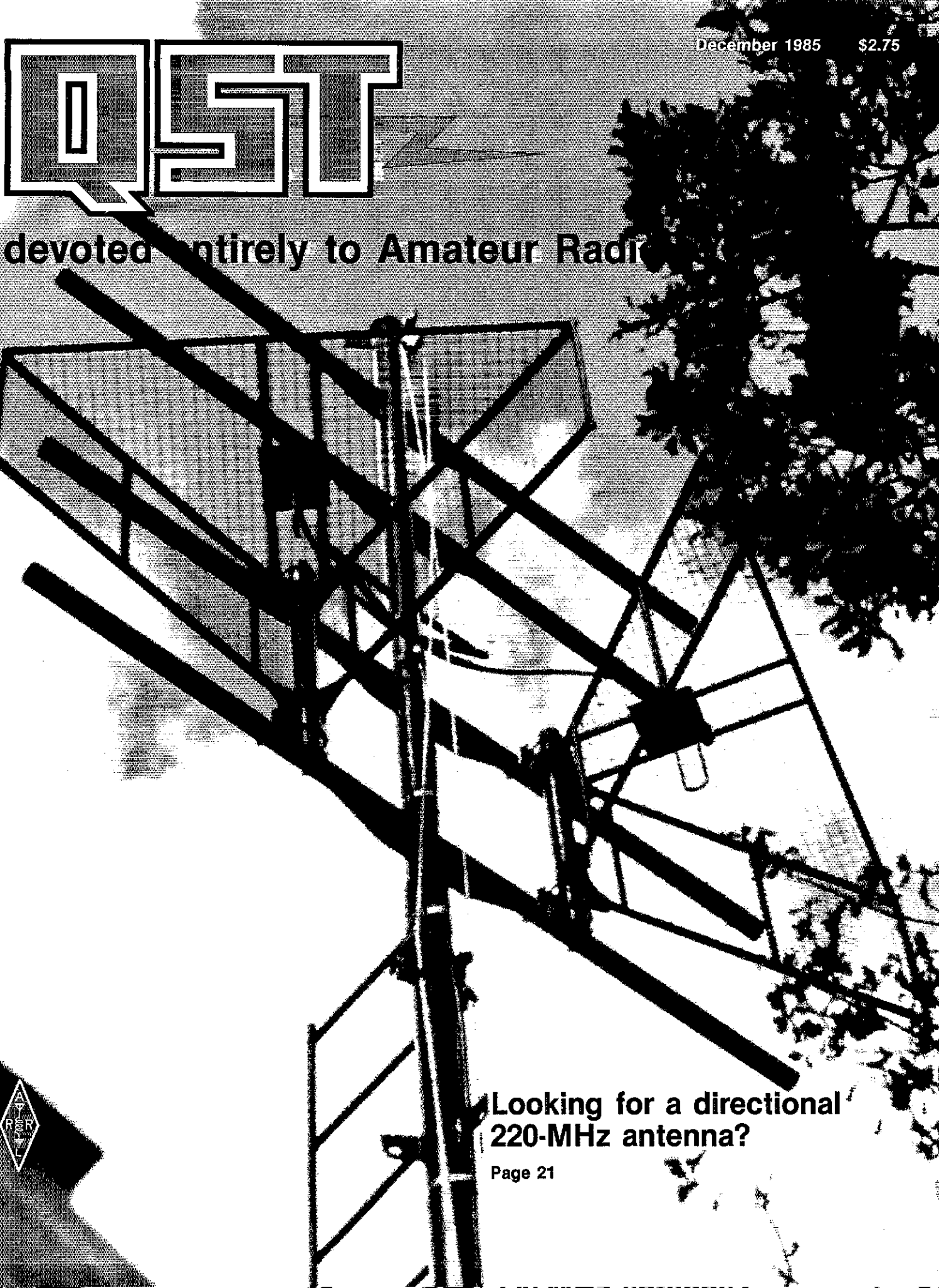


# QST

devoted entirely to Amateur Radio



Looking for a directional  
220-MHz antenna?

Page 21

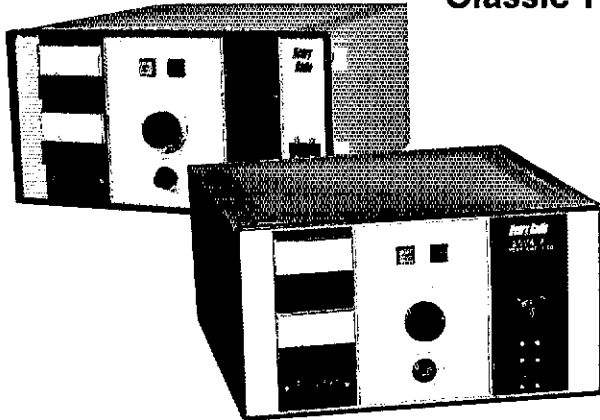


# Henry Report #3

**WHAT COMPANY HAS THE BROADEST LINE OF  
AMATEUR AMPLIFIERS ANYWHERE?**

**HENRY, OF COURSE!!**

**Classic HF linears, 3.5 to 30 mHz**



- 2KD Classic Desk Model
- 2K Classic Console
- 2K Classic "X" Heavy Duty
- 3K Classic MkII

**VHF**

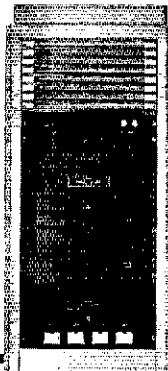
- 2002-A Desk Model
- 3002-A Console

**UHF**

- 2004-A Desk Model
- 3004-A Console

**WHAT COMPANY HAS THE BROADEST LINE OF  
COMMERCIAL, INDUSTRIAL, SCIENTIFIC RF POWER AMPLIFIERS?**

**HENRY, OF COURSE!!**



- Two megahertz to 500 mHz
  - 100 watts to 10,000 watts
- communications, high vacuum sputtering and etching, laser excitation, photo emissions spectrometry, micro meteor communications, nuclear magnetic resonance

*Let us know what you need!*

Henry amateur amplifiers are available from Henry Radio and select dealers throughout the U.S. and are being exported to amateurs all over the world. In addition to our broad line of commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.

We stock these plus many other fine names:  
AEA • ARCO • ARRL • ASTRON • B & K • B & W • BIRD •  
CDE • CONNECT-SYSTEMS • CUSHCRAFT • EIMAC •  
HAL • HUSTLER • HY-GAIN • ICOM • KENWOOD •  
LARSEN • NYE • ROBOT • TEMPO • VIBROPLEX • YAESU



## Henry Radio

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234  
Butler, Missouri 64730 (816) 679-3127

TOLL FREE ORDER NUMBER: (800) 421-6631 For all states except California. Calif. residents please call collect on our regular numbers.

# KENWOOD

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NEW!

## “DX-celence!”

### TS-940S

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

• **100% duty cycle transmitter.**

Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.

• **Programmable scanning.**

• **Semi or full break-in (QSK) CW.**

• **Low distortion transmitter.**

Kenwood's unique transmitter design delivers top "quality Kenwood" sound.

• **Keyboard entry frequency selection.**

Operating frequencies may be directly entered into the TS-940S without using the VFO knob.

• **Graphic display of operating features.**

Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.

• **QRM-fighting features.**

Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.

• **Built-in FM, plus SSB, CW, AM, FSK.**

**Optional accessories:**

- AT-940 full range (160-10 m) automatic antenna tuner
- SP-940 external speaker with audio filtering
- YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters;
- YK-88A-1 (6 kHz) AM filter
- VS-1 voice synthesizer
- SO-1 temperature compensated crystal oscillator
- MC-42S UP/DOWN hand mic.
- MC-60A, MC-80, MC-85 deluxe base station mics.
- PC-1A phone patch
- TL-922A linear amplifier
- SM-220 station monitor
- BS-8 pan display
- SW-200A and SW-2000 SWR and power meters.



• **High stability, dual digital VFOs.**

An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel!"

• **40 memory channels.**

Mode and frequency may be stored in 4 groups of 10 channels each.

• **General coverage receiver.**

Tunes from 150 kHz to 30 MHz.

• **1 yr. limited warranty.**

Another Kenwood First.



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

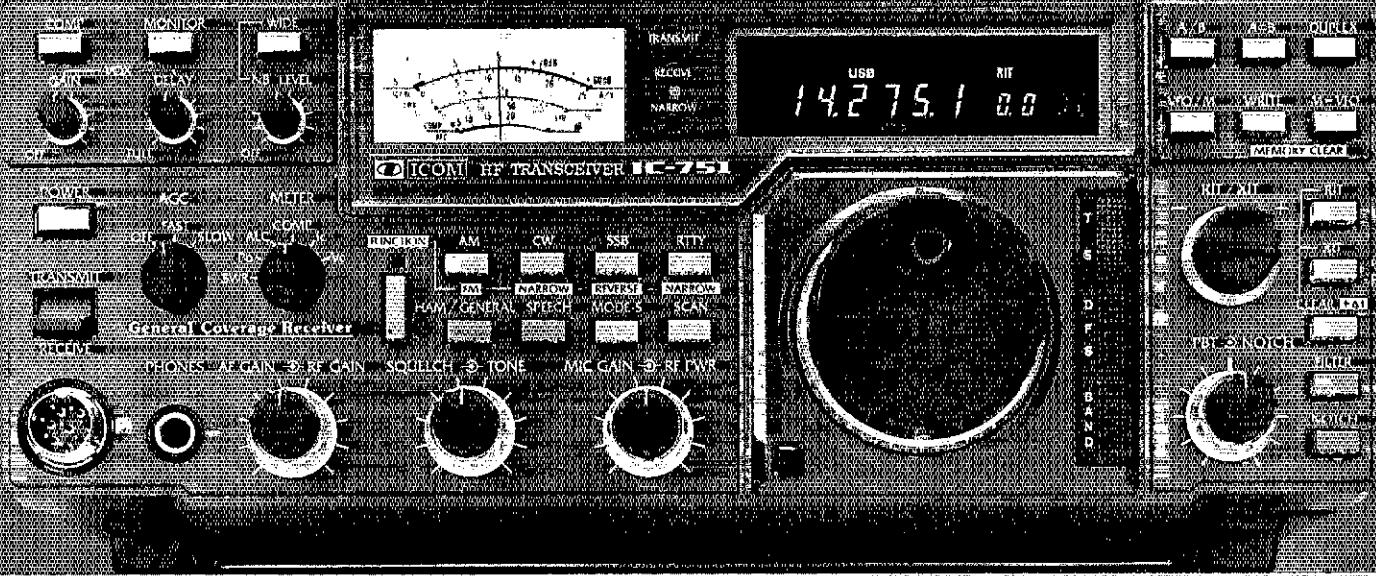
## KENWOOD

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1111 West Walnut Street  
Compton, California 90220

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

ICOM HF Transceiver

# IC-751



## The Standard of Excellence in HF Base Stations

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

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

- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanking
- RTT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power

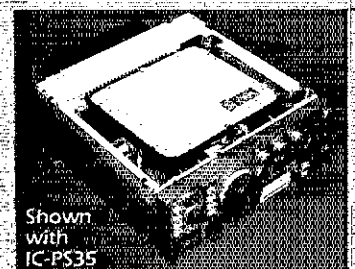
Options: IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic.

IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

### FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-3dB [KHz]	-60dB [KHz]
<b>STANDARD FILTERS</b>				
AM Ceramic	FL-44S IT	455	30	
SSB (PBT) XTAL	FL-30	9011.5	3	
FM Filter	5M15A	9011.5	151-3dB	
SSB Narrow (Hygrade Crystal)	FL-44A	455	24	
<b>OPTIONAL FILTERS</b>				
CW Narrow	FL-52A	455	0.50dB	
CW Narrow	FL-53A	455	11.25dB	
SSB Wide	FL-20	9011.5	28	
CW Narrow	FL-32	9010.6	0.50dB	
CW Narrow	FL-63	9010.6	0.25dB	
AM	FL-33	9010.0	0	

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



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

Now with a ONE-YEAR Warranty!



First In Communications



QST (ISSN: 0033-4812) is published monthly as its official journal by the American Radio Relay League, Newington, CT USA. Official organ of the International Amateur Radio Union and the Canadian Radio Relay League.

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## OUR COVER

At last! A 220-MHz repeater antenna that's a good performer, sturdy, relatively small and—well-suited for populated areas—directional. See pages 32-36. (photo courtesy W6RYX)

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# PACKET EVOLUTION



## ANOTHER BREAKTHROUGH FROM AEA

### *Packet + RTTY = Pakratt™ PK-64.*

If you've read about packet, or are already into it, you know how exciting it is. With the hot new Pakratt PK-64 we've just brought a new dimension to packet. The Pakratt PK-64 is a complete, fully assembled and tested packet radio controller which, together with a Commodore 64 or 128 computer, can convert your shack into a packet operations center. And we've included a new version of our advanced MBA-TOR™ software to make it the first packet controller with AMTOR, Baudot, ASCII and Morse. But an even more exciting part of the Pakratt controller is its great price.

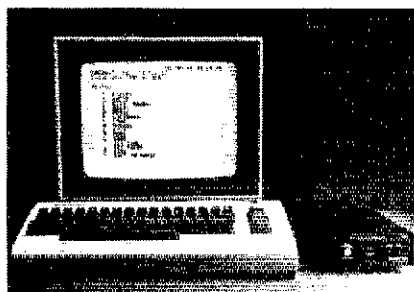
### *Incredibly Simple To Set Up*

Just plug the Pakratt controller into the C-64's game cartridge slot, add a mic connector for connecting to your particular

transceiver, and you're set. If you're anxious to try it out, our new "quickstart" manual section can get you on the air in under ½ hour.

### *Simply Powerful*

The versatile Pakratt controller shows messages and connect status simultaneously on your Commodore with a unique split-screen display. And it lets you



PK-64 shown with HF modem option. Computer not included.

send letter-perfect text from the text editor software while monitoring incoming messages. The 20K byte QSO buffer stores more than 20 video screens of text! Disk commands let you save

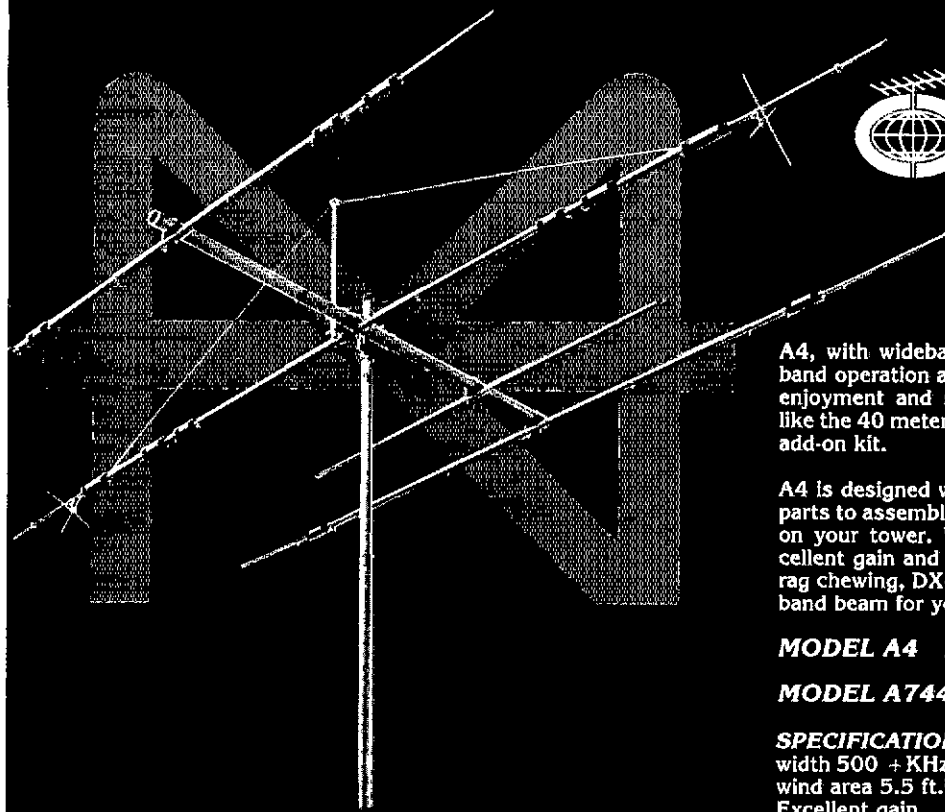
specific operating parameters for quick set-up for emergency services, clubs, and multiple frequency use. And the Pakratt controller's standard, TAPR style modem gives you 300 and 1200 baud operation with great HF/VHF performance.

We can't possibly list all of the important features of Pakratt here. But the absolutely best part of the Pakratt PK-64 is that it's at your dealer now. So stop reading, run down to your local dealer, and check Pakratt out. Because the real challenge will be to find one after the other hams see it.

Pakratt PK-64. Packet Power from AEA. At amateur radio dealers everywhere.



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



A4, with wideband performance, easy installation, 4 band operation and moderate price will give you more enjoyment and satisfaction from your hobby. You'll like the 40 meter operating possibilities with the A744 add-on kit.

A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

**MODEL A4 10, 15, 20 METERS**

**MODEL A744 40 METER ADD ON KIT**

**SPECIFICATIONS** SWR 1.2-1 bandwidth 500 + KHz, boom 18 ft., longest element 32 ft., wind area 5.5 ft.<sup>2</sup>, turn radius 18.4 ft., weight 37 lbs. Excellent gain.

## MORE CONTACTS, MORE SATISFACTION WITH **CUSHCRAFT BEAMS**



More contacts, less interference and a better signal at the receiving end are yours with this 2 element 40 meter Skywalker Yagi. The computer design maximizes gain and reduces side lobes. The design also gives low SWR with excellent bandwidth.

Holder of the North American contact record. This compact two element antenna has quickly become "the most wanted" 40 meter beam. Make it your first choice.

**MODEL 40-2CD 40 METERS**

**SPECIFICATIONS** boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.<sup>2</sup>,

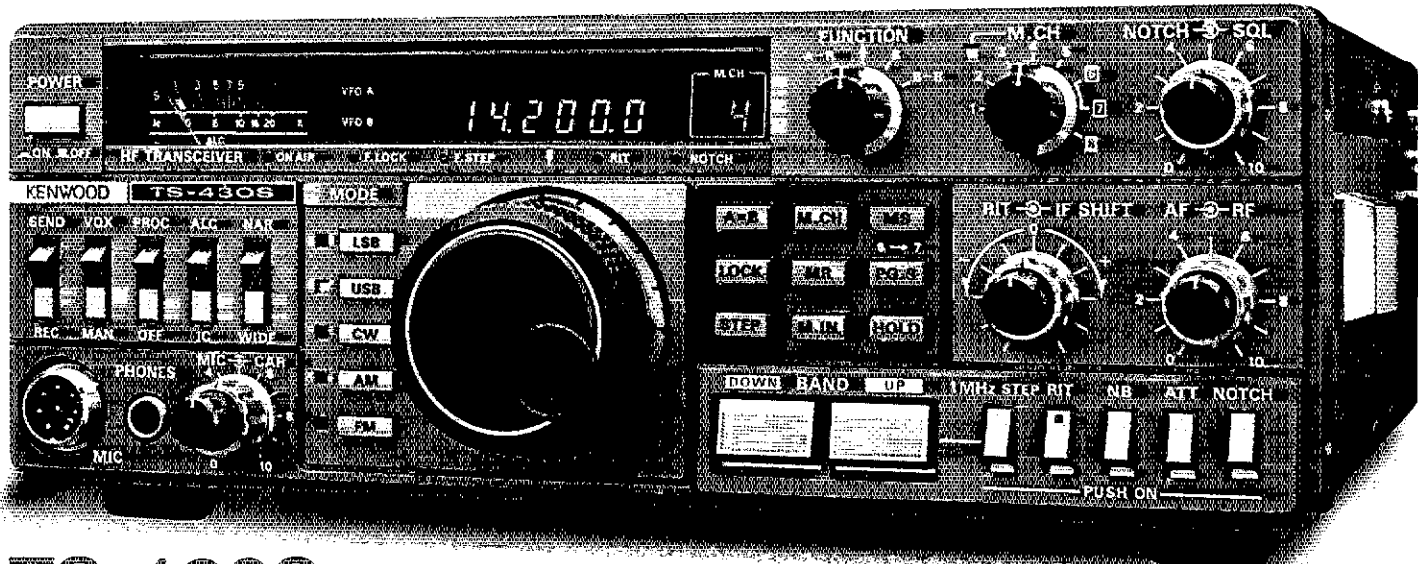
weight 40.7 lbs. Excellent gain.

P.O. BOX 4680 48 PERIMETER ROAD  
MANCHESTER, NH 03108 USA/603-627-7877  
TELEX 953-050 CUSHSIG MAN

# KENWOOD

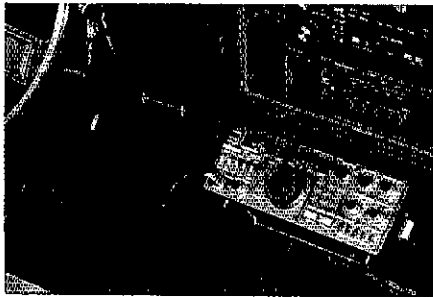
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## “Digital DX-terity!”



### TS-430S

**Digital DX-terity**—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!

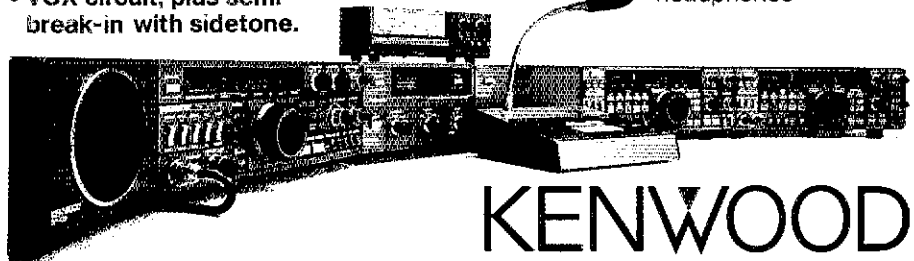
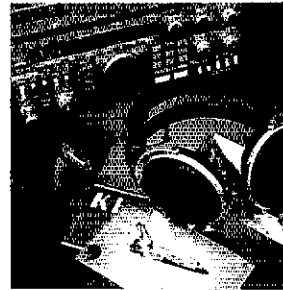


- **Covers all Amateur bands**  
160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction**  
Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker suppresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.

- **Reliable, all solid state design.**  
Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.**  
Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

#### Optional accessories:

- PS-430 compact AC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands
- AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands
- TL-922A 2 kW PEP linear amplifier
- FM-430 FM unit
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- YK-88A (6 kHz) AM filter
- MC-42S UP/DOWN hand mic.
- MC-60A/80/85 deluxe desk mics.
- SW-2000/200A SWR/power meters
- SW-100A SWR/power/volt meter
- PC-1A phone patch
- HS-4, HS-5, HS-6, HS-7 headphones



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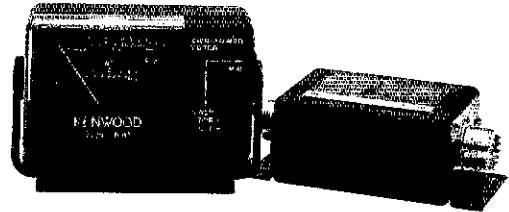
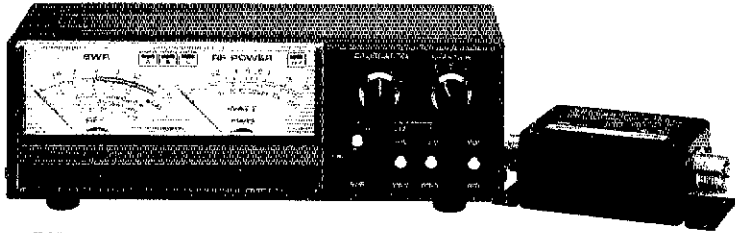
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# KENWOOD

...pacesetter in Amateur radio

## SWR/Power Meters



### SW-200A/SW-200B/SW-2000 Base station SWR/power meters

SW-200A supplied with SWC-1, SW-200B supplied with SWC-2, SW-2000 supplied with SWC-3

Selectable Peak-reading/RMS SWR/POWER meters cover 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) in range of 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) full scale for base station use

#### SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) • Power measuring range: 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) • Accuracy: Less than ± 10% of full scale • Sensitivity: Less than 2 W (SW-200A/B), 20 W (SW-2000) • Power supply: 12 VDC 100 mA • Dimensions: 193 (7.6) W x 62 (2.4) H x 79 (3.1) D mm (inch)

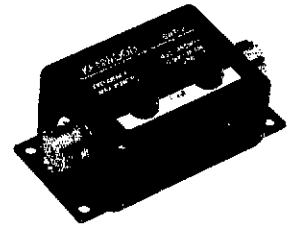
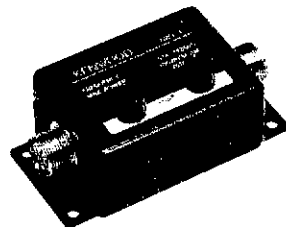
### SW-100A/SW-100B Compact SWR/power/volt meters

#### Compact SWR/power/volt meters

1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) in range of 150 W full scale for mobile use.

#### SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) • Power measuring range: 0–150 W • DC VOLT meter: 0–20 V • Accuracy: Less than ± 10% of full scale • Meter illumination: 12 V 50 mA • Dimensions: display 92 (3.6) W x 64 (2.5) H x 36 (1.4) D mm (inch), coupler 62 (2.4) W x 50 (2.0) H x 30 (1.2) D mm (in-h)



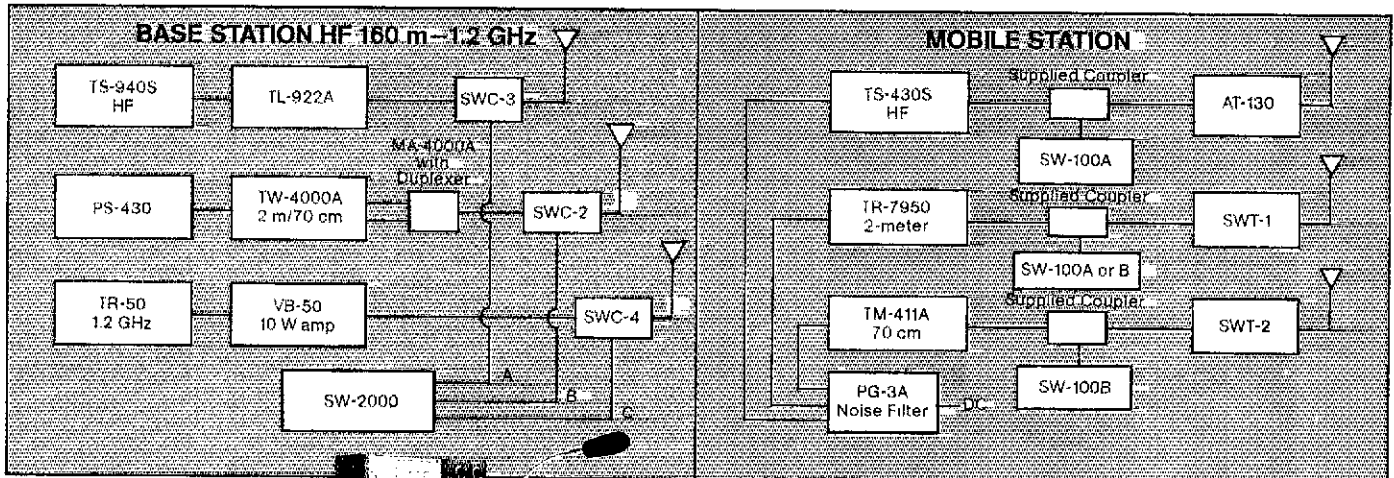
### SWC-1/SWC-2/SWC-3/SWC-4 Optional couplers

SWC-1 (1.8–150 MHz): Coupler for SW-200A/B, SW-2000  
SWC-2 (140–450 MHz): Coupler for SW-200A/B, SW-2000 } SO-239 connectors  
SWC-3 (1.8–54 MHz): Coupler for SW-2000  
SWC-4 (1200–1300 MHz): Coupler for SW-200A/B, SW-2000—Type N connectors

### SWT-1/SWT-2 Compact antenna tuners

#### Compact antenna tuners

• Frequency Range: SWT-1 (144–148 MHz), SWT-2 (430–450 MHz) • Input Impedance: 50 Ω (unbalanced) • Output Impedance (Matching range): 25–100 Ω (unbalanced) • Insertion Loss: Less than 0.3 dB • Max. Input Power: FM/AM 100 W, SSB 200 W (PEP) • Connector: SO-239 • Dimensions: 68 (2.68) W x 37 (1.26) H x 50 (1.97) D mm (inch) (Projections not included)



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

# KENWOOD

TRIO-KENWOOD COMMUNICATIONS  
1111 West Walnut Street  
Compton, California 90220

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*New Hampshire*  
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# THE AMERICAN RADIO RELAY LEAGUE, INC



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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA

Telephone: 203-866-1541  
Telex: 650215-5052 MCI.  
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# "It Seems to Us . . ."

## Lessons from Mexico City

When earthquakes struck Mexico City on September 19 and 20, they left tragedy in their wake and virtually destroyed communications between one of the world's largest cities and the rest of the globe. Relief efforts were hampered by the disrupted lines; distraught relatives were left with no means of contacting loved ones; the city was cut off from a news-hungry world. Radio amateurs were willing and able to bridge much of the gap.

But we weren't ready. And as a result, we weren't as able as we might have been.

As individuals, radio amateurs did an exemplary job of linking Mexico City with the outside world. The efforts (especially at the Mexico end) of those maintaining the circuits with the U.S. were almost super-human, and at that were just the tip of the iceberg: much more was being done by amateurs, both within Mexico and in the rest of Latin America, than reached our ears north of the border. Newspapers, radio and television broadcasts, and the thoughts of countless people on both sides of the border, are filled with words of praise for Amateur Radio—and rightly so, for without it the scope of the tragedy and suffering would have been even greater.

But let's not let it go to our heads. We could have done a lot better—and if we're as good as we like to think, we'll now turn our attention from the plaudits to the lessons learned. This is what is now occurring within the League's professional staff and volunteer organization.

Every natural disaster causes its own, unique set of problems. Some require only minimal Amateur Radio involvement; regular communications circuits remain intact, and our primary role is to supplement them, particularly within the affected area. For the rest, our facilities are available as required for official government use; for "order wire" communications needed to put the regular circuits back into operation; for use by relief organizations in coordinating their efforts; and for handling messages from the affected area to worried relatives and friends outside.

Long experience has taught us that welfare inquiries—messages originating outside the affected area, inquiring as to

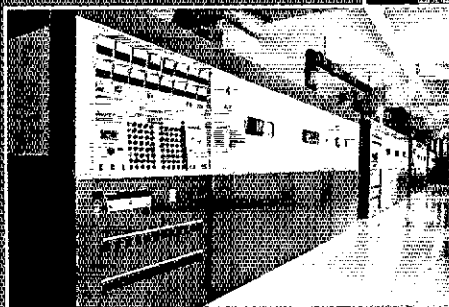
the status of someone within—must be given a lower priority. Usually, the communicators and workers on the disaster scene have too much to do to spend time tracking people down so such messages can be delivered, and an answer prepared.

Mexico City was different. Much of the local telephone system survived the 'quakes; once an XE station had received an inquiry, if it included a telephone number it was often possible to verify that someone was in good health simply by picking up the phone. Mexico City amateurs were quick to recognize and take advantage of this good fortune, and to set up a system for handling welfare inquiries that is probably without precedent in its efficiency. Tens of thousands of inquiries were answered—most with good news, many, inevitably, not.

While some sections of the ARRL field organization were equally quick to recognize and respond to the situation, as you will read elsewhere in this issue, by and large it was not prior planning and organization that carried the day. Rather, it was that most American of traits, *ad hoc* individual initiative. Sole reliance on established procedures, designed for a different scenario, would have left thousands of people unnecessarily frustrated in their quest for reassuring news. This sobering fact forces us to reassess some basic assumptions in Amateur Radio disaster communications preparedness. This process has already begun, and will lead, we hope, to our being able to respond faster and with greater organizational flexibility to future challenges.

Our most heartfelt congratulations go to the radio amateurs of Mexico and to their national IARU society, the *Liga Mexicana de Radio Experimentadores*, as well as to countless amateurs in the U.S., Canada and elsewhere, for a job well done. Especially deserving of praise are those of you who monitored in silence, ready to step in if needed but able to restrain the impulse to jump in and add to the confusion. You displayed the discipline that makes the Amateur Service a valued disaster-response partner in the eyes of governments and served agencies throughout the Americas.—David Sumner, K1ZZ

High Falls, VP Engineering,  
Radio Free Europe, Munich, stands  
beside CE 100 kW HF transmitter  
using EIMAC 4CV100,000C tube.



# EIMAC tubes provide long life for Radio Free Europe Service.

Radio Free Europe transmitters in Biblis and Lampertheim, West Germany, use EIMAC 4CV100,000C power tubes in 12 Continental Electronics 100 kW HF transmitters.

The station logbook shows most tubes have over 50,000 hours of service, and many tubes logged over 60,000 hours! And EIMAC tubes are still running strong—that's long life!

These figures are representative of the long life EIMAC tubes log in a variety of high power broadcast applications.

Take advantage of proven reliability, longest warranty in the industry and 50-year expertise. Choose EIMAC, the world's foremost manufacturer of high power broadcast tubes.

Call Varian EIMAC or contact any Electron Device Group sales organization worldwide.

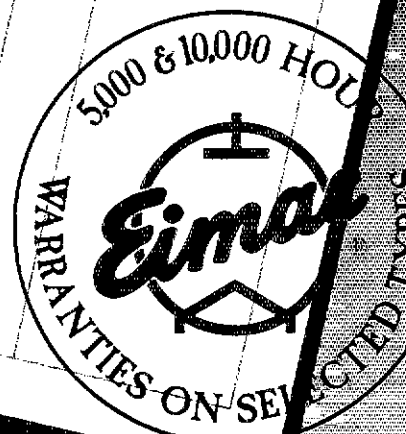
Varian EIMAC  
301 Industrial Way  
San Carlos, CA 94070  
Telephone: 415 • 592-1221

Varian AG  
Steinhauserstrasse  
CH-6300 Zug, Switzerland  
Telephone: 042 • 23 25 75



STATION: Biblis MONTH END: December, 1984

TYPE	IN SERVICE		SPARES		REMARKS
	Serial	Hours	Serial	Hours	
4CV	A6N-413	62660			
100,000C	A6N-415	68877			
	E6G-265	61829			
	E6G-270	59636			
	E6M-5A7	62456			
	D6V-896	59246			
	H6E-283	55892			
	H6T-368	64300			
	H6T-368	59472			
	H6T-890	64066			
	P6Q-624	62554			
	G5D-155	59907			
	H6J-367	39981			
	H6J-371	37805			
	J6A-2	42279			
	D6V-817	59386			
	F3Q-730	41416			
	D6V-815	47349			
	E6G-273	39067			
	J6A-7	57026			
	E6G-266	57865			
	F6R-1297	26683			
	H6C-161	31752			
	J6A-6	39358			







These and other students at the Union County Career Center, near Monroe, North Carolina, have another good reason to go to school: They get to work with Amateur Radio as part of their studies. With his students' help, electronics teacher James Gupton, Jr., KF4PW, converted a supply room at the Center into a ham shack, and developed Novice and General class code and theory classes. To enable the students to monitor actual amateur communications and to have first-hand experience copying code off the air, KF4PW put his Heath HW-101 into service in the shack. He hopes his success at the Center will inspire others across the country to bring Amateur Radio into the classroom. (KF4PW photo)



This year marks the 40th anniversary of the United Nations, and 4U1UN members are helping in the celebration. Among the many activities the UN Staff Recreation Council ARC has been involved in is the collection of contributions from radio amateurs from around the world on behalf of UNICEF. The first check, presented by UN Assistant Secretary-General Robert Muller on behalf of the UNSRC ARC to Nasra Hassan, UNICEF Senior Program Funding Officer, represents contributions totalling \$400 made by the first 100 amateurs who have qualified for the United Nations at 40 Award. The award is given to amateurs who contact two of the three stations operating with the United Nations prefix: 4U1ITU, ITU Headquarters in Geneva; 4U1VIC, Vienna International Centre; and 4U1UN, UN Headquarters, New York. Station equipment was donated by Trio-Kenwood Communications for use by delegates during the 40th General Assembly. Station operators include King Hussein (JY1) of Jordan, Prince Talal (HZ1TA) of Saudi Arabia, King Juan Carlos (EA0JC) of Spain and Prime Minister Rajiv Ghandi (VU2RG) of India.

## FCC Draws Clear Line Between Broadcast and Nonbroadcast Stations

The use of Amateur Radio by broadcast stations for newsgathering has always had its gray areas, particularly during emergencies when Amateur Radio is the primary source of information because normal lines of communications are down. Recently, the FCC moved to clarify the issue by redefining emergency communications, adding a prohibition on broadcasting to the Rules pertaining to repeater operation, and altering the text of the Rule prohibiting business communications (BC Docket 79-47). See this month's Happenings for details.

## Form 610: Remember to Use Current Form

After the first of the year, only the June 1984 and later editions of the FCC Form 610 may be used to obtain an amateur license. According to an FCC announcement on October 17, applying on earlier editions of the Form 610 will cause your application to be returned without action and you will have to refile on a current form. You can get a current FCC Form 610 for an s.a.s.e. to any FCC field office or the ARRL.



Thanks to the efforts of some New Jersey hams and state officials, amateurs in that state can obtain an attractive state QSL card (sample shown). Who qualifies? Any amateur who lives in New Jersey or has ties with the state. The QSL cards are issued in a package of 500 and are designed so that one's call sign or other information can be inserted in the upper right-hand corner. There is a \$3 charge for postage and handling. Allow 2-3 weeks for delivery. Requests, with a check payable to the State of New Jersey, should be sent to The State of New Jersey, Department of Commerce and Economic Development, CN 820, Trenton, NJ 08625-0820.



Congratulations to Clark S. Barrow, KI4UT (left), of Ft. Walton Beach, Florida, on being chosen the winner of the ARRL Scholarship Honoring Senator Barry Goldwater for the 1985-86 academic year. ARRL Southeastern Division Director Frank Butler, W4RH, presented Clark with the \$5000 award at the ARRL Florida State Convention in Melbourne. Clark passed his Extra Class amateur exam at the Melbourne Hamfest and is waiting for his new call. Also see the article on page 64. A number of scholarships and awards are available to promising young hams. Write to Scholarships, c/o ARRL Headquarters, for information.

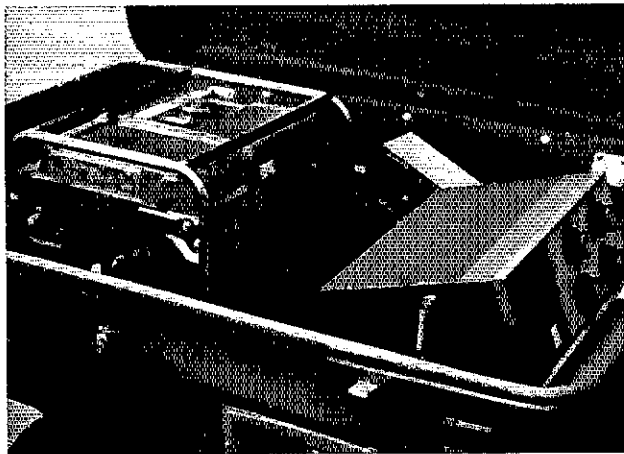
### Mexico Quake Reports

Details are in on amateur involvement in helping Mexico recover from a devastating earthquake. See pages 9 and 54.

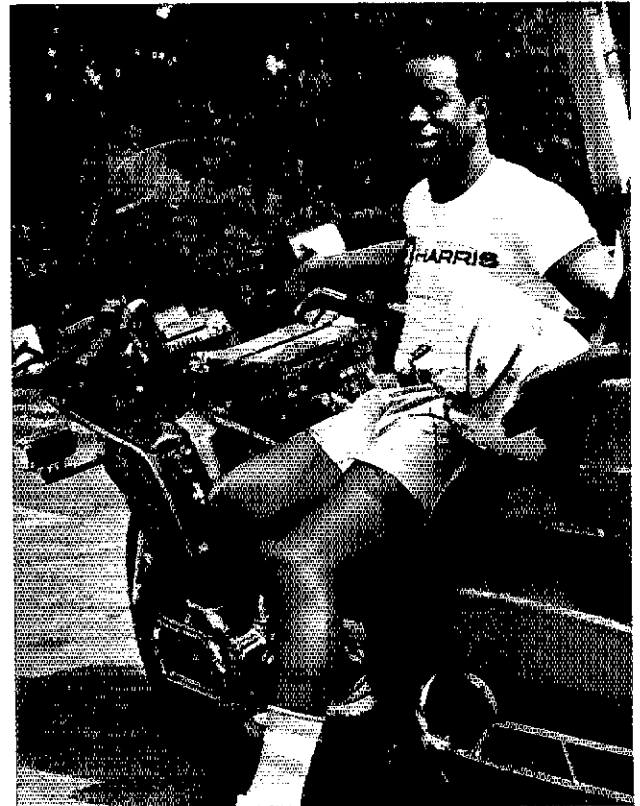
### Happy 150th, Texas!

1986 is the 150th anniversary of the independence of Texas, and the Texas DX Society would like you to share in the celebration by participating in the Great Armadillo Run (see October 1985 QST, page 50). To add to the festivities, Governor Mark White signed a proclamation on October 24 establishing "Armadillo County, Texas" during the

sesquicentennial year. From March 2 through December 31, 1986, any amateur operating from those highways marked "The Texas Independence Trail" may sign "Armadillo County, Texas." For more information on how you can get involved, contact Tom Taormina, K5RC, tel. 713-489-1152.



Bob Kerr, WA3MXO, of Adelphi, Maryland took some time in early September to ride to Newington to show staff members at ARRL Hq. his pride and joy: this 2-kW motorcycle-mobile Honda Gold Wing. An engineer at a local television station, Bob has spent the last couple of years experimenting with modifying his amateur equipment so he could simultaneously enjoy traveling the highways and airwaves. Equipment on the bike includes a TS-430S, mounted just in front of the driver and modified to include a receive preamp and a noise blanker; an IC-2AT, powered off the motorcycle's system and housed in a compartment just under the left handlebar; and two antennas—a half-wave for 2 meters, and an 80-10 meter (sometimes 160) whip. Other features include a PTT button on the left handlebar and a two-battery system. Audio is received through the power amp for the AM/FM radio system and out the speakers (headsets are illegal in many states), with auto muting of the AM/FM radio when the '430S is keyed. On his helmet, Bob uses a piece of coat hanger to attach a lapel-type microphone. The newest addition, the trailer, includes an NCL-2000 2-kW linear amplifier, a gas-powered portable generator capable of 12 hours of operation, a



Heath HM-2140 wattmeter for 1.8-3.0 MHz and blowers to keep the compartment cool. Bob notes that he has experienced no problems with vibration in the caboose. In over 20,000 miles of operating, Bob has proudly added contacts from Montreal to South America and from Maryland to the West Coast to his log. Happy motoring, Bob!

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# League Lines

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FCC announced on October 31 that effective January 1, 1986, the maximum allowable test fee will be \$4.29 for a Volunteer-Examiner-administered Amateur Radio examination. *The ARRL/VEC will charge \$4.25 per candidate* for tests taken in 1986 through Volunteer Examiner Teams working directly with the ARRL/VEC. The ARRL/VEC coordinates test sessions in all 50 states plus many locations overseas. Send an s.a.s.e. to Hq. for an updated printout of the test sessions in your area.

Effective November 8, FCC lifted Rule 97.26(h) requiring a candidate to wait 30 days before being retested on a failed exam element. *The Commission now prohibits a candidate from being retested using exactly the same test that was failed previously.* FCC also directs that the VE Teams have the right *not* to retest anyone at the same session. Under the ARRL/VEC procedure, a candidate who fails may not be retested at the same test session. Once the candidate fails a written element, his or her participation at a session has ended. Subsequent retesting will occur only when the candidate submits a new Form 610 application and an additional test fee.

*We have lost another round in the long battle to keep radiodetermination out of the top half of the 160-meter band.* By FCC Report and Order released October 31, nongovernment radiolocation has been given primary status at 1900-2000 kHz. FCC believes this action in PR Docket 84-874 is a necessary prerequisite to future displacement of radiodetermination now at 1605-1705 kHz, a position ARRL disputes. A future proceeding will address possible expansion of standard broadcasting at 1605-1705 kHz in the Western Hemisphere. (See Happenings, November 1984.) Effective December 9, 1985, amateur stations in the 1900-2000 kHz range must not cause harmful interference to the radiolocation services and are afforded no protection from interference arising from radiolocation operations. Though FCC will not accept applications from 1605-1705 kHz radiodetermination stations for moves to 160 until July 1, 1987, plans are afoot to allow new spread-spectrum radiolocation stations access to 1900-2000 kHz as early as December 9. FCC claims that amateurs will still have "virtually exclusive nongovernment use of 1900-2000 kHz until private radiolocation transmitters become operational." ARRL may file for reconsideration; January Happenings will carry further details.

*The Electronic Communications Privacy Act of 1985 (S.1667 and HR 3378) is pending in Congress.* The bill, introduced in mid-September, would amend Title 18 of the U.S. Code with respect to unlawful interception of wired and wireless electronic communication, authorizing the recovery of civil damages from, and introducing stiff penalties for, computer crimes and destructive "hacking." Amateur Radio and CB transmissions are listed among "unprotected" communications, but the progress and evolution of the Act will bear close watching.

*Announcing the ARRL International Humanitarian Award.* Your Board of Directors has established this important award to recognize the humanitarian contributions of radio amateurs worldwide. You can support this effort by contributing to the endowment fund and competing in the design contest. Details on page 57.

*MARCE in space.* The Marshall Amateur Radio Club Experiment (MARCE) will fly on Space Shuttle Mission STS-61C, scheduled for launch on December 18. The experiment will transmit telemetry in synthesized speech directly on 435.003-MHz FM and via AMSAT-OSCAR 10 relay on 145.972-MHz FM. Though the experiment may be audible mainly in the Southern Hemisphere, amateurs in the southern portion of the US may have a shot at taking part in taping MARCE's telemetry. For more details, contact the Development Office, ARRL Hq.

*The annual DXCC listing does not appear this issue;* the DXCC branch is presently experiencing a processing backlog.

*The DX Century Club Branch has an opening for an Assistant DXCC Manager.* Primary responsibility is checking QSL cards and making proper DXCC record entries. The Assistant Manager is responsible for managing the DXCC Desk in the absence of the Manager. Applicants for this position should have a General class (or higher) Amateur Radio license. A high degree of neatness and accuracy in recordkeeping is essential. Some interest in DXing and DX call signs helpful. Contact Don Search, W3AZD, DXCC Branch Manager, ARRL Hq.

*FCC's New Orleans District Office moved October 18.* The new address is 800 West Commerce, Room 505, New Orleans, LA 70123, tel. 504-589-2095. Public inquiries concerning telecommunications matters, complaints of electronic interference and schedules of commercial radio operator examinations will be handled during the office hours of 8 AM to 4:30 PM.

ARRL has succeeded in gaining *greater protection for 40-meter operators from the transmissions of FCC-licensed broadcasters in the Pacific.* In granting the League's Request for Partial Reconsideration in PR Docket 84-706, the Commission concurred that additional protection at 7100-7300 kHz can and should be afforded the Amateur Radio Service in Region 2, and that this can be done without placing undue burden on FCC-licensed broadcasters in Region 3.

# In Search of the Perfect Picture

Amateur slow-scan television has come a long way in 30 years. Look at what you can do now with a color scan converter and an IBM PC!

By Clayton W. Abrams, K6AEP  
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Slow-scan television (SSTV) is a fast growing and highly exciting Amateur Radio activity. There are many technical challenges to be met in attempting to produce high-quality SSTV images. This article outlines some of the technical milestones in SSTV and describes a commercial scan converter that displays and generates images of higher quality than any amateur unit to date. Because of the complexity of this subject, this article is presented in two parts. Part 1 discusses SSTV and its technical aspects and how digital display systems function as SSTV converters. In Part 2, I talk about the Robot 1200 SSTV converter and how it is interfaced to an IBM® PC. A computer/converter interface and two software packages that support the 1200 are described. Also, a weather-facsimile (WEFAX) application is introduced along with software and hardware packages.

I've titled this article "In Search of the Perfect Picture" because this has been one of my goals since 1971, when I first became involved with SSTV. For the past 14 years, I have been designing and developing equipment for my own use and providing assistance to others who might like to reproduce those projects. In this article, I will describe a system that can be used to generate and display images of a quality that approaches that of standard TV and are very close to the "Perfect Picture." But, let's first talk about the history of SSTV and how SSTV converters work, and then discuss some of the SSTV transmission characteristics.

## Background

SSTV was first introduced to the

Amateur Radio community in 1958 by Cophorne MacDonald (then W4ZII/2, later WA2BCW, now VE1BFL) while he was a student at the University of Kentucky; his work was published in *QST*.<sup>1</sup> MacDonald developed SSTV because of his desire to transmit images over normal voice channels. To make a system that was compatible with all amateur equipment, he had to reduce the normal TV-channel bandwidth from 6 MHz to 3 kHz, a ratio of 2000:1. His first experiments were made on the former 11-meter amateur band, and he proved that it is possible to exchange low-resolution SSTV images over voice channels.

It wasn't until 1968 that FCC permission was granted to allow SSTV transmission on all amateur bands; that was less than 20 years ago. In those days, amateur SSTV equipment was homemade and used vacuum tubes. The typical display was a CRT (cathode-ray tube) with a long-persistence (P7) phosphor salvaged from a WW II radar receiver. The images displayed on these tubes were grim at best. I remember spending long hours in darkened rooms squinting at such a display looking for DX stations on 14,230 kHz! This sure is a far cry from the high-resolution color images that are now heard and seen on that same frequency almost any day or night the band is open.

## SSTV Hardware

Most SSTV converters today use some sort of digital technology. In most respects, little difference exists in the modern SSTV

display system from that used in most personal computers. This was not always the case. Around 1973, a few amateurs designed the first SSTV converters independently and at approximately the same time. These amateurs (Michael Tallent, W6MXV, George Steber, WB9LVI, and Robert Suding, W0LMD) all used the most advanced electronics available at that time. The WB9LVI scan converter was described in *QST*, and for many years was the one "homebrewers" reproduced. Let's explore how these scan converters and their more modern counterparts function, and what good and bad points they have.

## SSTV Converter Memory

Fig. 1 contains a block diagram of a typical SSTV converter. The most critical portion of any scan converter is its memory system. The amount of memory available has a direct correlation to the quality of the displayed picture. Picture quality is usually described in terms of *pixels*. A pixel (the contraction for "picture element") is the smallest part of a picture. Pixels are referenced to a horizontal picture line. The resolution of the vertical axis of a TV picture is expressed as a certain number of lines. To provide a benchmark for SSTV, let's look at standard fast-scan TV using today's standards.

A commercial TV picture is composed of 525 interlaced lines. Normal noninterlaced TV has approximately 245 lines of vertical resolution and about 320 pixels per line. Each TV pixel has about 256 different gray levels. Therefore, if we were to design a digital system that would display a noninterlaced black and white (B & W)

<sup>1</sup>Notes appear on page 17.



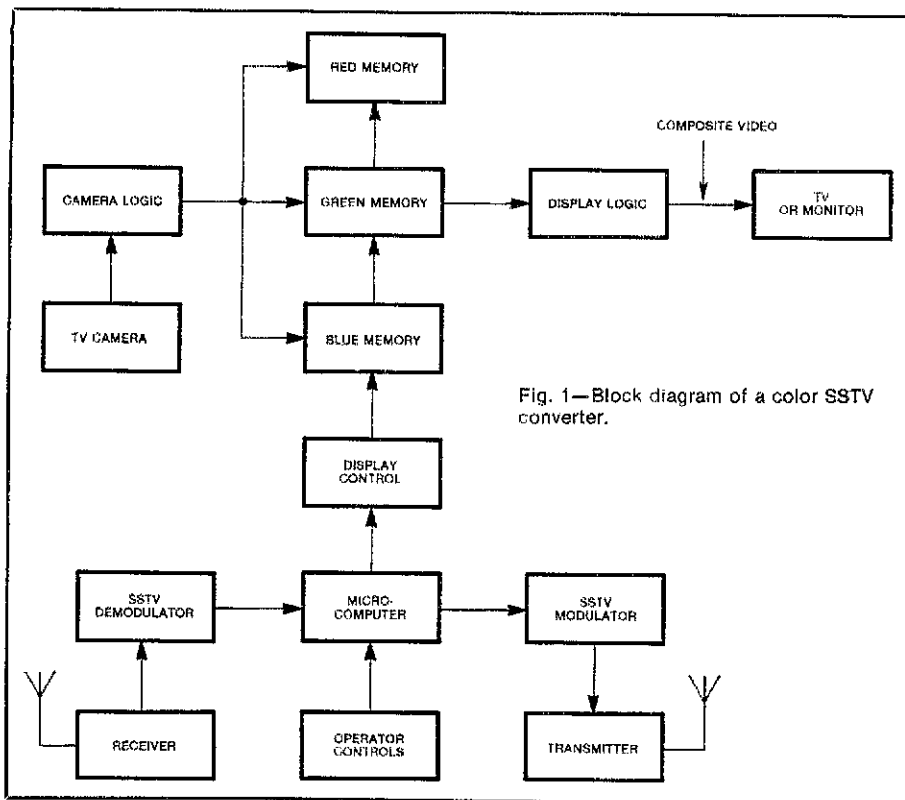


Fig. 1—Block diagram of a color SSTV converter.

picture with the same resolution as fast-scan TV, it must be able to store 78,400 pixels ( $320 \times 245$ ). If each pixel must have 256 gray levels, this means that each pixel requires one byte of memory. As you can see, a system like this would require more memory than is available with most of today's personal computer systems.

To display color, most SSTV converters use the RGB (red, green, blue) system. This means that each memory location is attached functionally to a single gun of the color picture tube. In order to display a standard NTSC (National Television System Committee) picture, 235,200 bytes of memory are required. (Things get com-

plex in a hurry!) But this isn't as big a number as it was a few years ago. Computer technology progresses rapidly, and 256-kbyte memory ICs are now commonplace. To design an amateur scan converter with the resolution of fast-scan TV is not practical at this time, however, because hardware costs are still too high. Therefore, any affordable amateur scan converter will have to settle for less resolution.

#### SSTV Detection Circuitry

The demodulator block of Fig. 1 processes the received analog audio signal and converts it into digital information. In

modern SSTV converters, two detection methods are common: analog and direct. Both methods have specific advantages.

#### The Analog Method

The analog SSTV detection method is the most effective. In this system, an analog SSTV signal from the receiver is converted into a dc voltage. Since SSTV is basically audio tones, it is easy to rectify the audio signal with a diode detector and produce an analog dc voltage proportional to the input frequency. This voltage is fed to an ADC (analog-to-digital converter). The ADC accepts the analog input voltage and converts it to a digital signal. Some analog filter stages are placed in front of the diode detector to remove noise.

#### The Direct Method

The direct digital detection method converts the SSTV audio signal directly to a digital form. The incoming audio signal is clipped and fed to a digital counter that determines the time between the zero crossings of the SSTV signal. A band-pass filter ahead of the detector removes noise.

#### SSTV Modulator

To generate SSTV, all that is required is to produce a sine wave and vary its frequency based on the pixel information. The SSTV modulator is that portion of an SSTV scan converter that generates the audio signal. As with detection, an SSTV signal can be generated by analog or digital means. Both techniques are equally easy to effect in hardware. The analog method uses an ADC to feed a dc voltage to a VFO that generates the SSTV audio tones. With the digital method, a series of square-wave pulses is produced using a timer IC. Software is used to load a register within the IC to control the frequency of the square-wave pulses. These pulses are fed through a low-pass filter to produce a sine wave; this sine wave becomes the modulating signal.



The SSTV picture on the left, like the title photo, was received on 20 meters. To the right, a picture received on 2 meters. (photos courtesy of K6AEP)

The analog method of SSTV generation has one disadvantage: It may drift with temperature, thus requiring periodic adjustment. With the digital method, tone frequencies are controlled by the computer clock and remain stable.

### Control Circuits

This section of the converter provides the operator interface, and controls the rate at which SSTV is received or transmitted and many other internal functions. Early scan converters used *hardware* (crystal-controlled oscillators and TTL circuits) to control the rate at which pixels were inserted or removed from display memory. The hardware approach did not allow early SSTV units to be converted easily to new SSTV formats. Amateurs made a few attempts to alter the older units to include newer formats, but the mechanical controls required for these updates made the units resemble the control panel of a 747 aircraft and were almost as complex to operate! It became obvious that it was necessary to provide some sort of microprocessor control.

With a microprocessor, it is possible to use *software* to control how SSTV is received or transmitted. By modifying the software, you can change the SSTV reception and transmission rates relatively easily. Modern SSTV equipment includes some intelligence in the scan converter to allow for picture processing, character generation and picture overlays. Providing for external control of the converter by a computer permits even more flexibility. A few SSTV systems have been designed to use popular personal computers. One system I designed uses the Radio Shack Color Computer.<sup>2</sup>

### SSTV Transmission Characteristics

The primary method of SSTV transmission is FM. All pictures are transferred over the air using audio tones that are encoded to carry picture information. These tones represent certain parameters that are described in TV jargon. To generate horizontal or vertical sync pulses in SSTV, a 1200-Hz audio tone is used. Tones in the range of 1500 to 2300 Hz add video information. Horizontal sync pulses are generated by allowing the 1200-Hz tone to be on for 5 ms, and the vertical-sync tone for 50 ms. The time between the horizontal sync tones is the horizontal scan rate of the picture and will vary from 66 ms to 498 ms, depending on the mode and resolution desired.

### Color SSTV

An NTSC color-TV image is produced using three colors: red, green, and blue (RGB). To display a red pixel, the red CRT gun is supplied with a high level and the green and blue guns have low levels. Producing a color picture with SSTV is usually done in one of two ways. With the first method, three separate frames—red,



Another picture gathered by K6AEP. This one was captured during Spacelab 2's 69th orbit in August 1985.

green and blue—are transmitted. The end of transmission of each frame is signified by the presence of a vertical sync pulse. At the receiving end, the three frames are combined to produce a composite color picture. This is called *frame sequential* transmission.

The second method transmits the information as a single-frame, *multiplexed* RGB signal. There are several different forms of multiplexed transmission, too. In its simplest form, a picture is transmitted on a line-by-line basis with RGB components in each line, every line followed by a horizontal sync pulse. Using this method, the color picture is displayed at the receiving end on a real-time basis—you don't have to wait for three separate frames to be received before the total picture can be viewed.

One other transmission method was recently introduced by Robot Research. This technique also employs a multiplexing method. The chrominance and luminance are combined to create a composite signal; this is similar to NTSC transmission.

### Picture Resolution and Frame Rates

Several different frame rates are currently in use on the amateur frequencies. This is because it is necessary to slow down the SSTV horizontal frequency when attempting to improve the picture quality or *resolution* in order to stay within the signal bandwidth restrictions. If a picture has 128 pixels per line, a horizontal line rate of 66 ms is satisfactory. As greater picture resolution is sought, the horizontal line rate must be decreased to 132 ms or less.

To compound matters, the vertical

resolution has improved from 120 lines with older equipment to 240-256 lines today. This increases the time required to transmit and receive pictures. Currently, about 13 different rates can be heard in use on the amateur bands. The number of rates is on the increase and tends to produce small pockets of special-interest groups on certain frequencies exchanging pictures at their own special rates. This is probably the most negative aspect of modern SSTV, as no one system in use today can copy and transmit all those rates. Some amateurs have two or three SSTV systems to make their stations as compatible as possible. In the future, the system with the most units in the field will establish SSTV color standards. (In my opinion, the system that I will present later will become the "king of the mountain.") The current frame rates in use on black and white are 8, 17, 24, 34 and 36 seconds; RGB color frame rates are: 8, 17 and 34 seconds; multiplexed transmissions or composite color SSTV rates are: 12, 24, 34, 36 and 72 seconds. Whenever an SSTV transmission is made, the person originating the transmission will usually state the transmission rate and type by voice before picture transmission is begun.

### SSTV Operation

SSTV operation on today's HF bands represents a challenge that taxes the patience of even the most dyed-in-the-wool SSTVers. In addition to fading (QSB) and interference (QRM), there's the present low sunspot cycle. But, if you are patient, superior pictures can be copied despite these inconveniences. The accompanying photographs show samples of off-the-air

**Table 1**  
**SSTV Operating Frequencies**

Band (Meters)	Frequency (kHz)
80	3,845
40	7,171
20	14,230
15	21,340
10	28,680

pictures I've received at K6AEP.

Over the years, a gentleman's agreement has been reached (except for contest weekends) on SSTV operating frequencies. These frequencies are listed in Table 1. The most congested band at all times is 20 meters. As a result of this congestion, some secondary frequencies have been established. Most color SSTV transmissions are done on 14,230 kHz. Black-and-white transmissions and computer experimentation can be found on 14,233 kHz. Some experimental FAX transmissions are done on 14,240 kHz, and the spillover of all these transmissions is on 14,180 kHz. If you are interested in learning more about SSTV, listen on these frequencies. Break in and ask questions. It sure is a lot of fun seeing the person to whom you are talking! Experimentation is a way of life on SSTV. Rarely does a day go by when you will not copy someone trying some new trick with pictures, hardware and/or computers. Few other Amateur Radio operational modes encourage such experimentation.

#### What To Look for in an SSTV Converter

Most amateurs do not have the time or desire to construct their own equipment and must rely on what is commercially available. If you take this approach to get on SSTV, some factors should be considered when looking at a commercial scan converter.

Let's assume you are considering a piece of SSTV equipment that is computer based, and you want the unit to be useful for the next few years. Software changes in the scan-converter microcode will be required to keep up with all the as-yet-undefined future SSTV modes. Can you make the software changes yourself, or must you depend on the equipment manufacturer to do this? If the manufacturer has a good track record, you can expect future product modifications to make the equipment perform better. In Part 2 of this article, I discuss a system that has all these attributes. A computer interface that expands the capability and enhances the performance of this system is presented. One such enhancement will allow the system to be used to receive WEFAX signals.

#### Notes

<sup>1</sup>C. MacDonald, "A Narrow-Band Image Transmission System," *QST*, Aug./Sept. 1958.

<sup>2</sup>C. W. Abrams and R. A. Taggart, "Color Computer SSTV," 73, Nov./Dec. 1984.

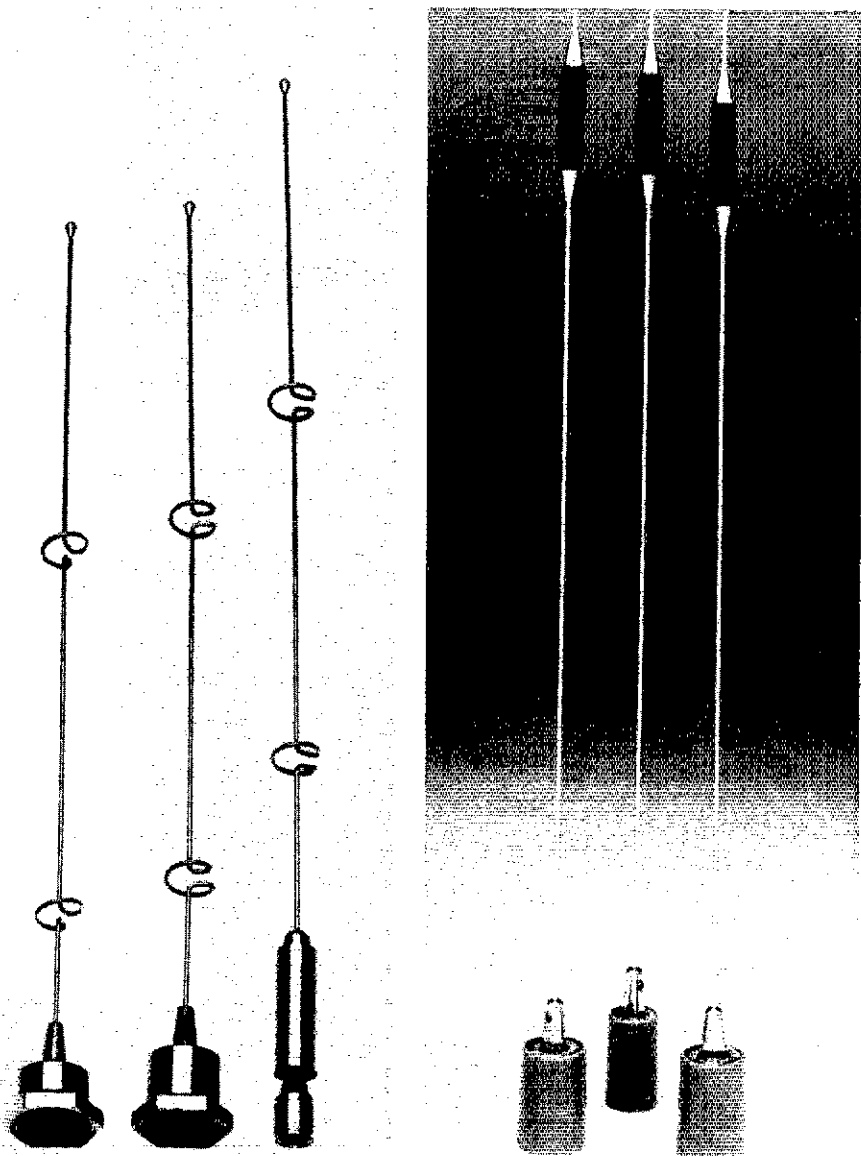
## New Products

### NEW ANTENNAS FROM LARSEN

□ Larsen Electronics has announced a series of dual-band (144-148 MHz and 440-450 MHz) antennas for dual-band radios. The new design incorporates a half-wave element for 2 meters and collinear elements for the 70-cm band, and conveniently serves both bands with high performance. The self-resonant design doesn't require a ground plane, according to the manufacturer, and allows most applications for boats and base stations with

standard Larsen BSA-K hardware.

Larsen has also announced three mobile models in a new 1290 antenna series. According to the manufacturer, the antennas are designed with high-gain characteristics and highly efficient phasing configurations that operate with or without ground planes in the 1.2-GHz amateur band. For more information, contact Larsen Electronics, P.O. Box 1799, Vancouver, WA 98668, tel. 206-573-2722.  
—Bruce O. Williams, WA6IVC



# Computer-Aided Two-Band Vertical Antenna Design

This program will help you design a loaded two-band vertical antenna to operate the 75- and 40-meter bands. It also supplies you with an option of adding 160-meter operation.

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Cedar Rapids, IA 52402

The antenna described here is simplicity itself, a sort of overgrown top-loaded mobile whip. Don't let its simple design fool you, however, as it is an excellent performer. The design calls for two different bands of operation, which we will name F1, for the lower of the two bands, and F2, for the higher frequency band. On F2 the loading coil acts as an RF choke, decoupling the top whip from the lower section, permitting two-band operation. It is also possible to add a band lower than F1 by manually switching in a base-loading coil. My antenna, shown in Figs. 1 through 3, uses this scheme and operates on the 160, 75 and 40-meter bands. Bandwidth is a function of Q, which in part is determined by the length and diameter of the radiator. For my antenna, bandwidth within the 2:1 SWR range is 1805-1855, 3795-3920 and 7000-7260 kHz. The performance of the antenna over the last three years is excellent on both 75 and 40 meters, with fair performance on 160. This is really a two-band antenna and use on a sub-F1 band is offered as a "make-do" option.

I've written this article to answer the many inquiries I have had about my antenna and to give the experimenter a basis for short, grounded vertical antenna design. The antenna itself is no technical breakthrough, having been with us almost since the beginning of radio. What makes it work or not is a matter of efficiency. A short vertical radiator exhibits very low radiation resistance. The RF power fed to an antenna divides itself between two imaginary resistors representing the antenna circuit. One resistor is termed radiation resistance, or the good resistor. It

represents the resistance that dissipates power equivalent to our radiated signal. The other resistor, the bad one, represents power loss or IR loss. Power losses in the circuit occur because of conductor resistance, mainly in the structure of the antenna itself and its ground connections. Ground connections in the form of radials form the return path of the circuit.

Therefore, low resistance is important in maintaining high efficiency.

We can easily see the relationship of antenna conductor resistance to efficiency, but not so obvious is the subject of ground resistance. I do not want to start an endless discussion on ground radials. There are many hams and professionals alike who view this subject as almost sacred. I'll just point out a few things and let you pass judgment.

Most of the research on radial grounds has been done in the area of AM broadcasting. Here the very low frequencies used (by our standards) penetrate several inches into the soil. Ground conductivity at AM broadcast frequencies is better than can be expected over the same ground at HF. AM broadcasters need to cover a relatively small area around the antenna site with as strong a signal as possible and they need to have this type of coverage each day with varying propagation conditions or local weather changes. The broadcast signal then is generated to reliably cover a radius that is small in terms of the wavelength employed.

Amateur Radio stations specialize in long-range communications. Here the primary requirement is for a strong signal at a great distance. Therefore, we want as low a radiation angle as possible. A reliable, repeatable communications path is secondary. The radio amateur is not normally so lucky as to be able to site an antenna in an ideal location. He or she has little control over the reflective and absorptive characteristics of the antenna's immediate environment. For example, attenuation through a brick wall is almost negligible at frequencies up to 2 MHz, but at 30 MHz the same wall attenuates the

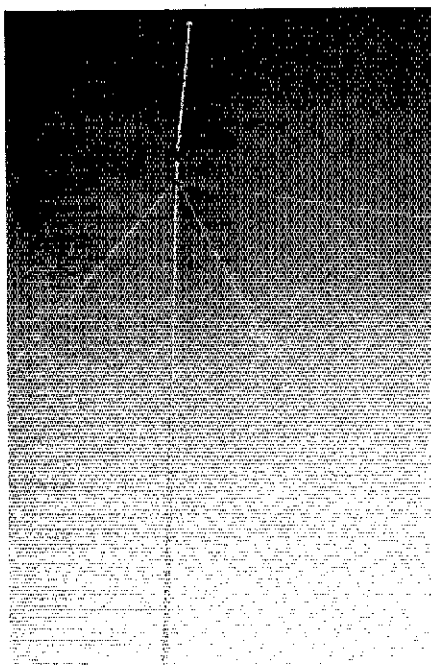


Fig. 1—The author's three-band vertical antenna design. Operation is excellent on 75 and 40 meters, with fair performance on 160.



signal by 2 to 5 dB depending on whether the wall is dry or wet. As the signal frequency increases, its ground penetration is less, and the ground conductivity losses increase. In short, the prescribed 120-radial ground with each radial at least  $\frac{1}{4}$  wave long is inconsistent with the preceding observations when dealing with signals in the amateur bands and environment.

To be truly effective, a ground system at HF should reach beyond the Fresnel zone.<sup>1</sup> We are talking in terms of the visual horizon and that is a big ground system. The antenna must also be sited in unobstructed terrain to reduce unwanted signal loss because of absorption. A ground screen under the base of the vertical located just under the surface of the ground will be as effective in most cases as the 120 radials discussed earlier. In those cases where this proves insufficient, take heart; nobody else in your area, no matter what they claim, will do much better. Poor soil conductivity as far out as the horizon is our worst enemy. I doubt many of us can afford that big an antenna farm.

At this point you may be asking what is so good about a vertical antenna? Well, in spite of the inefficiencies already referred to, the vertical is unsurpassed for long-haul communications. Compared to the low dipole most of us can erect in our urban backyards, the vertical will deliver more signal to a DX location. While it is true that the dipole has higher gain than a vertical referenced to an isotropic radiator, the higher radiation angle nullifies the dipole's advantage over a DX path. On the other hand, performance of the vertical at medium distances will be poorer than the dipole. So, for DX on the lower bands, a vertical will do a better job than a dipole erected at less than  $\frac{1}{2}$  wavelength in height.

The BASIC program presented here will help you design a loaded two-band vertical antenna. It will also provide matching network information to permit matching the antenna to 50-ohm coaxial cable. If the ground side of the circuit is laid out as suggested, you will have an effective antenna. A word of caution: If after erecting your vertical you find that the bandwidth is greater than 2 to 3 percent, be highly suspicious of your ground. A poorly conducting ground lowers the Q of the antenna and makes it broadband and inefficient at the same time. It is the same principle as in a tuned circuit. To increase the bandwidth of a tuned circuit, increase its series resistance.

### The Antenna

Before reviewing the program, I would first like to share the design of my vertical antenna, which is set up for three-band operation. Fig. 1 shows the antenna guyed by a single set of 3/16-inch-diameter nylon

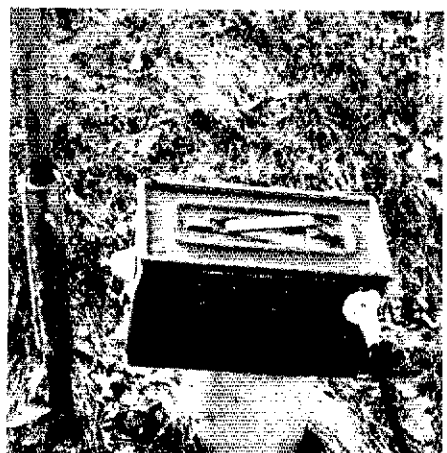


Fig. 2—The vertical antenna base showing insulator, TV mast section and coupler.

lines at the 33-foot level. A loading coil 1 foot long with an 8-inch-long coil wound on the outside of a 2-inch phenolic pipe can be seen at the top. Do not use PVC pipe here. It has very poor performance at RF and will cause the antenna to fail. Above the coil is a 3/8-inch-diameter whip made of a 10-foot-long aluminum rod, capped by a whimsically placed practice golf ball; the ball serves no practical purpose. Make sure the end of the whip is smooth and rounded to prevent corona discharge.

Fig. 2 shows the base of the vertical antenna. The insulator is made of the same phenolic tubing used for the loading coil. The TV mast section is shimmed to fit the larger ID of the phenolic tube by wrapping it with fiberglass cloth impregnated in resin. The coupler at the base is made of a 0.50-caliber ammunition box sitting on a drain tile for support. The bottom of the antenna is supported by a 1 1/4-inch water pipe driven into the ground.

The inside of the coupler box shows the 160-meter loading coil and matching

capacitors (Fig. 3). There is nothing magical about the component selection. The parts were retrieved from my junk box, and the coupler was made from parts on hand. For example, I did not have a variable capacitor rated at about 1000 pF at 15 kV, so I used an old trick—placing an inductor in series with C3 and C4 (Fig. 4). The capacitors are surplus TV high-voltage filters rated at 500 pF and 20 kV. C3 and C4 are placed in parallel to obtain the required 1000 pF. L1 adds “negative capacitance,” otherwise known as inductance, to trim the value of C3 plus C4 to the desired value. This value is found through experimentation to reduce the SWR to 1:1 at the center of the desired frequency range. Good engineering practice demands that each component do at least two jobs (Plasencia's rule). L1 is also the 160-meter loading coil.

The matching network and antenna loading coil (the one on the antenna) work together to operate on the entire 40-meter band and preselected portions of the 80- and 75-meter band without changing taps at the matching network. The taps are made using alligator clips and are variable only for use on 160 meters. By changing the taps for 160-meter operation, the antenna now becomes a monoband antenna working only on the selected frequency range.

Barely visible in Fig. 3 are two no. 12 bare wires making connection to the ground screen. The screen is approximately 10 feet in diameter. Fig. 4 is the schematic diagram for the coupler box.

### The Program

The listing in Table 1 is written for the Apple II+, but can easily be modified for the Commodore 64 and TRS-80.<sup>2</sup> To convert this program to run on computers other than the Apple, several Apple-BASIC statements must be changed. Fortunately,

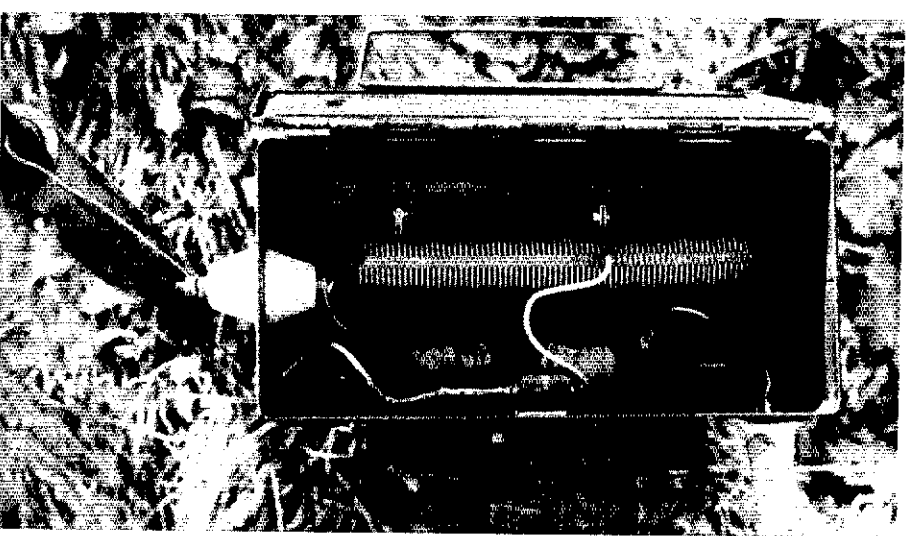


Fig. 3—An inside view of the coupler box. The 160-meter loading coil and matching capacitors are shown inside the converted 0.50-caliber ammunition box.

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

Table 1

```

1# REM VER. 3.1
2# CLEAR
3# HOME
4# PRINT "*****"
5# PRINT "*"
6# PRINT "*"
7# PRINT "DESIGN PROGRAM FOR"
8# PRINT "TWO BAND LOADED VERTICAL"
9# PRINT "ANTENNA"
10# PRINT "*"
11# PRINT "W#RPV JAN.1985"
12# PRINT "*****"
13# REM THIS PROGRAM PROVIDES A DESIGN APPROXIMATION
    FOR THE RADIO AMATEUR AND IS NOT INTENDED AS A SCIENTIFIC
    OR RESEARCH TOOL.
14# PRINT : PRINT
15# INPUT "LOW FREQ. F1 MHZ. = ";F1
16# INPUT "HIGH FREQ. F2 MHZ. = ";F2
17# INPUT "MAX.HEIGHT IN FEET= ";H
18# INPUT "IS F2 SECTION WIRE 'Y/N' ";Q1$
19# IF Q1$ = "Y" THEN K = 1:L2 = 246 / F2: GOTO 21#
20# IF Q1$ = "N" THEN L = 492 / F2: GOSUB 62#
21# L2 = 246 * K / F2: REM LENGTH OF L2
22# D1 = D
23# REM LENGTH OF L1
24# L1 = H - L2
25# IF L2 + (L2 * .15) > = H THEN 27#
26# GOTO 30#
27# HH = L2 + (L2 * .15)
28# HH = INT (HH * 100 + .5) / 100
29# INVERSE : PRINT "INCREASE HEIGHT TO "HH" FEET MINIMUM.":
    NORMAL : GOTO 17#
30# INPUT "IS F1 SECTION WIRE 'Y/N' ";Q$
31# IF Q$ = "N" THEN PRINT "ENTER ANT.ELEMENT DIA.IN
    INCHES.": GOTO 33#
32# IF Q$ = "Y" THEN 85#
33# INPUT "DIAMETER ";D
34# CA = 17 * L1 / (( LOG (24 * L1 / D)) - 1) *
    (1 - (F2 * L1 / 234) ^ 2)
35# L2 = INT (L2 * 10 + .5) / 10
36# L1 = INT (L1 * 10 + .5) / 10
37# CT = CA * 10 ^ - 6
38# XC = 1 / (6.28 * F1 * CT)
39# UH = XC / (6.28 * F1)
40# UH = INT (UH * 100 + .5) / 100
41# IF UH < = 0 THEN 43#
42# GOTO 45#
43# HOME : VTAB (8) : HTAB (12) : INVERSE : PRINT "ANTENNA TOO
    LONG. ": VTAB (12) : HTAB (3) : PRINT "PROGRAM IS FOR ANT.< L/4
    WAVE ON F1"
44# FOR T = 1 TO 5000 : NEXT T : NORMAL : GOTO 1#
45# GOTO 53#
46# INPUT "TURNS/INCH = ";WW
47# INPUT "ENTER DIA. OF LOAD COIL ";DL
48# A = DL / 2
49# B = 5
50# GOSUB 192#
51# GOTO 92#
52# END
53# REM WIRE TABLE
54# PRINT
55# PRINT "SELECT WIRE FOR LOADING COIL"
56# PRINT
57# PRINT TAB ( 5) "GAUGE #": TAB ( 15) "ENAMEL": TAB ( 25)
    "INSULATED": PRINT TAB ( 1) "8": TAB ( 15) "7.6": TAB ( 25)
    "7.1": PRINT TAB ( 1) "10": TAB ( 15) "9.6": TAB ( 25)
    "9.9": PRINT TAB ( 1) "12": TAB ( 15) "12": TAB ( 25)
    "10.9"
58# PRINT TAB ( 1) "14": TAB ( 15) "15": TAB ( 25) "13.8":
    PRINT TAB ( 1) "16": TAB ( 15) "18.9": TAB ( 25) "16.4":
    PRINT TAB ( 1) "18": TAB ( 15) "23.6": TAB ( 25) "19.8":
    PRINT TAB ( 1) "20": TAB ( 15) "29.4": TAB ( 25) "23.0"
59# PRINT
60# GOTO 46#
61# RETURN
62# PRINT "ENTER ANT.ELEMENT DIA.IN INCHES.": REM K FACTOR
    FOR NON-WIRE.
63# INPUT "DIAMETER ";D
64# LL = L * 12
65# R = LL / 0
66# IF R < 5 THEN K = .90
67# IF K = .90 THEN 83#
68# IF R < 8 THEN K = .91
69# IF K = .91 THEN 83#
70# IF R < 13 THEN K = .92
71# IF K = .92 THEN 83#
72# IF R < 17 THEN K = .93
73# IF K = .93 THEN 83#
74# IF R < 25 THEN K = .94
75# IF K = .94 THEN 83#
76# IF R < 50 THEN K = .95
77# IF K = .95 THEN 83#
78# IF R < 250 THEN K = .96
79# IF K = .96 THEN 83#
80# IF R < 5000 THEN K = .97
81# IF K = .97 THEN 83#
82# IF R = > 5000 THEN K = .98
83# K1 = K + .04
84# RETURN
85# REM WIRE DIA. TABLE
86# PRINT
87# PRINT "ENTER WIRE DIA.FROM TABLE."
88# PRINT "GAUGE #": TAB ( 1) "DIAMETER": PRINT " " "8":
    TAB ( 1) "1.285": PRINT " " "10": TAB ( 1)
    "1.619": PRINT " " "12": TAB ( 1) "1.988":
    PRINT " " "14": TAB ( 1) "2.441": PRINT " " "16":
    TAB ( 1) "2.958"
89# PRINT " " "18": TAB ( 1) "3.543":
    PRINT " " "20": TAB ( 1) "4.232"
90# PRINT
91# GOTO 33#
92# REM CALCULATE MATCH TO 50 OHMS.
93# PI = 3.1415926
94# REM F2 MATCH

```

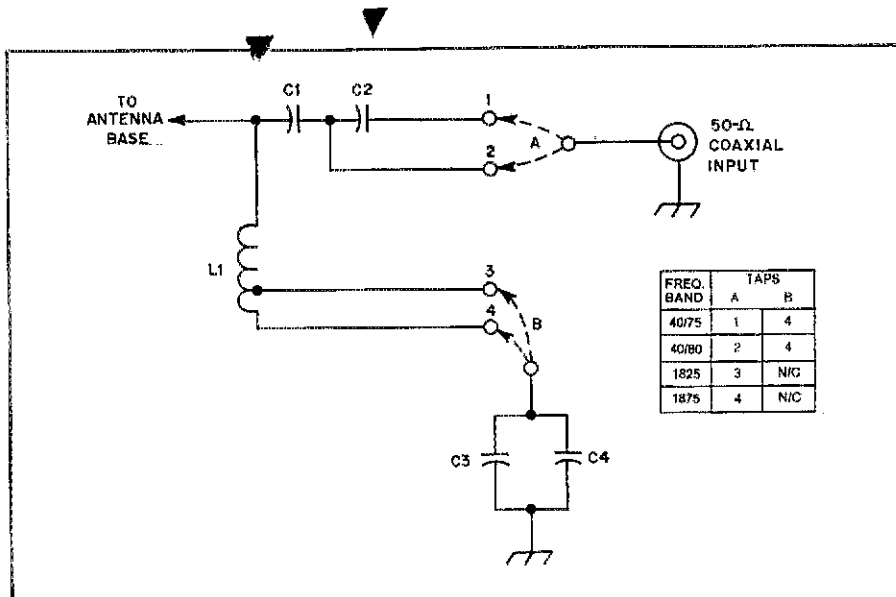


Fig. 4—The schematic diagram of the 160-meter coupler box shown in Fig. 3. Frequency coverage on the 40- and 75-meter bands is as follows: 7.00-7.30 MHz and 3.80-3.92 MHz, respectively. Operation on the 40- and 80-meter bands is as follows: 7.00-7.30 MHz and 3.55-3.70 MHz, respectively. The 160-meter frequency is ±30 kHz. Limits are specified at a 2.2:1 SWR at the transmitter input.

- C1, C2—430-pF, 20-kV capacitor
- C3, C4—500-pF, 20-kV capacitor
- L1—2½-inch diam., 10 turns per inch, 45 turns total and tapped at 38 turns. (Radiokit, Box 411, Greenville, NH 03048, tel. 603-878-1033; B & W no. 3031, \$7.35.)
- Jumpers A & B—flex braid or alligator clips.

VTAB moves the cursor to a certain row; HTAB and TAB move the cursor to a certain column; PR#1 turns on the printer, and PR#0 turns the printer off.

Lines 150-180 ask for the design center frequency and the design maximum height you wish to use. Also questioned is if the top section will be made of wire. Here the program calculates if the lower portion of the antenna will be resonant on F2 and takes into account the k factor of the con-

these statements are only for output formatting and control. Key words to watch for: CLEAR clears the video screen; HOME sends the cursor to the upper-left

corner of the screen; INVERSE turns on the Apple's dark-on-light character set; NORMAL returns to the normal character set; FLASH turns on flashing characters;

```

95# Y2 = 984 / F2
96# Q2 = 36# * (L2 / Y2)
97# G2 = O2 * (PI / 18#); G4 = COS (G2)
98# R2 = (6# - (G4 * 19#)) * (O2 / 36#) ^ 2; REM RAD.RES.
OF VERT. ANT.
99# R2 = INT (R2 * 1# + .5) / 1#
100# Z2 = (R2 * 5#) / SQR (R2 * (5# - R2))
101# Q2 = SQR (R2 * (5# - R2)) / (6.28 * F2); REM L
MATCH F2
102# Q2 = INT (Q2 * 1# + .5) / 1#
103# Q4 = Z2 / (6.28 * F2)
104# Q4 = INT (Q4 * 1# + .5) / 1#
105# C2 = 1 / (6.28 * F2 * Z2); REM C MATCH
106# C2# = STR$ (C2)
107# M2 = VAL ( RIGHT$ (C2#,2))
108# C2 = VAL ( LEFT$ (C2#,4)) * 1# ^ (6 - M2)
109# REM F1 MATCH
110# Y1 = 984 / F1
111# O1 = 36# * (H / Y1)
112# G1 = O1 * (PI / 18#); G3 = COS (G1)
113# R1 = (6# - (G3 * 19#)) * (O1 / 36#) ^ 2;
REM RAD.RES. OF VERT. ANT.
114# R1 = INT (R1 * 1# + .5) / 1#
115# Z1 = (R1 * 5#) / SQR (R1 * (5# - R1))
116# Q1 = SQR (R1 * (5# - R1)) / (6.28 * F1); REM L MATCH F1
117# Q1 = INT (Q1 * 1# + .5) / 1#
118# Q3 = Z1 / (6.28 * F1)
119# Q3 = INT (Q3 * 1# + .5) / 1#
120# C1 = 1 / (6.28 * F1 * Z1); REM C MATCH F1
121# C1# = STR$ (C1)
122# M4 = VAL ( RIGHT$ (C1#,2))
123# C4 = VAL ( LEFT$ (C1#,4)) * 1# ^ (6 - M4)
124# PRINT "SELECT TYPE OF SHUNT MATCH; "F1" MHZ."
125# INPUT "CAPACITOR OR INDUCTOR (C OR L) :";A$
126# IF A$ = "C" THEN 130#
127# IF A$ = "L" THEN 133#
128# IF A$ < "C" THEN 125#
129# IF A$ > "L" THEN 125#
130# UH = UH + Q1
131# GOSUB 192#
132# GOTO 138#
133# UH = UH - Q1
134# GOSUB 192#
135# GOTO 138#
136# PRINT
137# INPUT "PRESS RETURN TO CONTINUE.";C$
138# HOME
139# PRINT "INPUT CHOICE BELOW : "
140# PRINT "REFIGURE ANTENNA = 1": PRINT "PRINT TO
SCREEN = 2": PRINT "PRINT HARD COPY = 3": PRINT "EXIT
THE PROGRAM = 4"
141# INPUT " # ";A
142# ON A = 4 GOTO 146#
143# ON A = 3 GOTO 147#
144# ON A = 2 GOTO 148#
145# ON A = 1 GOTO 149#
146# HOME : GOTO 190#
147# HOME : GOTO 150#
148# HOME : GOTO 156#

```

```

149# HOME : GOTO 1#
150# WTAB (1); WTAB (15); FLASH : PRINT "** PRINTING **"
151# PRINT CHR$(4); "PR# 1"
152# PRINT " *** DESIGN FOR A TWO BAND VERTICAL
ANTENNA. ****"
153# PRINT
154# PRINT "VERSION 3.1"
155# PRINT
156# PRINT "DESIGN LOW FREQUENCY ";F1;" MHZ."
157# PRINT "DESIGN HIGH FREQUENCY ";F2;" MHZ."
158# PRINT "DESIGN OVERALL HEIGHT ";H;" FEET"
159# PRINT "LOW FREQ. SECT.HEIGHT ";L2;" FEET"
160# IF Q1$ = "Y" THEN PRINT "LOW FREQ. SECTION IS
ANTENNA WIRE."
161# IF Q1$ = "N" THEN PRINT "LOW FREQ.SECTION DIAMETER
";D1;" INCHES"
162# PRINT "HIGH FREQ.SECTION HEIGHT ";L1;" FEET"
163# PRINT " *** INCLUDES COIL LENGTH ***"
164# IF Q$ = "Y" THEN PRINT "HIGH FREQ.SECTION IS ANTENNA
WIRE."
165# IF Q$ = "N" THEN PRINT "HIGH FREQ.SECTION DIAMETER
";D;" INCHES"
166# PRINT "YOU SELECTED "AS"-MATCHING; "F1" MHZ."
167# PRINT "COMPONENTS ARE REFIGURED ACCORDINGLY."
168# PRINT "LOAD COIL INDUCTANCE ";UH;" UH"
169# PRINT "LOAD COIL DIAMETER ";DL;" INCHES"
170# PRINT "TURNS PER INCH ";NW
171# PRINT "NUMBER OF TURNS ";N
172# PRINT "LENGTH OF COIL ";B
173# PRINT "RADIATION RESISTANCE "F1" MHZ.="R1;" OHMS"
174# PRINT "RADIATION RESISTANCE "F2" MHZ.="R2;" OHMS"
175# PRINT "TO MATCH 50 OHMS; SHUNT FEED WITH -"
176# IF A$ = "C" THEN 178#
177# IF A$ = "L" THEN 180#
178# PRINT "MATCHING CAPACITOR "F1" MHZ.="C4;" UF"
179# GOTO 181#
180# PRINT "MATCHING INDUCTOR "F1" MHZ.="Q3;" OH"
181# PRINT "MATCHING CAPACITOR "F2" MHZ.="C2;" UF"
182# PRINT " * OR *"
183# PRINT "MATCHING INDUCTOR "F2" MHZ.="Q4;" UH"
184# NORMAL
185# ON A = 3 GOTO 187#
186# ON A = 2 GOTO 136#
187# PRINT CHR$(4); "PR# #"; HOME : GOTO 139#
188# PRINT : PRINT : PRINT
189# PRINT "W0RPV"
190# PRINT CHR$(4); "PR# #"
191# END
192# X = 1
193# FOR I = 1 TO 12
194# N = SQR (UH * (9 * A + 1# * B)) / A
195# N = INT (N * 1# + .5) / 1#
196# B = INT (B * 1# + .5) / 1#
197# B = N / NW
198# B = INT (B * 1# + .5) / 1#
199# X = X + 1
200# NEXT I
201# RETURN

```

ductors. The k factor for wire is fixed in this case since any wire likely to be used will have almost the same factor. The total height of the antenna in line 250 should be at least 15% longer than required for resonance on F2. The reason for this is that a top whip shorter than 12% costs dearly in terms of reduced radiation efficiency at F1.

Lines 340-400 calculate the capacity of the top whip and figure the required inductance for resonance on F1. The length and number of turns to make the required loading coil are calculated in lines 480-500.

Lines 920-1350 calculate the matching components for a shunt match to 50 ohms. The math is a bit unorthodox here, but it is in the interest of simplification in a rather narrow application.

The formula most generally accepted to obtain the radiation resistance of a grounded vertical is exemplified in *The Radio Engineer's Handbook*, by F. E. Terman.<sup>3</sup> This publication features as much information on grounded verticals as anyone could ever use. The problem is that the formulas apply either to antennas shorter than 0.1 wavelength or

1/4 wavelength and longer. The given formulas include horrible integrals used to solve for the size range of antennas most of us are able to build. So I have adapted Dr. Terman's work into the formula shown in line 980. It is simple to use, but works only between almost zero length and about 1/40 wavelength—good enough for amateur use.

The program offers the option of a hard copy or soft copy, as well as refiguring the problem. Along the way you will be asked to choose between a capacitive or inductive match of the antenna. This gives you the opportunity to use components from the famous junk box every ham has in his or her shack. Good luck fitting parts you have to your version of my favorite low-frequency antenna. See you on the "dc" bands!

**Notes**  
<sup>3</sup>This is the area remote from the antenna where a direct ray from the antenna at the lowest possible angle strikes the earth and reflects away from the antenna.

<sup>1</sup>The author will supply the computer program in Apple II+ on a standard floppy diskette for \$15. This includes the diskette, shipping and handling charges. The ARRL and QST in no way warrant this offer.

<sup>2</sup>F. E. Terman, *The Radio Engineer's Handbook*, New York: McGraw-Hill, 1943, Ch. 11, p. 792.

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# The Product Review Process

How does a piece of amateur equipment get into the Product Review column? Glad you asked!

By Bruce O. Williams, WA6IVC  
Assistant Technical Editor, *QST*

The Product Review column in *QST* is popular with readers, as evidenced by the many comments and suggestions we receive from ARRL members. Although this membership service has existed for more than 30 years, the policies governing the review process change periodically. In August 1979, a *QST* article described the process in detail.<sup>1</sup> Several recent changes make the reviews more responsive to members' needs, and are aimed at providing more timely information on new amateur products and ensuring the integrity of the process.

## Who Performs the Review?

The Technical Department at ARRL Hq. is responsible for management of the Product Review program. The Product Review Editor conducts the program on a day-to-day basis. Normally, the Product Review Editor, together with other members of the Hq. staff, selects equipment for review, based on anticipated member interest in the item, its uniqueness and its contribution to new technology. Suggestions from members for future review items are always welcome, however.

Product reviews are written by licensed members of the Hq. staff (with the exception of the Advertising Department), Technical Advisors (TAs), Contributing Editors, retired Hq. staff and members of the Board. The reviewers are all volunteers, but are assigned specific items for review on the basis of technical expertise and familiarity with similar equipment. Headquarters staff reviewers receive normal compensation for writing the review, but not for "on-the-air" time. If the review equipment is supplied in kit form, the reviewer builds the equipment on his or her own time, usually at a location other than the ARRL lab, and is allowed to keep the equipment instead of being paid for writing the review.

## Where Does the Equipment Come From?

In the past, ARRL accepted equipment from manufacturers, distributors or importers, who naturally are interested in

having their products appear as soon as possible in *QST*. We made every effort to ensure that the equipment furnished was a true production version, rather than a prototype or "tailored" version. In 1983, in response to a Board directive, a major change was made in the equipment-procurement method. Now, all equipment for product reviews, except for some kit items, is purchased off-the-shelf on the basis of competitive bids solicited from a number of dealers. The purchase is made with the understanding that the manufacturer or distributor will not be notified of the purchase. When the equipment must be procured from a manufacturer, the purchase is made clandestinely, and then the characteristics of the equipment are compared to a randomly selected unit to verify that they are typical. All source selection and buying is done through the ARRL Purchasing Department.

## What Does the Review Include?

The reviewer is charged with many responsibilities. He or she must become thoroughly familiar with the equipment under review, be aware of the types of problems that may be encountered with that equipment, and be able to operate the equipment and assess the ease or difficulty of operation. A reviewer's first concern is truthful reporting, and avoidance of personal preferences or opinion insofar as possible. It may be difficult for the reviewer to be completely objective, however, and usually there is some subjective criticism in the review. The circuit analysis is directed toward a general theory of operation, with little description of common circuitry. In the case of new or unique circuits, more complete descriptions are provided, together with schematic diagrams or simplified block diagrams. If the equipment is provided in kit form, the reviewer builds the item in strict accordance with the manufacturer's instructions, noting problems encountered, such as missing components, wrong or incomplete instructions and assembly problems.

If, during the course of the review, the equipment malfunctions or fails to meet the manufacturer's specifications, we follow the procedure that any buyer of off-the-shelf equipment would to have the defect

cured. We return the equipment to the manufacturer's warranty station for repair. In addition, we give the manufacturer the opportunity to explain or correct the faults before continuing the review. The repair turnaround time, cost and cause of the defect are, of course, reported as part of the review.

The first step in the review process consists of a complete physical examination of the equipment to establish that there was no damage in transit. If the equipment is provided in kit form, the assigned reviewer accepts the kit and the responsibility of inspecting and inventorying the parts, and building the item. Following completion of the kit or the initial inspection, the equipment is turned over to the ARRL laboratory for evaluation and testing. Here, the measured performance characteristics are compared with the manufacturer's specifications and FCC requirements. The data are presented in standardized formats showing the measured results and the manufacturer's specifications. For this discussion, we will cover only some of the tests used for receiver and transmitter evaluation. Receiving equipment is tested to determine minimum discernible signal (noise floor), blocking dynamic range and intermodulation distortion (IMD) dynamic range. Transmitting equipment is tested to determine keying characteristics, output power, spectral purity (spurious signal and harmonic content) and IMD. Transceivers are tested in both receive and transmit modes. Numerous other tests are performed as well, depending on the type of equipment being reviewed.

## Receiver Testing

Receiver test setups used in the ARRL lab are shown in Fig. 1. Fig. 1A shows the setup for measuring minimum discernible signal or noise floor. First the internally generated receiver noise is measured on the audio voltmeter, with no signal input. The signal generator output, tuned to the receiver frequency, is then increased until a 3-dB increase in audio output is noted on the audio voltmeter. This measurement indicates the minimum discernible signal (MDS) that can be detected by the receiver. It is defined as the signal that produces the same audio output as the internally

<sup>1</sup>Notes appear on page 24.

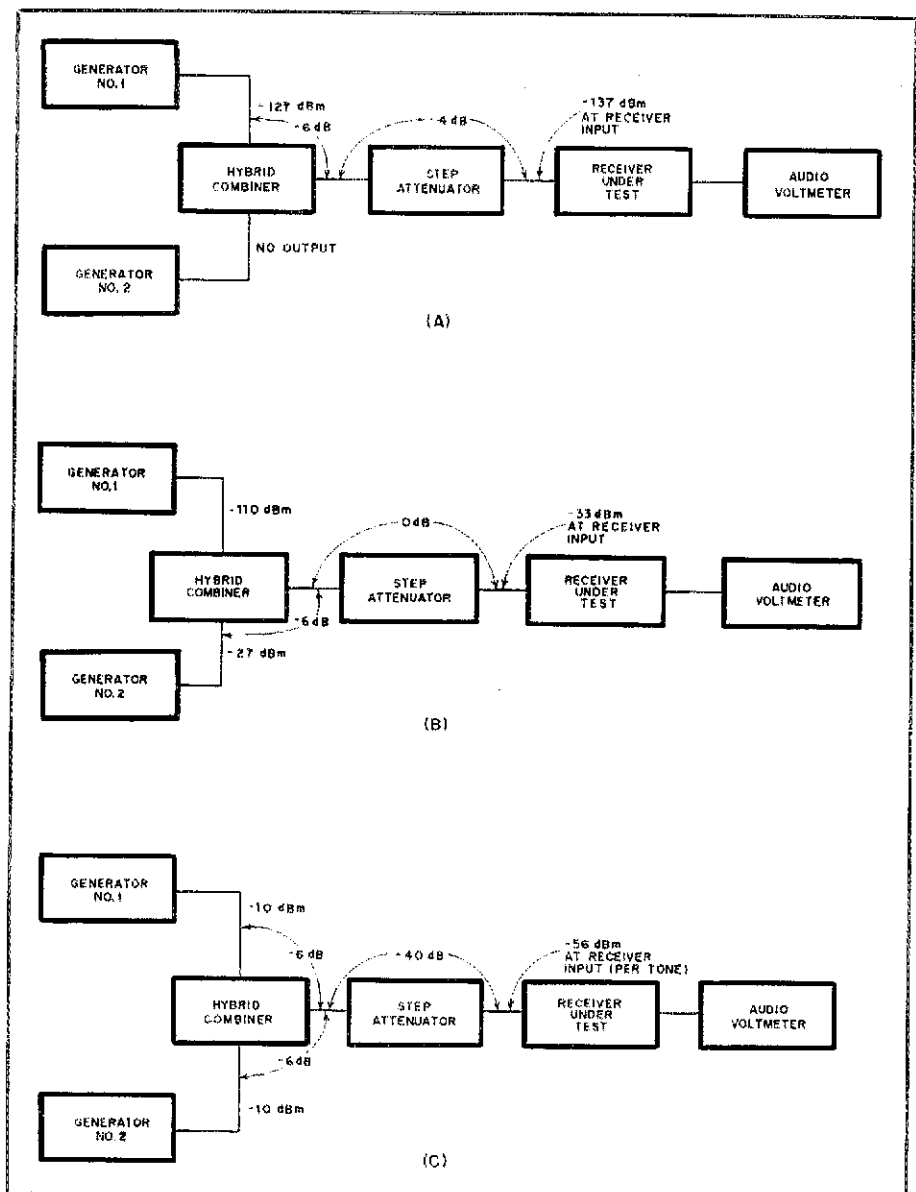


Fig. 1—Receiver performance-test setups. (A) Test setup for measuring receiver noise floor. (B) Test setup for measuring receiver blocking performance. (C) Receiver IMD performance test setup.

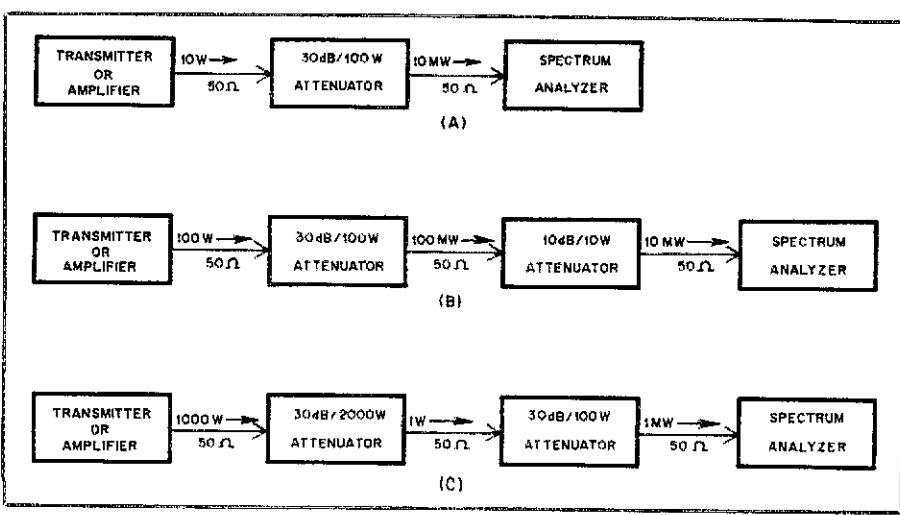


Fig. 2—ARRL laboratory test setup for several power level transmitters or amplifiers.

generated receiver noise. In the case shown in Fig. 1A, the signal-generator output is -127 dBm, the loss through the hybrid combiner is 6 dB, and the step attenuator is set at 4 dB. The noise floor can then be calculated:

$$\begin{aligned} \text{Noise floor} &= -127 \text{ dBm} - 6 \text{ dB} - 4 \text{ dB} \\ &= -137 \text{ dBm} \quad (\text{Eq. 1}) \end{aligned}$$

Fig. 1B shows the test setup for measuring blocking (gain compression). Both signal generators are used. One is set for a weak signal (roughly -110 dB), and the receiver is tuned to this frequency. The other signal generator is tuned to a frequency 20 kHz away from the receiver frequency, and the signal amplitude is increased until the receiver audio output drops by 1 dB. This measurement indicates the signal level that can be tolerated at the receiver input terminal before desensitization occurs. In the example shown, the signal-generator output is -27 dBm, the hybrid combiner loss is 6 dB, and the attenuator is set for 0 dB. The signal level at the receiver that will cause gain compression is then:

$$\begin{aligned} \text{Blocking level} &= -27 \text{ dBm} - 6 \text{ dB} \\ &= -33 \text{ dBm} \quad (\text{Eq. 2}) \end{aligned}$$

This can be expressed as dynamic range when referenced to the noise floor that was calculated earlier:

$$\begin{aligned} \text{Blocking dynamic range} &= \text{noise floor} - \text{blocking level} \\ &= -137 \text{ dBm} - (-33 \text{ dBm}) \\ &= -104 \text{ dB} \quad (\text{Eq. 3}) \end{aligned}$$

This is an absolute value, and would be referred to as a blocking dynamic range of 104 dB.

Another significant receiver parameter is the measure of the range of signals that can be tolerated without producing spurious responses. This evaluation is made with a two-tone intermodulation distortion (IMD) test. See Fig. 1C. Two signals of equal level, spaced 20 kHz apart, are injected into the receiver input. If we call these two frequencies  $f_1$  and  $f_2$ , then the so-called third-order intermodulation distortion products will be at frequencies of  $(2f_1 - f_2)$  and  $(2f_2 - f_1)$ . If the two frequencies are 14.040 and 14.060 MHz, the third-order products will be at 14.020 and 14.080 MHz. With the two signal generators spaced 20 kHz apart, the receiver is tuned to one of the third-order product frequencies. A measurement is made of receiver internal noise with no signal input. The signal generators are adjusted for outputs of -10 dBm, and the step attenuator is adjusted until the IMD product produces an output 3 dB above the noise level as read on the audio voltmeter. In the example, the output of the generators is -10 dBm, the loss through the combiner is 6 dB, and the amount of attenuation required is 40 dB.



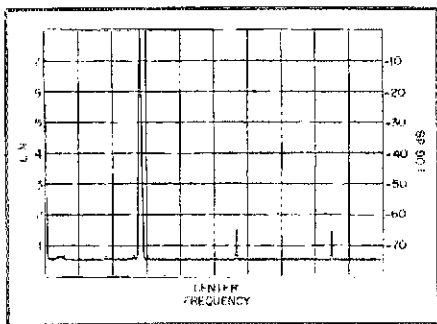


Fig. 3—Typical HF transmitter spectrum analyzer display. (See text.)

The signal level at the receiver input that just begins to cause IMD problems is then:

$$\begin{aligned} \text{IMD level} &= -10 \text{ dBm} - 6 \text{ dB} - 40 \text{ dB} \\ &= -56 \text{ dBm} \quad (\text{Eq. 4}) \end{aligned}$$

When referenced to the noise floor, this can be expressed as a dynamic range:

$$\begin{aligned} \text{IMD dynamic range} \\ &= \text{noise floor} - \text{IMD level} \\ &= -137 \text{ dBm} - (-56 \text{ dBm}) \\ &= -81 \text{ dBm} \quad (\text{Eq. 5}) \end{aligned}$$

Expressed as an absolute value, the IMD dynamic range of the receiver is 81 dB.

### Transmitter Testing

Transmitter testing in the ARRL lab is done with a test setup as shown in Fig. 2. As can be seen, different power levels require different attenuation schemes to limit the power level applied to the spectrum analyzer.

Fig. 3 shows a typical spectrum analyzer display for a transmitter operating key down on the 20-meter band. The pip at the far left is generated within the spectrum analyzer, and represents "zero" frequency. The horizontal scale is 5 MHz per division, and the vertical scale is 10 dB per division. Moving to the right, the next tall pip is seen at roughly 14 MHz. This signal is the fundamental frequency. When the spectrum analyzer is adjusted so the top of this signal touches the top (reference) line of the display, all other signal levels can be referenced to the power of the fundamental. Moving farther right, the next signal, at 28 MHz, is the second harmonic of the fundamental. Its level is 65 dB down from the fundamental. Even farther to the right is the third harmonic, at 42 MHz, which is also 65 dB down. These signal levels are typical of a well-designed multiband rig.

The test setup shown in Fig. 4 is used for transmitter IMD testing. Two equal-amplitude, but not harmonically related, audio tones are fed into the transmitter. (In the ARRL lab, we use 700- and 1900-Hz tones.) The transmitter is first adjusted for rated PEP output using just a single tone, then the single tone is replaced by the two equal-amplitude tones, and the two-tone

generator and microphone level are adjusted for best IMD performance while maintaining each tone at a level 6 dB below the top line (PEP output). Fig. 5 shows a typical two-tone display. Responses other than the two individual tones near the center are distortion products; third-order products are down 34 dB, fifth-order products are down 38 dB and seventh-order products are down 46 dB from the PEP output. The individual tones are 6 dB below PEP output because they are displayed as two discrete frequencies. For more information on these test procedures, see the *ARRL Handbook*.<sup>2</sup> A more detailed discussion of the use of spectrum analyzers in testing appears in August 1979 *QST*.<sup>3</sup>

### How Long Does All This Take?

It would be ideal if we could have a Product Review ready for publication concurrent with the release of an item of equipment for sale. Normally, a review takes from four to six weeks in the evaluation and writing process—longer if the equipment is in kit form or if a failure occurs during testing. The publication processing time may extend an additional two to three months, and sometimes an item scheduled for publication gets bumped because of space limitations. This means it may take six months or more for a Product Review article to appear in print.

### What Happens to the Equipment after the Review?

Equipment used for reviews may be retained at ARRL Hq. if it is needed for use in the lab, or it may be sold to anyone interested, on the basis of competitive sealed bid. Equipment in kit form is usually retained by the reviewer. Equipment is retained at Hq. for at least 30 days after publication of the review in *QST*. After that, a minimum bid is established and invitations to bid are published in *QST*. Anyone interested in purchasing the equipment may submit a sealed bid to Hq. within 27 days of the bid posting. The opening date for bids is always seven days after the closing date, and no bids postmarked after the closing date are considered. In the case of identical high bids, the earliest postmark

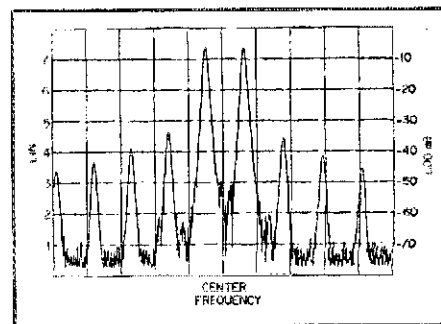


Fig. 5—Spectrum analyzer display showing the result of a two-tone test of an SSB transmitter. Each horizontal division is 1 kHz, and each vertical division is 10 dB.

establishes the successful bid.

### Is Information on Upcoming Product Reviews Available?

We treat all unpublished Product Review material as proprietary. We will not divulge information on the performance of an item until the review is published in *QST*. We do not give preview copies or specific contents of a review to anyone outside the ARRL Hq. staff. This means that manufacturers and distributors are generally unaware that their equipment is undergoing the Product Review process until the results of that review are published.

We hope this brief description of the current review process will help you understand why you can't always have a published review available when you're ready to buy that new equipment. Remember, however, that many of the Hq. staff are actively involved in this important service. We are continually trying to upgrade the procedure, improve the quality and provide more timely information through the Product Review process.

### Notes

- <sup>1</sup>J. Bartlett, "Anatomy of a Product Review," *QST*, August 1979, pp. 22-23.
- <sup>2</sup>M. Wilson, ed., *The 1986 ARRL Handbook* (Newington: ARRL, 1985), pp. 25-45 through 25-50.
- <sup>3</sup>J. Rusgrove, "Spectrum Analysis—One Picture's Worth A . . .," *QST*, August 1979, pp. 15-21.

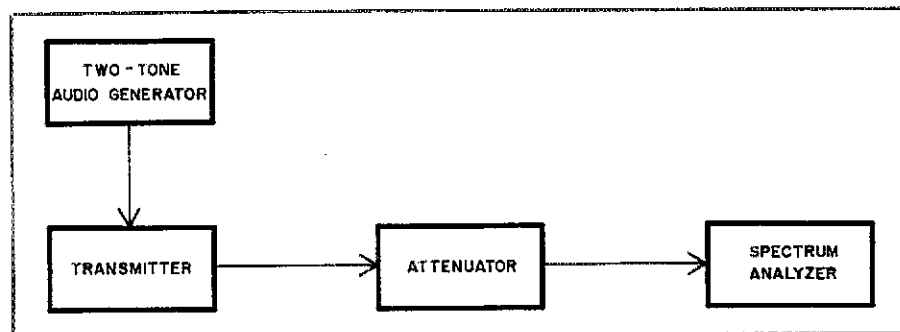
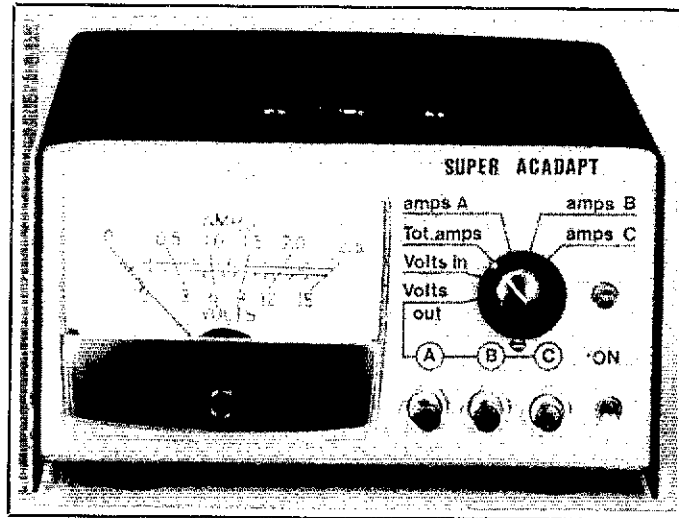


Fig. 4—Test setup used for measuring IMD performance of transmitters and amplifiers.

# The Super ACadapt



It may not be the *ultimate* ac adapter, but it takes the place of a good many of them!

By George Murphy, VE3ERP  
P.O. Box 759, Alliston, ON L0M 1A0

**M**y station has several low-voltage, battery operated devices, all of which I once powered with ac adapters to keep from going broke buying batteries. My big problem was finding enough ac outlets in the shack to accom-

modate all the adapters! To solve the problem, I built this handy little device. Now my junk box is richer by several ac adapters and a nice assortment of cube taps, extension cords and power bars, and there has been a drastic defoliation of the

jungle of wires at my operating position.

## Function

The Super ACadapt functions somewhat like the main power panel in your house. It has a fused high-voltage main entrance

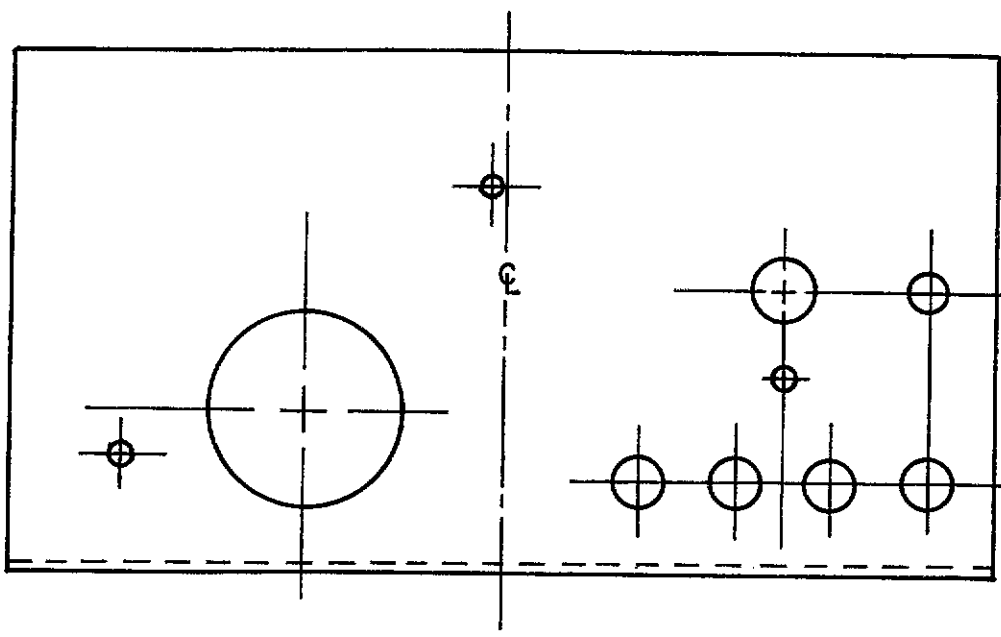


Fig. 1—Full-size front-panel template.

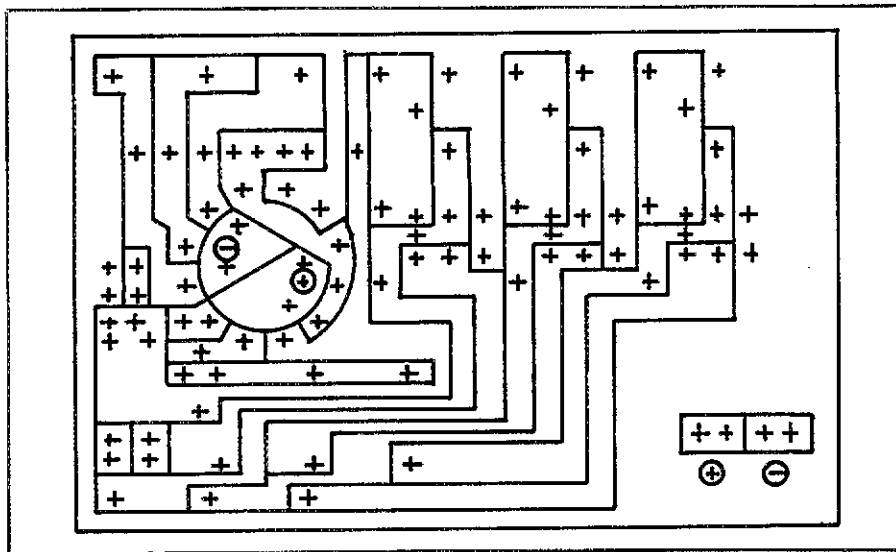
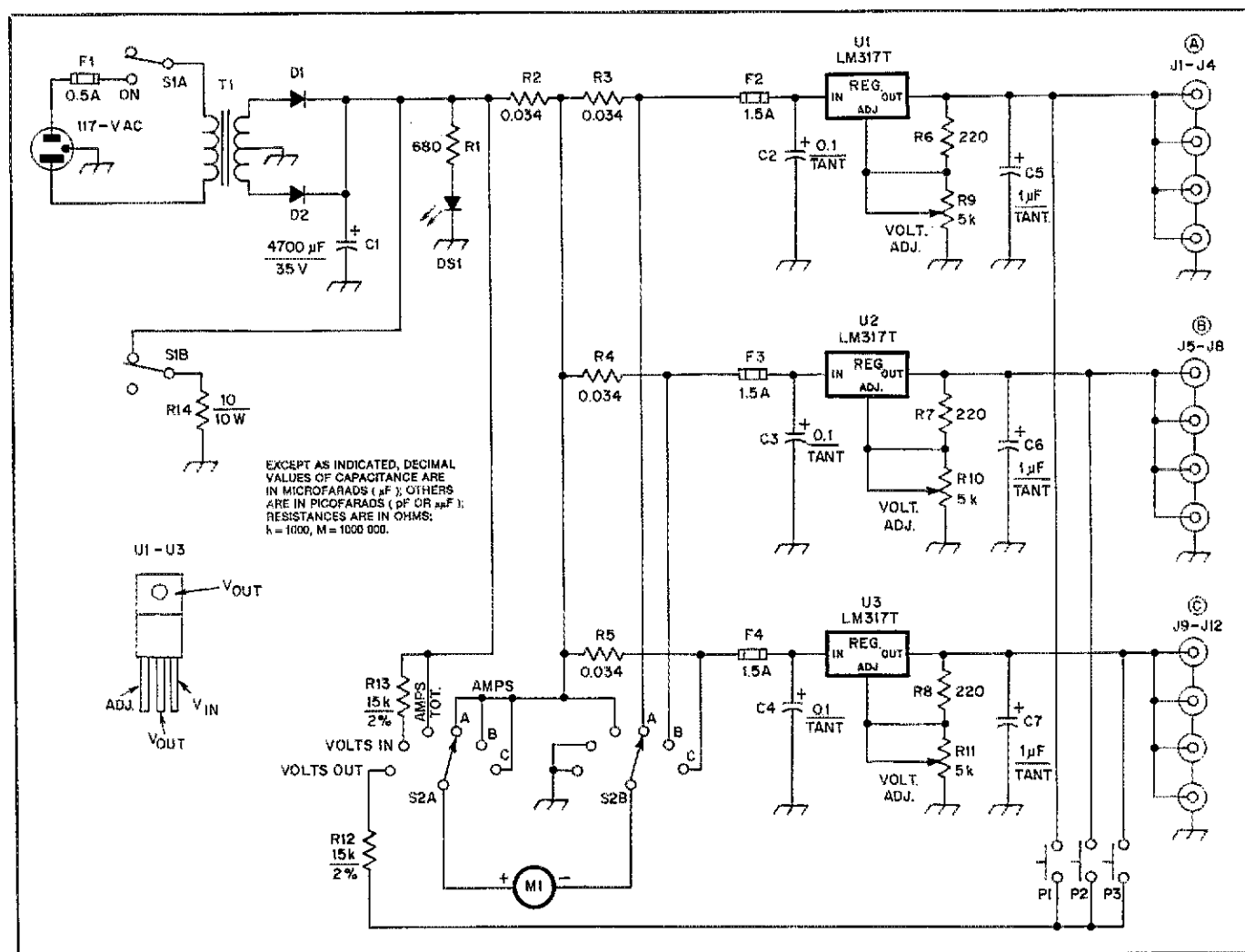


Fig. 2—PC-board pattern.

Fig. 3—Super ACadapt schematic diagram (see below). Part numbers in parentheses are from Radio Shack.

- C1—4700- $\mu$ F, 35-V electrolytic (272-1022).
- C2, C3, C4—0.01- $\mu$ F tantalum (272-1432).
- C5, C6, C7—1.0- $\mu$ F tantalum (272-1434).
- D1, D2—1N5400 (276-1141).
- DS1—Red LED (276-022).
- F1—0.5 A (270-1241).
- F2, F3, F4—1.5 A (270-1243).
- J1-J12, incl.—Phono jack (274-346).
- M1—Voltmeter, 0-1 mA, 85-ohm internal resistance (270-1754).
- P1-P3, incl.—Normally open push-button switch (275-1547).
- R1—680 ohm,  $\frac{1}{2}$  W.
- R2-R5, incl.—24.8-in. no. 22 solid hookup wire.
- R6-R8, incl.—220 ohm,  $\frac{1}{4}$  W.
- R9-R11, incl.—5-k $\Omega$  trimmer potentiometer.
- R12, R13—15 k $\Omega$ , 2% (see text).
- R14—10 ohm, 10 W (271-132).
- S1—DPDT toggle (276-346).
- S2—2P, 6-position rotary (275-1386).
- T1—25.2 V, CT, 2.0 A (273-1512).
- U1-U3, incl.—LM317T voltage regulator (276-1778).
- 1—cabinet (270-253).
- 1—fuse holder, panel mount (270-362).
- 3—fuse holders, in line (270-1238).
- 1—knob (274-415).



split into fused branch circuits that are adjustable for either high or low voltage. As in your house wiring, the total fusing of the branch circuits exceeds the capacity of the entrance fusing, on the premise that the

total branch circuit load at any time will rarely be sufficient to blow the main fuses.

The unit features adjustable voltages, and provides monitoring of both voltage and current for each branch circuit as well

as for the main entrance. A 12.6-V, 2-A dc supply is split into three 1.5-A branch circuits, each adjustable from about 1.2 to 14 V. I have found the unit to be more than adequate to power two keyers, two tape

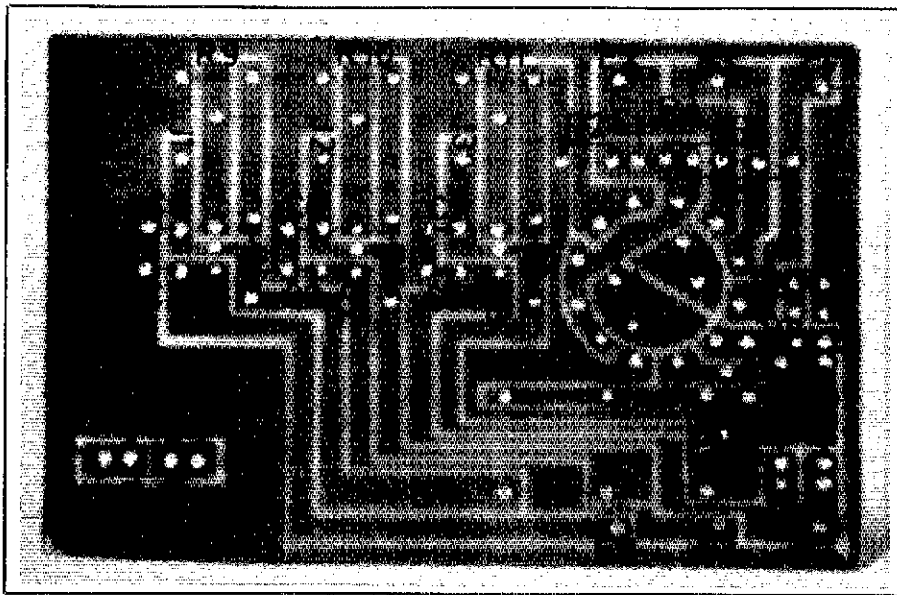


Fig. 4—Component side of circuit board showing parts locations.

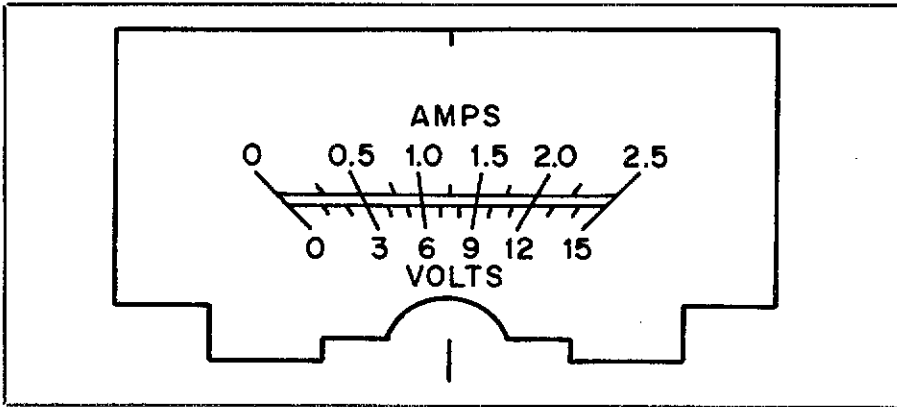


Fig. 5—Full-size pattern for new meter face.

recorders, a QRP rig and various computer peripherals. It also feeds a trickle charger for NiCd batteries.

I live in a small town, far from any major source of parts, so I designed this unit to be built entirely from Radio Shack parts.

### The Circuit

The circuit consists of a single rectifier feeding three, separate, regulated power supplies. It is essentially the circuit shown on page 125 of *Getting Started in Electronics*, by Forrest M. Mims (RS 276-5003). Meter monitoring has been added to this simple circuit. That's all there is to it.

### Construction

The front-panel layout is the only thing critical in constructing this unit (if you intend to use the circuit board shown). The circuit board is supported by its wiring to the front-panel mounted components. I recommend using the full-size front-panel template shown in Fig. 1 and the circuit board layout in Fig. 2 to allow direct con-

nection of the circuit board to the front panel.

### Circuit Board

The PC board pattern, shown in Fig. 2, physically matches the front panel to eliminate as much extraneous wiring as possible. To reproduce this type of board, I photocopy the pattern onto a self-adhesive mailing label, stick the label onto a pre-cleaned blank circuit board and cut away all the lines with an X-Acto® knife. After etching the board, I use a center punch to dimple the board wherever a hole is required (indicated by a "+" on the pattern). Then I remove what remains of the label and drill the holes. An added benefit of this type of pattern is that not much copper is removed, so it etches quickly and you can get a lot of boards from one small bottle of etchant.

If you can't find a mailing label large enough, go to your local art and drafting supply outlet and look at their stock of pressure-sensitive, self-adhesive products.

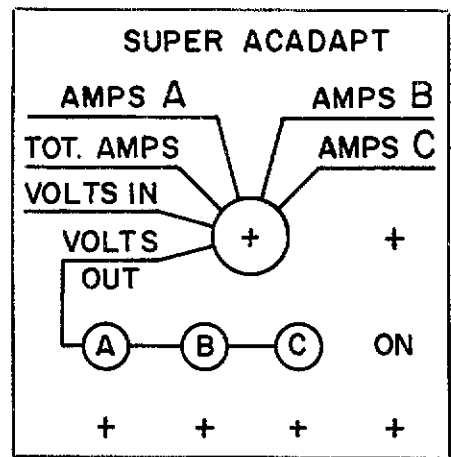


Fig. 6—Full-size meter function switch pattern.

One excellent material is a very thin, transparent film designed to be applied to engineering and architectural drawings. It comes in 8½- × 11-inch sheets and can be run through most office copiers.

The schematic diagram and parts list for the unit are shown in Fig. 3. Parts placement on the circuit board is shown in Fig. 4.

### Meter Details

A new meter face, shown in Fig. 5, must be installed in the Radio Shack meter. The plastic meter cover snaps off easily, and a photocopy or a tracing of Fig. 5 can then be glued to the meter face. If you cut the new face carefully along the lines at the bottom, it will seat accurately on the meter casing. When the glue has dried, trim the sides and top flush with the meter edges, and replace the plastic cover. The four shunt resistors—R2, R3, R4, and R5—are simply lengths of hookup wire. The length shown is the total length of each shunt, including the meter jumpers on the circuit board and the short leads from the board to the meter. The shunts can be tightly coiled, or you can wrap them around themselves and the leads going from the board to the rear panel jacks, as I did. Two 2%-, 15-kilohm resistors are required. One comes with the meter—measure its resistance with an ohmmeter, then go through your junk box until you find another that matches it within about 20 ohms. Panel layout for the six-position meter function switch is shown in Fig. 6.

### Circuit-Board Mounting

The circuit board is supported entirely by its connecting wiring to the front panel. I used no. 20 AWG solid bare wire for this wiring, which resulted in a rigid installation. To remove the board for servicing it is only necessary to cut or desolder the two meter wires, then remove the switch and push-button nuts. The whole assembly can

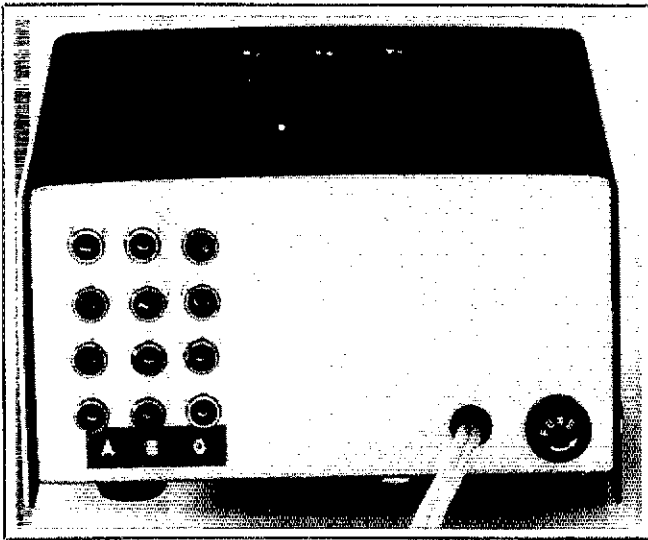


Fig. 7—View of rear panel showing three sets of four output jacks. Fuse F1 is shown on the right.

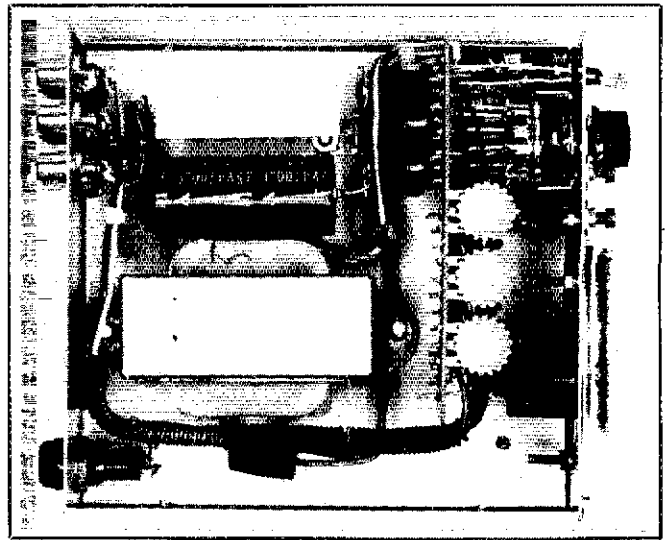


Fig. 8—Top view of cabinet showing C1 and R14 mounted on tie strips next to the transformer.

be removed as a unit. I mounted the front-panel components first, soldered wire extensions to their contacts, then threaded the board onto the wires and soldered them. If you make all the extensions slightly different in length, it is easier to thread them into the board one at a time rather than all at once.

#### Heat Sinks

I mounted the three regulator ICs right on the circuit board without heat sinks. My unit is used only with intermittent loads, none of which exceeds about 100 mA, and the regulators barely get warm. If your unit will be used for heavier loads, you might want to fashion some heat sinks out of scrap aluminum and

bolt them to the regulators.

#### Output Cables

I cut in half a few audio cables with phono plugs on each end and installed connectors on the cut ends to match the various devices in my shack. I made masking-tape labels for each end, identifying the voltage for each cable to remind me not to plug 12 V into a 1.5-V device. (I blew a few transistors before I thought of the labels!). Fig. 7 is a view of the rear panel of the unit, showing the 12 output connectors. Fig. 8 shows the general layout of components in the cabinet.

#### Superfluous AC Adapters

Don't throw them out or give them

away. The next time you build a low-voltage project, use one as a power supply built into your gadget. Use the same basic circuit as the Super ACadapt, mount the adapter on the circuit board with a little epoxy glue, add a few resistors and capacitors, and you will have an inexpensive regulated power supply good for several hundred milliamperes.

#### Conclusion

The Super ACadapt is a small but useful addition to any shack. It tidies up the place and provides a source of three variable, regulated dc voltages. Besides, what true ham can resist a neat little box with a meter, switches, push buttons and a function that is mysterious to the uninitiated? QST

## Strays



I would like to get in touch with...

- anyone with a service manual for a Galaxy V Mark II. Hal Wilson, WB9FNN, RR 8, Box 427B, Evansville, IN 47711.
- anyone who has assembly sheet no. 2 for shortwave receiver Conar Model 500 from the National Radio Institute Training Course. Ray Farmer, WA4EVS, 516 Chestnut St., Corbin, KY 40701.
- anyone with information on the type of coax connectors used on the slide mounts manufactured by USDC Quality Electronics. Paul Sturpe, W3GQ, 220 Wessex Hills Dr., Coraopolis, PA 15108.

## Next Month in QST

January QST will provide you with timely, useful information, whatever your interests. Amateurs searching for the perfect picture will want to scan the second part of a discussion on the hardware and software approach to an IBM® PC-originated SSTV system. Sightless—and sighted—hams will enjoy two construction projects: an audible SWR tuning accessory and a one-hand keyboard keyer. Amateurs interested in handling traffic will find some helpful hints on organizing a station to get the most out of operating skills. Contesters will find write-ups on the September VHF QSO Party Results, the ARRL DX Awards Program and the Novice Roundup. Long-range planners should take note of the 1986 ARRL calendar of major operating events and conventions. And finally, all hams will be interested in the latest information on license renewal, frequency allocations and power limits.

# The Ham-Radio Test Bench

**Part 2:** A workbench, alone, is not sufficient for most amateur-project needs. Homemade or commercial test equipment is essential for routine work. Here are some thoughts about setting up your test bench.

By Doug DeMaw, W1FB  
ARRL Contributing Editor,  
P.O. Box 250, Luther, MI 49656

Store-bought or homemade test equipment? The pros and cons in this matter are numerous. Some amateurs believe that acceptable test gear is too complicated to build. Others are convinced that commercial test apparatus is too costly for the ham radio budget. Both points of view are debatable from a practical and philosophical outlook. We might ask, "Is it proper to pay \$1500 for a transceiver, but object to a \$30 outlay for a VOM?" It depends on where we place our priorities. Conversely, should we operate with a \$40 homemade rig, but spend \$1000 for an oscilloscope?

I believe the answer lies within the objective thinking of each amateur. First, what does Amateur Radio mean to you? Are you into the pastime purely for communication with other hams, or do you wish to learn the fundamentals of the hobby so that you can build your own equipment? Obviously, no one needs a well-defined workshop if he or she simply boxes up a defective commercial rig and ships it out for service work when it fails.

This reminds me of a sad testimonial I heard on 75 meters recently: One amateur said to the other, "Gosh, my rig has low output power on 20 meters, so I'm shipping it to Milwaukee for repair." He went on to say, "I'm really lucky, because I still have the original factory cartons for shipping it out!" When asked by the other chap if he had tried to adjust the trimmers that would provide correct tune-up on 20 meters, he replied, "No, I'm afraid to fool with the rig."

There is no doubt that this type of ham has no need for a workshop! But those of you who have the old-time amateur spirit may benefit from this installment of our new *QST* series. Some



of us fondly refer to ourselves as "homebrew freaks," so please refrain from calling us "appliance operators!"

## How Elaborate Must Our Bench Be?

Most hobbies are the same, respective to money invested. Excellent pictures can be taken with some \$50 cameras, but many of us tie up a lot of "bucks" (perhaps \$2000) in cameras and allied equipment. The same is true of hi-fi equipment and computers. The added expense makes it possible to do more than basic things in a hobby, but perhaps the end result is the same as it would be without the extra "goodies."

I think we can all agree that hobbies are supposed to be fun, and that greater enjoyment results when flexibility is added through the implementation of those "extras" that we might otherwise do without. Surely, Amateur Radio fits that description. Therefore, our collection of test gear will be proportional to our depth of technical interest and ability to justify the added expense for a wide array of test gear. You must face this issue and seek

your own answers to the "completeness" of your test bench.

## The Most Basic Lineup

It is prudent these days to purchase *some* items of test equipment. A good example is the volt-ohmmeter (VOM). It is unlikely that any ham could build a VOM for the same or less money than an imported unit would cost. I've seen sale-priced small VOMs going for as little as \$10. True, they don't have much to offer by way of readout resolution and scale range, but they are adequate for most amateur needs. Furthermore, few of us would be willing or capable when it comes to creating an accurate meter scale for such an instrument. Bottom line: Buy a VOM within your means. Most of the units in the \$30 to \$50 range are fine for the ham workshop. Many high-quality, second-hand VOMs or VTVMs are available at flea markets, so stay alert at hamfests!

A choice needs to be made between a VOM and a vacuum-tube voltmeter (VTVM) or field-effect transistor voltmeter (FETVOM). How do these instruments differ? They are capable of making the same basic measurements (ac and dc voltage, resistance and, in some cases, current). Either type of meter may include a decibel scale as well. So, in terms of utility, the VOM and VTVM or FETVOM can do the same basic job. The principal performance difference relates to the input impedance of the two styles of instrument—VOM versus VTVM (or FETVOM). The former has a relatively low terminal impedance, which means that the measurements we make in high-impedance circuits (voltage) may provide inaccurate readings. This is caused by the low-resistance meter loading the sensitive circuit and changing its operating characteristics. The VTVM has a high in-



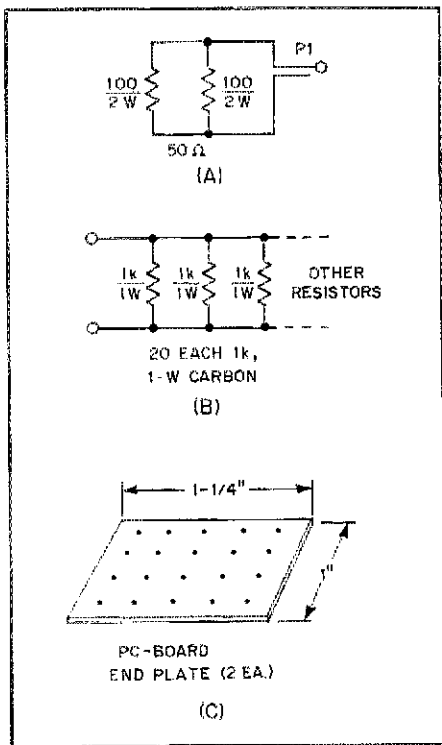


Fig. 1—The circuit at A is suitable for RF power levels of 2 W or less. The dummy load at B will handle 10 W of RF power. Illustration C shows one of the end plates for the load at B (see text).

put impedance (megohms), so when the test probes are attached to a circuit point, loading is not a matter of concern, and the readings are quite accurate. The VTVM or FETVOM is more suited to use with an RF probe than is the VOM, since most RF probes are designed for application with a high-impedance voltmeter. If you're in doubt when buying your first VOM, go for the VTVM or FETVOM. An RF probe of the type described in most editions of the *ARRL Handbook* will be a valuable accessory for your meter. It can be used to measure RMS values of RF voltage, thereby

permitting you to do signal tracing and power measurements by means of  $P(\text{watts}) = E^2/R$ , where  $E$  is in volts and  $R$  is in ohms.

A 50-ohm dummy load is needed in all workshops (and ham shacks!). If you plan to experiment with high-power equipment, a commercial 1-kW load is perhaps your best choice. Homemade, high-power loads are often expensive, and the task of finding the large noninductive resistors can be frustrating. I use an inexpensive can type of dummy load in my lab. For periods of sustained high-power testing, I place the load in a bucket of water (keep the top cover and relief valve *above* water) to enhance the cooling.

Most of my homemade equipment operates at 10 W or less of power output. I find that home-constructed dummy loads are fine for this application, and they are inexpensive. Fig. 1 shows how to make a dummy load of this variety. The unit may be operated as an air-cooled load, or you may install it in a small can (filled with mineral oil) to increase the wattage rating slightly.

Fig. 1A shows a 2-W, 50-ohm load that is suitable for many QRP rigs. Although a pair of 2-W resistors is used, the safe dissipation rating is half that value, or 2 W. I use a phono plug as a connector for this dummy load (see Fig. 2).

A 10-W, 50-ohm load can be built by placing twenty, 1000-ohm resistors in parallel (Fig. 1B). Single-sided PC board is used as the end plates to form a resistor "sandwich" (Fig. 1C). The resistor bodies are snugged against the end plates to minimize lead lengths. This aids in reducing unwanted inductive reactance, which could spoil the load performance at 28 MHz and higher. This 10-W load can be upgraded to 20 W if it is immersed in mineral oil. Non-inductive carbon-composition resistors are required for both dummy loads. You need not buy 5% resistors for these units unless high accuracy is desired. Chances are that the spread of values for 10% resistors will



net you a load that is very close to 50 ohms. Loads for higher power levels can be made by using 2-W resistors and by using more resistors in parallel to obtain the desired 50 ohms. For example, forty 2000-ohm, 2-W resistors in parallel will yield a 50-ohm, 40-W dummy load, air cooled.

#### Other Basic Gear

An "old standard" around the workshop is the dip meter. We knew these as "grid dippers" in bygone days. Now, the term "dip meter" fits the description of tube or solid-state dip meters. In some ways, a vacuum-tube dipper works better than does a modern solid-state equivalent. Not only will its oscillator generate a more powerful signal, but the dips observed on the indicating meter are generally deeper.

What can you do with a dip meter? First, it can serve as a signal source for casual testing. It may be used also as an absorption wavemeter when checking the frequen-

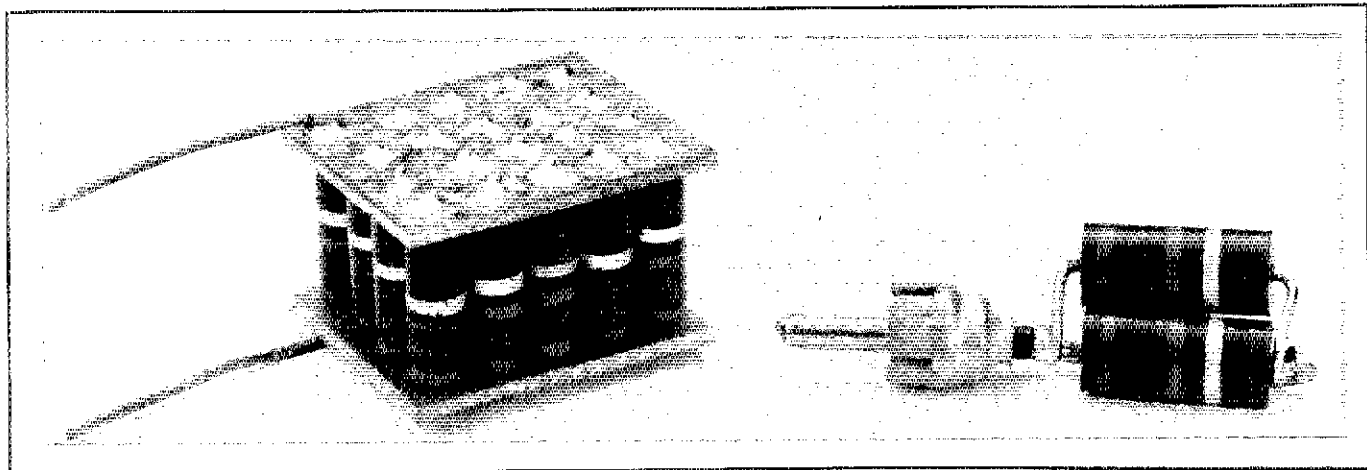


Fig. 2—The 2-W dummy load of Fig. 1A is shown at the right. The dummy load of Fig. 1B and C is at the left.

cies of transmitter or oscillator stages. Perhaps the greatest use comes when we need to check the resonant frequency of a tuned circuit or antenna. I've seen some used dip meters at hamfests for as little as \$10. A homemade unit (see *Handbook*) may cost slightly more, depending on the size of your junkbox.

A laboratory type of dc power supply is needed in your shop. It should have an output voltage that can be varied from 0 to 18 V for most amateur experiments. The supply should be regulated, and a current-limiting feature is desirable. A current rating of 1-A minimum is suggested. A homemade dc power supply should be inexpensive and easy to build. *Solid-State Design for the Radio Amateur* (ARRL) (out of print) has a chapter that covers practical power supplies and their design. In lieu of a regulated power supply, you may use a 12-V motorcycle or automotive battery in combination with a trickle charger.

### Toward Elaboration

The previous rundown represents a "get-by" setup for a ham workshop. It can be argued that my recommendations are too shallow, but I was able to survive nicely for many years with the equipment just described.

Perhaps the first item to consider for an expanded test setup is the oscilloscope. In order to make a wise choice we need to know something about scope performance. Scopes, like most modern ham rigs, are available with countless "bells and whistles." These extra features are an asset to a lab engineer or technician, but aren't

required for most of our amateur testing.

My first consideration has always been the *bandwidth* of the scope. The rated bandwidth tells us at what upper frequency limit the scope no longer produces accurate, well-defined traces on the display tube. You may still be able to obtain a sine wave on the display, but its indicated amplitude at some frequency above the rated bandwidth will be less than the true amount. The trace may also be fuzzy. The greater the bandwidth, the more the unit will cost. For most amateur work I suggest a 30-MHz scope. It would be nice to have a 1000-MHz scope, but I can't afford one! A scope with a restricted bandwidth will not reveal high-order harmonics in the waveform being viewed. You may see what looks like a pure sine wave, but in reality it may be terribly distorted with harmonic energy. I recently purchased a used single-trace scope with a 15-MHz bandwidth for \$25. I have seen a number of older scopes for sale as low as \$5 at flea markets, and the sellers assured me they were in working order.

Another important performance feature is "triggered sweep." Without this characteristic, the waveform being viewed may wander all over the face of the display tube. Also, the greater the sensitivity of the vertical amplifier in the scope, the better it will be for measuring low levels of ac and RF voltage.

What might you do with a scope? Well, they are invaluable for checking waveform purity and amplitude (assuming you have a scope that is calibrated, or if you have an external scope calibrator). They are useful for checking the wave shape of a keyed car-

rier when looking for proper shaping or the cause of key clicks. You can also check your transmitted SSB signal for unwanted flat-topping. An oscilloscope is perhaps the most important instrument we can use for signal tracing and general troubleshooting in receivers and transmitters. We can check the gain or loss of an amplifier, and we can determine if spurious energy is present on a waveform.

The uses for a scope are many; it is an instrument you may wish to add to your shopping list. It would be wise, prior to selecting your unit, to consult a friend who is familiar with oscilloscopes.

### Additional Gear

A laboratory-quality signal generator is highly useful in the amateur lab. There are a number of good-quality older commercial units available as surplus. The military-surplus URM series of generators are excellent also. Whichever instrument you purchase, be sure it has a calibrated attenuator. Without this feature, you cannot make meaningful assessments of receiver performance.

A second-hand Q meter is another luxury in which you may wish to indulge. Make certain the unit works before buying it! A resistance, capacitance, inductance (RCL) bridge is also a useful addition to the advanced ham test bench.

### Homemade Test Apparatus

We alluded earlier to the building of homemade equipment for the lab. To that end, I'd like to refer you to *Solid State Design for the Radio Amateur*. It is rich in simple instruments you can build at low cost. The *ARRL Handbook* also contains considerable data on the same subject. *QST* contains numerous descriptions of test gear you can build at home. If you have access to back issues of *QST*, check the annual index for each year (December issue) for a list of these circuits. Back issues or photocopies of *QST* articles are available from the ARRL at reasonable cost. Your local library may have a file of *QST* and ARRL books; don't overlook your library as a reference source.

### In Summary

No single article on this subject can approach completeness. It is likely that your workshop will contain the test equipment you feel is important for your projects. You need not start with a "bang" by buying or building every item you conceive as essential. Start small and grow, but please do consider heating an iron and building something you can view with pride. I would like to encourage you to attempt repairing your own commercial gear rather than capitulating and shipping your gray or black box back to the factory for maintenance. Amateur Radio will be more rewarding if you become involved in the technical aspects of the pastime along with the operating facet.



# The W6RYX Antenna

A ground-plane, phased, 90° corner reflector.

By Norwood J. "Pat" Patterson, W6RYX  
Radio Engineering Co.  
P.O. Box 420, Santa Ynez, CA 93460

Several years ago, while living in San Francisco, I saw the statement, "Find a need and fill it," displayed on a large, pink, concrete-delivery truck. This made a profound impression on me.

When Dawn, KB6CJJ, and I moved to the Santa Ynez Valley, 150 miles north of Los Angeles, we found a big "need" for amateur communications. We invited the 35 hams who live in the valley to our home for a get-acquainted barbecue and formed the Santa Ynez Valley Amateur Radio Association. We discussed the need for an amateur repeater to serve the valley during emergencies and to provide communications for other functions such as Danish Days in Solvang, Old Santa Ynez days, Lompoc's Flower Festival, the Santa Maria Elks' Rodeo and Queen Festival, and the 100-mile bike races each year.

We explored using a 2-meter repeater, but Santa Barbara's experience with repeaters located on Santa Ynez Peak showed interference from mobiles transmitting on hills and mountains in the Los Angeles area. One-sided conversations from mobiles operating into the WB6BJM repeater in Los Angeles are very common on the N6ZF machine in Santa Barbara because of close proximity and use of the same frequency, 147.00 MHz. With such

2-meter congestion in the area, we decided to use 220 MHz.

A coordinated frequency of 224.04 MHz resulted in duplicating the frequency of W6VIO in Los Angeles. To avoid interference problems, we decided to install a directional antenna system that would reduce radiation toward W6VIO and severely attenuate any signals coming from the Los Angeles area. Antenna criteria included a 3-dB beamwidth of 160° from southwest to northeast, and elimination or severe reduction of radiation toward Los Angeles and the mountainous, unpopulated area to the east.

We obtained a high antenna site in the mountains east of Santa Ynez Valley. Trees and small scrub oaks on the site dictated an antenna height of 35 feet. My wife, Dawn, arranged for the donation of a damaged light standard. Replacing the lower three feet with a new base and extending the top with a 2-inch-diameter, 10-foot pole provided the needed 35 feet. The refabrication was organized and supervised by my son, Sherwood, WD6FZQ, and done by various hams in the club. After these modifications to the mast, Ed Putnam, WB6AWQ, and his crew began their work. The hole was dug, concrete mixed and poured on location, and

mounting bolts for the base were aligned with meticulous accuracy so the pole would stand vertical when installed.

## Antenna Design

After considering various directional antennas, we concluded that a 90° corner-reflector antenna would best meet the need. I designed the antenna and supervised its construction. My son performed the testing to determine its proper operation. The W6RYX corner reflector antenna consists of a ¼-wavelength, folded radiating element bisecting the vertex angle between two flat-plane reflecting sheets. Most corner-reflecting antennas use a balanced, half-wave dipole antenna as a radiating element. Review of the references, listed at the end of this article, indicated that a conventionally designed 220-MHz corner reflector would be of considerable size. Changing the radiating element to a ¼-wavelength with a ground plane would reduce the vertical size of the antenna by half, and at the same time reduce the feed-point impedance by half.

The references gave antenna resistance curves for the corner reflector with a half-wave, balanced dipole antenna, but no impedance curves for a ¼-wavelength, ground-plane corner-reflector antenna. To

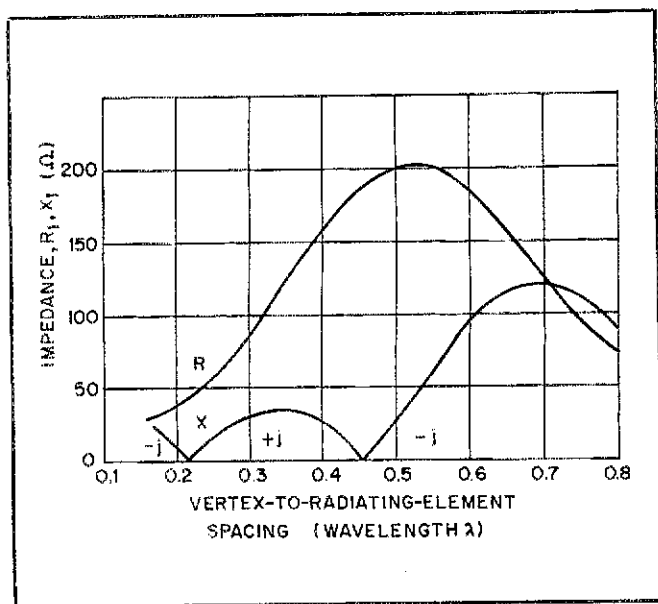


Fig. 1—Base Impedance compared to radiating-element-to-vertex spacing for a 90° corner-reflector antenna. The radiating element is a folded monopole.

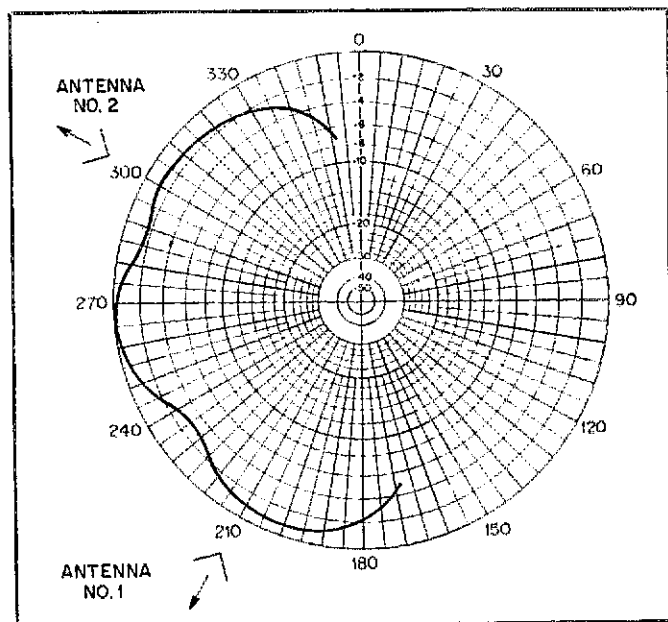


Fig. 2—Calculated antenna radiation pattern for two 90° corner-reflector antennas mounted 286° apart and fed in phase.

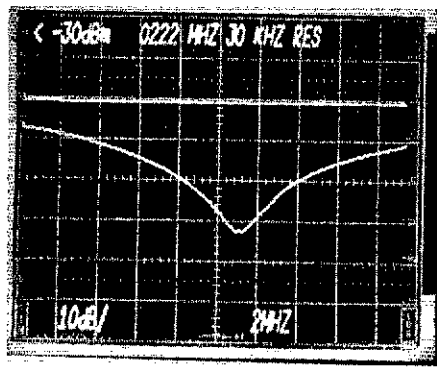


Fig. 3—Antenna return-loss measurement for a single 90° ground-plane folded-monopole corner reflector. The center frequency was 222 MHz. Vertical divisions are 10 dB each; horizontal divisions are 2 MHz each.

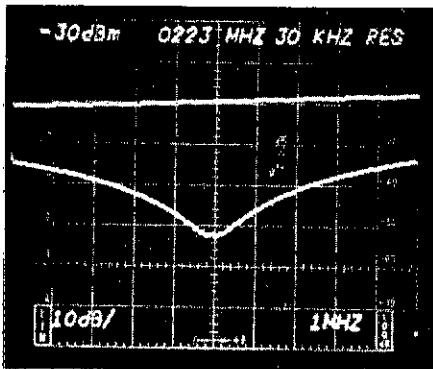


Fig. 4—Antenna return-loss measurement for two 90° corner reflectors with folded monopole radiating elements, spaced 286° apart and fed in phase. The center frequency was 223 MHz. Vertical divisions are 10 dB each; horizontal divisions are 1 MHz each.

Table 1  
Conversion of "Voltage-Ratio Method"  
Decibel-Difference Readings To SWR

dB	VSWR	dB	VSWR
1	17.41	17	1.33
1.2	14.50	18	1.29
1.4	12.43	19	1.24
1.6	10.90	20	1.22
1.8	9.66	21	1.194
2	8.73	22	1.170
2.2	7.94	23	1.153
2.4	7.29	24	1.138
2.6	6.73	25	1.120
2.8	6.26	26	1.105
3	5.85	27	1.093
3.5	5.03	28	1.083
4	4.42	29	1.074
4.5	3.95	30	1.066
5	3.57	31	1.058
5.5	3.26	32	1.051
6	3.01	33	1.046
6.5	2.80	34	1.041
7	2.62	35	1.036
7.5	2.46	36	1.032
8	2.32	37	1.029
8.5	2.20	38	1.027
9	2.10	39	1.023
9.5	2.01	40	1.020
10	1.92	42	1.016
11	1.79	44	1.013
12	1.67	46	1.010
13	1.58	48	1.008
14	1.50	50	1.006
15	1.43	55	1.004
16	1.37	60	1.002

determine proper spacing and impedance, the base impedance was calculated, using image antennas for the analysis. The results are plotted in Fig. 1. Eqs. 4, 5 and 6 give gain of the antenna, pattern, and base impedance as a function of spacing. (Equations appear in the Appendix.) Refer to Fig. 1. The base impedance was calculated using a folded-monopole

antenna with equal-diameter elements. A spacing between vertex and radiating element of 0.23 wavelength will give a 50-ohm base impedance with substantially zero reactance. The impedance step-up ratio ( $r$ ) is 4:1. Conversely, if a single-element radiating antenna were desired, the values shown in Fig. 1 would be divided by four (both resistance and reactance). For example, at approximately 0.23 wavelength the resistance of a single-element radiator would yield a resonant impedance of approximately 12.5 ohms ( $50/4$ ). This very low impedance would contribute to antenna inefficiency. The folded-monopole radiating element was chosen for the 50-ohm feed-point impedance and because a grounded antenna would also reduce static noise in the receiver.

To cover the required 160° with a 3-dB beamwidth, it was necessary to use two antennas fed in phase and separated 286 electrical degrees. The pattern was calculated in accordance with Eq. 6, and is plotted in Fig. 2. A ¼-wavelength matching section of 75-ohm coaxial cable was used to permit feeding each antenna with equal currents in phase. The input of each transmission line after the ¼-wavelength matching section showed a resistance of 112 ohms, which, in parallel, gave a feed-point impedance of 56 ohms. Fig. 3 shows a measured return loss of 32 dB, which equates to a very acceptable SWR of 1.052. During tests, the antennas demonstrated a considerable broadband characteristic effect. At the repeater frequencies of 222.44 and 224.04 MHz the return loss was 28 and 27 dB, respectively, which calculates to SWRs of 1.083 and 1.094, respectively (Figs. 3, 4; Table 1). An

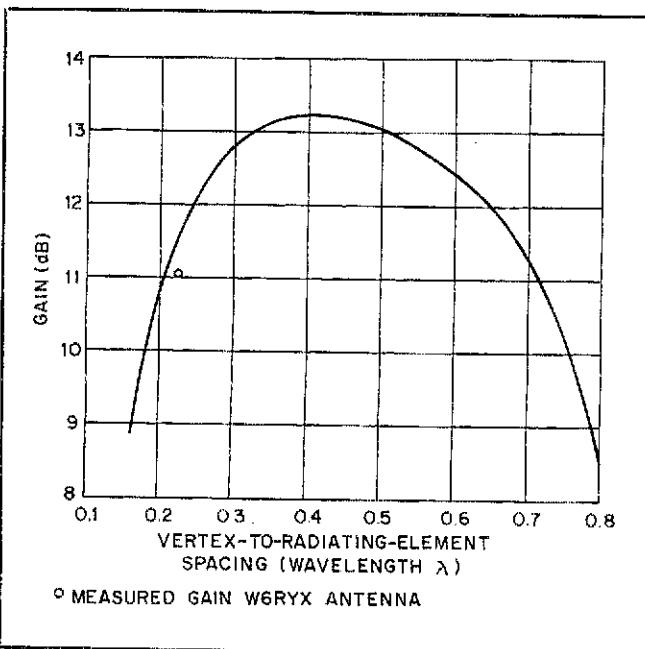


Fig. 5—Calculated gain of a 90° corner reflector with folded monopole radiating element as a function of radiating-element-to-vertex spacing. The calculations assumed a 1-ohm loss.

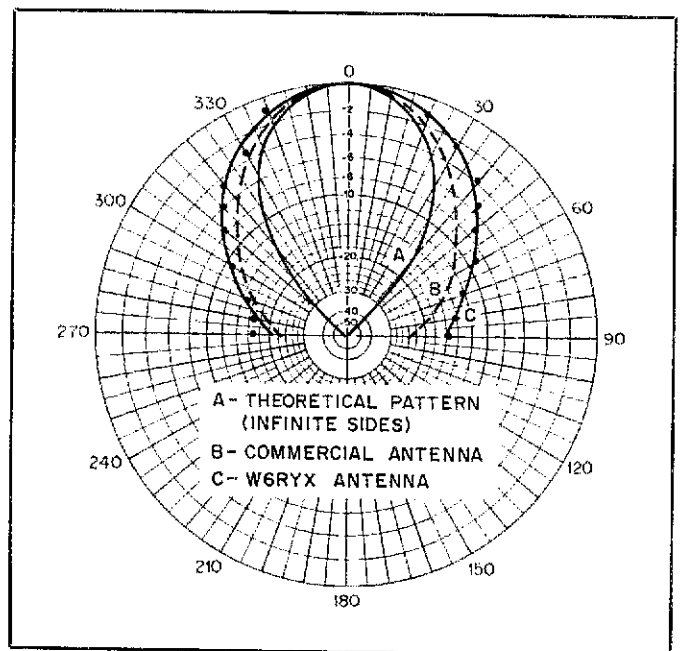


Fig. 6—Measured radiation pattern of the W6RYX 90° corner reflector compared with a theoretical pattern (with infinite sides) and a commercial antenna.

SWR of 1.5 or less was measured over an 11-MHz bandwidth.

For a corner reflector to have a good unidirectional pattern and reasonable gain, the length of the sides of the corner must be at least twice the spacing between the antenna and vertex (see Eq. 1). To keep the antenna small, a spacing of approximately 0.23 wavelength was chosen. Had a folded monopole not been used, a spacing between the vertex and the radiating element of  $\frac{1}{2}$  wavelength could have been used. This spacing would require the sides to be at least 1 wavelength long. Using the folded monopole accomplished three things: It gave the proper operating impedance of 50 ohms with a spacing of 0.23 wavelength; it reduced the physical size of the antenna by one half; and it reduced static noise. This compromise resulted in a small sacrifice of gain and a wider lobe. Fig. 5 demonstrates a theoretical gain of 11.5 dBd and a measured gain of 11 dBd, a reasonable sacrifice for the convenience of a smaller antenna. At higher frequencies, the physical size of the antenna would become smaller. A wider spacing between the vertex and the radiating element and use of a single radiating element, rather than the folded monopole, would give a good operating base impedance near 50 ohms with no reactance. The gain would increase approximately 2 dB over the W6RYX antenna (Figs. 1 and 5).

Fig. 6 demonstrates the effect on the horizontal pattern of using smaller sides for the reflecting surface. The theoretical pattern identified "A" shows a narrower beam, nulls at  $45^\circ$  and theoretically no radiation to the rear. Pattern "B" is a commercial corner-reflector antenna. Pattern "C" is the measured pattern of the W6RYX corner-reflector antenna and demonstrates a practical antenna for 220 MHz with a measured gain of 11 dB over a half-wave dipole in free space, with a unidirectional pattern.

### Construction and Installation

The W6RYX antenna would be mounted at an altitude of 3200 feet above mean sea level in the Southern California mountains, where severe winds sometimes occur. The ground-plane frame construction, of  $\frac{1}{2}$ -inch, lightweight, electrical conduit, met this challenge. The framework was bent to form a  $90^\circ$  angle at the vertex and welded together at the sides and corners with diagonal bracing for rigidity (see Fig. 7). Two parallel rods of  $\frac{1}{2}$ -inch, lightweight conduit were welded in position between the vertex and the aperture midpoint to facilitate tuning and positioning of the antenna during testing. When the optimum position between the vertex and the aperture midpoint was determined by measurement (minimum return loss), the antenna ground plate was welded into position on the parallel rods. After framework completion, and prior to testing, 1-inch-square-

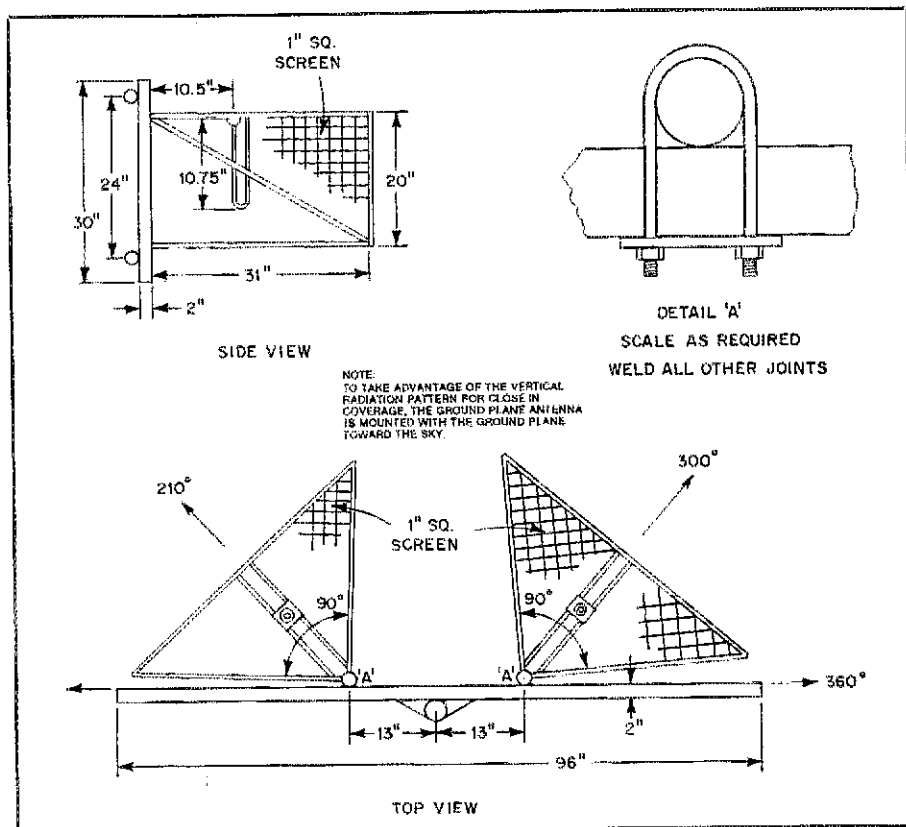


Fig. 7—Construction details for the W6RYX antenna.

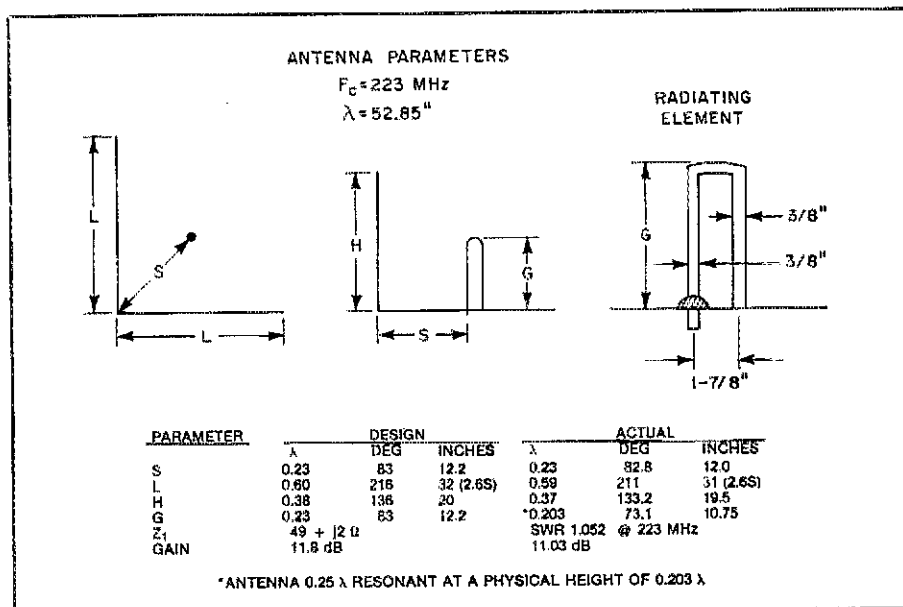


Fig. 8—Construction details for the folded-monopole radiating element of the W6RYX antenna.

mesh industrial galvanized screen was brazed to the sides of the reflecting surface and to the base of the ground plane.

The radiating element was made from a discarded commercial antenna that used a folded radiating element (see Fig. 8). It provided an insulated feed point and a ground for the folded portion of the antenna. The

original antenna, built for the 150-MHz commercial band, was shortened by cutting off the elements and repositioning them to the correct height for 223 MHz. Originally cut for the theoretical dimensions (0.23 wavelength), during testing it was trimmed to 0.203 wavelength to improve SWR. If a similar commercial antenna is

not available, the radiating element can be made from any rigid, conducting material with one end securely grounded to the ground plane and the other end insulated for the feed point. Quarter-inch-diameter aluminum aircraft tubing is suitable for the radiating element.

The 1/4-wavelength matching transformer is made of RG-11 solid-dielectric, 75-ohm coaxial cable (Eq. 2). The distance between these two antennas is 286°, requiring 3/4-wavelength matching transformers. They were cut to length by calculating length for the frequency involved, using a propagation factor of 0.66 and taking into consideration the connectors on the ends. No trimming of the transformers was required.

To mount the antenna, a crane was used to erect the supporting mast and to lift the antenna into position while Sherwood bolted it to the supporting arms of the tower (see Figs. 9 and 10).

### Conclusion

The W6RYX corner-reflector antenna, with a folded ground-plane radiating element, reduces static noise and is a respectable antenna with broadband characteristics. It exhibits an 11-MHz bandwidth for an SWR limit of 1.5. It is easy to construct and has a good unidirectional pattern with gain of approximately 11 dB. It can be used to reduce interference with other repeaters and to increase coverage, and it is sturdy and durable. The spacing of the antenna radiating element to vertex can be varied from 0.2 to 0.7 wavelength to obtain the desired base impedance with small effect on gain. Two resonant conditions occur with radiator spacings of 0.215 and 0.45 wavelength, while still exhibiting substantial gain. All design data included herein are expressed in wavelengths to facilitate other designs, configurations and applications such as wider spacing, single-element radiators or application to other frequencies.

We had a lot of fun designing and building this antenna system, and you will too. The antenna has been serving us for over 1 1/2 years with reliable public service communications from Santa Ynez to Santa Maria, California, using hand-held repeater telephone access. Any member on frequency will patch you into the phone, or an s.a.s.e. to W6RYX will get you the access codes. Design formulas on magnetic cards for HP97 or HP67 calculators, with loop and self-impedance graphs, are available from the author.

### Acknowledgments

I wish to acknowledge the invaluable assistance of all Santa Ynez Valley club members, especially Glen Mays, K6JNS, for construction of the antenna frames; Bill Long, K6EVQ; Mildred Long, KA6FCM; Glenn Todd, KF6OY; Ed Plante,

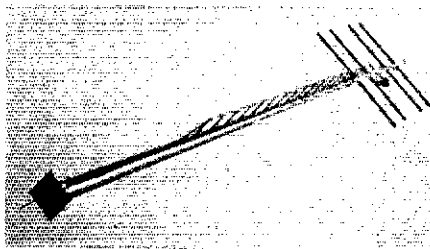


Fig. 9—Modified 35-foot light standard, with ladder, being placed in position by crane.

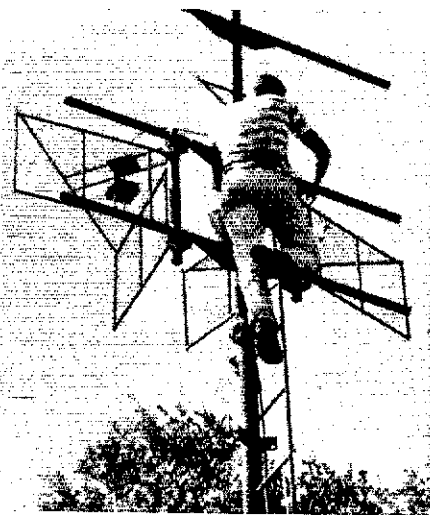


Fig. 10—Sherwood Patterson, WD6FZQ, making final connection of phasing harness on the W6RYX antenna.

WD6CSB; Ed Putnam, WB6AWQ; Evelyn Putnam, photography; Earl Tripke, W6GXU; Joe Roark, W6JGI; Frank DeNuzzo, W6SWM; and Jane DeNuzzo, W3OVV. Also thanks to Jane Roark for the good "eats" during construction, and to my son, Sherwood, WD6FZQ, for his invaluable testing and optimizing the antenna, and his skillful editing. And a great big thanks to my wife, Dawn, KB6CJJ, for the many proofreadings, editing and retyping.

### APPENDIX

#### Eq. 1

Antenna power gain estimate:

$$\cong 4 \left( \frac{300}{\alpha^\circ} \right)$$

$$\text{dB} = 10 \log \left\{ 4 \frac{300}{\alpha^\circ} \right\}$$

Gain of antenna in L reflector over antenna with same power acting alone.

#### Eq. 2

λ/4 transmission line transformation:

$$Z_1 = \frac{(Z_0)^2}{Z_2}$$

#### Eq. 3

Folded dipole transformation ratio:

$$\gamma = \left\{ 1 + \frac{\log \frac{2S}{d_1}}{\log \frac{2S}{d_2}} \right\}^2$$

When  $d_1 = d_2$ , the last term becomes 1.

$$\therefore (1 + 1)^2 = 4$$

$\gamma$  = transformation ratio of  $Z_1/Z_2$

#### Eq. 4

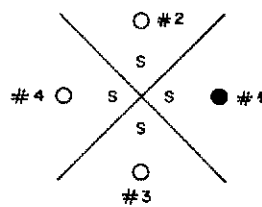
Analysis of 90° corner reflector antenna with images:

$$I_1 = 1 \angle 0^\circ$$

$$I_2 = 1 \angle -180^\circ$$

$$I_3 = 1 \angle -180^\circ$$

$$I_4 = 1 \angle 0^\circ$$



where

#1 = real antenna

#2, 3 and 4 = image antennas

$Z_{12}$  = mutual impedance between antenna #1 & #2.

$Z_1$  = base impedance of antenna #1.

$$Z_1 = \frac{I_1}{I_1} Z_{11} + \frac{I_2}{I_1} Z_{12} +$$

$$\frac{I_3}{I_1} Z_{13} + \frac{I_4}{I_1} Z_{14}$$

By substitution:

$$Z_1 = Z_{11} - 2Z_{12} + Z_{14}$$

Note:

I and Z are complex values.

$$Z_1 = |Z| \angle \Psi = R \pm jX$$

#### Eq. 5

Ground-plane antenna λ/4 gain and pattern over λ/2 dipole in free space (only lobe with real antenna):

$$\frac{F_1}{F} = \left\{ \frac{R_{11} + R_{1L}}{R_{11} + R_{1L} + R_{14} - 2R_{12}} \right\}^{1/2}$$

$$2.83 \{ \cos(S^\circ \cos \phi^\circ) - \cos(S^\circ \sin \phi^\circ) \}$$



where

- $I_1$  = current antenna #1
- $I_2$  = current antenna #2
- $I_3$  = current antenna #3
- $I_4$  = current antenna #4
- $R_{1L}$  = loss resistance of antenna #1 (1  $\Omega$  assumed)
- $R_{11}$  = self resistance of antenna #1
- $R_{12}$  = mutual resistance of antenna #1 to 2
- $R_{13}$  = mutual resistance of antenna #1 to 3
- $R_{14}$  = mutual resistance of antenna #1 to 4
- $\phi$  = azimuth angle from the plane bisecting corner angle
- $F_1$  = field from corner antenna
- $F$  = field from dipole  $\lambda/2$  antenna (free space)

Note: Base impedance for grounded vertical antenna taken from the self impedance curves computed by S. A. Schelkunoff.

Mutual impedance for identical antennas taken from mutual impedance curves of Chambers & Garrison.

Assumptions:

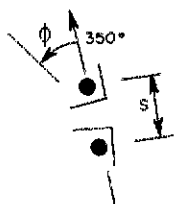
- Infinite sides.
- Infinite ground plane.

Eq. 6

Formula for antenna radiation pattern with the two antennas combined:

$$E_{\phi} = E_{1\phi} \angle 0^{\circ} + E_{2\phi} \angle S^{\circ} \cos \phi^{\circ}$$

(H plane only)



$S$  = spacing antenna #1 to #2 in degrees  
 $\phi$  = azimuth angle

Antenna patterns oriented:

- #1 =  $210^{\circ}T$
- #2 =  $300^{\circ}T$

$S$  =  $286^{\circ}$   
 $\phi$  =  $350^{\circ}T$  (antenna centerline)

Note: Because of the construction and orientation, no appreciable coupling between antennas was expected or observed.

Eq. 7

Reflection coefficient in decibels to SWR:

$$SWR = \frac{1 + |\gamma|}{1 - |\gamma|}$$

$$|\gamma| = \left\{ \frac{P_r}{P_f} \right\}^{1/2}$$

$|\gamma|$  = reflection coefficient  
 $P_r$  = power reflected  
 $P_f$  = power forward

$$|\gamma| \text{ (dB)} = 20 \log \left\{ \frac{P_r}{P_f} \right\}^{1/2}$$

$$= 10 \log \left\{ \frac{P_r}{P_f} \right\}$$

$$\frac{P_r}{P_f} = \text{antilog} \frac{\gamma \text{ (dB)}}{10}$$

$$\text{ie } |\gamma| = -15 \text{ dB}$$

$$\frac{P_r}{P_f} = 0.0316$$

$$\gamma = (0.0316)^{1/2} = 0.1778$$

$$SWR = \frac{1 + 0.1778}{1 - 0.1778} = 1.4326$$

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Norwood J. "Pat" Patterson received his Advance amateur License in 1938, and still carries his original call, W6RYX. He studied engineering at Pacific Radio School, San Francisco City College and San Mateo City College, and is an alumnus of Stanford University. He has appeared as an expert witness on numerous occasions before the state and federal courts of the U.S., the Federal Communications Commission and the U.S. Senate Hearing Committees, and has been accepted as an expert witness in radio, television and electronic engineering matters since 1947 by the FCC. Pat has been actively engaged in the design of directional antenna systems for over 35 years, and has been a consulting radio engineer with Radio Engineering Company, Santa Ynez, California. He is a consultant to manufacturers of radio and electronic equipment, doing measurement work and representation for type acceptance and certification grants from the FCC. Pat has been a member of ARRL for over 40 years, is a member of Old Timers' Club and the Broadcast Engineering Society, and holds the WAS and WAC Operating Award Certificates.

# Strays

## QEX: THE EXPERIMENTERS' EXCHANGE

□ Wonder what you've been missing by not subscribing to *QEX*, the ARRL newsletter for experimenters? Among the features in the November issue were:

- Feedback on the carbon composition resistor and a new MINIMUF subroutine.
- A patent summary on diversity receiver systems, by Bill Conwell, K2PO.
- How to interface your TRS-80R Model 100 portable computer to a Heathkit SB-104 transceiver and run a RTTY and CW program in BASIC.

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

## HOW'S MY AUDIO?

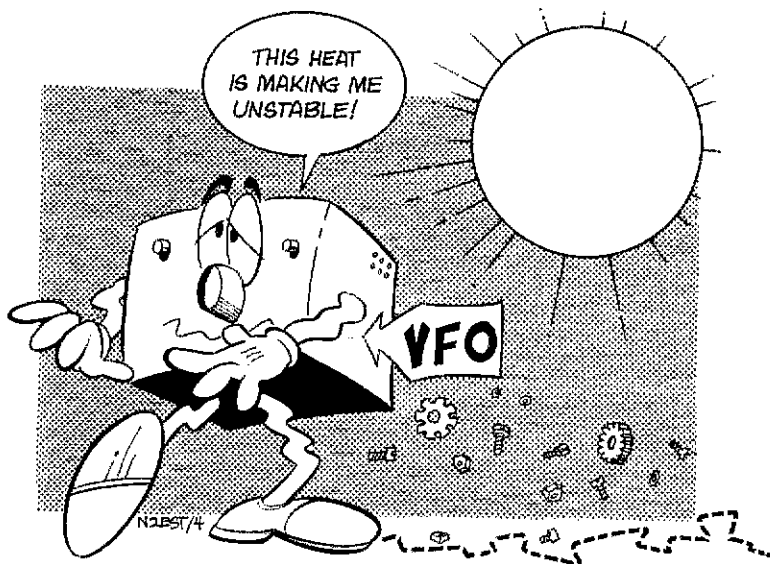
□ Does a 5-9 phone signal report always mean "perfectly readable"? Based on 20-plus years operating experience, Pete Killingsworth, KD7WZ, of Seattle, Washington, offers a humorous look at what the ham on the other end of a QSO might *really* mean.

- Superb audio: It doesn't sound like you, but at least it sounds human.
- Excellent audio: Sounds like your head is down in a barrel and you're talking into the wrong side of the microphone.
- Good audio: You do a great imitation of Donald Duck with the hiccups.
- Very punchy: Are you using a speech processor or a garbage compactor?
- A little hum on your signal: Is that a Boeing 747 warming up in the background?
- You may be overdriving it just a tad: I can hear your teeth hitting the microphone.
- Your modulation level is a little low: You might check your transmission fluid, too.
- Slightly tinny: I can't tell which sideband you're on.
- A bit garbled: I'm getting only about every third word, but that's okay because I'm not listening.
- Marginally scratchy: Sounds like your mike cord is shorted out to the ignition system of a '52 Plymouth.
- Your audio is not the best: I'd rather listen to the "woodpecker."
- Terrible audio: Maybe I can unload that old surplus Ferblungen microphone on this guy.

# The Principles and Building of SSB Gear

**Part 4:** As we approach the wrap-up of this series, let's discuss VFOs and examine a practical circuit for use with our SSB transmitter. Emphasis is on stability and purity of the VFO signal.

By Doug DeMaw, W1FB  
ARRL Contributing Editor  
P.O. Box 250, Luther, MI 49656



Drift, hum, low output and unwanted harmonic energy are the unwelcome bedfellows of some homemade VFOs. The cures are not casual, even though solid-state circuits are the way of life today! Some of us concluded that the passing of vacuum tubes for low-power applications would erase the usual shortcomings of home-built VFOs, but such is not the case. In effect, we have traded one cause of poor performance for another, and some of the maladies in both styles of VFO—tube or transistor—are caused by the same operating characteristics. In general terms, the solid-state VFO is easier to tame when problems arise, but certain design procedures are necessary. Let's examine the general problem before we get into the meat of this installment.

## Frequency Instability—the Causes

Heat-caused drift is perhaps the most common cause of frequency instability in an oscillator. The greater the change in VFO temperature, the more pronounced the drift problem. Changes in operating temperature can take place in the general area of the VFO assembly (ambient temperature changes) or within the components used in the circuit. Both forms of temperature shift contribute to the overall drift picture. These difficulties pertain not only to tunable oscillators, but also to crystal-controlled oscillators. The higher the operating frequency, the more pronounced the drift with any oscillator.

Ambient-temperature changes are caused by equipment warmup over time (power supplies and other stages in a transmitter or receiver) and by variations in room temperature where the equipment is being used. Circuits designed for critical operating conditions may be equipped with temperature ovens that maintain a nearly constant ambient temperature, irrespective of variations in air temperature in and around the VFO unit. Some amateurs build homemade ovens that use small incandescent lamps or resistors as heating elements; dc voltage is applied to the resistors to cause them to dissipate power and generate heat. Several of these resistors may be coupled thermally to the inner wall of the VFO or crystal-oscillator shield compartment. Heater power is supplied around the clock to stabilize the operating temperature.

Heating within the VFO components—particularly the fixed-value capacitors—is caused by RF energy flowing through these parts. Even a small amount of RF current can change the value of a capacitor. Changes in ambient temperature also affect these capacitors. Additional drift may result from transistor-junction heating when power is first applied. Changes in junction temperature create shifts in the internal capacitance and resistance of a semiconductor. This is not true of vacuum tubes. Fortunately, most transistors used in oscillators do not generate sufficient case or package heat to significantly affect the VFO ambient temperature, whereas tubes

contribute markedly to increased ambient temperature. This represents one of the trade-offs we mentioned earlier.

## Reducing Component-Heating Drift

The combined drift from ambient-temperature excursions and component heating may have a long cycle—an hour or greater. This is known as *long-term drift*. *Short-term drift* results from changes within the components at turn-on time; the drift period is generally 10 minutes or less. Learning to identify the nature of the drift problem, respective to elapsed time, helps to solve the cause of the malady. A frequency counter or stable receiver (both completely warmed up) is useful for this experiment.

Short-term drift can be minimized by keeping the operating voltage (and current) of the oscillator as low as possible, consistent with reliable oscillation. The lower the oscillator power, the better our chance to reduce component heating. Oscillator-chain power output can be increased inexpensively *after* the VFO stage by adding small amplifiers.

Another way to restrict drift from component heating is to use parallel capacitors in place of a single capacitor in critical parts of a circuit. Fig. 1 illustrates this principle. The greater the number of parallel capacitors (up to a reasonable limit), the better the current distribution among them; hence the lower the internal heat in any one capacitor.

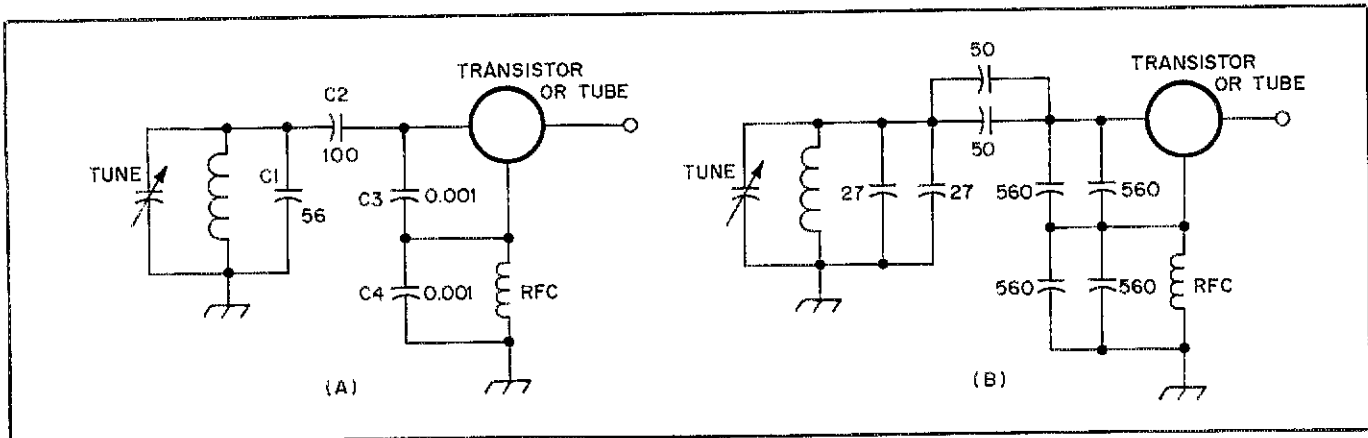


Fig. 1—Example A shows a common method for using capacitors in the critical section of a VFO. The circuit at B illustrates the use of additional capacitors in parallel to achieve the approximate values given at A. The additional capacitors provide a greater path for the RF currents; this reduces internal heating and resultant changes in capacitance.

Modern VFO circuits are generally built on PC boards. This practice contributes to drift problems. Double-sided PC board (copper on both sides) is the worst material we can use; single-sided material can be a problem, too, if the layout is not planned properly. Why do PC boards cause drift? We must recognize that PC-board foils act as the plates of a capacitor, and the phenolic or glass-epoxy insulating substance becomes the dielectric for the capacitor. These unwanted capacitors become part of the VFO circuit; because the board insulating material for capacitors is of poor quality, the capacitance value will change with heat. Therefore, when using a PC board for your VFO, make certain that the copper foils in the frequency-determining part of the circuit are far apart (1/4 inch or greater). Only glass-epoxy or Teflon® (expensive!) PC board is recommended.

#### Other Instability

Minute changes in VFO operating voltage can cause frequency jumping. Zener-diode regulators help in this situation, but are not ideal. The true regulating voltage of a Zener diode is not constant. As operating conditions vary, the Zener diode may allow small voltage changes about its nominal value. Such voltage variations will cause shifts in operating frequency. I have bought surplus or bargain-price Zener diodes that provided no regulation at all! It is wise to check them for performance prior to soldering them into your circuit. A variable dc power supply and a suitable series resistor will tell the story while monitoring the voltage across the Zener diode with a VOM. A stiff regulated power supply should be used to power the VFO and related circuitry.

Frequency jumping can have various mechanical causes, such as loose bearings in a variable capacitor. Trimmer capacitors may be prone to changes in value with vibration, owing to loose movable sections. Loose slugs in VFO coils are still another

source of abrupt changes in frequency. Frequently, this problem can be cured by melting a drop of bee's wax on the end of the slug. This cure has been used for loose VFO-coil slugs in the HW-8 and HW-9 QRP rigs.

While on the subject of coil slugs or cores, the ferrite or powdered-iron material is a cause of drift in most circuits. This pertains to toroids as well as slugs. Since the permeability changes with heat, ferrite is the worst of the two materials. No. 6 material (yellow color code) is perhaps the most stable of the HF core substances when using powdered iron. For example, we might use a T68-6 toroid as the foundation for a VFO inductor. Magnetic cores of this type create a positive drift (increased inductance) characteristic. This often requires the use of negative-coefficient capacitors to compensate for the positive drift. Polystyrene capacitors may be used successfully in such a situation to achieve drift balance. Silver-mica capacitors, on the other hand, are unpredictable. Some may

have negative drift, while others from the same batch may show positive trait. I avoid using them in VFOs. Zero-temperature coefficient (NPO) ceramic capacitors represent the best starting point in VFO design.

#### VFO Load Changes

Variation in operating parameters after the VFO will cause abrupt changes in frequency. A wise designer includes at least two isolation stages (buffers) after the oscillator. This minimizes load changes being reflected back to the oscillator. These changes are caused by variation in transistor operating conditions during the RF sine-wave excursion. Changes occur in transistor capacitance and resistance with dc-level alterations, and these variations are "seen" by the VFO as changes in reactance. However, the most significant load-shift effect is observed when the termination at the output of the VFO chain is changed, such as when switching from transmit to receive in a transceiver, or when

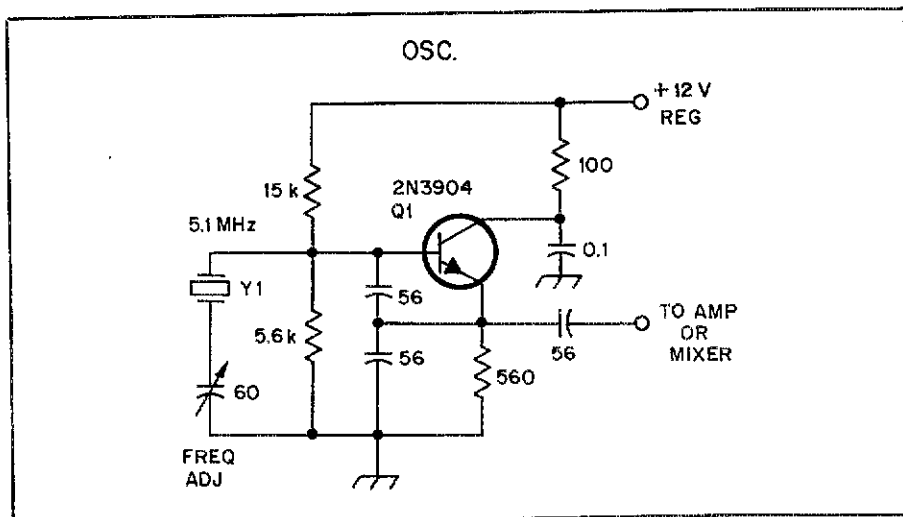
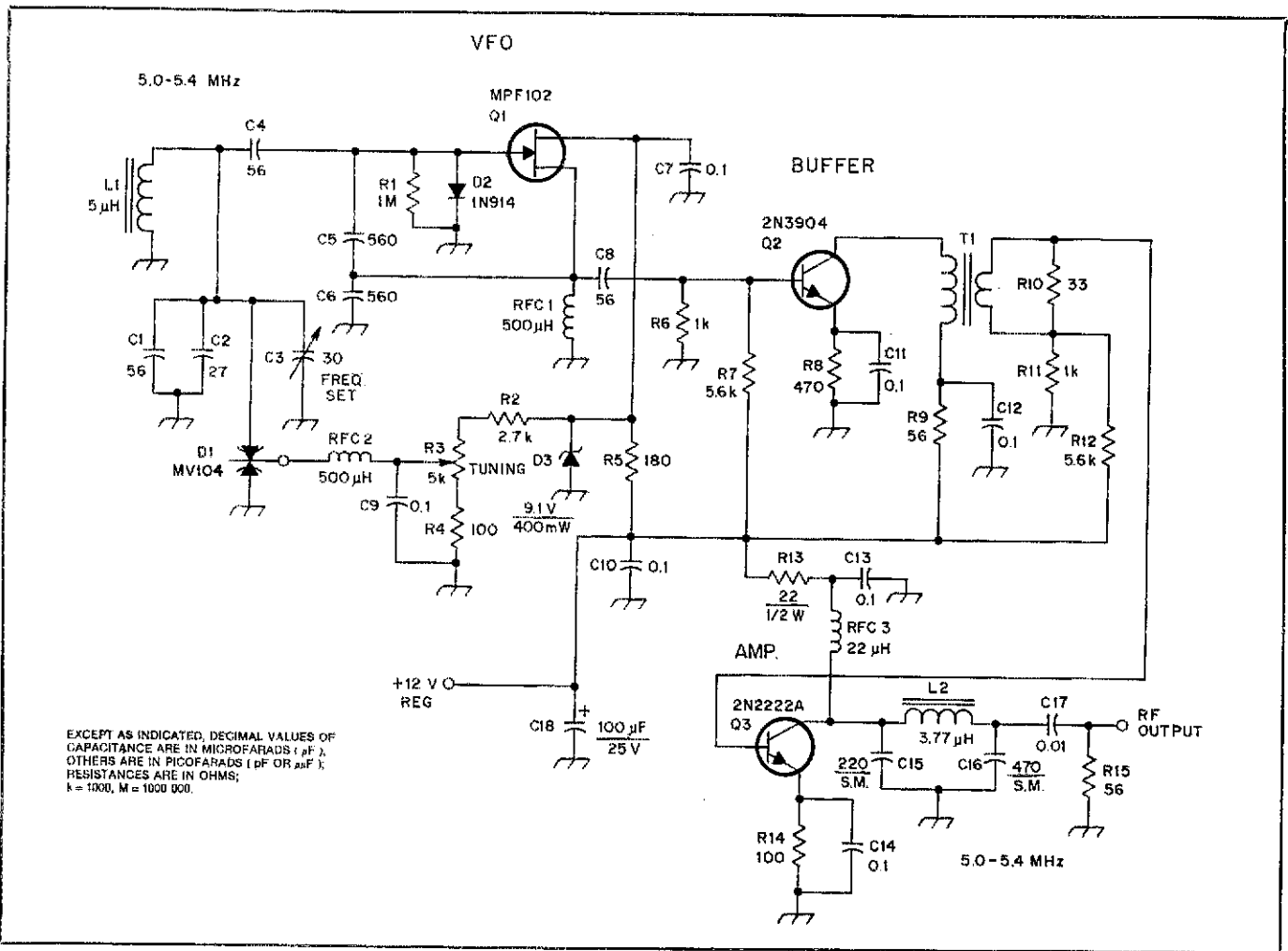


Fig. 2—Suggested circuit for a crystal-controlled LO for the SSB transmitter. This oscillator may contain several switched crystals to provide channelized operation. A buffer amplifier may be added, if desired.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF), OTHERS ARE IN PICOFARADS (pF OR µµF); RESISTANCES ARE IN OHMS; k = 1000, M = 1000 000.

Fig. 3—Schematic diagram of a practical 5-MHz VFO. Fixed-value capacitors are disc ceramic or tantalum or electrolytic. Fixed-value resistors are carbon composition and are ¼- or ½-W unless otherwise noted. Numbered components not appearing in the parts list are numbered for layout purposes only.

- C1, C2, C4, C5, C6 and C8—NP0 disc or dog-bone ceramic.
- C3—NP0 ceramic trimmer preferred. Plastic Radio Shack trimmer may be suitable.
- D1—Tuning diode, Motorola MV104 or equiv. Separate varactor diodes may be used if hooked in series as shown.
- D2—Small-signal, high-speed silicon diode.

- D3—Zener-diode regulator.
- L1—Toroidal inductor, 32 turns of no. 24 enam. wire on an Amidon Assoc. T68-6 core. See text.
- L2—Toroidal inductor, 3.76 µH. Use 30 turns of no. 30 enam. wire on a T-37-2 Amidon toroid.
- Q1—VHF JFET, Motorola MPF102, 2N4416

- suitable also.
- R3—Carbon control, linear taper (see text).
- RFC1, RFC2—Miniature 500-µH choke (Mouser Electronics or equiv.).
- RFC3—Same as above, but 22 µH.
- T1—Primary has 15 turns of no. 30 enam. wire on an Amidon FT37-43 toroid (ferrite, 850 µ). Secondary has 4 turns of no. 30 wire.

keying the main transmitter stages in a CW rig. The usual effect is a chirp on the signal, or a difference in VFO frequency between the transmit and receive modes. Light coupling between the VFO and all subsequent stages, plus two or more buffer stages, will minimize this problem. Abrupt frequency changes may result also from stray RF (from late stages in a transmitter) migrating into the VFO circuit. Supply-line decoupling and VFO shielding are mandatory if this ailment is to be avoided.

### A Practical VFO

Our SSB transmitter requires a mixer-injection voltage at a frequency of 5.0 to 5.25 MHz. We may use a crystal-controlled oscillator (Fig. 2) for channelized operation, or we can build the circuit of Fig. 3 for coverage of the 75-meter phone band. If you're a whiz with synthesizer design,

you may prefer to go that route for your local oscillator (LO).

Fig. 3 shows a three-stage LO that employs voltage-variable capacitor (VVC) diode tuning (D1). This eliminates the bulk and high cost of an air-variable capacitor. I should mention, however, that by adding one more semiconductor junction (D1), the potential for drift is increased. If this trade-off does not appeal to you, simply replace the tuning-diode circuit with an air variable. Once the Motorola MV104 reaches operating temperature, stability will be acceptable. R3 is a panel-mounted control used for tuning the VFO. A quality "pot" should be used, such as an Allen-Bradley carbon-composition, 1/2-W unit. It will be of better mechanical format than most low-cost controls, and should last much longer before becoming noisy and intermittent. A vernier drive can be used to

operate the control, thereby making the tuning smoother.

A JFET (Q1) serves as the oscillator. D2 helps to stabilize the transistor by limiting positive sine-wave peaks and stabilizing the bias. Output from Q1 is supplied to a class-A buffer, Q2. It operates as a broadband amplifier by means of T1, which is untuned.

Output amplifier Q3 is also a class-A stage. A low-pass, single-section filter is used at the output of Q3 to remove some of the harmonic currents generated within the system. The filter output impedance is 50 ohms. The injection level to the mixer (U1, Fig. 5, of Part 3, Nov. 1985 QST, p. 19) is 600-mV P-P. Depending upon the gain of your VFO transistors, it may be necessary to change the value of the blocking capacitor to pin 8 of the MC1496 mixer. If so, select a smaller value that will

allow 600 mV of injection. A scope or RF probe and VTVM can be used to measure the LO injection level.

### Practical Considerations

If you lay out your own PC board, keep the conductors short and direct. Q1, Q2 and Q3 should be placed in a straight line to minimize unwanted input-output coupling, which can cause self-oscillation in the amplifiers.

Place a shield box around the VFO assembly. Double-sided PC board can be used to form a low-cost box. Add a lid to the enclosure to keep air currents from reaching sensitive components.

Wind toroidal inductor L1 of Fig. 3 tightly, then coat it twice with Q Dope<sup>®</sup> or polyurethane varnish. This will keep the coil turns in place to aid stability of the VFO. A dab of flexible cement (Silastic or RTV compound), such as bathtub caulking, can be used to keep the toroid in

place on the PC board.

### VFO Setup


A frequency counter or calibrated receiver may be used to monitor the VFO output frequency while establishing the tuning range. A 56-ohm resistor can be used as a dummy load across the output of the VFO final amplifier (Q3 of Fig. 3). Attach the frequency-counter test cable across the resistor. If you use a receiver during the calibration period, attach a short length of hookup wire to the ungrounded end of the 56-ohm dummy load, then place the wire near the antenna lead to the receiver. Adjust the main-tuning control (R3) to provide the lowest VFO frequency. Next, adjust trimmer C3 to obtain a frequency of 5.0 MHz. This VFO will cover more frequency than is required (approximately 5.0 to 5.4 MHz) with the constants specified in Fig. 3. The tuning range can be reduced by restricting the voltage change across D1. This can be done by increasing

the values at R2 and R4. Some experimentation will be necessary to do this.

Circuit boards or parts kits for this project are available.<sup>1</sup> You may have a pet circuit to try in place of this one, so feel free to use it. The design shown in Fig. 3 can be used for other projects, such as receiver local oscillators and signal generators. You will find additional design information on VFOs in the *ARRL Handbook* and the *League's Solid State Design for the Radio Amateur*. Basic theory and practical-design information concerning the use of toroids and other magnetic cores is available in book form.<sup>2</sup>

### Notes

<sup>1</sup>A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, tel. 714-521-4160. PC boards and parts kits are available.

<sup>2</sup>D. DeMaw, *Ferromagnetic Core Design & Application Handbook*, Prentice-Hall no. 0-13-314088-1, Available from Amidon Assoc., Inc., 12033 Otsego St., N. Hollywood, CA 91607. 

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## New Products

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### UNCLE BILL'S SOFTWARE

□ Bill Clarke, WA4BLC, has two programs available for the Commodore 64: one for code-practice and another for antenna design. Both programs employ the color and sound features of the C64 in their presentations, and are easy to use.

There are three sections to the code program. In all program sections, the code is sent at 20 WPM using the Farnsworth method (variable spacing between characters) to reduce the overall code speed. Program Part 1 visually and aurally introduces each code character in response to a keypress. In Part 2, the computer sounds a code character without displaying it; you respond by pressing the appropriate key. A correct response prints the character on the screen. If your response is incorrect, the character is sent again. If you repeatedly err recognizing the character being sent and wish to hear a different character, you press the £ key. Pressing the asterisk

key ends the session and the computer grades your progress.

Under control of program Part 3, the computer continuously sends random Morse characters in groups of five until you press the asterisk key. The sending speed is selectable from five groups per minute to 20 WPM. You write down the characters as they are sent. Only after each group is sent is it displayed.

This code program allows for only four special characters—the comma, period, question mark and slant bar. I noticed one error in the tape version sent to me: The last code element of the slant bar (/) was a dash instead of a dot. This error has been corrected in subsequent program versions.

The menu-driven antenna-design program has two main-menu selections: Design an Antenna or Reduce an Antenna. Under the first option, you "design" dipoles, verticals and 2- or 3-element Yagis. The design process is actually an antenna-selection process. After you choose the operating frequency, you're presented a table showing antenna sizes in wavelengths and feet for full, half, quarter, one-tenth and 5/8-wavelength antennas. The chosen antenna is drawn on the screen with the antenna feed point, element lengths, radial lengths (if any), distances between elements (for multielement antennas) and for Yagis,

the direction of maximum radiation.

The antenna-size reduction option provides you with a means of shortening dipoles to fit the available acreage. You're asked for the operating frequency, reduction percentage, your choice of coil diameter—1½ to 3 inches in increments of ½ inch—and number of coil turns per inch. The selections build at the top of the screen as you progress. Finally, the finished antenna is drawn showing the placement of the coils, the feed point and element lengths required along with the table of chosen parameters immediately beneath it. Program options allow you to try another coil type, another frequency or return to the main menu.

These programs are available on cassette tape or disk for \$9.95 each. A special offer exists for Amateur Radio clubs that are teaching a license class. Uncle Bill will provide a copy of the code-practice program free of charge to the club if two conditions are met: (1) The club must provide a new, formatted disk or blank tape and self-addressed, stamped mailer; (2) The club agrees not to violate the program copyright by making copies of the program. To order or obtain more information, contact Uncle Bill's Fine Software, P.O. Box 2403, Falls Church, VA 22042, tel. 703-573-0013.—Paul K. Pagel, N1FB

# 1296-MHz Solid-State Power Amplifiers

Explore the DX possibilities of the 23-cm band with these modern amplifiers.

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

With the ever-increasing number of ready-to-go 1296-MHz transverters available on the market today, there is a great demand for a simple and economical way to generate higher power than the typical 0.5 to 1 W output these transverters provide. If 1 W or less is used to drive a typical 2C39/7289 stripline or cavity amplifier, the low output power is often disappointing. A tube-type amplifier run with 1 kV on the plate typically offers a gain of 10 dB. This means that, at best, you can expect 5- to 10-W output from your 1-W or less input.

A popular way of generating higher power is to cascade two tube-type amplifiers for 50- to 100-W output. Here I will show you an alternative: two solid-state amplifiers that can replace the tube-type driver amplifier and provide 10- to 20-W output—enough to drive a two-tube amplifier to full output.

The NEC NEL1306 and the NEL1320 1300-MHz power transistors are an economical solid-state approach to generating moderate power levels (10-20 W) at 1269 and 1296 MHz. These amplifiers can be used for terrestrial or satellite work. When OSCAR 10 was designed, it was thought that 10 W into a modest gain antenna (20 dBi) would produce usable signals from the satellite. Unfortunately, there were some problems, and the sensitivity of AO-10 was not as originally expected for the Mode-L uplink. These amplifiers can, however, be used as a driver for a higher-powered tube amplifier for Mode-L service. If all goes according to plan with the launch of AMSAT-OSCAR Phase IIIC, 10 to 20 W with a 20-dBi gain antenna will produce acceptable downlink signals.

The NEL1306 is rated for 6-W output at 1296 MHz at the 1-dB compression point; the NEL1320 is rated at 20 W. These devices offer several advantages for amateur experimenters. They were designed

**Table 1**  
Typical Operating Conditions for the  
1296-MHz Solid-State Power Amplifiers

Device	NE130681-12	NEL132081-12
P <sub>out</sub> (1-dB compression point)	7 W	18 W
Gain (1-dB compression point)	6 dB typ.	5 dB typ.
Collector efficiency	40-50%	40-50%
Idling current	50 mA	150 mA
I <sub>c</sub> @ 1-dB compression point	1.1 A	3.0 A
V <sub>cc</sub>	13.5 V	13.5 V
Power input	14.9 W	40.5 W

for collector voltages of 12- to 13.6-V dc, making them ideal for portable and mobile operation. Although the price may seem high to someone familiar with HF parts, these devices are less expensive than most microwave power transistors. The NEL1306 is in the \$26 price range, while the NEL1320 costs about \$42. California Eastern Laboratories makes these transistors available in single-lot quantities, so you don't have to be "in the business" to get your hands on them.<sup>1</sup>

The performance of the amplifiers I built and tested is shown in Table 1. The NEL1306 is a good buy. With 1.5-W input, 6- to 8-W output can be achieved. When the amplifier is tuned up at lower power levels, power gain can be as high as 10 dB. With 200-mW drive from my homemade transverter, an output power level of 2 W is attainable.<sup>2</sup>

Power gains as high as 17 dB are possible with a two-stage amplifier (an NEL1306 driving an NEL1320). With a mere 200 mW of drive, 10-W output is possible. When the

pair of amplifiers is driven with 1 W and tuned for maximum power output, the 1-dB compression point of 18 W will be achieved.

## Circuit Details

The basic design, shown schematically in Fig. 1, is an adaptation of a circuit described in the NEL1300 series data sheet. The design incorporates 30-ohm quarter-wavelength microstriplines on the input and output. C3, C4, C7 and C8, along with L1, form a pi network that matches the low input impedance of the device to 50 ohms. C5, C6, C9 and C10 and the 30-ohm transmission line (L2) form an output pi network that maximizes power transfer to 50 ohms. C10 is not always necessary, depending on variations among devices and circuit-board material.

I designed the amplifiers for 0.031-inch-thick, double-sided glass-epoxy circuit board. A 30-ohm line in this dielectric equates to a line width of 0.121 inch, which is equivalent to the width of the collector and base leads of the NEL1300 series devices. This minimizes the discontinuity between L1, L2 and Q1.

Bias is provided by R1, R2 and D1. R1 can be optimized, if desired, to adjust the collector idling current.

I selected RFC1 and RFC2 by choosing the lowest possible reactance that will not affect power gain or output power. The RF chokes and the 10-pF bypass capacitors afford adequate decoupling at the frequency of operation. The values of RFC1 and RFC2 are purposely made different to avoid oscillations caused by bias-choke coupling.

After building several of these amplifiers, I noticed that the transistors sometimes generated low-frequency spurious signals. Although these signals were very low in amplitude and caused no problems, they were annoying. I found that I could eliminate them by keeping the high-

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



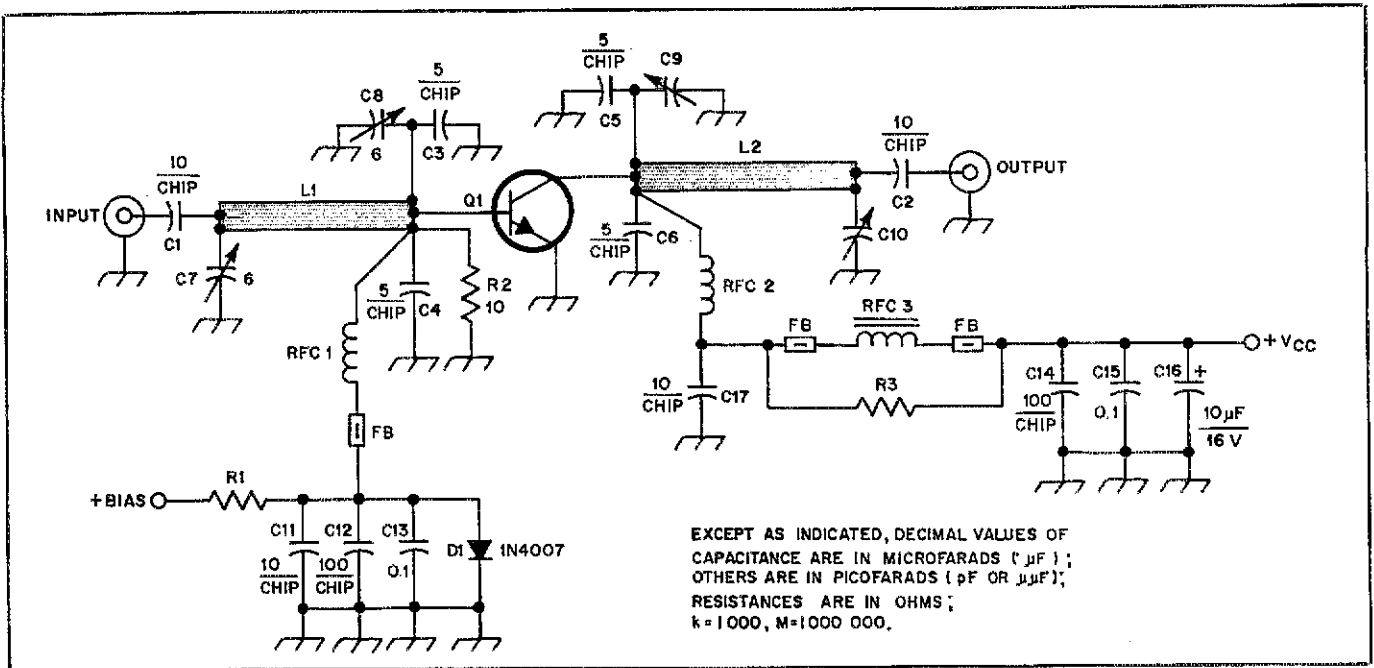


Fig. 1—Schematic diagram of the NEL1306 and NEL1320 1296-MHz solid-state power amplifiers. The schematic is identical for both versions. Component values are the same except as noted.

C1, C2, C11, C17—10-pF chip capacitor.  
 C3, C4, C5, C6—3.6- to 5.0-pF chip capacitor.  
 C7, C8—1.8- to 6.0-pF miniature trimmer capacitor (Mouser 24AA070 or equiv. See text).  
 C9, C10—Same as C7 and C8 for the NEL1306 amplifier. For the NEL1320 version, 0.8- to 10-pF piston trimmers are used (Johanson 5200 series or equiv.).  
 C12, C14—100-pF chip capacitor.

C13, C15—0.1- $\mu\text{F}$  disc ceramic capacitor.  
 C16—10- $\mu\text{F}$  electrolytic capacitor.  
 D1—1N4007 diode.  
 L1, L2—30-ohm microstripline,  $\frac{1}{4}$ -wavelength long (see text).  
 Q1—NEC NEL130681-12 (6 W) or NEL132081-12 (18 W) transistor.  
 R1—82- to 100- $\Omega$  resistor, 2-W minimum. Vary for specified idling current.

R2—10- $\Omega$ ,  $\frac{1}{4}$ -W carbon-composition resistor with "zero" lead length. See text.  
 R3—15- $\Omega$ , 1-W carbon-composition resistor.  
 RFC1—3t no. 24 wire, 0.125 inch ID, spaced 1 wire diam.  
 RFC2—1t no. 24 wire, 0.125 inch ID, spaced 1 wire diam.  
 RFC3—1- $\mu\text{H}$  RF choke; 18t no. 24 enam. close-spaced on a T50-10 toroid core.

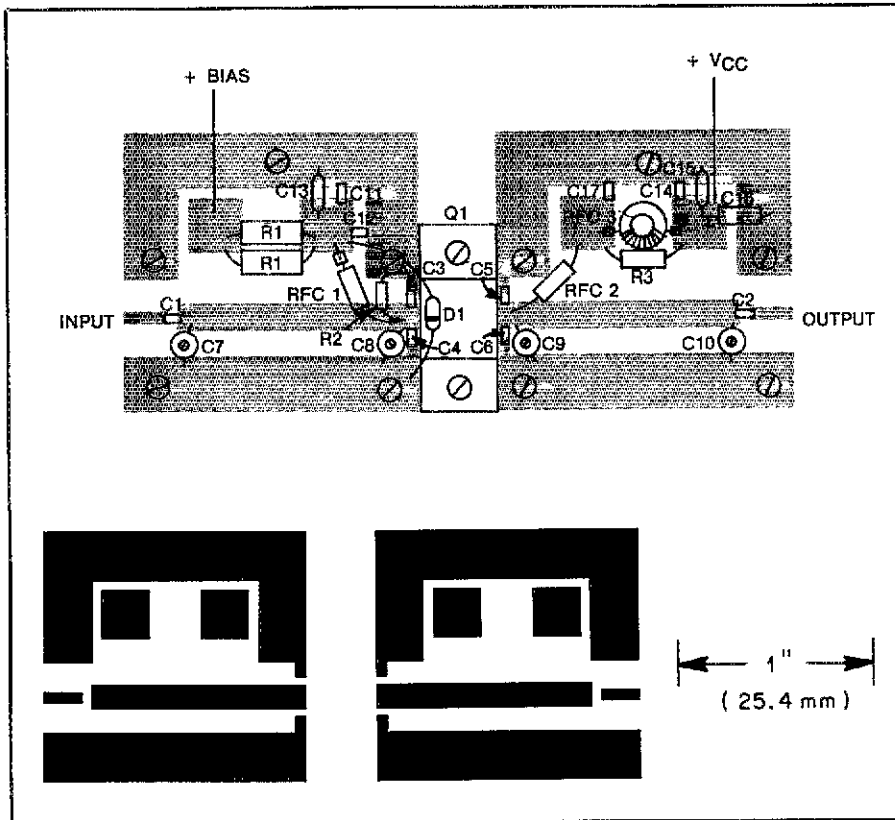


Fig. 2—Parts-placement diagram and full-size etching pattern for the solid-state 1296-MHz power amplifiers. All components mount on the etched side of the board. The same PC boards are used for each version.

frequency RF chokes in the collector circuit as small as possible and adding the parallel R3/RFC3 combination, as well as bypass capacitors C14, C15, C16. RFC3 must be capable of handling 1 A for the NEL1306 and 3 A for the NEL1320, so I made special RF chokes to withstand the current.

### Construction

Identical construction techniques are used for both amplifiers. Most of the components are mounted to the PC board, and the board and transistor are mounted to an aluminum base plate made from  $\frac{1}{4}$ -inch-thick stock. PC-board layout is shown in Fig. 2. Two separate boards are used—one for the input side and one for the output—and they are mirror images of each other. The copper is retained on the bottom side and serves as a ground plane. The grounded areas on the top side must have a good connection to the bottom ground plane for low-inductance grounding of the transistor emitter leads, matching capacitors and bias circuitry. Etched PC boards and partial parts kits for this project are available from A & A Engineering.<sup>3</sup>

Several effective methods of connecting the top and bottom ground planes are summarized here.

- 1) Plated-through holes at the critical grounding areas mentioned earlier.
- 2) Use of pins or screws that penetrate

through the circuit board into the aluminum base plate at the critical areas.

3) Use of "wrap-around" foils on all edges of the ground plane.

Plated-through holes are often used in the commercial and military electronic marketplace but are not so easily reproduced in the average builder's circuit-board shop. I've found that the best technique for the home builder is a combination of methods 2 and 3. First, wrap thin copper or brass foil around the board edges and then solder the foil to the top and bottom. Sometimes called "shim stock," thin sheet metal is often available from hobby shops or metal suppliers. Next, drill holes through the board and use no. 4-40 screws to tie the circuit board to the base plate at the critical areas shown in Fig. 2.

The transistor must be mounted so that its leads lie flat against the PC board. This poses a slight problem, since the transistor leads protrude from the device 0.165 inch above the bottom of the flange, and the PC boards are only 0.031 inch high. There are a couple of ways around this problem. They work equally well, so choose the method that is easiest for you.

If you have access to a machine shop, you can mill out a 0.240-inch-wide by 0.090-inch-deep slot in the aluminum base plate to clear the transistor flange. This is a simple task on a milling machine, and you can probably find a local machine shop that will do small jobs when business is slow. The other method is to mount the transistor to the base plate and use a piece of 0.090-inch-thick aluminum sheet to bring the input and output PC boards up to the right height. The 0.090-inch dimension allows a wrap-around foil and solder buildup of 0.040 inch, maximum.

I used 1-inch-long screws to secure the transistor to holes drilled and tapped in the aluminum base plate. The extra screw length that protrudes from the bottom of the base plate allows the use of an external heat sink, which is suggested if continuous operation is desired.

The clearance holes in the NEL1300 devices are for no. 4-40 hardware. I drilled out the holes to accept no. 6-32 screws to make the assembly more rugged, although this may not be necessary. Be careful if you decide to drill out the holes to accept no. 6-32 hardware; the transistor flange is soft copper, and you could damage the device. Use a small vise to hold the transistor flange during the drilling operation.

Solder the components to pads on the board using surface-mounting techniques. Silver solder (2%) is recommended for the chip capacitors, but SN63 will work fine. Use a 15-W iron and solder quickly to avoid burning the metallization off the capacitors.

The transistor leads should be soldered in place only after the circuit boards and transistor have been firmly bolted down to the base plate. This is necessary to minimize

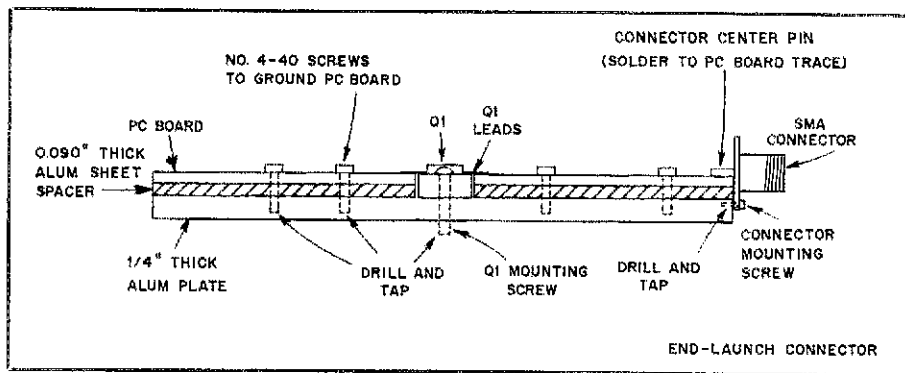


Fig. 3—Construction details for the solid-state 1296-MHz power amplifiers. See text for additional information.

any buildup of stress in the transistor leads. Chip capacitors C3, C4, C5 and C6 should be soldered directly onto the leads of Q1 to ensure the shortest possible lead length. Keep D1 close to Q1. Thermal compound will enhance heat transfer to D1 to ensure minimal drift in idling current with temperature changes.

In the original design of these amplifiers, Johanson piston-trimmer capacitors (5200 series or equiv.) were used for C7, C8, C9 and C10. These capacitors are fairly large, and in some instances the coupling between the bodies of C8 and C9 was enough to cause an in-band oscillation. Smaller variable capacitors should be used if at all possible. I've used a 1.8- to 6.0-pF miniature ceramic trimmer capacitor, Mouser Electronics part number 24AA070, in the input and output networks of the NEL1306 amplifier and in the input network of the NEL1320 amplifier with no performance degradation. I did use the Johanson piston trimmers in the output network of the NEL1320 amplifier because of the high RF currents involved.

The PC board makes use of end-launch SMA-type connectors. Fig. 3 illustrates this technique. Four-hole, flange-mount SMA connectors can be mounted to the edge of the base plate using two of the four mounting holes. Drill and tap the base plate for no. 2-56 hardware. Be careful—it's easy to accidentally cross-thread or over-torque the no. 2-56 hardware.

An alternative approach is to mount the amplifier in an aluminum die-cast box (Bud CU-124B or Hammond 1590B) and run miniature 50-ohm coaxial cable such as RG-174 from the amplifier board to the connector. The amplifiers shown in Figs. 4 and 5 use standard SMA connectors mounted to the walls of the metal box. BNC or Type-N connectors should work equally as well. When preparing each end of the coaxial cable, try to keep the pigtail leads as short as possible (1/8 inch or less); otherwise the mismatch will be difficult to tune out.

I compared the performance of an amplifier with end-launch connectors to that of another that used the approach just

described. I could measure no difference in gain or 1-dB compression point.

Considerable effort was put forth to make sure the amplifiers are stable. The devices have fairly high gain at the frequency of operation, so layout and good construction practices are very important. Here are some construction hints that can help ensure amplifier performance and stability.

- 1) Use the smallest (physical) size variable capacitors that will still handle the RF current.

- 2) Use wrap-around ground foils as noted. Grounding screws are required at the critical RF-ground areas near the shunt variable capacitors, shunt bypass capacitors and Q1 emitters.

- 3) Connect braids from the coaxial-cable jumpers to the same ground as the shunt variable capacitors.

- 4) Use as little lead length as possible on R2—less than 1/8 inch.

- 5) In some instances when the large piston trimmers are used, a shield approximately 3/4 inch high mounted on top of Q1 and grounded via the mounting screws can improve isolation between C8 and C9.

## Tune-up and Operation

Measuring RF power at 1296 MHz can be difficult. I used a calibrated 20-dB directional coupler along with enough attenuator pads to allow power to be read with a Hewlett Packard HP430C power meter and an HP477B thermistor mount. Even better is the HP431 power meter with its associated HP478A thermistor mount (a newer version of the HP430C that does not suffer from temperature-drift problems). Bird offers several low-power elements for the popular model 43 in this frequency range. Bird 400-1000 MHz elements are common, and they can be used with decreased accuracy.

Begin initial setup of each amplifier by terminating the input and output in good 50-ohm loads. I recommend that you use a fuse in the collector lead of Q1 to protect the device until you are sure everything is working normally. Start with all capacitors

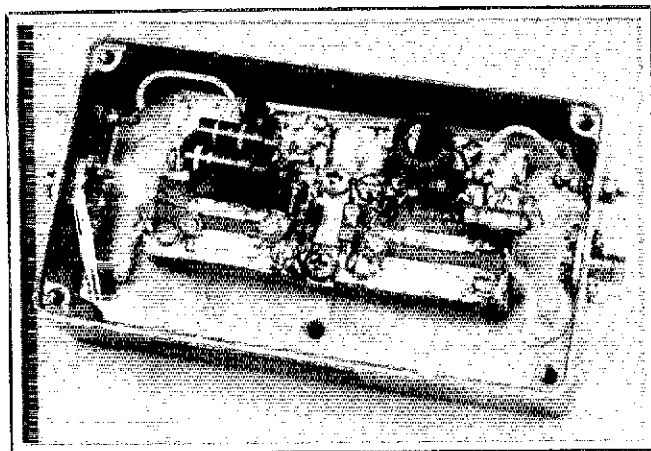


Fig. 4—This NEL1306 amplifier was built inside a die-cast box. Miniature coaxial cable runs to the connectors.

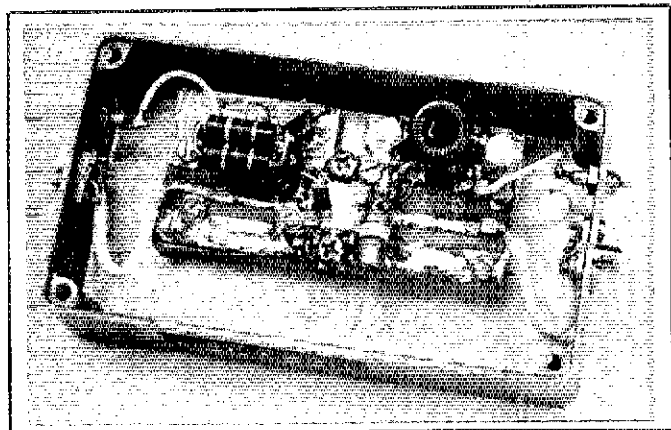


Fig. 5—The NEL1320 amplifier is virtually identical to the NEL1306 version of Fig. 4, except for the capacitors on the output strip line. C10 was not necessary on this version.

at minimum. Apply 12- to 13.5-V dc to the  $V_{cc}$  and bias terminals. The collector idling current should be as shown in Table 1. Vary the value of R1 for correct idling current.

For the NEL1306 amplifier, start out with 50 to 100 mW of drive. Adjust the output network for maximum power output and then peak the input network for maximum output power. Increase drive and repeak both matching networks for rated performance as shown in Table 1. Similarly, start out with approximately 1 W of drive for the NEL1320 and follow the same procedure. After a minute or two of operation at maximum power output, remove RF drive power and check to see that the collector idling current has not increased more than 25% over the initial setting. Keeping D1 in close contact with Q1 will minimize drift in idling current with temperature changes.

If you're going to use transistor

switching to apply dc to the power amplifier stages during transmit, consider the following technique. Apply 13.5-V dc to the  $V_{cc}$  terminal during receive and transmit. Use a series transistor switch to apply 13.5-V dc to the bias terminal during transmit. A power transistor capable of carrying only a few hundred milliamperes of bias current, as opposed to several amperes of collector current, will be required. More important, the voltage drop across the transistor switch in the  $V_{cc}$  line will be eliminated. This will ensure maximum power output of the NEL1300 devices by keeping  $V_{cc}$  at 13.5-V dc.

Switching the bias port off during receive is important for another reason. Normally during receive periods, the amplifier is left unterminated. Sometimes the input port is also left open. Depending on the length of the unterminated 50-ohm cable on the amplifier ports, the unit may show signs of instability if it is drawing idling current.

Several amateurs in the Dallas area have duplicated these amplifiers with no problems. Other amplifiers of this design are in use in different parts of the country. The NEL1300 series amplifiers offer a simple and inexpensive means of generating medium power on 1296 MHz. You'll be amazed at what you can work with 18 W that you can't with 1 W.

I wish to thank everyone who offered technical advice, especially Wes Atchison, WASTKU, for helping with the construction and evaluation of the prototype amplifiers.

#### Notes

<sup>1</sup>NEC transistors are available from California Eastern Laboratories, 3260 Jay St., Santa Clara, CA 95050, tel. 408-988-3500.

<sup>2</sup>Complete construction details for this transmitter may be found in Chapter 32 of the 1986 ARRL Handbook.

<sup>3</sup>A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, tel. 714-521-4160.

<sup>4</sup>Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071, tel. 619-449-2222.

## Strays



### I would like to get in touch with...

anyone having a schematic diagram or logic data for an Atronix CW Keyboard 105. John Cavett, W2AUZ, 8570 Herbert Ave., Pennsauken, NJ 08109.

anyone with a manual or schematic for an ICOM IC-22 2-meter receiver. John Marty, W9BTZ, Box 691, Kendallville, IN 46750.

anyone who has used the Radio Shack COCO personal computer in a ham radio application. Frank Burke, VO1BZ, Box 5612 EEPO, St. John's, NF A1C 5W8, Canada.

anyone curious to see if they are listed in the Wireless Assn. of America (1909-10) and Modern Electrics (1910) call books. Send an s.a.s.e to Art Ericson, W1NF, Box 212, Beverly, MA 01915.

anyone with schematics and operating specifications for Electronic Instrument Co., Inc. dc wideband oscilloscope, Model 460, and Sonobond Corp. Sonoweld, Model G-260A. Charles Dinkel, 131 Main St., Flemington, NJ 08822.

anyone with information on using a

VIC 20<sup>®</sup> to work CW on the SBE 34, manufactured by Sideband Engineers of the Raytheon Co. David Phillips, W3CWE, 344 N. George St., Millersville, PA 17551.

anyone interested in radio in the '20s and '30s. Kermit Eddy Yerkes, W6LXW, 915 Pine Tree La., Aptos, CA 95003.

anyone with an owner's or service manual for a Hallicrafter SX-130 general-coverage receiver. Shawn Sabo, 1555 Mill Run Ct., Lawrenceville, GA 30245, tel. 404-963-0547.

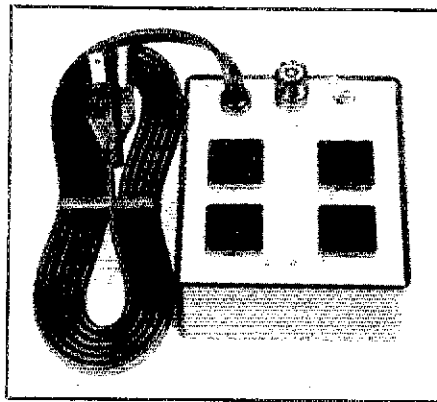
anyone with a schematic for the RME Communications VHF-602 transmitter. Michael Fontanarosa, WA2DIQ, 21 Debra Ct., Hawthorne, NJ 07506.

# New Products

## HEIL SS-2 SPEAKER

□ Heil Ltd., with Bob Heil, K9EID, at the helm, is offering the Heil SS-2 speaker. This speaker/amplifier provides two channels, each with 5 W of clean, audio-output power. It is designed to enhance the most-needed portion of the speech range. The box contains a 3.4-in woofer and a 1.5-in tweeter, with a passive crossover network that is set for 12 dB/octave at 1500 Hz. System response is rated at 90-14,000 Hz.

A source of 12.0- to 13.8-V dc at 0.4 A is required for operation, and if the LED POWER ON indicator is to be illuminated, a separate 5-V dc source is required. The SS-2 is furnished with a coil cord with a 5-pin DIN plug. All connections (except for the 12-V dc supply line) are made through the DIN plug. The unit is attractively packaged in a silver beige, high-impact metal case. The speaker grill is black, with a chrome trim ring. An accessory mounting bracket, a 117-V ac power adapter and a cigar-lighter power cable are available. Dimensions are  $5 \times 3\frac{3}{4} \times 3\frac{3}{4}$  in, and the speaker weighs 2.2 lb. For additional information contact Heil Ltd., 2 Heil Dr., Marissa, IL 62257, tel. 618-295-3000. —Bruce O. Williams, WA6IVC



## BIRD ELECTRONIC CORP. MODEL 4240-400 RF INTERSERIES ADAPTER KIT

□ With this new Model 4240-400 kit, it is easy to assemble compact, precision 50-ohm adapters for 30 different matching requirements between four popular coaxial RF connector series. The four series included in the kit are N, UHF, BNC and TNC connectors, one male and one female each, except that there are two male N and two female N. Also included are five couplers, so that five complete adapters can be assembled at any one time, allowing 28 combinations between series or with male/female of the same series. The two additional N connectors also permit assembling adapters with male N/male N and female N/female N functions.

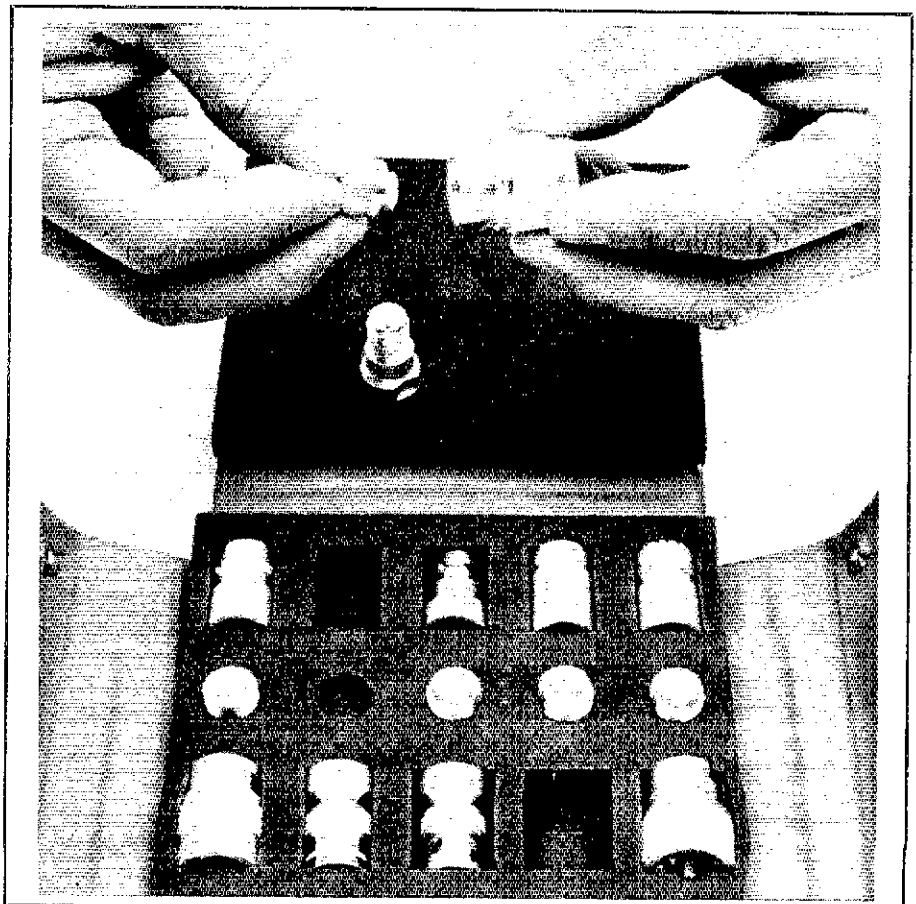
The adapters feature low VSWR as a result of precision machining and tight mating tolerances (the male N/female N combination VSWR is below 1.05 up to 1 GHz and below 1.1 up to 2.5 GHz). Price of the Model 4240-400 RF Interseries Adapter Kit is less than \$85. Available from Bird Electronic Corp., 30303 Aurora Rd., Cleveland (Solon), Ohio 44139, tel. 216-248-1200. —Bruce O. Williams, WA6IVC

mode. The unit has a total of six stages of surge suppression and provides five filtering stages on each of two circuits (two outlets per circuit). The four ac outlets are controlled by a master ON-OFF switch. Two LED indicators provide an indication that each mode of suppression is operational, as well as providing a quick check that the wall outlet is wired correctly. For price and delivery information, contact Kalglo Electronics Co., Inc., 6584 Ruch Rd., Bethlehem, PA 18017-9359, tel. 215-837-0700. —Bruce O. Williams, WA6IVC



## QPC PLUS SPIKE-SPIKER

□ Kalglo Electronics has announced its new model QPC Plus Spike-Spiker®. The QPC Plus has a response time of 1 picosecond and a suppression capacity of 18,200 A and 318.0 Joules. Clamping starts at 131 V, with a maximum let through of 232 V at 50 A. Noise at 10 MHz is suppressed by 38 dB on common mode and 50 dB on differential



## Ameritron AL-1200 HF Linear Amplifier

It's big, and that's good. It's heavy—77 pounds—and that's good, too. In these days of "smaller is better" (for example, hand-held VHF rigs that are barely larger than a pack of cigarettes and all-band transceivers the size of a shoebox), it's refreshing to see some manufacturers building big, heavy boxes and bragging about them. Even with all of the available modern technology, it's still not possible to build a tough, 1500-W-output, multiband HF amplifier with a built-in power supply that fits inside a shoebox and can be lifted with one hand.

The Ameritron AL-1200 allows legal-limit, continuous-duty operation on 160 through 15 meters, including the 10- and 18-MHz WARC bands. It is possible, with a simple modification, to put the amplifier on the 12- and 10-meter bands. The band switch has an extra, unmarked detent position allowing this modification.

All power supplies are built in, and the tube is cooled by a rugged forced-air system. An ALC circuit, hooked up to the transmitter ALC input, prevents amplifier output from exceeding 1500 W in case of excessive drive.

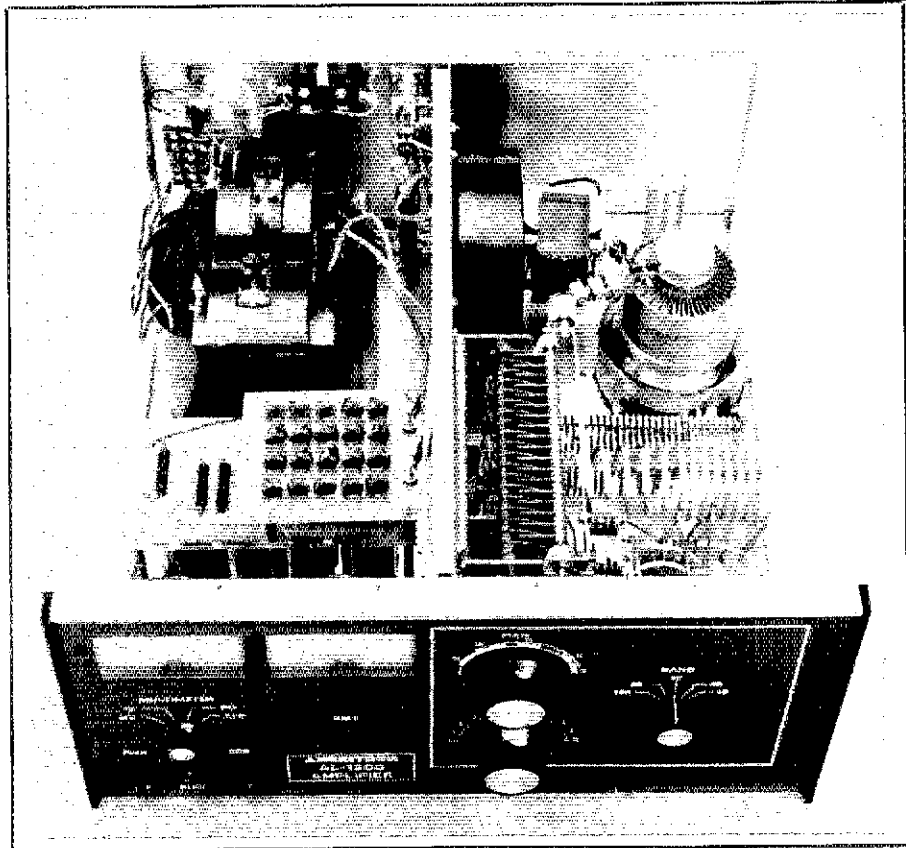
### Inside the Box

Ameritron's AL-1200 is the first commercially built, amateur-band amplifier to use the new EIMAC 3CX1200A7 ceramic/metal triode. This tube is designed to meet the requirements for amplifiers operating at the higher amateur power levels now allowed by the FCC. According to EIMAC, the 3CX1200A7 can be thought of as a ceramic version of the popular 3-1000Z. The 3CX1200A7 has drive, power-output, de-supply and frequency ratings similar to its glass counterpart. It features ceramic and metal construction and a thoriated tungsten filament requiring virtually no warmup time. Grid dissipation is 50 W, so the 3CX1200A7 is more rugged than other ceramic/metal triodes.

But back to the AL-1200. The interior of the amplifier is divided into two sections by a partition between the front and rear panels. The power supplies, metering, ALC circuitry and relays reside on the left side of the partition; the input network, tube, blower and tank components are on the right. When the cover is attached securely with its 30 screws, the RF circuitry is completely enclosed in its RF-tight compartment.

### Power Supply

The full-wave bridge rectifier is built on a PC board and includes five 1-kV PIV, 3-A diodes in each leg of the bridge. Ameritron has included 0.01- $\mu$ F capacitors across each diode for transient suppression, but no equalizing resistors. Filtering is accomplished by eight 210- $\mu$ F, 450-V electrolytic capacitors connected in series for a total filter rating of about 26  $\mu$ F at 3600 V. According to the front-panel HV meter, the power supply delivers about 3400 V under no-load con-



### Ameritron AL-1200 Full-Power Linear Amplifier, Serial No. 033

#### Manufacturer's Claimed Specifications

Frequency coverage: 1.8-2.0 MHz, 3.3-4.4 MHz, 6.3-8.3 MHz, 9.5-15.5 MHz, 15.5-21.5 MHz, 24-29 MHz (export model).  
Modes of operation: SSB, CW.  
Power output: 1500 W, all bands.  
Harmonics and spurious emissions: Not specified.  
Color: Gray front panel, black cabinet.  
Dimensions (height, width, depth): 10 × 17 × 18½ in.  
Weight: 77 lb.

#### Measured in ARRL Lab

As specified.  
As specified.  
See Table 1.  
See Fig. 1.

ditions and 3000 V under full load when connected to a 240-V line regulated to within 3%.

### RF Circuitry

A tuned input circuit is used to provide best linearity and drive characteristics, and the input circuitry is completely shielded in a metal box that attaches to the rear of the front panel. The plate-circuit band switch attaches to the rear of the input-circuit compartment so that the shaft from the front-panel band switch directly drives both the input- and the tank-circuit band switches. This thoughtful arrangement eliminates the need for elaborate chain drives or (heaven forbid!) separate input and output switching. The band switch is the genuine article—a heavy-duty ceramic switch

with 6-kV, 20-A contacts and a firm detent at each band position.

The tube, blower and plate RF choke are mounted on a small chassis at the rear of the amplifier. The blower is mounted to the partition so that it draws air through perforations in the side panel, past the transformer and other power-supply components. The air is forced into the chassis supporting the 3CX1200A7, and it must exit through the EIMAC air system socket, past the tube seals and through the tube cooler. The cabinet top is vented directly above the tube.

The tank circuit, a pi-L network on 160 and 80 meters and a pi network on the other bands, features a 190-pF, 4.5-kV air-variable PLATE tuning capacitor and an 800-pF,

**Table 1**  
**ARRL Laboratory Power Measurements**  
**Ameritron AL-1200 Linear Amplifier**

Band (MHz)	Mode	Plate Current (A)	Plate Voltage (V)	Power Output (W)	Drive Power (W)	Input SWR	Efficiency (%)
1.8	CW	0.700	2950	1150	100	1.24	51
	SSB	0.775	2900	1250*	100	1.29	51
3.5	CW	0.700	2900	1400	100	1.38	64
	SSB	0.775	2900	1500	100	1.30	62
7.0	CW	0.700	2950	1400	100	1.13	63
	SSB	0.775	2900	1500	100	1.21	62
14	CW	0.725	2900	1450	100	1.27	64
	SSB	0.775	2900	1500	100	1.34	62
21	CW	0.750	2900	1200	100	1.44	51
	SSB	0.850	2900	1250*	100	1.32	47
24	CW	0.775	2900	1200	100	2.30	49
	SSB	0.850	2900	1250	100	2.10	47
28	CW	0.700	2950	1000	54	1.70	46
	SSB	0.700	2950	1000	43	2.00	46

\*1500-W output could be obtained with 120-W drive.

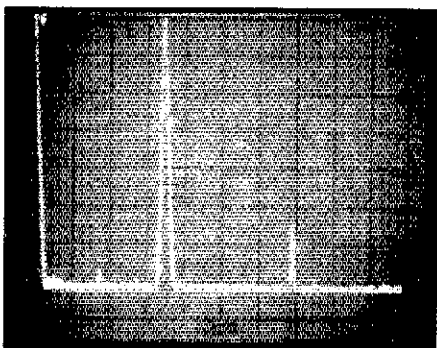


Fig. 1—Worst-case spectral display of the AL-1200 linear amplifier. Power output is 1500 W at 7 MHz. Horizontal divisions are each 2 MHz; vertical divisions are each 10 dB. All spurious and harmonic emissions are at least 54 dB below the fundamental output. The AL-1200 meets current FCC spectral-purity requirements.

1.2-kV air-variable LOAD capacitor. Fixed transmitting-quality ceramic doorknob capacitors are switched in parallel with the tuning capacitor for 160-meter operation, and similar capacitors are switched in parallel with the loading capacitor for 160, 80 and 40 meters.

#### Control Circuitry

The AL-1200 has a CW/SSB front-panel switch, but not for the traditional reasons. Since the FCC changed the Amateur Service power limitations to 1500-W output for both CW and SSB, different operating voltages for each mode are no longer necessary. In this amplifier, the CW/SSB switch changes the value of the Zener-diode voltage in the bias circuit. For SSB (and indeed SSTV or even AM), the tube operates in class AB<sub>2</sub> for best linearity. In the CW mode (for CW or RTTY), the bias is changed so that the tube operates closer to class B for greater efficiency. This feature really works; the efficiency does increase (see Table 1), and the tube dissipates less power. The result is cooler operation in the high-duty-cycle modes, probably leading to longer tube life.

Metering is another area where Ameritron

takes a step forward from traditional amplifier designs to produce an updated scheme for today's power rules. Many more tube failures result from excessive grid current than from excessive plate current, so it is important to monitor grid current at all times. Accordingly, the AL-1200 sports two meters: one constantly monitors grid current; the other, a multimeter, can be switched to monitor plate voltage, plate current, ALC (drive power) or peak RF-output power. During normal operation you would monitor grid current to protect the tube and peak RF-output power to ensure compliance with FCC rules. Dedicated plate-current meters (to monitor input power) are no longer necessary.

#### Construction

Overall, the AL-1200 is well built, although it is not an "overkill" design. The power transformer is impressive for a commercially built amplifier in this price range, as is the size and quality of the blower. Shielding is excellent, and the chassis and cabinet are up to the job of supporting all the weight. Machine screws, not sheet-metal screws, secure the cabinet cover.

The 3/16-in copper tubing used for the 20, 15 and 10-meter tank coil is silver plated. Tank coils are mounted well away from the chassis. Good design practices allow the use of air-variable capacitors, and fixed capacitors in the tank circuit are RF-type ceramics. Not once did I hear the telltale crackling indicative of arc-overs, even when I ran the amplifier at full output into an antenna with a 3:1 SWR.

#### Hookup and Operation

The AL-1200 is shipped in three packages: The 3CX1200A7 is shipped in the manufacturer's original shipping carton; another carton contains the power transformer; and the rest of the unit is in a third box. Ameritron supplies instructions, complete with drawings, for installing the tube and transformer. As shipped, only a few screws are used to secure the cabinet top. The rest come in a small bag to save you the trouble of removing 30 screws before installing the other parts.

Transformer installation takes about 10 minutes—just bolt it in place and connect six clearly marked wires. Tube installation is just

as easy. Firmly seat the tube in the socket, place the chimney in its spring clips, make the anode connection to the tube and you're ready to go (after replacing the 30 screws to secure the cover).

While the cover is off, you may wish to modify the amplifier for use on 12 and 10 meters. This is simple: Just clip the green wire that protrudes from the input compartment, and you're all set. These bands will then be operative in the unmarked position on the band switch. Consult the manufacturer if you have any questions about this modification.

We experienced some problems with our AL-1200. According to the manufacturer, these problems existed with only a few of the earlier serial numbers (ours is no. 33), and they have been taken care of on later units. The first problem, low high voltage, was caused by an improperly wound plate transformer. The second, low power output, was caused by a defective tube. Tom Rauch, W8JI, of Ameritron was exceptionally responsive in helping us track down the problems. He promptly replaced both defective parts, and the AL-1200 worked as specified.

The amplifier is indeed capable of continuous operation at full output power for at least half an hour, as claimed in the promotional literature. In fact, the amplifier case was cooler than our 2-kW dummy load at the end of a half-hour key-down test in the ARRL lab. Thanks to the pi-L output circuit and proper component choice, tuning on 160 and 80 meters is exceptionally smooth. The loading control actually has an effect! The AL-1200 works better on the low bands than on 10 meters, as shown in Table 1. The manufacturer says that the amplifier was designed with low-band operation in mind, and that's probably a good thing during this part of the solar cycle. The extra power really helps on 160 and 80 meters.

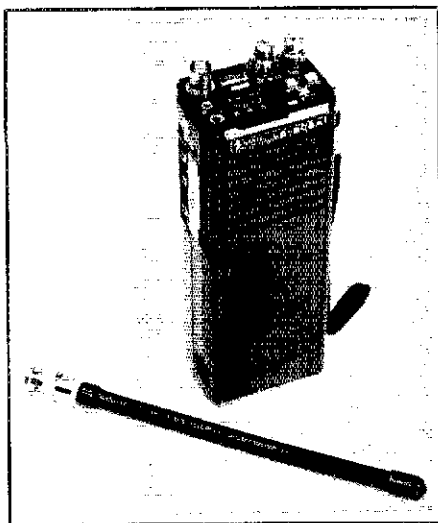
The AL-1200 is worth considering if you're in the market for a companion for your 100-W transceiver. It offers good performance and reliability. Given the cost of the components used in a power amplifier, this amplifier is reasonably priced at \$1695. Manufacturer: Ameritron, Division of Prime Instruments, 9805 Walford Ave., Cleveland, OH 44102, tel. 216-651-1740.—Mark Wilson, AA2Z

#### SANTEC LS-202A 2-METER SSB/FM HAND-HELD TRANSCEIVER

A 2-meter hand-held rig that includes SSB operation? Yes! Imagine having the option of calling through the local repeater or keeping in touch with your friends on sideband while walking (or driving) around town. If a lot of your 2-meter operation is on SSB, and you have resisted the temptation to buy a hand-held transceiver because you don't use the FM repeaters very much, Santec may have just the rig for you.

This versatile radio uses thumbwheel switches for frequency selection, with a slide switch to set +5 kHz offsets. The top panel also includes a MODE switch to select FM, USB or LSB. The on/OFF/VOLUME control and squelch control are mounted as a single concentric unit. RIT and VXO controls make up another concentric pair. (This pair operates only when the MODE switch is set for sideband operation.) There is a slide switch





to turn on a noise blanker, also only operational in the sideband mode. A small D'Arsonval-movement S meter doubles as a battery indicator when the radio is transmitting. A red LED should also light during transmit to indicate good batteries. If the LED does not light, or flashes, the batteries should be replaced. This indicator is handy for nighttime operation. It is also easier to take a quick look at the LED than the meter during mobile operation. A BNC antenna connector and a pair of jacks for an external speaker/microphone (2.5-mm jack for the mic and a 1/8-inch jack for the speaker) round out the top-panel complement.

A number of controls are located along the left side of the radio. The PTT switch is operated by a bar conveniently located toward the front of the radio on this side. Three slide switches are found behind the PTT bar. One slide switch selects +600 kHz offset, -600 kHz offset or simplex operation. Another selects either of two power levels. Slide the TONE switch on, and the radio transmits a short 1750-Hz signal when the push-to-talk bar is pressed. Some repeaters require such a signal for access. On the left side, near the top, is a yellow button labeled LAMP. Press this button and a pair of green LEDs light on the top panel. The idea is to illuminate the S meter and the frequency-set thumbwheel switches, although I never found the lamps helpful when trying to set a frequency in the dark. A jack for the wall-transformer battery charger is located on the left side, near the bottom.

There is a wrist strap attached to the top right side of the radio. It is easy to hold the radio securely with this strap slipped around a wrist. A metal belt clip slides into a slot on the back of the radio. I found that the radio has a tendency to slide off a belt if carried in this manner. The top portion of the front panel sports a grille with raised horizontal bars. The openings for the built-in speaker and microphone are in the bottoms of these bars. This protects the speaker, mic and other internal components from dust or even water that might tend to enter through a flat grille. The case is made of a very heavy, dark-green plastic.

The slide-on battery pack takes up the bottom rear quarter of the radio. The battery pack locks securely in place by means of a notch in the battery right side panel and a

## Santec LS-202A Hand-Held 2-Meter FM and SSB Transceiver, Serial No. 1197

### Manufacturer's Claimed Specifications

Frequency coverage: 144.000-147.995 MHz in 5-kHz steps.  
 VXO range:  $\pm 5$  kHz.  
 RIT range:  $\pm 1$  kHz.  
 Modes of operation: FM, LSB, USB.  
 S-meter sensitivity ( $\mu$ V for S9 reading): Not specified.

### Transmitter

Transmitter power (output):  
 High: 1.5 W at 7.2 V.  
       3.5 W at 10.8 V.  
 Low: 0.5 W at 9.0 V.  
       Not specified at 7.2 V.  
 Carrier Suppression: Not specified.  
 Third-order intermodulation distortion dynamic range:  
 Not specified.  
 Harmonic and spurious suppression: 60 dB.

### Receiver

Receiver sensitivity: Less than 0.25  $\mu$ V for 10-dB signal-to-noise ratio.

### Measured in ARRL Lab

As specified.  
 $\pm 5.8$  kHz.  
 $\pm 2.8$  kHz.  
 As specified.  
 50.

### Transmitter Dynamic Testing

1.8 W.  
 3.8 W.  
 0.5 W at 10.8 V.  
 0.2 W.  
 See Fig. 2.  
 See Fig. 3.

See Fig. 4.

### Receiver Dynamic Testing

Noise floor (Minimum discernible signal) (dBm): -138.  
 Blocking dynamic range (dB): 112.  
 Two-tone, third-order intermodulation distortion dynamic range (dB): 81.  
 Third-order input intercept (dBm): -16.5.

Receiver audio output at 10% total harmonic distortion:

More than 400 mW.  
 Squelch sensitivity: Not specified.  
 Color: Dark green.

400 mW.  
 0.07  $\mu$ V min, 0.3  $\mu$ V max.

Size (height, width, depth): 7 x 2.5 x 2 inches including projections (except antenna).

Weight: Approximately 1 lb with battery and antenna.

sliding catch on the case. Connections for the optional mobile console appear to be included on the radio bottom, although the operator's manual makes no mention of them. Markings indicate + and - terminals, along with a pair of connections marked LAMP and TXB. These connections are recessed 7/32 of an inch into the bottom. The schematic diagram leads me to believe that the + and - terminals may serve to power the radio or be used with a drop-in quick-charge unit, although no quick charger is listed as an accessory.

### Circuit Description

#### Receiver Section

The receiver uses single conversion on SSB and double conversion on FM. Signals are routed from the antenna through a low-pass filter and then to the RF amplifier stage. From there the signals go through a band-pass filter and are mixed with an oscillator output to produce a signal at the first IF, 10.695 MHz. Depending on the MODE switch setting, the signal is then sent either to the FM or the SSB IF section.

In the SSB IF section, the signal goes through a crystal filter, is amplified and detected by a diode-ring product detector. The FM IF section uses a different crystal filter and amplifier. A 10.24-MHz PLL-oscillator signal is mixed with the 10.695-MHz first-IF FM signals to produce a signal at the second IF, 455 kHz. A single IC provides a limiter amplifier, quadrature detector, active filter and squelch circuit.

The detected FM or SSB signal is finally routed to an audio amplifier that drives the speaker. An AGC signal is derived from the product-detector output during SSB operation. The S meter is driven by the product-detector output in the SSB mode and by the second-IF output in the FM mode.

#### Transmitter Section

In the FM mode, a voltage-controlled-

oscillator (VCO) generates a carrier signal at 10.695 MHz. This is mixed with the PLL heterodyne oscillator and doubled in frequency to attain the final output signal. An IC amplifier limits the microphone audio frequency to less than 3 kHz and amplifies this signal.

For SSB operation, a VCO generates a 10.6935-MHz carrier signal for USB and a 10.6965-MHz signal for LSB operation. This carrier is mixed with the microphone audio in an IC balanced modulator to produce a double-sideband, suppressed-carrier signal. This signal then passes through a filter to remove the unwanted sideband before being mixed with the output from a PLL oscillator to generate the final signal. Four stages of amplification increase the signal to the 2.5-W level.

The PLL unit uses crystal oscillators to generate the various signals, such as the 10.24-MHz master oscillator signal, which is divided by 2048 to produce a 5-kHz reference signal. The +5 kHz output switch also selects the proper crystal oscillator for the desired output. The RIT and VXO circuits for varying the SSB operating frequencies are included in the PLL section. An out-of-lock signal prevents the LS-202A from transmitting if the PLL circuitry is not locked.

### Operating the Radio

The LS-202A operating manual is nicely illustrated and clearly written—even if some of the English seems a bit broken. It is much better than some of the manuals that I have seen for imported equipment. But even without quickly going through the manual to become familiar with the operating details, you should have no trouble figuring out how to turn this rig on and "make it play." All controls are clearly marked, or their function is obvious to anyone who is even remotely familiar with radio equipment.

Battery packs available for the LS-202A range from 7.2 V to 10.8 V. The radio includes an IC voltage regulator, so it can be



operated from a supply in the range of 7 to 12 V. You are cautioned against connecting the rig directly to an automobile battery; the voltage-regulator output on most vehicles is in the range of 13.8 V, and that could easily damage the radio.

The standard battery pack holds six AA cells. One set of batteries comes with the radio. These are alkaline cells, recommended over carbon-zinc ones. There is no recharger included, since you should not recharge alkaline cells. After a short time I replaced the original batteries with NiCd AA cells, and was able to have a fresh set charged up and ready to go into the holder throughout the review period.

About a month after the radio for review was received, a package of accessories arrived. Included was the high-power NiCd battery pack, model NP-9. This is a 10.8-V, 450-mAh battery. With it, the radio produces about 3.5 W of output power. The wall-transformer unit that comes with this battery pack will recharge the battery in about six hours. You can also operate the radio with the charger plugged in, although I did notice a slight amount of ac hum on the transmitted signal if the battery was very low.

Another accessory item was a speaker/microphone. This is a most welcome addition if you plan to use the radio for any mobile operating. It is also very convenient to clip the radio to your belt and the speaker/mic to a shirt pocket while walking. The audio from the external speaker is not quite as clear as that from the internal one, but there seemed to be little if any difference in transmitted audio using the built-in or external microphones.

I was able to work into quite a few repeaters throughout the central Connecticut area. I had to keep the power switch in the HI position almost all of the time for reliable access to the repeaters. Of course, that is more because of terrain and distance to the repeater than any other factor. Using an eight-element log-periodic array suspended from the rafters in my attic I was able to work Chuck Hutchinson, K8CH, on SSB. His station is located about 20 air miles from mine. I was also able to work Mark Wilson, AA2Z, with no trouble, but Mark's station is only about 12 air miles away.

Later on, I mounted a Cushcraft A144-20T VHF Twist antenna on my roof. This antenna provides 10 elements with vertical polarization and 10 with horizontal polarization. Instead of phasing the two sets of elements to obtain circular polarization, I used one feed line to the vertical elements and one to the horizontal ones. That way I can choose the best antenna for FM repeater use or for SSB operation. With this rotatable array I am able to work through many more repeaters, and I have logged a number of other stations on SSB. With only 3.5 W of output power, I can definitely hear more stations on SSB than I can work, however!

A single battery charge can last a week or more if you are using it mostly to monitor a frequency for an hour or so a day and seldom transmitting, even on low power. If you are doing much transmitting, especially on high power, the battery may last less than an hour. If you are using the unit on SSB, the battery life seems to be extended by quite a bit. The manual claims that SSB operation extends the battery life three to four times over FM operation. I made no attempt to measure this, but

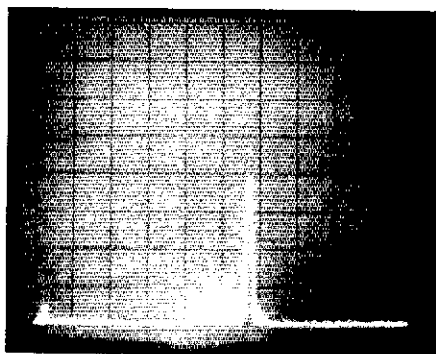


Fig. 2—Spectral display of the LS-20A operating on LSB with no modulation. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz.

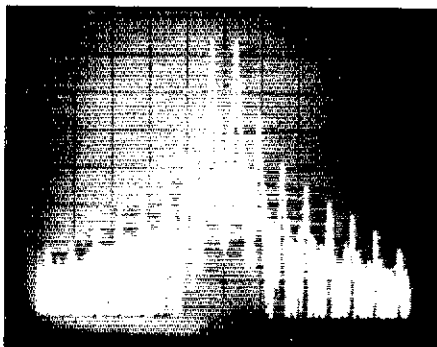


Fig. 3—Spectral display of the LS-20A undergoing two-tone, third-order intermodulation distortion test. Transmitter output is 1.4 W. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz.

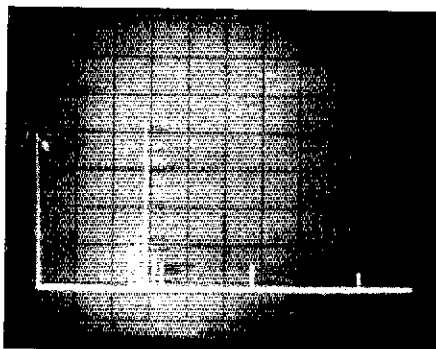


Fig. 4—Spectral display of the LS-20A operating on FM at 1.8-W output. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. The LS-20A complies with current FCC requirements for spectral purity.

with the reduced duty cycle of an SSB transmission as compared to an FM transmission, it certainly seems possible.

#### On-The-Air Impressions

Received audio reports were usually of excellent quality signals on FM (as long as I was able to work the repeater reliably). I did not receive any complaints of distorted audio or other problems. The quality is generally good on SSB, with one exception. There is a

noticeable amount of carrier transmitted with the SSB signal. I did receive a couple of reports about this, and a lab check with the spectrum analyzer confirmed it. Fig. 2 shows the LSB spectral output, with no modulation present. The large pip to the right of center represents the carrier, while the small, wider "hump" to the left represents noise generated in the radio that is being passed by the sideband filter. If the receiving station tunes properly, this carrier should not be objectionable, and the radio does meet the manufacturer's specifications for carrier suppression.

Fig. 3 shows the spectral display for the transmitter two-tone IMD test. The upper sideband distortion products are a little greater than the corresponding lower sideband products, and by comparison to other "standard" SSB rigs we might expect them to be reduced a bit more. But when you consider the size of this radio and the type of use that it can expect, the output is acceptable.

Fig. 4 is the spectral output of the radio operating in the FM mode. The tallest line represents the carrier frequency. This is a fairly typical FM spectral display.

#### Conclusion

I really can't find much fault with the LS-20A. It is simple to operate and does a fine job for its intended purpose. It lacks a lot of the bells and whistles found on many hand-held rigs today such as frequency memories, scanning features, DTMF (dual-tone multi-frequency) pad for autopatch calls, and so on, but it doesn't have the high price tag either! The SSB feature is a definite plus if there is much activity on this mode in your area. All in all, it is a fine radio.

One area that I might complain about is the tight spacing on the on/OFF/VOLUME, SQUELCH, RIT and VFO controls. My big fingers had a hard time finding the bottom, or outer knob on the concentric controls. Even though these knobs are a bit larger than the top or center controls, I still tend to turn both when I only want to adjust the bottom one. I also have a tendency to turn the adjacent set while turning the one I want. In other words, when I am adjusting the RIT control during SSB operation, I am likely to change the volume and squelch settings. The layout is very tight to fit even these few controls on the top panel. I don't see any way that the situation could be improved, but prospective buyers should decide how difficult it will be for them to operate the controls properly.

The frequency-setting thumbwheel switches are recessed a bit into the top panel, and the megahertz and 10-kilohertz switches are very close to the edge of the recessed area. I find them somewhat difficult to turn, but then my fingers don't always do what I expect them to. I also found that I am likely to turn two of the switches at once. It sometimes takes a bit longer than expected to dial in a specific frequency. I have found these same problems with other radios using thumbwheel switches, so it is not a problem specific to this radio.

The LS-20A is available from ENCOMM, Inc., 2000 Avenue G, Suite 800, Plano, TX 75074, tel. 214-423-0024, or from any authorized dealer. Price class: LS-20A, \$280; NP-9 quick-rechargeable NiCd 10.8-V battery pack, \$43; CA-110E ac charger for NP-9, \$18; SH-1 speaker/microphone, \$25; LA-207 speaker/30-W amplifier, \$160.—Larry D. Wolfgang, WA3VIL

## A CONVENIENT MOBILE MOUNT

□ Here is a sturdy mobile bracket for your 2-meter rig. The cost is very low, and I constructed and installed mine in about two hours.

My IC-255A measures  $2\frac{1}{2} \times 7\frac{1}{4} \times 9$  inches (HWD), so I present dimensions that suit it. Change the dimensions as necessary for your radio. Allow about  $\frac{1}{4}$  inch for bending of the sheet when laying out the dimensions.

Begin with a sheet of galvanized steel about  $6 \times 17$  inches. Use metal that is thick enough to prevent flexing, but that allows neat and easy bending. Fig. 1 illustrates the finished product. You can easily make a smooth, straight,  $90^\circ$  bend as follows: Draw a bend line on the sheet, place a small board with one edge on the bend line and clamp both pieces in a vise, and bend the sheet over the board. The results look professional.

The finished bracket is open from front to rear so that the speaker is exposed and connections can be made *before* inserting the rig into the bracket. A scrap piece of  $3/16$ - or  $1/4$ -inch-thick plywood or Masonite™ is inserted inside the bracket below the top. Drill two or three  $3/16$ -inch holes through the wood and bracket for attachment to the dashboard. Flat-head bolts, countersunk into the wood piece, cannot scratch the radio.

To keep the rig from sliding through the back of the bracket, use pliers to bend the rear corners of the bracket upward. Incline the bracket slightly so that the rig cannot slide toward you. This also makes the readout more visible. A coat of paint provides a finished appearance.—*P. K. Hurlbut, N5DHN, Midland, Texas*

## A SUPER GROMMET FOR MOBILE INSTALLATIONS

□ I ran across an easy solution to a problem while installing my HF rig in the car. My problem was, as in past installations, how to protect the power cable where it passes through the firewall. The cable is much too large to go through the normal wiring-harness grommet.

I went to the local auto parts house and, after browsing for a few moments, came up with a replacement grommet for a PCV valve, which fits into an auto valve cover. A 1-in hole would accommodate the grommet. Having done the "hole-saw routine" on the firewall, I found that the thicker side of the grommet, although of a smaller diameter, would not press into the hole. Once I reversed the grommet, a screwdriver easily pushed the thinner, but wider, side through the hole. There is now a perfect  $\frac{3}{4}$ -inch hole through which to pull the cables, with no chance of damage from sharp edges. The cost of the grommet was about \$1.50.—*G. B. "Jim" Lane, II, N5DC, Kingwood, Texas*

## RFI TO THE KENWOOD TS-430S

□ It was much to my pleasure that my friend, AF1U, decided to replace his old rig with a new Kenwood TS-430S. (I picked up the old rig as a standby.) After several weeks, George

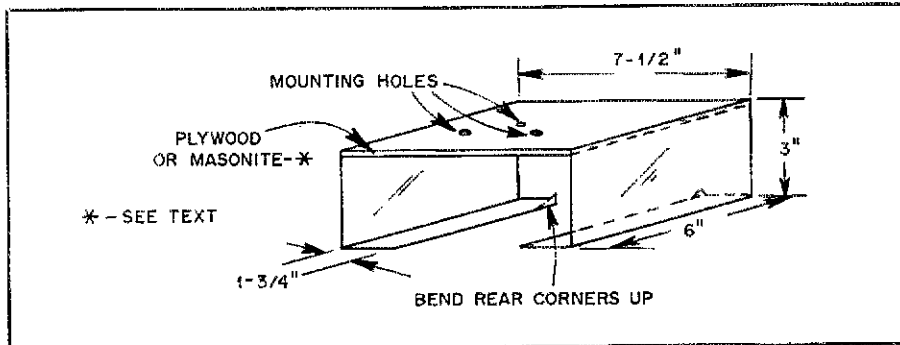


Fig. 1—N5DHN's drop-in mobile mount.

called to confess that he thought the change was a mistake. His new '430 would not operate with his SB-220 amplifier on 20-meter CW. He had never before encountered this problem.

When I visited him to see if I could help solve the problem, George had set up the '430 and '220 on the 20-meter band. The combination locked in a key-down condition when the first code element was sent. We first checked the keyer for a malfunction, but found no problem. RF was affecting the sensitive circuitry of the '430—but how? Next, I eliminated all leads exiting the radio except for the antenna lead and key line, but the problem remained. Although the key line was a shielded wire, I suspected it as an RF path into the '430. To solve this problem, I wound five turns of the key line on a toroid core, very close to the key jack. This solved the problem nicely. My friend George is, once again, happily operating on 20-meter CW.—*Louis Parascondola, WAIGSO, Ridgefield, Connecticut*

## THREE-TERMINAL REGULATOR SUPPLIER

□ The June 1985 Hints and Kinks column (p. 40) showed an incorrect address for Active Electronics (a supplier for the Texas Instruments 7810 voltage-regulator IC). You can contact Active Electronics at P.O. Box 9100, Westboro, MA 01581, tel. 1-800-343-0874 (outside Massachusetts) or 1-617-366-0500.—*Bob Schetgen, KU7G, ARRL Staff*

## TVI AND THE HEATH SB-230

□ I experienced TVI trouble with my SB-230 amplifier. The TVI was not appreciably reduced by improving the PA compartment shield. For significant TVI reduction, the open-frame antenna relay must be enclosed (with copper-clad circuit board or equivalent), the outer conductors of all coaxial cable leads must be soldered to the relay enclosure, and both coil leads must be brought into the enclosure via feedthrough capacitors. Solidly connect this new relay enclosure to the chassis of the SB-230.—*Bob Loving, Jr., K9JU, Streamwood, Illinois*

## SOME CALCULATOR KINKS

□ Whether at work, school or home, many hams use a hand-held calculator. Many calculators on the market combine LCD and CMOS technologies for low-current operation and use thin plastic printed-circuit "film" to connect the components. (My calculator, a TI-55™, is made by Texas Instruments.)

These calculators run on very low current and use two button-style flat batteries. It is important to maintain a good connection between the batteries and their film-circuit contacts; poor contact causes the calculator to operate erratically, with absurd display readouts.

When this happens, most people replace the batteries. I find that this problem comes up about every three months—a little too often! Inspection reveals that a layer of black oxidized metal coats the contacts—the result of a reaction between two dissimilar metals. Normal operation is restored by lightly scraping away this coating with a very blunt knife blade (liquid cleaners are deemed too risky). The copper layer on the circuit plastic is very thin, so it is important to avoid cutting it with a sharp or abrasive tool. This kink has allowed me to use one set of batteries for nine months, so far. (Those experiencing trouble with a TI-55 II should call 1-800-TICARES weekdays from 10 AM to 5 PM, Central time, even if the warranty is expired.)

If one resides in an area of high humidity (as the southeastern U.S.), corrosion on IC leads may eventually render calculators and other electronic gear inoperable. A silica-gel pack placed inside of the equipment case should prolong circuit life. Happy calculating!—*Robert Atkinson, K5UJ, University, Mississippi*

## HEATH HX-1681 ALIGNMENT

□ It is not necessary to use the internal meter for alignment checks on the HX-1681 HFO/mixer board after the transmitter is first assembled. Use an 11-MΩ meter instead and connect it between TP C on the HFO/mixer board and ground. Use the 1.5-V range.

Typical measured voltages do not correlate perfectly between the internal-meter readings and those of the external meter because the

**Table 1**  
Internal Vs. External Meter Readings for Alignment of the HX-1681

Manual Page	Band	Internal Meter (Lower Scale)	External Meter (V) (11-M $\Omega$ Input Z)
116†	80 m	3	0.30
	40 m	2	0.23
	20 m	not avail.	0.44
	15 m	not avail.	0.32
	10 m	3	0.33
117††	80 m	10	1.24
	40 m	7.5	0.75
	20 m	5	0.50
	15 m	2	0.26
	10 m	1.5	0.22

†HFO-level adjustment

††band-pass filter adjustment

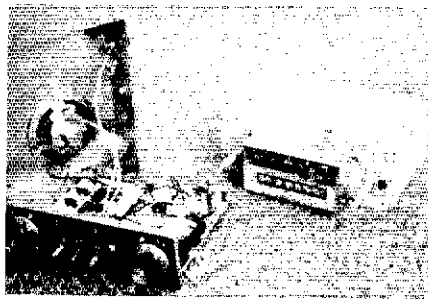


Fig. 2—A “junk” auto radio and a finished project built into a similar surplus chassis.

meters load the diode rectifier circuit on the HFO/mixer board differently.

In general, a meter reading of 3 on the lower scale of the internal meter corresponds to 0.3 V on an external meter. Table 1 summarizes measurements obtained during alignment with an external meter. Reasonable variation from the values in Table 1 can be expected: The manual suggests plus or minus 10%.—Herbert L. Ley, Jr., N3CDR, Rockville, Maryland

## SOURCES OF AUDIO-FREQUENCY TONES FOR ALIGNMENT

□ Alignment or tests of transmitters and other ham gear sometimes require a source of low-level sine-wave audio. Some technicians whistle into the microphone—at best, a very poor substitute for an audio signal generator. [Those wishing to build an inexpensive audio signal generator should look at “A Simple Function Generator,” *QST*, May 1984—Ed.]

I sometimes tune my receiver near a harmonic of the crystal calibrator to produce the desired tone (usually around 1000 Hz). This tone is then fed into the circuit to be tested. An attenuator must be used at the receiver output (a few hundred ohms is adequate) to decouple any power supply hum in the receiver output stage and to set the level of the desired tone. Avoid overloading the circuit under test and use available equipment, such as a sensitive voltmeter or oscilloscope to monitor the signal level. Keep the output load on the receiver or recorder during these tests. Shield all connecting leads to avoid hum and RF pickup. The tone frequency can be closely estimated by noting the difference between the zero-beat and desired-tone dial readings.

If your set is a transceiver, the desired tone or tones can be recorded on magnetic tape and played back when necessary. There is no substitute for a good audio oscillator, but this trick has done the job on a few occasions.—Cornelio Nouel, KG5B, Brownsville, Texas

## PROJECT CASES FROM OLD RADIOS

□ I have come across an idea that will be of interest to anyone who needs enclosures for small electronic projects. (See Fig. 2.) I work as a radio technician in the auto-sound

business. Over the years, I've accumulated many “basket cases”: car radios, tape players, and so on. Not only do the parts come in handy for projects, but the stripped chassis are ideal cabinets for many projects. For example, I needed a box with two holes for potentiometers. Nearly all auto radios have two control shafts—right? The 2 × 4-inch “nose” opening can be covered with ¼-inch-thick plastic, which has been drilled for LEDs, switches, jacks or any other front-panel components. The chassis are metal, and the bottoms are pre-punched with numerous holes to mount circuit boards and other parts. The finished cabinet is very sturdy. Metal cases are excellent RF shields and often come with finished top and bottom covers, which are already secured with screws.

Most auto-radio shops, with repair and installation facilities, have junk radios that you can salvage or buy very cheaply.—Robert B. Gooch, N3DRW, Baltimore, Maryland

## FILL THOSE HOLES!

□ I have found some “neat stuff” for filling holes in faceplates or chassis. It is an inexpensive automotive product called Liquid Solder. It is available from most auto-parts stores. Once applied and dry, it can be sanded smooth. This should interest home builders who often work with surplus chassis or panels.—Patrick Riggins, KA4ZNU, Knoxville, Tennessee

## REPLACEMENT OUTPUT TRANSFORMERS FOR OLDER VACUUM-TUBE RADIOS

□ While trying to revive an old vacuum-tube receiver, I found that the audio-output transformer had an open primary winding. Efforts to locate a replacement proved unsuccessful. A search through the junk box, however, produced a 117- to 6.3-V, 0.5-A, filament transformer of about the right size. Since the impedance ratio is the square of the voltage ratio, it occurred to me that this transformer might do the job. With an impedance ratio of nearly 400, the reflected load in the primary would be around 3000  $\Omega$ , when an 8- $\Omega$  speaker is used. The output tube actually called for a load of 5000  $\Omega$ , but I decided to give the transformer a try anyway. Results were surprisingly good, and the set, a fairly expensive one in its day, came back to life. I have not tried a 16- $\Omega$  speaker, which would double the reflected load on the tube, but the audio available with the original speaker is enough to drive me out of the room.

If an oscillation should occur, it may be necessary to transpose the primary-lead connections or replace the shaping capacitor, which is usually found across the primary winding. A 0.01- $\mu$ F (600 V) capacitor should be about right. In some cases, a negative-feedback resistor of about 1 M $\Omega$  may be connected from the output-tube plate to the driver-tube plate to reduce hum and distortion.

If the turns ratio of a transformer is not known, it can be determined by feeding a small voltage to one winding while measuring the voltage at the other winding. (Use extreme caution! High voltages can be present.) Do not use a lamp or motor control, which produces spikes, to control the low voltage, since this will give erroneous readings and may damage the transformer.—Cornelio Nouel, KG5B, Brownsville, Texas

## MORE CABLE TIES

□ Have you seen those garbage-bag ties that always seem to outnumber the bags? They make fine cable ties. Commercial nylon ties are expensive and hard to come by unless you have a good electronics supply house in your area. Also, commercial nylon ties can be used only once because you must cut them to remove them. Garbage-bag ties are adjustable, reusable and can be linked together to provide any length you need. I've also used these ties to secure coax along my antenna mast. They may not last as long in the weather as the commercial ties, but they've lasted a couple of years, so far, in the Northeast.—Ray Avery, WA2RRS, Vestal, New York

## THREADED FASTENERS AS COIL FORMS

□ In Hints and Kinks for May 1979 (p. 45), there is a clever idea for the use of small, plastic screws as coil forms. The basic idea is to select a screw of some appropriate diameter and thread pitch, wind the coil on the screw using the threads as a guide, secure the coil to a mechanical support, and connect it into the circuit.

The person submitting the idea suggests that a disadvantage to the technique is that, “... one cannot tune such a coil by adjusting the spacing between turns.”

It seems to me that once the coil is mechanically secured in place, the screw can be removed by simply unscrewing it from the coil. Then the coil can be adjusted easily.

If the screw is removed once the coil is formed, there is no need to limit oneself to using plastic screws. Metal screws come in a wide variety of diameters and thread pitches that are useful as coil forms.—Robert C. Arge, NY6W, Covelo, California

## COATS VS. “RUBBER DUCKIES”

□ Don't wear a VHF transceiver with a flexible antenna under your coat. Some brands of “rubber ducky” antennas may be disassembled by unscrewing the connector from the rubber body: Coat friction does this easily. I learned my lesson by losing the tops of two different antenna models in eight days. (Both were returned, but not everyone can be lucky enough to lose them at church!)—David T. Geiser, WA2ANU, New Hartford, New York

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

## HART'S LOOP ANTENNA

□ In their article describing the recent ARRL antenna-design contest, Hall and Schetgen stated that the gain of the loop antenna entered in the contest approaches that of a dipole.<sup>1</sup> In Technical Correspondence for July, Ted Hart, W5QJR (who entered the loop in the contest), claims his loop has a gain figure that considerably exceeds that of a dipole.<sup>2</sup> However, Hart's claim is not valid, as I will explain.

Hart stated that in free space the patterns of the loop and dipole are the same. This is fundamentally true for the *shape*, or directivity of the patterns, but only if their electrical lengths are similar. As the lengths become very short, the patterns approach a cosine plot, and the familiar "figure 8" pattern becomes two circles tangent to each other. However, the *size* of the patterns will be the same (and thus the gain) only if the I<sup>2</sup>R losses in the two antennas are also the same. Hart's claim is that the loop gain increases to 8.16 dBi (6 dBd) when it is mounted close to perfect ground. This is a theoretical gain figure obtained from the vector addition of the fields associated with the direct and ground-reflected waves in the far field in the directions where the two fields are in phase (6 dB results from field doubling because of the addition of the two *equal* fields of the direct and ground-reflected waves when there is no loss of field because of ground absorption on reflection).

What Hart seems to have overlooked is that the ground affords the same gain treatment on reflection for the dipole as it does for the loop. So, if the free-space gains of the dipole and loop are identical, and if the two antennas are mounted so that their respective fields are oriented identically relative to ground, then their gains resulting from ground reflections are also identical. Thus, the loop gain is 0 dBd, not 6 dBd. Since Hart's loop is electrically short (except on the higher HF bands), however, its pattern approaches the cosine shape, with somewhat less gain than that of a half-wave dipole. Hall and Schetgen's statement that Hart's loop gain *approaches* that of a dipole is evidently correct.

Hart also contends that with horizontal polarization there is little difference (in gain) between good ground and poor ground, and that with vertical polarization poor ground provides increased signal relative to good ground for elevation angles above 18°. His contention concerning horizontal polarization is overly simplistic and misleading, and that concerning vertical polarization is incorrect. With horizontal polarization the height of the antenna and the angle of incidence at the point of reflection are crucial to reflective gain. For heights less than 0.25 λ, the gain

with real ground is degraded at all angles of incidence relative to that with perfectly conductive ground, because of direct absorption of energy from the induction field as it intersects the ground—the poorer the ground (and the lower the antenna), the greater the degradation. At heights of 0.25 λ and greater, the reflective gain at high angles of incidence is also less with poor ground than with good ground because of the greater absorption. However, at heights greater than 0.25 λ with low, grazing angles of incidence, there is some truth in Hart's statement that there is little difference in gain between good and poor ground. With vertical polarization, I can find no evidence in the professional literature to support Hart's contention that poor ground provides a greater signal than good ground at elevation angles greater than 18° (or for any elevation angle). On the contrary, the literature I've researched indicates just the opposite. Radiation patterns appearing in Jordan and Balmain are typical examples.<sup>3</sup>—Walt Maxwell, W2DU, ARRL TA, 243 N. Cranor Ave., Deland, FL 32720

<sup>3</sup>Jordan and Balmain, *Electromagnetic Waves and Radiation Systems* (Englewood Cliffs: Prentice-Hall, 1968), Figs. 16-3, -4, -7 and -8 through -11.

## CW SHAPER UPDATE

□ It's relatively easy to adapt the CW Shaper for use with grid-block-keyed systems.<sup>4</sup> All that is required is to use a positive-ground hookup as shown in Fig. 1(B). Connect the key ground as shown and use a PNP transistor for Q1. Q1 may be any small-signal transistor with a V<sub>ceo</sub> greater than the grid-blocking voltage to be keyed. Note that the functions of the RELEASE and ATTACK potentiometers will be reversed.

I know of one individual who attempted to use the CW Shaper to key a transceiver with a built-in keyer. Such an arrangement will not work; the Shaper must be placed after the keyer—between the keyer output and the keyed line.—Eric P. Nichols, KL7AJ, P.O. Box 0, North Pole, AK 99705

## SUPER-DUPER BUBBLE

□ I would like to suggest a more efficient bubble-sorting algorithm be used in place of the one offered by George Allison in his article, "Super Duper" (QST, September 1985). Mr. Allison's sort requires repetitive

<sup>4</sup>E. P. Nichols, "Try This Versatile CW Shaper," QST, December 1984, p. 29.

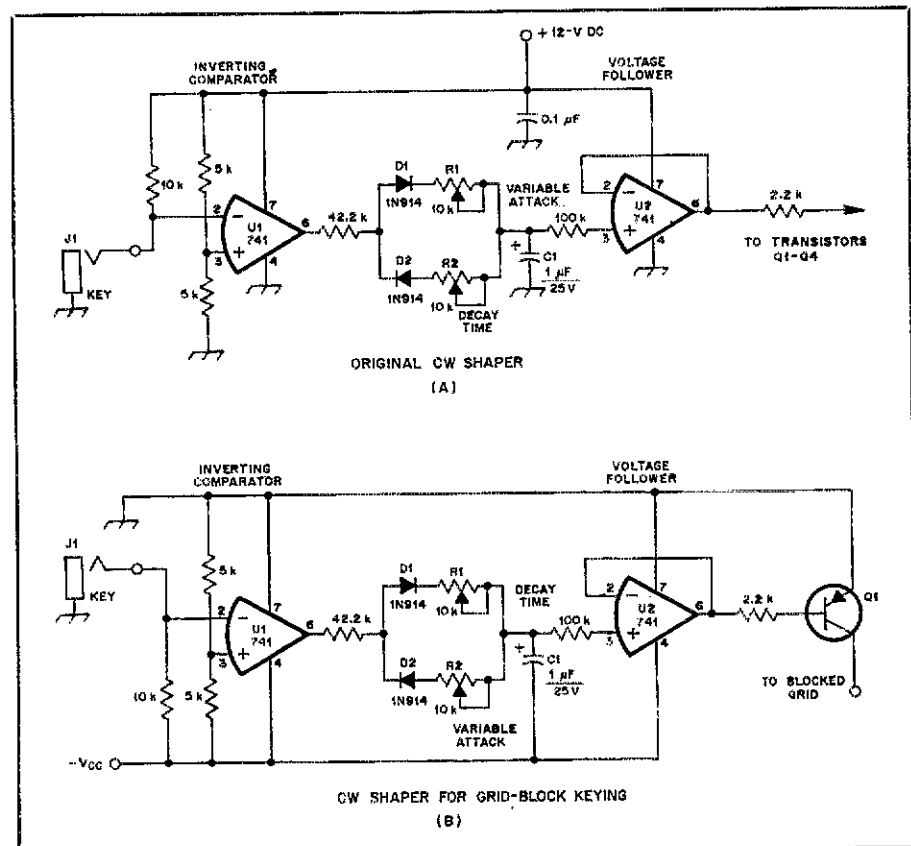


Fig. 1—The basic circuit of the original CW Shaper at A. At B, the CW Shaper configured for use with grid-block-keyed systems.

<sup>1</sup>J. Hall and B. Schetgen, "Six Winners Emerge from the ARRL Antenna Competition," QST, February 1985, pp. 44-47.

<sup>2</sup>T. Hart, "The Loop Transmitting Antenna," Technical Correspondence, QST, July 1985, p. 42.

**Table 1**  
Replacement Bubble Sort Routine for the "Super Duper"

```

26Ø REM **** BUBBLE SORT ****
27Ø FOR I = Ø TO CT-2
28Ø SF = I
29Ø IF Q$(SF, 1) LE Q$(SF + 1, 1) THEN GOTO 35Ø
30Ø FOR J = 1 TO 7
31Ø SWAP Q$(SF, J), Q$(SF + 1, J)
32Ø NEXT J
33Ø SF = SF - 1
34Ø IF SF GT - 1 THEN GOTO 29Ø
35Ø NEXT I
36Ø REM **** CONTINUE ****

```

**Table 2**  
Batch File Listing

```

"LOG.BAT"
COPY *.* C:
C:
BASICA LOG
COPY LOGDATA D:
COPY LOGINDEX D:
D: ^Z

```

mechanical disk drive, and "C:" is the RAM disk. The BASICA LOG calls the program, and when finished, the COPY commands transfer the data to the mechanical disk drive.

A file that would take an hour to sort with the bubble routine can often be done in a few minutes using the Shell-Metzner algorithm. It works by sorting successive decreasing increments of the data file. A routine for the IBM PC is shown in Table 3.

Before the listing of Table 3 is used, a routine must be written to find the total number of records in the file; this becomes the NO.OF.RECORDS%. Also, the data to be sorted needs to be read into the SRT\$ array. Then, between line 9Ø and 1ØØ, additional program lines must be added to read and write the data associated with the two files to be swapped. I realize that this is not a complete listing as the routine before the algorithm and the lines between 9Ø and 1ØØ is dependent on your particular program and may be only useful for those with some programming experience. But those who can apply this routine to their programs will find it well worth the time invested. The routine in my program sorts 210 records in 40 seconds!—Paul Wisiolek, KITKL, 1911 Grant Ave., No. 2, Redondo Beach, CA 90278

**MORE ON TRIMLINE® RFI**

I experienced telephone RFI problems similar to those reported by Ralph A. Dage,

W8PHZ, in "Trimline Telephone Interference," Technical Correspondence, QST, August 1985. My neighbor has a wall-mounted Trimline, and while the phone was on-hook he could hear my 20-meter signal. My solution to the problem is simple. I wrapped six turns of the telephone coil cord (near to the point it plugs into the wall receptacle) around an Amidon FT240-43 core. My neighbor doesn't hear me any longer. —Ken Reid, WØKCL, 2416 B Ave. NE, Cedar Rapids, IA 52402

**RFI—DON'T PHONE HOME**

QST readers might be interested to know that AT&T offers a small telephone filter. The Z100A is priced at \$10.95, is equipped with modular plugs, comes with a money-back guarantee, and is available at AT&T phone centers.

I use Miller No. 6302 chokes in the red and green telephone leads. These chokes have an inductance of 2.5 mH, a minimum resonant frequency of 1.3 MHz and a 9-ohm dc resistance. These chokes have eliminated all my telephone RFI from 160 through 10 meters.—Harry L. Luhrman, W4PZV, 1411 Curandis Cir., Lake Clarke Shores, FL 33406

**Feedback**

Make the following corrections to the November 1985 QST Loop Skywire article by Dave Fisher, WØMHS. On page 21, in the third column where the 80- and 40-meter measurements are given, the 80-meter antenna is an 80- to 10-meter loop. Line 15 in the second column on page 22 should read "... frequencies below ..." Also, Earlham College is in Indiana.

**Table 3**  
Shell-Metzner Sort

```

1Ø M% = NO.OF.RECORDS%
2Ø M% = INT(M%/2)
3Ø IF M% = Ø THEN 15Ø
4Ø K% = NO.OF.RECORDS% - M%
5Ø J% = 1
6Ø I% = J%
7Ø L% = I% + M%
8Ø IF SRT$(I%) < = SRT$(L%) THEN 12Ø
9Ø SWAP SRT$(I%), SRT$(L%)
1ØØ I% = I% - M%
11Ø IF I% > Ø THEN 7Ø
12Ø J% = J% + 1
13Ø IF J% > K% THEN 2Ø
14Ø GOTO 6Ø
15Ø RETURN

```

examination of the entire list for each exchange of elements. A true bubble sort will move an element immediately to its proper location (bubbling it up) as soon as an exchange is required. The entire list is scanned only once and therefore the process is more efficient. The sort described in the article, while functional, is probably no more efficient than a basic interchange sort.

I suggest the routine shown in Table 1 be used as a true bubble sort in the program. Note that the list is scanned only once and the use of the less than or equal condition (LE) in line 29Ø. This avoids the exchange of equal elements that would have occurred in line 29Ø of the original program. In fact, if all elements in the array were equal, the sort would never terminate! Line 29Ø would never find a "less than" condition.—Robert R. Keller, K3PCS, 214 Rhett La., Elkton, MD 21921

In "The Super Duper," author Allison states the known problem of time consumption when sorting large data arrays, such as those used for logs and dupe sheets. There are two ways of decreasing the sort time dramatically: Use a RAM disk and the Shell-Metzner sort routine rather than the bubble-sort routine.

I realize that Allison is not discussing random-access files, but for those that do use that application the following will help. I've set up my various random-access file programs (log, DXCC, WAS, Ten-Ten) with a batch file. The batch file causes the program and the data files to be transferred to the RAM disk. The program is then called by the batch file, and when the data entry is finished, the batch file continues and copies the data files back to disk. When a read or write operation is encountered in the program, the RAM disk provides a dramatic decrease in operating time because there is no mechanical read or write operation to perform. A batch file listing is shown in Table 2. "D:" is the

# The "Mexican Connection"

By Michael R. Riley,\* KX1B and Steven Ewald,\*\* WA4CMS

\*Public Service Manager, ARRL

\*\*Assistant Public Service Manager, ARRL

**D**uring the latter part of September, the ground rumbled and the radio waves crackled in central Mexico. Hundreds, if not thousands, of amateurs provided essential communications for people, organizations and governments during this emergency.

How did US amateurs fit into the picture? They fit in . . . exquisitely. Mexican and US amateurs cooperated with one thought in mind: "Let's do our best to help." The value of Amateur Radio to the public during emergencies has been realized as never before.

Rather than discuss Headquarter's view of this massive communications emergency, we would like to share with you the views and thoughts of several amateurs who rolled up their sleeves and helped. We can't, in a few pages, do justice to the thousands who assisted. Those of you not mentioned can rest assured you have our thanks and appreciation for your efforts. Most importantly, however, we're sure you have the heartfelt thanks of the survivors in Mexico City . . . and that's why we're in this "business" in the first place, right?

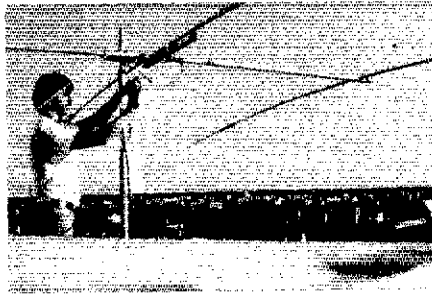
Agradecemos especialmente a los radioaficionados mexicanos que operaron durante esta emergencia con eficacia (y paciencia). (We especially thank the Mexican amateurs who operated during this emergency with efficiency—and patience.)

The following articles and photos by Sandy Donahue, WA4ABY, Bill Sheffield, KQ0J, Ted Seely, AA4GM, Fried Heyn, WA6WZO, and John Moore, NJ7E/XE1HDO, are just a sampling of the hundreds of reports received here in the Public Service Branch. We offer our thanks to those who submitted activity reports or manuscripts.

## Atlanta Responds

The terrible earthquake that inflicted so many thousands of casualties that dreadful Thursday morning, September 19, had its aftershock felt many thousands of miles away. The aftershock was the public's reaction to the disaster. This proves once again how valuable we amateurs can be when catastrophe strikes.

It was obvious, early Thursday morning, that the earthquake, measuring 7.8 on the



Scott Shaefer, WR4S, is shown making a final adjustment to the Yagi installed on the roof of the Mexican Embassy in Washington, DC. Scott and his crew were assisted by "Ramon," the Embassy engineer who, when asked where home was, pointed his finger at 230 degrees (plus or minus). (AA4GM photo)

Richter scale, immediately interrupted the city's telecommunications capabilities and delayed the news of the disaster itself for some period of time. In Atlanta, the bulk of Amateur Radio's effort took place on the campus of Georgia Tech, where the campus Amateur Radio Club station, W4AQL, was on the air almost continuously for five days relaying traffic into the stricken region from frantic relatives concerned about loved ones and keeping the local news media informed as best we could about the extent of damage. There is a large Mexican community in Atlanta, a fact we knew little about until the earthquake struck. Georgia Tech Amateur Radio Club President Sherman Banks, N4CXF, was studying in the club "shack" when a call came from the Georgia Tech News Bureau. "Can you get in contact with someone in Mexico? We are getting calls from news media about the earthquake." "What earthquake?" a shaken Sherman replied. That simple question began an exhausting but gratifying weekend with all previously planned activities left by the wayside.

With phone communications in Mexico City severely disabled, the news media and citizenry were initially dependent upon Amateur Radio for all their information. A case in point is this conversation I had with an assignment editor at the Cable News Network (CNN): "We would like to do a live interview with you about the sec-

ond earthquake." (This was on Friday night, September 21.) "Fine," I said, "Why not send a video crew over." "All our Atlanta crews have been sent to Mexico" she said. "Can you communicate with your own crews over your satellite links?" I asked. "No," she replied. "Every time we set up the uplink, we keep losing them after every tremor." Such is the reliability of expensive technology in an extreme emergency.

With all the publicity about the ability of W4AQL to communicate with Mexico City, we became very popular with the public. The telephone at W4AQL never stopped ringing. Initially, we were reluctant to do more than relay information from Mexico City. Callers requesting health-and-welfare information were told that priority must be given to traffic coming out of the affected area. Still, the phone never stopped ringing. Below is a chronology of activity at the Georgia Tech Radio Club during the Mexico earthquake:

## Thursday, September 19

First word of tragedy from campus news bureau comes at 1 PM. A quick tour through 20 meters shows little activity from XE1-land. Numerous stateside stations calling for information. 3 PM—News crew from local ABC affiliate tapes interview and sound from Mexico. Information is very sketchy.

At 7 PM, another TV station calls to ask us to find out about convention of 200 Atlantans in Acapulco. We are able to find out that there was little damage and no casualties. An NBC affiliate does live report from W4AQL on 11 PM news. Still handling no incoming traffic. Everything is outgoing from Mexico. We are hampered by a lack of Spanish-language training.

## Friday, September 20

The most frantic period for us during the emergency. Between the press and desperate relatives, we are having a very tough time coping. Among the callers is an official from a cola company headquarters in Atlanta inquiring about their people. The news is good. Little damage. No casualties known. All three local TV stations do extensive reports from W4AQL for 6 PM news. The phone never stops



ringing. Traffic for Mexico is piling up. We are able to pass traffic sporadically. Replies from Mexico are usually good. The Mexican Consulate in Atlanta offers to help with translation services—a major breakthrough.

#### *Saturday, September 21*

Football season opens at Georgia Tech. The season will not be delayed because club members are busy with earthquake traffic. Oh, the sacrifices we make in the name of public service. The phone keeps on ringing, but for the most part the weekend activities keep the TV crews from getting underfoot. We establish contact with Pedro, XE1HHA. With the help of translators from the Mexican community in Atlanta, Pedro handles our traffic efficiently in Spanish. The best part of this job is telling an anxious son or daughter that their parents are safe and well. We discover how fast traffic handling can be when we ran across XE1JE on RTTY. Our translators now need a second skill—typing.

#### *Sunday, September 22*

The phone is still ringing. We are handling lots of inquiries. Our hearts go out to one family we had to report as missing. Some Atlantans, frustrated with the uncertainty of it all, are flying to the disaster scene at great expense. Some call to offer help in delivering our traffic backlog. We decided that we'd better stick to radio. One local TV reporter calls to say he is going to Mexico with a tape crew. We give him the address of XE1HHA so he can record Pedro in action.

#### *Monday, September 23*

With classes upcoming at Georgia Tech, club members consider cutting back the effort. The phone continues to ring, mostly with repeat inquiries from callers who didn't get a satisfactory answer earlier. Most inquiries into the disaster area are now coming back with either a "no answer" or "out of order" report. Phone calls start dying down. The media finds fresher things to report about.

#### *Tuesday, September 24 to Present*

Many callers to the Georgia Tech club were still unable to receive information from the disaster area for weeks after the earthquake. The uncertainty of when long-distance phone service would be completely restored made many people anxious, especially those unable to afford the tab to fly to Mexico.

In summary, W4AQL handled over 700 originations into the affected area, all health-and-welfare inquiries. Additionally, we provided the news media in Atlanta with initial reports from the stricken zone, which helped boost our image for quickness and accuracy with both the media and the citizenry. For most Georgia Tech Radio Club members, it was their first experience with disaster communications. Amateurs

participating were N4CXF, N4JQD, N4JVY, WA4ABY, KB4BBH, N4MOP and numerous other Atlanta hams. Invaluable translation and food services were provided by the Mexican Consulate and the Mexican Trade Commission.—*Sandy Donahue, WA4ABY, ARRL Assistant Director, Southeast Division*

#### **Colorado Responds**

When I first heard of the devastating earthquake from Jess Treto, KA0UGJ, little did I realize that the Colorado Section would play such a role in providing emergency communications, serving as an information source for the news media, the Mexican Consulate and the Red Cross, and passing emergency and welfare traffic from Mexico to the United States.

KQ0J went on the air September 19 at about 1 PM and operated for a total of 11 days. With KA0UGJ (who had relatives in Mexico City) at my station, I put out a call and was answered immediately by Sam Schuster, XE1SSG, a Mexico City emergency station. He apprised us of the situation in Mexico and asked if we could pass some messages to his family. This contact began the effort of communications between Mexico and Colorado. During this first day we were giving information to all four major television stations and the two major newspapers, who had no communication other than Amateur Radio. Colorado has a large Spanish-speaking populace who have relatives in Mexico, and the word spread fast that Amateur Radio operators would try to provide information on their families.

By Friday, September 20 we knew we were in for a long siege. Our one telephone line was jammed with calls as hundreds of messages began to pile up. ARRL Colorado Section PIO N0FOE was assigned to help with the news media, while SEC WB0FQB and ASMs KA0MQA and W0RSG were trying to handle incoming calls and messages.

At about 9 PM, we lost contact with XE1SSG. Shortly thereafter we learned that there had been a second quake, and all Mexico City stations were off the air.

Messages continued pouring in on Saturday. To our surprise, at 10 AM XE1SSG was heard. Amateurs from around the United States with health and welfare inquiries caused Mexican amateurs to begin working them by call area. We decided a system was needed to determine which colonies (or neighborhoods) escaped damage. This would reassure the many people calling that the colony had not sustained damage. With several inquiries to XE1SSG and help from KA0UGJ (who had a knowledge of Mexico), we compiled a computer list of over 100 colonies (including buildings and hotels) which included the extent of damage. Being able to reassure many callers that their relatives were probably not affected began to make our job somewhat easier.

ARRL Colorado Section ACC WB0DUV was answering phone calls and passing messages on Saturday when an offer of help came in from Greg Patrick on behalf of a telecommunications company. His company offered to install three additional phones and have the telephone company bring in two more lines to help us with calls from throughout the nation. These additional phone lines enabled us to pass the steady outbound traffic we were receiving from Mexico. Mr. Patrick had also offered this same service to the Mexican Consulate in Denver. On Monday morning, KQ0P, N0FOE, KA0OGJ and Mr. Patrick visited with the Mexican Consulate and set up our plans to help with their communications.

On Tuesday, September 24, the Section Station of KQ0J and XE1SSG ran a phonepatch between Dave Sumner, K1ZZ, ARRL Executive Vice President, and the President of LMRE (Mexican League of Radio Experimenters). This patch gave both organizations the opportunity to discuss how Mexico wished to handle their traffic, and was also an opportunity for LMRE to express their gratitude for the efforts of American and Mexican amateurs and the cooperation between both countries during this disaster.

I cannot say enough for the efforts of the Mexico City amateurs and especially our main contact, XE1SSG, and the team of 15 people working with him. I also want to thank the many hams who spent hours in the effort of the Section Station: KA0MQA, WB0FQB, W0RSG, KD0PZ, WB0DUV, K0WOP, N0FOE, NM0X, NN0A, KD0RX, KD0TU, KA0PYH, N0BYM, KG0A, KA0CZW, KA0BSR, WD0EEA and KA0UGJ (our Spanish-speaking ham who bridged any communication gap we experienced with people who did not speak English). Our operation continued until Monday, September 30, when Mexico City had restored telex service. XE1SSG and KQ0J continued to meet each morning for any emergency traffic until October 3. The KQ0J team handled over 1000 telephone inquiries and inbound messages to Mexico City while passing over 800 outbound messages from Mexico during this disaster effort.

I might add that many other amateurs in Colorado also passed traffic during this disaster: K0OTU, Granby; N2IC, Boulder; KD0IO, Littleton; K0TER, KL7IPV, N0CMW, WA9ABB and WB0LWN, Colorado Springs, were some of the hams who helped with communications between Colorado and Mexico.

There is always room for improvement, but I believe that Colorado did an outstanding job of providing emergency communications during this disaster. We gained the respect of the news media, and we all had a good feeling when we passed a message that meant so much to another human being. The gratitude and thanks which we received is an experience that we



will not soon forget.—William "Bill" Sheffield, KQ0J, ARRL Section Manager, Colorado

#### On the Other End

On Monday, September 30, 1985, after working elsewhere in Mexico City, I arrived at the US Embassy in Mexico City to see if I could be of assistance there. Having heard a station operating from the Embassy, I asked at the citizen-services section if they knew anything about the operation. They had heard a rumor there was a station operating on the fourth floor from the Defense Attaché's Office (DAO). The ham was out when they called, so they sent me to the temporary disaster operations room, which had been set up by the AID. The folks there also had heard of an amateur operation on the fourth floor but didn't know much about it. In desperation, I went to the DAO's office and discovered a ham station sitting in the hallway outside the door. However, no one was in attendance. The secretaries in the office said the operator had left Mexico City for Ciudad Guzman, another hard-hit area. Other than that, they knew little of the operation.

Fortunately the operator, Jim Ripps, NCSH/XE1CSH, appeared. Jim had come down from Dallas to help the Dallas Mexican Consulate with health and welfare. He had persuaded the Embassy to let him operate and had borrowed a KWM-2 from them. An Air Force special-communications detachment, on duty for the disaster, had strung an antenna for the KWM-2, and he had been operating since.

When I met him, Jim was getting ready to travel to Ciudad Guzman to try to establish communications from the area; he was happy to have an operator to take over his station. He introduced me to the Embassy people and gave me a security pass. He was starting to hand over the operation when he discovered that his trip to Guzman had been cancelled; now we had two operators for the station. We operated until 20-meter propagation went out that evening and then quit for the day. I planned to operate the next day while Jim was going to finally take some time off.

Tuesday morning, when I reached the ham station, the KWM-2 was missing! I was informed that since the Air Force detachment was leaving, they needed their equipment back. Having seen some extra KWM-2s in the Embassy communications shop, I went down there and asked for help. Les Provst, who worked in the shop and is a former ham, kindly volunteered to get us another KWM-2 and tune it up. By late afternoon, we had it ready to go, and I took it up to the station. On arrival, I discovered another KWM-2 there, donated by the DAO! However, I also discovered that the antenna coax was being rolled up by an Air Force sergeant who had to take back all his equipment. Jim Ripps returned about this time to help.

A trip to the communications shop resulted in the donation of antenna wire, dipole insulators and coax. The next problem was stringing the new antenna. Non-Embassy employees are not allowed on the roof without escort. However, one of the assistant Defense Attachés detailed an employee to go to the roof with us. He had to leave at 1730, and it was already 1700 so we knew a race was on!



ARRL San Diego Section Manager Art Smith, W6INI (left), and ARRL Southwestern Division Director Fried Heyn, WA6WZO, show off the proclamation commending the response of amateurs in San Diego County during the emergency. (photo courtesy WA6WZO)

When we got to the roof, we discovered that a thunderstorm was in progress, with cold rain and nearby lightning. However, given the deadline, we decided to continue our efforts. A quick survey revealed that we could hang a wounded dipole—one leg horizontal and the other sloping. So Jim Ripps climbed up a tower to the sixth floor and started stringing wire. Never having been a tower climber, I chose discretion over valor and stayed below to work on the coax and to secure the sloping end of the dipole. It turned out that we had no power on the roof, so the connector was placed on the coax without the benefit of solder. Furthermore, we didn't have a tape measure, so we guessed at the 20-meter dipole dimensions and cut accordingly. By this time it was 1725. Jim hadn't finished the antenna, so we couldn't solder the connector. Our escort was firmly scheduled to leave at 1730. The mission looked pretty impossible.

About that time, however, we found another Embassy employee, a ham, who was willing to help, so we continued. He also provided an extension cord for the soldering iron. Half an hour later we finished the installation and headed down to the station. Amazingly enough,

everything worked and the antenna was resonant close to 14.200 MHz. We took a little traffic, sent outbound traffic we had accumulated for various Embassy personnel, and sent a long list for Arizona Senator DeConcini's office. My father, W0GYS, appeared on frequency, and we had a short chat. When the skip died, we called it a day.

On Wednesday morning, we discovered that the RFI on our new antenna was so bad that we couldn't hear anything. We left to work with the Asociacion Mexicana de Rescate, a private rescue group that was coordinating much of the disaster rescue and relief efforts. When we returned that afternoon, we were informed that all volunteer effort at the Embassy was ending and that we had to secure our station by 1800. We operated until then (still with RFI) and then shut down.

Fortunately, Jim had many good days of operation from the Embassy prior to the experience, and I was able to help elsewhere before and after. Those three days, however, provided a lot of adventure but very little communications. In spite of our difficulties, a number of Embassy employees in AID, the Defense Attaché's office and the communications shop went out of their way to help us, and we really appreciate their assistance.

It would be helpful in the future if the amateur community and the State Department had prior plans for such contingencies. During an emergency, State Department personnel have important duties that preclude them from handling routine health and welfare traffic. However, amateurs can help both citizens and the State Department by (1) providing the health and welfare traffic handling; (2) assisting in local tactical communications for disaster assistance; (3) handling routine traffic such as personal messages for Embassy staffers and volunteers; (4) providing backup communications for more important functions. In Mexico City, tactical (and in some cases priority) communications for relief agencies and US government agencies were handled partly by Amateur Radio as late as two weeks after the disaster.

The State Department would greatly facilitate these activities by providing: (1) Customs clearance for equipment (which in Mexico City would have resulted in a superior station and no need to borrow from the Embassy); (2) help in expediting local licensing or approval for emergency operation (which was provided in Mexico City); (3) in some cases, volunteer translators and telephones (which were provided in Mexico City); (4) either a location from which to operate (which was provided for a time in Mexico City) or help in acquiring such a location; and (5) integration into Embassy disaster plans in order to facilitate coordination with embassy officials.—John Moore, NJ7E/XE1HDO

# ARRL International Humanitarian Award

By Steve Place, WB1EYI

Staff Liaison, ARRL Volunteer Resources Committee

*WHEREAS Amateur Radio operators engage in assistance to people in need throughout the world, and daily communication between common people from all parts of the world, and*

*WHEREAS Amateur Radio is the only medium where average people throughout the world can meet to talk to each other and spread goodwill across otherwise impenetrable political boundaries, and*

*WHEREAS the world is in need of positive efforts toward international understanding and peaceful communications,*

*BE IT RESOLVED that the American Radio Relay League hereby establishes an annual international prize to be awarded to truly outstanding Amateur Radio operators in areas of international humanitarianism and the furtherance of peace.*

*—adapted from Minute 62 of the 1983 Annual Meeting of the ARRL Board of Directors*

A devastating earthquake strikes central Mexico, wiping out international communications. Emergency medical supplies are needed desperately at a remote African outpost with no link to the outside world other than Amateur Radio. A hurricane rips through a Caribbean island, demolishing all internal communications systems.

Time after time, in countless ways, Amateur Radio operators throughout the world assist people in need. This selfless use of Amateur Radio skill and ability for the public good goes to the heart of our reason for being. And indeed, as such efforts foster international understanding and peaceful communication, we should do all in our power to develop that potential, encourage international humanitarian efforts and publicly recognize those who use Amateur Radio for the benefit of others.

The ARRL International Humanitarian Award has been established to recognize those licensed radio amateurs (or groups of radio amateurs) worldwide who by use of their skills in Amateur Radio have provided extraordinary service for the benefit of

others in times of crisis or disaster. The Award will consist of a plaque or medallion to be presented at the ARRL National Convention or the recipient's home convention and an article describing the recipient's extraordinary achievements for *QST*, IARU societies' publications and general-interest consumer magazines.

Because of the importance of this award in promoting international friendship among not only Amateur Radio operators but all persons of the world, extreme care will be taken in verifying all nominations. Most rigorous scrutiny will be given to finalists in the selection process.

## Eligibility

Licensed radio amateurs or groups of radio amateurs from any country worldwide are eligible.

## Nominations

Nominations for the award will be accepted from any licensed radio amateur or any governmental organization that has received the benefits of a radio amateur's extraordinary service. Nominations must contain

- a summary of the actions of the nominee that qualify him or her for the award; and
- statements from at least two references including names and addresses (and telephone numbers where possible) for verification.

All nominations must be sent to: ARRL International Humanitarian Award, American Radio Relay League, 225 Main St., Newington, CT 06111, USA.

In the event that no nominations are received, the ARRL International Humanitarian Award Committee may itself determine possible recipients. The Committee reserves the right to make no award in a given year.

## Deadlines

Nominations and supporting materials for the 1985 ARRL International Humanitarian Award are due at ARRL Headquarters by the close of business on Thursday, May 1, 1986. The recipient of the 1985 (inaugural) award will be announced at the 1986 Second Meeting of the ARRL Board of Directors (July 1986).

Nominations and supporting materials for the 1986 ARRL International Humanitarian Award are due at ARRL

Headquarters by the close of business on Wednesday, December 31, 1986. The 1986 recipient will be announced at the 1987 Second Meeting of the ARRL Board of Directors.

Nominations for subsequent ARRL International Humanitarian Awards will be due at ARRL Headquarters by the close of business on the last day of the year for which the award is being made. The recipient will be announced at the Second Meeting of the ARRL Board in the following year.

## Design Contest

As a lasting token of the international Amateur Radio community's appreciation for extraordinary Amateur Radio service for the benefit of others, each year's recipient will be presented with a distinctive plaque or medallion to commemorate his or her achievement. The American Radio Relay League invites all licensed radio amateurs worldwide to submit designs for the plaque or medallion that will symbolize the ARRL International Humanitarian Award.

Designs will be judged on aesthetics and how well they symbolically represent both international understanding and goodwill, and assisting people in need through Amateur Radio. Each design must incorporate the ARRL diamond logo and the "ARRL International Humanitarian Award" title; each must be submitted on a separate piece of 8½ × 11-inch white paper. The name, address and call sign of the artist must not appear on the front of the paper but must appear on the back of each entry. Artists may submit as many entries as they wish. The recommended dimensions and other production specifications must be clearly stated for each submission.

The artist whose design is chosen will be awarded an engraved plaque, a clothbound *1986 ARRL Handbook* and photo coverage in *QST*.

Entries should be sent to "Humanitarian Award Design Contest," ARRL, 225 Main St., Newington, CT 06111. They must arrive at ARRL Hq. no later than the close of business on Monday, June 16, 1986. All entries become the property of ARRL and cannot be returned.

All design entries will be submitted anonymously to the Volunteer Resources Committee (the ARRL Board of Directors

Standing Committee tasked with administering the award) and then to the entire ARRL Board of Directors at its 1986 Second Meeting in July 1986 for a final decision.

### Contributions

The ARRL is developing an endowment to fund the International Humanitarian Award. Donations from individual radio amateurs, from nonhams who have been helped by radio amateurs in time of need and from concerned radio clubs and organizations are welcome. Checks, which

must be made out to "ARRL," should be clearly marked as being contributions to the International Humanitarian Award Endowment. All donations will be used exclusively for this award. Your contribution will be tax deductible; the American Radio Relay League is a nonprofit, tax-exempt 501(c)(3) organization. All donors will be recognized in QST.

The Des Moines Radio Amateur Association, an ARRL Affiliated Club whose members first proposed that ARRL establish an international humanitarian award for radio amateurs, has already pledged \$150 to the cause. We thank them

for their leadership and urge other individuals and groups who recognize Amateur Radio's potential for promoting international goodwill in times of crisis to follow their example.

Amateur Radio has provided a way to bring world citizens closer together since the early days of this century. With your help, the ARRL International Humanitarian Award will finally help us to recognize the contribution of radio amateurs in furthering international understanding and helping others whose needs transcend political boundaries. □

# Season's Greetings

From the ARRL Hq./IARU Secretariat Staff

Phil Accardi, AJ1N  
 Nao Akiyama, N1CIX/JH1VRQ  
 Thomas Alagna  
 Chrissy Arel  
 Jo-Ann Arel  
 Vicky Armentano  
 Bob Atkins, KA1GT  
 Julie Attardo  
 Lee Aurick, W1SE  
 Richard L. Baldwin, W1RU  
 Leslie Bartoloth, KA1MJP  
 Jeff Bauer, WA1MBK  
 Arline Bender, WA1VMC  
 Charles Bender, W1WPR  
 Robert Benson, VE2VW  
 Jon Bloom, KE3Z  
 Frances Bramon  
 Laird Campbell, W1CUT  
 Joe Carcia, KA1DBK  
 Rose Cavanaugh  
 Lori Chadwick  
 Debra Chapor  
 Michelle Chrisjohn, WB1ENT  
 Jim Clary, WB9IHH  
 Dale Clift, NA1L (ex-WA3NLO)  
 Ferne Collin  
 Loretta Collins  
 Brooke Craven  
 Rose Cyr  
 Gerry D'Ambrosio  
 Doug DeMaw, W1FB  
 Rich DiMauro  
 Chuck Dorian, W3JPT  
 Ruth Doucette  
 Bernice Dunn, KA1KXQ  
 Russel Erickson  
 Lorry Evans, KA1KQY  
 Steve Ewald, WA4CMS  
 Sue Fagan  
 John Foss, W7KQW  
 Lisa Fuini  
 Josephine Galati  
 Linda Schneider Geisinger  
 Sandy Gerli, AC1Y  
 Joan Gibson, KG1F

Bernie Glassmeyer, W9KDR  
 Sheila Gray  
 Bruce Hale, KB1MW  
 Gerald Hall, K1TD  
 Robert Halprin, K1XA  
 Penny Harts  
 Kim Hemmis  
 Katherine Hevener, WB8TDA  
 Curt Holsopple, K9CH  
 Edith Holsopple, N1CZC  
 Stan Horzepa, WA1LOU  
 Berta Hould  
 John Huntoon, W1RW  
 Joan Hushin, KA1IFO  
 Chuck Hutchinson, K8CH  
 Chris Imlay, N3AKD  
 Bart Jahnke, KB9NM  
 Deanna Jajliardo  
 Mike Kaczynski, W1OD  
 Bruce Kampe, WA1POI  
 Libby Karpiej, KA1DTU  
 Joel Kleinman, N1BKE  
 Leo Kluger, WB2TRN  
 Ginny Koza  
 Greg Kwasowski  
 Bill Lazzaro, N2CF  
 Michelle Legister  
 Carolyn Legnani  
 Sue Liberno  
 Robert Lincoln  
 John Lindholm, W1XX  
 Billy Lunt, KR1R  
 Dennis Lusic, W1LJ  
 Harry MacLean, VE3GRO  
 Kathy McGrath  
 Jodi McMahan, KA1JPA  
 Paula McKnight, N1DNB  
 Lindy Messmer  
 Bill Morris  
 John Nelson, W1GNC  
 Steffie Nelson, KA1IFB  
 David Newkirk, AK7M  
 Pushpa Ojha  
 Nancy O'Neill  
 Paul Pagei, N1FB

Rick Palm, K1CE  
 Jean Peacor, K1IJV  
 Lynne Pellegrino  
 Judi Petriw  
 Linda Pfister  
 David Pingree  
 Ann-Marie Pinto  
 Steve Place, WB1EYI  
 Sal Prado  
 John Proctor  
 Michael Riley, KX1B  
 Paul Rinaldo, W4RI  
 Deborah Sandler  
 Eileen Sapko  
 Cathy Scharr  
 Bob Schetgen, KU7G  
 Mary Schetgen, KA1NAJ  
 Don Search, W3AZD  
 Chris Settembri  
 Judee Sicuranza  
 Maria Somma  
 Scott Springate, N7DDM  
 Carol St. Laurent  
 Dave Sumner, K1ZZ  
 Mary Ann Taratula  
 Marge Tenney, WB1FSN  
 Maureen Thompson, KA1DYZ  
 Ed Tilton, WIHQD  
 Pete Tolisano, KW1J  
 Jonathan Towle, WB1DNL  
 Karl Townsend  
 Andrew Tripp, KA1JGG  
 John Troster, W6ISQ  
 Bill Tynan, W3XO  
 Tom Vesci, WB1CRH  
 Jeff Ward, K8KA  
 Bill Webb, KX1A  
 Maty Weinberg, KA1KOW  
 Ellen White, W1YL  
 Bruce Williams, WA6IVC  
 Perry Williams, W1UED  
 Mark Wilson, AA2Z  
 Larry Wolfgang, WA3VIL  
 Barbara Zaleski  
 Mike Zeigler

# The Doctor's VHF Cure for the Low-Sunspot Blues

If you've worked everything on HF, have all the awards and think there's nothing left to do—particularly amidst today's unexceptional band conditions—then this article may be just the prescription you need!

By San Hutson, MD, K5YY  
P.O. Box 188, Paris, AR 72855

Being a low-band DXer and contester for over 25 years, I thought VHF/UHF was a segment of our frequency spectrum inhabited by experimenters and seldom used for any meaningful type of QSO that would arouse excitement in a jaded old DXer like me. Boy, was I wrong!

A combination of events lead me to pursue a trial run at VHF/UHF communications. First, having attained a position at the top of the DXCC Honor Roll, a quest that took three decades, plus numerous other DX goals, I found my Amateur Radio activities were slowing to less than a snail's pace. Furthermore, with the lower portion of the present sunspot cycle rapidly approaching, my only interests were 160 and 80 meters along with a "casual" pursuit of CW DXCC ("new" CW countries were slim to none). My interest in ham radio needed a shot in the arm, especially during the summer season when 80 and 160 were dead and 20 meters was opening late and closing early.

The second impetus was the advent of the new ARRL VUCC (VHF/UHF Century Club) Award. It so happened that the VUCC program starting date of January 1, 1983 coincided with my first contact on 2 meters, and I was trying out a Collins transverter. In one week, I had worked several states, many of the so-called grid squares and even made an aurora CW contact! My first impression was that this VHF/UHF stuff was like shooting fish in a barrel. Wrong again!

The grid-square chase began to get in my blood. My eight-element beam and 100 W seemed to be doing okay, considering the conventional wisdom is that one had to have a kW, at least four Yagis at 100 feet, very expensive low-loss coax and a preamp with expensive GaAsFET transistors. It also seemed that one had to be an expert in homebrewing gear, and that the old days of clacking external relays had to be part of one's entrance into VHF. The stories about mast-mounted preamps constantly blowing those expensive GaAsFETs dampened my hopes to some extent. I thought that I could never be competitive on VHF, and the fun would be taken away



The author's effective Amateur Radio station, equipped for operation from 160 meters through 70 cm, has brought him new-found success since migrating to VHF from the HF bands.

by the constant problems that were sure to arise. Wrong again for the third time!

After 2½ years on VHF (2 meters and above), I now have VUCC with 196 grids worked and 46 states under my belt. Since my venture into UHF (432 MHz) last September, I have worked 86 grid squares and 22 states. VUCC came after seven months, confirmation from 50 grids being required as compared to 100 on 6 or 2 meters.

I run 100 W on 432, and until recently I only had 16 elements at 75 feet. On 144 MHz, I worked my first 100 grid squares with just a single 13-element beam and 150 W. I later stacked another beam on 2 meters but didn't have the kW in the line until after my 150th grid. I have done well enough that I do not feel the need for four or more stacked beams (unless I should try EME in the future). My tower is a crank-up model, and this negates the use of the better but expensive Hardline coax, without some special considerations. I've used a good RG-8, such as Belden 8214, but the newer 9913 is even better and hit the market about the time I became interested in 432. The 9913 is the only flexible coax I would use above 200 MHz. My preamps are kept simple, RF switched and inside my shack. The loss of a decibel or two can be tolerated, considering that I don't have a lot of worries with expensive relays, connectors or changing GaAsFETs at 85 feet!

New equipment—from multimode transceivers to linears, converters and antennas—comes out every month. Building and conversions are still being done by many VHFers, but with commercial rigs increasing daily, the practice of the homebrew art is not the necessity it once was.

Many VHFers run barefoot with 10 W, use no preamp and have a small beam at 30 feet. They get out quite well and are very competitive. On the HF bands, the guy with the best antenna, most power and most persistence usually gets through early in the pileup. In contrast, on VHF, you had better know something about propagation modes or you'll wonder why your kW and 16 beams didn't beat out your friend 80 miles away with 100 W and a single Yagi.

The scope of this short article does not allow an in-depth discussion of various modes of propagation (see accompanying sidebar). Basically, VHF operators usually rely on tropo inversion, but occasional ducting or super refraction makes things interesting. Sporadic E during summer and December along with several meteor showers during the year produce some spectacular contacts over several hundred miles. Aurora in the northern latitudes is very common in the spring and the fall and closely follows times of geomagnetic disturbances. EME (earth-moon-earth) is becoming a necessity for one's last three or four states from my part of the country, and certainly if there is a desire to pursue WAC or

## VHF Propagation Summary

**Aurora:** All auroral openings occur after a solar flare has released high-energy particles in the atmosphere. The intense ionization that results often creates the shimmering fluorescent curtains called auroras. The ionization is so great that the aurora is capable of reflecting radio signals. Maximum range is about 1300 miles, and the preferred mode is CW. Aurora can be identified by its distinctive "hissing" CW sound. Beams should be pointed north during aurora openings. Most auroras occur in the Northeastern US and adjacent Canadian areas.

**EME:** Popularly known as moonbounce, most EME (earth-moon-earth) activity takes place on 144 and 432 MHz when the moon is at perigee (closest to the earth). EME schedules are very similar to the techniques used by meteor-scatter operators: the best times to listen are during the two weekends of the ARRL International EME Competition. Although exacting station requirements are necessary for successful EME operation, amateurs with nothing more than a simple Yagi, preamplifier and multimode transceiver are able to hear the stronger stations.

**Scatter modes:** As meteors penetrate our atmosphere and burn up, they leave a trail of ionized air capable of refracting radio signals. Although meteors enter our atmosphere constantly, most scatter contacts occur during schedules made for periods of meteor showers. Meteor bursts are usually of short duration, so high-speed CW or SSB is used, with a specific format to prevent "doubling." Most scatter occurs on 6 and 2 meters, with distances of up to 1300 miles. Tropospheric scatter offers marginal communications up to 500 miles, while the best distances on ionospheric scatter have been 600 to 1200 miles.

**Sporadic E:** Clouds of ionized atoms formed at the ionospheric E layer (about 50 miles above the earth) give rise to a propagation condition called E skip. This effect often propagates 6- and 2-meter signals over 400 to 1300 miles or more. E skip may occur at any time or season, but is most likely in midmorning or early evening during the summer months.

**Tropospheric propagation:** Band openings are generally the result of a thermal inversion, a warm air mass sitting above an area of colder air. The boundary area between the two bodies of air—in the troposphere—may refract or bend radio signals far beyond the radio horizon (actually, all normal VHF propagation is through the troposphere, which extends up to about 8 miles above the earth's surface). Maximum tropo distance seems to be 1200 miles, but more commonly in the 400-600 mile range. Ducting in the troposphere causes VHF signals to follow the earth's curvature for hundreds or even thousands of miles. Ducting occurs as a result of windshears in the lower stratosphere and upper troposphere, separating two masses of air.

down" or concentrate on that favorite VHF/UHF construction project, activity is increasing during the winter (I actually did better during the January contest than in the September QSO Party). Other VHF events include the ARRL VHF Sprints, devoting a specific night to a particular band, and the new CQ VHF WPX (prefix) Contest in July, now part of the VHF tester's annual calendar.

The joy of finally completing a meteor-scatter QSO with that rare grid square or state seems to exceed the excitement of working a new European country on 80 meters late at night or getting up early to work that rare Pacific country on 160. The good tropo conditions and trying to predict meteor-shower peaks, and being there for that elusive E-skip opening are all part of the overall reason why VHF has intrigue—that is, intrigue as compared to the known times that the gray line appears on the low bands or the morning 20-meter openings to Europe. And the pileups that occur when one of these propagation modes manifests itself are as intense as any you've heard chasing the BY on 20 meters.

You actually have to be there to believe the excitement and frenzy! Running a string of W8s or W2s in Arkansas during a 2-meter tropo or E-skip opening is far more exciting than that string of JAs or Europeans on 20 meters. The perfect conditions on 144 MHz don't happen in a cyclic fashion; one does not know what to expect from day to day as compared to the more predictable lower-frequency propagation.

It's not all that easy to articulate the excitement felt after turning on the VHF rig in the early evening hours, expecting to hear the usual friends within a 200-mile radius, and instead hear a well-defined zone of W4s or W9s coming through! You dig through the QRM and QSB just as you would on 40 meters chasing a 5X5 in Africa. You try to work them all because they probably won't be there tomorrow!

DXCC. Lesser-known phenomena such as ionospheric scatter are tried by some VHFers. The normal F-layer reflection used in HF communications does not extend past the 6-meter band, thus the higher degree of difficulty in working grid squares and states at or above 144 MHz. To do well, you must "play" several types of propagation—wherein lies the challenge of VHF!

My personal experiences on VHF surely rival any low-band DXing experience! The June 1985 ARRL VHF Contest is the most recent memorable event, with some of the most fantastic tropo conditions seen in many years. Shortly before the contest began, the band was full of stations from W0 through the 8th and 9th call areas and extending up to W3. If only it could last through the contest. Well it did! Signals were S9-plus from stations that were so far away that one would think only meteor-scatter QSOs would do the job. Switching to 432 MHz was a surprise—signals were also S9 plus. Previously, this band had not yielded any QSOs over 500 miles; yet here I was working VHFers at a distance of over 800 miles! During the contest, I added several states and grid squares to my totals, and can truthfully say that the feeling it gave me was more rewarding than what I had experienced in most low-band contests.

Indeed, it's fun to stay up all night during the ARRL VHF QSO Parties in June and September and the January ARRL VHF Sweepstakes. Although the winter months bring less dramatic VHF propagation, and many hams "close

### VHF Information Sources

For those who would like more information on VHF operating procedures and propagation, please see the following materials:

#### General Reference Books

- The ARRL Antenna Book*
- The ARRL Handbook for the Radio Amateur*
- The ARRL Operating Manual*
- The RSGB Amateur Radio Operating Manual*

#### Newsletters

- VHF/UHF and Above Information Exchange*, c/o Rusty Landes, KA0HPK, P.O. Box 270, West Terre Haute, IN 47885.
- KC0W's VHF-Plus Update*, 2018 West La Osa St., Tucson, AZ 85705-2233.
- Midwest VHF Report*, c/o Roger A. Cox, WB0DGF, 3451 Dudley, Lincoln, NE 68503.
- 2-Meter EME Bulletin*, c/o Gene Shea, KB7Q, 417 Stadhaver, Bozeman, MT 59715.
- 220 Notes*, c/o Art Reils, K9XI, 215 Villa Rd., Steamwood, IL 60103.

#### Nets

- Central States VHF Society, 3.818 MHz, 0230 UTC, Sunday.
- EME group, 14.345 MHz, 1600-1700 UTC Saturday and Sunday.

#### QST Articles

- There have been many significant articles; some of the recent ones include "A Basic Approach to Moonbounce," J. Stewart, July 1985.
- "VHF Propagation and Meteorology," R. Miller, March 1984.
- "The Weather That Brings VHF DX," E. Pocock, May 1983.

Several of these good tropo openings should be expected each summer. Be prepared, however, for the amateur 50 miles away to be giving 20-over-9 reports when you *don't even hear* the other station. It's just about like missing out on the VU7 when the high-power crowd keeps beating you out. But your turn *will* come; when it does, you will fill page after page of log sheets with those rare states and hard-to-find grid squares.

I remember my first W7 QSO via an E-skip opening, my 100th grid square, my 40th state on 144 MHz and the tremendous 432-MHz tropo opening during the June ARRL VHF Contest. The funny thing is that I do *not* remember my first JA on 160, my 100th country on 80 or 160, or that "magic" moment when I worked my 300th DXCC country back in 1970 (or was it 1969?). By listening to the bands, it's obvious that a lot of avid DXers are now

coming aboard the VHF bandwagon.

One thing should be evident by now. When things are dull on the HF bands, VHF offers excitement and a challenge. But, be prepared to have part of you stay with VHF when you return to the old stompin' grounds on HF. You might just find yourself tuning the VHF bands as part of your daily routine *any* time of the year. You'll need to try VHF before you can say it's not for you. It surely fulfilled a need for me and quite possibly saved my hobby.

There are many others just like me. For example, KSUR, a well-known contester and DXer, has recently tried VHF. In an amazingly short period of time, he worked 35 states and over 100 grid squares with a single beam and 150 W. His is one of dozens of calls of DXers and contesters who have come on the VHF bands in recent months. These hams have seen the challenge and fun available in the

VHF/UHF spectrum.

I hope the above leaves you wanting some more details about VHF communications, and perhaps the observations above will entice you to at least give VHF a chance when you are sitting there wondering what to do when propagation is down or when you don't like what you hear on your favorite band. So be prepared to get hooked.

See you on the 144.2-MHz calling frequency!

*Licensed since 1958, Dr. San Hutson, K5YY, has reached the pinnacle of DX achievement, the top of the DXCC Honor Roll. In addition to this and a host of other DX awards, such as 75-meter Worked All Zones (WAZ), Five-Band DXCC, 160-meter DXCC and CW DXCC, San is the former chairman of the ARRL DX Advisory Committee, and is a member of the CQ DX Hall of Fame, and has been on 10 DXpeditions. Despite his relative newcomer status on VHF, he has already qualified for VUCC certificate no. 24 on 144 MHz and no. 21 on 432 MHz.*

## VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid square locators indicated in italics for each band listing. Numbers listed after calls refer to endorsements. The totals shown are current as October 31, 1985. An s.a.s.e. with one unit of First Class postage will bring you the rules and application forms for VUCC.

6 m (50 MHz)			100			1 1/4 m (220 MHz)			70 cm (432 MHz)			23 cm (1296 MHz)			13 cm (2.3 GHz)			9 cm (3.4 GHz)			6 cm (5.7 GHz)			3 cm (10 GHz)					
1	K8WKZ	300	51	AA2Z/3		4	N9KC	125	55	KA0ABA		22	WB8ART	70	1	W1JR	120	10	WB0DRL		1	W2SZ/1		1	W2SZ/1		1	W2SZ/1	
2	KB4CRT	225	52	WD5ICC	225	5	N0LL	150	56	KX0A		23	K1FO		2	W0SD	60	11	WA5TKU		2	W5RCI	70	2	WB9MSV		2	SM3AKW	
3	W1QXX	200	53	WA1AYS		6	WB4NMA	125	57	W9HAD		24	W3ZZ		3	WB0TEM	60	12	KD8SI		3	W5RCI	70	3	WB9MSV		3	SM3AKW	
4	N4MM	275	54	KB2XJ		7	WA4NJP	125	58	AA5V		25	W0RAP	120	4	WB8BK	70	13	VE3BFM		4	W5RCI	70	4	SM3AKW				
5	WB8WXZ	200	55	N2WK	150	8	K2WLR	150	59	WB0ZKG		26	KF0M		5	W4GJO	110				5	W5RCI	70	5	SM3AKW				
6	WB7OHF	200	56	WB2EBS		9	KF0M	125	60	N8CKH		27	K8TL		6	W2VC	60				6	W5RCI	70	6	SM3AKW				
7	WB1FVS		57	K2YOF		10	W4GJO	150	61	W8LSC		28	WB0DRL		7	W9JFM					7	W5RCI	70	7	SM3AKW				
8	WD4FAB	175	58	WB0PKN	200	11	N9AQ	150	62	W5FYZ		29	N180	90	8	KB5MR	70				8	W5RCI	70	8	SM3AKW				
9	WA3DMF	225	59	WB2NPE		12	SM4GVF		63	KC0OG		30	KC4EQ		9	W5HN					9	W5RCI	70	9	SM3AKW				
10	WA6BYA	175	60	K5WE		13	WA6MGZ		64	K5UR		31	KC0QR		10	W5HN					10	W5RCI	70	10	SM3AKW				
11	W400	200	61	KX9N		14	KB5MR	125	65	W5FF		32	VE3BFM		11	WA5TKU					11	W5RCI	70	11	SM3AKW				
12	KA1DHO	125	62	N9DCA		15	DELETED		66	W5FF	200	33	W8LSC		12	W0RAP					12	W5RCI	70	12	SM3AKW				
13	W3WFM	250	63	WA8LLY		16	K5WE		67	W0RT		34	KR9G		13	VE3BFM					13	W5RCI	70	13	SM3AKW				
14	N3COG	200	64	WB8KAY		17	KC0QR	125	68	W0RT																			
15	N2DXP	125	65	K9HEK		18	WA3HMK		69	WB0YZN																			
16	K1TOL	300	66	W5FF	200	19	K7CW		70	KD9QU																			
17	WA1OUB	275	67	WB4NJG	175	20	W5SUS	125		WB9QJR																			
18	W3EP/9	175	68	KE5P	125	21	W3EP/9																						
19	N5DDB	250	69	KD5RO		22	K8WKZ																						
20	W1WHL	125	70	W3ZZ		23	N4AR	150																					
21	WB4LSM	150	71	W2SZ/1	125	24	NR50																						
22	N2CEJ	175	72	KE4PE		24A	K5YY	150																					
23	WB8MVE	125	73	W0JRP		25	WD4DGF	150																					
24	N0LL	225	74	N2BJ		26	K4CAW																						
25	KI3L		75	WB0YZN		27	WB8BK																						
26	WB4NMA	125	76	W3OTC	150	28	K3MD																						
27	K0TLM	225	77	WD0CKF		29	WB8KAY																						
28	K8TGC	175	78	K5IS	125	30	KA9LDS	125																					
29	W1JR	175	79	W9VNE		31	W1JR																						
30	KC8PS		80	WA0DYU		32	WA1OUB	125																					
31	WB4OOJ		81	K6EID		33	WD9FSA	125																					
32	KC7QY		82	KA5LVP		34	N4BD																						
33	KA2BTD		83	K8GQB		35	K2TXB																						
34	WA4UAS		84	K8IXU		36	WB0YWW																						
35	N8EDL		85	KD6PY		37	K3RX	130																					
36	W5JME	150	86	KS5M		38	WB8ART	150																					
37	WA6CRA/4	150	87	KA0NVT		39	WD0FOY																						
38	N9CEX		88	W2CUK		40	WB0TEM																						
39	K0US		89	WB8KRY		41	N8ASU																						
40	WB8BK	125	90	WB6KLL		42	K2OS																						
41	N5GRH	150	91	KA3B		43	WA0TKJ																						
42	KA0JGH	175	92	KC0OG		44	W5RCI																						
43	N9ANO		93	KA9JYZ		45	WB0DGF																						
44	WB0ZKG	250	94	W2HRW		46	WA2FXB																						
45	K8YAH		95	N9FDS		47	N8BJN																						
46	KA9MGR	225	96	W9NO		48	K0TLM	125																					
47	KY9P					49	K0US																						
48	AK4T					50	SM3AKW																						
49	N2BMN					51	WA0VJF																						
50	N9DBB	125				52	WB4NXY																						
						53	N180	125																					
						54	W3ZZ																						



# The Christmas Gift

By Bruce Vaughan, NR5Q  
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Seems like the long cold nights of December are just made for thought. It is a time for remembering, for putting one's life in the proper perspective.

The Old-Timer pushed the swivel chair back from the operating desk where he had been bringing his logbook up to date. Slowly, he arose and walked over to the fireplace, stopping only long enough to fill his pipe with tobacco from the humidor on the mantle. Then he settled himself in the big easy chair and thought of the many years of hamming he had enjoyed.

The memories were pleasant, like passing his first ham exam almost 50 years ago and, of course, the never-to-be-forgotten thrill of his first QSO. Let's see, the receiver was a second-hand Sky Buddy, and the rig used a 47 xtal oscillator into a pair of push-pull 2A3s in the final. Everything in the transmitter but the crystal was salvaged from an old radio bought for 40 cents at an auction. He would have bid more, but 40 cents was all he had in his pocket. Oh well, he got the radio anyway.

Receivers like the HRO, SX17 and Super Pro were things he dreamed of, knowing he might as well wish for the moon. Factory-built transmitters were available, but no one in the many thousands of QSOs he had worked in those Depression years had used one. Being a ham in the '30s was not easy, and you soon learned what it was like to really want a good rig, knowing you could not possibly afford one.

As the smoke drifted up from his pipe, the Old-Timer's eyes roamed over his shack layout. There was the SX-28 he bought in the late '40s, or was it the early '50s? Still looking as good as new was his first transmitter built from a kit, an old Heath DX-60. Beside the DX-60 was his

homebuilt VFO with the beautiful National dial. Finally, his eyes came to rest on the brand-new state-of-the-art transceiver, purchased just last month. He had put off buying it for years until, finally, he could no longer resist. What a marvel—a full 200-W phone and CW transmitter with dual VFOs and an excellent solid-state receiver, all in a package slightly larger than his old Sky Buddy.

No doubt about it—ham radio was more advanced than he had ever dreamed. What would Hiram Maxim think if he could spend an hour in a present-day ham station?

Lost in all these thoughts, he had not noticed that the fire was getting low. He arose and put a log on the fire. Picking a long splinter from another log, he held it in the yellow flame until it was burning and then used it to relight his pipe. Walking over to the window, he pulled the curtain back and gazed out into the cold, snowy night, thinking how lucky he was to have this nice, warm home, his beautiful ham shack, and fine children and grandchildren. Best of all, they would be home in just a few days for Christmas.

Martha, his XYL, had been telling him that his shack was getting too cluttered, what with the old SX-28, DX-60, VFO, antenna tuner and all the other equipment gathered over the years. He knew she was probably right; she usually was. Just like she was right about him giving up pipe smoking. Oh, he never really quit, but he always had a little pang of guilt every time he lit his pipe. Thinking back to his teens when he was first licensed, he thought of just the place for some of his surplus gear. What better time of year to donate a radio to the local children's home and offer to

teach a Novice class. It just might spark the interest in a few young people to become full-fledged hams.


By golly he would pack it up tonight, wrap it in Christmas paper and drop it off so it would be under their tree on Christmas Day. Then he would have enough room on the operating desk to put the new pictures of his grandchildren.

When you are 70 years old you just naturally move a little slow, and it took the OT until almost 10 P.M. to pack and wrap the radio. The big, red bow alone took almost 30 minutes. Sitting at the operating desk, he had to admit that Martha had been right again; the shack did look better. There was no use keeping equipment that was seldom used when someone else could get so much good from it.

Well, the OT thought, guess I'll see what 40 meters sounds like before turning in for the night. Might hear someone I know.

Slowly, with a touch that was almost a caress, he turned the tuning knob of the SX-28. Sure enough, there was AI, W0AWP, putting out a good, strong signal as usual. His left hand hit the TR switch, and the little power transformer in the DX-60 purred like a contented kitten. The tubes glowed like fire flies, and the equipment gave off a welcoming warmth.

With a hand grown rough and stiff with age, he ever so gently reached for the old Vibroplex. In near perfect 25-WPM CW, he sent the words he had sent so many times before: "73 and a Merry Xmas to U and Urs, Gn."

After pulling the big switch, the Old-Timer slowly walked into the bedroom. Martha, pretending sleep, heard him mutter as he pulled off his shoes, "Never did need two VFOs anyway . . ." 



# Words Alone

A chance on-the-air encounter becomes an everlasting memory.

By Seth Williamson, WB4WQY  
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It was after 10 on a strangely cold night during the last week of summer. I was driving through Bristol, Tennessee, chatting with a ham in Charlotte, North Carolina on my 2-meter FM radio and trying to forget how many miles lay between me and my bed in Floyd County, Virginia. Orion blazed overhead despite the city lights, and the deejay on some rock station was telling everyone to throw another blanket on the bed that night. The guy in Charlotte said he had to call it a day, and once he was gone I couldn't raise anybody else. It looked like 200 miles of just me and the night.

Then I got another call. He was an older man by the sound of his voice. He must have been listening to my earlier conversation because he used my call sign.

"Listen," he said. "This is not a Mayday, but I need some help. Do you think you could come over to my house?"

It wasn't exactly what I needed so late and so far from home. Reluctantly, I asked for directions. Ten minutes later I was in one of Bristol's better neighborhoods, feeling my way apprehensively behind a large brick home. I was a little irked at the man's refusal to say why he needed me or what he wanted me to do.

I let myself through a basement door, as instructed, and saw immediately why he had called for help. At the far corner of a nicely furnished but dimly lit room was a man slumped nearly sideways in a wheelchair.

"Hey," he said weakly, "I'm John. Look a little funny, don't I?"

John, I discovered during the next half-hour, suffered from a progressive muscle disease. He was totally paralyzed except for some small movement in the fingers of his right hand. He needed help because he was about to fall out of his wheelchair. Somehow, he had slipped down to such a position that a nerve in his lower back was compressed, and he was suffering spasms that jerked his normally immovable head into bizarre positions. His wife, he said, was late in getting home from church choir practice, and he had feared she wouldn't return in time to rescue him from a bad fall. We talked for a few minutes after I got him

back into position—he seemingly at ease and glad for my company, and I feeling a vague guilt for my healthy, mobile body.

John's story, which I learned both from him and from other Amateur Radio operators who know him, is a remarkable one. Struck in his prime by the disease, he refused to surrender to it and continued to raise a family and advance his career. He had little time for self-pity. "I've never heard that guy ever say a word you might take as feeling sorry for himself," said one ham.

But by the time his children were on their own, he'd been forced

into the wheelchair. Each year he was a little worse, a little less capable of caring for himself. These last years his main contact with the world of active people has been Amateur Radio. Fellow operators set up his antennas and arranged his ham shack so he could operate his equipment with two fingers of his right hand. "Ham radio is what kept that fellow alive these last few years," said a friend.

But now the disease is taking even that consolation. "I've gotten so bad that some days it takes me half an hour just to get the rig turned on," he said. "I was lucky I had the 2-meter unit on that repeater tonight. If I'd had to change frequencies I'd have been out of luck. Anyway, I've decided the time has come to get rid of all this stuff now.

Know anybody who wants to buy some radio gear?" He moved his chair in a 360-degree turn, taking in the equipment and walls covered with 30-years worth of QSL cards from all over the world. If he felt sorry for himself, I couldn't detect it.

Before I left, John said something else. "Did you know you're one of the last Amateur Radio contacts I'll make? My wife and I have decided that a nursing home is the best place for me now. I guess I'll be leaving here before it gets cold this year." I wished him luck. "Hey, thanks for the help!" he called as I got into my truck.

"We cannot conquer fate and necessity," said Walter Savage Landor, "yet we can yield to them in such a manner as to be greater than if we could." I hope John's nurses see the mettle of their patient.



# Goldwater Scholarship Contributors Recognized

By Chris Imlay, N3AKD  
ARRL Counsel

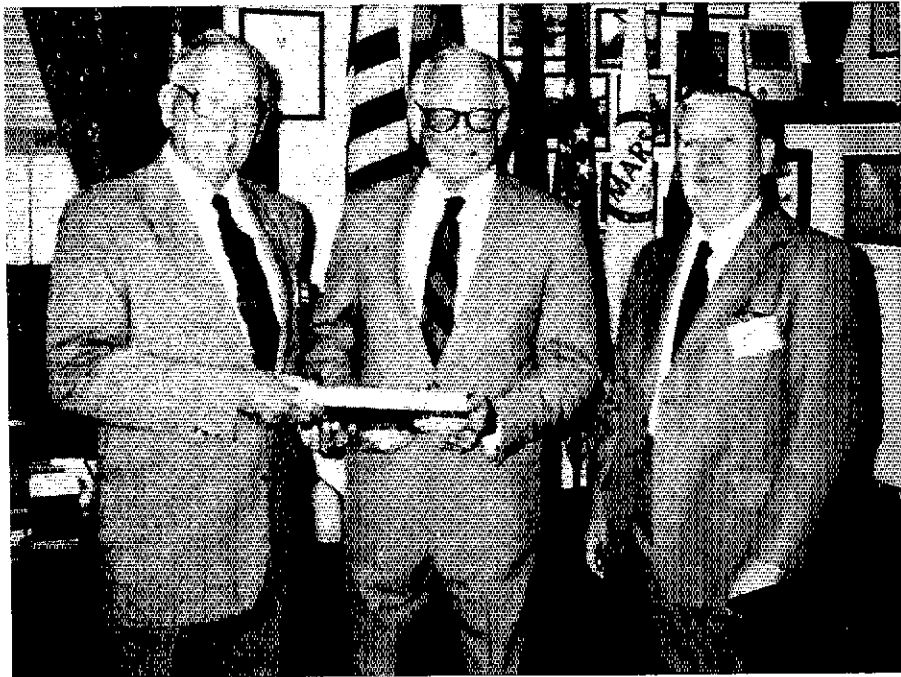
On September 30, 1985, in an upbeat ceremony in the office of Senator Barry Goldwater, K7UGA, Midwest Division Director Paul Grauer, WØFIR, President of the ARRL Foundation, presented the Senator with a commemorative book, "Charter Contributors to the Barry Goldwater, K7UGA, Scholarship Fund." Those present at the ceremony included Sen. Nancy Kassebaum (R-KS), ARRL Atlantic Division Director Hugh Turnbull, W3ABC, a large contingent of representatives of telephone companies from Kansas and the writer.

The Senator expressed his appreciation for the book, which lists the names and call signs of all initial contributors to the Goldwater Scholarship Fund. He noted that the same will permit him to personally acknowledge the gifts of each of the contributors—an endeavor he has already begun. League Headquarters has provided the Senator with addresses of each of the listed contributors.

Following the presentation of the book, Senator Goldwater noted his continuing commitment to improving the communications system of the United States, both in government and nongovernment radio facilities. Sen. Kassebaum spoke in praise of Sen. Goldwater's expertise in communications, noting that his colleagues in the Senate often seek and rely upon his experience in their own analysis of telecommunications legislation. Sen. Kassebaum interestingly enough referred to Sen. Goldwater as a "beacon" for others in the Senate to follow. A more appropriate comment could not have been made.

After the presentation, Sen. Goldwater discussed amateur matters of current interest with the League's representatives, including the FCC's PRB-1 preemption order, the effective participation of Amateur Radio operators in the Mexico City earthquake rescue efforts, and the possibility of furthering the reciprocal licensing program (which originated with Sen. Goldwater's legislative efforts).


It was clear to all in attendance that the scholarship has a great deal of significance for Sen. Goldwater. While the book of contributors to the scholarship lists those who have made it possible to reach the \$50,000 fund-raising goal, the Barry Goldwater Scholarship Fund is still



Senator Barry Goldwater, K7UGA (center) accepts a commemorative book listing the Charter Contributors to the Goldwater Scholarship Fund from ARRL's Midwest Division Director and ARRL Foundation President Paul Grauer, WØFIR (left) and Atlantic Division Director Hugh Turnbull, W3ABC.

receiving contributions.

As a postscript, congratulations go to 18-year-old Clark Barrow, KI4UT, winner of this year's Goldwater Scholarship. Clark

lives in Fort Walton Beach, Florida, and plans to use the \$5000 award to help pay for academic programs in electrical engineering at Auburn University. 

## Strays



### K7UGA MOBILE

□ Senator Barry Goldwater, K7UGA, has never been one to mince words. David Crowley, W1III, of Plymouth, Massachusetts, shares the following item from *The Boston Globe* (Oct. 2, 1985) containing some of "our man in Washington's" succinct statements.

"Sen. Barry Goldwater (R-Ariz), who is retiring next year, is slower afoot but still nimble of wit. Emerging from a White

House breakfast of Senate Republicans with President Reagan yesterday (Oct. 1, 1985), Goldwater was asked what had been discussed. 'I was sitting too far back,' he replied. 'I couldn't hear.' Well, asked another questioner, did he have any thoughts about Soviet leader Mikhail Gorbachev's public relations offensive on arms control? 'I don't know; I haven't talked to him this week.' One last try: As Goldwater was opening the door to his car, a television reporter asked why he locked it on the White House grounds. Goldwater—a ham radio operator since 1923 who helped the Mexican Embassy during the recent earthquake in Mexico City—responded, 'I have more electronics in here than you have out there.' "

## Proclamation

by  
Martha Layne Collins  
Governor

of the

## Commonwealth of Kentucky



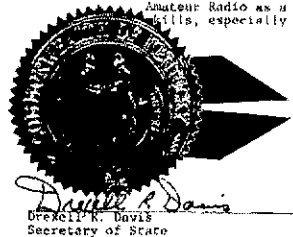
*To All To Whom These Presents Shall Come:*  
WHEREAS, More than 400,000 Americans, including more than 5,000 Kentuckians, are currently Amateur Radio operators or "hams"; and,  
WHEREAS, Amateur Radio is a unique hobby in that every amateur is licensed by their government on the premise that Amateur Radio is a service "in the public interest, convenience, or necessity"; and,  
WHEREAS, Amateur Radio operators relay personal messages (free of charge), compile and exchange weather information, train for emergencies, transmit messages to servicemen overseas, and participate in public service activities such as walk-a-thons; and,  
WHEREAS, Amateur Radio is often the first line of communication into and out of a disaster area and often provides emergency communications throughout the entire period from onslaught to cleanup; and,  
WHEREAS, Amateur Radio operators across Kentucky are standing by to respond to most any emergency for the sole purpose of providing emergency communications for government agencies and disaster relief organizations;  
NOW, THEREFORE, I, MARTHA LAYNE COLLINS, Governor of the Commonwealth of Kentucky, do hereby proclaim the week of September 29 through October 5, 1985 as

### AMATEUR RADIO APPRECIATION WEEK

in Kentucky and encourage all citizens to recognize Amateur Radio as a source of technical and communications skills, especially during emergencies.

DONE AT THE CAPITOL, in City of Frankfort, this the 24th day of July, in the year of Our Lord One Thousand Nine Hundred Eighty-five and in the year of the Commonwealth the One Hundred Ninety-fourth.

*Martha Layne Collins*  
MARTHA LAYNE COLLINS  
GOVERNOR



DEWEY H. DAVIS  
Secretary of State

This proclamation helped ensure that the week of the ARRL National Convention would be special.

### RADIO PIONEER F8DR A SILENT KEY

□ Guy de Bourg de Bozas, F8DR, a witness to the first amateur transatlantic two-way, became a Silent Key on August 4, 1985. He was 90. Du Bourg was present when Leon Deloy, 8AB, made historic two-way transatlantic contacts with Fred Schnell, 1MO, and John Reinartz, 1XAM, on November 27, 1923. An electrical engineer, Du Bourg held many patents, most of which concerned direction finding.

### THE MICHIGAN QMN NET—50 YEARS AND GOING STRONG

□ This fall, the Michigan QMN Net celebrated its golden anniversary. Begun in 1935 as a CW traffic net, it has operated daily, except during the war years. At first, message traffic was handled on an individual, ad hoc basis, and schedules were often arranged inadvertently after a chance reply to a directional CQ. Toward the middle '30s, we became aware of a new technology—crystal control—which opened the door for dependable, high-speed traffic circuits. The stage was set for something new: the one-spot traffic net.

In early 1935, at the Detroit Naval Armory, many out-of-state traffic men, including myself, were present when Jim Robinson, W8DVC, suggested we consider the possibility of using a net-type operation at a specific time on a single, crystal-controlled, 80-meter frequency—not just in the Detroit area, but statewide. Detroit Amateur Radio Assn. (DARA) members voted unanimous support, and the Michigan net was born.

From the original 12 amateurs that first night in 1935 we grew rapidly. The 1941 *QMN Directory* lists 305 Michigan stations, a few of whom actively check into the QMN Net to this day.—Don Devendorf, W8EGI

### AMATEUR RADIO STAMPS

□ Phil Sager, WB4FDT, of Falls Church, Virginia, offers this updated list of Amateur Radio stamps as an aid to collectors. While none of the stamps are expensive, they are rather difficult to find from the average stamp dealer. A complete set of all 31 issues would probably run about \$60. In attempting to locate stamps, use the Scott stamp catalog number, which will enable dealers to tell quickly if the stamps are on hand.

Country	Scott Cat. No.	Description
Argentina	1287	50th anniversary, Radio Club Argentina
Ascension Islands	301-4	Boy Scout set with one stamp showing ZD8JAM
Australia	304A	Souvenir sheet of the set
Bolivia	unlisted	1985 airletter
Brazil	638	Honors Amateur Club of Bolivia
Chile	1533	Amateur Radio Day
Chile	631D	60th anniversary, Radio Club of Chile
Colombia	813	40th anniversary, Amateur Club of Colombia
Colombia	C735	50th anniversary, Amateur Club of Colombia
Costa Rica	C633-5	16th anniversary, Central American Amateur Radio Convention
Czechoslovakia	908-11	10th anniversary, Amateur Radiosport
Djibouti	528	Honors Amateur Radio Club of Djibouti
Dominican Republic	773, C246	50th anniversary, Dominican Republic ARC
Dominican Republic	C286	Honors DXpedition to Beata Island
Dominican Republic	C320	Honors DXpedition to Catalina Island
German Democratic Rep. (East Germany)	1388-1392	One value in set honors Amateur Radio and shows code key
Japan	1312	50th anniversary, Amateur Radio in Japan
Jordan	1156-60	Set shows King Hussein in front of his amateur station
Poland	991-993	One stamp shows logo of Polish Amateur Radio Club
Poland	993A	Souvenir sheet containing set of 3
Poland	2088	IARU Conference in Warsaw, 1975
Poland	4733	Honors RS-1 and RS-2 satellites
Poland	4917	30th Amateur Radio Design Competition
San Marino	1051	Shows amateur operator using antique receiver
Solomon Islands	512	Shows amateur special-event station H44SI; first-day cover
Soviet Union	4084	Honoring Ernest Krenkel RAEM; scarce first-day Maxim card
Sri Lanka	655	50th anniversary, Amateur Radio Society; plate block of 10
Switzerland	677-80	One stamp in set honors Union of Swiss Amateurs
United States	1260	50th anniversary, ARRL
Uruguay	unlisted	50th anniversary, Radio Club of Uruguay
Yugoslavia	809	20th anniversary, Union of Radio Amateurs

# 7 Max, or DXCC on December 2 at 10 AM

By John G. Troster, W6ISQ

Contributing Editor

82 Belbrook Way, Atherton, CA 94025

“Gee, Old Tyme DXer, I see your call in *QST* way up on the DXCC Honor Roll. I don't guess I'll ever even make DXCC.”

“Aw, not to worry, kid. When you've been through as many sunspot cycles as me, you'll be way up there, too. You only had a license about half a cycle. How many countries you got?”

“97.”

“Ahhhh ... In 4 years ... 97?”

“Well, I call everything I can hear. And even some I can't hear.”

“Lotta people do that. Ahhhh ... you got a problem, kid. Oh, well. Maybe we can work out a little ‘Think DX’ strategy that will get you DXCC real quick ...”

“Gee, thanks, Old Tyme DXer. What I do?”

“First, let's look up in *QST* when some o' them big DXpeditions is going out. Check here with Ellen White on page 61. Hmmm ... here is one coming on the air today. Going to one o' them new J-call islands. It says here that the DXpedition will have 3 rigs and 8 operators and be there 7 days. This is a good one for you to start on, kid.”

“Okay, I'll call and call and call like usual.”

“Well, don't fight it. Stay on the edges of the pack. What rig you using?”

“40 watts, mostly CW, and a DOTR antenna ... ahhh ... Dipole-On-The-Roof.”

“Oooohhh ... ugh. That explains ... ahhh ... guess we're gonna have to change strategy even before we start. Hmmm ... Okay. The first thing you gotta do is throw that CW/phone switch on your Little Wheezer to phone. And you do not ... NOT ... call for the first 3 days. That's when the DXpedition works the Big Guns who like to play ‘king of the hill’ with new DXpeditions. But after that, the Big Guns get bored and tired of harpooning each other, and they will move off onto some other unsuspecting fella.”

“Okay. I'll stay away from Big Gun Royalty.”

“Right. But then the DXpedition runs out of loud callers, and they will start to work off a phone list with a Friendly List Master of Ceremonies doing all the work for them. That's when you get ready to strike.”

“I strike, yeah. New country.”

“Not yet, kid. The Friendly MC has to work down the first big list pileup. That

will take at least a day.”

“Okay ... next day. New country.”

“Not yet. You don't really expect to get the Friendly MC's attention the first day you call. Ahhhh ... you say 40 watts is all you can jam into that DOTR antenna?”

“Oh, I'll yell real loud into the mike.”

“Yeah, they all do. Be sure to use the phonetics that gives your call letters the best click sound. Maybe talk in a high-pitched falsetto that sounds like a YL. Maybe say portable. And talk and draw out your phonetics a loooooonnnnggg way. Helps blank out the opposition ... ahhh ... Do this all day. Good practice.”

“My voice is still a little squeaky.”

“Keep squeaking. Now you been waiting 4 days and practicing 1 day. So the sixth day is yours. If ya don't make it then, you have the seventh day for a last-gasp try.”

“Maybe I should wait for an 8-day DXpedition.”

“If you can't make it in 7 days maximum, the Big Guns will start drifting back for their 15th ‘king of the hill’ QSO. Then it's too late for you.”

“Okay, my strategic days is 7 ... maximum.”

“Now listen. What I'm 'gonna tell you now is the most important thing I'm gonna tell you. You gotta think DX. In all them first 5 days you think nothing but DX and Friendly List MC thoughts. Forget the YL, mom, work, weather ... everything. You got to *know* you're gonna get on the Friendly List MC's list, and he's gonna help you to work that new J-island.”

“Yeah, yeah! Hear me, O Friendly List MC. Listen, it's me ... just a little QRPeep aiming at Major Big Gun Royalty status. And, congratulations, I just worked a new country.”

“Naw, you're still just trying to get on the Friendly List MC's list. Got a tree anywhere?”

“Then why can't I begin thinking good Friendly List MC and DX thoughts 3 days ago and work 'em right away?”

“Ahhh ... First, you gotta soak up all these free goodies I'm telling you from 6 sunspot-cycles' experience. For you, maybe the DX Think System takes a few more days to operate, right? Anyway, you'll probably make the list on the sixth day. So, now, congrats, you got number 98.”

“Wait a minute, Old Tyme DXer. I just got on the Friendly List MC's list. I still ain't worked the J-island yet.”

“Oh, okay. Now you're on the list; the

rest is automatic. The Friendly List MC calls you, and then you call the DXpedition. Give your call and say '59' and then you count 5 and 9 ... just to make sure he's got the right report numbers.”

“Why 14?”

“Noooo ... not 14. Ya count to 5 and then ya count to 9. Ahhhh ... maybe ya got something new there, kid.”

“What do I say 14 times, Old Tyme DXer?”

“Nothing, kid. I can't believe it. Something new in DXing after 6 sunspot cycles.”

“Now, I've got DXCC 98. Now what?”

“Back to Ellen White in *QST*. Look for more 7-day DXpeditions. Here's one to Bermuda 2 days later ... that's 99. And here's a fella going on a 7-day vacation in Curacao on November 10. That's 100. You made DXCC. Easy when ya use the Think DX System.”

“I'm Big Gun Royalty.”

“Give 'em all 14s ... ahhhh ... to make sure you get a QSL.”

“Gee, let's see. He arrives in Curacao November 10. I wait 3 days, until the 13th. Then wait one more day for the list to thin out ... that's the 14th. Then I practice-call one day and get on the list the next day ... that's the 16th. Send QSL same day. He comes home next day ... the 17th. He begins to print QSLs on the 18th. A week at printers ... 25th. A week to answer my QSL ... 32nd ... errr December 2.”

“Hmmm ... 14 is too long to count out.”

“December 2 at 10 AM I will be in front of my house waiting for my Curacao QSL from the mailman.”

“So, how about 10? A 10 could really be a 5 × 5 of a 4 × 6 or a 6 × 4 ...”

“On December 2 at 10 AM I will be a Big Gun DXCC Royalty DXer.”

“Just one single report number is all we need. But maybe 10 is still too many to count. How about half a 5 by 9?”

“Okay. I'll begin my J-island count-down. Today is number one. Beautiful J-island ... Friendly List MC ...”

“7 could be the max report. 6 not so max, and 5 is please repeat ... and 7 is easy to count.”

“Think DX ... please, blinding sunspots, hover over that beautiful J-island in the sky ... 7 days max is all I need.”

“Right. A simple 7 max report is all we need. Hey, kid. You're going places in this DX game.”

- 421-430 MHz Goes to Land Mobile
- FCC Enforcement Actions
- New Third-party Agreement with United Kingdom

## Amateur Radio, Newsgathering and Broadcasting

The Commission's Rules generally permit rebroadcasts of transmissions of stations in nonbroadcast radio services, but prohibit the use of stations in services not allocated for broadcast purposes to transmit communications intended for broadcasting.

Such was one of the many comments read out by FCC in last June's *Report and Order* terminating the proceeding in BC Docket 79-47. It seems straightforward enough. The heading for 79-47 reads "In the Matter of Amendment of Parts 73 and 97 of the Commission's Rules Concerning Rebroadcasts of Transmissions of Non-Broadcast Radio Stations"; the intent of the proceeding was to clarify what use could be made of nonbroadcast radio by broadcast users of radio (and television!). Has it?

Some say yes, and some say no. FCC was pretty sure it had covered all the bases. In the text accompanying the rules changes ordered in 79-47, FCC touched upon broadcasting, Amateur Radio, General Mobile and CB interests. The Commission related how it had dealt with a request from the National Association of Broadcasters for the amendment of the rules to permit broadcast stations to rebroadcast CB emergency transmissions and to permit amateur stations to transmit emergency and public-safety information for broadcast and broadcast-related purposes.

Congress had modified Section 605 of the Communications Act of 1934 to eliminate the statutory proscriptions on the unauthorized interception of Amateur Radio and CB transmissions. Another modification of 605 in October 1984 did nothing to alter matters relating to privacy or rebroadcasts of Amateur Radio and CB communications. FCC had decided to undertake "a comprehensive review and revision of its regulations with respect to rebroadcasts of transmissions of non-broadcast radio stations."

Another log on the fire was the interaction between the broadcast media and Amateur Radio when the US invaded Grenada in October 1983. What about cooperation between Amateur Radio and the National Weather Service—the collection of weather data, the spotting of tornadoes and their associated severe-storm systems? It all had to be dealt with comprehensively in BC Docket 79-47. (See *Happenings*, September 1984 *QST*.) The outcome was the 18-page document released by FCC on June 13, 1985. The Report and Order revised several sections of Part 97, the Rules for the Amateur Radio Services; these revisions were covered briefly in August 1985 *Happenings* and in greater detail in Washington Mailbox, September *QST*. The full text of these revisions follows this piece.

Glossed, the revisions to Part 97 redefine "emergency communications," add a prohibition of broadcasting to the rules pertaining to repeater operation and slightly alter the text of the rule prohibiting business communications. There is great expansion on the theme of Section 97.113 ("Broadcasting and broadcast-related activities prohibited"): What was a two-sentence paragraph was revised to detail in *nine* paragraphs the dividing line between Amateur Radio and broadcast work. In paragraph 20 of the discussion accompanying these revisions, the Commission says that "we are revising the amateur rules and including specific provisions to prohibit use of amateur stations for broadcast news gathering or production purposes as proposed. These rules will prohibit use of an amateur radio station as a remote pickup or auxiliary link broadcast service facility. Such uses of an Amateur Radio station as forwarding weather reports or providing commuter traffic reports for use in any broadcast context will continue to be expressly prohibited." That seemed to nail things down pretty well.

Some customers weren't satisfied—ARRL, for one. The League took exception to the narrowing of the definition of "emergency communication" as set forth by the Report and Order (see "Petition for Reconsideration," below). The original Notice of Proposed Rule Making in 79-47 hadn't proposed such a revision, and the original definition was adequate.

The National Weather Service wasn't satisfied. Interpretations of the revised Part 97 in the 79-47 *Report and Order* from some sources in the Amateur Radio media had participation in severe-weather-spotting nets drying up. Couldn't Amateur Radio relay reports of threatening weather to NWS, or did it have to wait for actual tornadoes to drive actual straws through actual fence posts (or houses, or people) before reacting to an "emergency"? Could Amateur Radio report on a cracked dam that hadn't broken?

The cracked dam broke, so to speak, on September 19, 1985, when the first of several terrific earthquakes struck Mexico. Print and electronic news media descended on ham shacks in force. There was raw newsgathering in the ham bands. Perhaps worse, amateur frequencies were used for the passing of business traffic many observers say went beyond what was called for by the earthquake emergency. What, in the language of the final *Report and Order* in BC Docket 79-47, could have allowed this?

It will go down in amateur history as "the rule of reason." The black-and-white

revisions of Part 97 in the Order prohibit newsgathering right enough. But in paragraph 22 of the discussion preceding those revisions in the *Order*, FCC had opined:

We note that a rule of reason applies when interpreting this emergency exception to the broadcast prohibitions in the Amateur Radio Service. Thus, conveying news information directly relating to an unforeseen event which involves the safety of human life or the immediate protection of property falls within this rule of reason, if it cannot be transmitted by any means other than amateur radio because of the remote location of the originating transmission or because normal communications have been disrupted by earthquake, fire, flood, tornado, hurricane, severe storm or national emergency . . .

Boom. There it is. That was the loophole. That's what was behind the newsgathering and questionable business traffic you may have heard on amateur frequencies during the Mexican earthquake disaster. The clinker is that *the letter of the rules* prohibited much of what went on, no matter what related opinion in the 79-47 document had to say. Informal comment from FCC subsequent to all this has indicated that such use of amateur frequencies wasn't what they'd had in mind at all! But informal comment is just that: non-binding, unofficial. And what of the National Weather Service's plaint: shrinking participation in spotting and reportage of tornadoes, hurricanes and other severe weather on the part of radio amateurs who wish to continue their tradition of serving the public interest the best they know how—*while sticking to the rules*? Official clarification on a number of points in Docket 79-47 may be in order.

A copy of FCC's *Report and Order* in 79-47 may be had from ARRL Hq. for a business-size s.a.s.e. bearing 39 cents postage. To update your copy of *The FCC Rule Book*, revise paragraph (d) of Section 97.3 (Definitions) to read as follows:

(w) *Emergency communication.* A non-directed request for help or a distress signal directly relating to the immediate safety of human life or the immediate protection of property.

Paragraph (d) of Section 97.85 (Repeater operation) is revised to read as follows:

(d) A station in repeater operation shall be operated in a manner ensuring that it is not used for broadcasting (see §97.113).

Section 97.91 (One-way communications) is removed and reserved. Section 97.110

(Business communications prohibited) is revised to read as follows:

The transmission of business communications by an amateur radio station is prohibited except for emergency communications (see §97.3[w]).

Section 97.113 (Broadcasting prohibited) is revised to read as follows:

**§97.113 Broadcasting and broadcast related activities prohibited.**

(a) An amateur station shall not be used to engage in any form of broadcasting, that is, the dissemination of radio communications intended to be received by the public directly or by intermediary relay stations.

(b) An amateur station may not be used for any activity directly related to program production or news gathering for broadcast purposes.

(c) An amateur station shall not retransmit programs or signals emanating from any class of radio station other than amateur, except for emergency communications (see §97.3[w]).

(d) The following one-way amateur transmissions are not considered broadcasting:

- (1) Beacon or radio control operation;
- (2) Information bulletins consisting solely of subject matter relating to amateur radio;

(3) Transmissions intended for persons learning or improving proficiency in the international Morse code; and

(4) Emergency communications (see §97.3[w]).

(e) Round table discussions or net operations where more than two amateur stations are in communication with one another are not considered broadcasting.

**ARRL's Petition For Partial Reconsideration in BC Docket 79-47**

As mentioned, ARRL has asked for partial reconsideration in 79-47. Here are some of the finer points:

1) As noted above, prior to the effective date of its *Report and Order*, Section 97.3(w) of the Rules defined emergency communications as "any amateur communication directly relating to the immediate safety of life of individuals or the immediate protection of property." This definition has adequately served to inform amateurs of what constitutes emergency communications and what does not, from the point of view of exceptions to the prohibitions of one-way communications and of business communications.

2) The original Notice of Proposed Rule Making in 79-47 did not suggest revision of the definition of emergency communications. It did propose the elimination of the authority to transmit one-way "emergency communica-

tions including bona fide emergency drill practice transmissions" addressed to amateur stations. The League's comments objected to the deletion of express authority to engage in one-way emergency communications and to make such transmissions in *bona fide* simulated emergency-preparedness tests in which amateurs are engaged routinely.

3) No good reason can be found to justify the extremely narrow and restrictive definition of emergency communications cast upon the Amateur Service for the first time in the *Report and Order* in 79-47.

4) The "rule of reason" noted in the *Report and Order* is no substitute in this instance for a rule which is sufficiently broad on its face to allow amateurs the flexibility to exercise their own demonstrated reasonableness in emergency-communications situations. Licensees should not have to make snap decisions on the legality of a communication under emergency conditions; the rule itself should provide sufficient flexibility.

5) The old definition of "emergency communications," or one less restrictive than the former, should be adopted.

A copy of ARRL's Petition for Partial Reconsideration in BC Docket 79-47 may be had from Hq. for a business-sized s.a.s.e. bearing 22 cents postage.

**ARRL COMES DOWN HARD ON ATTEMPT TO USE AMATEUR FREQUENCIES FOR BROADCAST PURPOSES**

What's new under the sun? The proverbial rejoinder might be that there's nothing new except what's been forgotten. Let's take a peek into the 1933 edition of *The Radio Amateur's Handbook*:

... A hotel on the Pacific Coast offered an amateur radio club a fine meeting place with free light, power and heat—provided the amateurs would establish an amateur station and relay messages for guests of the hotel. A certain newspaper planned to 'organize an amateur radio club' and establish a 'net' for the collecting of amateur news for the paper. It offered the amateurs a club room and the facilities of a powerful station that it would install as 'net control station' in return for the things it could gain by making amateurs violate their amateur status!

What's new? It's been called PRB-2. On August 13, 1985, Lee Shoblom, K6ADA, President and General Manager of London Bridge Broadcasting, Inc. filed a request for waiver of the amateur Rules to permit him to use Amateur Radio in newsgathering for broadcast purposes. He requested that he be able to use 434 MHz for gathering news of community interest for broadcast on his low-power television station. Hmmm. Wasn't this just a fancy way of proposing the use of Amateur Radio in "remotes" (remote pickups) for "electronic news gathering" (ENG)?

ARRL thought so. One of the decisions taken at the August meeting of the ARRL Board's Executive Committee was that Counsel be ordered to file comments opposing "in the strongest possible terms"

the unwarranted intrusion of broadcasting into an amateur band. Here are some of those comments:

The League is frankly at a loss to understand how this request merits establishment of a pleading cycle for public comment. Even had London Bridge attempted to meet its burden to justify a waiver, the issue raised therein—use of Amateur Radio for broadcast purposes—has just been addressed directly in a full notice and comment proceeding. *Report and Order*, Docket 79-47 [see above] ... the solicitation of comment has caused a great deal of misunderstanding on the part of responsible broadcasters and amateurs. It has further confused the process of determining the reasonable parameters of cooperation in emergencies between the two types of licensees. The pleading cycle should be terminated immediately and the waiver request denied.

When an applicant seeks waiver of a rule, he or she must plead with particularity the facts and circumstances that warrant such action and give affirmative reasons to justify the grant of the waiver and the public interest ... London Bridge has not even attempted to meet this burden. The sole justification stated in the request is that: "I'm well aware that this is a most unusual request, but I feel it is right in line with the many recently lifted FCC restrictions, amateur and commercial, allowing better service to the community, more efficiency in our operations and a more reasonable approach to rules and regulations."

Such a general hearts-and-flowers approach fails utterly to justify a waiver of whatever Amateur Radio Service Rules London Bridge wishes to have waived. The request is procedurally inadequate and must be denied.

... London Bridge's request ... apparently seeks waiver of both Sections 97.110 and 97.113 of the Rules, which pro-

hibit ... business communications (except emergency communications) and broadcast-related activities. Specifically, Section 97.113(b) of the Rules directly prohibits use of an amateur station "for any activity related to program production or news gathering for broadcast purposes." This is, of course, exactly what London Bridge wishes to do with amateur station K6ADA.

... The broadcast services are adequately served by remote pickup broadcast service facilities for remote transmissions of the type sought by London Bridge ... it is obvious that the basis for London Bridge's request is that amateur television equipment is significantly less expensive than type-accepted broadcast remote-pickup transmitters and associated equipment and is of high enough video quality to be used for TV auxiliary use ... London Bridge more appropriately should have sought a waiver of type-acceptance requirements for TV auxiliary stations under Part 74 to allow use of non-type-accepted hardware on broadcast auxiliary frequencies ...

Commercial use of Amateur Radio is antithetical to the basis and purpose of the Service, as understood both nationally and internationally. Use of amateur frequencies for newsgathering and other broadcast-related purposes is expressly prohibited by the Rules, and has uniformly been so prohibited since the advent of the Service ... the instant waiver request is a blatant intrusion into the non-commercial nature of Amateur Radio with no explanation even attempted. With vast spectrum allocations available to TV auxiliary use in the area of Lake Havasu City, the absurdity of the request is apparent.

Reply Comments in PRB-2 were to have been filed by October 28. Thirty-nine cents postage on a business-size s.a.s.e. will bring you a copy of the League's comments in PRB-2. It's hoped that FCC's answer to the London Bridge request will be succinct. The same old question deserves the same old



answer: Broadcast use of amateur frequencies is not Amateur Radio. But that's nothing new.

## 421-430 MHz GOES TO LAND MOBILE AT DETROIT, CLEVELAND AND BUFFALO

Effective November 4, 1985, FCC has allocated portions of the band 421-430 MHz to the Land Mobile Service in the vicinities of Detroit, Cleveland and Buffalo. In its *Report and Order* in General Docket 85-113, released September 26, 1985, the Commission declared that this has been undertaken to reduce Land Mobile channel congestion near these cities. ARRL had opposed this reallocation; see August 1985 Happenings for details.

When ARRL filed its opposing comments in 85-113, 420-430 MHz had not yet been removed from the Amateur Radio Service above Line A. In an action chronicled in October Happenings, FCC did just that. This literally "cleared the air" for action in 85-113. Because 420 to 430 MHz was removed from the Amateur Service North of Line A as of 0001 UTC September 28, the use of 421-430 MHz by Land Mobile operations is expected to have minimal impact on amateur use of the 70-cm band. FCC puts it this way in its *Report and Order*:

17. South of Line A, the current amateur allocation at 420-430 MHz is secondary. As a secondary service in this band, amateur operation shall neither cause interference to nor claim interference from "stations of primary or permitted services to which frequencies are already assigned or to which frequencies may be assigned at a later date." Amateur stations are therefore secondary to the Government Radiolocation Service and will be secondary to the Land Mobile Service in Detroit, Cleveland and Buffalo.

18. Amateurs are concerned that their communications would be severely disrupted by the proposed reallocation. The land mobile allocation in Cleveland and Buffalo means amateurs south of Line A, but within interference range of those cities, will have to avoid interfering with the primarily land mobile service. However, amateur stations south of Line A may continue to operate in the 421-430 MHz spectrum as long as they do not cause interference to land mobile or

### Are You a Lawyer? Amateur Radio Wants You!

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

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

## Be a Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution now.

If your contribution is \$25 or more, we will list your name and call in QST. If your contribution is \$100 or more, in addition to your name and call appearing in QST, you will receive a signed photograph of the Senator, suitable for display in your ham shack. And for contributions of \$1000 or more, in addition to the above, we'll put your photo in QST.

We welcome all contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being? Please make your check payable to the ARRL Foundation Goldwater Scholarship Fund, and send to ARRL Foundation, 225 Main St., Newington, CT 06111.

Recent contributors of \$25 or more include: Mesilla Valley Radio Club; Elmer John Nolte, N5CLX; Peter Elmendorf, KB2DR; William Dean, W4SJ; Six Meter Club of Chicago, Inc., K9ONA; William R. Cottrell, W9DI; in memory of Russell Saye Hope, N4SNI, by John R. McAlpine, KZ4B; in memory of Herb Muth, N9ALX, by the Tri-State Amateur Radio Society; in memory of Martin C. Cornell, Jr., K6NS, by Richard A. Tyo, KC8L.

Government radiolocation users. We believe that the disruption to amateur radio will be minimal since the principal use of land mobile radio occurs during non-business hours... while the reallocation may preclude some amateur operation during business hours, the history of amateur radio points to innovativeness and flexibility in the resolution of any disruptive effects resulting from its operation...

FCC had proposed to delineate by counties the areas where land-mobile base stations could be located, but this was opposed by all who commented on the approach. Instead, a "point and radius" method of delineation is to be used. Geographic coordinates are specified for the center of each city, and base stations are permitted within a 50-mile radius of that point. Proposals that areas covered by this reallocation be expanded, perhaps to include the area of entire states, were not adopted.

Changes to Part 97 as a result of this action? None. FCC has amended the Table of Frequency Allocations in Section 2.106 of its Rules, though, to include a footnote allocating 422.1875-425.4875 and 427.1875-429.9875 MHz within 50 statute miles of Detroit and Cleveland, and 423.8125-425.4875 MHz and 428.8125-429.9875 MHz within 50 miles of Buffalo, to nongovernment land-mobile service on a primary basis.

A copy of FCC's *Report and Order* in 85-113 may be yours for a business-size s.a.s.e. bearing 22 cents postage.

### THIRD-PARTY TRAFFIC OK WITH UK

The Federal Communications Commission announced an agreement, effective October 14, with the United Kingdom's Department of Trade and Industry, permitting third-party communications between amateurs in the United States and special-events stations in the UK. This applies only to UK special-event stations using the prefix GB, but note that GB3 stations are excluded. Three conditions apply: (1) Communications are limited to conversations or messages of a technical or personal nature too unimportant for a commercial message. (2) No compensation, either direct or indirect, may be received for the passing of such traffic. (3) Communications must accord with regulations for amateurs in each country.

## REVOCATION AND SUSPENSION PROCEEDINGS AGAINST W6VCE AFFIRMED

In a decision released on September 24, FCC's Review Board affirmed the 1984 finding of an administrative law judge who found that James W. Smith, W6VCE, El Cajon, California, had willfully and maliciously interfered with other amateur stations. (See Happenings, July 1984 QST.) Specifically, Smith, without identifying his station, transmitted country-and-western and easy-listening music over his amateur station. William Grigsby, engineer-in-charge of FCC's San Diego District Office, personally monitored Smith's violations.

In appealing the finding, Smith contended that Grigsby had lacked the technical equipment necessary to access the repeater frequency on which the music was heard. He later claimed that Grigsby's testimony was prejudicial, and that he had been harassed by local amateurs.

The FCC review board found Smith's arguments to be without merit. The revocation and suspension proceedings will become effective 40 days after the release of the Board's decision.—Katherine Hevener, WB8TDA

## SONIC CABLE ORDERED TO PAY FINE

In a Memorandum Opinion and Order released September 16, FCC denied Sonic Cable Company's latest legal action seeking to avoid payment of a \$6000 fine. Following a 1982 FCC inspection of its plant, the California-based company was served with a Notice of Apparent Liability for its failure to correct harmful interference to a "Radio Communications Service" as well as signal-leakage levels in excess of those permitted under Part 76 of the Commission's rules. In seeking reconsideration, Sonic contended that the Commission lacked statutory authority for its action. The Commission, however, stated that Sonic's argument was "without merit" and ordered the cable operator to pay the forfeiture within 30 days of the release date of the Memorandum Opinion and Order. The FCC made clear its intention to continue without fundamental changes its processes for subjecting cable-television system operators to forfeiture liability for violation of its Rules or the Communications Act.—Katherine Hevener, WB8TDA



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.

## THANK YOU LAKELAND ARC

□ I want to express my sincere appreciation to members of the Lakeland Amateur Radio Club, Lakeland, Florida, for their assistance in selling the radio equipment of my late husband, Richard W. Mitchell, W4WWB, who was a Life Member of ARRL.

Coordinated by Norman Weddell, W9HOH, the group obtained the best return possible for the equipment by sale to other amateurs and by auction at their club meetings. This was done promptly following the death of my husband, and it gave me comfort to know that this phase of settling his estate was done with such consideration.

Many of the Lakeland Radio Club members are ARRL members, and I want to go on record that they represent the finest of ham radio.—*Mary Lucille Mitchell, Zephyrhills, Florida*

## THE RETURN OF NO-CODE

□ The arguments against the no-code Amateur Radio license concept have been fun to read. Besides using CW as a test of morality, CW is supposedly the one modulation technique that gets through when nothing else works. This probably explains why CW is used so extensively in public service and disaster communication. Of course, I never seem to actually hear much CW traffic during disasters, but since CW is so essential, I'm certain that CW activity reaches an all-time high during these emergencies.

During the Mexico City earthquake, I must have been too busy to notice all the CW traffic. But I'm sure that our extensive CW messaging system was well covered by the network television crews. After all, our CW efforts provided the only link during this communications crisis.

And I suppose I was much too busy handling voice and packet traffic to notice the extensive use of CW during the California fires. Or the use of CW as the Eastern Seaboard was clobbered by hurricanes. Or by the ham in space missions. Or during the Grenada invasion. Or during the Olympic games.

Yes, CW is essential for communications emergencies, and efficient, too! CW spectrum requirements are so efficient that disaster-originated signals seem to disappear all together! For such reasons, I'm sure that your local ARES group puts CW to good use during marathons, bike races, parades, and so forth, where it seems to work best through VHF and UHF FM repeaters.

This letter is written, of course, with tongue slightly in cheek. But it illustrates the fallacy of many arguments opposing a no-code Amateur Radio license at VHF/UHF. The only honest reason for opposing the no-code license is because we continue to believe in CW as a test of morality to pass only "good" hams, even though it filters out many times more "good" hams than it produces. Ask yourself, how many of your good, moral,

bright friends would join the Amateur Radio Service if the code requirement was dropped for a UHF voice and digital class of operation? Interesting to think about.—*Edward Mitchell, WA6AOD, Palo Alto, California*

## CW PR

□ Recently, the FCC, with the endorsement of the ARRL, decreed that the code requirements should remain. Now there's talk of enhancing Novice privileges, luring the Novice away from code. This does not make sense to me.

I realize that this step is being taken to try to hold the high percentage of Novice dropouts who never get on the air. To me, enhancing or glorifying the use of code would be more in keeping with the decision to keep the code requirements.

When was the last time that *QST*, or any ham magazine, ran an article on the use of code? The early edition of the ARRL *Operating Manual* contained a lengthy section on techniques and procedures on using code, as well as a large glossary of abbreviations and Q signals. The later editions contain very little on code use. The magazine ads hawk the latest state-of-the-art equipment, SSTV, RTTY, packet radio, etc. It's little wonder that the Novice shows apathy towards the use of code.

One need only tune in to the CW portion of the forty meter band during prime time to see that CW is very much alive. The new Novice needs a role model. It behooves those of us who use code to make ourselves known and speak up in behalf of using code. We must stop treating CW as a necessary evil and sell it for what it is—an important and fun mode of communication.

The use of Morse code is sadly in need of some good PR!—*John Billones, WD6GGC, El Cerrito, California*

## AMATEUR RADIO—WHAT'S THAT?

□ On a recent vacation to Hawaii, I took my Kenwood 2500 hand-held and the ARRL *Repeater Directory* with me. Although by scanning I could receive a number of signals, I could not contact any local stations.

I wanted to get in touch with a local ham or a local ARC; I was in a hotel and did not have a *Callbook*. First I asked the hotel operator if she could put me in touch with a local Amateur Radio operator or a club. She said "What's Amateur Radio? Do you mean CB?" I explained, "No, I mean Amateur Radio."

Next, I tried the local police. Here I spoke to two different officers. Both asked me if I meant CB; both had not heard of Amateur Radio! Next, I tried several government offices. None could help me.

It appears to me a massive public relations program is needed. If such a lack of understanding exists in one place, it may exist in many places.

At a time when there is real concern for the

long-term viability of Amateur Radio as a hobby, perhaps we better get our thinking out of a 50-year rut and get cracking with some well-planned and directed PR to let the general public know who we are and what we do.

My recent experience clearly points up the need.—*W. A. (Bill) Rook, VE3MBF, Agincourt, Ontario*

## UPGRADE FEEDBACK

□ After many years as a Tech, General and Advanced operator, I have attained the top grade as an Extra! My new call is NZ5E and was issued by the FCC on August 23, 1985. I must write you to thank the League for its fine work on the upgrade program, i.e., the code-practice sessions and the fine publications.

Although I have worked in the electronic and publications fields for many years, a theory review was an absolute essential in passing the test. Your manuals were great! As to the code (yuck), a three-month effort was made and resulted in a pass on the first try! Since I am now semi-retired, I managed to get up early enough to catch the morning code run, and I believe that mornings are the best time for learning. Anyway, it worked for me.

Keep up the good work!—*Robert F. Wille, NZ5E (ex-KB5PJ), Colleyville, Texas*

## SIX-METER SHORTAGE

□ The following brings to light some of the problems encountered trying to locate and purchase equipment for use on the 6-meter FM amateur segment.

What has happened is that most equipment manufacturers no longer produce FM-only radios for the 6-meter amateur band. Multimode radios are available from a few companies, with FM being an option.

Six-meter FM enjoys much popularity in rural and mountain areas of the U.S., but the lack of new, off-the-shelf radios has stunted all new growth. Used commercial equipment is available (often at premium prices), and then still must be converted for use on 6 meters. Used amateur FM gear for six is very hard to locate and is often quite old when found; my Regency HR-6 is 15 years old.

Recently, I attempted to purchase a new hand-held radio from commercial manufacturers to monitor my soon-to-be finished repeater. Most companies would not consider modifying a 42- to 50-MHz hand-held for 52 to 54 MHz. Some manufacturers even thought it to be illegal. The big name companies who would consider supplying a radio wanted \$800 plus, not counting accessories!

I just hope this letter draws enough interest from U.S. radio manufacturers to either modify or design a new line for this market. I am willing to offer some ideas on design features to any company that is interested.—*Mark A. Cobbeldick, KB4CVN, Fort Payne, Alabama*

## A European Visit

In mid-summer 1985, Dick Genaille, W4UW, and his XYL visited Luxembourg, Austria, Czechoslovakia, Yugoslavia and Switzerland, planning to combine ham radio's unique "hands-across-the-world" with some old-fashioned touring. Dick's trip report and photos make interesting reading, capturing much of the international-friendship flavor of our hobby.

When Dick and his wife arrived in Luxembourg, they were surprised to be paged by LX1BI, who took them on a short tour of the city. Happily the LX visit included some time with Paulette, LX1PZ, and her husband Johnny, LX1JZ. It must have been interesting, what with Paulette speaking Luxembourgian, German, English and French with great fluency, her OM speaking some English, and W4UW being fluent in French. With two lovely daughters, the family

lives in Bascharage, about 12 km from Luxembourg City. The rig at LX1PZ/LX1JZ is a TS-830S with a tribander.

While W4UW was in Vienna, he telephoned Milan, OK1AWZ, to let him know they were en route to Prague. Milan was busy helping his radio club get ready for an upcoming contest, but found time to join them in Prague for dinner at a Chinese restaurant! Milan, 36, is an active operator and electronics engineer, and lives on the outskirts of Prague in a town called Klanovice. He has earned DXCC, 5BDXCC, 5BWAS, 5BWAZ and DXCC.

W4UW's next stop took him south to Yugoslavia (where he had previously visited Zlatko, YU3MA/YU3DJK, at that earlier time). YU3MA is an avid contest operator. The accompanying photo shows the contest antenna location for YU3MA's homebrew

10-meter 7-element monoband Yagi with a 13-meter-long boom. The stacked array belongs to YU3FP, a hot 2-meter operator. This location is at 2500 ft on a mountain in a community called Vurberg. YU3MA operates from a tent during the contest, with power run in from the closest source, which is several hundred feet away. Zlatko uses a TS-530S and a Dentron MLA-2500B for his contest work.

All of Dick's YU friends live in or near Ptuj. The town was founded in 92 AD by Roman soldiers who decided they had had enough of soldiering and felt that the area on the Drava River would be a nice place to settle.

When next you take a trip and meet some new "old" friends, take your camera along to document your journey and share the photos with the readers of *QST*.



Sightseeing in Echternach are (l-r) W4UW, LX1PZ and LX1JZ.



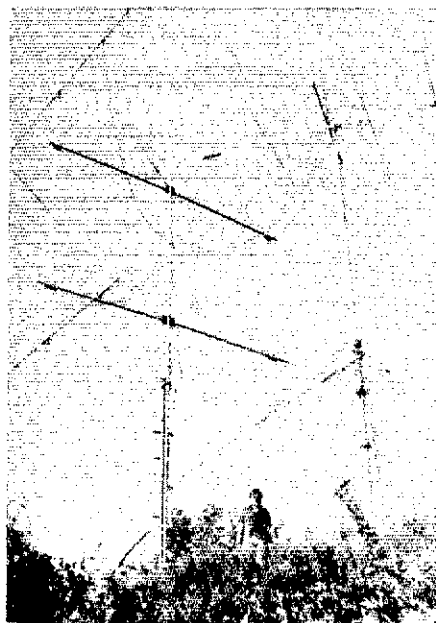
Left to right are Ivan, YU3UQX; daughter Jasna; Ivan's wife, Kristina, YU3HEJ; W4UW; and Zlatko, YU3MA.



Lojze, YU3FP, uses an ICOM 245E, a Dentron amplifier and a KLM PRA-144 preamp. He also has a Mirage 160-W linear. YU3FP's ham family also includes XYL Brigita, YU3HGL.



Milan, OK1AWZ



YU3MA's 10-meter Yagi at his remote contest location. The stacked array belongs to 2-meter-active YU3FP.



YU3MA

## JAPAN

Nineteen days after the U.S.-Japan reciprocal operating agreement took effect on September 7, five individual station licenses were issued to U.S. amateurs, effective October 1. 7JIAAA was issued to AH0A, 7JIAAB to NA2Y, 7JIAAC to KH2AC, 7JIAAD to WA4PRF and 7JIAAE to A10D. Full information for operating in Japan under the new arrangement is available from your ARRL Headquarters. The JARL's contact address continues to be Japan Amateur Radio League, 1-14-2 Sugamo, Toshima, Tokyo 170, Japan.

## CHANGING ONE'S QTH

Alex Comfort, G4/KA6UXX, just moved back to England after 11 years in California. His new QTH is next door to a working windmill. This represents a standing temptation because the sweeps (sails) are, by his calculation, exactly the right length to support a 40-meter quad. But how a rotating quad would perform he's not sure. At any rate, the mill is important as a historic building, and he isn't about to risk hassle by putting a mast and beam next to it. Alex settled for a trapped vertical. He thinks DX looks good. None of the JAs and ZLs are as loud as they were in Santa Barbara. Instead, the bands are full of Russian and Yugoslav club stations with brisk QSOs, apparently involved in a perpetual DX contest! His biggest hassle is his hybrid call sign. He stuck to his Novice call when he upgraded—a sentimental mistake. He is now saddled with a nine-character call, which is a jawful on phone. On CW, the replies are painfully similar. Want to sked Alex? Write to Dr. Alex Comfort, The Windmill House, The Hill, Cranbrook, Kent TN17 3AH, England, tel. 0580-712207.

## ISLA DE FLORES

The Uruguay DX Group has, after 10 years, decided to reactivate the prefix CV, operating

## Troster's Tips for Easy Listening

Listen to the other stations calling in the pileups. If they are calling at 40 WPM... why not try calling at about 12 WPM (or vice versa). Be a "contrarian." Do this while jockeying up or down in your calling procedure, as discussed in previous columns.

More next month from W6ISQ.

CV0U from the Isla de Flores Dec. 6-8. The island was discovered in 1516, during Juan Diaz de Solis's search for the passage from the Atlantic to the Pacific. Three contacts on three different bands (all modes) will net you a nice award. Cards, awards and additional information from CX2CS, Box 20063, Montevideo, Uruguay. (For awards, please include 20 IRCs.) For additional clout for the club in obtaining permission for more trips like this, send a photocopy of the page in your log noting the contact. The all-band operating team will include CXs 1AL 1BBL 2CS 3BJ 4CR 5AO 7AD 8CG 8CF 8BZ 9BBM.

## YASME SAILS AGAIN

The Yasme DX Foundation is happy to announce that Lloyd Colvin, W6KG, and Iris Colvin, W6QL, have left for South Africa and had hoped to be active from South Africa through the fall contest sessions. They are traveling to various nearby countries, operating 50-50 phone/CW for a period of about three weeks each. Although they obviously can't guarantee it, Iris and Lloyd hope to visit and operate in ZS3, A2, 7P, 3D6, S8, ZE, 7Q and 9J—returning to the United States in April of 1986 (in time for the International DX Convention in Fresno!). As usual, all cards go to the

Yasme Foundation, Box 2025, Castro Valley, CA 94546. (Note: Cards for the recent Yasme Clipperton operation, FO8XX, were delayed because of problems in making up the special card.)

## CHINA

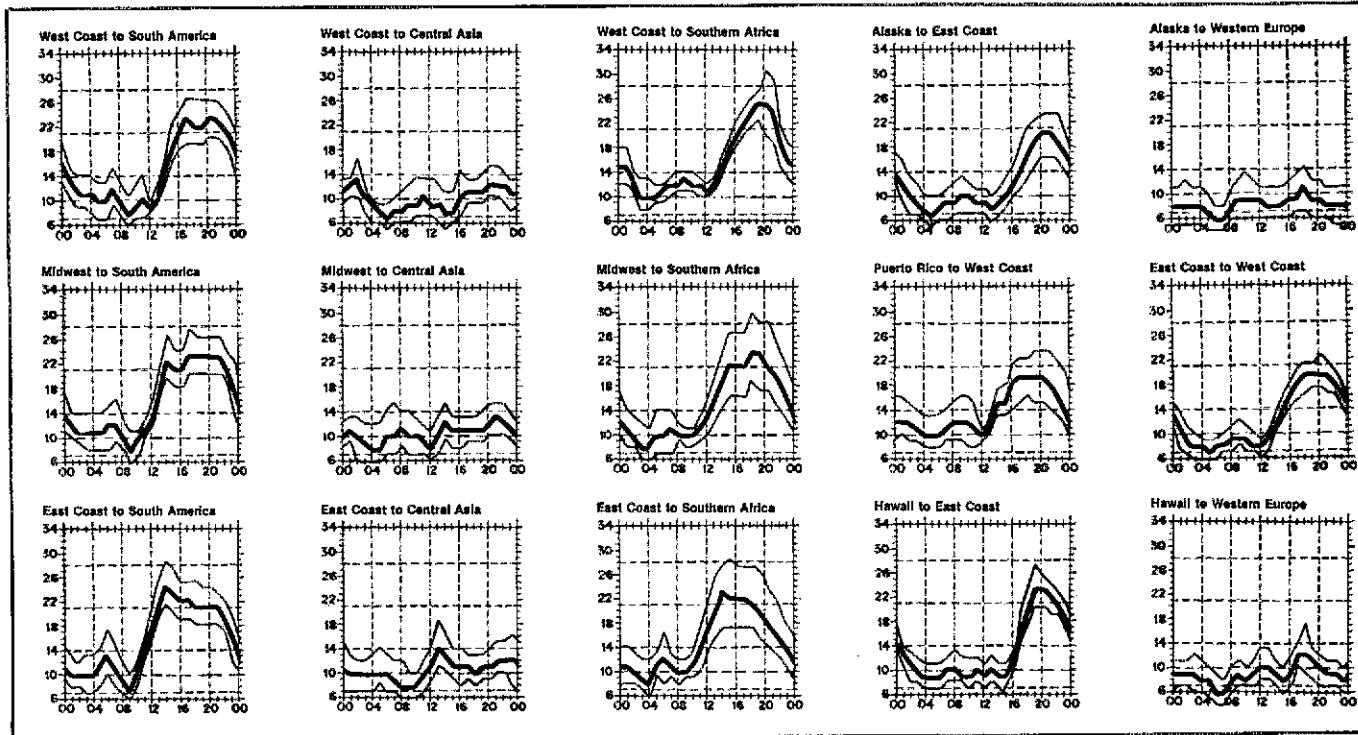
W7EA shares some encouraging personal news on the growth of Amateur Radio as a viable service in China. A recent letter thanked Pat (along with K7HH, KC7CF and K7LAY) for the donation of two TR-7 transceivers about four years ago. The gear is in operation today. One is set up in Beijing, BY1SK—a club station of the organization for youth instruction in science. The other is in the ancient city of Shanghai, installed in the Amateur Radio club station for ham radio old-timers, members of the Shanghai Institute of Electronics. That club call, naturally, is BY4AOM (All Old Men). BY4AOM's QTH is the Shanghai Institute of Electronics Amateur Radio Station, Box 227, Shanghai, China.

## GALAPAGOS/ECUADOR

The International DX Foundation's fall contest extravaganza to the Galapagos and mainland Ecuador scheduled 19 operators, representing the Cuenca Radio Club, L'Anse Creuse Amateur Radio Club, Mile-Hi DX Association, Northern Illinois DX Association, Northern Ohio DX Association, Southeast Michigan DX Association, Southwest Ohio DX Association, Quito Radio Club and the Yankee Clipper Contest Club. The CQWW DX phone call, HC8X, is licensed to NE8Z/HC1MD, Rick Dorsch, Box 62, Rochester, MI 48063.

## GUANTANAMO BAY

KG4CC would like to update the faithful on the Guantanamo situation. "I recently received a newly printed QSL for a contact taken place some 12 years ago. This guy really went back in



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

his log for this one. I cannot hope to service this card, and the KG4 has probably retired by now. The typical overseas tour is one year, two years when accompanied by family. When you work deployed military stations and desire a card, the key to getting one is to QSL promptly. I receive stacks of KG4 2 x 1 and 2 x 3 cards, and even KG1-9 cards, although Guantanamo Bay is and has been for a long time KG4 2 x 2. I do my best to reroute cards that aren't for GTMO promptly, but sometimes I do get swamped. I have a large stack of cards I do not have a forwarding address for. If you've been an active ham in Guantanamo Bay, please send me your KG4 call and present address. I may be holding cards for you. The WAG (Worked All Guantanamo) Award is still available. Work six KG4 stations and send the awards manager proof: call, date/time of the KG4 station worked for amateurs still on the islands, a photocopy of the card for amateurs no longer on base. You'll receive your award promptly."—Charles Campbell, KG4CC, GARC, Box 73, FPO, New York, NY 09593

### THE CIRCUIT

□ **Cape Verde:** Worked world-class op N6TJ at D44BC in the CQWW CW event? Cards *must* go via Julio S. Vera Cruz, Box 36, Mindelo, Cape Verde Is., Africa (a correction of last month's information).

□ **Azores:** Effective December 1, prefixes for Azores radio amateurs change from CT2 to CU, with the prefix number specific to each of the nine islands of the Archipelago: CU1 Santa Maria, CU2 Sao Miguel, CU3 Terceira, CU4 Graciosa, CU5 Sao Jorge, CU6 Pico, CU7 Faial, CU8 Flores, CU9 Corvo and CU0 reserved for repeaters.

□ **DXCC:** September 1987 marks the *Golden Anniversary of DXCC*. Watch for exciting commemorative events to be scheduled for ARRL's premier operating award. (special tnx to W6CF!)

□ **DX Convention:** Plan ahead! Word is out that the 1986 International DX Convention will take place April 18, 19 and 20 at the Airport Holiday Inn in Visalia, California. The entire 225-room facility will be booked to DXers only! Call for special rates: 209-651-9000, 8:30 AM-3:30 PM Pacific Time, Mary Kimber, Holiday Inn.

□ **Radio Amateur Charter:** WB6GFJ's 1985 South Pacific tour was, once again so enjoyable that Ross and his Tahitian friends are planning two weeks in French Polynesia around mid-July 1986. If you're interested in joining them, drop a note to Ross W. Forbes, WB6GFJ, Box 1, Los Altos, CA 94023-0001.

□ **WP4ATF/KP5:** W0JRN now manages cards for this station as well as for HI3RST/KP5. There are still many stations who have not sent for pasteboards. Forward your request to Jim Shearer, W0JRN, 5985 South Milwaukee Way, Littleton, CO 80121-2831.

□ **Jordan:** Too late for publication was news of the November 7-21 JY50 celebration marking the 50th birthday of JY1. If you worked five or more JY stations, send your log with either 10 IRCs or \$5 US to the Royal Jordanian Radio Amateur Society, Box 2353, Amman, Jordan. (Requests for special QSLs also go via this address.)

□ **Redwood Empire DX Association:** This is a DX and contest-oriented club serving the Pacific coast of California, north of the Golden Gate Bridge. The group sponsors the Redwood Empire Award for working stations in the North Coast region. Further information is available from club Secretary-Treasurer VP2ML, Box 4881, Santa Rosa, CA 95402.

□ **ARRL Operating Manual:** K1XA notes that many IARU societies have been extremely helpful in forwarding information to him for the brand-new international-awards chapter slated for the 1986 ARRL *Operating Manual*. If your society hasn't done so, please note that there is probably still time to send awards information and a sample certificate.

## QSL Corner

Administered By Joanna Hushin, KA1IFO

### The ARRL DX QSL Bureau System (Incoming)

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

#### How It Works

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

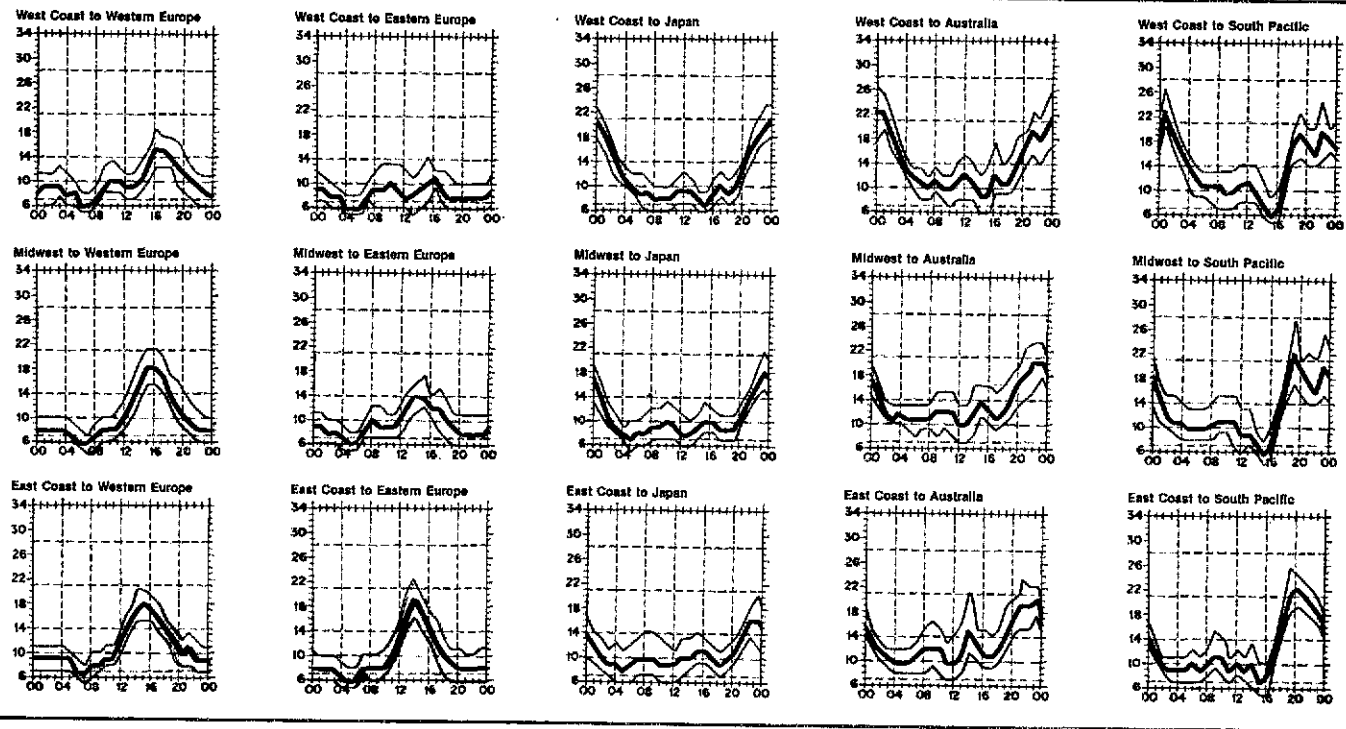
A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

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

#### Claiming Your QSLs

- 1) Send a 5- x 7½-in s.a.s.e. to the bureau serving your district.
- 2) Neatly print your call sign in the upper left-

(continued on page 86)



the lowest curve (optimum traffic frequency, or FOT). See April 1983 QST, page 63, January 1977 QST, page 58, September 1977 QST, page 35, and January 1979 QST, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for December 16, 1985 to January 15, 1986, assume a sunspot number of 11, which corresponds to a 2800-MHz solar flux of 73.

# DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from July 11 through July 31, 1985. An s.a.s.e will bring you the rules and applications forms for participation in the DXCC program.

## New Members

### Mixed

DF5MO/110	G4VOE/115	JM1KYK/120	JA6WV/146	OZ1JEN/128	KA2BZS/285	N5DDT/101	N6BCN/102	K9COV/102
DK6DK/156	G4XZX/105	JK3DGX/108	JE8NPA/121	PY2ZJ/150	WA2WVJ/264	K6SIK/101	WD6L/100	KA0GRO/111
DL5RAL/151	JA1KEV/102	JH4BUO/154	OK3CKW/106	N1DCM/155	WE4U/126	KG6IP/103	NE9H/101	WA6JRB/111
G4DDS/298	JA2IIT/116							

### Radiotelephone

DL3UY/126	G4KDV/109	I0UZF/147	JM1KYK/120	JH4BUO/152	VP8AQA/101	YC5NOF/100	KA2BZS/265	KG6IP/103
EA5DWQ/109	G4VOE/106	I0ZUT/150	JA3ANW/239	JE8NPA/115	XE1JRV/103	YV5JEA/120	AC3T/100	W7GYK/108
F6FYD/114	HL4XM/126	IK0EP5/130	JK3DGX/108	PY2ZJ/150	XE1NJ/126	N1DCM/139	K6SIK/100	KC9YE/102
F3VX/104								

### CW

DK7PS/104	JA3ANW/163	JA0DAI/137	SM6CVX/135	KA2BZS/127	NN4K/104	KD9M/128	W9XD/101	WA9CYG/100
I0UZF/104	JA5LFB/108	PA0TO/150	XE1MDX/104		K5SM/109			WA9VYB/100

### RTTY

TG9VT/105

### 160 Meters

KG4W/124 K8CCV/100

### 5BDXCC

KY7M	HB9BZA	DL1EV	OK3MB	AK8A	NE8M	W3OJS	KB3PD	YV3AGT
W2GVX	W5ODD							

## Endorsements

### Mixed

DJ2BW/359	I4UFH/260	OK3MB/278	K1HZ/319	W2AK/289	N4TL/270	K8WD/314	K8ONV/350	W9IL/200
DJ3XD/228	IT9TQH/284	OZ3PO/340	K1RH/295	W2JVU/363	N4WB/326	N6CR/315	KG8K/183	W9JUV/360
DJ5GG/290	I0UZF/179	OZ4LS/171	K1SF/310	W2KE/317	NE4A/311	NG6W/273	KK8J/326	W9KE/227
DJ5JH/335	I0ZUT/220	OZ8AE/253	KA1M/255	W2MIG/322	NX4N/260	W6DPD/297	KM8E/208	W9LW/324
DJ9ON/300	J88AQ/252	PA0TO/302	KA1Q/152	W2TO/272	W4LF/281	W6GMF/349	W8BF/363	W9MP/224
DJ0KQ/342	JH1QFA/294	PY4ALC/280	KB1JU/154	W2VJN/345	W4NNF/181	W6MI/339	W8CBA/294	W9SFR/357
DK1RV/296	JA2GSQ/157	SL0ZG/272	KC1A/133	WB2FTK/243	W4OEL/337	W6QNM/351	W8CFG/329	AJ0X/280
DK6NP/309	JA2KVD/314	SM5API/336	KX1AJ/257	K3FN/316	W4VOS/179	W6RQ/289	W8JBI/360	AJ0X/335
EI8H/330	JE2LQX/225	SM6AOU/344	W1GG/336	K3II/356	WA4DRU/328	W6TZD/381	W8QFR/335	K8VZR/274
F6DYG/289	JA3ANW/285	SM7ANB/352	W1GME/345	K3WS/323	WA4HVL/126	W6YK/359	W8YGR/345	KC8FJ/136
F8HKD/152	J83PXH/301	SV1PL/288	W1HJ/360	KA3FX/176	WA4JTI/321	W6ZM/352	K9BB/321	KD8JL/179
G2FFO/311	JJ3AFV/351	TG9AL/309	W1JJ/315	KA3KZF/125	WA4TL/318	K7EFB/225	KB9OC/319	KR8Q/299
G3JYP/197	JH4UVU/282	VE1BWP/252	AF2C/293	KB3OM/271	WB4RUA/315	W7OC/255	KD9M/275	NJ8M/176
HB9AAH/336	JH7BDS/291	VE3GDT/334	K2TQC/349	N3CY/231	WZ4S/156	W7QJ/355	K59Y/227	W8BA/289
HB9AQW/325	JH7BRG/301	VE3LMT/297	K2TWT/284	W3CV/344	K5GOE/280	W7QZ/199	W8AQ/341	W8PF/318
HB9BV/165	JA0DAI/288	VE3LGC/342	K2XA/324	W3KJ/294	KA5V/310	W7TE/326	W8BS/179	W8KZV/316
HB9CSA/251	JA0CRG/200	VE3MJ/340	KA2GER/165	W3LB/331	W5JE/285	WA7BEV/330	W8DH/339	W8MD/208
HB9MQ/348	LA4YW/283	VE6WQ/314	KM2P/329	WB3FD/291	W5UXE/180	AD8O/293	W8DWQ/355	W8PT/342
H18LC/311	LA9CE/337	XE1OX/306	KO2Q/224	AA4M/313	K8OJ/364	AK8A/246	W9QL/359	W8WJ/191
HL4XM/155	OH2NB/362	Y81GMV/250	KR2Q/327	K4AUL/335	K8RQ/352	K8CMO/317	W9GMS/281	W8YK/309
I1ZJ/353	OK1AOR/252	Z24JS/337	N2BAT/264	K4ZYU/328		K8OHG/346	W9HAH/255	W8ZV/349
I2QMU/275	OK1TN/305	ZL1BIL/308	NA2G/227	KE4UC/200				

### Radiotelephone

C53EK/126	I5JHW/291	PA0TO/276	XE1JW/155	KB2MY/271	KE4YD/252	WD6EAW/199	W8JBI/343	WA9BZW/204
DJ2BW/352	I8IXO/166	SL0ZG/237	XE1OX/306	KM2P/326	N4TL/261	NK7Y/124	W8TWA/286	AJ0X/335
DJ2YL/321	IT9TQH/279	SM4IKL/229	YB2BOT/225	KO2Q/150	WA4DRU/308	W7QK/303	W8YTM/225	K8GT/304
DK1RV/289	I0CEP/313	SM6AOU/284	YC0DPQ/159	KR2Q/306	WA4JTI/317	W7TE/337	K9BB/206	K8VZR/272
DK3HL/320	J88AQ/249	SP6DVP/171	Y81GMV/250	KZ2P/300	WA4TL/313	AD8O/292	K91KP/317	KA0NNF/260
DK6NP/291	JH1QFA/293	TG9AL/309	ZL1BIL/308	N2BAT/263	WB4FTI/289	K8CMO/314	KB9OC/319	W8BA/289
F8AOI/331	JA2GSQ/156	T12KD/200	N1API/281	N2DQ/127	K5GOE/270	K8ONV/334	W8DH/327	W8F/290
G3ZBA/329	JA2FVD/301	VE3GDT/334	W1GG/277	W2IOQ/316	K8WVA/175	K8WVA/175	W8DWQ/344	W8MD/205
G5AFA/330	JE2LQX/206	VE3MJ/340	W1JC/213	W2MIG/321	KC8EU/290	W8WVA/175	W9LW/340	W8PT/305
HB9BVV/165	J83PXH/290	VE3MRJ/344	W1JJI/315	WA2WVJ/264	W5LNU/281	W8BF/363	W9LW/256	W8WJ/170
H18LC/310	KL7XO/148	VE3MRS/310	W1JR/282	K3WS/306	W5DVI/287	W8CBA/292	W9PVD/126	W8YK/303
IK1AOD/225	OK3MB/175	VE8VQ/306	AF2C/281	K3WJ/294	N6CR/315	W8CFG/327	W9VSL/184	W8ZRA/251
I4UFH/260	PA0KB/315	YV1CC/224	K2PFWG/223	K4LR/305	W6DPD/297	W8GMF/345	W9SFR/347	WD8AQJ/258

### CW

DJ2BW/313	DL7CW/260	IT9TQH/211	JH7BDS/277	SL0ZG/239	KZJF/225	K8WD/258	W9KE/153	AJ0X/266
DJ3XD/220	F8HKD/150	I0ZUT/197	JH7BRG/301	SM4IKL/187	KO2Q/143	W7TE/272	W9NO/150	K8VZR/151
DJ5JH/290	G2FFO/206	JA3PXH/284	JA3BWQ/127	VE8VQ/262	W2MIG/303	W8LNO/179	W9SFR/308	KR8Q/210
DK1RV/221	HB9CSA/201	JH4UVU/257	OK3MB/246	K1RH/293	K3FN/314	W9DHI/266	W9ZM/310	W8YK/289
DK6NP/267	I2QMU/168	JA7AZU/134	OZ8AE/244	AF2C/169	WA4JTI/291	W9DWQ/311		

### RTTY

K4AGC/125

### 160 Meters

PA3BFM/127



## CRRL Officers and Directors

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## DOC Proposes New Certificates

On October 25, representatives of CRRL and CARF met with DOC in Ottawa to hear DOC's proposal for "Restructuring of the Amateur Service." Why restructuring? First, DOC feels strongly that the present structure, with its heavy emphasis on technical knowledge, is no longer relevant in a world where most amateurs operate using commercially built rather than homebuilt equipment. Second, DOC is concerned, as many of us are, that the Canadian Amateur Service may be dying. Last year, the growth rate fell to 1.1%. The average age of all Canadian amateurs is around 55. Very few young people are joining the ranks. What will happen when the old-timers pass on? Will there be any Amateur Radio as we know it?

Almost everyone who studies the problem seems to come to the same conclusion. If the Canadian Amateur Service is to remain viable, it must attract more amateurs. The service will also have to reflect the fact that nowadays few amateurs build their own equipment or even feel a need to know all that goes on inside their commercially built equipment. And, it will have to become easier for new amateurs, especially the younger ones, to join the ranks. Of course, the object will still be to have a quality Amateur Service.

DOC feels we can have this (and more) through "restructuring." Under the proposed plan, there would be three certificates: *Certificate A*: This would be the entry-level certificate. The sole requirement would be a pass mark on an examination on: (1) installation and operation of a modern amateur station, including interpretation of meter readings, adjustments to prevent interference, grounding and use of low-pass filters; (2) basic electronic theory, including safety practices while working on circuits and correcting interference problems such as front-end overload and audio rectification; (3) antennas and propagation, including types of antennas and feed lines and characteristics of various modes

of propagation; and (4) domestic and international regulations applicable to Amateur Radio. *There would be no code test.*

Holders of Certificate A would have the following privileges and restrictions: (1) the transmitter portion of the station, from microphone or key input to RF output, would have to be commercially built and specifically marketed for use on the amateur frequencies; however, other parts of the station (a receiver, transmatch, antenna or computer interface) could be homebuilt; (2) no emissions would be permitted on bands below 30 MHz; however *all* modes of emission would be permitted on bands above 30 MHz; (3) maximum power would be 250-W dc input; and (4) a holder of Certificate A would not be allowed to become a licensee of a repeater or remote base station.

*Certificate B*: This certificate would give additional privileges when used in conjunction with Certificate A. The sole requirement would be a pass mark on a Morse code sending and receiving test given at 12 WPM. Holders of Certificates A and B would have the same privileges and restrictions as holders of Certificate A, but would be permitted to use all modes of emission on *all* amateur bands, above and below 30 MHz.

*Certificate C*: This certificate would give additional privileges when used in conjunction with Certificate A or Certificates A and B. The sole requirement would be a pass mark on an examination of advanced electronic theory, with a degree of difficulty somewhere between that of the present Amateur and Advanced Amateur examinations. Holders of Certificate C would receive the following additional privileges: (1) the right to use homebuilt transmitting equipment; (2) the right to use maximum legal power, 1000-W dc input; and (3) the right to become a licensee of a repeater or remote base station.

Under the proposed new structure, candidates would be able to write the examinations for all three certificates at a single sitting.

Existing amateurs holding either an Amateur or Advanced Amateur Certificate would be deemed to have the privileges given by all three certificates, A, B and C. Existing amateurs holding a Digital Certificate would be deemed to have the privileges given by Certificates A and C.

At press time, your editor was working from a draft provided by DOC. Notice of the proposal had not yet appeared in the *Canada Gazette*. By the time you read this, the notice should have appeared and copies of the proposal should be available from all offices of DOC. DOC intends to give amateurs and other interested parties 180 days from the time that the notice appears in the *Canada Gazette* to make comment.

Take it from us—DOC is not interested in simple expressions of "yes" or "no." Comments will have to be qualified. Specific issues will have to be addressed. DOC offers these suggestions: (1) Are there significant factors that DOC has not considered that might affect the proposed structure? Could the proposed structure be improved? What would you suggest as an alternative? (2) If you were an aspiring amateur, would the proposed structure encourage you? Why or why not? (3) If you are an amateur, does the proposed structure realistically reflect the way you operate? (4) How will the proposed structure affect the future of Canadian Amateur Radio? (5) Does the structure adequately accommodate special-interest groups? Is there still a need for a Digital Certificate? (6) Would Canadian Amateur Radio benefit from a Novice-type licence similar to what is available in the U.S.? If so, how could a Novice-type licence be incorporated into the proposed structure?

Comments should go to the Director General, Radio Regulatory Branch, DOC, 300 Slater St., Ottawa, ON K1A 0C8. Please send a copy of your comments to CRRL. It will help your CRRL reps and workers with their homework over the next few months.

## MORE DOC NEWS

□ DOC has informed CRRL of a new third-party-traffic agreement with the UK. The agreement went into effect on October 16.

□ DOC will soon release a *Canada Gazette* notice calling for amendments to the *Radio Regulations* that will give Canadian amateurs access to the 18- and 24-MHz bands. The 18-MHz band is now clear of former users. The 24-MHz band still has one military user.

□ DOC will also be releasing a *Gazette* notice calling for the end of issuing special Amateur Radio prefixes to commemorate significant Canadian events. This news comes as a surprise. Earlier this year, DOC indicated its willingness

to work with a committee of amateurs that would screen all requests for special prefixes, with DOC giving final approval.

□ In case you didn't catch League Lines in November *QST*, at the RSO-CRRL '85 Convention, DOC announced that it had amended the *Radio Regulations* to permit Canadian amateurs to operate CW and phone, maximum legal power, on the entire 160-metre band, 1.8-2.0 MHz. (CRRL is checking to find out if the ban on mobile and maritime-mobile communications on the 160-metre band was also lifted.) Repeater use on 29.5-29.7 MHz was authorized. Six-MHz-bandwidth fast-scan television was also authorized, and slow-scan television no longer

requires a special endorsement. Amateurs from [TU Regions 1 and 3 operating under reciprocal licensing agreements were given the right to use the entire 2-metre band, 144-148 MHz, while in Canada. DOC also indicated its intention to proceed with "deregulation of mode subbands," which would allow Canadian amateurs to operate any mode on their amateur allocations, relying only on volunteer adherence to recommend band plans to maintain order.

## SEASON'S GREETINGS

□ From all your CRRL reps and workers, best wishes for a happy holiday season. May 1986 be your best year ever. [RECEIVED]



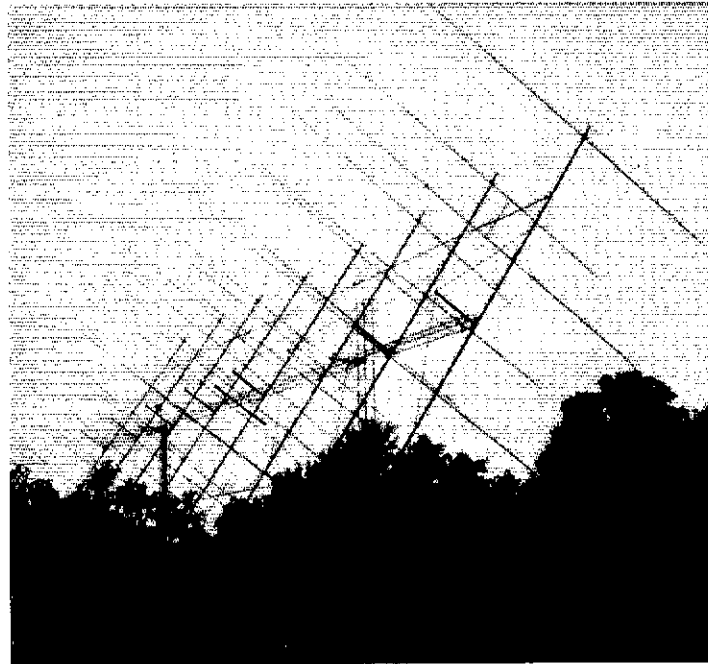
## Moonbounce for Everyone

This month's column heading may be a slight overstatement, but not much. With more and more people putting up really big arrays each month, the opportunity is growing for the "average" VHFer to make one or more contacts off the moon. In addition to providing the thrill of making an EME QSO, the existence of these "super stations" offers an excellent chance for many to add some hard-to-get states to their totals without having to make the investment in time and money to put together EME-capable stations of their own. For several years, this column has carried the exploits of such moonbounce installations as K1WHS and WA1JXN/7. There have been many accounts of single-Yagi stations hearing or working them. There was even a report of a British station working K1WHS and not even knowing that he was doing it via the moon. The G station merely had his antenna aimed northwest and the moon just happened to get in the way!

Several others are now reportedly putting together large antenna arrays that should allow "the little guy" to taste the thrill of earth-moon-earth communication. One who has such an installation operating is W5UN, located south of Houston, Texas. The accompanying photograph attempts to depict Dave's array, but I doubt that any picture can convey the impact of its sheer enormity.

Maybe W5UN's own words will better describe "the monster" than either the picture or I can.

"The slightly large array consists of 32 specially built KLM 17LBX Yagis with 75-ohm feed-point impedance. The 'H' frame is constructed from 97 feet of Rohn-25 tower with eight 40-foot-long crossarms, each holding four of the Yagis. The array is dual-point mounted, with the main pivot mast being rotatable. Both masts are about 30 feet high. Actual azimuth rotation is accomplished by turning the rear wheels on the mobile mount platform (an old Ford pickup chassis), which holds the moving mast. The mobile platform travels on a circular, nontracked, dirt pathway. The array requires almost an acre for full



The "Slightly Large Array" at W5UN.

rotation; 360 degrees of rotation takes about 6½ minutes.

"Early tests with the array indicate that it is performing about as was predicted. The main powerlobe (E plane) beamwidth is about 3¼ degrees wide. The H plane beamwidth is about 6½ degrees wide. Good noise readings are being obtained from the sun and other extraterrestrial sources. The first weekend of on-the-air operation resulted in my working about 40 stations on random calls via the moon.

"I am hearing my own echoes using an IC-251 without any preamplification and with a single Yagi antenna. Average-equipped stations using similar equipment should be able to hear me if they point their antennas toward the moon. I call CQ a lot on 144.008 MHz on weekends, beginning on my moonrise when the moon is in northern declination. I would be willing to schedule any stations who can hear my signal. Stations running 160 W or more and using a good antenna such as the Cushcraft Boomer or KLM 16LBX should be able to get enough power to the moon for me to hear them. For stations who cannot elevate their antennas, schedules will have to be on moonrise or moonset, when they can aim toward the moon."

Dave calls his creation "The Slightly Large Array." That would be abbreviated to TSLA, but we'll continue to call it the "monster."

There you have it. In W5UN's own words, stations with 160 W or more and a decent beam—even those with no elevation capability—have a chance to make an EME contact. Those east of Texas should try on the setting moon when that occurs at a reasonable hour. For those to the west, the rising moon provides the best opportunity. VHFers with very low power may wish to listen and experience the thrill of, at least, hearing a signal returned from 220,000 miles out in space! It certainly makes for something interesting to tell the gang at the radio club, many of whom appear to believe that VHF consists entirely of repeater operation.

### ON THE BANDS

**6 Meters**—At deadline, W5DZF/4 Miami comes up with some exciting 6-meter news. Scotty reports that, beginning about 2315Z Oct. 14, the band came to life with a good opening to the Caribbean. KP4 and KP2 stations were in with strong signals. These were followed with PJ2DW, PJ2DEW and TI2NA. For this time of the solar cycle and season of the year, that would

be considered an outstanding session. But there was more. The next contact was with CE3BFZ. Two other CEs were in there, but too weak to work. This should answer the question as to the occurrence of transequatorial propagation during this low part of the solar cycle. Sure would like to hear of some on 2 meters. TE is still alive on the other side of the world, according to a letter from VK8GB. Graham says that their fall, our spring, produced several 6-meter and few 2-meter

openings to Japan. Over the past few weeks, there have been a few afternoon but no evening 6-meter openings. VK8GB's country total stands at 39, with the latest, BY5RA China, added in Sept. 1984.

JAIRJU passes along an interesting account of more recent 6-meter operation from China. Kazu says that between June 13 and 15, he and JR1HHL operated from Beijing under the call BT1HHL. The two worked all bands, from

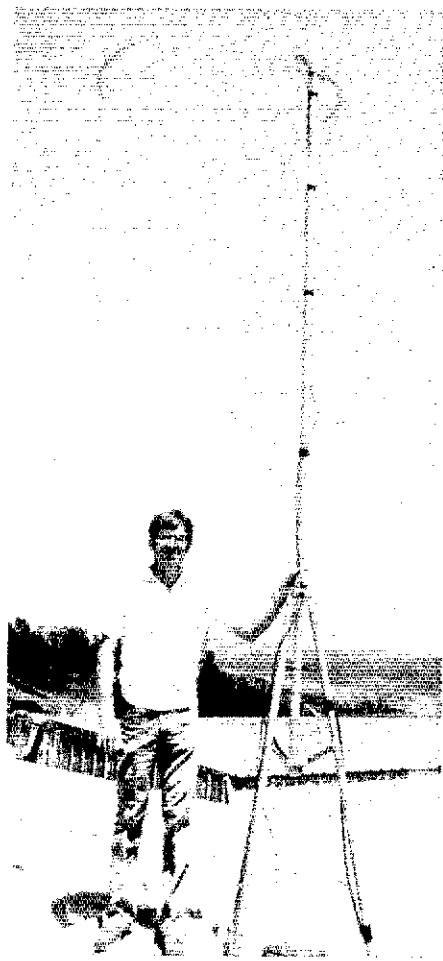
160 meters through 70 cm, including OSCAR 10. On 6 meters, their QSO total was 511. The next stop was Shanghai, where they used the call BT4RJU from June 15 to 18. From that QTH, 1741 6-meter contacts went into the log.

WA5IYX San Antonio continues to monitor the band for signs of life. Pat notes E<sub>s</sub> openings September 11 and 23. On the first of these days, WA7JTM, WD8CTX, WB8GEX, W4NJP and K4RZB were heard between 2315 and 0030Z. The opening on the 23rd was quite outstanding for the time of year. (See the 2-meter section.) WB7OHF, N7ARC, WA7JTM, WA6PEV and an El Paso station provided the activity on 6 meters. Many FM broadcast stations were heard at the same time. WA5IYX notes that Sept. 1985 produced more FM E<sub>s</sub> than any Sept. since 1980. A total of 230 minutes of propagation between 88 and 108 MHz was logged. This compares with no such openings from 1980 to 1982, 25 minutes for 1983 and 30 minutes for Sept. 1984.

Bob Hastings K6PHE, president of the Southern California Six-Meter Club, urges people to ask the Kenwood Company to market their Model TR-9300 in this country. The product in question is a 6-meter multimode rig, similar in size and features to the manufacturer's TR-9130 2-meter unit. It has recently been advertised in the British magazine *Radio Communication*, and is also reportedly available in Japan. If offered here, the TR-9300 should become a popular choice for mobile, portable and home station use, incorporating, as it does, CW, SSB and FM. I agree with Bob. Let's get behind this one and make it happen.

**2 Meters and Up**—The weekend of Sept. 28-29 and extending into Monday the 30th, was a period that will be long remembered by VHFers along the East Coast. Once again, a hurricane apparently played a major role in setting up the atmospheric conditions responsible for an opening that stretched from Nova Scotia to Florida. This time it was Gloria which, on Friday the 27th, skirted the coast, crossed Long Island and went inland up the Connecticut Valley, blowing itself out in Vermont. Unfortunately for many Long Island and southern New England residents, the storm caused widespread power interruptions, preventing many 1s and 2s from participating in the opening. W3OTC, Rockville, MD near Washington, describing the intensity of the opening, noted that W2MCF/1 Rhode Island who was running 3 W from a battery-powered rig, was S9 on 2 meters. W3OTC first caught the opening on 2 meters Sunday morning, first working WB4NMA EM84 Georgia for a new state. This contact was quickly followed by exchanges with WS4F, WB4TWX, W4HGN and W4OJK EM96, whom he worked on 70 cm as well. The Georgia stations were still building in strength when he had to leave at 1430Z. Returning at 2215, Bob nabbed KB4CSE EM94 in South Carolina and several others in the Carolinas, Georgia and even a Tennessee station, KE6HA. By 0000Z, he noted that signals from the South were building to the S9 level and that the 1s were getting quite loud off the back of the beam. The result was almost wearing out the rotator, alternating between working Northern stations such as K1WHS, WA1OUB and VE2DFO and Southerners such as W4CPZ, KD4LT and WA4CQG. The last represented another new state, Alabama. A third new state was added Monday morning by a contact with Florida station KI4CI EM90, and that evening VE1UT was worked on both 2 meters and 70 cm.

W2RS says that the opening started slowly for him, and for a while it didn't appear that it was going to get as far north as his QTH of Glen Rock, New Jersey. Ray listened with frustration to the southern New Jersey stations work the



The proprietor of the N0LL 6-meter beacon poses next to the single-bay halo used to radiate the signal far and wide.



The antenna farm at W3WFM Manchester, MD. On the short tower at left are an F9FT for 23 cm; a 19-element RIW for 70 cm; a Sr. Boomer for 2 meters; a dipole for 10, 15 and 20 meters; and a 5-element beam for 6 meters. On the tower to the right is the new, not-so-secret weapon—a Cushcraft Boomer for 6 meters perched 80 feet above Phil's 1200-foot asl QTH north of Baltimore.

“deep South.” But as Sunday afternoon unfolded, he began to eke out a few marginal QSOs with WA4NJP EM84 Georgia, K4LUV EM96 North Carolina and several others in North Carolina and Virginia. An interesting sidelight is that the signals peaked at about 240 degrees,

well north of the true direction. This same effect was also observed by nearby station WA2JSW. Finally, about 0200Z Sept. 30, signals began to peak up with many stations worked, the farthest being WA4CQG in Alabama.

VE1UT lists 37 2s, 3s and 4s worked on 2 meters, with the farthest being KI4CI Florida. On 70 cm, Bernie worked 10 stations including WB2OTK/4 EM84 South Carolina and WS4F EM84 Georgia. VE1UT picked a good time to get his feet wet on 23 cm. On that band, he runs 8 W to a feed line with 7-8 dB of loss and a single 45-element loop Yagi. But this was enough to snag K2UYH, W2VC, K2SMN, WB2NPE and W2TMM in FN20 New Jersey, plus Pennsylvania station WA3AXV and W1XP Massachusetts.

An inkling of the extent of the opening can be gleaned from the report of northern Florida 2-meter station KI4CI. During the three days, Carl completed contacts in 22 states and 50 grids. Best DX was the QSO with VE1UT.

N3AHI/4 near Atlanta used the superb conditions to increase his 1¼-meter total. Jim added three new states: WB2NPE New Jersey, WA3AXV Pennsylvania and KB5PX Louisiana. That brings his count to 16.

VE4MA reports on a Midwest tropo session a month earlier on the evening of Aug. 30. Some of the highlights for Barry included completing an over-800-mile 23-cm QSO with WBØDRL EM18 Kansas for state no. 4. His fifth 23-cm state followed a half hour later by virtue of a contact with WBØTEM Iowa. Unfortunately, no one was on the band from Missouri or South Dakota that evening or these states would have been added easily. Also worked on 23 cm was KØFQA Minneapolis. Signals generally ran 5 × 5, with WBØDRL running 5 × 8. A number of 70-cm contacts were made as well, with signal levels of S8-9 being common. Stations worked on the lower band included KØPAY EN11, KØNG, KØUS and KCØOG (both EN10)—all in Nebraska for state no. 41; WBØDRL and WBØYSG Kansas to make state no. 42; NØEKT Iowa and WBØWMO EM30 and WØVD EM87 Missouri. The last station is over 800 miles from Winnipeg. There was also a report that Barry's signals were heard by K5JL Oklahoma City at well over 1000 miles.

WP40 says that he and other Puerto Rican VHFers, including NP4X, KP4EOR, WF4G and KP4EKG, are looking for 2-meter MS skeds during upcoming showers. Ed asks that all such schedules be set up with KP4EOR. For other matters, his address is P.O. Box 30072, Rio Piedras, PR 00929.

On the 2-meter-EME front, according to KB7Q's *2 Meter EME Bulletin*, Kentucky station N4AR now has an array consisting of eight Yagis. The first day it was up, he made six contacts with no prearranged schedules. Among the stations worked were SM7BAE, W5UN, WA1JXN/7 and DL8DAT. The same issue lists the station of AL7FS and KL7WE as being on with six Yagis. To the relief of many, these two have pooled their resources to put Alaska back on 2-meter EME.

## VUCC STANDINGS

As established two years ago, the VUCC Standings are included in this issue. They can be found on page 61. Beginning in 1986, updates to that listing will be published every other month: February, April, June, August and October. The complete list will appear each December. The 2-Meter Standings are scheduled for January and July; 1¼ Meters for February and April; 77 Meters for March and September; 33 cm, 23 cm and 13 cm for April and October. The 6-Meter DX listing will be published in November, and the EME Annals in May.

## MICROWAVE PROPAGATION BY "TROPOBACKSCATTER"

Following is the text of an article I recently received from Carl Gustaf Blom, SM6HYG, concerning some observations made by him of "anomalous" microwave propagation across the Kattegat (the sea between Denmark and Sweden).

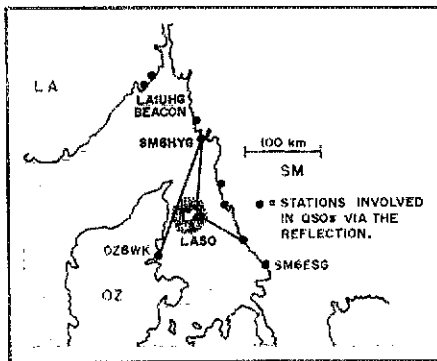
One of the disadvantages of microwave band QSOs is the fact that due to the high-gain/narrow-beamwidth antennas usually needed, it makes ring QSOs almost impossible. On the west coast of Sweden a "new" propagation for the higher bands 23-3 cm was found in April 1980 during a QSO between SM6HYG and OZ8WK and SM6ESG. As seen on the accompanying map, the path between SM6HYG and OZ8WK is about 150 km, mainly over water, with no high mountains interfering. Despite the good path, all tests on 13 cm were unsuccessful, even when 70 and 23 cm were 5-9 at both ends. During one of the tests, SM6ESG was able to hear my signals on 13 cm at S5-6 when he was beaming to OZ8WK. In fact, no signals at all were present at the direct path between SM6HYG and SM6ESG, only when we both aimed at OZ8WK.

What was causing this reflection? Why didn't OZ8WK hear me at all? He was receiving SM6ESG at good strength, so some kind of wall existed between me and OZ8WK. A closer look on a map covering the sea between Sweden and Denmark showed the small island Laso with its shallow sand beaches. The water surrounding Laso is for several hundred meters only a few meters deep. When on a clear calm spring day the sun heats up that water, a bubble of hot, humid air rises above the island. Due to the rapid change in refraction index, there is no way for the microwave signal to penetrate. Instead, the signal is scattered in different directions, making QSOs possible with the beam headings seen in the map. Due to the scattering effect, the signals get distorted, sounding as modulated with raw ac, and there is also a phase shift as the beam heading is altered. If one station is changing his antenna direction, the other station has to change his, too, probably to keep the proper angle for signals reflected. The total angle that can be used on either side of the maximum point is much smaller at SM6HYG than at SM6ESG due to the different distances to the reflection point.

Since this first QSO, several hundred QSOs with many stations involved have taken place on all frequencies from 23 to 3 cm. Even the beacon LA1UHG on 10,368 MHz has been heard via this propagation. But what happened to the "impossible" 13-cm QSO between SM6HYG and OZ8WK? Well, we just had to wait until a day with equal temperature on the whole path, and the QSO was made with ease. Probably, there are many locations in the world where this kind of tropo-backscatter propagation is possible. Why don't you test next time an "in line" contact doesn't work.

## MORE TEXAS MICROWAVE ACTIVITY

It seems that Texas is becoming a "hotbed" of microwave activity these days. Kent Britain, WA5VJB, writes to tell me that the North



Texas Microwave Society held its first formal meeting in September, with 21 attendees. He also writes that during the VHF contest, KDSRO made six contacts in three grid squares on 2304 MHz with a 1-W transmitter.

Coincidentally, comes the following information from KDSRO, Dave Hallidy, describing his "gridpedition" to EM24 in Arkansas.

This is a recap of my meager attempt to follow in the well-publicized footsteps of my friend Gerald Handley, WA5DBY. As most everyone in North Texas knows, Gerald has been taking his 1296- and 2304-MHz equipment on the road with him to provide the "needy" hams in this area with QSOs with rare grid squares.

On September 6, 1985, I had the opportunity to go up to Rich Mountain (EM24) in southwestern Arkansas on business. Knowing that several hams in the Dallas/Fort Worth area needed Arkansas on 13 cm, I managed to borrow a Maki Denki UTV2400 transverter, a 40-element loop Yagi and about 15 feet of 1/2-inch Superflex. I installed this on a 10-foot piece of TV mast and tied the whole thing to the door at the back of my van. The Maki Denki is a real barn-burner, running about 1-W output. Anyway, that was what I had, and connected to my Yaesu FT-480R 2-meter multimode, I certainly had a 13-cm station that would make anybody proud!

My wife, who is very tolerant of my insanity, was with me. I noticed several strange looks from her (as well as others) as the scene unfolded. We got to the top of the mountain (2861 feet above MSL) at about 7:30 PM, and I immediately began looking for a decent spot to set up the station. All the while, Al, WB5LUA, was talking to me on 2-meter SSB, letting me know how the signal strength was improving as we drove around. Finally, we picked a spot and began setting up. I quickly discovered that I had a problem: 2 meters was to be used for liaison, using another rig and an amplifier, but there was a dividing wall between the front (where the 2-meter rig was) and the rear (where the 13-cm rig was). This forced me to jump out of the back of the van, run around the side and jump up into the front seat every time I needed to use the 2-meter rig. Very convenient while trying to aim antennas for peak signal strength! We were finally ready.

I told Al to turn on his beacon (actually about 250 W to a 5-foot dish at 80 or 90 feet). I immediately heard him (RST 599), and I think he could detect the excitement in my voice on 2-meters. Now it was my turn

to transmit. I keyed the rig for about five minutes and called Al on two. Nothing. Finally, he realized that maybe I wasn't where he thought I was and reaimed the dish. Voilà! He heard me about 5-5-9. At 0125Z on September 7 I gave WB5LUA his first Arkansas on 13 cm. Two minutes later, we made it on SSB (him 5-9, me 4-4). At 0325Z, it was WA5DBY's turn. His signals (and mine) were much weaker, and it took about 10 minutes of sequencing to complete the QSO. We said goodnight on 2 meters, very pleased with the first night's results. Saturday night was even better. Although Al and I were the only ones on that evening, signals were stronger. At one point, Al was peaking S9 plus 10 dB! We decided to do it once more on Sunday morning, and Al said he would have everybody else that was active on 2304 (all three of them) on the frequency.

Sunday morning, we were up the mountain at 1215Z and ready by 1230. Immediately, I was able to work Al on CW (him 5-9-9, me 5-5-9), but we were concerned because signals had seemed better the night before. This was needless concern because the path quickly improved so much that Al and I were ragchewing on SSB. At 1233, I stood by for Kent, WA5VJB, but could not hear him. Instead, there were the beacon of Leroy, W5HN, loud and clear. I yelled on 2 meters that I was hearing him, and he stood by on 2304. We had a good QSO on CW, and then it happened. All of a sudden, as if my feed line was connected to his, Kent came pounding in 5-9-9! This is significant because he runs about 3W to a fairly low (185 miles) antenna and yet there he was, louder than Leroy! We exchanged 5-9-9 reports and went to SSB (Kent commented later that I was so loud that he thought it was Al retransmitting my 2-meter signal on 2304). At this point, Al was making comments like, "Sure would be fun to work you on the coffee can." He was so loud at that point, I was beginning to detect some receiver overload! So, he switched to his two-pound coffee can and we proceeded to have another QSO, exchanging S9 reports both ways. Last but not least, I must mention Gerald, who had to work so hard for his previous QSO. At 1244Z, he came up out of the noise to an S9 and we had our best two way, both on CW and SSB. I shut the station down at 1311Z September 8, very satisfied with the results.

I have to say that we were very lucky that weekend. The conditions were very much in our favor, and I don't think that this is to be expected under normal circumstances. One month earlier, WB5LUA and several others went to the same spot for the ARRL UHF Contest. It took hours of schedules and sequencing to work WA5DBY for a multiplier on 2304. In addition, another group, WB4LHD/5 from Tennessee, went up there for the ARRL September VHF QSO Party. Conditions were so poor they were not heard well on 1296.

Thanks to everyone who helped out, including K5GW for the loan of the Maki Denki, WB5LUA for the antenna and feed line, and especially to my wife, who seems not to mind being awakened very early for this craziness and who always has a hand ready to grab a feed line or an antenna mast. I am now a confirmed 13-cm nut. As soon as I get some equipment of my own on the air, I will gladly try to work you from EM13.

## European Views U.S. Repeater Scene

The following are the views of Dick Molby, WB7NZG/DA1DB.

It seems to me that the FM scene on 2 meters and up is totally out of control in the United States. The first thing that puzzles me about the 2-meter situation is why is it necessary, or even desirable, to have literally dozens of repeaters on the air in an area?

### Public Disservice

I cannot be convinced that this situation in any way assists us with one of Amateur Radio's prime reasons for existence—public service. In fact, I see this as a public disservice. By saturating an area with repeaters, we greatly increase the number of possible interference problems, and this obviously does nothing to help our public image.

If you are familiar with FM operation in Europe, you know that the majority of European countries have allotted only 10 repeater pairs for the 2-meter band. This number has proved to be more than enough even for large metropolitan areas. Private or closed repeaters are strictly *verboten* as they should and must be.

For example, in the Federal Republic of Germany, with "only" 10 repeater pairs, there is always overlapping 2-meter coverage in all areas throughout the country. Even in the remotest areas, there are at least three accessible repeaters, and in large population areas as many as eight. Is this not enough to serve the amateur community and the public as well, even in time of emergency?

There is constant talk of frequency conser-

vation, but little has been done. On the contrary, more and more frequency spectrum is being wasted on repeaters. After all, a repeater requires two frequencies, a fact that many apparently forget.

### Simplex—a Dead Mode?

I visited the U.S. in 1983 and attempted 2-meter operation in three areas of the nation, with very poor results. After being out of touch with the U.S. ham scene for many years, I wanted to contact locals to get a feel for activity. But in the three cities I visited, I was snubbed at every attempt to make a contact. I called for hours on a variety of simplex frequencies, with no results; simplex has apparently been forgotten. I did hear many repeaters busy with hams who were within simplex distance of each other but found it easier to tie up two frequencies on a repeater for hours on end!

The reason repeaters exist has been forgotten: to establish communication between two or more stations with low-powered equipment which would not be possible on simplex. If two stations want to ragchew, fine; but a repeater should never, under any circumstances, be used if communications can be established on simplex.

In West Germany, there are more 70-cm repeaters than there are 2-meter repeaters. This situation is because German amateurs have long recognized that spectrum space on 2 meters is limited, and it makes no sense to fill it up with repeaters when the space can be better used for other modes. As a result, it is nearly always possible to find an empty

frequency on 2 meters, or on any other band for that matter.

In conclusion, I wish to say that at least half of the repeaters on 2 meters should be shut down, 25% shifted to 220 and 450, and 25% left where they are. This would have drastic, positive effects on all of these bands. Both 220 and 450 need more activity if we are going to hold onto them, and 2 meters needs depopulating.

Hopefully, you will take my comments as constructive criticism. I do not pretend to have all the answers, but it would do good if U.S. hams would look around the world and see how things are managed in other places; they might get some good ideas.

### REPEATER LOG

According to September reports repeaters were involved in the following public service events: 39 weather emergencies, 1 criminal emergency, 15 medical emergencies, 208 vehicular emergencies, 20 fire emergencies, 22 public safety events, 32 drills and alerts and 9 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 44, W2VL 16, N3BFL 7, WB3JUE 5, W3UER 23, WD4JWO 2, WB4UDS 4, NSDWU 1, KC5RC 1, N6AHT 16, N6AVL 22, WA6BJY 8, WA6BLF 3, KB6DFH 1, KH6HHG 1, N6HNV 34, WA6HOB 9, K6IDU 2, K6KQL 1, WB6OSM 2, W6RHC 8, K6SOD 1, WA6UVV 36, KR6Y 2, K6YNW 25, KA6ZDL 21, WAZGU 5, WA6YKU 1, WC7AAT 1, K7IMZ 1, K7OMR 4, W8BI 17, K8DDG 12, KD8GL 4, WB8IEL 9, WA8ULB 7, W9QYQ 1.

## Strays



The second half of the NTRN program will feature an interview with James Berry, engineer in charge at the FCC monitoring station at Grand Island, Nebraska. Among the topics Berry will discuss are the historical role of the monitoring station, monitoring techniques used by the FCC today and what amateurs can do if they experience RFI or observe a violation of the Rules.

For more information on how to participate in NTRN or to obtain a list of participating repeaters, please send an SASE to NTRN Net Manager Timothy Loewenstein, WA0IVW, c/o Midway ARC, P.O. Box 1231, Kearney, NE 68847-1231.

### PITY ME MY ADDRESS

Alan Herridge, G3IDG, shares some unusual QTHs, as found in the RSGB Callbook: Pity Me (G4FOQ, Durham), Little-in-Sight (G8JAB, Cornwall), Old Wives Lees (G3LCK, Kent), Zeal Monachorum (G3NRY, Devon), Bold Clockface (G8OUI, Lancashire), Huish Episcopi (G3RPV, Somerset), Wyre Piddle (G6GHW, Worcestershire) and New Invention (G8JDE, West Midlands).

Stateside we have Soddy-Daisy, Tennessee and Fertile, Minnesota. Is your QTH unusual? Send a QSL card to "Strays."

### I would like to get in touch with...

anyone who served in the Ninth AF, 323 Bomb Gp., B-26 Squadrons in WW II. Bob Bowker, K6QT, Rte. 1, Box 255C, Payette, ID 83661.

someone with any information on the history of the development of antennas over the last century. W. Clem Small, KR6A, 26530 Parkside Dr., Hayward, CA 94542.

### QST congratulates...

Paul E. Drexler, WB3JYO, of Wycombe, Pennsylvania, on being named one of 25 first-prize winners in a nationwide engineering design contest sponsored by Mini-Circuits Corporation and *Microwave Journal*. A Junior in Drexel University's 5-year Electrical Engineering program, Paul made a study of RF mixer IMD characteristics.

### ACSSB/FCC MONITORING SUBJECTS OF NTRN TALK

Will amplitude companded single sideband (ACSSB) make your 2-meter FM equipment obsolete? Will it become *the* voice mode for satellite communications? Just what is ACSSB, anyway? These questions and more will be answered in the first part of the next North American Teleconference Radio Net, starting at 8 PM CST December 13, 1985. The speaker will be Paul Rinaldo, W4RI, Editor of *QST* and one of Amateur Radio's technical leaders. Rinaldo has closely followed the development of ACSSB and was instrumental in obtaining the ACSSB transceiver boards recently made available by ARRL.

## COUNTLESS POTENTIAL HAMS AWAIT

In October, we discussed the problem resulting from the fact that probably less than half the population of America has heard of ham radio. Obviously, we consider this the number one reason why we don't have more hams. But we listed six other reasons why more Americans don't take the plunge and become hams. Most people don't know that (1) there is a difference between ham radio and CB; (2) becoming a ham doesn't require that one be an electronics or mathematics whiz; (3) help in passing the examinations is available either through formal classes or through Elmering; (4) ham radio offers so many varied activities that it's almost impossible to become bored; (5) the equipment necessary to enjoy ham radio is within the financial reach of most Americans; and (6) the opportunities for various kinds of public service through ham radio are unlimited.

Those who *do* know that ham radio exists also must be informed of these facts. No, these people won't absorb them by osmosis (although some clubs—even those hurting for members—apparently feel that osmosis is the process by which all nonhams absorb the truth about ham radio). One or more of these problems is blocking at least half a million Americans who otherwise would be getting ham licenses. That's half a million hams we can't afford to lose. So let's look at the problems one at a time.

The "somber" shadow of CB: The performance of many CB operators, especially those involved with REACT, has been outstanding. Unfortunately, it has been overshadowed, in the minds of many who have listened to CB, by the impolite and often downright rude comments made on the air. CB has no long tradition of polite thoughtfulness as has ham radio. And it must be admitted that a few hams (fortunately, very few) seem to abandon all self-control when they pick up a microphone. But the fact is that thousands of CBers and ex-CBers are amazed when they hear for themselves the difference between CB and ham radio. The difficulty is that few CBers and ex-CBers have the opportunity to make the comparison. (Not too many CB rigs have general-coverage receivers.) Has *your* club invited CBers in your neighborhood to a demonstration of ham radio? If not, you're losing one of the most promising groups of potential hams in the United States. (It's one of the easiest groups to approach, too, because you already have much in common—especially experience in radio communication.)

"But what about the examination?" And they aren't talking only about the code. The code is a paper tiger—at least for the 5-WPM test. Nearly anyone can quickly master the code that well. "It's the theory." "It's the math." "It's the physics." "It's the . . . well, I'm just not into that stuff!" These people have a good argument: They've been psyched out before they've even seen a ham test! But they have passed tests far more difficult than a Novice or even a Technician examination during their school days, if not in their pres-

ent jobs. It's your responsibility, as instructors, to convince them that such is indeed the case—that they will have little or *no* trouble with the tests. Furthermore, courses are available, and Elmers are waiting to help them! (It's a great idea to have a potential Elmer or two right on the spot to meet the inquirers and personally assure them that help is available. You can't imagine how much a personal meeting helps until you've tried it.) A willing and sympathetic Elmer can make all the difference between an excited applicant for a ham ticket and a half-bored inquirer about ham radio. Try it and see!

Then there's the problem of the kinds of activities open to ham operators. *Problem?* It shouldn't be. But, strangely, it often is because most hams participate in only a few of the many facets of ham radio. (Think back and count how many different kinds of operating you have done in the past five years.) How much do you know about the ones you have never tried? Perhaps it's one or more of those that the potential ham will find most to his liking and will, in the end, hook him or her into ham radio. Hams should be aware of all the modes and kinds of activities available, from CW ragchewing through emergency nets to packet radio, satellite communications, moonbounce, and amateur television and facsimile—whether or not they participate in those activities. The ham who tries to promote only certain activities is sure to lose at least half the people who ask about ham radio.

"But isn't ham radio terribly expensive? I understand WX1XXX spent \$10,000 on his equipment. I can't afford that kind of thing." Neither can 99% of the licensed hams, but your inquiring friend will never know it if you don't say so! Communication throughout the world—real fun communication—is available for well under \$500—the price of a good television receiver or of a new set of high-quality golf clubs. Ham radio need not be expensive. Some people spend \$10,000 on a hi-fi setup for their homes, but such people are hardly typical of the American hi-fi enthusiast. Neither are big spenders typical of radio amateurs. A newcomer willing to do a bit of hunting at flea markets can get on the air for less than \$200—sometimes much less. Emphasize the economy of ham radio—not the luxuries. The luxuries always will be there when the fledgling ham has acquired enough personal on-the-air experience to know what really is needed.

Finally, more potential hams than most of us realize are restrained from becoming licensed for a less-often-considered reason: They are unaware of the opportunities for real, critically important public service on the ham bands. It's always a good idea to find out about the inquirer's interests and background *before* you get into a detailed discussion of ham radio. Does the inquirer belong to the Coast Guard Auxiliary? Does he or she teach Red Cross first-aid courses? Is he or she a volunteer at a hospital or shelter? If so, then emphasize the opportunities for public service available to licensed hams. (Again, be sure you're acquainted with *all*—or at least most—of those opportunities. The one you

skip might be the one that will most interest your prospect.) Save some clippings of ham activities during major disasters and show them to the inquirer. Your prospect won't have much trouble seeing himself or herself in the place of the ham operator in the picture, and you will have a new convert.

It all comes down to this one bottom line: a half-million nonhams—at the very least—could become hams within one year if, and only if, someone such as you explains to them the benefits of ham radio. If nobody explains, they will be lost forever to a most worthwhile activity that needs them desperately. Instructors, the proverbial ball is in your court. Swat it back over the net with a stroke powerful enough to catch those half-million potential new hams!

Merry Christmas, Happy Hanukkah, Season's Greetings to all you loyal readers of this column. In 1986, the column will appear in the even-numbered months (February, April, June, etc.). But the columns will be longer and will cover considerably more material than was possible under the old system of appearance in every issue. We hope you will like the new format. Let us know! BET

## Strays



### QST congratulates . . .

□ Donald (W7GNU) and Aletha (KA7ODM) Dunn, of Coeur D'Alene, Idaho, on being honored by the North Idaho Amateur Repeater Association as "the most helpful amateurs in the Northwest."

### QST congratulates . . .

□ Mary Duffield, WA6KFA, of Santa Cruz, California, on being chosen the Santa Cruz County Senior Citizen of the Year for her work in promoting international communication and cooperation among youth.

### Mini Directory

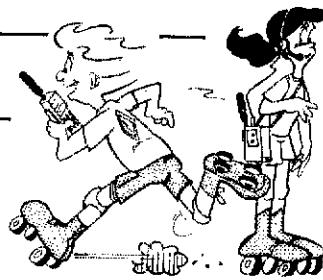
As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in QST.

Advisory Committee Members	Sept. 1985, p. 80
Affiliated Club Coordinators	May 1985, p. 71
Club Contest Rules	Jan. 1985, p. 72
License Renewal Information	Jan. 1985, p. 45
Major ARRL Operating Events and Conventions —1985	Jan. 1985, p. 46
MARS Information	July 1985, p. 46
QSL Bureaus	
Incoming	This issue, p. 86
Outgoing	Sept. 1985, p. 63
10-Meter Contest Rules	Nov. 1985, p. 103
160-Meter Contest Rules	Nov. 1985, p. 103
902-MHz Interim Band Plan	Oct. 1985, p. 51



# Making Waves

Conducted By Scott Springate, N7DDM  
2095 Broadview, Eugene, OR 97404



## MORE CLUB TIPS

By now, those of you who are working on starting a school club should be fairly far along. I have worked on getting one started at my school with help from one of our assistant principals, who is also a ham. While in the process of getting ours rolling, I found out some things I didn't know before writing the October *Making Waves*.

I found out that a constitution needs to be drawn up to give the school administration an idea of what the club's guidelines will be. I organized mine into five sections, or articles. This gave an overview on objectives, membership, meetings, officers and committees, and the order of business. If you are required to draw up a constitution, you may want to follow guidelines similar to these.

I also received a letter from Keith Higgins, WA6IYL/AA, offering some other suggestions: (1) Contact a Volunteer Examiner who might be willing to talk to students about taking that first crucial step, the FCC exam. (2) Try a series of class demonstrations for different grades using 220 MHz in addition to 2 meters. (3) Encourage school representatives to utilize the fine films available from the ARRL dealing with ham radio, particularly with OSCAR, Space Shuttle ham activities, disaster communications, public service and worldwide friendships.

If you haven't begun work on a school club, I would like to reemphasize that not only can you expose other students to ham radio, you can have fun at the same time. If you would like more tips on how to start a club, refer to October *QST*, page 65. It's not too late to start now!

## TWO SCHOOL PROGRAMS

It takes many things to make a ham radio program work at a school. Above all, it takes a great deal of commitment on the instructor's part and interest on the student's part. The following programs have just that—an instructor eager to work with the students, students eager to learn about and work with ham radio, and the support from hams and school administration alike. The efforts of these programs have not gone unnoticed. All the people involved in both of these fine programs should be commended for the time and hard work put into making them so successful. These are only two examples of the many other model programs across the country that also deserve much support and praise.

### Bethel, Connecticut

Bethel Middle School in Bethel, Connecticut (1 School St., Bethel, CT 06801), is home to the Bethel Educational Amateur Radio Society, or BEARS. Much of its success can be attributed to the club's advisor, Industrial Arts Coordinator Peter Kemp, KZ1Z. Formed in 1972 under the name Bethel Middle School Radio Club, the program has grown to serve any school-age person residing in the town of about 18,000, as well as former students. The school itself houses about 600 students in grades seven and eight.

Bethel Educational Amateur Radio Society is sponsored by the Industrial Arts Department and is affiliated with the ARRL. Eighth-grade students sign up for the Novice course as part of their elective program in electronics taught during the school day for credit. Seventh graders participate before and after school and during activities periods. The club operates CW and SSB

on HF and 2-meter FM. BEARS operates an all-youth Field Day, sponsors Volunteer Examinations for the area, participated in the Ham-in-Space programs, assists public-service agencies with communications for swimathons, walkathons and parades, and provided operators for the ARES/RACES Communications Center at the Bethel Office of Civil Preparedness. During the Mexican earthquake they provided information to area radio stations and passed welfare traffic for community members via NTS.

The BEARS program uses a large handout, drawn up by Peter Kemp, that outlines the teaching curriculum, the goals and characteristics of the program, and how the program is conducted. It is much like a constitution and teacher's guide in one. The guide, as well as the course, is titled "Exploratory Electronic Communications." It outlines the units of study and



Students at P.S. 22 in New York City operate WB2JKJ from their schoolroom.



During Hurricane Gloria in late September, members of the Bethel Educational Amateur Radio Society (BEARS) operated civil defense station KZ1Z at fire headquarters. Shown (l-r) are N1DNA, N1DPR, N1DOE and KZ1Z. (KA1FJR photo)

describes the activities used to explain that area. One example is How to Wire Electrical Plugs and Sockets, and the activities are: how to solder, soldering materials, plug/socket types and usage, underwriter's knot and electrical hand tools. Not all the study areas offer such hands-on experience. Some can only be taught in a classroom. But no matter how they are taught, the students learn what they need to know. This fact is shown by the 400-plus students who have earned licenses since the program started 13 years ago. All classes have been filled to capacity, and many stay after hours to use the equipment.

Mr. Kemp has received the 1983 Herb S. Brier Memorial Instructor of the Year Award, 1984 Ham of the Year by the New England Division and Distinguished Service Award from the Jaycees. The program has recently received a Vocational Improvement Practice (VIP) Award from Dr. Gerald Terozzi, Commissioner of Education for the State of Connecticut. All of these awards prove the success of the club.

### New York City

The next program got its start in a way many people would not expect. Joseph Fairclough, WB2JKJ, an English teacher at P.S. 22 in New York City (111 Columbia St., New York, NY 10002) started the program because he felt that the traditional ways of teaching English just weren't working. He took the standard English curriculum and revised it around ham radio as follows: (1) Teach the students Morse code in the beginning of the term and get them to a point where they can copy their spelling and vocabulary in CW. (2) Use *Tune in the World* as the class text. Diagram its sentences, examine its parts of speech, etc. (3) Assign readings from the various ham publications. This concept not only promoted interest and learning in English, but also in all the fields of study encompassed in Amateur Radio.

Their program is different in another way. It is self-sufficient and receives no funds from any government agency or the school. They purchased all of their equipment with money from fund-raising efforts by the students and Mr. Fairclough. He says, "It's very hard to survive this way, but it makes for a great spirit of everyone pulling together. Besides, hams are great people. Without them none of this would be possible."

The program has received much publicity. They have, in addition, gotten letters from prominent people—one from President Reagan praising the program and all the effort put into it. They have also received a letter of thanks from New York City Mayor Edward Koch. The students had been conversing with an old friend on the radio when he asked them to call Mr. Koch on the telephone and wish him best of luck for him, which they did. Mr. Koch wrote back thanking them for the message and at the same time offering a word of encouragement. U.S. Senator Barry Goldwater, K7UGA, has also written to Mr. Fairclough and his students encouraging the program and its continued success.

Recently, the program was incorporated under the New York state laws, with the goal of using the theme of ham radio to further enhance the education of young people.

Both of the groups discussed here prove once again that a ham radio club at your school is feasible and may take hold with much success. But the only way to find out is to get out there and give it a try! Who knows, your group may become as large and popular as these clubs. [REDACTED]



## Las Vegas Hosts 10th YLRL Convention

YLS and their families from across the U.S., Canada and the oceans journeyed to Las Vegas in June of this year to gather for the three-day 10th annual convention of YLRL. Thanks to the thoughtful planning of N7YL and K0EPE (and many other members), this year's convention on June 20 through June 23 was full of interesting activities and meetings as well as opportunities to become reacquainted with old friends and meet new ones.

Thursday evening, approximately 250 participants met to enjoy an evening's entertainment featuring talks and slide shows on hot-air ballooning by WB3EFQ, Ultra-Lights by WB8JIB, and "A Beautiful Bird Show" by KB8RT and WB0ZQZ. Friday evening was highlighted by the DX Festival—reports from YLS who have had the thrill of operating in some of the more exotic countries of Amateur Radio. Countries featured were French Polynesia, by K6HHD; USSR (Leningrad), by WD5FQX; Easter Island and Juan Fernandez, by W6QL and OM W6KG; and Jordan, by WA3HUP and WB3CQN. During the Convention, the YLS and their families

had a chance to visit Hoover Dam, enjoy the casinos and spectacular nightclubs, and socialize poolside at the Sahara Hotel, the convention site.

Saturday began with a business meeting, which gave members a chance to speak out on issues concerning YLRL. During the luncheon, current and past officers explained the roles of the various offices. The highlight of the Convention was the Saturday night cocktail party and banquet. Because YLRL's 11th Convention is scheduled to be held in our 50th state in 1989 (coincidentally YLRL's 50th birthday), as a prelude to that highly anticipated event KH6QI presented a slide show on Hawaii.

Many YLS found themselves stuffing their suitcases with newly acquired handmade quilts and items received during the traditional YLRL swap—an exchange of purchased or handmade items the women bring to the convention specifically to give to their friends from around the world. YLS reluctantly said their goodbyes on June 23 with promises to see each other again in Hawaii in June 1989.

### KA0UYM AND WB0VDK: VYLS (VERY YOUNG LADIES)

Hamming begins at a very early age in the Campbell family of Independence, Kansas. The newest ham is Cindi, KA0UYM, who this year found time in her busy schedule to fit in more hard work at a local ham club's code and theory class to obtain her Novice ticket. Her mom still marvels at the way Cindi "soaked up the CW." Cindi, 8, plays on a championship soccer team and swims, and yet manages to bring home

a report card filled with As.

Her sister Tonya, WB0VDK, earned her first ticket when she was just 10 years old. Now a premed sophomore at the University of Kansas, Tonya is vice president of the campus radio club. She is too busy with college activities to spend time on HF, but she and her family make use of 2 meters as a way to keep in touch going from campus to home. John (K0PUX) and Connie (WA0KLZ) Campbell are the proud parents of these two young amateurs.



Tonya, WB0VDK, is vice president of the University of Kansas Radio Club. (WA0KLZ photos)



Cindi, KA0UYM, enjoys hamming in the family motor home.

### YLRL 1986 Election Results

<b>Officers</b>	
President	Jackie van de Kamp, W5YKU
Vice President	Mary Lou Brown, NM7N (ex-N7DHA)
Secretary	Carol Shrader, W14K
Disbursing Treasurer	Karla Holmes, WA1UVJ
Receiving Treasurer 1-4	Jean Chittenden, WA2BGE
Receiving Treasurer 5-7	Sue Ludemann, KA6SOC
Receiving Treasurer 8-0, KH6, KL7, VE, US Possessions	Connie Hamilton, WD8MIO
<b>District Chairmen</b>	
1st District	Anne Manna, WB1ARU
2nd District	Minerva Fronhofer, WB2JNL
3rd District	Lois Gutshall, WB3EFQ
4th District	Alice King, N4DDK
5th District	Joyce Kepler, W5MWW
6th District	Betty Bravin, AG6C
7th District	Marion Dixon, WA7TLL
8th District	Donna Burroughs, KB8YS
9th District	Ann Arnholt, K9RXK
10th District	Gwen Ryder, WD0AKS
KL7 District	Shari Runyan, AL7FJ

### 1985 DX-YL to NA-YL Contest Results

#### SSB Winners

NA	DX
WD4NKP Gold Cup	DJ0EK
WD5FQX Second Place	IO2KYM
KM8E Third Place	GM4YMM

#### CW Winners

NA	DX
WD4NKP Gold Cup	CT1YH
VE1BWP Second Place	I2KYM
WD8MEV Third Place	VK3KS

#### Combined Score Plaque Winners

NA—WD4NKP	DX—I2KYM
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#### NA SSB Scores

*WD4NKP	640
*WD5FQX	488
*KM8E	440
*WD8MEV	420
*KE5UO	225
WB2OHD	128
*WA2NFY	90
*KA6SOC	75
*KA2ESQ	70
*KA5RAA	70
*WA2EFG	40
W2EEO	25
*VE7YL	24

#### NA CW Scores

*WD4NKP	88
*VE1BWP	31
*WD8MEV	25
*VE7YL	20
*WD5FQX	13
*WA2NFY	11
*KA6SOC	10

#### DX SSB Scores

DJ0EK	1290
IO2KYM	675
GM4YMM	345
CT1YH	270
VK3KS	149
DF6UJ	101
ZL1ALE	69
OK2BBI	25
G8LY	1

#### DX CW Scores

CT1YH	124
I2KYM	100
VK3KS	20
OK2BBI	11
G8LY	5

\*low-power multiplier  
IO2KYM—special prefix for I2KYM  
Check Logs: W3CDO, JA1AEQ and NY4H



**President:** Richard L. Baldwin, W1RU  
**Vice President:** Carl L. Smith, W0BWW  
**Secretary:** David Sumner, K1ZZ  
**Assistant to the Secretary:** Naoki Akiyama, JH1VRQ/N1CIX

**Regional Secretaries:**  
John Allaway, G3FKM  
Secretary, IARU Region 1  
10 Knightlow Rd.  
Birmingham B17 8QB  
England

Alberto Bhaio, HK3DEU  
Secretary, IARU Region 2  
9 Sidney Lanier La.  
Greenwich, CT 06830  
USA

Masayoshi Fujioka, JM1UXU  
Secretary, IARU Region 3 Association  
P.O. 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.

## Cruising and Amateur Radio

During the last decade or two an amazing number of small boats have taken off to sail beyond the horizon. Oh, there have been long-distance sailors for many years, beginning with Joshua Slocum around the turn of the century, but in recent years the number has been escalating. The Caribbean, the Mediterranean and the South Pacific are full of small boats of 10 to 30 meters in length. Some are solo adventurers; other boats sport a crew of two or three, or small family groups. They are, if you will, modern-day pioneers and explorers, charting what is for them an unknown horizon. It is an adventure—for some, the adventure of a lifetime.

Our present-day adventurers, however, have an advantage that Joshua Slocum didn't enjoy. They have Amateur Radio to track their progress, to help them through difficulties and to keep them in touch with a world they wish to escape but don't wish to let go of completely. And so we have maritime-mobile nets—Amateur Radio nets that exist to serve the voyagers and, not entirely coincidentally, also let the land-bound participants in the net share vicariously in the sailing adventures.

Here's a list of the nets known at the present time:

### Maritime-Mobile Nets

Time (UTC)	Freq. (kHz)	Net/Area Covered
0230	14,313	Seafarer's Net—Pac.
0530	14,314	Pacific Maritime Net—Pac
0630	14,320	S. African Maritime Net—Atl. Car

0700 & 1700	14,313	International Maritime Net—Atl. Med
0715	3820	Bay of Islands Net—S. Pac, Aus
0800	14,315	Pacific Interisland Net—Pac
0800 & 1800	14,303	UK Maritime Net—Atl. Med, Car
1030	3808	Caribbean EX Net—Car
1030	14,265	Barbados Cruising Net—Atl. Car
1130	14,320	S. African M/M Net—Atl
1230	7230	Caribbean M/M Net Car
1200	14,320	SEA Net—SE Asia, India, Aus
1245	21,400	Trans-Atlantic M/M Net—Atl. Med, Car
1300	7269	Waterway Net—US East Coast, Car
1530	14,295	Cates Navy—Mexican Coast
1600	14,313	CG M/M Net—Atl. Car, US
1700	14,340	Calif-Hawaii Net—S. Pac
1800	14,313	M/M Service Net—Pac
1800	7197	S. Pacific Sailing Net—S. Pac
1900	14,340	Manama Net—Mexican Coast
1900	7285	Shamaru Net—Hawaii
1900	21,390	Halo Net—N & S America
1930	14,305	Confusion Net—Pac
2100	21,390	Inter-American Traffic Net—N & S America
2300	21,404	Pacific Maritime Net—Pac, Car
2400	14,320	SEA M/M Net—Asia, Japan, Aus

Most of these nets meet daily, although some skip the weekends. You will note that 14,313 kHz is an unofficial international calling frequency that is generally active 24 hours a day. Some of the net information may by now be outdated. If you wish to suggest changes or corrections, contact W1RU or Fried Heyn, WA6WZO, 962 Cheyenne St., Costa Mesa, CA 92626.

Racers find Amateur Radio useful, too. In fact, there is some Amateur Radio use by the big, fast boats now taking part in the Whitbread Round-the-World race.

But with both groups, racers and cruisers, there is some abuse, and that abuse concerns us. Some yachtsmen get on the ham bands simply by assigning themselves an amateur call sign, or by getting an amateur license from some friendly administration whose licensing procedures are less than rigorous. We applaud the use of Amateur Radio by qualified and properly licensed operators as a way to provide for safety of life and property at sea, and as a way for lonely sailors (properly qualified and licensed) to maintain contact with "civilization." But we do not condone (except in a bona fide emergency) the use of Amateur Radio by nonamateurs. When you know of such unauthorized operation, encourage the individuals to become properly licensed. We all want to help; we don't want to turn anyone off or down. However, we owe it to ourselves and to the Amateur Radio Service to reserve the use of the amateur allocations to those who have demonstrated their competence before a recognized licensing authority.



After the CSRA celebration, Vice-Chairman Yao Zhi Xing of the Fuzhou Branch of the All China Sports Federation (the parent body of CRSA) and BY5RA Station Manager Dai Jia Qi visited Japan at the invitation of the group of Japanese amateurs who operated BY5RA in September 1984. The purpose of their visit was to observe special station 8J1XPO at the Tsukuba Science Expo and the annual Ham Fair in Tokyo in August. Ham Fair '85, incidentally, attracted about 50,000 people. Shown (l-r) are Mr. Yao, Mr. Dai and JARL President Hara.

The Fuzhou Branch of the Chinese Radio Sports Association (CRSA) celebrated the first anniversary of its headquarters station, BY5RA, on August 18, 1985. Among those attending the commemorative event were President Shozo Hara, JA1AN, of the Japan Amateur Radio League (JARL), which helped to establish the station a year ago, and the Vice-Mayor of Fuzhou.

It is with deep regret that we record the passing of these amateurs:

W1DCI, Wesley B. Bradshaw, New London, CT  
 WA1DXT, Joseph Gosselein, Brighton, MA  
 W1FTX, Richard M. Smith, Hampstead, NC  
 W1JCB, O. William Mandell, Clinton, CT  
 K1NTN, Paul Howe, Worcester, MA  
 WA1OKD, Peter T. Munley, Cumberland, RI  
 W1TXN, Vito Rizzi, Hinsdale, NH  
 K1UWB, Gerard Frechette, Seabrook, NH  
 W2AQN, Lester Dubin, Pelham Manor, NY  
 ND2E, Marion L. Dillenback, Selkirk, NY  
 WB2JDM, Jane B. Schlesselman, Bath, NY  
 W2NEL, William H. Schmidt, Rutherford, NJ  
 W2OSJ, Frank C. Mebane, Jr., Staten Island, NY  
 WA2PII, Elliott J. Hall, Laurance Harbor, NJ  
 K2VAC, Ronald J. Ackerman, Oakland, NJ  
 W3AZV, Robert S. Miller, Crownsville, MD  
 WA3EMA, John F. McCullion, Summit Hill, PA  
 K3FRO, John F. Weser, Mount Rainier, MD  
 W3IIJ, Arthur E. Dodd, Annapolis, MD  
 K3MKM, Robert L. Hill, Arnold, MD  
 K3NXX, William F. Hartman, Bel Air, MD  
 \*K3TG, Thomas G. Gabbert, Washington, DC  
 KB4BKV, James F. Prime, Vero Beach, FL  
 K4DOT, Levert L. Keeling, Pensacola, FL  
 WB4ECK, Alice H. Simpson, Memphis, TN  
 WD4FJW, Wesley D. Bonds, Mobile, AL  
 WB4GKW, James L. Essary, Darden, TN  
 \*WB4HAG, Robert W. Chanter, III, Fort Lauderdale, FL  
 W4HCZ, Earl Brannon, Greenville, SC  
 WA4IEB, August C. Christian, Jr., Shelbyville, TN  
 K4LZY, Raymond W. Fields, Burgaw, NC  
 K4NE, Lewis W. Sieck, Treasure Island, FL  
 KB4NL, Charles W. Winter, Jr., Marathon, FL  
 W4OIV, Clarence H. LeBrun, Sarasota, FL  
 W4OUU, David W. Bowman, Cape Coral, FL  
 WB4PSB, Joseph M. Richards, Lauderdale, FL  
 WB4QFH, Walter V. Wilson, West Palm Beach, FL  
 WD4RJO, William E. Nicholson, Spartanburg, SC  
 WASJK, John H. Kelley, West Palm Beach, FL  
 W4TUP, Robert Lee Ward, Elizabethton, TN

\*WB4UZY, Robert H. Petitpas, Huntsville, AL  
 K4ZGP, Gordon L. Dailey, Etowah, TN  
 K4ZXA, Steven Walter Boyd, Jr., Montgomery, AL  
 W5AQJ, Neil Koehler, Fort Worth, TX  
 KA5HBS, Lee W. Bandom, McAllen, TX  
 W5QT, Fred Irvin, Medford, OK  
 W5SNG, T. J. Rogers, Sr., Oklahoma City, OK  
 K6BKZ, Frank L. Wukits, Fresno, CA  
 W6GFX, Rudolph Compagnon, Glendale, CA  
 K6JKQ, David K. Pope, Stockton, CA  
 WB6JNH, Leslie T. Vaught, Santa Paula, CA  
 K6KFN, Richard G. Isaacson, Sunnyvale, CA  
 KA6LOR, Ralph DiPiero, San Francisco, CA  
 WA6MDC, Donald Lawson, Newark, CA  
 W6MOV, John E. Striker, Los Altos, CA  
 KD6MX, Clifford V. Stukalo, Diamond Springs, CA  
 W6PBJ, Charles E. "Chuck" Albert, Hayward, CA  
 KA6QCT, James S. Booth, Ventura, CA  
 W6UVO, Edward S. Ives, Canoga Park, CA  
 K7AFU, Stuart J. Lenhart, Puyallup, WA  
 WB7DGV, Earl R. Richards, Sun City, AZ  
 W7JEM, Marion C. Stanton, Colbert, WA  
 W7JOF, George E. Jaus, Laramie, WY  
 KA7KAD, Percival G. Dawson, Seattle, WA  
 K7MAI, Walter C. Connelly, Tacoma, WA  
 W7MS, Luther J. Cummings, Seattle, WA  
 W7NML, Evan J. Thibodeau, Butte, MT  
 W7OWX, L. L. Pafford, Tucson, AZ  
 K7RDV, Bernard K. Hoover, Nampa, ID  
 K7TRP, Paul A. Nelson, Astoria, OR  
 W8AE, James Penberthy, Southfield, MI  
 W8BRQ, Richard E. Walker, Mason, OH  
 W8EJL, Edwin L. Schroeder, Sr., Navarre, OH  
 W8HAL, Henry M. Lewis, Mayfield Heights, OH  
 W8JVP, Kenneth M. Irish, Sr., Kalamazoo, MI  
 W8NLT, Melvin Swillinger, Dallas, TX  
 KC8XJ, LeRoy D. Hager, Lapeer, MI  
 N9BIH, Joan Weaver, Jasonville, IN  
 W9DBU, Alex C. Walker, Matteson, IL  
 W9DPY, David E. Chapman, Lombard, IL

WB9DSR, Darrell G. Clodfelder, Odon, IN  
 W9GTB, Pasquale J. Eannelli, Wauwatosa, WI  
 KA9KOR, Leonard C. Miller, Huntington, IN  
 \*K9KZG, Harold F. Thomas, Long Grove, IL  
 KA9LUF, Maxon Cloukey, Evansville, IN  
 K9MFE, Daniel Grady, Yuba, WI  
 W9NKC, John T. Frankle, Warsaw, IN  
 WA9NXX, Thomas L. Roedig, Oshkosh, WI  
 W9TKR, Robert H. Johnson, Waukegan, IL  
 W9UHO, John Wesley Armstrong, Mena, AR  
 W9UUN, Ralph H. Severance, Fort Wayne, IN  
 WA9WDA, Albert M. Hillberry, Blue River, WI  
 W0ALD, Warren E. Throckmorton, Garnett, KS  
 W0BLZ, Rubert "Duke" Olsen, Harrisburg, SD  
 N0BVJ, Robert W. Crow, Raytown, MO  
 W0CLU, George D. Horras, Jr., Boulder, CO  
 N0FEB, Leroy Tefft, Bonne Terre, MO  
 W0QK, Richard K. Lemon, Bonne Terre, MO  
 W0TNO, Herbert Cushing, Williston, ND  
 W0UGG, Wayne F. Trask, Elk River, MN  
 K0UQE, Donald C. Carl, Oskaloosa, IA  
 W0YRX, Ernest L. Wylie, Olivette, MO  
 VE1SS, Thomas E. Daley, South Ohio, NS  
 VE3IG, Victor N. Olacke, Sarnia, ON  
 VE3PA, Alexander D. Snider, Kirkland Lake, ON  
 VE4EF, Edwin I. Dalgliesh, Killarney, MB  
 ZS6JM, John F. McCoy, Silvertown, Transvaal, Rep. of South Africa

\*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST.

## 50 Years Ago

### December 1935

- With the continued heavy increase in Amateur Radio licenses, our bands are becoming quite crowded. The Editor decries the "selfish signal," one with clicks or backwave, or the overmodulated phone.
- OM Mims down at W5BDB has built a "signal squirter" two-element beam with rotation controlled from a crank at the operating position. He points out its advantages in directional reception as well as transmission.
- J. M. Wolfskill reports that Bliley has developed a new crystal cut that produces a fundamental on 20 meters but is considerably thicker than older designs, and thus less susceptible to fracture.
- Dr. Dellinger of the National Bureau of Standards asks for amateur monitoring and reports on a strange phenomenon where high-frequency signals suddenly fade out completely for 30 minutes or so. It has occurred at 54-day intervals (twice the period of rotation of the sun), and the next chance to observe will be mid-December.
- Members in the new Southwestern Division will choose between nominees Charles Blalack, W6GG, and Walter Matney, W6EQM, for their first director.
- The Federal Communications Commission has cited several amateurs for signing their calls as "portable" at a fixed location (usually a will-be ham awaiting receipt of his ticket). "Portable" means just that, says the Commission.
- The next world conference on radio regulations is set for Cairo, Egypt, in 1938, and we are aiming at obtaining expanded amateur bands, particularly at 7 Mc. Cairo Committee members W8CMP, W1KH and W8HC request amateur monitoring of commercial bands adjacent to ours, hopefully to show low

occupancy in support of our expected requests.

- W2CTK says his carrier-control system cuts down considerably on heterodyne interference to other stations.
- WAC has been accomplished on 28 Mc. W3FAR, ZS1H and W7AMX are the first to confirm the feat, and informal reports indicate others are right behind.
- Time for another Copying Bee, in which W1MK and other prominent stations will transmit trick words and phrases to test our mettle. Not much copying behind in this exercise!
- With 2- x 4-inch frames and plywood panels, W3AKT has achieved professional quality in his new transmitter layout.
- Last year, the League spent \$4.35 per member in creating and supplying QST—not bad, with dues only \$2.50! The balance is made up through sale of advertising and other publications.

## 25 Years Ago

### December 1960

- QST is now 45 years old, the only radio magazine published for just one purpose for such a long period of time. The commemorative cover of the anniversary issue was done by Harry Hick, whose artistic skills enhanced the magazine right from its start.
- W0LQV says radioteletype systems work better with two audio tones rather than the frequency shift at i.f., mostly because very narrow audio filters are possible. He offers an oscilloscope circuit to enable accurate spacing adjustment.

- There are nearly as many different attitudes toward what constitutes the "best" electronic key as there are c.w. ops. W4DFR's version has one-knob speed control, no relays and a built-in sidetone monitor.
- K2BTM found that replacing the product detector in his HBR-16 with a 7360 beam-deflection tube provided greater audio output voltage, and much lower intermodulation distortion, and also limited impulse noise.
- V.h.f. transistors are now available at reasonable prices, and Daniel Meyer of the Southwest Research Institute has used them in a 50-Mc. converter, compact enough for mobile work but still of home-station performance.
- W1KRD hopes his cathode-ray transmitter monitor design will help others produce better voice signals. It incorporates tuned ham-band r.f. input, send-receive blanking and audio phase correction—features not found in scopes built for general measurement work.
- W4JRW discloses details of his patented system of using transmission-line sections instead of lumped-constant traps in multiband antenna systems. Shorted ¼-wavelength stubs provide r.f. insulation and also serve as part of the antenna.
- For pioneering 144- and 220-Mc. tropospheric propagation, W6NLZ and KH6UK were presented the 1960 ARRL Merit Award.
- During the Congo uprisings, 9Q5US was an important link to the outside world; American amateur military personnel set up and operated the vital service.
- HC1WB relates the heavy QRM difficulties he experienced while using WIAW code practice to attain his license, and makes a strong plea to the rest of us to keep the Hq. station frequencies clear during practice hours.
- Some 13,000 enthusiasts participated in the June Field Day. W7HZ/7, with up to 10 complete stations in simultaneous operation, topped all other scores.
- You don't need a beam or other fancy antenna to have fun in Amateur Radio, W1ICP tells his Novice readers—a "long wire" of most any length will do a good job if properly coupled to the rig.—W7RW

## Basic Satellite-Tracking Themes—Part 2

Last month, we talked of manual satellite tracking (locator) systems. This month, we conclude the basic tracking discussion with a review of computer tracking methods.

Computer programs designed to track satellites usually have a common set of "guzintas" (inputs) and a variety of "comsoutas" (outputs). The inputs are almost always in the form of the NASA orbital prediction bulletin. The prediction bulletins provide precise data on the position of the satellite at a reference instant (epoch), and are velocities and accelerations for the satellite. Based on the values supplied, the well-designed tracking program can output a wealth of information.

The output can be presented on your TV or CRT monitor, it can be printed or it might even steer you antennas for you by controlling the rotors through a suitable interface adapter. In the most elementary programs you get an output that tells you where the satellite is and which way to point to aim your beam at the satellite.<sup>1</sup> Advanced programs can dazzle you with maps showing the position of one or more satellites, and can forecast DX paths with selected QTHs that will be within view of a given satellite concurrent with you.

There have been three generations of programs. The first generation simply gave you a tabular display (or printout), i. e., time, azimuth and elevation and SSP of the chosen satellite for a selected period. For example, the computer could figure the pointing angles for OSCAR 9 for the next four hours.

The second-generation programs added graphics. Those developed by W0SL, GM4IHJ, W6WNK and others presented you with a Mercator projection map of the earth. Depending on the program, you would see the relative position of one or more satellites projected on the map. Provided is a table that tells which way to point to "look" at the satellite.

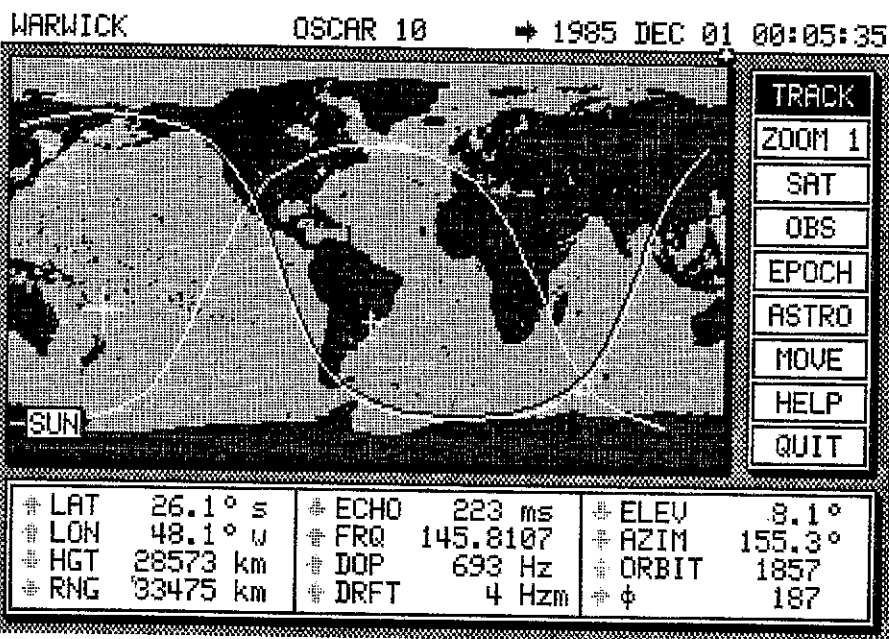
The first of the third-generation programs does all of this and much more. A system developed by W5SX and WB5CCJ is a remarkable combination of slick graphics and enormous flexibility. It provides tools for the satellite operations planners as well as users. And it runs with the 8087 math coprocessor, so it is very fast.

### What to Expect

What can be done besides merely giving you pointing angles to the bird?

1) Tracking from your location: Provides azimuth and elevation from your QTH for a selected satellite if the satellite is above the horizon. Advanced programs allow you to track several satellites simultaneously. Some will allow you to adjust the time step size to better resolve motion. Others let you set the horizon value so you are alerted to satellites just below the horizon where they can occasionally be worked. Most programs will tell you how far along its orbital path the bird has progressed on the current orbit. This is displayed in terms of phase or mean anomaly (MA). This is important because some satellites, AO-10 in particular, operate in different modes according to where they are along their orbital path.

2) Scheduling: This allows you to select a broad time window and ask the computer to display each rise and set of the selected satellite



Examples of the newest and best graphics tracking abilities of the GRAFTRAK II software of Silicon Solutions (I-r): a footprint of AO-10 over South America and western Africa while the sun is centered north of New Zealand (left).

within that window. More advanced programs allow scheduling of more than one satellite.

3) Mutual visibility: Time and pointing information for any two stations you select that will be simultaneously within view of the chosen satellite.

4) Satellite off-pointing angle: This new feature, this facility tells you how far off from your QTH the satellite's beam antenna is pointing. This is significant with AO-10 since it uses high-gain beams and occasionally the satellite's orientation is adjusted for better sun-angle. The algorithm for doing the off-pointing calculations was developed by Bob McGwier, N4HY, and is in several versions of his QUIKTRAK program.

5) Graphics: The addition of graphics distinguishes the second-generation tracking system from the first. Advanced graphics have handsome maps with detailed land mass outlines. The simplest programs will track but one satellite on the map. The best graphics capabilities I've seen are in the W5SX/WB5CCJ GRAFTRAK II package. Here you can watch the satellite's SSP traverse the map (as with the others) or you can plot the "footprint" (coverage zones). You can even zoom in to get more detail. Or you can do a special spherical projection to see what the earth looks like from the satellite at that instant. This, combined with its number crunching speed, distinguish GRAFTRAK II as the first (and for the moment only one) of the third-generation programs.

6) Autotrak: K0RZ homebrewed one of the first systems whereby the computer controls the antenna position directly without human intervention. Although fewer than 1 in perhaps 500 satellite users today have autotrak systems

running now, they will become very popular in the future.

7) Special features: GRAFTRAK II has a fast mode that allows you to watch the ground track and coverage zone move across the map at selectable high rates. This helps to plan access times to various QTHs you might want to chat with.

While tracking a satellite is a fascinating and instructive exercise, there are those who would just as soon treat the media as transparent and get on with the fun of QSOing. For them, computer-aided tracking and eventually auto-tracking is definitely the way to go. The ease of use and tremendous information content afforded, especially from those programs such as GRAFTRAK II with advanced graphics capability, make satellite use all the more enjoyable.

Next time we'll discuss the ultimate in easy-to-track satellites: AMSAT's plans for a fully geosynchronous satellite system, which just hangs in the sky with no apparent movement at all; just set your antennas and weld them in place. Next month: Phase 4 Satellites. The future is here!<sup>2</sup>

### Notes

<sup>1</sup>The satellite's position is usually given in terms of the latitude and longitude of its sub-satellite point (SSP). The SSP is the point on the surface of the earth lying on a line connecting the satellite and the center of the earth. In other words, the SSP is the point right "beneath" the satellite. The position information given may also include the elevation above the earth and the range to your QTH.

<sup>2</sup>A free catalog of AMSAT Software Exchange tracking programs is available for an s.a.s.e. to the author at the address above. (RIP)

[Attention: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in QST of prizes of any kind and games of chance such as bingo.]

**Indiana (South Bend)—Jan. 5:** South Bend Swap & Shop will be held at the Century Center downtown, on US 33, one-way north, between St. Joseph Bank Bldg. and river. Half acre on carpeted floor. Industrial history museum in same building. Four-lane highways to door from all directions. Talk-in on 52 and area repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, tel. 219-233-5307.

**Virginia (Richmond)—Jan. 12:** The Ninth Annual

ARRL Hamfest

Richmond Frostfest will be held Sun. at the Virginia State Fairgrounds from 8:30 AM to 3:30 PM. General admission \$4. Flea market spaces \$4, \$8 with 8-ft table. Booths available to dealers and exhibitors. Entire show indoors, with 21,000 more square feet than last year. No outside tailgating. Deadline for booths and reserved flea market spaces is Dec. 31. Buildings will be open Sat. for setup. Armed security at all times. VEC exams on Sat. Sponsored by Richmond Amateur Telecommunications Society. Write to Richmond Frostfest, P.O. Box 1070, Richmond, VA 23208, or call Bill Scruggs, N4DDM, at 804-272-8206.

**Wisconsin (Waukesha)—Jan. 11:** The annual Midwinter Swapfest will be held Sat. at the Waukesha Co. Expo Center Forum at 8 AM. Directions: I-94 to Co. F, south to FT, west to Expo. Bigger buildings. Admission: \$2 advance, \$3 at door. Tables (4 ft): \$3 advance, \$4 at door. Dealers welcome. Sponsored by the West Allis Radio Amateur Club. For tickets or information, write to WARAC SWAPFEST, P.O. Box 1072, Milwaukee, WI 53201 (s.a.s.e., please).

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

## Coming Conventions

### ARRL NATIONAL CONVENTIONS

September 5-7, 1986—San Diego, California

July 10-12, 1987—Atlanta, Georgia

August 19-21, 1988—Portland, Oregon

(continued from page 73)

hand corner of the envelope.

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

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

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

### Helpful Hints

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

### DOs

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

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

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

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

Do include an s.a.s.e. with any information request to the bureau.

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

Do be appreciative of the fine efforts of these volunteers.

### DON'Ts

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

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in September 1985 QST).

Don't send envelopes to your "portable" bureau. For example, WB8TDA/1 sends envelopes to the W8 bureau, not the W1 bureau.

### ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls\*—ARRL W1 QSL Bureau, Box 216, Forest Park Station, Springfield, MA 01108.

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

Third Call Area: all calls\*—C.C.A.R.S., P.O. Box 448, New Kingstown, PA 17072-0448.

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, P.O. Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls\*—ARRL W5 QSL Bureau, P.O. Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls\*—ARRL Sixth (6th) District DX QSL Bureau, P.O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls—Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls\*—Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls\*—W0 QSL Bureau,

Ak-Sar-Ben Radio Club, P.O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls\*—Radio Club de Puerto Rico, P.O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St. Thomas, VI 00801.

Hawaiian Islands: all calls\*—John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls\*—Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St., Stevens Point, WI 54481.

### CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1\*—L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS B3J 2T3.

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, P.O. Box 157, Downsview, ON M3M 3A3.

VE4\*—Larry R. Lazar, VE4SL, 30 Broughton Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5ADA, 739 Washington Dr., Weyburn, SK S4H 2S4.

VE6\*—N. F. Waltho, VE6VW, General Delivery, 9714-94th St., Morinville, AB T0G 1P0.

VE7\*—Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8\*—Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

VO1, VO2—Roland Peddle, VO1BD, P.O. Box 6, St. John's, NF A1C 5H5.

VY1—ARRL QSL Bureau, W. L. Champagne, VY1AU, P.O. Box 4597, Whitehorse, YT Y1A 2R8.

\*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

# Affiliated Clubs in Action

Conducted By Leo D. Kluger, WB2TRN  
Club Program Manager, ARRL

## GREAT IDEAS!

Stanley W. Henson, KB9UM, past president of the Twin City ARC (Champaign, Illinois), sent us a substantial booklet *14 Ideas for More Radio Club Fun*. In the forward to his booklet, Stan writes: "The intent of these ideas is to stimulate your thinking and provide some easily adapted plans that you can try with your group . . . In my opinion the local radio club has the potential to do more for the individual amateur than our national organizations can, and strong local clubs have an important place in the future of Amateur Radio. Clubs that have more fun will have more members; more members will lead to more activities and services that will make the local club even more important to its members and to the entire amateur community. Let's have more fun in our local clubs and discover more of their potential value."

The 14 main ideas in this booklet are presented in two groups. The first group, Meetings and Members, tackles dull meetings, the members' interests and negative attitudes.

### Meetings and Members—Introduction Time

A monthly meeting of the members is a common activity of local radio clubs, and although a few are ideal, many are an ordeal! "For a long time our club has opened its meetings with a self-introduction of everyone present by name and call sign. It's proven to be a good idea. It helps visitors and newcomers, and even lets the 'old hands' know who's in the back row. But our meetings became even more fun when a 'question of the month' was added to get a bit of personal detail from each person during introduction time. Almost any question can be used, and anyone who wishes to pass may do so. Some questions have been highly successful in pulling out some very interesting stories from our members.

"Here are some of the questions we've used: What bands or modes do you operate? What contests (if any) do you participate in? What was your most memorable contact? Describe your last CW contact. Have you built any electronic equipment (kits, antennas, test equipment and even stereo are included). What radio-related memorable mail have you received (perhaps a QSL card, that first ticket or maybe a pink ticket!)? When were you first licensed?"

"One caution if you add this to your meeting agenda: Our introduction time jumped from five minutes to 15 or 20 minutes when the question was added, but most of our members seem to enjoy sharing their radio experiences, and we have kept it as a regular part of the meeting agenda."

As you try various ideas in this booklet, please let Stan know how they work for you and your club. He would appreciate hearing from you.

We'll be publishing more ideas from Stan's book, space permitting, over the next few months. I invite you to write in with your comments and suggestions on the ideas presented here.

### UP-TO-THE-MINUTE NEWS FOR CLUBS

Newsletter editors: Here's an idea for obtaining more information for your club's paper: The Metroplex Amateur Communications Association, Inc., based in the New York City area, sent us a news release about their *Metroplex Network*, an Amateur Radio news service that transmits information for relaying on local repeaters. The following paragraphs are gleaned from their news release:

Coproduced with Westlink Radio, the

Metroplex Network presents a national news program and swap-and-shop every Monday, as well as all of the North American Teleconference Radio Nets. If your club decides to participate, you'd download the programs from a commercial satellite transponder or receive them via a UHF link or the telephone lines. To find out more about the Metroplex Network, contact Alex Magocsi, WB2MGB, Metroplex Network, P.O. Box 237, Leonia, NJ 07605, or call their 24-hour tape at 201-592-7614.

### HAMS ON TOP OF THINGS AT CITY HALL

Amateur Radio operators are frequently called upon to provide communications when natural disasters wipe out conventional means of getting information from one point to another. But in this case, it was tower-climbing skills that members of the Pittsburg County ARC (Quinton, OK) contributed. When their city hall burned to the ground, taking with it the police department's communications tower, club members climbed a newly planted 50-foot pole and installed a modified Ringo Ranger, connecting it to a temporary radio. The club members must have done a good job because the loaned radio and antenna worked better than the old system!

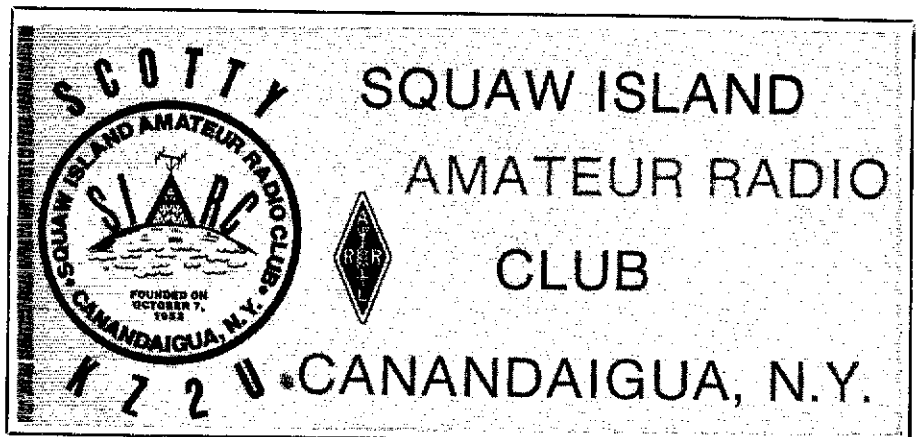


Shown in the photo (l-r) are Clyde Heathcock, WB5QYG, an unidentified city employee and Ralph Suter, KA5OLJ.

### The Newest Special Service Clubs

Congratulations to the League's newest Special Service Clubs (SSCs). These are the groups that have that "extra little bit" that sets them above the rest. SSCs are the leaders in their Amateur Radio communities. They're the ones with the active training classes, the ones who work with youth groups in contacting the Space Shuttle, the ones who sponsor local Amateur Radio Explorer groups, and the clubs with members who actively pursue technical projects.

- Conyers Amateur Radio Group, Conyers, GA (50 members)
- Downey ARC, Downey, CA (88 members)
- Foothills ARC, Greensburg, PA (60 members)
- Greater Fairfield, CT ARA (106 members)
- Gwinnett ARS, Lilburn, GA (47 members)
- Huntsville Area Young Ladies ARC, Huntsville, AL (23 members)
- Humboldt ARC, Inc., Eureka, CA (60 members)
- Mid-Atlantic ARC, Villanova, PA (200 members)
- Nashua Area Radio Club, Nashua, NH (195 members)
- Richmond ARC, Richmond, VA (164 members)
- Rockford ARA, Rockford, IL (130 members)
- Susquehanna County ARC, Montrose, PA (46 members)
- Wheaton Community Radio Amateurs, Wheaton, IL (203 members)



Members of the Squaw Island Amateur Radio Club, a Special Service Club in Canandaigua, NY, can display their call and club logo with pride, thanks to the artwork of fellow member Scotty Ross, K2ZU. The stickers are bright yellow, and the lettering and logo are in brown, red, green and silver and blue. Scotty suggests that bumperstickers of this nature can be used as a club fundraiser or, as in his case, be given to club members (it helps to have your own printing facilities, as does Scotty). Another good (and attractive) way to keep Amateur Radio in the public eye!



## Stop, Think and Listen

The following story arrived in the Public Service Branch within days of the Mexico City earthquake (discussed elsewhere in this issue) and Hurricane Gloria. Although the article is fictitious, shockingly similar events occurred during the last two weekends of September. We hope that reading this brief story while sitting comfortably in your easy chair on a crisp winter's evening might cause you to ponder your planned response next time.

### "QRX"

0200Z Thursday: "The Hurricane Center in Miami has issued a hurricane warning for the Seaward Islands, Puerto Rico and Haiti. Hurricane Sheila is now at 25N 65W and moving west at 15 MPH. Maximum sustained winds of 100 MPH. Residents of these islands are warned to take shelter immediately."

Roberto does not need any warning. He is busy pulling down the crank-up tower near his house on the main island of Caruba in the Seawards. Lightning is already flashing in the east, and the wind is hurtling rain like buckshot in his face as he struggles to save the antenna before the storm hits. As Q23AC, Roberto is a juicy catch for all those hungry DXers to the north. He is one of only six hams in the Seawards. Suddenly, Roberto's hobby could provide hope for thousands of islanders. The antenna down, he makes his way to his family huddled in a hallway of their house. He tries to smile, but he knows it is going to be bad. The lights go out.

Telephone poles become missiles, their wires a tangled mess of spaghetti that joins wood, trees and metal flying through the air. The island's satellite dish, their only link with the outside world, becomes a flying saucer for an instant, then disintegrates against the side of the battered and flooded government telecommunications building. Caruba is cut off from the other islands, cut off from the world. All this destruction happens in a few minutes, but Sheila still has five more hours in store for Caruba. The hurricane still has to flood most of the city, kill a hundred people, injure a thousand more and then demolish their only hospital.

2200Z Thursday: "Reports are sketchy, but the Seaward Islands seem to have suffered heavy damage from Hurricane Sheila. Most reports are being relayed by Amateur Radio operators, as all other communications with the Seaward Islands are nonexistent."

You already knew that. You are glued to your radio listening to Roberto. He has just gotten back on the air. The picture he tells is bleak. Propagation is good. The hundred watts he is able to milk from his emergency generator is hanging in. You have a kilowatt humming quietly nearby. He would hear you just fine. Do you want to help? Of course. You reach for the transmit button. This is the first time you have heard anything like this. You are understandably excited. Stop and think.

The first question is, "What can I do?" Right? No, let's back up a little further. How about: "What does he need?" Bingo! Simple, he needs communications. He needs a

transmitter and a receiver. Check. He has those. He needs someone who is listening and can answer back. Okay, here you are. *He needs a clear frequency.* Sure, but if you give him a clear frequency, how can you help?

For starters, give him that clear frequency while you ask yourself a few basic questions. First, if you got on the air right now, cranked up the full gallon and blew his ears off with your great signal, what would you say? Something like: "Here is NZ9XXX in West Peavyville, Illinois."

So now he knows that there is a station listening and, unfortunately, transmitting from West Peavyville, Illinois—so what? Does he need someone from West Peavyville, Illinois? You don't know, do you? If he does, he will probably ask. Well, I'll just let him know, you think to yourself. Anyway, he is not transmitting and the frequency is quiet. I'll be on and off—no long-winded stuff. Let's say you give him a shout—right in the middle of a transmission from AZ3ZZZ, the Red Cross Station in Washington, DC, who was running down a long list of *emergency* traffic. You did not hear the *emergency* traffic since the band is not open toward the eastern US. Now the two stations have to start over. You may have just delayed life-saving supplies by 10 additional minutes.

Wait a minute. Did you hear that? He just asked for a station that can get in touch with the Red Cross in Chicago. Chicago is only 50 miles away. The heck with the long distance charges. This is an emergency, right? "Click" goes the amplifier relay, and one thousand watts of "NZ9XXX ... NZ9XXX ..." go streaming out of your six-element beam southward—right on top of KX9AAA, the station at the Red Cross headquarters in Chicago. They only have a hundred watts and a hastily strung dipole with an SWR of 3 to 1. Roberto comes back to you. You did not hear the station in Chicago, and neither did anyone else.

Now Roberto asks you questions you should have asked yourself:

"Are you at or are you connected with the Red Cross or any other emergency organization?"

"No, sorry."

"Do you have a phonepatch?"

"Yes, but it's not working."

"Can you relay traffic?"

"I haven't before but ..."

Finally, the station at the Red Cross breaks in. You have cost the people of Caruba valuable time.

The phone rings, and you pick up the handset. Well, I'll be! It is the local television station. They need to know the status of things in the Seawards. Ham operators are the only link. One of the technicians at the station told the reporter that you have a ham radio. Yes, you're in contact with the island now. Could you contact the operator there when the television crew is taping? They would like to interview you on the 6 o'clock news! Sure. The reporter and crew are on their way. You hang up the telephone and run back to your rig. Wait just a minute. A news interview will take

time to set up and time to run. Is it really that important? It is good PR for Amateur Radio, right? So you break in again to ask if Roberto would mind talking to you during your "big chance" at stardom. When you called, however, Roberto was on the VHF link to the makeshift hospital taking a list of medical supplies. He heard the frequency come alive and ran back to the radio. He did not hear what you said. So you repeat it. He tells you in no uncertain terms that you will miss your chance to become a television "star" since he is running emergency traffic requesting food, medicine, air drops and shelter. The world can wait a little longer for your smiling face on the television screen. The Seawards can not waste one minute in getting emergency supplies.

Suddenly, there's a knock on your door. Now what? A woman and her son are standing in your doorway. They speak English with the same accent as Roberto. They saw your antenna. His brother, her son, is on the island. She has not slept since hearing about the hurricane. Can you find out if he is alright? How can you refuse? You let them inside and get the particulars. Now you can really help. Back to the radio. The mother and son stand nearby as you smile at them and then key the mike. You make your request in less than 10 seconds. Now the three of you stare intensely at your speaker as if to "will it to talk." This time Roberto does not come back. Instead it is WG4QQQ, the net control station. His reply is clipped.

"NZ9XXX—Down five."

You slide the dial down 5 kHz, and he calls you. You answer. It's obvious by the tone of his voice that he is near exhaustion. "This is an emergency," he states. "We are handling traffic on a priority basis. Health-and-welfare traffic has the lowest priority. Didn't you know that?"

He really does not need an answer. You don't venture a reply. The mother and son stare at you as you flash a half-hearted smile. "I'll keep trying," you say.

After an uneasy pause, you hear, "This is not a game. People are dying. WG4QQQ returning to net frequency."

Fortunately, none of this really happened. You were only thinking about it. Meanwhile, the frequency has been kept clear. Traffic is getting through in an orderly manner. You know how to help. You simply keep listening—just listening. People are being saved. The survivors, simply by living, have thanked you although they will never know your name or call sign and probably never will. But you helped. You helped a lot and you know it.—James Flynn, WB9AWX

### IN SERVICE ...

□ Point Pleasant Beach, NJ—July 17. The Ocean-Monmouth ARC was responsible for communications for the 1985 Walsh Offshore Grand Prix, a high-speed offshore power-boat race. Radio amateurs linked sea-to-land checkpoints with an OMARC member aboard each

of the 5 checkpoint boats spread throughout the nearly 156-mile course. A total of 16 Amateurs participated. (Michael S. DiPersio, KC2Q)

□ Baton Rouge, LA—July 24. Seventy Amateur Radio operators supplied communications for the National Sports Festival held from July 24 to August 4. Thirty-five different sports were contested during the festival at five major sites in and near the Baton Rouge area. A team of radio amateurs was assigned to each site and event that needed radio communication. Amateur Radio operators demonstrated their service through reliable operation during the 12-day competition. (Jim Giammanco, N5IB)

□ Dayton, OH—August 1. A chemical spill prompted 28 radio amateurs to respond to the emergency. The Dayton Amateur Radio Communications Van was called into action for possible use as a command center for evacuation. Nets operated by members of the Dayton ARA and the West Central Ohio ARES kept Dayton authorities informed of the wind and weather conditions. The winds dispersed the chlorine gas, and only one block area had to be evacuated. (Ron L. Moorefield, W8ILC, DEC, Ohio)

□ Checota, OK—August 4. A tractor-trailer carrying bombs exploded following an accident on Interstate 40. The Oklahoma Emergency Phone Net, the W5GA Repeater (Okmulgee) and WB5OFC Repeater (Holdenville) were used extensively to relay messages between the disaster site and the Oklahoma State Civil Defense Hq. (Don S. Wills, EC Okmulgee County)

□ Maui, HI—August 4. Maui County ARES members provided communication for the Run to the Sun, a 36.2-mile marathon that starts at Kahului (sea level) and ends at the summit of Mt. Haleakala at 10,023 feet. Seven radio amateurs linked six aid stations along the route. The race progressed smoothly with no emergencies. (Melvin Fukunaga, KH6H, EC Maui County)

□ Scotts Bluff County, NE—August 11. Seventeen members of the Scottsbluff ARES and the Tri-City ARC supplied tactical communications for the 6th annual Sonny's 26-mile bike marathon. Amateurs were stationed on each major corner of the route and at strategic points in between to provide emergency medical and repair messages for the riders and event organizers. One ARES member, KC0OZ, not only assisted in providing communications by riding his bike in the race, but also finished third in his category. (Jim Parks, WB0GPM, EC Scotts Bluff County)

□ Orange County, CA—August 11-13. A fire started in the remote, sparsely populated mountains and canyons northeast of Brea/Olindina. It raged out of control for two and a half days. Fourteen Amateurs helped supply round-the-clock communications for the Orange County Red Cross, which provided canteen and first-aid services on the scene. (Ralph E. Alexander, W6RE, EC Orange)

□ Bedford, IN—August 17. Members of Hoosier Hills Ham Club/ARES provided communications during the annual home-built raft race on the White River, located south of Bedford. Traffic control at the starting point was handled by KC9ED and KB9DI. WB9PFZ, an Emergency Medical Technician, operated the medical patrol boat and used 2 meters to maintain contact through WB9EMH with race officials at the finish line. Though no medical emergencies happened during the race, a drowning occurred several hours before the event. Conservation Officers and Sheriff's Deputies continued dragging operations during the race. (Jeff E. Howell, WB9PFZ)

□ Boston, MA—August 25. Amateur Radio came in handy during the USA Triathlon Federa-

tion meet in the Boston area. Rain made the course slick and potentially dangerous for 1000 participants in this swimming, cycling and running event. Amateurs reported three accidents that required ambulance assistance. Injuries recorded included a broken wrist, fractures, sprains and abrasions. Nine radio amateurs operated 2-meter FM along the route to link first-aid stations and follow the progress of the athletes. (John A. Carroll, ABIZ)

□ St. Charles County, MO—August 25. While returning from the St. Charles hamfest, WA0AYA spotted a wreck with injuries involved on Highway 94 two miles east of Augusta. Through the WA0FYA Repeater he contacted WA0AVG in Marthasville who called the Augusta Ambulance District. (Ken Bowles, K9OCU, DEC, Missouri)

□ Ridge, NY—September 7. Six radio amateurs gave excellent communications support for the annual Longwood Run, a 10-km run promoted by the Town of Brookhaven on Long Island to encourage physical fitness. Amateurs helped ensure the safety of the participants by setting up the Net Control Station, KA2JMA, alongside the Emergency Medical Technician. The race went smoothly, and no injuries were reported. (Bill Frisch, KA2JMA, EC, NY)

□ Butler County, PA—September 8. After receiving news of possible severe weather approaching Butler County, a net was opened at the Butler County EOC to track the storms. K3NPX, in adjacent Beaver County, was in contact with a Doppler Radar system at the Beaver County airport. He reported that severe weather in Ohio was heading east. Several area amateurs also reported weather conditions as the storm system moved through the area. No radio assistance was needed following the storms. (Ed Napoletan, WB3LKO, EC Butler County)



The National Sports Festival in Baton Rouge, Louisiana, invited area amateurs to coordinate communication during the competition. Participants shown are (standing, l-r) K5LUN, N5ADF, Baton Rouge Mayor Pat Screen, Festival Director Darrell Phillips, KA5JPH, NV5A, and (kneeling) KC5BQ and N5DSP. (photo N5IB)

### YOUR CONDUCTOR'S CABOOSE

Under the tree were two beautifully wrapped presents. At the crack of dawn the children ran for the tree in excited expectation. They ran for the large blue box first. Gleeefully they ripped off the wrapping and bow. They tore the top off the box and peered inside. They saw a bicycle in several parts. Assembly, it seemed, was required. They paused for a minute realizing that, given time, they might put the bike together. They

didn't have the time. It was Christmas!

Next they ran for the red present. Filled with laughter the children ripped the wrapping off, tore open the box and looked inside. The second box contained a bicycle, fully assembled. The children tore the box to shreds and admired the bike. Within minutes, the children were riding around the block on a cold winter's day. Their pride and love of their new possession overcame the freezing temperature.

Ladies and gentlemen, public service doesn't mean waiting until Christmas for assembly. It means serving the public—your communities, your neighbors—at every opportunity. You're the "bike" your neighbors may depend on in an emergency. Your ARRL Field Organization has your "training wheels" if you need them.

Is your "public service package" stamped "assembly required?"

The ARRL Public Service Branch (Mike, Steve and Kim) would like to wish you and yours a happy holiday season!

### ARRL SECTION EMERGENCY COORDINATOR REPORTS SEPTEMBER 1985

Section Emergency Coordinators reporting were: AB, CO, EMA, ENY, EPA, GA, IA, MAN, MDC, MI, MN, MO, MS, NC, NFL, NLI, NNJ, NV, OH, OK, ON, ORG, PAC, SC, SD, SDG, SF, SFL, SJV, SK, SNJ, SV, TN, UT, VA, WA, WI, WMA, WNY, WPA, WV.

Reports were not received by the following Section Emergency Coordinators: AK, AL, AR, AZ, BC, CT, DE, EB, ID, IL, IN, KS, KY, LA, LAX, MAR/NFD, ME, MT, NE, NH, NM, ND, NTX, OR, QUE, RI, SB, SCV, STX, VT, WIN, WY.

SEC monthly reports for December should be received in the Public Service Branch at ARRL Hq. no later than Jan. 12. Reports received after the 12th will be entered as time permits.

### Transcontinental Corps September 1985

December TCC reports should be received in the Public Service Branch no later than January 12.

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
<b>Cycle Two</b>				
TCC Eastern	108	87.8	548	1089
TCC Central	80	86.9	414	913
TCC Pacific	109	90.8	592	1142
Summary	289	88.5	1554	3144
<b>Cycle Four</b>				
TCC Eastern	140	83.3	1052	2010
TCC Central	60	91.7	370	724
TCC Pacific	113	94.0	518	1020
Summary	313	89.7	1940	3754

### TCC Certificates issued

W1NJM WB2QIX W1CE K1GRP KN1K KA1T W2AET W2YGW KQ3T AA4AT N4GHI AF8V K7OVK.

### TCC Roster

N5BB WB5CIC W5GHP K5GM K5OAF N5TC K5TL KV5X KW9J WB9NVN WB9UYU KB9X W0HI K5OU KK1A K1EIC WB1GXZ ND5T W5JOV KJ6D K6UYK WF6O KF7R W7TGU WB7WOW K7OVK KB7FE N0JA WA0YI WA0YNP N5DT K6UYK K6LL W6EOT W6INH W6VZT K7HLR W7LYA KA7CPT KD7EY KN7B NN7H W7EP W7GHT W7LG W7LYA WB7WOW W7VSE AD0A K00B K0EZ KJ8G N2IC VE6CHK WAJL WA4JTE N5AMK N5BT W5CTZ W5GHP W5KLY KD5KQ WB5OXE KD5RC KA5TTH K5SV WB5YDD KA9FEZ KW9J W9J3 NJ0B KA0EPEY W1EFW W1SIO KN1K

W1NJM W1QYY KA1T W1TN KW1U WA2FJJ W2FR  
W2GKZ WB2QX W2RO K2SB W2XD N2XJ W2YGW  
K2ZM W3ATO N3COY WB3EPU WB3GZU W3PQ  
K3RZ KQST WD4ALY AA4AT WA4CCK WD4FTK  
N4GHI AA4GL K4ST WB4PNY WB4UHC W4UQ  
W4VJR K8OZ W8PMM W8GHW AF8V VE3AWE  
VE3FAS W1CE WA1FCD K1GRP W2AET.

NOTE: Incomplete, illegible or late TCC monthly reports will not be entered in the January Public Service column.

### National Traffic System September 1985

December NTS reports should be received in the Public Service Branch no later than January 12.

Net	Sess.	T/c.	Avg. Rate	% Rep.	% to Area
<b>Cycle Two</b>					
<b>Area Nets</b>					
EAN	27	926	34.3	673	95.1
CAN	30	878	29.3	564	100.0
PAN*	57	749	13.1	485	94.4
<b>Region Nets</b>					
1RN	80	619	10.3	440	97.0 98
2RN	50	205	4.1	286	59.7 92
3RN	30	238	7.9	400	94.0 96
4RN	80	702	11.7	430	82.9 100
RN5	80	828	15.8	473	90.0 100
RN6	53	303	5.7	270	100.0 100
RN7	60	731	11.8	502	83.6 100
8RN					100
9RN	58	371	8.0	389	83.0 100
TEN	60	649	10.8	440	87.5 100
ECN					85
TWN	54	268	5.0	400	85.6 98
<b>TCC*</b>					
TCC Eastern	105	1215			
TCC Central	80	913			
TCC Pacific	109	1122			
<b>Cycle Three</b>					
<b>Area Net</b>					
EAN	30	351	11.7	559	65.6
<b>Region Nets</b>					
1RN	30	112	3.7	280	90.0
2RN	29	237	8.2	509	86.2
3RN					70.9
4RN					64.5
8RN					22.5
ECN					29.0
<b>Cycle Four</b>					
<b>Area Nets</b>					
EAN	30	1918	63.9	1589	98.3
CAN	30	1538	51.3	1465	100.0
PAN					
<b>Region Nets</b>					
1RN					100.0
2RN	60	346	5.8	492	88.3 90.0
3RN	60	315	5.3	413	96.1 100.0
4RN	60	629	10.5	450	100.0 100.0
RN5	60	1073	17.9	661	83.8 100.0
RN6	60	467	8.0	693	96.0
RN7	80	500	8.3	725	93.6
8RN	56	393	7.0	371	92.0 100.0
9RN	30	630	21.0	641	93.3 100.0
TEN	60	386	6.4	496	80.8 100.0
ECN	55	207	3.8	31	78.4 100.0
TWN	58	355	6.1	331	86.8
<b>TCC</b>					
TCC Eastern	145	1585			
TCC Central	58	708			
TCC Pacific	115	956			

NOTE: Incomplete, illegible or late NTS monthly reports will not be entered in the Public Service column.

\*PAN operates both cycles one and two.  
†TCC functions not counted as net sessions.  
ARRL Section Traffic Managers reporting: AB, AL, AZ, BC, DE, EMA, EPA, GA, IL, IN, KS, LA, MDC, ME, MI, MN, MO, MT, NC, NE, ND, NFL, NH, NLI, NJ, NY, NYLI, OH, OK, ONT, OR, ORG, QUE, RI, SB, SC, SD, SDG, SFL, SNJ, STX, TN, UT, VA, VT, WA, WMA, WNY, WPA, WV.

NOTE: Changing staff responsibilities no longer allow us to list individual section and local nets. December Section Traffic Manager reports should be received in the Public Service Branch no later than January 12. Incomplete, illegible or late STM reports will not be entered in the Public Service column.

### Public Service Honor Roll September 1985

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as

reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max.; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 points 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. December reports submitted for this column should be received at ARRL Hq. no later than Jan. 12. Late reports will not be published. PSHR reports should be listed separately from Section News reports.

1351 K5VRF	115 W9FZW	WB2MCO	77 N4JRE
246 K7VW	113 KB7FE	KA2BHR	W43UNX
207 KA5RGC	112 WA1TBY	KA4RSC	W4JLS
193 WB7WOW	AA4AT	WA6ZUD	WB4VMX
180 W7LRB	VE4AJE	WB5YDD	K2SCU
172 K6UYK	110 W2MTA	KA2UBX	76
166 KC2TF	109 W2ERT	WB4ADL	W0KK
156 WB1HHH	108 VE3DPO	90	NT4S
155 K4GCL	AG9G	KDBCL	75
153 KK3F	KA8AR	N0PCK	K0PCK
152 KD7ME	W2PKY	W6AWH	W6AWH
151 K8CY	WA2KJ	K4YV	W6B0X
150 KB0Z	WA2FJJ	N8FAZ	KB4OZ
147 N4EXQ	KD8RD	KA5SPT	WA4EYU
146 KA8EPY	107 VE3GT	KA5QYV	W0LAE
145 WA7VTD	WA4PFF	74	
143 K4NLK	KA2MYJ	KA4GUS	KA4GUS
142 KA3ETC	KF6J	WB0TFC	WB0TFC
141 K4ZK	KA4JST	AL7W	N1BJW
140 N4GHI	KA1GWE	KA0BCB	KA0BCB
139 KD8KY	KT1Q	VE2FMO	WA4CCK
138 KB1AF	106 W0FRC	73	
137 W9JUU	K4VWK	K2YAI	K2YAI
136 N5AMK	105 KA8VOZ	KB4IVV	KB4IVV
135 WB9FRJ	NZ5U	KB4BZ	KB4BZ
134 WB2EAG	WA4JDH	KB4LB	KB4LB
133 WB2EAG	104 WB2OWO	KT1Q	KT1Q
132 WB8JGW	103 N8AEH	W08OUO	W08OUO
131 NG4J	KA3DLY	K4ZM	K4ZM
130 WB2QMP	N4GHI	AA4HT	AA4HT
129 WA4QXT	102 W0OYH	KA4OZ	KA4OZ
128 KA2SPH	KB5MU	71	
127 WX4H	WB2IDS	KA4FZJ	KA4FZJ
126 WB9ESM	101 W9JUU	WA1YNZ	WA1YNZ
125 KK1A	N5AMK	W4HON	W4HON
124 WB1GYZ	WB8RHU	KA4YEA	KA4YEA
123 K5CXP	133 WB4WQB	KB4PW	KB4PW
122 KC3Y	WB2EAG	N5DFO	N5DFO
121 KA9FFO	131 WB8JGW	NF8B	NF8B
120 WB4WYG	NG4J	VE4IX	VE4IX
119 N4KFU	WB2QMP	A100	A100
118 K3JLJ	130 W4ANK	W7LNE	W7LNE
117 WB9YCV	WA4QXT	K7OVK	K7OVK
116 W4PIM	128 WB4KBW	N0GCG	N0GCG
115 WB2UVB	WA1FCD	W7LJG	W7LJG
114 WB1CMQ	127 WX4H	WB4ZDU	WB4ZDU
113 KW1U	KB4WT	N4PL	N4PL
112 N3COY	126 WB8RFB	VE3KK	VE3KK
111 KA8CPS	97 WB5GKH	WB1GXZ	WB1GXZ
110 AK2E	KK2VI	WA2VJL	WA2VJL
109 W7VSE	WB1GYZ	K8CY	K8CY
108 WB2VUK	K5CXP	W8CTZ	W8CTZ
107 KF4U	122 KC3Y	WA4PFF	WA4PFF
106 KA1KPS	KA9FFO	BPL for 100 or more origination plus deliveries:	
		WB1HHH	184
		W0QBK	115
		W9FZW	101
		WB2ZUV	100
		WB2EAG	100

64 WA3CKA	WD4PBF	WA8DHB	KB4MHH/T
K4MOG	N8GJO	W6RNL	49
63 N1BGW	61	59	VE2EDO
W0QUD	WB9PFFZ	W4TYU	48
NZ5J	KC3AV	WB4HX6/T	KA8RNY
WB8KWC	KB4JPN	58	KA8TNT/T
NDDZA	K6APW	W06DZQ	47
	KQ3T	54	W1YOL
62 N1DDC	KB5EK	KA7RFD/T	46
VE3GOL	60	N2EVG/T	N9EJO/T
WA2VKI	WB8WNJ	52	42
KA2DQA	N0BN	KA1MAM/T	WB1CBP
KC8WH	KA7AJD	51	40
	WAEIB	KA8HJK/T	N6FWG

### Brass Pounders League September 1985

The BPL is open to all amateurs in the United States, Canada and U.S. 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 hour of receipt in the standard ARRL form.

December reports submitted for this column should be received in the Public Service Branch at ARRL Hq. no later than the 12th of January. BPL reports should be listed separately from Section Traffic reports. All BPL reports should be complete and legible. Late, illegible or incomplete reports will not be published.

Call	Orig.	Rcvd.	Sent	Divd.	Total
KC0J	1017	1624	1624	1839	6104
N0BQP	31	1448	44	674	2397
KE4LS	140	1127	1007	85	2359
W7DK	---	---	---	---	1664
W5AC	320	347	378	288	1335
W3CUL	479	270	522	40	1311
N4EXQ	425	188	540	83	1216
WA8HJZ	0	787	56	416	1173
KA9CPA	15	929	68	7	1019
KW1U	1	532	451	6	990
N4GHI	50	434	439	38	961
KD7ME	---	---	---	---	954
K5VRF	237	237	237	237	948
W0JUU	2	460	450	0	912
WA4JDH	1	370	392	4	767
N0D5T	15	401	340	10	766
KA0CZV	30	322	102	250	704
N5AMK	0	373	285	0	658
WA4QXT	33	266	316	24	638
W5GN	147	171	173	145	636
WD4II0	233	91	287	16	627
WB6CLD	3	300	300	8	611
WB4ADL	34	283	281	27	605
WB1CQO	295	10	295	0	600
KA8CPS	19	262	281	33	595
WB7WOW	18	313	209	37	577
K4EJK	20	257	240	21	538
W0FRJ	21	230	250	20	521
WB8WNJ	0	285	234	1	520
N4PL	67	181	256	16	520
VE3KK	81	222	238	25	516
WB1GXZ	26	234	234	18	512
WA2VJL	170	87	170	85	512
K8CY	120	137	131	118	506
W8CTZ	0	243	260	1	504
WA4PFF	3	265	224	11	503

BPL for 100 or more origination plus deliveries:

WB1HHH	184
W0QBK	115
W9FZW	101
WB2ZUV	100
WB2EAG	100

### Independent Nets 1985 September 1985

December reports submitted for this column should be received in the Public Service Branch at ARRL Hq. no later than Jan. 12.

Net Name	Sess.	T/c.	Check-ins
Central Gulf Coast Hurricane Net	30	653	172
Early Bird Net	30	251	246
Empire Slow Net	30	63	332
Golden Bear Amateur Radio Net	30	135	1733
Hit and Bounce Traffic Net	30	422	607
IMRA	25	984	1483
Mission Trail Net	30	139	1002
New England Novice Net	30	35	166
NYSPTEN	30	70	584
Southwest Traffic Net	30	348	1145
Vermont RFD	30	430	100
Vermont SSB Net	5	62	18
West Coast Slow Speed Net	30	135	466
75 Meter Interstate SB Net	30	387	1213
7290 Traffic Net	48	535	2298

# Results, Eighth Annual ARRL UHF Contest

By Michael B. Kaczynski, \*W1OD  
\*Contest Manager, ARRL

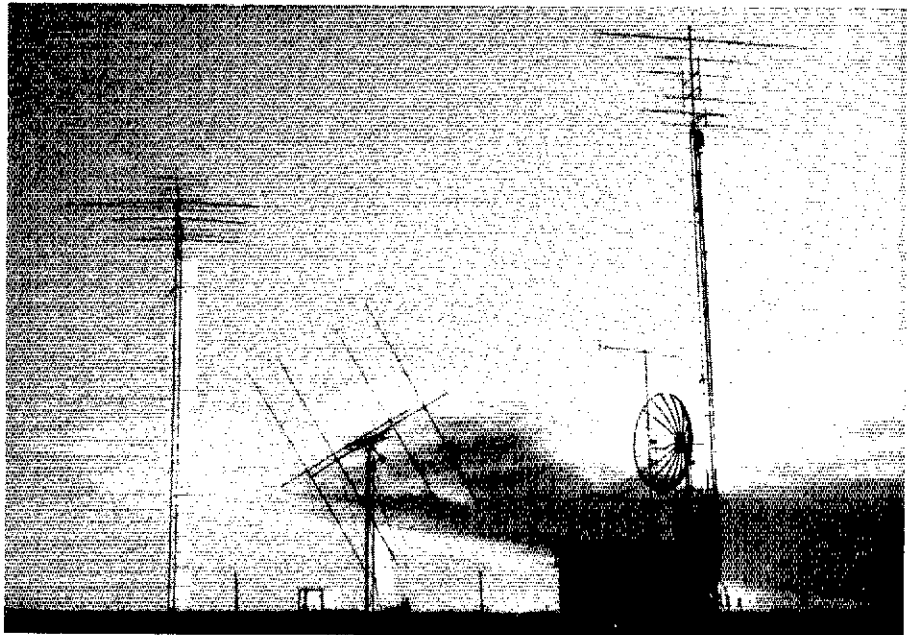
August 3-4 marked the eighth running of the increasingly popular ARRL UHF Contest. As usual, this contest was very successful. It is more than fair to say that this little gem is now a well-established operating event. Rather than jumping right to the leader boxes, let's look at two of the contest's outstanding West Coast efforts. While the scores might not be as large as those in the East, it's the *effort*, not the *score*, that really counts.

K6TZ operated Field Day-style, using solar power throughout the contest period. Storage batteries were used to maintain operations after sunset. One of their operators, WA6VNN, reported that the weather was the best in UHF Contest history. Fair propagation supported a 432.1-MHz contact between the group's Santa Cruz Island (DM04) QTH and Charleston Peak, NV. As far as can be determined, this was the first trans-California QSO on that band. Similarly, 220 was in good shape. It appears that on the west coast, as well as elsewhere, many new stations are being heard and worked on 220. This indicates a great potential for more QSOs on this band, if everyone with equipment for the band would use it! The gang at 'TZ promises more bands, higher power and better antennas in the future.

Another outstanding west coast entry was submitted by K7AUO, the Tektronix Employees' ARC. They operated from CN85, in Beaverton, OR. As is typical with stations in the UHF/microwave region, they are helping to establish microwave SSB in the States. WA3RMX has converted surplus 11-GHz telephone gear into a 10.368-GHz linear transverter. WB7UNU and W7UDM followed suit, so 3 such units now exist in the Portland area. More of these surplus rigs are available, so more 10-GHz SSB should be heard shortly. The basic transverter runs at 200- $\mu$ W output. A TWT amplifier on the original unit makes for a 10-mW-output rig. Success on 10-GHz SSB has been outstanding — with a 1.5-foot (0.5-m) dish on one end and a 3-foot (1-m) dish on the other, K7AUO and WB7UNU made a QSO over a 40-mile path . . . with only 200  $\mu$ W on each end! A QSO over the same path was attempted with 1.5 W of FM on 5.8 GHz, with marginal results. SSB really works! K7AUO reports that the group should have SSB gear operational on all microwave bands by next year.

Now, on to the boxes! K1FO, last year's number 3 multiop, operated solo this time and beat his group's multiop effort for a first-place single-op finish. WA2FGK came in second, with 1983-84 champ, WB8BKC, third. Doctor Al, K2UYH, got serious this year, to finish in the top 5 (number 4, to be precise). VE3BFM not only took Canada with his 19.7-k effort, but he also ended up number 5 overall.

Not much changed from last year on the multiop side, with perennial champs W2SZ/1

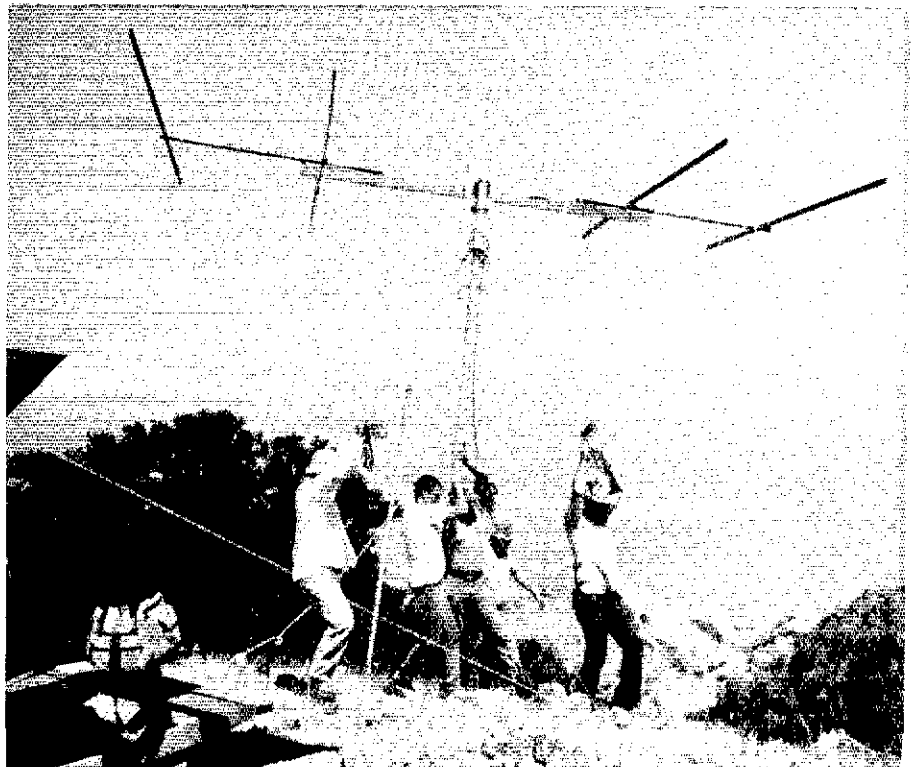


WB0DRL and WA0TKJ used this array of antennas to place first in the Midwest Division.

(remember them?) and W3CCX/8 finishing first and second, respectively. Despite a marked lack of propagation, the Mt. Greylock Hilltoppers still managed to top their 1983 record by 10 k. With the absence of K1FO, both VE3LNX and

AB4L moved up a spot in the standings. They were joined by N2CE1, to round out the top 5.

The 1986 ARRL UHF Contest will be held on August 2-3. Why not dust off that old 220 box and give the UHF 'Test a try?



Teamwork was required to set up the Santa Cruz Island operation of K6TZ.

**SOAPBOX**

Activity on Sunday was nil. I'd like to see the contest changed to the spring format, as I do better in 4 hours than 24! (K2GK). FB contest as usual. Tnx (WB2SZY). Five-year-old Eric helped dad call CQ with the memory keyer. Overall, good conditions, but less activity than usual (K2QR). I operated from rare FN46. The expressions of thanks from grid hunters made it very satisfying (VE3ASO/2). The bands were very slow this year. Saturday night wasn't too bad, but Sunday was very, very slow. The only excitement was replacing the fuses in the 220-MHz amp supply (VE3LNX). Conditions were good all week but fell apart Saturday morning. I worked W0SD Friday night with 5 x 7 signals, but rain came through and put the tropo to rest. The grid system definitely accounts for increased activity on UHF-up bands (N9KC). Conditions were very poor. A little January in August! (N180). Ex-K8HWW lives again as W8VO! (W8VO). What little time I was on, I noted very little FM activity on 220 and 440 MHz. It seems that we should be able to get more FM activity with the numerous hand-helds out there, and a contest such as the VHF and UHF contests help test our communications effectiveness

**Single Operator Top 5**

K1FO	47,403
WA2FGK	
(K2LNS, opr.)	38,979
WB8BKC	30,015
K2UYH	26,166
VE3BFM	19,662

**Multioperator Top 5**

W2SZ/1	136,998
W3CCX/8	65,664
VE3LNX	22,878
AB4L	15,435
N2CEI	14,760

in case of an emergency; and we still have fun! (N8CCC). Activity seemed to be up over last year and the June VHF. Missing FN22, which is line of

sight from my QTH was depressing! I hope to add 220 MHz next year (K2EK). I operated from home. Even with the mountains around me, I worked everyone I heard (KA2Q). Not much activity, combined with a Sunday drive of 100 miles each way to the Cedar Rapids Hamfest, hurt local activity. We need scoring based on miles to help this situation! (K0CCQ). I think I'm going to get some solid-state power amps. When you run a clean signal, everyone can move in close to you (K1FO). Where was Rochester on 220 and 432? (K1DS). Local activity was low, although conditions were good (NR6E/6). The contest was dead. I guess that the Hawaii opening last weekend wore everyone out (WA8LLY). Overall, we had a great time, and no big equipment failures. I think we have a shot at W2SZ/1 in the upcoming years. We'll give 'em a run for their money, anyway (WB2NPE, opr. W3CCX/8).

**FEEDBACK**

Please refer to January 1985 QST, page 78, for the following corrections. K8DW operated from Oregon, OHIO, and should have been listed after WA8TXT in the Great Lakes Division. K7HSJ was the winner in the Northwestern Division.

**Scores**

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 432 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 48 GHz) and ARRL Section. Example: K2UYH had a total score of 26,166, with 102 QSOs and 35 multipliers on 432 MHz, and 38 QSOs and 14 multipliers on 1296 MHz. He is located in the Southern New Jersey Section. Call signs of Division leaders and band indicators of band winners are printed in bold type.



K9GQ	2322	43-18-D	IL
NC9F	675	25-9-D	IL
N8TD	513	19-9-D	WI
WB8NTL	459	4-3-C	IN
		13-6-D	
W9YCV	378	14-9-D	WI
KA9QIK	270	15-6-D	IL
KR9G	210	10-7-D	IL

WA2TIF	4422	67-22-D	ENY
K2OV5	1056	32-11-D	NLI
KA2Q	45	5-3-D	ENY
N2CEI (+N2BOW)	14,760	58-22-C	NNJ
		50-16-D	
		5-2-E	
		1-1-I	
K2BJG (+WB2REB)	4896	25-10-C	NNJ
		31-11-D	
		6-3-E	

		38-18-E	
		8-8-F	
		7-7-G	
		7-7-H	
		8-7-I	
		4-4-J	
W1XM (N1s OPK, DMM, W1GSL, oprs.)	8000	7-4-C	EM
		47-15-D	
		13-6-E	
AB4L (+WA4s HTI, IVF, PGI, WB9AHM, WD4DUJ)	15,435	13-9-C	VA
		72-35-D	
		3-3-E	
		2-2-I	

**Atlantic Division**

K2UYH	26,166	102-35-D	SNJ
		36-14-E	
N2WK	14,804	38-22-C	WNY
		89-24-D	
W2EIF	12,987	29-15-C	SNJ
		48-14-D	
		21-8-E	
KB3OM	11,655	25-13-C	DE
		54-18-D	
		13-6-E	
W9IP2	7840	20-15-C	WNY
		32-20-D	
		6-8-E	
K4GHE3	6636	25-13-C	DE
		54-15-D	
W1XJ2	6237	21-14-C	WNY
		26-14-D	
		8-8-E	

**Delta Division**

W5RCI	1575	4-4-C	MS
		17-15-D	
		2-21-E	
WD4DGF	765	9-8-C	TN
		8-7-D	
WA4GBE	420	14-10-D	TN
NSHYV	198	11-6-D	LA
W5UKQ	176	11-8-D	LA
WA5TKU (+K5ASZ, WB5LUA)	9680	15-9-C	AR
		33-15-D	
		18-9-E	
		2-2-F	

**Midwest Division**

K8TLM	2232	7-7-C	MO
		22-16-D	
		1-1-E	
W8RT	780	10-12-D	KS
		1-1-E	
KC0QG	594	18-11-D	NE
N8CIH	378	3-1-C	IA
		11-8-D	
K8QC	288	10-7-D	IA
		1-1-E	
K8VUA	380	13-10-D	KS
W8RAP	150	5-5-E	IA
W8JRP	210	10-7-D	MO
WB8DRJ (+WA8TKJ)	8118	11-10-C	KS
		31-20-D	
		12-11-E	

K1EM (+K1RZ)	2397	10-5-C	CT
		37-12-D	
K1LPS (+VE2FUT, WB2ONA)	741	5-4-C	VT
		10-7-D	
		2-2-E	

**Northwestern Division**

K7HSJ	1326	14-6-C	OR
		8-4-D	
		4-2-E	
		1-1-F	
W7TYR	900	10-6-C	OR
		7-4-D	
		2-1-E	
		1-1-F	
K7RUN/7 (CN84)	345	4-1-C	OR
		3-1-D	
		2-1-F	
		1-1-G	
		1-1-H	
K7RUN (CN94)	42	3-1-C	OR
		4-1-D	

**Rocky Mountain Division**

NK8P	1551	2-1-C	CO
		24-8-D	
		8-2-E	

**Southeastern Division**

WS4F	1920	5-5-C	GA
		17-11-D	
		5-4-E	
W4ODW	720	4-4-C	NFL
		10-10-D	
		1-1-E	
N3AHI	243	9-8-C	GA
WB4RUA	182	9-8-D	GA

**Southwestern Division**

K8HXW6	2961	18-10-C	SB
		31-11-D	
K8LMN	2352	28-5-C	LAX
		24-6-D	
		3-3-E	
WD6BCN	306	17-8-D	SB
WB7OHF	132	11-4-D	AZ
K8PEW	80	5-4-D	ORG
K8TZ (K6SPK, N8FB, WA8s MBZ, VNN, WB6s HOZ, OBB, WD6ETK, oprs.)	7119	68-8-C	SB
		35-8-D	
		8-5-E	
		2-2-I	

**West Gulf Division**

W5GG	5873	31-21-D	NTX
		15-10-E	
K5SW	4371	13-10-C	OK
		34-21-D	
KE5EP	4140	38-18-D	NTX
		11-5-E	
W8RRY	3432	44-26-D	OK
K5DHU	2460	21-13-D	NTX
		10-7-E	
WB5AFY	2189	24-14-D	NTX
		7-5-E	
WA5VJB	1784	8-2-C	NTX
		12-7-D	
		7-3-E	
		1-1-F	
		1-1-I	

K2GK	5985	24-17-C	WNY
		33-18-D	
WA2ONK	3540	50-20-D	SNJ
K2OS	3120	40-28-C	WNY
NF2P	2772	38-10-E	SNJ
		2-1-F	
W2HRW	2574	15-9-C	SNJ
		24-13-D	
N3ET	2280	40-19-D	EPA
W3GL	2193	21-9-C	EPA
		22-8-D	
KA2MRP	1980	33-20-D	WNY
K8ZT	1836	15-9-C	SNJ
		21-17-D	
WB2SZY	1674	31-18-D	WNY
K3AKR	198	9-4-C	MDC
		2-2-D	

**Great Lakes Division**

WB8BKC	30,015	30-18-C	MI
		79-37-D	
		18-14-E	
K8VW	18,762	8-3-C	OH
		74-38-D	
		19-14-E	
WA8TXT	11,952	20-14-C	OH
		39-25-D	
		10-8-E	
K8DIO	8712	26-19-C	OH
		40-25-D	
KD8SI	5952	9-1-C	OH
		41-24-D	
		7-6-E	
N180	5742	38-33-D	OH
WA8EUL	5487	17-11-C	MI
		28-14-D	
		7-7-E	
KB8ZW	4050	3-2-C	OH
		41-28-D	
N8DJB	3978	51-28-D	OH
N8BJN	2460	22-12-C	OH
		19-8-D	
W8VO	2094	9-2-C	MI
		34-20-D	
NE8I	168	5-2-C	MI
		6-3-D	
N8CCC	128	6-1-C	OH
		8-2-D	

**New England Division**

K1FO	47,403	45-21-C	CT
		122-38-D	
		31-12-E	
WA1JOF	9831	13-8-C	EM
		40-12-D	
		30-9-E	
K1DS	9504	24-12-C	RI
		44-11-D	
		14-5-E	
W1RIL	3834	27-11-D	WM
		22-7-E	
WA1HYN	2430	54-15-D	CT
W1GXT	1680	18-7-C	EM
		14-5-D	
		4-2-E	
W3HQ71	1638	31-12-D	ME
		4-2-E	
K1VZI	1443	9-4-C	EM
		14-6-D	
		7-3-E	
W1GRW	1224	34-12-D	CT
AB1U	1020	34-10-D	
K1ISW	546	4-1-C	WM
		22-6-D	
KX1C	504	7-4-C	EM
		14-4-D	
AC1J	315	3-3-C	NH
		12-4-D	
W2SZ/1 (KA1GK, KA1DZV, KB1TG, WA2s AAU, SCA, SPL, KA2QHF, WB2s KMY, PKO, W2ARQ, NF2B, AK4L, WA8USA, G3SEK, oprs.)	136,998	78-27-C	WM
		144-40-D	

**Pacific Division**

WA8QAK	2907	12-7-C	SCV
		21-7-D	
		9-4-E	
K6AMY	1920	10-7-C	EB
		18-6-D	
		7-3-E	
NR6E/6	1428	13-7-C	SJV
		13-5-D	
		4-2-E	
KF6GL	441	21-7-D	SCV
WA8LLY	24	4-2-D	SF

**Roanoke Division**

W3JY/4	24,980	33-18-C	VA
		61-26-D	
		23-14-E	
K4QIF	5148	34-17-D	VA
		16-9-E	
WA4MMP	12	2-2-D	VA
W3CCX/8 (K2EWW, N2SB, WB2s NPE,			

# 1986 ARRL International DX Contest

To the serious DX contester and the casual country hunter alike, the third full weekend in February (15-16, for CW) and the first full weekend in March (1-2 for phone) bring the challenge and excitement of the ARRL International DX Contest. For these two weekends each year, the bands spring to life with DX aplenty. An operator can choose to go all out in the competition for a top score, or leisurely chase those last few countries needed to finish the requirements for the 5-Band DXCC award.

If you participated in the 1985 ARRL International DX Contest, you are that much ahead of the pack. The rules for the '86 contest are exactly the same as in '85.

Use of official entry forms makes the post-contest paperwork a snap for you and makes the job of compiling the results a lot easier at your end. To receive your set of entry forms, send a self-addressed, stamped, business-size envelope (for W/VE amateurs) or a self-addressed envelope and 2 IRCs (for DX amateurs) to ARRL Hq. Mail early and avoid the last-minute delay.

Complete contest rules are listed below. If you have any questions on any aspect of this contest, get in touch with us at Hq., and we'll do our best to help you out. Good DX!

## Rules

- 1) **Eligibility:** Amateurs worldwide.
- 2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz, excluding the 10, 18 and 24-MHz band. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.

## 3) Dates:

(A) **CW**—Third full weekend in February (February 15-16, 1986).

(B) **Phone**—First full weekend in March (March 1-2, 1986).

4) **Contest Period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.

## 5) Categories:

(A) **Single Operator**—One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time.

(1) *All band.*

(2) *Single band (one only).* Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) **Multioperator**—More than one person operates, checks for duplicates, keeps the log, etc.

(1) *Single transmitter.* One transmitted signal at any given time. Once the station has begun operation on a given band, it must remain on that band for at least 10 minutes, listening time counts as operating time. Multioperator, single-transmitter stations must keep a single, chronological log for the entire contest period. Violation of the 10-minute rule or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(2) *Two transmitter.* A maximum of two

transmitted signals at any given time, on different bands. Once either station has begun operation on a given band, it must remain on that band for at least 10 minutes, listening time counts as operating time. Both transmitters may work any and all stations; the second transmitter is *not* limited to working new multipliers only. Each of the two transmitters must keep a separate, chronological log for the entire contest period. Violation of the 10-minute rule by either or both transmitters or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(3) *Unlimited.* A maximum of one transmitted signal per band at any given time. Unlimited multi-multi stations must keep a separate, chronological log for each band for the entire contest period.

(C) **QRP**—Single operator, all band only. QRP is defined as 5-W output or less.

## 6) Contest Exchange:

(A) **W/VE stations** (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) send signal report and state or province.

(B) **DX stations** send signal report and power (three-digit number indicating approximate transmitter input power).

## 7) Scoring:

(A) **QSO Points**—W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.

(B) **Multiplier**—W/VE stations: sum of DXCC countries (except U.S. and Canada) worked per band. Foreign stations: Sum of U.S. states (except KH6/KL7) and District of Columbia (DC), VE1-7, VO, VE8/VY1, worked per band. Maximum of 58 per band.

(C) **Final Score**—QSO points  $\times$  multiplier = final score.

## 8) Miscellaneous:

(A) Call signs and exchange information must be received and logged by each station for a complete QSO.

(B) All operators must observe the limitations of their operator licenses at all times.

(C) Your call sign must indicate your DXCC country station location (KH6XYZ/W1 in Maine; FG0AAA/FS on St. Martin, etc.).

(D) One operator may not use more than one call sign from any given location during the contest period.

(E) The same station may be worked only once per band—no crossmode, crossband or repeater contacts.

(F) Aeronautical and maritime mobile stations outside the U.S. and Canada may *not* be worked for QSO or multiplier credits by W/VE stations.

(G) All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.

## 9) Reporting:

(A) All entrants are encouraged to use official forms available from ARRL (s.a.s.c. or 2 IRCs) to report contest results.

(B) Logs must indicate times in UTC, bands, calls and complete exchanges. Multipliers should

be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days of the last contest weekend (April 1, 1986). Logs not postmarked by the deadline will be classified as checklogs; no extensions, no exceptions. All stations are requested to send their entries in as early as possible. Entries received after mid-July will not make QST listings.

10) **Awards:** Plaques will be awarded in the following categories for both the CW and phone contests.

(A) Top W/VE scorer in each entry category—single operator-all band, single operator-single band (1.8-28 MHz), QRP, multioperator-single transmitter, multioperator two-transmitter and multioperator-multitransmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, QRP, multi-operator-single transmitter, multioperator-two transmitter and multioperator unlimited categories will receive plaques.

(C) Additional special plaques will be awarded as sponsored. See October 1985 QST for the current list and January 1986 QST for any additions.

(D) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL Section; top single-band entries in each U.S. call area and each country; top multioperator entries (both single and multi-transmitter) in each country, U.S. call area and in Canada. Additional single-band and multioperator certificates will be awarded if significant effort or competition is displayed. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local clubs. Details are listed in this issue.

## 12) Conditions of Entry:

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) **Disqualification:** An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the QST contest results.



# Rules, January VHF Sweepstakes

January 11-12, 1986 will mark the 39th running of the ARRL VHF Sweepstakes.

The VHF/UHF bands will come out of their winter doldrums and spring to life. Note that the QSO point values have been adjusted downward to reflect the multiplier-per-band change that was phased in last year.

Official entry forms are available from ARRL Hq. for a business-size s.a.s.e. with one unit of First Class postage. These forms will simplify the task of calculating your score and make our job of compiling the results much easier.

Also, don't forget the Affiliated Club Competition available to members of ARRL-affiliated clubs in the VHF SS. Check with your club secretary to see if your club is going to make an aggregate entry. If your club is not ARRL affiliated, contact the ARRL Field Services Department to find out how to join the ranks. Club secretaries note: See January *QST* for rules governing affiliated-club competition. *Each affiliated club wishing to enter the club competition must submit a current club roster showing the calls of all club members eligible to submit their scores for the club.* Now is the time to start planning for successful participation in the VHF SS.

Good luck!

## Rules

1) **Object:** To work as many amateur stations in as many  $2^\circ \times 1^\circ$  grid squares as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1900 UTC Saturday, January 11, and ends 0400 UTC Monday, January 13.

### 3) Categories:

(A) **Single Operator, Single Band**—one person performs all transmitting, receiving, spotting and logging functions. All QSOs for score listing in *QST* must be made on one band. Single-band entries may, however, submit QSOs made on other bands for credit in ARRL-affiliated club competition.

(B) **Single Operator, All Band**—one person performs all transmitting, receiving, spotting and logging functions.

(C) **Multioperator**—those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets. All equipment (including antennas) must be located within a 300-meter-diameter circle.

4) **Exchange:** Grid square locator (see January 1983 *QST*, page 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal reports is optional.

### 5) Scoring:

(A) **QSO Points**—count one point for complete two-way QSOs on 50/144 MHz; two points on 220/432 MHz; four points on 902/1296 MHz; and 8 points on 2.3 GHz or higher.

(B) **Multiplier**—total number of different grid squares worked per band during the contest. Each different  $2^\circ \times 1^\circ$  grid square counts as one multiplier on each band it is worked.

(C) **Final Score**—multiply the total number

## Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (x 1)	25	10
144	40 (x 1)	40	20
220	10 (x 2)	20	7
432	15 (x 2)	30	10
902	36 (x 4)	144	9
1296	5 (x 4)	20	3
2300 +	1 (x 8)	8	1
Totals:	132	287	60

$$\text{Final Score} = (\text{QSO Points}) \times (\text{Total no. Grid Squares})$$

$$17,220 = 287 \times 60$$

of QSO points by the total number of multipliers. See scoring example.

### 6) Use of FM:

(A) **Retransmitting either or both stations, or use of repeater frequencies, is not permitted.** This prohibits use of all repeater frequencies for contest QSOs. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) **Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies, is prohibited.** Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) **Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55, .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band.** Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

### 7) Miscellaneous:

(A) **Stations may be worked for credit only once per band from any given grid square, regardless of mode.** This does not preclude 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.

(B) **Partial QSOs do not count.** Both calls, the full exchange and acknowledgment must be sent and received.

(C) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC). The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) **Only one signal per band (6, 2, 1½,**

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 (i.e. able to communicate over at least 1 km).

(F) **Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz.** Even then, a complete, different station (transmitter, receiver and antenna) must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) **Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g. laser) and employing at least one stage of electronic detection on receive.**

### 8) Reporting:

(A) **Entries must be postmarked no later than 30 days after the end of the contest.** Use ARRL VHF SS forms or a reasonable facsimile.

(B) **Logs must indicate time in UTC, bands, calls and complete exchanges.** Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

### 9) Awards:

#### (A) Single Operator

1) Top single-operator score in each ARRL Section.

2) Top single-operator on each band (50, 144, 220, 432, 902 and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers. For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the highest single-operator Section leader and endorsement stickers for 50 and 220 MHz.)

(B) **Top multioperator score in each ARRL section where significant effort or competition is evidenced.** Multioperator entries are not eligible for single-band awards.

(C) **Club Competition: ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local.** Details will be listed in January *QST*.

#### 11) Conditions of entry:

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) **Disqualifications:** For excess duplicates and call sign/exchange errors. See January *QST* for complete details.

# Special Events

Conducted By Billy Lunt, KR1R  
Assistant Contest Manager, ARRL

**Steamboatin' on the Mississippi River:** WA3LLZ, W3KUX and K3KMO will operate from the steamboat *Mississippi Queen* Dec. 7-12 between New Orleans and Vicksburg, a cruise featuring K3KMO's Dixieland band, *Southern Comfort*. Operation will be 1500Z-2300Z each day, and other times when possible. Frequencies: SSB—7.275 14.275 21.375; CW—15 kHz from lower band edges; 2-meter FM on local repeaters. QSL via K3KMO, Box 60, Damascus, MD 20872.

**Bethlehem, Connecticut:** The Hen House Gang ARC will operate W1FHP throughout the month of December. Work any four Bethlehems around the world, any time, band or mode for extra special award. QSL to Robert O'Neil, W1FHP, Hard Hill Rd., Bethlehem, CT 06751.

**Pasadena, California:** W6MUK will operate from the 9th annual Doo-Dah Parade on Dec. 1, 2000Z-2200Z. Operation will be in the lower 15 kHz of the 20-meter band. SWLs welcome. QSL to WA6MUK, 932 N. Lake Ave., Pasadena, CA 91104-4517.

**Everglades National Park, Florida:** The Everglades ARC will operate W4SVI on Dec. 7-8 1300Z-2300Z each day to commemorate the 38th anniversary of the Everglades National Park. Operation will be in the lower edge of the 10-40 meter General phone bands and on 146.52. Certificate for large s.a.s.e. to Everglades ARC, 14511 SW 287 St., Leisure City, FL 33033.

**Christmas, Florida:** The Coronado Wireless Assn. will operate K4HML from 1400Z to 2200Z Dec. 14-15. Operation will be in the lower 10 kHz of the General

40, 20 and 15 phone and CW bands. QSL and no. 10 s.a.s.e. to K4HML, P.O. Box 1, Edgewater, FL 32032.

**Farmington, Maine:** The members of the Sandy River ARC will operate the Chester N. Greenwood Memorial Station from 1700Z Dec. 20 until 2359Z Dec. 22 to honor the inventor of the earmuff. Operation will be 10 kHz up from the lower edges of the General 160-10 meter bands. QSL and 9 × 12-in s.a.s.e. to KA1CNG via *Callbook* address.

**Bethlehem, Pennsylvania:** The Delaware Lehigh ARC will operate W3OK Dec. 20-22, 0500Z-1600Z each day, to commemorate Christmas Day. Frequencies will be 3.925 7.225 14.325. For certificate, send QSL and large s.a.s.e. to DLARC, Greystone Building, RD 4, Nazareth, PA 18064.

**Thomaston, Connecticut:** The Codex ARC will operate Number One Christmas Carol (N1CC) Dec. 24-25. Operation will be on 3.900 7.200 14.250 21.350 28.600. For a special Christmas Carol QSL, send s.a.s.e. to N1CC, 454 High St. Ext., Thomaston, CT 06787.

**Note:** The deadline for receipt of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach Hq. by Dec. 15 to make the February issue. Please include the name of the sponsoring organization, the location, dates, times(2), frequencies and call sign of the special-event station. Requests for donations will not be published.

**QSLing Special-Events Stations:** To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed stamped envelope. If sending for a certificate, use a 9 × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your s.a.s.e. 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.

## W1AW Schedule

October 27, 1985—April 27, 1986

MTWThFSSn = Days of Week

Dy = Daily

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

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
GST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
MST	Slow Code Practice	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.
	Fast Code Practice	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.
	CW Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Teleprinter Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	Voice Bulletins	Dy: 7:30 P.M., 10:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

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

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

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2300 UTC they are beamed south.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

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

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 July 1985 QST, pages 9 and 76," 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 76.

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

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

On alternate Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45 baud Baudot on the regular teleprinter frequencies. The next date for transmission will be given in regular satellite bulletins.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.962 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EST. 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 P.M. 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 December 25, January 1, February 17 and March 28.

## Strays

QST congratulates...

the following radio amateurs on 50 years as a member of ARRL:

• Hobart Avery, W2CUY, of Batavia, New York

• George Gabert, W9JM, of Sturgeon Bay, Wisconsin

• John Swaska, W4WKQ, of Shalimar, Florida

• Harold Hardy, W8OPO, of Kent, Ohio

• Douglas Lapp, W2EKL, of Melbourne, Florida

• Dana Pratt, W2QCV, of Haddonfield, NJ

I would like to get in touch with...

anyone who served aboard the *USS Ozark*, 1944-70. Willis Monk, WB5KHD, 1301 Ontario, Garland, TX 75040.

members of the 14th AACs Squadron headquartered in Cairo, Egypt, during WW II. Contact W9CSJ, K9OIW, WA9OPJ, WDBRJR, W2FQ, N4LZX, W9LLQ or W1CLF (see *Callbook* for current addresses).

former employees of the RCA, Camden, New Jersey facility. An RCA Amateur Radio Club has been established, and we would like to keep the former employees up-to-date on our happenings. RCA Amateur Radio Club, c/o Barbara Brocklehurst, Secretary, 17B-3-1, Camden, NJ 08102.

## DECEMBER

3

**West Coast Qualifying Run**, 10-35 WPM, at 0500Z Dec. 4 (9 PM PST Dec. 3). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award or endorsement.

7-8

**ARRL 160 Meter Contest**, Nov. *QST*, page 103.  
**TOPS Activity Contest**, Nov. *QST*, page 104.

11

**WIAW Qualifying Run**, 10-35 WPM, at 0300Z Dec. 12 (10 PM EST Dec. 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Dec. 3 listing for more details.

14-15

**ARRL 10 Meter Contest**, Nov. *QST*, page 103.

26

**WIAW Qualifying Run**, 10-35 WPM, at 1400Z (9 AM EST, Dec. 26). See Dec. 3 and 11 listings for more details.

29

**Canada Day Contest**, sponsored by the Canadian Amateur Radio Federation, from 0000Z to 2400Z Dec. 29. Everyone works everyone, 160-2 meters, phone and CW. Entry classes: single op, all bands; single op, single band; multiop, all bands. Work stations once per mode on each band. No crossmode QSOs allowed. Exchange RS(T), serial number starting with 001 and province/state/country. VE1 stations must also send their province. Count 10 points per VE QSO, 4 points for other countries. 10-point bonus for any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PE1 VE1-NB VE1-NS VE2-8 VE0 Y1). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.110 144.090/146.520 MHz. Suggest phone on the hour and CW on the half hour. Mail logs within 30 days (include s.a.s.e. or s.a.e./IRC for results) to CARF Contest, c/o N. Waltho, VE6VW, Box 1890, Morinville AB T0G 1P0, Canada.

31-Jan. 1

**ARRL Straight Key Night**, 24-hour period UTC (from 7 PM EST Dec. 31 until 7 PM EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice band edges. When participating in SKN, use SKN instead of RST preceding the three-digit report to clue in passersby. Following SKN, send a list of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote also for the most interesting QSO. Mail your report by Jan. 10 to ARRL Hq.

## JANUARY

1

**West Coast Qualifying Run**, 10-35 WPM, at 0500Z Jan. 2 (9 PM PST Jan. 1). See Dec. 3 listing for more details.

5

**ARRL Midnight Special**, from 0400Z Jan. 5 (11 PM EST Jan. 4 until 1 A.M. EST Jan. 5; 10 PM CST Jan. 4 until midnight CST Jan. 4; 9 PM MST Jan. 4 until 11 PM MST Jan. 4; 8 PM PST Jan. 4 until 10 PM PST Jan. 4). First hour, 80 CW; second hour, 75 phone. Work stations once on each mode. Suggested frequencies: 3.540-3.570 and 3.855-3.895. Exchange a 3-digit consecutive serial number (beginning with 001) and name. Example: WIOD might send 019 Mike. No multipliers. Final score equals the total number of QSOs worked. Mail entries by Feb. 3 to ARRL Hq. Top scores will be listed in *QST*.

9

**WIAW Qualifying Run**, 35-10 WPM, at 0300Z Jan. 10 (10 PM EST Jan. 9). See Dec. 3 and 11 listings for more details.

11-12

**ARRL January VHF Sweepstakes**, this issue, page 94.

**Michigan QRP Club CW Contest**, sponsored by the Michigan QRP Club, from 1500Z Jan. 11 until 1500Z Jan. 12. Three entry categories: 1 W or less output power; 5 W or less output power; more than 5 W. Exchange signal report, QTH (state, province or country) and power output. Count one point per QSO and multiply by the number of states, provinces and countries worked per band. Multiply total by 1.5 if using battery or natural power. Mail logs (include s.a.s.e. for results) by Feb. 23 to Chris Hethorn, KM8X, 6818 Meese Dr., Lansing, MI 48910.

**Hunting Lions in the Air Contest**, sponsored by Lions Clubs International, from 0000Z Jan. 11 until 1200Z Jan. 12. Open to all radio amateurs worldwide; 80-10 meters (excluding WARC bands), phone and CW. Phone and CW count separately. Categories are single op and multiop, single transmitter. Exchange signal report and serial number. Lion, Lioness and Leo club members will also send their club name. Work stations once per band and mode. QSOs with stations on the same continent count 1 point; QSOs with stations on other continents count 3 points. Bonus points: 10 points for QSOs with Lion, Lioness or Leo club members from different countries; 20 points (5 points for Brazilian stations) for QSOs with Rio de Janeiro Arpoador Lions Club members; 20 points (5 points for US stations) for QSO with a member of the Melvin Jones Memorial Radio Club of US; 25 points for QSO with Arpoador Official Station, PY1LCA (does not apply for members of Rio de Janeiro Arpoador Lions Club or Melvin Jones Memorial Radio Club). No multiplier. Mail logs by February 15 to Rio de Janeiro Arpoador Lions Club Contest Committee, Rua Sao Francisco Xavier no. 246, Apt. 407, 22551 Rio de Janeiro, RJ, Brazil, South America.

**World SSB Championships**, sponsored by 73. 40-meter contest, 0000Z-2400Z Jan. 11; 75-meter contest, 0000Z-2400Z Jan. 12; 160-meter contest, 0000Z Jan. 18 to 2400Z Jan. 19; 15-meter contest, 0000Z-2400Z Jan. 25; 20-meter contest, 0000Z-2400Z Jan. 26. There are five separate contests. Work stations once in each contest. No crossmode QSOs. Single op, single transmitter and multiop, single transmitter classes. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). Count 5 points per QSO with own continent, 10 points per QSO other than own continent. Multiply by number of states (48 max.), VE provinces/territories (13 max.) and DX countries worked. Stations in the District of Columbia count as Maryland for multiplier purposes. A 100-QSO-point penalty for each duplicate contact found in log. DX-window frequencies are reserved for split-band operation only. DX windows include 1.907-1.913 1.850-1.855 1.825-1.830 3.790-3.805 7.080-7.090. Official entry forms are available from the sponsor. Mail entries by Feb. 20. 40-meter contest entries go to Dennis Younker, NE6I, 43261 Sixth Street East, Lancaster, CA 93535. 75-meter entries go to Ron Johnson, KC7PA, 68 South 300 West, Brigham City, UT 84302. 160-meter contest entries go to Harry Arsenault, K1PLR/4, 704 Curtiss Dr., Garner, NC 27529. 15-meter contest entries go to Gary Vest, WA3KCY, Star Route, Box 34, Holliday, TX 76366. 20-meter contest entries go to Chuck Ingram, WA6R, 44720 N. 11th St. East, Lancaster, CA 93535.

18-19

**160 Meter World SSB Championship**, see Jan. 11-12 listing for more details.

**AGCW-DL QRP Winter Contest**, sponsored by the DL Activity Group CW, from 1500Z Jan. 18 until 1500Z Jan. 19. CW only, 160 through 10 meters. Classes are: A—less than 3.5 W input, single operator; B—less than 10 W input, single operator; C—less than 10-W input, multioperator; D—QRO stations, more than 10-W input, to contact QRP stations. Class C stations may operate full time; classes A, B and D must break for 9 hours. Exchange RST, QSO-number and input, adding "x" if crystal controlled. QRO stations add /QRO. Operation is limited to one class per band, VFO

or crystal-controlled. No more than 3 crystals may be used on one band. Contact each station once per band. Count 1 point for QSO with own country, 2 points for QSO with own continent, 3 points for QSO with DX (outside own continent) per DXCC list. JA, PY, VE, W and ZS call areas count as separate countries. Count 1 multiplier for each country and 1 for each DX QSO. Multiply points by multipliers on each band, then add band results. Crystal-controlled stations double total result. Submit a separate log for each band. Logs must be received within 6 weeks of the contest. Send logs (include 1 IRC for results) to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed. Rep. of Germany.

21

**WIAW Qualifying Run**

24-26

**CQ World Wide 160 Meter CW Contest**

25

**15 Meter World SSB Championship**, see Jan. 11-12 listing for more details.

25-26

**REF French Contest, CW**

26

**20 Meter World SSB Championship**, see Jan. 11-12 listing for more details.

25-Feb. 2

**Novice Roundup**

Jan. 26-27

**Classic Radio Exchange**

### Standard Contest Guidelines

- 1) Make sure your log details the date, time, band, call sign and complete exchange sent and received for each QSO claimed for contest credit.
- 2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.
- 3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.
- 4) Your log should be checked carefully for duplicate QSOs; 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.

## Strays



I would like to get in touch with . . .

□ anyone with a *Coax Connector Handbook* (orange cover), published by 73 magazine in the '50s or '60s. Jack Benz, KP4DDL, 690 W. 28th St., Hialeah, FL 33010-1293, tel. 305-888-1676 (days) or 357-4839.

## The ARRL Field Organization Forum

### CANADA

**ALBERTA:** SM, Bill Gillespie, VE6ABC—VE6AMM, VE6XC, SEC, STM/NM/DEC; VE6ABC, VE6AMM and VE6ABC attended RSO-CRRL Convention in London, Ont, Sept. 27-29. DCC announced opening of entire 160 meter band for maximum legal power for cw and ssb. Amateur classes commence throughout section, NARC has 50 recruits for amateur, advanced and digital licence classes. Traffic: VE6CEP 43, VE6ABC 22, VE6VC 16.

**BRITISH COLUMBIA:** SM, H. Ernie Savage, VE7FB—British Columbia Emergency net 3950 kHz at 0200 QNI 765, QTC 413. NM Darren, VE7DIP, British Columbia Public Service Net 3654 kHz, QNI 5260, Low 12, High 223, Average 169. Net Manager, Ford, VE7DDP would appreciate more care to monitor 3758 at 0130Z. Our neighbors to the South are causing great problems in conducting a Net that has been in operation on or near this frequency for 45 years - Thanks, Hans Happening 1st prize a handheld went to VE7BJL Don. The SM's absence from this page has been attending Ham Picnics and Hamfests on Vancouver Island, grand weather and great to visit amateurs and their families. John, VE7CTJ Section Traffic Manager, and VE7DIP Net Manager and VE7BN1 Asst. NM, for EC's NM, BCEN, VE7DDP, NM and VE7ECF Asst. NM. BCEN record QTC 066. Traffic: VE7BNI 407, VE7CDF 294, VE7DIR 165, VE7EJW 38, VE7CQC 32, VE7XA 29, VE7ATJ 23, VE7FSP 18, VE7BNH 16, VE7CTJ 16, VE7EKM 12, VE7BZJ 9, VE7FME 7.

**MANITOBA:** SM, Jack Adams, VE4AJE—SEC, VE4FK, OO, VE4FK, TC: VE4ALQ, ATC: VE4ADP, NM: VE4ANR, VE4AFO, VE4AJE, VE4EJ, VE4VJ, Secretary, CRRL/ARL Evening phone NET - VE4CR. The MTN (CW) will be going to the 7 day cycle starting the week of the time change. NCS will be M-VE4IX, T-VE4JHW, W-VE4EP, T-VE4AE, F-VE4FK, S-VE4CA, S-VE4RO. This net meets at 6:30 P.M. local time, PLSE QNL Jim, VE4FK, requires DEC & EC pse contact him or myself if interested (VE4AJE). Thank you to those who monitored and handled welfare traffic during the Mexico Earthquake Disaster. Traffic net reports, CRRL evening phone NET Sessions 30, QNI 1089, QTC 9 - MMN - Sessions 30, QNI 753, QTC 36 - MTN (CW) Session 17 QNI 150 QTC 22. Traffic: VE4AJE 48, VE4ANR 48, VE4LE 34, VE4AAD 21, VE4IX 18, VE4BJ 10, VE4ANP 9, VE4HL 3, VE4DT 3, VE4NE 3, VE4GB 2, VE4ZN 1.

**MARITIME NEWFOUNDLAND:** SM, Don. F. Welling, VE1WF—Asst. Aaron Solomon, VE1OC; Liverpool, N.S. ARC active Parks and Can. Day Net! Live! 1st, Sydney, N.S. ARC operated from three National Parks in Cape Breton. VE1GL & VE1KG handled traffic Mexican earthquake. IFRG group upgraded repeaters at Fredrickton and Sussex. Also installed new repeater VE1BI, Pleasant Ridge, N.B. These repeaters give coverage from Saint John, N.B. to Bangor, Me. Congrats to VE1HU, VE1GN, VE1AXO, VE1BCL, New Calls: VE1PK now VE3SIU, and VE1CKD now VE1CD. Hospitalization: VE1ABZ, VE1LR, and VE1MQ. Visitors: VE3HC and K1DA. Silent Keys: VE2FOU, VE1ACZ, VE1BLL, ex. VE1DB; ex. VE1JB; VE1KM; VE1WJ. Meetings: Meetings from your Section Managers, VE1WF and VE1OC. Traffic: Aug/85 VE1BKM 197; VE1XF 10.

**ONTARIO:** SM, Larry Thivierge, VE3GT—BM: VE3LST, PGL: VE3AR, SEC: VE3GV, STM: VE3BDM, TC: VE3EJO. Another RSO Convention has come and gone. This year, the combined convention was the CRRL held in London, was excellent and I had many pleasant evenings. SORT deserves our thanks for a job well done. There were forums covering a wide range of interest and appealing to all. The CRRL Amateur of the Year was our SEC, VE3GV, congratulations Jack. At an informal traffic luncheon I had the pleasure of presenting Section Certificates of Merit to VE3AJN, VE3CYR, VE3GFN, VE3GNW, VE3GV, VE3SB for their contributions to activities within the Section over the years—congratulations to all. Of interest to some of the old-timers, the Ontario and Quebec Sections will combine their cw traffic nets to form QON on 3667 kHz at 0000Z and 0300Z. Net managers will be VE2EDD and VE3KK. Peterborough ARC has replaced their repeater. New members of the Ontario Trilliums are VE3LQ and VE3NDB while VE3NXC is the new editor and publisher of their Bulletin, Tot-Tongs. K1J3PCL was the winner of the multi-operator, all-band Ontario Section award in the Canada Day contest. Operators were VE3AUI, VE3GRC, VE3MGD, VE3MGF, VE3MGU, VE3MGY, VE3OET, VE3WM, Windsor's Mr. DX, VE3BX has 294 countries confirmed on cw. The International Police Assoc. Net meets at 1700Z Sundays on 21.410 and/or 14.240 kHz. The net is made up of police officers throughout the world and is the official amateur radio net of the I.P.A. Toronto FM Communications Society celebrated the 20th anniversary of Canada's oldest amateur FM repeater, VE3RPT. VE3OJ has returned to the U.S. to take up an assignment in California. Congratulations to long time member of the North Shore ARC, VE3AEQ, on completing 50 years as an amateur. On behalf of your Section officials and appointees, Merry Christmas and Happy New Year to all. Traffic: VE3KK 516, VE3FAS 247, VE3GNW 227, VE3GSO 175, VE3GT 164, VE3DC 126, VE3CYR 108, VE3AJN 88, VE3EJW 78, VE3BDM 78, VE3FGU 77, VE3DDP 73, VE3AWE 67, VE3KZ 65, VE3OJ 44, VE3GFN 34, VE3BUO 31, VE3WV 26, VE3WM 23, VE3BAJ 18, VE3EAM 18, VE3EWD 13, VE3OER 12. (Aug.) VE3FGU 77.

**QUEBEC:** SM, Harold Moreau, VE2BP—STM: VE2EDD, BM: VE2AE, PIO: VE2YV, TC: VE2ED, ATC: VE2CP, NM: VE2ED. Effective October 15, QSN and OSN were replaced by a new net, QON (Ontario Quebec Net), QON Net Manager is Pat Franklin, VE2OC. About 20 amateurs from Quebec attended the RSO-CRRL '85 convention in London, Ontario. VE2GT a ete re-erlu president of club VE2CA a St-Hyacinthe. Les pratiques en Espagnol sur VE2TA sont tres populaires. Traffic: VE2EC 63, VE2BP 54, VE2EDD 52, VE2EK 51.

**SASKATCHEWAN:** SM, W. C. Munday, VE5WM—SEC: VE5CU, STM: VE5HG, BM: VE5NM, OBS: VE5JA, NMs: VE5AEJ, VE5AEM, VE5BAF, VE5EX, VE5HG. Net reports are not available at time of writing as preparations are under way to attend the RSO/CRRL convention in London on September 27-29. Amateur Radio came to the fore during the tragic earthquake in Mexico City. Many hours were

spent handling health and welfare traffic and not slinging any particular amateurs if it suffice to say thank you to all who participated for a job well done. Preparations are under way for the start of ham classes with the various SK radio clubs.

### ATLANTIC DIVISION

**DELAWARE:** SM, Harold K. Low, WA3WY—STM: W3DKX, SEC: W3PQ, PIO: KC3TI, PSRR: K3JL, W3DKX, Sept. 26/27 2 meter nets were called up over the state to furnish communications during Hurricane Gloria. The DEPN was run by W3DKX, WA3DUM and W3TUD for state wide coverage. KC3JM, KA3IXV and K3MXH kept SEN going for about 16 hours. K3PFV was acting EC in Sussex. The storm was not as severe as expected and damage was light. County and state officials were impressed by the manner in which the amateurs handled things. A big thanks to all. Clubs please note, I cannot put news in this column unless I have input. DTN QNI 389; QTC 50; 21 sessions; DEPN QNI 134; QTC 15; in 5 sessions; SEN QNI 75; QTC 2 in 5 sessions. Traffic: W3QC 17, K3JL 12, W3DKX 37, WA3JY 33, WB3DUG 27, KA3IXV 14, N3AXH 12, KC3JM 7, KC3FW 6, K3ZXP 3.

**EASTERN PENNSYLVANIA:** SM, James Post, KA3A—ASMs: KC3LM, KA3GJT, K3ZFD. ACC: KE3NE, PIO: WA3AMQ, TC: W3FAF, OO/RRF: N3CJO, STM: KB3UD, SEC: WA3PZO, ECs: K3QXC, AA3C, W3EEK, KB3UD, N3BFL, K3MVA, KB3LR, WA3JRL, N3AJA.

Name	Freq.	Time Daily	QNI	QTC Sess.	Mgr.
EPA	3910	00000300Z	502	172	61 A3B
EPAEPTN	3917	2300Z	528	183	31 WA3EHD
FTTN	3910	2300Z	237	88	31 WB3EPU
LOCAL NETS					
ATN	148.67	2000R W/F	25	5	W3TWV
D3ARES	145.37	1930R M	68	7	W3VA
D5ARES	146.865	2100R S	59	6	N3BFL
D5 TR CNTY	148.655	2100R 1stW	16	1	N3BFL
D6SEN	147.00	2000R TU/TH	77	10	8 WA3CKA
D8ARES	147.300	1900R TUES	42	0	4 WA3JRL
PWA/ARES	147.715	2000R SUN	0	0	0 KA3JO
MARC/ARES	147.060	2030R SUN	4	4	4 N3DSX
MARCTN	147.060	2030R M/W/F	161	4	13 KA3HKB
D2ARES			81	1	4 WA2COB

Congrats to our two new Special Service Clubs, Mid Atlantic ARC and Susquehanna ARC, Gloria, many reports from the entire section on ham involvement in rescue, emergency communications, and aid in general. Thanks to all who helped. Murgas ARC will celebrate the 80th anniversary of Fr. Murgas' wireless message on November 23. As you may or may not be aware, Fr. Murgas completed his message before Marconi but did not get the credit. Westminster ARC had KR3T John give a presentation on packet radio. According to their newsletter signals are broadcast automatically. Congrats to WB2RW Mike and Janet KA2YF recently married. Brian KC3QB has upgraded, not his ticket but his QTH. Mexican Earthquake - many reports from the section on ham helping out with traffic. A few calls N3EA, AD3L, WA3T, KA3ME, WA3PZO, WB3FKQ, N3AZW. New appointments: Bucks County E.C. Ed Andrews, WA3TRX, Delaware Co Paul Vincent, KA3JVN, DEC DIST 1 Bob Haacke, KA3DZY, Traffic: N3CJO 373, N3AZW 361, KB3UD 282, WB8BK 151, KA3DLY 125, AA3B 109, WA3EHD 81, KA3JOI 74, KU3R 41, N3EWF 36, WA3CKA 34, KA3JME 33, K3XT 27, WA3QAN 24, WA3DE 22, WA3GLX 20, W3CL 16, W3JXK 15, W3VA 9, WA3ZMC 7, WAU 6, W3TWV 5, W3FTG 5.

**MARYLAND-DC:** SM, John A. Barolet, KJ3E—I've been cancelling the appointments of inactive stations. All ARRL appointees must work at their assigned responsibilities continually and report regularly on their activity to their section leader or SM. Appointments: N3EGF as ASM W3VNV, TC, KA1PPP as ATC, WA3LAW as OD, Leadership positions open are SEC, STM, and BM. Responsibilities are administration and coordination of the work of section appointees; these positions do not require "super operator" or "super station" capability. If you would like to be a manager, an ARRL MDC leader, contact me. W3LDD and K3GMV are arranging seasons greeting radiogram opportunities for the Veterans Administration Hospital at Perry Point. Good public relations were obtained for ham radio in the DC area by WA3TAL, K3JVN, K3STM and others during the Mexican earthquake and aftermath. Hurricane GLORIA provided a further opportunity to test ARES preparedness; the MEPN and a number of ARES nets activated. Wicomico County ARES on the Eastern Shore had more than ninety checkins on the two coordinated Saturday repeaters and ARES stations were provided at Civil Defense, Red Cross, police, hospital and shelter locations. Other active ARES nets were Anne Arundel and St. Mary's. The MEPN conducted ten extra sessions but had no hurricane related traffic. The Mountain ARC conducted exams on Oct. 5 and four examinees passed: WA3JTY to advanced, KB3OR to extra, KA3LTT to general and KA3OIO to technician. AEC AJ3S directed the Allegheny County ARES SET operation. K3MR expects to obtain a Masters Degree in December and spend more time in ham radio. W3JZY reports via Navy WA3TQY, EC for Anne Arundel County, had 38 active and 39 reserve members on the ARES roster and sends the SM a good county emergency contact plan. N3AGM says he and other Frederick County ARES stations N3FRO, WA3ZCY, W3JUT, WA3FUJ, K3RFX, N3EAV and N3DBN provided communications for the Frederick Crop Walk raising money for the world's hungry. With the nets: Net/Manager Sessions/Traffic/Average QNI: MDD/W3FA 60/243/B, MEPN/WA2ERT 31/127/23, MSN/KC3Y 30/105/16, WAPON/WB3BFK 21/24/11, MDCPON/W3OY 4/2/16, WACTY2M/KC3OW 4/0/22, WICTY/ARES/KA3HUT 4/0/33, PG/ARES/KA3DUE 4/0/9, PSJR: K3F3 153, KC3Y 122, WA2ERT 109, W3FA 95, K3HJ 82, N3EGF 80, KC3AV 61, Traffic: KC3Y 286, KC3F 203, W3FA 191, KC3Y 188, KJ3E 164, N3EGF 133, W3ERT 83, W3DUM 77, KC3AV 61, N3DE 58, W3YVQ 57, K3NNI 55, W3DUM 41, WB3BFK 23, W3FZV 18, W3LDD 14, KA1FPP 13, WA3GYV 13, K3MR 5, WB3FUE 4, K3ORW 4, KC3D 4.

**SOUTHERN NEW JERSEY:** SM, Richard Baier, WA2HEB—SEC: K2CJL, STM: WB2JVB, ACC: K2JKE, TC: VACANT, SGL: KA2KM, PIO: VACANT, BM: WB2JVB, ATC's: K2JF and N2BQT. OOC: WA2HEB. Recently, I've

been asked by quite a few of you on how to report local malicious interference at the VHF and UHF level. I'll take a few lines to discuss it here. Your first contact point would be the Section Manager or Official Observer Coordinator. Assuming you know the source of the malicious interference, the SM or OOC would establish contact with the station in question and try to settle things peacefully. If the problem persisted, the matter would be referred to the Regional Monitoring Station and possibly the Division Director, again for the purpose of trying to peacefully settle the problem. Only if these mediation efforts fail will the FCC be called in for possible enforcement. Since the FCC does officially recognize the Amateur Auxiliary, the League's trained group of Official Observers, they expect us, the Amateurs, to follow the lines described above. This includes problems at the HF level also. When problems arise, contact your SM - not the FCC. Your help will be appreciated. 73 and happy holidays to all. Traffic: K2SB 267, WB2JVB 235, NG2T 129, WA2HEB 10.

**WESTERN NEW YORK:** SM, William W. Thompson, W2MTA—SEC: W2BCH, ACC: N2EH, PIO: WA2PUJ, TC: K2QF, BM: W2GLH, SGL: K2QX, OOC: WA2ET, STM: W2MTA(A), CONGRATS: K2TQC appointed to Contest Advisory Committee for Atlantic Division; WA2ANU on having 295th article published, "Available Power, SWR, and Loss" in "The Antenna Compendium" by ARRL; WB2IDS on another BPL; HAM-O-RAMA for a big turnout at Niagara Falls; Western District Net and WB2UO, the leaders in VHF Local Nets, who have moved 1830 session to the 144.57/145.17 repeater to collect more checkins (more than the 1700 that already happen each month!). Merry Christmas to all!

NYSM*	324-168-30	NYS/E*	428-227-30
WDM/NM*(64)	338-093-30	JCARC Net	358-006-25
Mike Farad	250-039-30	Lewis Co	055-000-05
NYPON*	635-322-30	ORAVEN/NET	048-001-04
NYSPTEN	584-070-30	BRVNC(655)	354-005-30
ECSS(6590)	322-060-29	CNYTN*	203-044-30
OCTEN/E	576-078-30	OCTEN/*	251-041-30
QJ Net (NJ)	614-012-30	STAR*(330)	018-010-05
WDNIE*(17)	627-173-30	WDNL*(64)	813-185-30
Blue Line	487-056-30	Moltak VTN	907-025-05
VHF THEN	041-000-04	NYS	408-217-30

\*NTS Net. Public Service Honor Roll: KA2BHR, WA2DOA, N2EVG, VE2FMQ, WA2FJJ, WA2HSB, WB2IDS, WA2KOJ, W2MTA, WB2OWO, N2DS, KA2UBX, K2YAI. The Old Timer Says: "until recently, I believed the only real threat to survival of amateur radio came from outside competition, like big corporations greedy for new spectrum space... I'm changing my mind. The big threat is from inside! From our fellow amateurs. After many hours of listening to Mexican earthquake nets, I am convinced that we have a severe and growing cancer in our vitals. The jamming of emergency nets, the continuing discourteous behaviour and deliberate interferences are surely not compatible with the noble objectives of amateur radio or, indeed, the Federal law. What is happening to our amateur radio service? What can we *hams* do about this horrifying situation? I'm tired of hearing--Just hang in there, things will get better!" THANKS: to all those who labored this month to make inquiries for the general public during the Mexico City area disaster, and to those who stood guard during the journeys of Hurricane Gloria. WB2PEF and KA2JQC report lots of activity in Orsego County with Glimmeridge Triathlon and Lions Day 10k and mutual aid drill in Oneonta. SKIP hope you HF fans are ready for 160 meters, get that skyhook up before the snow flies, and review the 160M band plan to promote communications, the nights get long. Traffic: WB2IDS 422, WB2OWO 386, WA2HSB 364, WA2FJJ 291, VE2FMQ 204, W2MTA 189, WB2QIX 184, KA2UBX 126, N2EVG 117, ND2S 112, W2FYM 106, KA2BHR 83, W2HYM 77, KA2DQA 74, KB2KW 74, K2YAI 74, WA2KOJ 57, KG2D 51, KA2BDD 43, KA1YE 40, WA2VKI 37, W2UYE 32, WA2SMZ 20, W2PPS 19, K2IUT 17, AF2K 16, WA2RRO 12, W2ZMV 8, WB2NAO 7, K2ZV 7. (August) W2GJ 47, K2IUT 1.

**WESTERN PENNSYLVANIA:** SM, Otto L. Schuler, K3SMB—STM & ASM: WN3VAV, SEC: WA3JFN, OO: Coop: KJ3Q, PIO: WB3JL, SGL: K3HWL, TC: K3LR, BM: K3RGC, ACC: KJ3J. We have a Silent Key this month miss him. I welcome AK3J who is taking the Affiliated Club Coordinator position. Please contact him for club info.

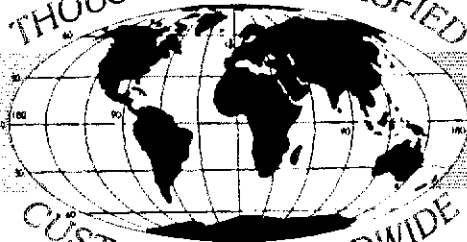
Net	QNI	QTC Sess.	KHz	TID	Net Man.
WPACW	175	162	30	3585	7:00P W3JUN
WPAFTN	545	152	30	3983	6:00P KC3O
WPA2MTN	604	83	30	146 28/88	8:00P K3BGC
NWPA2MTN	564	10	29	145 13/5314	00UTC KC3NY
PFN	212	57	30	3958	5:00P WA3THT

We need more stations to participate in the tlc nets especially in the sparsely settled counties in the section. If only a few hours a week. Also OO's are needed to cover the bands for problems that are many. How about Assis Technical Coordinators, OBS etc. Traffic handling can be fun and rewarding with a feeling of accomplishment when you call and deliver a message from a loved one. Amateur Radio has many branches but I enjoy the handling and I have received cards thanking myself and net members for our help. Also needed Operators for ARES & RACES in emergencies and disasters experienced operators. How to get this experience, get on traffic nets learn how to handle messages. EC's are reminded to get their SET reports in by Jan 31, 1986. I hope we have one for each county in the section. Our hobby is a great one but it has two sides the serious and the fun side so we should allow time to both. Remember public service is why we exist. Traffic: KC3T 279, KA3ETC 171, W3NGO 133, N3EMD 132, W3OKN 117, W3JUN 105, W3EKG 94, WA3BVB 69, WN3VAV 54, K3SMB 53, K3NPF 53, W3KME 46, K3QSM 37, KC3JQ 36, W3KUN 34, WA3QNT 31, N3EKL 18, WB3GUK 14, KA3COX 14, N3CZV 12, K3LTV 9, KA3EGE 8, W3SN 5.

### CENTRAL DIVISION

**ILLINOIS:** SM, David E. Lattan, W9EBQ—SEC: W9QBH, STM: KB9X, OOC: W9TT, BM: K9ZDN, SGL: W9KPT, PIO: K9IDQ, ACC: WB9SFT, TC: N9RF, ASM: K9ORL, Madison Co. ARES provided communications for a marathon and a Boy Scout event in Granite City. Morgan Co. EC W9OES provided an ARES exhibit at a United Way/Red Cross ac-

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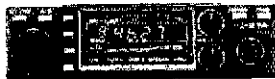
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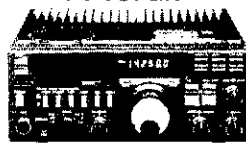
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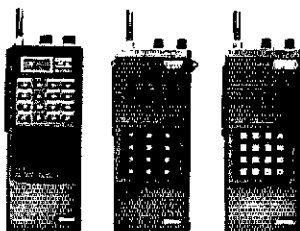
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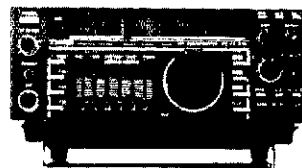
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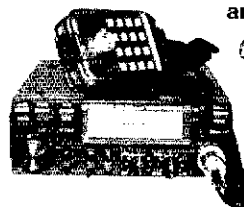
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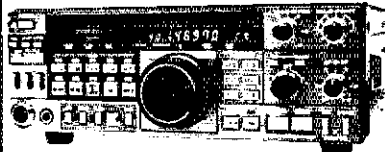




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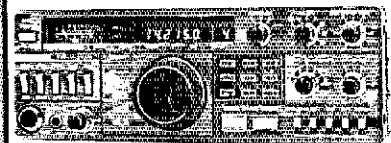
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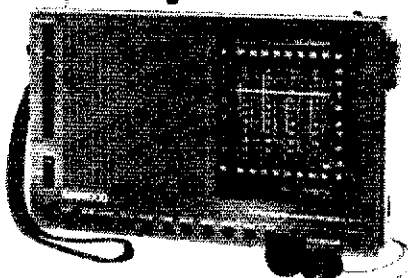
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tivity including a net check-in from one of the Red Cross vans. The Shawnee ARA hamfest at John A. Logan College on September 8th was a big success and included 12 upgrades to technician and 6 upgrades to general at the VE sessions, thanks to VEs W9PJT, KV9L, KV9R, KA9LUK, and W9CJW. Any of you OTs remember a Chicago to Yellowstone park route called the "Rainbow Trail," used in the early 1920's? If so, it was a hamfesten would like to hear from you for some research. He is doing. He also needs info from folks familiar with the history of Rockford and Elgin Illinois. Write Les at Box 117, RFD Rt 2, Centerville, SD 58327. TC N9RF attended an EMI seminar and will be available to do EMI presentations for Illinois clubs. Contact N9RF if your group is interested in a presentation on this subject. Illinois was represented at the ARRL National Convention by STM KB9X, and to use one of his more popular phrases, he was UNDER-WHELMED. The following are excerpts from his report. "The most significant aspect of the convention was not found in any session. Without exaggeration, 90% of the attendees were over 60 years old. It was painfully obvious that unless new blood can be attracted, we will lose our hobby in about 20 years." "Perhaps even more significant was the tone of the convention." There were no out of hours sessions, no mixers, no parties, no banquet. Sessions were scheduled over the lunch hour on both Saturday and Sunday. "If we are trying to attract new people into the hobby through (events such as this) and if the reaction of my wife is any indication of our success, we are failing!" Seems as though our failure to attract new blood in recent years has attracted quite a bit of attention, but not stirred much action. New hams aren't attracted by FCC rule changes or ARRL campaigns, they have to be attracted to the hobby by the people. The interest of an ELMER, a real person like the one that got most of us started. Lets quit being so selfish with our great hobby, and make a real effort for each one of us to invite an interested non ham friend to the shack to see what it's all about, and if the bug bites, put the heat on 'em to attend the next novice class in the area, or tutor them ourselves! Distribution of traffic from the section nets has been a hassle for some time in the Chicago Metro area. WB8RFB has tackled the problem by volunteering to be NM for the CTN or Chicago Traffic Net which will meet nightly at 9 PM local time on the NORA 147.69/09 repeater. If you're an operator at traffic please support the net. If you've never handled a message before, CTN will be a great place to learn good traffic procedure with the ease and comfort of FM operation. CTN will commence 1 Nov 85, so by the time you read this it'll be going. Tune in and help move the mail! Traffic: KW9J 439, KA9FEZ 307, W9NXG 193, WB8RFB, W9HTO 117, W9HLX 102, NC9T 87, NF9W 66, W9HBI 50, ND9V 49, KD9K 38, K9QEW 31, KA9BBV 28, KA9EWN 26, KB9VE 25, W9LDU 20, W9KR 19, K9EUI 18, KA9RBI 17, K291 17, W9JLJ 17, N9CLB 16, W9AAHO 14, NF9T 12, W9LNG 12, W9VEY/M 12, W9KPI 11, W9DBO 10, W9BTV 9, K9EHP 8, K9WMP 6, NG9F 6, WA9RUM 5, W9SHQW 4, N9ELU 3.

**INDIANA:** SM, Bruce Woodward, W9UMH—SEC; WB9ZQE, STM; W9JLJ, SACC; K9TUS, STC; K9PS, SGLC; WA9VQO, SOBC; KC9TA, SPIO; K9DIY, SRC; N9WB, SOCC; K9JG, Net Managers: ITN KD9DU, QIN K9J, ICN K9WB; IRN K9SU, VHF W9PMT, IWN K9ERC.

September Net Reports:

Net	Freq	Time	Daily	UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3322	483	2446	90		
QIN	3656	1430/0000/0300	674	333	1944	90		
ICN	3708	2315	53	18	408	25		
IRN	3629	0000	221	145	1215	28		
IWN	3910	1310	1663	0	367	30		
IWN VHF	Bloomington		987	0	171	30		
IWN VHF	Kokomo		1197	0	231	30		

Hoosier VHF Nets for September QNI 5152, QTC 151, Bulletins 590, QTR 4934 in 190 sessions for 19 nets. D9RN 371 messages in 353 minutes. IN: 72% Stns, K9CGS, W9JLJ, N9DWL, K9BEV, C9AND 878 messages in 30 sessions. D9RN 100% Stns, N9DWL, W9JLJ. Appointments: EC WA9BLA for Dearborn County, ATC N9FBD Peru. Silent Key N9ALX of Evansville. Due to the highly sensitive nature of many interference problems, the Official Observers with the FCC Amateur Auxiliary and the local RFI Committee in Indianapolis has decided to open a post office box. Address correspondence to FCC Auxiliary Monitoring and Interference Group, P.O. Box 27641 Southport, IN 46227. Indiana amateurs assisted many Hoosiers in getting information out of Mexico City. Those I know about are: K9RHH, W9SUJ, W9JVF, K9K9, N9EDJ, N9AZD, W9MCO, W9PEV, W9BVS, K9GK, K9QJH, WA9ZGE, K9CIM, W9JLJ, N9DOR, W9EVI, W9BLOJ, W9KRV, W9SGBA, W9TC, N9CPZ, W9BQTX, K9XKE, W9R9VN, W9UMS, W9CNE, W9PRO, K9BV, N9DWL, N9RD, WB9ZQE, N9RD, WB9ZQE, W9JLJ, K9DFK, K9ZD, WB9PTT, and W9JMU. Traffic: W9JLJ 912, W9CNE 372, K9J 206, K9RHH 197, W9UEM 158, W9JZV 132, W9JUY 92, W9QFG 87, WA9QCF 84, KA9FFO 83, K9WJ 75, W9QY 50, K9DFK 47, N9AEI 46, W9UMH 45, W9GWM 44, WA9OKK 42, K9RER 32, K9RN 32, W9PMT 25, K9KTB 21, W9AWI 20, W9SOZZ 17, W9SDWD 16, N9DHX 16, W9HII 16, K9RBF 13, A9A 13, K9PS 12, K9PD 11, K9WC 10, KA9EIV 9, KA9RN 8, K9JDF 7, W9ZCQ 7, N9DGT 7, K9BWW 6, N8CY 6, K9OLP 6, W9BFC 6, W9BDF 5, W9AJY 4, KA9RNC 4, W9EJ 3, W9ART 3, W9VPG 3, W9IHR 2, W9BTZ 2, W9EY 2, K9BDE 1, K9EBE 1, KA9LAU 1, WA9JNC 1, K9BDU 1, K9BSU 1.

**WISCONSIN:** SM, Richard R. Regent, K9GDF—SEC; W9OAK, STM; K9UTC, ACC; KA9FZ, BM; W9JWS, OOC; NC9G, PIO; K9ZJ, SGL; AG9V, TC; K9GDF. Special thanks to Wisconsin Amateurs who helped with Mexican earthquake welfare communications. Milwaukee Field Cross Reports area amateurs handled over 400 messages, with N9AW handling half and K9JUE following closely direct with Mexico City to inform concerned relatives and friends. Countless other Wisconsin Amateurs were helping for many weeks with earthquake and hurricane traffic; their efforts will long be remembered. WNA Picnic enjoyed by 65 traffickers plus visitors, elected new officers: Chairman, W9JLJ; Treas, KA9BI; Sec, K9CJ. In and Training Officer K9LQ. WNA agreed at meeting. In order to preserve this column, to list net reports here quarterly. NMs get monthly net reports to STM and SM, quarterly summaries will be in January, April, July and October QST. Also, individual monthly traffic totals of less than 50 points will not be listed here, except for novices and technicians, but still should be reported. New Assistant Technical Coordinators: N9EYU, W9WI, W9DLY, AA9W, KA9REK, N9BFB, N9EJO and NB9H. Special PSHR certificates to N9BDL, AG9G, KA9RIL and W9YCV for qualifying 12 consecutive months. W9VQD is on packet radio. WIK ARC new officers: Pres, A9B; Treas, Sec, W1ZT. The Greater Milwaukee LSA packed W9RN's house where K9BI gave program about receiver performance

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### FT 203

2m HT with TTP

### FT 103

220 MHz HT / TTP

### FT 703

440 MHz HT / TTP



### FT 209RH

2m Handheld

### FT 709R

440 MHz Handheld

#### Accessories:

YH-2 Headset

MH-12A2B Speaker/Microphone

FTS-6 Programmable Tone Squelch

PA-3 DC/DC Car Adapter/Trickle Charger

MMB-21 Mobile Hanger Bracket

NC-15 Quick Charger/DC Adapter

FBA-5 Battery Case for 6xAA

FNB-3 10.8V, 425 mAh Ni-Cd pack

FNB-4 12V, 500 mAh Ni-Cd pack

### FT 726R

Especially good for Oscar

#### Accessories:

6m-726 6-meter module

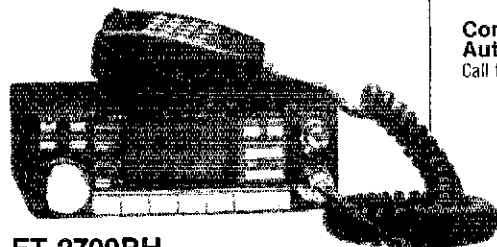
430-726 430-440 unit for Oscar

440-726 440-450 FM unit

HF-726 10-12-15 meter unit

SU-726 Satellite Duplex module

XF 455 MC 600 Hz CW Filter



### FT 2700RH

Duo-band 2m/440 Mobile Radio

### FT 270RH

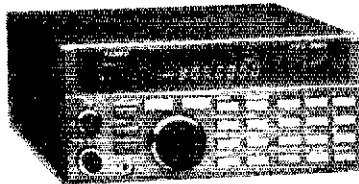
Compact 45 Watt 2m FM Mobile

#### Accessories:

FTS-8 Programmable Tone Squelch Unit

FVS-1 Voice Synthesizer Unit

## SHORTWAVE LISTENING



### FRG 9600

Scanning Receiver for 60-905 MHz  
FM/AM/SSB, 100 memories

#### Accessories:

PA-4B/PA-4C AC-DC Wall Adapter

SP-55 External Speaker

NTSC Video Unit

Coming soon: Software to extend the range of the 9600. Call for details.



### FRG 8800

General Coverage Receiver  
All-band, all-mode  
AM/SSB/CW/FM, 150kHz-30MHz

#### Accessories:

FRV-8800 Converter for 118-174 MHz

FRA-7700 Active Ant for 150kHz-30MHz

FRT-7700 Antenna Tuner

DC-8800 12-volt kit

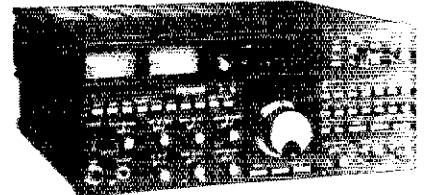
SP-102 Speaker with filters

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FT 2700RH, FT 203RK,  
and FT 103RK.

## HF TRANSCEIVERS



### FT 757GX

Mobile Transceiver, SSB/CW/AM/FM  
General Coverage Receiver  
Receives 500kHz-30MHz

#### Accessories:

FP-757GX Flatpack Power Supply

FP-757HD Heavy Duty Power Supply

FC-757AT Automatic Antenna Tuner

FAS-1-4R Remote Antenna Selector

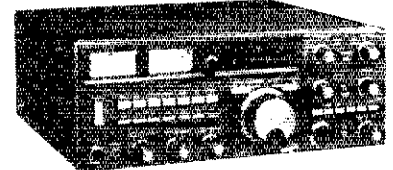
SP-102 Speaker

SP-102P Speaker

MMB-20 Mobile Mounting Bracket

FRB-757 Relay Box

MD-1B8 Desk Microphone



### FT 980 CAT

Computer Controlled Transceiver

#### Accessories:

GEN-980 General Coverage Kit

XF 8.9 HC 600 Hz CW Filter

XF 455.8 MCN 300 Hz CW Filter

SP-980 Speaker

SP-98P Speaker Patch

MD-1B8 Desk Microphone



### FT ONE

General Coverage Transceiver  
The all-mode Super Radio

### FT 77

Compact Transceiver

#### Accessories:

FP-700 Power Supply

FC-700 Antenna Tuner

FM-77 FM Unit

MK-77 Marker Unit

FV-700DM External VFO

XF 8.9 KC 600 Hz CW Filter

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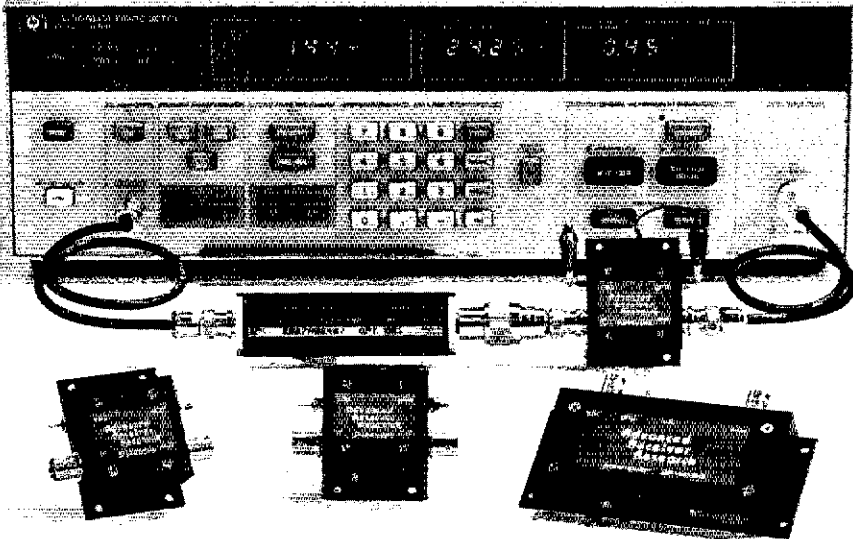






High Performance

# vhf/uhf preamps



Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	< 1.1	15	0	DGFET	\$29.95
P50VD	50-54	< 1.3	15	0	DGFET	\$29.95
P50VDG	50-54	< 0.5	24	+12	GaAsFET	\$79.95
P144VD	144-148	< 1.5	15	0	DGFET	\$29.95
P144VDA	144-148	< 1.0	15	0	DGFET	\$37.95
P144VDG	144-148	< 0.5	24	+12	GaAsFET	\$79.95
P220VD	220-225	< 1.8	15	0	DGFET	\$29.95
P220VDA	220-225	< 1.2	15	0	DGFET	\$37.95
P220VDG	220-225	< 0.5	20	+12	GaAsFET	\$79.95
P432VD	420-450	< 1.8	15	-20	Bipolar	\$32.95
P432VDA	420-450	< 1.1	17	-20	Bipolar	\$49.95
P432VDG	420-450	< 0.5	16	+12	GaAsFET	\$79.95

Inline (rf switched)						
SP28VD	28-30	< 1.2	15	0	DGFET	\$59.95
SP50VD	50-54	< 1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	< 0.55	24	+12	GaAsFET	\$109.95
SP144VD	144-148	< 1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	< 1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	< 0.55	24	+12	GaAsFET	\$109.95
SP220VD	220-225	< 1.9	15	0	DGFET	\$59.95
SP220VDA	220-225	< 1.3	15	0	DGFET	\$67.95
SP220VDG	220-225	< 0.55	20	+12	GaAsFET	\$109.95
SP432VD	420-450	< 1.9	15	-20	Bipolar	\$62.95
SP432VDA	420-450	< 1.2	17	-20	Bipolar	\$79.95
SP432VDG	420-450	< 0.55	16	+12	GaAsFET	\$109.95

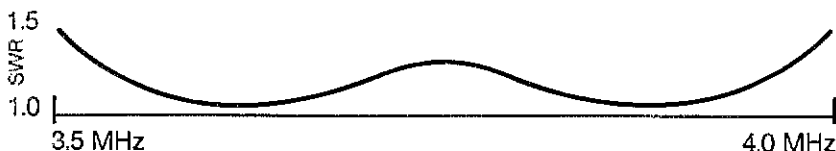
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measures. Frequency Coordinator Nels, WA9JOB, reports Wisconsin Association of Repeaters voted to continue using ARRL 30/15 plan for 146-148 MHz, most adjacent states are continuing to this plan. Nels notes, according to FCC representative he is not sure if another repeater output on your repeater frequency isn't harmful interference, instead it must be regular, unwanted interference to your repeater input to be considered harmful. Silent Keys W9UIV and W8LGO. New 3-element 40-meter beam at 140 feet and 2-element 80-meter beam at 125 feet should help KS9K's score in contests. Milwaukee computer information net on 146.91 MHz, Thursdays at 9 P.M. West Allis RAC annual dinner December 1st at Kuglitsch's, New Berlin. Milwaukee ARC Christmas party December 5th at American Legion Post hall, Elm Grove. WNA meeting, 3.985 MHz, 1 P.M. on December 7th. Milwaukee ARES could use more operators for Operation Santa Claus, December 25th. Get your club active in this month's 160 and 10-meter contests. Inspect and replace tower guy wires and parts, before the winter winds and ice give your antenna a surprise grounding. Traffic: KA9CPA 1019, W9CBE 233, K9GDF 185, KA9RII 168, W9YCV 165, N9AUG 154, N9BGE 151, W9YPP 133, WD9FPI 131, W9SICH 125, WA9WYS 114, W9J5F 100, W9UCL 100, N9BDT 89, W9ESM 89, N9BDL 86, WA9ZTU 80, KA9BL 79, KA9OBP 75, K9AKG 64, W9DND 64, AG9G 64, W9PDI 61, KA9JJY 26, KA9BK 25, Late (August) KA9RNB 5.

### DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KC0T—SEC: KA9ARP, STM: K00CI. September was another exciting month for Amateur Radio in Minnesota. Thanks to W8DGFU KB0CD, W8DGM, KA0BFT, N0EWA, KA0CDO, W8DGVV, KA0QAV, KA0EPP, K8DGG, KA9ARP, and many others who made the hazardous material drill in Virginia a great success. Good job! Thanks also to the great many Amateur operators who assisted with the health and welfare traffic to and from Mexico during a time of great need, another super job during an actual emergency. Also, those who aided with the hurricane. The Minnesota DX Net will commence operation on Monday Oct. 7 at 8 P.M. Local time on 3929 kHz and every Monday henceforth. Please spread the word to your friends. The new officers for the Upper Midwest Chapter 8 of OMA are: W0UGY President, K8MG Vice President, W8MGI Secretary, and W8WY Treasurer. Congratulations to all of you in your positions. There is a new official Bulletin Station KD8XP, Ramona Halverson, of Nisawa. Thank you for volunteering. If anyone is interested in helping in one of the various activities of interest please contact KA9ARP, K00CI, or KC0T to see what you might like to do. The Amateur of the Month was KA0LCD John of Jordan, Mn. Congratulations John and keep up the good work. Congratulations to the following upgrades: to General KA8JUZ and Adv. to Extra KD8XP, Ramona Halverson. A request, when submitting information for the column and if calls are included please give the first and last name of the individual. Congratulations to Keith Todd Olson elected Dakota Division Director and W0OZC, Howard Mark Vice Director. Keep up the good work! 73 de KC0T.

Net	Freq.	Time	ON/OCC/Sess.	Mgr.
MSN/1	3885	6:30P	315/97/30	KA0EY
MSN/2	3885	10:00P	177/35/30	NC0E
MSSN	3710	6:00P	198/14/28	KA0DY
MSN/RTTY	3820	7:00P	87/32/11	WA0LUT
MSPN/E	3929	12:05P	589/101/30	WB9WJN
MSPN/E	3929	5:30P	1250/202/30	W8D8S
MINA/WXNT	3929	8:15P	605/368/29	KA0I2A
Fleet	3925	8:00A	280/12/148	W8D8C

Emergency frequency in Section 3929. Traffic: WB9WJN 520, KA0EY 287, WA0TFC 248, KD0CI 186, W80N J 124, KA9ARP 118, A0B5 108, W0ZSW 99, KA0I2A 95, WA0NE 84, N0ED 82, W8EHI 82, KA0JUZ 73, KC0T 62, KB0WV 62, W8DGFU 61, KA0ODO 59, N0BY 58, N0CLS 56, N9GG 54, W8D8GS 53, W8DMM 50, K00GI 38, KT0R 34, KB0CD 28, N0EXP 24, KT0R 23, K00SE0 22, KB0WV/0 22, N0JP 21, KN9U 18, KA0BFP 17, K0CVD 16, N1X 13, KH0JC 13, N0EWA 11, N0CRO 11, KD0CI 7, W8KYG 7, N0GFA 4, KA0JF 1.

NORTH DAKOTA: SM, Michael Mankey, WB0TEE—News from the Minot club says that they will be giving license tests on December 7. Contact the club for further details. More from Minot says that they have a new repeater on 0141. The repeater is located in Berthold, N.D. and is reported to have excellent range. W8WV (Bill) is looking for Assistant Technical Coordinators. You do not have to be an expert to do this very rewarding job. In the event of a blizzard the DATA net frequency of 3883 will be used. If you can get on it will be appreciated as the reports will be given to the NWS offices. Snow depth and wind speed reports along with temperature are what they are looking for in the reports. A very merry Christmas to all. 73's Mike.

SOUTH DAKOTA: SM, Roland Cory, W0YMB—Ole Johnson, N0ABE & Bob Olson, WA0FPR, ASST. SM's. Correction from last month column. SD Novice Net is Sunday not Tuesday, sorry. New club officers elected around the state are: Sioux Falls ARC, N0ABE Pres, K0RVD VP, W0RWE Sec, W8DHHM Treas, Sioux Valley Rpt Assoc, W8LXQ Pres, K0LXE VP, W0RWE Sec, W8DHHM Treas, Hot Springs ARC, K0CR Pres, W8D8WS VP, W8DHO. Sec/Treas, KA0PB Activities Dir, Black Hills ARC, W8PWA Pres, KA0ADZ VP, N0BT Sec, K00L Treas. All traffic reports are welcome, even if the total is not very high. Just give to N0ABE or WA0FPR. Traffic: KA0IE 104, W8DLY 101, W8HOJ 72, WA0UEN 68, K0ZBJ 38, W0M2I 35, W80MF 30, N0ABE 26, WA0VRE 22, KA0KJ 11, KD0YL 3.

### DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, W85IGF—ASM: K5UR, SEC: N5BPU, STM: W9OK, ACC: N15D, SGL: W5LCL, TC: W5FD, BM: W5HYW, Repeater Coordinator: W5FDP, BIG FLASH! K5UR's 1984 CQ WW 160 meter CW score set a new USA record. Congratulations to Rick, I also have more good news. Don, W9OK, has been appointed our Section Traffic Manager, and Jim, W5HYW, has been appointed Section Bulletin Manager. These appointments fill two important slots and I am honored to have them. N15D, the Affiliated Club Coordinator has been making contact with some of the clubs pertaining to operations during the Arkansas Sesquicentennial next year. If your club is interested, contact Dora Anna. Several Amateurs are active in Packet Radio in the state. Contact W5FD or W5FDP for additional info. I would like to take this opportunity to wish each of you a very safe and happy holiday season from each of the ARRL officials in Ark.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: KA5PB, ACC: K5DPG, SGL: KD5SL, TC: N5JM, OOC: K5QK. For several months the KD5SL repeater (145.49) in Baton Rouge has been linked to the W5VAS repeater (145.64) in Slidell on Sunday and Wednesday nights at 9:00 PM for Public Service Activities, equipment

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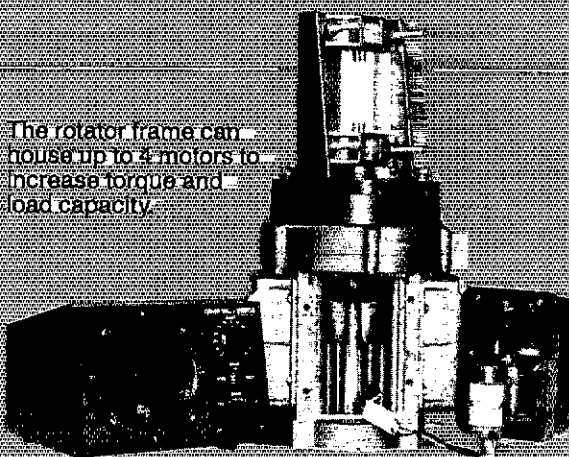
**By DOUG DEMAW, W1FB  
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Originally appearing in 1984 and 1985 issues of QST, the wide-ranging First Steps in Radio series helped newcomers to learn the electronic theory needed for licensing exams and to gain some insight into how their radio equipment works. The entire QST series is reproduced. You will find basic explanations of circuit components, see these components assembled into practical circuits, and see how the circuits make up your radio gear. Additional segments cover antennas, propagation and radio-frequency interference at a beginner's level. The purpose of this book is to open the doors to those who wish to learn more about the technical side of Amateur Radio.

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MEMBERSHIP  
NEWINGTON, CONNECTICUT

## Advanced Multi Torque Antenna Rotator



The rotator frame can house up to 4 motors to increase torque and load capacity.

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

The main frame and reduction gear train have been designed to withstand maximum wind loading.

Maximum brake power is 18,300 lbs/in when 4 motors are installed.

Low voltage (24 VAC) motors. Low cost 6-wire control cable. can be installed on the same base as a TELEX unit.

### Specifications

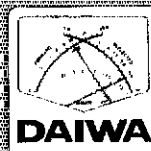
#### ■ Rotator Unit

Rotation time	MR-750E/PE		MR-300E
	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)	
Output torque Brake power	1 motor	610 lbs/inch	220 lbs/inch
		5,200 lbs/inch	1,700 lbs/inch
	2 motor	1,200 lbs/inch	440 lbs/inch
		9,600 lbs/inch	3,500 lbs/inch
	3 motor	1,800 lbs/inch	650 lbs/inch
		13,900 lbs/inch	5,200 lbs/inch
	4 motor	2,400 lbs/inch	870 lbs/inch
		18,300 lbs/inch	7,000 lbs/inch
Rotation angle	375 degrees		
Permissible mast size	1½ ~ 2½ inch (38 ~ 63 mm) < diameter >		
Control cable	6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)		
Continuous running	5 minutes Max. permissible		
Dimensions	15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)		
Unit weight	16.5 lbs (7.5 kg) < with 1 motor unit fitted >		

#### ■ Controller Unit

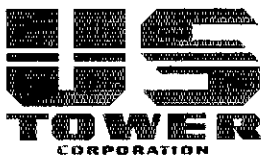
	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	4.9" H x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set

Wind Load	MR-750E/PE	MR-300E
1 Unit	18.1 Sq Ft	5.82 Sq Ft
2 Units	36.2 Sq Ft	11.64 Sq Ft
3 Units	54.3 Sq Ft	17.46 Sq Ft
4 Units	72.4 Sq Ft	23.28 Sq Ft



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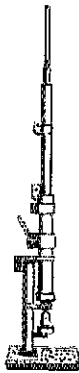
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**MA SERIES CRANK-UP MASTS.**

Will handle 10 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE*	
MA-40	40'	21'6"	2	300	3"sq.	4 1/2"	\$ 735.00*	
MA-550	55'	22'1"	3	525	3"sq.	5"	\$1245.00* <b>SALE</b>	
MA-770	71'	23'10"	4	925	3"sq.	8"	\$2385.00*	
MA-850	85'	23'6"	5	1295	3"sq.	10"	\$3695.00*	
MA-850MDP	85' section "QUADRA MAST" with heavy duty motor drive, positive pull down feature (MA-850MDP only).							\$5695.00*



**FREE STANDING CRANK-UP TOWERS**

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE*
TX-438	38'	21'8"	2	440	12 1/2"	15"	\$ 925.00*
TX-455	55'	22' "	3	700	12 1/2"	18"	\$1395.00*
TX-472	72'	22'8"	4	1175	12 1/2"	21 1/2"	\$2295.00*
TX-489	89'	23'4"	5	1650	12 1/2"	25 1/2"	\$3995.00*
TX-489MD*	89'	23'4"	5	1980	12 1/2"	25 1/2"	\$5995.00*

Shown w/optional MARB 550C rotor base.

\*Complete with new heavy duty motor drive unit with dual level and positive pull down feature. Limit switches are included.

**FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.**

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE*
HDX-538	38'	21'8"	2	600	15"	18"	\$1195.00*
HDX-555	55'	22' "	3	980	15"	21 1/2"	\$2095.00*
HDX-572	72'	22'8"	4	1620	15"	25 1/2"	\$3595.00*
HDX-572MD*	72'	22'8"	4	1820	15"	25 1/2"	\$5495.00*
HDX-589MD*	89'	23'8"	5	2500	15"	30"	\$7195.00*

\*Complete with new heavy duty motor drive unit with dual level and positive pull down feature. Limit switches are included.

**FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.**

Will handle 12 sq. ft. of antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE*
TMM-433SS*	33' w/o mast	11'4"	4	300	10"	17 1/2"	\$ 985.00*
TMM-433HD*	33' w/o mast	11'4"	4	430	12 1/2"	20 1/2"	\$1195.00*
TMM-541SS*	41' w/o mast	11'4"	5	480	10"	20 1/2"	\$1295.00*

\*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction.

**STANDARD BASES INCLUDED WITH ALL TOWERS**

ALSO AVAILABLE: • Motor drives for most towers • 5' to 24' antenna masts • Coax arms • Service platforms • Mast raising fixtures • Special bases

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swaps, and other ham activities. The link has provided excellent broad area coverage between Leesville, La and Gulfport, Ms. During the recent hurricanes Danny and Elena the links of several repeaters provided solid communication support to the LA. State office of Emergency preparedness and to the National Hurricane Group of the American Red Cross. The Amateur Radio Service Club at Baton Rouge reports increased interest in public service in the Lafayette area and that Al Qubra - K5DPG recommended that the Office of Civil Defense in New Iberia install extra antennas to connect with the 145.49 and 444.85 repeaters at Baton Rouge. This success in linking repeaters provides an excellent beginning and the foundation for a state wide link that could be used as a much needed reliable emergency net, for other public service events and various ham activities. Traffic: DRN-5 80 sessions with W5GHP, WA5LHL, K5WOD, WA5WBZ, K5EPF, K5SUWW, W5BNCM, & WA5TQA. CAND K5EPF 100% in 30 sessions.

MISSISSIPPI: SM, Paul Kemp, KW5T—SEC: AL7GQ. VHF Coord: N5DWU. STM: KB5W. ACC: KC5VD. Tremendous activity this month with the Mexican earthquake and the cleanup efforts of Hurricane Elena. The Ms. Hams came through as usual with help in both areas. It would be impossible to list all that was going on in providing communications towers. Hattiesburg and the Gulf Coast did a great job with getting good media coverage. MCARA provided another fine Hamfest. It was a pleasure in seeing everyone. N5DWU putting the final touches on the MS Repeater Council organization. K5VXV assigned the project of maintaining an up to date exam schedule for the state. Everyone keep him informed of scheduled tests. You may send him a SASE for a list of exam schedules and a 610 form. Hattiesburg now 100% ARRL member Club. NA5Y and myself wish each of you and yours a very good Holiday season. CAND (W5RKL) sess. 30 QTC 876. DRN5 (W55YD) sess. 60 QTC 82. MSN (W5HKK) sess. 30 QTC 823 QTC 91. MAM (W5BRMW) sess. 28 QNI 674 QTC 10. MTN (K5CAF) sess. 30 QNI 12B QTC 37. GCSBN (W5JHS) sess. 30 QNI 648 QTC 8. MSN (N5AMK) sess. 30 QNI 103 QTC 21. RCARES (W5DKD) sess. 20 QNI 183 QTC 6. Traffic: N5AMK 658, AJXB 398, K5OAF 282, KT52 132, K5QNE 46, KW5T 15.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OQJAA: W9FZW. PIO: WK4V. SEC: WA4GZC. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. This item is somewhat late as a news bit, but it is considered real noteworthy: "The fantastic job that William 'Bill' P. Sanders, KE4LS, has done in connection with the Mexico earthquake health and welfare traffic in the section. He has not only earned the ARRL "Brass Pounders" League certificate, he has also topped with over two thousand pieces of traffic. This was not easy as he spent from eight to twelve hours a day for about a week doing this fantastic PUBLIC SERVICE. Your Section Manager is awarding him a Certificate of Merit, and requesting them to make an appropriate award for this fine effort for the "JOB WELL DONE." No doubt all have heard that your Section Manager is or will still be trying to conduct the affairs of the Section for another two years. I still need the help and assistance of all the amateurs of Tennessee to do the job. There will be very little change in the section staff for the next two years. I must express my thanks to them for staying on with me. Many thanks STAFF. The PIO has asked some bit ago to be replaced. That is the only change. His replacement will be named soon. All section appointments terms will be reviewed for another two year term. Thanks to you also, I have omitted the section traffic and station reports for the last three months so that other pressing matters could be placed in the report. The activity will appear as happened: Section Traffic: LF - Sessions - 64, 81, 85; QNI-3437, 3814, 4330; QTC-126, 114, 207; VHF - Sessions - 61, 66, 45; QNI-2402, 1536, 612; CW - Sessions - 44, 41, 43; QNI - 224, 200, 239; QTC-66, 64, 109; RTTY - Sessions - 20, 20, (Net now terminated), QNI - 121, 66, None; QTC - 1, 2, None. Many thanks to W4VQE for a real try on RTTY net. It can readily be seen that the seasonal change is taking place in the amounts of activity. It is not too early for the clubs planning 1986 hamfests to start checking the schedules to avoid conflicts with others in the section and adjoining areas. Traffic: KE4LS 2359, NG4J 478, W9FZW 203, KA4RSC 166, WA4FMR 122, K4WOP 101, W4DDK 98, K4WWO 74, K4WOP 43, NN45 38, K4UMW 32, WD4GYT 24, W4PFP 23, WB4YPO 11, W4TYV 9, W3HEB 8, KA5KDB 8, W4TYU 7, W4PSN 6, W4TYU 3, WA4RMP 2.

**GREAT LAKES DIVISION**

KENTUCKY: SM, Rose Marie Perciful, KA4SAA—Thanks to everyone for their help and cooperation during my term as SM and Best of luck to the new SM Dale Bennett, W4JTE. Hope everyone will continue to give him their support. New Appts.: ATC-David E. Whittle N4FND, Brooks, KY; ATC-I. Zach Bruce WA4TJS, Mt. Sterling, KY. Congrats to the new net manager of KY RTTY Net (KYRN) Greg Hardisty, KA4LSQ. KYRN starting again on 3630 kHz daily at 0030Z and needs your support. Thanks to Phil Camp, KA4SKV, for his 2 1/2 years as net manager of KTN. All his efforts are greatly appreciated. KY Section Nets Aug-Sept:

MKPN	3959kHz	1330Z D	1109/95	1271/85
KYN	3959kHz	0000Z D	904/50	
KYN	3600kHz	0100Z D		203/116
KYN	3600kHz	0300Z D	116/36	124/40
KNTN	3727kHz	000Z D	326/120	294/87
		1400Z S-Sun		
KYRN	3630kHz	0030Z D		8/0
KRN	3959kHz	1130Z D	248/15	

Other KY nets Aug-Sept. TSTMN 601-20-617/11, KYPON 116/20-63/11, NKRRC 67/5, CARN 98/7-127/22, SKEN 22/0-29/2, WTEN 48/7-54-5, JARES 38/0, JARES 84/1, 11ARES 45/4-45/12.

MICHIGAN: SM, James R. Sealey, W88MTD—OMN, Amateur Radio's first spot-frequency traffic net, "where it all began," was 50 years old in October. The spirit of founder W8FX seemed strong in the elegant little restaurant in Northville on the afternoon of Oct. 13 where 38 of us gathered to review, absorb history, reflect, and enjoy fellowship and good food. Al, AB8W, our division V. Dir. (whose presence once again showed what a good friend he is to MI), summed up the dinner part by saying, "That's the best meal I've ever had at any ham radio occasion." No arguments. Numerous awards were presented, too many to mention here, save for the two most important, two beautiful custom-made plaques awarded to K8KMQ and W8SCW for their many years of devoted service and leadership in OMN, as chosen by popular vote of the membership, and very much deserved. Even the speeches, if not great, at least were mercifully short. (I have license to say that, since I was one of the speakers!) I'm pleased with OMN and proud to be associated with it, as an organization with its 50 years of fine tradition, and as a group of some of the finest

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The factory-tuned HR-1 is 20% shorter, lighter and places far less stress on your handheld connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave.

The Hot Rod antennas can be expected to make the same improvement to handheld communications that the IsoPole brand antennas have made to base station operations. Why pay more when the best costs less?

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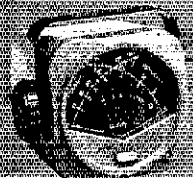


**CN-620B and CN-720B**  
Frequency Range: 1.8-150 MHz  
Power: 3 Ranges (Forward, 20/200/2000 W)  
(Reflected, 4/40/400 W)



**CN-630 and CN-630N**  
(N Type Connection)  
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Power: 2 Ranges (Forward, 20/200 W)  
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**NS-448**  
900 MHz-1.3 GHz  
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Separate Sensor Type



**CN-520**  
Frequency Range: 1.8-60 MHz  
Power Range: 200/2000 W

**CN-540**  
50-150 MHz  
20/200 W

**CN-550**  
144-250 MHz  
20/200 W

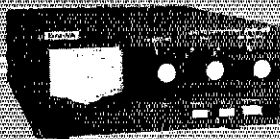
**CN-410M**  
Frequency Range: 3.5-150 MHz  
Power Range: Forward 15 W/150 W  
Reflected 5 W/50 W

**CN-460M**  
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15 W/150 W  
5 W/50 W

**CN-485M**  
140-450 MHz  
15 W/75 W  
6 W/25 W

Back-Dr. with mobile bracket.

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Power: 1 kW CW (50% duty)  
Band: 144 MHz (7/8)  
Output: 10-250/25-100 ohm  
Impedance: (On 3.5 MHz)

**CNW-419**  
Frequency Range: 1.8-30 MHz (17 bands)  
Power: 200 W CW (3.5-30 MHz)  
Band: 100 W CW (1.8-3.4 MHz)  
Output: 10-250 ohm

**CL-680 (no metering)**  
Frequency Range: 1.8-30 MHz (17 bands)  
Power: 200 W CW (3.5-30 MHz)  
Band: 100 W CW (1.8-3.4 MHz)  
Output: 10-250 ohm

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10-250 ohm

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Less than 0.2 dB

**CS-201G**  
2 position  
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1.8 GHz  
N type

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1.8 GHz  
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**PS-310MD** Max 31A/24A Continuous 13.8 VDC Fixed Plus sub-DC outlets  
Max 5.6A/5A Continuous 3 VDC-14.8 VDC

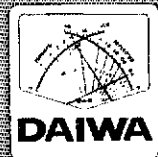
**LA-20135**  
Band: 144-148 MHz  
Input Power: 0.5-3 W  
Max. Output Power: 30 W plus

**LA-20135B**  
144-148 MHz  
0.5-3 W  
30 W plus

**LA-2065R**  
144-148 MHz  
0.5-3 W  
60 W plus

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M12 12-ch Programmable HT 219.95  
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### HF TRANSCEIVERS



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TS-930S HF Transceiver CALL  
With General Coverage Receiver  
Optional Automatic Antenna Tuner  
TS-430S HF Transceiver/SUPER SPECIAL  
With General Coverage Receiver  
TS-830S Transceiver CALL  
160-10 Meter With Power Supply  
TS-530SP Transceiver 160-10 M CALL  
With Power Supply & Notch Filter

### RECEIVERS

R-2000, R-600, R-1000, R-11 CALL  
General Coverage Receivers

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TR-7950/795J CALL  
3-meter Mobile Units 45 or 25 Watts  
TR-9130 2m all-mode 25W CALL



TM-211A or TM-411A CALL  
2m or 70cm FM Mobile Transceivers  
TM-201A 2m, 25-watt CALL  
TW-4000A CALL  
Dual Band 2m/70cm FM, 25 Watts  
TS-711A or TS-811A CALL  
2m or 70cm All-mode Transceivers  
Useable as mobile or base station

### HANDHELDS

TR-2500A 2m FM Transceiver... CALL  
With memories, LCD, scan

TR-21A, 21AT/TH-41A, 41AT CALL  
2m or 70cm Ultra-compact FM XCVRs  
Pocket size, Optional touchtone pad

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260 16-ch mobile 180.00  
100XL 16-channel handheld 225.00  
180 8-band/16-ch 139.95  
2020 40-ch/aircraft 199.95  
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300 50-ch scanner/aircraft 261.00

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Radar Detectors Call  
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**PANASONIC SWL** CALL  
**COBRA CBs** CALL  
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ST 6000 RTTY Demodulator 895.50  
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CRI 200 RTTY/CW Interface 259.95

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AFA PT64 209.95  
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Kantronics UTU-XT 299.95

### HARDWARE

MFJ 1224 with MJJ C-64/V-20 Soft 79.95  
MFJ New 1229 159.95  
Kantronics Challenger Interface 89.95  
Kantronics Interface II 210.95  
Kantronics UTU Interface 169.95  
AFA CP 1 Interface 179.95  
AFA CP-100 Interface 284.95  
AFA MP1 Micropatch 119.95

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Vic-20, C-64, Apple, Atari... Call  
**Kantronics Hamsoft**  
Vic-20, Apple, Atari, TRS-80C, TI-99 Call  
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Microlog AIR-1 Vic-20/C-64 179.95  
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EGE will be closed Dec. 25 and Jan. 1, 2, 3.



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 NEW FM240 2m, 25-watt ..... 299.95  
 Complete Line of Accessories in Stock  
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 includes CW keyer, AM/FM, CW filter  
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 AC Power Supply, Full Break-in CW,  
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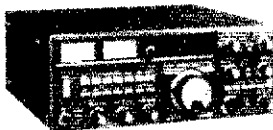
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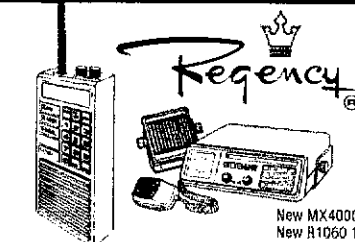
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 MX7000 25 MHz-1.2 GHz ..... 424.00  
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 593 3-position Coax Switch ..... 25.25  
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 370-15 All-band Dipole Antenna ..... 129.95  
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### Unarco-Rohn

**CUSHCRAFT**  
 A3 3-element 10-15-20m ..... 205.00  
 A4 4-element 10-15-20m ..... 264.95  
 R3 10-15-20m Vertical ..... 256.95  
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 ARX-2B 2m Ringo Ranger ..... 34.95  
 4218XL 2m Boomer ..... 88.00  
 10-4CD 4-element 10m ..... 104.95  
 15-4CD 4-element 15m ..... 118.95  
 40-2CD 2-element 40m ..... 279.95  
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 K134XA 6-element 10-15-20m ..... 479.95  
 2m-11X 11-element 2m ..... 59.95  
 2m-16LBX 16-element 2m ..... 91.95

**MOSLEY**  
 CL-33 3-element Triband Beam ..... 265.95  
 IA-33 3-element 10-15-20m ..... 239.95  
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 393S TH5DX 5-ele 10-15-20m ..... CALL  
 395S Explorer 14 10-15-20m ..... CALL  
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 214S 14-element 2-meter Beam ..... CALL  
 BN86 Beam Balun ..... CALL  
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 LARSEN LM-150 5/8 Mag Mount ..... 39.95  
 MINIQUEAD HO-1 ..... 141.95  
 BUTTERNUT HF5V 10-80m Vert ..... 112.95  
 BUTTERNUT HF4B 2-ele Beam ..... 189.95  
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Cablewave Hardline ..... CALL

**Self-supporting towers:**  
 HBX40 40-foot with Base ..... 198.00  
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 (Other BX, HBX, HDBX in stock)

**Guyed foldover towers:**  
 FK2558 58-foot 25G ..... 940.00  
 FK4554 54-foot 45G ..... 1296.00  
 Other sizes at similar savings.  
 Foldovers shipped freight paid  
 10% higher west of the Rockies

**Straight Sections:**  
 20G Straight Section ..... 36.50  
 25G Straight Section ..... 48.95  
 45G Straight Section ..... 109.00

**Complete Tower Packages:**

	25G	45G
40'	499.95	875.95
50'	549.95	989.95
60'	599.95	1089.95

Each package includes top section, mid section, base, rotor shelf, guy brackets, guy wire, turnbuckles, equalizer plates, guy anchors, cable clamps, thimbles. Ask about substitutions and custom designs. Tower packages are shipped freight collect FOB our warehouse.

**HY-GAIN TOWERS**  
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 HG52SS 52-foot tall ..... CALL  
 HG54HD 54-foot/higher load ..... CALL  
 HG70HD 60-foot/higher load ..... CALL  
 Order Hy-Gain tower, Hy-Gain antenna, and Hy-Gain rotor and receive tree shipping on all



W36 36-foot tall ..... 549.00  
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 Shipping not included. Shipped direct from factory to save you money

**CABLE BY SAXTON**  
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 Alliance HD73 ..... 105.00  
 Hy-Gain CD45 II ..... CALL  
 Hy-Gain Ham IV ..... CALL  
 Hy-Gain Fallwister TX ..... CALL  
 Hy-Gain Heavy-Duty 300 ..... CALL  
 Kenpro KR500 Elevation Rotator ..... 159.95

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 831SP PL25S silver ..... 1.10  
 831SP 1050 Nickel PL259 ..... 0.75  
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 2900 SD399-BNC ..... 2.99  
 3112 BNC RG59 ..... 1.35  
 312 BNC RG58 ..... 1.25  
 83185 Reducer RG58 ..... 0.25  
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 982 1.5 kW Tuner switch/meter ..... 185.95  
 949C 300-watt Deluxe Tuner ..... 129.95  
 941D 300-watt Tuner swch/meter ..... 89.95  
 1020A Active Antenna ..... 69.95  
 202 Noise Bridge ..... 48.95  
 752B Dual Tunable SSB/CW Filter ..... 79.95  
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# Our numbers talk

# 424B

## SUCCESS

### BOOMERS WIN

1983 Central States VHF  
Conference, Antenna Contest

144MHz BOOMER	1st Place
	2nd Place
220MHz BOOMER	1st Place
432MHz BOOMER	1st Place
	Commercial

### BOOMERS WIN AGAIN

1983 EME CONTEST WA1JXN

1st PLACE 2 METERS  
WITH 12 X 32-19  
PLUS  
1st TO WORK SPACE  
SHUTTLE

They have talked to winning scores in many important amateur activities including the 1979, 80, 81 June VHF contests, 1981 Central States antenna measuring contest, 1981, 82 EME contests, 1982 Rocky Mountain antenna measuring contest and many more. Now there are three new numbers: the 424B, 24 elements for 432 MHz; the 410B, 12 elements at 432 MHz; and the 416TB, 16 elements at 435 MHz for satellite communications. The new Boomer models feature insulated elements, stainless steel hardware, N type connector, T match feed and trigon reflectors.

## THREE EXCITING NEW BOOMERS

### HIGHEST GAIN BOOMER XL

Boomer XL is "the antenna for 2 meter DX" with higher gain and cleaner pattern this antenna is designed to perform and survive in harsh environments. It has 18 elements on a 28.8 ft. 8.8 m tapered boom.

MODEL 4218XL 144-145 MHz

### WIDEBAND BOOMER 215WB

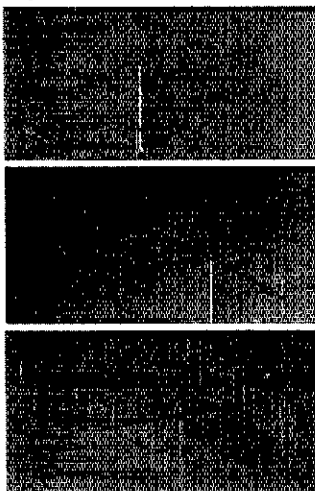
Featuring the latest in wideband technology. The 215WB is high performance across the entire 2 meter band, for FM, SSB or CW. It features 15 elements on a 15 ft. 4.57 m boom.

MODEL 215WB 144-148 MHz

### FM BOOMER POWER PACK

A combination of 215WB Boomers vertically polarized with support boom, power divider, and interconnect harness. Like all boomers it features all stainless steel hardware. You'll easily work those distant repeaters.

MODEL 230WB 144-148 MHz



## OSCAR BOOMERS

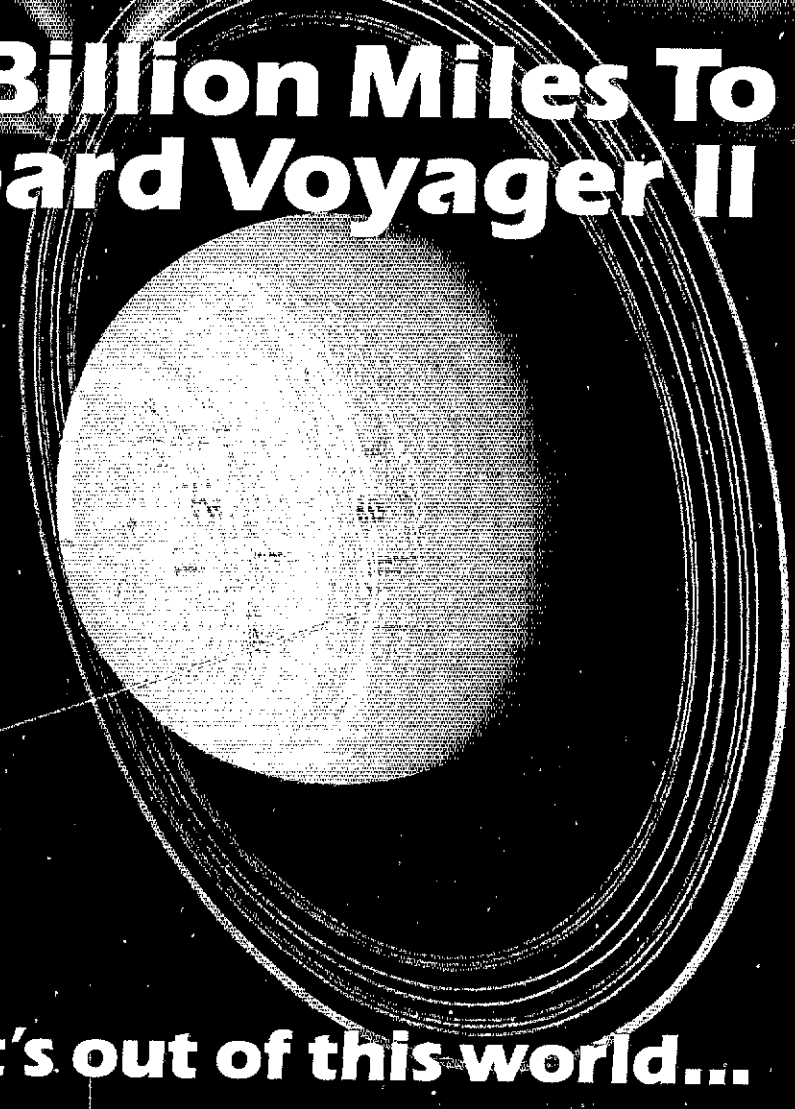
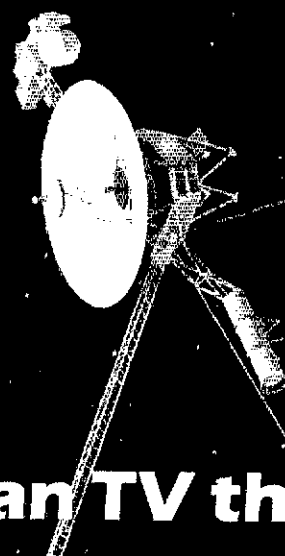
Enjoy the thrill of OSCAR 10 with a Cushcraft antenna system, featuring the fabulous 416TB BOOMER, giving more performance through better electrical design and superior construction.

Order a complete package as shown left: 416TB, A144-20T and A14T-MB. For less than \$200.00\* you'll enjoy the thrill of worldwide OSCAR communications.



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Operating Period**

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 Dates: Jan. 18 - Jan. 28, 1986  
 SSTV Frequencies and Modes:  
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 7220 kHz    21340 kHz  
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Call \_\_\_\_\_ Exp. Date \_\_\_\_\_

Enclosed check or money order \$ \_\_\_\_\_



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...pacesetter in Amateur radio

## "Dual-Band" Leader!

### TW-4000A 2-m/70-cm FM transceiver.

**The first is still the best! The original FM "Dual Bander" TW-4000A delivers 25 watts output on both VHF and UHF in a single compact package.**

**2 m and 70 cm FM in a compact package.**

Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).

**Single-function keys allow easy operation.**

**Large, easy-to-read LCD display.**

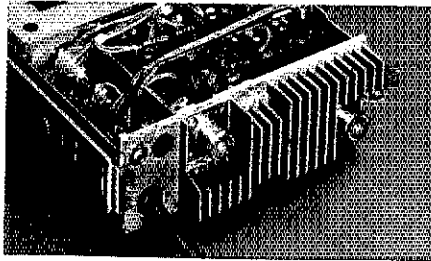
A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR". Dimmer switch.

**Front panel illumination.**

**10 memories with offset recall and lithium battery backup.**

Stores frequency, band, and repeater offset. Memory 0 stores receive and

transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



• **Rugged die-cast chassis.**

• **Two separate antenna ports.**

Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.

• **Programmable memory scan with channel lock-out.**

Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.

• **Band scan in selected 1-MHz segments.**

Scans within the chosen 1-MHz segment (i.e., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction

may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.

• **Priority watch function.**

Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.

• **Common channel scan.**

Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.

• **High performance receiver/transmitter.**

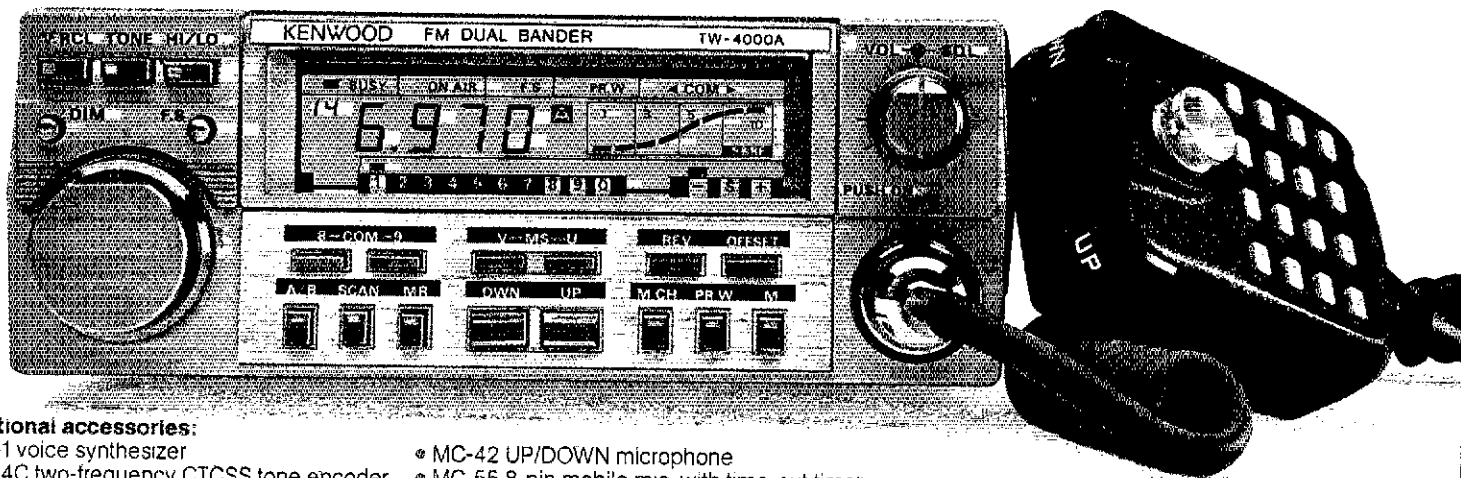
GaAs FET RF amplifiers on both 2 m and 70 cm, high performance monolithic crystal filters in the 1st IF section; provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.

• **Optional "voice synthesizer unit"**

Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.

• **Repeater reverse switch.**

More TW-4000A information is available from authorized Kenwood dealers.



**Optional accessories:**

- VS-1 voice synthesizer
- TU-4C two-frequency CTCSS tone encoder
- PS-430 DC power supply
- KPS-7A fixed station power supply
- MA-4000 dual band mobile antenna with duplexer
- SP-40 compact mobile speaker
- SP-50 mobile speaker

- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation. Antenna mag mount is not Kenwood supplied

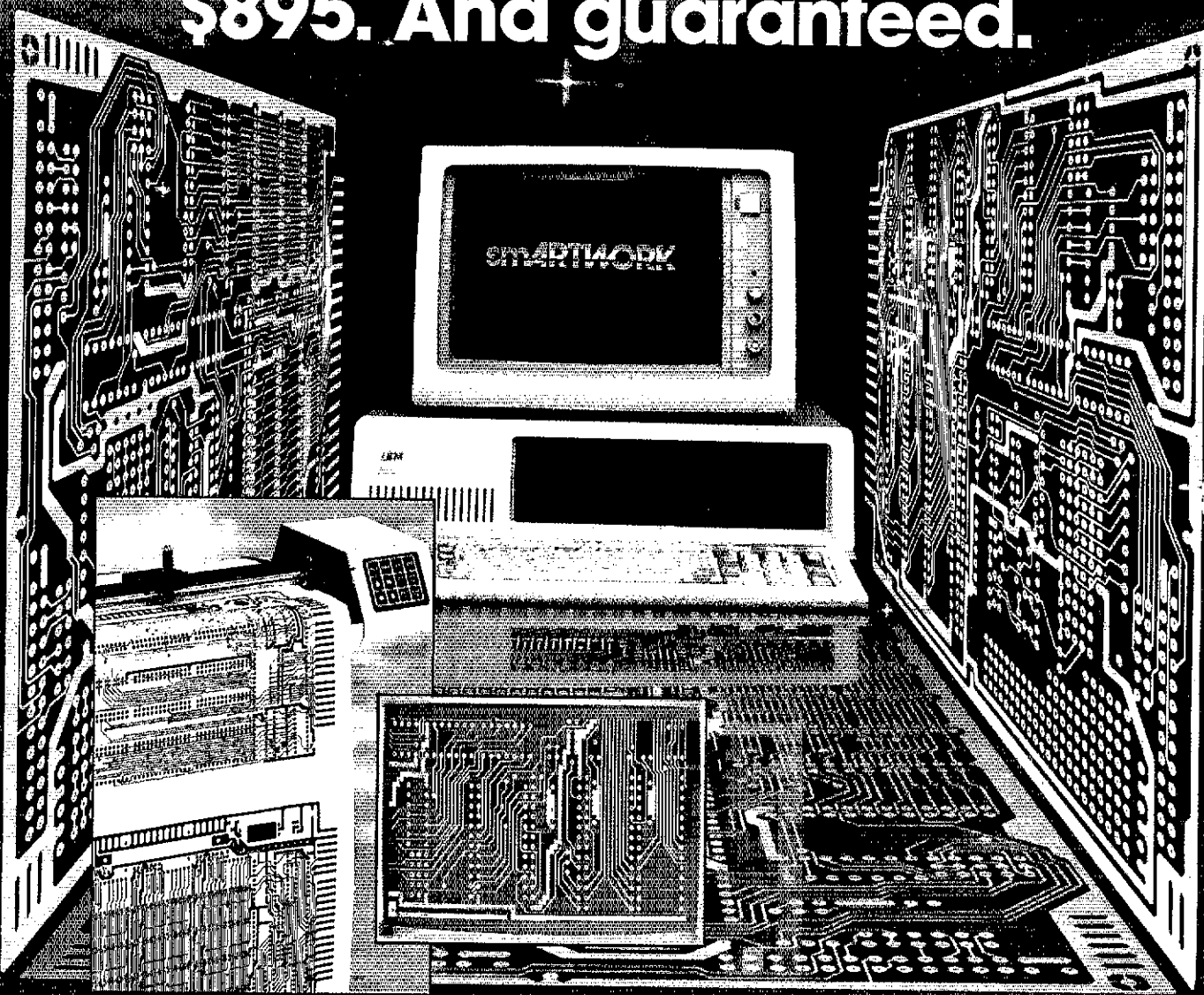
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Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.



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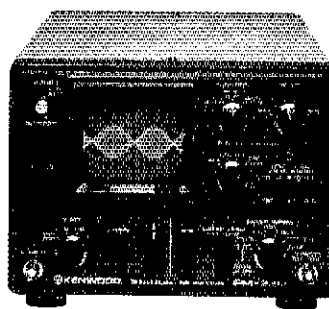
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pacesetter in Amateur radio.

## Accessories



**TL-922A** 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.



**SM-220** Station monitor/10 MHz oscilloscope Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.

### Not Shown:

**MC-50** Desk top microphone. Hi/Lo Z. 4-pin connector.

**MC-80** Desk-top microphone. 700  $\Omega$  unidirectional electret element with flexible boom. Built-in mic. pre-amp and UP/DOWN switch, with lock. (8-pin).

**MC-48** Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

**MC-46** As above, but with 6-pin connector.

**MC-42S** Hand microphone with UP/DOWN switches. (8-pin).

**MC-35S** Noise cancelling hand microphone, 50 k  $\Omega$  (4-pin).

**MC-30S** As above, but 500  $\Omega$ .

**PG-4A** Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

**PG-4B** As above, but 6-pin.

**PG-4C** As above, but 8-pin, as supplied with MC-60A.

**PG-4D** Extra 4-pin cable for MC-85.

**PG-4E** As above, but 6-pin.

**PG-4F** As above, but 8-pin.

**HS-7** Micro-headphones.

**KPS-7A** 13.8 V DC, 7.5 A intermittent DC power supply.

**RA-3** 2 m,  $\frac{3}{8}$   $\lambda$  telescoping antenna with BNC connector.

**RA-5** 2 m  $\frac{1}{2}$   $\lambda$  /70 cm  $\frac{3}{8}$   $\lambda$  telescoping antenna with BNC connector.

**RA-8B** 2 m StubbyDuk<sup>®</sup> with BNC connector.

**RA-9B** As above, for 220 MHz.

**RA-10B** As above, for 440 MHz.

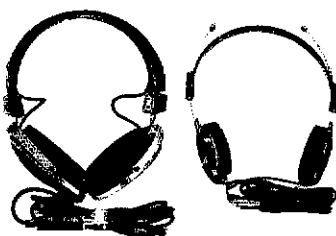
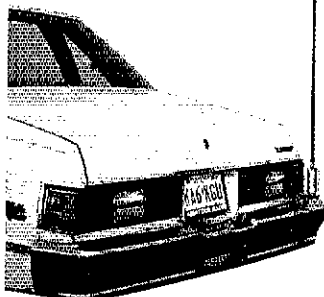
**RD-20** Dummy load, 50  $\Omega$  DC-500 MHz 20 W continuous, 50 W intermittent.

**PG-3A** DC line filter for mobile use.

**Service manuals** are available for all Kenwood transceivers and most accessories.

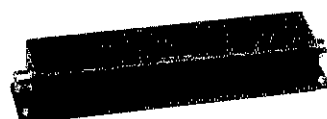
**MA-5** 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.5:1 or less. Easily adjustable for center frequencies.

**VP-1** Bumper mount for above.



**HS-5** Deluxe headphones.

**HS-6** Lightweight headphones.



**LF-30A** Low pass filter. 1 kW, 50  $\Omega$ . Insertion loss: less than 0.5dB at 30 MHz.

**MA-4000** 2 m/70 cm dual hand mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

**AL-2** Lightning and static arrester. 1 kW, 50  $\Omega$ .

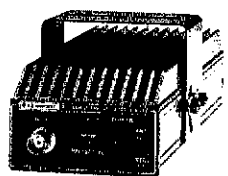


**SP-40** Compact mobile speaker.

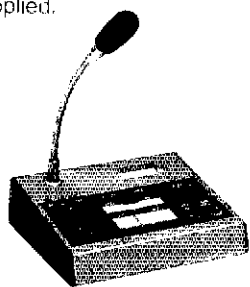
**SP-50** Mobile speaker.



**PC-1A** Phone Patch (FCC Part 68 registered).



**VB-2530** 25 W RF Power Amplifier (for TR-2600A). BNC-BNC cable, and mounting bracket supplied.



**MC-85** (8-pin) Multi-function desk-top microphone (8-pin) 700  $\Omega$  unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)



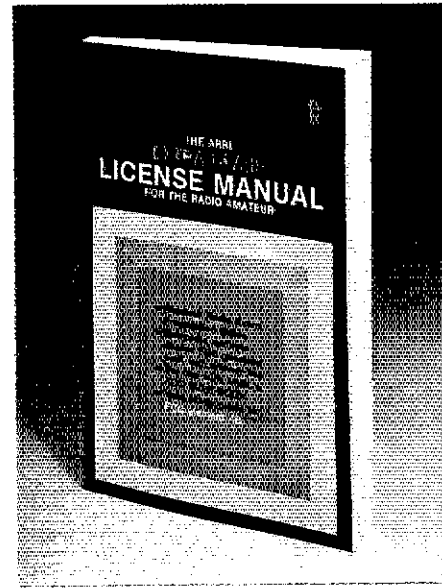
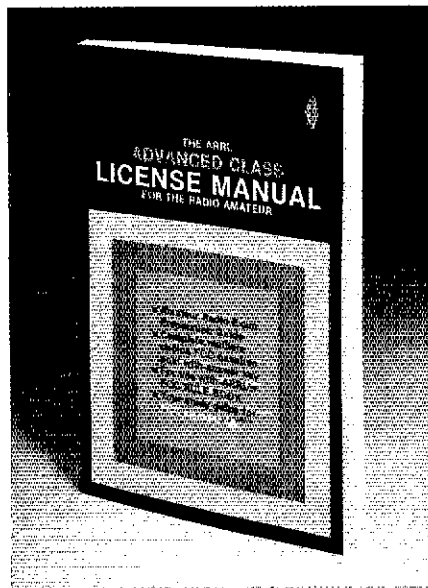
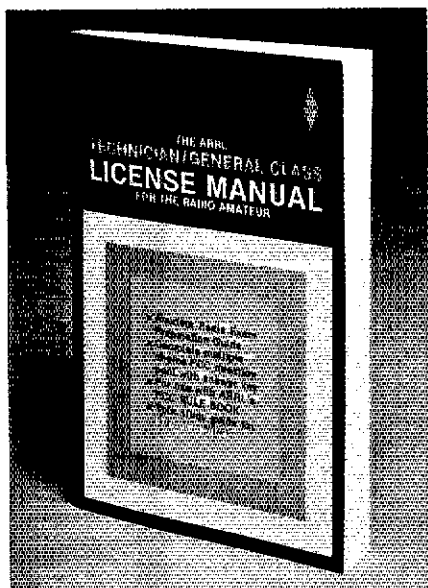
**MC-60A** (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.



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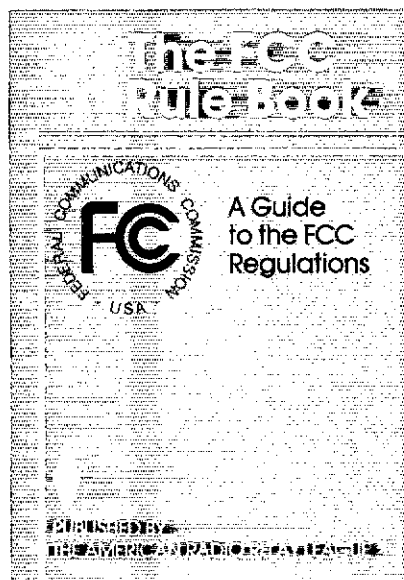
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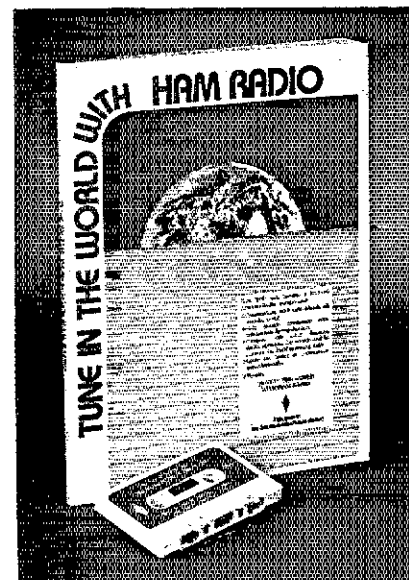


Tune in the World with Ham Radio \$8.50.

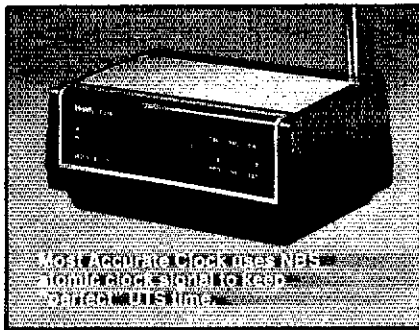
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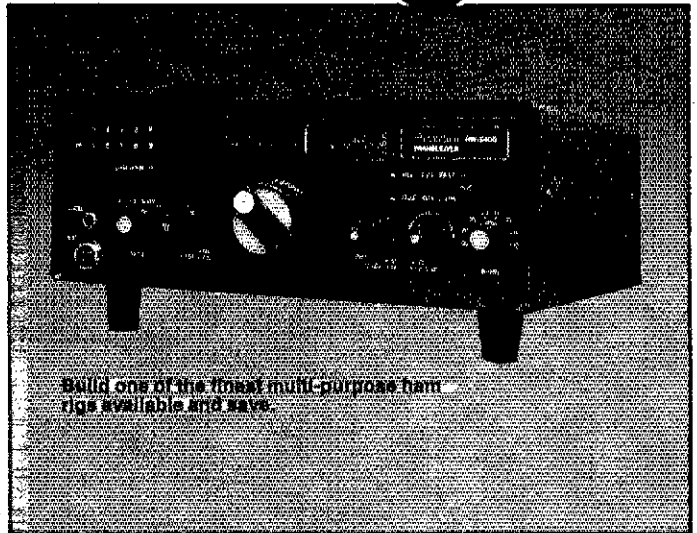
# FREE high tech catalog



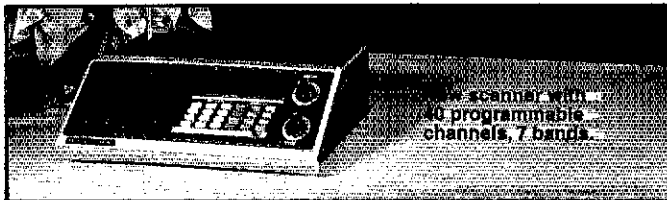
Most popular Heathkit transceiver with 10 microwatt CW and RTTY modes.



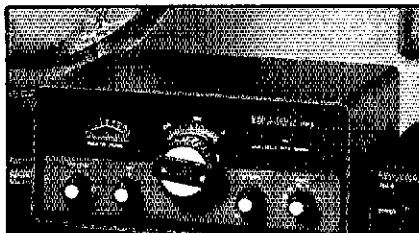
Crossfire visual tuning indicator (uses RTTY transmissions) fast.



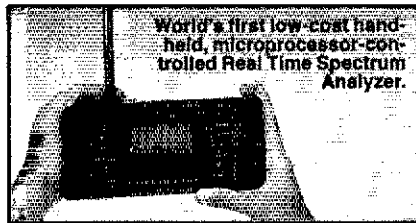
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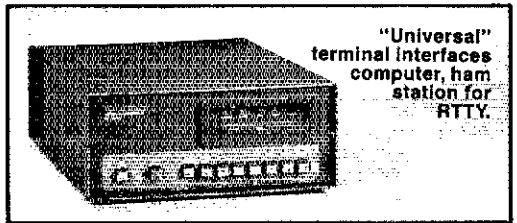
CW scanner with 40 programmable channels, 7 bands.



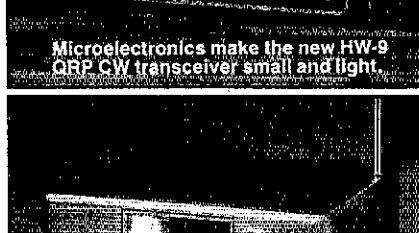
Microelectronics make the new HW-9 QRP CW transceiver small and light.



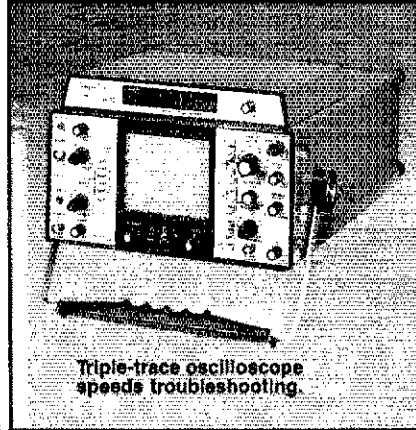
World's first low-cost handheld, microprocessor-controlled Real Time Spectrum Analyzer.



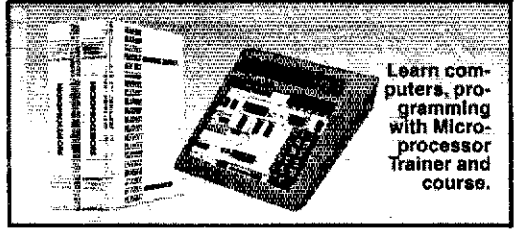
"Universal" terminal interfaces computer, ham station for RTTY.



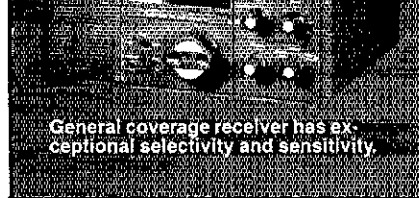
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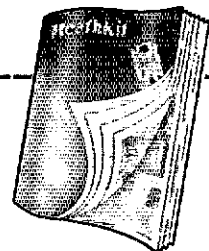
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## GREAT HAM RADIO ADVENTURES!

Tommy Rockford, K6ATX is back on the trail of high adventure! ARRL is proud to bring back updated editions of Walker Tompkins' exciting classics plus the *brand-new* thriller, **Death Valley QTH**. Newcomer and oldtimer alike will find that you just can't put these books down; and what a way to spark an interest in Amateur Radio among unlicensed individuals as well!

In **Death Valley QTH**, what starts out to be a typical field day operation becomes a matter of life and death for K6ATX and the members of the Santa Bonita Amateur Radio Club. **SOS at Midnight** finds Tommy up against the Purple Shirt Gang. Spark Gap Gallagher seems like a harmless character, but what did he have to hide in **CQ Ghost Ship**? Underwater adventure and ham radio join together to form the exciting conclusion to **DX Brings Danger**.

These new ARRL publications represent the efforts of accomplished TV screenwriter, newspaper columnist, historian, and biographer Walker Tompkins who is K6ATX in real life.

Each title is \$5.00. Please add \$1.00 for shipping and handling on orders under \$10.00. Expected shipping dates: *SOS at Midnight* and *CQ Ghost Ship*, December 1. *DX Brings Danger* and *Death Valley QTH*, December 15. Available from: ARRL, 225 Main Street, Newington, CT 06111.

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## Dependable Duo!

### TS-830S HF transceiver.

The "Pacesetter" has become a legend in DX and contest circles.

- Covers all 10 Amateur bands (50 kHz extended coverage).
- Wide receiver dynamic range, junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- Noise-blanker threshold level control.
- IF shift (passband tuning).
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- SSB monitor circuit.

- Built-in digital display, (fluorescent tube), with analog dial.
- Narrow/wide filter selection on CW.
- RIT and XIT (transmitter incremental tuning).

#### Optional accessories:

- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner/SWR/power meter.

- SP-230 external speaker.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.



### TS-530SP HF transceiver.

This "Cents-ational" HF transceiver is recognized worldwide for superior and dependable performance.

- 160-10 meters, LSB, USB, CW, all Amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.

- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- IF shift tunes out interfering signals.

- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220 W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.

- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

#### Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone.
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

More information on the TS-830S and TS-530SP is available from authorized Kenwood dealers.

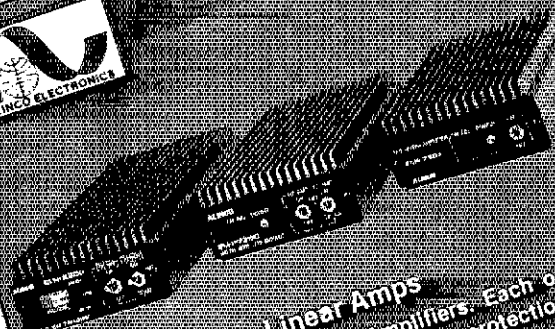


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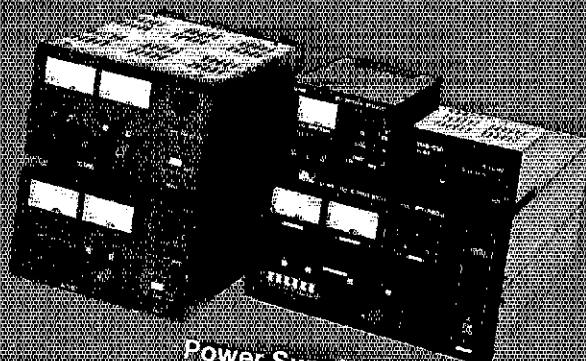
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at 9.8 V - High Power = 3. watt  
at 13.8 V - Low Power = .5 watt  
at 13.8 V - High Power = 5. watt



## Memo:

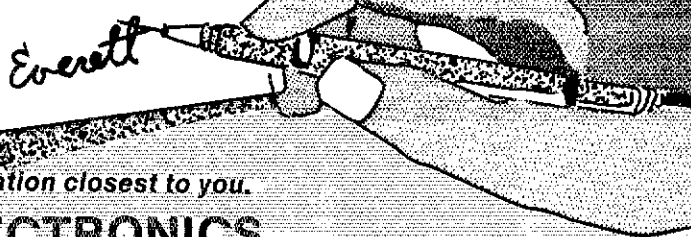
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From: Everett L. Gracey, President

If your customer has a failure with any Alinco product within 30 days, exchange the unit with a new one, so long as a truck has not run over it or that there has not been any tampering.

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## HF BROADBAND VERTICALS WORK THE WORLD

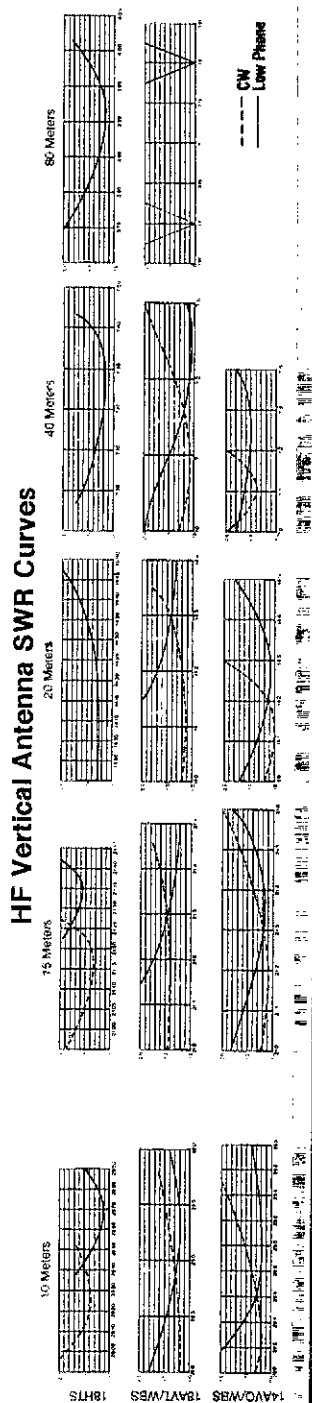
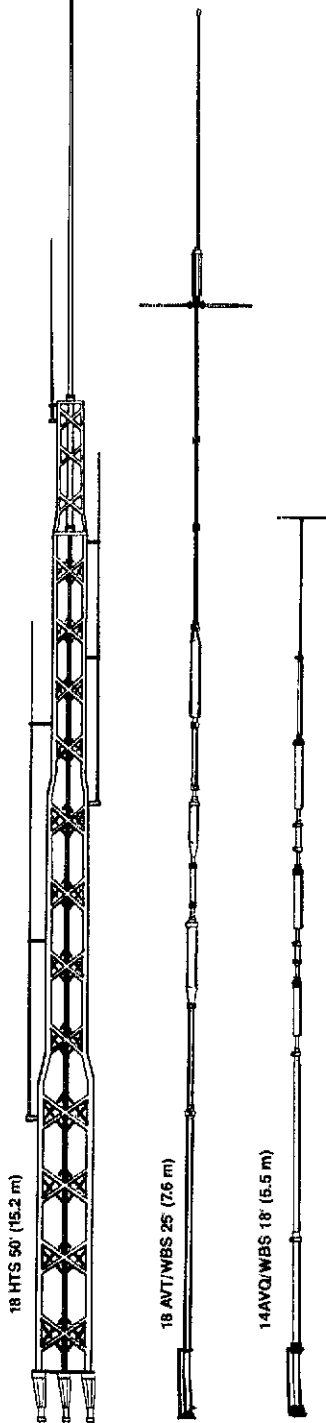
Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.

**18AVT/WBS (80-10 meters)** The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

**14AVQ/WBS (40-10 meters)** Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

**18 HTS (80-10 meters, 160 meters with optional loading coil)** The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical  $\frac{1}{4}$  wavelength (or odd multiple  $\frac{1}{4}$  wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended  $\frac{3}{4}$  wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.



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See Data Sheet for surge limitations.

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2 kW models designed for amplifiers. For maximum protection use both, with 200 W model between XCVR and AMP. All models include Arc-Plug cartridge and are designed for 50 ohms.

UHF "T-type" Connectors, for use through 30 MHz:

MODEL LT, 200 W ..... \$19.95

Super Ruggedized Super Low Loss Models (0.1 dB at 500 MHz), for use through VHF/UHF, with UHF connectors:

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CDN 667/3 ESS 322/60 NYPON 645/322 NYSS 324/188 NYSE 428/227 NYSL 405/217 SDN 306/129 Ulster RACES 38/9. Club News: Albany ARA-WA2MKH discussed Robotics; welcome new members KA2DLE, KA2LFF, WA2ZNO, KA2JKA; report W2JUI Silent Key; W2KLVW 50 years on air; K2VYV 180 meter DXCC; CNR-K2LV discussed updating tube units with mosfets/chips. Saratoga Cty RACES holding Novice & Tech/Gen courses; assisted with communications in Mechanicville with toxic spill from tank cars. Schenectady ARA-K2KGJ discussed rehabilitation Eng. talking signs for blind; new members KE4NA N2DGE; new officers: Pres-W1GP VP-W2DHT SEC-WB2JVC Treas-WB2MJJ Dir-W2VJF W2ILM KA2OPG WB2WHD. Ulster RACES stood by with 15 ops during Gloria. WEGA had slide show by WA2DHF Hudson Div. Vice Dir. and discussion of NYC Marathon. Congratulations to KA2MYJ, Tom new net manager of W2VJ and thanks to Joe, N2BDD for his past services. W2VJ appreciate more station reports to credit public service to W2MCO or myself. Please check your totals-3 reports this month had errors. By the time you read this, I will be set up and monitoring 145.01 packet. If you need to contact me, leave a message it will be on full time. September BPL: WB2EAG Sep. PSHR: KC2TF WB2EAG WB2YUK W2PKY KA2MJY WA2JBO K2ZVJ AK2E WB2MCO K2ZM WA2YBM WA2VKI. Traffic: WB2EAG 333, KC2TF 253, WB2MCO 226, W2PKY 204, K2ZM 164, WB2YUK 150, K2ZVJ 124, KA2MYJ 99, WA2JBO 79, N2BFG 28, WA2VKI 26, WA2YBM 23, AK2E 20.

NEW YORK-LONG ISLAND: SM, John H. Smale, K2JZ-ASM/ACC: WB2IAP, SEC: KA2RGI, OCC: NB2T, TC/RF: W2JUP, STM: WA2ARC, PIO: W2IYX. The following are traffic nets in and around the section:

"NLI CW"	3830 kpt	1900/2200	WB2EUF
NCVHF	6,745 rpt	1830 m-f	K2MT
BAVHF	6,677 rpt	200 m-f	K2YOK
SCVHF	6,377 rpt	2030 m-f	W2GZD
ESS	3590 kHz	1800	W2WSS
NYS/M	3677 kHz	1000	WB2EAG
NYS	3677 kHz	1900/2200	WB2EAG

\*Denotes section net, all times are local, please try and help out by checking in whenever possible. On behalf of myself, the XYL and the 4 ops I want to wish everyone a very Merry Christmas and a Happy New Year. 1985 was really something else for amateur radio, with all the stations helping handle traffic for the Mexican earthquake, I would like to list everyone but lack of space prevents me. WA2ZIS had a very nice write up in Newsday, KA2RGI, and many other stations went to the CTH to help handle the incoming and outgoing telephone calls. Those who can't get Gloria, I wish to renew my pleas, along with KA2RGI to please join and get involved with your local ARES nets, sometimes all the many hours of boring drills do pay off, all stations that helped out during the storm did an outstanding job, a lot of stations will be buying generators in the next few months, K2RIW and WB2FXN have been holding technical discussions on what type to buy, how to wire up your house to be able to switch the generator in and provide power to the furnace and freezer. What I am asking everyone is to become involved, yes we made it through a major hurricane, but we still proved that there is a need for the amateur radio operator, to provide accurate communications in times of emergency, please contact us ASAP to be involved. Packet Officers of Long Island (POLI) held their first meeting and elected as officers: AI2Q Pres., W2GZD V.P., KA2EYW SEC., KA2RGI Treas., this club is being formed to help spread around information on operating a packet radio set up. K2TIW will be moving to Calif., we wish him good luck in the new QTH, I will start listing the new test schedules as soon as they become available. Traffic: W2GKZ 95.

NORTHERN NEW JERSEY: SM, Robert R. Anderson K2BJG-ASM (VE liaison); N2XJ, SEC: KB2ZM, STM: KA2HNO, OO/AA: N2WM, ACC: K2BJG, PIO: WB2NOV, SGL: W2KB, TC: K2BLA, BM: N2CXX. September 1985 appointments are: From the SEC, New: KX2O DEC (Sussex), NE2M DEC (Somerset), DE2D (Hunterdon), W2COC (Dorset), V2ZEE DEC (Morristown), WB2YUF DEC (Morris), EC2O, N2BMM, and NJ2Q, OES: KA2FBO, KC2BW, KX2O, N2BMM, N2CIA, N2WM, NE2M, NJ2Q, W2CC, W2PXE, W2ZEE, WA2AXD, WA2DHF, WB2MJC, WB2YUF, and WB2WIH. From the STM, Endorsed OES's: KA2GQQ, KA2GSX, KB2HM, KY2P, KY2S, N2EBA, N2ELW, W2CVM, W2VQ, and WB2KLF. From the BM OES's Endorsed: AD7I and N2DXP. From the TC New: WA2DSQ ATC. From the OOC OO's Endorsed: KJ2D. Verification of all section appointments has now been completed. Those endorsed have been listed in this column. For a copy of the current NJJ field organization roster send a business size SASE to me, you may contact it from the WA2SNA1 PBBS. The process of rebuilding our section's field organization membership is continuing. Good progress has been made in the ARES area. I am pleased that our first ATC is on board. Now that the RFI function is under the TC it is important that we recruit a sufficient number of ATC's to adequately cover all geographic areas within the section. Help is still needed in all functional areas, particularly the OO/AA area where only the OOC and one OO exist. If you are interested in a NJJ ARRL field appointment, please contact the applicable leadership official listed above. Congratulations to the following who upgraded during September sessions of the Bayonne ARC and NJV VE Board. Technician: Robt Aitilio, Nick Conislaro III and Jr, Alan Slaight, KA2YPC, KA2ZDA, and WA2AHD. To General: N2PFN, KA2YPP and KAZYNG. To Advanced: KA2RQK, WB2DND, N2DZW, and N2PFI. To Extra: K2LSU, WB2GFR, KA2BZS, and N2BOY. Newly elected officers of the Bayonne OEM ARC are: Pres KA2CKV, VP NE2JQ, TR NE2R, SEC WA2JVK, BARRA is now scheduling VE test sessions monthly. Contact K2MHP. The NJ VE Board is continuing test sessions on the 2nd Sat each month. Contact N2XJ. Sorry to have to report Silent Key, Kay Sanders, W2VJL.

Please Note: TCETN now operates on 146.685/085

September Data:

Net	Freq	Time	Sess	QNI	QSP
NJM	3695	1000	Dy	---	---
NJPN	3950	1800	Dy	44	438 111
		0900	Su	---	---
NJSN	3735	1830	Dy	30	189 31
NJNE	3695	Dy	---	---	---
NJNL	3695	2200	Dy	---	---
NJVN	4949	2230	Dy	30	333 152
TCETN	147.12	2000	Dy	30	295 122
OBTTN	146.685	1930	Dy	30	98 31
NJRTY	147.51	Autostart	Not Available	---	---
NJPTT	45.01	WA2SNA1 PBBS	---	---	---

UPLINK Amateur Radio News call 201-735-8550

### MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, K6CY-SEC: KD8BG, BM: K6IRI. ACC: WB8OAM. PIO: N8EBA. OOC: KD8RT. TC:

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#### 10 Channels

10 memories, one for non-standard repeater offsets.

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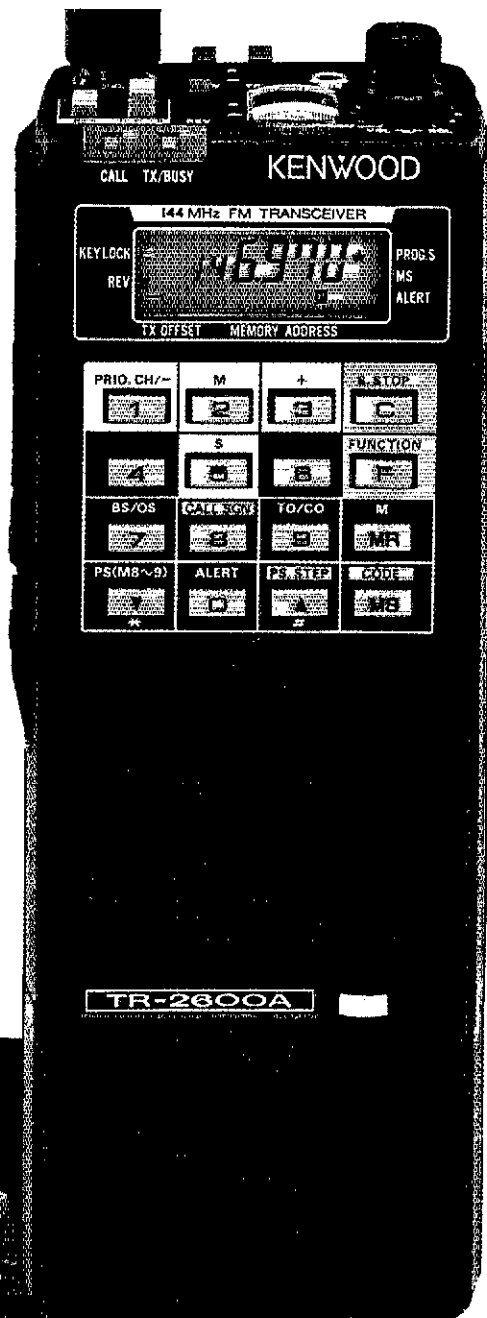
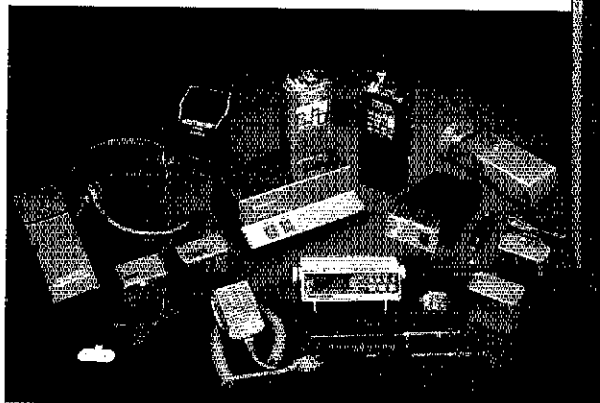
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- DC-26 DC-DC converter
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- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

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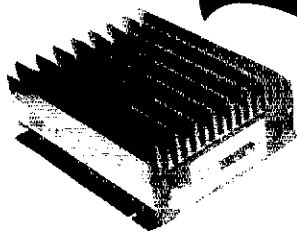


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**KADAS, SGL:** AKOQ, Congratulations to KBAAR as Midwest Ham of the Year. John was also selected as Iowa Ham of the Year earlier. Good S.E.T. reports, be sure to send copies to hqtrs and the SEC. It is also time to file Annual reports, both EC and club. Midwest Convention '85 will be in Sioux City in April sponsored by the 3900 Club, mark your calendar. Would like to see more clubs participate in the "Club Challenge." not much time left. Waterloo participating in Annual "Spook Patrol" Record number of names registering at "Old Threshers" at Mt. Pleasant. Another good "Radio Rodao" at Ft. Madison. New CBBS (packet) in Cedar Rapids. If you are still interested in ATC appl contact K0DAS or K0CY. Two clubs are close to becoming the second and third SSC in Iowa. Good chance we will have a State Convention in 1986, although no one has contacted me yet. Still need your support for the ICN. This is a good opportunity to involve some of your new area hams, in a good training net. Let the new novices not about it and assist them you will both benefit. Nets for September: ILCN-325-346-00 75M Phone 1945-139-50 ICN 36-14-12. Thanks to NIMA W6BAVW, W6YLS, N0DR for their efforts! Traffic: K0CY 506, W0SS 205, W0ALY 157, K0GP 141, W6YLS 133, W0JL 124, K0ADF 105, W0BFWB 66, W6BAVW 53, K0BXL 31, W0HTP 29, W0BJFF 26, K0AGSC 24, N0CR 22, W0BW 18, K0BRE 15, K0DBG 9, K0CSC 8, W0FQ 4, K0CMM 2.

**KANSAS:** SM, Robert M. Summers, K0BKF - If you did not get to attend the hamfest at Wichita in Sept., you missed a good one. All of the programs were well attended. Considerable interest still growing in this thing called PACKET RADIO. It is about time for the state of KANSAS to join with those already handling traffic by packet. Anyone interested out there? I would like to have a volunteer to coordinate the traffic into the packet system. If you are into this kind of thing, get in touch with your SM. Traffic totals for Sept. as reported are as follows: K0BNI QNI 1153 QTC 151, KPN QNI 357 QTC 40, KWN QNI 874 QTC 881 and KMWNI QNI 620 QTC 571. C0BN QNI 1630 QTC 51. QKS QNI 240 QTC 64 and QKSS QNI 23 QTC 10. Again thanks to those who helped KANSAS on TEN: N0FNI, W0HI, K0KI, K0SL, N0BZ, W0BZEN. We still have some fine CW operators left in Ks. We will be having a change in a few appointments soon or perhaps even by the time you read this. Doc, W0KL, who has been Section Emergency Co-Ord. for a number of years now has asked to be replaced. Marshal Reese, N0BLD, will be accepting the position as SEC effective Nov. 1st. Quite a few Kansas hams were active in the Mexico Earthquake emergency communications efforts. Hopefully by next month we can compile a list of all those taking part. Traffic: W0FRC 521, W0BKB 410, W0FIR 185, N0GCC 126, W0AB 132, W0CYH 72, W0DJ 71, K0BKF 63, K0SL 81, W0BZE 39, W0CHJ 3, W0FB 3, W0GMT 7, K0AE 4, N0APJ 4, N0BZ 3. (Aug.) W0HI 107.

**MISSOURI:** SM, Ben Smith, K0PCK - Newly elected officers of the Zero Beaters ARC are: Pres. W0AGN1, Sec. W0BELL, Treas. W0BQCS and PIO K0OCU. Members of the Southwest Missouri Hams Club provided communications for the Webb City Miners Days Celebration on Sept. 9. Amateurs assisting were: K0RPG, N0FYG, K0DUR, N0E2T and K0DRO. Silent Key reported to me this past month, W0ASLP. As W0AAYA was enroute home from the St. Charles Hamfest he was one of the first to arrive at the scene of an automobile accident with injuries. He was able to call for an ambulance on the W0FYA repeater. Joplin area amateurs assisted with the Mickey Mantle Golf Classic Sept. 21 and 22. K0DUR, W0BSAH, and N0E2T relayed information from the golf course area to N0E2T at the Channel TV van. N0FNI was on hand to help where needed. New Field Appointment for the month, W0EO, ATC. Amateurs from Missouri came through as usual in time of need. Amateurs throughout the Section, either working on their own or helping local agencies such as Red Cross Chapters made and received many Health and Welfare inquiries from the Mexico City earthquake. Not only did we provide service to a lot of people, but amateur radio received much recognition from the news media. I am sure there are many club activities and projects in the Section each month that are not reported to me. Let me know what your club and local amateurs are doing so we can share it with others. If your club is holding amateur exams send the information to W0BTEG, Section Bulletin Manager. Ann will then send out a Section Bulletin as a notice of your exam date.

NET	Seas.	QNI	QTC	Day	Time	Freq.	Mgr.
					PM	MHz	
MON	30	352	163	Dly	7:00P-45	3.585	K0SI
MOSSB	30	783	139	Dly	6:00	3.983	K15Y
MEOW	30	552	69	Dly	5:30	3.983	K0DSQ
PHD	5	133	26	Mon	9:00	146.43	W0KUH
MTTN	23	90	23	Mon-Sat	6:30	3.370	K0FBN
HBN	21	274	20	Mon-Fri	12:05	7.260	K0DSQ
N0E2T	11	59	11	T-Sat	7:30	144.5315	K0FTS
GMEN	4	62	6	WED	9:00	146.18178	K0PCK
PTN	9	17	6	MWFF	9:00	21.114	W0BR0Q
ZAEN	4	49	4	Tue	8:00	147.84124	K9OCU
RHABN	29	402	3	Dly	8:00	146.39179	K0LLN
CVE	10	18	3	MWFF	7:00	3.710	K0FTS
TCN	4	46	2	Thu	9:00	147.09169	K0BLO
MGARES	4	46	1	Thu	8:30	145.52	W0BELJ
LOZFM	4	26	0	Sun	9:00	148.13173	W0RTL
LARES	5	53	0	Wed	8:00	148.10170	W0BRHC
SARN	4	48	0	Thu	9:00	146.43173	W0ERN
JCCCN	4	43	0	Wed	8:00	146.40170	W0BDX
MDFRN	4	21	0	Wed	8:15	222.42142	A0B
COZCH	4	12	0	Sat	9:00	3.707	W0RTL

Traffic: K0ORB 213, W0BMA 162, K061 120, KTSY 120, K0BZL 109, N0SS 97, K0EAS 89, A0B 87, N0DN 84, N0IF 55, K20NP 53, W0UD 51, K0PCK 47, K0ML 46, W0BYX 42, K0DSQ 39, N0BKE 30, K0OCU 25, W0OTF 22, W0AKUH 20, W0BRCJ 9.

**NEBRASKA:** SM, Vern Wirka, W0BQOM - Seasons Greetings to all! Thanks to all of the dedicated amateurs that contribute so much to the hobby. If you have questions or suggestions about amateur radio please feel free to contact any of the section level appointees that can help you. SEC, Jim Sanford, N0AIH, SGL, Bob Mitchell, W0BRJ, TC, Chuck Conner, K0NG, ATC, Joe Eisenberg, W0BWR1, STM, Jerry Kohn, W0EGK, PIO, Mike Lannen, K0BEV, BM, Ken Johnson, W0EMR, ACC, K0BDA. Of course, your Section Manager is always available to assist you. K0BDCX reports he has a UHF repeater on 444.3 MHz with a plus input in Lincoln and he is looking for more stations to use the system. W0KK, of Lincoln, has put together an extensive computer program for the Commodore which figures various calculations for transmission lines. For further information about this computer program contact W0KK in Lincoln. 1985 has been a good year for amateur radio in the Nebraska section. Traffic handling has been running ahead of last year. Public service activity is up in all areas from weather spotting to providing communications for various organizations. Packet radio continues to expand across the section. There are many new amateurs and alot of upgrades due



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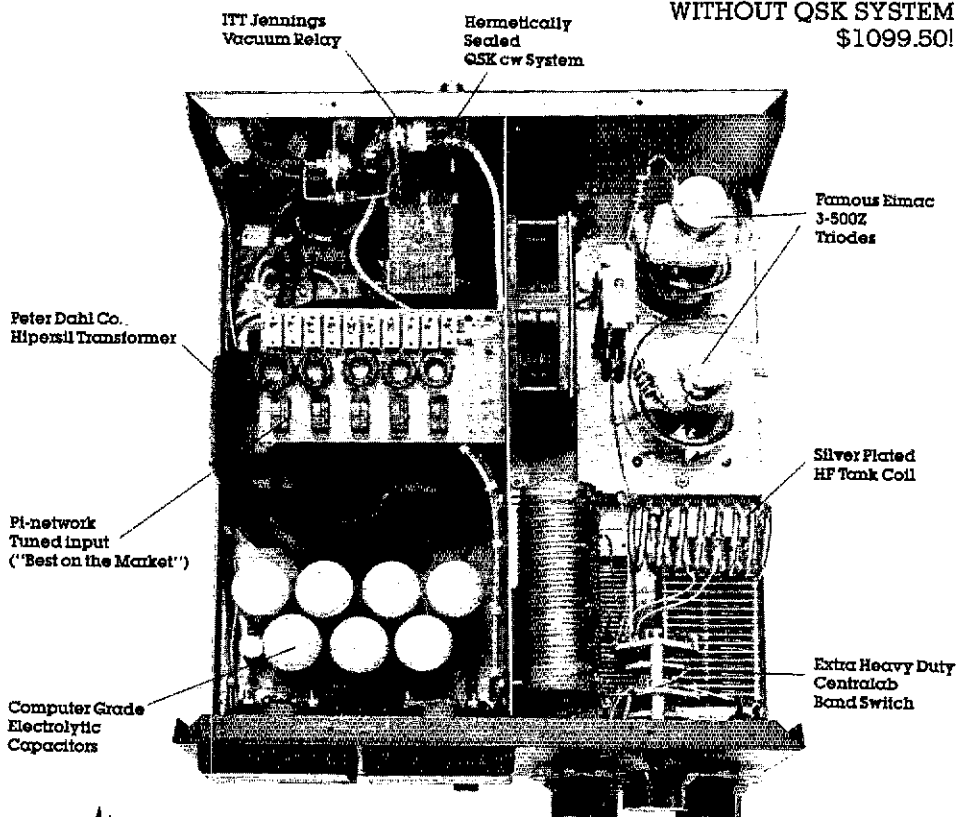
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Communications Electronics,<sup>™</sup> the world's largest distributor of radio scanners, introduces new lower prices just in time for the holiday season.

## Regency<sup>®</sup> MX7000-BB

List price \$699.95/CE price \$379.00/SPECIAL  
10-Band, 20 Channel • Crystalless • AC/DC  
Frequency range 25-550 MHz, continuous coverage and 800 MHz to 1.3 GHz, continuous coverage  
The Regency MX7000 scanner lets you monitor military, F.B.I., Space Satellites, Police and Fire Departments, Drug Enforcement Agencies, Defense Department, Aeronautical AM band, Aero Navigation Band, Fish & Game, Immigration, Paramedics, Amateur Radio, Justice Department, State Department, plus thousands of other radio frequencies most scanners can't pick up. The Regency MX7000 is the perfect scanner for intelligence agencies that need to monitor the new 800 MHz cellular telephone band. The MX7000, now at a special price from CE.

## Regency<sup>®</sup> MX4000-BB

List price \$629.95/CE price \$279.00/SPECIAL  
Multi-Band, 20 Channel • No-crystal scanner  
Search • Lockout • Priority • AC/DC  
Selectable AM-FM modes • LCD display  
Bands: 30-50, 118-136, 144-174, 440-512, 800-950 MHz  
The Regency MX4000 is gives coverage in the standard VHF and UHF ranges with the important addition of the 800 MHz and aircraft bands. It features keyboard entry, multifunction liquid crystal display and variable search increments.

## Regency<sup>®</sup> Z60-BB

List price \$379.95/CE price \$199.00/SPECIAL  
8-Band, 60 Channel • No-crystal scanner  
Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz  
Cover your choice of over 15,000 frequencies on 60 channels at the touch of your finger.

## Regency<sup>®</sup> RH250B-BB

List price \$613.00/CE price \$329.00/SPECIAL  
10 Channel • 25 Watt Transceiver • Priority  
The Regency RH250B is a ten-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to ten frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH250 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A UHF version of the same radio called the RU150B covers 450-482 MHz, but the cost is \$449.00. To get technician programming instructions, order a service manual from CE with your radio system.

## NEW! Bearcat<sup>®</sup> 50XL-BB

List price \$199.95/CE price \$129.00/SPECIAL  
10-Band, 10 Channel • Handheld scanner  
Bands: 29.7-54, 136-174, 406-512 MHz  
The Uniden Bearcat 50XL is an economical, hand-held scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order part # B5 which is 5 AA ni-cad batteries for \$13.00, a plug in wall charger, part # AD100 for \$14.95 and also order optional cigarette lighter cable part # P5001 for \$14.95.

## NEW! JIL SX-400-BB

List price \$799.95/CE price \$489.00/SPECIAL  
Multi-Band, 20 Channel • No-crystal Scanner  
Search • Lockout • Priority • AC/DC  
Frequency range 26-520 MHz, continuous coverage.  
With optionally equipped RF converters 150KHz-3.7 GHz.  
The JIL SX-400 synthesized scanner is designed for commercial and professional monitor users that demand features not found in ordinary scanners. The SX-400 will cover from 150 KHz to 3.7 GHz with RF converters. Order the following RF converters for your SX-400 scanner. RF-1030-BB at \$234.00 each for frequency range 150 KHz - 30 MHz. USB, LSB, CW and AM. (CW filter required for CW signal reception); RF-5080-BB at \$194.00 each for 500-800 MHz; RF-8014-BB at \$194.00 each for 800 MHz-1.4 GHz. Be sure to also order ACB-300-BB at \$99.00 each which is an antenna control box for connection of the RF converters. The RC-4000-BB data interface at \$259.00 each gives you control of the SX-400 scanner and RF converters through a computer. Add \$3.00 shipping for each RF converter, data interface or antenna control box. If you need further information on the JIL scanners, contact JIL directly at 213-928-8727 or write JIL at 17120 Edwards Road, Cerritos, California 90701 U.S.A.

## SPECIAL! JIL SX-200-BB

List price \$499.95/CE price \$154.00/SPECIAL  
Multi-Band - 16 Channel • No-Crystal Scanner  
Frequency range 26-88, 108-180, 380-514 MHz  
The JIL SX-200 has selectable AM/FM receiver circuits, tri-switch squelch settings -signal, audio and signal & audio, outdoor AC power supply - DC at 12 volts built-in, quartz clock - bright vacuum fluorescent blue read-outs and dimmer, dual level search speeds, tri-level scan delay switches, 16 memory channels in two channels banks, receive fine tune (RT) ± 2KHz, dual level RF gain settings - 20 db pad, AGC test points for optional signal strength meters all for this special price.

## Regency<sup>®</sup> HX1000-BB

List price \$329.95/CE price \$189.00/SPECIAL  
6-Band, 30 Channel • No Crystal scanner  
Search • Lockout • Priority • Scan delay  
Sidelit liquid crystal display • Digital Clock  
Frequency range: 30-50, 144-174, 440-512 MHz.  
The new handheld Regency HX1000 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 30 channels at the same time. The LCD display is even sidelit for night use. Order MA-256-BB rapid charge drop-in battery charger for \$68.95 plus \$3.00 shipping/handling includes wall charger, carrying case, belt clip, flexible antenna and nicad battery. Order now.

## NEW! Bearcat<sup>®</sup> 100XL-BB

List price \$349.95/CE price \$209.00/SPECIAL  
9-Band, 16 Channel • Priority • Scan Delay  
Search • Limit • Hold • Lockout • AC/DC  
Frequency range: 30-50, 118-174, 406-512 MHz.  
The world's first no-crystal handheld scanner now has a LCD channel display with backlight for low light use and aircraft band coverage at the same low price. Size is 13" x 7 1/4" x 2 1/4". The Bearcat 100XL has wide frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the AM aircraft band, the 2-meter and 70 cm. amateur bands, plus military and federal government frequencies. Wow...what a scanner!  
Included in our low CE price is a sturdy carrying case, carphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

## NEW! Regency<sup>®</sup> HX2000-BB

The World's First 800 MHz. Handheld Scanner  
List price \$589.95/CE price \$244.00/SPECIAL  
7-Band, 20 Channel • No-crystal scanner  
Priority control • Search/Scan • AC/DC  
Sidelit liquid crystal display • Memory backup  
Bands: 118-136, 144-174, 440-512, 800-950 MHz.  
The HX2000 scanner operates on 120V AC or 6 VDC. Scans 15 channels per second. Size 3" x 7" x 1 1/4". Includes wall charger, carrying case, belt clip, flexible antenna and nicad batteries. Selectable AM/FM modes.

## SPECIAL! Bearcat<sup>®</sup> DX1000-BB

List price \$649.95/CE price \$339.00/SPECIAL  
Frequency range 10 KHz. to 30 MHz.  
The Bearcat DX1000 shortwave radio makes tuning in London as easy as dialing a phone. Features PLL synthesized accuracy, two time zone 24-hour digital quartz clocks and more. Add \$12.00 for shipping.

## NEW! Bearcat<sup>®</sup> 800XL-BB

List price \$499.95/CE price \$294.00/SPECIAL  
12-Band, 40 Channel • No-crystal scanner  
Priority control • Search/Scan • AC/DC  
Bands: 29-54, 118-174, 406-512, 806-912 MHz.  
The Uniden 800XL receives 40 channels in two banks. Scans 15 channels per second. Size 9 1/4" x 4 1/4" x 1 1/2".

### OTHER RADIOS AND ACCESSORIES

Panasonic RF-2600-BB Shortwave receiver	\$179.95
Panasonic RF-8300-BB Shortwave receiver	\$195.95
RD95-BB Uniden Remote mount Radar Detector	\$139.95
RD55-BB Uniden Visor mount Radar Detector	\$119.95
BC20/20-BB Bearcat 40 channel scanner SALE	\$224.95
BC210XW-BB Bearcat 20 channel scanner SALE	\$209.95
BC 260-BB Bearcat 16 channel scanner SALE	\$194.95
BC 300-BB Bearcat 50 channel scanner SALE	\$254.95
BC-WA-BB Bearcat Weather Alert	\$39.95
DX1000-BB Bearcat shortwave receiver SALE	\$339.00
PC22-BB Uniden remote mount CB transceiver	\$99.95
PC55-BB Uniden mobile mount CB transceiver	\$99.95
Z45-BB Regency 45 channel scanner SALE	\$169.95
R1060-BB Regency 10 channel scanner	\$88.95
MX3000-BB Regency 30 channel scanner	\$199.95
C403-BB Regency 4 channel scanner SALE	\$65.95
R106-BB Regency 10 channel scanner	\$99.95
RH250B-BB Regency 10 channel VHF transceiver	\$329.00
RU150B-BB Regency 10 channel UHF transceiver	\$449.00
RP410-BB 10 ch. handheld no-crystal transceiver	\$399.00
BC10-BB Battery charger for Regency RP410	\$79.95
MA256-BB Drop-in charger for HX1000 scanner	\$68.95
MA257-BB Cigarette lighter cord for HX1000	\$19.95
MA917-BB Ni-Cad battery pack for HX1000	\$29.95
EC10-BB Programming tool for Regency RP410	\$20.00
SMRH250-BB Service man. for Regency RH250	\$20.00
SMRU150-BB Service man. for Regency RU150	\$20.00
SMRP410-BB Service man. for Regency RP410	\$20.00
SMXK7000-BB Svc. man. for MX7000 & MX3000	\$20.00
SMXK3000-BB Service man. for Regency MX3000	\$20.00
B-4-BB 1.2 V AAA Ni-Cad batteries (set of four)	\$9.00
A-1350-BB Crystal certificate	\$3.00
FB-E-BB Frequency Directory for Eastern U.S.A.	\$12.95
FB-W-BB Frequency Directory for Western U.S.A.	\$12.95
TSG-BB "Top Secret" Registry of U.S. Govt. Freq.	\$15.00
TIC-BB Techniques for Intercepting Comm.	\$15.00
RRF-BB Railroad frequency directory	\$10.00
CIE-BB Covert Intelligence. Elect. Eavesdropping	\$15.00
A60-BB Magnet mount mobile scanner antenna	\$35.00
A70-BB Base station scanner antenna	\$35.00
USAM-BB Magmount VHF/UHF ant. w/ 12' cable	\$39.95
USA6-BB 3/4" hole mount VHF/UHF ant. w/ 17' cable	\$35.95
USATL-BB Trunk 1/2" mount VHF/UHF antenna	\$35.95
Add \$3.00 shipping for all accessories ordered at the same time.	
Add \$12.00 shipping per shortwave receiver	
Add \$7.00 shipping per scanner and \$3.00 per antenna	

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To get the fastest delivery from CE of any scanner, send or phone your order directly to our Scanner Distribution Center. Michigan residents please add 4% sales tax or supply your tax ID number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A \$5.00 additional handling fee will be charged for all orders with a merchandise total under \$50.00. Shipments are F.O.E. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance.

Mail orders to: Communications Electronics,<sup>™</sup> Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add \$7.00 per scanner for U.P.S. ground shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, order toll-free by calling 800-221-3475. Telex CE anytime, dial 810-223-2422. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

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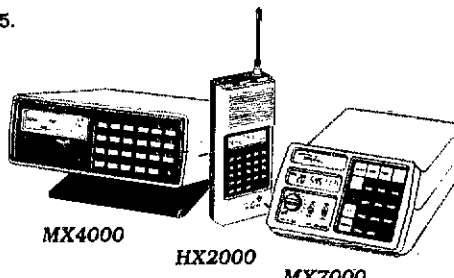
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### TH-21AT/31AT/41AT

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

• **High or low power.**

Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.

• **Pocket portability!**

Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) with PB-21.

• **Expanded frequency coverage (TH-21AT/A).**

Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.

**TH-31AT/A:** 220.000-

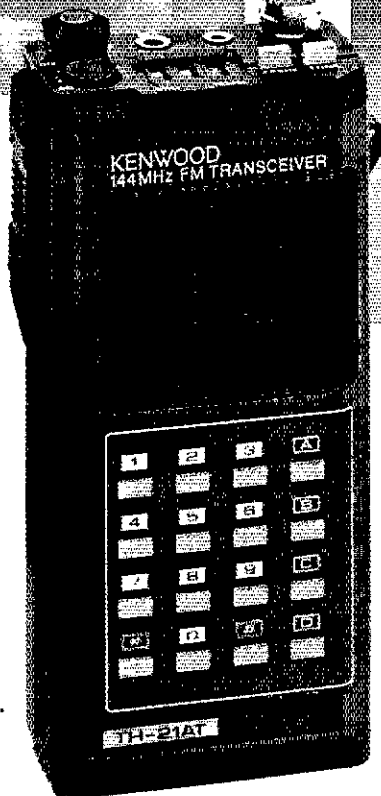
224.995 MHz in 5 kHz steps.

**TH-41AT/A:**

440.000-

449.995 MHz

in 5 kHz steps.



• **Easy-to-operate, functional design.**

Three digit thumbwheel frequency selection and handy top-mounted controls increase operating ease.

• **Repeater offset switch.**

**TH-21AT/A:**  $\pm 600$  kHz, simplex.

**TH-31AT/A:**  $-1.6$  MHz, reverse, simplex.

**TH-41AT/A:**  $\pm 6$  MHz, simplex.

• **Standard accessories:**

Rubber flex antenna, earphone, wall charger, 180 mAh NiCd battery pack, wrist strap.

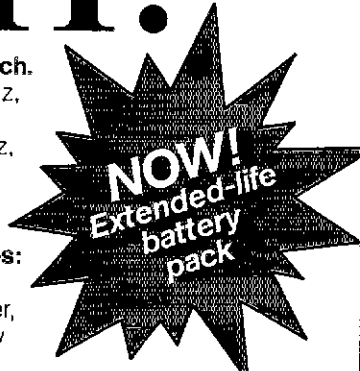
• **Quick change, locking battery case.**

The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.

• **Rugged, high impact molded case.**

The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

See your authorized Kenwood dealer and take home a pocketful of performance today!



**Optional accessories:**

- HMC-1 headset with VOX
- SMC-30 speaker microphone
- PB-21 NiCd 180 mAh battery
- PB-21H NiCd 500 mAh battery
- DC-21 DC-DC converter for mobile use
- BT-2 manganese/alkaline battery case
- EB-2 external C manganese/alkaline battery case
- SC-8/8T soft cases
- TU-6 programmable sub-tone unit
- AJ-3 thread-loc to BNC female adapter
- BC-6 2-pack quick charger
- BC-2 wall charger for PB-21H
- RA-8A/9A/10A StubbyDuk antenna
- BH-3 bell hook

# KENWOOD

TH-series transceivers shown with optional StubbyDuk antenna. TH-31AT shown with PB-21H. Specifications and prices are subject to change without notice or obligation. Complete service manuals are available for all Iro-Kenwood transceivers and most accessories.

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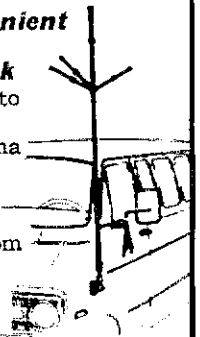
**Is Factory Pre-Tuning Good? No—it Just Does Not Work!**

Every HF mobile installation has its own characteristics, and the antenna must be tuned to fit them. Only the Spider™ Antenna with its patented tuning sleeves can be tailored by the user to fit his own requirements. If the antenna is later moved to a different installation, the Spider™ can always be re-tuned as needed.

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No more stopping to change coils. Once the Spider™ Antenna is tuned for 10, 15, 20 and 40 (or 75) meters, just switch your transceiver from band to band—the antenna will follow by itself.

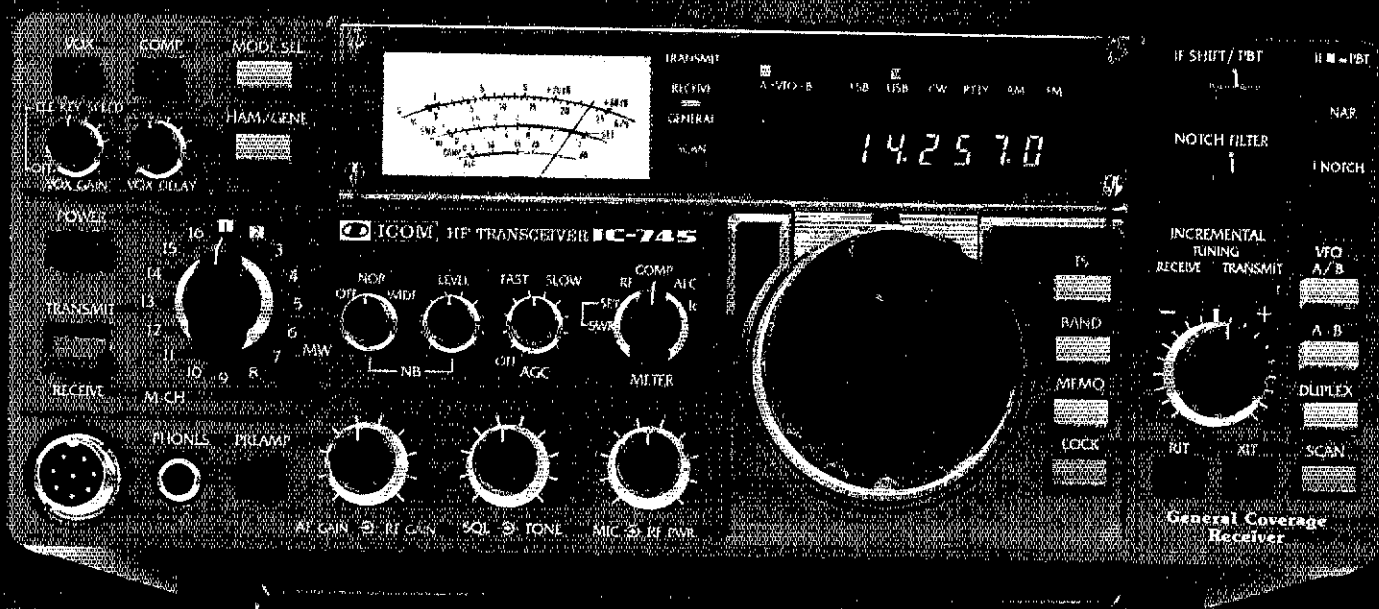


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ICOM HF Transceiver

# IC-745



## High Performance Maximum Flexibility

The IC-745 is a full featured, high performance HF base station transceiver with a 100dB dynamic range receiver. PLUS features usually found only in more expensive units.

### Compare these exceptional standard features:

- 100KHz - 30MHz Receiver
- 100 Watt RF output / 100% Duty Cycle
- Passband Tuning AND IF Shift
- Adjustable Noise Blanker (width and level)
- Adjustable AGC
- Receiver Preamp
- 16 tunable Memories with lithium battery backup



- Wide selection of filters and filter combinations (opt.)
- Continuously adjustable transmit power
- 10Hz/50Hz/1KHz Tuning rates with 1MHz band steps
- IC-HM12 Microphone with Up/Down Scan

### Other Standard Features

Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, program band scan, memory scan, all-mode squelch and VOX.

**Options:** IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, EX24L marker, EX24Z FM module, EX243 electronic keyer, IC-SM6 desk mic, and a variety of filters.

Filter	Width	Center Freq. MHz
FL45	500 Hz	2.000
FL54	270 Hz	2.000
FL44A	21 KHz	0.455
FL52A	500 Hz	0.455
FL53A	250 Hz	0.455

The IC-745 is the only transceiver today that has so much flexibility at a surprisingly low price. See it at your local ICOM dealer.

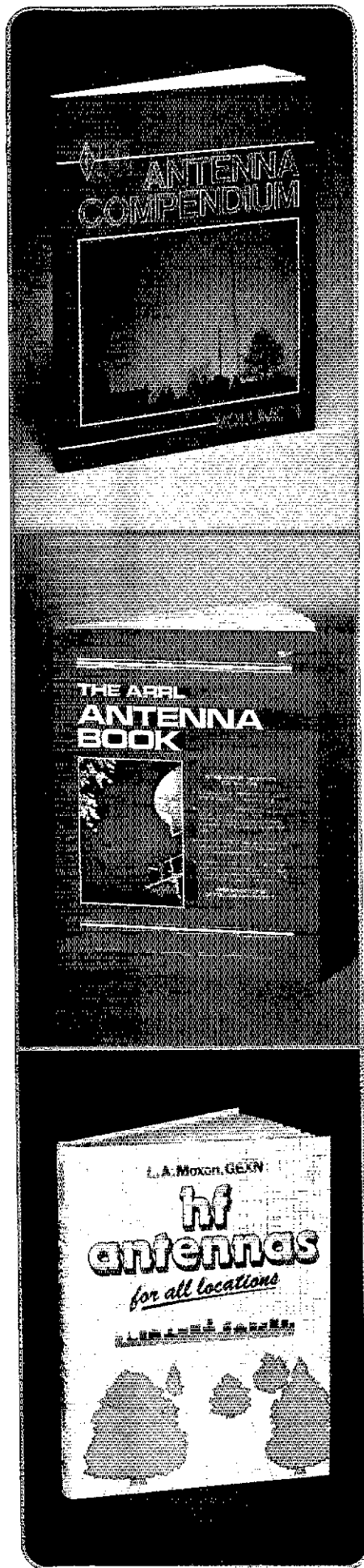


First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 7451284





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Because of space limitations in *QST*, we don't have room to run all of the good antenna articles that are submitted. The solution to this problem? **THE ARRL ANTENNA COMPENDIUM!** You'll find 178 pages packed with new material on quads, loops, log periodic arrays, other beam antennas, multiband antennas, verticals, reduced size antennas, plus such interesting topics as: Mr. Smith's "Other" Chart and Broadband Rigs; Available Power, SWR and Loading; Baluns: What They Do and How They Do It; The Horizontal Dipole Over Lossy Ground; and Antenna Polarization. Copyright 1985. Paperbound: **\$10.00** in the U.S., **\$11.00** elsewhere.

## OTHER ANTENNA BOOKS

**THE ARRL ANTENNA BOOK** The best and most highly regarded antenna information available. The 14th Edition contains 328 pages of propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Copyright 1982. Paperbound: **\$8.00** in the U.S., **\$8.50** elsewhere. Clothbound: **\$12.50** in the U.S., **\$13.50** elsewhere.

**HF ANTENNAS FOR ALL LOCATIONS** by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **\$12.00**.



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ICOM 144, 220 and 440MHz

# MOBILES



## The World's Most Compact Mobiles

ICOM's three ultra compact mobiles...the IC-27A 144MHz, the IC-37A 220MHz and the IC-47A 440MHz...are the smallest mobiles available.

Even in such a small package, the 25 watt mobiles contain an internal speaker which makes them fully self-contained and easy to mount.

Small size. The ICOM compact mobiles measure only 5 1/2" W x 1 1/2" H x 1 1/2" D (IC-47A is 9" deep), which allows them to be mounted in various compact applications. Yet the compact mobiles have large operating knobs which are easy to use in the mobile environment.

**More Features.** Other IC-27A/37A/47A standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan, and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 external speaker are also available.

Internal Speaker

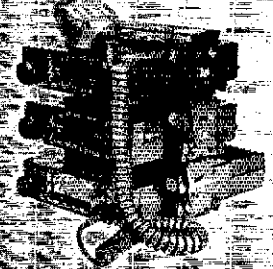


**32 PL Frequencies.** The IC-27A/37A/47A come complete with 32 PL frequencies.

**9 Memories.** The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

**Speech Synthesizer.** To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

**Scanning.** The ICOM compact mobiles have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel, and the scanning speed is adjustable.



**Stacking Mobile Mounts.** The IC-27A/37A/47A can be stacked to provide a three-band mobile station. Each band is full featured and will operate even when another band is in use.

The IC-27A/37A/47A provide superb performance in the mobile radio environment. See them at your local ICOM dealer.



# ICOM

## First in Communications



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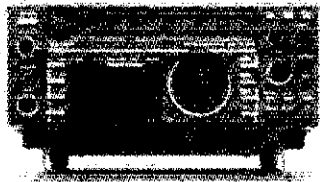
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Hegency UC102 VHF 2 Channel Handi Talkie . . . . . 150.00  
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## ACCESSORIES

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Bird Elements: H/59 00; A-E/48 00; . . . . . In Stock  
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## DON'S CORNER

First of all: The winner of our first Proofreading Con-  
test is Bob Reinhart, K1KK. Bob will be receiving our  
CALRAD SWR meter, prepaid and free. If you didn't  
win, look at this ad. This is an ongoing contest. Send  
us a card. First card with most correct errors noted  
wins.

If you're a collector of old equipment, call us on  
your money, and we'll tell you if the prices you're  
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posedly old-time ham who came into the store with his  
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dressed to Phantom Avenue. It's F-A-N-N-I-N.

Have a great Christmas from everyone at Madison.  
Hope that Santa brings you a real nice transceiver —  
and buys it from us.

73 & Good DX  
DON

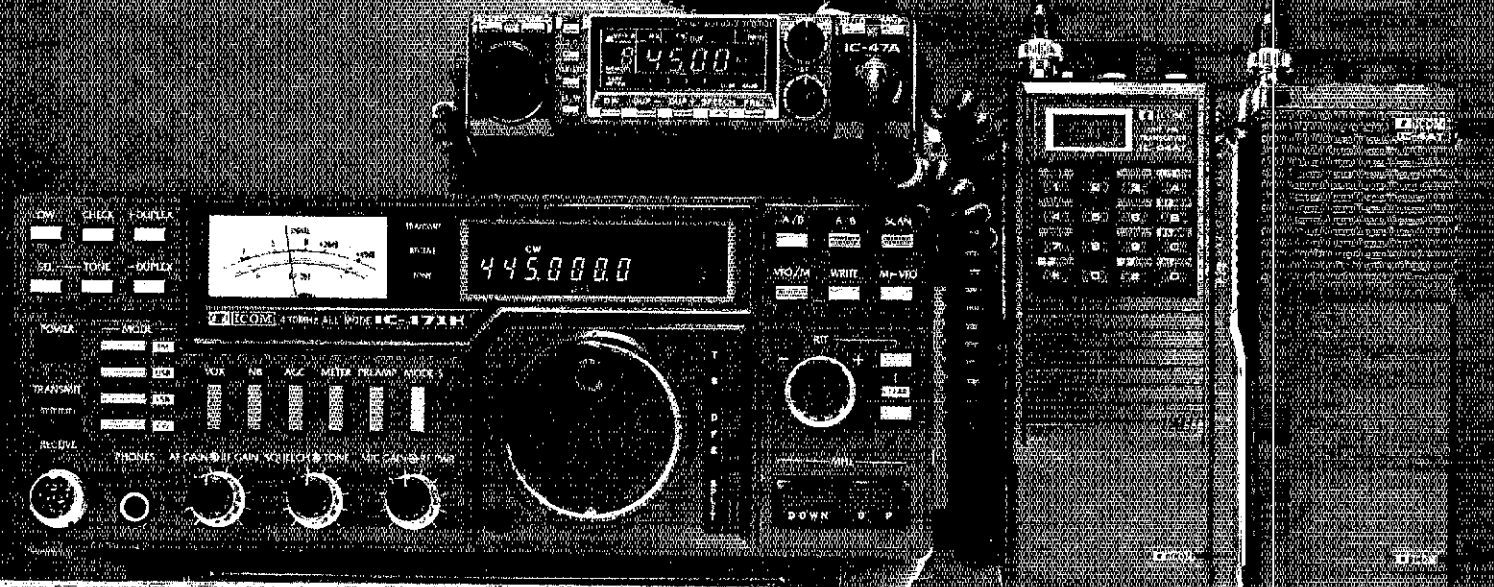
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## Electronics Supply

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# ICOM 440MHz



## For a Total UHF System, Choose ICOM

ICOM offers a variety of UHF gear to meet your operating requirements... the IC-471H base station transceiver, IC-47A compact mobile, IC-04AT or IC-4AT handheld transceivers, and the RP-3010 crystal controlled repeater.

The IC-471H all mode 430-450MHz base station transceiver provides 10 to 75 watts of adjustable power. With 32 full-function memories, 32 PL tones, memory scan, mode scan and programmable band scan, the IC-471H provides maximum UHF base station performance. The IC-471A 25 watt version is also available.

The IC-47A 25 watt 440-449.995MHz ultra-compact FM mobile provides superb performance in the mobile environment. Measuring only 5 1/2" wide by 1 1/2" high by 9" deep, the IC-47A also features nine full-function memories, 32 built-in PL tones and a complete scanning system. Each unit comes standard with an HM-23 mic with up/down scan and a mobile mounting bracket.

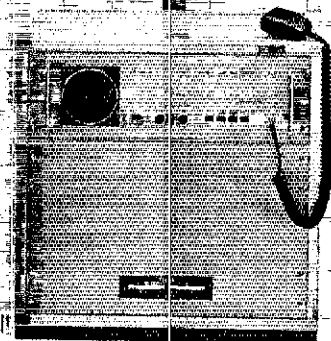
Optional AG-35 Mast Mounted GaAsFET Preamp/Filter for IC-471H



The IC-04AT top-of-the-line UHF handheld features DTMF direct keyboard entry, LCD readout, 32 PL tones, 3 watts standard (5 watts optional) and 10 memories which store duplex offset and PL tone.

The IC-4AT handheld features 440-449.995MHz coverage, a DTMF pad, 1.5 watts output and thumbwheel frequency selection.

The IC-04AT and IC-4AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. PLUS a wide variety of slide-on battery packs and accessories are available.



The RP-3010 crystal controlled UHF repeater covers from 430-450MHz and includes CTCSS, digit DTMF decoder and CW ID'er.

See ICOM's full line of UHF gear at your local ICOM dealer.



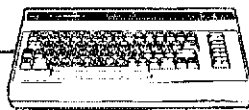
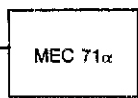
# ICOM

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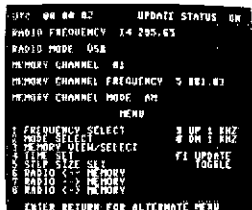
ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98005 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 471H1184

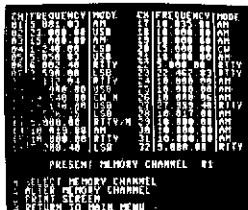
# ICOM R71-751-R7000\* COMPUTER INTERFACE



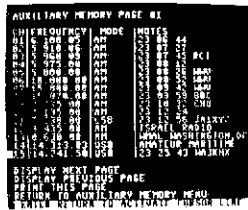
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**MAIN MENU** Control center for entire system. Showing: 24HR UTC time; radio freq. & mode; memory CH, freq, mode plus ID functions for your selection.



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**AUXILIARY MEMORY** Showing page 1 of 47 pages each having 15 memories. Freq, mode, UTC time and room for your notes. Auto log feature allows instant logging of receiver freq, mode, time...

- **Easy to use.** No computer knowledge needed, automatic program loading. No disk or tape required (except for aux memory storage).
- **Menu driven** to aid user at each step.
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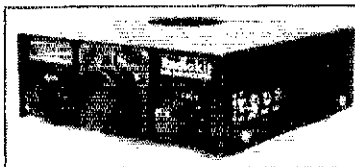


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## COMPACT 75 M SSB TRANSCEIVER



Dimensions 2" x 6" x 6"

Complete Kit  
**\$199.95**

plus \$3.00 shipping and handling

### RECEIVER:

Frequency 3.8-4.0 MHz  
Sensitivity 0.5 μV for 10 dB S/N  
Selectivity -8 dB @ 2.4 KHz  
AGC Range +60 dB in = +3 dB out  
Audio Output >350 mW into 8 ohms

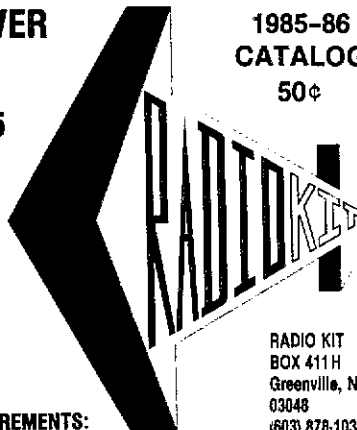
### TRANSMITTER:

Frequency 3.8-4.0 MHz  
Output 30 watts into 50 ohms  
IMD -30 dB  
Harmonics 2nd -47 dB, 3rd -55 dB  
SWR Immunity 30:1 @ all phase angles  
ALC Amplified, fast response rate (quasi-processing)

### POWER REQUIREMENTS:

Voltage 28 Vdc regulated  
Current 2A transmit, 65 mA receive

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CATALOG  
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to the volunteer exam program. More dedicated volunteers are always needed for the ARRL Field Organization so why not make 1986 the year you step forward. Traffic: K0DKM, 172. WB0TED, 86. W0KK, 81. K0IXY, 23. KA0BCB, 13. KA0BWM, 11. WA0BOK, 10. WB0GQM, 9. WD0BOX.

## NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EJC. SEC: KA1ECL, BM: K0ZJJ, ACC: KG1M. OO/RFI: NA1J. TC: W1HAD, PIO: KA1B, SGL: K1AH. NET 3640. LOCAL TIME 309 167. CPN 3985 1800 M-S 378 127. WCN 78/18 2030 475 195. WB1GXZ.

Greetings to all in the Conn. section. The month of September was undoubtedly one of the most trying months for our field organization in recent years. The earthquake in Mexico and our own Hurricane Gloria provided an opportunity to provide emergency communications for not only our section but that of another country as well. Many radio clubs, ARES groups, traffic nets, and individuals joined in to serve others. Many reports have come in stating superior skills and dedication during the entire period of time that was requested. Radio and television stations requested help and also at the same time promoted our efforts. Agencies served were numerous, among the many served were police, fire, Red Cross, National Weather Service, civil preparedness, radio and T.V. to name just a few. Your SEC and STM and their dedicated staff of net managers, E.C.'s, and members deserve the utmost praise in the manner in which they conducted themselves in working over long periods of time and under trying conditions. As the reports come in I will try to incorporate them in this column. I am proud to be your S.M., congratulations and thank you for a job well done. WB1GXZ did it again with another 100% to FRN for Sept. Next month you will be seeing a new format for the section news column. From now on each of your section leadership will be writing a part of the column to inform you better on various topics relating to tlc, ARES, OO, clubs, tech., news, etc. I hope you will like our new format and remember to let me know. 73's, Traffic: WB1CQO 600, WB1GXZ 512, W1EFW 317, KA1KPS 287, K1EIR 287, KA1GWE 221, KA1BHT 131, WB1CRH 85, KA1KTH 81, W1WVP 79, W1YOL 52, W1QV 28, WA1NLD 27, W1BDN 26, KA1AQ 24, N1BOW 22, W1COH 8, K1OQG 3.

**EASTERN MASSACHUSETTS:** SM, Luck Hurdur, KY1T—ASM: N1BBT & K9HI. OO/AA: KA1KF. SEC: KB1PA. STM: KW1U. ACC: K1AZE. TC: KA1UI. PIO: K1HLZ.  
Net Mgr Freq TimeLoc/Dy Gtc Onl  
EMRI N1AJJ 1500/200/Dy 280 185  
EMRIPN N1BGM 3890 1730/Dy 240 260  
EM2MN KA1AMR 63/23 2000/Dy 252 462  
NEEPN K1BZD 3945 0830/SN 10 56  
HHTN WB1CQO 04/84 2230/Dy 239 538  
EMRISS KA1EXJ 3715 1600/2030/Dy 137 251  
CITN N1BYG 845/045 1930/Dy 81 225

During September, many dedicated EMASS Amateurs showed their public service communications expertise and stamina. First, as the true effect of the Mexico City disaster became known via Amateur Radio, countless stations swung into action, including among them W1ZLG and K1TN, both of whom received extraordinary coverage in the press. Most EMASS League officials were simply inundated with requests for information from the press, indicating that the word is out as to whom to contact in time of disaster. Long before the Mexican communications emergency was resolved, alas - along came Gloria! Under the expert guidance of K1BZD and his Net Controls, the New England Emergency Phone Net provided information, assistance, and assurance to countless communities up and down the east coast. SEC KB1PA mobilized his DEC's, EC's and ARES members throughout the Section, all of whom provided communications support both to the State and to their local communities. Weather data and emergency shelter information were two of the most often-heard topics throughout the section during the hurricane. Much of the professionalism displayed by ARES & NTS Amateurs throughout both emergencies was the result of training gained on the day-to-day networks that are listed at the top of this column. Do yourselves and your localities an enormous favor, and become active in one or more nets so that you can become that much more proficient when it counts! A hearty welcome to new Net Manager N1CVE, and a warm thank you to KA1EXJ for her valuable support of EMRISS. Traffic: KW1U 990, KN1K 451, WA1BY 398, W1PEX 300, WA1FCD 247, N1BGM 231, K1GR 215, KB1AF 203, KA1AE 186, K1T 153, N1AJJ 152, W1CJ 141, W1CJ 128, WB1CQO 118, W1BHT 114, KA1AMR 99, N1DDC 68, N1CVE 62, W1DA 59, KA1EID 58, KA1ON 58, KB1PA 55, K1ABO 38, KA1MAM, 37, WA16NH 37, WA1TZO 38, W1DMH 33, WA1FNM 28, W1ZHC 26, KA1KCU 19, KA1LH 17, K1BZD 15, K1IK 12, KY1B 11, KA1DJV 8, K1LCQ 5.

**MAINE:** SM, Cliff Lavery, W1RWG—SEC: KL7JG/A, STM: AK1W, ACC: KY1C, BM: W1JTH, OOC: W1KX, PIO: KY1E, SGL: K1NIT, TC: K1PV. Welcome to the Mid-Coast Repeater Association to the circle of ARRL Affiliated Clubs. Glen, K1MAN, Belgrade Lakes, has been serving as world-wide system control for Mexico City emerg network on 14.275 with XE1HC, XE1ALD, XE1EM, assisted by Al, W1OLQ, and Ernie, W1BFA. Hurricane Gloria was thwarted, communication-wise, by dedicated hams on emergency nets CMEN and MP5N. Mid-Coast organized for emergency traffic on 146.985 at CEP headquarters, Rockland. ARRL VEC exams are being run monthly in Rockland. Section Manager, W1RFB, is looking for applications for Section Emergency Coordinator. KL7JG will be retiring this coming year. Maine Section needs bulletin stn in Aroostook and needs many more ATC's and PIA's. PSHR: N1BJW 74, WA1YNZ 71, KL7JG 67, WB1CBP 42 (Novice). Traffic: K1M2B 171, AK1W 113, KA1AVU 99, W1ISO 79, N1BLZ 66, N1BJW 49, W1RWG 49, W1JTH 38, WB1CBP 36, W1BMX 31, KL7JG 29, KA1JQJ 26, WA1YNZ 24, WB1GLH 14, W1GCB 13, W1OTQ 12, KA1FTL 12, KA1ENL 7, NB1T 2.

**RHODE ISLAND:** SM, John (Bob) Vota, WB1FDY—KB1G the S.E.C. has an A.R.E.S. Net on Tues. evening at 8:00 P.M. on 146.70. TNX to the S.E.C. and his team the Mexico City earthquake and Hurricane Gloria was well covered. Tnx all for a job well done. The N.C.R.C. with the A.S.M. KY1G and P.I.C. N1DRL was on hand for the Trilateral field in Newport, RI. Their group helped assist in first aid to a cyclist that was injured on route. The BVARC applied emerg. comm. for the Autumnfest Parade. The EBWWA is running GEN. and Tec. classes at Barrington High School. Tnx to all clubs for a job well done. We have a Silent Key, KA1KQ, Rick Talbot. He will be missed. I wish you all the best of Happy Holidays. Traffic: KA1KML 136, KA1JXH 50, W1E0F 38, WA1CRY 27.

# IC-02AT

## ICOM 2-Meter Handhelds

If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

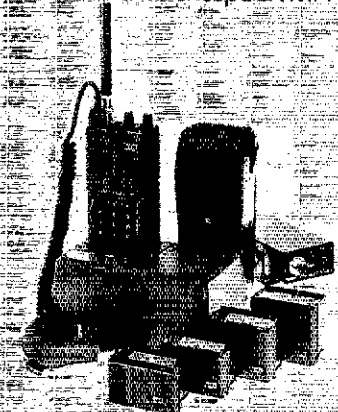
**Frequency Coverage.** The IC-02AT covers 140,000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz...both include frequencies for MARS operation.

**IC-02AT Features.** ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

**IC-2AT Features.** The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selec-

tion. The IC-2A is also available and has the same features as the IC-2AT except DTMF.



**Accessories.** A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAh IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and a assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

Often imitated,  
never duplicated.



First in Communications





# GOOD OLD



- **A FUN WAY TO LEARN THE CODE**
- **A FUN WAY TO IMPROVE YOUR PROFICIENCY**

Just plug the Morse University\* cartridge into your Commodore 64™ or C 128 computer, choose one of the five routines from the MU\* menu and the fun begins!

The LEARNING ROUTINE teaches individual characters. Each character is sent at 20 WPM, but with 3 seconds between characters so you will learn the code by sound. Let's suppose you have progressed to session 5. The new letter that you will be learning is "T". Select "groups of 1" and the program sends: "TTTTTTT . . . ." Select "groups of 2" and random 2-letter groups are sent consisting of "T" and any 1 of 4 previously learned letters: "TK BQ QT FB TQ TF . . . ." Select "5 letter groups" and the program sends at random all 5 letters that you have learned in 5 letter groups: FKBQT BQFKT TBQKF BTFBK QBFTK . . . . The number of times the new character appears can be selected so that it is sent all of the time, half of the time or at random.

The PROFICIENCY ROUTINE sends a random sequence of characters with options as to practice duration, start speeds and finish speed. For example, you can start at 5 WPM and the speed will gradually increase to 20 WPM over a 10-minute period.

The SENDING ANALYSIS ROUTINE analyzes character formation and spacing.

In the RECEIVING GAME, a series of thunderclouds passes over the ham antennas in a small town. After the characters have been sent, a lightning bolt is released. If you correctly type in the characters that were sent, you zap the lightning bolt. If not, or you are too slow, the bolt will knock down one of the antennas. The game is over when 19 antennas are down.

You can compose your own code practice for other students using the MORSE KEYBOARD. The characters may be stored in a buffer until sent.

The menu also allows you to select the tone and also color if you have the proper monitor.

### THE ARRL MORSE UNIVERSITY\* AMATEUR RADIO STARTER KIT

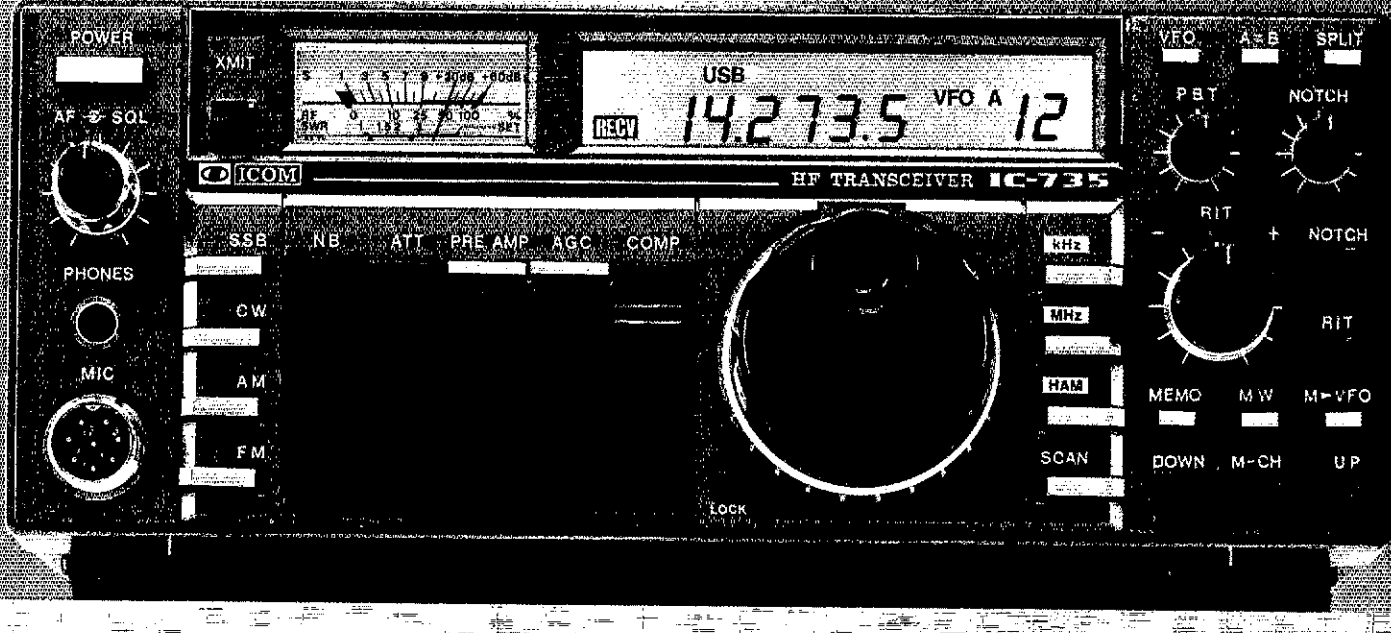
Consists of the cartridge described above, instruction manual, Tune-in the World with Ham Radio (book only) and other information for the prospective Novice. Can be used only with C 64 or C 128 computers and TV monitor, not supplied. Price of the package is \$40.00. Available from: ARRL, 225 Main Street, Newington, CT 06111.

\*MORSE UNIVERSITY is a trademark of AEA, Inc.

# NEW!

# ICOM HF TRANSCEIVER

# IC-735



## Ultra Compact

The new ICOM IC-735 is what you've been asking for...the most compact and advanced full-featured HF transceiver with general coverage receiver on the market. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine or base station operation.

## More Standard Features

Dollar-for-dollar the IC-735 includes more standard features...FM built-in, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.

## Superior Performance

It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

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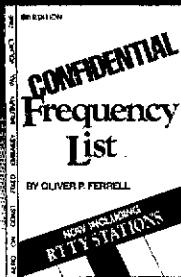
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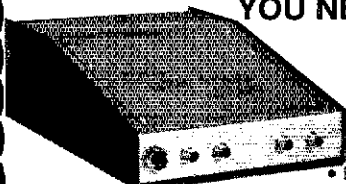


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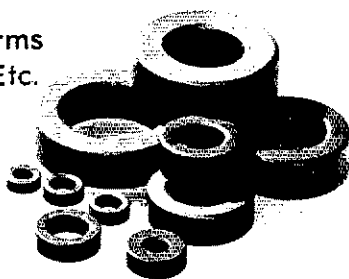
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VERMONT: SM, Ralph T. Stetson, KD1R—HAPPY HOLIDAYS to all! Hope your holiday season is a joyous one. To all of you who pitched in during the hurricane Gloria Emergency a very special thanks for giving of your time. We were able to prove several things from this emergency first we were able to get stations on in a minimum period of time covering all of Vermont on both HF & VHF bands I was very impressed by the rapid forwarding of vital weather information via Packet Radio it certainly proved its usefulness in VT. We were very lucky this time who knows that the next Emergency will bring so everyone stay prepared we don't always get good warning like we did this time to W1WV and a others efforts are really appreciated as well. On lighter note the CQ ERG had a very successful auction led by K1KMB asst by WB1AJG, KA1MNH, N1CPO and Maureen (N1CPO YL). Also congrats to WIPMH new SGL from CVARC. Joe W1KRV is taking over as TC, I wish to thank you Joe for the great job you have done for us as SGL, and am looking forward to working with you in the future as TC for VT. Anyone interested in an ATC appt. contact W1KRV he is good in Callbook. I realize it is only December but lets start thinking about FD 88. Now is time to select your FD Manager and get the ball rolling. Still nothing in my mailbox on who the youngest active Ham in VT is? Heard on the Grapevine that Silicon Junction and In Essex, Jct also the CVARC is doing same in Northfield as well as the Ct Valley FM assoc has classes in the Lebanon/White River area. Looks like a bumper crop of new hams coming along. Good luck to all. If it is time for you to renew your ARRL membership consider doing it through your club and give them a hand in meeting the Club Challenge for 85. Your membership could help win a transceiver or one of several other prizes being offered. NETS VTN 31/130/79; VSBN 30/430/10; WFFD 8/62/18; GAR 25/742/45; VFN 47/65; CVFMM 5/1/10; Traffic: KT1Q 496; AE1T 154; N1COB 55; W1KRV 40; W1OAK 34; KB1UE 23. HAPPY NEW YEAR 1985.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T-SEC/SGL: WB1RH, OO/RFI: N1CM, PIO/ACQ: K1BE, STM: W1UD, TC: KA1JJM, Provin Mt. Club joining ARRL. Congrats to KA1MP, who is now Advanced and KA1MGA who has passed Extra at age 13! HCRA has over 40 students in their license classes. This was THE month for Public Service. NOBARC did comms for Josh Billings triathlon. And there was the Mexican earthquake. Then Gloria a week later. Everyone in independent nets, direct contact with Mexico, NTS, ARES, CD are to be congratulated for their work. Rep. Catjakis filed House Bill 4871 to eliminate ham license plate fees in appreciation. WB1HH made BPL with 126 originations. WA1LES and WB1HH got nice coverage in Springfield and N. Adams papers and W1KK on Ch. 22. For Gloria over 85 were active in WMA, including staffing all National Weather Offices. At. Tom at Baystate Med. Center, and Gary at local police and GB holds Quota from the public. "He has helped so many people". "It was wonderful". "We are so grateful". "They're great". From the hams. "We'll go as long as we have to". "We (are) grateful for the privilege". "That's the whole idea behind the hobby".

### NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB—SEC: KL7QS, OO/RFI: AL7FL, STM: KL7T, PIO: NL7CP, KL7GG-Mel Bowns is the new Frequency Coordinator. He has a repeater questionnaire to be filled out so your favorite repeater will be correctly logged in the directory. It is with great reservation that I announce the resignation of Martha, KL7QS, from Section Emergency Coordinator and Neol AL7FL Resignation as Official Observer/RFI and also Regional Monitoring Station. Both Martha and Neol are leaving the state. Their work and labor has been much appreciated by all. It is time for our next meeting so survey your membership and pick the best. Vince W1LK, informs me the Field Day trophy JARC has won the past two years is free for all clubs in Alaska to try and win. Remember handling traffic may take time but is appreciated by all. Motley 1093; KL7GID 100, KL7VL 12

IDAHO: SM, Lem Allen, W7JMH—SEC: KD7HZ, STM: W7GHT, OO: KU7Y, RFI: K7QOP, PIO: WB7PFQ, TO: W7ZRC, ASM: KAT7, CLUB NEWS: Twin Falls Club provided Communications for the annual Rim-to-Rim Run in Twin Falls. Boise Club sponsored VE Exams Sept. 28, 11 attended, 7 upgraded. ARRL MATTERS: N7BI appointed Asst SEC. He will be acting as SEC during absence (3 months) of KD7HZ. PEOPLE AND THINGS: WA7RUT has new TS-130S. Many Idaho Hams met at Walla Walla Swapfest Sept. 21. Congrats to KA5SF (N) KA7VOM new G's: KA7VND, KA7UCC, KA7VFN, KA7VFN, KA7VFN; Fred Castleman new net w/vice. Special congrats to Bob Bristol, blind and deaf, who now has new Nvices call KA7WCE. W7WU on a month-long motor home trip to SW US places. KD7HZ gone to Calif for 3 months. We all mourn the passing of Frank Smith, N7GOT. We will miss him.

NET REPORTS:

Net	Freq.	Time	Sess.	QNI	OTC
FARM	3937	Lsb 8P Da	30	1984	103
ID CD	3990	Lsb 810A M-F	21	784	48
IMN	3835	CW 9P M-F	21	240	103

GENERAL: FCC has announced that effective Nov. 8, 1985 the 30-day waiting period before re-examination will be dropped. A notice if you could take a day after failure, if an exam opportunity existed. Traffic: W7GHT 406, KA7KA 172, W7JMH 56, KA7HO 16.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE, SEC: N7CPA, PIO: K7YV, SGL: KA7XSK, STC: N7EML, ACQ: K7BC, OO: N7SC, RFI: AK7T, Upgrades: KA7RCC, N7DJENQTN (EXTRA); N7FFE, KA7OMW (Advanced); KA7RNO, KA7VGI, KA7GZQ, N7GZK, N7HIM (General); KA7THY (Tech). Congratulations, The N.W. Shrine ARC had it's semi-annual meeting in Portland on 5 October. Newly installed officers from Oregon were KA7RFR as President and K7BC as Sec/Treas. The club supports stations in the NW Shrine Hospitals. They are for messages and phone patches for the children in residence. They also provide a place for the kids to learn about Amateur Radio. If you are a Shriner or interested the group meets every Sunday morning at 9AM on 3925 kHz. KA7USZ, Jeremiah, from Newberg doesn't seem to have any trouble QSOing with VE7EKL, Gwen of Clearwater B.C. on 40 CW. He is ten and she is twelve and would probably have a difficult time talking as much person to person. N7CPA and several others from Newberg were active from George Fox College for the Mexico City disaster. They were able to use the college facilities and phone lines to handle health and welfare traffic and to relay information to the Mexican Consulate in Portland. Traffic: W7VSE 648, WA7VTD 388, KT7QK 246, AL7WP 143, W7ZB 107, N7FXJ 96, N7BGV 75, KA7AD 42, W7FB 29, W7LNE 11, K7TX 8.

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# IC-1271A



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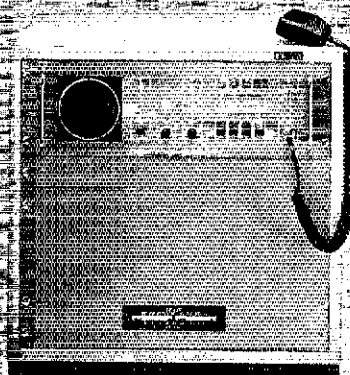
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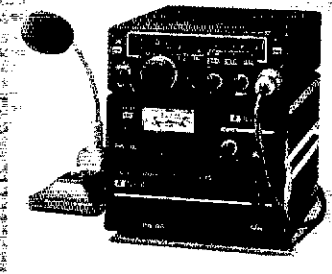
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Net	Freq.	Time/2	QNI	QCT	Mgr.
EWTN	146.46/	0030/0430	38	50	WA7CBN
NTN	3970	1900	1086	89	
NV55S	3946	0130	696	29	W7HEN
PSST	145.33	0030/0430	186	123	W7IEU
WARTS	3970	0100	3209	418	W7IGC
WISN	3950	0145/0445	514	207	W7GB
WARNS	3940	0200	AR NEWS	NET	W7KZ

This is my last writing of this column. I have enjoyed the last four years as SM and hope that I contributed in some small way to the improvement of Amateur Radio. I wish to thank you my many friends that have given your help and cooperation and were so courteous to me. I have always deemed it a privilege to serve as SM. Let us welcome our new SM Gene Sprague, KD7G, aboard and wish him much success. I urge all of you to help Gene when needed to administer this large responsibility. His section level appointments are: STM KD7ME, SEC W6IHL, OO COORD. N7IL, TC W7BUN, P10/SGL W7CKZ, ACC K07PB, BM is yet to be announced. Kitsap County ARS is ready! D.E.C. K7FA reports a successful exercise was conducted using Amateur Radio as back-up communication. Thirteen hams responded to a simulated explosion at the KC fairgrounds and the three Bremerton hospitals. Herb said the plan worked well and he is confident that if called for, the real thing, ARS would do the job well. The Issaquah ARC has a new editor for their informative newsletter the Squakbox. N7GGW said he would like to help Amateur Radio by making the new sets he has in the area. The club will again furnish comms for the Issaquah "Salmon Days". The Clark Co. ARC emergency operations trailer is nearing completion. W7WFO is preparing the original club insignias in fine detail and 20" in dia. for each side of the trailer. The club's Sept. flea market was a success and they suggest you look for future repeats. Pierce Co. ARS gets new EC! KA7INX steps in as EC to replace N7DRT who resigned to become State RACES Radio Officer. Ed has been busy in his new job handling many searches and is doing a good job. King Co. ARS also has changed EC! KA7AEF replaces N7ACW upon his retirement after an active and successful two year term. Thanks to you Keith and we set the Western Wash. Fair handled 828 messages, had over 500 Hams sign the quest book and 150 sign up for license classes. KD7ME was in charge with an assist from N7BXI and scores of RCT members for the three week event. Traffic: W7DK 1664, KD7ME 954, W7WOW 577, K7GXZ 291, K7YF 186, W7LG 162, W7GB 111, KD7J 59, K7L 57, W7IEU 51, N7E3 30, N7FXM 29, K7CPH 28, KD7 27, KA7TCE 26, K7AJT 19, WA7BDD 19, W7APS 17, N7GDW 12, W7AZU 8, KD7MW 7, K7OXL 6, W7AIB 1. — 73, WA7RWK

### PACIFIC DIVISION

EAST BAY: SM, Bob Vallo, W6RGG — ASM: W6ZF. N6DHN. SEC: W6LJ. STM: N616. OO: W6TGF participated in a public hearing on a new antenna ordinance in Pleasanton. He also passed Health and Welfare traffic for visitors from their sister city, Tulancingo, Mexico, who were in Pleasanton at the time of the earthquake. EBARC members N6IA, K6AGD, N6GC, N6DRT, N6EEG, K6SHF, N6IUJ, N6JNK, K6BNQJ, K6F6D, W6P5H, W6B6DS, W6V7J, K6AWAG and W6ZVF operated club station W6CUS in support of Salvation Army Hd. in San Francisco during the emergency. Their club welcomed new members K6BRC, W6THD, Dave Pugatch, N6ASE, N6LSV, and W6S6V. K6BFR moved from Novice to tech as N6MNI, and W6ZV moved up to Extra. Cheers to both. W6RGG put in 45 hours working with XE1DD during which time 142 pieces of traffic were exchanged. LARK members K6GACK and W6B6XP both upgraded to General. Conrats. Traffic: K6APW 176, W6B6B 141, W6WOM 140, (Aug.) K6APW 101.

NEVADA: SM, Joe Lambert, W8IXD — SEC: K7HRW. P10: WA7JUD. TC: K7ICW. ATO/RFI: KD7BT. New ATC's are N7GWR and N7DBN. Nevada Weather Net (NCS KA7EUA) had 345 check-ins for the month. SNAPS Volunteer Exams were given in Reno in September and are scheduled for Feb. 22, April 19, and June 21, 1986. Contact K7YV or K7HRW for info. There is increased Packet Radio Activity in Southern Nevada, with about 15 stations and two mountain-top repeaters reaching into Southern California. About 20 Nev. stations handled more than 200 pieces of traffic in Reno and Las Vegas. Favorable TV publicity in both Reno and L.V. There are still openings for ATC's—contact K7ICW if you can help. Anyone interested in ARRL Field Appointments, contact W8IXD, SM, P.O. Box 1201, Boulder City, NV 89005.

PACIFIC: SM, James Wakelield, AH6CO — Fox Hunts are in - BIARC held one on Sept 15 and EARC on Oct 13. Lots of fun! Try one! The RC-95 Cont/AutoP on 2282z Line is up and functioning FB with club members and emergency numbers programmed. Wimea High on Kauai has 26 in Novice class. Don't miss a bet like this for a school near you! KH6DW and KH6LT did FB job with traffic for the Mexican quake. Who else? Efforts through the ARC and Mexican Consulate proved most effective. KD2FF now AH6GJ. KH6B and the 6L6 Project is beginning to roll. Look for your local club for more info. KH6JAT is new coordinator for the HF emergency net. Will stimulate UHF activity! HIU reports PTN to W6 and is nearly inactive due to condx and other things. Needs members now. 73 Traffic: KH6LT 128, KH6S 45, KH6H 13.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW — This is my first column as your SM and I want to thank all who expressed their confidence in me by voting for me. I also want to thank Glenn Koropp, W6YFW, who is an Assistant Pacific Division Director and who has been acting as SM since the resignation of Ron Monet, N6AUB. Glenn has been very helpful and has promised his future support. The Nevada County ARC and the Sierra Foothills ARC held a joint picnic, and the Grass Valley members complain that they were outnumbered two to one and vow to do better next time. It is good to see interclub cooperation and the friendly rivalry - keep it up! Congratulations to the new officers of R.A.M.S., K6ZD, R6V, W6EJF, V.P. K6SGB Sec. W6TIC, Treas., and K6YV, W6S6V, K6B6U Directors. Golden Empire ARS, Chico, had a busy day. They held their first examination session as a VEC and held their annual "Steak Bake" with great prizes the same day. Amador County ARC held a work party to paint the CDF building that houses their repeater as a gesture of thanks to the CDF. Traffic: W6CLD 611, N6CUD 321, W6WJZ 169, N6LUY 89, W6BZQ 76, K6SFR 70, W6AZUD 20, W6BSRQ 6.

SAN FRANCISCO: SM, Bob Smith, N6BT — SEC: Peter Spruance, K6BLF. STM: Bob Franklin, K6TP. Dick, W6IPL, is a Silent Key. He was very active in Traffic Handling, was Net Manager of RN6, usually handling 400-500 pieces of

traffic per month. He will be missed by all. The SCRA Flea Market was a huge success this year, a vote of tnx goes to N1AL, W6DTV, and the whole crew from SCRA for a job well done. W6DTV is the section's newest ATC. Interested? See N1AL for information. SFRC now has their own equipment from the estate of Hensley, W6BDJ; I know it will be put to good use. SFRC XMAS party will be at Max's in Daly City this year. MARC was chosen the Volunteer Organization of the year in Marin County. What is the oldest amateur upgrade in testing? Maybe Earl, K6AAHK, wins, 60 years young and upgraded to SCRA testing in September. Can you beat this? Earl is suffering from a broken nose and will be repaired soon. Glad to see Section active in traffic handling after the Mexico City Quake, ready made PR and a use that amateur radio was made for, tnx to all who participated. Humboldt county entered the Computer age recently with the advent of Packet Communications, interested? See K6BLF or W6BME for the details on the newest form of communications. Traffic: W6RNL 150, KK1A 101, K6TWJ 83, N6FWG 21.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: W6YAB. STM: N6AWH. TC: W6BEXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. The ARRL Club Challenge for the 80's ends Dec. 31. Your affiliated club still has time to sign up new ARRL members under this program. The Kings ARC has a club house at the Kings County Fairgrounds. The Fresno ARC planning its Hamfest for the first week of May, 1986. W6GQ is W6B6. W6AB, K6G5V, N6MOT, W6AGJZ and N6JOT are K6B6. Advanced. K6BHTL is General, K6BJHX, K6BJHW, K6BIO are Tech. N6DTB is working DX. K6SSJ visited the Central Cal DX Club. Merry Christmas and Happy New Year to all. Traffic: N6AWH 154, K6B6HW 18, W6DPD 11, W6YAB 6.

SANTA CLARA VALLEY: SM, Rod Stafford, K6BZV — BM: W6BCY. P10: N6BIS. TC: K6HLE. SEC: K6ZTL. ACC: W6MKM. ASM: N6SN. STM: W6PHT. As of December 1, 1985, Santa Clara Valley Section will have a new Section Manager. The new SM is Glenn Thomas, W6B6W. He will be completing my term as SM due to the fact that I will be assuming the duties of the Pacific Division Director on January 1, 1986. Glenn has been the Emergency Coordinator for the City of Milpitas and has been very much involved in emergency and public service work in the section. I'm sure he will do an excellent job as SM. If you have the need to contact Glenn, his address is 554 Simas Drive, Milpitas, CA 95035. He intends to continue the Tuesday night section net on W6CQSI/R (146.76) at 9:00 PM so he will be available at that time also. Rusty Epps, W6CAT, recently gave a talk on the 1985 DXpedition to Clipperton at a West Valley ARA meeting. It was undoubtedly one of the best programs about a DXpedition that I have ever seen. He gave a brief history of Clipperton and then presented a slide show with a day-by-day narrative of the group's adventures on the island and their trip to and from the island. East Bay SM W6RGG and N6QJ were members of the group that went to Clipperton. They were both at the meeting and answered questions after the talk. If your club is looking for a program, even if your group is not into DXing, give W6CAT a call and invite him to present the program at one of your meetings. A lot of amateurs in the section handled traffic after the Mexico City earthquake. Amateur radio operators received some very nice comments in several of the area newspapers as a result of their traffic handling. Palo Alto EC W6A6NIL coordinated much of the traffic handling and the following amateurs handled piles of messages: KD5YL, NM6J, W6BZ, N6PHT, K6K6W, K6BHD, W6BYTS, W6B1, W6KSR, N6GCH, W6ASH, N6GXZ, W6JON, W6HJF, W6D, W6C, W6C, K6A, A16, W6P5H, W6RGG, W6B6W, K6B6U, W6B6W, N6MOD, K6APLO, W6A6LD, N6DJ, N6LYK & K6G6, W6ASH and his wife spent a great deal of time working on trying to get messages into and out of Mexico for worried relatives. Good work by all of those involved. An interesting insight to the Mexico City affair involved N6IUJ. He was sent to Mexico City by the Red Cross in his capacity as Disaster Chairman. N6IUJ had taken the Red Cross portable earth station to Mexico and established satellite communication with the Red Cross back in the U.S. After taking care of business, he requested GTE in New York to initiate a reverse telephone patch to the W6B6Z/R (146.115) in San Jose and was able to talk to W6A6Z/R, W6B6W and other. The conversation was carried over the W6B6Z/R, K6B6B/R, W6G6YH/R and a couple of other repeaters in the section. It was very interesting to hear a first hand account of the situation in Mexico City from one of our local hams. The 1985 Simulated Emergency Test seemed to go very well within the Section. This year seemed to bring out a lot of hams who in the past have not participated in the SET. Last year SCV Section was ranked 7th out of the 73 ARRL Sections and we may do even better this year. The results are generally released around the following June. W6SER is once again teaching prospective Novices the fine art of Amateur Radio. He has been responsible for quite a few hams getting their tickets in the San Mateo area. K6APLO has been doing the same thing through the Electronics Museum ARC for several years. I wonder how many hams Don Johnson, W6QIE, has licensed over the many years he has been teaching ham radio classes. It seems that the Novice classes are always being taught by the same dedicated individuals. Think about volunteering to help teach a Novice class through your own club. Who knows, you might really enjoy it! Speaking of Novices, please take the time to let me know what you think about the ARRL Expanded Novice Privileges proposal, or for the matter, anything related to Amateur Radio membership and Emergency Communications nets that run in the section:

Mon. 8:00 pm 145.27 SVECS  
Tues. 8:00 pm 148.115 SVECS  
Wed. 7:00 pm 145.45 & 146.115 Section ARES  
There is a need for a repeater in San Mateo County that can be used for Emergency Communications work. If you know of a repeater that would be available for such activity, please contact SEC K6ZTL on the Section ARES Net listed above. Traffic: W6B6W 165, W6PHT 117, K6BCVM 40, W6PFI 35, W6ZRJ 22.

### ROANOK DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4M. STM: K4NKL. RM: K4IWM. ACC: WC4T. P10: WA4OBR. TC: K4ITL. OOC: K1PLR. SGL: KE4ML. Hurricane Gloria big news this month. Section was well prepared for emergency communications. Governor and Lt. Governor were in EOC and watched Amateur Radio in operation first hand. Governor was well pleased with our communications capabilities. From reports received, approximately 500 amateurs checked into the Emergency Traffic Nets ready to help or assist. Due to band propagation, many repeats were needed. Many thanks to all who helped. Several radio clubs in section participated in Mexico City earthquake disaster H & W traffic. I noted

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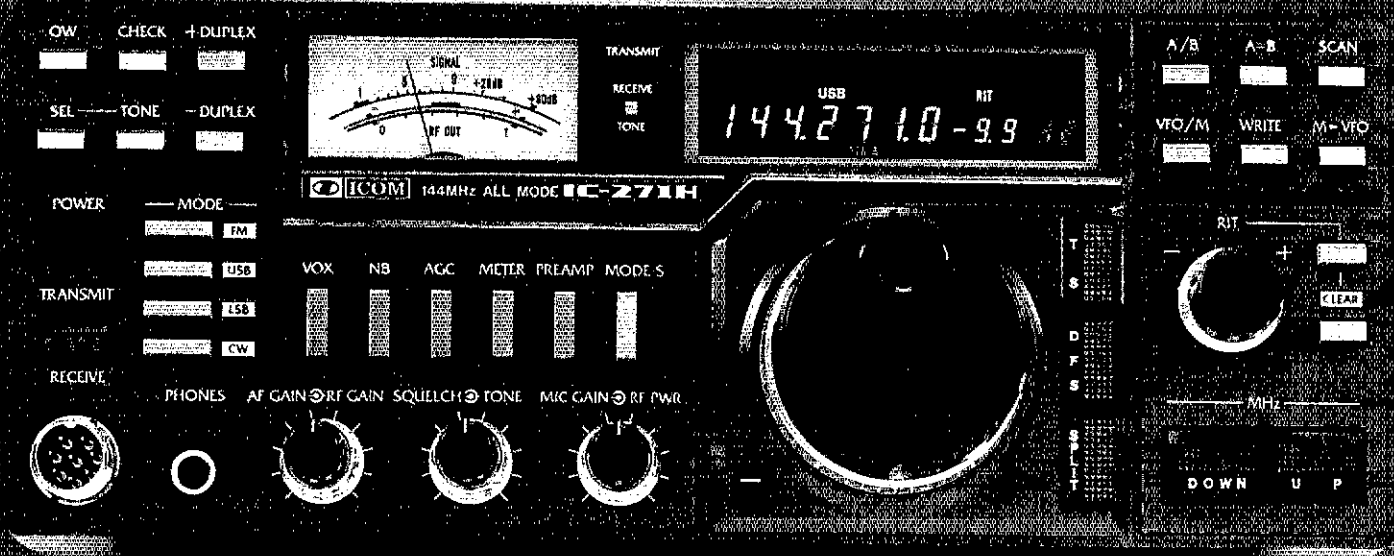
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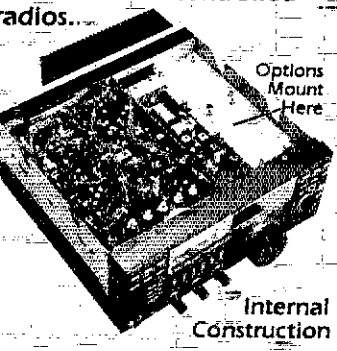
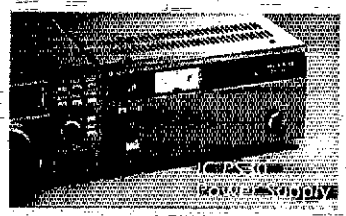
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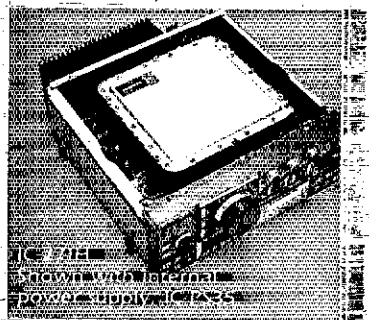


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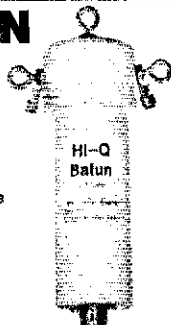
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RT-857/ARC-134	MK-1004/ARC
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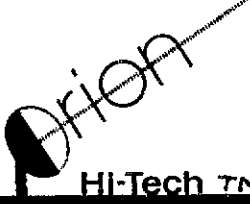
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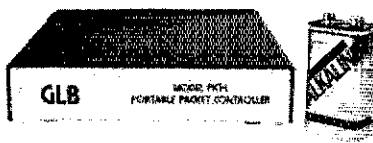
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many stations not familiar with traffic handling, E/C/DEC. can help teach traffic in your area. Contact STM for Info. Get others involved. Congrats to: KE4ML on appointment as Section State Government Liaison. Will register Section as a Lobby for Amateur Radio which is now a requirement by State Law. Lobbying efforts will intensify for June '86 session to push for passage of License Plate Bill HB-952 in the Senate. N4LST new Net Manager for CSN which meets each month on 3715 kHz at 6 PM local time. Open invitation to all Novice/Technicians. Is an excellent way to learn how to handle traffic and improve code proficiency. K4NLK gave traffic program to W4CC gang. This SM representative Section of Salvation Army Disaster Response Seminar for N4ISC. Get involved in generating Christmas traffic at malls/shopping centers. Make the public aware of Amateur Radio. K4UJM feeling much better after long visit in hospital. WB4HCP made a timely suggestion: Hospital located in your city? Make contact with personnel and generate enthusiasm to sponsor a Novice class with special emphasis on doctors and nurses. Winter is now here. Keep emergency gear ready. Section staff wishes everyone a Merry Christmas and Happy New Year.

Net	QNI	QTC	Tfc.	QND	Sess.	NM
NCEN	1955	257	495	2050	87	WB4WJ
N4MM	1338	548	1337	91		WB4HRR
GN	1817	823	795	4255	184	NJ4L
CSN	780	154	150	2535	91	N4LST
GNCTN	2859	420	365	1642	92	WA4MNR
PCTN	1645	498	431	1510	92	NE4J
RARS	631	76	76	1135	92	K4ABJ
M2MEN2805	128	120	1513	93		K4DJC
THEN	1608	173	147	2348	92	W4YBO
PETN	551	132	95	1733	85	WD4CEB
CFARS	1121	55	53	1311	93	KE4HW

Totals 16956 3564 3158 21009 1189  
New appointments: KF4NJ, K4AV ATC. Traffic: K4NLK 408, K4EYF 413, NJ4L 228, K4JHF 222, KB4IUV 129, WB4HRR 127, KB4FWM 95, WD4RMO 68, WA4MNR 58, N4JRE 53, K4YV 50, K4AYMY 45, WB4N 43, K4SWN 43, N4LST 41, N4JEO 37, K4GI 34, N4BYV 33, NE4J 31, WB4CYN 30, KU4W 30, N4LUO 29, K4YJB 25, NT4K 23, N4UE 21, K4ME 20, K4QXA 19, WB4WJ 19, WD4EQK 14, AA4MP 12, N4CJJ 10, W4PRG 9, WR4E 8, W4EFH 8, NV4F 8, N4KYD 5, WD4MRD 5, KIPLR 5, K4WC 2.

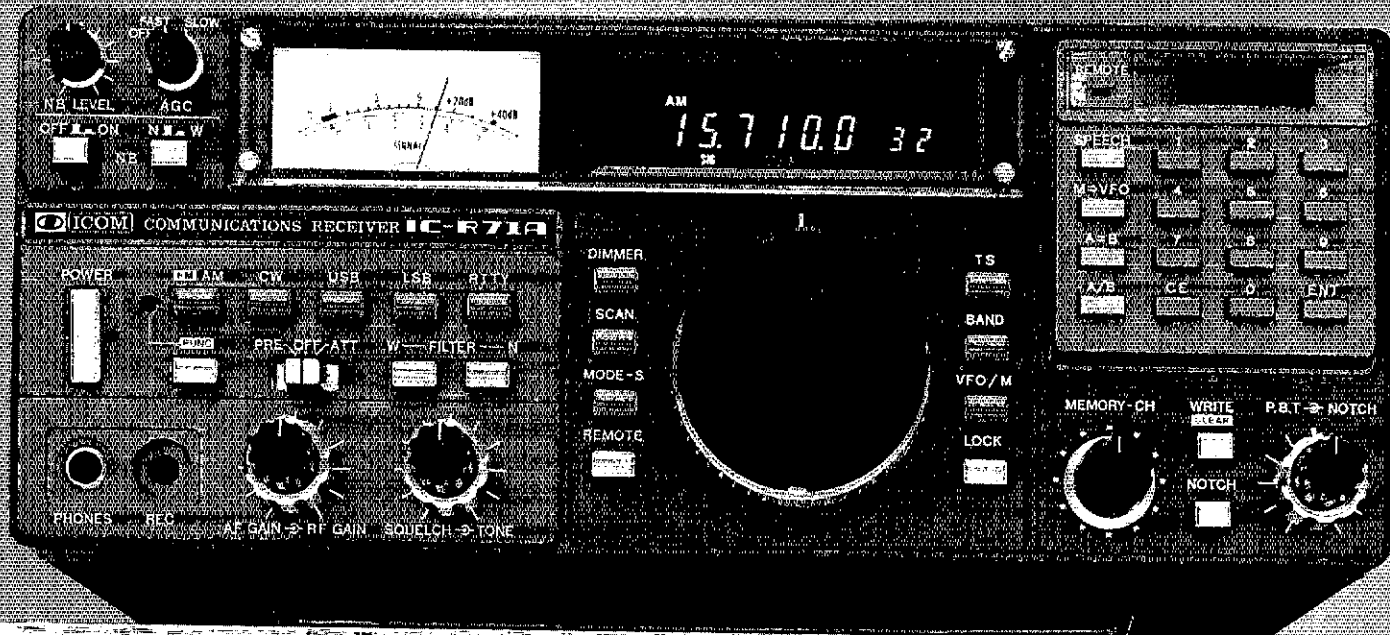
**SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ** — I attended a meeting with representatives from 14 other voluntary organizations from throughout the state at which we voted to establish a SC Chapter of National Voluntary Organizations Active in Disaster (NVOAD). Plans are to be established with the national organization by January 1 and to hold a SC Convention during February 1986. Membership is limited to organizations national in scope and purpose with voluntary memberships and a not-for-profit structure with a stated policy of commitment of resources to meet the needs of people affected by disaster. The purpose of NVOAD is to bring together organizations active in disaster service to foster more effective service to people affected by disaster through cooperation, coordination, communication and education. If it were not for time each of you have given during a communication emergency, I do not believe that Department of Social Services and Governor's Office would have asked me to attend this meeting and represent SC amateurs. CONGRATS and BEST WISHES for the HOLIDAY SEASON! Traffic: K4ZN 181, W4FMZ 103, KB4BZA 94, W4ANK 93, K4ALRM 43, N4LST 41, WB4UDK 41, K4FRX 37, W4JR 24, K4YF 27, K4ZB 17, W0IKT 16, K4J4K 16, W4DRF 3, WD4FJP.

**VIRGINIA: SM, Claude Feigley, W3ATQ** — STM: KB4WT, SEC: WB4UHC, OCC: W4HU, ACC: NT4S, BM: AS4J, TC: WB4MAE, SC: W4VTH. For a status on the 1985 one year long month's GS. There have been no changes. NT4S has been appointed as the Section's Affiliated Club Coordinator. Any club either affiliated or non-affiliated needing assistance please contact Rob, NT4S. I am pleased to announce that the Richmond Amateur Radio Club has been certified by ARRL Hdqs as the Section's Third Special Service Club. Many other section clubs can qualify for this recognition. Contact NT4S for details. The many months of training by the Section's ARES personnel and nets has paid off with their fine performance during hurricane Gloria emergency operation and the Surry Nuclear Power station drill. The performance of the amateurs during these operations was so impressive to Governor Robb that he sent a letter expressing his gratitude to all who participated during the Gloria emergency. ARES members keep their operating skills sharp by participating in their local ARES nets and performing community service. I am sorry to report WB4UOI as a Silent Key. Mac performed an outstanding service to the VE exam program in Richmond area. It was nice meeting many of you at the ARRL State Convention at Virginia Beach. The ARES/Traffic forum was well attended with SEC WB4UHC, STM KB4WT and the RAOCES Emergency Coordinator N4EXQ leading the discussions. The Packet forum was crowded as interest in this mode of operation continues to grow in the section. The Richmond digipeater is now operational and the Eastern Shore digipeater will follow. Is this the medium that will provide statewide VHF linking for high-speed emergency communication? As a follow-up of last month's ARRL appointments here are the ECs on record at League Hdqs: N4CFA, K4COW, N4DCC, K4DEO, N4FTN, K44BU, AB9I, K4JDM, K4JST, W4XKE, NM4L, KC4LY, WA4PAS, W4PVA, KB4PW, W4PXA, K44SR, WA4TCJ, WA4TVS, KE4VL, WA4VRL, KA4WBW, W44WD, W44WB, WB4WPW, K44X, ORS. appointments are: WD44LY, AA4AT, K44XF, W34TC, W35BN, W44BB, W44CCK, K44EY, WB4DOZ, W44EDD, W44EY, W44EY, K44EFP, W44FD, W44F, A44GL, K44GR, NM4I, K44IUM, K44J, W44LS, K44JM, K44JS, W44X, N44E, W44LJ, K44MB, W44MAE, K44MLC, W44NA, W44O, W44PNY, W44PVA, KB4PW, N3RC, K3RZR, NT4S, N4FT, N4TE, WA4TVS, W4TCZ, WB4UHC, KR4V, WA4VRL, K4VVK, KB4WT, W4YE. If you have any questions regarding ARRL appointments listed here and in last month's QST, contact the SM. As many of you may know, my term of office as SM expires April 1, 1986. Nominating petitions for the office of SM must be filed prior to December 5, 1985. It is my intent to seek reelection for one more term as your SM. Your support will be appreciated. Traffic: N4EQX 1216, N4GHI 981, WB4PNY 444, AA4AT 427, W34TO 365, KB4WT 222, K4JST 201, AA4GL 199, WD44LY 188, W44LS 131, WB4FLT 114, K44XF 110, W44CCK 109, WD4COW 109, K44JM 85, NN4I 78, WB4VMX 76, W44LJ 67, K44ERP 65, K44DJ, K44M 65, NT4S 64, K3RZR 58, N44O 55, W44VK 53, K46GZ 47, W4TCZ 37, WB4KIT 36, WB4DOZ 35, WD4MS 35, K44IUM 34, KB4PW 30, N44DWO 26, K4GR 25, N44K8O 24, WB4UHC 24, K44PW 22, W4PVA 21, N4FNT 19, WB4ZNB 13, W44TVS 10, KB4NGO 8, W44LX 7, K44MLC 5, W44X 1, W4YE 1.

**WEST VIRGINIA: SM, Karl S. Thompson, K8KT** — New WV ST Amateur Radio Council officers are: Pres WBAH,

ICOM HF Receiver

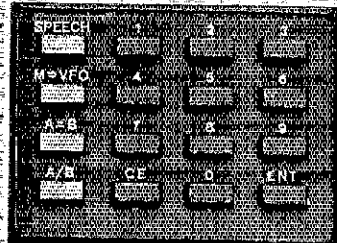
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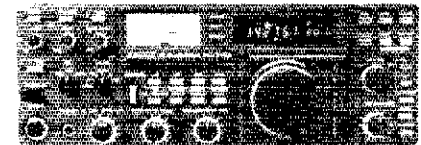
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FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/ 1-30 MHz rcvr	999.00	769 <sup>95</sup>
PS-35 Internal power supply	160.00	144 <sup>95</sup>
EX-241 Marker unit	20.00	
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FL-53A 250 Hz CW filter (2nd IF)	96.50	89 <sup>95</sup>
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HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	



IC-751 9-band xcvr/1-30 MHz rcvr	1399.00	1089
PS-35 Internal power supply	160.00	144 <sup>95</sup>
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89 <sup>95</sup>
FL-53A 250 Hz CW filter (2nd IF)	96.50	89 <sup>95</sup>
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IC-720A 9-band xcvr • (CLOSEOUT)	1349.00	699 <sup>95</sup>
PS-15 20A external power supply	149.00	134 <sup>95</sup>
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
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**Other Accessories:**

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CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234 <sup>95</sup>
OPC Dpt. cord, specify 2, 4 or 6-pin	5.90	
SP-3 External base station speaker	49.50	
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PP-1 Speaker patch (specify radio)	139.00	129 <sup>95</sup>
SM-8 Desk mic - two cables, Scan	69.95	
AT-100 100W 8-band auto. antenna tuner	349.00	314 <sup>95</sup>
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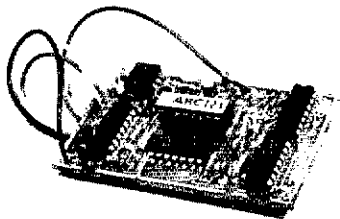
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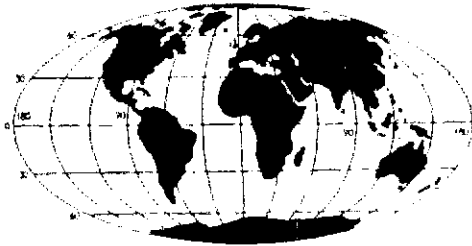
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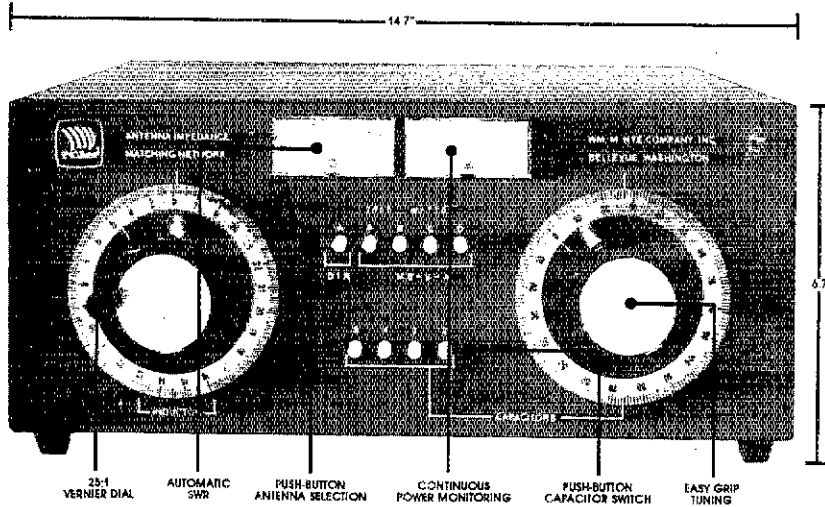
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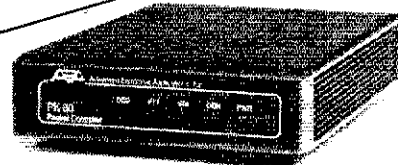
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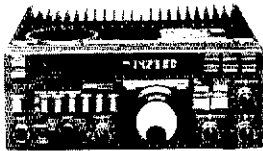
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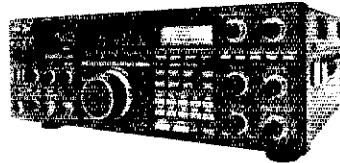
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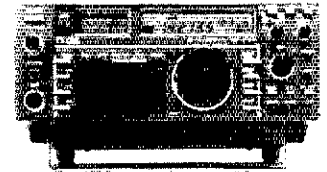
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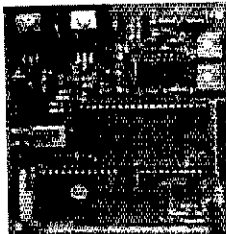
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pand their world through Amateur Radio. The System matches students with one-to-one helpers, provides instruction material and support, and loans radio equipment.

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Then Call for More Ideas



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BT2 Battery Case 1H/1A1	7.95
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Beltclip TR2600	4.95
HS4 Headset	19.95
SC8T Case 1H21AT	8.95
SC9 Case 1H2600	19.95
ICOM BP4 Battery Case	12.50
YAESU FRB757 Relay box	9.95
HUSTLER MO-1/MO-2 Mast	21.50
BM-1 Bumper Mount	15.95
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10 and 15 meter	11.95 17.95
30 meters	15.50 21.95
30 and 40 meters	17.95 23.95
75 meters	19.95 26.95
HY-GAIN 203S 3-ele 2-meter Beam	24.15
BN86 Beam Balun	24.00
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LAC3 Thru-the-wall Blitz Bug	7.95
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PacTerm IBM	24.95
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108 Dual 24-hour LCD clock	18.95
DAIWA CS201 2-position switch	21.95
WELZ TP5X Handheld watt meter	19.95

## Under \$50

ICOM HM9 Speaker Mike	34.00
HS10/HS10SB Headset/switch	38.00
BP-3 Battery Pack	29.00
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A147-4 2m 4-ele Beam	29.95
A147-11 2m 11-ele Beam	44.95
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AVANTIA.S. HM 151.3G 2m on-glass	37.50
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MFJ 202B Noise Bridge	48.95
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DAIWA LA2035R 2m Amp/Preamp	77.95
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## Under \$200

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YAESU FT 203RK 2m HT with TTP	199.95
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TH31AT 220 MHz Handheld	Call
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Buy one TH Handheld and get a PB21 for 1.00	
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With speaker mike, extra battery	
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KANTRONICS UTU Interface	199.95
Packet Controller	199.95

REGENCY HX1000 Handheld Scanner	199.95
Z30 30-channel Scanner	166.00

MICROLOG AIR-1 Vic-20/C-64	179.95
AEA CP-1 Computer interface	179.95

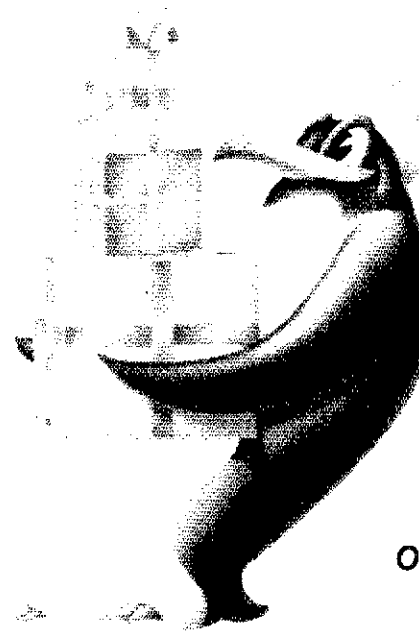
PK64 Packet for L64	Call
PK80 Universal Packet	Call
MFJ 9621.5 kW HF Tuner	185.95
1229 Computer Interface	157.95
BUTTERNUT HF4B Butterfly Beam	182.95
KENPRO KR500 Elevation Rotator	169.95
MIRAGE B3016 2m Amp 25 in, 160 out	199.95

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## Under \$300

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# The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode, with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

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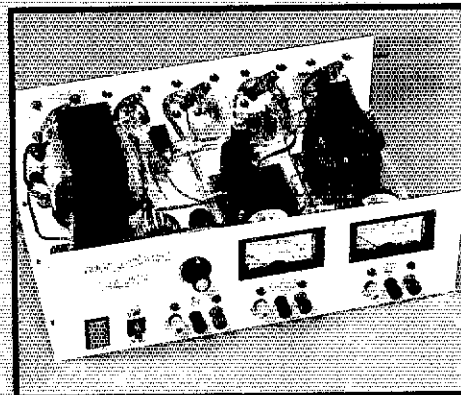
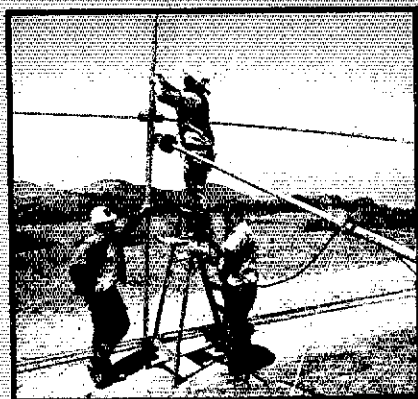


FT-209RH shown actual size.

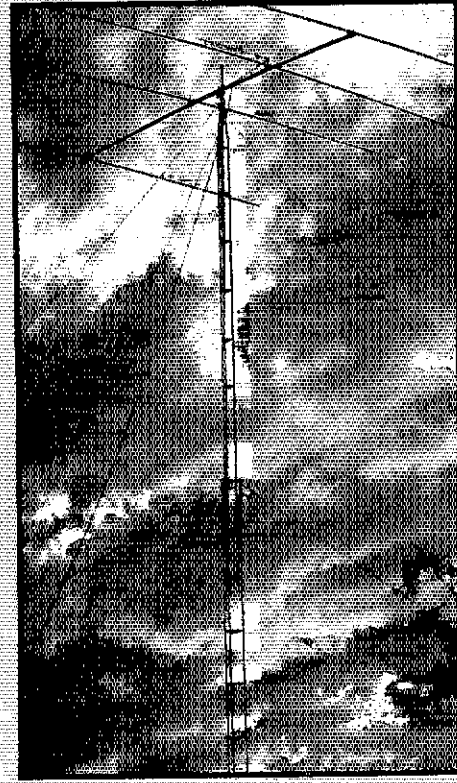
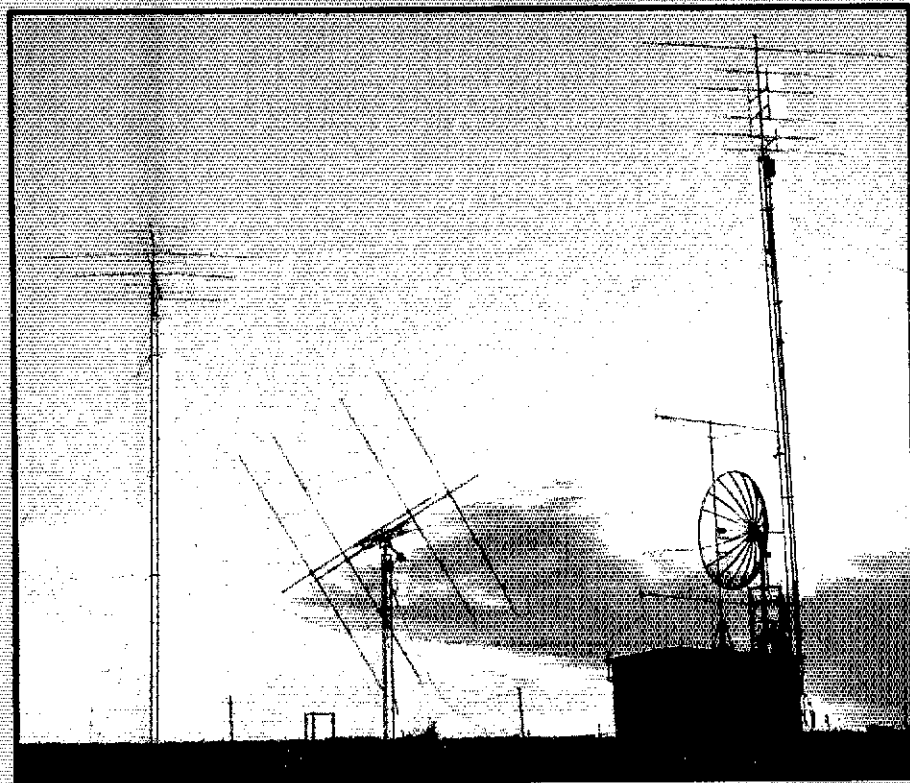
FT-203R transceiver.



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# THE ARRL 1986 HANDBOOK FOR THE RADIO AMATEUR



### Modulation and Demodulation

M... of modulation and demodulation techniques...

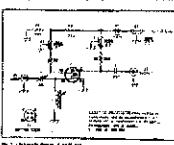
### Special Modulation Techniques

A... of special modulation techniques...



### VHF Radio Equipment

T... of VHF radio equipment...



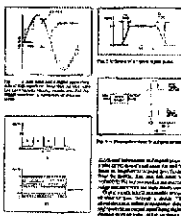
### UHF and Microwave Equipment

U... of UHF and microwave equipment...



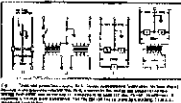
### Digital Basics

D... of digital basics...



### Power Supplies

P... of power supplies...



### Electrical Fundamentals

E... of electrical fundamentals...

# THE PLOT THICKENS!

The ARRL 1986 Handbook for the Radio Amateur takes over where the 1985 Edition left off. Each of the 40 chapters has had some revision, and there are more than 500 new or revised figures. The new edition will contain 1184 pages — way up from last year's count of 1024. Many key chapters with "hot" topics among today's radio amateurs have been completely revised and rewritten. In fact the new material represents 532 text pages.

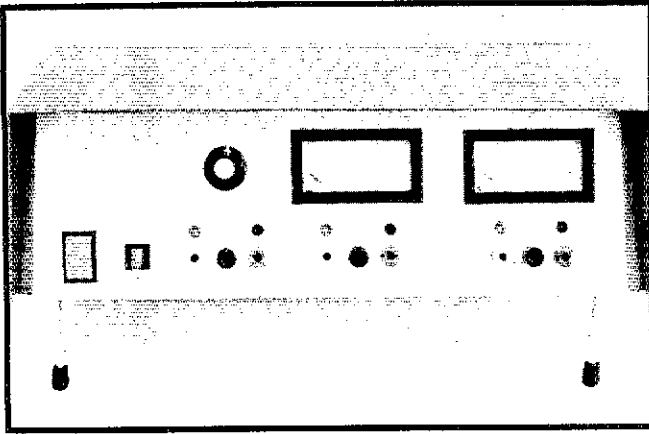
An understanding of digital electronics is a must these days since such circuitry has so many practical applications in station control, frequency synthesis, telemetry, word processing and other information-handling systems. The Digital Basics chapter will help you to understand what is going on in everything from simple keyers to sophisticated microcomputers. Packet-radio enthusiasts will find the most up-to-date information available in the Digital Communications chapter. There are new sections on data interfacing and modems, 50 new and revised figures, plus an expanded bibliography and glossary.

The Special Modulation Techniques chapter has the latest on spread-spectrum. On the fun side, we've added a new section on remote control of model aircraft and vehicles.

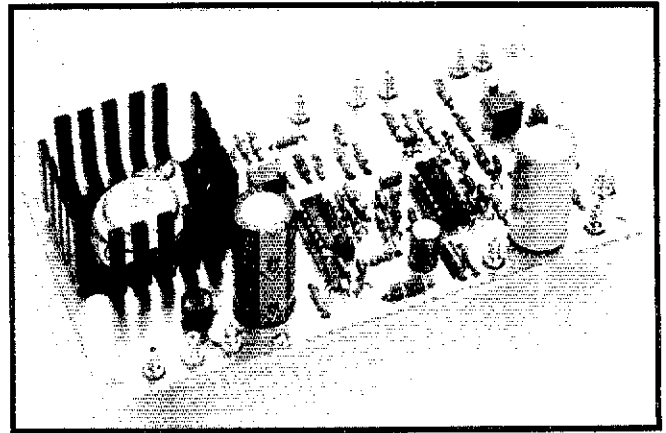
On the practical side, you will find many of the 27 new projects described on the next page. There are new power amplifiers for 1.8, 50, 144 and 1296 MHz, plus preamplifiers and transverters for the VHF/UHF enthusiast. The new digital PEP Wattmeter - SWR Calculator will be one of the most popular projects.

We've only scratched the surface in describing what is in the standard manual of RF communication. Over 5.7 million copies of *The Handbook* have been published in 63 editions since 1926. The new edition will be available in early November. It is must reading for today's radio amateur!

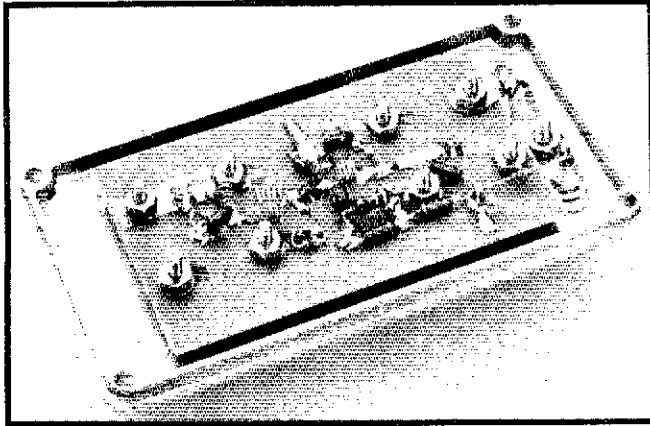
The 1986 Handbook will be available in November. Paperbound prices are \$18.00 in the U.S., \$19.00 in Canada and elsewhere. Cloth prices are \$27.00 in the U.S. and \$29.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.



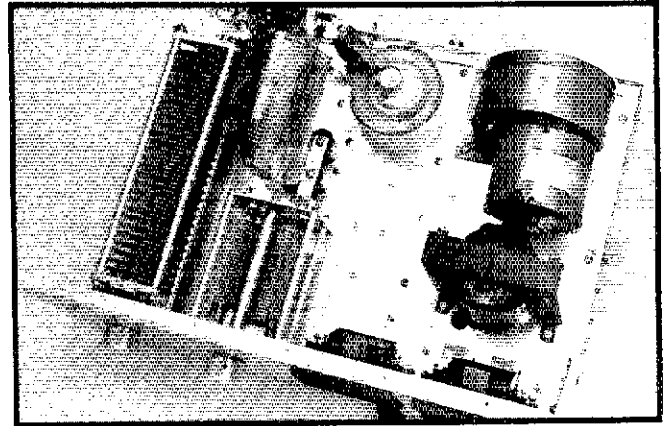
New supply covers a wide range of low dc voltages



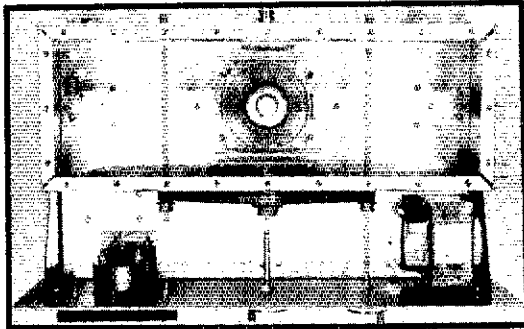
RF-proof regulator board in the new high current power supply



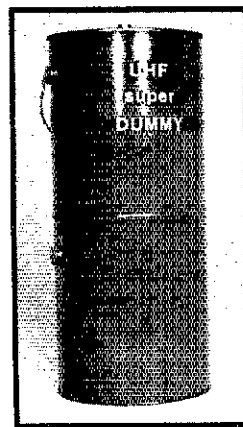
GaAsFET Preamplifier for 70 cm



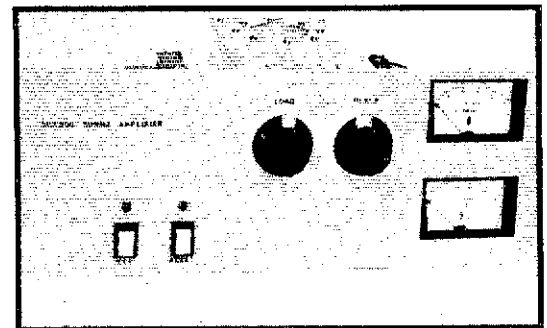
160-meter Amplifier using the 8877



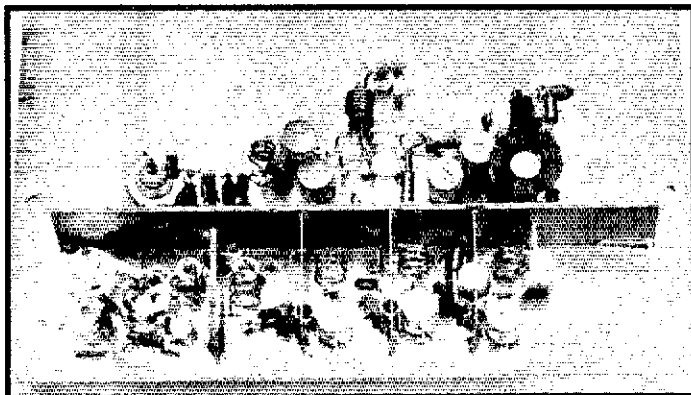
Legal-limit 2-meter Tetrode Amplifier



UHF Dummy Load

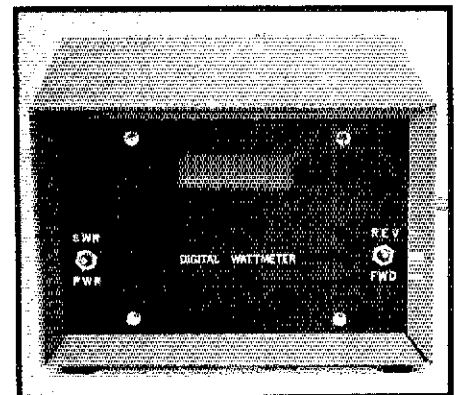


6-meter Amplifier using the 3CX800A7



Transmit converter board: 220 MHz Transverter

**New  
for  
'86**



Digital PEP Wattmeter-SWR Calculator



New

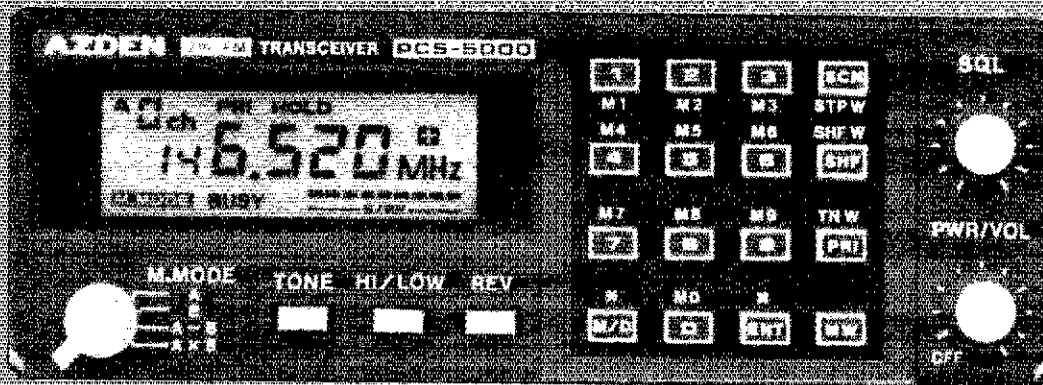
New

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COMMERCIAL — GRADE



**UNPRECEDENTED WIDE FREQUENCY RANGE:** Covers 140,000-153,000 MHz in steps that can be set to any multiple of 5 kHz up to 50 kHz.

**CAP/MARS/NAVY MARS BUILT IN:** The wide frequency range facilitates use of CAP and ALL MARS FREQUENCIES including NAVY MARS. **COMPARE!**

**TINY SIZE:** Only 2 inches high, 5 1/2 inches wide and 2 1/4 inches deep.

**MICROCOMPUTER CONTROL:** Gives you the most advanced operating features available.

**UP TO 11 NONSTANDARD SPLITS:** **COMPARE!** this with other units!

**20 CHANNELS OF MEMORY IN TWO SEPARATE BANKS:** Retains frequency, offset information, PL tone frequency.

**DUAL MEMORY SCAN:** Scan memory banks separately or together. **ALL** memory channels are tunable independently. **COMPARE!**

**MEMORY SCAN LOCKOUT:** Allows you to skip over channels you don't want to scan.

**TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan ranges separately or together with independently selective steps in each range. **COMPARE!**

**BUSY SCAN AND DELAY SCAN:** Busy scan stops on an occupied channel. Delay scan provides automatic auto-resume.

**DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency desired when scanning.

**PRIORITY MEMORY AND ALERT:** Unit constantly monitors one memory channel for signals, alerting you when channel is occupied.

**LITHIUM BATTERY BACKUP:** Memory information can be stored for up to 5 years even if power is removed.

**FREQUENCY REVERSE:** Allows you to listen to repeater input frequency.

**ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Keys are easily seen in the dark, and actuation is positively verified audibly.

**CRISP, BACKLIGHTED LCD DISPLAY:** Easily read no matter what the lighting conditions!

**DIGITAL S/R F METER:** Shows incoming signal strength and relative transmitter power.

**MULTI-FUNCTION INDICATOR:** Shows a variety of operating parameters on the display.

**FULL 16-KEY TOUCHTONE PAD:** Keyboard functions as auto-patch when transmitting.

**MICROPHONE CONTROLS:** Up/down frequency control and priority channel recall.

**PL TONE GENERATOR BUILT IN:** Instantly program any of the standard PL frequencies into the microcomputer. **COMPARE!**

**TRUE FM, NOT PHASE MODULATION:** Unsurpassed intelligibility and audio fidelity. **COMPARE!**

**HIGH/LOW POWER:** Select 25 watts or 5 watts output — fully adjustable.

**SUPERIOR RECEIVER:** Sensitivity is better than 0.15 microvolt for 20-dB quieting. Commercial-grade design assures optimum dynamic range and noise suppression. **COMPARE!**

**DIRECT FREQUENCY ENTRY:** Streamlines channel selection and programming.

**OTHER FEATURES:** Rugged dynamic microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, tubes and hardware are included.

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HEAVY DUTY TANK CIRCUIT ALLOWS PLATE EFFICIENCY OF 70% FROM 160 THROUGH 15 METERS.

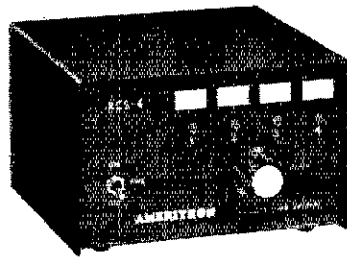
The Ameritron AL-80A combines the time proven economical 3-500Z with a redesigned heavy duty tank circuit to achieve 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A new Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

The AL-80A will provide a signal output that is within 1/2 "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost.

Size: 15 1/2"D. x 14"W. x 8"H. Weight: 52 lbs.

## NEW AMERITRON RCS-4 REMOTE COAX SWITCH

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The Ameritron RCS-4 is a remote controlled coax switch that selects one of four antennas by supplying all control voltages through the coax feed line. The elimination of a control cable results in a neat and inexpensive installation.

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\* FEATURES: small 7x7x2.5". Push to look (PTL) T/R switching. GaAsfet downconverter tunes whole 420-450 MHz band. Two switch selected video & audio inputs . . . 10 pin color camera jack & RCA phone jacks. Xmit video monitor output. Over 1 watt pep RF output on one or two (add \$15) selected crystal controlled freq. 439.25, 434.0, or 426.25 MHz.

ATV APPLICATIONS: you can show the shack, projects, home video tapes, computer graphics & listings, repeat SSTV, or even Space Shuttle video & audio if you have a home satellite receiver. Do public service events such as marathons, races, parades, search & rescue, major fires, repeat weather radar, etc. DX depends on terrain and antennas, typ. 1 to 40 miles. For greater DX we have 20 watt amp for \$109 and 50 watts for \$185.

WHAT IS REQUIRED FOR A COMPLETE OPERATING SYSTEM? The TC70-1s downconverter outputs to any TV on ch 3 for receiving. Connect a good 70 cm antenna and low loss coax. Plug in camera, VCR, computer, etc. or any composite video source. Plug in mic for standard 4.5 MHz TV sound. Connect to 13.8 vdc for base mobile or portable. SEE Chapt. 20 1985 ARRL Handbook. That's it!

CALL (818) 447-4565 OR WRITE FOR OUR CATALOG, more info, or who is on in your area. Downconverters start at \$49 to receive. We stock antennas, modules and everything you need for ATV. Prices include UPS surface in cont. US. Transmitting equipment sold only to licensed Tech class or higher amateurs verifiable in 85 callbook or copy of new license.



ed by the ARRL Board of Directors & that takes a little time. I have no idea why the State Legislature approved the new \$25 Amateur Radio Tag fee but we are in the process of finding out. For the services we render to the citizens they ought to be free. Might need ur help on this one. W4BKK made the only BPL this year while during Sept the following made PSHR: W4PIM, W4WOL, K4VHC, W4BKK, W4HON, K4BAI, K4MOG & K4BJN. There are many ARRL appointments available to League members, won't u see which u desire & let me know. There will be a lot of Holiday traffic as usual. Please check into one or most of the nets and handle some. We need u. Traffic: W4PIM 298, W4BKK 201, W4WX 115, W4ADVZ 72, W4NXC 54, W4WOL 52, W4JWD 44, W4HON 35, K4BAI 34, W4BARJ 33, N4UZ 28, W4BSP 27, KF4FG 24, K4EV 17, N1BKC 7.

**NORTHERN FLORIDA:** SM, Phil O'Dwyer, WF4X—ASMIACC; N4ADI, BM; K4BLB, P10; W4APUO, OQ; K4JJE, SEC; W44PLB, SGL; KC4U, STM; W4AGHU, TC; N4KF, NOFL wants to congratulate Bethany Wait AA4MU on her Extra Class upgrade. First license in 1981 at the age of 8, she upgraded one class a year to reach the pinnacle in August 1985. We know that KA4OKW and W4LNX and many others share her joy on this accomplishment! We also want to recognize KA4WMX, W44HSX, W44FJY, W44A and XE2TM for their outstanding efforts in communicating with Mexico during the earthquake disaster. Many employees of Walt Disney World Epcot Center were concerned about the safety of their families and these members of the Amateur Radio Community responded. Special thanks to them and others who assisted. We have generally agreed that our activity with Hurricane Elena in the section will be our SET for 1985. Those localities who so desire may also participate in the Oct. 19-20 SET. Still need Ham's for this column: N4ADI, P.O. Box 1599, Maitland, FL 32715. Traffic: W4AOXT 638, W4JHO 827, W4BADL 605, N4PL 520, W44H 495, K4BLB 1434, W44G, HJ 381, K4AKK 205, AA4HT 194, K4MHH 169, W4D 132, KF4U 129, K44VK 117, AA4FG 117, W44GU 113, W44IU 102, K44LB 101, W44MLQ 91, K44FIY 83, W44FJY 77, W4KIX 71, N4GMU 71, KF4TM 68, N4ADI 66, W44EYU 58, W44DY 51, W44EQB 51, N4JAC 50, W44PUP 46, N4DY 44, W44MO 42, W44SXW 39, W44TZR 39, W44HBP 31, W44IM 31, N44F 29, N44C 28, K44CQ 25, N44P 24, K44KAH 22, W44YOP 19, W44HUZ 17, N44ENL 10, W44AWG 9, N44JH 8, KF4GY 6, W44APUO 6. (Aug.) N4DY 74, W44D 32, W44TZR 19, W44IM 12.

**SOUTHERN FLORIDA:** SM, Richard D. Hill, W4APFK—SEC; W4SS, STM; K4ZK, TC; K14T, BM; W44KBW, P10; W44WR, SGL; KC4N, OQ; W4SS, ACC; W44NBE, W44KBW reports a total of 198 bulletins received and transmitted this month. OBS stations reporting were: AA4EN 10, W4DL 27, W44TF 9, KA4GUS 15, K41EK 12, W44KBW 52, W44EIC 47 at Miami 18, W44VH was in the hospital (ICU) and is now back home in the hospital strength before further surgery. N44KB was in the hospital with a mild stroke but is back home and back on the air. Congrats to K44EWD who now has her advanced license. W44LLA handled 83 phone patches this month - 82 of these were for the research vessel Knorr, which located the Titanic! KA4GUS had a full page in the magazine section of the Miami Herald concerning his MARS and NTS efforts. The article also outlined how he operates his station using a tape recorder and Braille typewriter. There has been a great deal of good publicity for amateur radio here due to your efforts during the recent hurricanes and the Mexico earthquake. W44IM and SunStar had his 20 meter work with over 100 pieces of Mexican traffic acknowledged in a very nice article in the SunStar. His usual was instrumental in providing communications concerning delivery of a shipment of medical supplies and as a result there will be a follow up article in the paper in the near future. W44AEP sent me a description of his and W44MTC's efforts in the Mexico City operations. After working the first two days individually W44MTC and W44AEP decided to combine their efforts. W44AEP's XYL answered the phone and the two of them acted as net control for XE1GGU in Mexico City from about 9 AM until 10:30 PM each day. They not only sent in their Mexico City traffic but handled phone numbers from all ten US call areas and several countries. The most unusual was from an XE2 who could not work into Mexico City. In all, over 700 phone numbers were forwarded to XE1GGU. During the project they received a great deal of media coverage including a complete 30 minute local news segment by the TV station right from W44MTC's shack. Congrats to them and to all the MANY stations who provided such invaluable service in the aftermath of this disaster! AA4EE is doing an absolutely superb job of organizing the Broward name for emergency communications. W44AID writes that he is very active in music teaching and has been giving Master classes in flute - coming up is one in Gainesville and another in the Tampa area. W44AID is also the volunteer Park Photographer for the Oxhatchee National Wildlife Refuge. His XYL, K44A00, is now substitute organist at their church so this is why they have not been as active on the air recently. Recently appointed Assistant Technical Coordinators are W44MJE Monroe, W44PRX Manatee, N2WX Brevard, K4CAG Dade (bilingual), W4SQG Dade, W4NTA Martin and W44IFM Indian River, 73 de W44PPK Traffic: W3CUL 1311, K4EUK 536, W44PF 503, K4ZK 352, K4SCL 302, K44FZ 291, KF4JA 257, W4DL 195, W4NFK 174, W44EIC 172, K4IA 147, W3VB 145, K4AGUS 128, W44YR 120, W44WYG 120, W44UR 111, W44VGO 103, W44EY 103, W44R 101, K44SH 99, W44KBW 98, W44AEP 77, W44EY 69, K44YH 68, W44XHU 65, W44LLA 64, KY4U 62, K44RL 63, W44ESH 52, W4SS 48, W44PK 44, K44BK 41, K44H 33, K44Y 36, N44ML 35, W44GCK 32, N44ET 32, K4J 25, K44QU 20, AA4M 20, K44KAW 20, W44MCC 20, N44OJA 19, K44ZV 19, KY8Y 19, W44F 18, W44NXX 18, W44TLV 17, W44JUR 16, K44Y 14, K44EWO 14, W44H 14, W44FD 13, K44VC 12, W44VND 12, K44AMC 11, K44RT 10, W44ATF 8, N44LN 8, W44F 8, K44GR 7, W44BKC 6, W44GIE 5, W44MPV 5, W44AWN 3, AA4IF 3, K44GDU 3. (Aug.) W44HDH 26, W44S 24.

**WEST INDIES:** SM, Carlos Flores, WP4J—WINS Net Daily 2300Z (3,710 kHz), WINC Net Daily 2230 Z to 2245 Z (148,940). Hello friends from West Indies. SM WP4J has appointed Bob, W0DX, D.E.; Klaus, WP2ACV, E.C.; Parker, W2BJ, E.C.; William, KP2I, E.C. All in Virgin Islands. St. Thomas and St. John. At the moment, there is more communications and activity with ARRL matter between Puerto Rico, St. Thomas, St. Croix, St. John, Culebra and Vieques Islands. Thanks to our SM Carlos, WP4J, and all the cooperation among the islands. The efforts by WP4J have been very positive, and we can see that West Indies is more active than before. The SM will travel to St. Croix and St. Thomas soon in November. SM WP4J, SGL, Alberto, WP4CSG and SEC Vives, NP4NF, with their efforts, have made possible for the first time in Puerto Rico,

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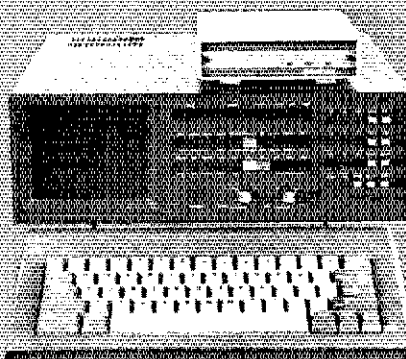
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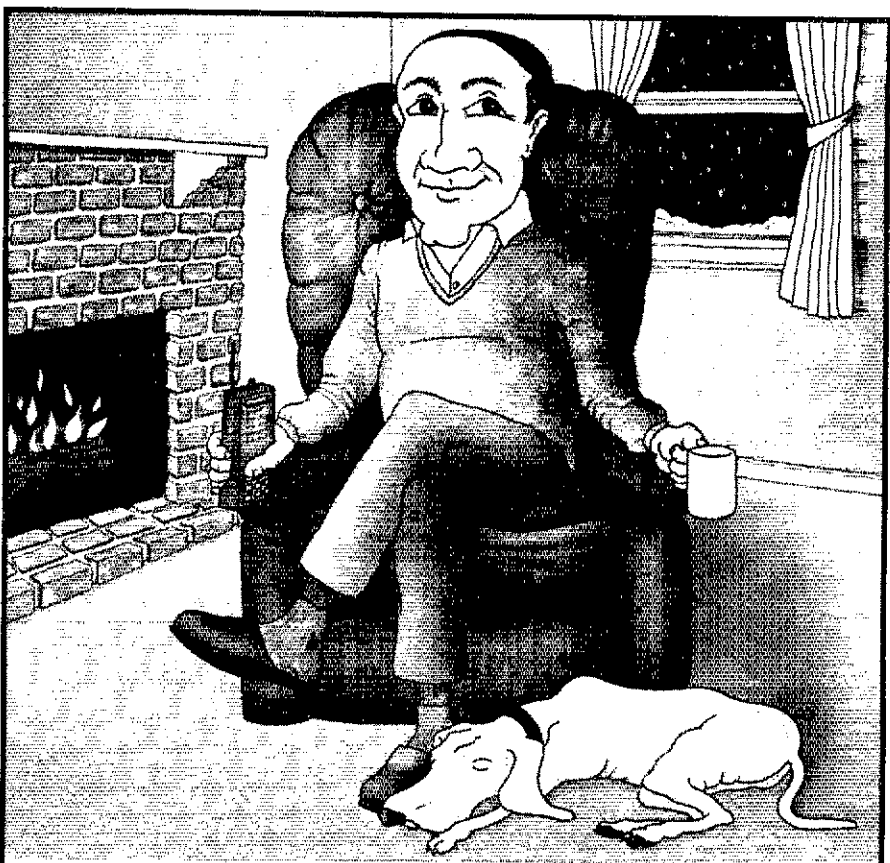
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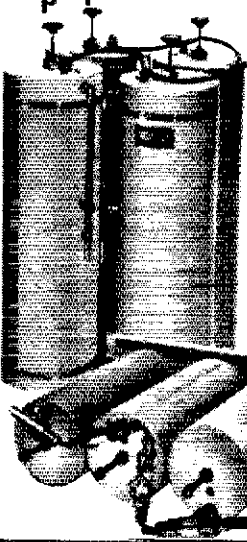
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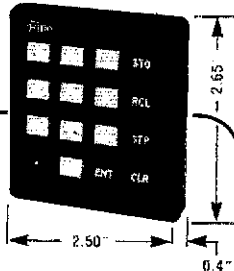
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The State Civil Defense Recognition Radio for their participation in the events of every year on the 27th of the ARES program. From now on, emergency with the CD in Sept., this day will be dedicated to all amateurs in PR for their efforts with the CD in the ARES program. The Amateurs in PR have passed between P.R. and Mexico City around 800 to 1000 messages. Stations that have been working day and night: WP4F, KP4BL, KP4CL, KP4U, KP4FI, KP4FFM, WP4CSG, WP4AQB, KP4IO, NP4LX. Hasta Luego. Traffic: KP4DJ 19.

**SOUTHWESTERN DIVISION**

**ARIZONA:** SM, Jim Swafford, W7FF—Biggest news this month is the Mexican earthquake disaster that began on the morning of 18 Sept. All long distance telephone communications into and out of Mexico City were knocked out. Many AZ hams, too many to list here, responded and helped pass emergency traffic. At least seventy hams are known to be active in the Phoenix, Tucson and Yuma areas where there are large concentrations of Hispanic people with friends and relatives in Mexico. Several thousand H. & W. messages were passed during the balance of the month. A summary report including call signs of known AZ participants is being sent to Mike Riley, KX1B for QST's Public Service records. Three who deserve special mention include N7DD who established the first link between ARES Cross and Mexican Red Cross in Mexico City; N17Y, who personally handled over fifteen hundred relays to Mexico City from California stations; NJ7E who flew to Mexico City and personally operated at XE1HC and later XE1XDO receiving, confirming, and sending thousands of H. & W. reports. Complete and final traffic counts and number of participants may be impossible to compile due to the widespread activities by individual "unsung heroes", but the overall results were fantastic and demonstrated the effectiveness of amateur radio and its dedicated people on both sides of the border. The XE stations performed admirably. Let's hope it never happens here, but am sure that if it does, AZ hams will be ready and will be THERE. "OPRC's OK Corral Special event" at Tom Posner sent very well with over fourteen hundred contacts. Beginning this month all Net and individual trc reports should be reported to STM, W7EP. WB7CAG reports new Cactus Net Operation on repeater on Pecos Mtn. 147.86/26, check-ins invited daily at 1830 hrs. MST. Your SM wishes everybody best holiday greetings for the season. Hope 1986 will be a good year for all. 73, Jim. PSHR KB7FE ATEN: QNI 847 QTC 149. Cactus NET HF: QNI 573 QTC 137. Cactus Net VHF: QNI 16 QTC 0. SWN: QNI 153 QTC 192. Traffic: KB7FE 312, K6LL 265, W7AMM 195, W7EP 142, W7KCM 76, KATHEV 58, W7LVB 41, W7OIF 35, WB7CAG 31, KAT7AR 31, W7KXE 23, K7PQO 13, K7JKI 12, NN7A 11, W7KQE 11, K7NMQ 6, N7BKY 5, K7RL 2.

**ORANGE:** SM, Joe H. Brown, W6UBQ—ASM: KARL, N6BVU, SEC: JIM, AE6N, STM: ERNIE, W6QCA, OOC: ALEX, W6RGL, LOREN, N6HJO, TC: JOHN, KD7XG. RIO: JOE, W6BXT. The C-C reports two upgrades. Paul Chandler to General, Ed Slaughter to General, and Mike Gunderman to Tech. Lorraine Valley Amateur Radio Club new officers. Pres. Bob Hays, W6WUJ, Vice Howard Kollanse N6GGK, Sec. Thelma Kollanse K6CFD. Ted Knowlton W6ORA, congratulations and good luck. Hughes Fullerton Employees Association, Congratulations are in order for Michels Massoth and Steve Davies on recent upgrades to Technician class. The Oct. Bulletin featuring pictures of Field Day 1985 via AB6R were fantastic. The Coachella Valley Amateur Radio club, the local VEC Exam will be Nov. 16th Saturday. Checkin time will be 9:00 AM. The location will be the Palm Springs Police Training Center. Deadline is Nov. 11th. For additional information contact Hal R6GP, 619.347-4294. Upgrades for that group, Andy N6LRO General. From the Morongo Basin Amateur Radio Club, upgrades to general Betty N6MKK, Bill K6BEH, Earl K6BKF. To Advanced Pop N6MKV. Those Amateurs who are not members of The American Radio Relay League are invited to join; better still, join through your local club. When you renew your membership in (ARRL) do so through the club. This is the time of year when club officer nominating committees will be calling. Election time again. Now is the time to accept a nomination for officer in your local Amateur Radio Club. I strongly urge you to accept this opportunity to become part of the governing body of your club. RAY FROST, W6BTEY sign key. The Amateur Radio Operator's Amateur Ray may the Good Lord take a liking to you 73. NET FREQ Time Sess. QNI TFC

SCN/1	3598	1830	30	312	251	WF60
SCN/2	3598	2015	28	187	71	WF60
SCN/V	146.645	2100	30	470	358	WA6QCA
PSHR/V1	45.12	0900	60	410	76	KA6HJK

PSHR, WF60, WB6QBZ, KA6HJK, WA6QCA. Traffic: WF60 319, WB6QBZ 182, WA6QCA 158, KA6HJK 119, W6TKV 114, N6GOT 110, KD7XG 105, ADOA 85, W6CPE 74, K6DD 72, K6ZCE 61, W6RE 32, W6NTN 21, N6LNI 14.

**SAN DIEGO:** SM, Arthur R. Smith, W6INI—The 1986 ARRL Nat. Conv., Sept. 5-7, will feature Tony England, W0ORE, as banquet speaker. Tony will also put on spi program for young, prospective amateurs. Packet radio is sweeping hamdom, Palomar ARC is planning a digipeater for its Palomar Mtn location. San Diego City Emergency Mgmt Volunteers (ARES) held "hands-on" packet workshop led by KB5MU, assisted by N6CQR, W6JWL, W6BDR. Join your local club! The South Bay ARS meets 1st Thu at Norman Park Rec.Cen., 270 F St., Chula Vista, at 1930. Contact Pres. W6ZVA, 422-7391. Give a friend a Xmas or birthday present - a membership in his local Amateur Radio Club. Many SD hams active with traffic to Mexico City. Among them are K6DBJ, K6BDNR, N6ELP, KA6IBZ, N6KI, N6LSD, K6QS, W6BRJP, W6THR, K6VU. Apologies to those I missed. Attn. Packeters: NEEDED - a self-sufficient team of four operators with HF packet station capable of being air-transported anywhere when needed. W6DCSS, N6IGP, W6IMN. K6PD are net control on 224.9 MHz ARES net at 1900 Saturday. N6JTN handled 116 msgs on 29 sessions. Traffic: K6UD 379, KB5MU 114, KM6I 45, N6GW 21, WA6BDW 20, WA6IJK 2.

**SANTA BARBARA:** SM, Byron Looney, K6FI—Many stations active in handling Mexican traffic. Write your Congressman urging reciprocal operating agreement with Mexico. Ventura County preparing for the winter floods that follow summer fires. Many amateurs attending Red Cross courses on Shelter Management, Damage Assessment and Disaster Assistance. It makes sense to understand the other fellow's job. You may have to do it! The Estero Club barbeque was a big success. Next is the Paso Robles fish fry. NTSIARES meeting in Santa Barbara will replace SET. This could become an annual affair. Sept SBARC program by CSTI on "Anatomy of an Earthquake". Very timely. Contact CSTI or your SM if you are interested in one of their programs or a scholarship. How is your emergency power source? It can happen here! Traffic: N6HYM 39, K6YD 14, KD6ZM 6.

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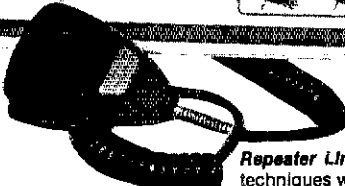
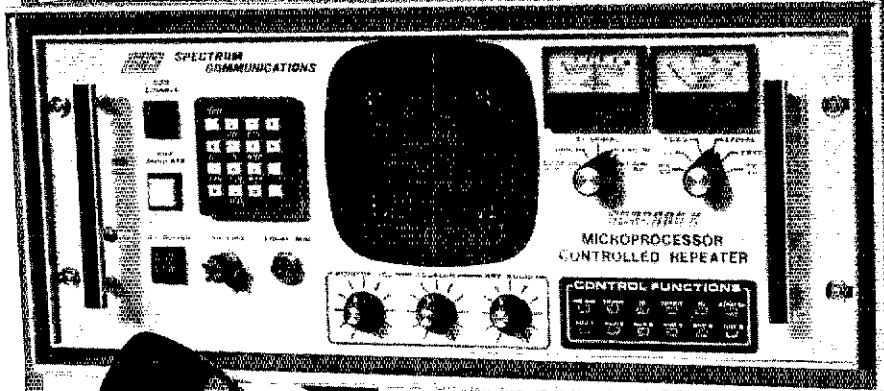


NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. M/ACC: N5V, STM: A05I, BM: W50XK, RFI: W55JBO, TC: W5LNI, PIO: K5HGL, SGL: W5UXP. The new appointment of Asst. Technical Coordinator has been greatly accepted here in our Section; I am pleased to announce the appointments of KA5QYV, KE5ZW, WA6KZA, WB5KYK, N5FXX, KA5RGC and KO5D to the A. T. C. office. These fine and capable amateurs stand ready to help you out in any of your technical problems; and I am sure would make excellent speakers for club meetings. Our new Public Information Officer for N. TX. is Gary Engleman, K5HGL. In Garland, Gary has had many of his fine pix published in QST and other ham publications; including several covers. If you need any P. R. material or assistance with your local media or press, Gary will be glad to help you out. Our local area traffic handlers were very busy with the Mexico City quake t/c. Several thousand pieces of H&W t/c. passed through N. TX. into and out of the disaster area, and a great job was done by NB5L, W5GN, WB5JBP, WB5CIC, AE5I, the Garland Club station and many others. Gene Smith, AE5I, is this year's winner of the James Dunn Memorial Award for his tireless dedication to amateur radio. Congrats, Gene! A. T. C. WB5KYK rpts. lots openings into zero land on 432 in Sept. Larry is erecting quite an antenna farm for VHF and UHF, and plans more show work in Oct. The Texas Tech. Net picnic was held at Lake Mexia, with a talk by W5CTZ, packet demo, and lots of Barbeque and small QSO's. The Radio Amateurs of Texas Tech activated the club station for handling t/c re the Mexico City disaster. 30 priority messages were handled for the Red Cross. Operators were: KA5FSJ, N5HEE, N5HFR, N5HYH, KA5CZY (Lubbock Co. E.C.) WA5RWW (Dist. 2 O.E.C.) KA5WWR and N5FFX. PSHR for Sept. KA5SPT, KA5QYV, K2SCU, AE5I, KE5YG, KA5RGC and W5GN. Traffic: W5GN 636, W9OYL 286, AE5I 251, KA5SPT 243, WB4HML 203, KD5RC 196, K2SCU 129, KA5QYV 48, KE5YG 42, KB5UQ 9, N5IGR 6, K5PC 2.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG, SEC: W5ZTN, STM: KV5X, ACC: NJ5Y, BM: W5AS, PIO: W50FB, OOC: K5WG, SGL: W5NZS, TC: W5QMJ. I am working with the SGL, et al, to develop strategy for implementation of PRB-1 in Oklahoma. Please drop me a note to let me know specific regulations in your locality, and any suggestions you may have regarding implementation. Congratulations to W5SAGO for achieving WAC and WAS on 144 MHz using moonbounce (EME); quite an impressive accomplishment. WASUJF received an Emergency Communications Commendation for his work as EC in Garfield County. Kudos to the Texoma Hamarama '85 organizers for conducting an exceptional hamfest this year. That function certainly seems to be in a growth pattern once again. It should definitely be on the "don't miss" list for 1985. "Club Challenge of the 80s" is nearing completion with a little over a month left. Don't lose sight of the many exciting prizes, including an HF rig for the top club in each category. Several clubs are actively trying to let me know enthusiastic drive the last few weeks could really pay off. Everyone has a safe and joyous Thanksgiving, and a very Merry Christmas. Traffic: W5AS 200, NX5I 134, W5RKC 163, K5CXP 156, KB5EK 106, KV5X 101, WD5OHK 100, W5RB 64, WA5OUV 60, K5GBN 58, K5CQU 55, N5IKN 55, NB5N 46, W5SIFB 44, KA5TTH 41, WA5ZOO 34, W5SUG 31, W5SXR 30, WA5OGC 25, W5VLW 25, W5VOR 24, NR5L 18, K5CAY 16, K5ENA 10, ND5S 6, W5JJ 2.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — SEC: KA5KRL, STM: K5QEW, ASM: N5TC, TC: NZ5U, PIO: WA5UZB, WA5UZB appointed PIO effective October 10. The earthquake in Mexico is the big item for this Section. AJ5K, one of the ops at W5AC, reports that W5AC handled a total of 1335 messages into and out of Mexico with much help from Mexican Student Association. OO K5VRF recently upgraded to Advanced Class, an up a total of 948 messages, mostly via KE1DDE. OOC WA2VJL, OO K5LE, OO W5KQ and DEO K5DGP put over 200 messages into Mexico via KE2AS and XE2BX. TC NZ5U, ex-N5AMH, helped out during Hurricanes Danny, Elena and Gloria. OBS W5KLV reports 11 bulletins and 1 CRRL bulletin given 126 readings on 8 nets. Old calls for new: KA5PEX is now NZ5J; N5AMH is now NZ5U; WD5GLS is now KE5Z — and congratulations to all. NZ5J reports that he, along with K5IG, W5UPS and K8GCU have completed paperwork needed to become an ARRL VE team for Guadalupe and Comal counties. DRN5 Manager WB5YDD reports 229 messages passed, with STX represented 100% by W5KLV, WB5EPA, W5SQU, W5CTZ, K5DSE, NX5V, K5SKO, N5GKA, N5DFO, NZ5U, WA5ZJY, KA5THB and WB5YDD. CAN Cycle II manager W5KLV reports 878 messages passed, with DRN5 represented 100% in STX by NV5U, N5DFO, WB5EPA, WB5FQU, W5KLV, K5EKC, NX5V, WA5ZJY and WB5YDD. OOC WA2VJL is looking for applicants for OO appointment. TC NZ5U is looking for applicants for the ATC appointment. Try it, you'll like it. Traffic: W5AC 1335, K5VRF 948, WA2VJL 512, W5CTZ 504, N5DFO 468, W5KLV 416, WB5YDD 368, K5SV 228, WB5FQU 127, WB5EPA 110, WD5GKH 82, K5HZR 75, NZ5U 57, ACZ5 50, N5GKM 30, NZ5J 14.

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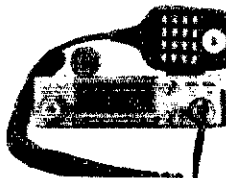
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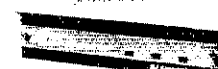
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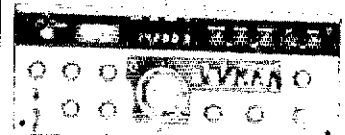
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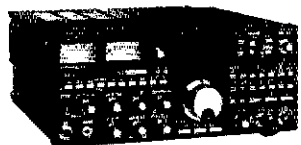


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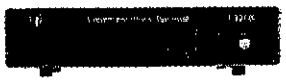


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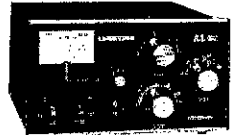
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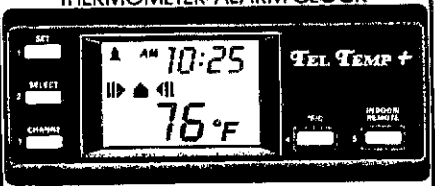
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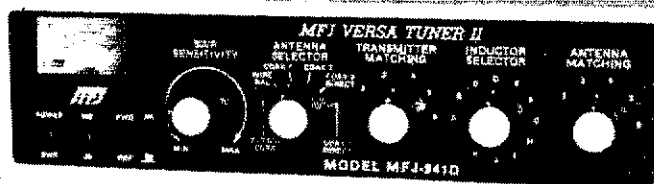
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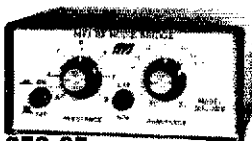
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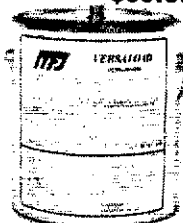
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Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, \$9.95.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).

- One year unconditional guarantee • Made in USA.
- Add \$4.00 each shipping/handling • Call or write for free catalog, over 100 products.

# MFJ

MFJ ENTERPRISES, INC.  
Box 494, Mississippi State, MS 39762

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**800-647-1800**. Call 601-323-5869  
in Miss. and outside continental USA  
Telex 53-4590 MFJ STKV



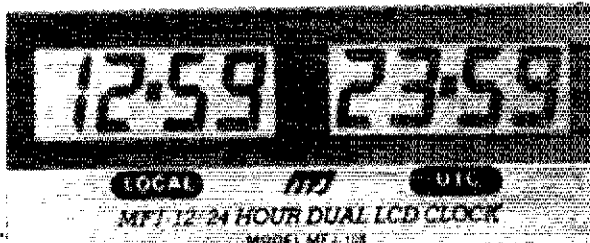
# BEST OF MFJ

## MFJ 24 HOUR LCD CLOCKS

These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

Read both UTC and local time at a glance with the MFJ-106, \$19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the MFJ-107, \$9.95 single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature huge easy-to-see 5/8 inch LCD numerals and a sloped face that makes reading across-the-shack easy and pleasant.



MFJ-108  
\$19.95



MFJ-107  
\$9.95

MFJ-24 HOUR LCD CLOCK  
MODEL MFJ-107

You can read hour, minute, second, month and day and operate them in an alternating time-day display mode. You can also synchronize them to WWV for split-second timing. Both are quartz controlled for excellent accuracy.

They are battery operated so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included. MFJ-108 is 4 1/2 x 12 in. MFJ-107 is 2 1/4 x 12 in.

## RTTY/ASCII/AMTOR/CW MFJ-1229 COMPUTER INTERFACE \$179.95



Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multipole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates retuning while checking for inverted RTTY.

An extra sharp 300 Hz CW filter really separates the signals for excellent copy.

12 1/2 x 12 1/2 x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, \$9.95.

## MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5 1/2 x 6 1/4 x 2 1/4 inch Phenolic case. Built-in antenna tuner, field strength meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621  
\$79.95



## MFJ ANTENNA BRIDGE MFJ-204B \$79.95

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

## REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna"

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships. Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control.

Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, \$9.95.

MFJ-1024  
\$129.95

## 200 WATT VERSA TUNER MFJ-901B \$59.95

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.



## ROLLER INDUCTOR TUNER MFJ-989 \$329.95



Meet the "Versa-Tuner V-2", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everything from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989 is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted meter that reads SWR and forward and reflected power in 2 ranges (200 and 2000 watts). Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10 3/4 x 4 1/2 x 15 inches.

## MFJ "DRY" DUMMY LOADS

MFJ-262  
\$64.95



MFJ-260  
\$26.95

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. MFJ-260 (300 watt), SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2 1/2 x 2 1/2 x 7 in. MFJ-262 (1 KW), SWR 1.5:1 to 30 MHz, 3 x 3 x 13 inches.

## MFJ ELECTRONIC KEYS MFJ-407 \$69.95

MFJ-407  
\$69.95



MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying, 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7 x 2 x 6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, \$9.95.

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MasterCard



# NEW FROM MFJ

**MFJ'S BEST 300 WATT TUNER NOW GIVES YOU A CROSS-NEEDLE METER THAT READS SWR, FORWARD AND REFLECTED POWER — ALL AT A GLANCE.**



**MFJ-949C** MFJ's best 300 watt tuner is now even better!  
**\$149.95** The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet.

You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

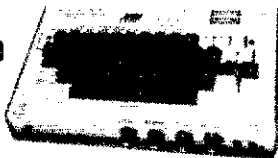
A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 1000 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

## SUPER KEYBOARD

**MFJ-496**  
**\$169.95**



Price slashed 50% to \$169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

You get the convenience of a dedicated keyboard—no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

A 256 character keyboard buffer gives you perfect CW even if you "hunt and peck". A meter reads CW speed and buffer remaining. 4 message memories lets you store up to 256 characters. 4 preprogrammed messages lets you send CQ CQ DE, CQ TEST DE, DE, QRZ. Has speed weight, tone and volume pots that remembers their settings even after power is turned off. Send 60 WPM Baudot and 100 baud ASCII.

You can use it as a deluxe full feature memory keyer that has automatic and programmable memories, lmbic operation, dot-dash memories. Has random and pseudo random code generator.

Automatic serial numbering, message repeating, tune switch, shielded for RFI. 12 VDC or 110 VAC with MFJ-1312, \$9.95. 12 x 7 x 3 1/2 inches.

## CROSS-NEEDLE SWR/WATT METER

**MFJ-615 \$59.95**

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance! SWR is automatically computed—no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6 1/2 x 3 1/4 x 4 1/2 inches.



## 2 KW COAX SWITCHES

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning.

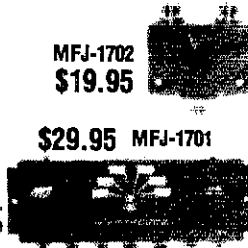
2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, \$19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2 1/2 x 1 inches.

MFJ-1701, \$29.95. 6 positions. White markable surface for recording ant. positions. 8 1/2 x 1 1/2 x 3 in.

**MFJ-1702**  
**\$19.95**

**\$29.95 MFJ-1701**



## ANTENNA CURRENT PROBE

**MFJ-206 \$79.95**

This new breakthrough MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- Indicate transmission line radiation due to high SWR, poor shielding or antenna unbalance.
- Detect re-radiation from rain gutters and guy wires that can distort antenna field patterns.
- Detect RF radiation from ground leads, power cords or building wiring that can cause RFI.
- Determine if ground system is effective.
- Pinpoint RF leakage in shielded enclosures.
- Locate the best place for your mobile antenna.
- Use as tuned field strength meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strength meter. 4 x 2 x 2 inches.



## DIGITAL SWR/WATTMETER

**MFJ-618**  
**\$89.95**



Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad, mismatch tri-color LEDs indicate SWR conditions. Small size (5 1/2 x 4 1/4 x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz. 12 VDC or 110 VAC with MFJ-1312, \$9.95.

## MOBILE ANTENNA MATCHER

**MFJ-910 \$19.95**

Lower your SWR and get more power into your mobile whip for solid signals and more QSOs.

Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions on how best to lower SWR. Fits anywhere, 2 1/2 x 2 1/2 inches.



## TRIPLE OUTPUT LAB POWER SUPPLY

**MFJ-4002 \$149.95**



Triple output lab quality power supply gives you plenty of voltage and current for all your analog and digital circuits. You get 3 completely isolated outputs: 2 variable 1.5-20 VDC at 0.5 amp and a fixed 5 VDC at 1 amp. Connect in series or parallel for higher voltage and current. It's short circuit protected, has excellent line (typically 0.01% /V) and load regulation (typically 0.1%). 2 lighted 3 inch precision meters monitor voltage and current simultaneously. It's ruggedly built so you'll get many years of trouble free service. 12 x 3 x 6 inches. 110 VAC with safety ground.

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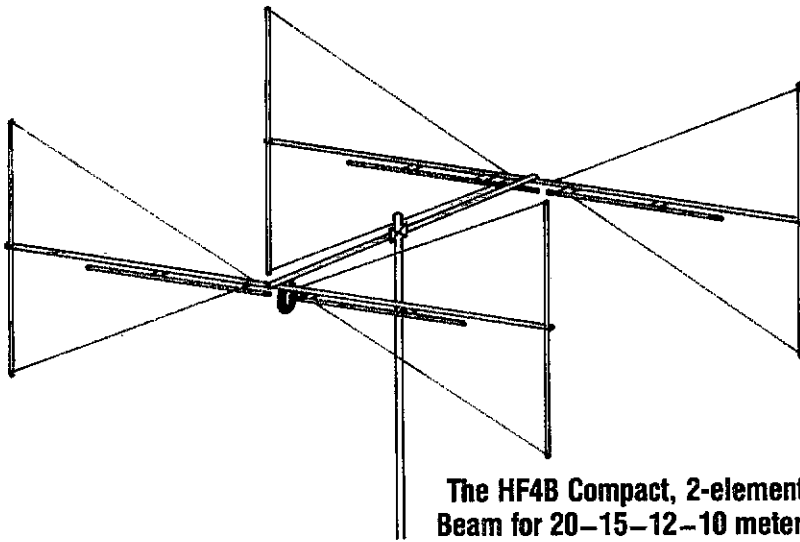
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## Introducing the BUTTERFLY™ Beam from Butternut!

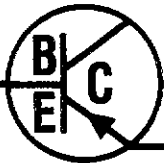


The HF4B Compact, 2-element  
Beam for 20-15-12-10 meters

### Compact Size

The HF4B's 12½-foot elements and 6-foot boom are ideal for home-station use and for weekend retreats, condos, apartments and other places where oversized beams are prohibited. Its light weight (17 pounds) means it can be turned with a tv rotator, yet it is robustly constructed in the best tradition of our world-famous Butternut verticals.

See your authorized  
Butternut dealer



## BUTTERNUT ELECTRONICS CO.

405 East Market Street  
Lockhart, Texas 78644

Please send all reader inquiries direct.

### Performance

The HF4B BUTTERFLY™ has not sacrificed performance for compactness. Its unique design with fanned elements and L-C circuits avoids use of power-robbing traps yet provided high-efficiency operating on all bands. The BUTTERFLY™ outperforms anything in its class.

## Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham-Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" x 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November QST. If the 20th 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 their advertising before their ad can appear.

The publisher of QST will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

### Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14,280 MHz, 1900-2000 GMT, Br. Bernard Frey, 1 Fryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VVWA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. 1417 Stonybrook, Mamaroneck, NY 10543.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Duniap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77080 (S.A.S.E. please).

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

MORSE TELEGRAPH CLUB, established 1942, seeks landline and radio operators interested in telegraphy and Morse history. 46 chapters USA & Canada. For information and sample paper contact W. K. Dunbar, AD9E, 1101 Maplewood Dr., Normal, IL 61761 309-454-2029.

THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

THE GOOD SAM HAMS CLUB invite RV operators to check in the Good Sam Ham Net 14,240 or Sundays 1900Z also 3,880 or Tuesdays at 2359Z Net control, N5BDN, Clarksville, TN.

"12-12" WORLDWIDE is promoting activity and good operating practices on the new 12-Meter Band. During Charter Membership months you may get your Number, Certificate, and quarterly newsletter, by joining. \$4 per year. "12-12" Worldwide, Box 222, Cherokee, OK 73728.

INDIANA: SOUTH BEND Swap & Shop, Jan. 5 at the Century Center downtown, on U.S. 33, One-way north between St. Joseph Bank Building and river. Half acre on carpeted floor. Industrial history museum in same building. Four lane highways to door from all directions. Talk-in 52-52 & area Repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, Telephone 219-233-5307.



Master code or upgrade in a matter of days. Code Quick is a unique breakthrough which simplifies learning Morse Code. Instead of a confusing maze of dits and dahs, each letter will magically begin to call out its own name! Stop torturing yourself! Your amazing kit containing 5 power-packed cassettes, visual breakthrough cards and original manual is only \$39.95! Send check or money order today to WHEELER APPLIED RESEARCH LAB, P.O. Box 3261, City of Industry, CA 91744. Ask for Code Quick #106 California residents add 6% sales tax.

You can't lose! Follow each simple step. You must succeed or return the kit for a total immediate refund!

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- \*\*Master the standard exchange in just a few evenings!\*\*
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Easy-to-learn lessons on two 60-minute audio cassettes.

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**TRAVEL-PAK QSL Kit** — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, P.O. Box 203, Wynantskill, NY 12198. 518-283-0258.

**DON'T** buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch; will give quote. Little Print Shop, Box 9848, Austin, TX 78766.

**DISTINCTIVE QSL's** — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

**FREE samples** — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

**QSLs & rubber stamps.** Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

**EMBROIDERED** emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6865 M, Marietta, GA 30065.

**QSLs** — 1) Famous K0AAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. 4) Multiple call signs. 5) Ham "business cards." State your sample wants. 3c self addressed business size envelope required. Marv Mahre, W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

**QSLs Samples 40c** (stamps OK) Fred Layden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

**INTRODUCING:** Beautiful natural full color photo QSL cards, made from your color negative or slide. From \$285, for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

**BE SURPRISED** - get a variety of cards - 100 for \$8 or 200 for \$13. Samples \$1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

**FINEST** custom QSLs, large cut catalog and samples \$1 refundable on first order. Hitz Print Shop P.O. Box 45018, Westlake, OH 44145.

**QSL's** — since 1956, free samples. Rusprint, Box 7575, Kansas City, MO 64116.

**QSL samples** — 25¢ Samcards — 48 Monte Carlo Dr., Pittsburgh, PA 15239.

**FREE, 100 QSLs** with first order. Samples 50c. Gazebo Press, Rt. 4, Box 4148, LaPlata, MD 20646.

**ENGRAVING, CALLSIGN/name** badges by W0LQV. GASE for price sheet. Box 4133, Overland Park, KS 66204.

**CADILLAC** of QSLs — Completely different! Samples \$1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

**PICTURE** QSL cards of your shack, etc. from your photograph or black ink art work. 500 \$23.00; 1000 \$34.50. Also unusual non-picture designs. Send stamp for illustrated literature. Generous sample pack \$1.00; half pound of samples \$2.00. Custom printed cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, PA 19140. Phone: 1-215-228-5460.

**FIRST CLASS, Full Color QSL** from your prints or slides. Confirming report and address printed on back, \$199/2,500. Smith Printing, 20420 Calhaven Dr., Saugus, CA 91350. 805-251-7211.

**QSLs, QUALITY and Fast Service** for 25 Years. Include Call for Decal. Samples 50c. Ray, K7HLR, Box 331, Clearfield, UT 84015.

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**QUALITY QSLs, Samples 50c.** Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

**THANKS TO ALL** our friends and customers who helped make 1985 a record year. Best wishes for a Merry Christmas and a healthy and prosperous New Year. Wayne, W4MPY and Lota, N4KAI.

**ANTIQUÉ-VINTAGE-CLASSIC**

**WANTED:** Early Hallcrafters "Skyriders" and "Super Skyriders" with "Silver" panels. "Skyrider Commercial," early transmitters HT-1, HT-2, HT-8, etc., other Hallcrafters gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallcrafters Collector, 4500 Russell, Austin, TX 78745.

**WANTED:** old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

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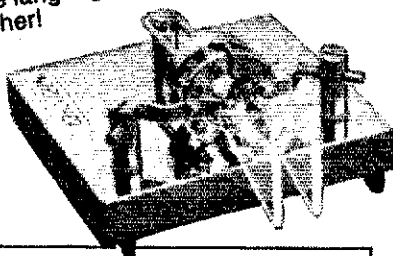
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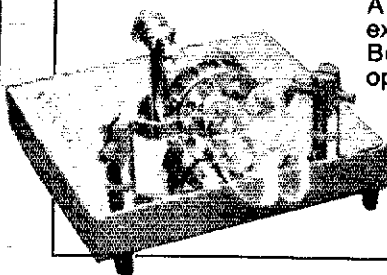
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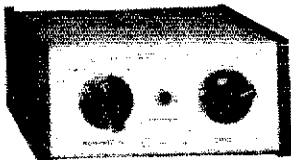
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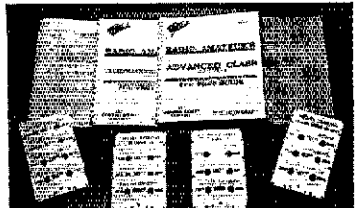
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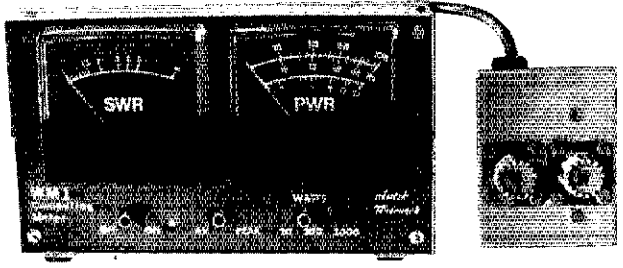
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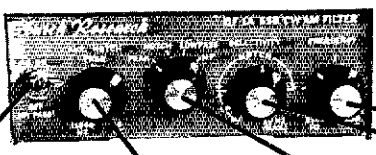
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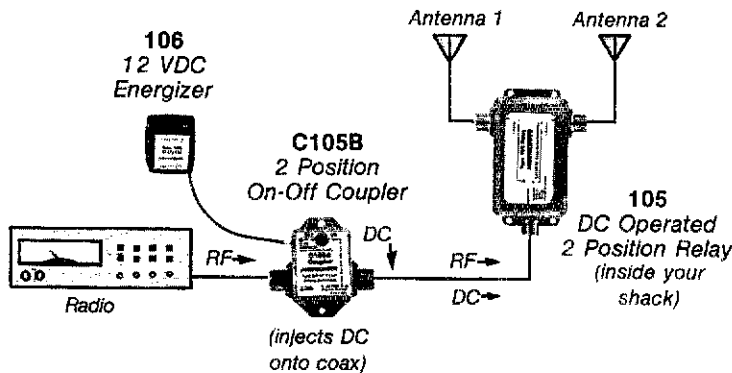
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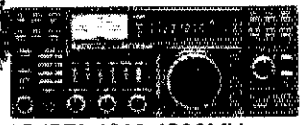
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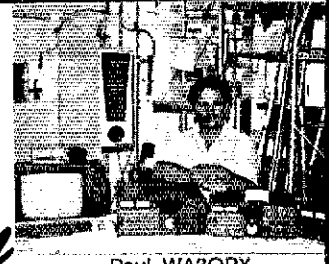
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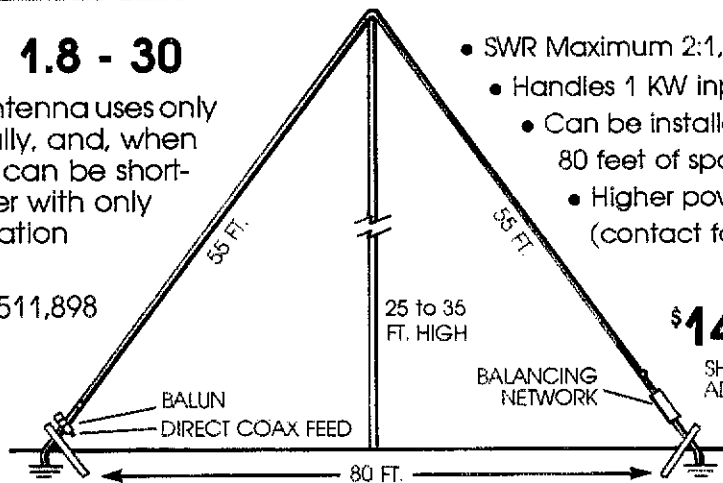
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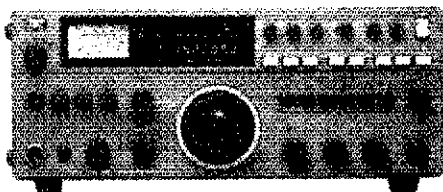
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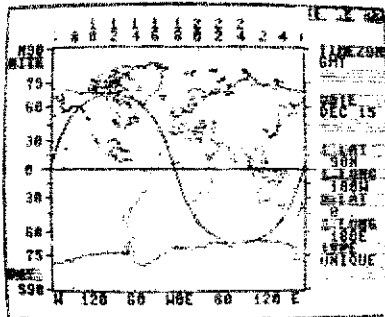
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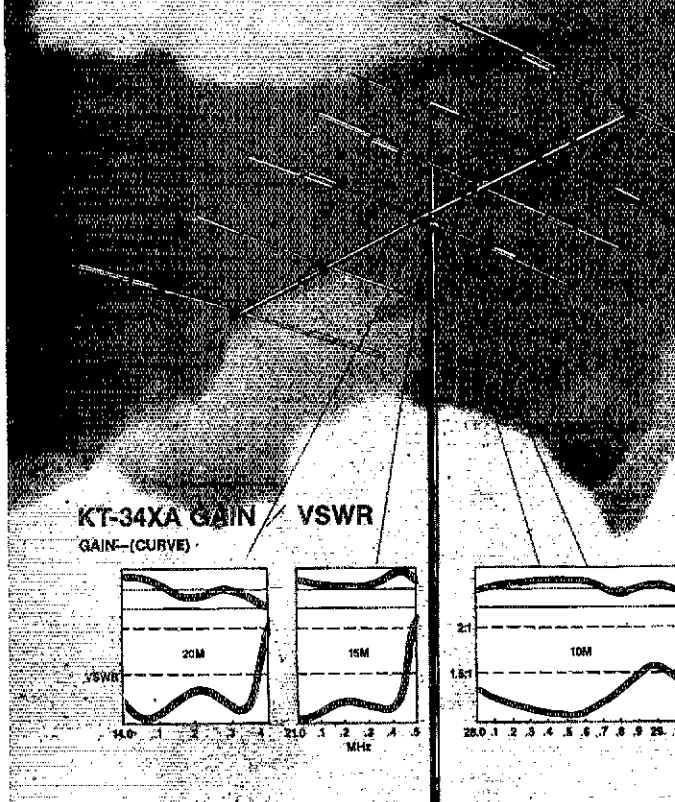
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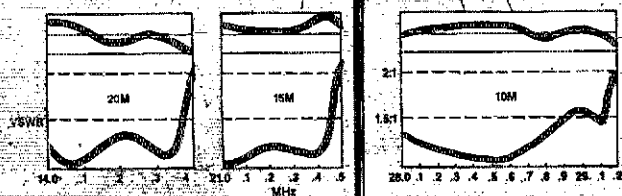
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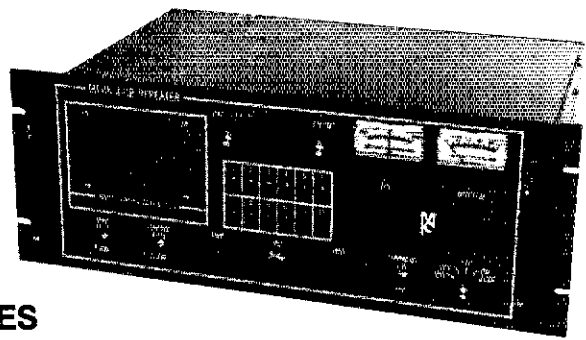
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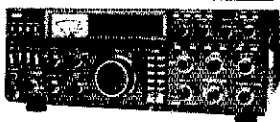
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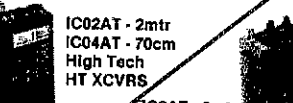
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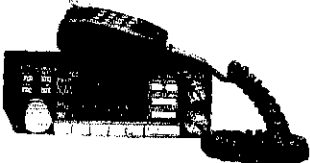
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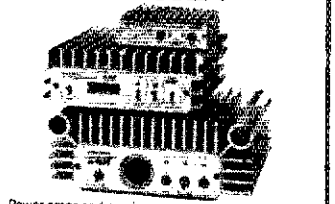
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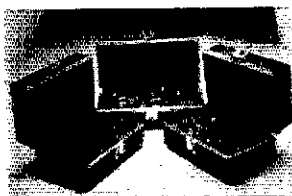
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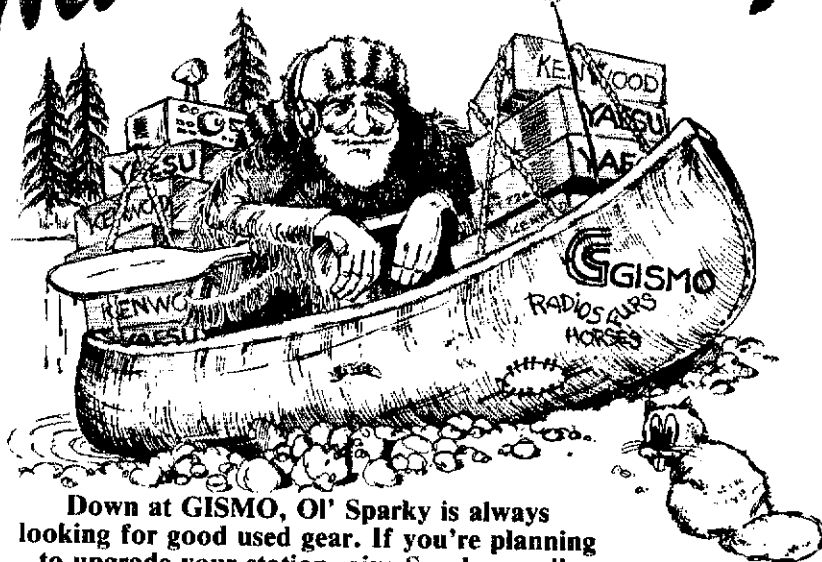
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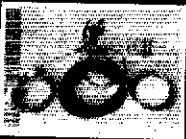
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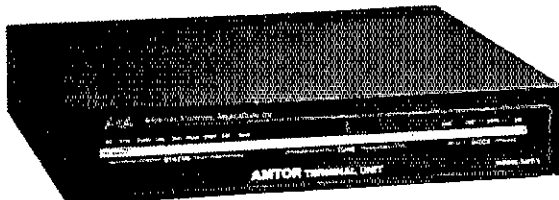
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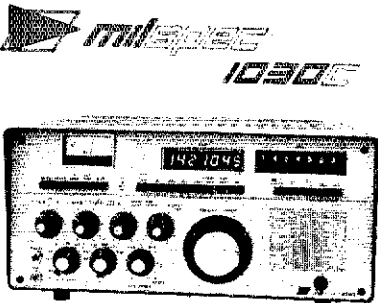
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FOR SALE: Kenwood '520S immaculate condition. Manual, Org. box. Was back-up rig. "T" Bruno, WA2AET, 201-548-9520.

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COLLINS: 75S-3C, 32S3, 312B4, 516F2, includes Crystal Pack. Operate on WARC in transceiver. Rcvr has 6 kc 2.1 kc .5 kc cand. 3 kc Filters. All round emblem, High sn \$1000. Also clean high sn KWS-1 and 75A4 with 2.1 kc .5 kc and .3 kc Filters \$750. KM1A, 203-663-2153 06417.

TS-430S, Astron RS20A, FM Board, Manuals, mint. Asking \$650. KA1LWU, 203-749-4423.

KENWOOD T-599 with A.M. Needs work, no manual. As is: \$75. Thomas Bott, 7939 Jefferson Hwy, B-101, Baton Rouge, LA 70809, 504-924-1951.

KENWOOD TS-820-S with 250 Hz CW and Fox-Tango 2.1 kHz filters. Radio has been well cared for. Performance test shows significantly superior selectivity and sensitivity. Package includes SM-220 Station Monitor with BS-8 Band Scope, VFO-820 and MC-50 microphone. \$795 includes UPS. John, K0CAM, 1611 Elmore Ave., Davenport, IA 52803. 319-355-6052.

FOR SALE: HEATH SB-301, 401 w/all Filters, HS-1661 Spkr, and some spare tubes, clean - \$160. Swan 500C ea PSY117XC - \$160. Heath HW-8 mint - \$75. MFJ Grandmaster Memory Keyer - \$30. All plus shpg. Don, KD9FK, 414-921-5508.

SELL - HEATH HW-101 (needs repair) with HP-23 Power Supply \$125. Gonset Communicator III two-meter band excellent condition \$65. Pickup only. W2MCD, 718-383-6654.

SELL: DRAKE 2-C Rcvr, \$100. Drake 2-NT CW Xmr, \$100. HQ-170 Rcvr, \$125. All good working condition. Bill Moessner, K3WRD, 1002 Windsor Rd., Warminster, PA 18974 215-674-3892.

WANTED: CV-591 or MSR-4 SSB Converter by TMC. W6RNC, P.O. Box 478, Nevada City, CA 95959.

KENWOOD TS-520, CW Filter, MC-50. Like new, original carton, manuals \$385. W4MGG, 919-924-0934.

DRAKE TRAC, Power Supply, original manual, new tubes. Excellent condition. K8OK, 616-532-5196.

SELL: CX7, SX117, HA-10 K8RNE, 216-322-8722.

SELL: COMPLETE OSCAR Satellite Station. Kenwood TR-9130 2 Meter Allmode, TR-9500 70 cm Allmode, both with BO9A System Base Units, and KPS-7 Power Supplies. Complete Station absolutely scratchless mint. \$1050. N4AVV, 919-276-8518 after six thirty Eastern time.

PC/MS-DOS Ham Software. Send \$6.50 for sample disk and catalogue. Rockford Systems, 7474 Hessler, Rockford, MI 49341.

KENWOOD TR-900 with base \$275. Mini Quad HQ-1 with Balun \$50. Cushcraft A147-4, A449-6 \$15 each. All like new condition. KB8TV, Joe Schwob, 7241 N.E. 6th Drive, Boca Raton, FL 33431. 1-305-994-3041.

COLLINS KWM-380 with Speech Processor, CW Filter, all updates. High serial number. Mint condition. Little used. \$2295. W3ALZ, 301-384-2969.

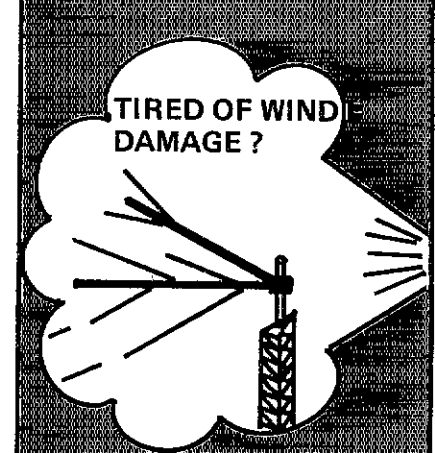
TRADE: My KENWOOD TS-620 Transceiver towards eight-inch or larger telescope. Steven Henry, WA4WRC, 61 Polks Landing, Chapel Hill, NC 27514, 919-966-2380 or 919-967-5434.

COLLINS S-Line: 75S3B, 32S3, 312B-4, 516F-2, SM-3, all round emblem with 500 and 200 Hz filters. \$900, prefer local pickup. Also 75S3, \$200. W3MA, 7 Treble Lane, Malvern, PA 19355, 215-644-0806.

SELL COLLINS HF-380 serial #1, with Keypad \$4000 OBO. McKay Dymek Rcvr DR-44 with Cabinet, DP-40 Preselector & DA-100 Active Antenna also DA-9 VLF Preamp/Antenna included \$3000 OBO. Warranty available. All above mint condx. Must sell. George, W6NRE, 818-901-7440. Want KWM-1 in mint condx.

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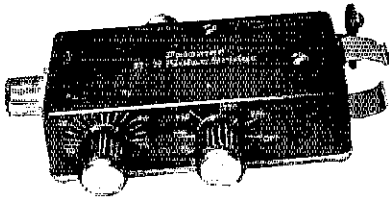
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- Adjust it to your operating frequency quickly and easily.

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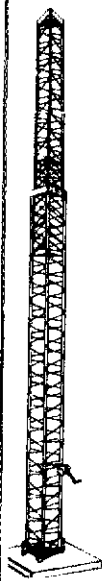
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# ANTENNA/TOWER SALE!



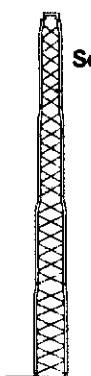
## hy-gain CRANKUP SALE!

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
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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.!



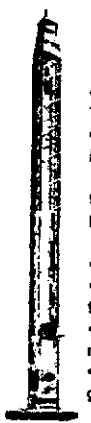
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### FREIGHT PREPAID

- 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	164	\$329
HBX48	48 ft	10 sq ft	303	\$429
HDX56	56 ft	10 sq ft	385	\$499
HDX40	40 ft	18 sq ft	281	\$399
HDX48	48 ft	18 sq ft	363	\$489

\*Year Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.



These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

- 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	Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	\$694	\$579	
W51	51.0 ft	20.5 ft	9.0 sq ft	\$1154	\$899	
LM354	54.0 ft	21.0 ft	16 sq ft	\$2010	\$1599	
LM470D	70.0 ft	22.0 ft	16 sq ft	\$4195	\$3199	
DX86	86.0 ft	23.0 ft	25 sq ft	\$7200	Call	

(Motorized)



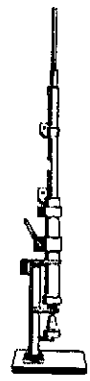
**MA-40**  
40' tubular  
Regular \$745  
**SALE! \$549**

**MA-550**  
55' tubular

Will handle 10 sq. ft. antennas at 50 MPH winds.

Regular \$1245  
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### RG-213U

\$ 29/ft \$279/1000ft  
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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\$ 19/ft \$179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket • Foam Dielectric

### Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type Imped.	10MHz	30MHz	150MHz	450MHz	
RG-213/U	50	6	9	2.3	5.2
RG8X	52	8	12	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
1/2" Alum	50	3	5	1.2	2.2
3/4" Heliax	50	2	4	9	1.6
1" Heliax	50	1	2	5	9

### HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

- 1/2" Alum. w/poly Jacket. \$ .79/ft
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### HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
1/2" Alum	\$19	\$19	\$19	\$25
1/2" Heliax™	\$25	\$25	\$25	\$25
1/2" Heliax™	\$49	\$49	\$49	\$49

### AMPHENOL CONNECTORS

Silver PL259	\$1.25
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### ALPHA DELTA

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A4 4-el Tribander Beam	\$269
A744 30'/40mtr Kit for the A4	\$75
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AV5 80-10mtr Vertical	\$99
D40 40mtr Dipole	\$149
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A50-5 5-el 6mtr Beam	\$79
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### hy-gain

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#### Discoverer 3-el Conversion Kit

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V25 2-mtr Base Vertical.

V45 440MHz Base Vertical.

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TH7XD5 7-el Tribander Beam.

TH3JRS 3-el Tribander Beam.

205BAS 5-el 20-mtr Beam

155BAS 5-el 15-mtr Beam

105BAS 5-el 10-mtr Beam

204BAS 4-el 20-mtr Beam

64BS 4-el 6-mtr Beam

18 AVT/WB 80-10mtr Vertical

18HTS 80-10 mtr Hy-Tower Vertical

23BS 3-el 2mtr Beam

25BS 5-el 2mtr Beam

28BS 8-el 2mtr Beam

214BS 14-el 2-mtr Beam

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BN86 80-10 mtr KW Balun W/Coax Seal

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10 ft Stack Sections

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25G	\$49.50	55G	\$134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

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	FK2568	68 ft	11.7 sq ft	\$999
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	FK4554	54 ft	29.1 sq ft	\$1299
	FK4564	64 ft	28.4 sq ft	\$1399

25G Foldover Double Guy Kit. \$219  
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\*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	\$29	\$49	\$59	\$79
18 in Wall	\$39	\$69	\$99	\$129
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Mon-Fri: 9am - 5pm  
Sat: 9am - 1pm

# TEXAS TOWERS

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(Prices & Availability Subject To Change Without Notice)

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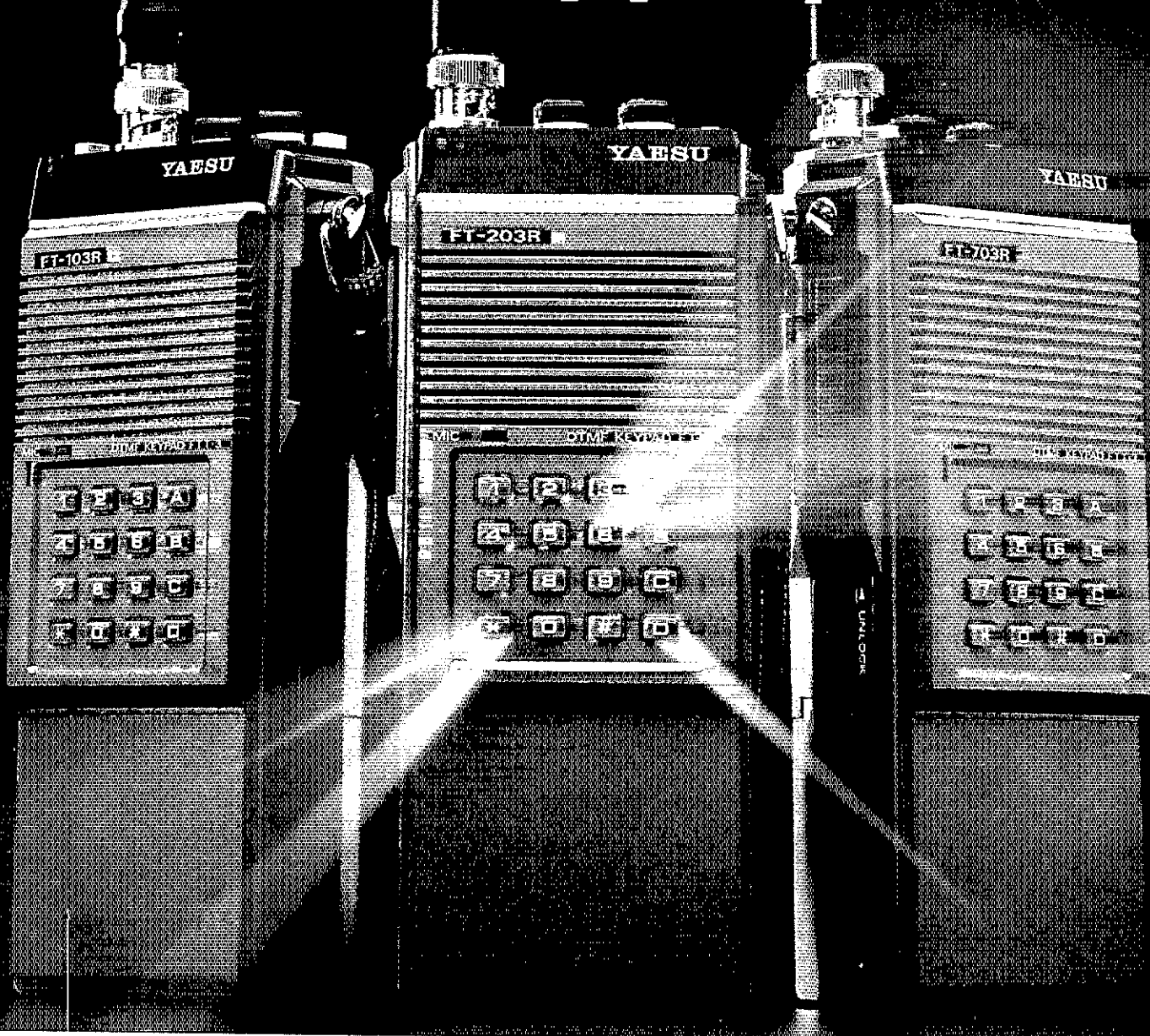
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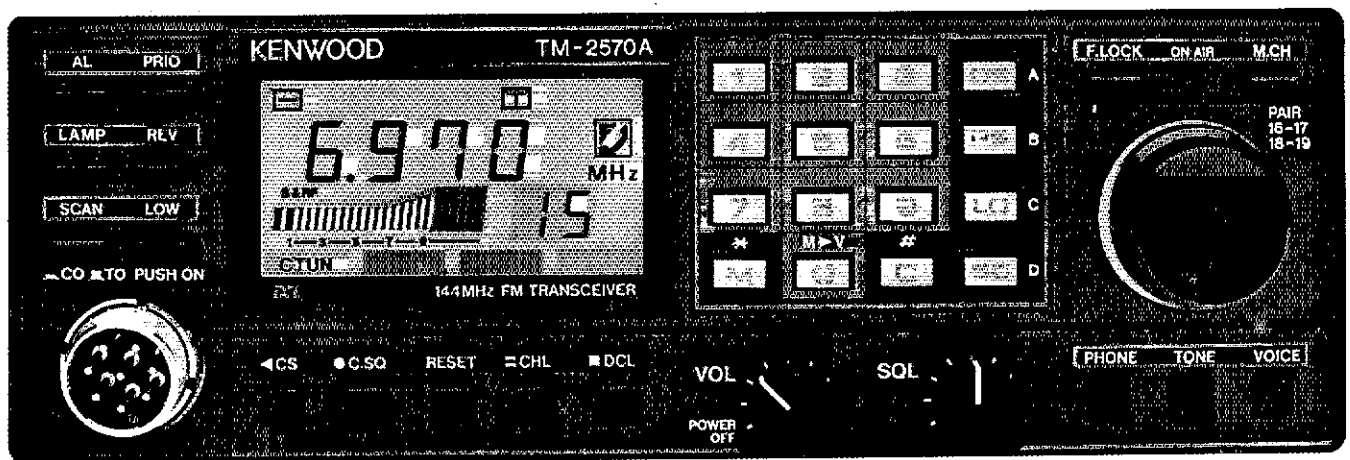
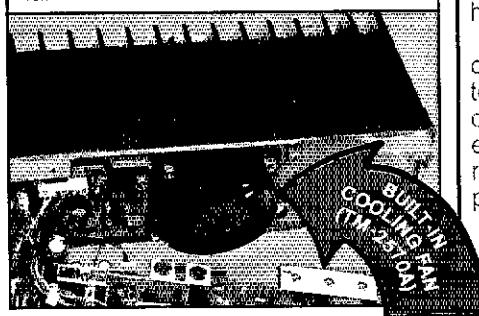
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- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-2550A/2530A

- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DWN switch
- **MC-42S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
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- **SW-100A/SW-100B** compact SWR/power meters
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