648*

**AK7M:** Oversoldered PL-259 pins can be filed or scraped clean of excess solder, but this procedure may also remove the pin's plating. Go easy.

□ A bit more trouble soldering cable braid to PL-259s? I just drill the connector-barrel solder holes slightly larger—no problem! —*Richard Mollentine, WA0KKC, 7139 Hardy, Overland Park, KS 66204*

### A GOOD, CHEAP HEADSET

□ Several headsets on the market are useful for mobile and hand-held-transceiver operation. Most of these headsets cost \$40 to \$50, and others cost up to \$80. Here is a cheaper way to get a good headset.

The latest Radio Shack® catalog (no. 432) includes "voice-actuated FM headset walkie-talkies" on page 70. Each of these units includes a headset consisting of a microphone, one earphone and a 17-inch earphone-mounted whip antenna. You can order a replacement headset (part no. Z-7868) through a Radio Shack store [and perhaps through Tandy National Parts—*Ed.*]. The price of the headset at the time I bought it was \$10.18 plus tax!

The earphone cable consists of two coaxial cables (one with a clear-plastic-insulated center conductor and gray shield wire, and the other with a gray-plastic-insulated center conductor and black shield wire) and two single leads (one blue, one black). The clear-insulated-center-conductor coax carries RF; the black-insulated-center-conductor coax carries microphone audio. (The microphone uses an electret-capacitor element; in addition to audio, the mike cable carries voltage for the mike element.) The single blue and black wires carry earphone audio.

Through experimentation, I determined that the headset's mike element works well with the voltage and polarity present at my Kenwood TR-2600A's mike jack. (The '2600A's mike line sources 4 V dc [center conductor, positive] for use with capacitor mike elements.) The TR-2600A drives the headset earphone well.

Attempts to drive the headset's 17-inch whip failed until I discovered and removed the whip's inductive loading. To take the loading inductor out of the circuit, unscrew the earphone cover and lift the earphone element to one side. Solder a short piece of solid wire across the inductor terminals, and reassemble the headset. Modified in this way, the headset whip—somewhat shorter than  $\frac{1}{4} \lambda$ , I admit—works on 2 meters at a reasonable SWR and provides communication over a greater range than a "rubber duckie."

For remote PTT switching, I mounted a SPST switch in a 35-mm-film can, and connected the switch to the mike-jack PTT terminals with two-wire cable. Clipped to my belt with a key-ring clip, this arrangement makes TR switching easy.

Of course, suitable connectors must be installed on the headset earphone wires, and antenna and microphone cables; because the connectors required vary with the application, I leave these details to you. —*Al Brogdon, K3KMO, Box 60, Damascus, MD 20872*

### A SOURCE OF FERROUS CORE MATERIAL FOR FILAMENT CHOKES

□ Ferrite cores from TV flyback transformers can serve well as core material for filament chokes. Here are my experiences in fabricating and testing a filament choke wound on such a core in a home-built two-813 amplifier. The core I used is rectangular, with inside dimensions of about  $1\frac{3}{4} \times 1\frac{1}{2}$  inches.

After removing the transformer windings, I wound several layers of electrical tape on the core to protect the choke winding from the core's sharp edges. Next, I wound 34 bifilar turns of no. 12 enameled wire—as many as would fit—on the core. (I obtained the wire from an electric-motor repair shop.)

My next concern was whether the core would saturate with the choke windings supplying filament power (10 V ac at 10 A) to the 813s. To test this, I wound a few turns of wire on the core and shunted this winding with a capacitor. Then, I determined the resonant frequency of this parallel tuned circuit with a dip meter. Next, I checked the tuned circuit's resonant frequency with 10 A flowing through the choke windings. No change had occurred in the circuit's resonant frequency; hence, I concluded that the core could handle 10 A without saturating.<sup>1</sup> The core's ac voltage drop tested as 0.2 V at 10 A. (I needed this information because I planned to heat the 813s' filaments with a rewind power transformer. That I did; my rewind transformer puts out 10.2 V under load.)

<sup>1</sup>Core saturation would reduce the core's permeability, and, assuming that the core material is operative at the test frequency, the inductance of the test winding. An increase in the test tuned circuit's resonant frequency would indicate that such an inductance shift has occurred.—*AK7M*

With the flyback-core filament choke in place, my amplifier works well from 1.8 to 30 MHz. The choke also works well in a single-3-500Z amplifier that covers the same frequency range.

I thank Larry Stark, K9ARZ, for encouraging me to test this idea, and Arne Sjomeling Jr, K0AS, for providing me with technical material on choke design. (Arne tested some flyback cores and determined their permeability to be about 1000.)—*Mark Meyer, WA0NSY, Rt 2, Box 28, Watertown, SD 57201*

### UNIVERSAL JOINTS PREVENT ANTENNA-MAST BINDING

□ Aligning a rotator with a mast so that no binding occurs when the mast turns can be frustrating and time-consuming. Even a slight misalignment can cause the mast to bind in the tower thrust bearing, possibly causing damage to the rotator motor.

I solved this alignment problem by using two universal joints (U joints) to couple the rotator to the mast (Fig 3). The universal joints are installed so that their pivot directions are offset by 90°. The U joints permit the mast to remain vertical in the tower while accommodating considerable misalignment between the rotator and mast.

The U joints shown in Fig 3 are from a NATCO multiple boring machine and are approximately 7/8 inch in diameter. Similar U joints, used in farm machinery and power take-off units, are available at farm-implement or hardware stores for \$2 or



Fig 3—Jay Lowe uses two universal joints to correct misalignment between his rotator and antenna mast. (photo by Jack McCann, KD0SV)



or less. A short length of 1-inch-diameter pipe, drilled to pass the rotator-to-joint bolt, couples the rotator to the lower U joint; the antenna mast is coupled to the upper U joint in this way. The U joints are coupled by a metal rod of suitable diameter and length.—*Jay Lowe, KAØRKR, 3901 Missouri, Joplin, MO 64801*

### ALC FOR RTTY OPERATION

□ As a radioteletype (RTTY) enthusiast, I've been frustrated by incompatibility between transceivers and the automatic-level-control (ALC) output of various external power amplifiers. An external ALC circuit (Fig 4) suggested to me by Erwin Weber, W9DBM, has proven quite successful in solving this problem. With this circuit in place, I can adjust my amplifier for linear operation and, by adjusting R1, reduce the amplifier's output power—without retuning the amplifier—to that suggested by the amplifier manufacturer for safe RTTY operation.—*Hal Cupps, W7LBD, 5833 E Onyx Ave, Scottsdale, AZ 85253*

### SOLDERING TO STAINLESS STEEL—AGAIN

□ Concerning the March column's "Soldering to Stainless Steel—Almost": I've

successfully soldered stainless steel to stainless steel—and to iron, cast iron, brass, copper and other metals—by using homemade acidic soldering flux made of the following ingredients: 37 g of zinc chloride, 23 g of glacial acetic acid and 40 g of hydrochloric acid. (This formula produces a considerable quantity of flux; you can scale down the quantities in proportion to suit your needs.) To make the zinc chloride, I dissolve zinc in hydrochloric acid until the solution is saturated; then I carefully add the rest of the ingredients.—*Roger Del Nero, WA2HNO, RFD #6, Box 291, Rome, NY 13440*

**AK7M:** This formula calls for chemicals that are hazardous to touch and breathe. Hints and Kinks recommends that readers unsure of their ability to handle dangerous chemicals purchase ready-to-use zinc-chloride flux instead of trying to blend their own. Preformulated acidic fluxes are hazardous, too; use them carefully.

### ELECTRONIC BIAS SWITCHING FOR THE AMERITRON AL-1200

□ Adding electronic bias switching (Fig 5) to the Ameritron AL-1200 grounded-grid-3CX1200A7 amplifier allows noiseless break-in when an electronic TR switch is used. Because this circuit biases the tube

off in the absence of excitation, it can lengthen the life of your 3CX1200A even if you don't operate break-in.

The circuit is an adaptation of similar schemes by Clements<sup>2</sup> and Pittenger.<sup>3</sup> Two paralleled 56-kilohm resistors (R1 and R2) are placed in series with the stock AL-1200 bias circuit. With no excitation applied, Q1 and Q2 (a Darlington amplifier) are turned off, and voltage drop across R1 and R2 produces sufficient bias to cut off the AL-1200's 3CX1200A7. Excitation, rectified by D1 and D2 and filtered by C1, turns Q1 and Q2 on, bypassing R1 and R2 and applying normal operating bias to the tube.

Mount the circuit components on a piece of perf board and install this module above the AL-1200 circuit boards (immediately behind the amplifier meters). Caution: Voltages in the AL-1200 can kill you. Unplug the amplifier and ground the 3CX1200A7 plate connection before working on the amplifier.—*Hank Garretson, W6SX, 18831 Capense St, Fountain Valley, CA 92708*

<sup>2</sup>P. Clements, "All Solid-State QSK for the Heath SB-220," *QST*, Jan 1980, pp 25-27.

<sup>3</sup>J. Pittenger, "3CX1200A7 10 to 80-Meter Amplifier," *ham radio*, Aug 1985, pp 75-78, 83, 84-85, 87.

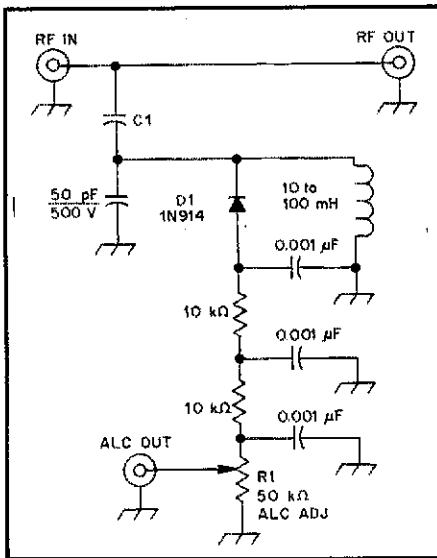


Fig 4—Hal Cupps uses this circuit to produce adjustable ALC voltage in his RTTY system. The polarity of D1 determines the polarity of the ALC signal produced. As shown here, the circuit produces a negative voltage with respect to ground. C1 consists of a ¾-inch-square piece of double-sided PC board (C1's leads go to opposite sides of the board). D1 may generate harmonics of the applied signal; because harmonics can cause interference to radio and TV reception, check reception of your local radio and TV signals after you've added the circuit to your station to be sure D1 isn't causing interference. If D1-generated interference occurs, low-pass filtering between C1 and the antenna can solve the problem.

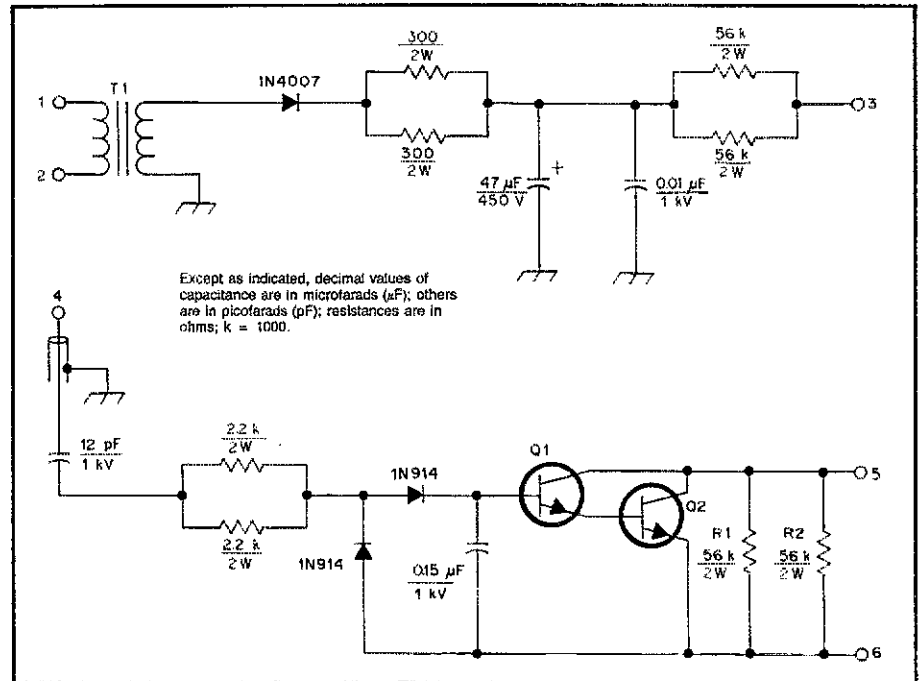


Fig 5—Hank Garretson added electronic bias switching to his AL-1200 with this circuit. The 12-pF, 0.01-μF and 0.015-μF capacitors are ceramic. Connect Terminals 1 and 2 to 120 V ac at the primary of the AL-1200's heater transformer, Terminal 3 to the center tap of the AL-1200's heater transformer, and Terminal 4 to the RF-IN terminal on the AL-1200's ALC/Power Board AR-574; do not change the AL-1200's wiring for these steps. Break the white wire between contact A of RLY1 and the RLY terminal on Meter Board AR-545 in the AL-1200. Connect Terminal 5 to contact A of RLY1 on the AL-1200, and Terminal 6 to the RLY terminal of the AL-1200's Meter Board AR-545.

Q1, Q2—2N5655. Alternatives: 2N5656, 2N5657, 2N4055, 2N4056, NTE 157, MJE3439, MJE3440, MJE9741, MJE9742.

T1—Isolation transformer, 120-V primary and secondary (two low-current filament transformers connected back-to-back will also work).

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

## REDUCING POPCORN NOISE IN ACTIVE FILTERS

□ Although some noise in active filters is unavoidable, noise caused by poor circuit design can be reduced or eliminated. Consider the two low-pass filters shown in Fig 1. According to most simple circuit models, they have identical outputs. The only difference is in the amplitude of the dc voltage (which isn't important for most low-level audio work) across capacitor C1.

When you consider, however, that there is noise at the output of voltage regulators, as well as in typical circuit grounds, the picture changes markedly. In Fig 1A, any change in voltage of the 78L05 regulator (U3) translates to some noise injected into the audio circuit, because the dc output of U1 follows the regulator output, which is followed by the input pins of U2. This action is easily verified with a voltmeter. Replacing the voltage regulator with a passive divider doesn't help any—voltage fluctuations still occur, and may even be worse.

In Fig 1B, there is essentially zero dc voltage across C1. This means that an easy path for noise into the audio chain has been eliminated. With a real (as opposed to theoretically perfect) capacitor at C1, the advantages of the zero dc voltage become more apparent. Flaws in the capacitor (such as leakage current and changes in capacitance value due to environmental changes) become magnified as the dc voltage is increased.<sup>1</sup>

Although these noise voltages are small, they become quite annoying when amplified by some 60 or 80 dB in a direct-conversion (D-C) receiver. With attention to details such as this, the construction of a -137 dBm MDS D-C receiver with a 700-Hz bandwidth and no RF amplifier is not only possible, but quite practical. The area of low-noise audio filters and amplifiers is a good one for further investigation by amateurs without test equipment—these low-level audio problems are best solved by *listening* to the result of circuit changes and *thinking*. All that the fancy test gear often does is inject even more noise into the dc circuit!—Zack Lau, KH6CP, ARRL Lab Engineer

<sup>1</sup>The absence of dc voltage between U2's + input and the signal ground also means that an electrolytic capacitor cannot be used at C1: An electrolytic capacitor depends on the presence of a dc voltage to form its dielectric. In practice, this restriction is unimportant in audio-frequency filters; in such filters, the value of C1 will usually be small enough (less than 0.1 μF) not to tempt a builder to use an electrolytic capacitor for C1. If you're building filters for a seismograph, though, keep this limitation in mind!

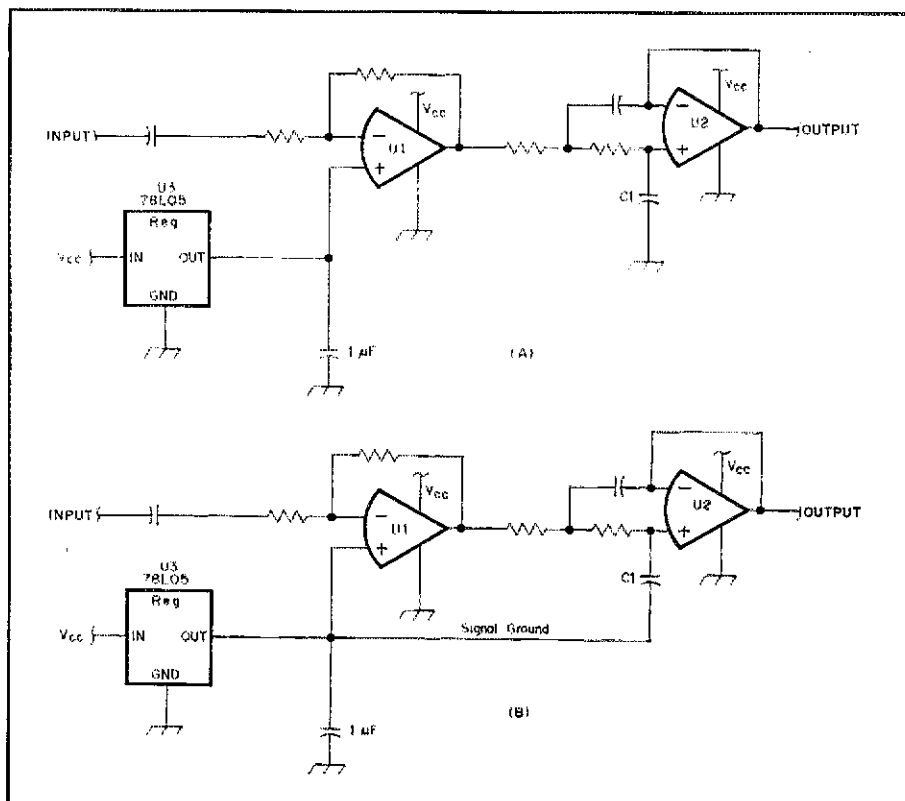


Fig 1—A comparison of two audio active low-pass filter circuits. At A, noise can be introduced into the circuit from voltage fluctuations occurring at U3. By making the small circuit modification shown at B, the noise path to the audio circuit is eliminated.

## THE DDRR

□ I'd like to comment on the sidebars that appear in "The Mobile Roof-Rack Antenna," QST, Nov 1988, pp 29-32. The name DDRR should be dropped in all future reference to this antenna.<sup>2</sup> The designator implied that some property of the antenna had something to do with *directional discontinuity*, which is misleading. The identifier DDRR was later changed (see note 2) to imply *directly driven ring radiator*, but lots of antennas are directly driven, and the ring is a *non-radiating* top load; it is a transmission-line radiator. More recent references to this antenna, that attempt to retain the acronym DDRR, change ring to *resonant*.

Peter Dodd's reference to *The Antenna Book* (vol 2) refers to a book published by the IEE: *The Handbook of Antenna*

<sup>2</sup>J. Belrose, "Transmission-Line Low-Profile Antennas," QST, Dec 1975, pp 19-25.

*Design*.<sup>3</sup> There are two references in this book to transmission-line radiators, written independently by R. A. Burburry and me (Chapters 17 and 15, respectively).

Increasing the height of the ring above ground increases the antenna's efficiency dramatically. Increasing the diameter of the ring changes the antenna's resonant frequency, because the total length of the radiator, plus the perimeter of the ring, equals about a quarter wavelength at the antenna's fundamental frequency.

For single-frequency operation, no end-loading capacitor is necessary; however, the antenna is easier to employ with a small capacitor added for tuning. As the end capacitance of the antenna is increased, the resonant frequency decreases, the current

<sup>3</sup>A. Rudge, K. Milne, A. Olver and P. Knight, eds, *The Handbook of Antenna Design*, IEE Electromagnetic Waves Series, (London: Peter Peregrinus, 1983.)

through the end capacitance increases and the radiation resistance of the antenna decreases. As the end capacitance is increased further, the antenna changes from an essentially vertically-polarized radiator to a half loop of near-constant current, and its elevation radiation pattern changes accordingly.—*John S. Belrose, VE2CV, ARRL TA, 17 Tadoussac Dr, Aylmer, PQ J9J 1G1 Canada*

#### NO APRIL FOOL'S JOKE

□ It seems that some amateurs have questioned the seriousness of my article, "The Coaxial Resonator Match and the Broadband Dipole."<sup>4</sup> I was afraid that the publication of such a radical idea in the April issue would lead to some confusion. Honest, folks, it was not an April Fool's joke! It really works! Edward Parsons, K1TR, and I have been using our antennas for months with excellent results. I encourage you to give it a try.—*Frank Witt, A11H, 20 Chatham Rd, Andover, MA 01810*

#### AUDIO AMPLIFIER IC NOTES

□ I was pleasantly surprised to see Leonard Van Prooyen's article in *QST*.<sup>5</sup> National's LM383 is a good choice for that application. I have several comments about the design and the components used that may be of interest to readers.

National Semiconductor now recommends the inclusion of a 1-Ω resistor (let's call it R5) in series with C4 (see *QST*, Jan 1989, p 20, Fig 1.) The action of the 0.22-μF capacitor and 1-Ω resistor is not to kill oscillations, but to compensate the bottom side of the output stage. The bottom side is a compound Darlington formed by a PNP driver and NPN output device. This connection is inherently unstable and necessitates the pole-zero compensation afforded by the RC network. Originally, the LM383 was stable with only a capacitor connected to the output pin, but owing to changes in processing, the addition of a 1-Ω resistor is now required for stability.

Another device that could have been used for the amplifier is National's LM2002. This device is similar to the SGS Semiconductor TDA2002. All these devices (the LM383, LM2002 and TDA2002) are compatible provided that the compensation and supply bypassing components are correctly chosen. The TDA2002 and LM2002 require a 0.1-μF supply bypass, and 0.1-μF/1-Ω output-compensation networks, and the LM383 requires a 0.22-μF supply bypass and a 0.22-μF/1-Ω output-compensation network. Polyester-film capacitors

are recommended for use at C3 and C4, and R5 can be an ordinary ¼-W carbon-film or carbon-composition unit: *Don't use a wire-wound power resistor for R5!* Also, the physical placement of C3, C4 and R5 is important. They should be connected as close as possible to the body of the IC, with minimum lead length.

Because only a small dc potential (700 mV) is developed across C2, it's possible to use a low-voltage type to minimize the physical size of the capacitor.<sup>6</sup> The Panasonic SU capacitor series is the smallest I've seen, some with a length of less than 0.5 inch. These capacitors—in fact, all of the parts used in the amplifier—are available from Digi-Key.<sup>7</sup>

The value of the output-coupling capacitor (C5) can be reduced if you don't mind compromising the low-frequency response of the amplifier. C5 can be reduced to a value of 100 μF for use with an 8-Ω speaker, or 220 μF for use with a 4-Ω speaker, while maintaining adequate bandwidth for voice signals.

The ability of an amplifier to develop output power is dependent on supply voltage and load (speaker) impedance. The LM383 P-P output swing is approximately  $V_S - 2$ . The output power is therefore  $(V_S - 2)^2 \div 8R_L$ . You can't do much about the supply voltage, but the speaker impedance ( $R_L$ ) is variable. A 2- or 4-Ω speaker is a much better choice than an 8-Ω speaker. Another advantage of the outboard amplifier is that it operates on a separate *higher voltage* supply than the hand-held transceiver. Where the hand-held may have only 10.8 V or less available, the LM383 has a 14.4 V supply if used in a motor vehicle.

A frustrating characteristic of monolithic audio power amplifiers is their minimum-stable-gain requirement. The LM383 must be connected for a high-frequency voltage gain of greater than 10 to ensure stability. In a power-booster application, this is a real aggravation because a gain of 2 or 3 is more suitable. There are several ways to solve this problem. One way is to attenuate the input signal. The disadvantages of this method include reduced noise rejection and signal-to-noise ratio. The signal-to-noise-ratio reduction is probably inconsequential because the amplifier is going to run at nearly full output in normal use. Reduced noise rejection can be a problem because the positive input of the amplifier exhibits 40 dB of gain; the circuit will be sensitive

to stray fields. The inclusion of R1 in Van Prooyen's circuit is a good idea because it reduces the impedance and noise sensitivity of the input.

If you want to reduce the closed-loop gain, I suggest substituting a 100-Ω resistor for R3, and a 5.1-Ω resistor for R4. This gives a gain of about 20, which is a good compromise. Assuming the hand-held transceiver develops a minimum output of 4 V P-P, and that the LM383 clips at about 12 V P-P (with a 14.4-V supply), a gain of 3 is ideal. With the aforementioned resistor-value changes made to the published circuit, an input attenuation of 6.7:1 would result in an overall gain of 3. Without the resistor-value changes, the circuit attenuation would have to be 33:1 for an overall gain of 3.

There is yet another way to get a gain of 3. Let's say R3 and R4 are 100 Ω and 5.1 Ω, respectively. The input signal can be injected into the summing node (the junction of R3 and R4) through a 33-Ω resistor, while the positive input of the amplifier is simply bypassed to ground by C1. This circuit modification may work with some transceivers, but not with others (the speaker output of some hand-held transceivers is attenuated by a series resistor—100 Ω or more).—*Mitchell Lee, KB6FPW, Linear Applications Engineer, National Semiconductor Dr, PO Box 58090, Santa Clara, CA 95052-8090*

**Note:** All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary. □

## Feedback

□ Please refer to "Simple 5/8-Wave Verticals for 12 and 17 Meters," *QST*, Apr 1989, pp 19-20. On p 19, in the third paragraph of the third column, the second sentence should read: "I chose a length of 23 feet, 5 inches..."

□ In "A VFO with Bandsread and Bandset," *QST*, Jan 1989, p 32, Fig 1, the bottom view drawing for Q1 has the drain- and source-lead identifiers reversed.

□ Please refer to Emil Pocock's April 1988 *QST* article, "Sporadic-E Propagation at VHF," note 17, p 39. The equation shown contains an error and should read:

$$d = 420 \sqrt{\left(\frac{5.33}{f_m}\right)^2 - 1}$$

where

d = path distance in km

f = working frequency in MHz

f<sub>m</sub> = maximum usable frequency in MHz □

<sup>6</sup>As mentioned in Note 1, electrolytic capacitors depend on the presence of dc to form their dielectrics. Because of this, and taking a safety factor of at least two into account, the optimum dc working voltage for C2 is 2 to 3. Higher-voltage capacitor capacitors can be expected to exhibit considerably less than their marked capacitance when used at a working voltage of 0.7.—Ed.

<sup>7</sup>Digi-Key, 701 Brooks Ave South, PO Box 677, Thief River Falls, MN 56701-0677, tel 800-344-4539.

<sup>4</sup>F. Witt, "The Coaxial Resonator Match and the Broadband Dipole," *QST*, Apr 1989, pp 22-27.

<sup>5</sup>L. Van Prooyen, "A Speaker Amplifier for Hand-Held Transceivers," *QST*, Jan 1989, pp 20-22. See also Feedback, *QST*, Feb 1989, p 48 and *QST*, May 1989, p 51.

## Can Packet Radio Be Saved?

Back in the good old days, I could contact my local PBBS at will. I'd leisurely type "C WIAW-4" and the CONNECT LED on my TNC would turn on instantly. Then I would read my mail, kill my mail, send some mail, read somebody else's mail, read some files and log off.

Things began to deteriorate some time ago. Instead of making a direct connection over the 16-mile path to WIAW-4, I had to use a digipeater, later to become a NET/ROM node, to make the same connection. And as I read, killed and sent my mail, \*\*\*connect request messages would occasionally be interspersed through my readings.

Things really got bad about a year ago. I found it impossible to make a connection with WIAW-4 during my "normal" operating hours. Occasionally, I could make a connection just after WIAW-4 stopped auto-forwarding mail, but usually I had to pick and choose my connections carefully. I had to make the connection either late at night or early in the morning (during times I should have been sleeping).

### LAN Logjam

My problem connecting with WIAW-4 is due to channel congestion. The number of packet-radio operators has been growing rapidly during the last five years and most of the operators are using Amateur Radio's most popular band, 2 meters. However, during this packet-radio population growth, there has not been a proportional growth in the 2-meter radio spectrum that is set aside for packet-radio operation. As a result, hundreds of packet-radio operators are trying to use the same number of channels that were used by only a handful of operators five years ago.

Besides the explosion of the packet-radio operator population, there has also been a proportional explosion of packet-radio operations and, as a result, digipeaters, network nodes, PBBSs, packet-radio clusters, etc., are also competing with users for the same frequency space. This competition for the use of a limited number of channels results in packet-radio transmissions from the various competitors that are colliding with each other, which forces repeated transmissions of the same packets and deterioration of the data throughput on the channels.

This problem is not unique to the Greater Wolcott metropolitan area. Every populated area of the country is undergoing the same malady to one degree or another. This land's LANs are jammed and, as a result, packet radio is becoming a very frustrating

mode of communications, at least on 2 meters.

### The Cause

The number of users is not so much the problem as is the equipment that is being used. Most packet-radio operators are using radios designed for FM-voice applications to pass data; the data rate that these radios can support is limited to a relatively slow speed (typically, 1200 bauds on 2 meters). In the past, when there were fewer users, this was not a problem; you could get away with using a radio that was not optimized to pass data and modems that plodded along at 1200 bauds. However, as channel congestion reaches the saturation point, the usage of inappropriate radios and slow-speed modems becomes critical.

According to Tucson Amateur Packet Radio (TAPR), voice radios have receive-to-transmit and transmit-to-receive turnaround times of about 150 to 400 milliseconds (ms), which dramatically reduces the amount of data that can be sent and increases the chance that two or more stations will interfere with one another. Another problem cited by TAPR is that the modem-to-radio interface of such radios depends on audio response, filters and audio levels intended for microphones and speakers, which more often than not lead to incorrect deviation of the transmitted signal, noise and hum on the audio, etc. Splatter filters and deviation limiters distort frequency response and further reduce the performance of the packet-radio system. In this environment, you are stuck using a 1200-baud modem unless you want to modify the radio to improve the environment to allow higher-speed operation. The problem is that trying to perform surgery on your typical 2-meter FM voice transceiver is difficult to impossible because of the use of LSICs (large-scale integrated circuits), surface-mount devices and miniaturization.

Do not pull the big switch on your TNC yet, because there is hope for packet radio. Relief for packet-radio congestion is on the way.

### The Solution?

The PacComm folks down in Tampa have come up with The PacComm Narrow-band 9600-Baud Packet Radio System, or The NB-96 Series, for short. The heart of the system is PacComm's commercial 9600-baud modem design, which is licensed from James Miller, G3RUH. According to

PacComm, the modem features digital generation of the transmit audio waveform with precise shaping that compensates exactly for the amplitude and phase response of the receiver. This results in a *matched filter* system; that is, the received audio offered to the data detector has the optimum characteristics for minimum errors. It also allows very tight control of the transmit audio bandwidth. The bottom line is that this modem will provide 9600-baud packet-radio operation on 2 meters, as well as the other VHF and UHF bands.

The modem is available in two flavors: an internal model that mounts directly to the modem disconnect header of the TNC 2, its clones and all PacComm TNCs, and an external model that may be used with TNCs that do not have a modem disconnect header. Besides the modems, the NB-96 series also includes a digital transceiver which consists of a commercial-grade 2- to 5-W RF deck, a 9600-baud modem and, optionally, a TNC. It is available for 144, 220, 440 and 920 MHz.

On the other side of the bay, the folks at DRSI in Clearwater are also trying to speed things up with a new 2400-baud modem, called the M-24, that uses differential phase-shift keying (DPSK) modulation and is completely compatible with the Kantronics 2400-baud modem that was introduced two years ago. The M-24 is intended to operate external to an IBM® PC or compatible computer that contains DRSI's PC Packet Adapter (a TNC on a card that is installed in an expansion slot of a PC). The M-24 will also operate at 1200 bauds using frequency-shift keying (FSK) for compatibility with all of the other 1200-baud modems in packet-radio land.

Meanwhile, on the other side of the continent, the gang at TAPR are beta-testing their packetRADIO, a 25-W, 5-channel, crystal-controlled digital radio that will operate at 1200 bauds using audio frequency-shift keying (AFSK) and 9600 bauds using FSK on 2 meters or, optionally, on 220 MHz. TAPR's packetRADIO switches between the transmit and receive modes in less than 1 ms and is capable of full-duplex operation with an optional second local-oscillator board. It will be available with or without an internal TNC.

Hopefully, the efforts of DRSI, Kantronics, PacComm, TAPR and others will prove that higher data rates are attainable on 2 meters, and the congested conditions that now prevail on the band will be alleviated.

# Antenna Tuners: Are They Necessary?

The short answer, as you may have guessed, is "sometimes." The longer—and more enlightening—answer follows.

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

Antenna-matching networks are known by several names, but they all perform essentially the same kind of work: They enable you to match your feed line to your transmitter. For example, suppose your feed line presents a 100- $\Omega$  impedance to your 50- $\Omega$  transmitter.<sup>1</sup> In order to ensure maximum transfer of RF energy, you must match the unlike impedances. In some situations a matching network may be used to do this.

Another consideration is that the correct impedance be presented to the transmitter, because modern solid-state rigs have a built-in SWR-protection circuit. The higher the SWR (standing-wave ratio) the lower the transmitter output power. This circuit prevents the final-amplifier transistors from being destroyed (vacuum tubes are more tolerant of high SWR values).

When a tuner is used to match the transmitter output to a feed line, ARRL literature refers to the network as a *Transmatch*, for "transmitter match." It is important to note that a Transmatch does not correct a mismatch that may be present between the feed line and the antenna feed point.

## What Does a Transmatch Do?

A high SWR is caused by a significant mismatch between the antenna and its feed line. Depending on the electrical length of the line, this mismatch may be reflected as a pure resistance, or as a resistance plus reactance at the line input. A Transmatch can cancel the reactance and make the antenna system appear resistive (ideal) at the rated impedance of the transmitter, normally 50  $\Omega$ .

Transmatches contain variable capaci-

tors and coils (inductors). The coil may be tapped to permit band changing, or it may be a roller inductor with a counter dial. Roller inductors are most useful; they ensure continuously variable inductance. A tapped-coil inductor has only coarse-adjustment capability, so it may be impossible to match some impedances.

Fig 1A shows the circuit of a T-network Transmatch. This circuit (The Ultimate Transmatch) was popularized by Lew McCoy, W1ICP, in *QST*,<sup>2</sup> although that version uses a two-section variable capacitor at the input side of the network. Fig 1B

shows a parallel-tuned Transmatch suitable for matching an unbalanced source to a load that has balanced feeders (50  $\Omega$  to 300  $\Omega$ , for example).

Most commercial tuners contain a version of the T network shown in Fig 1A. Some manufacturers include a *balun* (balanced to unbalanced) *transformer*—a broadband toroidal transformer that allows you to connect unbalanced coaxial cable to balanced feed line, such as 300- $\Omega$  ribbon or 450- $\Omega$  ladder line. The balun transformer can be useful under ideal matching condi-

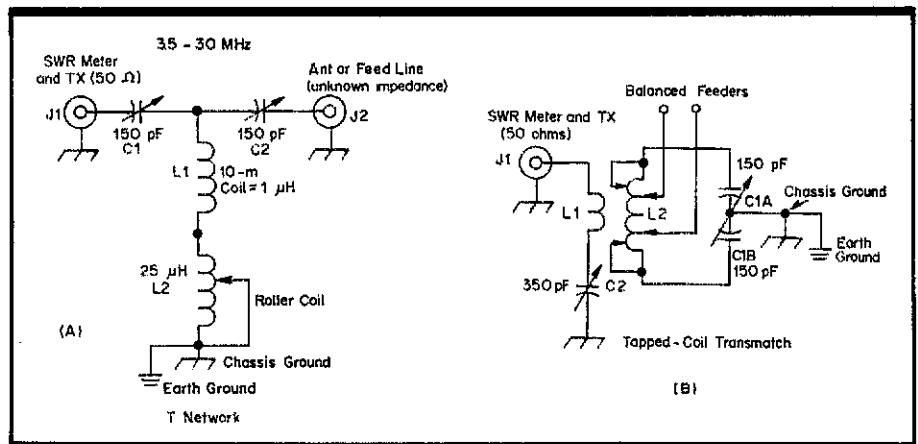


Fig 1—Circuit examples for Transmatches. The popular version at A is used by most manufacturers of commercial tuners. L1 is usually included to improve the circuit Q at 10 and 15 meters, because some roller inductors do not have a tapered coil pitch at one end of the inductor. Increasing the capacitance at C1 and C2 to 300 pF will enable the circuit to work at 1.8 MHz as well. Circuit B has a tapped coil. The outer taps are adjusted to change the coil inductance. The inner taps are moved equally from the ends of L2 to obtain a matched condition for balanced feed lines. C2 is adjusted along with C1 to obtain an SWR of 1:1. L1 is a small link over the center of L2. A single-wire antenna may also be tuned with this circuit by connecting it to one of the inner coil taps.

<sup>1</sup>Notes appear on page 44.

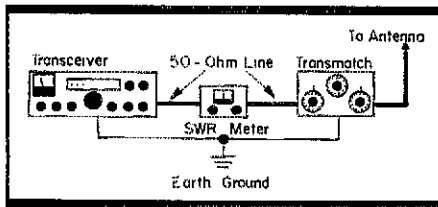


Fig 2—The correct way to connect a transceiver to an SWR indicator and Transmatch. Some Transmatches contain a built-in SWR meter. In this case the outboard SWR meter may be eliminated. Most commercial Transmatches are equipped with a built-in balun transformer to allow the use of balanced feed lines. Terminals for a balanced line are located on the rear apron of the tuner.

tions. The balanced Transmatch in Fig 1B is a better device for this job, however, as it can provide the desired match without a significant loss of power.

Any tuning network has an *insertion loss*, however minor. The addition of a balun transformer increases this loss.

### Seeing SWR

An SWR meter enables us to observe the power reflected from the Transmatch back to the transmitter as we tune out the reactance in the antenna system. The lower the reactance, the lower the reflected-power reading. (Remember: The SWR in the line between the Transmatch and the antenna does not change.)

The SWR meter should have the same characteristic impedance as the coaxial feed line and transmitter output circuit. Typically, this is 50  $\Omega$  for RG-58, RG-8 and other 50- or 52- $\Omega$  cable. Don't use a 75- $\Omega$  SWR indicator in a 50- $\Omega$  line, or vice versa; it will provide inaccurate readings. Always locate the SWR meter between the transmitter output port and the input port of your Transmatch. Use 50- $\Omega$  coaxial cable to connect the unit to the transmitter and tuner.

### How to Hook Up and Adjust Your Transmatch

A proper hookup for the SWR meter and Transmatch is shown in Fig 2. An effective earth ground should be attached to your transmitter and Transmatch. A short, heavy conductor (such as the shield braid from RG-8 coaxial cable) may be connected to a cold-water pipe—only if you have copper or galvanized steel plumbing.

If your plumbing uses PVC pipe (which is nonconductive), connect your station (again, using a short heavy conductor) to an 8-foot ground rod driven into the soil near your shack. If the cable between your equipment and the ground is more than a quarter-wavelength long or longer at your operating frequency, your ground may not function effectively, or may even be worse than no ground at all! (See December 1988 *QST*, page 57, and the sidebar, "What is a Counterpoise," on page 44 of November 1988 *QST*.)

Most commercial Transmatches have instructions, but for those who need them, generic instructions follow.

- Set the SWR meter function switch to REFLECTED or REF.

- Activate your transceiver and choose an operating frequency.

- Adjust the Transmatch controls while listening to your receiver. You will find settings that yield maximum background noise or signal response; these represent a coarse starting point for your Transmatch adjustments.

- Make sure the frequency for testing is not in use. Turn on the transmitter and allow a small amount of power (about 20 watts is okay) to pass to the Transmatch.

- Adjust the Transmatch controls until the SWR is 1:1 (zero reflected power).

- Adjust your transceiver for full power output and quickly readjust the Transmatch controls to correct for any residual SWR that may be indicated. Be sure to identify your station.

You are now ready to operate! Log the Transmatch dial settings so you can return to this frequency another time without needing to go through the tuning process.

### When to Use a Transmatch

Many antennas are fed with 50- $\Omega$  coaxial line, and the SWR is low—less than, say, 2:1—across most of a given amateur band. There is no point in using a Transmatch in this situation. Most transmitters can handle an SWR that is 2:1 or lower. Dipole antennas, trap verticals and triband Yagis should not require a Transmatch if they are adjusted to the usual operating frequency and the feeder is matched correctly to the antenna feed point.

There are situations where a Transmatch is useful with a dipole, vertical or beam antenna. If the antenna has a low SWR at one end of a band (such as a tribander adjusted for the high end of a band), it may have a high SWR at the other end of that band. Your Transmatch may then be used to provide the desired 50- $\Omega$  interface to the antenna system. But this does not correct the mismatch at the antenna end of the line. It merely allows your transmitter to deliver its full power to the feed line.

End-fed wire antennas normally require a Transmatch, especially if you plan to use the wire for multiband operation. With this type of antenna, the feed impedance varies greatly from one amateur band to another.

Although they are simple to install, end-fed wires can cause problems, at least on some frequencies. Radio-frequency voltage is often brought into the ham shack because one end of the antenna is connected to the Transmatch. This RF energy finds its way into keyers, antenna rotator control boxes and the audio (microphone) circuitry of our transceivers. This causes audio squeals and howls and can make a keyer send gibberish. You may also experience a tingling sensation when you touch your rig, microphone or key, caused by RF voltage on these items! The best way to avoid these

### Glossary

**Antenna tuner**—A device that matches the output of a transmitter to its feed line.

**Balun transformer**—A device that matches a balanced load to an unbalanced line, or vice versa. Used when coaxial cable (unbalanced) is fed to a dipole antenna (balanced), for example.

**Impedance**—Total opposition to current flow, including reactance as well as resistance.

**Insertion loss**—The amount of power lost due to the addition of a network or circuit.

**Reactance**—Similar to resistance, and also measured in ohms. May be inductive (abbreviated  $X_L$ ) or capacitive ( $X_C$ ).

**SWR**—Standing-wave ratio: A measure of the power reflected back to the transmitter. The higher the SWR, the less power reaches the antenna.

**Transmatch**—Another name for antenna tuner.

problems is to use a coax-fed antenna, such as a dipole.

### Store Bought or Homemade?

Many amateurs build their Transmatches to save money and provide some workshop fun. Certainly a Transmatch is one of the least complicated home projects you can build! Be on the lookout for surplus variable capacitors and roller coils at flea markets and in parts catalogs. New parts for tuners may be purchased from RADIO-KIT and Barry Electronics.<sup>3,4</sup> Transmatch circuits are published in *The ARRL Handbook and Antenna Book*.

Choose variable capacitors that have a wide spacing between the plates (1/16 inch or greater for 100-watt transmitters). This will help prevent arcing between the capacitor plates. The 200-pF preset variable capacitors from WW-II Command transmitters are excellent for Transmatch use at power levels below 200 watts.

### In Summary

Operating with a 1:1 SWR is not a sacred mandate. No one will notice a difference in your signal strength if the SWR is 1:1 or 2:1, assuming your transmitter has some output-matching capability. The main consideration is that you keep your transmitter "happy" by providing it something near a 50- $\Omega$  load. There's no need to buy or build a Transmatch if you don't need one!

### Notes

<sup>1</sup>Words that appear in italics are defined in the Glossary.

<sup>2</sup>"The Ultimate Transmatch," *QST*, July 1970, pp 24-27, 58.

<sup>3</sup>RADIOKIT, PO Box 973, Pelham, NH 03076, tel 603-437-2722.

<sup>4</sup>Barry Electronics, 512 Broadway, New York, NY 10012, tel 212-925-7000.

# The Marshall H. Ensor Memorial Museum

A museum in honor of a master teacher of radio amateurs, who provided prewar W1AW-style code practice in the Midwest, opens in Kansas.

By Clayton L. Hogg

36 Philomethian  
Chagrin Falls, OH 44022

**B**ack in 1939 when I was in high school, a neighbor helped me build a small two-tube superregenerative receiver. After just a few hours of listening on the ham bands, I was fired up enough to try to get my own ham license.

So I began studying about radio in the League's *Handbook*. But like so many newcomers in radio those days, I had no organized way to learn the Morse code.

Then one winter evening in 1940, I picked up a powerful, clear, crisp signal sending code practice. This was just what I needed, I thought, so I began listening to those lessons on nights when school activities didn't interfere. The station's call letters were W9BSP, operating from near Olathe, Kansas. In a subsequent lesson, the operator said his name was Marshall Ensor, an industrial arts teacher at Olathe High School.

Every night about 7 PM, Marshall sent code tapes for about an hour on a Signagraph Tape Sender. Using paper tapes that he meticulously prepared, he started at a slow speed and gradually built up to faster speeds for more advanced students. These lessons went on seven nights a week as part of a nine- or 10-week course. On the nights that Marshall was absent, his sister Loretta, W9UA, did the honors.

In the summer of 1941, W9BSP was awarded the William S. Paley Amateur Radio Award for his dedicated 10-year voluntary service of sending code practice (as reported in July 1941 *QST*). The award was presented in a ceremony at the Waldorf-Astoria Hotel in New York on June 2. For most of those 10 years, he had been transmitting 50 to 70 lessons each year.

I suppose it was midway through the course in the winter


of 1941 that everything changed. As I warmed up my 30-tube receiver on December 7, I suddenly heard announcements on 160 meters that all Amateur Radio operations would cease until further notice. The next day, President Roosevelt declared war on Germany and Japan. So ended the W9BSP code-practice service, at least for the duration.

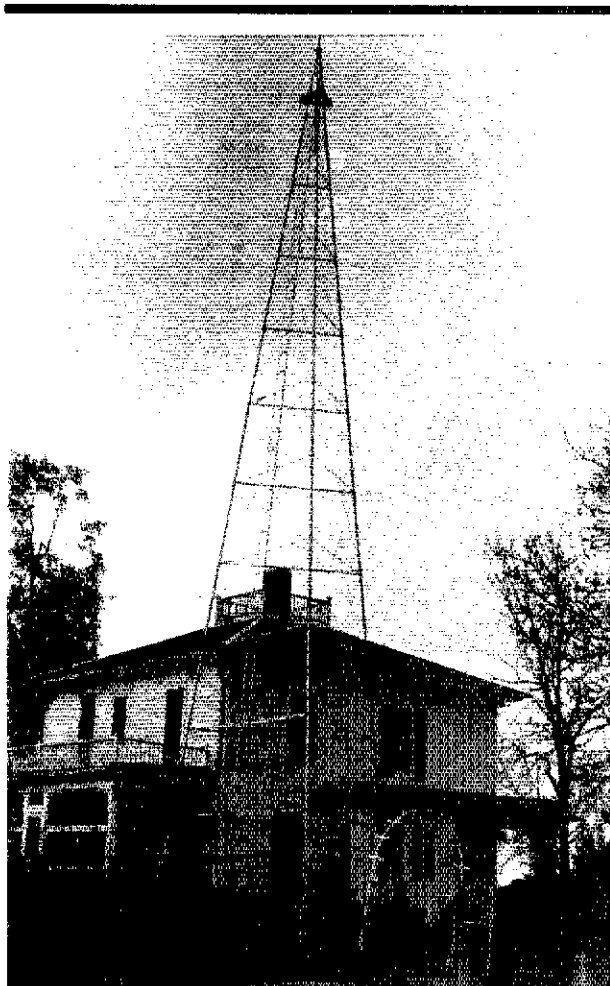
Marshall Ensor served in the Navy

during WWII, teaching radio at the Naval Air Station outside Seattle. After the war, he came home and got back on the air as W0BSP (as Kansas was now in the tenth call district). In 1970, after a distinguished career as an educator—in Amateur Radio as well as at the secondary school level—he passed away.

The entire Ensor farm has recently been designated as a park and a museum in his honor and is, of course, open to the public. You'll find not only Amateur Radio equipment from fifty years ago on display, but also many fascinating projects turned out by Marshall's industrial arts students from the high school.

For the thousands of amateurs and would-be amateurs who learned Morse code from Marshall Ensor, it is a poignant experience to see his original station. It is set up in the bay window of the old farm house where he sat transmitting code practice fifty years before. His transmitter, including the 1-kW class-C amplifier with a pair of T-814s in push pull, appears to be the same as it was when it was featured in a February 1939 *QST* article called "Eight Years Before the Mike." His 246-foot antenna was supported by two windmill towers; the 80-footer still stands to this day (the 100-footer fell victim to a severe storm back in the early 70s).

For any hams traveling in the Kansas City area, a trip to this historic location is well worth the time. Maybe in those days, Amateur Radio seemed bigger than life, or maybe it was just the imagination of a kid who was fascinated by the whole idea of radio. Based on the many listeners who ultimately got licensed as a direct result of Marshall's code-practice transmissions, I surely wasn't alone in that feeling! 



Marshall Ensor's home and his original 80-foot tower are included in the Marshall H. Ensor Museum, located a few miles south of Olathe, Kansas. For further information, contact the Ensor Museum at 18995 183rd St, Olathe, KS 66061.

# The Couple That CQs Together, Stays Together

What do you do when your husband-to-be schedules your wedding around major contests?

By Ronni Stern, KA1NRR

PO Box 99  
Essex, VT 05451

**M**y husband is a very active ham. When we were dating and considering marriage, he gave me a list of all contests and hamfests and let me know that these were firm commitments, like it or not. When that didn't scare me off, he figured he might as well marry me. Of course, our wedding was planned around these ham radio events.

When I said, "I do," I really meant it. Ten days later, I was sitting in a ham radio class, learning my dits and dahs and theory. Need I mention, one of the teachers was my husband. Early on, I took the attitude that if you can't beat him, you join him—and so I did. Two months later, I proudly passed my Novice test, and shortly after that my Technician. With the-ink's-not-even-dry-yet license in hand, KA1NRR immediately got on the air. I also started my "I need a good rig for my car" routine, and that lasted until I got one.

Three years have passed, and my experiences are many. Even before obtaining my license, I learned how helpful it is to be a ham and how helpful hams are. I was really convinced when we broke down on the parkway in New York on Thanksgiving night. The OM simultaneously got on two radios. Before we knew it, not only was there a tow truck on site, but also a new friend.

When Novice Enhancement gave us phone privileges on the 10-meter band, my world opened up. Last year, I got my first real taste of being a contester during the ARRL 10-Meter contest. It's not easy for two hams to compete from the same station, but we did. This year, however, the OM is being kicked out. He'll have to work from another site. What does he mean, he's taking the better rig. Time to protest!

Field Day was quite an experience! Besides my duties of keeping the OM well fed during the outing, I was handed a transceiver, a tent and a 10-meter beam



Author Ronni Stern, KA1NRR, competes with her husband during major contests for time in the shack.

in many bits and pieces and was told to assemble the Novice station! With help from several of the new hams in the group, we assembled a fine setup. Then, guess what? I had to *work* the pileups on 10 meters. Next thing you know, they'll want me to operate CW!

Other experiences include the madness of doing public-service communications, along with 400 other hams, for the New York City Marathon. We always look forward to that event. Or speaking of madness, how about the yearly trip to Dayton. Now that's an experience! We love it—the flea market, the exhibitors, forums and, of course, the hospitality suites and parties. I particularly love it when new equipment gets

purchased—for *me* to use.

I feel fortunate to be a ham and part of the ham community, but even more so to be the YL of a very active ham, both locally and division-wide. I love my hobby! I've met some wonderful people and have made many new friends. But just one question—aren't there any hams living in Rhode Island and Delaware with a signal that can reach Vermont on 10 meters to help this poor YL Technician finish off her 10-meter Worked All States?

*Ronni Stern's OM is Mitch, WB2JSJ (who is often active with the club call WBIGQR). She reports she confirmed Rhode Island and Delaware on 10 meters since she wrote this article.*



# Radio Scouting: An Adventure for All Ages!

Radio Scouting is coming to the National Scout Jamboree this month. You can help!

By Lary Eichel, K2NA  
PO Box 13278  
Boulder, CO 80308

Scouting exposes young people to a wide variety of activities with a focus on leadership experience and learning skills useful in life. Among the best known Scouting activities are hiking and camping, but the range is from agricultural business to woodworking. Across that range, there are samples of high tech and handcrafts. There are choices to suit everyone.

Advancement in Scouting depends on learning required and optional skills (Merit Badges, community service, and so on); demonstrating leadership; and participating in scouting activities. Some years ago, advancement requirements included learning Morse code. For many Scouts, meeting that challenge led to a new hobby: Amateur Radio. Times have changed, though; Morse code proficiency is now part of an optional award known as *Radio Merit Badge*. Fortunately, Radio Merit Badge leads Scouts to Amateur Radio. Over 740 Scouts earned Radio Merit Badge last year, and that number is growing. For more information on Radio Merit Badge, and how you can become a Merit Badge Counselor, see Steve Place's February 1988 *QST* article.<sup>1</sup>

## Radio Scouting

Radio amateurs with Scouting experience are the heart of Radio Scouting. Our goals are to share the camaraderie of Scouting worldwide via on-the-air activities, and to increase the number of young people who share interests in Scouting and Amateur Radio.

Until recently, the only national-level ties between Amateur Radio and Scouting in the US have been the annual Jamboree-On-The-Air (JOTA), K2BSA activity and ARRL's youth programs. In 1986, I began editing and publishing *Scoutgram*, a quarterly newsletter that I distribute to Radio Scouters around the world. Since I established *Scoutgram*, circulation has grown; awareness of, and support for, Radio



photo courtesy Jim Bond, KA1ANT

Scouting have increased among those interested in both pursuits. The goal of *Scoutgram* is to tie Amateur Radio into Scouting, in hopes of benefiting both communities.

International Radio Scouting's one an-

nual event is Jamboree-On-The-Air. JOTA is held on the third weekend of every October, and many hams from the US participate. The Greater Boston Council (Massachusetts) of the Boy Scouts of America (BSA) is one of several councils that plan their regular fall activities to include JOTA.

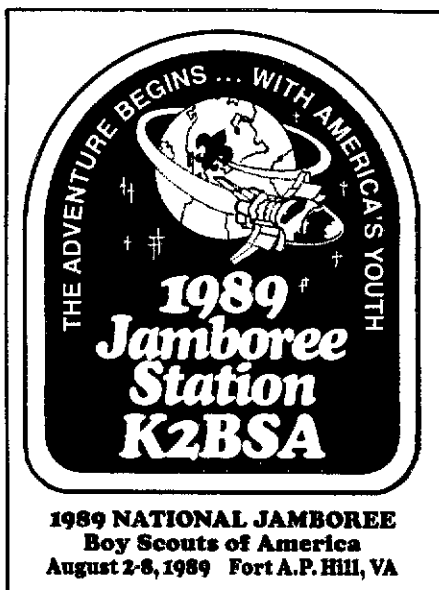
## National Scout Jamborees

Once every four years, Scouts and Scouters (adult leaders) gather from all around the country to participate in National Scout Jamborees. The last two Jamborees (1981 and 1985) were held at Fort A. P. Hill, a US Army base near Fredericksburg, Virginia, in the historic area between Washington, DC, and Williamsburg, Virginia.

The 1989 Jamboree, to be held from August 2-8, will also take place at Fort A. P. Hill. Approximately 34,000 Scouts and Scouters, from the US and many foreign countries, will be in attendance. Using the theme, "The Adventure Begins...with America's Youth," the Jamboree will inspire the spirit of Scouting and encourage participants to share their Jamboree adventures with others when they return home.

## The First Jamboree

Lord Baden-Powell of England founded the Scouting movement after World War I, in the spirit of encouraging worldwide peace



This is the Jamboree Radio Scouting logo. A variation of the official BSA 1989 Jamboree logo, this adaptation was designed by Dave Crocker, W1TMO.

<sup>1</sup>S. Place, "Radio for 1,000,000 Scouts," *QST*, Feb 1988, pp 47-48.

**Table 1**

**International Scout Frequencies (MHz)**

CW: 3.590, 7.030, 14.070, 21.140, 28.190.

SSB: 3.740\*, 3.940, 7.090\*, 7.290, 14.290, 21.360, 28.350, 28.990.

\*These frequencies are for use by radio amateurs in countries that permit SSB operation outside the US phone subbands; they will be monitored by K2BSA at the Jamboree.

and happiness. His vision developed into a worldwide Scout brotherhood that, in 1920, brought together 8000 Scouts from 34 countries. That gathering of Scouts was held in London's Olympia Stadium.

Describing this gathering using the words *rally* and *exhibition* didn't suit Lord Baden-Powell, so he chose the more descriptive term, *Jamboree*. Eleven National Scout Jamborees have been held in the US since 1937.

**Preparing for the 1989 National Scout Jamboree**

During the 1989 Jamboree, Fort A. P. Hill will be the 17th largest population center in Virginia; it takes a *lot* of work to prepare the site for such a gathering. A support staff of 4000 will run the Jamboree. Planning and preparation for the Jamboree began in early 1987, just a year and a half after the 1985 Jamboree ended.

Scouts and Scouters will begin to arrive at the site on July 31, and on Wednesday, August 2, flags, streamers and banners of all descriptions will be raised over gateways and ceremonial areas throughout the encampment. On this opening day, Scouts, Explorers, leaders and visitors will be treated to a spectacular arena show—to be held in a huge, natural amphitheater—under the direction of famed

film producer Steven Spielberg.

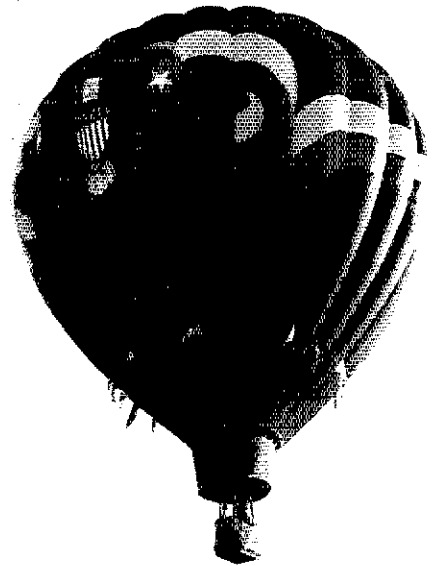
Radio Scouting will play an important role in the Jamboree. The Jamboree's Radio Scouting staff of 40 will operate demonstration station K2BSA; provide Merit Badge instruction; originate more than 5000 messages on behalf of Jamboree participants, mostly via packet radio; provide emergency communications, if necessary; and maintain two on-site VHF repeaters. (Repeater frequencies will be 145.17/144.57 and 224.60/223.00.)

K2BSA staff operators will demonstrate fast- and slow-scan television, HF and VHF packet radio, satellite, SSB and CW operation. Daytime operations will emphasize getting Scouts on the air and showing off the variety of Amateur Radio to the visiting public. In the evenings, licensed Scouts and Scouters participating in the Jamboree will use K2BSA's facilities for keeping home-town schedules. Nighttime operation by the staff will be DX-oriented. Primary operating frequencies will be the internationally recognized Scout frequencies given in Table 1.

On the Merit Badge Midway, Scouts will have opportunities to try different skills, and even to earn some Merit Badges. Radio Merit Badge staff will hold kit-building sessions, operate a shortwave-listening post and conduct training sessions. At least one VEC-administered test session is also planned for the Jamboree.

**How You Can Help**

Many Scouts never get a chance to attend a Jamboree. But Amateur Radio offers a chance for them to feel the excitement of a Jamboree by making radio contact with K2BSA. To get in on the act, contact your local BSA council office (listed under Boy Scouts of America in the White Pages), and ask for the name and phone number of the




The Boy Scouts of America devotes considerable time and effort to organizing and holding National Scout Jamborees. For many Scouts, a Jamboree is a once-in-a-lifetime experience; K2BSA's 40-member Radio Scouting staff will do all they can to make the 1989 Jamboree memorable—in more ways than one—for all present. (K2NA photo)

Scoutmaster of a troop near your home. You can invite members of a local Scout Troop over during the Jamboree period and make contact with K2BSA. By so doing, you'll not only give the Scouts a chance to experience the Jamboree, you'll also be showing off Amateur Radio's excitement and capabilities. All the stations contacted by K2BSA will receive a commemorative QSL card.

If you're coming to the Jamboree with a hand-held rig, be sure to stop by the K2BSA tent and sign the guest log—you'll receive a name tag announcing your ability to help with communications, if needed, while you're present.

**Acknowledgments**

Many Amateur Radio-equipment manufacturers and other groups have pledged their support for the Jamboree's Radio Scouting efforts in the form of equipment loans and donations, and services necessary to the K2BSA effort. This assistance in making Radio Scouting a success at the Jamboree is greatly appreciated. Supporting groups include AEA; Amphenol; Antennas-West; ARRL; Astron; Cushcraft; Digital Radio Systems, Inc (DRSI); John Hoffman, WB4GJZ, of Ham Radio Outlet; Heath-Zenith; ICOM; Kantronics; Kenwood; MFJ; Radio Shack; RF Concepts; Robot Research, Inc; Spectrum Communications; Ten-Tec; Times Fiber; TX/RX Systems, Inc; Yaesu; and Woodbridge Wireless, whose members have worked long and hard in preparing and testing equipment for use at the Jamboree. 



A Scout from the Great Salt Lake Council experiences Amateur Radio in the K2BSA/4 tent at the 1985 National Scout Jamboree. (Boy Scouts of America photo)

# 160 Meters: A Tribute

N4LBJ's lifelong fascination with 160 culminated in a DX achievement dedicated to those who kept the flame burning on Top Band for so many years.

By C. Drayton Cooper, III, N4LBJ

PO Box 5  
Bowling Green, SC 29703

I had a dream come true today; the mail brought notification from the ARRL DXCC Desk that my application had been verified, and I am now free to proclaim to the world that I am a holder of 160-meter DXCC!

When that 160-meter DX Century Club certificate arrives, it will be carefully framed and hung right there beside the other piece of wallpaper of which I am the proudest: my official citation from the Governor of South Carolina for "meritorious and outstanding service" during the Hurricane Gracie emergency in 1959.

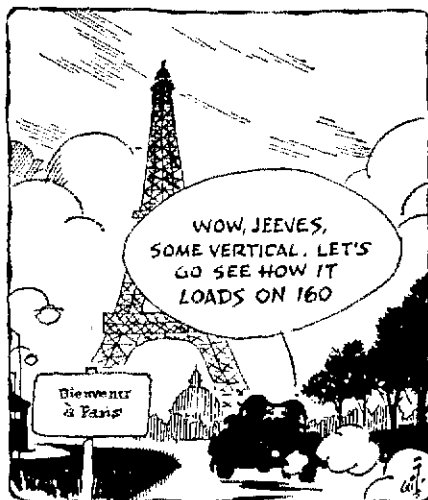
160 meters was the band that served as my introduction to ham radio in the late 1930s. I was just a kid then, but a neighbor's home-brew 160-meter AM rig made a profound impression on my young mind.

That early memory of 160 stuck with me when I was licensed for the first time in 1956. As a result, I gravitated to 160, despite horrendous interference from Loran radar and severe power limitations. It was a challenge squeezing our QSOs into tiny slices of spectrum only 25-kHz wide. But because we were treading where radio pioneers had blazed new trails, the band of frequencies just above the broadcast band held a magic charm. It was here, too, where the gentlemen hung out, where the ground was level, with no license-class distinctions. If you merely shared an interest in 160, you were always welcome.

In those days, we were content to rag-chew over a 300 to 500 mile range—at night. DX was being worked, but only by Stew, W1BB, in Massachusetts. Stew seemed to know something none of the rest of us did. We were satisfied to call DX a 15-minute opening to Colorado at 4 AM local or a W6 at daybreak. If we were fortunate enough to make such a contact, it was a thrill we talked about for days.

Along about the time SSB began replacing AM in the early 1960s, I traded my trusty old Viking II for a shiny new box that transmitted *and* received the new voice mode from a hybrid mix of tubes and something new called transistors. But it didn't do it on 160. "Not enough interest," the manufacturer said, "to include 160."

So I left the grand old Top Band in favor of working my share of DX on the higher frequencies, although thoughts of 160 kept coming to mind. Stalwart W1BB still



showed up, just like clockwork, in the How's DX? column in *QST*, with an impressive list of DX stations worked.

Sometime in the early 1970s, my interest in ham radio waned. After months of inactivity, I sold my rig. But the minute I deposited the check, I knew I had made a mistake. "Someday," I thought to myself, "I'll be back." And when that time came, I knew that whatever rig I owned would have 160-meter capability.

It was the 1980s. My life had changed. A new job, new QTH, kids grown, relicensed as N4LBJ, and an ARRL member once more. The time was right for ham radio again. True to my promise, I acquired a rig that tuned Top Band.

Little did I know the changes those years had brought to 160, either. I strung a piece of wire, switched on the rig and tuned around. *QST* had reported that deregulation had liberated 160: a full 200 kHz, 1500 watts PEP output, and burgeoning activity.

Reading is one thing, listening is another. The low end of the band sounded like 40 CW—signals everywhere, and no Loran! *Everybody* now had 160 on their transceiver's band switch. I could resist no longer. I started making contacts. I was back on Top Band!

As I operated more, I discovered that 160 was still the "gentlemen's band." Everyone was friendly and willing to bring me up to date on what had been going on during my long absence.

The guys informed me that Stew, W1BB,

had made DXCC number one on 160, a feat absolutely unthinkable in the old days, and that others had come after him. I also learned that health considerations had curtailed Stew's 160-meter activity. It was then that I thought of the new generation of operators discovering 160 for the first time, for whom the call W1BB—belonging to the individual who almost single-handedly kept 160 alive during the dark years—had no significance. Then it struck me that, for all intents and purposes, I was one of those newcomers myself!

In December 1984, I decided to enter the ARRL 160-Meter Contest. I had never been in a contest before, but with my new-found enthusiasm for 160, I resolved to give it a try.

Running 100 watts to a simple wire, using a straight key and no CW filter, I knew I wasn't going to set any records. But I had a good time, even managing to work a bunch of new countries in the process. At that point I realized that if I could do this with the various limitations of my station, think what I could do under better circumstances. That night, I set a goal: I would qualify for 160-meter DXCC!

I began living between 1825 and 1840 kHz. I listened to enough static and pileups to almost perforate my eardrums! But I was determined. I studied low-frequency propagation and sunrise/sunset times around the world. I was hungry!

Once I acquired a CW filter, my country total improved markedly. Next came an antenna that had a vertical component and a good ground system. Then a used linear amplifier. My log was soon filling up with new countries.

Finally, I worked GD4BEG for number 100! It was a thrill that I will long remember. About four months later, I had enough cards (including a few extra for insurance) to submit to the DXCC desk. My cards and the application were carefully boxed and sent off to Newington. As they say, the rest is history. In a few weeks, I will gratefully frame and hang my 160-meter DXCC certificate.

And as I do, I'll say a heartfelt thanks to the faithful gang that hung in there and kept the Top Band alive when the going was toughest. But especially to a man I never met, nor indeed ever had the privilege of working, but who did more for 160 than anybody else. As my certificate is hung on the wall, I'll proudly say, "This is for you, Stew, and thanks!"

# 6K24SO: Korean Amateurs Commemorate the Seoul Olympics

Going for the gold, Amateur Radio style, at the 24th Olympiad!

By Bae Sook "Usuk" Kwak, HL1ATL

Editorial Director,  
Korean Amateur Radio League  
Central PO Box 162  
Seoul, Korea

It was about 3 o'clock on September 4, 1988. On the fourth floor of the Religious Center in the Olympic Village, 11 members of the Korean Amateur Radio League (KARL) were engrossed in a dice game, the winner to become the first amateur operator to put special-event station 6K24SO on the air! Kim, HL1ADL, rolled lucky number 9 and emerged victorious: The first transmission from 6K24SO on 20 meters was his. From that point on, 6K24SO operators enjoyed a virtual month-long fantastic pileup.

The station operated 24-hours a day through October 5, primarily on 40- through 10-meter SSB and CW. Conditions were generally good to all parts of the world, particularly on 20 and 15 meters through mid-September, and 10 meters from then on. 6K24SO made a total of 18,328 contacts, 70% on SSB and 30% on CW, representing 158 different DXCC countries. See Table 1 for a QSO breakdown by continent.

But this operation did not consist merely of running contest-like DX pileups for purposes of commemorative contacts. For the first time in the 35-year history of KARL, the

government authorized the handling of third-party message traffic on behalf of the Olympic teams. The first messages were handled on behalf of the Argentinian delegation, and many more followed. Typical of these messages was a heartwarming radiogram from a Canadian Olympic rower to her young son back home, telling him what day to watch her event on television and otherwise sending her love to the family in North America.

Many athletes and coaches were fascinated by the capability of Amateur Radio to provide contact with their families, regardless of from what point on the globe they hailed. This message-handling service would not have been possible without the able assistance of the Australian emergency net under the leadership of VK6RQ, AX6AP and VK3JCQ. In addition, KARL members provided communications support for the yachting competition in Busan, a harbor city to the south of Seoul. They also activated another special-events station, 6K88SO, located at the Olympic Park adjacent to the Olympic Village.

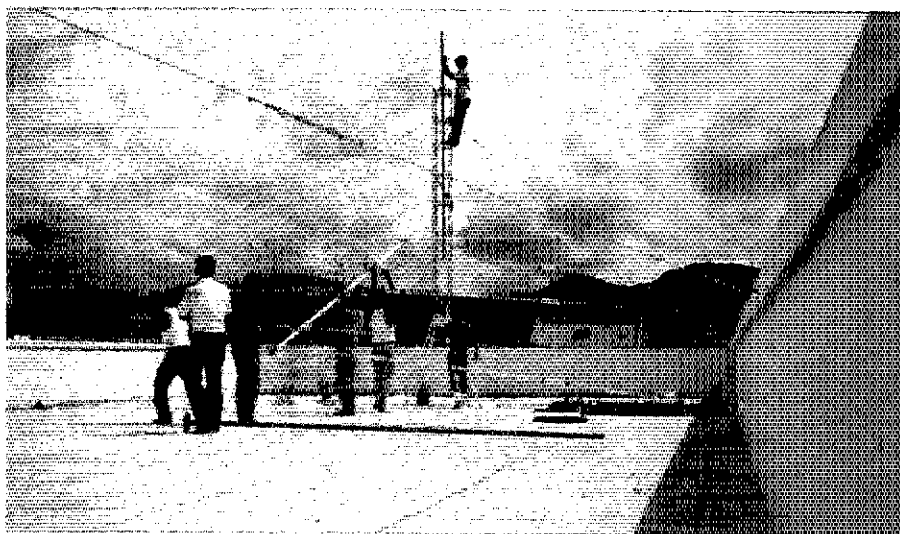
It was a great privilege for all the operators of 6K24SO to be a part of the 24th Olympiad and to share in the Olympic spirit. Many thanks to everyone who participated, both the dedicated station operators and the multitude of radio operators around the world who called in. And now the real fun begins: answering thousands and thousands of QSL cards!

**Table 1**  
**6K24SO QSOs by Continent**

Continent	QSO Total
Asia	8683
North/South America	4846
Europe	3769
Oceania	1000
Africa	30
Total	18,328



The first visitor to operate 6K24SO was Bob, N6CHU, an NBC-TV technician, who pounded out hundreds of contacts on 20-meter CW. Bob was one of many visiting hams operating from 6K24SO during the month-long event. All told, 33 different operators manned the station around the clock.



KARL members set up the 6K24SO antenna system on the rooftop of the Religious Center building in the Olympic Village. From this vantage point, the antenna crew had spectacular views of Mt Namsan to the south and the Han River to the north, as well as downtown Seoul. The antenna system at 6K24SO included a five-element Yagi and various wire configurations.

QSL

## • At the Foundation

# In the Good Old Summertime

By Mary Schetgen, N7IAL

Secretary  
The ARRL Foundation, Inc

Now that Field Day has passed and the temperature in the shack may be downright tropical, you may be ignoring your rig in favor of sipping a mint julep on the veranda. Front-porch portables may never have occurred to you as you swat mosquitoes and stare out into your evening yard. But—suddenly—you are seized by the impulse to relive that recent outdoor operating event that netted you contacts you never dreamed you'd work. There's the big oak tree, 20 feet in front of you and 60 feet tall. It's just crying out for a minutes-to-make simple dipole, and the orientation is one you've never tried on the regular shack antenna. That grounded extension cord in the garage will feed nicely along the foyer floor and out the screen door to the little rig and power supply, now set up on the TV tray next to your patio chair. You too can conjure up this summertime fun at your own place and keep in mind: Autumn is just around the corner. If you've a son or daughter (or yourself) headed back to college, why not make a contribution to the ARRL Foundation Scholarship Program? Send your tax deductible contribution to: *The ARRL Foundation, 225 Main Street, Newington, CT 06111.*

### SAREX 2—We Deliver!

At 8:30 PM on the evening of May 30, 1989, the redesigned SAREX 2 hardware was powered-up by members of the Johnson Space Center ARC. The new, miniaturized power supplies, made possible by a grant from the ARRL Foundation, have allowed system design modifications resulting in greater power efficiency for the hardware. As payload weight is always a consideration on Shuttle flights, this new package is lighter, yet it retains the look of bread board splendor so near and dear to the hearts of home-brew experimenters!

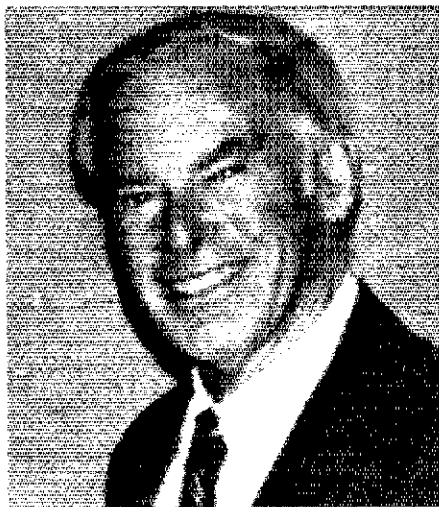
Lou McFadin, W5DID, monitored the SSTV action during the start-up. Packet tests were conducted by Gerry Creager, N5JXS, and Don Noble, W5CLW, with Jerry Coles, KB5ARA, and Dwight Andrews, KA5IYI assisting in this historic event.

### GENEROSITY, LIKE CHARITY, BEGINS AT HOME

When F. George duPont, WA1SVY, past treasurer of the Foundation became a Silent Key in August 1987, we noted the passing of this well-respected, longtime ARRL and

ARRLF colleague and friend with expressions of our heartfelt gratitude for his years of service to these two organizations. In his passing, George did not let his beneficial relationship with us end. Not only did he leave a legacy of fond memories, but also two substantial bequests to be used to support the work of the Foundation.

ARRLF programs will continue thanks to the kindness and commitment shown by WA1SVY and the many other hams who have remembered us in their wills. That George was one of our own Foundation Board members and deeply interested in the future of the Foundation makes his gifts all the more meaningful to those of us who share his vision to give you, the ARRL member, and others, the finest possible programs for Amateur Radio advancement, innovation and preservation.



Past ARRLF Treasurer F. George duPont, WA1SVY, SK.

### Contributor's Corner

We wish to thank the following for their generous contributions to:

#### *The Victor C. Clark Youth Incentive Program Fund*

A. H. Elsner, W6ENV  
in memory of Herb Becker, W6QD

#### *The Don Riebhoff Memorial Scholarship Fund*

Joe Rudi, NK7U

#### *The Bill Bennett, W7PHO Scholarship Fund*

Bob Entrop, W7JXR

#### *The Goldwater Scholarship Fund*

Francisco Ho, N5FMD  
Richard H. Badgett, KA5SRV  
Michigan Amateur Communications System  
in memory of Joe Hasset, W8PVB

#### *The General Fund*

Jane A. Haworth  
in memory of James Leslie "Jay"  
Haworth, WB0LGY.  
Larry P. Spangler  
Playground Amateur Radio Club (FL)  
in memory of Sam Galloway, W5RHE  
Alson E. Braley, W0GET  
Albert Randall, Jr, KA2KBX  
Daniel R. Embody  
Joseph E. Graber, K4EJC  
Ismael Toledo Colon, WP4CKX  
Richard P. Schiller, K4BQH  
Paul Volslager, W6UGU  
Thomas Maciaszek  
F. A. Dodd  
Michael Kravitz, K2MK  
George F. Maier, KU1R  
Robert Millis, WA7RGO  
Demetrio L. Tindoy, KA1RSI  
Chris D. Sweeney, KA8ZAY  
Leon D. St James, WB1AKG  
Irving Ratchick, WA2LFZ  
Walter T. Anderson, W8ERB  
in memory of William F. Gilbert, W0OPL  
Paul V. Smith, KA3QEF  
William D. Hooper, W4RMM  
Byron P. Liles, W9LOH  
Mark A. Moynahan, K3EE  
Forbes R. Koehler, W1DQL  
Leon Emerson, NM6M  
Paul F. Utay, N5FNZ  
Verdt L. Leighton, N1AVL  
Thomas Williams, WA0HCJ  
Pilot Knob Amateur Radio Club (KS)  
in memory of Killian "Bud" Dolsberry,  
N0OA.  
As received and acknowledged during the  
month of May.



## THE ARRL FOUNDATION, INC.

*"for the advancement of amateur radio"*

# Product Review

(continued from page 36)

clude this fix. Modified as Chip suggests, the review FT-747GX produces crisp, communications-quality receive audio. Yaesu has released a technical bulletin giving instructions for removing the culprit capacitor; you can obtain a copy of this bulletin by writing to Yaesu.

The selectivity improvement afforded by the FT-747GX's narrow CW filter is offset somewhat by distortion somewhere in the rig's receive-audio chain. Because of this, it's sometimes easier for me to copy weak CW signals in the '747's "CW wide" mode than in "CW narrow."

## Overall Impression

I like the FT-747GX. I don't miss the absence of RF-gain-control and IF-shift functions, and I had no trouble getting used to the rig's detented tuning and tuning-speed options. Its controls are well thought-out and easy to use, and its compactness amazes me. As an added attraction, the FT-747GX works well as a general-coverage LF, MF and HF receiver. If you need solid tune-and-talk communication on a budget, consider adding an FT-747GX to your station.

Price class: FT-747GX, \$700; FP-757GX compact power supply, \$220; FP-757HD heavy duty power supply/speaker, \$270; MD-1B8 desk microphone, \$110; FM-747 FM unit, \$45. Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 213-404-2700.

## Notes

<sup>1</sup>I put quotes around *RF gain* because the RF-gain controls in most current transceivers actually adjust *IF* gain. The receive RF amplifiers (if present) in most current MF/HF transceivers

are fixed-gain (often switch-selectable) preamplifiers.

<sup>2</sup>In other words, a keyed TR relay with adjustable hold-in time.

## MORE TO COME ON THE MFJ-1278

The MFJ-1278 Multi-Mode Data Controller reviewed in July was from an early production run. There have been several changes to both the unit's hardware and firmware. In order to present an accurate picture of the capabilities and performance of currently available units, a review of a current MFJ-1278 will appear soon in *QST*.

## SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before August 27, 1989. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

Please clearly identify the item you wish to bid on, using the manufacturer's name, model number, or other identification number if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Advanced Radio Devices model 230A MF/HF linear amplifier, s/n 0126 (see Product Review, May 1989 *QST*). Minimum bid: \$4700.

Uniden® President™ HR2510 10-meter transceiver, s/n 83000616 (see Product Review, May 1989 *QST*). Minimum bid: \$179.

Kantronics KAM® multimode communications processor, s/n 74146 (see Product Review, June 1989 *QST*). Minimum bid: \$220.



## QEX: THE ARRL EXPERIMENTERS EXCHANGE AND AMSAT SATELLITE JOURNAL

The July issue of *QEX* includes:

- "Practical Spread-Spectrum: An Experimental Transmitted-Reference Data Modem," by Andre Kesteloot, N4ICK. A simple data link using the transmitted reference approach. Included is a brief description of circuitry (most elements have been described in previous articles).

- "NET98.EXE: A Japanese Version of the KA9Q Internet (TCP/IP) Package," by Masahiro Yamada, JK1NNT and Takayuki Kushida, JG1SLY. Modifications include the support of Kanji characters and support of the PC-9801 series personal computer.

- "Correspondence," describes an easy way to calculate distance and bearing between two locations using USGS maps.

- ">50" by Bill Olson, W3HQT gives an update of solid-state RF receiving devices.

*QEX* is edited by Paul Rinaldo, W4RI, and is published monthly. The special subscription rate for ARRL/AMSAT members is \$10 for 12 issues; for nonmembers, \$20. There are additional postage surcharges for mailing outside the US; write to HQ for details.

# Improving and Using R-X Noise Bridges

(continued from page 32)

$$Z_i(f + f_x/4) = Z_0 \left( \frac{Z_1 \sinh(\gamma\ell) + Z_0 \cosh(\gamma\ell)}{Z_0 \sinh(\gamma\ell) + Z_1 \cosh(\gamma\ell)} \right) \quad (\text{Eq 27})$$

Eqs 26 and 27 can be manipulated so that the characteristic impedance can be found by

$$Z_0 = \sqrt{Z_i(f) Z_i(f + f_x/4)} \quad (\text{Eq 28})$$

The square root is complex, and may be calculated with a scientific calculator using the Eqs 29 through 33.

$$Z = R + jX = Z_i(f) Z_i(f + f_x/4) \quad (\text{Eq 29})$$

$$|Z| = \sqrt{R^2 + X^2} \quad (\text{Eq 30})$$

$$R_0 = \sqrt{|Z|} \cos\left(\frac{1}{2} \tan^{-1} \left[ \frac{X}{R} \right]\right) \quad (\text{Eq 31})$$

$$X_0 = \sqrt{|Z|} \sin\left(\frac{1}{2} \tan^{-1} \left[ \frac{X}{R} \right]\right) \quad (\text{Eq 32})$$

$$Z_0 = R_0 + jX_0 \quad (\text{Eq 33})$$

Transmission-line attenuation can be calculated after using this transmission-line impedance equation:

$$Z_i = Z_0 \left( \frac{Z_1 [\cos(\beta\ell) + j\alpha\ell \sin(\beta\ell)]}{Z_0 [\cos(\beta\ell) + j\alpha\ell \sin(\beta\ell)]} + \frac{Z_0 [\alpha\ell \cos(\beta\ell) + j\sin(\beta\ell)]}{Z_1 [\alpha\ell \cos(\beta\ell) + j\sin(\beta\ell)]} \right) \quad (\text{Eq 34})$$

This equation yields an error of less than 5%—as long as the transmission-line loss is less than 3 dB. If the transmission line is an odd multiple of a quarter wavelength ( $n = 1, 3, 5, \dots$ ) and is terminated by an open circuit, or if the transmission line is an even multiple of a quarter wavelength ( $n = 2, 4, 6, \dots$ ) and is terminated by a short circuit, the input impedance is given by

$$Z_i = \alpha\ell Z_0 \quad (\text{Eq 35})$$

The attenuation of this transmission line can be found by

$$\alpha\ell = \frac{R_i}{R_0} \quad (\text{Eq 36})$$

where  $R_i$  and  $R_0$  are the resistive parts of the input impedance and the characteristic impedance, respectively. The transmission-line attenuation increases with frequency. An estimate for this attenuation is given by

$$\alpha\ell(f) = \alpha\ell(f_0) \left( \frac{f}{f_0} \right)^\sigma \quad (\text{Eq 37})$$

where

$$0.5 < \sigma < 1$$

This equation can be used to interpolate between unmeasured values of attenuation. For most coaxial cables,  $\sigma = 0.5$  works well.

# SET Showcases Amateur Radio Preparedness

## Scenarios and Results, 1988

By Steven Ewald, WA4CMS  
Assistant Public Service Manager

**H**ow would Amateur Radio respond if a communications emergency occurred in my community? The quest to answer this is the challenge to the ARRL Field Organization and especially the Amateur Radio Emergency Service (ARES). Preparedness is the key to getting a satisfactory answer, an answer that public-service minded radio amateurs know takes a lot of planning and practice.

The 1988 ARRL Simulated Emergency Test (SET) was an opportunity for the ARES and the National Traffic System (NTS) to put their skills into practice for the time when an emergency requires a disciplined response. For a specified period of time on or near the weekend of October 15, SET encouraged the Field Organization to realize their group's strengths and to discover weak points in their emergency plans.

The real strength of SET results when emergency planning is done while working closely with served agencies within your community. The following representative scenarios tell the story of how radio amateurs work toward answering the questions on emergency communications.

### Hurricane Scenario in New Hampshire

Western Rockingham County (New Hampshire) Amateur Radio operators,



Hamp Yearwood, KG5MG (left), Vice President of the Snyder ARC, and Perry Westmoreland, N5JSU, Director of Emergency Medical Services for the City of Snyder, direct ambulances and personnel via Amateur Radio during the simulated emergency.

under the leadership of Emergency Coordinator (EC) Richard Magalhaes, N1FDJ, began the drill on October 15 as a simulated hurricane named "Debbie/Lerol" ripped through New England, leaving a swath of destruction throughout Rhode Island, Eastern Massachusetts, and New Hampshire (south of the White Mountains).

Shortly after 8 AM, the New Hampshire Office of Emergency Management, located on the State Campus in Concord and manned by WA1WOK and KA1OU, sent a digital message to ham operators throughout the area. The alert asked all emergency personnel to prepare for cleanup in the aftermath of the storm.

Tasks included photographic surveillance and visual observations from the air involving NH Civil Air Patrol (CAP) and ground crews (comprised of CAP, ARES and Radio Amateur Civil Emergency Service [RACES] volunteers), as well as providing liaisons with the NH State Police, Fish and Game Commission, and the Aeronautics Agency.

Within 12 minutes of the state alert, ham

operators mobilized the necessary equipment to begin their two-day operation. The Western Rockingham County Emergency Net was activated with liaison to Merrimack and Hillsboro Counties along with parts of the sea coast area.

By 8:38 AM, the ARES packet net was established with eight stations on standby, two of which were capable of mobile/portable operation. Within the hour, the state officials had requested the Emergency Net to dispatch units to check on the status of telephone service in the area. At 9:40 AM, the Salem Civil Defense Net opened, and the simulation progressed as Salem was declared "without electricity." Repeater operators went to emergency power.

Late Saturday morning, N1FYD asked operators to participate in a simulated search and rescue mission along the Merrimack River as part of the annual Amoskeag Rowing Club's annual regatta. N1FDJ advised the state office of this request, and traffic was passed by KA1ROH, Net Control Station (NCS) for the New Hampshire Novice Traffic Net which was operating on 10 meters.

At 7 AM the next morning, nine amateurs

### 1988 ARES Analysis

	1988	1987	% Change
Number of EC Annual Reports received	397	403	- 1.50
Number of ARES members in your group	18,593	15,635	+ 18.93
ARES members on CW	7,532	7,167	+ 5.53
ARES members on VHF	17,531	13,854	+ 26.54
Emergency powered (HF)	4,995	4,138	+ 20.71
Emergency powered (VHF)	10,737	10,405	+ 3.20
Members operational on HF mobile	3,038	2,484	+ 22.30
Members operational on VHF mobile	14,692	13,319	+ 10.31
Net sessions/drills per year	9,856	17,527	- 43.77
NTS liaison	266	273	- 2.20
RACES liaison	271	270	+ 0.37
ARES packet-radio participants	3,006	2,368	+ 26.95

### 1989 SET Top Ten

Section/Local Nets	Total Points	Local ARES Activity	Total Points
Michigan	8351	Michigan	8914
Ohio	3465	Ohio	6530
Indiana	2499	Georgia	6370
Orange	1812	Indiana	4088
Northern Florida	1144	Orange	2742
Kentucky	911	Northern Florida	2507
Connecticut	753	Western New York	1907
Iowa	681	Southern Florida	1555
Alabama	660	Santa Clara Valley	1314
Georgia	420	Iowa	1265

## NET Reports

Regional Nets reporting	Net Manager	Total Points
Second Region, Cycle 2	W2MTA	80
Second Region, Cycle 3	W2MTA	75
Eighth Region, Cycle 2	K8BCPS	144
Section/Local Nets	No. of Net Managers Reporting	Total Points
ARRL Section		
Alabama	1	860
Arizona	1	140
Arkansas	1	78
Colorado	1	154
Connecticut	5	753
East Bay	1	56
Eastern Massachusetts	2	130
Eastern New York	1	237
Eastern Pennsylvania	2	103
Georgia	2	420
Illinois	4	361
Indiana	15	2499
Iowa	10	68
Kentucky	5	911
Maine	2	150
Maryland-DC	1	45
Michigan	37	8351
Minnesota	4	278
Missouri	1	80
New York City-Long Island	1	78
North Carolina	2	382
North Texas	1	28
Northern Florida	9	1144
Northern New Jersey	1	68
Ohio	21	3465
Oklahoma	1	313
Orange	5	1812
Oregon	1	65
Pacific	1	54
Rhode Island	1	46
Sacramento Valley	1	92
South Carolina	1	293
South Dakota	2	341
Southern Florida	1	228
Tennessee	3	396
Vermont	1	97
Virginia	1	87
West Texas	1	317
West Virginia	4	344
Western New York	4	367
Western Pennsylvania	1	146
Wisconsin	1	31

converged on Lambert Park in Hooksett, New Hampshire, to provide tactical operations for the Rowing Regatta. This activity helped to wrap up the SET. In total, 46 hams, 41 of which operated in part or in total on emergency power, and eight packet-radio stations participated in four nets and one public-service event.—*Phil McGan, WA2MBQ, Public Information Officer, New Hampshire.*

### Aiming for the Best in Marysville, Ohio

Enthusiasm was the key word for the ARES in Union County, Ohio. For the 1988 Simulated Emergency Test, EC Clyde Morrow, KE8DQ, set a goal. "We wanted to make this one of the best ever. We started planning two months ahead of time so everything would fall into place." The following summary of Clyde's SET report tells how their group showcased Amateur Radio for the community in preparation for the test weekend.

We wanted to get information out to the public, so KE8DQ checked with the *Bargain Hunter*, a local weekly shopper that has a circulation of 32,000. The *Bargain Hunter* staff indicated that an announcement could be carried free of charge, and W8OM would take care of placing all articles. Another publicity-related opportunity was arranged when the radio amateurs asked the mayor to declare October 15, 1988, as Amateur Radio Day for the county. With the help of KA8SJH, Mayor Tom Kruss signed the proclamation for Amateur Radio Day in Union County. The local newspaper covered the story and previewed what would happen during the Simulated Emergency Test. The crew also enlisted the help of local radio station WUCO to announce the event and to invite the public to the Command Center in New Dover.

As part of the training exercise, the team had three high-frequency stations set up at the New Dover Command Center. N8CBF and W8OM served as traffic liaison between 2-meter and 75-meter nets. KA8VGC and W8BJN also assisted at the command station. A packet-radio station was also ready for work. Messages were passed on behalf of the Red Cross and the local civil defense office. SET related messages were also handled by members of the ARES to help sharpen their procedures for traffic handling. Packet radio, SSB and 2-meter FM modes were employed.

Later in the day, 43 Cub Scouts and parents from the Ostrander area visited the station. At one time, we made contact with a Mexican Boy Scout station in connection with the Jamboree-on-the-Air. It was a lot of fun and educational for the Scouts. Special thanks to W8BJN, KA8SJH, WB8A, N8CBF, W8OM, KD8HB, KA8VGC, KB8BQC, KA7KAJ, KB8FMC, N8IID, N8IXJ and K8ES for the support in making this a successful SET.—*Clyde Morrow, Sr, KE8DQ, Emergency Coordinator, Union County*

### Scurry County is Scene of Texas-Sized Drill

Radio amateurs were invited to participate in a full-scale drill held by the city of Snyder, Texas and Scurry County. This drill was held under the auspices of the Texas Department of Emergency Management and several served agencies and local officials were also involved.

The scenario was a simulated tornado that swept through the southeast side of Snyder, striking a school and residential area. The drill involved handling injured mock victims played by nursing students from Western Texas College.

Over 150 persons participated with a crew of 11 radio amateurs. The hams served as weather spotters and provided back-up/auxiliary communications for the agencies involved. Hams in the outlying communities helped in the exercise by relaying weather reports and messages to surrounding cities.

## Local ARES Activity

ARRL Section	No. of ECs Reporting	Total Points
Alabama	1	151
Arizona	3	992
Colorado	2	474
Connecticut	3	330
South Dakota	1	30
East Bay	1	138
Eastern Massachusetts	3	322
Eastern New York	2	482
Eastern Pennsylvania	4	697
Georgia	27	6370
Illinois	6	707
Indiana	21	4088
Iowa	11	1265
Kansas	4	294
Kentucky	4	966
Louisiana	1	87
Maine	2	221
Maryland-DC	3	446
Michigan	40	8914
Minnesota	4	556
Missouri	5	417
Nevada	1	144
New Hampshire	1	294
New York City-Long Island	2	159
North Carolina	5	1172
North Texas	2	517
Northern Florida	17	2507
Northern New Jersey	3	283
Ohio	33	6530
Oklahoma	2	431
Orange	10	2742
Pacific	3	262
Rhode Island	1	90
Sacramento Valley	2	269
Santa Barbara	1	83
Santa Clara Valley	8	1314
South Carolina	1	413
South Dakota	2	382
South Texas	4	723
Southern Florida	4	1555
Southern New Jersey	1	239
Tennessee	3	381
Utah	1	221
Vermont	1	120
Virginia	5	731
Western Washington	3	507
West Virginia	5	745
Western New York	10	1907
Western Pennsylvania	2	157
Wisconsin	1	111

In summary, the event went very well and showed the city and served agencies what Amateur Radio can do. It also pointed out shortcomings that have been addressed in everyone's disaster plans.—*Paul Gilbert, KESZW, EC Scurry County.*

### The Results

The 1988 SET results are organized in two main categories: National Traffic System and Local Activity conducted by ARRL Emergency Coordinators. Each reporting ARRL section is listed alphabetically with the number of ARES teams reporting and the cumulative score of each section.

Each entrant's total score was based on a preannounced point system. Point values were assigned to several categories related to emergency communications and preparation. SET participation, traffic handling and digital-mode operations were encouraged as was interaction with community and served agencies.



# Moved and Seconded . . .

**MINUTES OF THE EXECUTIVE COMMITTEE**  
**Meeting Number 434**  
**St. Louis, Missouri**  
**June 24, 1989**

## AGENDA

1. Approval of Minutes of April 1, 1989, Executive Committee Meeting
2. FCC Matters:
  - 2.1 Review of status of 220-MHz defense
  - 2.2 Review of status of General Docket 87-389 (Revision of Part 15 of FCC Rules)
  - 2.3 Review of Report and Order in PR Docket 88-139 (Rewrite of Part 97)
  - 2.4 Other FCC matters
3. International matters
  - 3.1 Review of preparations for hosting of IARU Region 2 Conference, Orlando, September 4-8, 1989
  - 3.2 Preliminary Report on ITU Plenipotentiary Conference
  - 3.3 Other international matters
4. Actions assigned to the Executive Committee by the Board at 1989 Annual Meeting
  - 4.1 Minute 80: review of Standing Orders
  - 4.2 Minute 81: action plan for FCC compliance with RFI legislation
  - 4.3 Minute 105: action plan for greater FCC enforcement (with Counsel and Legal Strategy Committee)
5. Actions assigned by Executive Committee at April 1 meeting
  - 5.1 Ways of documenting economic value of Amateur Radio
  - 5.2 Connecticut law as it pertains to disabled participation in ARRL meetings
6. Review of progress on Board directives:
  - 6.1 By the vice presidents and/or chairmen, for the committees
  - 6.2 By the Executive Vice President, on Headquarters actions
  - 6.3 WIAW renovation
7. Local antenna/RFI matters
8. Recognition of new Life Members
9. Affiliation of clubs
10. Approval of conventions
11. Other business
12. Date and place of next meeting
13. Adjournment

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 8:30 A.M. Central Daylight Time, June 24, 1989, at the Airport Marriott Hotel, St. Louis, Missouri. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Jay A. Holladay, W6EJJ; Executive Vice President David Sumner, K1ZZ; and Directors Tom Frenaye, K1KI, Paul Grauer, WØFIR, Stephen A. Mendelsohn, WA2DHF, and Hugh A. Turnbull, W3ABC. Also present were Directors Rush S. Drake, W7RM, and Edmond A. Metzger, W9PRN; and Counsel Christopher D. Imlay, N3AKD.

1. On motion of Mr. Mendelsohn, the Minutes of the April 1, 1989 meeting were adopted as printed.
2. FCC matters:
  - 2.1. Mr. Price observed that with the FCC acting on our reconsideration petition, reaffirming its original decision in the 220-MHz reallocation (General Docket 87-14), ARRL has exhausted its administrative remedies. The next step is to petition the U.S. Court of Appeals for the District of Columbia Circuit for review of the FCC action. Authority for this step having already been given, no further action by the Executive Committee is required at this time.
  - 2.2. Mr. Price reported that following denial by FCC of our motion for stay of the effective date of the new Part 15 rules, Counsel Imlay had filed an emergency motion for stay with the U.S. Court

of Appeals for the D.C. Circuit. The Court of Appeals denied the motion on June 21. Thus, the new Part 15 rules are now in effect. FCC has not ruled on the merits of the various petitions for reconsideration, including ours, that have been filed in this proceeding. ARRL staff will be attempting to arrange an ex parte presentation to appropriate FCC staff in an attempt to resolve apparent differences of opinion as to our engineering showings.

2.3. Mr. Price reported that he had requested the members of the Part 97 Rewrite Committee to review the FCC Report and Order in this proceeding, first, to identify those typographical and other errors that should be corrected immediately by issuance of errata by FCC, and second, to identify those substantive amendments that should be sought later through a petition for rulemaking. A petition for reconsideration does not appear to be required in this proceeding.

2.4.1. Mr. Sumner noted that with the FCC termination of the PRB-3 call sign proceeding, it was now timely to discuss possible ways of resuming the issuance of club station licenses with Commission staff. Progress reports will be made to the Board as appropriate.

2.4.2. Mr. Price reported that he had discussed the problem of inappropriate remarks by an FCC official, reported at the previous meeting, with the official's superior. Regrettably, it appears that there will be no action forthcoming to correct the remarks for the record.

2.4.3. The Executive Committee noted that it was encouraged to hear that enforcement action finally is underway in New York City aimed at eliminating the illegal use of the ten-meter band by taxicabs.

2.4.4. In response to a question, Mr. Sumner reported on discussions with CRRL President Atkins concerning rumors of threats to the 220 and 440 MHz amateur allocations in Canada. The rumors appear to be unfounded.

2.4.5. On motion of Mr. Frenaye, Counsel was authorized to file comments opposing reconsideration of the FCC decision in Docket 88-467 concerning 18-MHz privileges.

2.4.6. A question arose regarding comments filed in Docket 89-65, concerning band segments for automatically controlled beacons. Vice President Holladay was asked to look into the matter and report to the Executive Committee.

2.4.7. The Legal Strategy Committee was asked to review the text of H.R. 911, a bill to encourage states to provide protection from liability to volunteers, to determine if there were any aspects of the proposed legislation which should not be supported by the League.

2.4.8. On motion of Mr. Mendelsohn, the Committee voted to support amendment of the Communications Act of 1934 to make multilateral, as well as bilateral, agreements a basis for the issuance of reciprocal operating permits to aliens.

2.4.9. On motion of Mr. Frenaye, the Committee voted to oppose amendment of Section 4(f)(4)(J) of the Communications Act of 1934 to eliminate the requirement that individuals and organizations receiving reimbursement from examinees maintain records and certify annually to the Commission that all costs for which reimbursement was obtained were necessarily and prudently incurred.

### 3. International matters:

3.1. Mr. Price reported, on behalf of International Affairs Vice President Olson, that preparations for the hosting of the IARU Region 2 Conference in Orlando September 4-8 were proceeding smoothly.

3.2. Mr. Sumner reported that the ITU Plenipotentiary Conference appeared to be leaning toward calling two Administrative Radio Conferences of probable significance to Amateur Radio, for 1992 and 1993. More detailed information is expected shortly, though the exact agendas and dates

may not be known until after the next meeting of the ITU Administrative Council.

3.3. Mr. Price reported briefly on his attendance at the meeting of the Canadian Radio Relay League Board of Directors, May 20-21.

4.1. The Committee resumed the review of Standing Orders of the Board begun at its previous meeting, with a recess for luncheon from 12:00 to 12:45 P.M. Without dissent, this review was set aside at 12:56 P.M. until completion of the remainder of the Committee's business.

4.2. Mr. Imlay noted that according to FCC statistics, interference complaints resulting from inadequacies in the design and manufacture of consumer electronics equipment and involving amateur stations appear to be declining. There are several possible explanations for this, including the fact that it is difficult to lodge a complaint with FCC owing to staff shortages and overloaded telephone lines. He recommended the collection of data to demonstrate that the problems that had led Congress to adopt Public Law 97-259 have not been solved.

4.3. The staff report on the Amateur Auxiliary, which had been reviewed at the previous meeting and circulated to the Board, was well received by the Board. In view of this, and of reports that the FCC was placing increased reliance on evidence developed by the Amateur Auxiliary in its enforcement efforts, the Committee concluded that the objectives of Minute 105 are being substantially accomplished. The Committee will continue to monitor developments to ensure that this trend continues.

5.1. Mr. Price gave an interim report on his study of how to document the economic value to the public of Amateur Radio. A detailed analysis of this economic value by a recognized, impartial agency (such as a university) would entail significant expense, though the results might be well worth it in future defenses of amateur allocations. The study is continuing.

5.2. Mr. Sumner reported that Connecticut corporate counsel had reviewed the revised travel policy pertaining to participation in meetings by League officials with physical disabilities and had found no inconsistency with state law.

6.1. On behalf of the Administration and Finance Committee, Mr. Metzger, as chairman, reported that the Committee will meet July 20 at Headquarters. On behalf of the Membership Services Committee, Mr. Holladay reported that the Committee will meet July 19.

6.2. Mr. Sumner distributed a summary of action taken to date on assignments arising from previous Board meetings, and answered questions arising therefrom.

6.3. Mr. Sumner reported that WIAW renovation was proceeding on schedule in virtually all respects. Work on the new antennas is expected to begin next week. Delivery of the bulletin transmitters also is expected next week. The building should be ready for the rededication ceremony July 20.

7. Mr. Imlay reported on the unfavorable status of *Winfield Village Cooperative v. Ruiz*. Review by the Illinois Supreme Court on appeal has been requested, but review is discretionary with the court. The case involves an eviction action arising from an RFI nuisance complaint in which federal preemption appears to have been ignored.

8. On motion of Mr. Turnbull, the names of 48 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in *QST*.

9. On motion of Mr. Mendelsohn, the following clubs were declared affiliated:

### Category 1

Ashcraft Repeater Club, Inc., Dallas, Texas  
Central Oregon DX Club, Bend, Oregon

(continued on page 65)

## FCC Declines to Reconsider 220-MHz Decision; ARRL to File in Federal Court

The FCC announced on June 15 that it had reaffirmed its decision to reallocate the 220-222 MHz band from the Amateur Radio Service to commercial land mobile interests. In so doing, the FCC rejected arguments presented in some 700 petitions for reconsideration that its original decision had failed to adequately consider the impact of the reallocation on radio amateur volunteers. Among the parties requesting reconsideration were ARRL, National Communications System (NCS) and hundreds of amateurs—all in opposition to the reallocation. TV Answer, Inc (TVA), requested reconsideration until its petition for 500 kHz of spectrum in the 216-222 MHz band could be acted upon.

With regard to the TVA petition, FCC stated "an allocation of .5 MHz to the Fixed Service in the 220-222 MHz band would undermine the intent of the allocation to the Land Mobile Service, which is to foster the development of narrowband technologies. FCC believes that such an allocation would impede and even discourage manufacturers from making significant investments in narrowband technologies."

"The Commission's action is a disappointment, but not a surprise," commented ARRL Executive Vice President David Sumner. "The entire history of this proceeding is one of the Commission ignoring evidence that did not support its preconceived position. Now it will be up to the federal Court of Appeals to

determine whether, by so doing, the Commission overstepped its bounds." Sumner observed that the ARRL Executive Committee had already decided to ask the US Court of Appeals for the DC Circuit to review the FCC decision in the event the Commission refused to reconsider on its own.

Last May, a Congressional subcommittee chaired by West Virginia Congressman Bob Wise conducted an oversight hearing into the Commission's decision-making process on the 220-MHz proceeding. "During the hearing, we observed a number of occasions where the FCC testimony overlooked evidence in the record, or contradicted what the Commission had said last August when the decision was made," Sumner said. "We had hoped that their significance would not be lost on the FCC, and that we wouldn't be forced to go to court to point them out. Instead, in the course of today's meeting, the Commission reverted to the rhetoric of last August."

On June 7, Rep Wise wrote to FCC Chairman Patrick urging consideration of four compromise scenarios in which the essential interests of all parties to the allocations dispute would be preserved. Mr Wise stated his desire "that the Commission make sure that every possible compromise solution is considered before it takes action on the pending petitions for reconsideration." ARRL Counsel Christopher Imlay later observed: "Despite Commission statements to the contrary, it

was apparent today [June 15] that no substantive consideration had been given to those alternatives. The US Court of Appeals for the DC Circuit has repeatedly held that an agency's stating a factor has been considered is no substitute for considering it."

In the course of discussion, the Commissioners did indicate that they would be willing to entertain, in some future proceeding, the possibility of some shared use of the 216-220 MHz band by amateurs. "We don't hold out much hope of this coming to pass," Sumner said. "The way for the Commission to demonstrate sincerity would have been to deal with this possibility now, rather than to relegate it to some uncertain future time."

Amateurs continue to use the 220-222 MHz band for a variety of purposes, including development of a state of the art intercity data communications network that offers a backup emergency communications capability to the government and the general public. No date has been set by FCC for terminating amateur access to the band.

FCC has also denied ARRL's request for oral argument before the full Commission with regard to General Docket 87-14. The FCC noted in its news release reaffirming reallocation that "it is not [FCC] policy to grant routinely oral arguments in rulemaking proceedings, particularly in proceedings that have a full written record as is the case in this proceeding."

### FCC DENIES ARRL MOTION FOR STAY IN PART 15 REVISION

On June 19, 1989, the FCC denied the ARRL Motion for Stay of the effective date of the Part 15 revision. In the Motion for Stay, the League demonstrated that irreparable harm would occur if the new Part 15 standards were allowed to go into effect as scheduled on June 23, 1989. The League had requested a stay until all administrative and judicial remedies had been exhausted in this proceeding. Part 15 devices are unlicensed, low-power transmitters, such as garage door openers. The League argued that the general radiated limits for Part 15 devices are too high and warns against the co-location of Part 15 devices and amateur stations due to the interference potential. Additionally, it would be virtually impossible to remove from service the Part 15 equipment that would then be permitted into the marketplace. The June and July Happenings

columns give more information on these new rules.

In the denial of the ARRL motion, the FCC stated, "Although we appreciate the League's fears of increased interference... they are unfounded. For instance we [FCC] are unaware of any interference to amateur operations from Part 15 transmitters in the 1.705-30 MHz band. The large numbers of licensed users effectively preclude the general operation of Part 15 devices... Similarly, it is not likely that this situation will change. Within the band 30-900 MHz, the low emission levels permitted for Part 15 transmitters effectively preclude the operation of these devices except in relatively shielded areas or on vacant bands. Thus the potential for Part 15 transmitters to cause interference to amateur operators is self-limiting." FCC stated that interference "does not appear" to be a problem for these devices.

ARRL Counsel Chris Imlay, N3AKD,

filed an emergency motion for stay with the US Court of Appeals for the DC Circuit on June 20. The court of appeals denied the motion on June 21. Thus, the new FCC Part 15 rules are now in effect. The FCC has not ruled on the merits of the various petitions for reconsideration, including the ARRL's, that have been filed in this proceeding.

### FCC SEIZES OVER \$30,000 OF ILLEGAL CB EQUIPMENT

On May 17, 1989, representatives from the FCC's Philadelphia office and from the US Marshals Service conducted a search and seized over 200 pieces of electronic equipment including illegal CB transceivers and illegal linear amplifiers with an estimated value of over \$30,000. The search warrant was executed against Jade Electronics of Trevoze, Pennsylvania.

The seized items were believed to have been manufactured in the Far East and

imported to the US for illegal sale. The CB transceivers were capable of operating on frequencies not permitted by FCC regulations with power levels in excess of that authorized by FCC. Additionally, the seized items did not have FCC type acceptance which is required of equipment marketed in the US. The importation and sale of such devices is a violation of Section 302 of the Communications Act and maximum penalties include fines of up to \$200,000 and imprisonment for a term not exceeding one year.

## ARRL FILES COMMENTS ON BEACON SUBBAND NPRM

ARRL has filed comments on the FCC Notice of Proposed Rule Making (NPRM) in PR Docket 89-65 which proposes changing the subbands for 2-meter and higher frequency automatically controlled beacons. Last September, ARRL filed a petition for rule making which asked the FCC to change the beacon subbands due to increasing requests from VHF/UHF weak-signal users and from the amateur community generally active on the VHF/UHF bands. Here is a comparison between the present beacon subbands and the ARRL proposal:

Present	Proposed
144.05-144.06 MHz	144.275-144.300 MHz
220.05-220.06 MHz	220.275-220.300 MHz
222.05-222.06	-----
432.07-432.08 MHz	432.300-432.400 MHz

In the NPRM, FCC notes that 220-222 MHz "had been reallocated... but that beacons may continue to transmit in the 220-222 MHz segment until such time as the rules are adopted effecting the reallocation." The ARRL noted that we have no indication when the reallocation will take effect and that the beacon subband on 1 1/4 m should be moved to 220.275-220.300 in the meantime—or, at the very least, the changes at 144 and 432 MHz should be adopted and the proceeding kept open for later action on 220 MHz.

## SECOND NOTICE—ARRL BOARD ELECTIONS—CALL FOR NOMINATIONS

Nominations are now open for Director and Vice Director in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions for the two-year term beginning January 1, 1990. From now until August 20 at noon, the Secretary will accept nominating petitions signed by 10 or more Full members of a Division, naming a Full member of that Division as a candidate for Director or Vice Director.

The ARRL Board of Directors is the governing body of the nonprofit, educational and scientific corporation chartered under laws of Connecticut as the American Radio Relay League. The Board of Directors is ultimately responsible for all League matters, including deciding ARRL priorities and services that will be made available to the membership. There are 15 Directors who are elected by the membership on a geographical basis. Eight of the

Directors stand for election in even-numbered years, seven in odd-number years. At the same time Directors are elected, Vice Directors are also chosen who can fill in when Directors are unable to serve. For this reason, candidates for Vice Director must meet the same requirements as the candidates for Director.

ARRL full members have the privilege and responsibility to decide either that they like the actions of their incumbent representatives and support them actively for reelection or that someone else could do a better job and support that person's election.

For a candidate to be eligible for the office of Director or Vice Director he or she must submit a nominating petition bearing the signatures of 10 (or more) Full members of a Division naming him or her as a candidate for Director or Vice Director. The petition must be received by League HQ **no later than noon on August 20, 1989**. Each candidate must also provide information (on a form provided by HQ) that will allow the Election Committee of the Board of Directors to determine the eligibility of the candidate in accordance with the provisions of the ARRL Articles of Association and By-Laws.

The candidate may also include a statement of not more than 300 words setting forth the candidate's qualifications. This statement will be included with the ballot mailed to members without content editing. If the statement as submitted exceeds 300 words, the first 300 words will be used. The statement must be relevant, truthful and not misleading (as determined by the Election Committee). Along with the 300-word statement, the candidate must submit a signed statement certifying that the information is true to the best of the candidate's knowledge and belief. Any willful violation of the statement will be grounds for disqualification by the Election Committee. A candidate may also submit a recent photo of himself/herself for inclusion on the ballot.

The nominee must hold at least a Technician-class amateur license, must be at least 21 years of age and must have been licensed and a Full member of the League for a continuous term of at least four years immediately prior to the election. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of League affairs by the Board or by the improper exploitation of his office for the furtherance of his own aims or those of his employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his influence in the affairs of the League could be used for his private benefit. The idea behind these rules is to ensure that candidates: (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for ARRL and (3) are free from conflicts of interest.

The Elections Committee will meet

shortly after August 20, so candidates should make sure their information form arrives at HQ as early as possible but **no later than August 20**. (It is in the candidate's best interest to get the nomination in early.) If there is to be a mid-August nomination for some unavoidable reason, the candidate information, 300-word statement, signed certification and photo should accompany the nominating petition.

Whenever there is more than one candidate for either office, ballots will be sent to all Full members of the League in that Division who were in good standing as of September 10. (You must be a licensed radio amateur to be a Full member.) The ballots will be mailed not later than October 1, and, to be valid, must be received at HQ by noon on November 20. A group of nominators can name a candidate for Director or Vice Director, or both, but there are no "slates" as such—candidates appear on the ballot in alphabetical order. If a person is nominated for both Director and Vice Director, the nomination for Director will stand and that for Vice Director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for Vice Director if he or she wishes.

### Nominating Form

The following form for nomination is suggested; it may be copied onto any paper, or a form may be obtained from HQ upon request:

Election Committee  
The American Radio Relay League  
225 Main St  
Newington, CT 06111

We, the undersigned, Full members of ARRL residing in the... Division, hereby nominate... of... as a candidate for Director; and we also nominate... of... as a candidate for Vice Director from this Division for the 1990-91 term.  
(Signature... Call... City... ZIP... Date...)

Nominees, or indeed any member, may obtain a copy of the Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials by requesting same from HQ.

### Absentee Ballots

All ARRL members who are licensed by FCC, but are temporarily residing outside the US, are eligible for Full membership. Overseas members who arrange to be listed as Full members in an appropriate Division prior to September 10 will be able to vote this year where elections are being held. Members with APO and FPO addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal address.

Even within the US, Full members temporarily living outside the ARRL Division they consider home may have voting privileges by notifying the Secretary prior to September 10 and giving their current

*QST* address and the reason that another Division is considered home. If your home is in the Atlantic, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern Divisions, but your *QST* goes elsewhere, please let the ARRL Secretary know as soon as possible, but no later than September 10, so you can receive a ballot from your home Division.

### *The Incumbents*

These persons presently hold the offices of Director and Vice Director, respectively, in the Divisions conducting elections this year:

Atlantic—Hugh A. Turnbull, W3ABC, and James M. Mozley, W2BCH.

Dakota—Howard Mark, W0OZC, and Bruce Meyer, W0HZR.

Delta—Joel M. Harrison, Sr, WB5IGF, and Joseph A. Butler, K5OS.

Great Lakes—Leonard M. Nathanson, W8RC and Allan L. Severson, AB8P.

Midwest—Paul Grauer, W0FIR, and L. C. "Chuck" Miller, WA0KUH.

Pacific—Rodney J. Stafford, KB6ZV, and Charles P. McConnell, W6DPD.

Southeastern—Frank M. Butler Jr, W4RH, and Evelyn Gauzens, W4WYR.

Petitions need 10 or more signatures of Full members and are due at HQ by noon August 20. If there is only one eligible candidate for an office, he or she will be declared elected by the Election Committee; otherwise, ballots will be mailed not later than October 1 to Full Members of record September 10. To be valid, ballots must reach HQ before noon November 20. The new term will begin at noon January 1, 1990.

For the Board of Directors:

June 27, 1989

David Sumner, K1ZZ

Secretary

### **ARRL DIAMOND JUBILEE CONVENTION**

The ARRL Diamond Jubilee National Convention was something special! Commemorating the 75th anniversary of the founding of the ARRL, it was held in Arlington, Texas from June 2-4. The convention was well attended with 8750 amateurs at Ham-Com '89. Among the attendees were all ARRL Directors, as well as many Vice Directors and Officers. The many forums covered virtually every aspect of Amateur Radio and they afforded amateurs the chance to meet face-to-face with ARRL and FCC officials.

At the FCC forum, John Johnston, Chief of FCC's Personal Radio Branch, and Robert McNamara, Chief of the Special Services Division, Private Radio Bureau, spoke at length about several important FCC decisions which were announced at the National. These include the completion of Part 97 rewrite and the termination of the PRB-3 proceeding regarding the possible privatization of a special call-sign system.

The packed ARRL forum was

moderated by West Gulf Division Director Jim Haynie, WB5JBP. ARRL President Larry Price, W4RA, and ARRL Executive Vice President Dave Sumner, K1ZZ, both spoke and later opened the floor for questions. QCWA President Leland Smith, W5KL, stated that his organization had presented 14 amateurs with 75-year certificates. President of the Federacion Mexicana de Radio Experimentadores (FMRE) Guillermo Nunez, XE1NJ, was the guest of honor at the convention. He presented the ARRL with a silver tray in commemoration of the League's 75th anniversary.

An instructor workshop and forum was held with speakers presenting papers on educational and recruitment topics followed by questions from the audience. These papers were bound into a book entitled *Proceedings of the ARRL National Educational Workshop*, which is now available from ARRL HQ for \$12.00 plus \$2.50 for shipping and handling.

The convention banquet was also well attended. After opening comments by Jim Haynie, Larry Price, Dave Sumner and Guillermo Nunez, Father Gerry Kambites, 5X5GK, gave a rousing speech attesting to the value of Amateur Radio throughout the extraordinary adventures in his life. A former doctor/priest/teacher in Uganda, he urged the audience to "...open the books of our minds, preserve Amateur Radio... be humble, strive for excellence, help other people and always do good."

Passersby of the League booth couldn't help but notice the reminders of the League's long history. These included "Old Betsy," Hiram Percy Maxim's spark transmitter (c 1920), and the original Wouff Hong (c 1919), the famed instrument of torture for enforcing good operator practice. W1AW/5 operated at the site of the convention, with station operators logging approximately 3000 contacts worldwide.

You say you missed the National this year? Get ready for the 1990 ARRL National Convention to be held in Kansas City, Missouri, June 8-10, 1990.

### **ANERCOM MEETS IN WASHINGTON**

The ARRL National Emergency Response Committee (ANERCOM) met in Washington, DC, in late May to visit served agencies that were directly involved in the aftermath of Hurricane Gilbert. This enabled participants to learn how Amateur Radio has performed from the agencies' perspective and to compare notes on plans that have been developed since Hurricane Gilbert and the earthquake in Armenia.

US Office of Foreign Disaster Assistance staff stressed the importance of proper education and training in communication procedures and network operations during and after disasters. In meetings with the Red Cross and the Salvation Army, it's apparent that ARRL's cooperation and Amateur Radio's role in providing communication is appreciated and growing stronger. Since the major disasters of the fall of 1988, both the Salvation Army and

the Red Cross are integrating Amateur Radio into their plans and updating their data bases.

With valuable input received during the Washington, DC, meetings, the committee has begun to lay groundwork for a stronger ARRL on-the-air presence and response during disaster situations.

### **CRRL BOARD OF DIRECTORS MEET**

The Board of Directors of the Canadian Radio Relay League (CRRL) held its annual meeting in Rexdale, Ontario on May 20-21.

The CRRL Board approved region changes which will increase the number of CRRL regions and elected CRRL regional directors from five to seven. The CRRL Board also voted to have the CRRL president and vice president elected by the Board rather than by the general membership as is done at present. Only the president and the two regional directors will be voting members. This places the majority vote in CRRL executive committee in the hands of people who must first be elected by CRRL members.

Annual dues for CRRL membership with *QST* Canada were left at the present rates: \$27 regular and \$24 for seniors. The Board approved a modest dues increase, \$4 a year, for CRRL membership with *QST* Canada and *QST*. The Board also approved a class of membership with *QST*, but without *QST* Canada at an annual rate of \$42 regular and \$39 for seniors. Lastly, the CRRL Board approved a skeleton plan which could lead to the creation of a single Canadian Amateur Radio organization.

### **SPACE SYMPOSIUM TO MARK 20TH ANNIVERSARY OF AMSAT-NA**

This year marks the twentieth anniversary of the Radio Amateur Satellite Corporation (AMSAT-NA). In celebration of this event, plans are underway for the 1989 Space Symposium and Annual Meeting of AMSAT-NA. Hosted by the Central Iowa Technical Society (CITS), the symposium will be held on November 10-12 in Des Moines, Iowa. Seminar topics will include Microsat/PACSAT, Phase IV, UoSAT D and E, satellite fox hunting, command station development program and digital signal processing. For more information, send an SASE to CITS—AMSAT '89 c/o Ralph Wallio, W0RPK, 1250 Highway G24, Indianola, IA 50125.

### **ARRL OFFERS NEW RECRUITMENT BROCHURES**

"How do I get started in ham radio?" We've all been asked this question by prospective amateurs. Well, we have some new tools to help answer this question and others. HQ has developed three new promotional brochures aimed at answering

(continued on page 68)

# The New Part 97: Amateur Rules to Take Us into the 21st Century

By Tom Hogerty, KC1J

Regulatory Information Department Manager

“The rules and regulations... are designed to provide... (a) Recognition... of the value of the amateur service to the public... particularly [in] providing emergency communications... (b)... contribute to the advancement of the radio art... (c)... improvement of... the communication and technical phases of the art... (d) [provide a]... reservoir... of trained... electronic experts... (e)... enhance international goodwill.”

Sound familiar? It should. Unchanged from the old Part 97, these words form the basis and purpose of the Commission's new Part 97: Amateur Radio rules and regulations. Thus, the value of the Amateur Radio Service to the public and our government has not diminished one iota!

## Remembering the “Good Ole Days”

Ah, it was so much simpler in the 1950s—there were only five basic emissions: A1 for CW, A2 for modulated CW, A3 for phone, A4 for facsimile and A5 for television. By the 1970s, the list had grown to 14, ranging from A0, an unmodulated carrier, to P for pulse emissions.

With changes mandated by the 1979 World Administrative Radio Conference, there were almost 1300 different emission types in the FCC rules! Confusion over emissions was just one of the reasons for the proposed FCC reorganization of the amateur rules.

According to the FCC, many rules were redundant or obsolete. Still others duplicated extensive details contained in other parts of the FCC rules.

## Pressing on into the Present

On March 24, 1988, in the proposed Part 97 reorganization (PR Docket 88-139), the total body of the amateur rules had been reduced by roughly 40% (For example, the number of emission designators was reduced to 9!) According to the FCC, “a host of new technologies have emerged and become popular in the amateur service. These additions and revisions to Part 97 have resulted in a patchwork of rules that can be confusing, especially to new amateurs.”

ARRL filed extensive comments on November 29, 1988, expressing opposition to certain provisions of the FCC's proposed wording. One of the most important pro-

visions in our comments was our assertion that the rules must allow for “due process of law” rather than FCC proposed administrative sanctions that could be taken without an opportunity for hearings.

FCC announced on May 31 that it had completed its revision and reorganization of Part 97. According to the FCC, the revision makes the amateur service rules easier to understand and provides a foundation upon which future advancements in communications could be incorporated into the amateur service. This “new foundation” is to become effective September 1, 1989.

So, what's new in Part 97? Lets take a look.

## Format

Part 97 is now restructured into a format consisting of six subparts and two appendices:

- *Subpart A, General Provisions*, contains rules concerned with license and station location requirements.

- *Subpart B, Station Operation Standards*, consists of those conventions that apply to all types of amateur station operation.

- *Subpart C, Special Operations*, has the requirements that apply to beacons, repeaters, auxiliary links and the Amateur Satellite Service.

- *Subpart D, Technical Standards*, goes over authorized bands, emission types, transmitter power standards, digital emission codes and type acceptance of power amplifiers.

- *Subpart E, Providing Emergency Communications*, covers the rules applicable to operations in distress and disaster situations along with the Radio Amateur Civil Emergency Service (RACES).

- *Subpart F, Qualifying Examination Systems*, deals with the regulations under which the Volunteer Examiner program operates.

- *Appendix 1* lists the geographic areas where the Amateur Service is regulated by the FCC.

- *Appendix 2* lists volunteer examiner coordinator regions.

## Basis and Purpose of the Rules

FCC made no change to this section of the new Part 97. In its comments, ARRL

agreed: “No purpose would be served by revising the principles that have stood for nearly four decades as the general statement of objectives for the amateur service in the US.”

## Imposition of Quiet Hours

Virtually every comment received from amateurs strongly opposed FCC's proposed §97.221, entitled “Restricted operation.” This section removed certain specific time periods for the imposition of operating restrictions on an amateur station in RFI cases. ARRL wouldn't sit still for it either, stating “Under no circumstances can the Amateur Radio Service tolerate the proposed elimination of the procedural protections for amateurs in Section 97.131 of the current rules, as suggested in Section 97.221... The notice proposal, which gives the FOB the authority to impose whatever restrictions it wishes, is completely unacceptable and violative of due process of law.”

While FCC didn't quite agree with ARRL's position, it did revert to the original wording used in §97.131 of Part 97 before the rewrite.

## Scope of Amateur Service Communications

FCC codified a number of existing policies in §97.113, “Prohibited transmissions.” In review, this section says that the Amateur Radio Service may not be used to conduct business; as an alternative to other authorized radio services; to engage in any form of broadcasting activities related to news gathering; to transmit music; or to retransmit programs from radio stations other than an amateur station.

The “codified” policies amount to exceptions to this section. For example, amateurs may:

- “Facilitate the public's safe observation of, or safe participation in, a parade, race, marathon or similar public gathering.” However, “... any benefit to the sponsoring organization...” must be incidental.

- Engage in “swap nets” for the sale or trade of equipment normally used in an amateur station, as long as the amateur does not do so repeatedly with the objective of making a profit.

- Transmit news for dissemination to the public if the information involves the immediate safety of life or the immediate

protection of property; is directly related to the event; cannot be transmitted by another means because of disruptions to normal communication systems; and could not be reasonably provided by other means of communication before or at the time of the event.

• Rebroadcast communications originating on US Government frequencies between a space shuttle and its associated Earth Stations with prior approval from NASA. Note: FCC said "No" to NOAA weather station rebroadcasts though, stating "These broadcasts can be widely received by very affordable receivers."

It is the intention of §97.113(c) to permit broadcast journalists to file reports using Amateur Radio under limited circumstances. These reports must not, however, detract from the efforts of other stations that are actually engaged in providing emergency communications.

In comments to FCC, ARRL indicated that the Amateur Radio Service needs flexibility in the regulations to permit the widest range of experimentation, public service and emergency communications. On the other hand, protection is required from encroachment by commercial entities which would exploit the Service.

### Definitions of Terms

The FCC had proposed to eliminate a separate section in Part 97 for definitions and to define them as they were first used in a particular section. This made it difficult to find where terms were defined, as the League pointed out in its comments to the FCC. As a result, the new Rules include a §97.3 giving definitions of many terms used throughout Part 97. There are some subtle differences between what the ARRL asked for and what the FCC provided, some of which will likely be the subject of some follow-up with the Commission.

### Follow-up

As this is written, the HQ staff and the League's Part 97 rewrite committee are carefully reviewing the new version of the Rules to make a comparison between what we asked for and what we got. Inevitably, in a document of this scope and detail, there is an opportunity for typographical and other errors to creep in. So, identifying errata and reporting them to the FCC is the first order of business in the review. Having completed that, work will focus on things we asked for and didn't get. In the Report and Order, the Commission recognized that the ARRL and others asked for things that were not granted, on the grounds that this was supposed to be a reorganization of the existing Rules, not a real change. However, the FCC left the door open for a subsequent petition for substantive changes, and the League is now considering what should go into such a petition or petitions.

### New FCC Rule Book

ARRL HQ editors are hard at work rewriting the entire *FCC Rule Book* to reflect the new Part 97. In addition, the book will contain vast, new sections on state and local antenna regulation, malicious interference, emissions, the Amateur Auxiliary and obscene transmissions—all topics that have been sources of some confusion to many amateurs.

The goal is to have the new book on the streets when the new rules become effective on September 1. To order your copy, see the ad on p 138 of this issue of *QST*. The *FCC Rule Book* will be your complete and comprehensive guide to understanding the new amateur regulations.

### Station Antenna Structures

Our proposal to codify, in the new Part 97, FCC's declaratory ruling regarding the limited preemption governing the height and placement of antenna structures (PRB-1) is included in Subpart A, §97.15(e)! It reads, "Except as otherwise provided herein, a station antenna structure may be erected at heights and dimensions sufficient to accommodate amateur service communications. [State and local regulation of a station antenna structure must not preclude amateur service communications. Rather, it must reasonably accommodate such communications and must constitute the minimum practicable regulation to accomplish the state or local authority's legitimate purpose.]"

### Cause for Cautious Optimism

With the advent of the Amateur Radio satellites and more recently packet gateway stations that enable us to span continents easily, we wonder more and more, "Is this third-party traffic, or not?"


ARRL requested inclusion of an exception to the definition of third-party traffic, to the effect that if the "third party" is a licensed amateur, this communication is permissible.

FCC's new definition of third-party communications is, "A message from the control operator (first party) of an amateur station to another amateur station control operator (second party) on behalf of another person (third party)." This doesn't shed much light on whether FCC concurred with our recommendation, but §97.115(a)(2) does! This section states that while third-party prohibitions still apply to those countries with which the US has not entered into an agreement, "This prohibition does not apply to a message for any third party who is eligible to be a control operator of the station." We assume this means that most

indirect international amateur-to-amateur communications are okay.

### Amateur Radio Poised for the Future

The many other changes to the new Part 97 are too numerous to mention in this article. While there are a few problems with the revision, they can probably be addressed without great difficulty. As mentioned previously, ARRL intends to act on substantive issues in the near future. Stay tuned!

The new amateur rules are a significant improvement over the old Part 97. They provide the framework for the continued health, welfare and growth of the Amateur Radio Service into the 21st century. 

## New Books


### A USER'S GUIDE TO THE SPACE ENVIRONMENT SERVICES CENTER GEOPHYSICAL ALERT BROADCASTS

By David A. Rosenthal and Joseph W. Hirman. Published by the National Oceanic and Atmospheric Administration Environmental Research Laboratories, Space Environment Services Center, NOAA/ERL/SEL-R/E/SE2, 325 Broadway, Boulder, CO 80303. 1989 edition. Soft cover, 8½ × 11 inches, 15 pages. Available free of charge.

Reviewed by Paul K. Pagel, N1FB

Right now, solar activity is hitting the highest levels recorded in 20 years. One way to better understand solar-terrestrial conditions is to monitor WWV's Geophysical Alert Broadcasts. These broadcasts are made at 18 minutes past each hour on station WWV, the US National Institute of Standards and Technology's radio station in Fort Collins, Colorado. WWV broadcasts continuously on 2.5, 5, 10, 15 and 20 MHz. (The National Institute of Standards and Technology was formerly known as the National Bureau of Standards.)

According to David Rosenthal, N6TST, this is the first time any *official* guide has been made available for people interested in making use of the Geophysical Alert Broadcasts. You don't have to be a highly-educated technician to use the guide; it's written for people with little or no scientific background. A step-by-step explanation of the standardized format and terminology of the bulletins is provided. Specific terms are highlighted and defined in a glossary. This technical paper is a worthwhile addition to every Radio Amateur's library.

To obtain your free (yes, free) copy of this guide, contact the Space Environment Services Center at the address given in the heading. Request NOAA Technical Memorandum ERL SEL-79. 

## Good Grief, Another Reef!

Aptly coined by KA6W, that phrase catches the flavor of the 40th Annual International DX Convention held in Visalia, California this past April. Hosted this year by the Northern California DX Club and attended by over 600 of the DX-Contest faithful, this event incorporated a number of well-received consecutively held seminars: DX Packet Networks (KD6AZ), Beam Antenna Wind Survival (W6QHS), DX Forum (W6CF), Contest Forum (N6TJ), VK9NS Pacific DXpeditions (W6OSP), Rotuma Island DXpedition (W6SZN), Phase Noise and Intermodulation in Transmitters (WA7TZY), Mellish Reef (VE3IEC), Joint USA/USSR USØSU Expedition (W6MKB), and the Colvins' Travels (W6KG/W6QL). The convention

has grown to such proportions that a regular Friday night feature is the FOC (First Class CW Operator's Club) West Coast Mini-dinner, hosted by N6RA.

The DX forum, smoothly run by W6CF, reviewed new DXCC country applications pending before the DXAC, rules interpretations, and so on. Globe trotting OH2BH was inducted into the CQ Hall of Fame. W6WB received the CQ Magazine Living Legend Award. VP2ML, editor of *The DX Bulletin*, noted that he will soon be doing the DX column for CQ Magazine.

N6RJ's *Second Op* (now published and available from the Radio Amateur Callbook, Inc) was in evidence. Revised as of March 1989, this desktop circular rule contains a myriad of vital information in

an easy-to-use format: prefixes, continents, zones, country name, beam headings, postage rates, ITU prefixes, postage, QSO/QSL record, QSL Bureaus. If you're fully computerized, note that the N6RJ Electronic 2nd Op (for IBM compatibles) is also available. Nice going, Jim!

There was sad news at the convention too—the mid-March passing of a true DX pioneer, Herb Becker W6QD, and the illness of W4AI (W6MHB/T19MHB).

If you haven't attended one of these April events, plan to do so this coming year. Visalia captures all the necessary convention essentials—meeting with friends old and new, excellent seminars, modest pricing, superb prize drawings, etc. Hope to see you next year!

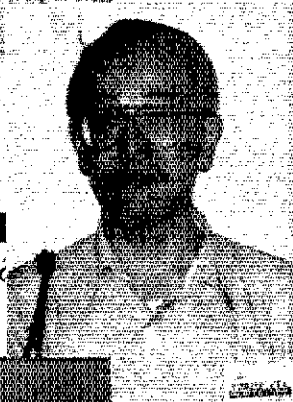
Visible at the April International DX Convention in Visalia, CA (W1YL photos)



SMØCCM



LA5HE



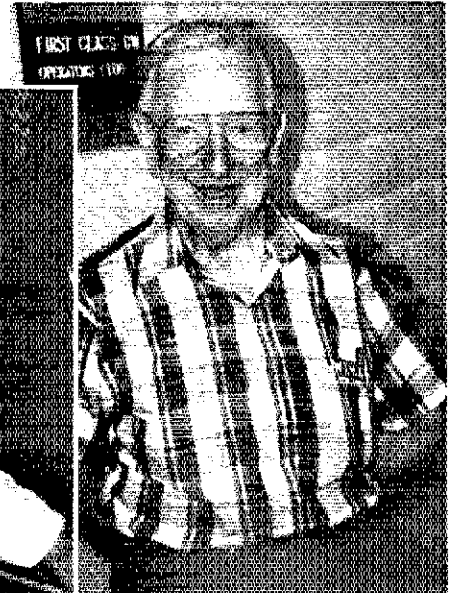
JE1CKA



KH6IJ & XYL



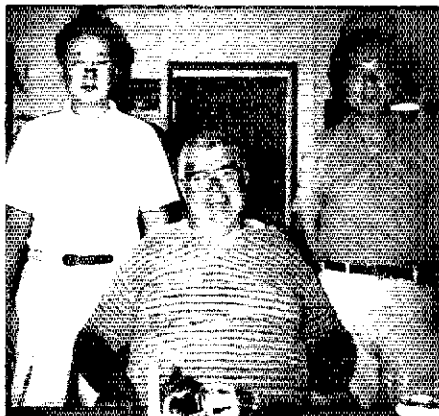
W6KG/W6QL



W1HX/5



One of the ops from the club station JE2YRD.



(l-r) KC6SI (JA7MHZ), KC6JC, KC6MS (JA2NQG). (KC6IN photo)

Additionally, the NCDXF has 30 slide shows and 23 VHS videotapes for loans to groups (the only cost is postage in both directions, about \$5). Some excellent program material is available for DXers as well as general audiences. Request the list of availables via Jo Clarke, WB6ZUC, 207 Evergreen Dr, Kentfield, CA 94904.

### QSL MANAGERING

There has been quite an uproar in the Amateur Radio press in recent months concerning controversial QSL practices. LA5HE's Commandments for QSL Managers (this column, August 1988 QST) capsuled what most active DX type hams feel to be a responsible way in which to handle cards. Let's take a look at what a 20-year QSL manager has to say, from that highly regarded Radio Amateur WA3HUP:

"I've enjoyed helping out DX stations, as well as those in need of cards. I've made many wonderful friends throughout the world. Now, something has come up which is very disturbing to me. The policy of requiring one SASE for each card is ridiculous. I, for one, am very much against this policy. Green stamps which I've received have helped in this work but I've also had to dig into my own pocket, as I'm sure other managers have done. If a stateside station works the same station on five bands and sends cards to the US manager requiring one envelope per card, the cost would be \$2.50. Should that same station QSL via an overseas manager with the same requirement, the cost would be \$11.75 (postage one way \$2.25, two IRCs for each card at 95 cents each!). If you're able to buy IRCs for 50 cents each,

the cost would be \$7.25. Can you imagine the cost for a DX station QSLing to those managers? Now, I ask you, is this fair?

"Some managers will not accept cards via the bureau. I can't believe this. It is so wrong, and I personally do not condone this practice. The bureaus were organized to help the hams save a little money. Postage rates are so high. You may have to wait longer for a card, but then there are times when we wait a long time for a card from a manager for one reason or another.

"Amateur Radio isn't a business. Come on, be a bit more compassionate and help where you can. I for one will always accept more than one card for a single envelope, providing it doesn't exceed the postage on the envelope. I will always accept cards coming via the bureau. I answer them all, including SWL cards. This has always been my policy and the way I'll continue to operate. I might add that it takes two IRCs for direct air mail. (Many DX stations have sent only one IRC.)

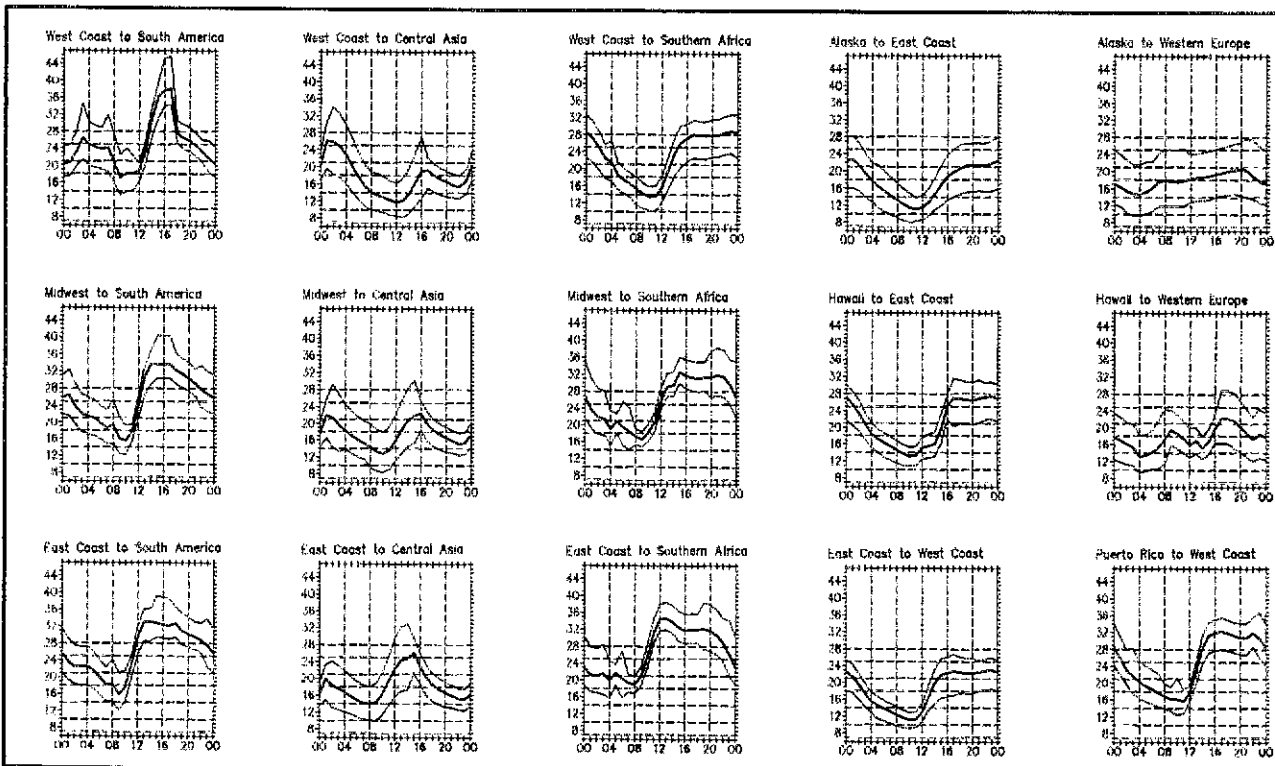
"If I've angered some managers, I'm sorry. Think back to when you started, and let's all be friends please. If you were just starting out now, I'm sure you would agree with me."

### QSLING THE SPEEDY WAY

WB2DND notes that those working the current ZS8MI Marion Island operation will be in for a pleasant surprise when it comes to QSLing. Peter is logging completely by PC. With the help of WB2DND, ZS6P, ZS6BZJ and others, Peter is using the WB2DND Log Database program. After each 50 contacts or so, Peter copies the file to a program which will compress the data in a delimited form.

### NCDXF

The Northern California DX Foundation (NCDXF) assisted 17 DX operations in the previous year, supplying close to \$25,000 in cash, equipment or QSL cards. Operations supported include ZS8MI, 3D2CR (Conway Reef), the aborted XW8 operation, 3D2XX (Rotuma Island), XF4L, VK9ZM, VK9ZW, SM0AGD for S9AGD, DJ6SI for 5U, PY0S, TY9SI, C9MKT, T22VU/3D2VU, VK9Y, VK9X, 9Q5NW/TN4NW, ZS6BCR for ZS3/3DA0, YK1AO and 9X5AA. The Foundation has aggressively pursued new additions to the DXCC list, leading to new country status petitions filed with the DXAC for Rotuma, the Marquesas, Austral Islands, Conway Reef, and Banaba (Ocean) Island.



**When are the bands open?** These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing 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). The horizontal axis shows Coordinated



They're then further compressed through an archiving program. These small files are then sent by HF packet back to South Africa, where they're used by ZS5E who adds the new logs to the master program. (Note: ZS6PT's *Callbook* address as ZS5E is not yet listed.) In contrast to the usual 6- to 12-month delay, cards are in the mail as soon as one week after being received at Peter's home QTH. Don, WB2DND, notes that the program was originally written for Tom Gregory's 9Q5NW/TN4NW/etc African operations, and is now in use by hams on all continents. Further details are available from Don at Micro Way, Box 79, Kingston, MA 02364.

**CIRCUIT**

□ **VQ9LF:** Merchant seaman N6HPX had an unusual opportunity to operate on Diego Garcia April 19-21 and found out first hand what rare DX is all about! Larry asks that chasers be patient with beginning DXers, and gear their operating techniques accordingly. Thanks to all who helped from Larry Fields, N6HPX, USNS Spica T-AFS-9, FPO, San Francisco, CA 96678-4066.

□ **5H3RB:** As previously noted, Roel's Dar es Salaam, Tanzania, operations have come to an end after 30,000 contacts on SSB, CW, AMTOR and HF packet. He worked 1200 different prefixes and earned numerous awards. Roel was Head of the Consular and Administrative Affairs of the Royal Netherlands Embassy (since August 1986). Following leave in Holland, he'll be heading for a three-year assignment in Peru. Cards may go via Box 20061, 2500 EB The Hague, The Netherlands.

□ **Routing:** CT3FN goes only via HB9CRV, as do OD5PL and OD5VT. UA4WGR at home and at UW2F via Alexej Djupin, 58-18 Bummashevskaja St, Izhevsk 426050, USSR.



PY0FF, the only resident ham on Noronha, scene of the February '89 ZY0FX (W9VA) operation. (W9VA photo)

- |   |   |   |  |
|---|---|---|--|
| BT1TUS<br>BY7HY                                 | (BY1QH)<br>Box 14,<br>Yueyang<br>City,<br>41400,<br>Peoples<br>Republic<br>Of China | TA2BK<br>T19FAG<br>TL8NS<br>T27RA<br>T33RA<br>UB5HA                   | (DJ8UJ)<br>(T12FAG)<br>(IN3EYY)<br>(KN6J)<br>(KN6J)<br>P.O. Box 1,<br>Kremen-<br>chug,<br>Ukraine,<br>315300,<br>USSR      |
| FOSLZ/M   | BOX 41,<br>Nuku Hiva,<br>French<br>Polynesia  | VQ9LV<br>VQ9ZZ<br>V21CW<br>VP5VRS<br>XF4F<br>ZK1XV<br>ZL0AAH<br>3D2YY | (WA2ALY)<br>(W1HZZ)<br>(KA2DIV)<br>(JR3RVO)<br>(WA3HUP)<br>(VK2BCH)<br>(W0RPK)<br>(JH4IFF)<br>(OH5NZ)<br>(K3ZO)<br>(ON7KC) |
| J6LQC   | (P.O. Box<br>1563,<br>Castries,<br>St Lucia   | (JF1WQC)<br>(5B4TI)<br>(N1CIX)<br>(HB0CUY)<br>(EA3AOC)<br>(K4ERO)     |  |
| KC6MJ<br>P3AA<br>P40P<br>P40YL<br>S01DX<br>S79I |   |   |  |

**QSL MANAGER VOLUNTEERS**  
WSRQO AA5DW

**SPECIAL NOTES:**

The new address for the South African Radio League (ZS) QSL Bureau is:  
QSL Bureau  
PO Box 2327  
Johannesburg 2000  
Republic of South Africa

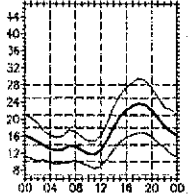
□ QSL Corner, July 1989 *QST*, page 65 contains information and addresses for the ARRL Incoming Bureau. QSL Corner, March 1989 *QST* page 68, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.

**QSL Corner**

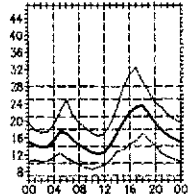
Administered By Joanna Hushin, KA1IFO

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.

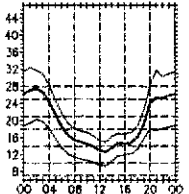
West Coast to Western Europe



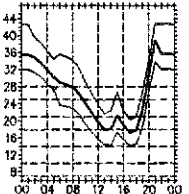
West Coast to Eastern Europe



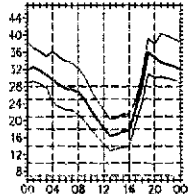
West Coast to Japan



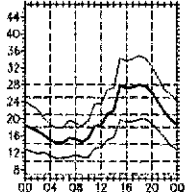
West Coast to Australia



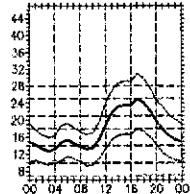
West Coast to South Pacific



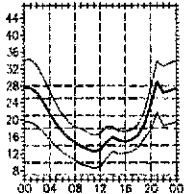
Midwest to Western Europe



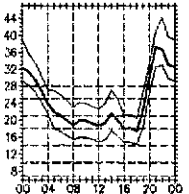
Midwest to Eastern Europe



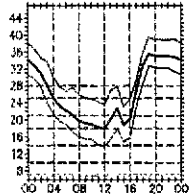
Midwest to Japan



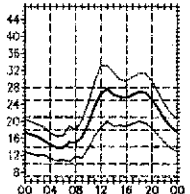
Midwest to Australia



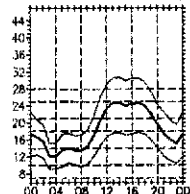
Midwest to South Pacific



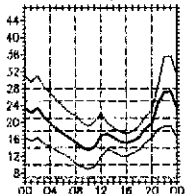
East Coast to Western Europe



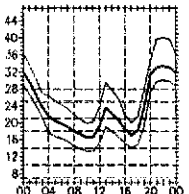
East Coast to Eastern Europe



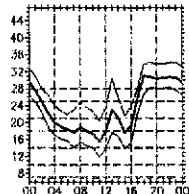
East Coast to Japan



East Coast to Australia



East Coast to South Pacific



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Sunspot data provided by the Sunspot Bulletin, published by the Sunspot Index Data Center, Brussels, Belgium. Curves are generated using IONCAP. These predictions, for August 16 to September 15, 1989, assume a sunspot number of 184, which corresponds to a 2800-MHz solar flux of 228.

# 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 DXCC Countries List. You may endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The satellite, 160 Meter, and 80 Meter DXCC awards are endorsable in 10-country increments above 200. The totals shown below are exact credits given to DXCC members from April 1 to April 23, 1989. An SASE will bring you the rules and application forms for participation in the DXCC program. Send \$1.00 to request the ARRL DXCC Countries List.

## New Members

### Mixed

DF3TZ/208 DF7L/103 DK6DX/223 FA10D/291 F6COZ/124 I2IEY/178	JA1SNA/220 JE1OUF/126 JG1LBN/209 JA2DSY/325 J2EMF/207 JR2TRC/104	JA3GN/110 JN3XL/113 JF6DG/115 JA8VGC/169 KL7TG/103 VE2QO/257	VS6CP/122 ZL1BIV/104 7J6CAB/100 9X6AA/100 K1HI/100 K1MNS/100	KA1MEW/108 W1NXW/157 KA2NBB/116 KD2TT/109 KE2GL/102 NB2X/101	NR2E/102 W2CMW/149 WM2B/105 KA3MGZ/102 N3EQF/130 WA3YVT/103	WA3ZTW/100 WB3LFC/105 N4JED/103 N4COP/106 N4SZE/129	NP4AT/303 W4PWR/104 W4MBE/106 K05HE/108 KM5H/299	NV5CJ/103 KE6MK/105 KD7SO/285 WA7QET/162 NF8U/129	WB8QLA/114 WB8KND/103 WB9JK/303 WB8V/221 W8WK/101
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### Phone

E45AH/110 F8AWW/206 F6GVD/251 F9XA/135	JA1SNA/115 JE1CTA/110 JE1OUF/125 JG1LBN/124	JA2DSY/318 J2EMF/194 JN3XL/113 KL7TG/101	LX2EA/111 LZ2JE/105 OZ1KGH/119 W2OMV/113	KZ3D/109 N3EYM/112 N3FXW/110 WB3FYP/101	N4JED/102 WD4EDN/199 K05HE/107 KM5H/272	WA5HWB/117 WM5C/105 N61XX/103 N6OKU/114	KZ7T/107 WB7SWM/102 KE6MK/104	NA8C/105 WB8JX/314 WB8KND/100	KE9JR/103 KD3GN/104 NB8L/255
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### CW

I2IEY/110 JE1CTA/124 JG1LBN/139	JM3DDG/105 JA5PXF/110 JA8DMV/147	LZ2JE/105 K1FJ/100 W2OMV/104	K3WUW/109 KA3KWH/104 WA4SSI/109	KM5H/238 W5OLN/104	NT6G/105 K7ET/117	K8BL/106 WB8QLA/107	K9WY/108 ND9X/115	NT9L/101 NB9Q/107	NO6Z/110 WB8V/152
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### RTTY

DL5KAT/103	JA4VUQ/103	VE3DLR/101	AJ3H/102	K8NEU/101					
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### 160 Meters

DJ2YA/105	IN3DEI/120								
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### 80 Meters

HA8XX/144	JA3EMU/244	LZ2JE/105	K3SEW/136	N4ONI/117					
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### 10 Meters

F6EQS/169 HA8XX/180 IK2DJV/126	LU1JDL/105 LZ2JE/105 SM6BZE/144	VP2MBA/102 ZL4LZ/230 KA1ERL/119	K2PF/131 N2DAO/105 N2GVB/104	K3QAM/108 K3SEW/137 WA3DMF/156	KC4AIG/104 WB4FOT/139 W6BCQ/109	W8OTC/103 KC7E/143 K8GWU/104	KA8ZM/103 W8CD/120	K9BQL/156 KA9TNZ/104	KA9ULN/109 N9HFR/103
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### 5BDXCC

KA1X KC1AG OK3THM	JA1UQP JA7DRM	WG4Q VE3JGE	JA6HUG WB7EWC	WB9JKI OK2PEX	LZ2JE NQ1K	OZ1JLX W2NUS	JA2DSY W9NNE	WB9Z JA6BNT	K1YR WC9N
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## New Honor Roll Members

### Mixed

316 HB9AF/326	312 NS7Z/317 N9GK/319	311 JA2DSY/325 K2JLA/318 W6NLG/315	Phone 312 WB2P/316	311 JA1MDK/316 K2JLA/318 W6SN/316
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## Endorsements

### Mixed

DF2HL/303 DF3AO/305 DF3BL/149 DJ2MN/326 DJ2YA/349 DJ5FM/277 DK1RV/313 DL1DA/327 DL1FBW/227 DL1JW/357 DL1MA/1268 DL8U/328 DL9TJ/312 DL9YC/290 F6WJ/322 F9IE/340 G3YMC/269 G4CNY/313	HA5KAG/203 HA8X/270 HB9BIO/201 HB9CX/219 HB9QR/248 HL1SX/281 HL9EP/175 I2MQP/318 IK2DJV/285 IK2HSW/229 IT9ZGY/360 JA1EL/329 JA1GTF/332 JA1MDK/325 JA1PCY/323 JA2GBO/314 JA2IVK/321 JH2WBU/258	JA3FYC/326 JA3KL/181 JA3MNP/329 JH3CKP/206 JM3ADO/202 JR3RRY/264 JF4PAG/230 JA5ELM/316 JA5PUL/322 JA7AQ/322 JA7PWR/298 JA8U/229 JA8EA/1329 JA8DMV/260 JA8GZ/324 KP4DO/199 LA7AFA/254 OH2LA/357	OH2QV/350 OH2XF/348 ON4DM/361 ON6BC/323 OZ1FA/302 OZ3PO/343 PY3EM/314 PY5EG/318 SI8ZG/299 SM3EVR/322 SM7OY/358 SM6BSB/215 SM6KRN/243 VE3DR/319 VE3NMS/182 VE4MT/261 VE4OP/217 VE7DFW/315	VE7EW/210 VQ2GD/288 YU2YM/326 YU3QJ/314 4X6RA/140 K1NJE/334 K1QPV/180 KA1ERL/257 KB1EW/134 KC1AG/282 N1DCI/127 N1TZ/314 NO1E/179 NG1I/132 NT1J/180 W1CKU/263 W1MNM/237 W1WAI/315	WA1EOT/320 AA2X/280 K2FJ/232 K2OEA/355 KS2M/253 N2BCF/123 W2FIU/181 W2IQB/320 WA2UUK/DU2/185 WB2P/316 WB2TJU/224 K3JGJ/312 K3KA/317 K3WUW/175 K3BY/177 NM3U/184 W3HAC/282 W3HOR/199	W3KRB/201 AB4N/270 KB4PEF/147 K4Q/219 K4C4N/225 K4CAJ/152 KJ4PV/136 N4GDU/177 W4UXI/301 WA4AFE/203 WB4FOT/271 WB4FZO/280 WD4LOR/201 K5DB/317 K5GL/304 K6SJM/282 K6SBR/153	KF5PE/180 W5HL/176 W5MCH/301 W5XJ/330 W5BQB/267 WY5O/200 WZ5Z/134 N8NXV/175 N6PE/266 W6MND/320 W6XQ/183 WB6WXS/157 K7EFB/275 N7CNH/149 N7RT/327 NN7T/228 NV7J/205	K8BL/157 K8CHN/129 K8FF/348 K8BEE/254 K8DII/236 K8XN/250 NB8FL/148 N8G/249 W8AH/361 W8EVZ/345 W8GIC/316 W8LU/321 WB8DO/163 W8TV/213 NSAL/205 NB9DK/280 NK9Y/201	W9KDX/225 W9NNE/321 W9CKL/315 K9BEE/254 W9OTI/132 W9RJK/330 W9BEEJ/288 WD9GBH/149 K0TV/225 K08K/228 K08AU/176 K08NL/295 N0CW/161 NB0H/159 NB9C/158 WBRT/307 WC9Y/269 WK08/154
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### Phone

CT1RM/324 CX2CB/291 CX8CG/201 DF2HL/295 DF3AO/302 DJ2YA/340 DJ2YI/354 DJ5JH/312 DK1RV/210 DL1JW/341 DL2NAR/202 DL6N/320 DL8UJ/323 EA1DZA/174	EA1QF/319 EA7LQ/319 E18AU/270 F3TC/176 F9IC/339 HA8X/264 HB9CX/212 HC2RG/280 HL1SX/281 IK1AVW/277 IK1BQB/239 I2MQP/318 IK2DUU/269 IK2HSW/228	ILX/296 I4WZK/317 I7VEZ/280 IK7BDN/200 IK8JWA/125 IT9GA/338 I1J5HN/310 IT9ZY/346 JA1EL/327 JA1GTF/310 JA1PCY/311 JA2GBO/293 OZ1LDN/156 PP7HS/308 PY3CM/252	JR3JBA/141 JR3RRY/264 JF4PAG/230 JA5PUL/321 JH8MKH/293 JA8GZ/321 I1J5HN/310 QA4BS/320 CA4CS/337 OCSK/127 ON4DM/361 OZ1LDN/156 PP7HS/308 PY3CM/252	PY3EM/310 PY5EG/318 PY5PS/315 SL8ZG/289 SM6KRN/132 SV8CS/311 TR8SA/275 VE4AS/324 VE7EW/210 XE1LJ/202 Y5AJK/351 ZP6PX/278 4X6RA/140	8P6OV/292 K1NJE/332 K1YR/290 KA1ERL/252 KB1EW/132 KC1AG/282 K1BJ/250 N1TJ/308 NT1J/179 W1NXW/156 W1WUW/270 WA1EOT/307 W2IQB/303	WA2ZLK/205 WE2W/270 X3FNW/250 KA3F/16 N3DYW/176 N3FBN/225 WYHR/291 WB3COA/124 AA4X/317 KE4WY/261 KK4HD/251 W41MN/150 W4UWC/348	W4ZCB/320 WA4ETN/275 WA4MXD/205 WA4TL/321 KA5CFY/130 K6SJM/282 N7RT/303 N7J/203 WB7WQ/281 K8GWM/314 K8BEE/254 N8FT/216 WB8LUJ/154 W5ZJ/134 K6EID/320	N8NXV/175 W9YJ/207 WB8LQ/300 K7BC/321 K8BNT/308 N7RT/303 N7J/203 WB7WQ/281 K8GWM/314 K8BEE/254 W8AH/361 W8EVZ/342 W8GIC/316 W8GMF/345	W8LU/318 W8TV/156 K9CZ/311 KA9TNZ/287 K08NA/252 N9BA/311 W9NCG/125 W9OKL/315 W9RXJ/330 WB9DBX/249 K0TV/225 WB9GN/184 WC9Y/223
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### CW

DF2HL/258 DJ2YA/229 DK1RV/287 DL9TJ/256 DL9YC/224 G3YMC/237	HA8XX/205 HB9BIO/178 I1YRL/277 IK2DJV/263 IT9AZ/252 JA1ELY/321	JA1GTF/316 JA2GBO/288 JA2IVK/257 JG2LGM/164 JH2WBU/170 JA3FYC/320	JA3MNP/312 JH3CKP/202 JA5PUL/239 JA7FWR/252 JA8EAT/319 LA7AFA/230	OH2LU/299 OZ1FAQ/294 SL8ZG/279 SM3EVR/319 SM6OLL/226 SM6BSB/215	SM6CCM/301 SM6KRN/223 VK4DA/155 VK6HD/269 NC1E/139 AK2O/229	K2JLA/245 W2IQB/227 WB2P/286 K3JGJ/234 KZ3H/226 NM3V/201	K4GSK/176 N4GVT/151 WD4AHZ/175 W5XJ/243 WY5C/175 K6EID/266	N6PE/256 N7RT/302 WA7OET/125 K8ZH/314 W8AH/321 W8LU/305	WB8TV/155 K0ZC/297 WB8EE/255 K8BJ/251 WC9Y/214
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### RTTY

DK1RV/151	OH2LU/156	K6EID/138							
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### 160 Meters

JA1GTF/166	WB2P/116	N4XR/111							
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### 80 Meters

JA1GTF/201	WB2P/207	W3GG/212	W3MFW/304	K6EID/181					
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### 10 Meters

DL9TJ/130	JA1ELY/312	JA1GTF/254	WB2P/251	K6EID/275	W9ROK/127				
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All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of QST assume no responsibility for statements made herein by correspondents.

## THE COMMITTEE RECOMMENDATION ON A CODE-FREE LICENSE

□ After reviewing the report of the committee examining the codeless license issue, I've decided to express my opinion on the report . . . and I wholeheartedly agree with what they have to say. It is obvious that they've examined the issue from all sides and viewpoints. They've also distinguished between emotion and fact. The conclusions are well thought out and worthy of serious consideration.—*Bob Runnels, AJ9U, Milwaukee, Wisconsin*

□ I was not convinced pro or con on the merits of a codefree license until I read the committee report in May QST. I am in favor of the proposal as it stands. I believe it will enhance the ranks of Amateur Radio.—*Willis K. Smith, WD4CHP, N Ft Meyers, Florida*

□ Regarding the committee report on a codeless license—No! We need to keep some kind of a dynamic skills test in the licensing process. What could be easier than 5-WPM Morse code?—*Steve Kirschner, WY6P, Redondo Beach, Florida*

□ I understand the League's basic assumption that a number of technically competent individuals may be discouraged from getting into Amateur Radio due to the code requirement, but I believe that the League's study committee, in its eagerness to protect the integrity of our spectrum, is flawed in its solution to the problem.—*Michael D. Fanning, WA4QHI, Tuscaloosa, Alabama*

## GET THE RIGHT INFORMATION

□ Our club, the Perkiomen Valley Amateur Radio Club of Pennsburg, Pennsylvania, held an open house to build interest in Amateur Radio and announced Novice exams would be given. One of our members received a call from two boys, age 13 and 14, who wanted to take the Novice test and asked for time and location.

When they arrived, I spoke to them asking how they became interested in ham radio and who was helping them. They told me that they had heard about ham radio, but didn't know any local hams. They had gotten several books from the local library and had studied on their own. They showed me the books they had been using. These books were study guides that were 12 years old! You can guess the rest. Both boys know the theory well enough, but were way out-of-date on the rules and regulations.

Two clubs that I am a member of, the Perkiomen Valley and the RF Hill Amateur Radio Club, have started putting the up-to-date *License Manuals* into as many of the local libraries as possible. All clubs should check their area libraries, both public and school. We have found that most have *License Manuals* and *Handbooks* that are

10-15 years old. A great club project idea is to replace these out-of-date books. This project may also be used to get some publicity, as many local newspapers often run pictures of clubs making various donations to area organizations.—*Warren Erdman, K3ZXQ, Perkiomenville, Pennsylvania*

[The complete ARRL library of books can be purchased for \$120. This is a significant savings off the cover prices. Contact ARRL HQ for details—Ed.]

## RECRUITMENT EFFORTS

□ As the outgoing President of the University of Maryland Amateur Radio Association (UMARA), I can make several observations about interest in Amateur Radio among young people, the level of technical awareness of college students and the possible impact a codeless license would have.

The campus has a total student body of 30,000, yet our club has about 25 members of which only 10 or so are truly active. Obviously, something is wrong here. In our recruitment of college students, we find that there are many interested in electronics and communications technology who inquire how they can become involved. "Well," we respond, "you have to take a multiple-choice exam on regulations and technical subjects." Fair enough. But when we say, ". . . and you have to learn Morse code *just to start out*," we might as well say good-bye. Those of you who would say "good riddance" are simply shooting yourselves and the Amateur Radio Service in the foot. It's not that these people are not intelligent, motivated and potentially good amateurs, it's just that they do not find CW to have any relevance to modern communications. In addition, since most are college students with busy schedules, they just can't see the justification for spending valuable study time on something that has no widespread use in any communications service—even those who drive ships for a living are abandoning CW.

. . . I am not advocating that amateurs should never learn the code, or that it has no relevance. Being an amateur operator and learning the code has been a very rewarding experience for me. I am just disheartened when I see those who cannot or will not take that first hurdle—the code requirement. A codeless license would allow them to get "hooked" and encourage them to go on and get a General class or higher license. In the end, we would wind up with more amateurs with code proficiency than before.

It is clear that a codeless VHF/UHF license would provide at least a moderate influx of new "quality" amateurs. College clubs would continue to flourish, supported by students interested in communications and technology.

It is for the above reasons that we here at UMARA enthusiastically support the proposals of the codefree license study committee.—*Paul W. Schleck, KD3FU, College Park, Maryland*

## THE GOOD, THE (MOSTLY) BAD AND THE UGLY

□ [With regard to the new Part 15 revision], it seems to me that the devices [which will result] may have the same or even worse susceptibility to interference as the TV sets with 21-MHz intermediate frequencies manufactured in the late 40s and early 50s. Good luck in your opposition to these new gadgets. You [ARRL] are our front line of defense.—*Charles M. Allen, W3SG, Jessup, Maryland*

□ Congratulations for the outstanding editorial, "Spectrum Management, Or Abdication?" which appeared in the May issue of QST. You've certainly revealed the "perfect example!"—*Richard W. Groton, W1OBH, New Castle, New Hampshire*

□ Concerning the May editorial in QST, my thoughts are that the sad state of the FCC is the result of Reaganomics creating a deregulated FCC. Right now, I am being received on my next door neighbor's touch tone phone with 30 watts to my 15-meter antenna. I find that this is a sad testimony to the quality of the products offered in the marketplace. I encourage you to place high emphasis on efforts to improve the RF susceptibility of consumer goods.—*Brian Stapleton, W7DFO, Seattle, Washington*

## THANKS FOR THE PATRON

□ I received my copy of the April issue of QST and I read it from cover to cover. I just wanted to say that I really enjoyed it. Several of the articles were very good, but "The Patron" by Bruce Vaughan, NR5Q, was outstanding!—*Dave Hardee, KI6IU, Brandywine, West Virginia*

□ Bruce Vaughan, NR5Q, tells it like it is! We need to hear more [from him], and I trust you would have space for him in every future issue of QST—he's good!—*Raymond P. Gascon, W7SJS, Salem, Oregon*

## OPERATING AN AMATEUR RADIO STATION

□ Congratulations on the new edition of *Operating An Amateur Radio Station* [available from HQ for \$1 postpaid—Ed]. It is a plethora of good usable information for the new ham, and it is written so that it won't insult his or her intelligence. It is also an excellent review for the experienced ham too!—*Bill McGrannahan, K0ORB, Kansas City, Missouri*

## Penn-Mar Radio Club Provides Communications for Reenactment of Battle of Gettysburg

By Ron Paull, N3ECL, ARRL District  
Emergency Coordinator

When asked if the Amateur Radio community would be able to provide communications for the 125th anniversary and reenactment of the Battle of Gettysburg in 1988, our response was, "Of course we can! When do they want us to help?" That was when the first of two bombshells was dropped on us. The dates selected for the reenactment would coincide with Field Day! The second shock was when we discovered that the total number of participants in the reenactment was estimated at 10,000, and the area of coverage would be slightly in excess of 500 acres. It suddenly became painfully evident that this radio club of 50 or so members was going to need some help. In fact, a lot of help...

Fortunately, judicious use of packet-radio bulletins and the ever-popular Amateur Radio grapevine soon netted us over 150 volunteers—even on Field Day!

### Day One—Murphy Strikes

The first of our activity was scheduled for June 23, but Mr Murphy struck us ahead of schedule and saw to it that the emergency communications aspects of this project began 24 hours in advance. South central Pennsylvania was in the grip of a prolonged drought and heat wave. The temperature quickly rose to over 100 °F. While this may not seem uncommonly high for this time of year, if you've never been to a Civil War reenactment before, be assured that these people are absolute sticklers for authenticity. The military uniforms worn by the participants are kept as close as possible to the original, and that means real wool. That's right—wool—in temperatures reaching 105°. Needless to say, people started dropping like flies. Most, weary from a long drive, were already tired. As communicators, this gave us a taste of what was to come, and we quickly established a link between the site and the Adams County Emergency Operations Center.

### Day Two—Tents and Artillery

Arriving at the site at 5:30 AM on June 23, we found the communications center in full swing. As the sun rose, one could note white tents staked out in the fields as far as the eye could see. Two encampments, one Union and one Confederate, accounted



Shown here are members of the Penn-Mar Radio Club (an ARRL Special Service Club) who served as committee members for the 125th anniversary Battle of Gettysburg reenactment. (l-r) K3VCT, N3FST, N3ECL, WA2CRK, KA3OGL.

for about 4000 of these authentic Civil War-era tents on about 100 acres of land. Over 300 pieces of Civil War artillery pieces had been towed in for the weekend; horses were everywhere. While observing some of the Confederate troops, we noticed that many were ready to drop from exhaustion. Hundreds of these men had marched up from Virginia in full uniform!

### Day Three—The First Battle

Arriving back at the site at 6:00 AM, the air was still and the temperature was about 10 to 15° higher than normal for that time of day; it was to be another scorcher.

I received my first posting to the Confederate field hospital. By the time that the battle started, calls for assistance were coming in faster than we could count. A man was thrown from his horse, numerous cases of flash burns from the percussion caps and black powder were reported, and a cavalryman had been dragged by his horse when his saddle slipped. When the ambulance arrived to tend to this particular case, I noticed that the side window had been cracked, and there was a large dent in the side. The ambulance attendant said that after the patient was loaded aboard, the horse had suddenly turned around and

viciously kicked the side of the ambulance. Fortunately, the amateur providing communications in the ambulance escaped unharmed.

Back at the communications center, many messages were being handled routinely. Lost medication, lost parents (no lost children, just lost parents!) and messages from home kept the communications teams busy.

### Day Four—The Sound of Thunder

I woke from a deep sleep at about 4:40 AM to the sound of distant thunder. A picture of several thousand little white tents being flushed down a hillside during a thunderstorm raced through my mind. The National Weather Service had established a monitoring station at the reenactment site and predicted that the storm line would dissipate before becoming a threat. What we had not counted on, however, was a strong westerly wind in addition to the heat. This wind blew dust and grit into everything—the antenna tuners, disk drives, hair and mouths. The stuff was absolutely everywhere, and minor communications tasks became major ones.

As is often the case during spirited reenactments, there are often unfortunate circumstances that result in real injuries.

During the cavalry battle, one Union trooper was thrown from his mount and dragged across the battle area before the animal could be restrained. After the trooper was removed from the horse, it bolted again and disappeared through the crowd of spectators. A second trooper had his mount rear up and roll over backward on top of him. This trooper was removed from the battlefield area by ambulance to a local hospital. A valuable lesson learned from this engagement was the absolute necessity of communications teams with triage experience. These teams were assigned to the Signal Corps during this battle and were dressed in Union uniforms.

Although first-aid stations were set up just off the battlefield, many of the injuries occurred a distance from the field hospital sites. These injuries were reported to the command center by Amateur Radio operators, dressed in Civil War period clothing, who were actually moving with the troops on the field of battle. They provided invaluable communications assistance from the areas that could not be seen from the field hospital sites.

### The Final Day

On Sunday morning (still hot, windy, and dusty), all 15,000 participants, over 400 pieces of field artillery and hundreds of cavalry troops aligned themselves along two lines to prepare for the final assault. The noise was deafening, and some of the Amateur Radio operators had difficulty communicating. The rifle fire caused the radio's speech amplifiers to limit and cause breaks in transmissions.

Minor problems quickly became major

ones. The water supply evaporated quickly. The well had gone dry, and no ice was available. Amateur Radio operators accompanied replacement water tankers to relay location and destination information, while state police provided escorts for the tankers to get them through the throngs of traffic.

On the lighter side, a new Novice, KC4AXQ, when asked why he was leaving his operating position, stated that he'd be right back. He had to go fight in the battle, but would get "killed" right away so that he could come back and operate the radio. Another amateur was in position at the lost-and-found station. Imagine her surprise when she was handed a lost object, and upon looking up, found herself staring into the face of a very large horse.

### Epilogue

In addition to enjoyable moments, hams were responsible for the communications of 249 medical emergencies, from wool itch to a severed femoral artery. Communications for health and welfare were provided 24 hours a day for five days, or 300 man-hours per day. For us, it's hard to imagine a more complicated task than providing communications for emergencies which occur during a staged man-made disaster!

### SPOTLIGHT ON SERVICE

#### Polk Ham Club Runs Message Center

By Ginger Fitzgerald, WB4SOU

For the sixth year, the Polk County Civil Defense Amateur Communications Society, known more simply as the Polk Ham Club, set up and operated W4TJM at the Lakeland, Florida Airport from April 9-15, 1989.

A message center was set up and the mobile

communications van was utilized to send free messages as a public service. Message distribution was handled through the National Traffic System.

A total of 865 visitors signed the guest register at the message center, 337 of whom were Amateur Radio operators. A total of 765 messages were sent to 47 states and three countries.

Seven staff and 24 workers worked a total of 844 hours. The message and communications center was operated by members of the Polk Ham Club and Amateur Radio volunteers from Polk County and adjacent areas. Many of the volunteers hold multiple memberships in related organizations, such as the Amateur Radio Emergency Service, Radio Amateur Civil Emergency Service, the National Traffic System and other public-service organizations.



These smiling faces belong to members of the Polk County (FL) Civil Defense Amateur Communications Society, running a public-service message center for the sixth year. Note the attractive and eye-catching message center sign.

## Happenings

(continued from page 58)

a prospective ham's questions about Amateur Radio.

The first one focuses on recruiting youth into Amateur Radio and it is entitled "Ham Radio: Your Key to Excitement" (code E1). It emphasizes fun and excitement of Amateur Radio. The second brochure, entitled "Ham Radio... Today and Into the Future" (code E2) is aimed at adults and it emphasizes how Amateur Radio can enrich one's everyday life. The last brochure, "Hobby of a Lifetime! HAM RADIO" (code E3) targets seniors at or near retirement. It stresses camaraderie and

the absence of physical or age limitations in Amateur Radio.

Small quantities of these new brochures can be obtained by writing ARRL HQ, 225 Main St, Newington, CT 06111.

### ARRL HQ POTPOURRI

Several changes have been made within the Regulatory Information Department (RID) at ARRL HQ. RID Manager Tom Hogerty, KC1J, is now editor of *The ARRL Letter*. Jay Mabey, NU0X, outgoing editor of *The ARRL Letter*, has assumed responsibility for editing the *Repeater Directory* and John Hennessee, KJ4KB, is now conductor of *QST's* League Lines and *Happenings* columns, in addition to the Correspondence column.

### CYCLE 22 NEWS

Cycle 22 is really hot, and it is expected

to peak in December 1989. Researchers expect that it will be one of the most violent in 250 years.

According to researchers at the National Oceanic and Atmospheric Administration (NOAA), the intensity of sunspot activity is expected to increase between now and next December. NOAA reports the average number of solar flares (51.3 per month over a 13-month period) is greater than that observed in a similar period in 1957 (40.7), the previously strongest sunspot cycle ever recorded.

NOAA researchers predict that the present cycle will peak at 150 to 200 sunspots per month. Massive magnetic storms on the sun are expected to play havoc with radio communications and electric-power transmission at times during this period. Most of the time, though, expect some of the best band conditions in years! ☐

# Field Organization Reports May 1989



## ARRL Section Emergency Coordinator Reports

Twenty-four SEC reports were received, denoting a total ARES membership of 18,083. Sections reporting were: CO, EPA, GA, IA, MI, MN, KS, KY, LAX, NFL, NH, OH, OK, PAC, RI, SD, SDG, SFL, UT, VA, WNY, WTX, WV, WWA.

3RN	29	37	1.27	.171	88.5	96.7
4RN						58.1
8RN						96.7
ECN						83.8
<b>Cycle Four</b>						
<b>Area Nets</b>						
EAN	31	1045	33.71	1.193		96.7
CAN	31	889	28.67	1.009		100.0
PAN	29	608	20.97	.864		97.1
<b>Region Nets</b>						
1RN	62	479	7.73	.546		96.8
2RN	52	205	3.94	.428		77.0
3RN	62	257	4.14	.402		95.7
4RN	62	515	8.31	.358		97.7
RN5	62	398	6.42	.460		100.0
RN6						
RN7	62	405	6.50	.559		90.8
8RN	59	251	4.25	.334		89.0
9RN	62	300	4.84	.350		97.2
TEN	62	274	4.42	.354		100.0
TWN	59	210	3.56	.346		83.0
ECN						
ARN	31	71	2.29	.082		100.0

\*PAN operates both cycles one and two.

ARRL Section Traffic Managers reporting: AR, AZ, CT, EMA, ENY, EPA, GA, IL, IN, MDC, ME, MI, MN, MO, NC, NFL, NLI, NNJ, NTJ, OH, OK, OR, ORG, SB, SCV, SD, SDG, SFL, STX, TN, UT, VA, VT, WMA, WNY, WPA, WWA, WI, WV.

70	WA4RNP	KA4KGZ	56
NW8M	N8PWA	KA1RVN/T	KA8HJK/T
N8FPN	NY8W	62	KB5BNJ
WARDHB	WS7U	KD8KU	N4MMM
K14W	WB8YPG	NO8A	55
69	KC5NG	KA3MVM	N2EVG/T
KB2EPU	N1FNN	61	N2IKR/T
WX7A	KD0YL	WB0ZNY	54
W3VYQ	K14BR	KA9CTW/T	W7TGU
68	N3EGF	KA1KML	52
WB1BTJ/T	NC3V	N2HLZ	KB2CDB/T
WB5YDD	K3GHH	W2YGW	60
W90BU	65	WA9VLC	KA6TND/T
KA1JXH	N5NZH	WA4RUE	48
NB2D	NC9T	KD8NH	N8JYV/T
KB2BNW	KA7WSW	WB0WJN	KA2JMA/T
67	K2TWZ	WA2UKM	40
WB8R	64	WB2FTX	KA2JMT/T
KA8CPS	K8JDI	W2FR	N4TJT/T
N59Q	N59Q	58	
N6GGJ	N4ORZ	KA8TVU/T	
KJ9J	KB4WT	N8KIA/T	
KE2JX	KC4GCK	57	
KG2D	63	KA22NZ/T	
66	WB8KWC	KA1QFVT	
W6CPB	KB4OPR		

The following stations qualified for PSHR during the month of April, 1989, but were not listed in last month's column: KA1JXH, KA4GCK, KA9CTW/T, K9CNP, W9HBI, N9HVHT, W90BU, KA9QXI, NC9T, KA8TVU/T, WA9VLC, WB0FFV.

## Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
<b>Cycle Two</b>				
TCC Eastern	113	91.00	414	852
TCC Central				
TCC Pacific	110	88.71	330	625
Summary	223	89.85	744	1477
<b>Cycle Three</b>				
TCC Eastern				
TCC Central	61	83.60	220	475
TCC Pacific	124	86.29	423	807
Summary	185	84.94	643	1282

## TCC Roster

TCC Eastern Area, Cycle 2: KW1U, Director. K1EIC K1T1Q W1QYY WA1TBY WA2FJJ W2FR NN2H WB2MNA W2MTA N2XJ N3AZW N3EMD NC3V WA3YLO AA4AT WD4FTK N4GHI WB4PNY W4SQQ N4SS W8BO W8PMJ NJ8S KA8WNO WB8YDZ VE3ORN

TCC Central Area, Cycle 4: K5GM, Director. WB5J W5JDF KM5L K5MXQ N5TC K5TL W5TNT KB5W W9CBE NR9K WB9UYU A10O K80U KB0Z

TCC Pacific Area, Cycle 2: ND5T, Director. W3GL ND5T W5JOV K6UYK WF6O W7AMM KF7R W7TGU W7IGC N8HFZ WA0YNP VE6CHK VE7EIL

TCC Pacific Area, Cycle 4: K0DJ, Director. N2IC ND5T W5QVK K8LL W8EOT W6INH N8VZT K7GXZ W7EP W7GHT W7LG W7VSE KA7CPT KN7B NN7H NR7E K0EZ K0TER KC0D KJ0G.

## National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
<b>Cycle Two</b>						
<b>Area Nets</b>						
EAN	31	699	22.55	.748		87.1
CAN	31	560	18.06	.490		100.0
PAN*	62	429	6.92	.509		97.8
<b>Region Nets</b>						
1RN	62	380	6.12	.417	81.3	96.8
2RN	56	246	4.39	.341	85.0	96.8
3RN	31	98	3.16	.330	92.0	100.0
4RN	62	308	4.97	.280	69.0	96.8
RN5	62	435	7.02	.379	87.0	100.0
RN6	61	112	1.83			95.1
RN7	59	325	5.50	.462	89.3	100.0
8RN	62	280	4.52	.273	96.2	93.6
9RN	62	289	4.66	.327	89.5	100.0
TEN						100.0
TWN	62	257	4.15	.393	87.7	98.3
ECN						38.7
<b>Cycle Three</b>						
<b>Area Net</b>						
EAN	31	140	4.52	.387		80.2
<b>Region Net</b>						
1RN	31	89	2.87	.259	88.9	87.1
2RN	30	96	3.20	.291	96.0	77.4

## 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 NT8 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.

562	109	N3EMD	WA1JYV
KC9CJ	WB2VUK	K8BXF	N8HWD
304	WT7A	K5MXQ	82
WBAKF	K4ZK	95	WA4EIC
194	KA0PDM	N5NAV	WD0GUF
WB2OWO	N2XJ	N4MEJ	N2AKZ
171	108	K8CQF	81
WD8V	WD8KQC	WB4ZTR	KA0ARP
159	WA9VND	94	WA0TFC
KA8BBY	107	K8TVG	80
149	KA1GWE	WD5GKH	N2IYA
WA2SPL	105	N4KFU	79
145	AA4AT	93	W7LBK
WT0G	104	WB4WQL	77
135	WA4JDH	W4CKS	77
W12G	WAPIM	KB9LT	N7BGW
W12G	K5UPN	W9DM	K3RXK
131	KF5BL	KA2JF	K2YAI
WG9J	AG9G	92	76
128	KT1Q	WA4QXT	N25J
W7TVA	N4EXQ	KA7EE	KC1KJ
127	K3JL	WY7U	KA2INE
W2MTA	103	91	W1KK
126	N6NLW	W5YQZ	75
N9BDL	K9CNP	KA0KPY	WB5J
120	AA2VZ	W4JLS	N8HSC
N2EIA	101	AA4ZV	KA4FZI
118	WB4DVZ	90	KC4ESG/T
NM1K	KD8HB	N2IMP	WS8A
N4GHI	WA2ERT	K2VK	KJ3E
117	W9CBE	NN2H	74
EAN	WF6O	89	K4MTX
CAN	KD7ME	N2HIF	N3AZW
PAN*	WB2QMP	NR9K	N2DXP
116	N2GPA	W3FA	73
WA9W	100	88	N8CEI
115	KA7AID	W1FX	KA9FVX
KC4BHX	K5CXP	87	WA4TZC
N4HRV	N4HRV	W4QAT	W80UD
WB2ZVF	W2RRX	W5CTZ	
ND2S	WB2ZVF	WB0YH	
114	99	K5CXP	WB7WVD
KJ4VT	WB8SYA	WB1HIH	NB0N
113	N8FOO	86	WA2PAC
WA4PFK	WB4VMX	W1FRWG	WA2FJJ
111	98	K9ERM	NJ3V
N03M	W4ANK	85	KA1FC
WB4KSG	WB2EAG	KC3Y	71
KA3DLY	K4NLK	N8JPR	WA3UNX
110	97	84	N1DHT
KA4HHE	KT9I	W9UMH	K4BGZ
NSMEA	96	83	K4IWW
W7LNE	K16ZH	AC5Z	N3DRM
	W7GHT	W9HBI	KC2HJ
			KA2QOO

## 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.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a tone-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the call-sign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Divd	Total
WBAKF	296	1537	2182	247	4262
W3CUL	797	801	1312	95	3005
WB9YPX	0	1181	118	760	2059
WB0TAY	0	844	844	0	1688
N0BQP	29	864	46	599	1558
WA2SPL	1	640	642	48	1331
KC9CJ	14	636	46	463	1159
KIUGM	517	517	0	0	1034
W3VR	347	259	388	27	1021
KA1IFC	8	566	378	7	976
N0FBW	8	483	487	0	974
W3IWI	0	384	388	0	770
WB0WJN	210	95	404	1	710
N3AZW	8	329	313	20	670
WA1TBY	302	325	21	1	649
WA4JDH	2	285	343	3	635
WF6O	11	307	293	21	632
K14FL	0	299	296	0	599
WB1BTJ	0	157	388	4	559
K5UPN	0	260	292	3	555
WB2OWO	74	202	179	93	548
K0YFK	26	245	271	0	542
K0HOA	2	268	268	0	536
NM1K	32	245	230	29	536
WG9J	9	269	233	26	527
K4DOR	82	181	261	0	524
WA9W	13	268	224	12	517

BPL for 100 or more originations plus deliveries:  
W0FIR 210  
WB2QMP 139  
WD4IIO 115

The following stations qualified for BPL during the month of April but were not listed in last month's column: WBAKF, N0BQP, W0LVI, N0HFZ, K0YFK.

## Independent Nets

Net Name	Sess	Tfc	Check-ins
Amateur Radio Telegraph Society	27	346	366
Early Bird Net	31	489	
Empire Slow Speed Net	31	42	378
Golden Bear Amateur Radio Net	31	83	1379
IMRA	27	701	1561
Mission Trail Net	31	145	945
NYSPTEN	31	66	442
Southwest Traffic Net	31	201	1521
West Coast Slow Speed Net	31	101	494
20 Meter ISSB Net	27	766	396
75 Meter Interstate SB Net	31	183	1080
7290 Traffic Net	50	422	3231

# The World Above 50 MHz

Conducted By Bill Tynan, W3XO

Send reports to HCR 5 PO Box 574-334,

Tierra Linda Ranch, Kerrville, TX 78028

or call 512-257-1296 to record late-breaking information.

## Let 'em Have VHF/UHF

That phrase, reminiscent of the admonition attributed to Marie Antoinette—"let them eat cake," is a common theme in many of the comments surrounding the proposed code-free license. One of the arguments used by those favoring such a license is that code is seldom used on VHF, so why should people who are interested only in operating in that part of the spectrum be required to pass a Morse code test? Many, opposed to a code-free license, concede that "the code barrier might be dropped as long as operating privileges, associated with such a license are confined to VHF and UHF bands."

Let me make it clear that I am not using this column to take a stand on the issue of a code-free license—one way or the other. What I want to bring to the attention of readers is the attitude of all too many hams about what goes on in the VHF/UHF part of the spectrum, and why this attitude poses a danger to our kind of hamming. Apparently the conception is widely held that the world above 50 MHz is used for little more than FM repeaters and packet digipeaters. I am sure that some hams are vaguely aware that there is a "handful of super experimenter types" who bounce their signals off the moon or meteors. What they apparently don't appreciate is the fact that thousands of average hams derive some of the most enjoyable operating Amateur Radio has to offer from regularly working each other using CW and SSB on 6 meters and above—taking advantage of whatever propagation mode is available

at the time. One does not have to put up 48 long Yagis, or wait days for a meteor to leave an ionized trail as it streaks into the atmosphere, to have a lot of fun on our VHF and UHF bands. I'm not implying that such pastimes aren't fun, because they are. But operating in the world above 50 MHz can be enjoyed by those with even a limited amount of time, money and effort to expend.

Why has this myopic view of VHF and UHF operation taken such a firm hold? I believe that some degree of blame can be laid on the tremendous popularity of 2-meter FM, since this is the only exposure so many hams have to VHF. I believe that the advent of FM and repeaters in our VHF and UHF bands was a most beneficial development in the history of Amateur Radio—now packet radio gives every indication of being another. It is vital, however, that a way be found to inform those unaware of the myriad of other activities that take place above 50 MHz, that FM and packet are not the only games in town. Why is it important that this be done? Can't we just go on doing our own thing without letting the rest of the world in on it? For several reasons, I feel that the answer is a resounding no! It is in our best interest to inform our fellow amateurs that more than FM voice operating goes on in the VHF and UHF part of the spectrum in order to protect our small slices of frequency from inroads by wideband modes. If those interested only in such modes don't even know we are here, it's

natural that they will see no reason why their activities should not occupy the entire expanse of each of the bands. There are already too many instances of casual, and even organized, FM operation taking place in the portions of the bands we have always considered our preserves. One example is the weekly FM net held on 50.3 MHz by the Six Meter Club of Southern California. Another example is the recent action of a frequency coordination group in southern California of reassigning a packet DX cluster to 144.375, after finding that its original assignment of 144.46 caused interference to the AO-13 Mode JL operations. One wonders if 50.110 or 144.2 might be next. With many new hams coming into the hobby, via a code-free license or otherwise, pressure for use of the VHF and UHF bands can only increase. If we can inform existing and new hams, no matter what class of license, how we use the bands above 50 and perhaps convince more of them to join us, maybe we can help prevent our narrow slices of spectrum from being converted to other use—uses which by their very nature are destructive to the kind of low-noise environment we must have to take best advantage of the weak-signal capability afforded by SSB and CW. Another reason for spreading the word is that more activity makes for more interesting operation.

What can we do to get our message across? For starters, we must become better missionaries. Giving presentations to local radio clubs is one way of doing this. Most

### 1 1/4-Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US call areas, plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the US, Canada or Mexico. In order to make the standings a true reflection of stations currently active on 1 1/4 meters, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued interest and activity. WAS holders are listed whether or not they report regularly. However, they are encouraged to update their grids and call areas. Compiled June 9, 1989. Deadline for receipt of next updates is December 5, 1989.

#### WAS Holders

1 W0VB*	MN	13	---	W1GXT	MA	17	9	---	W83LJK	MD	28	10	56	W5HN	TX	23	7	28	K0ALL	ND	30	10	---
2 W0SD*	SD	---	---	W1EJ	NH	15	8	---	WA3FYJ	PA	23	10	44	WA5VJB	TX	17	6	---	K0DAS	IA	29	10	---
2 W0TEM*	IA	---	---	K1LPS	VT	14	6	35	W3RUE	PA	18	10	20	WB5AFY	TX	12	5	39	K0TLM	MO	23	7	53
4 K5FF*	NM	14	---	W1RIL	MA	13	8	30	AC3T	DE	15	6	13	W5NZS	OK	12	---	25	K0IFL	MO	22	7	50
5 W5FF*	NM	13	---	WA1HYN	RI	12	7	28	KA3B	PA	7	4	9	KE5EP	TX	7	---	9	K00QR	NE	21	6	48
6 WBSLUA*	TX	---	---	W1FAJ	CT	12	7	15	WS4F	GA	35	11	79	N6AMG*	3	3	---	---	KF0M	KS	16	5	28
7 VE3EMS*	14	---	---	KA1DHO	MA	11	4	14	KC4EG	KY	36	9	55	W7JF*	MT	17	9	---	W0RT	KS	12	5	---
8 W3GPY*	PA	---	---	WC2K	NJ	36	11	90	WD4DGF	TN	31	9	63	---	---	---	---	---	W0JRP	MO	7	3	19
9 K9KFR*	IN	---	---	W2PGC	NY	23	10	39	WA4CQG	AL	26	8	---	WB8BKC	MI	34	9	99	W0RZ	CO	5	3	6
10 KA0Y*	IA	---	---	N2WK	NY	22	10	61	WA4SBC	VA	21	7	25	W8IDU	MI	26	8	---	VE1UT	NS	7	4	---
				K2GK	NY	22	8	57	N3AHI/4	GA	20	8	---	WB8PAT	OH	23	8	42	VE3LNX	ON	20	9	50
				WB2IEY	NY	17	8	50	WB4SLM	GA	20	7	54	K8AXU	OH	19	7	27					
				N2BJ	NY	16	7	40	K4CKS	GA	13	4	15	W8VO	MI	11	7	---					
				K2UA	NY	13	7	30	N4MW	TN	10	4	---	NN9K	IL	26	8	56					
				WB2YZV	NY	12	5	26	NA4I	GA	3	2	12	WB9OJR	IL	21	8	50					
				KJ2A	NY	10	6	22	W5RCI	MS	35	8	64	WB9MSV	IL	19	7	47					
				KDSRO/2	NY	10	4	18	K5UR	AR	34	9	102	W0UC/9	WI	16	9	40					
									K5SW	OK	26	18	71	KB9NM	WI	5	4	---					

\*Some states worked via EME.

---Information not supplied.



## 2-Meter Standings

For WAS holders, listing is WAS Number, call, state, call areas worked and grids worked. For others, call, state, states worked, call areas worked and grids worked. Call areas are the 10 US continental 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. The UN does not count as a call area. Grids are the Maidenhead designators worked since the VUCC Award was instituted in January 1983. In order to make the standings a true reflection of current 2-meter activity, those not reporting within the past two years are subject to being dropped. They will be reinstated upon presentation, in writing, of continued activity. It is not necessary to show additional states, call area or grids worked to be reinstated. WAS holder are listed in any case. Compiled May 9, 1989. Updates for next listing must be received by November 5, 1989.

WAS Holders																
1	K0MQS*	IA	46	W0ANH*	MN	92	WB4KNF*	TN	37	11	149	AA7A*	AZ	28	10	109
2	K5CM*	OK	47	W4ANJP*	GA	93	WB0SWD*	IA	34	11	68	K7ICW*	NV	23	9	60
3	N0JA*	MO	48	W5HM*	NM	94	W7IUV*	AZ	32	11	64	WB8BK	MI	40	12	170
4	K9HMB*	IL	49	W7C*	AK	26	95	W0RT*	KS	27	150	K8AXU	OH	40	12	83
5	K1WHS*	ME	50	N5KW*	OK	13	96	W2PGC*	NY	23	90	WB9NR	OH	36	12	146
6	W4AMV1†	1	51	W0TEM*	IA	23	97	DL8DAT*	—	—	—	WB9NPX	OH	35	9	130
7	K5JL*	OK	52	W0FOY*	IA	23	98	WD9ACA†	IL	50	—	W8E0J	OH	32	10	144
8	W9DOT*	WI	53	W0RWG*	MO	16	99	W5SUS†	AR	—	—	KB8SQ	MI	30	8	—
9	WB0ZXU*	IA	54	W5ERD*	TX	—	100	AF1T*	NH	24	—	WB8VM*	WV	23	24	—
10	K9CA*	IN	55	W4WD7†	UT	—	101	W8YSG*	KS	—	—	W9UD	IL	46	14	164
11	W0SD*	SD	56	KE5C†	UT	—	102	W8KRT*	IN	—	—	WB9MSV*	IL	45	14	210
12	K5BMG	TX	57	W4ACQG*	AL	—	103	K9UIF*	IL	—	—	NN9K	IL	45	11	201
13	K5GW*	TX	58	W9CAS*	IL	—	104	N4GJV	NC	—	—	KB9NM	WI	43	14	—
14	W8SLUA*	TX	59	W2CNS*	NY	33	105	W5UWB*	TX	39	—	N9AQ	IL	42	13	201
15	K4GL*	SC	60	K0ALL*	ND	26	106	W0VB	MN	—	—	WB9OJR	IL	41	9	170
16	W0VB*	MN	61	K9XY*	WI	29	107	KB3PD	DE	21	140	K9VGE	WI	39	11	147
17	WB5LBT†	LA	62	K1FO*	CT	18	108	F6BSJ	—	—	—	KD8JQ	IL	38	—	153
18	K4PKV*	NC	63	W4DFK*	VA	—	109	K3W	PA	53	234	W9YCV	WI	34	11	131
19	W0RWH*	MO	64	W5CRK*	OK	—	110	W5VJB	TX	—	—	W0UC9	WI	23	10	116
20	W8IDU*	23	65	WB8PAT*	OH	39	97	111	K9SR	IL	—	—	—	—	—	—
21	K1MNS†	NH	66	KX0O†	CO	30	137	112	K5WE	OK	26	176	—	—	—	—
22	WB9VEN*	IL	67	W7HAH†	MT	60	231	—	—	—	—	—	—	—	—	—
23	K5FF†	NM	68	K1BKK*	VT	—	—	N1BUG*	ME	42	42	174	—	—	—	—
24	W5FF†	NM	69	K7KOT*	WA	—	—	WA1OUB*	NH	41	24	155	—	—	—	—
25	W7FN*	WA	70	KB8RO*	OH	—	—	W1A1M*	VT	39	15	103	—	—	—	—
26	W1JR†	MA	71	W7BBM*	AZ	—	—	K1KA*	NH	34	12	93	—	—	—	—
27	WB0QMN*	CO	72	SM2GGF*	—	—	—	N1AIS	MA	34	12	—	—	—	—	—
28	WB4EXW*	NC	73	KD8SI*	OH	—	—	W1EJ	NH	31	13	—	—	—	—	—
29	K9KFR*	IN	74	K2OS†	NY	17	—	W1RIL	MA	30	13	74	—	—	—	—
30	K3VGX*	PA	75	K1GVM*	MA	34	—	K1SF	MA	29	11	—	—	—	—	—
31	SM7BAE*	21	76	W9OZN*	IL	—	—	K5MA/1	MA	27	11	106	—	—	—	—
32	WA7BJU*	OR	77	W6MGZ†	CA	59	232	WA1AYS	MA	27	10	—	—	—	—	—
33	VE7BQH†	57	78	WD5AGO*	OK	38	—	K1LPS	VT	25	11	62	—	—	—	—
34	W6PO*	CA	79	WD4DGF*	TN	36	174	WA1TRE	ME	24	10	58	—	—	—	—
35	WA3VJS*	PA	80	VE1JT*	NS	42	—	—	—	—	—	—	—	—	—	—
36	AL7FS*	AK	81	W0RRV/5*	OK	30	—	W2RS	NJ	38	13	129	—	—	—	—
37	WB0YSG*	NE	82	W0VVV*	IA	—	—	N2WK	NY	38	11	137	—	—	—	—
38	N7NW*	WA	83	W5RCI*	MS	12	197	KE2N	NY	37	13	138	—	—	—	—
39	W5LUU*	TX	84	W2GSX†	NY	27	—	W2UAD	NY	37	13	108	—	—	—	—
40	WA4JQ*	KY	85	WA0TKJ*	KS	25	171	N2BJ	NY	36	13	114	—	—	—	—
41	K5UGM*	TX	86	KB7Q*	MT	—	—	WB2CUT	NJ	36	13	—	—	—	—	—
42	W5UN	TX	87	AB3D*	DE	25	32	K2OVS	NY	36	12	70	—	—	—	—
43	WA4LYS†	FL	88	KF0M*	KS	28	173	WA2FGK	NJ	36	11	—	—	—	—	—
44	WA1JXN/7†	MT	89	W2K*	NJ	38	233	K2GK	NY	35	11	124	—	—	—	—
45	W5JTL*	MS	90	N5BLZ*	TX	—	—	K2LME	NJ	32	—	102	—	—	—	—
			91	K0AOD*	MO	—	—	WA2ZPX	NY	31	8	—	—	—	—	—
								W2WGL	NY	28	11	82	—	—	—	—
								WB2ZSY	NY	26	11	88	—	—	—	—
								WA3USC*	MD	47	25	—	—	—	—	—
								WB3LJK	MD	39	14	132	—	—	—	—
								W3CWG	PA	38	12	185	—	—	—	—
								W3RUE	PA	38	12	112	—	—	—	—
								W3ZZ	MD	37	12	135	—	—	—	—
								AE3T	PA	37	12	—	—	—	—	—
												N6AMG*	32	37	—	—
												K6PVS*	29	22	245	—
												K6QXY*	20	14	—	—
												WA6LHD	20	9	81	—
												W6PFE	5	4	21	—
												W7RV*	AZ	44	24	169

†WAS completed in NC, now in SC.

\*Some contacts made via EME.

†WAC.

—Information not supplied.

clubs are desperate for people to put on programs, so your offer should receive a warm welcome. Becoming Elmers to those who display even a passing interest in our kind of VHF/UHF is another approach that can pay big dividends. Other suggestions on what we can do will follow next month.

## ON THE BANDS

**6 Meters**—Indications are that the summer E-skip season is off to a rousing start. In addition to numerous single-and-double-hop contacts within the US and Canada, many have reported working a number of Caribbean and South American stations. Lack of space, particularly with the inclusion of two boxes in this month's column, prevents even a cursory summary for this band.

One report I must pass on. It comes from N6CW located in the San Diego area. Terry

says that on the evening of June 4 about 0545Z, several JAs were worked by him and N6XQ. He adds that signals were quite weak. Apparently, this was a multi-hop E<sub>s</sub> opening of the kind first observed in the mid-70s by WB6NMT and others.

**2 Meters**—As of early June, This is shaping up to be quite a good E-skip year for 2-meter devotees. W7XU/0, Colton, SD, reports two openings. The first was a brief one to Alabama and Mississippi on May 15. Not surprisingly, an excellent 6-meter opening was in progress at the time. Arliss said he worked KA5AGD EM42 at 0247Z, followed by KSSM EM50. N0EPS, operating North Dakota State University ARS station, W0HSC, Fargo, ND, apparently caught the same opening, also working KA5AGD. Craig says that W0HSC is recently active on both 6 and 2.

W5FYZ, Minden, LA, tells of an opening to California from the Dallas area, and apparently much of Texas, the evening of

May 18. W5OZI, Junction, TX, was having so much fun on 6 meters that he missed most of it. Pat did finally turn on the 2-meter rig in time to work KB6JDC, WB6FTF and K6UQH between 0240 and 0252Z. WS5C, San Angelo, about 75 miles to the northwest, told him that the band had been open for at least an hour.

WD4AFY, Savannah, GA, reports another E<sub>s</sub> opening June 1 at 0048Z when he worked KILL/0 DN84 in South Dakota. A few hours later, at 0223, K8RZB, Conover, OH, hooked up with WA7KYM DN71, Wyoming for state number 40. Also taking advantage of this one was WB4JGG Cleveland, TN. David added state number 40 by working W7JF, Montana, and number 41 with a contact with KA7WOZ, Wyoming. WD4AFY also notes that a few days earlier on May 25, he worked XE2M FL06. Also the 31st, Bob had a field day beginning at 0336 QSOing KSSW EM25, W5UGO EM16, NSFEQ EM15, W0DFK EM47, K5YY EM35, K5GO and W5SUS both in EM26.

## Road Culvert Serves as Repeater Tower

Since 1986, the Southern Sierra Amateur Radio Society (SSARS) of Tehachapi, California, has been operating a solar-powered, 220-MHz repeater on Observatory Ridge at nearly 8000 feet. The weather is very harsh, with wind speeds in excess of 100 mi/h common. The repeater has been resistant to vandalism and extreme weather, providing hams with trouble-free operation.

The unique casing, which is the shell of the tower, is a common ridged-steel road culvert pipe that is 20 feet long and has an inside diameter of 24 inches. One end of the culvert is sunk five feet in the ground. A steel plate, which is welded to the bottom of the culvert, has drainage holes. A one-inch vent pipe at the top of the culvert permits condensation to escape. For extra strength, the tower is guyed with 3/8-inch, steel-stranded cable. To complete the tower, a 4-foot-square, 6-inch thick concrete slab encircles and stabilizes the structure. It also diverts water away from the base.

The repeater circuits are housed in a 55-gallon metal drum that rests at the base of the culvert where the temperature is approximately 41 °F. Inspections and repairs are made by means of a shoulder-height access plate on the tower's side. The drum is raised and lowered by means of a detachable hand-crank that is stored securely inside the access door. The door is a weather-stripped, 18-inch-square, steel plate which is bolted and padlocked to a flange. All of the housing hardware was purchased for under \$600.

The heart of the station is the contents of the three shelves inside the drum. The bottom shelf holds two Globe 80-Ah gelled-electrolyte batteries, the middle shelf holds the repeater, and the top shelf holds the duplexer cavities that were made from a kit described in April 1979 issue of *QST*. The article by Robert Shriner, WA0UZO, described how to make a duplexer out of circuit-board material.

The batteries are kept charged by two ARCO 40-W solar panels mounted on a 4-foot-square platform on the top of the tower. The panels are oriented in a fixed position to take maximum advantage of the winter sun when bad weather is most likely to reduce charging time. Voltage regulation is adjustable using a transistor-packaged LM350K voltage regulator set at 13.5 volts. The station has a built-in sleep timer that reduces battery drain to 100 mA after eight minutes of channel inactivity. Everything is then turned off except for two receivers and a CMOS switch which reactivates the station on the next transmission. The system is engineered to continue operating for up to 20 overcast days.

Sharing space on the platform with the

solar panels is our home-brew, 5/8-wave-length, vertical antenna which is enclosed in a PVC sleeve and mounted atop a galvanized pipe. This has survived for two years. (Two commercial antennas could not withstand the weather. One lasted four months and the other three days.) The platform is 3/4-inch thick, 4 x 8-foot plywood panel, cut in half and sandwiched together resulting in a thickness of 1 1/2 inches.

The entire project was a joint effort by SSARS members. Bob Parsons, W6PVG, designed it; Bill Jones, WU6V, drafted the plans, and Ken Krebs, WZ6A, was responsible for the metal work on the culvert and internal elevator system. Ken also used his

backbone to help install the housing at the site. Others soldered and assembled circuit boards. Two years of effort and hard work resulted in a repeater that has added new dimensions to local radio contacts.

One of the greatest strengths of this system is just that—its great strength. This was amply proven when a member accidentally backed his 4-wheel-drive truck right up one of the guy wires until the truck was hung up on the cable. No damage was done to either the truck or our installation. That incident gave all concerned new respect for the culvert tower and its guy wires.—*DeLong R. Murray, N6TGD, and Lucille Murray*

## W1AW Schedule

**August 1-October 29, 1989** 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: 0145, 0445
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: 9:45 PM, 12:45 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: 8:45 PM, 11:45 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: 7:45 PM, 10:45 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: 6:45 PM, 9:45 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.5815, 7.0475, 14.0475, 21.0775, 28.0775, 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, 7 1/2, 10, 13 and 15 WPM.

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

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 January 1989 *QST*, pages 9 and 100" 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 100.

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

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies, the 2200 UTC bulletin being cut short if necessary.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. 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 September 4.

## Caveats For Choosing Microwave Capacitors

Another commonly used microwave component is the chip capacitor. Physically, chip capacitors are simply small, leadless capacitors. But all physically small, leadless capacitors are *not necessarily* microwave-quality components. Very small chip capacitors are becoming much more common as a result of their use in miniaturized circuits. Circuits that operate at only a few megahertz (or tens of megahertz) can get by using inexpensive chip capacitors; the problem is that the dielectric materials used in inexpensive chip capacitors show very low loss at VHF/UHF, but are entirely unusable at 10 GHz. One necessary characteristic of microwave-rated components is low dielectric loss at microwave frequencies.

A second characteristic of all capacitors—including chip versions—that comes into play is the presence of undesired series and parallel inductances that result from the device packaging. These inductances not only have reactances; they also result in series and parallel device resonances. Where capacitors are used as bypass or de-blocking devices, series resonances aren't a problem because impedance is minimized. Parallel resonances, however, can be highly detrimental to circuit performance.

A third consideration when chip capacitors are used in microstripline circuits is that they create physical discontinuity, and cause some reflection of incident power as a result. This, too, can give rise to losses. Well-designed circuits use capacitors that cause minimal impedance discontinuities.

When a circuit calls for a particular type and value of capacitor, use of the specified component may be critical to circuit performance. Thorough designers take into account the factors discussed above, and select capacitors with low loss when designing equipment.

Loss data on a capacitor can be obtained by testing its effect when used as a dc block in a microstripline circuit. To do this, etch a board with a microstripline of the desired impedance, and leave a small gap in the line. The gap can be bridged by either the capacitor under test or a length of copper foil. First measure the circuit loss when the gap is bridged by the copper foil; then with the capacitor in place of the foil. The difference in attenuation is the additional loss caused by the capacitor.

Loss data for one line of commercial microwave chip capacitors rated for use at frequencies up to 4.2 GHz shows that one particular 120-pF capacitor has a loss of almost 0.4 dB at 3 GHz. A 100-pF capacitor from the same series shows less than 0.05 dB loss at that frequency. In this

case, substitution of the 120-pF capacitor for the 100-pF capacitor would result in considerable performance degradation in a 3-GHz circuit—not from the change in capacitance, but from associated packaging effects. This also applies to nominally equivalent capacitors from different manufacturers. If you make substitutions without knowledge of these factors, you may find yourself in unexpected trouble.

Further references to microwave components and microstrip circuitry can be found in the "New Frontier" columns in January 1981, December 1981, April 1982 and June 1988 *QST*.

### More on Combining Gunn-Oscillator Outputs

In the March 1989 column, I mentioned a *Microwave Journal* article that discussed an experiment in which two Gunn-oscillator outputs were combined. In that experiment, the combined output power of the two oscillators was *more than the sum of the individual oscillator outputs*.

I received a few letters on this subject after the column was published. In one of these letters, the correspondent suggested that the column might have been an early April fool's joke (it wasn't). Others wrote and suggested why this phenomenon might have been observed, and some questioned the validity of the experimental results (after all, it sounds like cold fusion). The original article is for real, and the authors used professional techniques and test gear—spectrum analyzers and bolometric power meters—and I have no reason to question their conclusions. I've since heard of an article (in another publication) in which the authors claim to get 16 times the individual oscillator power from four Gunn oscillators! (I will reserve further comment on this until I can track down the original source of this information. Stay tuned.)

I know of two attempts to verify the combined-Gunn-oscillator power-increase phenomenon by amateurs. Kent Britain, WA5VJB, used a magic tee (also discussed in the March column) to couple two oscillators: one 80-mW version and one 100-mW version. Kent found the combined output power to be 170 mW—no oscillator-combination gain was obtained. After some tweaking of coupling irises, Kent was able to obtain an indicated output of *430 mW!* Unfortunately, when he checked the output with a spectrum analyzer, Kent found it to be broadband garbage. At no time was it possible to obtain a clean output *and* any indication of power gain. Kent did find that the stability of the combined oscillators was excellent, however.

Individual Gunn oscillators usually show a frequency variation of about 30 or 40 MHz/V supply-potential change. Locked together, the two oscillators showed only a few megahertz of frequency variation for a 1-V supply variation.

The *RSGB Microwave Newsletter* reports on similar work done by Jean Pierre Morel, HB9RKR, and Angel Vilaseca, HB9SLV, who mounted two Gunn diodes  $\frac{1}{2} \lambda$  apart in a waveguide cavity. Individually, the diodes produced about 80 mW each at 10.4 GHz. When both were energized, the frequency dropped to 10.1 GHz and the total power output was 160 mW. Once again, no system gain was observed, but when the outputs were combined, the current drawn by the diodes decreased slightly, indicating increased efficiency.

Despite the disappointing lack of clean power gain, both experiments show that Gunn-oscillator outputs can be combined with good efficiency and, probably, increased frequency stability. Such a system, using combined outputs from two or more oscillators, could be used as the basis for a high-power wideband-FM transmitter, an interesting project in itself. [RECEIVED]

## Strays



### LOTS OF OATs

I had just gotten done working a West Virginian station on 40-meter CW, when I got a strange call. I sent QRZ?? Again, the same call came back—KA9OAT. At first, I thought someone was playing games. I went back to him and found out it was a good contact. After that initial QSO, we've had many on-the-air and telephone contacts. Last year, I went to visit Richard, and our families got along like we had known each other for a long time. Since that time, I have also worked KA7OAT in Oregon.—Richard McPeak, KA8OAT, Southington, Ohio

### CHAVERIM INTERNATIONAL NET

The Chaverim International Net fosters fellowship among Jewish amateurs and meets Sundays at 1300 UTC on 14.326 MHz. To encourage participation from the West Coast, another net has been added on Sundays at 1600 UTC on 14.326 MHz.

### I would like to get in touch with...

anyone who has the documentation for the Weston VTVM model 982. Jeff Duntemann, KI6RA, 103 Hidden Dr, Scotts Valley, CA 95066.

## Bird Watching—Part 1

Periodically it helps to survey our lot. Where are we in terms of our collection of OSCARs? How many of the old birds are still functioning? What birds are ready for launch? What lies just over the horizon? Let's take a quick walk around the field to see what's what.

### Old Russian Birds

The oldest of the OSCARs still regularly heard is probably RS-1. Its 29.402-MHz CW beacon can occasionally be heard beeping out its nonsense telemetry 5015. Launched on October 26, 1978, RS-1's battery failed in 1980, ending its transponder's functionality. However, when illuminated by the sun, the solar panels power the telemetry transmitter back to life. The last of RS-1's later siblings to fail were RS-5 and RS-7. Launched with RS-3, RS-4, RS-6 and RS-8 on December 17, 1981, they were confirmed to have expired about a year ago—in mid-1988—after several years of service.

### UO-9

The oldest of the birds that can be truly said to be operational is clearly UoSAT OSCAR 9. UO-9 was launched on October 6, 1981. An early anomaly with its command receivers was overcome and it has since become one of the most productive OSCARs ever. The statistics on this bird are fascinating.<sup>1</sup> Its end will come suddenly later this autumn when it will reenter the atmosphere and (presumably) burn up in the process. Best current estimates for the reentry are mid- to late October, although a sudden upturn in solar activity could bring it down more quickly.

Coincidentally, two new satellites from Surrey, UoSAT-D and UoSAT-E, are due for launch just about the time UO-9 is expected to re-enter earth's atmosphere. However, if UO-9 can hold on to its tenuous perch for a while longer, that will allow Surrey to claim the current title for the most satellites in a series that are operational at once—four.<sup>2</sup>

UO-9 has downlinks on 2 meters (145.825 MHz), 70 cm (435.025 MHz) and 13 cm (2401.0 MHz). It's believed that UO-9's 3-cm beacon (10.470 GHz) was never activated. UO-9's phase-coherent beacons on 7.050, 14.002, 21.002 and 29.502 MHz have provided an interesting and informative probe on ionospheric absorption.

### AO-10

AMSAT OSCAR 10 remains comatose, but partially functional. AO-10 suffered cumulative radiation damage to its computer over the first three years of its life such that, by mid-1986, the satellite was not fully controllable. However, the Mode B transponder works well when—because of seasonal changes in the sun angle with respect to the solar panels—enough power is available to

charge the batteries.

The failure of AO-10's computer was anticipated because the design incorporated memory ICs that were not fully radiation hardened. Launched on June 16, 1983, AO-10 could limp along for several more years providing periodic service in its elliptical orbit. AO-10 was the first amateur satellite to employ an elliptical orbit with an apogee at geosynchronous altitude: 22,200 miles (35,520 km).<sup>3</sup> The coverage from that altitude can often include four continents.

AO-10's Mode B transponder takes uplink signals from the 435.030- to 435.180-MHz frequency range and transmits them on frequencies from 145.975 to 145.825 MHz. The 2-meter beacon can be heard on 145.810 MHz when the batteries are charged sufficiently to power the transmitter.

The failure of the Mode L transponder on AO-10 was a major disappointment. In effect, this failure (detected shortly after launch) retarded the development of the 24-cm satellite uplink band for five years—until the advent of AO-13 in 1988. The failure is thought to be attributable to a bias regulator in the Mode L 70-cm transmitter power amplifier.

### UO-11

Next oldest of the currently operational birds is UoSAT OSCAR 11, launched on March 1, 1984. It, too, experienced some teething problems. But, some ten weeks after launch (on May 14, 1984), UO-11 finally responded to commands. Since then, UO-11 has completed nearly 28,000 orbits. The satellite remains fully operational. Various on-board experiments have yielded a wealth of data. Moreover, the Digital Communications Experiment (DCE) has helped pioneer the digital message store-and-forward technology that FO-12 and future OSCARs will employ. UO-11 has downlinks on 2 meters (145.825 MHz), 70 cm (435.025 MHz) and 13 cm (2401.5 MHz).

UO-11's Digitalker® has enchanted and inspired students in hundreds of schools the world over. The charge-coupled device (CCD) camera, while yielding modest results, has provided a baseline of information for further experiments.

Considering how quickly it was built and how much has been accomplished with it, UO-11 may have set a record for productivity in terms of information yielded per hour (or pound sterling) invested in it. UO-11's altitude of about 431 miles (694 km) should keep it from meeting the fate of its predecessor, UO-9, anytime in this century, at least.

### FO-12

Beginning what is destined to be a long heritage of Japanese OSCARs, the Japanese

Amateur Radio League (JARL), in conjunction with JAMSAT and a small consortium of industrial partners, launched Fuji OSCAR 12 on August 12, 1986. Departing earth from Tanegashima Island on a Japanese H1 launcher, FO-12 was placed precisely in a circular orbit 932 miles (1500 km) high.

FO-12 has an analog and a digital transponder on board. Both operate in Mode J: 2 meters up yields 70 cm down. The analog (linear) transponder accepts signals on the uplink frequencies from 145.900 MHz to 146.000 MHz and transmits them in the frequency range of 435.900 MHz to 435.800 MHz. The Mode JA beacon is heard at 435.795 MHz. The digital mode requires the use of a special modem. Four uplinks (145.850, 145.870, 145.890 and 145.910 MHz) yield a downlink on a common channel: 435.910 MHz.

Unfortunately, FO-12 has had power problems since launch. Evidently, the systems consume too much power, or the yield from the solar panels is less than anticipated, or both. As a result, operational reliability in the months immediately after launch was spotty. With increased awareness of the problem has come a cohesive plan of operations that affords the user a modicum of predictability in planning his FO-12 transponder use. Nevertheless, because of the power problems, the need for a special modem on Mode JD (the digital mode) and the availability of AO-10 and later AO-13, use of FO-12 has been fairly light.<sup>4</sup>

One of the early "cute" achievements on FO-12 was an FO-12 to AO-10 cross-link on August 28, 1986. As reported in *Amateur Satellite Report* (ASR) no. 134, October 13, 1986, W2RS heard KH6IBA via a two-satellite cross-link. KH6IBA's AO-10 2-meter downlink was picked up by FO-12's 2-meter uplink receiver and transmitted on FO-12's 70-cm downlink. A two-way QSO was not possible because FO-12 was out of range of KH6IBA at the time, but OSCAR cross-links are exceedingly rare in any case. Precise planning can, however, afford the expert a shot at a two-bird cross-link.

Next month, we'll continue this review with more recent satellites and look to the future at the new projects.

### Notes

<sup>1</sup>This column focused on UO-9 and its imminent demise in the May 1989 installment.

<sup>2</sup>The all-time record is held by the RS builders who, in December 1981, had RS-3, 4, 5, 6, 7 and 8 all percolating at once!

<sup>3</sup>OSCAR 4, launched on December 21, 1965, had an apogee of 20,847 miles (33,564 km) and a perigee of 101 miles (168 km) when measured shortly after launch. AO-10's perigee is about 2438 miles (3926 km).

<sup>4</sup>An updated and improved version of FO-12 is slated for launch in early 1990.

# Coming Conventions

## S TEXAS SECTION CONVENTION

August 4-6, 1989, Austin

The South Texas Section Convention will be sponsored by the Austin ARC and the Austin Repeater Organization. It will be held at the Austin Marriott Airport, I-35N and US 290. Doors will be open on Friday at 4 PM for registration, Saturday 8 AM-5 PM, Sunday 8 AM-12 PM. Features will include flea market, dealers, ARRL Forum, programs on packet, DX, QRP, ATV, VE exams, Saturday evening BBQ (\$9 advance registration), Austin Aqua Festival, annual business meeting/convention of the Texas VHF-FM Society. Admission will be advance \$6, door \$8. Talk-in will be on 146.34/94. For further information contact Austin Summerfest, PO Box 13473, Austin, TX 78711, tel (D) 512-838-5045 or 891-2718, (N) 512-345-0800 or 836-1485.

## 10-10 INTERNATIONAL NET CONVENTION

August 11-13, 1989, Milwaukee, Wisconsin

The 10-10 International Net Convention will be sponsored by the 10-10 International Net Inc. It will be held at the Grand Hotel Milwaukee. Take Howell Ave, north of General Mitchell International Airport. Doors will be open from noon on August 11 to 4 PM on August 13. Features will include forums, banquet and VE exams. Talk-in will be on 144.53/145.13. Admission will be \$5 in advance and \$7 at the door. For further information contact Joseph F. Williams, WA9TSG, PO Box 93181, Milwaukee, WI 53203.

## DELTA DIVISION CONVENTION

August 12-13, 1989, Shreveport, Louisiana

The Delta Division Convention will be sponsored by the Shreveport ARA. It will be held at the Shreveport Convention Center, exit 1-20 at the Spring Street exit, turn right on Millam St, go to the corner of Clyde Fant Pkwy. Admission will be advance \$2, door \$3. Talk-in will be on 147.63/03. For further information contact Elaine Bonough, 2036 Francois Dr, Shreveport, LA 71118.

## NORTHWESTERN DIVISION CONVENTION AND TACOMA HAMFAIR

August 19-20, 1989, Tacoma, Washington

The Northwestern Division Convention and Tacoma Hamfair will be sponsored by the Radio Club

## ARRL NATIONAL CONVENTION

June 8-10, 1990—Kansas City, Missouri

of Tacoma, Inc. It will be held at the Pacific Lutheran University, exit 127 from I-5 follow the signs. Doors will be open on Saturday from 9 AM-5 PM and Sunday from 9 AM-1 PM, flea market setup Saturday 5 AM-9 AM. Features will include Friday evening entertainment 7 PM-9 PM, commercial exhibits, flea market, Saturday banquet 6 PM (\$10 until August 6), Pacific Rim Disaster Team "Radio Communications for the Armenian Earthquake," RV parking (no hookups) \$2.50 each night, logger's breakfast Sunday 7 AM-10 AM, dormitory rooms (no reservations required), single \$15, double \$22, license examinations Saturday and Sunday 10 AM walk-ins welcome, ladies' activities and displays, technical seminars, forums, refreshments. Admission will be in advance \$5 until August 6, at the door \$7, \$1 for nonhams; 12 years and under free. Tables will be \$18 includes registration. Talk-in will be on 147.38. For further information write Radio Club of Tacoma, PO Box 11188, Tacoma, WA 98411, or tel RCT at 206-759-2040, or Bill Morgan, W7GPR, 206-531-3821.

## SOUTHEASTERN DIV CONVENTION

August 19-20, 1989, Huntsville, Alabama

The Southeastern Division Convention will be sponsored by the Huntsville Amateur Radio Club. It will be held at the Civic Center which is located across the street from a parking garage in downtown Huntsville. Doors will be open on Saturday from 9 AM-4 PM and Sunday from 9 AM-3 PM. Features will include dealer show, flea market, forums and Cavec license exams Saturday at 9 AM, full access for disabled individuals is provided. Talk-in will be on 146.34/94. For further information contact David L. Reasoner, N4KTY, 3103 Holly Hill Rd, Huntsville, AL 35802, 205-883-7629, or Don Tunstill, WB4HOK, 1215 Dale Dr, Huntsville, AL 35801, 205-536-3904.

## SOUTHWESTERN DIV CONVENTION

August 25-27, 1989, Los Angeles, California

The Southwestern Division Convention will be sponsored by the Los Angeles Area Council of Amateur Radio Clubs. It will be held at the Los Angeles Air-

port Hilton Hotel, 5711 W Century Blvd. Doors will be open for registration a from 4 PM-9 PM, Saturday 7 AM-5 PM, Sunday 7 AM-9 PM. Features will include on Friday Spark to Space Celebration in honor of the 75th anniversary of ARRL, commercial and club exhibits, technical sessions on Friday. Saturday TRW swapmeet, exhibits and technical sessions: DX, MARS, QSLing, Emergency Preparedness, packet radio, T-Hunting, recruiting, ARES/RACES, code proficiency, ARRL Field Organization, ARRL Forum, traffic, RFI, VHF-UHF, RTTY, antennas, legal forum, radiation hazards, contests, 10-10 Forum, ATV, ladies' programs, banquet featuring Astronaut Kenneth Cameron, KB5AWP (advance \$25, door \$30), Wouff Hong ceremonies at midnight, VE exams (9 AM-2 PM, bring a photo ID, your license original and copy, make check for \$4.75 payable to ARRL/VEC); and Sunday breakfast featuring Russian DXpeditioner Terry Dubson, W6MKB, technical sessions and exhibits, 11 AM auction (bring your used gear 5% commission), T-Hunt at 1 PM including special 220 Novice-only hunt. Admission will be until August 11 for advance registration, at the door \$12, kids under 12 free. Talk-in will be on 147.00/60, 147.510 simplex. For further information contact Hamcon Inc, PO Box 18201, Encino, CA 91416-8201, for hotel information mention HAMCON for the special rate of \$75 single or double, tel 213-410-4000 or 800-HILTONS for reservations.

## MICHIGAN STATE CONVENTION

August 26-27, 1989, Saginaw

The Michigan State Convention will be sponsored by the Saginaw Valley ARA. It will begin on Saturday at the Florentine Inn and will continue on Sunday at the Civic Center located west of I-75, two miles along the I-675 bypass, from exit 2 follow the signs to the Civic Center. Doors will be open at 6 PM Saturday. Features will include Wouff Hong initiations at 10 PM on Saturday, guest speakers include Billy Lunt, KR1R, ARRL Contest Coordinator, and Kimball Williams, N8FNC, an electromagnetic specialist who will talk about RFI and TVI, Irby Tallant, Jr, the Engineer-In-Charge at the FCC Detroit office. There will be plenty of net meetings. Admission will be advance \$1, door \$3 (all advance sales will close August 14). Talk-in will be on 147.240. Tables will be advance \$10, door \$15, no trunk sales. For further information contact Five-County Swap Committee, 1214 McKinley St, Bay City, MI 48708.

# 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.

<sup>†</sup>Alabama (Mobile)—September 9-10. Sponsor: Mobile ARC. Time: 9 AM-4 PM. Talk-in: 146.22/82. Admission: \$2. Contact: Porter Chambers, K14FE, 3320 Emelye Dr, Mobile, AL 36693, tel (H) 205-661-1160, (B) 205-434-7614.

Alaska (Fairbanks)—August 26. Sponsor: Arctic ARC. Place: Moose Lodge, 10th Ave and Steese Hwy. Features: talk sessions, formal demonstra-

tions, VE exams, evening dinner. Talk-in: 146.28/88, 146.34/94 in town. Admission: \$1. Tables: swap tables \$10. Contact: Joan Soutar, N0AJW, PO Box 81389, Fairbanks, AK 99708.

<sup>†</sup>California (Pomona)—August 19. Sponsor: Tri-County ARA. Time: setup 7 AM, public 8 AM-2 PM. Place: Palomares Park Recreation Hall, 491 E Arrow Hwy, north side of Arrow Hwy, at Orange Grove, between Towne and Garey. Features: refreshments, VE exams (check-in 8 AM, need completed 610, original & copy of current license; permit disallowed), photo ID & SASE, programs, free parking. Admission: \$3. Tables: limited number of 2½' x 8' tables available must be reserved in advance with a donation of \$3 per table for members or \$5 nonmembers (no personal tables are allowed). Contact: Joe Lyddon, WB6UFX, 6879 Sard St, Alta Loma, CA 91701, tel (D) 714-980-4563.

<sup>†</sup>California (Santa Barbara)—August 13. Sponsor: Santa Barbara ARC. Time: 9 AM. Place: from the south, off at Patterson exit; from the north off at

Fairview Ave. Features: T-hunt, QLF, EQCC, refreshments, VE exams starting at 10 AM. Talk-in: 146.19/79. Admission: no advance, door \$7.50. Tables: swap tables. Contact: Jack M. Goldsworthy, 805-968-8303.

<sup>†</sup>Delaware (Dover)—August 20. Sponsor: Kent County ARC. Time: 8 AM-4 PM. Place: US 13 Intersection Del 100 (Dennys Rd), 3 miles north of Dover. Features: refreshments, VE exams, vendors, tailgating. Talk-in: 146.37/97, 147.195/795. Admission: no advance, at door \$4. Contact: Ed Biter, (D) 302-736-6011, (N) 302-736-1855.

<sup>†</sup>Florida (Melbourne)—September 9-10. Sponsor: Platinum Coast ARS. Time: 9 AM-5 PM. Place: corner of Hickory and Hibiscus. Features: meetings, forums, ladies activities. Talk-in: 146.25/85. Admission: advance \$4, door \$5. Contact: Jerry Vanderzyl, KF4YE, 731 Indigo St, SE Palm Bay, FL 32909-4158, tel (D) 407-723-3680, (N) 407-725-5481.

<sup>†</sup>Georgia (Madison)—August 26-27. Sponsor:

<sup>†</sup>ARRL Hamfest

Confederate Signal Corps, Inc. *Time:* Saturday 9 AM-5 PM, Sunday 9 AM-2 PM. *Place:* I-20 and US 441. *Features:* refreshments, forums, VE exams. *Talk-in:* 146.265/865. *Admission:* free. *Contact:* Roy L. Jordan, WB41LR, tel 404-996-4587.

**Illinois (Danville)**—August 27. *Sponsor:* Vermilion County ARA. *Time:* 8 AM-3 PM. *Place:* exit Rte 1 north from I-74 and follow signs. *Talk-in:* 146.22/82. *Admission:* advance \$2 each or 3 for \$5. *Contact:* John Cunningham, WA9WJG, 217-443-0100.

**Illinois (Harrisburg)**—September 10. *Sponsor:* Shawnee ARA. *Time:* 7 AM-3 PM. *Place:* just east of Harrisburg on Rte 13 at Southeastern Illinois College. *Features:* refreshments, VE exams (9 AM, bring original license and one copy), new equipment, computers. *Talk-in:* 146.25/85, 146.07/67, 146.28/88. *Admission:* \$3. *Tables:* free flea-market tables. *Contact:* Bill Johnson, W9ERI, 502 West Keenicott, Carbondale, IL 62901, tel 618-457-7586.

**Illinois (Quincy)**—August 20. *Sponsor:* Western Illinois ARC. *Time:* 8 AM-3 PM. *Place:* Eagle Alps Lodge, 3737 N 5th St 1 mile north of intersection 5th St, and US 24. *Features:* contest forum, VE exams, refreshments, overnight camping nearby. *Talk-in:* 147.63/03, 146.34/94. *Admission:* advance \$2, door \$3. *Contact:* Michael Nowack, NA9Q, c/o WIARC, PO Box 3132, Quincy, IL 62301, tel 217-224-8526.

**Indiana (Fairmont)**—August 13. *Sponsor:* Grant County ARC. *Time:* 9 AM. *Place:* PlayAcres Park. *Admission:* free. *Tables:* bring your own tables, chairs, lunch. *Contact:* Dennis Clevenger, KA9JUB, 516 S Walnut, Fairmont, IN 46928, tel 317-948-9351.

**Indiana (Lafayette)**—August 20. *Sponsor:* Tippecanoe ARA. *Time:* 5 AM. *Place:* Tippecanoe Co Fairgrounds, Teal Rd and 18th St. *Features:* flea market, dealers, forums and refreshments. *Talk-in:* 146.13/73. *Admission:* \$3. *Contact:* D. C. Roberts, 5124 Jackson Hwy, West Lafayette, IN 47906.

**Indiana (La Porte)**—September 10. *Sponsor:* La Porte ARC and Michigan City ARC. *Time:* vendors 6 AM, public 8 AM. *Place:* La Porte Co Fairgrounds on State Rd 2. *Features:* refreshments. *Talk-in:* 146.52, 146.01/61, 131.8 PL. *Admission:* \$3.50. *Contact:* La Porte ARC, PO Box 30, La Porte, IN 46350.

**Indiana (Valparaiso)**—August 13. *Sponsor:* Porter Co ARC. *Time:* 7 AM. *Place:* Porter Co Fairgrounds and Expo Ctr, Rte 49 south of US 30, just east of Valparaiso. *Features:* walk-in VE exams (register 8-10 AM), flea market, commercial vendors, refreshments. *Talk-in:* 146.175/775, 146.52. *Admission:* advance \$3.50, door \$4. *Contact:* Hamfest Committee, Porter County ARC, PO Box 1782, Valparaiso, IN 46384.

**Iowa (Cedar Rapids)**—August 5-6. *Sponsor:* Cedar Valley ARC. *Time:* Saturday 8 AM-5 PM, Sunday 8 AM-3 PM. *Place:* Teamsters Hall, 5000 J St SW. *Features:* seminars, VE exams (Sunday), commercial vendors, flea market, free outside tailgating, free parking. *Talk-in:* 146.16/76, 146.52. *Admission:* \$4, age 12 and under free. *Tables:* \$8 without electricity, \$10 with electricity, commercial tables \$15 each. *Contact:* Cliff Goldsberry, KA9QEA, 2926 Schaeffer Dr SW, Cedar Rapids, IA 52404, tel 319-365-8849.

**Kentucky (Georgetown)**—August 13. *Sponsor:* Bluegrass ARS. *Time:* 8 AM-4 PM. *Place:* Interstates I-75 and I-64 to Georgetown, then US 25 two miles north of Georgetown to Scott Co High School. *Talk-in:* 146.16/76. *Admission:* advance \$5, door \$6. *Contact:* Bill DeVore, N4DIT, 606-273-8345, evenings, or Rick Turnley, WA4BVJ, 606-272-6363, evenings.

**Massachusetts (Dalton)**—August 13. *Sponsor:* Northern Berkshire ARC. *Place:* Dalton American Legion, Rte 9. *Features:* refreshments, tailgate space free to sellers. *Talk-in:* 146.31/91. *Admission:* \$1, YLs and kids free. *Contact:* Dick, WB1HH, 413-458-8267 or tel 413-458-8452.

**Minnesota (St Cloud)**—August 13. *Sponsor:* St Cloud ARC. *Place:* Whitney Senior Ctr. off Hwy 10 into Sauk Rapids via Benton Dr, to 9th Ave, to Northway Dr, south of the Vo-Tech School, off I-94 to Hwy 15 to Vo-Tech School and Northway Dr. *Features:* refreshments. *Talk-in:* 146.34/94, 147.615/015. *Admission:* \$3 (extra ticket \$2). *Contact:* St Cloud ARC, Box 141, St Cloud, MN 56302.

**Missouri (St Charles)**—August 27. *Sponsor:* St Charles ARC. *Time:* 6:30 AM-2:30 PM. *Place:* Blanchette Park. *Features:* dealers, flea market \$2/space, forums, VE exams, refreshments, handicapped parking available. *Talk-in:* 146.07/67, 444.65/449.65, 146.52. *Admission:* free. *Contact:* Mike Nolan, KA0UXQ, 16 Gateswood Dr, St Peters, MO 63376.

**Montana (Havre)**—August 18-20. *Sponsor:* Hi-Line ARC. *Place:* BN Campground, 15 miles south of Havre in Beaver Creek Park. *Contact:* Richard J. Girres, W7IDK, 16-9th St, Havre, MT 59501.

**New Jersey (Mullica Hill)**—August 27. *Sponsor:* Gloucester Co ARC. *Time:* 8 AM-4 PM. *Place:* Rte 295 to Rte 322 east to Rte 45S, to Rte 77S, 1.7 miles to 4-H grounds. *Features:* refreshments, VE exams, dedication of Club building. *Talk-in:* 146.52, 147.78/18. *Admission:* advance \$3.50, door \$4. *Contact:* Gloucester Co ARC, PO Box 370, Pitman, NJ 08071, tel (D) 609-478-4738, (N) 609-772-6352.

**New Jersey (Oakland)**—August 19. *Sponsor:* Ramapo Mountain ARC. *Time:* vendors 6 AM, public 8 AM-1 PM. *Place:* American Legion Hall and Grounds, 65 Oak St. *Features:* VE exams (registration begins 8 AM, tests begin 9:30). *Talk-in:* 146.49/147.49, 146.52 and 146.55 simplex. *Contact:* directions on file at WA2SNA-1 PBBS, for further info contact Marc, WA2S @WA2SNA packet or tel 201-652-1318 or 201-652-8493.

**New Mexico (Alamogordo)**—September 2-3. *Sponsor:* Alamogordo ARC. *Place:* Otero Co Fairgrounds. *Features:* programs, banquet, VE exams (preregistration \$5, at the door \$6). *Admission:* free. *Tables:* \$5. *Contact:* Alamogordo ARC Hamfest Committee, Box 276, Alamogordo, NM 88311.

**New York (Ballston Spa)**—September 9. *Sponsor:* Saratoga Co RACES Assn, Inc. *Time:* 9 AM-5 PM. *Place:* Saratoga Co Fairgrounds, take I-87 (Northway) to exit 12 and follow red and white hamfest signs. *Features:* refreshments, forum by the Hudson Division Director Stephen Mendelsohn, WA2DHF. *Talk-in:* 146.400/147.00, 147.84/24. *Admission:* \$3 includes outside selling space. *Contact:* David Atwell, N2FEP, 911 East High St, Ballston Spa, NY 12020, tel 518-587-7388.

**New York (Ithaca)**—August 19. *Sponsor:* Tompkins Co ARC. *Place:* 4H-Acres, located just off Rte 13, 7 miles north of Ithaca. *Features:* overnight camping, vendors, refreshments, handicapped parking, tailgaters \$1. *Talk-in:* 146.37/97. *Admission:* \$3, under 18 free. *Tables:* indoor \$5 each. *Contact:* Bob, KD2IM, tel 607-347-4444.

**North Carolina (High Point)**—August 19-20. *Sponsor:* High Point ARC. *Time:* Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place:* Kivett Dr, exit off of Hwy 29/70/Bus 85, 1 block west to Elon Place, then right on Armory Dr. *Talk-in:* 147.765/165, 146.52. *Admission:* advance \$4, door \$5. *Contact:* High Point ARC, c/o Mark McMahan, PO Box 1163, Jamestown, NC 27282-1163, tel 919-882-2345.

**North Carolina (Shelby)**—September 2-3. *Sponsor:* Shelby ARC. *Time:* Saturday 6 AM-5 PM, Sunday 6 AM-2 PM. *Place:* east of Shelby, NC, on US 74 Business, near the intersection of US 74 Business and NC 180 at Cleveland Co Fairgrounds. *Features:* refreshments, camping. *Talk-in:* 146.28/88. *Admission:* advance \$4, door \$5. *Contact:* general info John Ledford, 3410 Oakcrest Dr, Shelby, NC 28150, tel 704-482-4507, or Larry Vassey, 619 Polkville Rd, Shelby, NC 28150, tel 704-487-0470, for dealers contact Barbara Elliott, N4MRZ, PO Box 191, Fallston, NC 28042, tel 704-538-7919 (after 1 PM).

**Ohio (Findlay)**—September 10. *Sponsor:* Findlay RC. *Time:* 8 AM-4 PM. *Place:* Hancock Co Fairgrounds, 1017 East Sandusky St. *Features:* AMSAT North America Forum, Buckeye Belles forum, packet, radio forum. *Talk-in:* 147.75/15, 449.15/444.15. *Admission:* advance \$3, door \$4. *Contact:* Hamfest, PO Box 587, Findlay, OH 45839-0587.

**Ohio (Warren)**—August 20. *Sponsor:* Warren ARA. *Time:* 6 AM-4 PM. *Place:* Trumbull Branch Campus of Kent State University, at the intersection of State Rte 5 Bypass and State Rte 45. *Features:* indoor exhibit area, flea market \$2 per 10' space, VE exams, refreshments, free parking. *Talk-in:* 146.37/97. *Admission:* advance \$2.50, door \$3, under 12 free. *Contact:* Warren ARA Hamfest, PO Box 809, Warren, OH 44482.

**Ontario (Brantford)**—August 12. *Sponsor:* Brant-

ford ARC. *Time:* vendors 7 AM (vendors sales permit suggested which can be obtained from Ministry of Revenue, PO Box 2112, 119 King St, Hamilton, Ontario L8N 3Z9. ATTN: B. Smith, tel 416-521-7504 or 1-800-263-9229), public 8 AM-1 PM. *Place:* Woodman Park Community Ctr, 491 Grey St. *Features:* refreshments, auction sale. *Talk-in:* 147.750/150 VE3TCR, 448.025/443.025, 146.52. *Admission:* \$3, children under 12 free. *Tables:* \$4, tables held till 9 AM. *Contact:* Marvin, VE3MWF, PO Box 1661, Brantford, Ontario N3T 5V7, tel 519-442-6298.

**Pennsylvania (Butler)**—September 10. *Sponsor:* Butler Co ARA. *Time:* 9 AM-4 PM. *Place:* Butler Co Farm Show Grounds at Roc Airport. *Features:* refreshments, flea market, parking, overnight campers welcome, handicapped parking available. *Talk-in:* mobile check-in fill noon 146.52, directions 147.96/36. *Contact:* Chairman, PO Box 1787, Butler, PA 16003-1787.

**Pennsylvania (Republic)**—September 9. *Sponsor:* Uniontown ARC. *Place:* club grounds located on the Old Pittsburgh Rd, just off Rte 51 and 119 bypass in Uniontown, PA, signs will be posted. *Features:* refreshments, free swap & shop. *Talk-in:* 147.045/645, 145.17/144.57. *Admission:* \$3 each or 2 for \$5. *Contact:* UARC Gabfest, c/o John T. Cermak, WB3DOD, PO Box 433, Republic, PA 15475, tel 412-246-2870.

**Pennsylvania (Warrington)**—August 13. *Sponsor:* Mid-Atlantic ARC. *Time:* setup 7 AM, public 8 AM-3 PM. *Place:* Bucks Co Rte 611 Drive-In Theatre, 5 miles north of PA Turnpike exit 27 (Willow Grove) on US 611. *Features:* tailgate space \$2. *Talk-in:* 147.66/06, 146.52. *Admission:* \$3. *Contact:* Al Muslin, W3DZI, 405 Ellis Rd, Havertown, PA 19083, tel 215-446-4936.

**Rhode Island (West Greenwich)**—August 26. *Sponsor:* Washington Co ARA. *Time:* vendors 8 AM, public 9 AM. *Place:* West View Inn, Rte 3. *Features:* flea market, refreshments, free parking. *Talk-in:* 147.765/165, 223.900, 444.275/449.275. *Admission:* free. *Tables:* \$5. *Contact:* Steve Brunelli, N1FGJ, tel 401-397-5833.

**Tennessee (Lebanon)**—August 27. *Sponsor:* Short Mountain Repeater Club. *Time:* 7 AM-3 PM. *Place:* Cedars of Lebanon State Park, US Hwy 231, 7 miles south of Lebanon. *Features:* exhibitors (bring your own tables, space available on first-come basis), refreshments. *Talk-in:* 146.31/91. *Admission:* free. *Contact:* Mary Alice Fanning, KA4GSB, 4936 Danby Dr, Nashville, TN 37211, tel 615-832-3215.

**Texas (Amarillo)**—August 12-13. *Sponsor:* Panhandle ARC. *Time:* 9 AM-4 PM both days. *Place:* Amarillo Civic Ctr Exhibit Hall in association with the Amarillo Chamber of Commerce. *Features:* ladies' and kids' programs. *Talk-in:* 146.07/67 W5WX, 3.933 (call W5WX). *Admission:* advance \$6, door \$7. *Tables:* \$5. *Contact:* Golden Spread Hamfest, PO Box 1524, Amarillo, TX 79105-1524.

**Texas (Victoria)**—August 19. *Sponsor:* Victoria ARC. *Time:* 8 AM-4 PM. *Place:* Knights of Columbus Hall, 3610 N Ben Wilson. *Features:* indoor swapfest, VE exams, programs, refreshments, free parking, community tours, test equipment bench. *Talk-in:* 144.59/145.19. *Admission:* \$3. *Contact:* Gene Salonek, 365A Carefree, Victoria, TX 77901, tel (D) 512-572-1183, (N) 512-575-4377.

**Vermont (Essex Junction)**—August 12. *Sponsor:* Burlington ARC. *Place:* Champlain Valley Fairgrounds. *Features:* flea market, packet and ATV demos, VE exams, camping available. *Talk-in:* 146.34/94. *Admission:* \$4 US, or \$5 Canadian, children under 12 free. *Tables:* indoor \$5. *Contact:* Barb Kimball, N1DLE, 1 Sundown Dr, Williston, VT 05495, tel 802-878-5555.

**West Virginia (Parkersburg)**—August 12. *Sponsor:* Mid-Ohio Valley ARC. *Time:* 8 AM-3 PM. *Place:* Grand Central Mall. *Features:* free parking, table space available. *Talk-in:* 147.36/96. *Admission:* \$1. *Contact:* Ken Harris, WA8LLM, 304-679-3470 or Bill WF8U, 304-485-7777.

**Winnipeg (Manitoba)**—August 18-20. *Sponsor:* Winnipeg ARC. *Time:* registration starting on Friday at 2 PM, Saturday 9 AM-4 PM, Sunday 9 AM-noon. *Place:* International Inn, 1808 Wellington Ave. *Features:* programs, forums, exhibits, banquet Saturday evening, refreshments, flea market. *Contact:* Ed Hendersson, VE4YU, PO Box 352, Winnipeg, Manitoba, Canada R3C 2H6, tel 204-694-0667.



*President:* Richard L. Baldwin, W1RU  
*Vice President:* Michael J. Owen, VK3KI  
*Secretary:* Larry E. Price, W4RA  
*Assistant to the Secretary:* Naoki Akiyama,  
N1CIXJH1VRQ

*Regional Secretaries:*  
John Allaway, G3FKM  
Secretary, IARU Region 1  
10 Knightlow Rd  
Birmingham B17 8QB  
England

Alberto Shalo, HK3DEU  
Secretary, IARU Region 2  
9 Sidney Lanier La  
Greenwich, CT 06830  
USA

Masayoshi Fujioka, JM1UXU  
Secretary, IARU Region 3 Association  
PO Box 73, Toshima  
Tokyo 170-91  
Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

## Guatemala Hosts Region 2 Executive Committee

Guatemala City was the site of the IARU Region 2 Executive Committee meeting February 11-12. In attendance were all nine EC members: YV5BPG, President; YN3FI, Vice President; HK3DEU, Secretary; VE3CDM, Treasurer; and area representatives VP9IM, W4RH, HI8LC, CP5EC and LU4AH. Also in attendance was the Secretary of IARU Region 1, G3FKM.

New to the Region 2 EC is Manuel Winer, LU4AH. Mr Winer is the President of the

Radio Club of Argentina and was appointed to complete the term of Carlos Kaufman, LU9CN, who passed away last fall.

Preparations for the triennial Region 2 Conference in Orlando, September 4-8, and for a possible ITU WARC in the 1992 time frame, dominated the agenda of the meeting. Subjects likely to be brought up at the Region 2 Conference, including band plans and awards credits on 10 MHz, were reviewed. Other topics included review of the application of the Aruba Amateur Radio Club

for IARU membership; the application was approved for forwarding to the Administrative Council and will be voted upon by the member-societies.

The meeting's location made it possible for the Executive Committee members to meet with the presidents of the IARU member-societies of Guatemala, Honduras, Mexico, Nicaragua and El Salvador to discuss their concerns and to urge their attendance at the Orlando conference.

### AMENDMENTS TO IARU CONSTITUTION ADOPTED

The IARU member-societies have voted to adopt amendments to four Articles of the IARU Constitution, and to the Bylaws. A proposal to amend a fifth Article failed to attract sufficient support for adoption.

The adopted Constitutional amendments, to Articles II, III, V, and VI, clarify certain parts of the present IARU Constitution which has been in effect since 1984. The amendments were drafted to conform to the principle that the language used should be clear, unambiguous and consistent, and used bearing in mind that English is not the first language of many of those who will use the documents. A detailed procedure for nomination and ratification of the IARU President and Vice President is now included in the Constitution, as is the authority of the Administrative Council to establish bank accounts in the name of the IARU. A formal means of recording an abstention on an IARU proposal will now be available to member-societies.

The proposal which failed to win the necessary two-thirds approval would have inserted a definition of "Radio Amateur" into the IARU Constitution. Several member-societies concluded that the proposed definition did not achieve its intended objective and declined to support it.

The amendments to the IARU Constitution and Bylaws became effective May 9, 1989.

### W1RU REELECTED IARU PRESIDENT; VK3KI NEW VICE PRESIDENT

By unanimous vote of the 75 member-societies casting ballots, the nominations of Richard L. Baldwin, W1RU, and Michael J. Owen, VK3KI, to serve as IARU President and Vice President, respectively, have been ratified. The term of office is five years. Mr Owen's election marks the first time that a radio amateur from outside North America

has served as an officer of the IARU.

Mr Baldwin has served as IARU President since 1982. Previously he served as IARU Secretary from 1976 to 1982 while employed as General Manager of the ARRL. While on the ARRL staff, he spent 15 years in preparation for the 1979 World Administrative Radio Conference (WARC) of the International Telecommunication Union. During his previous term as IARU President, Mr Baldwin inaugurated the teaching of training courses in Amateur Radio Administration for staff members of telecommunications administrations in developing countries under the auspices of the ITU and the US Telecommunications Training Institute. He has traveled extensively and has attended every IARU Regional Conference held in recent years. Mr Baldwin regularly attends meetings of the International Telecommunication Union in Geneva in order to represent the Amateur Radio Service.

Mr Owen, presently residing in London, England, has been involved in IARU affairs for 20 years. He was Federal President of the Wireless Institute of Australia for four years. He served as a Director of the IARU Region 3 Association from its inception and was a member of IARU President Noel Eaton's ad hoc WARC Advisory Committee in the years prior to the 1979 WARC. At the 1978 Special Preparatory Meeting of the International Radio Consultative Committee (CCIR) and at the 1979 WARC, Mr Owen was a member of the Australian delegation by nomination of WIA as representing the Amateur and Amateur-Satellite Services. He has served, on occasion, as the Region 3 representative on the IARU Administrative Council between 1983 and 1986. Mr Owen is presently the resident partner for the London office of his Australian law firm. He is also licensed as G3ZML and ZL1BGY.

Mr Owen replaces Carl L. Smith, W0BWJ, as IARU Vice President. Mr Smith is retiring after long service in the office.

On being notified of his reelection, Mr Baldwin observed: "Michael and I are grateful for the mandate given to us by the member-societies to lead them during what may be a critical period for Amateur Radio. Another ITU WARC with frequency allocation authority may be scheduled for as early as 1992. If so, Amateur Radio will face even more difficult challenges than those we faced successfully in 1979."—Larry E. Price, W4RA, IARU Secretary

## Strays



### RUSSIAN PHRASE BOOKLET UPDATE

Several members have written to express concern over the June 1989 Stray entitled "Russian Phrases for Amateur Radio" which offered a booklet "free of charge" containing information to help amateurs better communicate with their Soviet colleagues. What they received was a postcard explaining that the response was overwhelming and amateurs should send \$5 to the Beyond War Foundation to help defray expenses. A telephone call to the ham who placed the Stray, Len Traubman, W6HJK, helped to clarify the matter. Len explained was that he was inundated with over a 1000 requests for the booklet. He said the first 300 were sent out for free, but it would be impossible to keep the project self-sustaining unless the foundation requested donations. He added that he encourages people to make copies of the booklet just to get the information out. Len said that the Beyond War Foundation is a nonprofit educational foundation set up to communicate to people the obsolescence of war as a means of resolving conflict and to build global cooperation through dialogue. The Foundation plans to produce a cassette tape to coincide with the booklet.

## The YLs of the International Mission Radio Association—Part 2

Sr Alverna O'Laughlin, WA0SGJ, learned about IMRA from Fr Aidan Schaefer, W8BPQ, who wrote to tell her about an accident at a mission in Honduras. A worker had fallen from a scaffold used at Fr Schaefer's village church, and the seriously injured victim was sent to St Mary's Hospital in Rochester, New York, where Sr Alverna was working in the rehabilitation unit. WA0SGJ combined profession and hobby to keep a weekly schedule through the IMRA net so the young man could speak with his mother in Honduras.

In 1980, WA0SJK became the full-time educational service coordinator for the Handi-Hams, a nationwide group that helps persons with disabilities become Amateur Radio operators. Her varied activities include selling used equipment at hamfests, attending Handi-Ham sponsored radio camps in Minnesota and California, presenting the Handi-Ham System to service groups, sending out study materials to members and encouraging them to study code, looking for a local amateurs to assist students with putting up antennas and congratulating students via radiograms on their recent upgrades. Helping people through Amateur Radio will continue to be a high priority for Sr Alverna.

Ruth Paz, HR2RP, is known internationally for her humanitarian efforts on behalf of the people of Central America. She works primarily with the Leonardo

Martinez Hospital and the Hogar Emmanuel Orphanage. HR2RP serves as a liaison between the facilities that need medical supplies and assistance, and the service providers.

HR2RP became involved with a group of surgeons from California and Florida called Interplast who perform free reconstructive surgery for people in Third World countries. The physicians treat severe burns and congenital defects and provide speech therapy. Ruth arranges for the patients to stay in private homes, takes care of the necessary legal paperwork, obtains passports for the children and accompanies them on trips to the United States for further treatment.

Today she works with the Heal the Children Foundation as well as the Shriners Hospital in Shreveport, Louisiana. Ruth provides communication between the children in the States and their parents in Honduras. On Sunday afternoons, Shrine member Gayle Hamilton, N5OAF, brings his rig to the hospitals so that Ruth can reunite children with their families.

Interplast, HR2RP, and Amateur Radio successfully combined to assist an eight-year-old Honduran girl who was suffering from severe burns on both legs and required extensive skin grafts in a US hospital. Through a phone patch with Bill Barry, WB4ELX, in Ft Lauderdale, and Ruth in Honduras, the child was cheered by being able to talk with her father.

Ruth has received many prestigious awards for her outstanding commitment to public service.

Roxann Moss, NO9W, had been married only four months when her OM, John, NO9V, went to Vietnam. While there, John kept in touch with her through MARS. While at a hamfest in September 1985, Roxann saw literature about the IMRA, and the idea of talking to missionaries inspired her to become involved. Once she began, Roxann put all her efforts into her studies. In March of 1986, she received her Novice ticket, and three months later, her Extra.

Today, Roxann teaches 4th- and 5th-grade Sunday school classes and uses Amateur Radio to let the children talk to missionaries. She has helped the children to raise nearly \$4500 to send to their correspondents. The missionaries express their gratitude by radio, informing the children of what their generosity has done for the people in their mission.

Roxann is grateful to the IMRA and all the people on the net. "They have helped me to become a better operator with their patience. It is good to know you are aiding someone even in a small way," said Roxann. What is important to her about Amateur Radio is the service aspect—doing for other people. "IMRA is like one big family," she adds, "I feel close to the people on the net and would like to see more YLs on the net."



Besides her service to the IMRA, Sr Alverna O'Laughlin, WA0SGJ, is the education service coordinator for Handi-Hams. (photo courtesy of WB2GQW).



Ruth Paz, HR2RP, acts as liaison between Interplast, a group of surgeons who perform reconstructive surgery, and Third World children.



Roxann Moss, NO9W, has her Sunday school classes talk to missionaries via ham radio. Her classes have raised \$4500 to aid the people of the missions. She was recently elected IMRA corresponding secretary.



It is with deep regret that we record the passing of these amateurs:

W1BA, Arthur W. Ferguson, Bradenton, FL  
NICGE, Paul T. Reagan, Swanzy, NH  
WA1FSD, Michael C. Boryszewski, Whitman, MA  
KAIGDO, Elliot P. Cogswell, Peterborough, NH  
KQIG, Mervin A. Holmberg, Titusville, FL  
W1HYZ, Joseph E. Kehoe, Melrose, MA  
W1KUO, John W. Baldwin, New Haven, CT  
KA1QF, John P. Hirtle, Greenland, NH  
KA1TJZ, Thomas W. Swedis, Worcester, MA  
WA2FMB, Ira Zwillich, Yonkers, NY  
K2GMP, William E. Carman, Eagle Bay, NY  
W2GOR, Shirley H. Davis, Elmira Heights, NY  
WA2HAX, Margaret M. Timmons, Hilldale, NJ  
W2IUI, Francis M. Kendall, Hatboro, PA  
WB2KQX, Corwin C. Denny, West Fulton, NY  
W2MPY, Richard E. Keck, Jamesburg, NJ  
K2RUP, Edward F. Koell Kapaa, HI  
WA2SWG, Vincent L. O'Brien, Garden City, NY  
K2UDZ, Joseph A. Verdone, Edenton, NC  
NO2U, Raymond Timmons, Hilldale, NJ  
W2UXL, Johanna D. Conrad, East Brunswick, NJ  
K2YEH, William Korb, Chittenango, NY  
WA2YHF, Richard E. Allen, Centerport, NY  
K2YF, William G. Corey, Sr Binghamton, NY  
KW3C, William J. Macon, Beaver, PA  
WA3EVQ, Warren E. Stitzer, Fleetwood, PA  
N3GTJ, James L. Machamer, Ocean View, DE  
KC3JF, Robert W. Allen, Toledo, OH  
WA3MAQ, William G. Schwartz, Reading, PA  
VE3OGL/W4, David Thiessen, St Petersburg Beach, FL  
K3OZL, Charles G. Peterson, Penlynn, PA  
KA3REI, Homer J. Morrison, Tatamy, PA  
W4CEN, Tom Brandon, Charlotte, NC  
K4CHC, Kingsley W. Given, Dunedin, FL  
K4DRZ, Causby Gann, Anniston, AL  
N4EHR, Lawrence S. Poore, Knoxville, TN  
W4GNR, Howard E. Street, Orlando, FL  
W4GU, James A. Mayberry, Jr, Wesley Chapel, FL  
W4IER, Seymour S. Rogers, Greensboro, NC  
W4JFX, Joseph S. Brownstein, Louisville, KY  
K4KCR, Arthur H. Fullmer, Cape Coral, FL  
W4NKS, Jesse A. Maynard, Huntsville, AL  
W4PPQ, Katherine M. LePine, Miramar, FL  
K4VSW, Gerow F. Carr, Atlanta, GA  
W4WT, Robert E. Tucker, Sumter, SC  
K4ZKT, Herschell V. Carr, Jonesboro, GA  
WB4ZXD, George Gottfried, Tamarac, FL

KB5BFR, Raymond E. Nichole, Long Beach, CA  
K5DGX, James W. Stokes, Harlingen, TX  
K15H, Claude S. Ramzel, Socorro, NM  
WB5TBE, Franklin W. Harvey, Shawnee, OK  
W5TXQ, Thomas N. Paxton, Dallas, TX  
W6AVG, R. E. Winenow, San Carlos, CA  
W6AZM, Charles V. Harlow, Sr, Long Beach, CA  
WD6BLH, Clifford Wishon, Modesto, CA  
WA6CIM, Horace G. Lawrence, Yucaipa, CA  
W6CIT, Gordon R. Elliott, Redwood City, CA  
W6DUE, Colin C. Brown, San Clemente, CA  
WB6EGQ, Thomas B. Finney, Paso Robles, CA  
W6GYA, Orville W. Baldock, Vallejo, CA  
N6HUI, D. H. Arnette, Yucaipa, CA  
W6HYO, Robert J. Stilwell, Sacramento, CA  
KA6JJA, William F. Ell, Pasadena, CA  
K6JB, W. R. Stangel, Lakeport, CA  
KD6KN, Robert J. Hendricks, Santa Barbara, CA  
K6MXO, Thomas R. Rivera, Lompoc, CA  
W6NDS, Eugene N. Clark, San Mateo, CA  
W6NX, Frank J. Quement, San Jose, CA  
KB6PHY, Amy C. Hilton, Moreno Valley, CA  
WB6RHP, Warren V. Klinger, Jenner, CA  
K6SBI, Curtis A. Knight, Salyer, CA  
W6ST, William S. Barnard, Flintridge, CA  
K7CZN, Albert J. Johnson, Billings, MT  
W7EJQ, Stewart J. Popp, Woodburn, OR  
N7FWV, Lawrence E. Shane, Spokane, WA  
W7IKZ, Tony L. Mannion, Phoenix, AZ  
WA7RSQ, Charles J. McNelly, Mine Mile Falls, WA  
W7VMB, Melvin S. Majerus, Lewistown, MT  
W8VZT, Charles N. Raney, Renton, WA  
K8AF, Colvin C. Cooley, Kearsage, MI  
W8ECX, Landon Fickel, Danville, CA  
W8GVC, John W. Hinton, Bangor, MI  
W8IYT, John E. Tierney, Detroit, MI  
W8JLQ, Howard F. Zeh, Temperance, MI  
\*K8OZ, Jerry C. Spencer, Castalia, OH  
W8PBZ, Pete Marino, Broadview Heights, OH  
N8RG, Robert E. Grable, Springfield, OH  
W8VNJ, Paul L. Miller, North Fort Myers, FL  
WE8VTL, Robert C. Holland, Bowling Green, OH  
KB8YU, Robert B. Sankey, Bedford, OH  
KA9BGO, Arthur Held, Northbrook, IL  
KA9BUC, Donald J. Juleen, Sturgeon Bay, WI  
W9BY, Edwin M. Hinsdale, Indianapolis, IN  
WD9CHZ, Michael J. Rund, Villa Grove, IL  
KA9EPS, Edgar C. Cook, Jr, Steward, IL

W9FWD, Kenneth E. Emmons, Madison, WI  
WA9FYB, Matthew Gresak, Chicago, IL  
W9IBA, John J. Antalek, Glenview, IL  
W9KLK, George A. Greeson, Jr, West Allis, WI  
W9KZ, John L. Tavener, Dixon, IL  
WB9LKO, Rolla D. Greenwood, Flora, IL  
W9RPF, Don F. Lavery, Cicero, IL  
W9SUH, Edward D. Jurasinski, Franklin, WI  
W9ZPQ, Joseph R. Sperath, Chicago, IL  
\*N0AAR, Paul H. Schuler, Durango, CO  
KB0HG, Jonathan P. Whitney, Cambridge, MN  
NV0N, Thomas D. Wright, Littleton, CO  
W0NSD, Arthur H. Bidleman, Coffeyville, KS  
WA00OU, Bernard W. Schultz, St Paul, MN  
W0OPL, William F. Gilbert, Auburn, NE  
W0PHY, Lewis A. Stapp, Hays, KS  
W0ZRU, Elbert W. Goddard, Joplin, MO  
OKISE, Frantisek Sedlacek, Praha, Czechoslovakia  
ZL2FF, N. M. Roberts, Wellington, New Zealand

\*Life Member, ARRL

Notes: 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.

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. Canadian reports should be sent to the CRRL HQ address on page 9.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111.

## 50 Years Ago

August, 1939

□ That odd-looking structure of two-by-fours and cross braces atop the Hq. building on LaSalle Road is for antenna and feedline experimentation by our technical staff.

□ Major Armstrong's experimental f.m. broadcasting projects are well under way, and U. of Conn. professor Dan Noble (WICAS) shows us the fundamentals of the new system and what advantages it might hold for amateur communication.

□ A two-band, three-element beam? W9TB licks the problem by using different stubs and feed lines when switching from 20 meters to 10.

□ More and more groups and individuals are building portable and emergency gear, and there are plenty of ideas on small transmitter construction and design in QST's symposium of five variations in compact equipment design.

□ Some tidbits from the League's "perpetual" questionnaire survey of members: Our average age—29.5. Average power input used—175 watts. (A separate survey shows DXCC members average 370 watts.) Two-thirds of receivers are manufactured, but 96% of transmitters are still home-built.

□ QST highlights the outstanding career of Dr. Arthur E. Kennelly, a recent "silent key." A Harvard and M.I.T. professor best known for his development of the ionized-layer theory of wave

propagation, he was a director of the League in the early 20s.

□ "Polly-sty-reen" is the pronunciation of a new solid dielectric, the acknowledged leader in low-loss materials. W1DSK details for us the electrical and mechanical characteristics of the new polymer.

□ Five meters put on a good DX show again this summer, with 1000-mile contacts not unusual. Interest is increasing also in 112 Mc. work, but ranges are generally in the 50- to 75-mile area.

□ One of F.C.C.'s radio inspectors has an appropriate response to any B.C.L. who brags that his receiver will "bring in positively everything." He says, "The mark of a good receiver is not what it will bring in, but what it will leave out."

## 25 Years Ago

August, 1964

□ With high-speed automated record-communication devices in greater and greater use (e.g., RTTY), especially since World War II, there has been talk of phasing out hand c.w. capability as a requirement for an amateur license. The Editor notes that a recent Department of the Army study concluded that c.w. capability "continues to be required by all tactical forces to assure effective communications."

□ Yippee!! We have been successful in winning approval of the Post Office Department for the

issuance of a commemorative postage stamp honoring amateur radio operators. We're not elated with the design chosen, but at least we have the stamp, to be issued later in the year, the League's 50th.

□ Hopefully Oscar III will also appear before yearend. W6SAL outlines how this first relay amateur satellite can be used for DX work on 144 Mc. Design problems were considerable, since both input and output channels have to be within the 144-146 Mc. limits of the worldwide band.

□ An oscilloscope pattern of a sideband signal is notably different than that of the usual amplitude-modulated r.f. wave. W1DF explains the variations, and how we should interpret the patterns we see on the screen.

□ Toroidal ferrite cores are being used in more and more amateur applications. W2IMU found advantages of both compactness and efficiency in his broad-band balun, a wide-band transformer for low-impedance operation.

□ The Hudson Amateur Radio Council is hard at work preparing for our national convention in New York City later in the month. Senator Barry Goldwater, K7UGA, will be the main banquet speaker.

□ The Monimatch is a most useful instrument for transmission-line measurements, but K6CYG points out that there is still confusion about standing-wave ratio, and helps us avoid some common circumstances in which the unit may give misleading information.

□ Public TV in New York City has an introductory course on "Electronics at Work," which recommends the ARRL Handbook as one of its texts.—W1RW

# Rules, September VHF QSO Party

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized frequencies above 50 MHz.

2) **Contest Period:** Begins 1800 UTC Saturday, Sep 9, and ends at 0300 UTC Monday, Sep 11.

### 3) Categories

(A) **Single Operator:** One person performs all operating and logging functions.

(1) **Multiband.**

(2) **Single Band:** Single-band entries on 50, 144, 220, 432, 902, 1296 and 2304-and-up categories will be recognized both in QST score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) **Single Operator, QRP Portable:** Run 10-W output or less using a portable power source from a portable location. The intent of this rule is to encourage operation from "remote" locations, not to have home or fixed stations run low power.

(C) **Multioperator:** Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1,000 feet).

4) **Exchange:** Grid-square locator (see Jan 1983 QST, p 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal report is optional.

### 5) Scoring

(A) **QSO points:** Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count three points for each 902- or 1296-MHz QSO. Count four points for each 2.3-GHz-or-higher QSO.

(B) **Multiplier:** The total number of different grid squares worked per band. Each 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) **Final score:** Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example).

### 6) Use of FM

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the ARRL Repeater Directory may be used for contest purposes.

### 7) Miscellaneous

(A) **Stations may be worked for credit only once per band from any given grid square.**

## VHF-UHF-EME LOG

log sheet 1 of 2

CALL USED W6CPL

ARRL SECTION or COUNTRY LAX

50 QSOs per side  
Number each new multiplier as worked

FREQ.	MODE	DATE/TIME UTC	STATION WORKED	COMPLETE EXCHANGE		LIST NEW MULTIPLIERS	POINTS
				SENT	RCVD		
144	AS	9/9/89 1415	KALFAY	DMA4	DM03	DM03 1	1
		17	NGRMS		DM14	DM14 2	2
		18	NGNVE		DM14		1
		23	BELO		DM03		1
		26	KEMER		DM04	DM04 3	3
		30	WAGRAY		DM14		1
		31	KLOXY		DM08	DM08 4	4
		32	WALHLD		DM08		1
		43	WABOTE		DM13	DM13 5	5
		47	WABREL		DM03		1
		52	W6BCN		DM04		1

Properly completed sample log sheet.

regardless of mode. This does not prohibit working a station from more than one grid square with the same call sign. Such a roving station, however, must submit a separate entry for each grid square from which operation takes place. In this situation, the entrant may opt to waive rule 7 (C) and use a single different call sign from each different grid square. Crossband QSOs do not count. Aeronautical mobile contacts do not count.

(B) Partial QSOs do not count. Both calls, the full exchange and acknowledgment must be sent, received and logged.

(C) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by the FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) Only one signal per band (6, 2, 1 1/4, etc) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified for contacts, equipment should be capable of real communications (ie, able to communicate over at least 1 km).

(F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(G) A station located precisely on a dividing line between grid squares must select only one as the location for exchange purposes.

### Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (× 1)	25	10
144	40 (× 1)	40	20
220	10 (× 2)	20	5
432	15 (× 2)	30	10
1296	6 (× 3)	18	3
Totals	96	133	48

Final score = (QSO points) × (total no. grid squares): (6384 = 133 × 48).

A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmission (eg, laser) and employing at least one stage of electronic detection on receive.

(I) Marine Mobile (and Maritime) entries will be listed separately as "Marine Mobile" in the score listings and compete separately for awards.

### 8) Reporting

(A) Entries must be postmarked no later than 30 days after the end of the contest (Oct 11, 1989). No late entries can be accepted. Use ARRL official forms or a reasonable facsimile.

(B) Logs must indicate time in UTC, bands, calls and complete exchanges. Multipliers should be marked clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

### 9) Awards

(A) Single operator

(1) Top single operator in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432, 902, 1296 and 2304-and-up categories) in each ARRL Section where significant effort or competition is evident. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.) For example, if WB0TEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator Section leader and endorsement stickers for 50 and 220 MHz.

(B) Top single-operator QRP portable in each ARRL Section where significant effort or competition is evident.

(C) Top multioperator score in each ARRL Section where significant effort or competition is evident. Multioperator entries are not eligible for single-band awards.

10) **Condition of Entry:** Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications:** See Jan 1989 QST, p 104.

## AUGUST

1

**West Coast Qualifying Run**, 10-35 WPM, at 0400Z Aug 2 (9 PM PDT, Aug 1). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

5

**YL/OM Summer SSB Sprint**, see Jul *QST*, p 94.

5-6

**ARRL UHF Contest**, Jul *QST*, p 93.

**YO DX Contest**, sponsored by the Romanian AR Federation, from 2000Z Aug 5 until 1600Z Aug 6, 80-10 meters, phone and CW. No cross-mode QSOs. Classes: Single operator, single band; single operator, multiband; multioperator, multiband. Exchange signal report and ITU zone. YO stations will send two letters indicating their county. Count 2 points per QSO with own continent, 4 points for different continent and 8 points for YO stations. Multiply by sum of YO countries and ITU zones worked per band. Mail entries by Sep 3 to RARF, PO Box 05-50, R-76100 Bucharest, Romania.

**Ten-Ten International Net Summer Phone QSO Party**, see Jul *QST*, p 94.

11

**WIAW Qualifying Run**, 10-35 WPM at 0200Z Aug 12 (10 PM EDT, Aug 11). Transmitted simultaneously on 1.818 3.58 7.047.5 14.047.5 21.08 28.08 50.08 147.555 MHz. See Aug 1 listing for more details.

12-13

**European DX Contest**, CW, see Jul *QST*, p 94  
**New Mexico QSO Party**, see Jul *QST*, p 94.

13

**QRP ARCI Summer Daze Sprint**, see Jul *QST*, p 94.

19

**SARTG World Wide RTTY Contest**, sponsored by the Scandinavian Amateur Radio Teleprinter Group, from 0000-0800Z and 1600-2400Z Saturday, Aug 19, and 0800-1600Z Sunday, Aug 20. Classes: Single op, all band; single op, single band; multiop, single TX, all bands; SWL stations. Use normal frequencies on 80, 40, 20, 15, 10. Exchange RST and QSO number starting with 001. Points: Your own country 5 pts; other countries, same continent 10 pts; other continents 15 pts. Work each station only once per band for point and multiplier credit. Multipliers are *DXCC Counties List* and each call district in Australia, Canada and US. Total score is sum of all points  $\times$  multipliers. Awards. Send complete logs by Oct 10 to SARTG Contest Manager, Bo Ohlsson, SM4CMG, Skulsta 1258, S-710 41 Fellingsbro, Sweden.

19-20

**ARRL 10 GHz Cumulative Contest**, Jun *QST*, p 102.

**SEANET Contest**, phone, see Jun *QST*, p 103.

**KCJ Single-Operator CW Contest**, see Jul *QST*, p 95.

**New Jersey QSO Party**, see Jul *QST*, p 95.

**Missouri QSO Party**, sponsored by the Northwest St Louis ARC, from 2100Z Aug 19 until 0000Z Aug 21. No time limit or power restrictions. The same station may be worked per band mode. Mobiles can be worked from more than one county. Exchange signal report and state/province/ or country

(Missouri stations give county). Missouri stations count 1 point per QSO for fixed or portable stations; 2 points for Missouri mobile QSOs. Multiply points by number of states/provinces/countries. Non-Missouri stations count 2 points each Missouri QSO; 3 points each Missouri mobile. Multiply points by number of counties worked (possible 115). Awards. Suggested frequencies: CW—3540 7040 14040 21040 28040; phone—3940 7240 14280 21340 28480. QSLs for club station K0AXU go via K0GSV. Send SASE for results. Mail logs by Sep 30 to Rich Zysk, K0GSV, 3457A Humphrey St, St Louis, MO 63118.

26-27

**All Asian DX Contest**, CW, see Jun *QST*, p 103.

29

**WIAW Qualifying Run**, 10-35 WPM, at 2000Z Aug 29 (4 PM EDT, Aug 29). See Aug 1 listing for more details.

## SEPTEMBER

3

**LZ-DX Contest**, sponsored by the Bulgarian Federation of Radio Amateurs, from 0000Z-2400Z Sep 3. CW only. Work stations once per band. Entry classes: A—single op, multiband; B—single op, single band; C—multiop, all band; D—SWL. Exchange signal report and ITU zone. Suggested frequencies: 3.510-3.560 7.000-7.040 14.000-14.060 21.000-21.080 28.000-28.100 MHz. Count six points per QSO with LZ stations, one point per QSO with stations on the same continent (including the same country) and three points per QSO with stations on other continents. Separate logs required for each band. Multiply by the sum of different ITU zones worked per band for final score. Mail logs within 30 days to Central Radio Club, PO Box 830, Sofia 1000, Bulgaria, Euope.

6

**West Coast Qualifying Run**

9

**WIAW Qualifying Run**

9-10

**European DX-Contest**, phone, see Jul *QST*, p 94.

9-11

**ARRL September VHF QSO Party**, this issue, p 80.

10

**North American Sprint**, CW, sponsored by the National Contest Journal, from 0000Z to 0400Z Sep 10 (SSB Sprint Sep 17). Single operator only. No helpers or spotting nets. No cross-mode. Suggested frequencies: CW—3.540 7.040 14.040; phone—3.900 7.225 14.280. Work same station once per band. For exchange, send other stations call/your call/your serial number/name/location (state/province/country). Only valid 2-way contacts count and logging must begin with serial number one (001). Scoring: Multiply total valid contacts by the sum of the states/provinces/NA countries to get final score (do not count US or VE as countries). KH6 is neither state nor country. The eight VE multipliers are Maritime (VE1, VO1 and VO2), VE2-7, and Yukon-NWT (VY1 and VE8). Non-North American countries do not count. Send CW logs to Trey Garlough, WN4KKN, 7609 Hardy Dr, Austin, TX 78757. Send phone logs to Rick Niswander, K7GM, 910 West Claremont, Phoenix, AZ 85013. Send summary, logs, dupe sheets no later than 30 days after Sprint.

16-17

**ARRL 10-GHz Cumulative Contest**, Jun *QST*, p 102.

17

**North American Sprint**, SSB, see Sep 10 listing.

27

**WIAW Qualifying Run**

### Standard Contest Guidelines

- 1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.
- 2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.
- 3) Cross-band, cross-mode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.
- 4) Your log should be checked carefully for duplicate QSOs; and if more than 200 QSOs are made, dupe sheets should be included with your entry.
- 5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.
- 6) Avoid standard net frequencies.
- 7) International contests generally offer awards to top scorers from each US call area and each country, state QSO parties to each state/province.
- 8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

**Deadline:** The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **September 1** to make the **November** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

## NCJ NATIONAL CONTEST JOURNAL

*NCJ* features articles by top testers, letters, hints, statistics, scores and much more. Big gun or small, the *NCJ* provides you with a valuable source of information on the exciting world of competitive radio.

The July/August issue includes:

- NP4A: A 3-Element 80-Meter Dream
- 1988 CQ WW CW at VP2MW
- USA Single Operator Championship
- *NCJ* Subscribers—Who are You?
- *NCJ* Profile—HB9AMO

Other features include columns on propagation, VHF/UHF contesting, contest tips, state QSO parties, and USSR Tidbits.

*National Contest Journal* is edited by Tom Taormina, K5RC, PO Box 800228, Houston, TX 77280-0228, and is published by the ARRL. Letters, articles, club newsletters and other editorial material should be submitted directly to the *NCJ* editor.

Subscription rate for 6 issues (one year) is \$10. There are additional postal surcharges for mailing outside the US; write to HQ for details. *NCJ* subscription orders and changes of address should be sent to *NCJ* Circulation, ARRL, 225 Main St, Newington, CT 06111

# Special Events

Conducted By Phil Rice, WB9JKI  
Assistant Contest Manager

**South Dakota:** South Dakota hams will operate a special-event station from **May 10 through Sep 4** from a horse-drawn covered-wagon train to commemorate the state's Centennial. Suggested frequencies: CW—40 kHz from the bottom end of all bands 80-10; phone—3.890 7.265 14.265 18.150 21.340 24.970 28.340. They will also check in SD nets at 1300Z on 3959.5; 1715Z/2300Z on 3870.5. County Hunters should check 14.066 and 14.336 throughout the day. Send QSL and SASE to South Dakota Centennial Wagon Train, PO Box 91, Sioux Falls, SD 57101.

**Ottawa, Ontario, Canada:** The Royal Canadian Mounted Police ARC will operate VE3RCMP from **Jun 23 until Aug 23**. This operation commemorates the 50th anniversary of RCMP Telecommunications. There will be daily operation on all bands/modes and by schedule. Send QSL and SASE to VE3RCMP, 1200 Vanier Pky, Ottawa, ON K1A 0R2, Canada.

**Lockport, New York:** The Lockport ARA will operate a special-events station to celebrate the 60th Anniversary of the LARA organization in western New York. Operation will take place **Aug 3-5** in the Novice 10-meter phone band and General bands. For QSL, send QSL and 9 × 12-in SASE to W2RUI, 199 Ontario St, Lockport, NY 14094.

**San Benito, Texas:** The San Benito ARC will operate WA2VJL from 1500-0300Z daily **Aug 4-6** to commemorate the Dog Days of Summer. Exchange local weather conditions (temperature, humidity, etc). Suggested frequencies: phone—21.360 28.325; RTTY—14.095. For certificate send no. 10 SASE and local weather report to San Benito ARC, Attn: Brenda Ryan, PO Box 1382, San Benito, TX 78786-1382.

**York, Pennsylvania:** The York ARC will operate W3EDU from 1300-2300Z **Aug 5** to celebrate York County Parks Summer Community Days. Operation will be phone and CW. For QSL, send QSL to Millard J. Martin, NN3Z, 2070 Thelon Dr, York, PA 17404.

**Saginaw, Michigan:** The Saginaw Valley ARA will operate K8DAC from 1400-2300Z **Aug 5** in conjunction with the 15th Annual Downtown Saginaw Ethnic Festival. Suggested frequencies: phone—General portion of 20, 15, 10, plus Novice 10 meter. For certificate send QSL and no. 10 SASE for folded or 9 × 12-in SASE for unfolded, to K8DAC, SVARA, PO Box 1783, Saginaw, MI 48605.

**Abingdon, Virginia:** The Mountain Empire ARS will operate N4AKZ from 1200-2400Z **Aug 5** to commemorate the 41st Annual Virginia Highlands Festival. Suggested frequencies: 7.275 14.250. For certificate, send QSL and SASE to Phil Berry, N4AKZ, 356 Monticello Dr, Bristol, VA 24201.

**Mobile, Alabama:** The Mobile ARC will operate W4LAX from 1400-2200Z daily **Aug 5-6** to commemorate the 125th anniversary of the Battle of Mobile Bay. Suggested frequencies: phone—3.920 7.240 21.300 28.400. For certificate send large SASE to Rick Wiles, 124 McKeough St, Saraland, AL 36571.

**Titusville, Pennsylvania:** The Oil Creek Valley RS will operate K3HWL from 1400-2300Z daily **Aug 5-6** at the site of the historic Perry Street railroad station in commemoration of the Oil Creek & Titusville Railroad. Suggested frequencies: phone—7.250 14.275 28.350; CW—3.710 3.675 7.110. Other frequencies possible. For QSL, send QSL and no. 10 SASE to Robert Myers, K3HWL, RD 1 Box 143-G, Titusville, PA 16354.

**Wilber, Nebraska:** The Crete ARC will operate K0JQJ during Czech Days from 1400-2300Z daily **Aug 5-6** in the lower 25 kHz of the 40-meter phone band. For certificate, send SASE to Don Duckett, Rte 1 Box 19, Wilber, NE 68465.

**Manitowoc, Wisconsin:** The Mancorad RC of Manitowoc will operate W9DK from 1500Z **Aug 5** until 0200Z **Aug 6** and from 1500Z **Aug 6** until 0200Z **Aug 7** from the WW II submarine *Cobia* to celebrate Maritime Week. Suggested frequencies: 7.250 14.250 21.350 28.450. For certificate, send

QSL and SASE to Mancorad RC, PO Box 204, Manitowoc, WI 54221-0204.

**Stratford, Connecticut:** The Greater Bridgeport ARC will operate W1RJI beginning at 1300Z **Aug 5-6** both days to commemorate the 350th anniversary of the town of Stratford. Suggested frequencies: 14.300 28.350. Operation will be in Booth Park on Sunday. The public is welcome. For certificate send QSL and SASE to Greater Bridgeport ARC, c/o Mildred Blotney, 11 Pearl Hill St, Milford, CT 06460.

**Trois-Rivieres, Quebec, Canada:** L'Association Radio Amateur de la Mauricie, Inc will operate CJ2MO from **Aug 10-20** during the World Youth Baseball Championship. Operation will be on 20, 15, and 10-meter phone. For special QSL, send QSL and SASE to VE2MO, PO Box 1473, Trois-Rivieres, PQ, Canada G9A 5L6, or VE2AJD via the *Callbook*.

**Smith Island, Maryland:** The Nanticoke ARC will operate KW3Z from 1600Z **Aug 11** to 1600Z **Aug 13** from this island in the lower Chesapeake Bay. Operation will be in the lower portions of the Advanced bands, CW and phone, 80-10 meters. QSL via Patrick Ryan, KW3Z, 905 Short Ln, Seaford, DE 19973.

**Lower Lake, California:** The Lake County ARS will operate KB6ALT from 1700-2300Z **Aug 12** from the Anderson Marsh Interpretive Association's Annual Blackberry Festival. Operation will be 7.225 7.300, 28.300-28.500 and call-in on 146.775. For QSL, send SASE to KB6ALT, PO Box 897, Kelseyville, CA 95451.

**Colorado:** The Arapahoe RC will mount their 5th annual ham radio expeditions to Colorado's 14,000-foot mountain peaks from 1600-1800Z **Aug 12**. CW on 14.050-14.060 with participants calling CQ 14 and phone around 14.285 calling CQ Fourteeners. The number of ops and their time on the air will depend on the weather. QSL direct or via K9AY, 7318 S Birch St, Littleton, CO 80122.

**Lebanon, Pennsylvania:** The Lebanon Valley Society of RA will operate from the Bologna Fest from 1300Z **Aug 12** until 2100Z **Aug 13** celebrating Lebanon Bologna. Operation will be on the lower end of phone 80-10. Send a no. 10 SASE or larger for unfolded certificate to Robert Sweigert, NG3I, 15 Plymouth Dr, Jonestown, PA 17038.

**Mt Davis, Pennsylvania:** The Somerset Co ARC will operate N13D from 1800Z **Aug 12** until 1800Z **Aug 13** from atop Mt Davis, the highest spot in Pennsylvania. Operation will be in the lower 50 kHz of the Novice 10-meter phone band and General bands. For certificate, send QSL and SASE to N13D, RD 2 Box 71, Somerset, PA 15501.

**Ashford, Connecticut:** The Southcentral Connecticut ARA will operate W1GB **Aug 12-13** all day in the General portion of 80-15 meters and the Novice portion of 10-meter phone from Paul Newman's "Hole in the Wall Gang" camp for children with cancer and blood disorders. For special QSL, send QSL and SASE to Bill DeBenedetto, K1PVT, 55 Thompson St 13E, East Haven, CT 06513.

**Bridgewater, New Jersey:** The Somerset Co Office of Emergency Management will operate WC2ADK from 1400-0100Z daily **Aug 16-18** to promote Amateur Radio, RACES, and public service at the annual 4-H Fair. Suggested frequencies: lower 25 kHz of General 80-10 meters and 10-meter Novice; visitors check in on 145.320 simplex. Send QSL and SASE to Somerset Co OEM/4H, PO Box 3000, Somerville, NJ 08876.

**Toronto, Canada:** One of Canada's most ambitious Amateur Radio Exhibits will again be part of the Canadian National Exhibition from **Aug 16 to Sep 4**. Listen for VE3CNE on all HF bands and apply for one of their colorful QSL cards at VE3CNE Executive Committee, 44 Innisdale Rd, Scarborough, ON M1R 1C3, Canada.

**Greenville, Michigan:** The Montcalm Area ARC will operate KE8JW **Aug 18-20** from downtown Greenville in conjunction with the 25th anniversary of the Danish Festival. Suggested frequencies: lower

25 kHz of the 80, 40, 20, and 15-meter General phone bands and 28.325 Novice phone. For certificate, send QSL and 9 × 12-in SASE to KE8JW, c/o MAARC, PO Box 312, Greenville, MI 48838.

**Cardington, England:** The Bedford and District ARC will operate GB2WW **Aug 19** for the Remembrance Service for the 379th Bomb Gp USAAF at Kimbolton School. Operation will take place primarily on 15-and-20 meter phone. QSL to G3WTP, 1 Perring Close, Sharnbrook, Bedford MK44 1JE, United Kingdom.

**Fremont, Nebraska:** The Pioneer ARS will operate W0RCH **Aug 19-20** from the John C. Fremont Days Celebration. Operation will be CW and phone on 80, 40, 20, 10, plus Novice bands. For QSL, send QSL and SASE to Steve Benke, N0ILA, 1807 North 1 St, Fremont, NE 68025.

**Williamsport, Pennsylvania:** A local group of Amateur Radio operators will operate to celebrate the 50th Anniversary of the International Little League in conjunction with the playing of the 43rd International Little League World Series Tournament. Operation will be from 0000Z **Aug 19** until 2400Z **Aug 27**. Suggested frequencies: phone—3.780 7.250 14.250 21.325 28.495; CW—3.550 7.050 14.050 21.050 28.050. For QSL send QSL and SASE to Des Warzel, ND3L, 346 Oak St, Jersey Shore, PA 17740.

**Voyager Spacecraft Encounters Neptune:** The Jet Propulsion Laboratory ARC will operate W6VIO from 0000Z **Aug 19** until 2359Z **Sep 3** to commemorate the *Voyager 2* encounter with Neptune. The primary SSB and SSTV frequency will be 14.235. Also look for SSB on 3.865 7.235 21.335 28.485; CW—7.035 14.035. Also OSCAR 13 and FM in the Los Angeles area on 146.52 223.5 224.04. Greatest activity will be weekday noon/evenings and weekday days/evenings local time. For QSL, send QSL and SASE to W6VIO, JPL ARC, J Holladay, 4800 Oak Grove Dr, Pasadena, CA 91103. DX stations QSL via the bureau.

**Bellingham, Massachusetts:** Amateur Radio station WA1UMA will operate from 1500-2200Z **Aug 20** to celebrate the Assumption Parish Picnic in Bellingham. Operation will be on 40, 15, 10 and 2-meter phone. For QSL, send SASE to WA1UMA, 31 Saddleback Hill Rd, Bellingham, MA 02019.

**Los Angeles, California:** The Inland Empire ARC Inc will operate WA6ZEF from the floor of the Southwestern Ham-Con Convention. The club will be on the air from 1700-0900Z daily **Aug 21-27** operating 75-10 phone in the General portion of the band. For certificate send SASE to Ken Walston Sr, 1248 N Cypress Ave, Ontario, CA 91762.

**Deadline:** The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Sep 1** to make the **Oct** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be published.

**QSLing Special-Event Stations:** To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9 × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

## The ARRL Field Organization Forum

### ATLANTIC DIVISION

**DELAWARE:** SM, Walt Dabell, KD3GS—ASM: Bill Ryan, WA3DPJ. Congrats to Ed Hill, W3FEG, winner of the QCWA Meritorious Service Award from QCWA ch 150. Welcome to the two new ECs in New Castle County. Rick Crossan, KA3TKR, and Randy Carlson, WB6JJK. I am sure you will be hearing a lot from these two as they start putting together an ARES group in NCC. The Delaware Hamfest and the next Delaware ARRL staff meeting will be August 20 at the Kent County VoTech Center, North. The VoTech is north of Dover, just west of Rt. 13, right beside the Terry Campus of Del-Tech. Watch for the WDOV/WDSR radio antennas north of Dover. The VoTech is right across the street from these antennas. Talk in on 148.97. May net rpt: DTN stns 327 t/c 30 in 23 sessns, DEPN stns 40 t/c 4 in 4 sessns, SEN stns 85 t/c 11 in 5 sessns. Traffic: W3QQ 93, WB3DUG 93, WA3WY 32, W3PVO 20, KA3GRQ 20, K3JL 17, KD3GS 33, Total 226.

**EASTERN PENNSYLVANIA:** SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZF. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3AO. STM: BM: KB3JL. PIO: W3XZV. TC: W3FAF. Please send your VE test information for the rest of 1989 to KC3LM now for publication in Section newsletters and packet bulletins. We want to include all sessions, regardless of VEC. Clubs now getting into the VE picture include Perkiomen Valley, Lehigh Valley and Tri-State (Pike Co.). There is a disappointment at hamfests when people show up to take license tests without having found out if pre-registration was required, or what time the tests begin, or even if there will be tests at all. Always contact the sponsors well in advance to get the facts. This month you can have fun at the Red Rose Repeater Ass'n's computerfest on the 6th and the Mid-Atlantic ARC hamfest on the 13th. It's a pleasure to welcome my dad, KD3NI (ex-N4ICR), to EPA from Georgia. Some local net updates to the ARRL Net Directory: SEPA TN now meets Sunday/Wednesday at 8 PM local time and is cross-linked to the Palmetto ND3VF 220 MHz repeater so Novices can participate. The Mid-Atlantic ARC ARES Net changed its name to "MARF Net" to avoid confusion with the recently-instituted Delaware County ARES/RACES net that meets on various repeaters in the county. Please note that if you list your local net as "NTS affiliated," we would appreciate receiving net reports from you. Nothing elaborate is required; just QRL, QTC, and number of sessions, addressed in duplicate to the SM and STM, deadline the 8th of the month. DEC3 WB3FFL reports praise for ham communications support in Schuylkill and Berks Counties from the PA State Police during the "Tour de Trump" bicycle race last spring. An ARRL Certificate of Merit was awarded to WA3YMU for his fine work in organizing hams for that event. Several outstanding EPA hams were nominated for Atlantic Division "Amateur of the Year." They (and plenty more) should be nominated again in 1990. EPA extends our 73 and congratulations to the winner, Mayer Zimmerman W3GXK of Maryland, and to the 1989 "Grand Old Man," Sid Chiswell W2ICZ of Western NY. To each person who took the time to nominate someone: Thank you for thanking them! While we're in that mode, thank you to PIO W3XZV and ACC KC3QB for representing ARRL at May hamfests I was unable to attend. Traffic (May): N3AZW 670, N3CD 142, AA3B 30, W3JXK 86, K3TX 56, KA3DLY 54, W3JPF 50, KD3AO 37, N3COY 31, W3DP 30, KA3SKT 27, N3GFC 24, KA3QYH 23, W3BNR 12, W3BEV 21, W3AQH 17, N3DRM 17, KU3R 15, W3GL 15, W3AED 10, W3VA 10, KA3MVM 9, W3KOD 7, W3FAF 6, W3HKH 3. Nets (May QRL/QTC): SEPA TN 105/9, MARF CTN 190/61, MARCNET 61/1, D3ARES 85/18, SCSN 85/6, D3ARES 76/1, EPAEPTN 508/140, EPA 445/145, PTTN 203/63. @ PBBS: @WA3TSW 172, @WB3JOE 52.

**MARYLAND-DC:** SM, Kenneth L. Cohen, N3IF—Hello folks! I'm your new Section Manager! Please keep club bulletins and newsletters, cards, letters and packetgrams (@ WA3ZNV) coming, so I can let the world know that MD/DC hams are the world's best! Thanks to W3FZV for a smooth transition and to KJ3E for initiating my SM petition. Local hams plan to participate in the Chesapeake Swim Meet on 6/11. Tnx to MD Mobileers, especially WA3SCW for getting June 19-25 declared Amateur Radio week by Governor Schaefer. Winchester had medical drill on June 3. Kudos to Goddard ARC for shuttle transmissions—they received this SM's first certificate of Merit for same. W3AB6, myself and other locals joined HQ staff at capital hill hearings to try to save the bottom of 220 MHz. Our Section's Grand Dame, W3CDO, became a Silent Key at the age of 90. Liz will be missed by all, especially the CW set. Thanks to NB3P, our new BM for recruiting new OBS operators among the packet ops-voice and CW net ops who are interested should contact him as well. Area hamfests have been great! How about a Dayton at Galtersburg? CU at FD! WITH THE NETS: NET/MGR QND/OTC/QNI: MSN/KC3Y 31/45/302, PON/WB3BKF 27/28/185, MDD/W3FA 61/299/510 (MDD Top BRASS W3FA/99 W3CQ/82 K3GHH/73 WA3YLO/70), MEFN/K3RXX 30/151/747, HOCARES/WA1QA 2/3/24, Traffic: W3WV 770 (BPL), NB3P 240, K3GHH 165, N3CV 165, K3JE 146, K3RXX 136, KC3Y 134, W3VA 109, N3EGF 77, W3DQI 77, K3GF 70, W3FZV 68, W3YVQ 49, K3USO 43, K3NNI 31, KD0M 26, N3GJB 26, WB3BKF 22, W3EAX 22, K1BGT 19, KD3JK 16, W3SVD 12, W3LDD 12, WA3GYW 8, KA3DXX 6, W3ZNV 4, WA1QAA 3, PS3H W3FA 89, KC3Y 85, K3RXX 77, KU3E 75, W3YVQ 69, N3EGF 66, N3CV 66, K3GHH 66.

**SOUTHERN NEW JERSEY:** SM, Richard Baier, WA2HEB. SEC: K2QJL. STM: WB2UV. ACC: K2XKE. TC: N2BQT. PIO: K2ZRAF. SGL: VACANT. BM: WB2UV. OOC: WA2HEB. ATC: K2JF, KA2RJA and WB2MNF. The 30th annual NJ QSO Party will be held on Aug. 19 and 20. Full details should be in July's QST under Contest Corral. The bill to solve the

problem of amateurs having radios in their vehicles capable of receiving police/government frequencies has been introduced into the NJ Assembly (Bill A-4557) and the Senate (Bill S-3593). Be advised that the bill, if enacted, will repeal N.J.S. 2A:127-4; the so-called "Scanner Law." We need the support of all of you. Frank, N2IGO has done an awful lot of work to get the precise wording needed. Frank has prepared a "position paper" on this issue and we would like you to arrange personal visits with your local Assemblymen and Senators to discuss this topic and to give them a copy of this paper. Contact me for details. Also write the respective Committee Chairmen: Assemblyman Newton E. Miller, 10 Furler St., Totowa, NJ 07512 (refer to A-4557) and Senator Frank X. Graves, Jr., 100 Hamilton Plaza, Paterson, NJ 07505 (refer to S-3593). Any questions feel free to contact me. Until next month, 73. Traffic: KB1BD (PBBS) 74, KB2CDB 30, WA2HEB 5.

**WESTERN NEW YORK:** SM, William W. Thompson, N2IYA, W2MTA—ARES: SEC: NN2H. DECS: WA2AIV (Western District) WB3CUP (Mohawk District), KY2F (Central District), WB2NAO (Northern District), WA2UFQ (Southern District); SEVEN counties have no Emergency Coordinator appointed. Can you help in Cattaraugus, Chautauque, Fulton, Montgomery, Schuyler, Tompkins or Wyoming Counties? Contact NN2H if you want more information about the EC appointment or the Official Emergency Station appointment. Public Service Honor Roll: KG2D N2EJA N2EJV WA2FJJ W2FR NN2H K2C2HJ N2IKR W2MTA WB2OWO KA2QOO ND2S NJ2V K2YAI W2YGW KA2ZNN. May BPL to WB2OAI. Welcome: Madison-Oneida ARC and XEROX ARC new League Affiliated Clubs. Congrats to Atlantic Division Ham-of-the-Year W3GXK, and to W2ICZ, awarded the Division's Grand Old Man Award.

Net	Mode	QNI/QS/QND	Net	Mode	QNI/QS/QND
NYSEMO	SSB	100/009/45	NYSR	CW	09/003/004
WYSIM*	CW	289/249/01	WYSIE*	CW	311/136/31
NDM/W	FM	349/113/01	NDNE*	FM	504/184/31
NYP	SSB	148/107/28	TIGARDS	FM	42/005/04
NYPON*	SSB	484/330/21	BLUELINE	FM	135/015/25
ESS	CW	378/042/91	VHFTHIN	FM	468/000/05
NYSPTN	SSB	442/066/01	BRVSN	FM	268/001/28
LCARES	FM	015/000/02	CNYTN*	FM	288/062/31
QCTENE*	FM	672/100/21	QCTENL*	FM	261/085/31
Q NET	FM	367/001/21	WONDL*	FM	467/159/31
STAR*	FM	286/058/21	NYSL*	CW	344/271/31
PFN	FM	332/003/30	QRTN	SSB	43/000/025
JCRACN	FM	368/013/30	OARCN	FM	078/004/05

\*NTS Net. No SPNS reports received. OO Reports: KA2MOO. Sorry to see Jake, W2UPT, listed in Silent Keys...many memories come back to mind from the VHF Contests on Utsayanika in the fifties when W2UPT and W2JGU regularly teamed to carry home the WNY top slot in the warm months. Today the mountain at Stamford is sprouting with communications antennas and structures...just goes to show how many hams lead the way in communications! Now, if we could learn how to lead the way in setting savvy policy for the future, we could really show 'em! Let's wrap up the meaningless issues and address the real challenges in Amateur Radio's future. No growth? No CW? No Fun? Let's put the adventure back into HAM RADIO! Traffic (May): WB2OWO 548, W2MTA 542, N2EIA 407, KC2HJ 283, NJ3V 269, WA2FJJ 230, ND2S 196, WB2JHJ 169, KA2BBD 146, KA2QOC 129, NN2H 126, N2IYA 126, K2YAI 114, WB2QIX 101, W2FR 96, KA2ZNN 83, KA2SJK 81, WB2OE 58, WB2NUL 57, KG2D 45, N2IKR 37, AFJ 36, N2DLN 33, W2UYE 30, W2PPS 27, N2EJV 25, KC2JW 23, KA2TWY 21, KA2DQA 12, WA2JPB 6, WA2OEP 2. Hamfests: July 9 Batavia, Aug 12 Verona. Traffic picnic: Aug 19 Tompkins Co.—Sept 16, Liverpool, Sept 30 Horseheads, Oct 14 Syracuse—Have Fun and Adventure!

**WESTERN PENNSYLVANIA:** SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: NO3M. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J. SGL: KA3EOM. PIO & ASM: N3DOK.

Net	QNI	QTC	Sess	KHz	T/D	Man
WPACW	239	112	31	3585	7:00 P/D	WA3UNX
WPAPT	407	79	31	3983	6:00 P/D	NO3M
KFN	152	67	21	3983	1:30 P/D	KA3CEM
PFN	187	164	31	3958	5:00 P/D	WA3THT
WPA2MTN	323	55	31	28/98	8:00 P/D	KA3BGC
NWPA2MTN	581	38	28	53/45.133	9:00 P	KC3NY

The last month was a busy one in the section. We received many rumors about activities but no reports officially. I would like to put them here if you drop me a line. N3DOK and I want to know what you are doing. We need to let the public know, too. Does your club have an assistant PIO who can get the news out? I am sorry to announce the following Silent Keys: N3DXF, Robert Herron D.M.D., W3TUG, Michael Yacenic, K3LYX, Matt Emanuele, and W3SE Eugene Sulkowski whose death occurred while trimming a tree. PLEASE, if you must trim any trees around your antennas, make sure it is clear of hot wires and use a non-metal ladder. Use a belt to hook onto. If a shock should occur and cause you to be knocked down, you will be caught. The fall was the fatal part for our dear friend. The Pittsburgh Marathon was a success this year and the amateurs who participated were praised for doing a fine job with communications. Konrad, N3EJK, deserves credit for an excellent job in organizing ham participation. While attending the Rochester Hamvention, I went to several meetings where no-code license was discussed. No consensus was reached. Packet was also in the forefront. May traffic: N3EMD 292, N3FA 252, W3OKN 132, NO3M 119, WA3UNX 104, WA2QXA 82, N3AES 72, W3RUL 85, W3NGO 46, KA3EOM 34, KC3YE 34, WA3DBW 20, KC3HR 14, WA3HJC 11, KD3AC 4.

### CENTRAL DIVISION

**ILLINOIS:** SM, Dave Carlson, AA9D—SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: K9IDQ. PIO: N9EWA. ACC: W9SFT. TC: N9RF. DEC: W9EBQ. Illinois Section Nets

Net	Freq	Times (Local Illinois)
ISN	3905	1800 DAILY
ILN	3690	1830 & 220 DAILY
ITN	3705	1900 DAILY
CTN	149.69/09	2100 DAILY
ILARES	3905	1630 1ST & 3RD SUNDAYS
Illinois Independent Nets		
IEN	3940	0900 SUNDAYS
ILPN	3855	1645 M-F; 0830 SUNDAY
NCPN	3915	0700 MONDAY-SATURDAY
NCPN	7270	1215 MONDAY-SATURDAY

Congratulations to Bob, WB9ZD, who won the State Award for Outstanding Special Need Student. Several weeks ago, he was named the National winner by the Nation's Council on Vocational Education. He was chosen from 50 students nationwide, based on his academic and personal achievements. Bob will spend four days in Washington DC, and receive the award on June 14th. Time to think about football already? Well...almost! On September 2, 1989, the football teams of the University of Illinois and the University of Southern California will meet in Moscow to play in the "Glasnost" bowl, the first American college football game ever played in the Soviet Union. To celebrate this unique international collegiate sports event which will be televised worldwide, there will be two or three special event stations operating simultaneously for 48 hours from USC, Illinois, and hopefully the University of Moscow. Date/Time: 0000 Z, Sept 2 to 2400 Sept 3, 1989 Frequencies:

WB6JHC (USC) W9YH(L) Soviet station UZ3AZO 3.550 3.555 3.560 7.0407.045 7.050 14.050 14.055 14.060 21.050 21.055 21.060 28.05028.055 38.060 3.875 3.890 3.885 7.250 7.255 7.260 14.250 14.255 14.260 21.250 21.355 21.360 28.350 28.355 28.360 For a certificate, send your QSL, contact number and 1 IRC or 2 units of first class postage to: TCARC, P. O. Box 4101, Urbana, IL 61801. A special certificate will be awarded to any station that works all three special event stations on any combination of bands/modes and to any station working any combination of the special-event stations on any combination of bands/modes and to any station working any combination of the special event stations on all five bands. Traffic: KA9FEZ 369, W9HB 158, W9HLX 119, K9CNP 98, W9HOT 98, WA9VLC 88, W9OBU 54, WB9TV 49, WD9CIR 40, NC9T 40, KA9JNE 39, K9CTW 31, W9K1 16, K9TVUT 15, N9VH 12, N3AIA 11, W9LNC 8, W9VEY 7M 7, WA9AXL 5, W9WMP 5, @N3AIA-BBS 21.

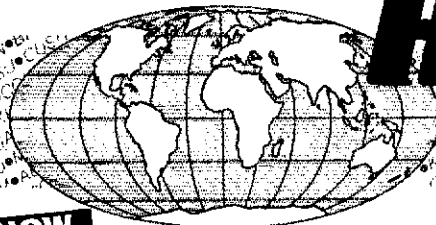
**INDIANA:** SM, Bruce Woodard, W9UMH—SEC: WD9AVQ. STM: WA9OHX. ACC: K9ZBM. TC: WA9JWL. SGL: WA9VQO. BM: W9OCL. PIO: KA9WXT. OOC: K9JF. Net Managers: ITN KA9EIV, QLN K9JL. ICN KD9ER. VHF W9PMT. IWN KA9ERC. May Net Reports:

Net	Freq	Time/Daily/UTC	QNI	QTC	QTR	Ses
ITN	3910	1300/2100/2300	2980	386	2208	92
QIN	3656	1430/0000/0300	434	263	1158	62
ICN	3705	0100	121	32	480	31
IWN	3910	1310	1446	411	311	31
IWN VHF Bloomington			859	310	311	31
IWN VHF Kokomo			1039	195	311	31
IWN VHF Ft. Ligonier			821	320	311	31

Hoeser VHF Nets 12/1 4934 133 4040 229  
D9RN for May 289 QTC 622 sess. IN 84% by K9ZLS, K9GBR, W9UEM, K9CQS, N9DWW, WA9OHC. CAND 560 QTC in 31 sess. D9RN 100% by N9DWW, N9RQ, K9ZLS. Early Bird Wet Net Report for May WA9OKK 284 QTC in 1400 minutes and 23 sess. Silent Keys: Rev. William G. McClaughtin, W9 (Green Zombies Trainers) GZT. Mac was active on ITN and a member of Indianapolis Radio Club. I wish I could remember his Amateur Radio prayer. Lloyd Wehnert, K9B9R, of Fort Branch, Indiana, was active on ITN and Army MARS. A contribution was sent to the American Lung Association in his name from the ITN flower fund. Lester T. Daffron, WA9HGO, of Elmore, Indiana, was a member of the Wet Net. Rev. Roy Gray, WA9TPI, Indianapolis, was active in DARR church radio group. Ed Raynes, K9RRN, of Huntington. They will be missed. The Indiana Code Net (ICN) has changed the net time, as of July 1, to 0100Z from 2315Z. This should work better for everyone. It would be nice if some of the "old fists" would find time to help out—they need NCSs. Check with KD9ER, ICN Net Manager. I had an amateur come up to me at the Muncie Hamfest and looking at my name badge ask me what an Indiana Section Manager was. I asked, have you heard of public service? I must admit I was sure he hadn't. May issued in a busy schedule of public service activities. March of Dimes Walk-A-Thon, 10 K walk for CF, Special Olympics, 500 Mini-Marathon, 500 Festival Parade, several weather alerts and special events and hamfests and you have a busy month. OO reports: KA9YUJ N9EWH N9GSX KA9DZM KJ9G and KC9V. EC reports: N9DUZ WD9X K9OIZ KA9RTD KA8EIV W9CNE WB9PZF N9ENC N9FMO KA9DZM KA9OHD KD9HB WD9BKA W9KGE KA9VNK WB9LRR KD9ZN N9DGT WA9OQT WB9NCE. Packet BBS reports: W9ZRK 5639, KA9LOM 1499, WA9UXP 1431, W9B9SYK 1070, N5AAA 946. Public Service reports: Sullivan County K9RGF, De Motte, KD9MI, Jefferson County, W9BAHJ, Hendricks County KD9ZN. Tippecanoe County KE9OV. Traffic: N9BK 464, KJ9J 204, W9UMH 137, WA9OHX 118, K9ZLS 86, W9ZGC 84, K9KOC 58, W9OCL 53, KA9LOM 44, K9SBA 41, WA9CQF 39, NX9A 33, N9DWW 32, W9PPO 32, KA9ERC 30, K9EPI 30, KB9HH 26, WB9JHR 21, WD9HII 20, KA9QME 20, KE9OV 19, WB9QPA 18, K9GBR 18, KA9QMI 17, W9PMT 13,

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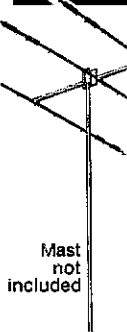


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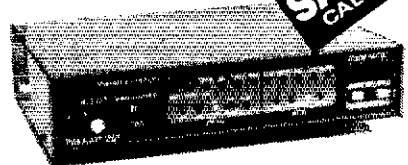
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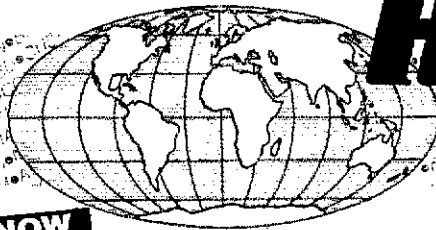


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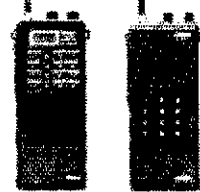
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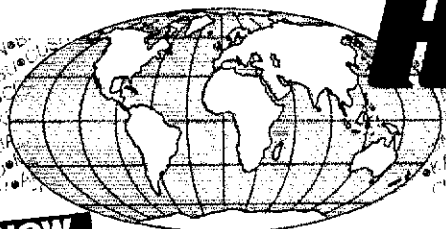


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# Is R5 the world's best ham antenna?

June 1, 1989

Bill Carpenter, WA8HFN  
3934 Maidstone Drive  
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President  
Cushcraft Corporation  
48 Perimeter Road, P.O. Box 4680  
Manchester, NH 03108

Dear Sir:

I am compelled to write this letter to tell you how much I appreciate my R5 vertical antenna. Enclosed please find a copy of two pages of my logbook which represent about one month of activity. I have worked "four new ones". These are indicated by the orange marker. Should I get them to QSL my DXCC total will be 320 countries. The "new ones" of course were in "pileups" against hams with big antennas and great height. I don't get "20 over 9" reports but I work everything I go after.

My R5 is eight feet above the ground in my backyard. Beams are not allowed at this QTH. The R5 doesn't take up a lot of room and is not as visible as a beam antenna.

My wife convinced me to buy the R5. I didn't want to buy it as I thought I could not work DX without a beam. I also thought that I would have to bury a lot of ground radials. I had always used a beam at other locations, (A4).

The R5 has exceeded my expectations and I am delighted with the results that I have seen so far. I thought you would like to know how well your antenna is performing here at my location.

Keep up the good work and thanks again for designing and producing a quality product.

Sincerely,

*Bill, WA8HFN*  
Bill, WA8HFN

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**WISCONSIN:** SM, Richard R. Regent, K9GDF—SEC: W9ZAG, STM: KC9CJ, ACC: KA9FOZ, BM: WB9SJW, OOC: NC9G, PIO: K9ZJ, TC: K9GDF. New Section Traffic Manager is Dick, KC9CJ (who is also Net Manager of Badger Weather Net). Send Dick your net, traffic and PSHR monthly reports. Thanks to K9EP for his work as previous STM and best of health. Watertown ARC and Tri-County ARC combine efforts for emergency communications. The Taylor County ARC is considering becoming ARRL affiliated. Sheboygan County ARC members will be operating from the USS Cobra submarine using call W9DK on August 4th through 6th. The MANOCRAD Club and Manitowoc Maritime Museum will sponsor the event as the anniversary of first 1944 patrol. WA9PWP's son Bob, N9HAD, received Eagle Scout Award from Boy Scouts of America. His other son, Steve, is KA9RMG and wife, Jane, is N9AWW; they live in Madison. Looking for new Affiliated Club Coordinator and State Government Liaison. ATC and OES N9SH moved to Milwaukee. Milwaukee Chapter 10-10 International will host convention August 11th through 13th at Grand Hotel, 4747 South Howell Avenue, Milwaukee. Forums, indoor flea market, ARRL booth, exams, prizes and banquet will be part of the fun, plus Dave Sumner, K1ZZ, ARRL Executive Vice President is guest speaker. Be sure to attend this tremendous event. Advance tickets or info from KA9MTY (P. O. Box 83134, Milwaukee 354-7452). August 19th, Green Fox ARC Picnic and Auction starts at noon with rain date August 20th. Free food, drink and admission. Congratulations to newly elected directors of Milwaukee RAC: KA9MTY, N9HBN and KE9LL. As a reminder, Wisconsin Association of Repeater officers are: Chairman, N9CCI, Vice Chairman, WB9MHS; Secretary WA9POV; Treasurer N9AOZ; Technical Director KA9UOP. Thanks to Frequency Coordinator WA9JOB for his excellent volunteer work to coordinate repeater frequencies. Sorry to report Silent Keys N9JB and KC9IL. When working toward the solution of a problem, it always helps to know the answer.

Net	Freq.	Time	Manager
BWN	3984	6 AM	K9GJ
BEN	7283	Noon	WA9W
WSBN	3885	5:30 PM	K9ANV
WNN	3723	8 PM	KA9TTM
WSSN	3645	8:30 PM	N9BDL
WIN-E	3662	7 PM	WB9ICH
WIN-L	3662	10 PM	W9NGP
NWTV	3494	6:30 PM	N9SQ

Traffic: WB9YPPY 2059, KC9CJ 1159, W99J 527, WA9W 517, W9CBE 298, K9GDF 204, W9YCV 177, W9LKN 150, W9CXY 120, N9BDL 114, KA9BHL 102, AD9X 100, AG9G 91, W9NGP 64, K9AKG 63, KA9KZL 60, W9UCL 54, K9UTQ 53, N9BCX 48, W9IEM 46, KA9FVX 43, NS9Q 36, KE9LX WB9ICH 35, K9FHI 34, K9JPS 31, K99B 29, W9UW 15, KA9VIA 13, W9ODV 6, K9BED 4.

## DAKOTA DIVISION

**MINNESOTA:** SM, George Frederickson, KC8T—Not much input this month, but I can report that the Minnesota Section Nets are alive and well. We managed a traffic count of 2,483 with 22 stations reporting. I really appreciate all reports and hope that everyone who has any traffic activity for the month would be sure to send me at least an SAR. It all adds up and I know we have some who are active who did not send me a report. Our thanks to Cal, NR8S, for his work as Net Manager of MSN/1. Cal decided it was time for him to make a change. So, until another comes along, I will be taking Cal's place as Net Manager of MSN/1. Congratulations to Brian, N9BG, of St. Louis Park who is our Amateur of the Month for May. Keep up the good work, Brian. In keeping the Packet BBS cleared of Minnesota traffic. And thanks to all Minnesota participants for your great help and support. That's it for this time—have to go cut grass! Until next time 73 and GL. Jim Swisher, KA8EPPY, STM.

NET	FREQ	TIME	QNI/QTC/SESS	NET MGR
MSN/1	3685	6:30P	322/68/31	KA8EPPY
MSN/2	3685	10:00P	279/48/31	KD8NH
MSSN**	3710	4:00P	352/40/31	KA8SBY
MSPN/1	3860	12:05P	273/18/30	WB9WJN
MSPN/E	3860	5:30P	583/159/30	KC8T
PAW	3625	8:00A	24077/23/179	WD8SAC

\* Additionally, MSSN sent 58 Training Messages. Alt. Freq. MSN/1 and MSN/2: 7070; MSPN/N-7232. Traffic: WB9WJN 710, WA8TFC 302, KA8EPPY 255, KA8PDM 192, W8GRW 150, N9FOU 126, K9JL 119, KA8SBY 93, N9CLS 86, NR8S 83, N9KCM 54, W9DM 50, WD8GUF 45, KA8ARF 44, KC8T 42, N9FG 37, KD8NH 32, N9HWD 21, W90P 16, W9KYG 10, K9OGL 10, N9JP 6. Total Traffic: 2,483

**NORTH DAKOTA:** SM, Bill Kurtz, WC8M—Dickinson Picnic Aug 12-13 at Lake Tschida. Congratulations to WB8OAJ & Sharon for their new baby girl. Also the following upgrades Extra, N4EJL, W8YEQ, K8OYN, K7MYH. Advanced N8OJQ, N8JMG, KA8OBY, WD8CJL, N8JJS. General K8ODQY, KA8LSH. Tech KB8ELV, KB8EHR, KB8EHS, KB8EJN, KB8EJG. It was sure nice to get to Blismarck and attend their May meeting. Plenty of discussion with the upcoming Party of the Century planning. Their new ARES picture ID cards sure look nice. Will miss N8CYT who is moving to Baltimore, MD, to take on a new job. NT8V is our new Goose River Net Mgr. Also the net is moving back to 9 AM Sundays. Real good job by the FORX Amateurs under the leadership of WD8OAY in the Flood this spring. Fargo & Wahpeton Amateurs were also active in flood work, but I haven't got a report from them yet. Traffic: KA8F5M 56.

NET	FREQ	TIME	SESS/QNI/QTC/	MGR
Goose River	1990 kHz	9am Su	4/56/2	NT8V
Data	3941 kHz	6:30 da	31/464/17	N8JR
Wx Nets	3885 kHz	Will resume in Oct 9am-12:30am nonn on Mon-Fri		WB8FE
Storm Net	3941 kHz	During storms only		WC8M

**SOUTH DAKOTA:** SM, R. L. Cory, W8YMB—Asst SM N8ABE, WA8FPR. SEC: KA8KPY, STM: KD8YL. When you read this if you haven't operated from the South Dakota Centennial Wagon Train, there is still time to take advantage of this once in a life-time event. Contacts have been going very well with even some DX. ARRL Official Observers report for last year reported 661 out-of-band edge followed by 398 for Chirp and 358 for no i.d. The South Dakota Noon net has moved from forty meters back to 3870. The Moberidge Area Digi has been

moved from Sherwood Hill west of Moberidge to Tower Hill 4 miles East of Moberidge with much better results. With good conditions, it will hit Terry Peak thru Glad Valley. Traffic reported for May was 293 which is quite a drop from previous months.

## DELTA DIVISION

**ARKANSAS:** SM, Bob Harmon, W5SEP—This is the season for hamfests and Field Day activities. The Northwest Arkansas Amateur Radio Club had their largest hamfest with Randall Spear as Chairman. First prize of an ICOM 725 went to Randy Banks, N5LML. I had the pleasure to attend the Dallas Hamfest which hosted the ARRL National Convention. It was sure nice to meet ARRL President Price and all the Directors. A new QCWA chapter was formed in the Northwest Arkansas-Southwest Missouri area. The chapter is the Ozark Chapter with Floy Milliren, AF5W, as president. Our new Section Emergency Coordinator WB5OFN, Wayne, reports that we have approximately 70 new ARES members. I would appreciate any news from around the state for the next column.

**LOUISIANA:** SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX, SEC: N5ADF, ACC: K5KR, SGL: KD5SL, TC: W5RWF, OOC: WB4ICV, Packet: W5SAD, SNM-CW: WB4FDT. Recently elected officers of the Ibarville Repeater Assoc. & ARC are: Pres: Cecil, WD5CQH, V.P.: Jim, N5MHT, Sec: Kermit, N5JIZ, Treas: Helga, KB5EH. The Baton Rouge ARC had an outstanding hamfest and annual banquet in their new location. Their BRARC Meritorious Service Award went to Bill Yorty, W5RWF. Their good Samaritan Award went to Doug, KA5VSY. Fitting recognition for contributing so much to our hobby. Jim, K5NV in New Orleans is running a DX Packet bulletin board on 145.05. Recent severe tornado damage in both north and south Louisiana and the onset of the 1989 hurricane season stresses the need for an effective statewide emergency net. Unfortunately, we do not have an organized and reliable system with an emergency coordinator and emergency stations in every parish. Needed most is a Leadership Volunteer as the Section (state) Emergency Coordinator to organize and exercise a state-wide net. Further, we need volunteers in each parish to assist as a local coordinator or emergency station. Contact me if you would be willing to spend an hour or so each month to help make an effective Emergency Communications Public Service program in Louisiana. I'm listed on page 8 of QST. Recently elected officers of the South East Louisiana ARC (SELARC) in Hammond area: Pres: Joe-W5OR, V.P.: Joe-N5HDW, Treas: David-KA5UJL, Sec: Phil-AASJF. I hope to chat with each of you at the top notch Ark-La-Tex Hamfest and ARRL La. State Convention in Shreveport on August 12 & 13. Please mark your calendar now. 73 & GL de "Wondy" K5KR.

**TENNESSEE:** SM, Harry Simpson, WM4I—Eastern Assistant SM and PIO: W4TYU. Central Assistant SM: WA4GLS, Western Assistant SM and ACC: K4CXY, STM: NG4J. SEC: K4UVH, OOC: K4LSP, SGL: N4PQY, TC: W4HHK. The TN Phone Net is on 3980 kHz with early session at 8:40 AM Eastern, Regular sessions at 7:45 AM Eastern Monday thru Friday, at 9 AM Eastern on Saturdays, Sundays and Holidays. Evening sessions are Monday thru Saturday at 7:30 PM Eastern. CW Net Sessions are on 3635 kHz at 8 PM Eastern, Monday thru Friday. Guess what? The CW Net now has a bulletin! Net Manager WB4LAL put out a Net Newsletter, complete with a membership roster—the first in many years, at least in my memory. Thanks for a fine job, Ike, on the way you run the net, and the newsletter. It is with a great deal of regret that I record the passing of three TN hams, N4WF, William Fulcher, Jr. of Hendersonville; NY4T Reggie Phillips of Humboldt; W4CYL George Dowd of Meadon. All will be missed by their many friends. A brighter subject: the Knoxville Hamfest! It was a just great! Congratulations to the Cebikas, L. B. and Jean, W4RNL and N4TZZ, and to all the members of RACK who made it a memorable occasion. You know how boring forums (loria?) are—well the ARRL Forum wasn't! Delta Division Director Joel Harrison joined me, and about twenty-five members took part with an active give-and-take. I enjoyed it immensely, and I believe that everyone else did. I'm sorry that Steve Ewald was on another ARRL assignment, and couldn't come. Unfortunately, I was unable to attend the Humboldt Hamfest—it was always a super occasion for eyeballing, etc. The weather was horrible, with thunderstorms, flash flood warnings, high winds, etc. I got within a few miles, and had to stop because of visibility. After an hour, I decided that it wasn't going to get any better and returned home. Hey, let's give ole Ike some help on the CW net! As he says, don't worry about code speed—if you check in at ten wpm, you will be answered at that speed. Traffic: W4FMR 132, WA6ZGZ 76, W5M1 65, WB4LAL 52, W4DDK 48, KA5KDB 39, W4TYV 39, K4WDP 36, W4PFP 22, WA4HJU 21, K4CXY 16, W4EWR 6, W4PSN 6.

## GREAT LAKES DIVISION

**KENTUCKY:** SM, John Themas, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. (May) The Tornado season is upon us! The following amateurs provided emergency communications support in West Louisville: AA4VL, N4PEN, W4OYI, AA4RL, KB4XE, KA4BCM, KA4FWI, AB4BF, WB4NHO, KA4YBL, NU4O, KB4YLO, KM4OF, and WD4IMK. Emergency assistance was also provided in the Owensboro area on May 19th by WB4ANL, W4OYI, WB4NHO, N4PEN, KB4XE, N4PHW, N4PRD, KA4FWI, AA4VL, WB9RCV, WA9AWG, KA4BCM, WB4BSL, KA4NIP, WD4IYH, WB4NTT, KB4YLO and W4TOY. Emergency Commendation certificates were awarded to each for a volunteer effort well done.

Net	QNI	QTC	Sess	Mgr
MKPN	1376	175	31	WD4RWU
KTN	691	107	26	WD4RWU
KY(N)both	349	137	62	K4AVX/KZ8Q
TSTMN	427	33	31	KZ8O
KNTN	326	108	36	WA4EBN
NKEN	85	1	4	KI4QH

SAR (May): WD4RWU 257, N4PET 180, KA4VHF 146, KC4WN 74, KB4LJL 72, WA4EBN 68, N4LAF 51, KI4QH 38, K4AVX 38, KA4MTX 28, WA4SWF 22, WB4AUN 16, WA4HLN 12, WA4NOG 10, K4A 4, N4PEK 4. PSHR: KI4QH, KA4MTX 85.

**MICHIGAN:** SM, George E. Raca, WB8BYG (@N8FTY)—ASM: WA1RL (@WA1LRL), STM: WD8JKQ (@N8TR), SGL: N8CNY, TC: W8YZ, OOC: WA2AJL, ACC: N8JVA, PIO: N8KBA, BM: W8W. Silent Keys, with great regret: W8LZV,

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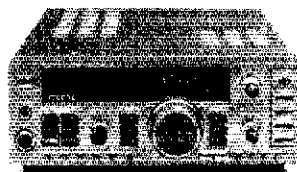
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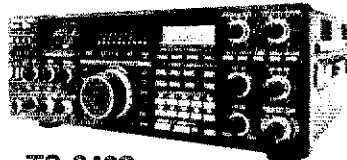


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IC-2GAT  
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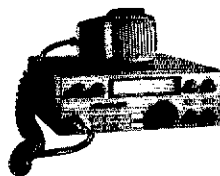
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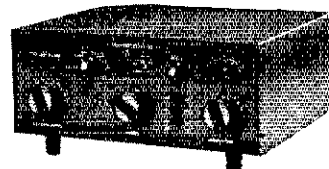


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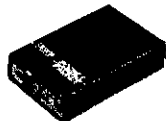
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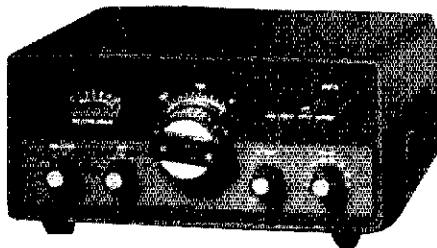
Assembled HK-21



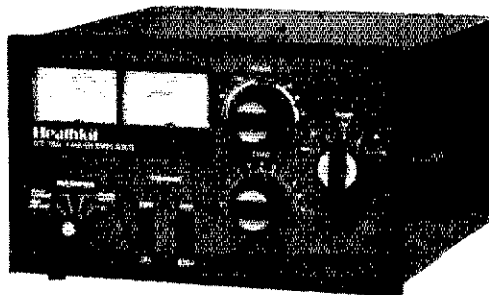
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WA8HBZ, W8TMO and W8ERI. New officers for the Au Sable Valley ARC: Pres. Kim, N8ISC, VP Don, N8EPJ, Sec. Ross, KABESE, Treas. Ken, KB8TS, Oak Park new officers are Pres. Dick, N8NKB; VP Wally, KB8GNV; Sec. Alan, KA8ZFR, Treas. Marsha, KA8DMR; ML Mark, K8ED; PM Jay, WB8SBI and TD John, WA8UYM. Crawford-Roscomarc ARC new officers: Pres. Mark, WF8R; VP Franz, WA8CUP; Treas. Jack, N8KHC; Sec. Tex, WB8CHC and Activities, Marty, WA8SJK. April 29th marked the end of an era. Amateurs gathered in Davison at the home of Ralph, W8LHG, in celebration of Samuel Morse's birthday. Sounders and keys tapped out American Morse. This was the last time that Western Union will connect the US and Canada via wire lines. All present were saying "good-bye" to the last of an era. In landline Morse, "30" means "that's all for now" and will be remembered by all that were present on this historic occasion. This month marks the annual Five-County Swap and Shop in Saginaw. The Five-County group again hosts the Michigan ARRL Convention on August 26 and 27. Join us for the pre-convention activities Saturday evening at the Florentine Inn and Sunday for the many net meetings, forums and special presentations at the Convention Center. A last minute reminder: The U.P. Hamfest will be held July 29 at Lakeview Arena in Marquette. Hope to see you there. On May 31st at 7:00 PM, lightning took its toll at the BGY QTH. My HF and VHF rigs, TNC, computer and many other items gave their all. My thanks to Skip, WD8KQC, for helping me meet the column deadline and collecting all of the reports. Hopefully, by the time you read this, most of the equipment will be replaced or repaired. 73 Please support the following MI area Nets:

NET	FREQ	TIME/DAY	QNI	QSP	SESS	MGR
UPN*	3921	8:00PM Dy	930	51	35	WA8DHB
MACS*	3953	11:00am M-Sa	324	44	30	K8CCP
MTN	3953	7:00PM Dy	543	144	31	WD8EIB
QMN*	3663	8:00PM Dy	474	122	62	WB8R
SEM-TN	145.33	10:15PM Dy	415	105	31	N8HSC
MNN*	3722	5:30PM Dy	225	156	61	KA8BBY
GLETN	3932	9:00PM Dy	1086	45	31	NW8M
WSSBN	3935	7:00PM Dy	541	35	31	W8ND1

\*QMN Fast: 6:30PM Dy, QMN Late: 10:00PM Dy; MNN: 8:00PM Dy; MACS: 1:00PM Sun; UPN: 12:00PM Sun. Traffic for May: K8PCP 345, KA8BBY 288, WD8KQC 135, NJ8S 119, N8FTY\*BBS 100, N8HSC 82, WB8SVA 69, WA8DHB 67, WB8YDZ 57, NW8M 54, N8IIC 50, K3UW0 49, N8FPN 46, K8ZJU 40, WD8EIB 36, WB8R 36, W8EOI 33, W8IHX 32, WB8YPG 31, W8YIQ 31, K8UPE 29, K8CCP 29, K8OCP 28, WB8BGY 28, NY8W 24, N8JAT\*BBS 23, N8CNY 23, KA8BYK 22, W7LVB 20, WD8JB 20, N8HXK 15, K8IQ 12, WN8H 12, W8BEZ 11, KA8LAR 8, W8RNO 6, KB8FON 6, N8HWO 5, KN8JDN 5, WB8WJV 4, W8CSO 4, W8URM 2.

OHIO: SM, John Haungs, WA8STX Phone: (513) 563-7373-ASM, David Kersten, N8AUH, Ph (216)221-8740. SEC: WD8MPV. STM: KFBJ. ACC: KJ3O. ACT: BM: W8PH. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIO: K8QOE. May 1989:

NET	QNI	QTC	SESS	TIME (LOCAL)	FREQ	MGR
BN(E)	246	96	31	1845	3.577	WB8C
BN(L)	194	82	31	2000	3.577	K8TVG
BNR	245	81	31	1800	3.605	W8EK
BSSN	---	---	---	1900	3.873	K8OZ
OSN	253	71	31	1810	3.708	WB8KBW
QSSN	1889	822	53	1030 1815 1845	3.9725	KA8CQF
OSSN	254	73	31	0645 M-F	3.577	KD8HB
OSSN	---	---	---	0800 S-SN	3.577	KD8HB
OBMN	---	---	---	2100M-W-F	90.16	WB8CXTX

OHIO SECTION AREA NET 1700 Sun 3.875 WD8MPV  
 The Miami town Bridge disaster occurred on Friday May 26 at 5:27 P.M. It was reported that the temporary one-lane bridge over the Great Miami River collapsed just minutes before officials had planned to close it. Steve, KB8DWZ, arrived at the scene and called for assistance in a search for several reported cars that just vanished into the flood swollen river. Local Hamilton Co. EC's could not be located. The ARPSC Repeater 145.21 was activated with an Emergency Net with Steve, KB8DWZ, taking the initiative to act as net control. Several Butler Co. ARPSC members came to the scene to assist. The Hamilton Co. Civil Defense Director and a Colonel from the Sheriff's office were at the scene and had requested immediate Amateur Radio assistance. Twenty-six Amateurs checked in and some responded to the scene and assisted in the search. Those who participated: KB8DWZ, KB8ALM, KA8LMO, K8CPT, KC4ICW, KB8BNT, KA8YRN, N8JFY, N8CKE, WB3KGS, W3EOA, N8AJV, WA8GF, KB8AHT, N8KKR, KB8GZK/T, WB4VVO, N4BRJ, K4QO, WA8VJ, KA8QOS, KC4AMY, KB4CF, KD8TE, WD8PRH, KB8GQ. The search was called off at 9:45 P.M. Hamilton Co. ARS was officially notified by Hamilton Co. Civil Defense Dir. on Sat that Amateur Radio Communication might be needed at the disaster site. KA8LAY and WD8DKQ responded and set up a net on 148.48 with K8QH, KB8BV and KA8FFI, KA8QEQ and KB8TE. The Butler Co. VHF Society had 10 to 15 Amateurs working long hours for seven days in a row during the flood that washed out a hefty chunk of Northern Butler County. The Hamilton Red Cross dispatched Hams to Somerville, Collinsville, and parts of Oxford, St. Clair Township, and Milford Township. The Hamilton Red Cross Chapter commended the Amateur Radio operators for donating their time, their own equipment and their own vehicles to perform this first line of communication, and were very grateful for fourteen years of service that has been extremely valuable. Congratulations to the new Editors of the Alliance Amateur Radio Club "Zero Beat." Dennis & Janice Barber, KB8GCF & KB8GCE, both new Novice class operators in January. Walter Harris, KA8KLP is the acting Editor of the Greater Cincinnati Amateur Radio Assn. "Mike & Kay." Being an Editor of a club newsletter is an important job and takes a lot of help from other members of the club. Send your club newsletter Editor an article. Congratulations to Jerry First, N8BW IARC's "Ham of the Year." Traffic: N8XX8/BBS 320, W8BO 319, W8PMJ 285, KD8HB 243, KD8KU 217, W8SKP 212, K8TVG 203, W8RSSI 181, KB8EF 141, WBZLO 137, WB8STX 136, N8FWA 131, KB8CV 129, K8JDI 128, KA8ALY 126, KC4YV 126, KC8TW/BBS 104, N8IP 103, WD8KFN 101, WD8IK 99, KA8HBN 87, KB8MR 84, KA15 83, WA8LDU 82, W8EK 76, W8GZK 76, N8GCE 75, N8INE 69, WA8HD 67, KC8NM 62, WD8FSV 57, WD8QXT 54, W8JLV 54, WB8JGV 53, N8JSN 49, KA8SON 47, N8EFB 47, WD8KBW 42, N8EX 42, KA8YIT 41, WB8KWC 34, N8JYV 33, W8BI 32, KB8AKV

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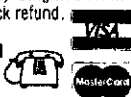
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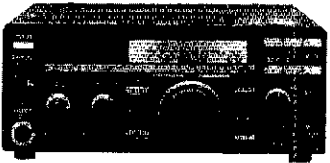


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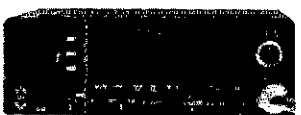

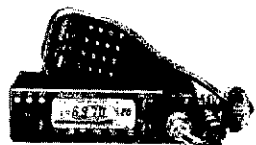
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			<p><b>TM-231A</b></p> <ul style="list-style-type: none"> <li>• 50 Watt</li> <li>• 2 Meter Transceiver</li> </ul> 	

<p><b>FT 470</b></p> <ul style="list-style-type: none"> <li>• Compact</li> <li>• Dual Band HT</li> </ul> 	<p><b>YAESU</b></p> <p><b>FT 212 RH</b></p> <ul style="list-style-type: none"> <li>• Full Featured</li> <li>• 2 Meter Mobile</li> </ul> 	<p><b>FT 747 GX</b></p> <ul style="list-style-type: none"> <li>• Economy</li> <li>• HF Transceiver</li> </ul> 	<p><b>FEA</b></p> <p><b>FSTV-430</b></p> <ul style="list-style-type: none"> <li>• New</li> <li>• ATV Transceiver</li> </ul> 	<p><b>MM-3</b></p> <ul style="list-style-type: none"> <li>• Morse Machine Deluxe Keyer</li> </ul> 
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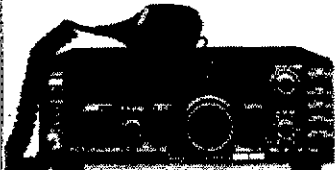
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## HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydateny, WB2VUK—ASM: K2ZM, STM: WB2EAG, SEC: WA2ZYM, BM: WB2JXR, PIO: KB2TM, OOC: N2DVO, ATC: WA2VGM, SGL: KB2HQ, ACC: KV2A, ASM/NWSLTR: WB2NHC ASM/PACKET: N2FTR, NET REPORTS FOR MAY (ON/USP): AESN 4/93 ESS 3784/2 HYN 382/66 NYP 145/107 NYPON 494/330 NYSE 311/136 NYSL 344/281 NYSM 289/249 SDN 289/124. CLUB NEWS: Albany ARA provided comm. for a run on May 25 with WA2YBM WB2VJC WB2FMB WA2WQZ KA2MBA KA2AXN WB2VXS assisting. W2OJQ, Bill Lowenberg became a Silent Key and will be missed by all. Mt. Beacon had a program on antennas at the June meeting. PEARL reports that W2IEU W2IHX W2SIS K2L BG K2LYE WA2GSH WA2JQL WB2HOL WB2PDV AJ1J KA2FJQ KA2UCP KB2BNJ KB2FA KB2FPE KB2FLP K2ZTF K2CZF K2DFA K2DJQ N2EFA N2EPT N2GPP N2HXO N2IMA N2IMU N2JAA N2JFD all helped for March of Dimes walkathon. Saratoga RACES held elections in May with Pres-KG2H VP-WB2HH Treas-KC2KL SEC-KV2A Dir-KY2N, N2FEP, KA2CZL, KA2DXK. Don't forget hamfest Sep. 9th. Schoenectady ARA welcomed new members KA2HRM KD2AC KD2AB KA2SQI. Westchester ARA had an update seminar with W2LSZ on propagation, KB2QN on what's new in DX and W2JAJ on oscillators. WECA held elections with Tech-N2DVO and Dir @ large-N2DHH and they worked on Field Day plans. Hope everyone had a good Field Day. Many meetings are planned for the fall season including a traffic handlers fling. Hope as many as possible will make an effort to attend and get involved. There are many appointments available for those who may be interested. Contact me for further information. May BPL: WB1BTJ May PSHR: N5MEA WB2VUK N2HF WB2EAG K2ZVI KB2EPU WB1BTJ. May Traffic: WB1BTJ 559, WB2VUK 246, N5MEA 230, WB2EAG 154, K2LYE 104, WB2IUV 82, K2ZVI 81, KB2EPU 68, WA2GYY 57, WD2K 52, KB2FPL 9 K2HNW 3, WB2NVR 2.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI—ASM: N2GQR, ACC/PIO: KA2LCC, SEC: WA2UJI, STM: K2MT, OOC: NB2T, TC: W2UQU, BM: W2JUP. The following are traffic nets in and around the section that handle NLI:

NET	FREQ	TIME	DAY	MGR
BAVHF	145.350/R	3000	DLY	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
SCVHF	145.370/R	2000	S-F	KA2JMA
NYPON	3913 kHz	1700	DLY	KA2JBD
NYS/M	3677 kHz	1000	DLY	N2EIA
NYS/E	3677 kHz	1900	DLY	KU2N
NYS/L	3677 kHz	2200	DLY	KU2N
NLT	28450 kHz	2100	WED	N2IMP
ESS*	3580 kHz	1800	DLY	W2VSS
PNS	146.01	24hr	DLY	A1CQ-4
PNS(AII)	146.03	24hr	DLY	WB2IBO-4

\*Independent Net, recognized by NTS, all times are local. VE LISTINGS: LIMARC-second Saturday of each month at 9:30 AM at Salten Hall, NY Institute of Technology, Old Westbury; contact Al Jones, W2ZDB 516-675-790 SUFFOLK COUNTY VE TEAM-second Saturday of each month at 9:30 AM at the Suffolk County Community College, Selden; contact George Slinchek, WA2VNV 516-751-0894; GRUMMAN ARC-second Tues. of each month, at the Bethpage High School, Bethpage, at 5:00 PM at the Grumman Recreation Center, Bldg. 800, South Oyster Bay Road, Hicksville; contact Howard Liebman W2QUY 516-354-6861; GREAT SOUTH BAY ARC-fourth Sunday each month at 12 Noon at the Babylon Town Hall Office Annex, North Babylon; contact Walter Wenzel, KA2RGI 516-957-6726; MAARC-last Thursday each month at 6:00 except July, Aug, and Dec., at the Robert Wagner JHS, Manhattan; contact Rubina Asil, KD2IZ 212-838-5995. If your group holds regularly scheduled license exam sessions and/or classes let me know so they can be added to this listing. There is an increased amount of activity within the area toward emergency preparedness and an increase of ARES/RACES participation. This means that we need more active persons to be involved within ARES not just during the evening times and weekends but also during the daytime. With the NDMS exercise scheduled for the beginning of August the need for packet emergency communications links has been stressed. We are therefore looking for operators with portable packet stations to become more active within ARES and become Official Emergency Stations. If you are interested in finding out more information about the ARES operation and the integrating of packet into emergency communications or curious as to what NDMS is please contact me or your local EC. The section is still looking for people to handle the position of Assistant Technical Coordinator. The National Weather Service is looking for a dedicated Ham Operator or two that is interested in assisting with interfacing between the NWS and Ham Radio. The individual must be able to report to the NWS Office in NYC during weather emergencies and have the desire to work along with the NWS directly. If you are interested contact me directly and I will be glad to give you the rest of the information. Traffic: N2AKZ 308, W1G2 281, N2IMP 165, KA2VZX 167, N2AQA 146, WA2UKM 64, W2GKZ 62, N2HLZ 57, K2TWZ 53, N82D 28, K2JLD 28, K2MT 23, KA2JMA 18.

NORTHERN NEW JERSEY: SM, Richard S. Moseeson, NW2L—ASM's: KA2F (Recruiting), KY2B (SE), K2C2A (SW), ACC: WA2QYX, BM: K2ULR, OOI/AAC: KA2BZS, SEC: WB2HBZ, STM: K2VX, SGL: W2KB, TC: KA9Q, PIO: NW2L, NNJ Ham Radio Info Line 201-680-1585 New section level leadership official appointments by our new Section Manager NW2L, effective 7/89 are listed above. The NNJ Section membership is grateful and thank the outgoing officials for their service. Appointment endorsement for the next two year term starting 08/89 is: OBS KD6TH. New appointments effective 06/89 are: Worth Cunningham, WB2EPW, District Emergency Coordinator (DEC) for Hunterdon County, N2DUP EC for Hunterdon's Kingwood Township and KB4CYC EC North Plainfield, OES's: WB2EPW, N2DUP and KB4CYC, NNJ Field Organization statistics as of 6/89 are in addition to the sec-

tion level leadership positions listed above. Leadership - DEC (11), EC (65), NM (9), Station - OBS (11), OO (10), PIA (6), OES (103), ORS (73) ATC (3). I regret to have to report silent key "Nancy," KA2HQN, EC, OES, ORS and former STM. Veteran NNJ traffic handler "Lee," W2QNL is reported doing well following surgery. The 30th annual New Jersey QSO Party sponsored by the Englewood ARA will take place on August 19 - 20. Congratulations to the following who were newly licensed or upgraded during May sessions conducted by: Raritan Bay ARC (18/10), Northeast NJ Testing Assn. (10/5), Bergen ARA (Hamfest session 93/34), NNJ VE Board (27/13) and Ft. Monmouth ARC (17/10). Novice (11): L O'Keefe, F Berkshire, R Chamberlain, D Doran, D Ng, J Soifer, D Tang, J Macor, T Conigliaro, S Loamach and R Walsh. Technician (33): KA2ANZ, KB2GNH, KB2GTG, KB2HRN, KA2TMA, KA2TMB, A La Conte, B Tagliari, KB2WAD, KB2DOS, KA2CXY, KB2FOI, KB2DVL, KB2HDG, KB2HMJ, KB2HNJ, KB2HEV, KA2NJD, KA2OZH, KA2QNH, KA2ZBW, C Chen, M Brennan, R Smith, D Taunton, Z Zakarian, D Ray, KB2BBP, KB2GPC, KB2HTL, KB2HTT, KB2FZS and WB2GBL General (6): KA2QQC, N2ILK, N2ISG, KB2CVL, KB2FLW, and KB2ATG. Advanced (8): KB2HTD, N2IOP, N2HDV, N2IIN, KA2PKF, N2DITJ, KB2GDU, KE2KE, KB2ONF, WB2PHL, WB2VAO, KB2FEV, N2IUT, KA2RKF, WB2SHY, KD2ZV, WA2MYL and WB2USA. Total applicants (165). Total New or Up-Grade (70), 42.4%. Traffic Nets and Statistics for May 1989 follow.

Net	Mgr	Freq	Time	Sess	Ses QNT	GSP
NUM	WB2ZUF	3695	1800	DY	31	NOT REC
NUPN	W2OC	3950	1800	DY	38	253
NUNE	W2QNL	3955	1900	DY/P	31	278
NUNL	WA3OPY	3955	2200	DY/P	31	120
NJNVE	WB2FTY	146.895	1830	DY/P	31	597
NJNVL	N2FGC	146.49	2300	DY/P	31	234
NJN	KA2INE	3738	1830	DY	31	173
OBTTN	WB2RX	147.12	2300	DY	31	157
NJTTN	N2DXP	223.68	2100	DY	31	312
NJNPL	W2QNL	145.01	24HR	VIA	WA2-SNA-1	

Packet NTS activity: Total 154, WA2SNA-1 auto forward (70) plus liaison (84) by N2ZT (37), W2QNL (6), W2KB (2), WB2FTX (26), KA2CKV (2) and KA2KJF (11). SAR/PSHR: W2RRX 180/100, K2VX 163/90, N2XJ 152/65, N2KJ 254/109, N2DXP 372/74, KA2INE 76/76, W2FTX 92/60, WA2HMA 21/, W2XPD 15/, KA2KJF 254/93, KE2JX 93/67, KB2CO 120/, WB2QMP 294/117, WA2CLP 11/, NR2O 62/, W2CC 19/, WA2PAC 8/72, KB2WJ 23/, KB2BNW 36/68 and N2ZT 114/. BPL: WB2QMP. It has been my pleasure to serve you as SM of the NNJ Section for two terms. 73 de Bob, K2BJG.

## MIDWEST DIVISION

IOWA: SM, Wade Walstrom, W8EJ—SEC: KD8BG, STM: WB8AVW, ACC: NU8P, OOC: WA8QMU, BM: K0IR, TC: KD8AS. Regrettably, K0CKX has resigned as Section Traffic Manager. Eric has been instrumental in promoting packet and RTTY for passing traffic in the Iowa section. Thanks for your support, Eric. WB8AVW has relinquished his Assistant Section Manager position and has been appointed as the new Section Traffic Manager. Rollie has, of course, been extremely active on the 75 meter nets and will do a fine job at STM. KERWQ has been nominated for the Hiram Percy Maxim Memorial Award. W0QJD is the winner of the 1989 Willis Otto Award in Davenport. Congratulations, Vern! The Davenport ARC helped out with the March of Dimes Walk-America. New upgrades at Fort Madison include K0CKX to Technician, and WB8ZHB to General. There were also three unlicensed folks who got to Technician. A Fort Dodge VE session found WB8VBY and KA0VBY upgrades to Technician, NU8JW and K0YWL to General, and NB8YK to Advanced. The Benton County ARC VE session at Marshalltown on May 20 yielded 1 Novice, 2 Technicians, 3 Generals, 1 Advanced, and 1 Extra. Congratulations to all! The Eastern Iowa DX Packet Cluster is on 14.91 from Cedar Rapids. The system supports 16 simultaneous connections and handles DX spotting and data bases. Traffic: W8SS 133, K0GP 58, K0IP 58, KA8ADF 44, W8VLS 41, WB8MXX 34, K0CKZ 13, K0CMM 13, KA0VBA 7, KANSAS: SM, Robert M. Summers, KB8XF—SEC: N8BLD, STM: W8OYH. Kansas was well represented at the Dayton Hamvention this year. W8PB was on a forum program explaining the Maidenhead Grid locator system. Traffic totals for April are as follows: K8BN QNI 1357 QTC 171, KPN 339/24, KMWN 694/611, KWN 1101/801, CSTN 1899/57, QKS 232/50 and QKS-SS 17/6. Did you know that QKS was organized in 1941 thru the efforts of WB8AWP, who was SCM Ks at that time. The KPN was organized in about 1947 under WB8VC as SCM and the K8BN was re-organized in May 1965 with K0BFX, then SCM after the net got off to a poor start in Jan 1965. KWN started in Nov 1961 with K0EMB as mgr. QKS-SS was started, while W8FN3 was SCM and K0BFX was mgr. I believe in the early '60s or late '50s. Congrats to K0JDD and XYL Vada on their 50th Wedding anniv. By the time you read this column the Salina hamfest will be over and thoughts will be turning to the Ks State Convention to be held in Wichita Sept 30/Oct 1 1989. Organize a group attendance from your club, bring out all those new hams that have recently received their calls.

Interested in a Packet Radio Newsletter? Write to Kansas Packet Group P.O. Box 771218, Wichita, KS 67277-1218. Traffic: WB8FR 4.25, N2XZM 215, K0BFX 187, KA8RCH 163, W8FRG 124, W8OYH 73, WA8TJU 64, W8QMT 53, WA8ZNY 42, N8BDG 27, W8PB 8, W8AYXK 6, W8MYM 6.

MISSOURI: SM, Ben Smith, K0PCK—Bill Stultz, KA0ELU was presented the "Ham of the Award" by the members of the Ozark Amateur Radio Society. The Kimberling City ARC held demonstrations of amateur radio for different groups during May. They presented programs at a Vo-Tech School, a Church School, and at a local Shopping Center. Ten members of the Heart of America ARC provided safety communications for the Colonel Swope Biathlon. Members of the CMRA and the Mid-MO ARC provided communications for the Ozark 100 triathlon held in Central Missouri. Helping from the Mid-Mo Club were: NU8F, N8SS, and KA0DLD, from the CMRA; K8BATZ, WB8TEG, ND8N, KA0IBS and K0PCK. The St. Charles ARC provided amateur support for the St. Charles March of Dimes Walk-America. Members taking part were: N8HMZ, WB8CJB, WA8HGD, N8QCM, N8FTF, WA8MZP, NU8JK, K8B8CM, KB8DVO and W8VNW. For seventeen years in a row amateurs assisted with the March of Dimes Walk-America. Twenty three amateurs took part this year. St. Charles ARC members N6CTT and K0CRR provided emergency communications for the Diabetes Bikeathon. This will be my last Missouri Section





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Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. All prices shown are subject to change without notice.

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  - IC-u2AT 2m (Special) 329.00 279<sup>95</sup>

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- IC-4GAT 440MHz, TTP 449.00 399<sup>95</sup>
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- IC-12AT 1w 1.2GHz FM HT/TTP (Special) 473.00 349<sup>95</sup>
- IC-12GAT 1W 1.2GHz HT/batt/cgr/TTP 529.00 469<sup>95</sup>

- Aircraft band handhelds Regular SALE
- A-2 5W PEP synth. aircraft HT..... 525.00 479<sup>95</sup>
  - A-20 Synth. aircraft HT w/VOR..... 625.00 569<sup>95</sup>

- Accessories for all except micros Regular
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  - BP-8 800mah/8.4V Nicad Pak - use BC-35... 79.00
  - BC-35 Drop in charger for all batteries 79.00
  - BC-16U Wall charger for BP7/BP8..... 21.25
  - 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
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  - MB-12 Mobile mount..... 25.99
  - R-7000 25MHz-2GHz rcvr (Special).... 1199.00 999<sup>95</sup>
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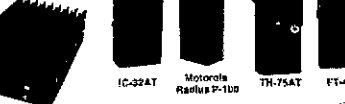
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News report. As of July 1, K6ORB will begin his term as Section Manager of this Section. I have enjoyed serving as Section Manager of Missouri for the past six and a half years. It has been great to attend the various club meetings and other events across the state. The hospitality we received will never be forgotten. I especially want to thank all of those who served in Section Leadership positions. Their work made mine a lot easier and all together I think we made some accomplishments for the good of amateur radio in Missouri. Thanks to the Net Managers and all the appointment holders who were faithful in turning their reports in each month. Good luck to K6ORB and lets all give him our support. Silent Keys: W0MMJ, K6BUH.

Net	QNI	QTC	Sess
MON	62	194	68
MOSSB	31	651	66
MEOW	31	425	40
MON	82	194	68
HBN	28	425	24
St.LARES	5	295	3
KCARES	3	107	17
CARL	5	33	0
SWMOSKW	5	237	6
KCARC	3	107	17
PHD	5	141	11
CMEN	6	107	3
ZAEN	6	57	3
SARN	4	42	0
QCWAN	4	69	0
CARL	4	26	0
PRN	4	188	0

Traffic: N0FBW 974, W800ZI 194, A100 119, K6ORB 93, WA0HTN 76, N0DN 74, WA0YJX 72, K0PCK 45, W80UD 44, WR0R 17, KE0AH 12, W0AKUH 10, W0RL 4, K0JAA 2.

NEBRASKA: SM, Vern Wirka, W80GQM—Two new Emergency Coordinators have been appointed in the Nebraska Section. Steve Narans, W80VNF, of Fremont, is the new EC for Dodge County and the new EC for Boone County is Steve Wright, K0WVEU, of Albion. The next VE tests, in Lincoln, will be August 12, and again October 29—contact John Hauner, W80PY, of Lincoln for details. The Ak-Sar-Ben Radio Club of Omaha sponsors two nets on ten meters, especially for Novice operators. Both nets meet on Thursday evenings; the CW net is on 28.125 MHz at 2000, local time, and the SSB net is on 28.325 MHz at 2100, local time. All check-ins are welcome; look for net control, N8HFI, Alan, on Thursday evenings. Net activity remains high in the Nebraska Section, however, there is always room for more participation. There are many local nets on 2 meters throughout the section. Check with your local club for times and frequencies. The widest coverage 2-meter net is the Eastern Nebraska ARES, which meets Monday through Friday at 2100, local time, in the Lincoln Amateur Radio Club 145 184-75 MHz repeater. Three section nets meet daily on or around 3892 and the Nebraska Storm Net at 1900, during daylight saving time, and 1830 during standard time. Please send you club newsletter and publications to your Section Manager; they are appreciated. Traffic: K0DKM 149, W0KIC 57, K0SGB 28, W80GQM 13, W80EWH 7, KE0XQ 5, N0BA 5, W80SK 5, W0CZ 2.

**NEW ENGLAND DIVISION**

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H, STM: K1EJC, SEC: N4GAA, OOC: NA11, ACC: NK1J, BM: N1EE1, PIO: WA1CFM, TC: W1HAD, SGL: K1AH. Hello again. I would like to change the pace of this writing a bit. After being in ham radio for 21 years, I have watched our hobby grow into a well-respected group of individuals. We have worked hard to gain that respect, and deserve every bit of it. But we must never lose sight of what put us here, or where we came from. That is the only way we can continue to grow, learn and be beneficial to others and ourselves. Through breeding, we are a very competitive type of radio operator. We must not let that competitiveness infiltrate areas of our hobby where it does not belong. There are aspects of our hobby that can only flourish and serve their purpose if we work as a team. There is no compromise when it comes to teamwork. In such modes as packet, and others that deal with our dedication to serve in the best interest of the public, and Amateur Radio. No one man or station is an island, and yes, it's a thankless job, so if you're doing it for pals on the back, you backed up the wrong team. But if you're the type that is content with the self satisfaction that you did help others, then you're the one to get involved in public service, there is no room for any other. So let's all take a close look at ourselves and instill back what may have been lost, and make a real effort to work as a team. Let's make the difference. Thanks to all that participated in Field Day. I hope you found it as enjoyable as I did. A lot of work, but a lot of fun. Hope to hear you all next year. N4GAA is planning for the SET, so make your plans. Clubs, get your liaison ready. Now is the time to start planning how your group will be involved. Let's make this a good SET and get all clubs involved. Interested in getting your club involved with the ARRL? Well, give Chris, NK1U, a call. He'll be more than happy to fill you in. Till the next time, 73.

Net	Sessions	Stations	Traffic	NM	Liaisons
WESCONN	31	420	119	KATGWE	CPN
NATN	31	468	326	NK1H	CSTN
CN	62	318	210	W1WCG	IRN
CPN	31	420	111	KY1H	FRN
GSN	20	104	35	N1FRN	IRN
RTN	31	200	56	WA1FCA	CN
TRMCRN	4	253	6	NM1K	

CT Section Traffic Node, KY1T BBS: 291 QTC, N1DCS-4 403, NM1K-2 102. Traffic: NM1K 536, KY1T 212, KATGWE 197, KATJAH 168, KATROL 85, KY1F 57, W1KBD 51, N1GBP 48, N1FMN 46, W1WYU 36, K1HEJ 32, K1KZ 26, N1API 23, W1BND 21, W1CUD 20, K1COL 20, KATREQ 18, WA1NLD 18, N1BOW 15, W1YOL 13, W1QV 6.

**EASTERN MASSACHUSETTS:** SM/SEC, Barry Porter, KB1PA—STM: WA1TBY, PIO: K1HLZ, BM: KA1NO1, OOIJA: AG1F, SGL: K3HI, TC: KA1IU, ACC: KA1SAO, EMass Hot-line: 617-437-011

Net	Mgr	Freq	Time(EDT)	Day	Sess	QTC	CN
EMRI	N1AJJ	3636	1900/2200	DY	69	180	224
EMRPN	WA1FCD	3680	1730	DY			
EM2MN	N1DUB	6328	2000	DY	31	176	428
NEEPN	K1BZO	3945	0830	SUN	4	8	34
HHTN	N1FLO	0464	2230	DY	31	231	414

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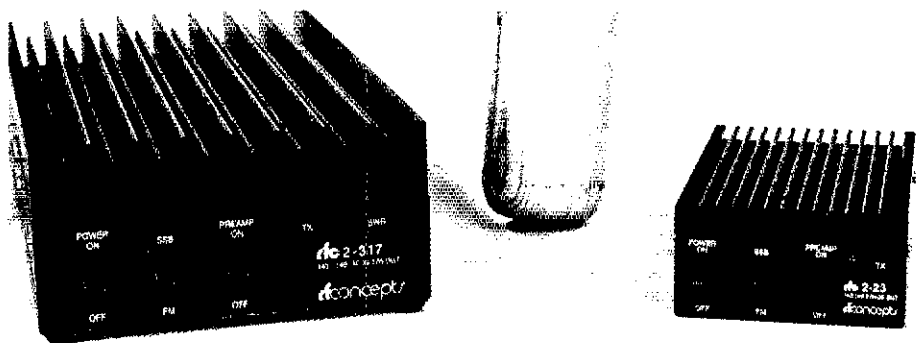
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1-1SG-17 RF Gen	140.	
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1-801 A Curve Trcr	200.	
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<b>MISCELLANEOUS</b>		
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Recently a number of safety related incidents have happened to Hams in this area. Remember, this is a HOBBY, and NOT worth risking your life over. If you are in charge of a work party, please be sure that the people you are working with are in acceptable physical condition, and at least one or two of the party have CPR training. Also be sure all proper safety precautions are taken and equipment is in usable condition. Every year someone needlessly gets hurt or dies because these principals are forgotten or ignored. Don't let this happen to you or your friends...Become a Safety Nut!!! Do You know your town's RACES Radio Officer is?? Do You know if your town even participates in RACES. 70% of the towns in Eastern Massachusetts do not currently participate. The RACES/ARES program wants YOU!!!! To find out if your town participates or not, talk to your local Emergency Preparedness (CD) Director. This program is VITAL for the protection of life and property in your community, because in a real disaster, communication with the State and Federal Governments can speed assistance to your community. If you run into difficulty, let me know. We should have at least 95% coverage of the communities in this part of the state. Have you done anything to enhance ham radio's reputation this month?? Please express your opinion on amateur radio issues to your section or division staff. We appreciate your input.

MAINE: SM, Ted Bonesteel, WA2ERT—Maine Emergency Communications Manual is published thanks to the efforts of a dedicated group of Maine amateurs. Kennebec County MEMA holds emergency exercise. Paul, KA1MVG, Stacy, KA1HMB, and Carl, W1SIN, provided amateur communications. I regret to report the passing of Gene, N1BME, who became an SK on May 29. Upcoming exams: Aug 12, Sat 10 AM, St. Albans hamfest, NU1L; Aug 26, Sat 9 AM, Bangor EMVTI, K1AG; Sept 9, Sat 2 PM, Windsor hamfest, WA2CJO; Sept 21, Thurs 6:30 PM, South Paris, KA1REB. Net Activity: PTN/W1KX/30/196/113; SGN/K1GUP/26/814/130; AEN/WA1YNZ/5/76/15; CMEN/N1DZI/10/155/12; Kennebec/K1LPW/4/70/1; Oxtord/W1RWG/4/41/11; Cumberland/K1A1ODT/5/54/1; Hancock/WA2ERT/4/41/3. Bulletin stations xmtd 39 bulletins. Station activity: W1KX 241, KA1REB 64, WA2ERT 63, NR1F 62, K1UNQ 61, N1BCF 48, KA1ODT 38, KAZZKM/1 37, WA1YNZ 32, W1BMX 30, W1OTQ 15.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—ACC: K1M. STM: KB4N. As I promised last month, we'll start off with two rather unique public service events. Amateur operators from GBRA and the seacoast area aided in safety and communications with the Granite State Spring Bike Trek, sponsored by the American Lung Assoc. It was a 140-mile course through Maine and NH and Bill WA1PEL forwarded copies of press releases in the local papers with Amateur Radio being a good plug! The trek finished at UNH with plans already underway for another trek in the fall. While the bikers rolled on, Ralph, KA1TIO, was attending an Armad Forces Week celebration in Rochester. Ralph is a Navy recruiter and a member of GBRA. And now...the Solar Car race?! From our first contact with Bob Wills, the Tour De Sol director, we knew that this would be a unique experience...how unique we were to soon learn! The cars started in Vt, then on to Hanover where our communications team picked up the task of helping keep track of 6 solar powered cars and one (are you ready for this?) solar-powered bicycle over a 60 mile run to Concord! NCS was at the Governor's Office of Emergency Management in Concord with repeaters from Hanover to Darry used to track the cars. Hams were at check points along the route and shadowed each vehicle as it traveled the 60 mile run. One vehicle was solar-cell limited and had to stop regularly to recharge batteries. W1GUX and KB1DL trailed the car for most of the day reporting in position and status to the tour director. Primary NCS was Cal WA1WOK with relay stations Jack K1NOR and Sam W1EMN providing valuable support. The list of Hams working the race is too long to include here, but our thanks to Warren WB1HBB and NHARA for superb organization and execution and our appreciation to the 30 Amateur operators involved for making this a safe and successful event. The Governor welcomed the cars at NHVTI and, after an overnight rest and afternoon and morning battery recharging, the cars headed for Lowell through southern NH on a shopping Saturday! Again the Amateur team helped keep things under control and the remaining solar cars rolled into the Univ of Lowell safe and mostly sound. We heard stories of solar panel modules falling off onto the roads, close calls with impatient or inattentive drivers, and "high speed" runs following solar cars at 40+ MPH! In summary, a challenging effort well supported by the Ham community. We will be playing an expanded roll next year in what is expected to be a much bigger event. Rich, KB4N, has been elected to fill an unexpired term as Member at Large of the Eastern Area Staff. Congrats to Rich, N1FDJ, who is our first officially Certified Emergency Coordinator. Rich passed the test with flying colors and qualified under the new guidelines! In club activities, Pete, K1M, our ACC presented the ARRL Affiliation Certificate to SVARC Pres W1FJH as they join us as the newest affiliated club. And the Contocook Valley RC liked their first annual fleamarket so well, they are going to make it semi-annual with "Day-East2" on Sunday, Sept 17th in Contocook. It's a good location and easy to get to— but what about all those grazing sheep...? For more info, contact Warren, WA1RLO, or Dave, K1OPQ. The recent NARC Novice classes turned out many new Hams including Paul, KA1TMK, who is the local Red Cross Disaster Chairman! NARC maintains a station at the Red Cross and this now provides a key comm link for both groups and improves an already excellent working relationship. Still on clubs- I have been getting copies of the 1989 Annual ARRL club reports from HQ. Thanks to those clubs who take the time to provide this needed info. It helps us all keep current on the contact people and meeting locations. Your club should be submitting the report soon, if it hasn't already done so! Don't let it slip by- it's another way the Field Organization keeps the data base correct and insures that you will get mailings during the year. My visits included the IRS for a satellite program, NARC, WRONE (reported last month), but I missed the NHARA state meeting in Henniker due to prior commitments. Tom, K1KI, our Division Director was featured at the meeting and Warren reported good discussions and comments. Club Pres- watch for the next NHARA meeting and plan to attend or send a representative from your club! On the traffic front, we have a significant change in process as reported by Rich KB4N, our STM. Due to the low participation in

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Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-720B	1.8-150 MHz	20/200 W/2 kW	SO-239
NS-660A*	1.8-150 MHz	20/200 W/3 kW	SO-239
NS-660PA**	1.8-150 MHz	20/200 W/3 kW	SO-239
NS-663BM*	140-525 MHz	20/200 W	SO-239
NS-663BN*	140-525 MHz	20/200 W	N-Type

\* Back lit with remote sensors available  
\*\* NS-660PA-Peak power reading

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	1.8-180 MHz	15/150 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-465M*	140-450 MHz	15/75 W	SO-239
CN-520M**	1.8-60 MHz	200 W/2 Kw	SO-239

\* Back lit with mobile bracket  
\*\* Optional mobile bracket available

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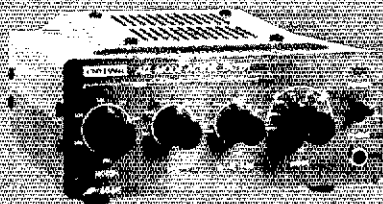
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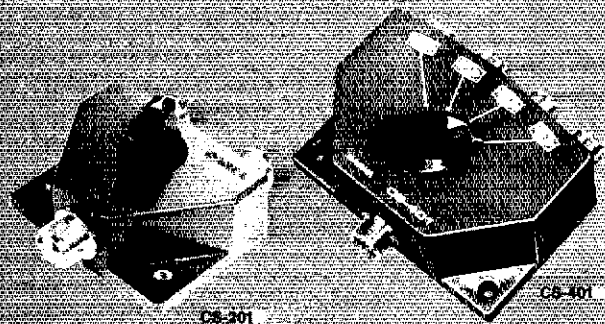


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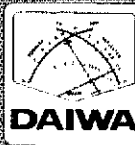
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### Coaxial Switches

Pat. No. 5,900,380



	CS-201 2 Position	CS-201G 2 Position	CS-401 4 Position	CS-401G 4 Position	CS-4 4 Position
Frequency:	500 MHz	1.3 GHz	800 MHz	800 MHz	1.5 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
Isolation:	+60 dB	+60 dB	+80 dB	+90 dB	+60 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	800 W PEP 280 W CW
Insertion Loss:	All models less than 0.2 dB				



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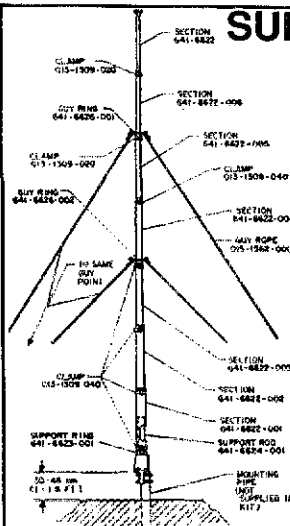
V-160, 160 meter vertical. This single band vertical includes loading coil and capacity hat for 160 meter operation. Height is 36' with two guy positions. Radials and ground rods recommended for best operation. See "160 meter vertical" construction article in MAY 1989 CQ Magazine for additional information. Price: \$295.

Radial Kit, contains 300' of 14 gauge stranded copperweld. Price: \$29.

Ground Rod Kit, contains three 6' copperweld rods, clamps & wire. Price: \$35.

LA-2818, Lightning Arrestor mfr. by DALE Electronics has a minimal loss up to 300 MHz with UHF connectors. This is a must for antennas such as the verticals described above which can attract lightning easily. 2.875" long body has a 2" square mounting flange which should be connected directly to a ground rod system (three rods placed in a 12' triangle is recommended). Price: \$89.

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the NH Section CW net (NHN). Vermont and NH are combining their section CW nets to produce the Vermont/ New Hampshire Net (VTNH). Beginning Wed. June 14, VTNH will meet at 1900 local on 3539 kHz. Liaisons and traffic handlers should address questions to Rich (packet @ KB4N). We hope that this combining process will strengthen operations in both states and your support will be greatly appreciated during this transition. In other net activities, we had 93.6% rep on 1RN, 90.3% rep on 1RN/4 and 100% rep on FRNI. Again, thanks to all who make it happen! TRAFFIC: NGS: GSPN 126, G5FM 102, NHH 30, T5FMEN 8, T5EN 3, MCEN 1. Stations: WIPEX 2443, KB4N 1432, K1TQY 454, W1FYR 442, N1CPX 408, KA1NXT 115, KK1E 63, W1ALE 61, N1ALM 33, KA1ROH 13, KA1HPO 11, K1IM 8, KA15XM 3, KA1FKX and KA1LMR 2. BPL: WIPEX, KB4N, K1TQY, W1FYR. PSRR: W1PEX, KA1NXT, N1CPX, KA1HPO.

RHODE ISLAND: SM, William M. Foss, KA1JXH—On March 11, OSARG provided comm. for the Whitewater Canoe Race and the St. Patrick's Day parade in Providence. OSARG also provided comm. for the Gaspee Day parade on June 10th. OSARG last Novice Class had 13 new Novices. Novice classes will start in August. Contact Dick, K1CVP, at 401-944-8488. The American Lung Association June 18-24 sponsored a 6-state 570 miles bike race through New England. Traffic: W1EOP 252, KA1KML 175, PSRR 61, KA1JXH 111, PSRR 68.

WESTERN MASSACHUSETTS: SM, Bill Voedtsch, W1UD—OO/RFI: N1CM, P1O/ACC: K1BE, SEC/SGL: WB1HHH, TC: KA1JJM. STM: W1KK. During the club banquet of the HCRA AC1T was presented with the first award to have the new NTS logo. John headed the group that put the W1NY PBBS and digipeater on the air. Resulting in access to the second largest city in Western Massachusetts, Springfield. Luck Hurd presented Jean, KA1EXJ, with a merit plaque for her outstanding work in the NTS. If you have been reading the traffic standing and the BPL certificate awards you would see that Jean has received a BPL certificate for the past twenty months. No small feat by anyone's standards. As I have said in other past years, we will be getting visitors to our section this summer. Make them feel welcome by giving them all the assistance you can. Traffic: KA1EXJ 959, KA1RVN 108, KA1EXJ 88, KA1QV 77, W1KK 74, W1SJV 61, K1JHC 41, K2IU 28, WB1HH 23, W1ZP 5, W1UD 184, KA1MWZ 4, WA1OPN 3, W1EVJ 2, K1ZL 1.

### NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—ASM: K7REX, OOC: WB7CYO. STM: W7GHT. ACC: N7BL. P1O: W7GE. I don't know what happened to W1MU this year, but next year is IDAHO's turn to host the W1MU hamfest. I would like to have it somewhere in SE Idaho to coincide with Idaho's centennial. If you have a suggestion or know a good place that would be attractive for a family-oriented type hamfest, please let me know. If you have any thoughts about code-free ham licenses, the ARRL is seeking comments. Traffic: W7GHT 272, KA7WZM 121, WS7U 41, T3J, Don. Net reports:

NET	SESS	QNI	QTC	MGR
Farm	31	2152	102	WA7GSM
IdahoGD	23	685	35	K7UBC
NWNT	31	940	44	N7LMA
NWN	31	296	243	KA7EE

MONTANA: SM, Pete Peters, KF7R—ASM: WA7PZO/WB7QDN. SEC: K57R. KA7RRR Bill Brumley became a Silent Key May 23. Bill was very active on Packet; up grades; Extra; K7LUH, KF7BQ. Adv: N7KEU, N7MPP, WB7USV; Gen: N7MSB, N7MTT; Tec: Kevin McCray, Tom Cordingley, Bill Jenko, Bruce Walters, Owen Warren, Bill McGuire, Maurice Austin, Marcus Moffitt, Deborah Vlam, KB7CPD, KA7BY5; Novice, Jin Nybo; Tec: KB7APB; New Auto Patch 25/85 Helena: Public Service events worked: Helena Butte Great Falls Missoula Billings Bozeman Kalispell; contacts for Novice Class: KB7AN, WB7SWH, WB7QDN, WA7SPE, WB7QDL, N7RB, K57R, WC7U, N7HKU, WB7WBW, N7KOR, N7MHO, WA7ZOO, N7LDR, WQ7S, WA7PZO, N7ATT, KF7KN, KA7IZU, KE7X, N7AIK, KY7D, KF7R; TPC: W7TGU 212, KA7YYR 128, WB7WWD 100, PSRR

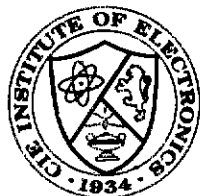
NET	SESS	QNI	QTC	NET MGR.
MTN	31	1474	87	N7AIK
MSN	4	88	0	KF7R
IMN	31	295	243	KA7EE

OREGON: SM, Randy Stinson K27T—ASM: KM7R. ASM: W7FBP. STM: W7VSE. SEC: KV7F. P1O: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. SEA-PAC Ham Convention is over and, as usual, there were more exhibitors and attendees than the previous year. The convention center is going to enlarge the facilities by half, and just in time because the convention has outgrown the present building. SEA-PAC honored three people for their service to the Ham community. First was Randy Cobb, WN7W. He taught Novice classes for five years at Portland Community College, ran the VE testing program from the beginning at PC every first Saturday of the month and is very active with the Oregon Tuatatin Valley ARC. Next was Doc McLendon, W7GWC, who started the SEA-PAC convention seven years ago and Al Berg, WB7SIC, who teamed up with Doc and co-chaired SEA-PAC until 1987. I would like to personally thank all three of these people for their dedication over the years. I have asked Bren, KM7R, to take over the ORIS program. ORIS stands for Oregon Repeater Interlink System. It is a state-wide linking system on two meters. It would be similar to the Evergreen Link in Washington. Traffic (P) = Packet: W7VSE 383, KA7EEE 383, WB7VMS 349, N7BGW 285, WGH 207, WB7EMO 174, W7TA 96, N7CPA 80P, W7ODG 77, W7LNE 76, WE7A 73, KA7AID 41, KV7F 39, N7DRP 26, KD7YJ 26P, KA7WFV 8, W7BDU 3, AL7W 3. (April) WE7A 79, N7CPA 63, N7DRP 8.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM: KC7MM. ACC: NQ7M. SGL: KD7AC. TC: W7DBV. It was a pleasure to meet amateurs from all over the section at PLU in Tacoma, August 19 & 20. Station appointments are a way for you to provide services to other amateurs or the public in general. Contact the SM if you are interested in information about Official Relay, Official Emergency or Official Bulletin Stations. I apologize to those stations who turned in traffic reports and who have not been recognized by this column. WA7CBX SEC reports 1438 hours of public service for April 89. Is Amateur Radio included in your county's emergency plan??? Traffic:

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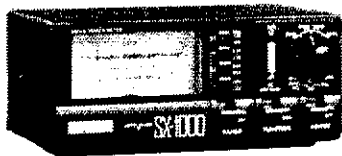
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For detailed information please read the "New Products" article in April '89 CQ Magazine.

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Model	Band	Lth	Am Net
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X-200A	2M&70cm	8'	159.95
X-500NA	2M&70cm	17'	199.95
U-200A	70&23cm	6'	129.95
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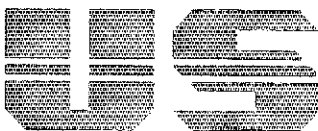
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MA-550	55'	22'1"	3	435	3" sq.	6"	\$1369.00
MA-550MDP*	55'	22'1"	3	620	3" sq.	6"	\$2909.00
MA-770	71'	22'10"	4	645	3" sq.	8"	\$2509.00
MA-770MDP*	71'	22'10"	4	830	3" sq.	8"	\$3969.00
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TX-455	55'	22'	3	670	12 1/2"	18"	\$1539.00
TX-472	72'	22'8"	4	1040	12 1/2"	21 1/2"	\$2529.00
TX-472MDP**	72'	22'8"	4	1210	12 1/2"	21 1/2"	\$4069.00
TX-489	89'	23'4"	5	1590	12 1/2"	25 1/2"	\$4399.00
TX-489MDPL*	89'	23'4"	5	1800	12 1/2"	25 1/2"	\$6599.00

\*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets)

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HDX-555	55'	22'	3	870	15"	21 1/2"	\$2309.00
HDX-572	72'	22'8"	4	1420	15"	25 1/2"	\$3959.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25 1/2"	\$6049.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30 1/2"	\$7919.00

\*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

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\*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction.

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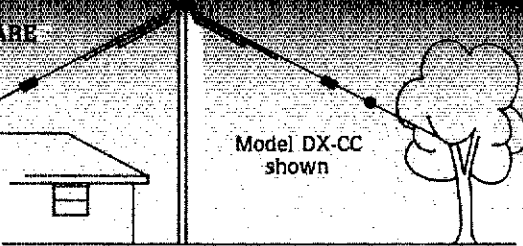
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(Feb-April) K7GXZ 696, W7GB 395, WA7YEN 255, W7LBK 149, N7HAT 43. (May): W7GXZ 189, W7GB 139, WA7YEN 116, W7LBK 75.

**WESTERN WASHINGTON:** SM, Ed Holloway, KA7INX (@KE7OM). STM: KD7ME (@K7KNZ). SEC: NM7N (@KE7OM). OOC: N7DVR (@W7LVJ). SGL: KD7AC. BM: N7CAK (@W7LVJ). PIC: N7FKV. ASM: K7CLL (@K7IFG). ACC: KR7L (@W7LVJ). It is with great regret that I have to announce the passing of Hal Jones, W7UOF, who became a Silent Key the early part of this month. His passing is a big loss not only to his family but to his many friends in Amateur Radio. Hal was the Assistant Section Manager, and the Washington Emergency Net Manager. Jack, W1PRT, has volunteered to handle the WEN until a permanent replacement can be found. Yakima Hamfair over and a great success Olympia OARS Pres advised me that the club is going to be playing CW Bingo (Gee wish I had thought of that one). A real good way to get the Novices involved. (They are a good source of new ARRL members and a new hat for you to boot!). Don't forget the Northwest DX Convention to be held July 28-30 at the Holiday Inn, Renton, Wash. That's the one nice thing about Ham Radio, something going on all the time!! It's a wee bit early, but—the Radio Club of Tacoma's Hamfair will be hosting the Northwestern Division Convention at the PLU setting (same as past years). This will be August 19/20. Public Service hours for the section was 715. Traffic: K8AJT 8, K7CLL 6, KA7CRN 19, N6EQZ 78, KR7F 144, K7FFF 59, N7GGJ 126, W7IGC 354, N7IJJ 6, W7LG 209, KA7PMD 30, W1PRT 20, K7SUX 130, KA7TTY 40, W7TVA 463, K7UQH 78. PSRR: W7TVA 128, KD7ME 117, N7GGJ 67. 73, Ed, KA7INX, SM.

### PACIFIC DIVISION

**EAST BAY:** SM, Bob Vallio, W6RGG—ASM: W6ZF. W63FCV. SEC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. MDARC welcomes new members N6MIN, W6DEOS, KC8AQO, Pat Newman, and Dick Spragens. The club mourns the loss of W6RDW. EBARC welcomed into membership the following recent graduates of their Novice class: A. G. Troya, Bill Gore, Willie Gore, and Dale Grosch, as well as KD6JL, WD6ACM, WB6VEX, and Florentino Iabao. Member N6TUU recently upgraded to General at the tender age of 13. FBI THE LARK RACES/ARES group found themselves with a walkathon and bike ride on the same day, so WA6TGF scheduled them both on AD6X/R for some disaster simulation communications! The 300 walkers and 616 riders were taken good care of by this proficient group: N6DOA, N6FQQ, KA6DXY, KB6DXR, KF6VU, WW6I, KB6YVY, WA6SDA, N6PFX, N6OPL, KASAP, WB6ALR, N6SLE, NC6Z, KA6ECD & WA6TGF. It's no wonder that the City of Livermore presented a Certificate of Appreciation of LARK RACES contributions over the years. HRC welcomes new members K6QDJ, KC6COL, Danny Bowen & Nicholas Karanikolas. CCCC new members are WA6MGK, KJ6BN, KB6KVI, KL7MP, KC6BID, KC6AWX, K66EW, & KC6CTW. May fix: WB6DOB 250, W6VOM 136, WB6UZX 24.

**NEVADA:** SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. LVRAC had a successful picnic last month and a very successful public service ham radio demonstration in the Meadows Mall, LV, on June 10. Several prospective hams were recruited. There is a QCWA Net Monday nights, 9 PM on 145.39 in the Las Vegas area. We have omitted the monthly traffic report from this column for quite a while now, because there was so little traffic reported in this Section. Marty, K4AM, has volunteered to coordinate the monthly traffic report, and we would appreciate it if you would submit your traffic input to him, before the end of the month. Glad to see Herb, KW6HF, up and feeling much better and attending the last two LVRA meetings. Many Northern Nevada hams did a bang-up job on this year's International Special Winter Olympics. Please send announcements of your club events well in advance—at least two months to W8IXD. See you next month.

**PACIFIC:** SM, Wayne Jones, NH6GJ—The biggest news this month was the statewide tsunami exercise. It was planned as a command post type exercise, and relatively few were involved. On Kauai, participants were NH6HF, NH6KG, KH6JPT, KH6JIB, KH6E, KH6AJ, KH6FK, and KNH6S. On Oahu, participants were NH6GJ, KH6NJ, KH6JBS, NH6PY, KH6JCA and others in a mobile role. It was a very worthwhile exercise in that it exercised the professional staff of Civil Defense, and volunteers from all agencies. On Oahu, ten schools were successfully evacuated without incident. On Guam, AH2AT, AH2AE, AH2BT, AH2CC, KH2A, WH2AEN, KH2CC, KH2DN, KA6VIP, WA4HTX, and W1YRM provided support to the JAL Marathon. W1YRM, KH2D, and WH2AEN also provided support for a 5K run/walk that drew about 800 participants. I have been having trouble with my packet setup, so all traffic figures are not available, notably, those from KH6GMP. Will update the figures next time. Until next time, Aloha to all! Traffic: KH6GMP: N/A, KH6H 18, KH6S 30.

**SACRAMENTO VALLEY:** SM, Bob Watson, W6IEW—It was a very interesting month with visits to several clubs and talks with many hams. The main concern is the no-code issue and a very strange situation seems to have developed—those on whom the proposal will have little or no impact are the most vocal in opposition. In many cases, it turned out that they really did not know WHAT the proposal was, the many THREATS to ham bands that generated it, or the fact that it was ORIGINATED by hams, mainly TAPR and AMSAT. After sampling the present or planned future usage of the VHF and UHF bands by members of the Amador County ARC, Butte ARC, Golden Empire ARS, Shasta Cascade ARS and Sierra ARC it appears that no more than five percent have any interest at all in the bands of frequencies being proposed for use by the new license. Interestingly enough, most of the ones that do have an interest in those bands support the new license concept. Therefore, if those who DO NOT have an interest in the frequencies involved WILL BE FAIR, put emotion aside, and support their fellow hams who DO have an interest. Traffic: WA6WJZ 130, K6SRF 41, W6ZUD 34, W6CFQ 33, W6RFF 22, W6BSRQ 10, KB6WJ 3, W6RHC (Silver Dollar Fair) 61.

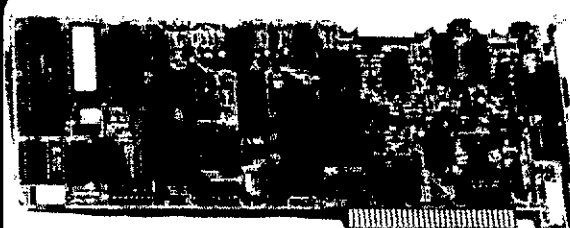
**SAN FRANCISCO:** SM, D. Wilson, K6LRN—W6RLS passed away in May. W6ZHO WA6UHA W6VW W6TFW W6ZXW W6OAA KA7JAN WASGTY and R. Lugtu of SFRC worked the Golden "Gait" Walkathon. N1AL KC6BSI WD6CKP N6DDK N1DJE W6D7V KJ6EC WB6EKV WD6EVL N6FAX W6FCQ N6FYU K6EVE N6GX1 N6GZU WA6XIC W6BHZ W6JFN N6KLU N6KML K6QJ W6LLY K6LS N6MHG W6AMGK KA6OFR N6ONZ N6OOA N6PTM N6RMW N6QAV K6QY



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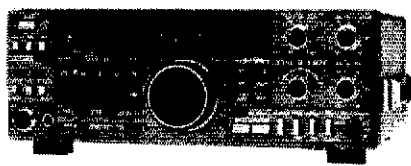
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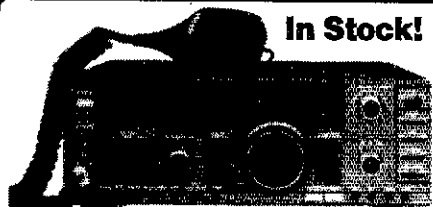
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**SAN JOAQUIN VALLEY:** SM, James Wakefield, AH6CO—As I am returning to Hawaii, this is Aloha No and Byron Smith, WA6YLB, is taking over the position of Section Manager. His address is 269 So. Silva, Tulare, CA 93274. Land line (209) 685-0305. Send future reports and bulletins to him. Reports show full participation of the clubs in the section for Field Day. How did you do? Report right away for coverage in this column. Very short report this month! 73, Jimmie.

### ROANOKE DIVISION

**NORTH CAROLINA:** SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PID: AB4FW. The new District Emergency Coordinator (DEC) for "Area C," the 18 southeastern counties, is Jim MacLeod, W4NHV. Jim is replacing KA4PAZ who served as DEC for over four years (THANKS TO ADRIAN FOR A JOB WELL DONE!). Jim will coordinate ARES activities in these counties and work directly with the NC Em. Mgt. Div's. "Area C" Coordinator, Buddy Jackson (KA4HLZ). W4NHV is well qualified for this appointment. He has been EC for Robeson Co. for the last three years and was Asst. EC under W4VZ when the tornadoes of 1984 severely damaged Red Springs and Maxton. Jim has made MAJOR contributions to Amateur Radio in NC over the years. His first involvement in emergency communications was in the early 1950's as an EC for four NC counties in the mountains. Jim's is a Amateur Radio family, his wife Suzanne is W4ZKY and his daughter Suzie is W4PET. We are all fortunate to have Amateurs like Jim involved in NC ARES. [BT] FIELD DAY REPORTS ARE DUE !! Please be sure your group submits a report on time. Field Day is a major exercise and it is important to document our participation. [BT] A Hurricane Preparedness Exercise was held on June 8 & 9 involving almost a third of the state. The DEC's from Area A, WA4MOK, and AREA C, W4NHV, were at the Area offices and most of the county EOCs and the NWS offices were manned for both days of the exercise. This was the largest hurricane exercise ever held in NC. Visitors from Alabama and Virginia were at the State EOC in Raleigh as observers. The role of ARES and importance of Skywarn Nets were mentioned by NWS officials at all the briefings. A "telephone failure" was part of the exercise, which required all communications for the Area A office to be via Amateur Radio. [BT] The NC Em. Mgt. Div. was presented with the National Hurricane Conference's 1989 Em. Mgt. Award for Outstanding Contributions to Hurricane Preparedness on April 6. ARES, as a member of the State Emergency Response Team (SERT), shares in this national recognition. [BT] Friday, June 16, at 7 PM several tornadoes struck Alamance Co. The RDU Skywarn Net had been active since 2 PM due to Severe Thunderstorm Watches & Warnings. 188 homes were damaged or destroyed, the only injuries were two people trapped in a car by a falling tree and fortunately no deaths were reported. Amateurs were already relaying damage reports to 9-1-1 when ARES was activated by WB4SGA, Alamance County EC & "Area D" DEC. The county Em. Mgt. Coordinator asked that stations be set up at the Town of Elon College command post (at the fire station), county communications center, county EOC (using the 26-H just purchased by the Burlington Police for ARES), a club station permanently set up in the City garage, and the Duke Power Co. operations center (power was lost throughout much of the county, ca. 30,000 customers were affected). The next morning Amateurs worked with damage assessment teams. The operation involved 23 Amateurs and continued for 38 hours. Alamance Co. ARES has a long history of effective service and excellent relations with local Officials (who have supplied a communications vehicle for ARES for the last 15 years). Moore, Durham & Forsyth Co. ARES groups were standing by to assist if needed. Asst. SM AB4S commented that the net on 146.07/67 was one of the most effective and efficient he had heard. [BT] High Point ARC Hamfest scheduled for August 19 & 20. Shelby ARC (which has 100% ARRL membership) will hold their 32nd Annual Shelby Hamfest ("the grand-daddy of them all") on Sep 2 & 3. [BT] May traffic: K4NLK 351, W4HTE 290, N9CGD 124, K4IWW 110, KB4FWL 83, W4L00 79, AA4KZG 70, AA4ZV 64, K4GI 63, KA4EYF 62, W4BWI 51, AA4ZV 50, N4UE 49, N4SVZ 44, WA9NEW 43, W4MRD 41, N4L8T 40, WA4MNR 37, W4EHF 36, KP4NJ 32, N4M3M 30, W4EHF 24, W4LWZ 20, KB7LX 19, KC4GCK 17, WA2EDN 17, N4SHE 16, N4VHU 15, W4LSS 15, KC4GCK 14, N4JTG 12, AB4W 11, W8KLF 9, A4JF 9, W2JDB 7, N74K 7, K4YV 6, KM4BN 6, N4TOH 5, W4EAT 3 [AR].

**SOUTH CAROLINA:** SM, Ned Moeller, NF4VU—In May, 55 South Carolinians received licenses. Volunteer Examiners: THANK YOU. Novices: IMPROVE your code speed. LISTEN on 3715 kHz daily at 6 PM local time to the Carolinas Slow CW Net. Affiliated Clubs: DEVELOP programs in these 6 areas: (1) Public Relations, (2) Emergency Communications, (3) Training, (4) Technical Advancement, (5) Operating Activities, & (6) ARRL membership. These programs establish Special Service Club eligibility. The Columbia ARC was granted SSC status in May. Blue Ridge ARS Inc, Greenville and Anderson RC reaffirmed their SSC commitment. Clubs: NOMINATE an Asst EC, PIA, OBS & ORS. Forward their names to the SEC, PIO, BM STM or SM for their ARRL appointments. All ECs & AECs: JOIN RACES. There is no conflict. Why the misunderstanding? When an emergency exists, we radio amateurs at specific locations respond on our designated emergency nets for the sole purpose of passing message traffic as a Public Service. If there are any questions, contact me. K14FL 599, N4MEJ 82, W4ANK 47, KA4LRM 42, W4DRF 40.

### VIRGINIA: SM, Claude Feigley, W3ATQ—STM: N4GHI. SEC: WB4ZTR. ACC: NT4S. OOC: W4HU. BM: AB4U. PIO: AA4VP. TC: WX4C. SGL: W4UJMC.

VIN	1 PM	390777280	W4JLS
VSN	6 PM	3947	K14BR
VSN	8:30 PM	3680	N4KSO
VN(EARLY)	7 PM	3550	N4GHI
VN(LATE)	10 PM	3690	WB4KSG
VLN	10:15 PM	3947	KF4FV
SVEN	9:15 PM	148.82	N4TS
STARES	9 PM	148.97	KJ4VT
DECEC	9:45 (3rd Wed)	3947	KA4NWK

**PLEASE NOTE:** There has been a change in both the STM and SEC appointments. Effective June 10, N4GHI, has assumed the job of STM and WB4ZTR has taken over the post of SEC. It was with deep regrets that I accepted the resignations of Earl, N4EXQ, as SEC and Glynn, KB4WT, as STM. Both of these fellows have served the section with great distinction and they will be missed. Earl has been advised by his doctor to slow down and take things a little easy and Glynn is up to his ears at ODU and busy with other outside activities that require much of his available time. I am sure all will give Geri, N4GHI, and Steve, WB4ZTR, the same full support they have given in the past. As his final report, N4EXQ, sez we have over 1200 ARES members and they are very active with participation in events such as: The Summer Special Olympics in Richmond, the re-enactment of Civil War battles at New Market and Louisa County, NT4S reports the Southern Peninsula Amateur Radio Klub (SPARK) has been designated as a SPECIAL SERVICE CLUB and that the Portsmouth ARC, the Roanoke Valley ARC and the Shenandoah Valley ARC have been officially renewed as SPECIAL SERVICE CLUBS. The LPM held in Ripley, WV was well attended. Sorry some of you missed a chance to discuss the problems facing ARRL. Be sure to send your comment on the No Code proposal of the ARRL special committee to our director, N4MM, so he will be prepared for the July ARRL Board meeting. Upcoming VE exams- Aug. 6, Berryville Hamfest, contact Walt Quitter, NC4B. Aug. 19, Hampton Roads Radio Assn, contact Bill Runyon, N4BDH, Sept. 10, Gaithersburg, contact W3QF. Sept. 17, VA Beach State Convention, contact KF4CW. Traffic report, May traffic count was 6121 with 48 stns reporting. In reviewing the traffic report, it appears that some stations may be crediting origins incorrectly. Messages originated by you as the operator of your station DO NOT COUNT AS ORIGINATIONS, they count as ONE SENT. Only messages from a THIRD party count as ORIGINATIONS. It was a pleasure talking to many of you at Manassas, hope to see you at Berryville in Aug. and Va. Beach in Sept. Traffic: WB8TAX 1688, K4DOR 524, N4HOG 326, W4SQO 288, N4EXQ 281, N4GHI 268, W4JLS 267, WB4QJ 244, AA4AT 163, W3ATO 152, WB4MIX 147, WB4KSG 145, K4MTX 145, WB4PNY 145, W44MIS 119, KJ4VT 119, KB4WT 87, W44MZ 84, W4TZC 75, KC4ESG 69, WY7U 69, WQZB 68, K14BR 66, K4BZG 52, WB4ZTR 46, KF8L 43, AA4GL 40, N6GVG 27, WB4KIT 25, K4JM 22, K4R 18, N4FNT 15, K4MLC 15, W4HDW 14, KD4NH 4, KB2CEV 1.

**WEST VIRGINIA:** SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord. WB8GDY. Trn to everyone who has supported us on the 220 MHz issue. Keep tuned, it is far from over. New ACC is Ed Sutton, WA8FLF. Trn Ed for accepting this important job. Also thanks to Bill, WD8EBH for his willingness to help. WX cooperated, and the 1989 Wheeling H. F. had a record attendance year. Congrats to HF committee. Regret to report that WD8BVN has become a Silent Key.

### NET FREQ TIME QNI QTC SESS NM

NET	FREQ	TIME	QNI	QTC	SESS	NM
WVFN	3685	9:00	1038	138	31	WD8DHC
WVN	3567	7:00	269	74	31	KZBQ
WVMD	7235	11:45	793	60	31	WDBV
WVRN	3640	6:30	168	28	31	K8LG
WVNN	3730	7:30	98	42	30	KABZGY
Hillbilly	14290	Noon\$u	126	10	4	W8YP

Traffic: N8JPR 380, WDBV 378, KABWNO 159, W8YP 140, K8TPF 95, K8QEW 71, K8EFL 62, K8AQG 59, WDBDHC 53, N8FXH 48, K8KT 40, W8JWX 25, WD8EBH 12, KABOGF 8.

### ROCKY MOUNTAIN DIVISION

**COLORADO:** SM, Edie Sheffield, KA8MQA—SEC: K4UBU, STM: KB0Z. ACC: WB8DUV. PIO: WB8FQB. OOC: KA8CDN/W4JUR. SGL: W8HINQ/W8HNP. TC: W8LFL. BM: KA8VKM. Tim Armstrong, WB8TUB, has resigned as the SEC. The Section thanks him for his many years of ARES work. Bob Hughes, K4UBU, who has been the E. Slope DEC will assume the position of SEC. Bob Ragain, WB4ETI, Dist. 22 EC will assume the position of E. Slope DEC. Many Clubs, groups and individuals are gearing up for UHF/VHF QSO Party and Field Day. Good luck to all. The International Golf Tournament will once again be using amateurs in their Control Center for Communications. Contact K6WOP or K6JQ if you wish to help. A standard Jacket is being made up for Colorado Amateurs. Red w/white lettering. It has Colorado Amateur Radio on the back with your call letters. For info on price and ordering contact Dan, KB8J, WIMU will be held in Jackson-hole, WY on Aug 5 & 6th. Congrats to NCARC & Greeley ARC for coordinating communications for the July 4th parade in Greeley. 73, KA8MQA. Nets: CWN QNI 60 QTC 50. QNF 289, 286 Sess. CWNX QNI 1422, QTC 1222, QNF 2790, 31 Sess. HNN; QNI 1682, 120-644, 31 Sess. Col. QNI 1016, QTC 49-140, QNF 978, 29 Sess. NCTN; QNI 293, QTC 52, QNF 293, 31 Sess. SCTN; QNI 324, QTC 33, QNF 344. Traffic: N8BOP 1558, K8YFK 542, K8HOA 538, N8HFZ 479, W8LV 410, N8FCR 238, KA8WV 202, WT8G 89, K8SN 38, W8DGVH 30, N8KIA 26, KB2Z 24, W8NFW 4.

**NEW MEXICO:** SM, Joe T. Knight, W6PDY—ASM: K5BIS. SEC: K6EYJ. DEC: W8SHCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GJ. ACC: KA5BEM. Southwest Net meets daily, 3583 @ 0230 UTC, handled 84 msgs with 135 checkins. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 91 msgs with 972 checkins. NM Breakfast Club meets daily, 3939 @ 6:30 AM, handled 154 msgs with 866 checkins. Yucca 2-Mtr Net, 78/18 handled 16 msgs with 388 checkins. Caravan Club 2-mtr Net, 66/06 with 114 checkins. SCAT Net, 68/08 handled 18 msgs with 500 checkins. Info Net 12/72, with 63 checkins. Lots of us looking forward to the Alamogordo Hamfest September 2nd & 3rd and to the Northern New Mexico Hamfest September 30th. Hope to see many of you at one of these events. So very sorry to report that WB5OGG suffered another heart attack and stroke on May 31st. At this moment things don't look good for John. We

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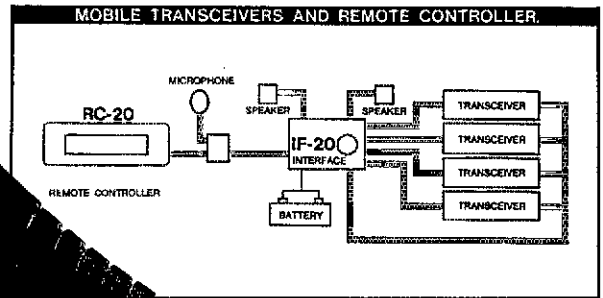
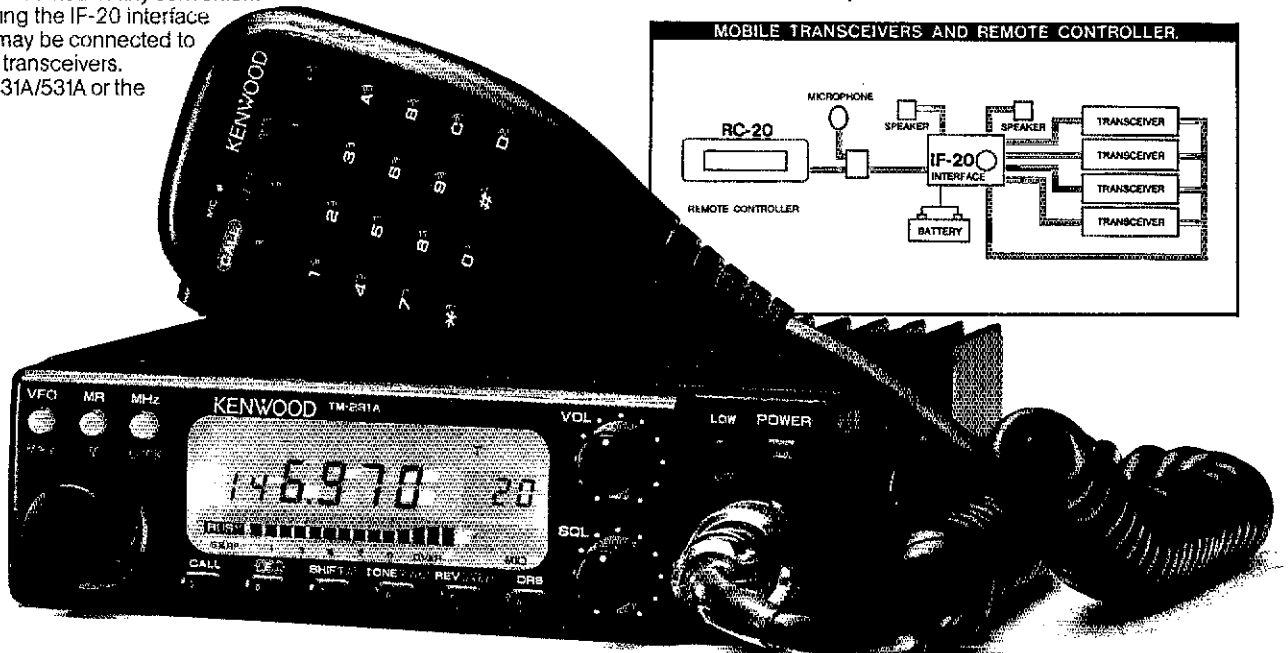
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  - Programmable VFO**  
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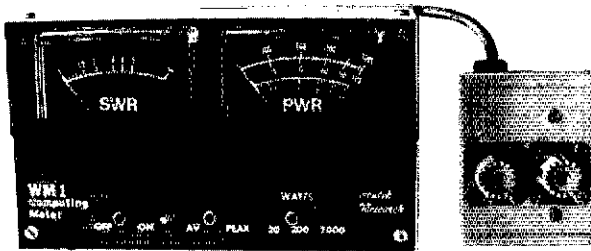
- Dual band (2m/70cm) mobile antenna (mount not supplied) • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **PS-430** Power supply • **PS-50** Heavy-duty power supply • **MB-201** Mobile mount • **PG-2N** Power cable • **PG-3B** DC line noise filter • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **TSU-6** CTCSS unit

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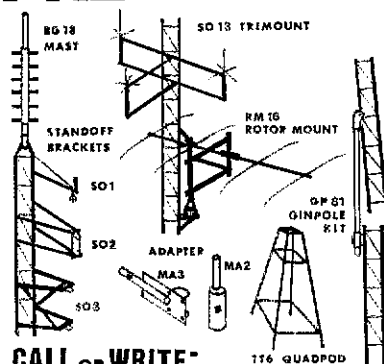
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all wish him our best. Traffic: KN5D 64, KF5VF 81, Sunday Noon Packet Net 54.

**UTAH:** SM/STW, Jim Brown, N7AG—SEC: Rich Fisher, NS7K, Aaron Farr, W7HJK, has received a Governor's medal for Science and Technology on May 11 for developing a successful 400 Hz ground power station for aircraft. Congrats, Aaron! NS7K reminds those wishing consideration for Section appts to get letters to him ASAP. I've enjoyed my time as SM, and would have run for re-election had more time been available. Thanks for your support the past 4 years. 73 de N7AG. Traffic: N7JLC 76, WA7MEL 40, N7ASY 25, N7AG 25, NS7K 21, N7IUN 19.

**WYOMING:** SM, Jim Balsler, N7GVV—Traffic: NH7H 191; W7SQT 108; Cowboy net 23 ses. 673 QNI 8 QTC; Pony Express 4 ses. 176 QNI 1 QTC, Albany ARES 4 ses. 30 QNI; Sheridan ARES 5 ses. 55 QNI: At the State Special Olympics on May 18 thru 20 in Sheridan: KA7CPT, KA7MSV, KB7CEC, KB7DWG, WA7YZO, WD8EAK, N7GYA, N7KEO, W7JID, W7RSJ, W7JK, WA7B, and WA7D worked with the emergency medical technicians handling radio traffic for medical problems, lost children detail, and general traffic at several athletic fields. KB7AAY assisted with the food service. Bud, WA7D, did an excellent job of coordinating the communications during this three day event held at several sites in Sheridan. These amateurs plus other volunteers gave of themselves so that the SPECIAL OLYMPIANS could have their time in the spotlight.

## SOUTHEASTERN DIVISION

**ALABAMA:** SM, James Spann, WO4W—ASM: W4XI. SEC: KB4GDN. STM: N4RT. PIO: KB4KCH. ACC: AA4BL. OOC: KF4VS. SGL: N4FRQ. BM: KA4ZXL. This month, we lost two members of our section staff—our Section Traffic Manager, Ron Thomas, N4RT, and our Technical Coordinator, Derrick Robertson, N4QL, have resigned due to increased work load (we all can understand that!) I have named Jack Bramlett, W4PIM, of Arlon, to be our new STM. Jack is a long-time traffic handler and is manager of the Alabama Day Net. Net managers please send your reports now to Jack and I will continue to take individual reports for station traffic and PSNR. I hope to find a new TC soon. If you are interested, please let me know! We all are looking forward to the Huntsville hamfest and ARRL SE Division Convention this month on Aug. 19 and 20. Thanks to all the Alabama clubs who helped with the Alabama Reunion train project back in May—it was a tremendous success as the stations worked hundreds of amateurs across the state and country! Even Governor Hunt got a good taste of Amateur Radio on board. Thanks especially to KA4ZQA and WA4ZIO who did all the work on getting the station on the air. The Alabama Repeater Council still working on getting autopatch rates lowered for amateur repeater systems despite thumbs down from Alabama PSC. BPL: WA4JDH. PSNR: WA4JDH, W4PIM, W4CKS, W4QAT, WA4RNP. Traffic: WA4JDH 635, W4PIM 231, W4CKS 83, W4QAT 77, WA4RNP 52, WO4W 11, W4DGH 7, W4ZJY 2.

**GEORGIA:** SM, Eddie Kosobucki, K4JNL—ASM: KC4MJ. SEC: NC4E. STM: WB4WQL. Packet: W4CO. ACC: KM4IH. BM: WB4ZQJ. PIO: WB4DEB. SGL: WB4UVW. TC: WD4PAH. First of all Harvey, W4TG, who has been a very capable OOC for the section had to resign his position due to heart surgery and didn't need any stress. Harvey from the section a full recovery & TNX for the FB efforts. We convey our deepest sympathy to the families of W4GGV, Henry Ivis & W4UJH, Roy Brewer who became Silent Keys recently. Georgia Single Sideband meeting will be held in Macon on Aug 26th at the Quails Nest on Sherrling Drive to elect new officers & have the annual meeting. Once again my annual visit to Gwinnett ARS to meet old friends made my day. After a year in retirement, I just had to go back to work because washing dishes etc is not my favorite thing to do. Hi! No, really, I was getting bored & working just makes me feel a lot better. To tell the truth, the money isn't bad either. If ur club or group wants me to pay a visit, I'll be glad to know well in advance so I can once again spend my days off. The May PSNR honorees are: KC4BHX, KA4HHE, WB4DZV, WB4WQL & K4ZUY. The list dwindled during May. I know many more can make it, so give it a try. I have a complete GA SECTION roster of the YES. So if u need any info on someone call or write me & I'll be glad to supply u with names. Once agn, TNX to all who send me their monthly newsletters. I really do enjoy reading them. Until next month, GOD BLESS & 73. Traffic: KC4BHX 131, WB4DZV 110, KA4HHE 102, WB4WQL 97, N4UZ 57, W4AET 53, K4JNL 38, WA4YYQ 36, N4MWR 18, K4BA1 17, K4ZUY 14.

**SOUTHERN FLORIDA:** SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. TC: K4AT. BM: WD4KBW. PIO: N4PBF. ACC: W4TAH. ACC: K4EC. SGL: K4CN. PKT MGR: K4CY. Heard from WD4HHH that K4EUK had an emergency appendectomy but is doing fine. Congrats to K4GHT who upgraded to General—he was on the ARRL Information Net the very next Saturday! Congrats to Cathy and Bill (KA4GDV) West who were married in Orlando May 19. KA4GDV is the son of Miss Phil, KA4FZ1, who is manager of the All Florida CW Traffic Net, QFN. She is also the Southern Florida nominee for ARRL Professional Teacher of the Year. She shared this note with me that was received from the parents of one of her Novice radio class and computer class students: "Rarely in a child's school years does he have the opportunity to meet a truly wonderful educator. You have been this special person for Andy. You lit a special fire for Andy. In believing in his abilities you have shown him he is a capable and special person. As his parents, we will be forever grateful and as a student, Andy will never forget what you gave him. Thank you, Jerry, Diane and Andy (last name deleted)." As a teacher for the past 38 years, this writer understands what she means. She also reports that eight of her Novice class students now have their licenses, and many requested the class for next year. KA4FZ1 was also voted TEACHER OF THE YEAR by the faculty at Caloosa Middle School. The members of the Port Myers ARC have supported her efforts through equipment donations, special speakers, two line helpers and three club memberships for the new Novices. One parent expressed great appreciation for the acceptance her son received from the older members when attending his first club meeting. Dade County amateurs have certainly been busy the past several months—amateurs have assisted with the March of Dimes Walkathon, the Multiple Sclerosis Bike Ride, the Metro-Dade Marathon, the Orange Bowl Parade and most recently the 3rd Annual US Triathlon Series. Congrats to the Tampa Bay ARS—they have been officially renewed as a Special Service Club. Con-

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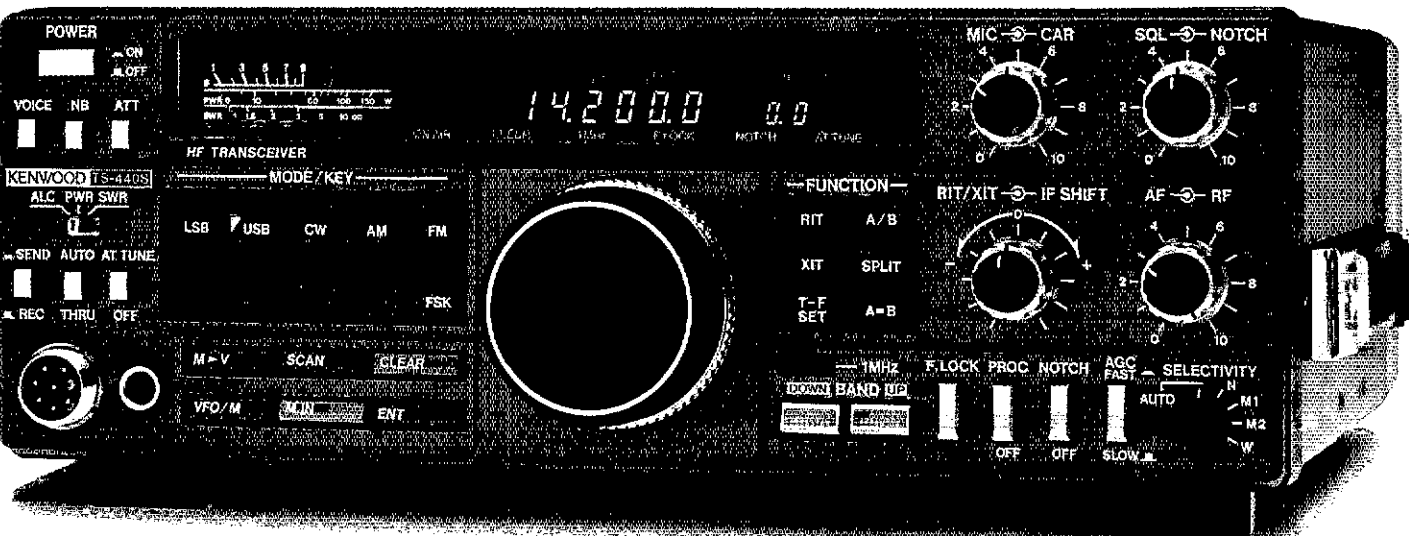
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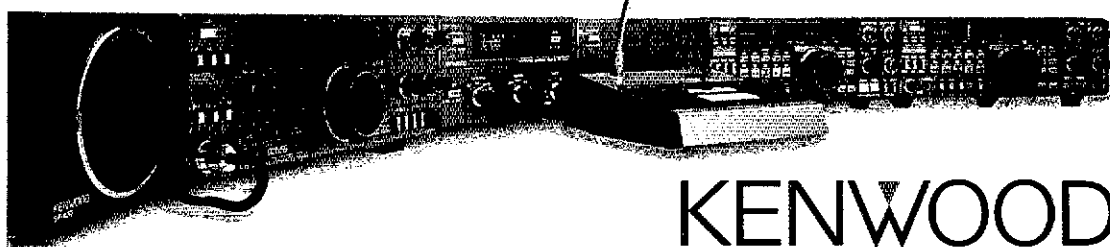
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**Optional accessories:**

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- AT-250 external auto. tuner (160 – 10 m)
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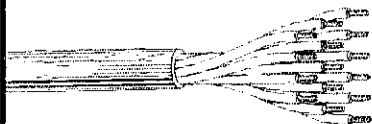
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100	1.4
200	1.8
400	2.6

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grats also to the West Palm Beach ARC who have been officially designated a Special Service Club. The Gator Chapter QCWA Newsletter reported that Les Pulley (no call given) had been presented with a 75-year certificate and also a Century Club Certificate. It also stated that the May Newsletter is the last one until next October. The Everglades ARC reports they will be running battery power this year for a new experience. Club newsletters received included the Manasota Repeater Assoc. Fort Myers ARC, South Brevard ARC, Englewood ARS, the Southwest Florida Traffic Net Palmetto ARC Bug Juice and the Martin County ARA, Common Emitter. All of them are informative, enjoyed and appreciated. Many thanks. Congrats to Jim, KD4GR, who became manager of the Southeast Florida Traffic Net June 1. A big thank you to Jim, KA4YHS who gave so much to the net these past two years—thanks for a job well done! The Southeast Florida Traffic net held a picnic June 4 which was very well attended. A considerable number of questions were asked by the members who showed much interest in traffic handling. Talked with W7LUS who operates a BBS in Sunrise which I connect with on a daily basis in addition to KB4FO's BBS. NX5Q showed me a CW program which he is working on—and I was extremely impressed! Some features of the program...word oriented, training in word recognition and copying behind, 3 wpm (Farnsworth 137 to 40+), chooses random word from list of several hundred, variable word length from 1 (alphabet) to 9-plus many more. Congrats to the new Emergency Coordinators appointed by W4SS; N4LXG, Polk County; N8JLO, Pinellas County; N8HEZ, Manatee County. Many thanks to the outgoing ECs who all have given so much of their time and efforts and now are taking a well-earned rest! WB8VLR, Polk County, W4GPL, Pinellas County and WA3TOX, Manatee County, WD4KBW reports 92 bulletins sent and received by W4DL 17, WA4EC 38, WD4KBW 6, WA9VND 7, and K4IEK 24, WD4KBW has been very QRL lately moving his QTH from Ona to Winter Haven. Remember the ARRL Information Net meets on 3940 kHz each Saturday morning at 8 AM. 73 de WA4PFK. Traffic: W3CUL 3005, W3VR 1021, WA9VND 451, K4SCL 344, WA4PFK 303, WB2HOX 195, WA4EC 184, K4ZK 174, KA4FZ 162, W4NFK 145, N4HAP 144, AA4BN 142, KD4GR 122, N4KFU 116, K4IA 108, W4DL 106, WB4WYG 97, N4MML 96, K4FQU 83, W4DWN 77, WA4RUE 76, K4EUK 75, W3TLV 71, N4ET 69, KB4KXV 61, N4ORZ 60, KC4VK 54, KF4RL 51, KA4AJR 48, KB4WBV 55, K3KT 40, WA4NBE 33, K4ZW 31, KC4GHT 31, KA4NXF 28, WB4GCK 26, KA4SIH 20, KA4UIA 20, AA4CH 20, KA9AKY 19, K4JI 18, KB4UHC 16, K9ALX 15, W4VQE 13, KB4MON 12, KB4LBN 10, N4PSV 10, W4MPV 10, KA4GYF 9, KA4GDU 7, AB4BC 6, W3JIR 5, KA4KFV 5, KB6ECH 5, N4OIA 3, N4NSY 2, W4MFD 2, N4RFJ 1.

**VIRGIN ISLANDS:** SM, Ron Hall, KP2N—ASM: KV4JC, SEC: NP2E, NM: VP2VI. Increased activity on the islands getting ready for the hurricane season. ARES members to participate in VITEMA test exercise for first time. KV4JC, NP2B, NP2E, NP2BR attended VITEMA table top emergency exercise. ARES check-in for St. Croix was 53 in 4 sessions. St. Thomas/St. John reported 23 check-ins in 4 sessions plus 4 messages handled. VIARC and ARES to combine for 2A station on Field Day located on north side of St. Thomas. SE director Butler will attend this year's Field Day. VE exams on St. Thomas has 11 show up with 10 passing or upgrading. St. Croix also has 11 with 9 passing or upgrading. St. Croix club will be holding exams in Sept, Dec, Mar & June on a regular basis. VP2VI needs check-in stations for his 1984 net at 0001 Z. Will be looking for you all on Field Day. 73 de KP2N.

## SOUTHWESTERN DIVISION

**ARIZONA:** SM, Jim Swafford, W7FF—STM: W7EP, ASM: K7OMR, OOC: N17E, SEC: KX7P, SGL: KE7WD, ACC: N7ECE, TC: K7KI, BM: W1FJI. Congrats to Cliff, N7JIG, on his OBS appointment. He plans to air ARRL bulletins on the London Bridge 2 meter ptr at Lake Havasu. Was sorry to hear of the loss of Kirk, WATKOE, who has become a Silent Key. He held ORS, NM, and OBS station appointments and in the past was a real stalwart in the field organization. We'll miss him. Rich, N7ND, and Bill, W7YS, plan to visit the Soviet Union in August as part of an exchange program with Russian hams. Project RAFT (Russian and Americans For Teamwork) will be sending Russian and American youths down the Colorado River and through the Grand Canyon in Aug. Rich's plan is to establish an Amateur Radio link from the bottom of the canyon to Flagstaff and from there over the north pole to Bernaul, Siberia. The project is supported by the Coconino ARC. Good luck, and more later on this. KF7DN, our PIA in Holbrook, sent in nice report on club activities. One of their club's Novice class graduates, Ron Fox, Jr., KB7FFE, made Eagle Scout, BSA, at age 16. The club rewarded him with one year's dues in ARRL, plus a brass belt-buckle with his call sign. FB. We need to encourage more young people to take up our great hobby. (Thanks, Dwayne.) Perhaps by the time you read this, our Board of Directors will have addressed the "code-no code" issue. Watch ARRL bulletins for announcement. TRA elected Ray, K7OMR, as Treasurer to fill gap by the untimely passing of Bill Davidson, NF7JZ. Steve, KD6ZZ, replaces Ray as board member. (Tx, Intermod). Congratulations to Cochise ARC on their re-instatement as ARRL affiliated club. Hear they had FB swapmeet in May. Will try to make it next year. The CADXA has a new "DX Packet Cluster" network on 144.93 MHz for dissemination of DX and propagation info, etc. Contact Jim, N7US, for details. (Tx, ADAW). Cactus Keys (YLs) plan to have June meeting in Show Low and July meeting at Ft. Tuthill, FB. For past several weeks your SM has been operating on all digital modes (except packet) on HF bands from Pineblow, CW, our original digital mode, has certainly come a long way! Hope to see all of you at Ft. Tuthill hamfest July 28-30, or at SW Division Convention in L.A. Aug. 25-27. Til then, 73, Jim.

Net	Abbrev	QNI	Traffic	Sess	Liaisons			
SOUTHWEST								
NET	SWN	135	84	31	TWN			
ARIZONA								
CACTUS					ACN			
NET (HF)		549	52	30	RWN			
ARIZONA								
CACTUS ACN		178	41	31	ACN (HF)			
ARIZONA								
IPC & ATEN		993	126	31	TWN			
Traffic:	W7AMM	192	W7EP	146	W7OIF	52	WE7G	45
	K7POF	31	W7KXE	24	N7ETP	20	(April) WE7G	18

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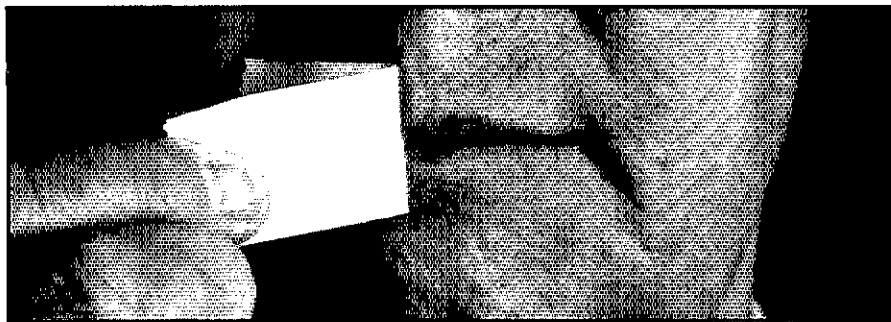
#### Optional Accessories

- **PB-5** 7.2 V, 200 mAh NiCd pack for 1.5 W output
- **PB-6** 7.2 V, 600 mAh NiCd pack
- **PB-7** 7.2 V, 1100 mAh NiCd pack
- **PB-8** 12 V, 600 mAh NiCd for 5 W output
- **PB-9** 7.2 V, 600 mAh NiCd with built-in charger
- **BC-10** Compact charger
- **BC-11** Rapid charger

- **BT-6** 6-cell AA battery case
- **DC-1/PG-2V** DC adapter
- **HMC-2** Headset with VOX and PTT
- **SC-22** and **SC-23** Soft case
- **SMC-30/31** Speaker mics
- **WR-1** Water resistant bag.

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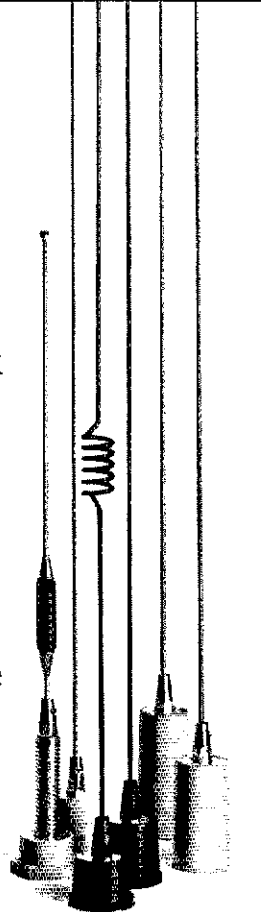
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IN CANADA: Canadian Larsen Electronics, Ltd., 149 West 6th Avenue, Vancouver, B.C. V5Y 1K3. 604-872-8517.



LOS ANGELES: SM, Phineas J. Iconbice, Jr., W6BF—WHO'S IN CHARGE? was the ARES seminar co-hosted by the City of LA, KFVB News 98, and the Salvation Army. This emergency management program was spearheaded by our outstanding ARES group led by Ron Boan, AK6Y and our great group of DEC's. Especially, Hank Magid, K8YMD and Dennis Smith, KA6GSE, are complimented for the expected — a job well done. The purpose of the seminar at PARKER CENTER was to find out WHO IS IN CHARGE — when the big emergency DOES ARRIVE. The following speakers were named: Jim Begansky, FEMA REGION 9, N6GWS, Don Root Cal. office of Emergency Service, WB6UCK and Richard Rudman Engineering Manager KFVB, W6TIA. OTHER local speakers were Mehrdad Larjaniha an engineer with LA City General Services (KB6VFN), Charles Hagen, KB6WJK, is with the American Red Cross Disaster Services in the position of a disaster training specialist. Donald Britton, K6ZTP, is the Technical Support Manager for Pacific Bell and manager of the EOC-back-up communications system. This one day seminar brought in a number of non-hams so that they could see just what the HAM COMMUNITY IS DOING for Emergency Preparedness in the LA Area. LA county ~ 8.4 million population. If you need more details on this conference please contact Dennis, KA6GSE, 818-994-8359. ARES IS one of the best ways to give something back to your hobby as well as help yourself. Most antenna engineers understand the value of antenna height but your neighbor may not understand that you need an antenna and tower for EMERGENCIES!!!! — It could be your neighbors emergency! In some cases it may be of value to compare the value of your antenna and tower for emergency work to that of a fire extinguisher. When a fireman is called to an EMERGENCY where he is limited to using short hoses and short ladders — this would be comparable to asking EMERGENCY RADIO HAMS to limit their systems to short towers and small antennas. We only hope that our fire extinguisher works when we need it — and we only hope that our next door communicator can communicate during a real EMERGENCY.—CALL Ron Boan and get involved with ARES and EMERGENCY COMMUNICATIONS you may find that it is very rewarding. (AK6Y, Ron, 213-598-7449 the good guys that try to help during the hard times often reap great benefits — like good antenna ordinances.— Questions arise from time to time about intruders in our Ham Bands, this is becoming more and more frequent. The AIRS (ARRL Interference Reporting System) tape prepared by W7JIE, M.L. Gibson is a real eye opener for most hams not associated with the AIRS program. The March 1989, summary report of (intrusion) interference to amateurs totaled 547 reports from 25 stations reporting. Some of these very obnoxious transmitters are like the Russian Woodpecker. They always seem to be on when propagation is good. If we are going to save our Ham Bands more of us must help by supplying hard facts and data to our paid officials and insist on action. ARRL is doing this to some extent with the AIRS program. YOU are being short changed by our paid and elected officials — but, consider who is responsible? THE WESTERN SHRINE AMATEUR RADIO ASSOCIATION is now operating a NET every Monday at 7 PM local time on 7.243 MHz according to K6AIZ, Maurice 2nd VP, K7OXP, VP and K5DGZ, President. This is in addition to the Sunday AM Shrine Hospital Net for patients. The Shrine Hospital is free call 1-800-237-5055. Join the net for more information. 73. STM News: It was reported that W6DQ was a Silent Key. That was in error. It should have been W6QD. Don't know where the letters got transposed. Our apologies. Still waiting for a new STM to show up on the scene. This guy is getting old, and its time after 57 years in the business to take it easy and some younger one to take it over. We built it, now you can use it. Nothing new lately as band conditions have been very poor and some of the fellows are taking early vacations. Traffic: W6TH 310, W6SAN 71, N7CZF 67, W5INH 64, W6NKE 33.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Riv Co. Bob W6LKN (714 686 3823). ASM: ORG CO, RALPH W6BJE 714-776-9272. ASM: San Berdo Co. Ken WA6ZEF 714-983-1272. ARES/RACES. Councils are meeting regularly and progress is being made in the Amateur Radio and Public Safety Coordination. SW Div Convention news: ATV is being put into play. Sessions and activities will be xmitted thru local ATV rpt. CU in LA via ATV. FCC AUX INFO The San Diego office of the FCC has agreed to an Amateur AUX/FCC agreement covering the Riv Co area. Another step toward for Amateur Radio. Club News Inland Empire ARRL will activate the SW Div Conv Special Event Station. Warren KC6BZK will head the crew. The ATV affair will have Tony, W6QHB, in charge. Lee De Forest RC will man the Farmers Fair Amateur Radio booth for ten days in Oct. Special Event, traffic and displays. The Hemet area will need lots of people, for info contact Pat W6HFD 714-927-5949. ARCs pick a day Oct 6 thru 15. SOARA: A retraction is due. The split or lack of split between SOARA and BCWS was in error. It seems this SM was taken in or should I say April fooled. TRW ARC: Use Caution. You are a guest on private property at the SWAP meet. Follow traffic and parking laws. Failure to comply will result in ticketing and/or towing at your expense. Packet Racket The Riv Co W6TJ System Digi function is being turned off on PCRN nodes, you must use the simple "connect" to node first, then connect to desired station. For info call Mike N6KZB 714-682-8212 or N6KZB @ N6KZB, (145.07). NTS Southern California Net Session (SCN2) is part of the ARRL NTS System. It is a slow speed net. You check in at 2 WPM, net members and NTS will CW talk to you at 2 WPM. Most net members are veteran CW traffic handlers who are there to help new people and the net. You don't know Q signs?? No problem, they will talk to you in English. Wait for Net Control to send QNI QTC (traffic or checks?) Send an initial or two from your call. I send "W" when NCS sends "WU". I send GE (good evening) de N6NLW QNI (no traffic). That's all there is to it. Have fun. De Jim N6NLW. Time/FREES 10 PM Daily on 3705 KHz. Traffic: 5CN1, 31 SEC, QNI 302, QTC 213, 5CNV 31 SEC, QNI 261, QTC 122, PSHR: W6FO, W6CPB, KA8HJK, KA8TND, BPL: W6FO. TOTALS: W6FO 632, W6SX 189, ADOA 83, K6ZCE 76, KA8HJK 64, W6CPB 44, KA8TND 38, KB6VFN 20, N6GKS 17, W5TZR 12, N6HRU 10, KA6GND 8, KD6GX 8, WA6WKG 6, KG6NL 2, KA6JOB 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI. STM: N6GW. PID: N6PKY. TC: N6JZE. SEC: W6INI. The 1989 Southwestern Div Conv will be held at the LAX Hilton Aug 25-27. Keynote speaker is astronaut Ken Cameron, KB5AWP. In Firestop II, at Camp

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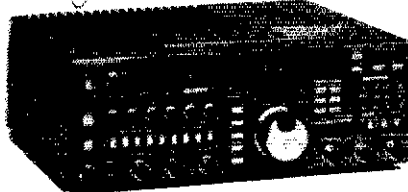
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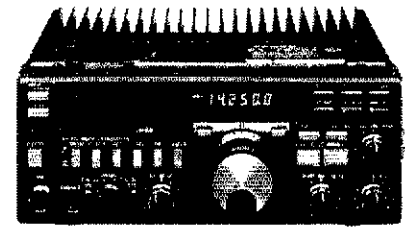
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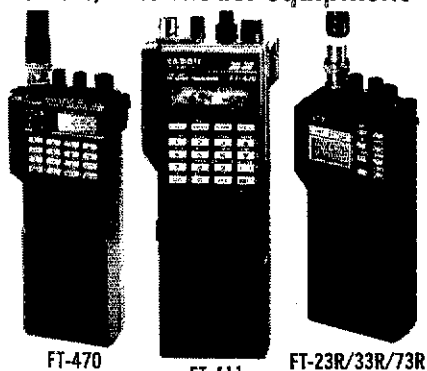


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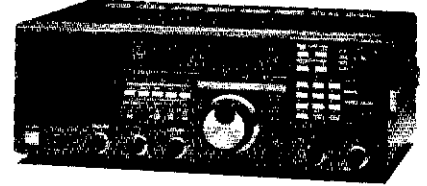
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## An Inside Look at Direct Digital Synthesizers (DDS)

**T**he incorporation of a Direct Digital Synthesizer (DDS) in ICOM's new generation transceivers marks a significant step forward in modern amateur radio technology. This advanced-design unit plays several important roles in radio communications today. DDS noticeably improves reception of weak DX stations, assures an exceptionally clean transmitted signal, and it produces very fast T/R switching time for superb Packet or full break-in CW operations. This Tech Talk explains DDS in basic and easy-to-understand form. We trust you will find its descriptions both informative and beneficial for selecting your next transceiver.

Direct Digital Synthesizing concepts are used in the injection oscillator circuit, or PLL section, of a transceiver. As you may recall from electronic theory studied during license preparations, the injection oscillator's signal heterodynes with received signals in a transceiver's first mixer stage. As you rotate that transceiver's main tuning knob, the oscillator's output frequency changes. This tuning process aligns only one of several incoming signals with the I.F. stage's narrowband filters. It is then selected, detected, audio amplified, and applied to the transceiver's speaker for you to copy.

The previously mentioned first mixer stage and its injection oscillator's signal are also used during transmit mode to convert an internally-processed signal to a selected output frequency. Any spectral impurity or noise on that oscillator's signal is obviously directed into the first mixer, causing undesired receiver "hash" that limits its ability to copy weak signals. During transmit, the hash also creates broad-

band noise that can block or degrade performance of nearby receivers.

Understand that an unavoidable and minute amount of spectral impurity or noise is present on any injection oscillator's signal; even those produced by classic vacuum tube circuits (which were also quite prone to drift). A conventional PLL-generated injection signal typically exhibits the most impurity, however, because its internal filters cannot effectively remove noises caused by phase-comparing DC voltage levels associated with digital tuning.

ICOM's custom-designed Direct Digital Synthesizer significantly improves injection signal purity by using a digitally synthesized and frequency-stepped wave rather than a simple DC voltage to control a PLL's output frequency. Not only is this DDS-related signal cleaner, it is easier to phase-compare and filter. The dual results are a quieter performing receiver for copying previously unreadable signals, and a transmitted signal with less spurious radiations for top performance in multi-rig setups like Field Day or contests. Additionally, the loop filters used in DDS systems have been redesigned for greater efficiency and faster oscillator lock-in time. This step substantially reduces propagation delays inherent in regular L/C filters. That change also produces the smoothest operating Packet and full QSK CW systems in amateur radio today. These modes require rapid T/R switching to avoid Packet collisions, missed "ACK/NAK" signals and clipped "first-transmitted characters."

Not only does DDS handle these requirements perfectly, it also supports incredibly fast speed scanning. This added feature is especially attractive for SWL'ing because

the more channels you scan in a given period, the more action you monitor.

Although Direct Digital Synthesizing has been employed in professional equipment and laboratory measuring applications for several years, financial limitations have restricted its applications in amateur radio. Thanks to recent cost reductions and innovative adoptions of hybrid DDS/PLL designs, this new technology can be incorporated in ICOM transceivers. This hybrid combination is necessary, incidentally, because a 100-percent DDS injection oscillator system would increase a transceiver's cost tenfold. ICOM thus strived for and achieved an optimum balance in incomparable performance and affordable cost. The results are undeniable: no other transceiver even comes close in performance!

ICOM's new generation transceivers equipped with Direct Digital Synthesizers include the pacesetter IC-781, the outstanding IC-765, and the go-anywhere IC-725. These radios are in a class all their own. They outperform competitive models "hands down" and you can put one of ICOM's advanced-designed transceivers in your station today. Visit your local amateur radio dealer and test-tune ICOM's new DDS-equipped transceivers. They are, as you always expect from ICOM...simply the best!

*Would you like to see a particular subject discussed on this Tech Talk page? Send your requests to ICOM America, Inc., 2380 - 116th Avenue N.E., Bellevue, WA 98004.*



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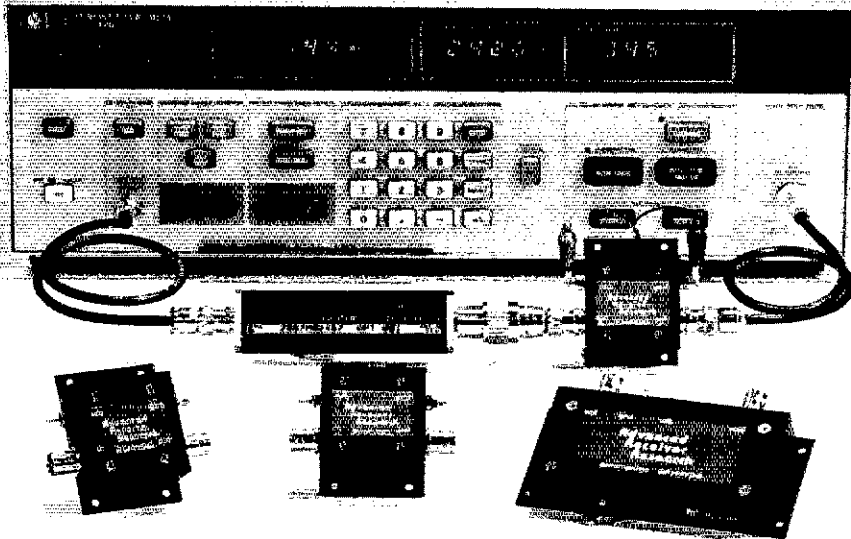
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P50VDG	50-54	< 0.5	24	+12	GaAsFET	\$79.95
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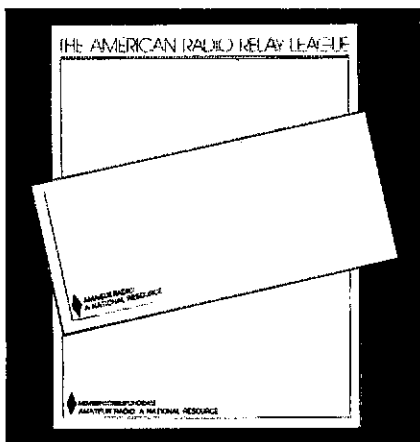
  

Inline (rf switched)						
Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
SP28VD	28-30	< 1.2	15	0	DGFET	\$59.95
SP50VD	50-54	< 1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	< 0.55	24	+12	GaAsFET	\$109.95
SP144VD	144-148	< 1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	< 1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	< 0.55	24	+12	GaAsFET	\$109.95
SP220VD	220-225	< 1.9	15	0	DGFET	\$59.95
SP220VDA	220-225	< 1.3	15	0	DGFET	\$67.95
SP220VDG	220-225	< 0.55	20	+12	GaAsFET	\$109.95
SP432VD	420-450	< 1.9	15	-20	Bipolar	\$52.95
SP432VDA	420-450	< 1.2	17	-20	Bipolar	\$79.95
SP432VDG	420-450	< 0.55	18	+12	GaAsFET	\$109.95

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Pendleton, the Calif. Dept. of Forestry demonstrated latest wildland firefighting equipment and techniques May 22 thru 25 with the assistance of ARES/VIP. Participating were W6BFO KCB6JM K6CV N6ELP W9FQN W6GBM N6GNE W6HCD W6BHSZ W6INI KR6K K6BNMK N6PDZ N6PEA N6RVO K6S6 WA6VMO. Palomar ARC's rpt, 146.73(-), contributed to the operation's success W6VK has moved to the land of volcanoes, the isle of Hawaii. Good luck, Rick, Upgrades; W6IOV, KJ6SZ to Extra. Congrats to Susan, N6QDB, on her appt to the US Naval Academy. Palomar ARC has installed an HF xcvr in CDF's Red Mountain station to improve Red Flag communications. Net controls for the North County Tlc Net (NCTN), 146.73 (-), at 2000 daily, are: N6TEP Sun, K6PCF Mon, K65MU Tue, KA6UI Wed, W6EYP Thu, N6NZX Sat. NCTN: 30 sessions, 54 mspgs, 306 ck-ins. Traffic: K6ZH 184, N6RVO 48, K6IZM 35, K6PCF 29, N6GW 15, WA1ZEN 16, WA6IK 5.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ACC: K6SAH. ASMs: N.Vntra-N6MA, S.Vntra-W6AKF, Sbar-W66YU, BM: N6TNG. STM: N6WP. OOC: W6AKF. PIO: N6FOU. TC: W6KFV. SEC: W6BIIY. DECS: Vntra-W66RVA, S.Sbar-KA6KGF, N.Sbar-KI6XG, SLO-W6BIIY. Last month I promised to list the operators involved in the January chlorine spill incident, but I regret that I don't have the list available. Continuing Ventura County's saga we'll look at the "Dewey Incident" through the eyes of Ventura DEC Paul Ryan, W66RVA, and Assistant EC Dan Feeny, N6SYC. What follows is taken directly from their reports with only slight editorial revision: On May 4, 1989 at 11:06 PM, the Fillmore City Fire Department was called to a structure fire at the Dewey Garden Center in Fillmore. At 11:11 Fire Chief Pat Askren and his firefighters had arrived on the scene to a fully involved structure fire, and initiated their investigation. A thorough evaluation of the situation indicated that there were hazardous materials stored within. Chief Askren requested the support of the Ventura County Fire Department, and the Hazardous Materials (HAZMAT) and Environmental Health Teams. At 11:15 the Ventura County Fire Department dispatched personnel and equipment to the scene. With Fillmore Police Department coordination an evacuation shelter was opened at the Fillmore High School (FHS) Gymnasium and immediate evacuations of the affected area began. The Ventura Chapter of the American Red Cross (VCARC) arrived at FHS to handle sheltering. DEC Paul Ryan, W66RVA, received a call from Martha-Ruth Lafave of VCARC at 12:45 advising him of the fire. Following the Incident Command System (ICS) plan he called area 7 (Santa Paula, Fillmore and Piru) Assistant EC Dan Feeny, N6SYC, and County EC John English, W66KQF. N6SYC handled initial setup and incident command liaison while W66KQF took care of staffing. Ventura EC John McLane, W66BPF, opened the Ventura County Red Cross (VCARC) facility; WA6SOT, W6BSOU and N6UCY were assigned to the FHS shelter. All stations were operational within 30 minutes - there already were 350 - 400 evacuees at the center. The time was now 12:20 am. As the morning wore on things got a bit hectic. By 1:50 the gas cloud started drifting toward the High School. By then there were about 800 people to be moved. At 2:00 Camarillo EC, N6NAO, and three additional operators were dispatched to the Church of Jesus Christ of the Latter Day Saints to meet the evacuees already enroute. The St. Francis of Assisi and Beth El Baptist Church were opened as shelters and began receiving evacuees by 2:40. Further operators were called to help the Red Cross team responding from Thousand Oaks. Testing and analysis for toxics were completed by Fire and Environmental Services personnel at about 4:30. Based on test results the evacuation area was reduced in size and the majority of the evacuees were allowed to return to their homes. The remainder were requested to move to the St. Francis of Assisi Shelter after which the Church of Latter Day Saints and Beth El Baptist Church sites were closed. At about 5:00 the remaining evacuees were allowed to return to their homes and on scene Red Cross personnel were released. The ARES net handled Red Cross Shelter traffic, traffic between the shelters and the incident command post, and assorted pieces of traffic for county fire and sheriff. Throughout the night there were numerous requests for special services. There was at least one nursing home and other senior citizen housing facilities in the evacuation area. Their needs, such as ambulances, special wheel chair busses and emergency medication, were communicated through Amateur Radio, and often these arrangements were made by ARES and Red Cross personnel. The net consisted of three shelter sites and the Incident Command System. Operations control was established at the Ventura County Red Cross headquarters - Staffing was done from Simi Valley. The on scene EC remained in the Fillmore area. The IC operator stayed with the incident commander in Fillmore. Net control was W6HWK located in Oxnard. The IC concept worked well and the operation went smoothly. There were no major problems with equipment and in spite of the early morning callouts there were enough operators to cover all locations. Special thanks for a job well done to the following operators: Net Control - W6HWK; Red Cross - AA6BD, W66BPF, W66OON, W6MUQ, K66DHF, K66YFD, K66IWN; Fillmore Shelter - W6BSOT, WA6SOT, K66NAO; Baptist Church Shelter - N6NAY; LDS Shelter - N6UCY, N6UCY, K66AKK; Fillmore IC - N6KFD, N6SYC, K6CAB; Relief Operators - AA6MX, K66WGO, W6M6P; Ventura County EC - W6EYV, W66KQF; Ventura County DEC - W66RVA. That's all the space for this month. We'll list the May and June upgrades in the next issue, meanwhile, don't forget the Santa Barbara ARC Hamfest and the ARRL Southwestern Division convention in August. 73 for now. Traffic: W6AKF 4202, N6NLW 257, W6NOR 130, VE3AWE/6 49, N6TP2 35. (April) W6AKF 6029, W6NOR 72, VE3AWE/6 15.


WEST GULF DIVISION  
NORTH TEXAS: SM, Dan Dansby, W5URI—The National Convention is history. According to W5JBP, West Gulf Dir. more than 10,000 attended. The first edition of the new Quarterly Section newsletter was out in time for the Convention. This was mailed to all Section Leaders, station appointees and Affiliated Clubs in the Section. I have a few copies left. If you would like a copy, drop me a line. Pat Bell, KG5SC, has been appointed ASM for the NE area of the section. David Cheek, WA5MWD has agreed to be Net Manager of the NTS Packet Net. CW is not dead. Larry, W6CIC had a full house with session on "How to learn & send CW," at the Convention. The new ACC & Editor of the section news is Don Thomas, KA1CW. K6MXQ is chairing a committee to bring Packet and



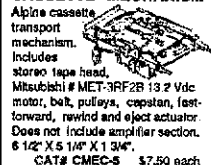
★ QUALITY PARTS ★ DISCOUNT PRICES ★ FAST SHIPPING

# ALL ELECTRONICS CORP.

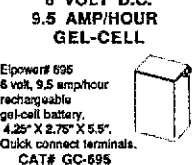
**3 to 6 Vdc MOTOR with GEARBOX**  
Probably designed for child's toy. Lever selects 2 forward and one reverse speed. 1st gear approx. 120 rpm/vdc, 2nd gear approx. 300 rpm/vdc, Reverse approx. 120 rpm/vdc. 3.35" X 1.75" X 3.25"  
CAT# DCM-10 \$6.00



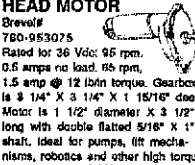
**CASSETTE MECHANISM**  
Alpine cassette transport mechanism. Includes stereo tape head, Mitsubishi MET-3RF2B 13.2 Vdc motor, deck, pulleys, capstan, fast-forward, rewind and eject actuator. Does not include amplifier section. 6.12" X 5.14" X 1.34".  
CAT# CMEC-5 \$7.50 each 10 for \$65.00



**6 VOLT D.C. 9.5 AMP/HOUR GEL-CELL**  
Eipowatt 695 6 volt, 9.5 amp-hour rechargeable gel-cell battery. 4.25" X 2.75" X 5.5". Quick connect terminals.  
CAT# GC-695 \$15.00 each




**12-36 VDC GEAR-HEAD MOTOR**  
Brewer 780-93075 Rated for 36 Vdc; 95 rpm. 0.6 amp load. 1.5 amp @ 12 lb/in torque. Gearbox is 3 1/4" X 3 1/4" X 1 1/2" deep. Motor is 1 1/2" diameter X 3 1/2" long with double flanged 5/16" X 1" shaft. Ideal for pumps, light mechanisms, robotics and other high torque applications. CAT# MOTG-11 \$15.00 each - 2 for \$25.00



**WALL TRANSFORMERS**  
ALL PLUG (JULY) 8702 VARIO  
0Vdc @ 250 ma. CAT# DCT3-420 \$2.65  
6Vdc @ 150 ma. CAT# DCT3-425 \$2.50  
9Vdc @ 250 ma. CAT# DCT3-425 \$2.50  
12Vdc @ 250 ma. CAT# DCT3-425 \$2.50  
15Vdc @ 1 amp. CAT# DCT3-425 \$2.50

**LED'S**  
STANDARD 5MM DIFFUSED 1/2" IN DIA.  
GREEN CAT# LED-1 10 for \$1.20  
RED CAT# LED-2 10 for \$1.20  
YELLOW CAT# LED-3 10 for \$1.20  
RED CAT# LED-4 10 for \$1.20  
FLUORESCENT LED  
GREEN 1/2" IN DIA.  
RED 1/2" IN DIA.  
GREEN 1/2" IN DIA.  
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GREEN 1/2" IN DIA.  
RED 1/2" IN DIA.  
GREEN 1/2" IN DIA.  
RED 1/2" IN DIA.

**DOOR/WINDOW ALARM**  
Protects doors and windows from intruders. Opening of door or window pulls pin from alarm module and triggers loud buzzer. Simple installation. Operates on 2 AA batteries (not included). Plastic case is 3.82" X 2.29" X 1.19". Ivory WBR brushed aluminum face.  
CAT# DWA \$2.00 each 5 for \$9.00



**WIDE BAND AMPLIFIER**  
NEOS UC1361L 100MHz @ 1 dB. Gain: 100 @ 100Hz to 5 MHz approx. Frequency: 100Hz to 5 MHz approx. CAT# UC1361L 2 for \$1.00 10 for \$4.50 - 100 for \$20.00  
N-CHANNEL MOSFET  
CAT# 9F1 \$1.00 each 10 for \$8.00 - 100 for \$25.00  
LARGE QUANTITIES AVAILABLE

**SWITCHES**  
PUSH BUTTON  
1/2" DIA. 1/2" HIGH  
PUSH TO LOCK: HATCO-1 1 amp switching, 2.25 amp every period. P.C. mount. 1/2" DIA. 1/2" HIGH. 19 for \$8.00 - 100 for \$50.00  
SPST MINI-ROTARY  
On/Off 1/2" DIA. 1/2" HIGH  
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1/2" DIA. 1/2" HIGH

**RELAYS**  
12 VOLT D.C. COIL, 8 P.D.T.  
General 820-164P 4 Amp contacts  
1/2" DIA. 1/2" HIGH  
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1/2" DIA. 1/2" HIGH

**SOUND AND VIDEO MODULATOR**  
TM12M381-1 Designed for use with T.V. computers. Can be used with video cameras, games or other audio/visual sources. Ball 1/2" dia. switch enables user to switch from 1.0 sec. without disconnection. Operates on standard 1.5 AA batteries. 12 Vdc. Hook up diagram included.  
CAT# VM30 \$5.00 each



**PIEZO WARNING DEVICE**  
Model 606 PPS-60A High pitched siren alarm. Operates on 1.5 AA batteries. 12 Vdc. Hook up diagram included.  
CAT# PPD-60 \$1.50 each 10 for \$12.00 - 100 for \$125.00

**SPST PUSH BUTTON**  
Marquardt 1845  
1/2" DIA. 1/2" HIGH  
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1/2" DIA. 1/2" HIGH

**LED HOLDER**  
2mm pins included.  
DATA REEL 10 for \$5.00

**NICKEL-CAD BATTERIES (RECHARGEABLE)**  
SPECIAL AA SIZE  
Panasonic P14AA 1.2 Vdc @ 180 mA  
CAT# NCB-AA1 \$1.50 each 10 for \$12.00 - 100 for \$125.00

**STROBE KIT**  
Variable rate strobe kit. Operates between 80 to 1200 pulses per minute. 1/2" dia. 1/2" high. 12 Vdc. Hook up diagram included.  
CAT# STROBE-11 \$1.50 each 10 for \$12.00 - 100 for \$125.00

**A.C. LINE CORDS**  
3' Long 1/2" DIA. 1/2" HIGH  
1/2" DIA. 1/2" HIGH  
1/2" DIA. 1/2" HIGH  
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1/2" DIA. 1/2" HIGH

**10 AMP SOLID STATE RELAY**  
ELECTRONIC 12VDC CONTROL  
Rated 5A @ 120V AC  
1/2" DIA. 1/2" HIGH  
1/2" DIA. 1/2" HIGH  
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**1/4 WATT RESISTOR KIT**  
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**TRANSISTORS**  
CREATED BY PART #  
PN2222 NPN  
TO-18 5 for \$75  
PN2017 PNP  
TO-18 5 for \$75  
2N3055 NPN  
TO-18 5 for \$75  
2N2907 PNP  
TO-18 5 for \$75  
MJE2955 PNP  
TO-18 5 for \$75  
MJE3055 NPN  
TO-18 5 for \$75  
TIP29 NPN  
TO-18 5 for \$75  
TIP27 PNP  
TO-18 5 for \$75  
TIP21 NPN  
TO-18 5 for \$75  
TIP22 PNP  
TO-18 5 for \$75

**LOOK WHAT \$1.00 WILL BUY**  
200 ASSORTED 1/4 WATT RESISTORS  
Best leads, carbon comp., and 50 ohm film. CAT# ORS-1 \$1.00 per assortment  
200 ASSORTED 1/2 WATT RESISTORS  
Best leads, carbon comp., and 50 ohm film. CAT# ORS-2 \$1.00 per assortment  
50 ASSORTED 1000 P.F. CAPACITORS  
Best lead wire and 50 ohm film. CAT# ORS-3 \$1.00 per assortment  
15 VALUES OF ELECTROLYTICS  
Best lead wire and 50 ohm film. CAT# ORS-4 \$1.00 per assortment

**12 VOLT DC SOLID STATE BUZZER**  
Sawtooth 12VDC  
1/2" DIA. 1/2" HIGH  
1/2" DIA. 1/2" HIGH  
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1/2" DIA. 1/2" HIGH  
1/2" DIA. 1/2" HIGH

**OPTO SENSOR**  
U shaped package with mounting holes. 1/2" DIA. 1/2" HIGH. 12 Vdc. Hook up diagram included.  
CAT# ORS-5 \$1.00 each 10 for \$10.00 - 100 for \$100.00

**14.7 VOLT TRANSFORMER**  
Sole Industries  
CS-810A 14.7 volt  
50 Hz @ 250 mA  
1.47" mounting holes on 2.5" centers.  
CAT# TX-147 \$3.00 each 10 for \$27.00 - 100 for \$250.00

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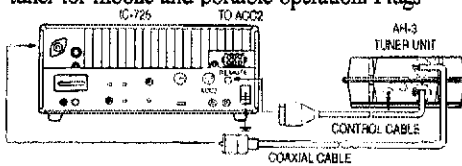
**Full Featured Operation!** 26 tunable memories with Band Stacking Registers which enable you to store a frequency, switch bands, and return to the stored frequency • 10Hz digital frequency display • Three tuning rates • Three scan modes • Highly effective Noise Blanker • RIT • Semi-QSK CW • Optional narrow CW filter • Built-in AH-3 controller • IC-725 measures only 9.0 x 3.7 x 9.4 inches (H, W, D).

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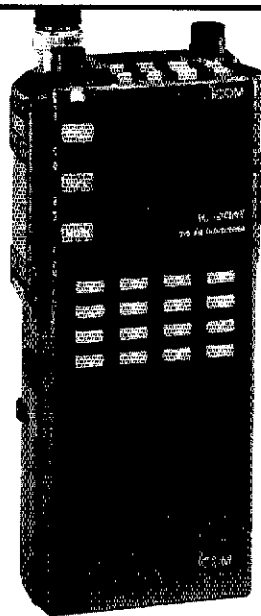
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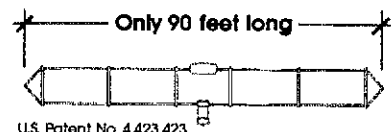


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## 1 ANTENNA = 9 BANDS

The GARANT GD-6 dipole was tested and recommended by TCA (The Canadian Amateur; similar to QST) in June 1985. The GD-6 and GD-8 were tested and recommended as first choice in a test of three wire antennas by the CNIB (Canadian National Institute for the Blind.) TCA and CNIB confirmed that the GARANT GD-antennas need no tuner on all bands tested.

MODEL	BANDS	MAX. LENGTH
GD-5	40-30-20-15-10M	67'
GD-6	80-40-20-17-12-10M	137'
GD-8	80-40-30-20-17-15-12-10M	137'
GD-9	160-80-40-30-20-17-15-12-10M	255'

Choose between 500W PEP or 2KW versions. Install as a horizontal dipole or an inverted-V. SWR usually better than 1.5:1. No tuner needed if properly installed. See letters of our ham customers in our data report. The GD-windom dipoles are no dummy load antennas. Our special GD-balun (500W or 2KW) matches the low impedance (50Ω) coax feedline to the high impedance windom-type antenna. All GARANT GD-windom dipoles come with a 3-year limited warranty and a 10-day money-back guarantee. Who else has that much confidence in his products?

VE2MNL, Michel: "I have installed my GD-7. Only one antenna to cover 7 bands with practically perfect SWR on all bands. VE1AZZ, Gordon on his GD-8: "I find the SWR exactly as you claimed." VE7TH, John on his GD-9: "FB on all bands. Great for DX." VE7BKU, Rob on his GD-8: "A great antenna. Excellent bandwidth." VE1VCD, Stu: "Very pleased with the GD-6/2KW. In less than six months operation have logged over 85 different countries. Recommend it to anyone considering a wire antenna."



Write or phone for our free data report on all our GARANT GD-windom dipoles with technical data, actual SWR curves, customer comments, and our low factory direct prices. Take advantage of our sale prices. We ship worldwide & accept VISA or MASTERCARD.

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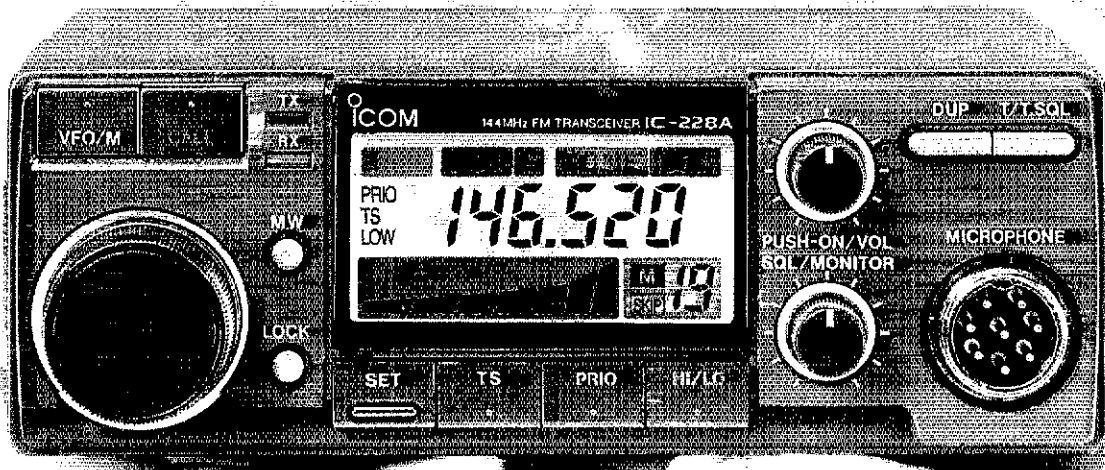
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**DUPLEX INDICATOR**  
Indicates plus or minus duplex.

**PRIORITY WATCH**  
Monitor any channel for calls while continuing operation on another frequency.

**TUNING STEP INDICATOR**  
Programmable tuning steps of 5kHz, 10kHz, 15kHz, 20kHz or 25kHz.

**45 OR 25 WATTS**  
The IC-228H delivers 45 watts; the IC-228A 25 watts. Both include selectable low power.

**SRF INDICATOR**  
Shows signal strength when receiving, and relative output power selection when transmitting.

**SUBAUDIBLE TONES/BEEPER**  
Includes all subaudible tones built-in. TONE appears when the tone encoder is turned on. SQL lights when the optional UT-40 pocket beep function is activated (silently monitors for calls with your pre-programmed tone).

**WIDE BAND COVERAGE**  
Full reception of 138-174MHz including public service and NOAA weather bands. Transmit range of 140-150MHz includes MARS and CAP frequencies.

**20 MEMORIES**  
Each memory stores any Tx offset and subaudible tone.

**MEMORY LOCKOUT**  
Lights when a memory channel is programmed as a skip channel.

- Wideband Coverage 138-174MHz Rx
- 20 Memories with Memory Channel Lock-Out
- 45/25 Watts
- Color Keyed LCD
- Band and Memory Scanning from Supplied DTMF Mic
- Call Channel
- Optional Beeper
- Priority Watch

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# Satellite Anthology

The second quarter-century of OSCAR satellites has begun! We've collected the best of the "Amateur Satellite News" column and articles out of 31 issues of **QST** to better document this new era. This handy volume can be used alone or as a supplement to the previously published *Satellite Experimenter's Handbook*. Available separately below.

You'll find the latest information on OSCARs 9 through 13 as well as the RS satellites. Operation on Phase 3 satellites (OSCAR 10 and OSCAR 13) is covered in detail. A heretofore unpublished article gives a profile of the *UoSAT-OSCAR 11* Satellite. The popular four-part series, "Adventures in Satellite DXing," and "Working OSCAR - the basics," are included. Timely information appears on the use of digital modes, tracking, antennas, RUDAK, microcomputer processing of telemetry and where to find additional OSCAR information. *The ARRL Satellite Anthology* belongs in every OSCAR enthusiast's library. The retail price is \$5.00.

## Satellite Experimenter's Handbook

This 208-page classic book on amateur satellites was written by Dr. Marvin Davidoff, K2UBC and published by ARRL in 1984. Under one cover is what the Amateur Radio Operator needs to know in order to communicate through the OSCAR satellites. Thousands of ham radio operators, scientists, educators, and satellite enthusiasts have used these "birds" for pleasure, education and experimentation. \$10.00.

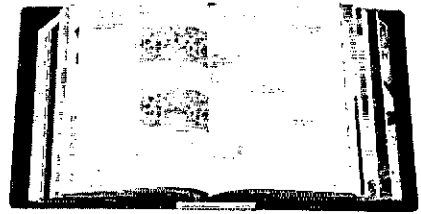
## AMSAT Space Symposium

This conference was held in conjunction with the 1987 Amsat Annual Meeting in Southfield, MI, Nov. 6-8, 1987. 11 papers are presented with topics on: trends in spacecraft technology, and space science education. FO-12 mailbox, QRP EME, Phase III-C and Phase IV developments in orbital determination and attitude control. Over 100 pages \$12.

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Dunagan, W05EJ of Big Springs has been very busy lining up ECs for the various counties in his district and almost all the counties in West Texas have ECs. The Panhandle ARC of Amarillo W.A.S. Award has been captured by KB5CTQ Jim and N5IZY Larry according to Jim Ogle KB5UDX Pres. of PARC.—It seems more and more air shows are seeing the help given them by amateurs to assist with First Aid, Traffic Control and other communications.—AISZ Chuck has been elected Pres. of San Angelo ARC. N5AE Dick and W05PUM started another Novice class on Sat. from the Red Cross at the ARC station in Amarillo. . . 73 Hope to see you all on the West TX SM Net on 3931 at 0100 the 2nd and 4th Thursday of every month. Milly Wise, W05OVH. Traffic: W05F 382, AE51 212, W05OXE 16, K5KKO 15, K5UYH 19.

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**TRANSMITTER HUNTING** by Joseph D. Moell, KØOV and Thomas N. Curlee, WB6UZZ. You'll find out how direction finding (DFing) can be both fun and practical. Combine the techniques taught in this 323-page book with those used by search and rescue teams and you can learn how DFing can even save lives! Explore the challenge of hidden transmitter hunts (fox hunting) and locating causes of both accidental and malicious interference to Amateur Radio communications. Find out about the history of RDF, how to get started, directional antennas, doppler DF units, all about S-Meters, commercial and military direction finding systems, direction finding from fixed sites, VHF mobile hunting techniques, T-hunting from orbit, hunting below 50MHz, how to be the "Fox" and triangulation using two BASIC programs. Copyright 1987 by Tab Books. \$18 plus postage and handling\*.

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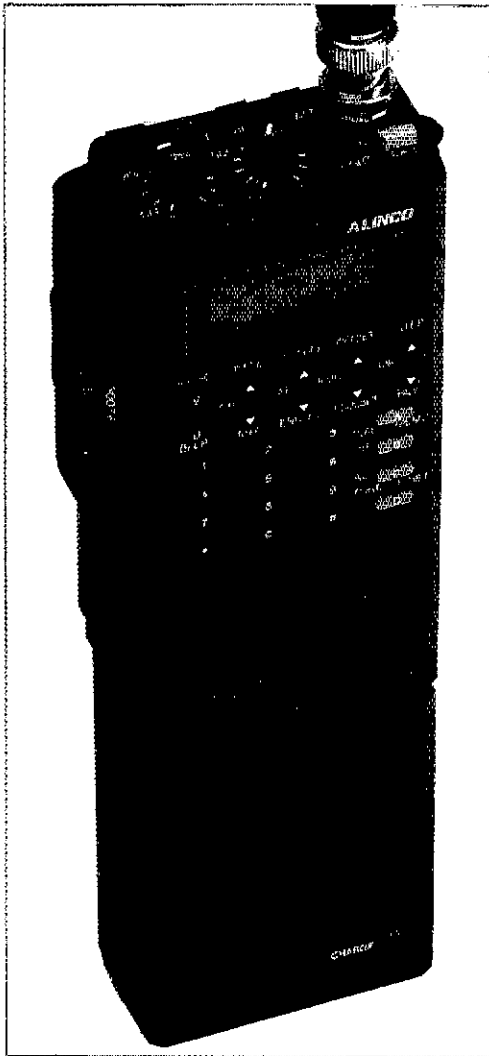
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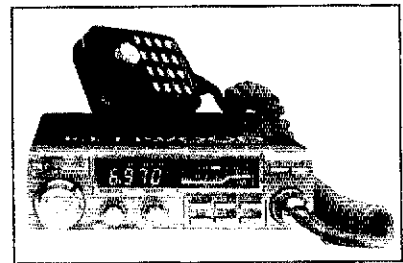
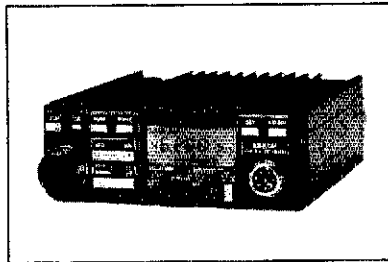
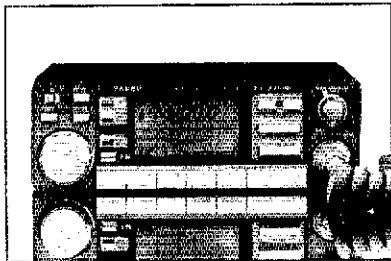
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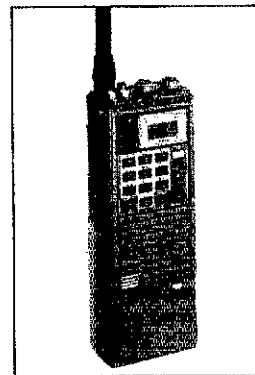
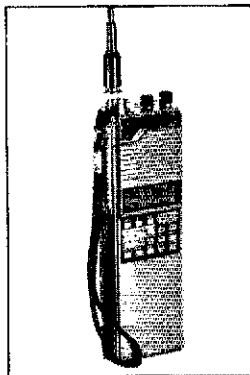
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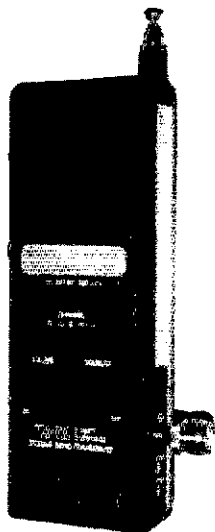
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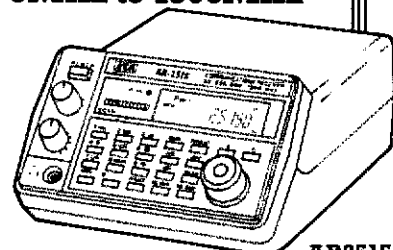
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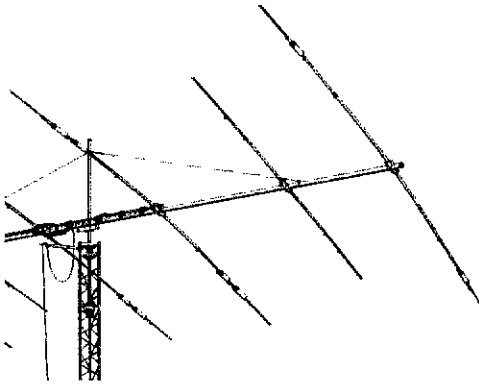
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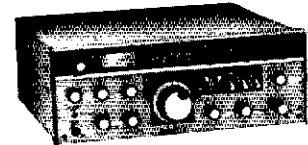
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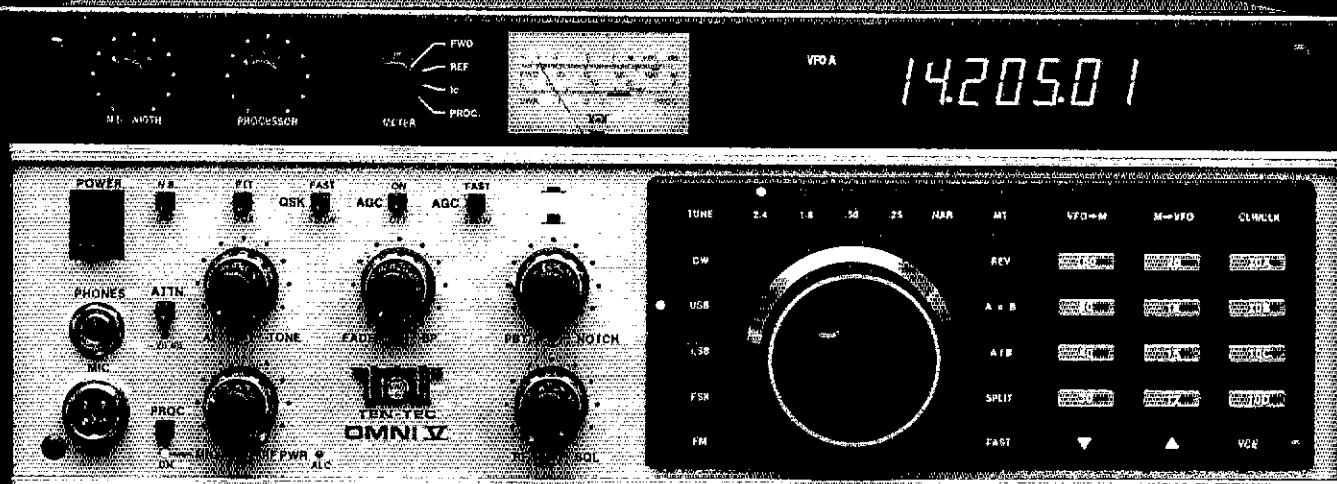
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# The NEW OMNI V:

The OMNI V is a Paragon with a 12 band crystal mixed local oscillator in place of the general coverage synthesized oscillator. The result is receiver cleanliness like the legendary Corsair and Omni series. The OMNI V local oscillator is a new ultra low noise 5.0 to 5.5 MHz PLL design. Phase noise is simply eliminated as a significant variable. Dynamic range is maintained right up to the edges of the crystal filters, even under the most adverse conditions.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, the frequency stability of a PLL, 25 tuneable memories, VFO to MEM, MEM to VFO and the SCRATCHPAD feature. RS-232 interface is standard and includes remote band switching for the HERCULES II amplifier. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, fast or slow QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 30 kHz over-shoot at the band edges. The four 500 kHz segments of the 10 meter band are switched automatically as you tune through the

**The OMNI V Station with Model 961 Matching Power Supply, and the Mighty Titan Amplifier.**

segment limits. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

An auxiliary frequency tuning system is available and plugs into the rear panel. This allows you to remotely tune the frequency from the most convenient and comfortable position. It takes about 10 ms to fall in love with this option.

A noise blanker and audio speech processor are standard equipment as is the cw sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX antenna input. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN or HERCULES II. Changeover in fast QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, bright, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F crystal filter positions are push-button selectable, independent of mode. A second filter socket is also provided, in series, behind the standard 2.4 kHz filter in the 9 MHz I-F. This may be used for an optional 2.4 kHz, 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the "NARROW" button. This adds six or eight poles into the crystal filter network and

even further reduces the impact of adjacent strong signals. Most impressive!

If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX'er and/or contester, the OMNI V is the best choice.

## GENERAL SPECIFICATIONS

**Frequency Range:** Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 30 kHz over-shoot at the upper and lower edges of the segments.

**Frequency Control:** LO generated from a crystal oscillator mixed with a low noise 5.0 - 5.5 MHz phase locked loop.

**Frequency Stability:** Worst case, 1 PPM per degree C at 29,999 MHz.

**Frequency Accuracy:** + - 100 Hz @ 25 degrees C.

**Antenna Impedance:** 50 Ohms, unbalanced.

**Printed Circuit Boards:** G-10 epoxy glass.

**Power Required:** Receive = 1.5 A. Transmit = 20 A. 12-14 Vdc.

**Dimensions:** HWD 5 3/4" x 14 3/4" x 17". 14.6 x 27.3 x 43.2 cm.

**Net Weight:** 16 lbs. 7.25 kg.

## TRANSMITTER

**Modes:** USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).

**DC Power Input:** 200 watts maximum.

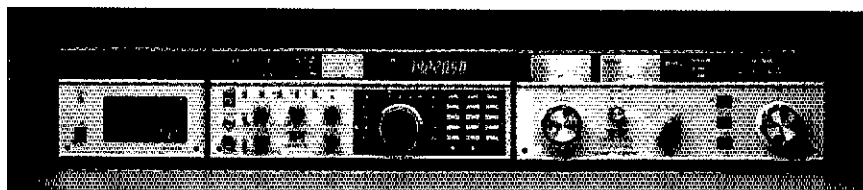
**RF Power Output:** ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.

**Microphone Impedance:** 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.

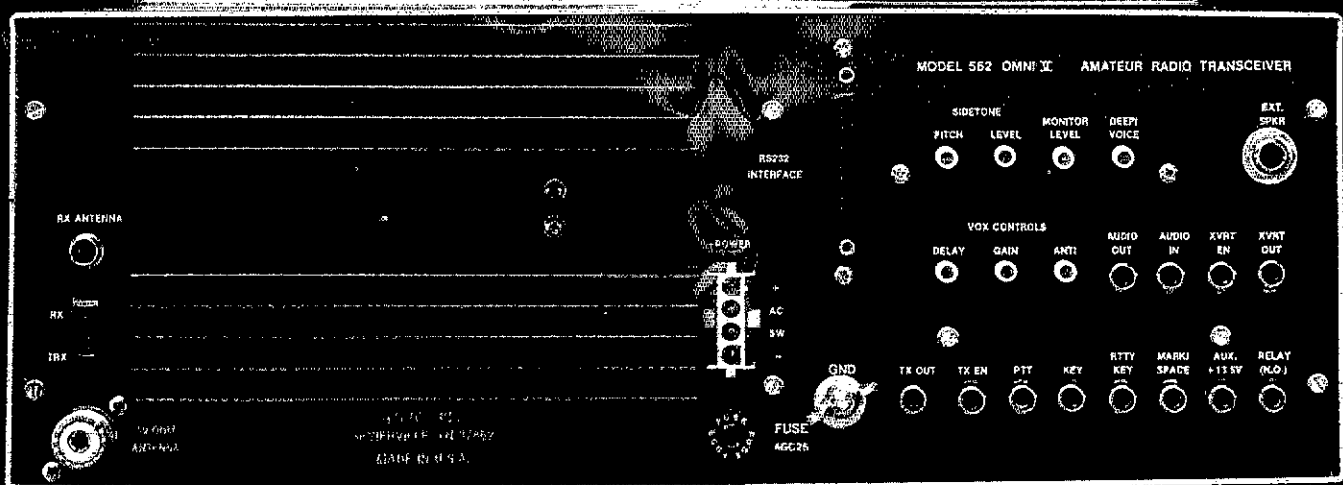
**CW Sidetone:** Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.

**SSB Generation:** 9 MHz, 8 pole crystal ladder filter, balanced modulator.

**Carrier Suppression:** Greater than 60 dB.







# Impressive from either end... but it's how we make ends meet that really delivers the difference.

**Unwanted Sideband Suppression:** Greater than 60 dB at 1.5 kHz AF input.  
**Harmonic Emissions:** Greater than 45 dB below peak power output.  
**Third Order Intermod Products:** -30 dB from two tone at 100 watts PEP.  
**Metering:** Switchable forward power, SWR, collector current or audio processing level on SSB.  
**CW Offset:** 600 Hz.  
**FSK Shift:** 170 Hz.

## RECEIVER

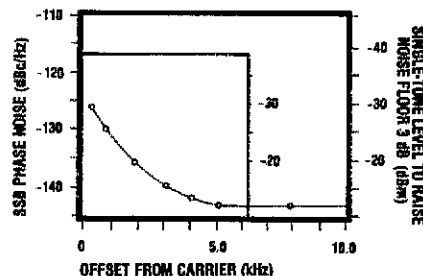
**Modes:** LSB, USB, CW and FSK. FM with optional board.  
**Sensitivity:** .15 uV for 10 dB signal to noise ratio at 1.8 kHz bandwidth. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.  
**Selectivity:**

	-6 dB BW	-60 dB	Shape Factor
Standard 2.4 kHz	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz	1.8 kHz	2.90 kHz	1.60:1
Opt. 500 Hz	500 Hz	1.40 kHz	2.80:1
Opt. 250 Hz	250 Hz	.85 kHz	3.40:1
Opt. FM	15 kHz	30.00 kHz	2.00:1

**Attenuator:** -20 dB.  
**I-F Frequencies:** 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.  
**Image Rejection:** > 100 dB.  
**I-F Rejection:** > 60 dB average.  
**Noise Blanker:** Switchable on/off with width adjustment.  
**Dynamic Range:** 97 dB, measured with standard 2.4 kHz filter at 20 kHz spacing. 100 dB + with cw filters.  
**Third Order Intercept:** + 10 dBm.  
**Noise Floor:** -133 dBm @ 2.4 kHz bandwidth.  
**Squelch Sensitivity:** Less than .6 uV.  
**Receiver Recovery Time:** Less than 30 ms.  
**Pass Band Tuning I-F Shift:** + -2.3 kHz.  
**Audio Output:** Speaker, 1.5 watts @ 8 Ohms. Fixed level 1 mw @ 600 Ohms.  
**Notch Filter:** 250 Hz to 2.2 kHz, greater than 50 dB notch depth.

**Audio Bandpass Filter:** 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width @ -6 dB.  
**Tone Control:** Variable 15 dB roll-off @ 5 kHz.

**PHASE NOISE PERFORMANCE OF THE OMNI V**  
 -127 dBc/Hz @ 250 Hz offset from carrier.  
 -146 dBc/Hz @ 5 kHz offset from carrier.



Here is a graph of the phase noise performance of the OMNI V receiver. These measurements can only be made under laboratory conditions and, even then, our test equipment is at the limit of its ability to measure the noise at the narrow offsets. The significant measurements are those close-in. Note that this graph does not even go out to 25 kHz offset where many of the published measurements are made. Certainly, we invite comparison.

## A WORD ABOUT COST

The OMNI V and the Paragon are the same price. Our 12 band crystal mixed oscillator is the same cost to manufacture as our general coverage synthesized oscillator. The choice between these two transceivers is based on general coverage vs. the best possible receiver performance in the ham bands.

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961 Deluxe 22A ps w/speaker	239.00	219 <sup>95</sup>
256 FM transceiver module	65.00	
257 Voice synthesizer	89.00	
258 RS-232 interface	65.00	
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	



CORSAIR II	List	SALE
561 9-band digital transceiver	1495.00	1289
961 Deluxe 22A ps w/speaker	239.00	219 <sup>95</sup>
263G Remote VFO	269.00	249 <sup>95</sup>
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
603 KR-1B Dual keyer paddle	69.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	

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ACCESSORIES	List	SALE
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3115 15m mobile antenna	30.00	
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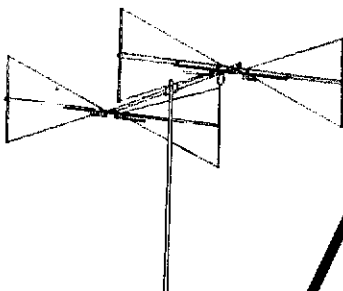
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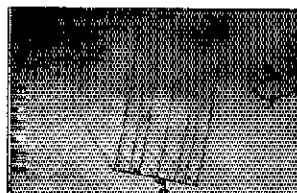
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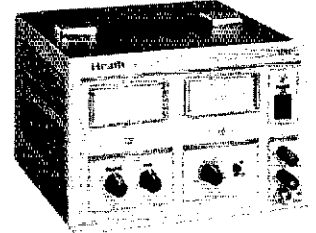


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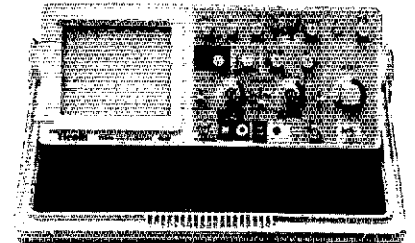


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# CELEBRATE

## the 75th anniversary of ARRL with a new Handbook!

1989 marks the 75th anniversary of the founding of the League. There's no better way of celebrating this momentous occasion, than with the new *1989 ARRL Handbook for the Radio Amateur!*

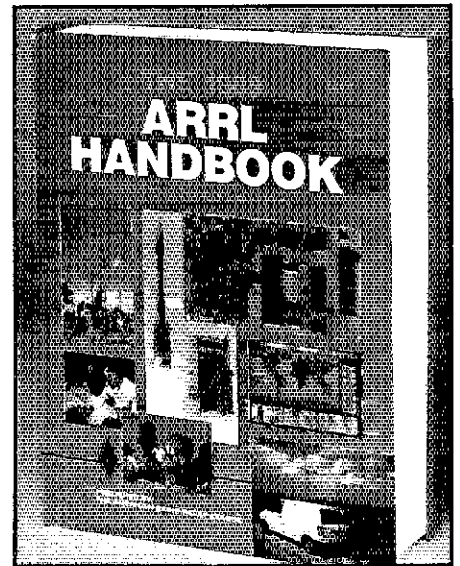
The 1200-page sixty-fifth edition contains over 2100 tables, figures and charts. The new *Handbook* is better than ever with revised information on phase noise measurement, direct frequency synthesis and spread spectrum communication techniques. The section on repeaters has been updated including a new CW identifier circuit. You'll find new spectrum analyzer and oscilloscope material, as well as several new projects in the test equipment chapter.

As always, we've added a host of new construction projects to this new edition. Just some of the new projects include: A 500-MHz frequency counter, 160 through 10 meter legal limit amplifier, simple CMOS keyer project, digital audio memory keyer and a L/Q meter for measuring coil inductance.

But that's not all. You'll find many other popular construction projects that can be built in a weekend such as power supplies and VHF/UHF preamps. For the more ambitious builder there are projects like the 1.8 MHz QSK transverter (there are VHF/UHF transverter projects too) and there are many amplifier designs to suit your needs from HF through microwaves.

*The Handbook* has always been famous as a reference for component data and you will find an entire chapter devoted to everything from transmitting tube and transistor specifications to aluminum tubing sizes. Satellite enthusiasts will find that the digital TR sequencer will add operating convenience to your station. Of course, you'll find the most up-to-date information on digital techniques, and the video communications chapter is packed with information not only on SSTV, ATV and FAX but Weather FAX as well. QRP enthusiasts will find the famous "Cubic inch" transmitter; not much bigger are the QRP SWR indicator and QRP Transmatch. There is also a VXO-controlled 6-watt CW transmitter for your favorite band between 80 and 15 meters. There are a number of useful station accessories that you can build like DTMF encoders and decoders, PIN-diode TR switch, digital PEP wattmeter and SWR calculator, Transmatches and dummy loads.

For \$21, *The ARRL 1989 Handbook for the Radio Amateur*, remains an exceptional value for a hardcover technical publication. The price outside the US is \$23. For postage and handling, add \$2.50 (or \$3.50 for insured mail or UPS—please specify)



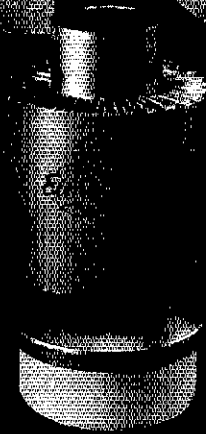
Here is a description of what is covered in the Handbook:

The first 5 chapters serve as an introduction and cover: basics of Amateur Radio, electrical fundamentals, radio design technique and language, and solid state fundamentals. Vacuum tube principles as they pertain primarily to high power amplifier design are also presented in these introductory chapters. There are 12 chapters devoted primarily to these radio principles: power supplies, audio and video, digital basics, modulation and demodulation RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another 4 chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in 2 chapters. The construction and maintenance section has 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll find up-to-date component data that the Handbook is famous for. The final 5 chapters cover how to obtain your license, station design and operation, interference, monitoring and direction finding. An abbreviations list, huge index and etching patterns make up the balance of the book.

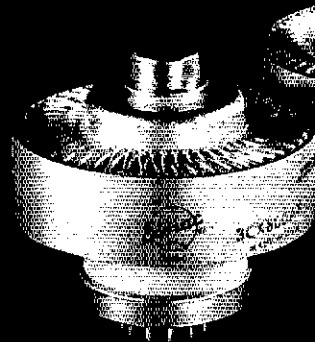
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**THE ARRL ANTENNA BOOK** Written by members of the ARRL Technical Department staff and sixteen well-known outside authors, all of whom have done much to contribute to the state-of-the-art in antenna and transmission line theory and practice. The recently published 15th Edition presents the best and most highly regarded information on antenna fundamentals, propagation, transmission lines, Yagis and quads, as well as all of the popular wire antenna designs. You'll find antennas for limited space, portable, mobile, VHF, UHF, microwave and space communications. Contains over 700 pages and 987 figures. **Chapter lineup:** Safety First, Antenna Fundamentals, The Effects of Earth, Selecting Your Antenna System, Loop Antennas, Multielement Arrays, Broadband Antennas, Log Periodic Arrays, Yagi Arrays, Quad Arrays, Long Wire and Traveling Wave Antennas, Direction Finding Antennas, Portable Antennas, Mobile and Maritime Antennas, Repeater Antennas Systems, VHF and UHF Antenna Systems, Antennas for Space Communications, Spacecraft Antennas, Antenna Materials and Accessories, Antenna Supports, Radio Wave Propagation, Transmission Lines, Coupling the Transmitter to the Line, Antenna and Transmission Line Measurements, Smith Chart Calculations, Topical Bibliography on Antennas, Glossary and Abbreviations. Edited by Gerald L. Hall, K1TD, QST Associate Technical Editor. Copyright 1988. #2065 \$18\*.

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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 designed and built a highly competitive and successful Amateur Radio contest station. 210 pages cover the following subjects: Performance Calculations, Simple Yagis, Performance Optimization, Loop Antennas, Ground Effects, Stacking, Practical Designs. Designs for 7 through 28 MHz. Hardcover. Copyright 1986. #0410 \$15\*

**NOVICE ANTENNA NOTEBOOK** At last, an antenna book written for the beginner! Don't let the lack of an antenna keep you from getting on the air. With this book you can choose which wire, vertical or beam antenna suits your needs, and you'll be ready for all of the fun of seeing that the antenna you put up really works! Contains pictorial drawings that show dimensions for Novice and Technician band use. Written by W1FB in his usual plain language style that makes him so popular as a QST author. Copyright 1988. #2073 \$8\*

**ANTENNA COMPENDIUM** We don't have room for all of the good antenna articles that are submitted to QST, so we have packed this volume with new material on verticals, quads, loops, Yagis, reduced-size antennas, baluns, Smith Charts, antenna polarization and other interesting subjects. 176 pages. Copyright 1985. #0194 \$8\*

**LOW BAND DXING** John Devoldere, ON4UN completely explores the 160, 80,

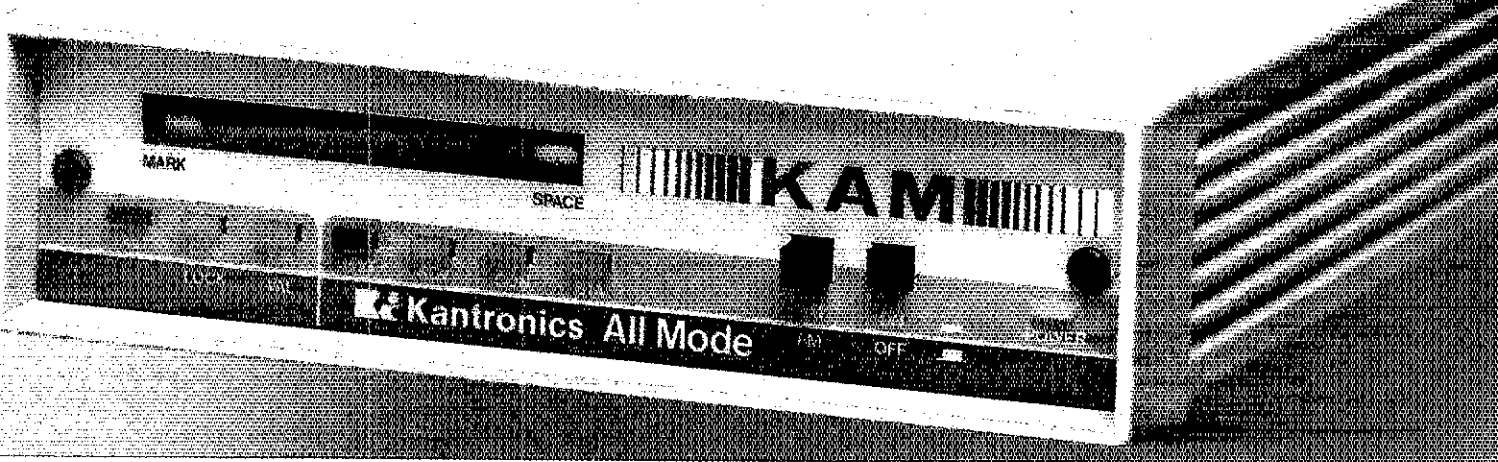
and 40-meter bands. A large portion of this book is devoted to propagation characteristics and design and building of efficient antennas for these bands. 210 pages. Copyright 1987. #047X \$10\*.

**HF ANTENNAS FOR ALL LOCATIONS** was written by L.A. Moxon, G6XN for the RSGB. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, but you'll find descriptions of some aluminum antennas as well. Copyright 1982. #R576 \$15\*.

**TRANSMISSION LINE TRANSFORMERS** At last there is a source of practical design data covering the use of these devices for both commercial and amateur applications. Written by Dr. Jerry Savick, W2FMI, this book covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, limitations at high impedance levels and test equipment. Hardcover, 128 pages, Copyright 1987. #0471 \$10\*.

**W1FB'S ANTENNA NOTEBOOK** Not everyone has a great deal of real estate to put up a forest of aluminum. Doug DeMaw tells how to get the best performance out of unobtrusive wire antennas and verticals and how to build tuners and SWR bridges. 122 pages, Copyright 1987. #0488 \$8\* For shipping and handling add \$2.50 (\$3.50 for insured parcel post or UPS)—please specify.

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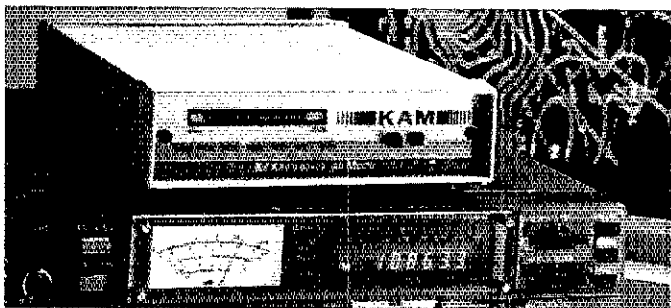
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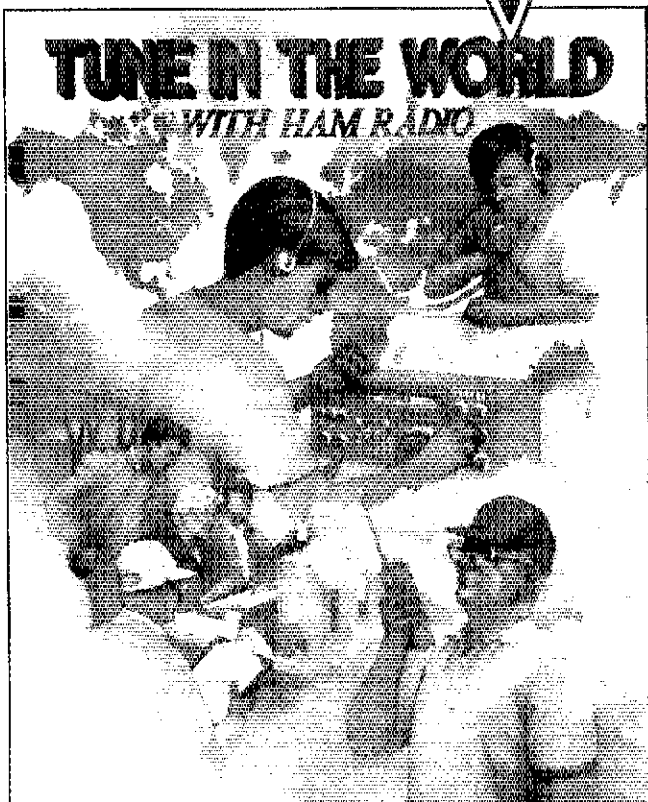
**R**ead our lips. The KAM™ is the only true dual-port when it comes to packet. Your Personal Packet Mailbox™ is accessible from both HF and VHF! Version 2.85 has dual-port compatibility with RLI/MBL boards and KISS mode for both ports. You can monitor HF and VHF packet operations at the same time. Users can even gateway from HF to VHF (or in reverse) through your KAM.

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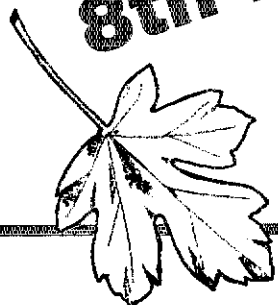
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# Just in Time for Fall Classes!



**New  
8th Edition**



The new edition covers questions that will be used on exams effective November 1, 1989. The new package should be ready for shipping in mid-August.

New exams mean a new edition of *Tune in the World with Ham Radio*! Using ARRL's beginner's package, students will quickly pass their exam in no time and be on the air to enjoy the great band conditions we are experiencing today. Novices can now communicate not only using Morse code, but voice communications on 10-meters and VHF/UHF repeaters as well. They can also use digital communications to link home computers through packet radio networks. Imagine being able to personally communicate with an astronaut as the Space Shuttle circles the Earth or with someone on a remote island in the South Pacific!

Besides the bright new cover, we're also excited by the new text which we've made even more understandable and fun for the newcomer. There are hundreds of illustrations that describe important concepts. As with the last edition, two 90-minute cassettes are included. One teaches the code and the other provides practice to make passing the code portion of the exam a snap! Since the tapes are recorded in stereo, the voice portion can be switched off for self-testing and even more practice.

The 30-question part of the exam on regulations and basic radio theory is chosen from categories of topics that are contained in the total pool of 372 possible questions. The text presents all of these questions and distractors along with the answer key and a sample Novice test.

The *Tune in the World with Ham Radio* package including the text and both tapes is available for \$19. The book alone is \$14. Add \$3.50 for shipping and handling.



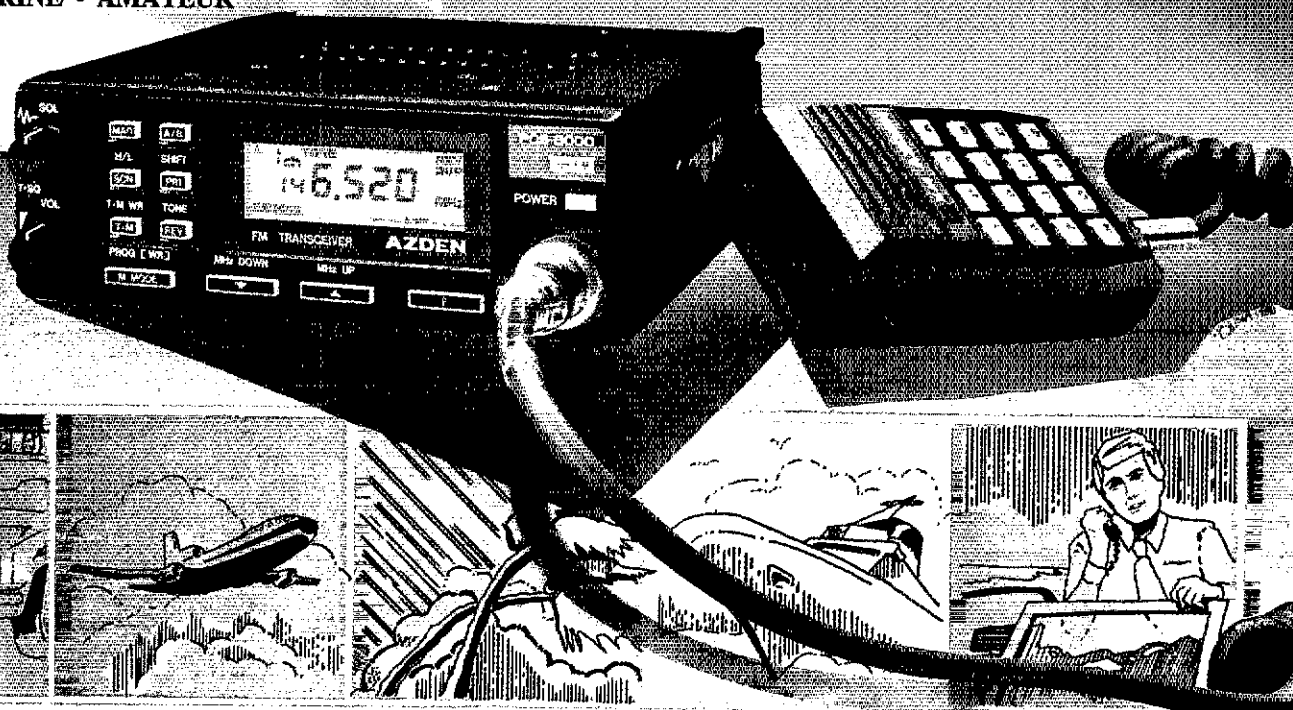
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**TINY SIZE:** Only 2 inches high, 5 1/4 inches wide and 7 1/4 inches deep!! Easily fits anywhere, even in the smallest car!

**20 CHANNEL MEMORY IN TWO BANKS PLUS 1 TEMPORARY CHANNEL (TM):** Two memory banks, A and B have 10 memory channels each. The memories store frequency, shift width, offset information, and PL tone frequency as programmed. An extra memory channel (that we call TM-temporary memory) is provided to allow you to store any operating condition instantly again and again!!

**UP TO 21 NONSTANDARD SPLITS:** Program any split in any channel.

**VERSATILE SCANNING FUNCTIONS:** Dual memory scan, programmable band scanning, hold scan and delay scan functions are provided, with selectable delay time. ALL memory channels are tunable independently.

**PRIORITY CHANNEL MONITORING:** Memory Channel B0 (the first channel in memory bank B) is monitored every four seconds regardless of any operating condition. When a signal is received, a beep is heard.

**DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency desired when scanning.

**PROGRAMMABLE FREQUENCY STEPS:** In memory, frequency steps can be set at 5KHZ to 20KHZ in any increment.

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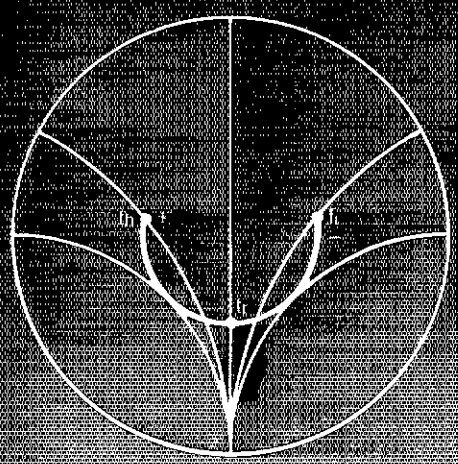
★★ **NEW!**  
**HOT OFF**  
**THE PRESS**

This book is of importance to those who want to maximize antenna effectiveness. A properly matched antenna as the termination for a line minimizes feedline losses, and power can be fed to such a line without the need for a matching network at the line input. Even if you have no special expertise, *Antenna Impedance Matching* shows how to use the Smith Chart™ to develop even the most complex matching network. With over 200 pages, this hardcover book is a must for the antenna designer and serious amateur. Available at your dealer or directly from ARRL, \$15.00



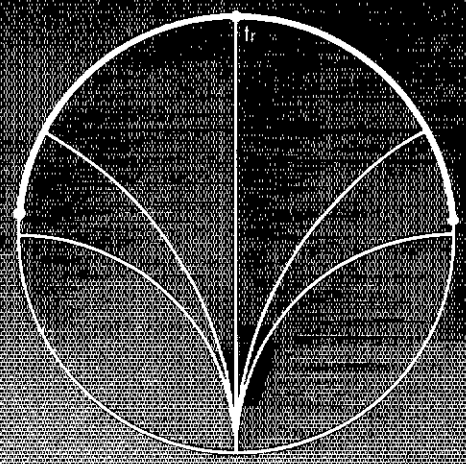
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# ANTENNA IMPEDANCE MATCHING

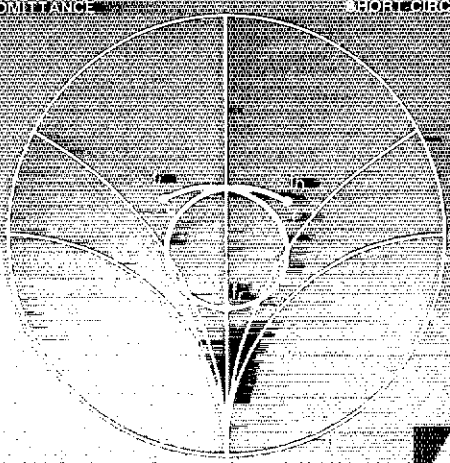


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PLUS



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by  
**Wilfred N. Caron**

ANTENNA IMPEDANCE MATCHING



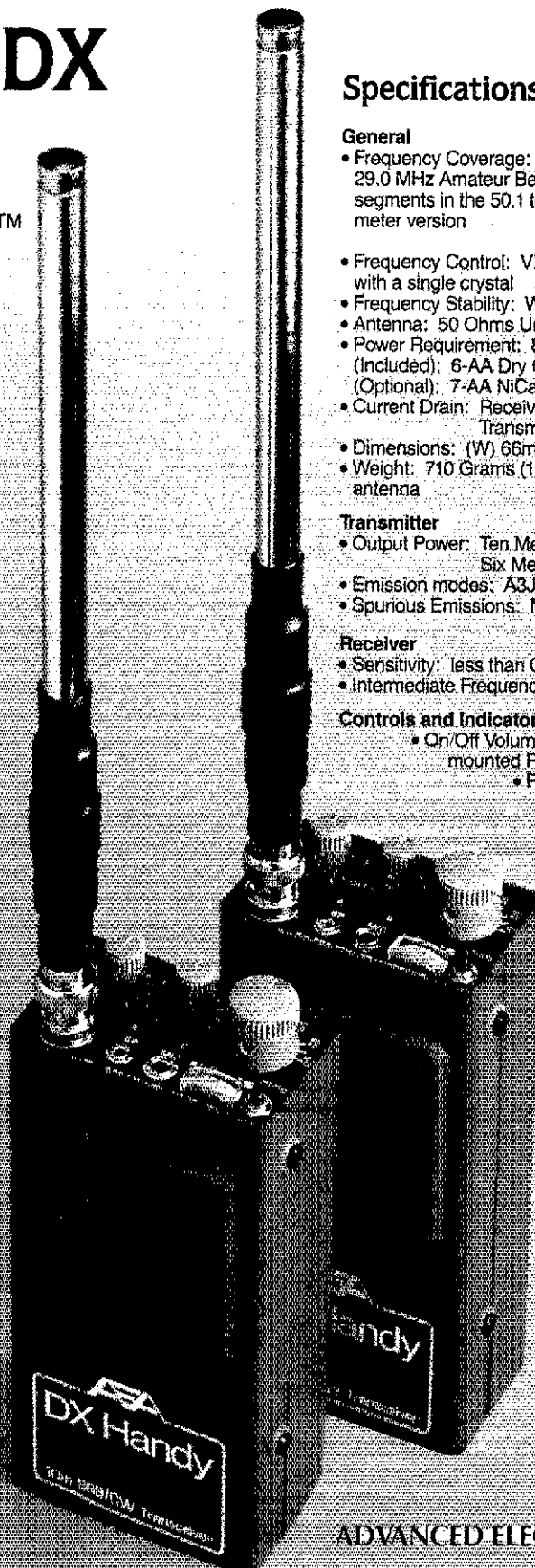
# Handheld DX with the DX Handy™

The idea of handheld DX seems far-fetched, but it's actually very simple. The DX Handy is a battery powered (six pen-light AA drycells included) SSB/CW transceiver with two watts output. DX Handy can also use nicad rechargeable batteries, or be powered with 9 VDC.

Two variable crystal oscillators (VXOs), each with 50 KHz range, can be selected with a top panel switch. Crystals for 28.250 to 28.300 and 28.300 to 28.350 Mhz are included in the ten meter DX Handy. Crystals for 50.1 to 50.15 and 50.25 to 50.3 are included in the six meter DX Handy. Other crystals are available at a nominal cost.

CW operation can be by either the built-in push button or with an external key or keyer. External speaker and microphone jacks are also provided, and the telescoping antenna is included. The DX Handy also has a top panel S-meter, output power meter and an effective noise blanker circuit. DX Handy is housed in an attractive gray metal case comparing in size to popular VHF FM handhelds.

With DX Handy all amateurs novice to extra-class, can enjoy the thrill of working handheld DX.



## Specifications

### General

- Frequency Coverage: Any 50 KHz segments in the 28.0 to 29.0 MHz Amateur Band for the ten meter version, or an 50 KHz segments in the 50.1 to 50.3 MHz Amateur Band for the six meter version
- Frequency Control: VXO provides 50 KHz of continuous tuning with a single crystal
- Frequency Stability: Within  $\pm$  500 Hz from a cold start
- Antenna: 50 Ohms Unbalanced, BNC connector
- Power Requirement: 8.4-9.0 VDC  
(Included): 6-AA Dry Cells (1.5 volt/cell) = 9.0 VDC  
(Optional): 7-AA NiCads (1.2 Volt/cell) = 8.4 VDC
- Current Drain: Receiving - Approx. 70 mA  
Transmitting - Approx. 620 mA
- Dimensions: (W) 66mm  $\times$  (H) 39mm  $\times$  (D) 142mm
- Weight: 710 Grams (1 lb. 9 oz.) with batteries and antenna

### Transmitter

- Output Power: Ten Meter DX Handy - 2 Watts at 9.0 VDC  
Six Meter DX Handy - 1 Watt at 9.0 VDC
- Emission modes: A3J (USB) and A1 (CW)
- Spurious Emissions: More than 40 dB down

### Receiver

- Sensitivity: less than 0.5  $\mu$ V for 15 dB S/N
- Intermediate Frequency: 11.2735 MHz

### Controls and Indicators

- On/Off Volume control Top mounted Potentiometer
- Receiver Incremental Tuning (RIT): Top mounted Potentiometer with center off detect position
- Frequency: Top mounted 50 KHz VXO
- Frequency Range: Top mounted 2-position switch
- Noise Blanker: Top mounted On/Off switch
- S/R/F meter: Top mounted S/R/F meter
- Built in CW key: Top mounted momentary switch
- External Speaker output: Top mounted 1/8" phone jack
- External Microphone Input: Top mounted 1/8" phone jack
- Antenna Connector: Top mounted Female BNC
- Transmit Indicator: Top mounted Transmit LED
- Push-To-Talk: Side mounted momentary switch
- External Power: Bottom mounted 2.1 mm coaxial
- External key input: Bottom mounted 1/8" phone jack
- Mode Selector Switch: Bottom mounted 2-position switch
- Charge/External Power: Bottom mounted 2-position switch selecting 12 VDC external power function

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# ARRL's Great Lineup of New Publications!

## **Tune in the World with Ham Radio**

We've taken our popular beginner's package and made it even better! The revised text is easier to read and covers the question pools that will be used on Novice exams given on November 1 and later. We've also updated the two popular code-teaching and code-practice cassettes that are included in the kit. The 8th edition is sure to be a hit among instructors and students alike. Text and two 90-minute cassettes (#0380-8) \$19 Text only (#0399-8) \$14 please add postage and handling.\*

## **The FCC Rule Book**

Here are the new rules with important interpretations in the style that has made the "Washington Mailbox" column in *QST* so popular. Find out what you can and cannot do under the new regulations. These are the most sweeping changes in the Amateur Radio rules in decades, so you'll need to have a copy close at hand. 8th Edition (#0453-8) \$9 plus postage and handling.\*

## **The Technician Class License Manual**

On November 1, 1989 the new element 3A—Technician Class exam becomes effective. We've written this book around the new question pool to provide an understanding of key concepts and to make passing the exam a snap! At the beginning of each chapter, you will find a list of key words that appear there, along with a simple definition for each word or phrase, and as you read the text you'll find these words printed in **bold type** the first time they appear. At the end of the book you'll find the complete question pool with distractor questions, answer key (with page references showing where you can check the text for a quick review) and there's also a glossary of all the key words used in the book. (#2375) \$6 plus postage and handling.\*

## **The General Class License Manual**

There won't be a change in the General Class exam until November 1, 1990, but we've taken this opportunity to break out the element 3B material from the *Technician/General Class License Manual* and put it in a separate book. The description above of the *Technician Class License Manual* also fits the new *General Class License Manual*. (#2383) \$6 plus postage and handling.\*

## **Proceedings of the ARRL National Education Workshop**

What's the best way to motivate students and hold their interest in your Amateur Radio classes? How can you make learning the code fun for all? Learn what top instructors had to say at this successful conference. (#2405) \$12 plus postage and handling.

## **Proceedings of the 23rd Central States VHF Conference**

EME is the hot topic this year plus horn and dish construction, a 23 cm Transverter, propagation, and more! (#2413) \$12 plus postage and handling

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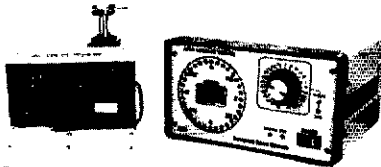
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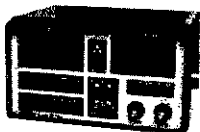
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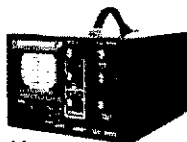


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## SDU 8000

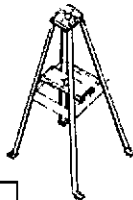
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- Variable sweep rate
- 3 inch CRT
- 120V 50/60 Hz

Introductory Price \$595.

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### ALINCO ROOF TOWERS

Model No. Specifications	ETS-210
Spacing Between Legs At Roof	2'10"
Actual Height	6'6"
Max. Vertical Load	350 Lbs.
Max. Rotational Torque	135 Foot Lb.
Max. Mast Length-From Rotol Plate	5'6"
Roof Mounting Pads	Adjustable For Roof Pitch
Weight	28 Lbs

\$140<sup>00</sup>

roof towers require guy wires for safety.

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20G	top sect. 9'	89.95
25G	10' sect.	69.95
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TB-3	thrust bearing	66.95
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435-40CX	70cm satellite	O
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2M-16LBX	2 meter	

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CR-18



CR-30



CR-45

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MODEL	HEIGHT	MAXIMUM ANTENNA WIND LOAD IN FT 2	BASE WIDTH	MAX. VERT. LOAD LBS.	TOWER WEIGHT LBS.	PRICE
CR-18	5'10"	21 @ 90 MPH	31-173"	440	26	\$135.00
CR-30	9'10"	27 @ 90 MPH	39"	1,322	39	224.00
CR-45	14'9"	23 @ 90 MPH	39"	881	55	328.00
CK46	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2 1/2"					52.00

\*GUYING IS REQUIRED ON ALL ROOF TOWERS. UPS SHIPPABLE

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CUSHCRAFT A3 — CALL!  
CUSHCRAFT ARX2 — CALL!  
ALLIANCE HD73 — CALL!

MISC ITEMS		
API51-3G	2m on glass	37.95
UGM	1/4 λ mag.	21.95
HB1448N	2m duck	16.95
Coaxseal		2.95
MS	5' mast	5.95
TR160	5' tripod	21.95
AR300XL	TV rotor	59.95
258XUJ	25' cable	9.95
508XUJ	50' cable	15.95
758XUJ	75' cable	20.95
1008XUJ	100' cable	25.95
SW1X2	coax switch	19.95
	AND MORE!	

### PRO-AM

805	Ball mount	19.95
PHF-10	10m resonator	18.95
PHF-15	15m resonator	18.95
PHF-20	20m resonator	18.95
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PHF-75	75m resonator	19.95
PHF-160	160m resonator	84.95
ABS	5 band kit	89.95
PAQM	mini mag 2m	21.95

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ISOPOLDS ARE BACK		
IN STOCK!		
2 Meter		55.95
220 MHz		55.95
440 MHz		83.95

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CR2AM	PERM MT — CALL —	41.00
CR2A	2M Mag MT	41.00
CR3A	220MHz Mag MT	37.00
CR4A	140MHz Mag MT	34.00
CR2RD	Radome Cover — CALL	12.00

CABLE IS NOT INCLUDED

### CUSHCRAFT

A45	4 el. triband	357.95
A3	3 el. triband	CALL
AV5	5 band trap vert.	128.95
32-19	19 el 2mt boomer	128.95
215WB	15 el wide band	
	2 mt.	92.95
424B	24 el. 70cm boomer	92.95
416TB	16 el. OSCAR 436 MHz	71.95
A144-10T	10 el. OSCAR 145.9 MHz	61.95
AOP-1	OSCAR pack 2mt. & 70cm	178.95
AR-2	2mt. vert. ringo ranger	28.95
ARX-2	2mt. vert. ringo ranger II	CALL
ARX-2B	2mt. vert. ringo ranger II	42.95
	AND MORE!	
R5	5 band vert	245.95
	AND MORE!	

### BUTTERNUT

HF6VX	80-10 vertical	138.00
HF2V	80-40 vertical	131.00
2MVCV5	2mt vertical	60.00
BRKII	rotor mtg. kit	52.00
TR160S	160m add on	53.00
MPS	mtg. post sleeve	7.00
HF5B	HF mini beam	220.00

### HY-GAIN

TH7DS	7 el. triband	C
TH5MK2S	5 el. triband	A
EX-14	4 el. triband	P
TH3JRS	3 el. 750W pep	L
18AVTS	5 band trap vert.	R
14AVGS	4 band trap vert.	C
V2S	2mt. omni-direct	F
V4	70cm omni-direct	S
	AND MORE!	B

### HY-GAIN ROTORS

T2X	20 sq. ft.	399.95
HAM IV	15 sq. ft.	335.95
CDASII	8.5 sq. ft.	237.95

### DAWA ROTORS

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MR750PE	w/preset	439.95
MR750U	motor	119.95

### LARSEN

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NM0MM	2m coil & whip	25.95
NM0150	mag. mt	20.95
NM02170	2m coil & whip	28.95
KD4270	coil & whip	38.50
LM220	dual band duck	24.95
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	AND MORE!	



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# Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

Note these rates will be changing in November 1989 issue of QST to \$1.00 and 30 cents per word respectively.

(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" x 11" sheet of paper.

(4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 14 through September 13 will appear in November QST. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in QST advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear.

The publisher of QST will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

## CLUBS/HAMFESTS/NETS

**PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAC/6, 146 Coleen Street, Livermore, CA 94550.**

**IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14,280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.**

**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. Pleuter, Jr., Secretary, 48 Murdock Street, Fords, NJ 08863.**

**FCC EXAMS. Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24hr. Gordon, W6NLQ, President, Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.**

**MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15510.**

**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., 1409 Cooper Drive, Irving, TX 75061.**

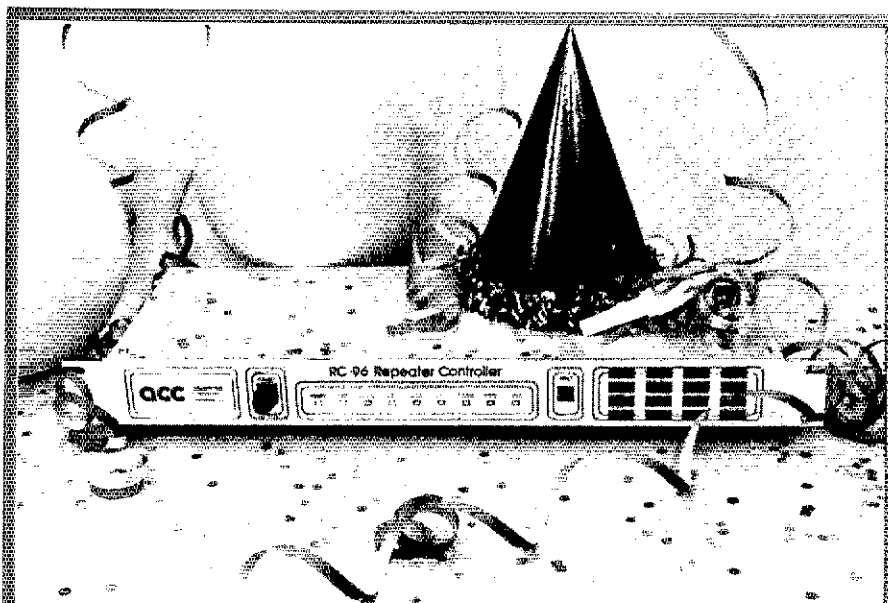
**LITTLE Big Horn Nets Sundays: 14,057-2200Z, 21,150-2230Z. Native American Indians and Others Welcome. Info WA2DAC.**

**AYN RAND admires new 2nd Sunday every month 0045Z, 14270-14280 from RI discuss ideas in her novels Atlas Shrugged and The Fountainhead. K1UKQ.**

**RADIO EXPO 89. The Chicago FM Club will sponsor Radio Expo 89 on Sept. 23rd & 24th at the Lake County Illinois Fairgrounds near Rts. 45 & 120 in Grayslake, IL. Manufacturers & distributors of radio & computer technologies will display their products. VE exams will be given by DeVry covering Novice thru Extra. Indoor flea market tables & electricity available. Overnight security provided. Camping & parking available. Admission: \$4 advance, \$5 at door. Talk-in on 146.16/76. For more information contact Mike Brost, WA9FTS, P.O. Box 1532, Evanston, IL 60204.**

**INTERESTED In Public Service. Join your local radio emergency associated communications team. In Pennsylvania call 717-938-6943.**

**GOOD SAM RV Radio Network—Largest intl' group of hams that are Good Sam's. M-F 2100 Central 7, 292. Sunday 1400 Central 14,240. Info send 9x4 SASE to Net Manager Jack Russell, KG5IO, P.O.B. 207, Golden, TX 75444. Do join with us.**



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The new RC-96 controller for your repeater will make its day. And yours.

For you, remote programming will let you easily make changes to your repeater from anywhere without a trip to the hill. Change codes, autodial numbers, ID messages and more, with reliable storage in E<sup>2</sup>PROM memory.

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And most important, your repeater will have a new sense of pride in being able to serve you better. You'll even hear it in its voice!

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HPD-2"	80-40M max performance dipole, 85" long	\$85 pcp
HPD-4"	160-80-40M hi-performance dipole 117" long	\$79 pcp
SSD-4"	160-80-40-20-15-10M space saver dipole 71" long	\$125 pcp
SSD-3"	80-40-20-15-10M space saver dipole specify L, 42" x 105	\$2-\$108 pcp
SSD-4"	80-40-20-15M space saver dipole specify L, 46" x 90	\$2-\$90 pcp

\*8 bands with wide-matching range tuner.  
SASE for catalogue of 39 dipoles, slopers, and space-saving, unique antennas

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# MARK 4CR

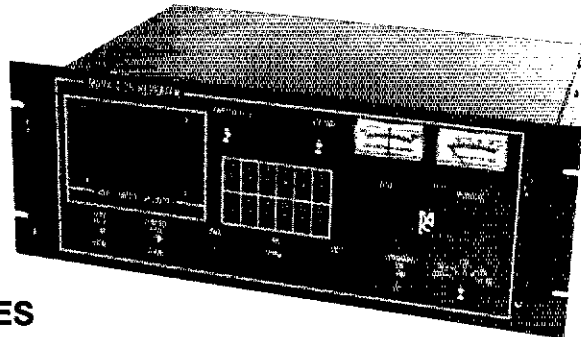
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No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

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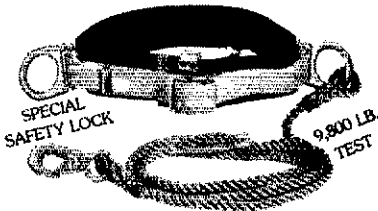
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FAX: 201-368-2460

## Spider Antenna

U.S. Patents 4349825, 4460896



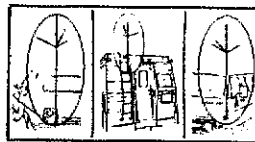
These trademarks are your assurance of quality and performance.

Wherever you may roam, on Land or Sea . . .  
or even at Home

The Spider™ Antenna will help you keep in touch with your ham friends around the world. Four bands — 10, 15, 20 and 40 (or 75) meters. Needs no antenna tuner. Custom made with highest quality workmanship and materials.

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Suitable for use on any motor vehicle from a compact automobile to a motor home. Work four bands without stopping to change coils.

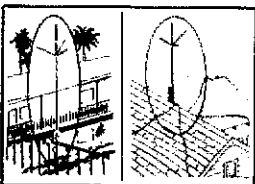


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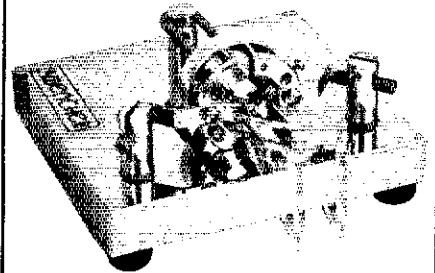
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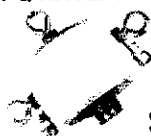
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- Overall length 135 feet, less when erected as an inverted vee or sloper
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D-40	40/15	66'	28.95
D-20	20	33'	17.95
D-15	15	22'	25.95
D-10	10	16'	25.95
Shortened dipoles			
SD-40	80/75	40'	7.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80 40 20 10/15	130	43.95
PD-4010	40 20 10/15	66'	37.95
PD-R040	80, 40/15	130'	39.95
PD-4020	40, 20/15	66'	33.95
Dipole shorteners — only, same as included in SD models			
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CANADIAN QSL Cards, send \$1 for samples refundable with your order. M. Smith, VE7FI, 18610-62nd Avenue, Surrey, BC CANADA V3S 4N9.

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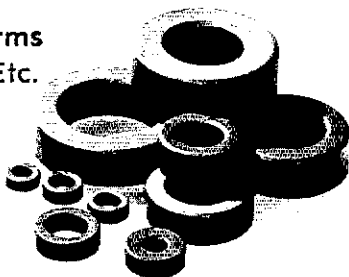
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If you tell me to go to the low end of twenty meters, I'll be there in a second—all tuned up and ready.

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Teach me once how to match your high-SWR antennas (up to 2:1) and I'll never forget. I can even remember five different special set-ups on each of my nine bands!\*

Not only that, when you're bouncing back and forth among bands DXing or contesting, I'll always return to the last spot you used on each one. Isn't that neat? You'll love it!

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Like automatic grid current limiting with delayed trip-out, to protect my 3CX800A7 tubes against severe overdrive without getting all riled up over occasional peaks.

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\*Operation above 21 MHz subject to FCC rules.

# ALL BAND ANTENNAS

## MULTI BAND TRAP ANTENNAS

### TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55"	\$64.95
D-52	10/15/20/40/80	2	105"	69.95
D-56	10/15/20/40/80	6	82"	114.95
D-68	10/15/20/40/80/160	8	146"	149.95

### TRAP VERTICALS-"SLOPERS"\*

Model	Bands	Traps	Length	Price
VS-41	10/15/20/40	1	28"	49.95
VS-52	10/15/20/40/80	2	49"	64.95
VS-53	10/15/20/40/80	3	42"	74.95
VS-64	10/15/20/40/80/160	4	73"	94.95

\*Can be used without radials

Feedline can be buried if desired

\*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded Copper/Weld ant. wire and End Insulators. Automatic Band Switching - Unusually clear reception - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works at bands - Instructions included - 10 day money back guarantee!

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Model	Band	Length	Price
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D-15	15	22"	18.95
D-20	20	33"	19.95
D-40	40	66"	22.95
D-60	50/75	130"	25.95
D-180	180	200"	34.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded Copper/Weld Antenna wire and End Insulators.

## LIMITED SPACE DIPOLES

- Reduces overall length over 40%
- "Shorteners" are enclosed, sealed, weatherproof and lightweight.
- Complete with Deluxe Center Connector, 14 ga. Copper/Clad antenna wire, end insulators, and assembly instructions.
- Use as inverted "V", or flat-top.
- Excellent for all class amateurs.

Model	Band	Length	Price
LS-40K	40	36"	\$44.95
LS-80K	50/75	90"	\$49.95
LS-180K	180	160"	\$49.95

- Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add \$8.00 to antenna price.

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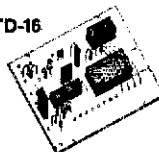
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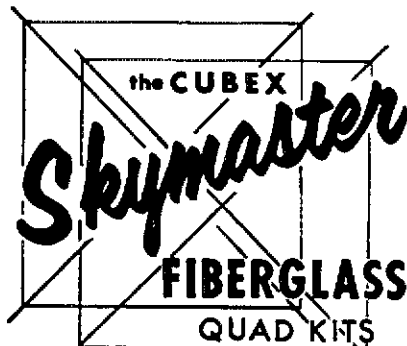
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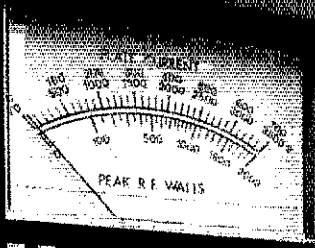
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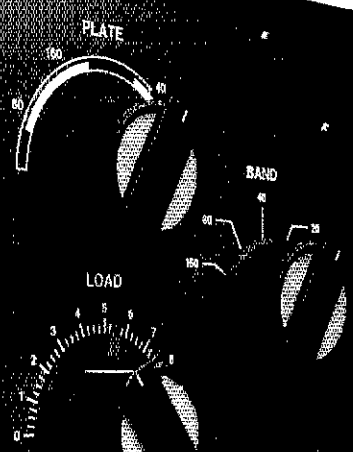
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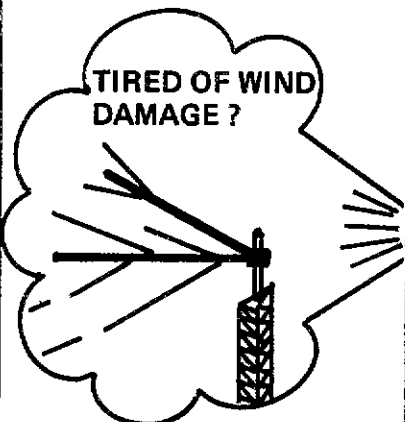
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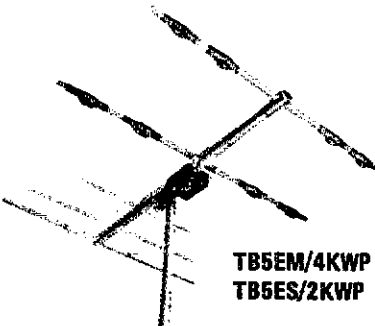
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SELL—HRO 60 with 7 coil sets, 1 coil storage box and matching speaker. No mods. Very clean. Best offer. Ken, WB9OZR, 362 Echo Valley, Kinnelon, NJ 07405, 201-492-9319.

**GENERAL**

DO-IT-YOURSELF DXpedition. Stay at ZF8AA, 2 br. cottage, beach, quad. Fish or dive if bands fold. Write airmail: ZF8AA, Little Cayman, CAYMAN ISLANDS.

COLLINS Equipment Wanted: KWM2-A w/n/b, 30L-1, 30S-1, 312B-3, 312B-4, 312B-5, 516F-2, 180S-1, 302C-3, 399B-4, 399B-5, KL-1, PM-2, MM-1, MM-2, SM-3, 637T-2. Original top condition only. Sannazzaro Alberto, 1K1 CXJ-Str. Pontecurone, 9 15042 Bassignana, ITALY.

WANTED: 2M X-tal controlled HT, max \$75. State model & condition. Also looking for IC-u2A, IC-228A/IC-28A and HR2510. Send details to: LA9GL, Per Hagen, Brekkev 24, 4344 Kvernaland, NORWAY or FAX No. 011-47-448-5401.

WANTED: Microwave Test Equipment and Surplus Components for Microwave Experimenters Group Downunder. Contact P.R. Woodland, 10 Schooner Bay Drive, Frankston, Victoria, AUSTRALIA 3199, Phone 61-3-7765913, FAX 61-3-7765914.

CUSTOMIZED Printout of antenna headings, distances, including CQ and ITU zones, over 700 worldwide locations and prefixes. \$12.95 ppd. Brian Henderson, VE6ZS, 23 Deermoss Place SE, Calgary, Alberta, CANADA T2J 6P5, 403-276-2084.

WANTED: Noise Blanker for the Ten Tec 580 Delta. G2DRT.

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-526-4052.

FAST, ACCURATE, readable, nonsensational—The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send \$19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 06111.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315. SASE K3IWK.

COMPREHENSIVE Apple II/II+/IIE Software CW/RTTY with/without TU or TNCless Packet. Call sign and \$49.95 brings either and manual on 5.25 inch disk. SASE for free brochure. W1EO, 39 Longridge Road, Carlisle, MA 01741.

SAVE \$1.50 SHIPPING on any ARRL book. Send book price plus \$1 to Marshall Hill Enterprises, Bradford NH 03221.

RTTY JOURNAL, published 10 times per year for those interested in digital communications. Read about RTTY, AMTOR, MSO, Packet Radio, RTTY DX and Contests, and Technical Articles concerning the digital modes. \$10 per year (foreign higher). RTTY Journal, 9085 La Casita Avenue, Fountain Valley, CA 92708.

RADIO SHACK Color Computers: Hardware and Software for ham use. Dynamic Electronics, Box 896, Hartselle, AL 35640, 205-773-2758.

SPY RADIOS WANTED! Buying all types of espionage radios and code machines! Especially wanted are military-type radios in civilian suitcases! Museum, Box 8146, Bossier City, LA 71113, 318-798-7319.

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco, CA 94128, 408-729-8200.

ELECTRONIC CENTER, INC. can save you money! Call for savings on Kenwood, ICOM, Yaesu, Encom, Hohn Towers, SWL Receivers, and all accessories. Texas 1-800-441-0145; Nat'l 1-800-527-2156; Metro 263-7484, or 214-969-1936. Ham Department, home of the world-famous Sidewalk Sale, 2809 Ross Avenue, Dallas, TX 75201.

BEAM Headings your QTH. \$9.95. W8JBU, 253 River Road, Hinckley, OH 44233.

CLEAR Glass Coffee Mug: Custom engraved with your call sign and your first name. Only \$10 per mug. CA residents add 6% sales tax. Write: Regency Glass Engraving, P.O. Box 802, Novato, CA 94949.

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GET Smart power when you need it! Universal Regulated Multi-Voltage DC for Experimenters! Laboratories! Industry! Send for facts! Pricelists! Pepperkit, 527-10th Street, Sparks, NV 89431-0811 USA.

SCHOOL CURRICULUM For Ham Radio by Carole Perry, WB2MGP. 26 lesson plans, code practice oscillator, audio cassette and VHS video tape. Suitable for all school grade levels with pull-out lessons. Can be used as separate course or as part of Social Studies or Science program. Also suitable for summer camp program, \$99.95. Media Mentors Inc., P.O. Box 311646, S.I., NY 10313-0006, 718-983-1416.

ATARI CW, RTTY, ASCII, and Packet Programs for 8 bit models. Each program available on disk for \$15 and on cartridge for \$35. SASE for info. Electrosoft, 1656 South California Street, Loveland, CO 80537.

RIGID Plexiglas Cover for following keys: Bencher \$9.95; MFJ-422 \$9.95; Vibroplex Iambic \$11.95. George Chambers, K0BEJ, 302 S. Glendale Avenue, Colleyville, KS 67337.

ATLAS RADIO-Swan Repair Service: Factory trained technicians, fast service and reasonably priced. RF Parts Co., 1320 Grand, San Marcos, CA 92069, 619-744-0720, 800-854-1927.

DX QSLs. The "Go List". We make getting the QSL cards as much fun as the QSO itself. Over 5000 QSL managers. Updated and published monthly. The W6GO/K6HHD QSL Manager List, POB 700A, Rio Linda, CA 95673. \$20/yr/USA.

ATTENTION! Trade your old wristwatches (Rolex, Hamilton, Patek, Chronograph, etc.) for my classic ham gear or \$3.50 each. 619 Broadway East, Seattle, WA 98102, 206-932-6621.

"HAMLOG" Computer Program. 17 Modules Full features. Auto-logs, 7 band WAS/DXCC. Apple \$19.95. IBM, CPM, Kaypro, Tandy, C-128 \$24.95. QST-KA1AWH, POB 2015, Peabody, MA 01960.

'N-TENNA Quad Kits, Boomless Tribanders, \$64.50. Box 5332, Hickory, NC 28603.

KWM-380/HF-380 Repairs. Kirby, K7WOC, 713-320-2324.

TUBES WANTED: I pay cash or trade for all types of transmitting or special purpose tubes. Mike Forman, 1472 McArthur Blvd., Oakland, CA 94602, 415-530-8840.

QRP CW Xmt'r Kits and Components. SASE brings catalog. W1FB, Box 250, Luther, MI 49856.

HAM PROGRAMS for Commodore, IBM-PC, Apple, TI99/4A. Send legal size SASE: EPO Software, 7805 NE 147th Avenue, Vancouver, WA 98682.

ELECTRON TUBES. All sizes and types. Transmitting, Receiving, Microwave—large inventory. Same day shipment. Ask about our 3-500Z special. Daily Electronics, P.O. Box 5029, Compton, CA 90224, 800-346-6667.

APARTMENT Dwellers/Portable Antenna System. For HF. SASE for information. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 312-482-9310.

CIPHERING Equipment (M-209, M-94, others) Wanted. Books, Manuals, anything related to secret writing. WB2EJK, 17 Alfred Road, Merrick, NY 11566, 516-378-0263.

LIMITED Space Dipoles... Tri-Bander 160/80/40... \$75; Dualband 160/80, 160/40, 80/40... \$59.50; 50/40... \$47.50. All coax fed, low VSWR, no tuning required, maximum power. G5RV... \$35; G5RV junior... \$32. UPS prepaid. SASE Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

VACATION—Ham high in Colorado Rockies. Furnished Mt. Chalet with 205B @ 85' and Collins station. By week. W0LSD, 719-395-6547 nights.

NOSTALGIC OM looking for Philmore NT-200 Novice Rig, B and W 5100-B, Johnson Viking Mobile TX, National NC-88. Even if not working, unit should be cosmetically mint or near mint or else I get thrown out of the house along with "all that dirty junk". Will pay fair price. Contact WA1YVW, 3245 Heather Hill Lane, Tallahassee, FL 32308, 904-693-3936 after 9 PM.

ATLAS RADIOS Wanted—working or not. RF Parts Co., 619-744-0720, 800-854-1927.

HAM HOLIDAY in VP5. Join cycle 22 fun from rare DX QTH, Turks & Caicos Islands. We supply transceiver, antenna, process license and offer accommodations as low as 7 nights \$380 each; double occupancy in private bungalow. Direct Pan Am service, 60 minutes Miami. Details VP5D, P.O. Box 100858, Ft. Lauderdale, FL 33310.

1989 CALLBOOKS. North American \$26. International \$29. Both \$52. Personal check. Insured UPS paid. Immediate shipment. Avatar/W9JVF, 1408 W. Edgewood, Indianapolis, IN 46217.

SUPER VR85 replaces the popular VR85 satellite tracking program for the Commodore 64. Features include high resolution color map and satellite sprite, tracking data display, foot-print sprite, ground trace, mutual acquisition table, transmitter mode display, room for twenty satellite Keplerian element sets. Autotrack compatibility, extensive instructions, and strong user support. Send SASE for details. Super VR85: \$35 ppd. (CA residents add 6% sales tax.) RLD Research, McCloud, CA 96057. W6AMW owner.

# ***“I want to set the record straight”***

**Dear Fellow Hams,**

Like many computerized products, the MFJ-1278 has evolved very rapidly, so I was disappointed to see a model from the very first production run reviewed in **QST** for July, 1989.

The current production MFJ-1278 is now in its fifth generation firmware (version 3.2) and in its fourth hardware revision (board revision 9).

Each new release has brought new features, new enhancements and extensive improvements.

**Let me bring you up-to-date on the QST review . . .**

1. The MFJ-1278 is a highly sensitive multi-mode. The initial audio level problem was solved by changing the value of a coupling capacitor.
2. The MFJ-1278 is the only multi-mode that uses a PLL modem. It is the most tolerant of signal amplitude variations of any multi-mode modem. And it has a true DCD circuit that ignores background noise and prevents DCD dropout common on HF packet. Extensive test published in *Packet Radio Magazine* prove the MFJ-1278 HF modem with proper DCD operation copies HF packet more accurately than all other modems tested.
3. Major software and hardware improvements give the MFJ-1278 excellent CW performance. The new Autotrac™ feature adjusts to hand sent code and automatically locks and tracks CW speed. It significantly improves CW copy.
4. Our technical department has never found an MFJ-1278 that FAX can't be lined up on.  
The current production MFJ-1278 has a new built-in Multi-Gray Level FAX/SSTV Modem. It gives you better sync and much more detailed pictures and maps than any other multi-mode.
5. The MFJ-1278 manual has been re-written and expanded.

Several important features are not mentioned: 32K RAM, lithium battery backup, free AC power supply, random code generator and automatic serial numbering.

Additional new features: AMTOR, Navtex, Easy Mail™ Personal Mailbox, packet anti-collision technology, KISS and full CW break-in.

Our newest features: transmit audio level pots for adjusting each radio port, simple internal high speed modem installation, and you can monitor transmit and receive audio, CW sidetone and packet connect bell with an external speaker.

Since we improve our MFJ-1278 so quickly, it now comes with a coupon good for one free Eprom upgrade exchange so you can add new software features without cost.

All previous versions are upgradable at a moderate charge.

**QST** has promised to review a more recent MFJ-1278.

But I wanted to set the record straight so you would have accurate up-to-date information in case you are considering a multi-mode.

I hope you decide to join the thousands of satisfied MFJ-1278 users.

Thank you for hearing me out.

**Martin F. Jue, K5FLU  
President  
MFJ Enterprises, Inc.**

# MFJ's Deluxe 300 Watt Tuner

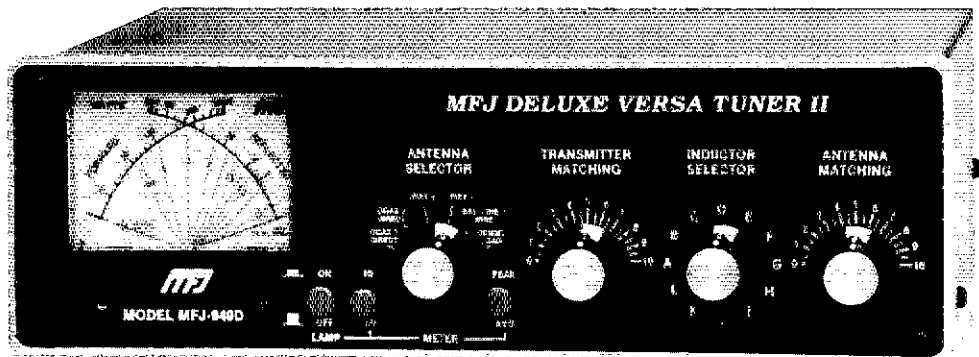
... gives you **full** 1.8-30 MHz coverage, a **peak reading** (and average) Cross-Needle meter, built-in **dummy load**, antenna switch and balun ... all covered by a **full one year unconditional guarantee** ... for only \$149.95

MFJ-949D

**\$149<sup>95</sup>**

Made in U.S.A.

- **Peak reading meter**
- **Built-in dummy load**
- **Covers 1.8 to 30 MHz**
- **1 full year guarantee**



You won't find all these useful features in any other 300 watt tuner -- not even at twice the price.

### New peak reading meter

The new **peak** and average reading Cross-Needle meter in the MFJ-949D shows you SWR, forward and reflected power -- all in a single glance.

Without a **peak reading** wattmeter you just won't be able to tell if your rig is putting out all the peak SSB power it's designed for. Don't be without one if you want top performance.

### Built-in dummy load

A built-in 300 watt 50 ohm dummy load makes tuning up your rig sooooo easy. How do you tune up your rig without one?

An external dummy load will cost you about \$30 more -- plus it takes up valuable space at your operating position and requires another cable.

### Full 1.8 to 30 MHz coverage

The MFJ-949D gives you **full** 1.8-30 MHz coverage.

**Make** sure the tuner you're considering covers **all** the HF bands.

**Don't** get a tuner that keeps you from operating all the frequencies you've worked for -- now or in the future.

### Plus more ...

You get a versatile 6-position antenna switch and a 4:1 balun for balanced lines.

You can run up to 300 watts PEP and tune out SWR on coax, balanced lines or random wires.

### Unconditional Guarantee

You get a **full one year unconditional guarantee**. That means we will repair or replace your MFJ tuner (at our option) **no matter what** for a full year.

**Others** give you a 90 day **limited** warranty. What do you do **after** 90 days? Or **before** 90 days when they say, "Sorry, it's your fault"?

### What's really important? precise control for minimum SWR

**What's** really important is your tuner's ability to get your SWR down to a minimum -- and the MFJ-949D gives you more precise control over SWR than any tuner that uses two tapped inductors.

**Why?** Because the two **continuously** variable capacitors in the MFJ-949D give you **infinitely** more positions (than the **limited** number on two switched coils).

**This** gives you the precise control you need to get minimum SWR and maximum

power into your antenna.

**After** all, isn't that why you need a tuner?

### High efficiency and a compact size: performance is most important

The MFJ-949D uses a **single** airwound coil. Using only one inductor takes up a minimum of space and there's no mutual coupling problems.

The excellent form factor of the short fat coil gives you highest Q. Plus you get plenty of inductance that gives you a much wider matching range than other designs.

**This** results in a highly efficient tuner that puts maximum power into your antenna **and** a compact 10 x 3 x 7 inch size that complements your rig and fits right into your station.

**Competing** tuners using **two** tapped coils require a large cabinet -- not just to house the coils but also to help reduce detrimental coupling between the inductors. The result? A tuner that's **bigger** than your radio.

### Your very best value

The MFJ-949D gives you your very best value, first-rate performance, proven reliability and the best guarantee in ham radio. ... all from the **most trusted** name in antenna tuners. Don't settle for less. Get yours today!

## MFJ's 1500 Watt Tuner



For a few extra dollars the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. It covers 1.8 to 30 MHz.

You get MFJ's **new peak** and average reading Cross-Needle SWR/Wattmeter.

You also get a 6-position antenna switch and a teflon wound balun with ceramic feed-thru insulators for balanced lines. Measures just 10 3/4 x 4 1/2 x 14 7/8 inches.

### How can an American manufacturer like MFJ give you more tuner for your money than clearing houses for foreign competition?

MFJ tuners are made in America.

**Here's** how MFJ gives you more tuner for your money than any clearing house for foreign competition.

MFJ builds every tuner cabinet from scratch using the latest high-speed

computer controlled punch presses.

MFJ manufactures, assembles and tests every PC board that goes into MFJ tuners.

**Instruction** manuals and other materials are printed in MFJ's print shop.

MFJ tuners go directly from our factory to your dealer. We're not just an importer adding profits, tariffs and import charges.

With MFJ's efficient in-house manufacturing and straight to your dealer distribution you get the most tuner for your money.

### WHY CHOOSE AN MFJ TUNER?

**Hard-earned Reputation:** There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ tuners throughout the world than all other tuners combined.

**Proven Reliability:** *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

**First-rate Performance:** MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere*.

**One full year unconditional guarantee:** That means we will repair or replace your tuner (at our option) **no matter what** for a full year.

**Continuing Service:** MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

**Your very best value:** MFJ tuners give you the most for your money. Not only do you get a **proven** tuner at the lowest cost -- you also get a one year **unconditional** guarantee and **continuing** service. That's how MFJ became the world's leading tuner manufacturer -- by giving you your very best value.

**Choose** your MFJ tuner with confidence! You're getting proven performance and reliability from the most trusted name in antenna tuners. Don't settle for less.

**Call** or write for a **free** full-line MFJ catalog with all 10 of our tuners and tons of ham radio accessories!

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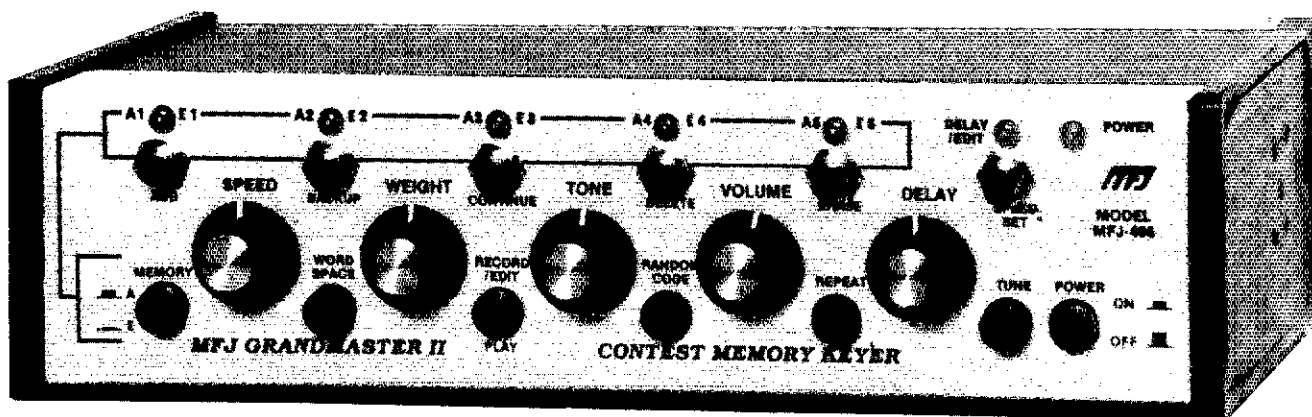
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# MFJ Grandmaster Memory Keyer™

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MFJ-486

**\$189<sup>95</sup>**

Made in U.S.A.

**Simple . . . intuitive . . .** you instantly know which knob to turn, what button to press. It's unmistakable.

**That's** the MFJ Grandmaster concept -- more than user friendly . . . it's really easy to use.

**There's** no keypad, no complex keystroke sequences to confuse you.

**The** new MFJ-486 Grandmaster Memory Keyer™ gives you the best of both worlds -- all the features you'll ever need and the easy-to-use MFJ Grandmaster concept.

**Exclusive CW Word Processor™** MFJ's exclusive CW Word Processor™ lets you change a message in memory without having to rekey it all in.

**Special** function keys make it simple to move around within any message, insert, delete and change your message until it's just the way you want it.

**With** other memory keyers you have to erase an entire message and rekey it all in to make even the smallest change.

### Combine messages into other messages

**The** MFJ-486 lets you combine frequently used messages into other messages.

**You** can store QTH, rig/antenna, QSL info and other comments in separate memories.

**Then** you can easily build a new message by keying in memory numbers wherever you want that info in your message.

**MFJ's Custom-Speed™ Control** Customize your speed control to fit you!

**By** pressing the Speed Set button, you can set your slowest speed to start at 4, 5, 6 -- any speed up to 20 WPM -- and your fastest speed is 20 to 100 WPM.

**Matching** CW speed to a QSO is best done by ear as you adjust a speed knob.

**With** keypads you have to figure out the exact speed of your contact and then go through an awkward keystroke sequence.

**That's** why matching speed with a

keypad is so demanding.

**Without** MFJ's Custom-Speed™, a wide range speed control is very hard to use because the slightest touch causes radical speed changes.

### Built-in CW Course

**The** MFJ-486 gives you a well-organized three step CW course for upgrading and teaching.

**The** first step gives you random five character groups. After you learn the letters you can add punctuation.

**The** second step gives you random 1-8 character groups for real-world code practice.

**The** third step gives you an infinite number of random plain English QSOs in the same format as FCC ham license tests.

**When** you can copy these random QSOs, you're ready to pass your test and upgrade!

**You** also get Farnsworth option, answer-replay to check your copy, punctuation on/ off and earphone jack for private practice.

### Remote Control . . . for memories and function keys

**The** MFJ-77 remote control lets you control your message memories and CW Word Processor™ function keys at your key paddle for only . . . \$19.95.

**It's** a lot more useful than a remote that gives you no editing functions and only lets you control a few memories.

### MFJ Keyers are used year after year

**Not** so long ago there was a glut of keypad keyers. They were novel, and a lot of hams spent their money.

**But** because they were hard to use they ended up in drawers and closets.

**They** were soon no longer made.

**Most** original MFJ keyers are still being used -- day after day and year after year.

**Why?** Because they're easy-to-use. And that's why more new MFJ keyers are being put on-the-air today than ever.

### More for your money

**To** make it really easy-to-use, it cost more to build the MFJ Grandmaster.

**It** just takes more hardware -- knobs to turn, buttons to press, LEDs to show

you what's going on. Plus it takes more labor, more software, more everything.

**It's** a real bargain compared to cheaper-to-build but harder-to-use keypad keyers.

### Plus More . . .

**You** get over 8000 characters in 10 soft-partitioned memories -- far more than you'll ever need.

**You** also get . . . lithium battery backup, automatic serial numbering, automatic message repeat, beaconing, A or B type iambic keying, manual or automatic word spacing, speaker, earphone jack, easy-to-use front panel controls for speed, volume, tone, weight and delay, tune control, powerful Z-80 microprocessor plus much more. 9x2½x6 inches. Use 12-15 VDC or 110 VAC with MFJ-1312, \$12.95.

### One Full Year

#### No Matter What™ Guarantee

**You** get MFJ's full one year no matter what™ guarantee.

**That** means MFJ will repair or replace your MFJ-486 (at our option) no matter what happens to it for a full year.

**Others** give you a 90 day limited warranty.

**What** do you do after 90 days when it burns up. Or before 90 days when they say, "Sorry, your limited warranty doesn't cover that?"

**Why** take chances when MFJ gives you no matter what protection for one full year?

### Don't struggle with keypads -- enjoy the easy-to-use MFJ Grandmaster

**Don't** struggle with a hard-to-use keypad and complicated keystroke sequences.

**Choose** the memory keyer that's really easy-to-use and has all the features you'll ever need - the new MFJ-486 Grandmaster.

**Get** yours today . . . you'll love it!

Nearest Dealer/Orders: 800-647-1800

**MFJ**

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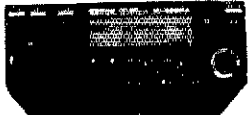
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### Amplifier Trouble?

If you experienced sudden tube failure in your amplifier, the odds are 99 to 1 that it was not due to operator error or a tube defect, even if the tube was replaced under Eimac's very generous warranty. It is most likely that your amplifier had an intermittent VHF parasitic-oscillation. This is not an uncommon problem when conventional parasitic-suppressors are used with modern, high-gain, amplifier-tubes.

If you have heard your amplifier spit, pop, or arc, this is a good indication that your amplifier is on the verge of a serious VHF parasitic-oscillation.

(For more information, see QST Magazine, Oct. 1988, page 36)

If you know how to solder, this problem is easily corrected by installing improved VHF parasitic-suppressors.

Suppressor Retrofit-Kits are available from the author of this article. All materials, MCF resistors, capacitors, instructions, diagrams and a 430°F silver-solder kit are supplied, nothing else to find. Retrofit-kit for a (1) or (2) 3-500Z amplifier: standard duty-cycle, \$12; delivered; increased duty-cycle option, add \$2. Suppressor retrofit-kits are also available for HF-amplifiers that use 572B, 8122, 8873, 8874, 8875, 3CX300A7, 3-1000Z, 3CX1200A7, and 8877 tubes.

To order a suppressor kit, or for more information and a price list, write to: Richard (Rich) Measurie, AG6K, 6455 La Cumbre Road, Somis, CA, 93066, or 805-482-3034.

Also available: Telephone RF-Interference suppressor retrofit-kits with diagram and instructions, five (5) kits for \$7, delivered via First Class Mail.

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WHERE THERE'S A WILL, there's a way. Want to really do something for amateur radio? Leave some or all of your estate to the RAIN Foundation. Call or write for information and a free cassette. Hap Holly, KC9RP, Executive Director, 312-827-7246.

THRUST Bearings: plans changed, no longer needed. Nick G. Lash, 458 W. 900 S., Hebron, IN 46341.

FREE Ham Radio Gospel Tracts. SASE. N3FTT, 5133 Gramercy, Clifton Heights, PA 19018.

TOWERS: Alumna crank-up with hinged base, house bracket, mast. Mobile van, rooftop, trailer towers. Stack sections. Take amateur gear or computers on trade. McClaran Sales, P.O. Box 2513, Vero Beach, FL 32961, 407-567-8224.

OLDTIMERS! N6AW is writing a book about W6AM. If you have a story to tell about Don Wallace, take a few minutes to jot it down and send it to me, Jan D. Perkins, N6AW, 524 Bonita Canyon Way, Brea, CA 92621.

THE DX MAGAZINE is your monthly ticket to the DX game: Expedition reports, QSL managers, propagation, equipment reviews, more. Only \$15/year. Box 50, Fulton, CA 95439, 707-523-1001.

ROPE, ROPE, ROPE. Putting up an antenna? Tree top? Roof top? Tower? You need Rope. Rope. Rope. Best Quality-Best Price. Current Special: military specification, braided dacron polyester, minimum stretch, olive drab color, blends with trees. Resists: fire, fungus, ultraviolet rays. Super Value: \$9.95 per 200', plus \$2.50 postage. Whatever your rope needs contact us, no order too large. Send check or money order to: Rope, Rope, Rope., Box 6601, Portsmouth, VA 23703. Personal check allow 5 weeks. VA residents add 4.5% sales tax.

THE DX Bulletin provides all the DX, propagation, QSL, equipment, DXpedition information you need every week. SASE or call for samples. Box 50, Fulton, CA 95439, 707-523-1001.

WANTED: ICOM IC560, IC505, IC551, or IC551D 6M Multimode Radios. Reasonable. WA3RSP, 469 Jayson Avenue, Pittsburgh, PA 15228.

FREQUENCY Directories: Press, Maritime, Aero, Military, Spy, SW/MW/FM Broadcast, Utes, Police, Federal Agencies, all modes, 10 KHz to 900 MHz. Free catalog. CRB Research, Box 58-QS, Commack, NY 11725.

LINEMAN Safety Belt \$84. (State waist size.) Adjustable strap with snaps \$45. Pair Gorilla Hooks \$104. UPS paid. Personal check. Free info. Avator/W9JVF, 1408 W. Edgewood, Indianapolis, IN 46217.

PRINTED Circuit Boards for projects in QST, Ham Radio and 73's. SASE for list. FAR Circuits, 18N640 Field Court, Dundee, IL 60118.

WANTED: Azden PCS4500 or Yaesu FT627RA 6M FM Radios. Reasonable. WA3RSP, 469 Jayson Avenue, Pittsburgh, PA 15228.

HOSS-TRADER ED says, "Shop around for the best price, then telephone the Hoss last for the best deal". Wm Nye 3KW MB-6 Antenna Tuner \$675 cash price \$569; new ICOM 725 Transceiver regular \$1039 cash \$935; newest ICOM 735 Transceiver regular \$949 cash \$825; call for lowest price in USA on newest model ICOM 765 Transceiver; used Collins S-Line complete mint condition \$695; new Azden PCS-6000, \$349; new ICOM 2-AT, \$268; used Collins KWM-2A with AC Supply, \$695; sale on MFJ Products: some below cost. Visa/Master Card Accepted! Moory Electronics Co., P.O. Box 506, Dewitt, AR 72042, tel. 501-946-2820.

AZDEN Service by former factory technician. Rush service available. PCS-300 NiCads \$36.95. Southern Technologies Amateur Radio Inc., 10715 SW 190th Street #9, Miami, FL 33157, 305-238-3327.

RADIO DESK Console Cabinet. Build your own. Drawings, photographs, list of materials, \$7.95 ppd. Bill Morris, WA5RSC, P.O. Box 3, Temple, TX 76503-0003.

WANTED: All types of Electron Tubes. Call toll free 1-800-421-9297 or 1-812-429-9397, C & N Electronics, Harold Bramstedt, 8104 Egg Lake Road, Hugo, MN 55038.

MICROWAVE 100 + Watt Linears and 2C36 Cavities for 2304 MHz, 1296 MHz and 902 MHz. Hi-Spec, Box 387, Jupiter, FL 33488, 407-746-5031.

\$\$\$ SUPER SAVINGS \$\$\$ on Electronic Parts, Components, Supplies and Computer Accessories. Send \$1 for one year subscription for our 40 page catalogs and their supplements. Get on our mailing list. BCD Electro, P.O. Box 830119, Richardson, TX 75083 or call 214-343-1770.

WANTED: Kenwood TS-440S, Accessories. KJ6HL, 818-887-6750.

WANTED—Rotator T2X, Drake MN2700, Heath Keyer SA 5010, Cushcraft Boomer and Ringo Ringer II, any 2M Hand-held. WJUGM, 66 Columbus Avenue, Closter, NJ 07624, 201-767-0123.

220 MHz Amp Wanted. Mint Encom 250 Watt Model only. Call WA9KLZ, 317-869-4073.

COLORFUL Logging Program for IBM \$29.95. Works monochrome also. One main database for all your QSOs. Prints QSL cards and labels. Keeps track of WAS, DXCC and prefixes. Can import files from other sources. Special section for net operations. \$5 refundable brings manual. WJ2Q, P.O. B. 18, McConellsville, NY 13401.

MOTOROLA Saber and STX Portables Wanted. Call Bill, WD9CMS, 1-505-662-3710 weekends.

MICROWAVE Antennas. 4 ft. spun aluminum, 1/8" inch thick. F/D 35. Call John for prices. WA1ZRT, 203-269-2164.

# NO OTHER FULL DUPLEX PATCH OR REPEATER CONTROLLER GIVES YOU SO MUCH FOR SO LITTLE

## FULL DUPLEX AUTOPATCH USING DUAL BAND RADIOS...

Most people are within radio range of their base station 90% of the time. Why not install an 8200 and enjoy your own private full duplex mobile telephone system? Only 3 connections are required. The 8200 provides both full duplex and half duplex operation.

(Inquire about Private Patch V for simplex operation. Operates in enhanced sampling or VOX modes...user selectable.)

## ADVANCED AUTOPATCH FEATURES...

The 8200 incorporates many features which are simply not available in any other product. For example...

**90 Phone Number Auto Dialer:** The 8200 will store (in non-volatile memory) 90 phone numbers which can be dialed with abbreviated two digit key codes. The auto dialer is programmable over the air or with the built-in keyboard.

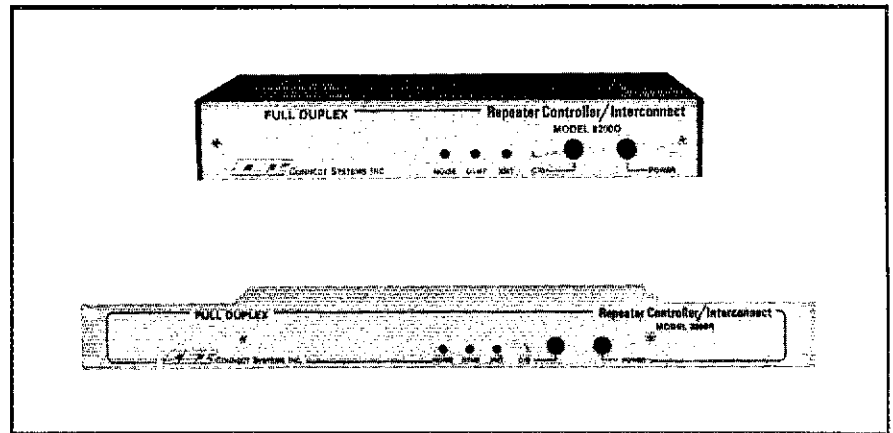
**Last Number Redial:** Redialing the last number called is reduced to a single digit (plus access code).

**Hookflash:** Operates call waiting etc. Simply press \* three times. Only CSI has it.

**Call Progress Tone Detection:** Busy signals and second dial tones are detected and cause automatic disconnect. Ample time is allowed for dialing second dial tones when required.

**Powerful Toll Protection:** One to four digit sequences can be restricted. For example, you could lock out 0, 1, 976 and 911. Additionally, digit counting will prevent dialing more than 10 digits. A separate 2 to 6 digit toll override code allows making toll calls when desired. Re-arm is automatic.

**Dial Access Remote Base:** The 8200 can be accessed and controlled from any telephone. Call up and drop into the system from your desk phone at lunch hour!



**Ringout Selective Calling:** Ordinary calls can be received using ringout (reverse patch) and mobiles can be selectively called using regenerated DTMF.

**Optional ANI access codes:** This option will allow up to 50 separate (remotely programmable) 1 to 6 digit access codes. A call can only be disconnected with the code that initiated the call. Thus eliminating sabotage disconnects.

## AN ADVANCED REPEATER CONTROLLER...

The 8200 is a powerful repeater building block and is perfect for all private and club systems.

The 8200 contains everything necessary to convert any receiver and transmitter into a powerful repeater. Only one connection to the receiver and two to the transmitter are required.

Menu style programming is accomplished with the built in keyboard and display. The user can select a 3 digit repeater up/down code, CW ID message, CW ID interval, hang time, activity timer time, and you can even select any Morse character as a courtesy beep!!

An optional plug-in CTCSS board converts the 8200 to private use. The incoming CTCSS is filtered out and replaced with fully regenerated tone. 32 tones are dip switch selectable.

## STANDARD FEATURES...

- Line in use detection
  - 90 number auto dialer
  - Redial
  - Hookflash
  - User programmable CW ID
  - Regenerated tone/pulse dialing
  - Selectable activity, timeout and hang time timers
  - 3 digit repeater on/off code
  - Two remotely programmable 1-6 digit autopatch connect codes. (Regular and Toll Override)
  - Powerful toll protection
  - Remotely controllable relay (relay optional)
  - Ringout (reverse patch)
  - Busy channel ringout inhibit
  - Ring counting
  - Auto answer
  - Telephone remote base
  - DTMF-DTMF selective calling
  - Courtesy beep (any Morse character)
  - Automatic busy signal and dial tone disconnect
  - MOV lightning protectors
  - Non-volatile memory
- And MUCH more!



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FAX (805) 642-7271

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Hours 8:30-5:00 M-F Price Subject to Change Without Notice

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256	10' section	\$59.90
25AG2 & 3	model 2 or 3 top section	\$59.90
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456	10' section	\$140.00
45AG3 & 4	model 3 or 4 top section	\$142.90
506	10' section	\$180.00
M200	10' mast 2' rod	\$14.90
BX-40	40 self supporting 16 sq ft	\$215.90
BX-48	48 self supporting 16 sq ft	\$274.90
BX-56	56 self supporting 16 sq ft	\$368.90
BX-64	64 self supporting 16 sq ft	\$474.90
H8X-40	40 self supporting 10 sq ft	\$249.90
H8X-48	48 self supporting 10 sq ft	\$338.90
H8X-56	56 self supporting 10 sq ft	\$432.90
H8X-64	64 self supporting 10 sq ft	\$515.00
H8X-40	48 self supporting 18 sq ft	\$423.90
* GUY WIRE SPECIAL *		
3/16HS	300 galvanized 7 strand	\$45.00
1/4HS	300 galvanized 7 strand	\$55.00

## HYGAIN-TELEX ANTENNAS & ROTORS CALL FOR PRICES

### CUSHCRAFT ANTENNAS

AQP-1	complete Oscar Link system	\$169.00
AP8	8band 1/4 wave vertical	\$159.00
A3	4 element triband beam	\$270.00
A743	7 & 10 MHz add on kit for A3	\$87.00
A744	7 & 10 MHz add on kit for A4	\$87.00
D3W	10/12/17 mtr dipole	\$139.90
4218X1	18 element 2 mtr. 28 ft. boom	\$142.00
R4	10-12-15-20 meter vertical	\$209.90
R45k	17 meter add kit for R4	\$31.00
H5	10-12-15-17-20 mtrs	\$230.00
A45	4 element triband beam	\$355.00
AV4	40-10 mtr vertical	\$79.00
AV5	80-10 mtr vertical	\$122.00
ARX2R	2 mtr. Hingo Hanger	\$40.50
AH450B	450 MHz Hingo Hanger	\$40.50
A144-11	144 MHz 11 ele. VHF	\$51.00
A147-11	11 element 146-148 MHz beam	\$51.00
A147-22	22 element Power Packer	\$146.00
A144-10T	10 element 2 mtr Oscar	\$58.00
A144-20T	20 element 2 mtr Oscar	\$85.00
115WB	15 element 2 mtr Boomer	\$88.00
220B	17 element FM Boomer	\$108.00
230WB	144-148 MHz 30 element	\$232.00
32-19	19 element 2 mtr Boomer	\$122.00
444B	24 element boomer	\$88.00
10-3CU	3 element 10 meter Skywalker	\$125.00
10-4CU	4 element 10 mtr Skywalker	\$159.00
15-4CU	4 element 15 mtr Skywalker	\$194.00
20-4CU	4 element 14 MHz Skywalker	\$238.00

### HUSTLER ANTENNAS

491V	40-10 mtr vertical	\$79.00
591V	60-10 mtr vertical	\$105.00
681V	6 band trap vertical	\$124.00

### ROTORS

Alliance	H073 [10.7 sq ft]	\$108.00
Alliance	U110	\$49.00

### CABLE

[2-18 & 6-22]	4080 - per foot	\$0.25
[2-16 & 6-20]	4090 - per foot	\$0.35
1600	R68U Mini 8 low loss foam per foot	\$0.22
1198	R68U Columbia superflex 100'	\$31.00
1180	R68U low loss 100% braided foil shield	
	88% tin copper braided shield - per foot	\$0.42
1176	R6213 Columbia - per foot	\$0.40

## TENNA PHASE III POWER SUPPLIES

PS4	\$21.90
Fully regulated, 13.8 VDC, 4 amps constant with surge protection, overload protection w/instant auto reset	
PS7	\$27.90
Fully regulated, 7 amp constant 10 amp surge capacity	
PS12	\$37.90
Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset	
PS20	\$72.90
Fully regulated, 25 amp surge capacity, 13.8 VDC, 17 amp constant, with meter	
PS25	\$89.90
Regulated 4 5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage	
PS35	\$109.90
Same as above except 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts	
PS50	\$179.90
Fully regulated 40 amp, adjustable voltage 11-15VDC, dual metering, short circuit protection, multiple binding posts (4), carry handles	

## MAXON \$26.95

Model 495A - 49 MHz, FM 2-WAY RADIO hands free operation, auto activated transmit up to 2 min. Batteries optional

model 49B same features as 495A except uses AA nicad batteries and comes with battery charger

model 49F5 \$49.90

3 Ch FM 2 way, with Earphone mic, others hands free voice activated or push-to-talk TX VOX activated by Hi-Med-Low mic Sensitivity Switch. 54x22x141

## uniden

### BC70XLT

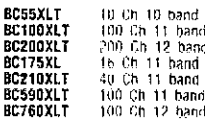
\$149.90

20 Ch 10 band channel lockout scan delay, auto search programmable track tuning direct channel access built-in mic, battery pack, WAC adapter & charger



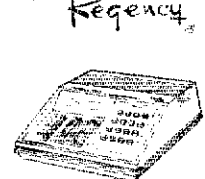
### BC560XLT \$99.90

16 Ch 10 band mobile scan delay, priority memory backup, Ch lockout, direct Ch access, weather search delay track tuning



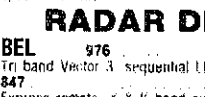
### BC100XLT \$87.00

100 Ch 11 band hand held



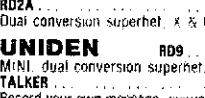
### R1090 \$79.90

45 Channel 9 band weather programmable permanent memory backup priority control channel lockout manual control dual scan speed AC only



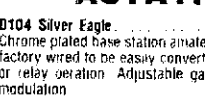
### MAXON RD25 \$74.90

Deluxe mini X & K band, dual conversion superhet



### UNIDEN RD9 \$109.90

MINI dual conversion superhet, sequential LED s, audible alarm



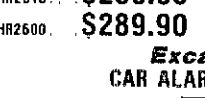
### ETS D104 SE \$84.90

Same as above with end of transmission Roger Beep



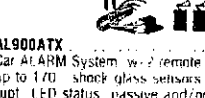
### HR2510 \$239.90

25 WA11 10 Meter Transceiver, all mode operation, backup multi function LCD meter, frequency lock, auto squelch, NB HF gain, PA external speaker jack 7/8x9 1/2x2 1/8



### HR2600 \$289.90

25 WA11 10 Meter Transceiver, all mode operation, backup multi function LCD meter, frequency lock, auto squelch, NB HF gain, PA external speaker jack 7/8x9 1/2x2 1/8



### AL900ATX \$119.90

Car Alarm System w-2 remote key chain transmitters that operate up to 170' shock glass sensors, full time panic alert, starter interrupt, LED status, passive and/or active arming, 1200B siren



## uniden

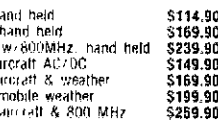
### BC800XLT \$219.90

WHILE THEY LAST! The units that receive CELLULAR telephone 40 Ch 12 band 800MHz, instant weather priority, track tuning, auto search direct Ch access, lockout, memory backup, AC/DC



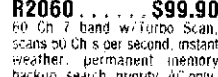
### BC145XL \$92.90

16 Ch 10 band programmable built-in delay review, priority, memory backup, Ch lockout, direct Ch access, weather search track tuning AC/DC



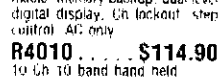
### BC55XLT \$114.90

10 Ch 10 band hand held



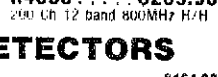
### BC175XL \$149.90

16 Ch 11 band aircraft AC/DC



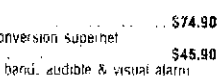
### BC210XLT \$169.90

40 Ch 11 band aircraft & weather



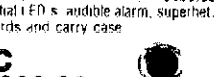
### BC590XLT \$199.90

100 Ch 11 band mobile weather



### BC760XLT \$259.90

100 Ch 12 band aircraft & 800 MHz



### R2060 \$99.90

60 Ch 7 band w/Furbo Scan, scans 90 Ch s per second, instant weather, permanent memory backup search priority AC only



### R1070 \$74.90

10 Channel 5 band programmable memory backup dual level digital display, Ch lockout step control AC only



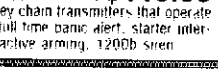
### R4010 \$114.90

10 Ch 10 band hand held



### R4020 \$199.90

100 Ch 11 band hand held



### R4030 \$269.90

200 Ch 12 band 800MHz H/H

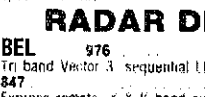


## Regency



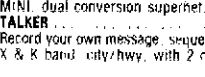
### R2060 \$99.90

60 Ch 7 band w/Furbo Scan, scans 90 Ch s per second, instant weather, permanent memory backup search priority AC only



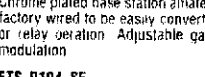
### R1070 \$74.90

10 Channel 5 band programmable memory backup dual level digital display, Ch lockout step control AC only



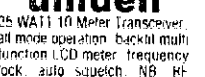
### R4010 \$114.90

10 Ch 10 band hand held



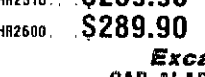
### R4020 \$199.90

100 Ch 11 band hand held



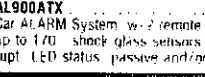
### R4030 \$269.90

200 Ch 12 band 800MHz H/H



### R2060 \$99.90

60 Ch 7 band w/Furbo Scan, scans 90 Ch s per second, instant weather, permanent memory backup search priority AC only



### R1070 \$74.90

10 Channel 5 band programmable memory backup dual level digital display, Ch lockout step control AC only



10 Ch 10 band hand held



100 Ch 11 band hand held



200 Ch 12 band 800MHz H/H



60 Ch 7 band w/Furbo Scan, scans 90 Ch s per second, instant weather, permanent memory backup search priority AC only



10 Channel 5 band programmable memory backup dual level digital display, Ch lockout step control AC only



10 Ch 10 band hand held



100 Ch 11 band hand held



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10 Ch 10 band hand held



100 Ch 11 band hand held



200 Ch 12 band 800MHz H/H



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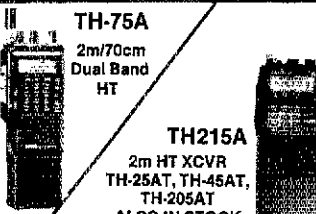
**TR-751A**  
**All Mode 2m Mobile**



**COMPACT 2M FM Mobile**

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**TM 2550A (45W) TM231A (50W)**  
**TM 2530A (25W)**

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 TH-25AT, TH-45AT,  
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**ALSO IN STOCK**  
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# ICOM



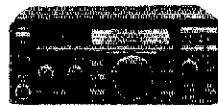
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**HF "PERFORMANCE" RIG**  
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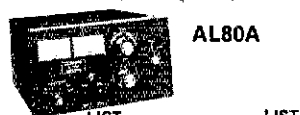
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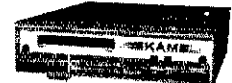


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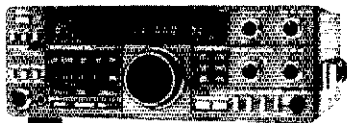
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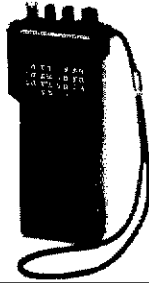
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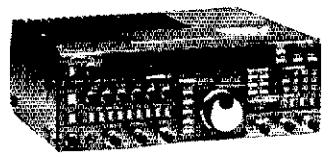
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FOR SALE: Swan 700CX/VOX, 4 sets 8950 Finals, 29 RX/TX Tubes, \$450. MFJ-989 Tuner lnew, \$250. E.M. Laughner, Greengate Apt. D-10, Greensburg, PA 15601, 412-837-9163.

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WANTED: Ten-Tec Argonaut and Century 22 in mint physical and working condition, with original manuals. Please give description and asking price. All replies will be answered. Mike Ross, W2VD, 148 Milton Street, Brooklyn, NY 11222.

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WANTED: Ten-Tec 580 Transceiver (Delta Model). Working or not. Please state condition of rig. KZ5B.



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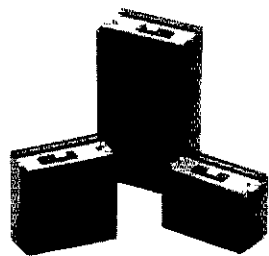
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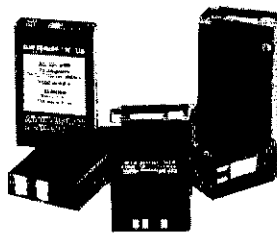


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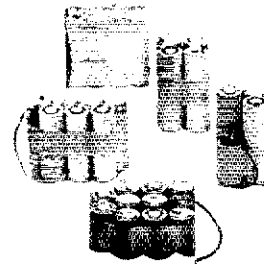
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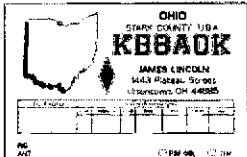
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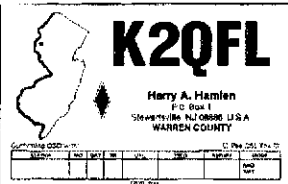
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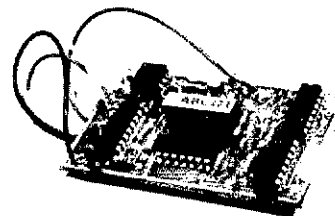
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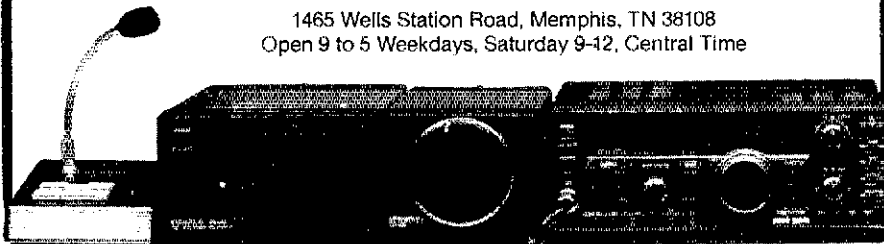
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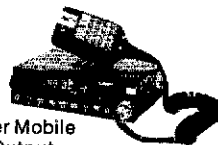
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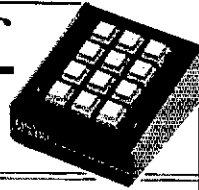
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The Most Used Accessory in Any Station

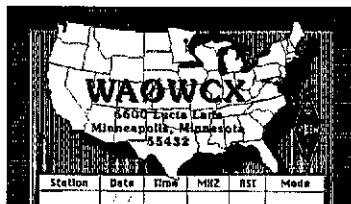


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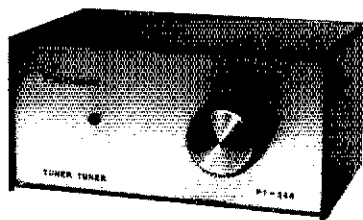


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203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

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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
HQ37SS	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	\$449
HBX48	48 ft	10 sq ft	303	\$589
HBX56	56 ft	10 sq ft	385	\$699
HDX40	40 ft	18 sq ft	281	\$569
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\*\*Year 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, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for 70 mph wind zone. 90 mph wind zone packages 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'	\$839	\$1499	\$1939
60'	929	1679	2169
70'	1129	1879	2399
80'	1199	2199	2799
90'	1279	2369	2969
100'	1529	2569	3239
110'	1629	2979	3449
120'	1899	3149	3699

## 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, Thrust bearings, 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
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MA55 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX665	22'	65'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

\*Note-towers rated at 50 mph to EIA specifications

## RG-213U

\$ .39/ft \$379/1000 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!

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- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

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- Same Specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

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Lowest Loss for VHF/UHF!

1/2" Alum. w/poly Jacket ..... \$ .79/ft.  
 1/2" LDF-4-50 Andrew Helix\* ..... \$1.99/ft.  
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select connectors below  
 Helix\* is a Registered Trademark of the Andrew Corp.  
 Coaxial Cable Loss Characteristics (90/100 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
9088	50	.4	.64	1.7	3.1
1/2" Alum	50	.3	.5	1.2	2.2
1/4" Helix	50	.2	.4	.9	1.6
1/8" Helix	50	.1	.2	.5	.8

## HELIX\* CONNECTORS

Cable Type	UHF	FML	UHF MALE	N FML	N MALE
1/2" Helix*	\$29	\$29	\$29	\$29	\$29
1/4" Helix*	\$55	\$55	\$55	\$55	\$55

## COAX CONNECTORS

Amphenol Silver PL259	.....	\$1.50
UG21B N Male	.....	\$3.50
9086/9913 N Male Connector	.....	\$4.95

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1/4 mile 18ga copper-clad steel wire	.....	\$30
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1:1 Balun	.....	\$15
Center Insulator	.....	\$8
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 155BAS 5-el 15-mtr Beam  
 105BAS 5-el 10-mtr Beam  
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 64BS 4-el 6-mtr Beam  
 12 AV0 20-10 mtr vertical  
 14 AV0 40-10 mtr vertical  
 18AVT/WB 80-10mtr Vertical  
 18HTS 80-10 mtr Hy-Tower Vertical  
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 BNBS 80-10 mtr KW Balun W/Coax Seal

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10 FT. STACKED SECTIONS

20G	.....	\$54.50	45G	.....	\$153.50
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Model	Height	Ant. Load*	Price
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FK2558	58 ft.	13.3 sq. ft.	
FK2568	68 ft.	11.7 sq. ft.	
FK4544	44 ft.	34.8 sq. ft.	
FK4554	54 ft.	29.1 sq. ft.	
FK4564	64 ft.	28.4 sq. ft.	

25G Double Guy Kit ..... \$299.  
 45G Double Guy Kit ..... \$319.

\*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.

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- Engineered for the DX-Minded and Contesting Ham
- Its Got It All!


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- Full CW Break-in
- Lots More Features

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- Optional 50 MHz, 220 MHz or 1.2 GHz
- 25 Watts Output on 2 Meters, 220 and 70 cm
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- Receive 30 kHz to 33 MHz
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Complete Terminal Unit for Morse, Baudot, ASCII, AMTOR

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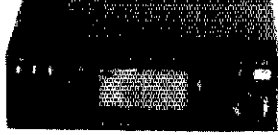
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- One Watt Power on Each Band
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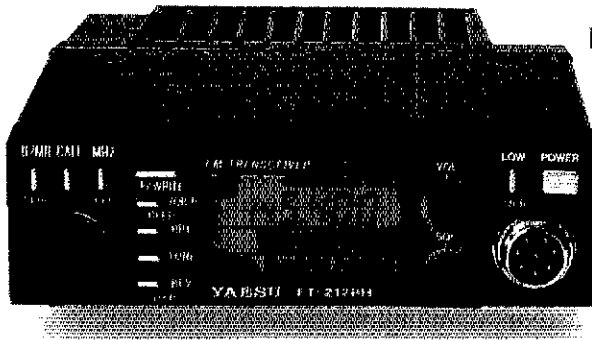
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**FT-4700RH. DUAL-BAND PERFORMANCE, REMOTE-HEAD DESIGN.**

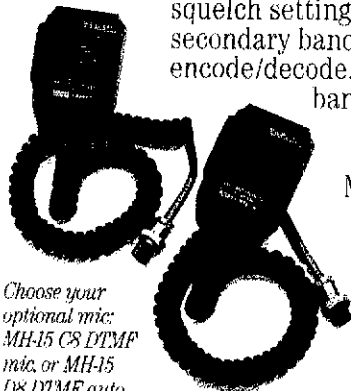
Mount the FT-4700RH almost anywhere—the "brains" on your dash, visor, or door; the "muscle" under your seat. 50 watts on 2 meters, 40 watts on 70 cm. Full crossband duplex. Simultaneous monitoring of each band, complete with independent squelch settings on the main and secondary bands. Built-in PL encode/decode. 9 memories (each



band). Extended receive. Reverse repeater shift. High/low power switch. Patch cord for remote mounting. Bright LCD display. Backlit controls. Choice of optional mic. More.

Want more information? Call **(800) 999-2070** toll-free. Or ask your dealer about Yaesu's FT-212R Series and FT-4700RH mobiles today. Two of America's favorites.

*Choose your optional mic: MH-15 CS DTMF mic, or MH-15 D8 DTMF auto-dialer mic*



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## Warp Drive!



### TS-790A Satellite Transceiver

The new Kenwood TS-790A VHF/UHF all-mode tri-band transceiver is designed for the VHF/UHF and satellite "power user." The new TS-790A is an all-mode 144/450/1200 MHz transceiver with many special enhancements such as automatic uplink/downlink tracking. Other features include dual receive, automatic mode selection, automatic repeater offset selection for FM repeater use, VFO or quick step channel tuning, direct keyboard frequency entry, 59 memory channels (10 channels for separate receive and transmit frequency storage), multiple scanning and multiple scan stop modes. The Automatic Lock Tuning (ALT) on 1200 MHz eliminates frequency drift. Power output is 45 watts on 144 MHz, 40 watts on 450 MHz, and 10 watts on 1200 MHz. (The 1200 MHz section is an optional module.)

- **High stability VFO.** The dual digital VFOs feature rock-stable TCXO (temperature compensated crystal oscillator) circuitry, with frequency stability of  $\pm 3$  ppm.
- **Operates on 13.8 VDC.** Perfect for mountain-top DXpeditions!
- **The mode switches confirm USB, LSB, CW, or FM selection with Morse Code.**
- **Dual Watch allows reception of two bands at the same time.**
- **Automatic mode and automatic repeater offset selection.**
- **Direct keyboard frequency entry.**
- **59 multi-function memory channels.** Store frequency, mode, tone information, offset, and quick step function. Ten memory channels for "odd split"
- **CTCSS encoder built-in.** Optional TSU-5 enables sub-tone decode.
- **Memory scroll function.** This feature allows you to check memory contents without changing the VFO frequency.

- **Multiple scanning functions.** Memory channel lock-out is also provided.
- **ALT—Automatic Lock Tuning—on 1200 MHz eliminates drift!**
- **500 Hz CW filter built-in.**
- **Packet radio connector.**
- **Interference reduction controls:** 10 dB RF attenuator on 2m, noise blanker, IF shift, selectable AGC, all mode squelch.
- **Other useful controls:** RF power output control, speech processor, dual muting, frequency lock switch, RIT.
- **Voice synthesizer option.**
- **Computer control option.**

#### Optional Accessories:

- **PS-31** Power supply • **SP-31** External speaker
- **UT-10** 1200 MHz module • **VS-2** Voice synthesizer unit
- **TSU-5** Programmable CTCSS decoder
- **IF-232C** Computer interface • **MC-60A/MC-80/MC-85** Desk mics • **HS-5/HS-6** Headphones
- **MC-43S** Hand mic • **PG-2S** Extra DC cable

## KENWOOD

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