QST

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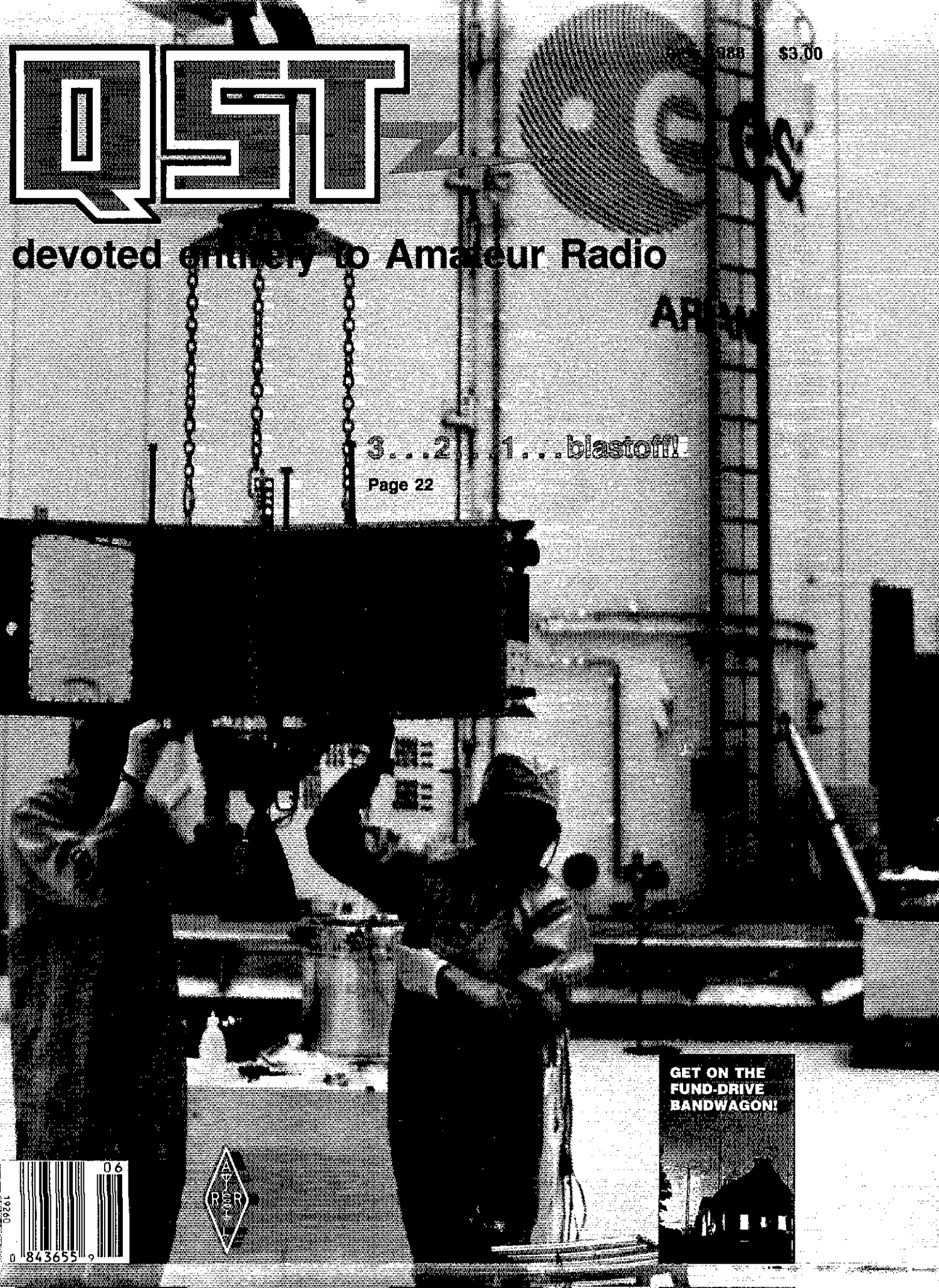

GET ON THE FUND-DRIVE BANDWAGON!

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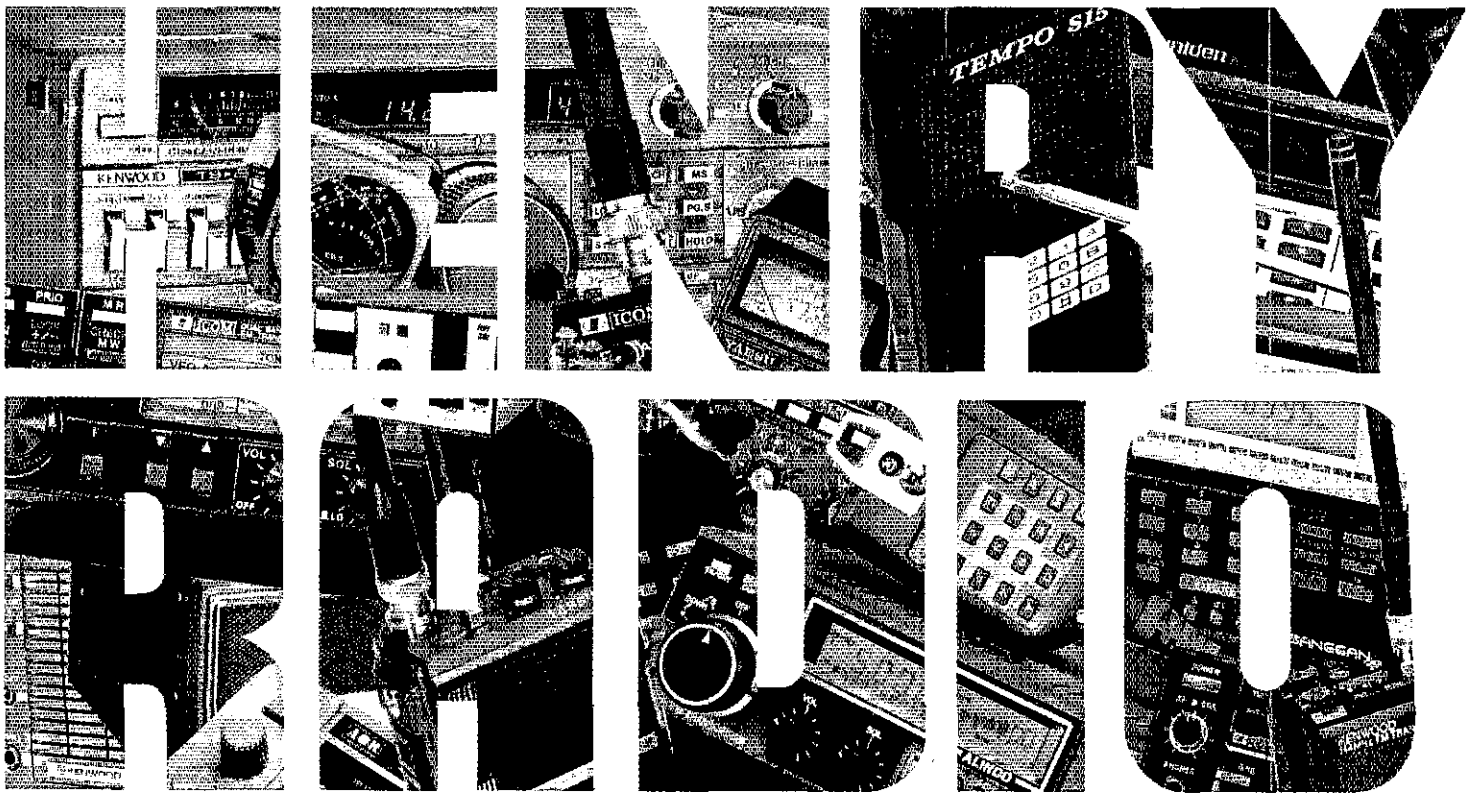

"The amateur world knows us well"

For more than 60 years we've been a world leader in amateur radio. . .selling the finest equipment at a fair price. We manufacture a quality line of high power linear amplifiers and we stand behind what we sell. That's why thousands of amateurs keep coming back.

☆ Featuring a large inventory of fine equipment from the world's leading manufacturers ☆ A knowledgeable staff dedicated to amateur radio ☆ A complete line of accessories ☆ A well stocked repair shop staffed by experienced technicians ☆ We take trade-ins and sell used equipment ☆ Generous discounts on cash purchases ☆ We accept Visa, Mastercard and Discover and carry our own term financing

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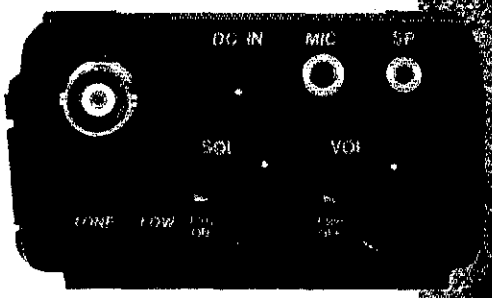
220 MHz TH-315A Here Now!

This HT Has it All!

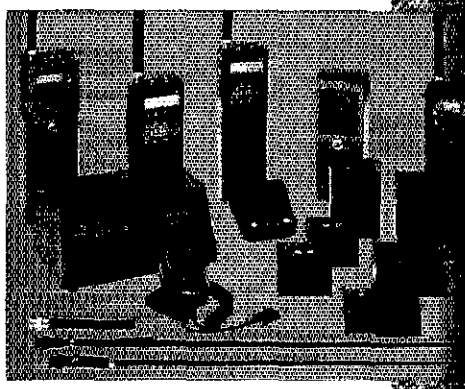
TH-215A/315A/415A

Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the *new TH-215A for 2 m, TH-315A* for 220 MHz, and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from hamshack to portable *to mobile with the greatest* of ease!



- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz. TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.**
- ***Odd split, any freqency TX or* RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts applied, RF output is 5 W! (Cable supplied!)
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** *Used to check the frequency when* CTCSS encode/decode is used or when squelch is on.
- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** *The beeper has a* unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.



Optional Accessories:
• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, *1600 mAH NiCd pack (1.5 W output)* • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter

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

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ICOM | IC-228A/H 2 Meter Mobiles

THE BEST THINGS COME IN SMALL PACKAGES

Meet the master of 2-meter FM mobiles! ICOM's easy-to-operate IC-228A/H answers your requests for custom big rig performance and maximum frequency coverage in a compact unit designed to fit today's autos. Operate odd split and subaudible-tone accessed repeaters, monitor NOAA weather and enjoy incomparable ICOM quality with every call!

DUPLEX INDICATOR
Indicates plus or minus duplex.

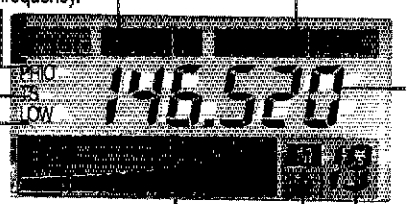
PRIORITY WATCH
Monitor any channel for calls while continuing operation on another frequency.

TUNING STEP INDICATOR
Programmable tuning steps of 5kHz, 10kHz, 15kHz, 20kHz or 25kHz.

45 OR 25 WATTS
The IC-228H delivers 45 watts; the IC-228A 25 watts. Both include selectable low power.

SRF INDICATOR
Shows signal strength when receiving, and relative output power selection when transmitting.

SUBAUDIBLE TONES/BEEPER
Includes all subaudible tones built-in. TONE appears when the tone encoder is turned on. SQL lights when the optional UT-40 pocket beep function is activated (silently monitors for calls with your pre-programmed tone).



WIDE BAND COVERAGE
Full reception of 138-174MHz including public service and NOAA weather bands. Transmit range of 140-150MHz includes MARS and CAP frequencies.

20 MEMORIES
Each memory stores any Tx offset and subaudible tone.

MEMORY LOCKOUT
Lights when a memory channel is programmed as a skip channel.

- Wideband Coverage 138-174MHz Rx
- 20 Memories with Memory Channel Lock-Out
- 45/25 Watts
- Color Keyed LCD
- Band and Memory Scanning from Supplied DTMF Mic
- Call Channel
- Optional Beeper
- Priority Watch

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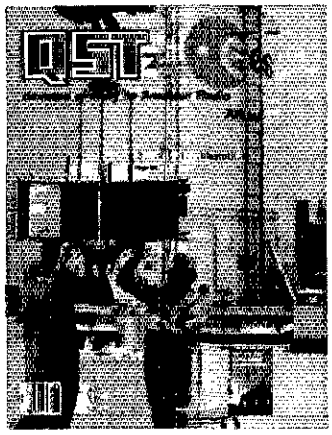


OUR COVER

Technicians from AMSAT-NA and AMSAT-DL prepare the Phase 3C satellite for launch at the Guiana Space Center, Kourou, French Guiana, South America. An extensive preview of this exciting new amateur satellite appears on pages 22-30. *(AMSAT-NA photo by Jeff Zerr)*

CONTENTS

June 1988
Volume LXXII Number 6

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

Others May Try to Imitate, But...

Only One Can Be The Best

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

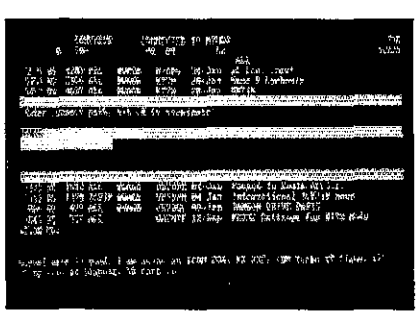
Amateur Net Price $319.95

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

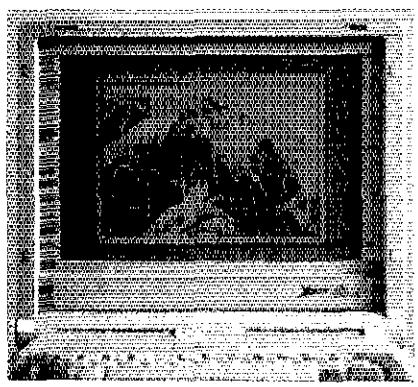
1 Versatility

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

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



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

2 Software Support

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

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

3 Proven Winner

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

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

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

Advanced Electronic Applications, Inc.

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AEA Brings you the Breakthrough!

R4

NO GROUND RADIAL VERTICAL

10, 12, 15, 20 METERS

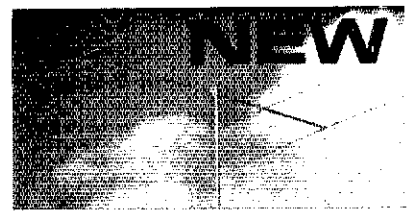
The R4 is a second generation electrical half wavelength vertical antenna. Developed from the very successful R3 it has many new design features for easier assembly and operation plus improved performance.

The half wave design gives optimum current distribution for best low angle radiation and excellent DX communications. R4 brings high performance antenna features to those living in apartments, condominiums or on small city lots. Even if you have plenty of space, R4's combination of neat appearance and DX capability make it ideal for your ham station.

The new R4 design has a broadband solid state impedance matching network for full coverage of all four bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 ohm coax. The unique counterpoise ground uses four 48" long by .100" diameter stainless steel rods. This system gives excellent RF decoupling for mounting in any location from ground level to roof top. Make R4 your compact choice for a full-performance no-compromise HF vertical antenna.

R4 FEATURES

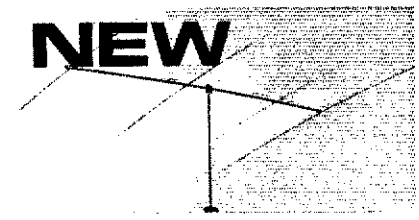
Frequency: 10, 12, 15, 20 meters
Gain excellent
Low angle radiation
360° radiation pattern
Broadband impedance matching
Hi Q frequency selecting traps
SWR: 1.2-1 typical
2:1 SWR bandwidth: 10M-1.7 MHz 12M-100 KHz
15M-450 KHz 20M-350 KHz
Power handling watts: 1800 PEP
Connector: UHF Female SO-239
Self-supporting
Height: 18 ft. 5.5 M
Weight: 8 lbs. 3.7 Kg
Mast mount, in (cm): Min.-Max. 1.5 (3.8)—1.75 (4.44)



12 METER 4 ELEMENT SKYWALKER

Enjoy the most popular WARC band. Whether your interest is friendly rag chewing or operating awards and DX-ing, the Cushcraft 12-4CD is designed to punch your signal through on this active new band.

Forward Gain	excellent
Front to Back Ratio	excellent
SWR	1.2:1
Boom Length	18 ft (5.5 m)
Longest Element	19 ft 10.5 in (6.1 m)
Turning Radius	15 ft (4.6 m)
Wind Surface Area	4 ft² (.46m²)
Weight	21 lb (9.5 kg)



A4S THE PREMIUM 10-15-20 METER BEAM

The A4S is the true high performance tribander. Precisely tuned high power traps, carefully selected element lengths and proper spacing combine to make A4S the preferred antenna. It has pinned boom sections and formed aluminum brackets to keep elements straight under all conditions. All hardware and clamps are stainless steel.

Forward Gain	excellent
Front to Back Ratio	excellent
SWR	1.2:1
Boom Length	18 ft (5.5 m)
Longest Element	31 ft 4.5 in (9.6 m)
Turning Radius	18 ft (5.5 m)
Wind Surface Area	5.5 ft² (.51 m²)
Weight	37 lb (16.8 kg)

cushcraft CORPORATION
THE ANTENNA COMPANY

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70 W/45 W/25 W 3 Choices

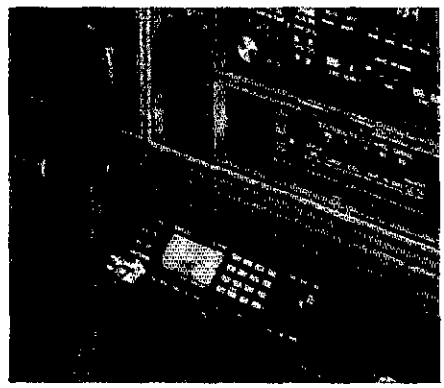
Three Choices for 2m!

TM-2570A/2550A/2530A

Feature-packed 2m FM transceivers

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

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

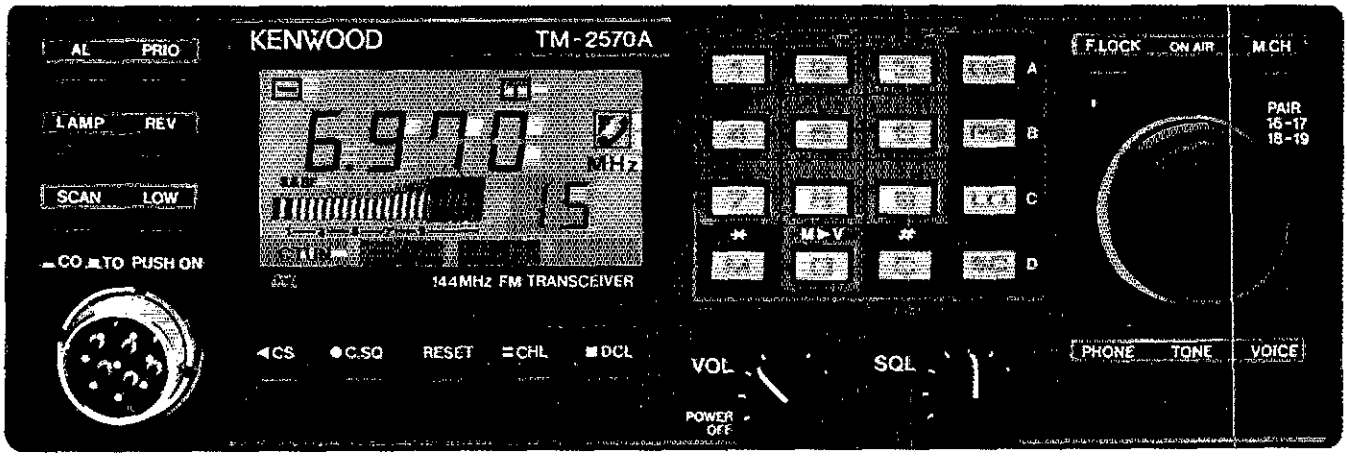


- New 5-way adjustable mounting system
- Automatic repeater offset selection—**another Kenwood exclusive!**
- Direct keyboard frequency entry
- Front panel programmable 38-tone CTCSS encoder **includes** 97.4 Hz (optional)
- Big multi-color LCD and back-lit controls for excellent visibility
- The TM-3530A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

DCL Introducing... Digital Channel Link

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

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



Actual size front panel

Optional Accessories

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

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

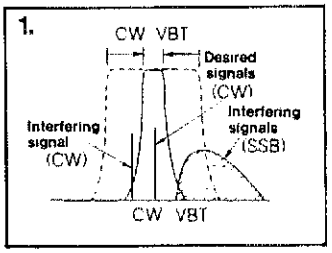
#1 Rated HF!

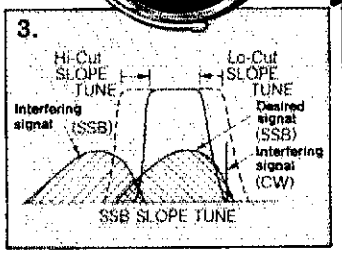
TS-940S

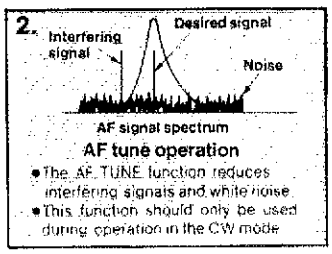
Competition class HF transceiver

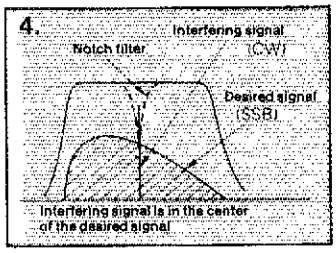
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***









1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters, YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

Complete service manuals are available for all Kenwood transceivers and most accessories.
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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 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

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

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

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA
Telephone: 203-666-1541 Telex: 650215-5052 MCI.
MCI MAIL (electronic mail system) ID: 215-5052
FAX: 203-665-7531 (24-hour direct line)

Canadian membership inquiries and correspondence should be directed to CRRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-660-1200.

"It Seems to Us . . ."

QRM

It was in the glorious "good old days" of King Spark, in the January 1917 issue of *QST*, that "The Old Man" contributed his classic "Rotten QRM" article to our annals. In so doing he added several new terms to the English language, the one best known today being "wouff hong." (It wasn't until a couple of years later that anyone knew what a wouff hong—an instrument of torture to be used on rotten operators—looked like, but that's another story.)

A few months later, such concerns took a back seat to World War I and the silencing of amateur stations for its duration; such cataclysms do serve to put things in perspective. But at the time, it no doubt seemed to many amateurs that growth in numbers was surpassing our ability to absorb it. In those days it was hardly possible to put a station on the air without interfering with everyone else for miles around, and there was an uncountable horde of unlicensed, low-power spark-coil operators who were at best poorly informed about operating procedures and the capabilities of better-equipped stations. The number of amateurs who can remember those days is dwindling, someday to vanish altogether; the rest of us can only imagine what it must have been like.

Things today are simultaneously easier, and far more complex. If you were watching this space in April, you may recall the discussion of the combination of FCC-mandated and voluntary restrictions which are intended to help keep us out of one another's way. They do help, but not to the extent of completely eliminating QRM (interference) between amateur stations—nor should we expect them to.

Indeed, zero QRM is an utterly unrealistic expectation in Amateur Radio. If interference-free communication is your primary goal, you're in the wrong hobby—you should be fooling with fiber optics. Here's an attempt—one that we hope won't lead to World War—to put QRM into perspective. Here we're referring only to interference from one amateur station to another, not to RFI/TVI or to nonamateur intruders into exclusive ham bands.

Except when it's to emergency communications, amateur-to-amateur interference is not, in and of itself, illegal. Each amateur station has an equal right to operate; just because you've used the same frequency since 1947 doesn't mean you have any more legal right to it than the guy who got his license in the mail five minutes ago. It's willful or malicious interference that's prohibited by the rules.

What's malicious interference? Here's an example. If two hams, or groups of hams, find themselves on the same frequency pursuing mutually exclusive objectives, that's happenstance, not malicious interference. On the other hand, if one moves to another frequency and the other follows, for the purpose of continuing to cause QRM to the first, the second has crossed the line. Do it enough, and he'll put his license in jeopardy. Of course, what sometimes happens is that they'll all sit on the one frequency and argue about who has more right to be there. This is the kind of behavior "The Old Man" had in mind when he invented the wouff hong; all it accomplishes is to keep the frequency from being used by anyone, for anything worthwhile.

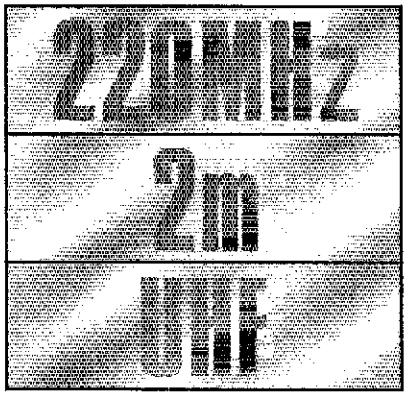
Several other FCC Rules are intended to minimize (but not to eliminate) interference. One says, "...amateur stations must use no more than the minimum transmitter power necessary to carry out the desired communications." There's also a requirement that "...each amateur station shall be operated in accordance with good engineering and good amateur practice." But our obligations to one another don't end with the rules; even more important is the need for common sense, and common courtesy, in the sharing of our common spectrum resources.

We each have the right to pursue our legitimate objectives within the privileges conveyed by our licenses; but we also have the obligation to minimize the inconvenience and loss of enjoyment that we cause to others. If there's a tiny segment of a band that's used for international communication, surely it's not too much to ask that local ragchews take place elsewhere. If our establishing a beacon in the middle of a densely populated area is going to QRM nearby weak-signal enthusiasts, surely we can find another place to put it. (Insert your own favorite example here.) And surely, in such cases we don't need the FCC to tell us what growing up in a civilized society should already have taught us to do.

There are more amateur stations on the air today than there were yesterday. Tomorrow, there will be even more. The resulting interference will cause some of us to learn how to use less-populated bands—one of the desirable side effects of congestion. With that, and with a bit more common sense and courtesy, there will be room for even more newcomers—adding to our ability to deliver public service, and to earn public support.

They say courtesy is contagious. It's worth a try. Besides, who wants to take their chances with the wouff hong?—*David Sumner, K1ZZ*

Yaesu's mini HTs. The smallest, smartest, toughest radios. Anywhere.



Whether you're a Novice or Extra class operator, you're sure to appreciate the high power, durability and size of Yaesu's FT-23R Series mini-HTs.

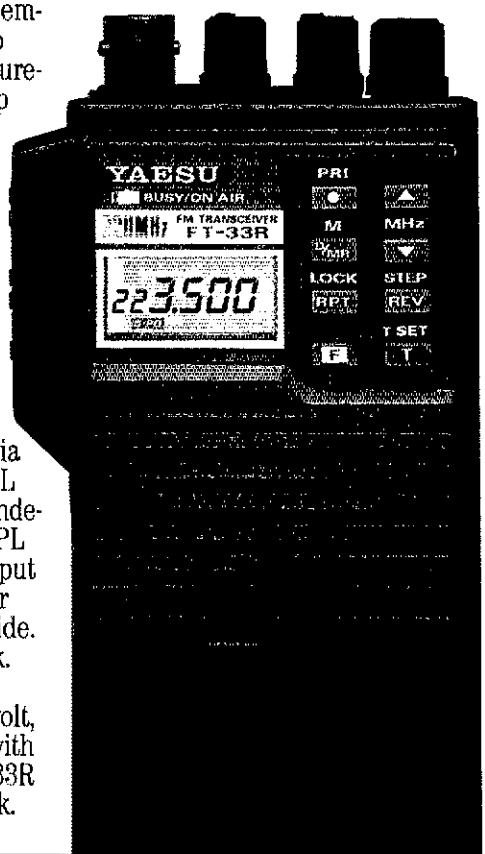
To begin with, you'll find a model that's right on your wavelength. The 2-meter FT-23R. The 220-MHz FT-33R. Or the 440-MHz FT-73R.

Whichever you choose, you benefit from incredibly small packaging. (Take a look at the actual size photo.) Aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. And moisture-resistant seals that really help keep the rain out.

But perhaps best of all, each radio blends sophisticated, microprocessor-controlled performance with surprisingly simple operation. In fact, it takes only minutes to master all these features:

Ten memories that store frequency, offset and PL tone. Memory scan at 2 frequencies per second. Tx offset storage. Priority channel scan. Channel selection via tuning knob or up/down buttons. PL tone board (optional). PL display. Independent PL memory per channel. PL encode and decode. LCD power output and "S"-meter display. Battery-saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch.

The FT-23R comes with a 7.2-volt, 2.5-watt battery pack. The FT-73R with a 7.2-volt, 2-watt pack. And the FT-33R with a powerful 12-volt, 5-watt pack.



You can choose the miniature 7.2-volt, 2-watt pack shown in the photo below. And all battery packs are interchangeable, too.

And consider these options: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And more.

Check out the FT-23R Series at your Yaesu dealer today. Because although we can tell you about their incredible performance, toughness and small size, seeing is really believing.

YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701. (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.

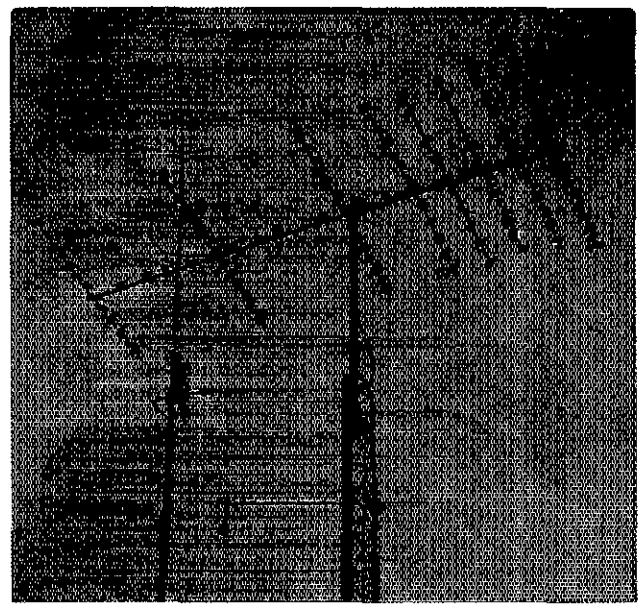
Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-33R shown with optional FNB-9 battery pack.

UP FRONT in QST

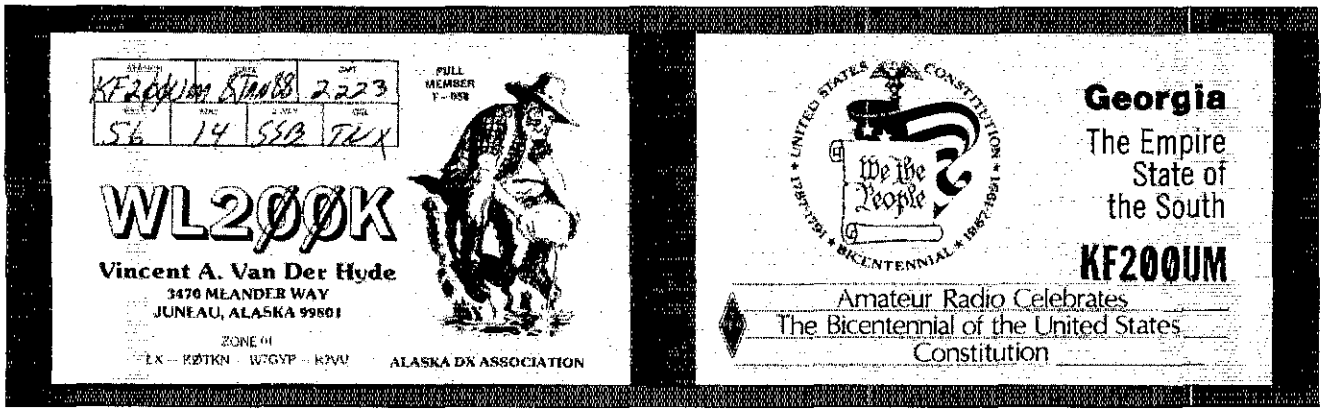
On top of the world: The SkiTrek expedition arrived at the North Pole at about 0700 UTC on Tuesday, April 26, and is now more than halfway to its goal—Ellesmere Island, Canada. At the pole, with media repesentatives swelling the number of people on hand to about 200, there was an official exchange of greetings among government officials of the USSR and Canada. For more on the expedition, see the article on page 62. The SkiTrek team is right on schedule and is pleased with the success of the expedition so far. (*photo courtesy VE3CDM*)

Frozen ham: Robert Danelen, KF6SP/VE8, of Van Nuys, California, contacted CI8C, the SkiTrek support base, while at Resolute Bay, Northwest Territories during an assignment for *Good Morning America*. Robert is standing on the 7-foot-thick frozen Arctic Ocean; the temperature was 25 degrees below zero (F). "The radio was only good for one or two transmissions before it quit and had to be thawed inside my jacket," Robert reported. (*photo courtesy Tony Gonzalez*)

Century club: Ernie Wheatley, W1UHI (second from left), celebrated his 100th birthday in Richmond, Vermont in October. His son Don, KA1LX (left), and Burlington ARC President Ben Lamb, K1AUE, look on as Vermont SM Frank Suitor, W1CTM, presents Ernie his Century Award. Ernie is a regular net check-in and provides younger ops with first-hand reports of the early days of Amateur Radio in Vermont. Congratulations, Ernie! (*photo courtesy W1CTM*)

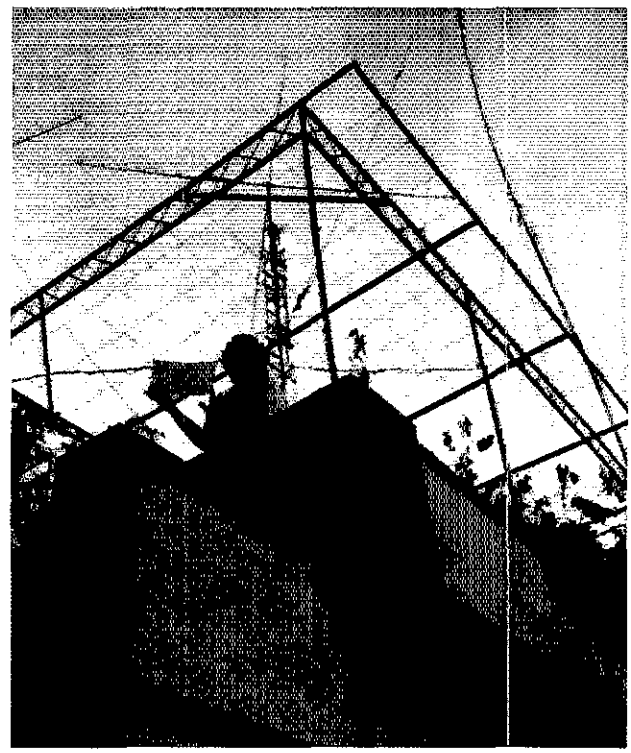


Is your antenna properly loaded? Patrick Page, KK6C, of Campbell, California, took this picture of his 8-element 6-meter beam to demonstrate how to load an antenna. He says the only time the blackbirds will "load" his beam is when it is about to rain. We suspect that they quickly "unload" it as soon as Patrick starts transmitting! (*photo courtesy KK6C*)



A "200" first: A contact between KF200UM in Hinesville, Georgia and WL200K in Juneau, Alaska on January 8 may have been the first two-way contact between two "200" Bicentennial special-event stations in different states, and possibly the first contact between two "200" stations anywhere. Raymond Anderson, N4PUJ, of Midway, Georgia sent along the QSL cards confirming the historic QSO.

A typical mobile installation? Dave Drummond, WB4HHY, of Northport, Alabama sent this picture of one of the beam systems used by the Tuscaloosa ARC (W4XI) for Field Day. Looks like one of the nicer setups rolling on wheels! (*photo courtesy WB4HHY*)



Hams, hams, everywhere hams: While visiting Funchal, Madeira Island (off the coast of Morocco) in February, Charles Clarke, KE2DT, spotted an antenna farm and a woman hanging laundry on the roof. Not knowing any Portuguese, he whistled CQ; the woman immediately smiled and said several words, including "radio amateur." The woman's granddaughter then came out and explained that her grandfather, Antonio Caldeira, CT3AY, was not home. The woman then gave Charles a QSL card. Amateur Radio does open doors! (*photo courtesy Diane Clarke*)

The Good Old Days

The W1AW Renovation Fund Drive continues; this issue features a look back at the W1AW of yesteryear by Rod Newkirk, W9BRD. You'll find Rod's remembrances, as well as information on how you can help keep W1AW the flagship station of Amateur Radio, on p 64.

Take a Break

Are long contesting hours taking their toll on your voice? Now phone operators can have the voice equivalent of a memory keyer to save their voice (and give a respite for a cool drink!) during those long hours filled with "CQ Contest." The RePlay Digital Voice Message System, described in an article beginning on page 31, can give your voice a break and increase your contest enjoyment.

Welcome to Amateur Radio: Larry Jarc, KB6UVU, of Long Beach, California, made his first contact while visiting the amateur station aboard the *Queen Mary*, which happens to be berthed conveniently in his hometown. Larry's father is N6PUK and his mother is KB6UVT (left). If you visit the *Queen Mary*, bring your license (or a photocopy) and operate W6RO while you're there. (*photo courtesy W6LRF*)

The ham that lost: *Shown with an unidentified ham* (center) who did *not* win the 1987 ARRL DX Contest are Peter Weatherall, G3MLO (left), and Frank Cooper, G2QT. Frank, whose butcher shop is located next to his home QTH in Ashford, Kent, England, has led the Gs in the contest since 1984. Congratulations to Frank for his fine contest efforts. (*photo courtesy K4MOC*)

What's Coming?

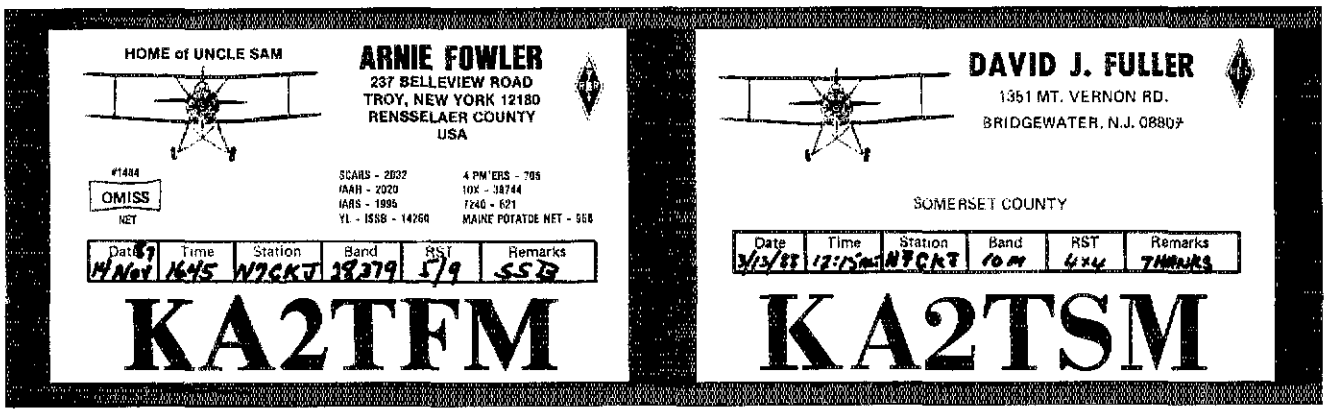
What should the Amateur Radio comunity expect from the proposed rewrite of Part 97 of the FCC Rules? Check out the article in this issue for details of this important FCC action.

Got the RTTY Itch?

Looking for an inexpensive way to get on RTTY? The Cheap n' Easy Modem is a high-performance unit that won't take a big bite out of your wallet. See NK1P's article, beginning on page 15 of this issue.

Move Up in Amateur Radio

Have you had a hankering to try contesting VHF style, but weren't sure what to expect or how to get started? "The Adventure of VHF Contesting," by Curt Roseman, K9AKS, Emil Pocock, W3EP, and Mike Owen, W9IP, offers a look at this exciting facet of Amateur Radio and how to get started. With the ARRL June VHF Sweepstakes just around the corner, don't delay—get ready with the article which begins on page 57 of this issue.



Something in common? Randy Jones, N7CKJ, of Spokane, Washington received two QSL cards which seem to bring the laws of probability into question. In addition to having the same design, the calls and last names are suspiciously similar. Randy says he is now working on his Worked All KA2T__M award!

League Lines

The FCC has released its proposed reorganization of the amateur rules, Docket 88-139, and the HQ staff is now conducting a line-by-line review of the NPRM. For more details, see page 53.

The Albert Wohlers Company, which administers the ARRL equipment and club liability insurance programs, is moving. Effective June 17, their new address is: 1440 N Northwest Highway, Park Ridge, IL 60068. Their toll-free number, 1-800-323-2106, remains the same, but their local number will change to 312-803-3100.

Going abroad this summer and want to bring your ham equipment? Remember, to operate in any foreign country (except Canada), you must have a license from that country even if the US has a reciprocal agreement with that country. Many countries take 4-6 weeks to process an application for a license, although a few will process walk-in applicants. For more information about the licensing requirements for specific countries you plan to visit, write or call the Regulatory Information Branch at HQ.

Job opportunities at HQ. Three openings exist in the Technical Department at HQ. Needed are licensed (and experienced) amateurs with a Bachelors degree in science or engineering, or equivalent experience.

One of the openings is for a Lab Supervisor. Candidates must have sufficient experience in industry to know laboratory procedures and test standards, and have the ability to train and counsel laboratory personnel. The ideal candidate would have a design background, and an ability to work with experimenters in the field. Starting salary is $34,000.

The other two openings are for Assistant Technical Editors. Successful candidates for these jobs must be able to write effectively, have a solid grasp of electronic fundamentals and be able to conduct library research. The ideal candidates would have experience in preparing material for publication, in operating personal computers and in speaking before groups. Starting salary is $25,012 with excellent benefits. Contact Chuck Hutchinson, K8CH, at HQ.

Attention telephone callers: Hundreds of phone calls come into HQ each day. We can serve you better if you have your questions ready for the operator, or know which department you wish to contact. It is not necessary to identify yourself and your call sign to the operator.

W1AW will participate in the coverage of the Phase 3C launch now scheduled for June 8. Information bulletins, prepared by AMSAT, will be carried on regular bulletin schedules, and live coverage will occur during the actual launch.

It's here! The new DXCC Countries List is available from HQ for $1. Included are listings for Western Sahara (SØ) and Aruba (P4), as well as the revised DXCC Rules.

Club Bicentennial call signs continue to be very popular. For those of you trying to work all states with "200" call signs for the special endorsement sticker, remember that the District of Columbia (which was March 26-April 1) is available as a "wild card" in case one state is missed. In June and early July, look for "200" prefixes from preregistered clubs in the following states:

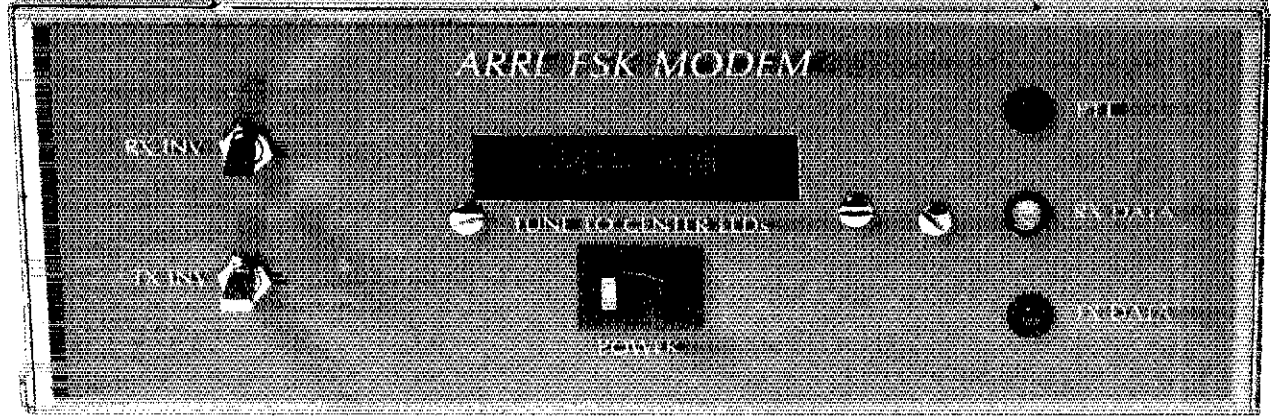
May 28-June 3—South Carolina, Kentucky, Tennessee
June 4-10—New Hampshire
June 11-17—Arizona
June 18-24—West Virginia
June 25-July 1—Virginia
July 2-8—Idaho

Summer is almost here, and while most folks are thinking about vacations, hams are thinking about Field Day, June 25-26! Complete Field Day rules appeared in May *QST*, page 87. If you haven't done so already, send for your Field Day package containing publicity kit, dupe sheet, summary sheet and check list by sending a 9 × 12-inch SASE containing 4 units of first class postage or 4 IRCs to ARRL HQ, Special Requests, 225 Main St, Newington, CT 06111. This year, bonus points will be awarded for contacting each of the 11 CRRL official bulletin stations ending with a "QST" suffix, such as VE1QST.

The FCC is reminding amateurs not to use their amateur equipment in other radio services such as Land Mobile. Many amateur transceivers and hand-helds can be easily modified to operate on adjacent frequencies used by other radio services. However, amateur transceivers are not type accepted by the FCC and it is against FCC rules to use them on any bands other than amateur or MARS, even if the amateur is licensed to do so.

A Cheap n' Easy Modem

Why spend hundreds of dollars for good modem performance? You can have it for a lot less—and experience the joy of building the modem yourself!



By Tom Miller, NK1P
ARRL Lab Technician

The many forms of digital communications (Baudot/ASCII/AMTOR RTTY and packet radio) have become extremely popular in just a few years.[1] Some amateurs, whose piggy banks contain more cobwebs and air than cash, find themselves outside, noses pressed against the window, looking in on RTTY and the other digital modes of operation because they lack a good modem.

Obtaining a good modem *usually* means you need to spend a lot of money. Note I said *usually*. Here's an RTTY modem that—depending on the contents of your parts junk box—costs about $50 to build. Sounds good, doesn't it? The modem looks good, too, as you can see from the pictures of the prototype in the title photo and Fig 1.

This modem receives and sends mark- or space-high signals, provides a choice of five commonly used shifts and baud rates, and has a band-pass audio filter for maximum rejection of adjacent-signal interference. You also have a choice of RS-232-C or TTL-compatible control and data I/O. The LED display provides for accurate tuning of incoming signals. Because of space restrictions, this display will be described in next month's *QST*.

All parts for this modem are readily available from Radio Shack®, Jameco Electronics®, other mail-order companies or your local electronics parts distributor.

Circuit Details

Figs 2, 3 and 4 are the schematic diagrams of the modem, power supply and the status-indicator LED board. The LED board, mounted behind the front panel (see Fig 5), supports DS1-DS3, inclusive. The function of each of these LEDs is covered in the following discussion.

Refer to Fig 2. The circuit can be broken into two basic sections: the modulator and the demodulator. I/O

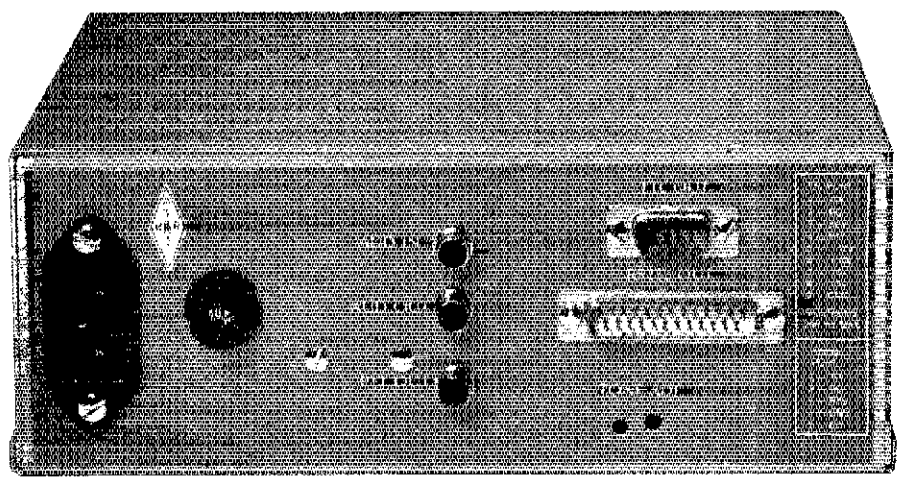


Fig 1—Rear view of the modem. To the right of the DB-9 (J1) and DB-25 (J2) connectors is a list of the connector pin numbers and the signal present on each. The two holes at the bottom labeled TONE ADJ allow access to the modulator mark and space adjustment potentiometers.

[1]Yes, CW is a digital mode, too, but it's not part of this discussion!

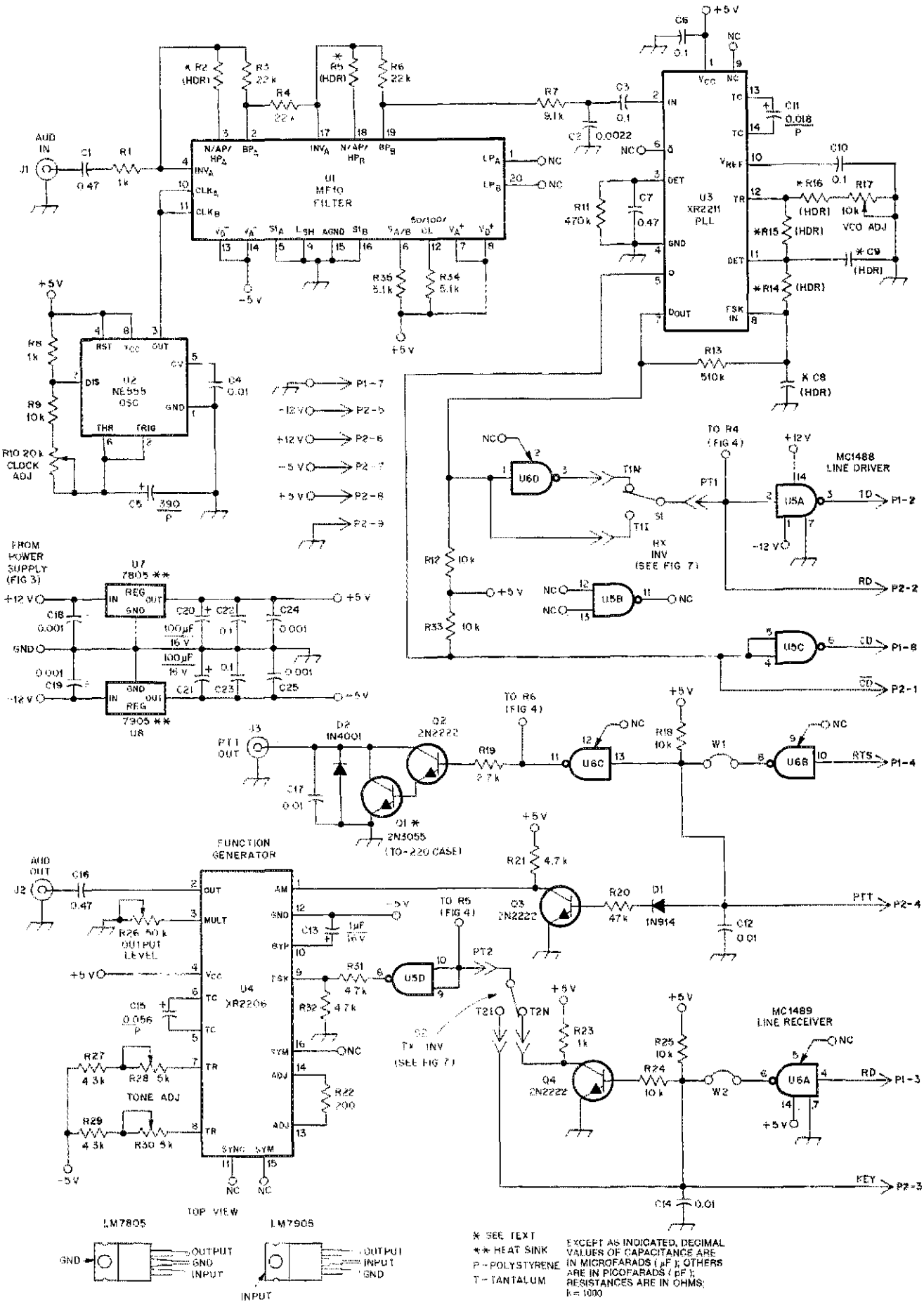

AUD IN
J1
C1
0.47
R1
1k
U1
MF10
FILTER
* R2 (HDR)
R3 22k
R4 22k
* R5 (HDR)
R6 22k
R7 9.1k
C3 0.1
C2 0.0022
U3
XR2211
PLL
C6 0.1
C11 0.018 P
C10 0.1
* R16 (HDR)
R17 10k
VCO ADJ
*R15 (HDR)
* C9 (HDR)
*R14 (HDR)
R11 470k
C7 0.47
R35 5.1k
R34 5.1k
-5 V
+5 V
R8 1k
R9 10k
R10 20k CLOCK ADJ
U2
NE555
OSC
C4 0.01
C5 390 P
P1-7
-12 V P2-5
+12 V P2-6
-5 V P2-7
+5 V P2-8
P2-9
R13 510k
* C8 (HDR)
TO R4 (FIG 4)
U6D
T1N
T1I
R12 10k
R33 10k
U5B
U5C
U5A
MC1488 LINE DRIVER
RD P2-2
CD P1-8
CD P2-1
FROM POWER SUPPLY (FIG 3)
U7 7805 **
U8 7905 **
C18 0.001
C19 0.001
C20 100µF 16 V
C21 100µF 16 V
C22 0.1
C23 0.1
C24 0.001
C25 0.001
TO R6 (FIG 4)
J3 PTT OUT
D2 IN4001
Q2 2N2222
R19 2.7k
U6C
R18 10k
W1
U6B
RTS P1-4
C17 0.01
Q1 * 2N3055 (TO-220 CASE)
FUNCTION GENERATOR
AUD OUT
J2
C16 0.47
R26 50k OUTPUT LEVEL
U4
XR2206
C15 0.056 P
R27 4.3k
R28 5k
TONE ADJ
R29 4.3k
R30 5k
C13 1µF 16 V
R31 4.7k
R32 4.7k
U5D
R22 200
TO R5 (FIG 4)
PT2
S2 TX INV (SEE FIG 7)
T2L
T2N
R21 4.7k
Q3 2N2222
R20 47k
D1 1N914
PTT P2-4
C12 0.01
R23 1k
Q4 2N2222
R25 10k
R24 10k
W2
U6A
MC1489 LINE RECEIVER
RD P1-3
KEY P2-3
C14 0.01
TOP VIEW
LM7805
LM7905
GND
OUTPUT
INPUT
* SEE TEXT
** HEAT SINK
P = POLYSTYRENE
T = TANTALUM
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF); RESISTANCES ARE IN OHMS; k = 1000

Fig 2—Schematic diagram of the modem. The terminal connections at S1 and S2 indicate that those switches are panel-mounted.
J1-J3, incl—phono jacks.
P1—DB-25P connector.
P2—DB-9 connector.
R10—20-kΩ, single-turn potentiometer.
R17—10-kΩ, single-turn potentiometer.
R26—50-kΩ, single-turn potentiometer.
R28, R30—Rectangular, PC-mount 10-turn potentiometer.
S1, S2—SPST switches.

Table 1
Component Values and Related Data for Commonly Used Frequency Pairs

Low tone (Hz)	2125	2125	2125	1615	1275
High tone (Hz)	2295	2550	2975	1785	1445
Fo (Hz)	2210	2337.5	2550	1700	1360
Shift (Hz)	170	425	850	170	170
Data rate (bauds)	110	300	300	110	110
FCLK (Hz)	110,500	116,875	127,500	85,000	68,000
R2 (kΩ)	4.7	6.8	10	6.2	7.5
R5 (kΩ)	4.7	6.8	10	6.2	7.5
R14 (kΩ)	100	100	100	100	100
R15 (kΩ)	270	100	47	270	300
R16 (kΩ)	20	18	16	27	36
C8 (μF)	0.022	0.01	0.01	0.022	0.022
C9 (μF)	0.0047	0.0047	0.0047	0.0047	0.0047

signal routing is handled by U5 and U6. These ICs, which are line transmitters and receivers, respectively, are used for the optional RS-232-C interface for the two modem sections.

Modulator Section

U4 and its associated components make up the modulator. Transmit data is fed into this part of the circuit by the RS-232-C Receive Data line (RD) or TTL (KEY) inputs. Which input is recognized is determined by an on-board jumper, W2. The polarity of the transmitted data can be selected by means of S2, TX INV. An LED, DS2, monitors the data line.

The high or low condition of the transmit data selects one of the two tones that U4 will produce. These tone frequencies are determined by the combination of R28 and R30 (LOW and HIGH TONE ADJUST), in conjunction with C15. R26 (OUTPUT LEVEL) controls the output level of the FSK signal fed to the transmitter.

This circuit also employs automatic PTT switching for ease of operation. The PTT OUT line is controlled by the RS-232-C RTS line or the PTT TTL line. On-board jumper W1 selects the proper line. The state of the PTT line is monitored by DS3, another LED. Keying for positive-voltage PTT lines is provided. With a 2N3055 at Q1, the PTT OUT line can switch currents as high as 1 A.

Demodulator Section

U1 through U3, inclusive, form the demodulator section. Most transceivers can supply the minimum 200 mV of audio required by the demodulator to reliably demodulate an FSK signal. Receiver audio is fed to pin 4 of U1, a switched-capacitor audio filter operating in its band-pass mode. The center frequency of this filter is partially determined by the clock frequency (FCLK) derived from U2, and the values of R2 and R5.

After passing through the filter, the audio is fed to U3, a PLL. U3 trans-

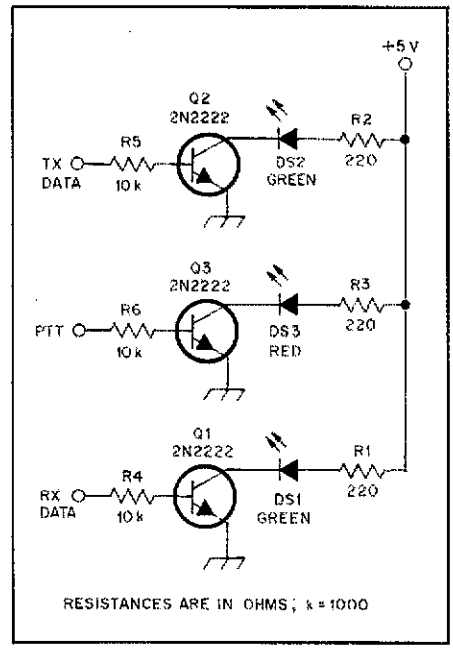


Fig 4—Schematic diagram of the status-indicator circuit.

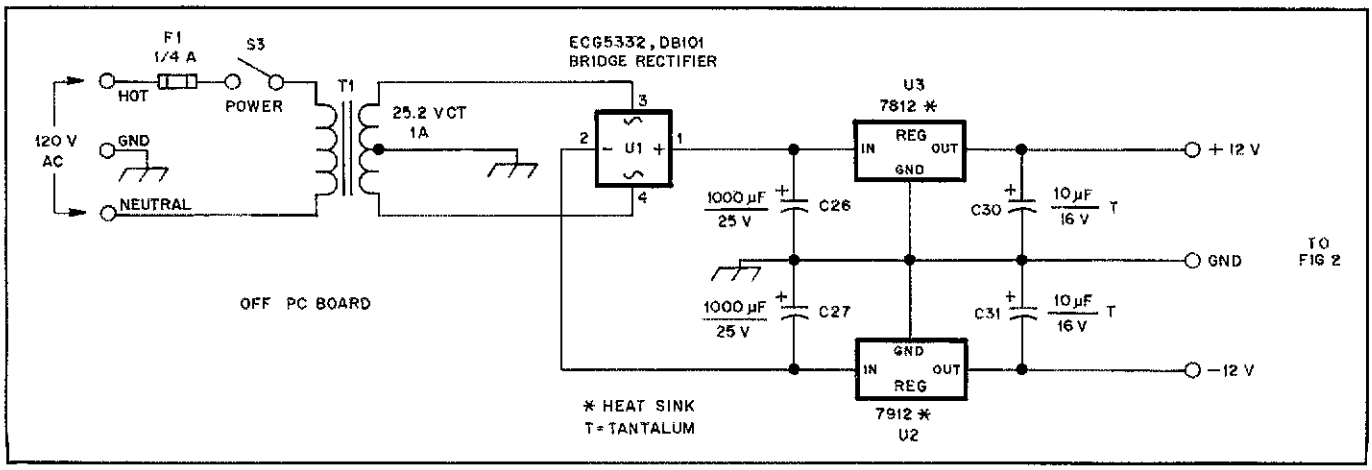


Fig 3—Power-supply schematic. If you have a supply capable of delivering 500 mA at ±12 V, you needn't build this one.

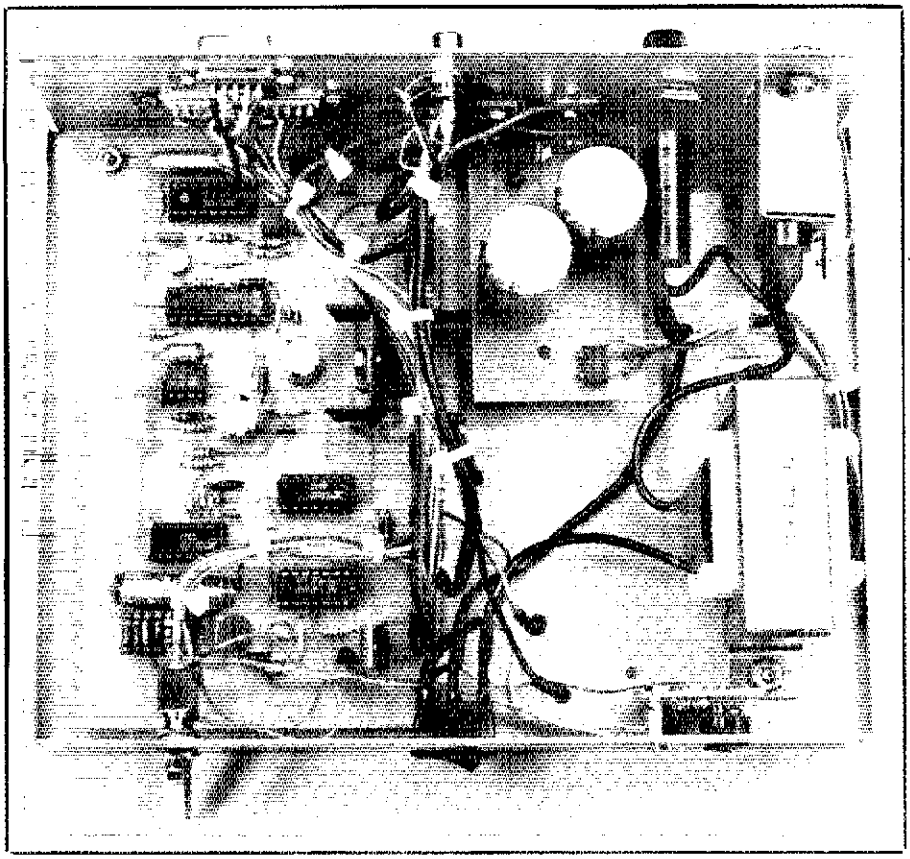


Fig 5—An inside view of the modem. At the left is the main circuit board. The header carrying some of the demodulator's frequency determining components can be seen at the lower left of the board, immediately above the RX INV and TX INV switches. Between the main board and fuse holder is the power supply rectifier/filter subassembly. This board is secured to the rear panel by machine screws that also hold the regulator tabs against the panel. Mica insulators are placed between the regulator tabs and the panel.

To the right of the fuse holder is the three-circuit ac line plug/filter. At the bottom right of the photo is the power transformer. Just to the left of that, mounted on a small circuit board, are the status LEDs. The POWER on/off switch is mounted at the bottom middle section of the front panel.

Not visible in this photo is the LED tuning indicator—that will be shown next month. The four unconnected wires in the harness (foreground) and the "extra hole" in the power supply rectifier/filter board are used for the tuning indicator board.

forms the analog audio signal into digital data. The frequencies to which the PLL responds are determined by R13-R17 and C8-C11. Component values for several commonly used frequency pairs are listed in Table 1.

If necessary, demodulated data can be inverted simply by toggling S1, RX INV. This data is available in RS-232-C or TTL formats at the RS-232-C TD and TTL RD outputs. DS1 monitors the status of this line. Carrier detect output is present at the RS-232-C CD and TTL $\overline{\text{CD}}$ points.

Power Supply

A power supply is included in this version of the modem, helping to make the unit completely self-contained. The power supply schematic is shown in Fig 3. You can, however, power the modem with any supply you have that delivers 500 mA at ±12 V. By eliminating the internal power supply, you can reduce the overall size of the modem and save a few more dollars, too.

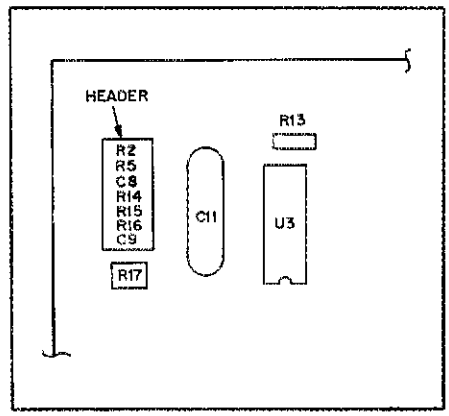


Fig 6—This pictorial shows the location of the components on the plug-in header. The components in Fig 2 labeled HDR are mounted on the header. You can see a header, and some of the components on it, immediately above the toggle switches in Fig 5.

Construction

The main section of the modem is built on a 5¾- × 3¾-inch PC board. Three smaller PC boards are used for the optional LED display, status indicators and power supply subassemblies. (See the Appendix for the PC board patterns and parts overlays.)

There are 10 jumpers on the main modem board. Be sure to install the jumpers *before* placing any other components. That's because some of the jumpers lie *beneath* IC sockets and would be difficult to reach once the sockets are installed!

The frequency determining components in the demodulator and filter are mounted on a removable 14-pin DIP header on the PC board. Those components are identified by the letters HDR in the schematic. Refer to Table 1 for the component values required for the chosen tone frequencies. Fig 6 shows the orientation of these components on the header. The placement of the header on the main PC board can be seen in Fig 5.

It is not absolutely necessary to use a DIP header (the components can be soldered directly to the PC board), but the header allows you to readily change the mark/space frequencies. In the protoype shown here, a 14-pin IC socket is soldered to the PC board to allow the header to be removed and replaced quickly.

Fig 7 shows three board I/O pad groupings and identifies the connections to the RS-232-C and TTL output jacks as seen from the component side of the main PC board. The drawing also shows the connections to S1, S2 and the status LEDs. In the prototype, male single in-line pin PC-mount headers are used at these three locations. Mating female connectors join the main board to the subassemblies. Other than convenience in assembly and disassembly, there's no real need to use these connectors. You can save a few dollars by eliminating the headers and soldering the interconnecting wires directly to the boards.

An aluminum enclosure (a modified Hammond 1411R) houses the modem shown here. Any box physically large enough to contain the assemblies you decide to include will suffice. S1 (POWER), S2 (RX INV), S3 (TX INV), the status indicator LEDs (PTT, RX DATA, TX DATA) and optional LED tuning display are located on the front panel. The rear panel (shown in Fig 1) supports a DB-25P

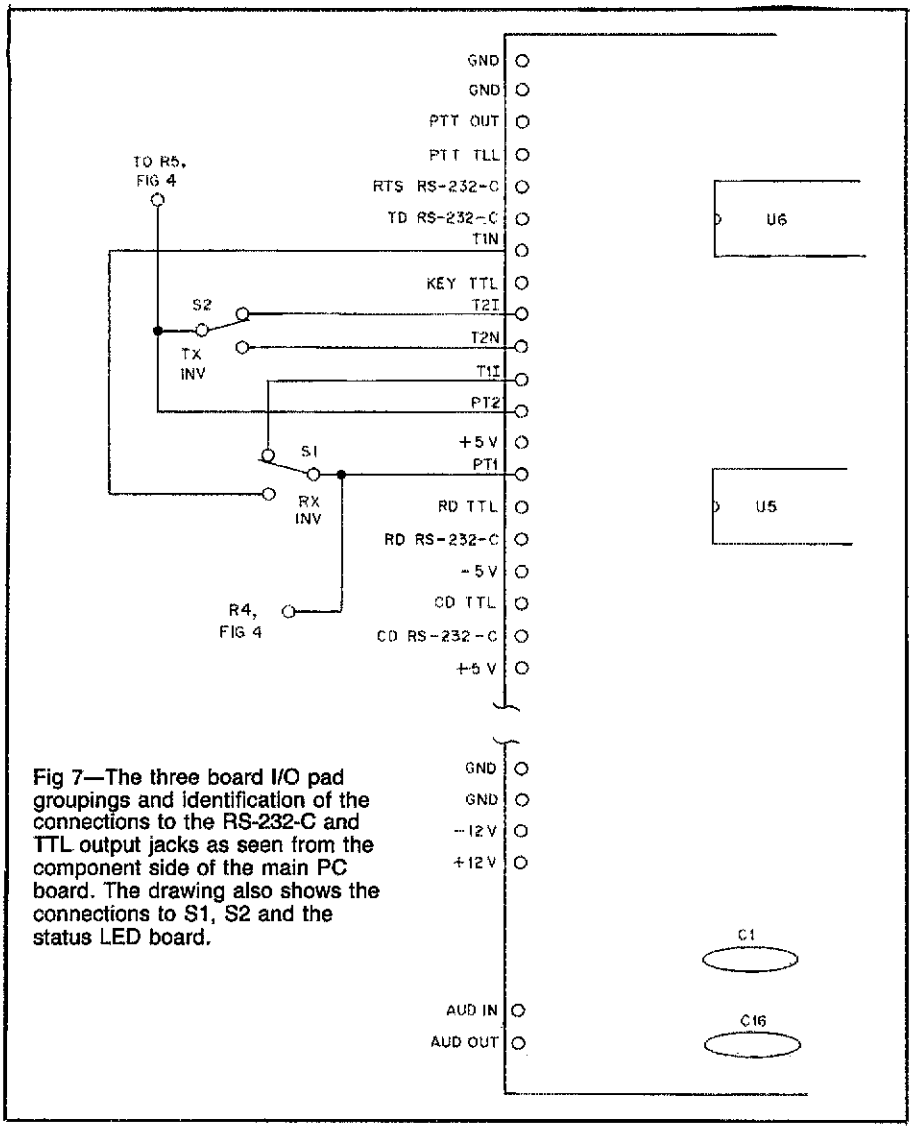


Fig 7—The three board I/O pad groupings and identification of the connections to the RS-232-C and TTL output jacks as seen from the component side of the main PC board. The drawing also shows the connections to S1, S2 and the status LED board.

and DB-9P connector for RS-232-C and TTL I/O ports, respectively. A three-circuit ac line plug and filter assembly, fuse holder, and three phono jacks, J1, J2 and J3 (AUD IN, AUD OUT, PTT OUT, respectively) are also on the rear panel. Two holes (labeled TONE ADJ) provide access to R28 and R30.

If you elect to make the modem RS-232-C compatible, W1 and W2 must be installed. A DB-25 plug (P2) is mounted on the back panel for the RS-232-C I/O lines. For TTL compatible I/O, W1 and W2 are omitted and a suitable connector of your choice can be used; a DB-9 plug (P1) is used in this model. Audio and PTT connections to J1-J3, inclusive, should be made with shielded wire—RG-174 coaxial cable is suitable.

Alignment

The following procedures describe the alignment of the modulator and demodulator. You'll need the following test equipment: A frequency counter, an audio generator capable of generating frequencies of 1 to 5 kHz, and a voltmeter or oscilloscope—a scope is preferred.

Assume, for ease of description, that the modem is going to be set up for tone frequencies of 2125 and 2295 Hz. Wire the header with components of the proper value (selected from Table 1) and install the header. Next, connect the frequency counter to the AUD OUT jack. Apply +5 V to the RTS line, if W1 is installed, or ground the PTT terminal of the TTL port if W1 is omitted; this enables U4 to produce an output tone. Depending on the setting of S2, R28 or R30 will be the LOW TONE ADJ, and the other will be the HIGH TONE ADJ. (You may have to experiment with both controls until you've determined which is which.) Let's assume R28 is the LOW TONE ADJ potentiometer. Adjust R28 until U4 produces the low-tone frequency (2125 Hz). Next, toggle S2 (XMIT DATA INVERT) and adjust R30 for the high-tone frequency, 2295 Hz.

Remove the bias voltage from the RTS line (or ground from the PTT line) and connect the frequency counter to U2, pin 3. Next, set the clock frequency (FCLK). This is done by adjusting R10. In this case, the frequency should be 110.5 kHz. This adjustment is not overly critical, but the resultant frequency should be within 10% of the given figure.

The final adjustment is that of the PLL. Set the audio generator to the high tone (2295 Hz), using the frequency counter to ensure accuracy. This tone should be applied to the AUD IN jack at a level of approximately 1 V P-P. Use a scope (preferred) or an accurate voltmeter to make the required measurements.

Scope Method

If a scope is available, reference its trace using the voltage at U3, pin 10. Then, connect the probe to pin 8 of U3 and measure the voltage *difference*. The voltage at pin 8, with reference to pin 10, is approximately −1.5; this adjustment is made using R17 (VCO ADJ).

Next, set up the audio generator for the low-tone frequency (2125 Hz). Once again, measure the voltage as referenced to pin 10. The difference should be equal, and opposite in polarity, to that of the high tone. If it isn't, adjust R17 accordingly until both tones produce a voltage that varies equally above and below that on pin 10.

Voltmeter Method

If you're using a voltmeter, the measurements are the same, but proper adjustment is a bit trickier to accomplish. This is a critical adjustment, so take your time. Double-check the measurements, and readjust R17 if necessary. Proper operation of the demodulator is dependent on correctly setting R17.

Summary

Next month, Ed Hare, KA1CV, and I will cover the construction of the LED tuning indicator. Until then, there's no reason you can't experiment with the modem and check its performance. We used several communications programs with the Cheap 'N Easy modem connected to an IBM® PC; all worked well. There are lots of public-domain, shareware and commercial programs available. Check your local telephone and packet-radio bulletin boards for the public-domain and shareware programs.

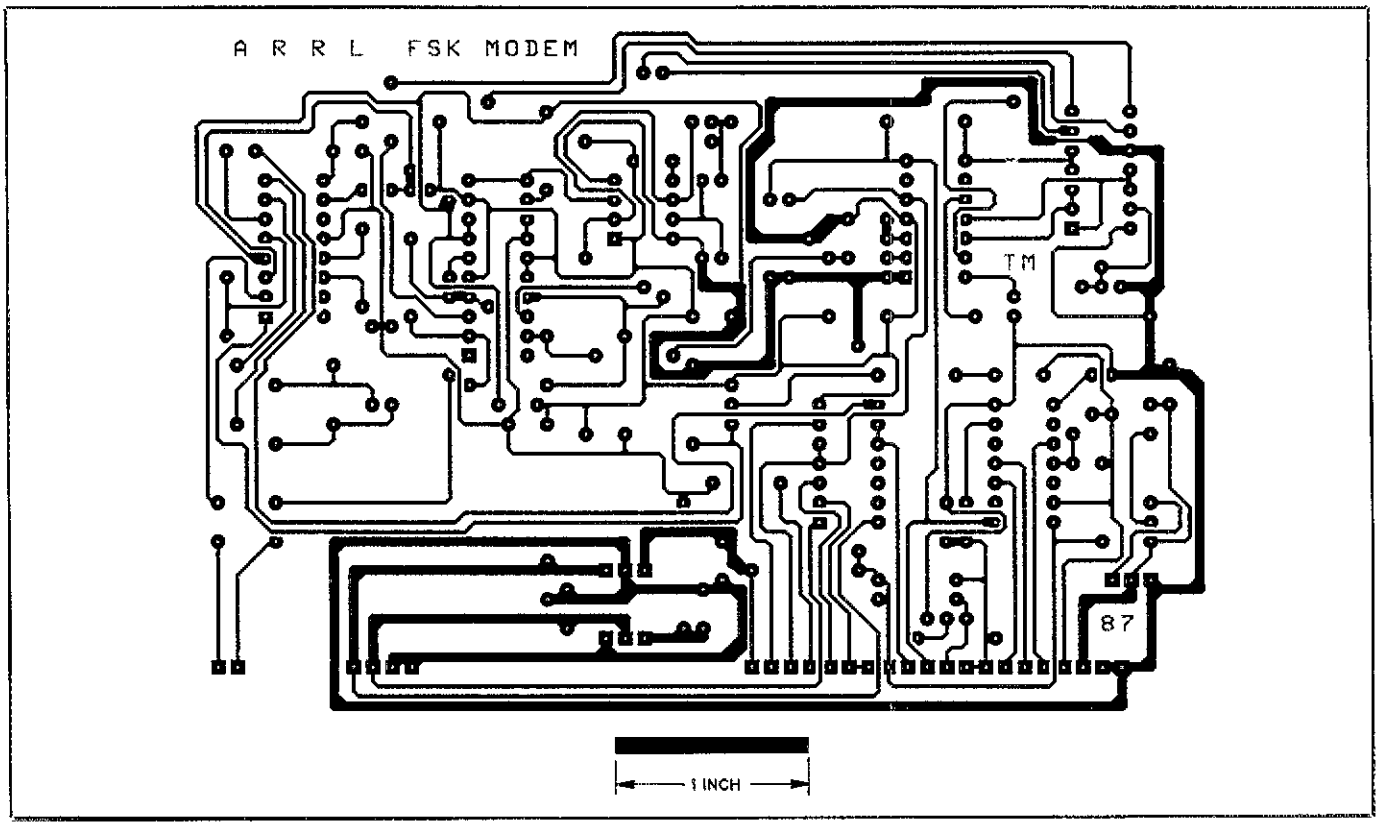


Fig A—Circuit-board etching pattern for the ARRL modem. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

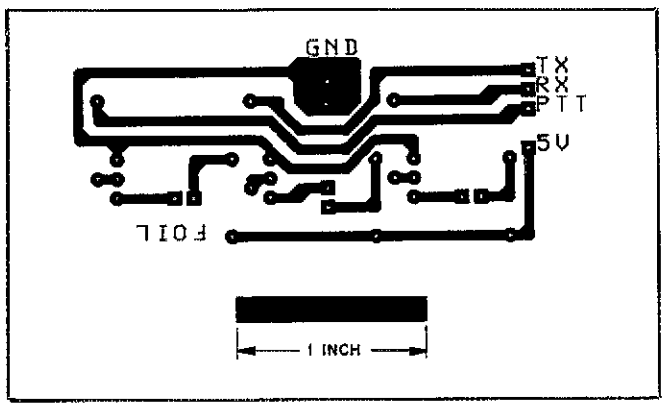


Fig B—Circuit-board etching pattern for the status-indicator board. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

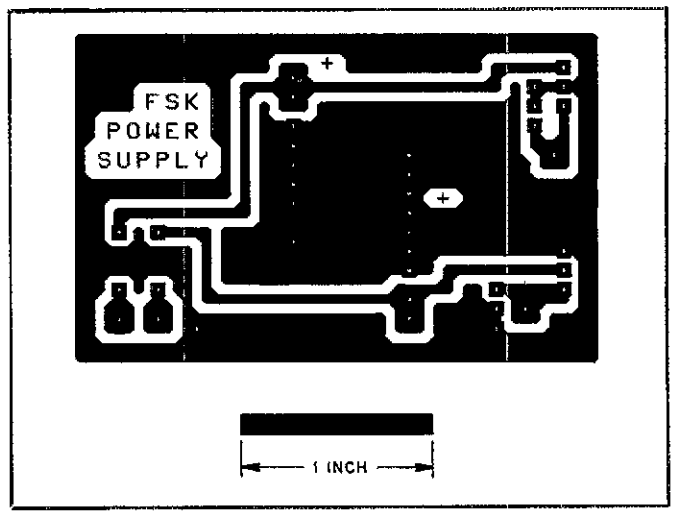


Fig C—Circuit-board etching pattern for the modem power-supply board. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

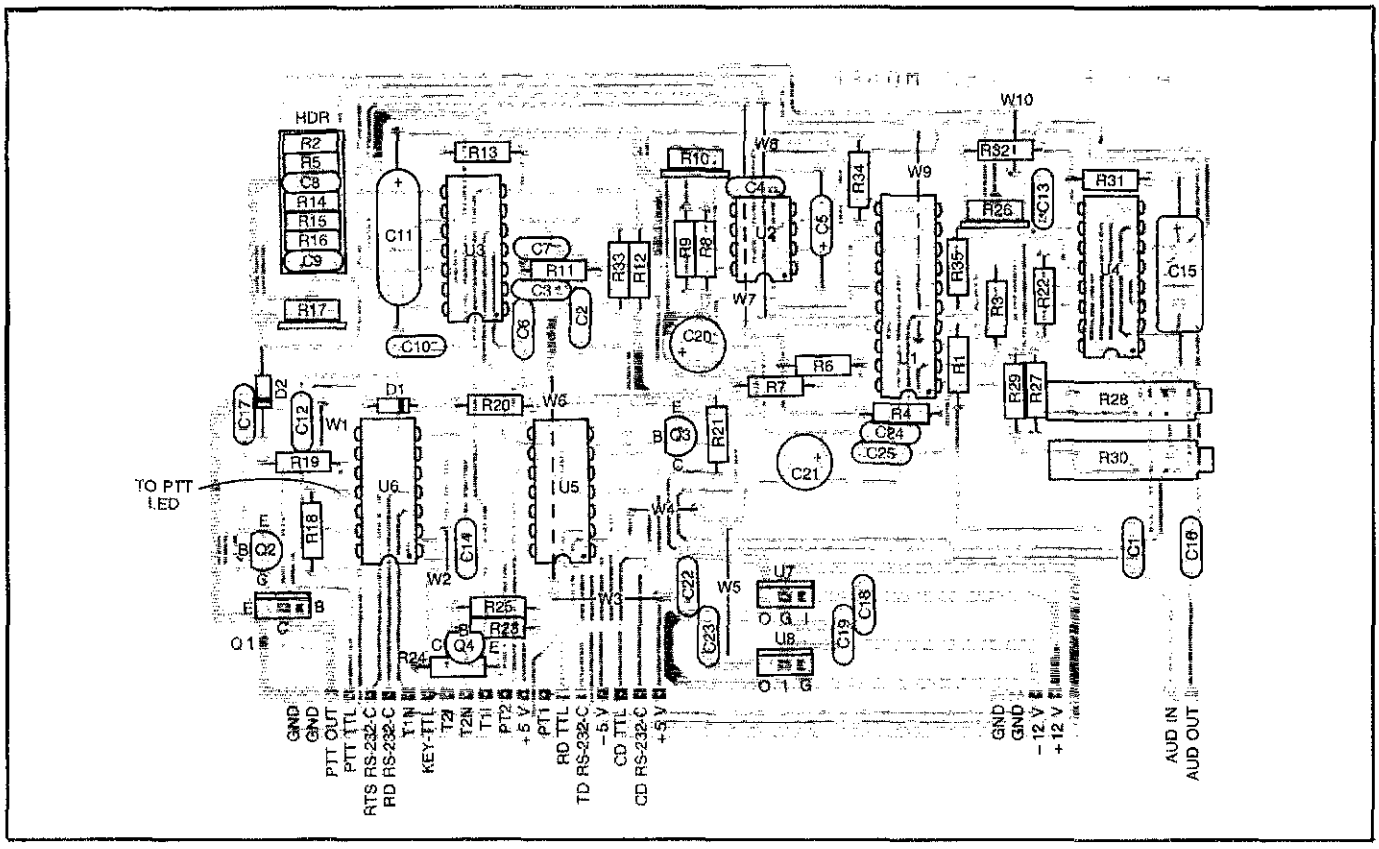


Fig D—Parts-placement guide for the ARRL modem. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. Be sure to install the jumpers first.

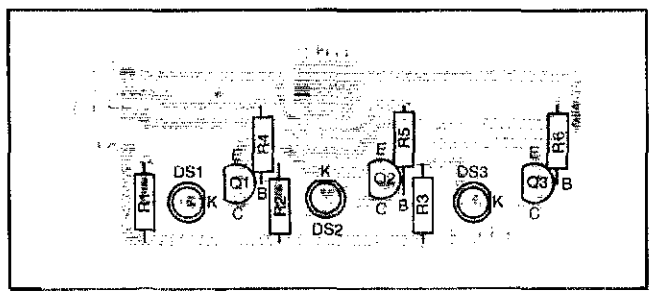


Fig E—Parts-placement guide for the status-indicator board. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

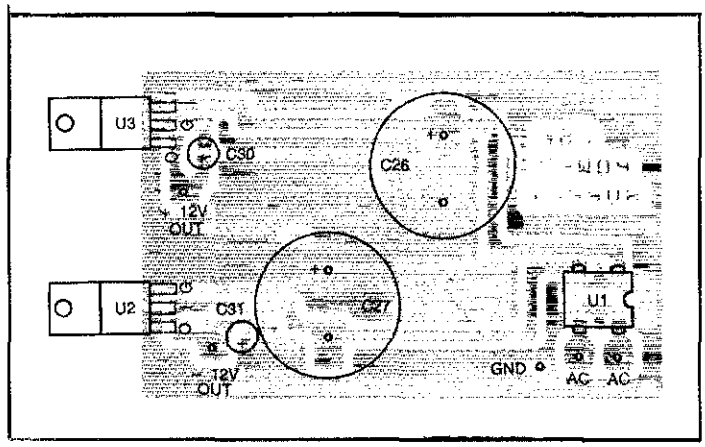


Fig F—Parts-placement guide for the power-supply board. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

Strays

I would like to get in touch with...

☐ anyone with a service manual for Clegg FM-28 2-meter xcvr. James Cadoo, KB4VUH, 313 Wildwood Dr, Edgewater, FL 32032.

☐ anyone with a manual and/or schematic for Hallicrafters S-38C. Joe Wychock, RD 1, Box 194N, Brackney, PA 18812.

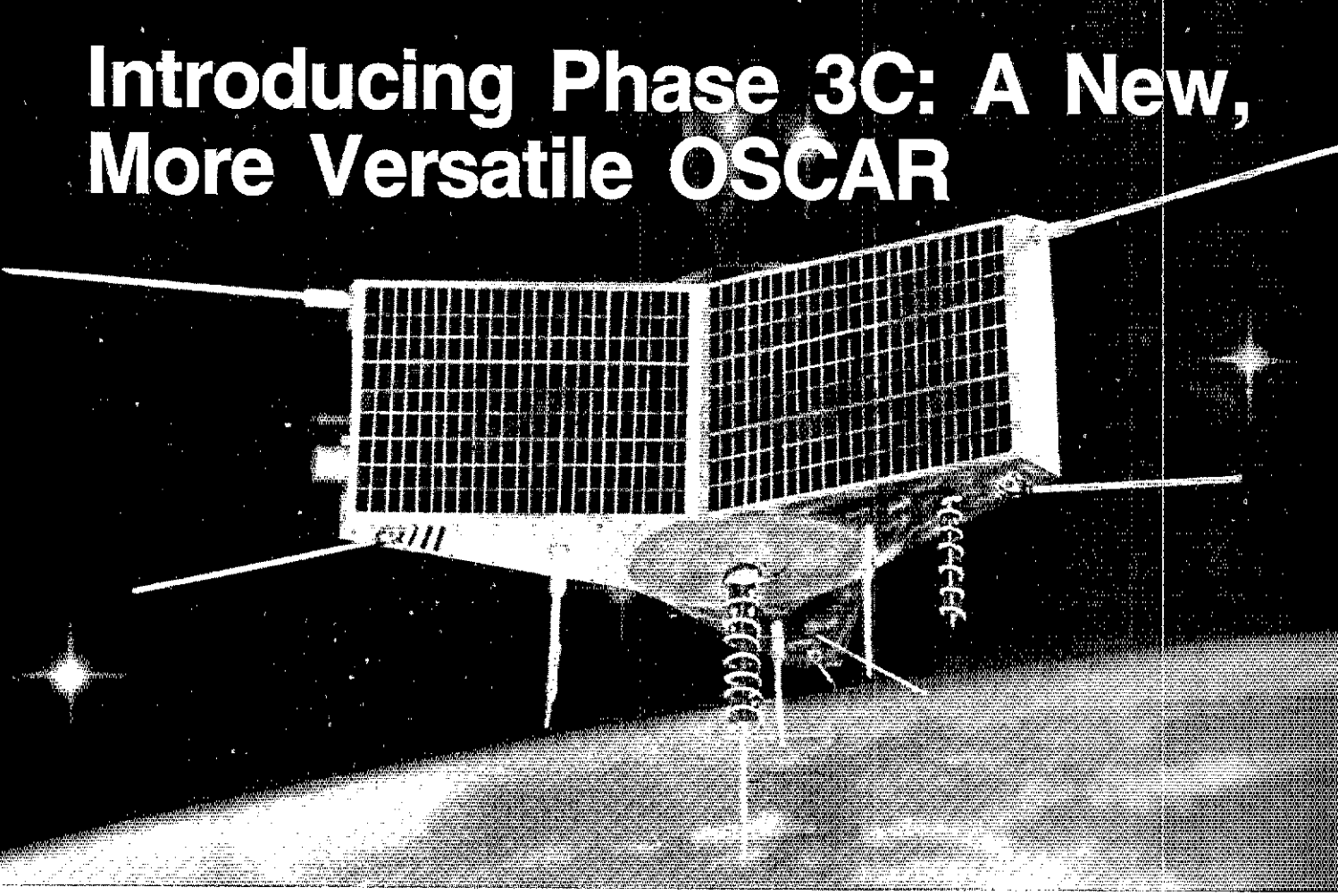
☐ anyone with a schematic for a Heathkit HM-2141 VSWR meter. Al Lorona, W6QWC, 415 Edwin Aldrin, Montebello, CA 90640.

☐ anyone who has plans or construction information for a wooden 40-foot tower for a small monoband 10-meter beam and rotator. Ken French, KA1PUJ, RR 1, Box 821, Dorset, VT 05251.

☐ any players of Avalon Hill games for over-the-air play. Leonard Kay, KB2R, 21 Prospect St, Ware, MA 01082.

☐ anyone with schematic and power requirements for National HRO-7 receiver. Charles Leidner, K4QZO, 4538 Menewa Path, Pensacola, FL 32504.

Introducing Phase 3C: A New, More Versatile OSCAR



Easily accessible and easy to use, Phase 3C offers many operating alternatives to those of previous Amateur Radio satellites.

By Vern Riportella, WA2LQQ
PO Box 177
Warwick, NY 10990

What has been around for more than 25 years, has been used by tens of thousands of hams, including a US President and a king, and now stands poised for a new series of breakthroughs? Since this is an article about OSCAR, you probably guessed the answer right away![1]

But suppose I made the question slightly more difficult. Did you know the latest OSCAR is ready for launch and will permit intercontinental QSOs on voice, CW, SSTV or packet?

It's a fact. As you read this, the newest OSCAR may have already been placed in orbit. A new Amateur Radio satellite will be plying its way across the heavens, providing superb VHF and UHF communications to those who know how to use it. Surprisingly, using the new OSCAR will be easier than ever—even though it's by far the most complex and versatile OSCAR ever launched.

OSCARs Are Easier Than Ever To Use

The new ease of operation results from several significant factors, including noteworthy improvements in the area of user support. For example, tracking OSCARs used to be a chore. Now, computer programs make tracking a breeze. Some of the newer systems automatically point your antennas. And if your radios can be interfaced to a computer, there are programs to tune your radios to compensate for Doppler shift. You just sit back and enjoy the QSOs!

Furthermore, an improved network of OSCAR Elmers is being established to ensure you get the help you need when getting started. The equipment needed to work any OSCAR is readily available. Many quality VHF and UHF transceivers can be found on the new- and used-equipment markets. (I still use a vintage TS-700S I purchased 12 years ago for OSCAR work.) Antennas and preamps proliferate in magazine ads and on flea-market tables. Moreover, OSCAR users are a resourceful group and often enjoy renewing the "home-brew" legacy in their own shacks. Many homemade helical antennas are regularly used for OSCAR operation. In sum, Phase 3C will be easier to use. Taking advantage of technological advances, the new OSCAR will provide more payback in user satisfaction than any of the earlier amateur satellites.

What is Phase 3C?

Phase 1 OSCARs were simple battery-powered RF beacons usually placed in low orbits (the first was launched in 1961). They had typical life spans of only a few weeks to a few months. Phase 2 OSCARs were more sophisticated. They carried solar cells and batteries for longer life spans. Most important, Phase 2 OSCARs carried repeaters, or, as they are properly called, *transponders*. Phase 2 satellites such as AMSAT-OSCARs 6, 7 and 8 provided useful VHF/UHF communication between amateurs separated 3000 miles and, on occasion, more. Using AMSAT-OSCAR 7, contacts between the East Coast and

[1]Notes appear on page 30.

Table 1

Phase 3C Operating Modes and Frequencies

Mode	*Uplink Band*	*Downlink Band*	*Notes*
B	70 cm (435 MHz)	2 m (145 MHz)	AO-7 and AO-10 favorite
S	70 cm (435 MHz)	13 cm (2401 MHz)	New; first use on Phase 3C
JL	2 m & 24 cm (1269 MHz)	70 cm (435 MHz)	New; first use on Phase 3C
RUDAK	24 cm (1269 MHz)	70 cm (435 MHz)	New; first use on Phase 3C

Beacons Mode B: General beacon 145.812; Engineering beacon 145.985 MHz
Mode JL: General beacon 435.651; Engineering beacon/RUDAK downlink : 435.677 MHz
Mode S: Beacon: 2400.325 MHz

Mode B

Uplink	*Downlink*	
	145.985 MHz	Engineering beacon
435.420	145.975	Passband limit, upper
435.430	145.965	
435.440	145.955	
435.450	145.945	
435.460	145.935	
435.475	145.925	
435.480	145.915	
435.490	145.905	
435.500	145.895	
435.505	145.890	Passband center
435.510	145.885	
435.520	145.875	
435.530	145.865	
435.540	145.855	
435.550	145.845	
435.560	145.835	
435.570	145.825	Passband limit, lower
	145.812	General beacon

Mode S

Uplink	*Downlink*	
	2400.325	Beacon
435.601	2400.711 MHz	Passband limit, lower
435.605	2400.715	
435.610	2400.720	
435.615	2400.725	
435.619	2400.729	Passband center
435.620	2400.730	
435.625	2400.735	
435.630	2400.740	
435.635	2400.745	
435.637	2400.747	Passband limit, upper

RUDAK

Uplink	*Downlink*	
1269.710	435.677 MHz	Single channel

Mode JL

L Uplink	*J Uplink*	*Downlink*	
1269.330		436.005 MHz	Passband limit, upper
1269.340		435.995	
1269.345	144.425	435.990	J sub-band limit, upper
1269.355	144.435	435.980	
1269.365	144.445	435.970	
1269.375	144.455	435.960	
1269.385	144.465	435.950	
1269.395	144.475	435.940	J sub-band limit, lower
1269.400		435.935	
1269.410		435.925	
1269.420		435.915	
1269.430		435.905	
1269.440		435.895	
1269.450		435.885	
1269.460		435.875	
1269.470		435.865	
1269.475		435.860	Passband center
1269.480		435.855	
1269.490		435.845	
1269.500		435.835	
1269.510		435.825	
1269.520		435.815	
1269.530		435.805	
1269.540		435.795	
1269.550		435.785	
1269.560		435.775	
1269.570		435.765	
1269.580		435.755	
1269.590		435.745	
1269.600		435.735	
1269.610		435.725	
1269.620		435.715	Passband limit, lower
1269.710	RUDAK up	435.677	Engineering beacon/RUDAK downlink
		435.675	
		435.665	
		435.655	
		435.651	General beacon

Although this table might suggest the passbands are divided into many 10-kHz channels, this is not the case; there are no "channels" as such. The table merely shows the correlation of uplink and downlink frequencies across a continuous spectrum of available frequencies with certain "guideposts" illustrated for convenience.

Hawaii could be accomplished under some conditions.[2]

By 1976, however, designers sought to provide regular intercontinental linkups and longer periods of coverage. They recognized that aside from the recreational aspects of Amateur Radio, OSCARs could play a vital role in public-service emergency communications. But, emergency communicators cannot wait for a satellite to appear; a communications channel has to be available nearly always. Recognizing this fundamental public-service requirement, together with the existing Amateur Radio community's appetite for longer access and ease of use, the OSCAR designers began to raise their sights above the low earth-orbiting (LEO) Phase 2 OSCARs.

At first, the designers considered a geosynchronous satellite, but soon realized the inherent limits. For one thing, it would be expensive, and only one could be built. Because it would be expensive, it had to be the product of a large consortium of Amateur Radio satellite groups. But, if the satellite were geosynchronous, its communications area would cover less than one third of the earth's surface. Some countries would be left out. How could the geosynchronous satellite be positioned to serve the contributors equitably?

The answer is the series of Phase 3 satellites. By using a type of orbit pioneered by the Soviets called *Molniya*, a kind of semi-synchronous orbit could be achieved. The Molniya orbit is elliptical instead of circular, and has a period of about 12 hours. For much of the orbit the satellite remains high above the earth (nearly 36,000 km;

22,000 miles) to provide a footprint as large as that of a geosynchronous satellite. Then the bird plummets close to earth only to rise toward its apogee (high point) elsewhere. In this way, Phase 3C provides benefits of broad coverage that can be distributed among a worldwide user population. In other words, the Phase 3 Molniya orbit gives the next best thing to intercontinental coverage all of the time: intercontinental coverage *much* of the time. The Molniya orbit spreads that coverage equitably across the globe, obviating difficult decisions on positioning a geosynchronous satellite's footprint.

By 1980, the first Phase 3 bird, Phase 3A, sat on the launch pad in French Guiana. From there, it was to fly into a Molniya orbit from which it could serve a worldwide community of OSCAR users clamoring for the fun of satellite DX. Many looked forward to working rare DX without regard to the vagaries of F_2 propagation. Others sought to make obsolete the hurried QSOs so common on the low-orbiting Phase 2 satellites that quickly whizzed from horizon to horizon.

The Phase 3A project ended in disaster, however, when an errant launcher was destroyed, dropping its payload into the Atlantic ocean. The product of years of work—transponders, computers, everything—literally went down to the sea in chips!

Not to be bested by "outrageous fortune," the AMSAT team went back to work to develop Phase 3B in 1983. Phase 3B became AMSAT-OSCAR 10 upon its successful insertion into orbit. Since then, nearly 150 countries have been heard on AO-10, and numerous firsts have been achieved. Now, the stage is set for the latest, most powerful and capable OSCAR yet: Phase 3C, the third in its generation.

Table 2

Phase 3C Effective Radiated Power, Isotropic (EIRP)

Mode	*Band*	*EIRP PEP*	*EIRP Average*	*Peak/Average*
B	2 m	23 dBW (200 W)	17 dBW (50 W)	6 dB
JL	70 cm	26.5 dBW (446 W)	20.5 dBW (111 W)	6 dB
S	13 cm	0.97 dBW (1.25 W)	(continuous)	0 dB

Phase 3C Subsystems

Phase 3C is a self-contained system. It carries all the resources it will need to operate in space for 5 years or more. The satellite's four major subsystems are: communications, power, control and propulsion.

The Communications Subsystem

The Phase 3C communications subsystem consists of four transponders. Each of these functions as a cross-band repeater. (See Table 1.) You transmit on the uplink frequency and listen on the downlink frequency. Because you transmit and receive on different bands, you can transmit and receive simultaneously (full duplex operation), and even listen to your downlink signal delayed up to a third of a second—an experience that is unnerving to those who've not experienced it before!

The Mode B and JL transponders are linear. That means the signal appearing in the uplink receiver is transmitted on the downlink so that SSB, CW, SSTV and various digital waveforms are faithfully reproduced. Moreover, the transponder passbands are wide enough to accommodate several contacts at once. That means European amateurs can chat with those in South America, while hams in Africa can chat with North Americans and others in between at the same time, albeit on different frequencies within the passband.

The Mode-S transponder is an experimental UHF-to-UHF transponder designed primarily for a single FM channel. It can handle up to four SSB stations, providing they each stay below the hard-limiting threshold of the transponder. RUDAK—the English translation: *Regenerative Repeater for Digital Amateur Communication*—is a new type of packet-radio repeater. It uses the most advanced form of digital modulation (phase shift keying, PSK) and techniques to create an efficient digital communications channel.

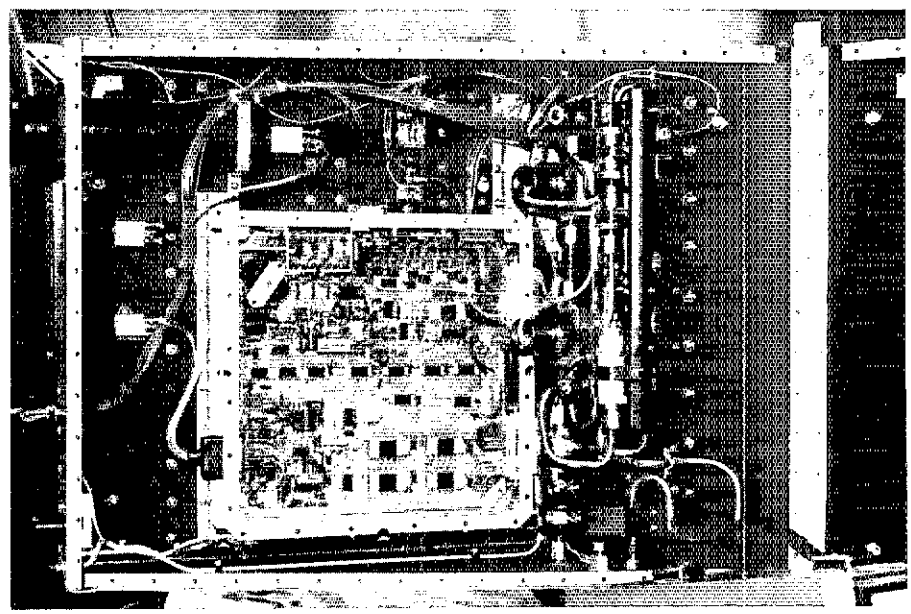
The antennas on Phase 3C are an assortment of VHF and UHF designs. Coverage of the 2-meter band is accomplished using two antennas. The 2-meter high-gain array, a so-called ZL Special, consists of three two-element beams phased in such a way as to produce right-hand circular (RHC) polarization.[3] This array has a gain of about 6 dBic (decibels referenced to a circularly polarized isotropic source), and a 3-dB beamwidth of roughly 100°. An omnidirectional 2-meter antenna is used for conditions where the high-gain beam is inappropriate. This antenna is linearly polarized, has as much as 2 dBi gain and a toroidal pattern.

The UHF antennas on Phase 3C are common types. On 70 cm, a monopole is also used for the same reasons as the 2-meter monopole, and it gives comparable performance. The 70-cm high-gain array consists of three phased dipoles over a groundplane, and produces 9.5 dBic gain with a theoretical 3-dB beamwidth of 67°. The 24-cm antenna is a 5-turn RHC helix supported by a frame. Its gain is 12.2 dBic and its 3-dB beamwidth is 49°. The 13-cm antenna is a 6-turn RHC helix providing 13 dBic gain and having a 3-dB beamwidth of 45°.

The satellite transmits a strong signal that can be heard well across a distance of as much as 40,000 km (25,000 miles). Phase 3C's effective radiated power referenced to an isotropic source (EIRP) is shown in Table 2.

The Power Subsystem

The Phase 3C power subsystem consists of the solar-cell arrays, battery charge regulator and batteries. The solar arrays are made up of hundreds of silicon solar cells on six separate surfaces. Together, they generate 50 watts when first placed in orbit.



View of one arm of Phase 3C showing the sun sensor and earth sensor (left), sensor electronics unit (center) and propulsion flow assembly (right). (*photo by Robert J. Diersing, N5AHD*)

Table 3

Phase 3C Preliminary Telemetry Channel Allocations and Estimated Equations

Telemetry Channel	*Function*	*Typical Equation (Subject to final cal.)*	*Units*
00	Solar panel out and BCR input voltage	n × 150	mV
01	70-cm transmitter average power output	$(253 - n)^2 / 2000$	W
02	70-cm receiver temperature	(n – 127)/1.82	°C
03	(Reserved) 04 BCR output and main battery voltage	(n – 10) × 75	mV
05	(Special Purpose)	xxxxxxxxxxxx	—
06	2-m transmitter power amplifier temperature	(n – 127)/1.82	°C
07	+14-V rail current to transponder	(n – 15) × 20.64	mA
08	+10-V regulator voltage	(n – 12) × 50	mV
09	He tank high pressure	(TBD)	Bar
0A	IHU temperature	(n – 127)/1.82	°C
0B	+14-V rail current to magnetorquers and antenna relay	(n – 15) × 4.128	mA
0C	BCR oscillator #1 status	0 = Off; N < 10 = On	—
0D	He tank low-side pressure-control voltage	(TBD)	—
0E	BCR temperature	(n – 127)/1.82	°C
0F	+10-V regulator current	(n – 15) × 4.128	mA
10	BCR oscillator #2 status	0 = Off; N < 10 = On	—
11	N_2O_4 tank pressure	(TBD)	Bar
12	SEU temperature	(n – 127)/1.82	°C
13	Battery charge current	(n – 15) × 10.32	mA
14	Top (+Z) photocell sun sensor	(See note below)	—
15	Motor-valve status	(TBD)	—
16	Auxillary battery #1 temperature	(n – 127)/1.82	°C
17	Active BCR ouput current	(n – 15) × 20.64	mA
18	Bottom (–Z) photocell sensor	(See note below)	—
19	S-Band-transmitter power output	(TBD)	mW
1A	Auxiliary battery #2 temperature	(n – 127)/1.82	°C
1B	Active BCR input current on 28-V line	(n – 15) × 10.32	mA
1C	Spin rate {if n<139, r =	(139 – n) × 0.8 + 20	r/min
	or {if n <= 139	r = 508/ (n – 116)-2	r/min
1D	24-cm receiver	AGC {if n × 100 AGC = 0	dB
	or {if n <= 100	AGC = $(n - 100)^2 / 189$	dB
1E	Main battery temperature	(n – 127)/1.82	°C
1F	Solar panel #6 current	(n – 15) × 4.128	mA
20	2-m-transmitter average power output	$(200 - n)^2 / 2000$	W
21	He tank temperature	(n – 127)/1.82	°C
22	Solar panel #1 temperature	(n – 127)/1.82	°C
23	Solar panel #5 current	(n – 15) × 4.128	mA
24	70-cm receiver AGC	$(n - 83)^2 / 1000$	dB
25	70-cm transmitter PA temperature	(n – 127)/1.82	°C
26	Solar panel #3 temperature	(n – 127)/1.82	°C
27	Solar panel #4 current	(n – 15) × 4.128	mA
28	Special purpose	xxxxxxxxxxx	—
29	24-cm receiver temperature	(n – 127)/1.82	°C
2A	Solar panel #5 temperature	(n – 127)/1.82	°C
2B	Solar panel #3 current	(n – 15) × 4.128	mA
2C	+14-V regulator voltage	(n – 10) × 61.5	mV
2D	RUDAK temperature	(n – 127)/1.82	°C
2E	Top (+Z) skin temperature of arm #1	(n – 127)/1.82	°C
2F	Solar panel #2 current	(n – 15) × 4.128	mA
30	Mode-B transponder +9-V supply voltage	(n – 10) × 50	mV
31	Wall temperature in arm #2	(n – 127)/1.82	°C
32	Bottom (–Z) skin temperature of arm #1	(n – 127)/1.82 C	
33	Solar panel #1 current	(n – 15) × 4.128	mA
34	Special purpose	xxxxxxxxxxx	—
35	Wall temperature in arm #1	(n – 127)/1.82	°C
36	N_2O_4 tank temperature	(n – 127)/1.82	°C
37	Reserved		—
38	Auxiliary battery voltage	(n – 10) × 75	mV
39	Mode-S transponder temperature	(n – 127)/1.82	°C
3A	+Z platform temperature (SERI experiment)	(n – 127)/1.82	°C
3B	Reserved		—
3C	Mode-L transponder +9 V supply voltage	(n – 10) × 50	mV
3D	AZ-50 tank temperature	(n – 127)/1.82	°C
3E	Nutation damper temperature	(n – 127)/1.82	°C
3F	Reserved		

Radiation damage incurred in orbit after the first three years is expected to reduce the total array power to about 35 watts. The battery charge regulator (BCR) ensures the two nickel-cadmium batteries on board are optimally charged. The primary battery has a capacity of 10 Ah; the auxiliary battery is rated at 6 Ah. Together, the elements of the power subsystem provide closely regulated power to the other subsystems. Thus, the battery ensures that the satellite is powered even when in Earth's shadow.

The Control Subsystem

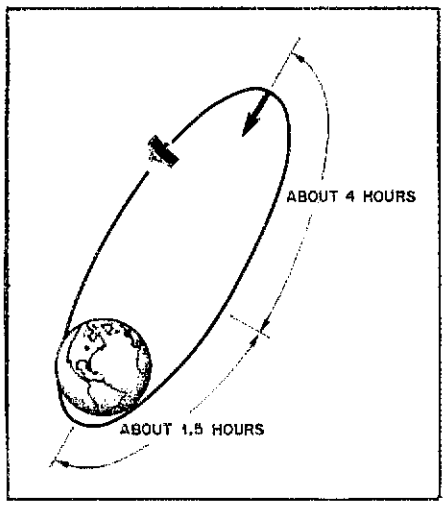
The control subsystem is perhaps the most complex of all. It consists of a computer and its associated memory, software, command detectors, telemetry multiplexers, sensors and attitude-control devices. The heart of the control subsystem is the integrated housekeeping unit (IHU). The IHU consists of an RCA COSMAC CDP1802 microprocessor, its memory and various supporting elements. This CPU was chosen because a radiation-hardened silicon-on-sapphire version was available. Even though much more advanced CPUs are now available, the 1802's comparatively light task loading allows it to loaf along. The memory for the CPU consists of special Harris HS-6564RH radiation-hardened CMOS ICs donated by Harris' Custom Integrated Circuit Division, Melbourne, Florida. The total memory carried is 48 kbytes, of which the error-corrected available net memory is 32 kbytes. The software is written in *IPS*, a FORTH-like multi-tasking language developed by Karl Meinzer, DJ4ZC, and his colleagues about 10 years ago.

The IHU controls the satellite. Com-

Notes on Table 3

The equation values are preliminary estimates *only*.
IHU = integrated housekeeping unit; the computer
BCR = battery charge regulator
He = Helium
SEU = sensor electronics unit
N_2O_4 = nitrogen tetroxide; the propellant oxidizer; AZ-50 is aerozine-50, the propellant fuel
TBD = to be defined

Notes regarding channels 14 and 18:
These two sensors detect sunlight on the top (+Z) surface and the bottom (–Z) surface of the spacecraft. They provide only a rough indication of sun position and are used to resolve ambiguity in the readings from the sun sensors. When in full sunlight, a sensor count of 65 results. A count of about 10 is background noise only, and the sun is present when the count exceeds 20. The main spacecraft solar cell arrays receive maximum illumination when the sun is perpendicular to (normal to) the spin axis (Z axis). When this condition exists, both the +Z and –Z detectors will yield background readings (10) only. A count of 20 or greater on either indicates misalignment. The higher the count, the greater the misalignment of the spacecraft with respect to the sun angle (beta angle)—Source: Jan King, W3GEY, Apr 15 86; *ASR* No. 93, Dec 31 84; I. T. Ashley, ZL1AOX, Jan 27 88.



Phase 3C circles the earth in a semi-synchronous orbit called Molniya. The Molniya orbit is elliptical and has an orbital period of about 11 hours.

mands are uploaded from the ground to the IHU. The IHU then controls the satellite for weeks or months without intervention from ground controllers. The IHU turns the transponders on and off according to a prescribed schedule, carefully regulates the battery charge in conjunction with the BCR, and issues a continuous stream of telemetry via the communications subsystem to show sensor and status indicator readings in the satellite.

The IHU controls the attitude of the satellite in space to ensure it is aimed precisely at earth, so its antennas are properly illuminating the target area and so the solar panels are aligned toward the sun. To control the satellite's attitude, the IHU compares readings from its earth sensors and sun sensor with mathematical models contained in its memory. When it detects a deviation in attitude from the proper one, it applies carefully timed pulses to on-board electromagnets. The field from these magnets interacts with the earth's geomagnetic field, creating a torque that tends to reorient the spacecraft. When the spacecraft's attitude has been restored to the desired value, the magnetorquing ceases.

The IHU also maintains the proper spin rate for Phase 3C. Again using the magnetorquers, the IHU spins the satellite like the armature of a motor. The spinning stabilizes the satellite, just as spinning stabilizes a top. Spinning also ensures the satellite stays thermally manageable. Like the spit of a rotisserie, the satellite spins in the brilliant glare of the sun, absorbing heat when facing the sun, and radiating it to the blackness of space when facing elsewhere. Phase 3C will be spun at about 33 revolutions per minute for most of its operational life.

The IHU also schedules and transmits pre-stored bulletins on the various beacon frequencies. The bulletins usually consist of user-related information, such as the satellite operating schedules, orbital data, special advisories and so forth. The bulletins are sent in various modulation formats: (1) CW, (2) 45-baud FSK RTTY and (3) 400 bit/s PSK ASCII bulletins.

Temperature and pressure sensors, and various electrical sensors, feed a multiplexer that then feeds the IHU, which produces the 64-channel telemetry format. The telemetry suite (See Table 3) is comprehensive, allowing close monitoring of virtually all important aspects of satellite operation by command stations and suitably equipped ground observers. The earth sensors and sun sensor feed the sensor electronics unit (SEU) that the IHU uses to determine spacecraft attitude.

If it were not for the IHU, the satellite would be little more than a big hunk of dumb iron. *With* the IHU, the satellite is one of the most advanced Amateur Radio devices ever built. The fact that the satellite is totally under IHU software control ensures unprecedented satellite flexibility. The IHU can run the satellite for weeks without intervention from the ground command team.

The Propulsion Subsystem

The Ariane-4 rocket that carries Phase 3C to orbit is the largest launcher ever built by the European Space Agency. It will carry two large commercial geosynchronous satellites in addition to Phase 3C. But the Ariane-4 does not place any of the three payload satellites in their final orbits. Rather, each is deposited in its own geosynchronous transfer orbit (GTO—see Table 4). A GTO is the point of departure between the launcher and the payloads. The launcher orients itself, spins up the satellites and sets them off on their own. The GTO is a highly eccentric ellipse with a perigee around 220 km (137 miles) and an apogee of about 36,000 km (22,000 miles). Each satellite must get to a more usable orbit using its own rocket system called a *kick motor* (so named because it figuratively "kicks" the satellite from the GTO to a higher orbit).

For Phase 3C, the objective is to get from the GTO to a more stable orbit within a few days. There is some urgency in raising the perigee quickly, since satellites with 220-km perigees tend to fall from the sky regularly and, on occasion, in a great flurry of debris—literally as man-made meteorites. Since AMSAT folks fancy themselves builders of spacecraft and not ersatz meteorite makers, the designers have resolved to execute the first in-orbit burn as soon as the orbit parameters can be accurately determined. Using a special ranging technique and sophisticated mathematical models on powerful computers, AMSAT engineers will be able to develop GTO orbital data for Phase 3C within a few days of launch.

The perigee kick motor (PKM) on Phase 3C is a small rocket engine that uses two fluids stored in separate portions of a fuel tank. Under pressure from a helium system, the propellant and oxidizer combine in the combustion chamber and spontaneously ignite in a controlled explosion to produce a thrust of 400 Newtons (about 95 lbs). A 400-N thrust would not move your Buick up the highway that smartly, but on the business end of a 140-kg (309-lb) satellite, the result is moderately impressive.

In a series of kick-motor burns spread over a few weeks, the perigee is raised to about 1500 km and the inclination of the plane of the orbit is raised from the 10° GTO to about 57°. The total velocity change imparted by the little Messerschmitt-Boelkow-Blohm (MBB) engine amounts to an impressive 1480 m/s (4854 ft/s). To put that number in perspective, that's the equivalent of going from rest to 3310 mi/h (Mach 5). (Phase 3C could outrun an SR-71 Blackbird superspy jet!) Fortunately, the acceleration imposed on Phase 3C is not overwhelming: At just 3Gs, it amounts only

Table 4

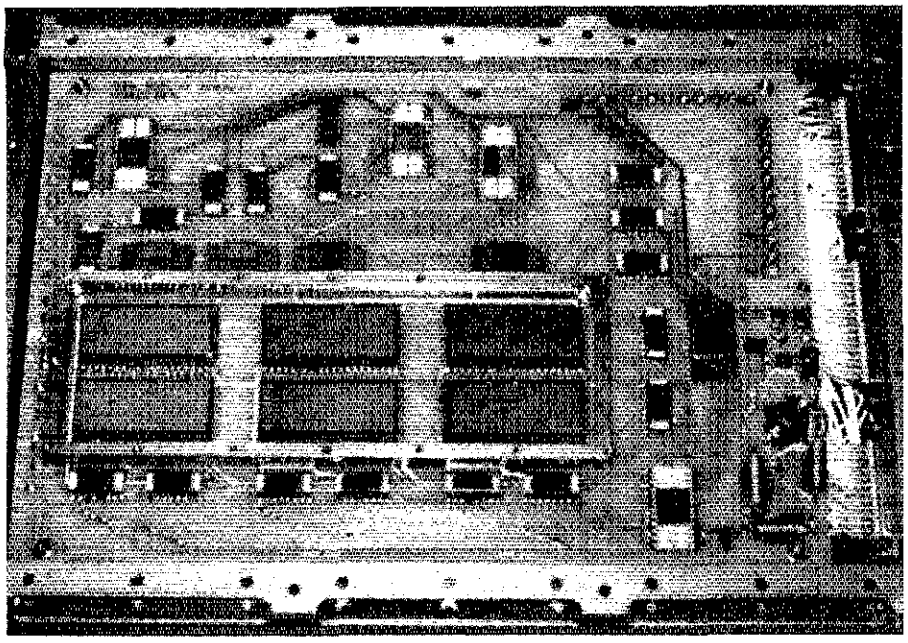
Orbital Characteristics (at separation from launcher)

Geosynchronous transfer orbit (GTO)

Perigee altitude:	222.504 km
Apogee altitude:	36076.636 km
Inclination:	9.997 degrees
Argument of perigee:	178.148 degrees
Ascending node longitude:	– 135.541 degrees/lift-off
True anomaly:	127.554 degrees
Epoch:	Instant of Separation (L +4797.1 s)
Spin rate at deployment:	29.47 degrees per second
Separation velocity:	0.59 meters per second

Objective Phase 3C orbit (final orbit after two or three burns)

Apogee: 36,000 km
Perigee: 1,500 km
Inclination: approx 57 degrees
Argument of perigee: 178 degrees (determined by launcher)
Anomalistic period: approx 662.4 minutes
Longitude increment: approx 184.5 degrees East per orbit



The Phase 3C integrated housekeeping unit, a sophisticated computer that controls the satellite, now contains radiation-hardened memory donated by Harris. The IHU was designed by Steve Robinson, W2FPY, and built by Gordon Hardman, KE3D. *(photo by Dick Daniels, W4PUJ)*

to a modest imposition for which the designers have taken adequate provision. The rocket engine can be restarted several times to refine the orbit until the desired result is obtained. All burns, however, should be completed within a month of launch.

What's To Do On Phase 3C

Since Phase 3C *is* primarily a spaceborne communications system, logic suggests communications is the main activity. Logic holds here. The Mode-B transponder provides a useful training ground for those learning the ropes. Its 150 kHz of available bandwidth is adequate for about 50 simultaneous QSOs under optimum conditions. Since most satellite contacts involve more than two participants, Mode B can actively serve more than 100 users at a time.

The equipment required to use Mode B is reasonably modest, and many individuals can get the feel of satellite operations on the new bird with borrowed equipment or that already on hand. Rag chews, DXing, nets and general socializing are popular. Round table discussions are a favorite of mine. Getting a half-dozen chums from across the globe together for an easygoing, relaxed rag chew is very enjoyable. Annoying QRM is virtually absent and QSOs are clearly audible. Conditions are comparable to those on the 20-meter band at its peak, as if you had a large swatch of it to yourself. With coverage times measured in hours, there's no need to rush QSOs as was necessary with low earth-orbiting satellites. And since Phase 3C moves slowly across the sky when near apogee, antennas needn't be moved much, if at all. Table 5A details ground station requirements for Mode B.

The Mode-JL Transponder

Although Mode B may become the mode of choice for satellite beginners, Mode JL seems destined to become the most popular and productive. Using combined uplinks on 24 cm and 2 meters, Mode JL has the right combination of attributes to delight the satellite veteran and newcomer alike. It combines a passband broad enough (290 kHz) for perhaps 90 simultaneous SSB QSOs with other attractions bound to make it a pleasure to use. The uplink power requirements on 24 cm are quite modest, as Table 5B shows. Since antennas can be small and power requirements are modest, I suspect Mode JL will become popular with amateurs wanting to operate from remote locations (campsites and mountaintops). Whereas the 24-cm Mode-JL uplink offers the prospect of portable antennas, the 2-meter Mode-JL uplink is designed for lesser-developed nations where 24-cm equipment is rare or nonexistent.

The Mode-S Transponder

Mode S will be a special delight to use if all goes according to plan. The Mode-S experiment is designed for a single FM channel. The actual use of this channel hasn't been determined, but some ideas have been suggested. Besides the obvious QSO activities between two or more individuals, the Mode-S transponder has been suggested for occasional use as a bulletin channel. The high-quality audio that can likely be received at well-equipped Mode-S stations could be easily patched into local terrestrial repeaters to furnish a

Table 5A

Minimum Mode B Station Requirements

Uplink

Frequency: 435.420-435.570 MHz
EIRP: 21.5 dBW (141 W) for 20 dB peak and 10 dB average SNR on downlink
Polarization: Right Hand Circular (RHC)
Suitable uplink components 10 watts to 12 dBic gain antenna

Downlink

Frequency: 145.975-145.825 MHz
Polarization: RHC
Minimum recommended antenna gain: 10 dBic
Maximum receive system effective noise temperature: 625 K (NF = 5.0 dB)
Minimum figure of merit: −18 dB/K

Table 5B

Minimum Mode JL Station Requirements

Uplink

Frequency: Mode L: 1269.620-1269.330 MHz
Mode J: 144.425-144.475 MHz
EIRP: Mode L: 25 dBW (316 W) for 20 dB peak and 10 dB average SNR on downlink
Mode J: 25 dBW (316 W) for 20 dB peak and 10 dB average SNR on downlink
Polarization: RHC
Suitable uplink components: Mode L: 10 watts to 15 dBic gain antenna
Mode J: 20 watts to 12 dBic gain antenna

Downlink

Frequency: 435.715-436.005 MHz
Polarization: RHC
Minimum recommended antenna gain: 13 dBic
Maximum receive system effective noise temperature: 290 K (NF = 3.0 dB)
Minimum figure of merit: −12 dB/K

Table 5C

Minimum Mode S Station Requirements

Uplink

Frequency: 435.601-435.637 MHz
EIRP: Approx 27 dBW (501 W) under average Mode B AGC conditions
Polarization: RHC
Suitable uplink components: 25 watts to 13 dBic antenna

Downlink

Frequency: 2400.711-2400.747 MHz + beacon @ 2400.325 MHz
Polarization: RHC
Minimum recommended antenna gain: 28 dBic
Typical antenna: 1.4 m dish (assuming 50% efficiency)
Maximum receive system effective noise temperature: 290 K (NF = 3.0 dB)
Minimum figure of merit: +3 dB/K

fine bulletin distribution system. This might be viewed as a prototype for operational planning for AMSAT's Phase 4 geosynchronous satellites planned for the early 1990s. Up to four SSB stations can use the Mode-S transponder, too. Ground station requirements for Mode S are detailed in Table 5C.

The Rudak Project

RUDAK is essentially a digipeater designed and built by AMSAT DL engineers in Munich. The architects of RUDAK envision it providing an interconnect between local area networks in addition to point-to-point contacts. An independent receiver in the Mode-L transponder is provided for the RUDAK uplink on 1269.710 MHz. The demodulator converts the 2400-bit/s biphase PSK signal into a clean digital signal for the RUDAK processor. Thanks to the sweep circuit in the demodulator, the uplink signals only have to be within ± 7.5 kHz of the center frequency.

On the downlink side, the output data modulates the RUDAK beacon transmitter in the Mode-L transponder on 435.677 MHz using BPSK at a data rate of 400 bit/s, the same as for the general beacon of Phase 3C. The rate can be increased to 1200 bit/s using NRZI (nonreturn to zero) modulation for experimental reasons. Details on interfacing to RUDAK are beyond the scope of this article and have been published elsewhere.[4]

Some basic RUDAK station requirements are provided in Table 5D.

QSOs, Competition and Techno-Sport

Satellite activities other than one-on-one QSOs, round tables or nets are organized by AMSAT and other groups. Emergency communications exercises have been carried out on earlier OSCARs and will continue on Phase 3C. On the other hand, linking terrestrial repeaters to the hemispheric coverage of Phase 3C should provide some excitement for many whose only radio is a 2-meter or 70-cm FM handheld transceiver. Imagine talking to someone in Australia from the comfort of your easy chair while holding your hand-held transceiver! Gateways provide a means of consolidating resources so that many can enjoy the thrill of satellite communications without making a large investment in equipment. When users find out how much fun it can be, they may opt to establish their own satellite stations. Gateways are, in essence, a means of tasting the wine before buying the bottle.

Competition on OSCARs has always been approached with caution. There are good reasons for this. First, transponder operation is different from the HF bands. On HF, there is a degree of frequency sharing. If you turn your HF beam away from an interfering station, you can reduce the QRM and continue your QSO. Various propagation zones appear and disappear. Not so on the OSCAR satellites! On the transponder, everyone listening on a given frequency hears everyone else using that frequency equally well (more or less, assuming comparable equipment). There is no frequency sharing afforded by geography (space diversity). The satellite illuminates its footprint evenly. Consequently, the potentially disruptive effects of high-intensity contests are magnified within the bounds of the transponder passband.

Second, the competitive spirit of contesting on the HF bands leads some participants to use copious amounts of power. Increasing power on HF increases the coverage zone. The higher the power, the larger the zone covered, and the less are the possibilities of frequency sharing. (Some high-power Navy VLF signals are heard the world over, even by submerged submarines!) Barring untoward splattering, raising your power on 20 meters does not, however, affect a QSO 100 kHz away.

Unfortunately, the same cannot be said for satellite operation. A finite amount of power is available to the transponder. Since the transponders are linear, the manner in which the available downlink power is divided among passband users is in direct proportion to the strength of their uplink signals. If one very strong uplink signal appears in the passband, it uses an inordinate amount of the available downlink power and, consequently, reduces the power available to the other users. In contrast to HF operation, therefore, an overpowered station 100 kHz down the band *can* unduly affect your QSO. "Power hogging" is an abomination to the conscientious satellite operator and, since contests seem to promote power escalation scenarios, contests have been discouraged on all OSCARs.

But there is more to on-air competition than contests. DXing on satellites is a form of long-term competition that is reasonable insofar as it, too, stays under control. DXing and seeking awards for grid squares, countries or whatever is normally a lower-keyed form of competition and is encouraged and promoted with various satellite awards. Furthermore, a new type of competitive activity was begun on AO-10 and will soon be resumed and enhanced on Phase 3C. This new competitive activity is called *Techno-Sport*. It's a variation on the highly popular radio sport concepts of the USSR and other countries. In AMSAT's Techno-Sport activities, the idea is to harness the competitive drives of individuals in a way that promotes learning about technical matters and development of useful technical skills.

For example, AMSAT's *ZRO Test*[5] got started in 1985 on AO-10. The challenge of the ZRO Test is to develop and operate a superior Mode-B or Mode-L station that can "hear" exceedingly well. Through carefully calibrated and controlled conditions, an uplink signal is sent to the satel-

Table 5D

Minimum RUDAK Station Requirements

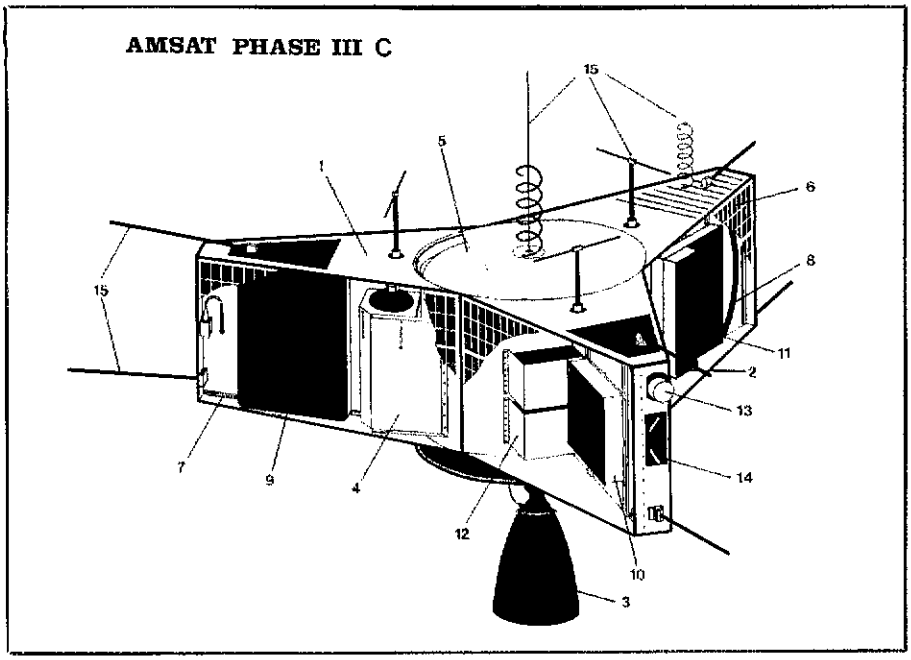
Uplink

Frequency: 1269.710 MHz
EIRP: 26 dBW (400 W)
Typical suitable uplink: 8 watts to 17 dBic antenna
Polarization: RHC

Downlink

Frequency: 435.677 MHz
Typical receive antenna gain: 10 dBic for 12 dB E_b/N_o ratio†
Polarization: RHC

†Energy per bit to noise ratio



The AMSAT Phase 3C satellite. (*graphic by AMSAT-DL*)

1—Aluminum space frame
2—S-band transponder
3—Kick motor
4—Helium tank container
5—Fuel and oxidizer tank
6—Solar panel
7—Magnetorquer coil
8—Nutation dampener
9—Integrated housekeeping unit
10—Battery charge regulator
11—Modulator
12—Auxillary battery
13—Earth sensor
14—Sun sensor
15—Antennas

lite. All listeners receive equal downlinks (within a fraction of a decibel) because of the position of the satellite. After a practice run, a series of CW numbers is sent at the baseline signal strength level. The baseline downlink level is set to equal the beacon. The power output of the beacon remains constant in both the short and long term. This ensures level correlation from month to month between test sessions and should reduce calibration errors because of variations in satellite attitude and ionospheric absorption.

ZRO Test participants carefully copy the numbers sent in slow CW. The uplink power is then reduced by half (3 dB). More CW numbers are sent and copied. Then power is reduced by another 3 dB and more numbers are sent and copied. The process continues in 3-dB increments until the CW on the downlink is so weak that virtually no one copies it (at 24 dB below the baseline level, the uplink is less than 1 watt!). Certificates are awarded to those who copy the baseline numbers. Endorsement stickers are awarded each time a competitor demonstrates that he or she has improved his or her receive sensitivity by 3 dB. Only one competitor (Jeffrey Bishop, W7ID) has ever garnered the long-sought Z-8 award—24 dB below the baseline.

New Techno-Sports are being planned for Phase 3C. There's *SatFox*. This is a derivative of the terrestrial radiolocation sport, Fox and Hound. In the satellite version, you and your computer try to figure out where the hidden transmitter is. Instead of traipsing through the swamps with your DF loops, however, you play hound from the comfort of your shack.

SatFox will use the movement of the satellite itself to obtain "fixes" on the hidden fox who could be 80 or 8000 miles away. If you're a clever hound, you should be able to narrow the fox's QTH down to a county-sized area. You send in your estimate by mail. If you do well, you earn a handsome award or an endorsement to a prior award.

The SatFox location technique will use Doppler-shift measurements to isolate a hidden RF source, rather than signal strength (used in some terrestrial Fox and Hound competitions). Doppler shift measurements are the basis of the search-and-rescue satellite system now being operated by more than a dozen nations using the SARSAT/COSPAS satellites of the US and USSR.[6] Project SatFox on Phase 3C will work in an analogous way. The fox will transmit a beacon, but since the motion of Phase 3C is low compared to SARSAT/COSPAS satellites, extra care will be required to make precise position determinations. That's where skill comes in. And that's what Techno-Sport is all about: combining the fun of competing with the satisfaction of learning and the occasional reward of prevailing and being recognized for superior performance. Thus, there's plenty to do on Phase 3C. With all the activity that's on tap, contests are scarcely missed.

Operating Tips

Operating via any satellite is a snap once the basics are mastered. True, there are a few new things to learn to become proficient on the OSCAR satellites, but learning new techniques is part of the enjoyment of satellite operation. To successfully operate via the OSCAR satellites, you should have knowledge of five basic areas:

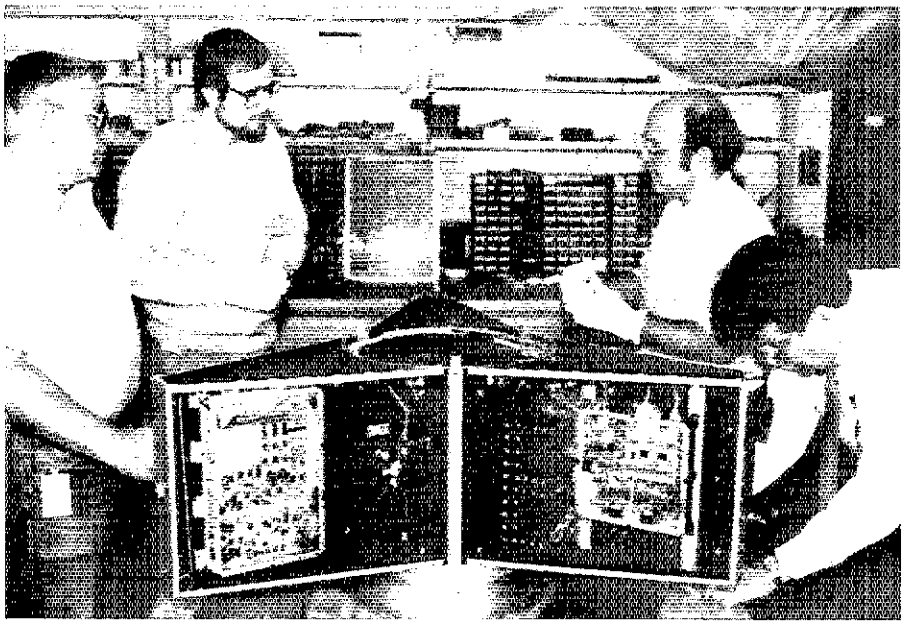
1) Where the satellite is
2) What mode it's in
3) What frequency to transmit on
4) What frequency to receive on
5) Basic operating practice[7]

Determining "where the satellite is" is called *tracking*. Since high-gain antennas are required, you need to aim them at the satellite properly. Tracking tells you where to aim. Manual tracking devices are convenient, inexpensive and sufficiently accurate for satisfactory results. Tracking with the aid of a computer is by far the easiest—just enter the data on the satellite's orbit.[8]

Item 2, mode of operation, is a matter of scheduling. The operating schedule of Phase 3C will be announced after launch. You can learn the operating schedule by listening to W1AW bulletins, by obtaining official AMSAT net bulletins via on-air nets, from packet-radio bulletin boards, or by land-line bulletin boards.[9]

Items 3 and 4, transmit and receive frequencies, are addressed in Table 1. More specific operating information comes in the form of band plans. The preliminary idea is to divide the satellite passbands into thirds, as was done for AO-10. The lowest third is for digital modes such as CW and packet, the upper third is for voice modes such as SSB, and the center third is for mixed modes.[10]

Item 5, basic operating practice, reduces to some very straightforward guidance. For example, always wear headphones when operating SSB. Why? Since you're operating full duplex, a feedback path will exist between your receiver's speaker and the transmitter microphone. The feedback path will round through the satellite back to you again. Howling feedback soon alerts you to the need to don the "cans." Next, never swish the transmitter across the passband to locate your downlink frequency. Estimate your downlink frequency by using Table 1. Then, send a short series of CW dots or briefly whistle into you microphone while listening carefully for your downlink signal and tuning your receiver slightly. To correct for Doppler shift on Mode B and Mode JL, adjust your transmitter frequency only. On Mode S, adjust your receiver frequency only. General operating guidelines appear in AMSAT's *Phase 3 Operating Handbook*. This Handbook is now being revised for Phase 3C and is due for completion soon. Experience is a good



The AMSAT-DL team members work on Phase 3C during integration in Golden, Colorado; (Left to right) Konrad Mueller; Hanspeter Kuhlen, DK1YQ; Karl Meinzer, DJ4ZC; Werner Haas, DJ5KQ. (*AMSAT-DL photo*)

teacher, and many helpful colleagues can be found on OSCARs, since they feel proud of having joined the space-age hobby. They are often glad to share their findings with you!

I hope you have gathered that becoming proficient on OSCAR, even Phase 3C, is no big deal. Sure, there is some esoteric information involved, but Amateur Radio in general probably appeared fairly mysterious to you until you got thoroughly involved. Identifying and using reliable information sources is the key.[11]

In this article, we've learned what Phase 3C is and what it can do. We've recognized that getting to know how to use it and have a great deal of fun in the process is simply a matter of getting interested and having access to the right information. Products and activities of the space age are all around us in our everyday lives. Getting your signal onboard OSCAR and being a part of the Amateur Radio space program is as natural for hams as can be. Phase 3C could be your entry into this vast, rewarding new realm of radio communications. See you there!

Acknowledgments

The propulsion section is based on Richard L. Daniels, W4PUJ, "The Propulsion Systems of the Phase-III Series Satellites," *Proceedings of the 1st Utah State University Conference on Small Satellites*, Oct 7, 1987. (This work is reprinted in the *AMSAT-NA Technical Journal*, Vol 1, No. 2, Winter 1987-88, published by AMSAT-NA).

The IHU section is based on Gordon Hardman, KE3D, "The Integrated Housekeeping Unit—A Method of Telemetry, Command and Control for Small Spacecraft," *Proceedings of the 1st Utah State University Conference on Small Satellites*, Oct 7, 1987. (This article is also reprinted in the *AMSAT-NA Technical Journal*, Vol 1, No. 2, Winter 1987-88, published by AMSAT-NA).

I am especially grateful to AMSAT's Vice President of Engineering, Jan King, W3GEY, for help in preparing this article and for his leadership in the amateur space program.

Notes

[1]OSCAR stands for Orbiting Satellite Carrying Amateur Radio. OSCAR 1 was launched in 1961. President Gerald Ford's voice (tape delayed for the next orbital pass) was heard via AMSAT-OSCAR 7 on July 1, 1976. King Hussein of Jordan, JY1, has operated via AMSAT-OSCAR 10. Used as a generic term, OSCAR includes all the individual OSCARs and the Russian RS (Radio Sputnik) series as well. In a slightly more abstract sense, OSCAR connotes the notion that there's a place for direct public access to space and space-based activities, that is, the Amateur Radio space program.

[2]The Russian RS10/11 and the Japanese FO-12 satellites carry on the Phase 2 satellite tradition.

[3]Circular polarization is used extensively in space communication to offset the effects of polarization rotation in the geomagnetic field and to reduce the effects of the spinning spacecraft. Circular polarization is covered in the ARRL publication *The Satellite Experimenter's Handbook* and is recommended reading.

[4]RUDAK description quoted from an article by Peter Guelzow, DB2OS, appearing in *Amateur Satellite Report* No. 126/127, June 24, 1986. Also, see the *QST* Amateur Satellite Communications column for July and August 1988.

[5]The ZRO Test is the ZRO Memorial Satellite Station Engineering Award. It is a memorial to Kaz Deskur, K2ZRO, who, until his death in April 1984, was a strong AMSAT technical resource person.

[6]SARSAT/COSPAS is the same system that was used to track the Russian and Canadian SKITREKers on their journey across the North Pole beginning in March. A small emergency locator transmitter (ELT) signal was picked up by the SARSAT/COSPAS satellites. On the ground, the Doppler shift of the resulting downlink was analyzed and the trekers' position closely determined by plotting various curves based on the Doppler shift measurements.

[7]I've covered many of these topics in my Amateur Satellite Communications column appearing in *QST* over the last few years.

[8]Orbital data originates with NASA. Two distributors of orbital elements are the ARRL and AMSAT. Tracking software is available from the AMSAT Software Exchange, PO Box 27, Washington, DC 20044. Send an SASE for a list of available programs.

[9]Operating schedules in general were discussed in the Amateur Satellite Communications column in April 1988 *QST*.

[10]An international band-planning committee is being considered to help develop a Phase 3C band plan.

[11]AMSAT members receive regular newsletters and access to helpful publications, such as the *AMSAT-NA Technical Journal*.

New Products

ENCOMM DUAL-METER WATTMETERS

☐ ENCOMM, Inc, has introduced a new line of Santec dual-meter wattmeters. Three models are available: the W-710 covers 1.6 to 60 MHz and has forward-power scales of 2000, 200 and 20 W. The W-720 covers 1.8 to 200 MHz and has forward-power scales of 200, 60 and 15 W, and the W-740 covers 140 to 525 MHz and has forward-power scales of 200, 60 and 15 W. According to the manufacturer, the meters are housed in sturdy metal cases and are virtually unaffected by RF fields. For more information, contact ENCOMM, Inc, 1506 Capital Ave, Plano, TX 75074, tel 214-423-0024.—*Rus Healy, NJ2L*

Strays

I would like to get in touch with...

☐ any amateurs who are members of Greenpeace. Bill Wilson, WA8YTM, Box 228, Oak Hill, WV 02901.

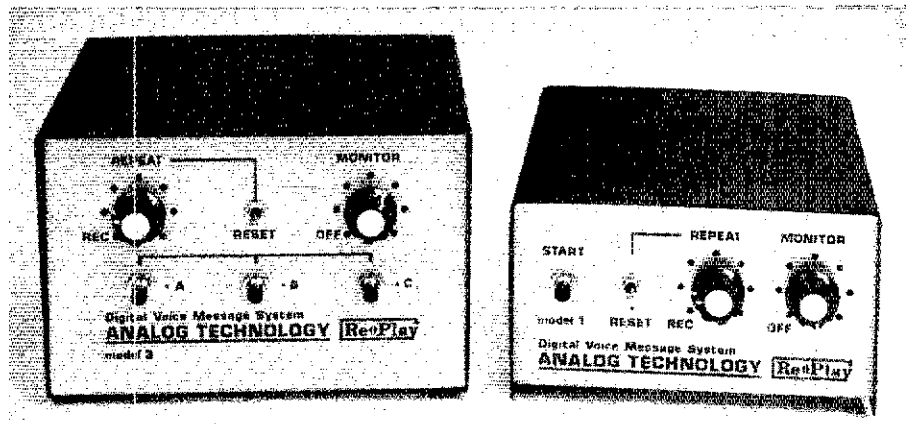
☐ any members of USS *Davison* (DD618) regarding the mid-July reunion at Stevens Point, Wisconsin. Frank Hoose, K4RZ, PO Box 209, Bluemont, VA 22012.

☐ anyone interested in an exchange of ideas regarding reliable regulator circuits for mobile motorcycle operation. Wes Herdeg, W6XO, 1892 Litchfield Ave, Long Beach, CA 90815.

☐ anyone with information on how to obtain enclosures made by the Apollo Products Co, formerly of Vaughnsville, Ohio. Howard Kraus, K2UD, 372 Callodine Ave, Amherst, NY 14226.

☐ anyone with a manual for a Tektronix 545 oscilloscope and/or a type CA plug-in. David Kraft, WB2RNC, Box 253, Roopville, GA 30170.

The RePlay Digital Voice Message System



Contests are popular among radio amateurs, but several hours of calling CQ on phone can make contesting seem like more work than fun! Here's a way to put the accent back on FUN!

By Richard Nelson, WBØIKN
3640 Juanita Rd
Fort Collins, CO 80524

Over the years, imaginative contesters have devised various tape-loop schemes to call repetitive CQs, but these methods are far from ideal. Since the introduction of memory keyers for CW operators, phone contesters have dreamed of the day when *they* would have a similar device. Having recorded CQs with variable repetition times, instant replay and transmitter PTT keying at your fingertips would certainly make phone contesting more enjoyable.

Several manufacturers now offer ICs and hybrid modules designed specifically for use in digital voice recorders. Probably the simplest of these modules to use are offered by Phoenix, Inc.[1] Their voice record/playback modules are available as a complete system with 1 Mbit of DRAM—the 3264—or as a control/audio circuit—the 32DV01—that can address external memory in the form of static RAM, dynamic RAM (DRAM) or erasable, programmable read-only memory (EPROM).[2]

The Phoenix modules contain all of the functions required for a complete digital voice record/playback system: A speech amplifier, analog-to-digital (A/D) and digital-to-analog (D/A) converters, filters, memory controller, clock and control circuits and memory (with the 3264). All of this is contained in an epoxy-potted hybrid block. Both of the modules will allow you a total of 128 seconds of record time, allocated among as many as 16 separate messages. Playback time is automatically adjusted to the record time so that messages may be of any length. (See the sidebar, "Recording by Numbers.")

With the addition of some external control and audio circuits, these modules are the centers of the two versions of the RePlay Digital Voice Message System models 1 and 3. The model 1 supplies a *single* message playback; the model 3 offers *three* messages. The physical differences between the two units can be seen in the accompanying photographs. Refer to the title photo. The START button on the model 1 initiates playback of the single message. The A, B and C buttons on the model 3 permit playback of any of three stored messages.

Construction details will be presented for the single-message unit, the RePlay model 1. Information on the three-message RePlay model 3 unit is available by mail.[3] The RePlay model 1 and model 3 units share features that make them useful not only for contesting, but for DXing and repeater-voice identification as well.

System Description

Signal flow through the RePlay model 1 is shown in Fig 1. The schematic diagram of the RePlay model 1 single-message unit is shown in Fig 2. Microphone-level audio at J1 is split between the output mixer,

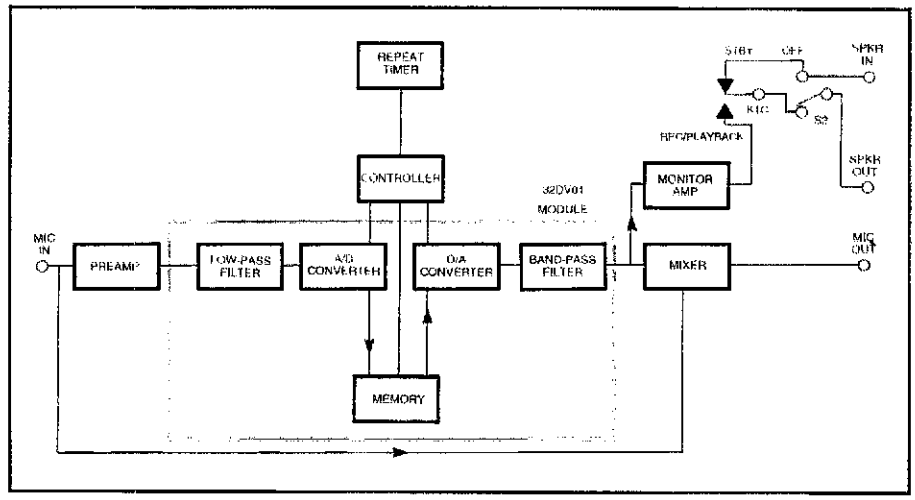


Fig 1—A block diagram of the RePlay model 1 and signal flow through the unit. Much of the circuitry is contained in the 32DV01 hybrid module, reducing the parts count and construction complexity. See the sidebar, "Recording by Numbers."

[1]Notes appear on page 37.

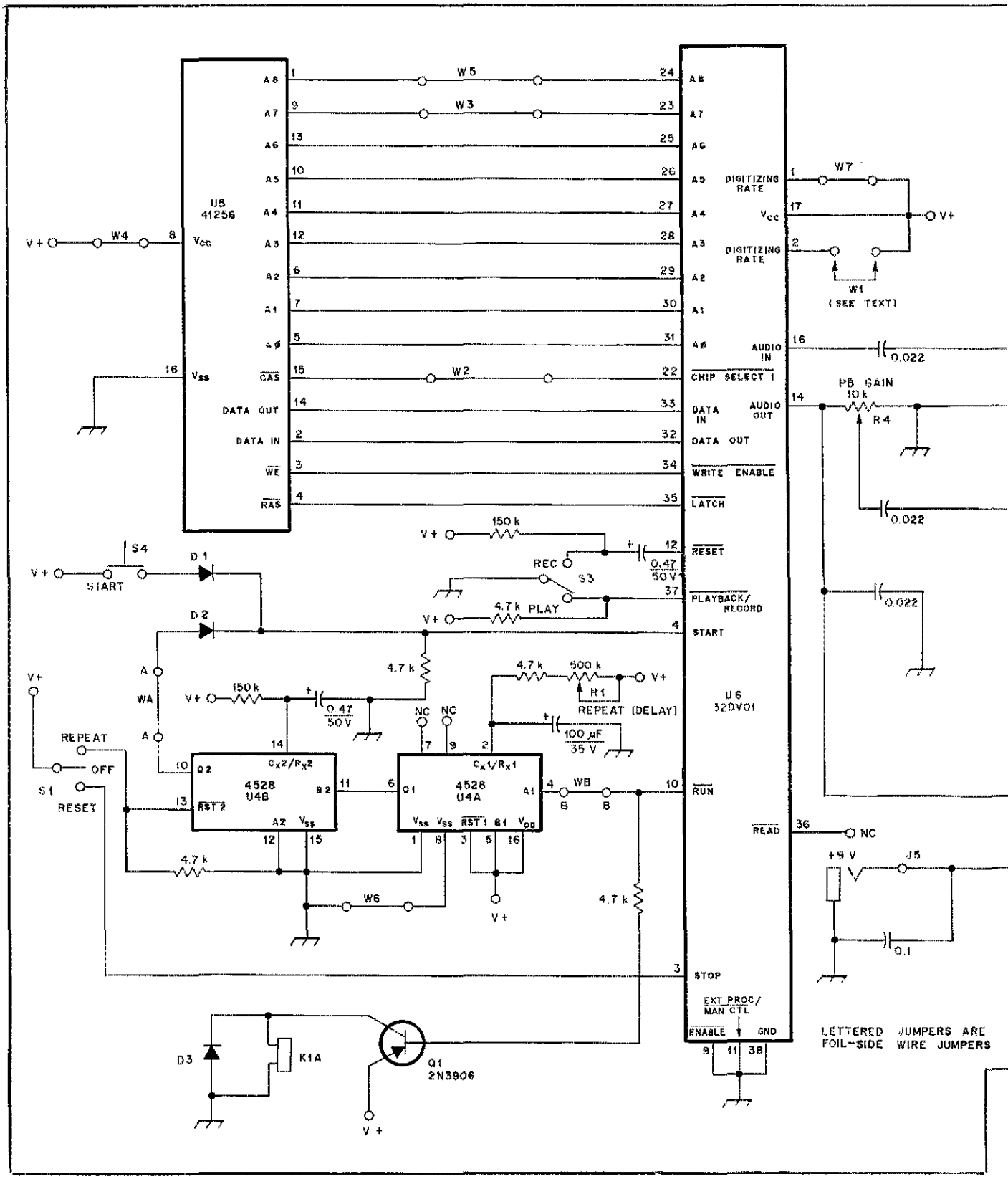
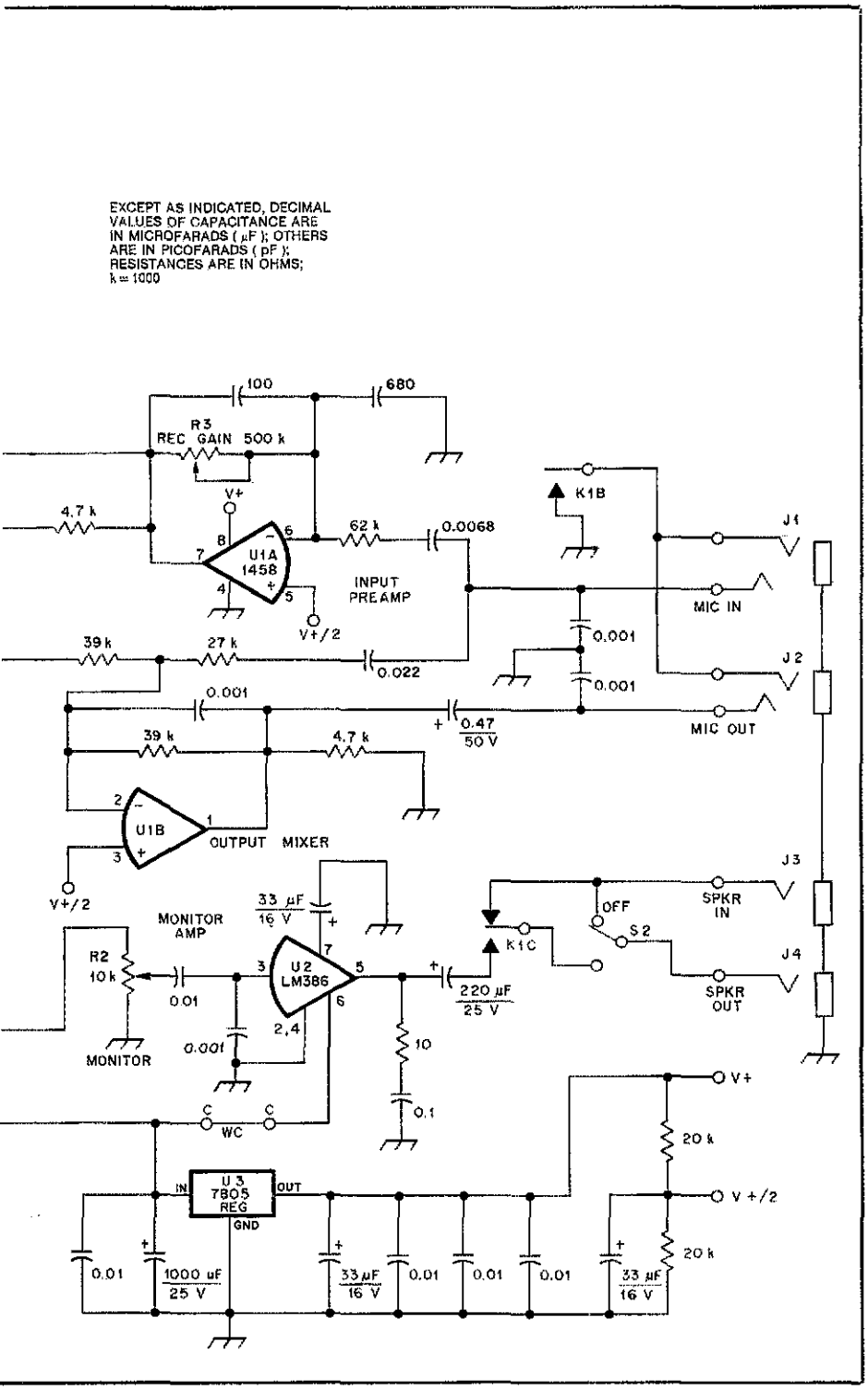


Fig 2—Schematic diagram of the RePlay model 1 single-message digital voice recorder. Several hard-wired jumpers are required on this board; three are on the foil side (WA, WB and WC). W1 is discussed in the text. Resistors are ¼ W, 5% tolerance units.

J1, J2—Three-conductor (stereo), ¼-in. jack.
J3, J4—Two-conductor, ¼-in. jack.
J5—1/8-in. jack.
K1—DPDT PC-mount relay, 5-V coil.
R1—500-kΩ panel-mount potentiometer.
R2—10-kΩ panel-mount potentiometer.
R3—500-kΩ PC-mount trimmer potentiometer.
R4—10-kΩ PC-mount trimmer potentiometer.
S1—SPDT center-off toggle switch.
S2—SPDT rotary switch, part of R2.
S3—SPDT rotary switch, part of R1.
S4—Panel-mount, normally open push-button switch.
U1—1458 op amp.
U2—LM386 audio amplifier.
U3—7805 5-V, 1-A voltage regulator.
U4—4528 dual monostable multivibrator.
U5—41256 256-kbit DRAM.
U6—32DV01 Phoenix, Inc digital voice recorder. These modules are sold by Viking Electronics, Inc, Hudson, Wisconsin. Unit price in small quantities is $76 each. Viking prefers not to sell single units.



U1B, and the input preamp, U1A. Preamp gain is adjustable (by means of R3) to match the microphone level to that required by the recorder module. The 32DV01 filters the incoming audio signal to remove high-frequency components, samples the signal with an internal A/D converter, and stores the digitized information in U5, a 256-kbit DRAM.

During playback, the 32DV01 retrieves the data stored in U5, transforms it into audio with an internal D/A converter, filters out the harmonics produced by the digitizing process, and outputs the restored audio signal at pin 14. This signal is split between the output mixer (U1B) and the monitor amplifier (U2). U1B mixes the playback audio and direct microphone audio and feeds these signals to J2, the MIC OUTPUT jack. Playback level is adjustable (by means of R4) to match the microphone level.

The monitor amplifier (U2) can be switched between two modes. While the RePlay is in standby, the speaker-level audio from your receiver is routed directly from J3 SPKR IN to J4, SPKR OUT. During record or playback, the source of the signal at J4 is determined by the position of the MONITOR switch (S2), mounted on the MONITOR level control, R2. When the monitor is enabled, the amplifier is connected to J4 through contacts K1C of relay K1. The amplifier is used to check the record level and to monitor the output signal during playback. Turning the MONITOR control off feeds the receiver audio straight through at all times for use with rigs that have a monitor function. The MONITOR level control adjusts the monitor amplifier gain to match the output level of your receiver.

Playback and record are initiated by closing the START switch, S4. S4 is a push-button switch, but its action can also be duplicated by means of a digital control signal.

D1 and D2 form a simple OR gate to provide triggering by either the START button (S4) or the repeat timer circuit. A high input to either diode triggers U6, pin 4 to start record or playback as determined by the position of S3, REC/PLAY.

A repeat circuit, based on a dual monostable multivibrator, U4, allows the message to be continuously repeated with a variable listening period. During playback, U6 pin 10 goes low. It switches high at the end of playback, triggering the positive trigger input of U4A. The Q output of U4A goes high for a time determined by the resistance of REPEAT (delay) control, R1, in conjunction with the 100-μF capacitor. This delay time can be as long as 20 seconds. The Q output of U4A feeds the negative input of U4B. If the $\overline{\text{RST2}}$ input of U4B is brought high by switching S1 to REPEAT, U4B will send a pulse from its Q output, through D2, to U6 at the end of U4A's timing cycle, restarting the playback function. Moving S1 to the center (OFF) position cancels the repeat function at the end of the current playback cycle. Moving S1 momentarily to RESET immediately cancels operation at any time during any mode.

Pin 10 of U6 also controls the relay circuit. Q1 buffers and inverts the signal so that the low state at U6 pin 10 during record/playback is converted to a high output to actuate K1. In addition to switching the monitor amplifier, K1 also controls transmitter keying when connected in parallel with your microphone (or foot switch) PTT line.

The RePlay model 1 can be powered by a +9 to +12 V source, including most +9 V wall transformers rated at 500 mA or more. The monitor amplifier is connected directly to the power-supply input. A three-terminal voltage regulator, U3, provides +5 V for the digital and audio circuits.

Construction and Use

Parts kits are available for the RePlay model 1, and are highly recommended to

Recording by Numbers

Although the operation of the Replay mimics that of a Morse code memory keyer, the circuit demands the latest in solid state ingenuity to implement. Although it's been possible for several years to record speech digitally using a personal computer, a self-contained system like the RePlay is feasible as a result of recently introduced digital recorder chips and drastic price reductions in large dynamic RAMs.

There are several methods of digitizing and reproducing a complex waveform such as speech. They all perform a function called *sampling* to calculate a numeric representation of the amplitude at specific points in time. These "snapshots" of the waveform may be stored in digital memory and recalled sequentially during playback.

The two parameters that define digital memory size for a given message length are the *sampling rate* and the *sample size*. A sine wave of a particular frequency can be represented by a minimum of two equally spaced data points. Therefore, the sampling rate must be at least twice the highest frequency to be recorded to avoid a form of distortion known as *aliasing*. [Aliasing refers to a form of distortion that occurs when an insufficient number of signal samples are taken. The Nyquist Theorem specifies that a sampling rate must be at least double that of the highest frequency sampled.—Ed.]

The sample size determines the dynamic range of the system. Increasing the number of data bits in the sample increases the range of amplitudes that can be recorded and reproduced accurately. Larger samples improve the signal-to-noise ratio, but also increase the amount of memory required to store the sample.

Data compression techniques can be employed to reduce the required memory size. The recorder module used by the RePlay relies on a process called *adaptive differential pulse code modulation* (ADPCM). Instead of storing a number representing the amplitude of the signal at each sample, it stores a number that represents the difference in amplitude between the present sample compared to that of the last sample. A sign bit indicates whether the waveform is rising or falling, and three data bits represent the difference from the previous sample. This method is illustrated graphically in Fig A.

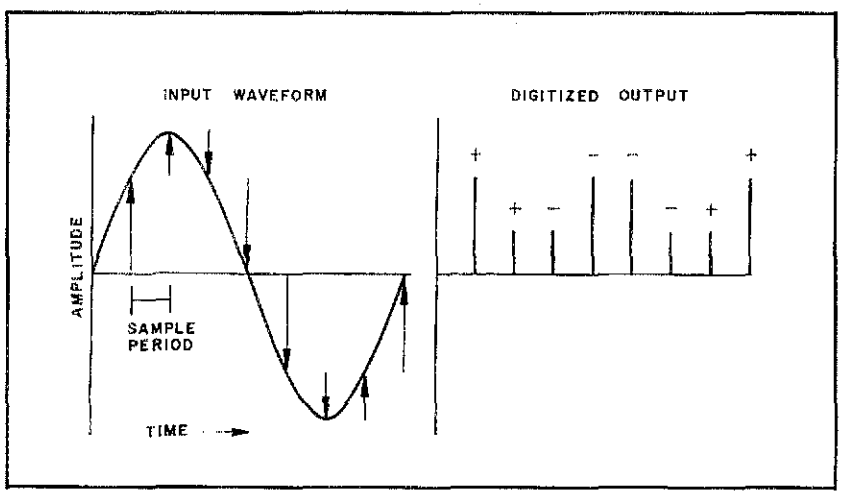


Fig A—The adaptive differential pulse-code modulation (ADPCM) digitizing method used by the 32DV01 module computes and stores the difference in amplitude between successive samples. This modulation method requires fewer data bits than others that directly store the waveform magnitude of each sample.

Even with data compression, enormous amounts of memory are required to store digitized audio waveforms. The RePlay-1 uses 256 kbits of memory for its single 8- or 16-second message.

The data-crunching requirements of memory keyers are simple by comparison. The dynamic range of Morse code can be represented by a single data bit: 0 for off, and 1 for on. Also, the data transmission rate is relatively slow. A 20-WPM Morse code message requires a clock frequency of only 16.7 Hz. This means that a CW message that requires a kilobit or so of memory to store digitally, will require an Mbit or more to store as digitized speech! (Who said Morse code is inefficient?)—*Richard Nelson, WBØIKN*

ensure repeatable results.[4] (A PC-board template and parts overlay appear in the Appendix.) The hybrid module is expensive, and a wiring error could damage it. Although the kit is simple to build, beginners should practice their soldering technique before starting assembly. U6's inputs are buffered, and by using the PC board supplied, everything should function correctly the first time power is applied.

The RePlay must be inserted into both your microphone and headphone (or speaker) lines. You can either cut your existing cables, or prepare suitable interconnecting cables. When using rigs that require multipin microphone connectors, it's often simpler to insert a "breakout box" in the microphone line. Or, you may elect to install jacks at J1 and J2 that mate with your existing connectors.

Before using the RePlay, you must decide on a digitizing rate. The digitizing rate determines the frequency at which speech is sampled, the amount of memory required to store a given message, and the quality of the audio on playback. The 3264 and 32DV01 modules permit a choice of four digitizing rates: 32, 16, 11 and 8 kbits/s. The two slower rates, however, do not provide enough bandwidth and dynamic range to make them attractive for Amateur Radio use. The two higher digitizing rates yield record/playback times of 8 or 16 seconds with 256 kbits of DRAM. (With 1 Mbit of DRAM, the RePlay model 3 offers 32- or 64-second record/playback times divided among the three messages.)

To select the faster digitizing rate with the RePlay model 1, a shorting clip (W1) is installed on a pair of connector pins on the circuit board. The clip is removed to choose the slower rate. Although the slower rate provides for longer messages, you'll notice a slight reduction in audio quality. Because contest and DX CQs usually last less than eight seconds, you'll probably want to select the higher rate to ensure a close match between the microphone and playback audio quality. (The operator at the other end may react to the audio quality difference by thinking he or she is listening to another station!)

The RePlay consumes little power, so a power on/off switch is not included. Also, the absence of the switch helps avoid the possibility of accidentally turning off the unit; that could be annoying in the midst of a contest!

To get the RePlay running, connect the power source to J5. Turn the MONITOR control to its midpoint, the REPEAT control to the REC position, and press the START pushbutton, S4. You'll hear the relay click, indicating that recording has started. While monitoring your audio through headphones (to avoid feedback), adjust the RECORD GAIN control (R3) for the highest level that does not produce distortion. You may trim the MONITOR control for a comfortable volume level. Setting the record gain may take longer than eight seconds. When recording stops, turn the REPEAT control clockwise to place the unit in the playback mode, then back to REC and press S4. Repeat this process until the audio sounds right to you. When recording your message, be sure to momentarily press the RESET switch fully at the end of your

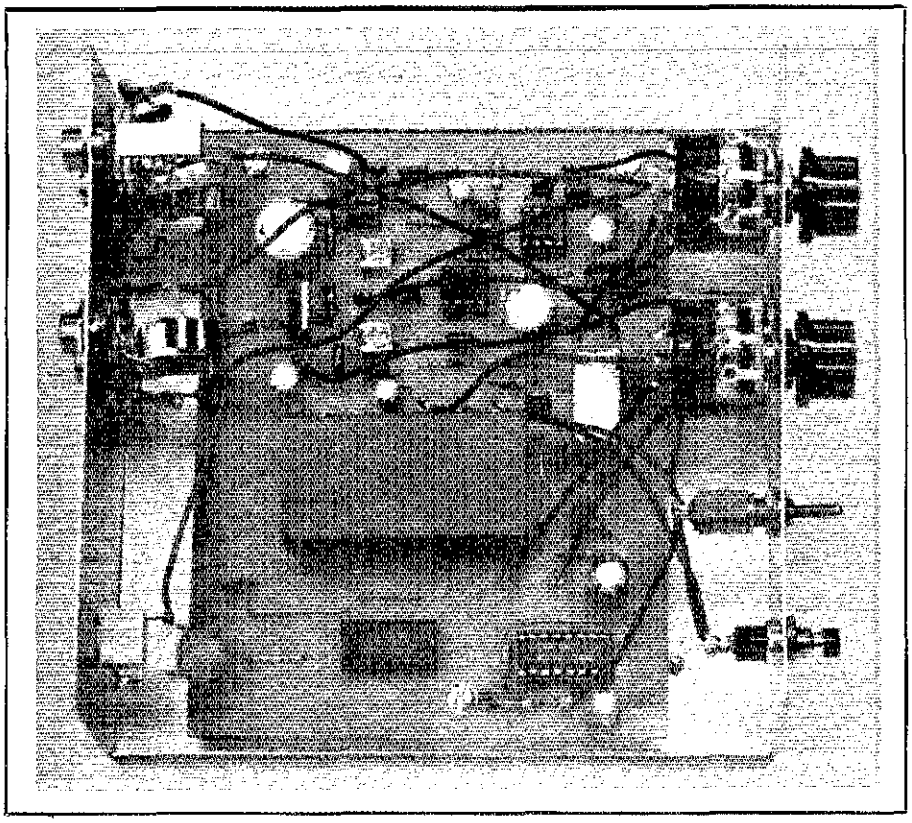


Fig 3—An internal view of the RePlay model 1. U6, the 32DV01, is the large, black rectangle near the center of the PC board. W1, which selects the digitizing rate, is the small rectangular object near the upper-right corner of U6, next to the relay.

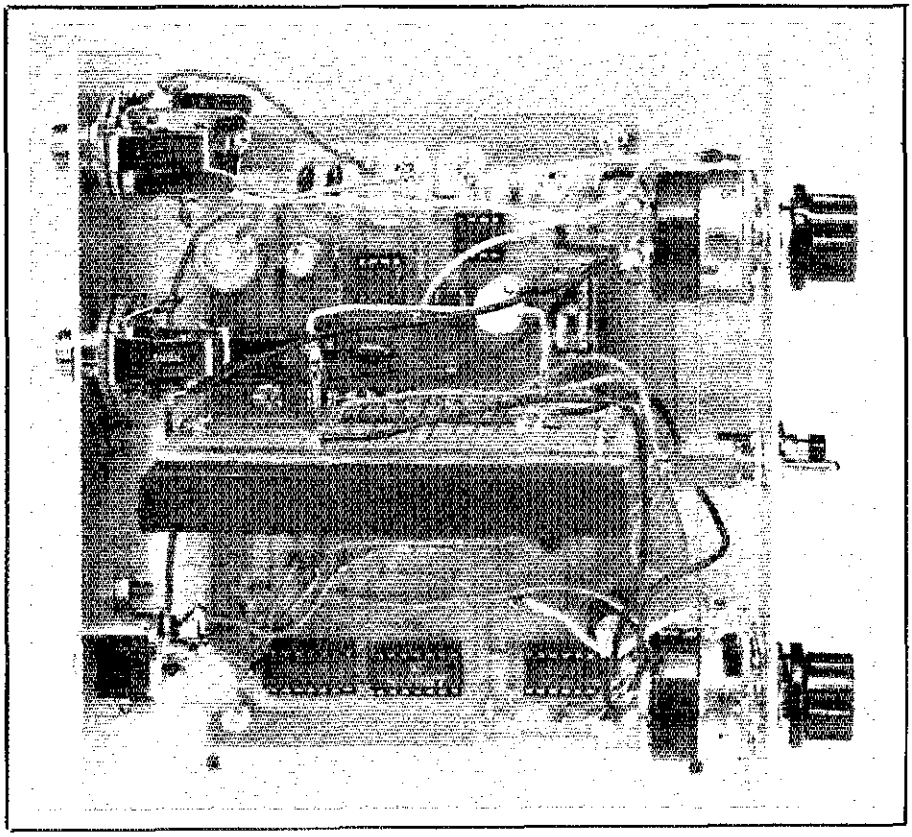


Fig 4—In this internal view of the RePlay model 3, some of the reasons for the physical differences between it and the model 1 become apparent. The 3264 is narrower, but mounted vertically on another PC board, and requires more headroom. The digitizing rate jumper is shown in place across the middle of the module's PC board.

The 32DV01/3264 Voice Recorder Modules

The "black box" on which the RePlay-1 is based is the 32DV01 voice recorder module manufactured by Phoenix, Inc. Inside the epoxy encapsulant is a hybrid circuit consisting of surface-mount devices (SMDs) on a small PC board.

The 32DV01 includes all of the components of a digital speech recorder except the memory (the Phoenix 3264 module in the RePlay-3 includes one megabit of built-in memory).

Audio from the microphone preamplifier is low-pass filtered by the 32DV01 to prevent aliasing. The waveform is then digitized by a 4-bit ADPCM A/D converter. The serial data stream is stored in memory; in this case, a 256-kbit dynamic RAM. A digitizing rate of 32, 16, 11 or 8 kbits/s can be selected. This provides record/playback times of 8 to 32 seconds with 256 kbits of memory, or 32 to 128 seconds with 1 Mbit. The two slower digitizing rates, however, do not exhibit adequate fidelity for most Amateur Radio applications.

During playback, data is read from the DRAM and the 4-bit samples are converted back to audio by a D/A converter. A band-pass filter removes digitizing noise from the output signal.

A controller circuit adjusts the clock frequency, stores message locations, addresses the memory and selects the record or playback mode. Messages start and stop automatically regardless of their length.

The 32DV01 is an incredible module and is representative of the state of the art in digital voice recorder technology. Its sophistication is the secret behind the RePlay's simple design and easy assembly.
—Richard Nelson, WBØIKN

message. This tells the internal controller when to change back to standby mode at the end of a playback cycle.

Next, turn the REPEAT control clockwise to place the unit in playback mode, and press S4. You'll hear your recorded message. With a dummy load attached to your transmitter, key the transmitter and speak into the microphone at a normal level. Adjust the transmitter mic gain control for proper operation. (Keep in mind that the RePlay adds 3 dB of preamplification to your microphone level, requiring you to slightly reduce your transmitter mic gain from its normal setting.)

Now, press S4 to initiate playback of the recorded message. Adjust R4 (PB GAIN) to match the playback level to that of the microphone level. That done, the RePlay is ready for action! Simply press S4 whenever you want the recorded message

played. To send a longer CQ, press S4 *twice*—quickly. This will send two CQs with no delay between cycles.

To use the repeat function, simply move S1 to the REPEAT position at any time before, or during, a playback cycle. Adjust the DELAY control (R1) for the desired listening-period delay. At the end of the listening period, the playback cycle will automatically repeat. To cancel the repeat function, flip S1 to its mid position. The current playback cycle will complete itself and the unit will return to standby. Moving S1 to RESET will stop playback immediately and cancel repeat if it was selected.

It's possible to control the RePlay externally, either with a foot switch or digital control. The unit can be connected to any digital gate that is CMOS compatible. This makes it a great addition to repeater installations where it can be easily substituted for a CW IDer to provide voice IDs. Connect the control line in parallel with S4. A +5 V pulse applied to the START terminal will initiate playback. And, most microprocessor-controlled repeaters can—automatically or in response to a tone command—use the three-message capability of the RePlay model 3 for phone patch instructions, club announcements and other such information.

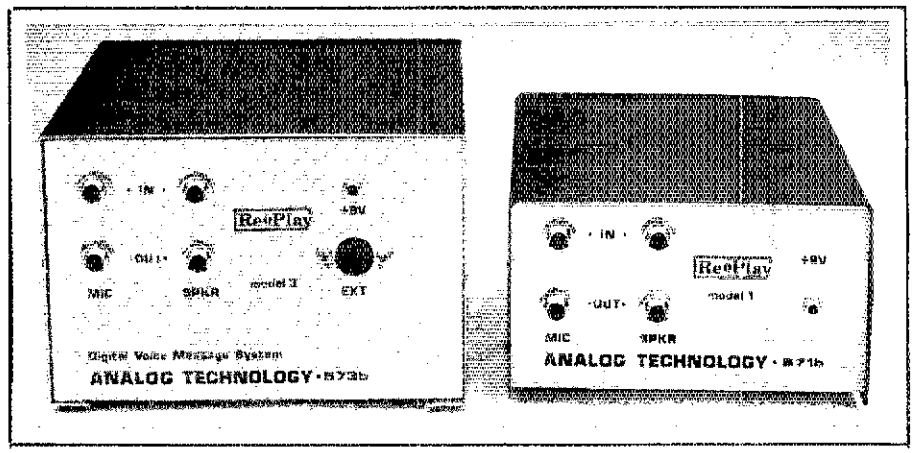


Fig 5—Rear panel view of the RePlay models 1 and 3. An external control jack (EXT) is featured on the model 3. (A similar arrangement can be made for the model 1; see text.)

Summary

Memory keyers changed the style of CW contesting during the '70s. Digital voice recorders are destined to do the same for phone contesting in the '80s. Using the RePlay will take the effort out of slow stretches and help increase your QSO rate by keeping a signal on the air when you would rather be resting your vocal chords! RePlay will speed up high-rate periods by calling CQ while you catch up on your dupe sheet, drink a soda, or simply catch your breath.

If you've decided that phone contesting has become an effort, try the RePlay. It's guaranteed to make contesting FUN again!

My thanks to Don Springer at Phoenix, Inc for supplying design details for the 32DV01, and for patiently answering my many questions.

Notes

[1]Other manufacturers include Oki data, MX-COM and NEC. There are also a number of digital signal processor ICs available (such as the Texas Instruments TMS320 family) that may also be used in digital recorders. I considered all of these and settled on the Phoenix module (Phoenix, Inc, PO Box 314, Lakeland, MN 55043) as the best compromise between simplicity and price.

[2]One digital voice recorder was reviewed last year in *QST*. See "Nel-Tech Labs DVK-100 Digital Voice Keyer," Product Review, Nov 1987 *QST*, pp 39-40.

[3]Send an SASE to the author for information on the RePlay model 3.

[4]Kits and assembled units are available from Analog Technology, PO Box 8964, Fort Collins, CO 80525; tel 303-484-6759. The prices are as follows: RePlay model 1 PC board and all board-mounted parts, $138; complete kit (including cabinet and off-board components), $159; assembled and tested unit, $195. The RePlay model 3 (available only as an assembled and tested unit), $295. The ARRL and *QST* in no way warrant this offer.

APPENDIX

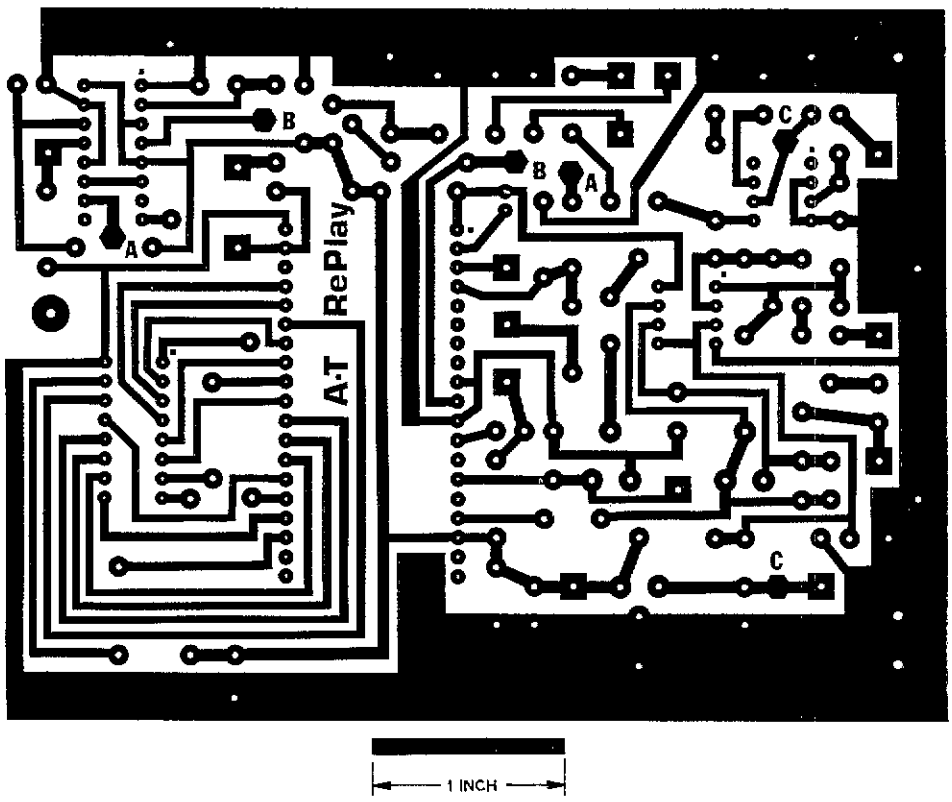


Fig B—Circuit-board etching pattern for the Replay model 1. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Note the six hex-shaped, lettered pads. These pad pairs must be connected by means of three wire jumpers on the *foil side* of the board. Connect together the two pads labeled A, the two labeled B and the two labeled C after installing all parts, but prior to inserting the ICs into their sockets.

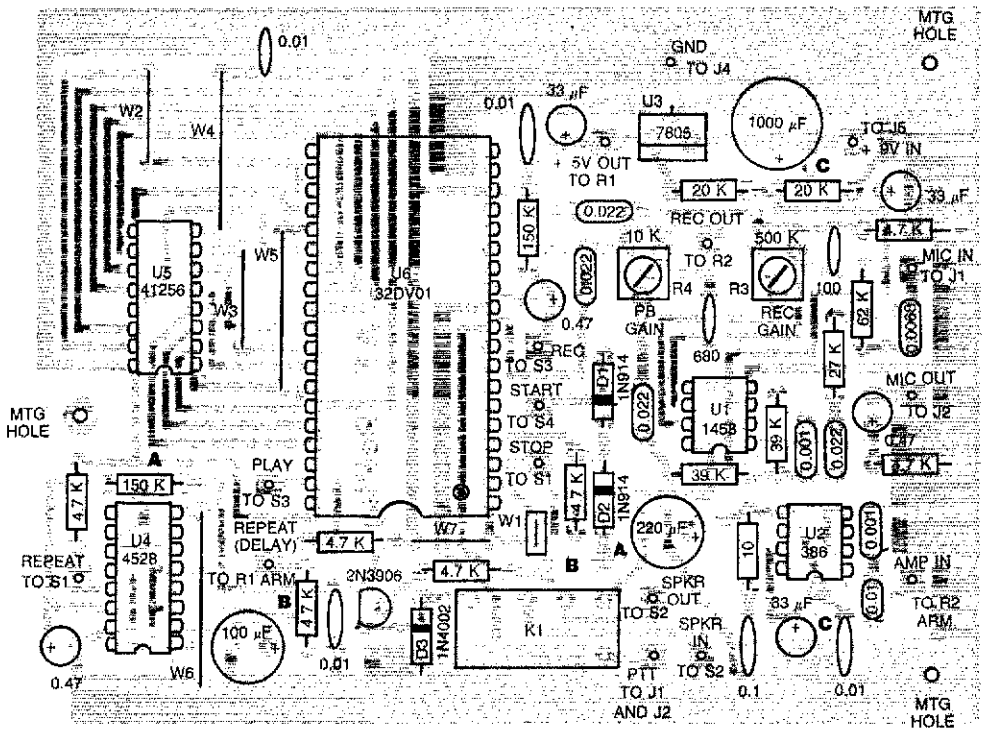


Fig C—Parts-placement guide for the RePlay model 1. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. There are seven jumpers on the component side of the board; six of these (W2-W7) are hard-wired—W1 is a jumper block (see text). Also, there are three *foil side* jumpers required (see Fig B and its caption). Pads A-A, B-B and C-C indicated in boldface type must be connected beneath the board. These jumpers are referred to as WA, WB and WC on the schematic diagram shown in Fig 2.

New Products

NETWORK SERIES-1000 "RINGROTOR" ANTENNA MOUNT

☐ TIC General, of Thief River Falls, Minnesota, has introduced an antenna rotation system designed to allow you to take advantage of the full height of your tower by allowing antennas to be mounted at virtually any position along a tower's height. The Ringrotor mounts around the tower, and antennas are clamped to it. Among the advantages of this rotation system is the ability to mount several antennas on a single tower, each at optimum height, with independent rotation capability. A matching control unit with a digital display is available for the Ringrotor. Technical specifications are as follows:

Maximum tower face width: 26 in
Maximum tower-leg diameter: 1½ in
Maximum/minimum antenna boom diameter: 3½ in/2 in
Tested static load: 500 lbs
Tested off-center load: 200 lbs @ 4 ft from center
Tested wind survival @ antenna area: 50 mi/h @ 16.8 sq ft
24-V dc 1/20-HP motor
Tested stall torque: 7800 in-lbs
Matching control resolution: 1 degree
Rotation: 360 degrees

Options include nickel finish, a vertical truss and an ice-resistant coating. Price class: Ringrotor, $679; matching control unit, $179. For more information, contact Network 1000, PO Box 1, Thief River Falls, MN 56701, tel 800-423-6417 or 218-681-1291.—*Rus Healy, NJ2L*

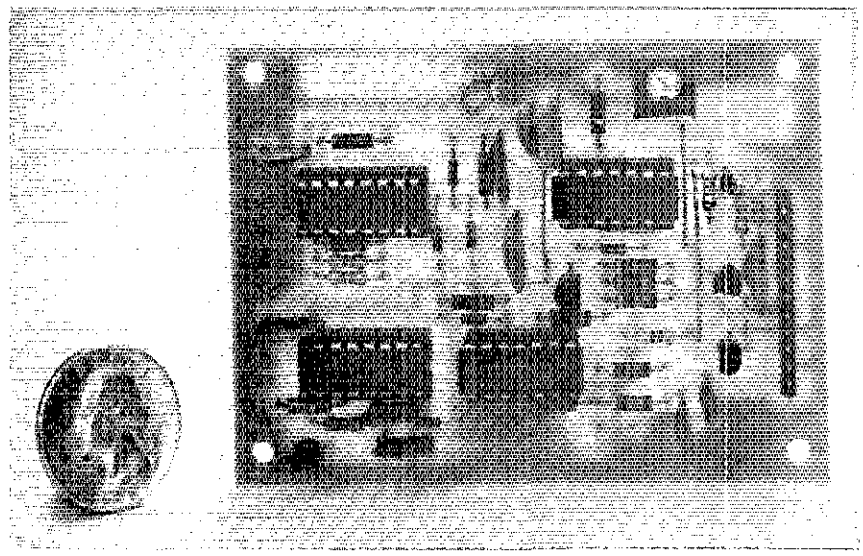
TS-COMM COMMUNICATIONS AND CONTROL SOFTWARE FOR KENWOOD RADIOS

☐ Ham Radio Outlet, Inc, and GRF Computer Services, Inc, have introduced a computer software system that allows control of many of the functions of Kenwood TS-940S, TS-440S, TS-711A/811A and R-5000 radios using an IBM® PC/XT/AT computer. All functions controllable through the appropriate IF interface for each radio are supported by the software. Features include real-time display of all supported functions, VFO and memory channel selection, control of RIT and XIT functions, mode selection, control of VBT and slope tuning (TS-940S only), printing of memory channel data, voice-synthesizer actuation, PL-tone control, and control of memory scanning and several other functions.

TS-COMM is supplied with a 32-page instruction manual. Computer hardware requirements are an IBM PC/XT/AT or compatible, DOS 2.1 or later, at least 512 kbytes of RAM, one floppy-disk drive and one serial-communications port. A printer is optional. Price: $69.95. Available from Ham Radio Outlet, Inc, 2620 W La Palma, Anaheim, CA 92801, tel 800-854-6046, 714-761-3033 or 213-860-2040.—*Rus Healy, NJ2L*

The AD7Iambic Cheap Keyer

Need a small, low-cost, low-current-drain keyer? This four-IC CMOS unit will have you slinging flawless strings of dots and dashes in no time—and for next to nothing!



By Paul Newland, AD7I
ARRL Technical Advisor
PO Box 205
Holmdel, NJ 07733

I'm not a great CW operator, but I do enjoy using that mode. CW is excellent for getting the most from low-power (QRP) operation. One thing gets in the way of my enjoyment of CW, however: I suffer from a chronic case of QLF (that is, my skill with a straight key is pretty poor). I rely on an electronic keyer to make my signals easier to copy for people I work on CW. I prefer to have keyers as integral parts of the rigs I operate (usually QRP rigs or old klunkers), rather than housing them in separate boxes at the operating position. This philosophy is an outgrowth of my desire for minimum box count for portable operation; it represents one fewer box to pack and one fewer set of cables to remember (or forget) before an outing.

Including a keyer in each rig can get to be expensive if you use commercial keyer boards or chips. To save money, I have often relied on some of the popular, simple one or two generic-chip keyers for built-in applications. Overly simple keyers usually give less than adequate performance, however. In my case, these keyers don't make my signals sound much better than when I use a straight key! I always find myself reverting to commercial iambic keyers with dot and dash memories—in spite of their cost.

I decided to see just how many chips I'd need to make a basic iambic keyer with dot and dash memories. This article shows the result of my efforts: A keyer that I not-so-modestly call the AD7Iambic Cheap Keyer, or *Cheaper* for short. The component count for the Cheaper isn't minimal, but the *cost* is.

The Cheaper provides the features mentioned earlier, as well as sidetone generation. The keyer uses four common ICs, seven diodes, four transistors, 21 resistors, 13 capacitors and two potentiometers. I checked a catalog from a popular mail-order house and found the total cost of the components used for the Cheaper—including the perf board and a speaker, but not IC sockets—to be less than $10. If you choose to use an etched PC board instead of point-to-point wiring on a perf board, it will cost more to build the keyer. If you want to add an enclosure (assuming you're not going to build the Cheaper into a radio), it's still less expensive to build than the custom single-chip solution. The Cheaper is still fairly small; the overall parts count isn't much more than that for the single-chip solution!

Design Philosophy

My designs usually fall somewhere between unique invention and blatant plagiarism (and frequently lean toward the latter). I find that often the best designs are improvements on other effective designs; the Cheaper is no different. Here are some of the building blocks incorporated in the keyer. The clock circuit was designed by Roy Lewallen, W7EL, and was used in his keyer project that first appeared in an issue of *SPRAT*—a QRP journal—several years ago. This clock has the advantage of good asynchronous starting without elongating the first clock period. I used a couple of other borrowed ideas in the Cheaper, but I don't know who to credit for either one. First, I used exclusive-OR gates for memory elements, which I must say is a pretty clever idea. Second, a Schmitt-trigger gate configured as an AF oscillator serves as a handy, low-cost, minimum-parts-count sidetone generator. Fig 1 shows the schematic of the Cheaper. For a discussion of how the circuit works, see the sidebar, "Cheaper's Circuit Operation."

Building the Keyer

I built the Cheaper on a piece of perf board. Nothing about the layout is critical, so feel free to change the layout shown in Figs 2 and 3 to suit your needs. Just about any construction method is fine; dead bug, wire wrap, point-to-point and etched-PC-board wiring are all fine. One caution you need to observe is the sensitivity of CMOS ICs to static electricity. Always use a grounding wrist strap or its equivalent to protect the ICs during handling. Also, if you elect not to use the PC-board layout shown in Fig 2, be sure to place the bypass capacitors as close as possible to their respective IC pins. The signal levels in the keyer are very small, and poor RF bypassing can make the Cheaper do some mighty strange things.

A word of caution about capacitors: I designed the Cheaper with CMOS ICs to provide keying at minimal current drain. Because of this, no on/off switch is included. Be sure to use low-leakage capacitors in the keyer (either ceramic or tantalum). Don't use garden-variety electrolytics if the Cheaper will be battery powered; electrolytics are often very leaky. The keyer will work fine if you use leaky

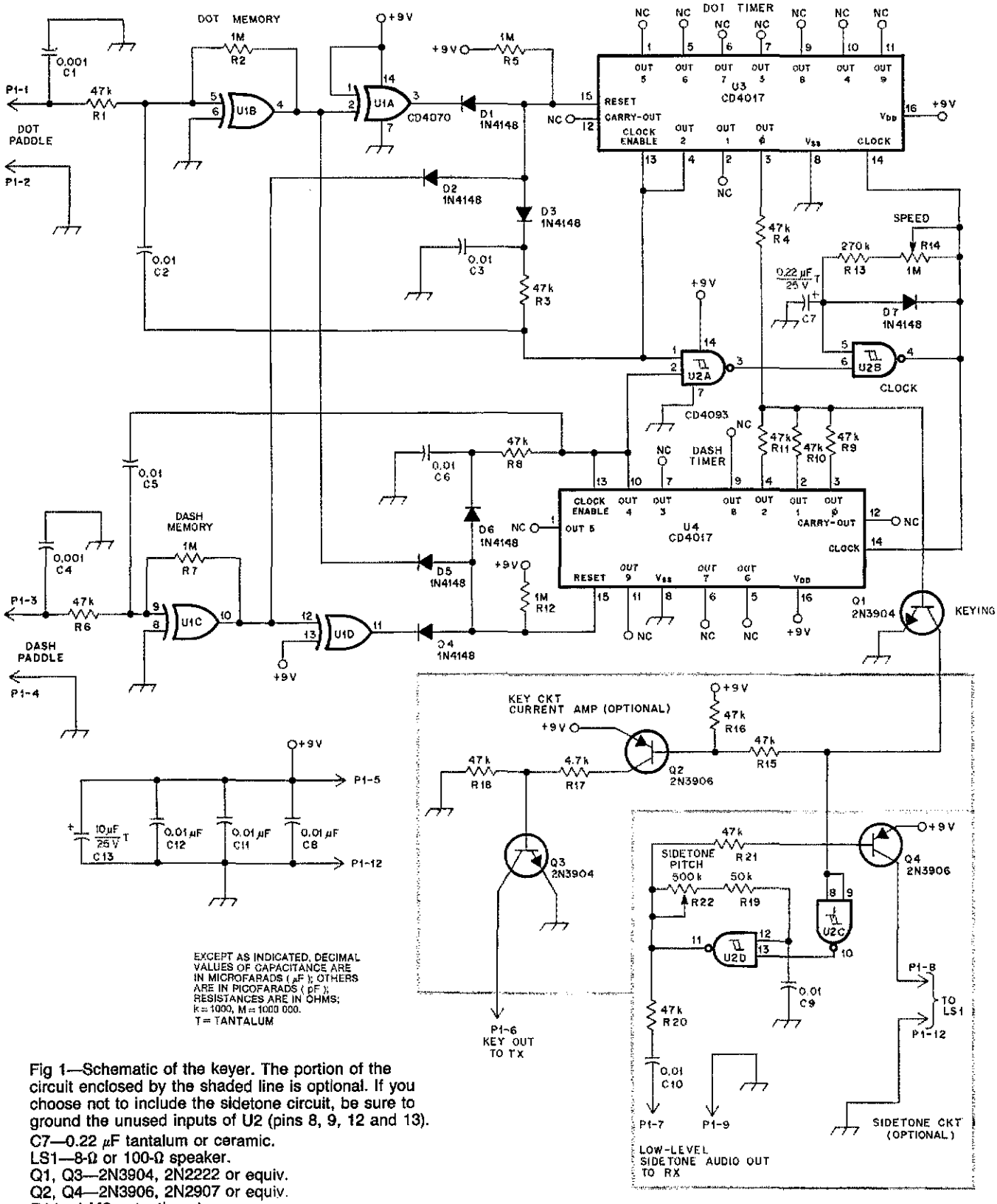


Fig 1—Schematic of the keyer. The portion of the circuit enclosed by the shaded line is optional. If you choose not to include the sidetone circuit, be sure to ground the unused inputs of U2 (pins 8, 9, 12 and 13).

C7—0.22 μF tantalum or ceramic.
LS1—8-Ω or 100-Ω speaker.
Q1, Q3—2N3904, 2N2222 or equiv.
Q2, Q4—2N3906, 2N2907 or equiv.
R14—1-MΩ potentiometer.
U1—CD4070.
U2—CD4093.
U3, U4—CD4017.

Miscellaneous

2½ × 3-in. perf board.
Two 14-pin IC sockets.
Two 16-pin IC sockets.

Cheaper's Circuit Operation

The Cheaper circuit is composed of five major sub-circuits. They are:

- Dot timer
- Dash timer
- Dot memory
- Dash memory
- Asynchronous clock

First, let's focus on the dot and dash timers. The heart of each timer is a CMOS 4017 decade counter (see Fig 1). This chip's count advances on the rising edge of the clock input when both the reset and inhibit inputs are low. If the inhibit line is high, clock signals are ignored. When the reset line is high, the counter immediately goes to the zero state. The outputs of this counter are decoded. That is, when the counter output is in the zero state, the zero output is high and all other outputs are low. When the counter is in the two state, the two output is high and all other outputs are low, and so on.

The dot and dash timers operate in a similar way. For clarity, we'll cover just the dash timer. When no dashes are desired, the timer is in the four state and is held there because the inhibit input is tied to the four output. If both the dot and dash timers are inhibited, both inputs of U2A are high and the clock is disabled. When in the idle state, the outputs of both the dot memory (U1B) and dash memory (U1C) are high. Note that when the dot memory is in the idle state (high), D5 is reverse biased, and when the dash timer is idle, D6 is reverse biased. This is because U1B and U1C are configured as inverters.

The only thing keeping the dash timer from being reset is that D4 is forward biased, holding the dash timer's reset input low (inactive). When the dash paddle is closed, the output of the dash memory formed by U1C, R6 and R7 goes low (C4 bypasses stray RF). This signal is inverted by U1D, and D4 is then reverse biased. Because all diodes at the reset input of the dash timer are reverse biased, the reset signal goes high, forcing the counter to go from four to zero.

When the dash timer is in the zero state, the keying transistor, Q1, is biased on by the current flowing through R9. Because of the low base-emitter voltage drop of Q1, most of R9's current goes into the base-emitter junction of Q1. When the state-four output of the dash timer goes low (when the timer leaves the four state), the clock signal from U2B goes from high to low and quickly back to high. (The speed of this process is determined by how fast C7 discharges through D7.) The time constant provided by R8 and C6 ensures that the dash timer remains reset long enough to ignore the first rising edge of the clock. (If this time constant is too short, the first dash would only be two Morse elements in length instead of the requisite three.) On the second rising edge of the clock, the dash timer moves from state zero to state one. Now the bias current for Q1 is provided by R10 instead of R9. Similarly, R11 provides bias current for state two. State three provides the space for the interelement timing period.

The next rising edge of the clock moves the dash timer into the idle state (state four) and disables the clock. A clear pulse from the dash timer's state-four output also tries to clear the dash memory (U1C) via C5. If the paddle is open, this pulse clears the memory to a high state. If the paddle is still closed, the pulse momentarily clears the dash memory, but because of the remaining key closure, the memory is set again as soon as the charge on C5 is dissipated in R6.

If the dot paddle is closed while a dash is being sent, the dot memory is set before the dash timer reaches state four. During the period when C5 is trying to clear the dash memory, the dot timer is reset (D4, D5 and D6 all reverse biased). This makes the keyer send a dot followed by a space immediately after the dash/space combination is finished. Voilà—iambic operation! During the time when the dot timer is active, the dash timer is held idle by forward-biased D5 until the dot-timer cycle finishes.

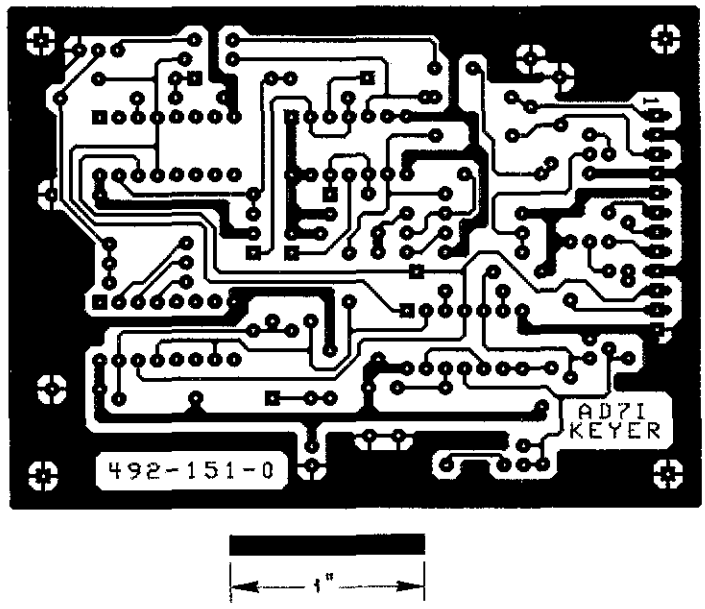


Fig 2—PC-board layout for the CMOS keyer. The pattern is shown full size from the foil side of the board. Black areas represent unetched copper foil.

caps, but battery life will be markedly reduced.

Optional Circuitry

The circuitry enclosed by the shaded line in Fig 1, including the keying amplifier and the sidetone circuit, is not essential. I designed the Cheaper to use CMOS gates because of their flexibility, as well as the low current drain already mentioned. These devices can be powered from anything between 3 and 15 V (74HC-series parts could also be used, but over a narrower supply voltage range). The problem is that these devices can only supply a few hundred microamps of current from their outputs for a guaranteed logic level. If these gates are used to drive a transistor with a gain of 50 or so, only a small amount of keying current will be available to drive a transmitter. Often, this is too little current for anything but QRP rigs. Q2 and Q3 (with associated resistors) form the keying amplifier, and increase available current to levels suitable for keying almost any transmitter. The value of drive current can be controlled by changing the values of R17 and R18. In general, decreasing the value

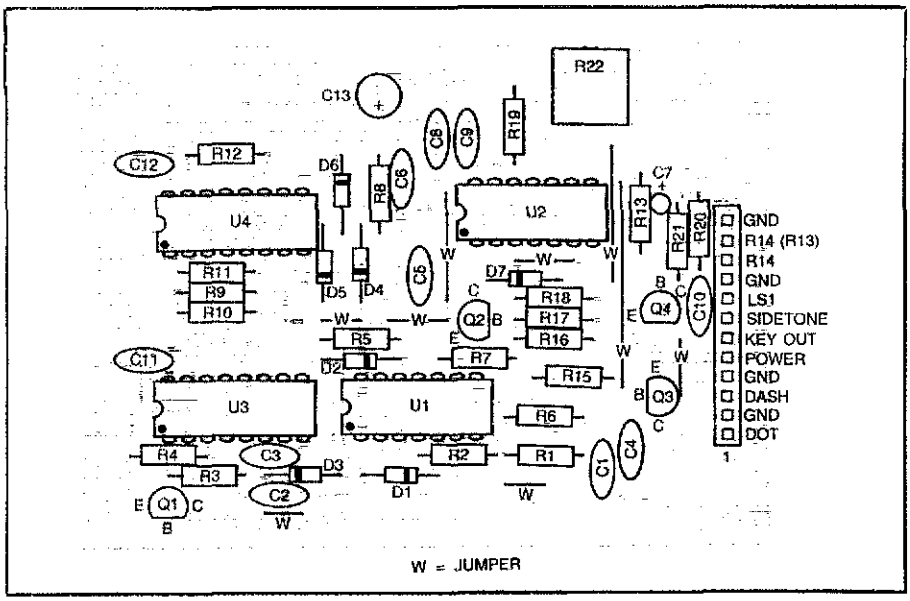


Fig 3—Parts-placement diagram for the keyer. Parts are mounted on the non-foil side of the board; the shaded area represents an X-ray view of the copper pattern. W indicates wire jumpers.

of R17 will increase the available keying current.

The second optional item is the sidetone generator formed by a Schmitt-trigger gate (U2D) with an RC circuit for feedback. The sidetone frequency can be changed by varying R22. As the resistance of R22 is increased, the frequency of the sidetone decreases. Low-level audio output is available to drive an audio amplifier (such as the one in a transceiver), and the high-level output is suitable for driving a small speaker. Try to avoid using the high-level output to drive a speaker if you are running the Cheaper from a 9-V battery. The sidetone circuit itself doesn't draw much current, but a speaker sure does! Whenever possible, let the rig provide the sidetone, or you'll be feeding the Cheaper an awful lot of batteries.

Operation

The Cheaper operates just like any other electronic keyer. The circuit has one anomaly that you should be aware of, however. When power is first applied (when you connect a battery, or turn on your rig if the Cheaper is built into it), a reset pulse is not always sent to the dot or dash counter chips. The lack of a reset signal can cause more than one of the counters to be in active states at the same time, and the keyer will stick in the key-down mode. All it takes to "un-stick" the keyer is to squeeze the paddle after power is applied. This anomaly generally isn't a problem because battery life is long, and the power is only cycled when changing cells. If you build the keyer into a rig, however, this key-down bug can be more objectionable. In this case, try a different set of 4017 counters at U3 and U4.

Summary

I designed the Cheaper to provide a basic, low-cost iambic keyer. You may be able to reduce the cost even farther. I welcome suggestions for any modifications that further reduce cost or component count of the Cheaper while retaining the features described.

The Cheaper is a good weekend project for anyone who needs a good, basic, iambic keyer with dot and dash memories. Besides, it's a cheap way to make for better CW keying—it certainly helped to cure my case of QLF!

PC boards and kits of parts are available from A & A Engineering, 2521 W La Palma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114. For the PC board alone, order no. 151-PCB, and enclose $6.95 plus $1.50 shipping and handling per board. A kit of parts including the PC board, all board-mounted parts and the speed-control potentiometer is also available as no. 151-KIT. Enclose $19.95 plus $1.50 shipping per kit. The ARRL and QST *in no way warrant this offer.*

Strays

I would like to get in touch with...

☐ anyone with source for a 50-MHz duplexer. Matthew Bush, KA9RIX, 7061 35th Terrace N, St Petersburg, FL 33710, or 813-345-0609 after 6 PM.

☐ any hams who are also in the antique car hobby. George Stringos, N1ELC, 5 Robinson Rd, West Woburn, MA 01801.

☐ any Native American amateur or club. M. McDaniel, W6FGE, 940 Temple St, San Diego, CA 92106.

☐ anyone who knows of any foreign-language nets, particularly German-speaking, in the US. E. J. Puneky, WA5JKS, 905 Monroe St, Gretna, LA 70053.

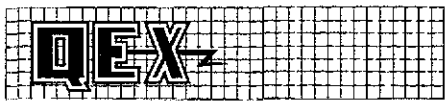
☐ anyone with info on the use of the call N6DBZ on an episode of *Magnum P.I.* Randy Jones, N7CKJ, E 1704 Ross Ct, Spokane, WA 99207.

☐ anyone with a service manual for Drake R4C. Jacques Castille, F6GZT, 100 Ave de Fontresquieres, 30200 Bagnols-sur-Ceze, France.

☐ anyone who knows of a modification to automatically resume scan on a Yaesu FT480R. Bob Jones, WB7VMA, Rte 2, Box 46, Bonanza, OR 97623, tel 503-545-6466.

☐ anyone with an operating manual, schematic and/or service manual for Hickok Model 650 universal video generator. Charles Ferguson, K4WK, 209 Home Ave, Graham, NC 27253.

☐ anyone who has modified an ICOM IC22S to allow frequency selection without diode programming, or any other mods. Todd Rusk, N6OEN, 9777 Witter Springs Rd, Witter Springs, CA 95493.



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

A local oscillator (LO) is the heart of a transverter. The 759-MHz LO featured in May's issue is easily duplicated and produces a signal to be mixed with the IF to produce the transmitted signal in an upconverter, or with the received signal to produce the IF in a downconverter. This design can also be modified to allow the LO to be used as an exciter for a 903-MHz beacon transmitter, a crystal-controlled 903-MHz portable transmitter, or as the low-frequency portion of a microwave frequency-multiplier chain.

The May issue of *QEX* includes articles on:

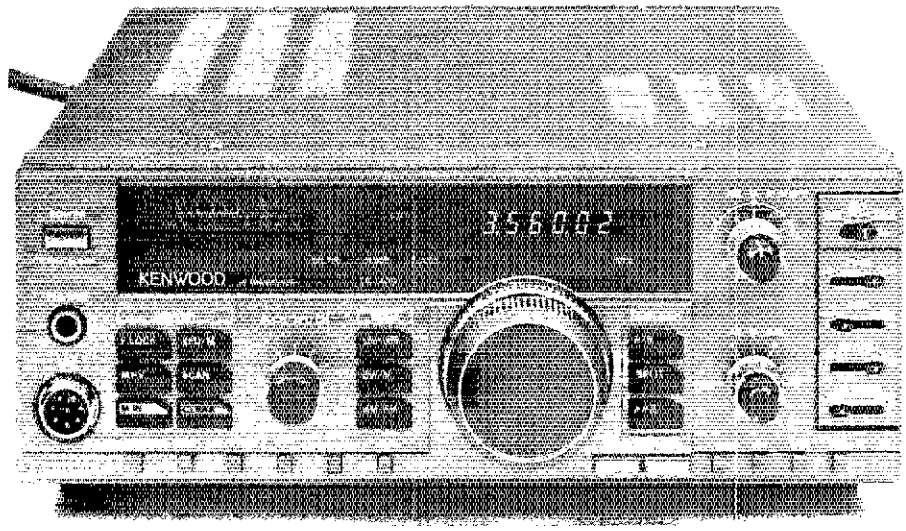
- "Practical Spread Spectrum: Achieving Synchronization with the Slip-Pulse Generator," by Andre Kesteloot, N4ICK
- "A 759-MHz Local Oscillator," by Dave Mascaro, WA3JUF

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

Conducted By Mark Wilson, AA2Z
Senior Assistant Technical Editor

Kenwood TS-140S 160- to 10-Meter Transceiver

Reviewed by Larry Wolfgang, WA3VIL



Kenwood's newest 160-10 meter radio is intended to appeal to those who want a full-featured transceiver, but with a lower price than the top-of-the-line rigs. This transceiver comes with plenty of bells and whistles, so don't get the mistaken impression that it's a bare-bones rig. In fact, the TS-140S has most of the features we've come to expect in a modern transceiver.

Two digital VFOs (really tunable memories, as Dave Newkirk explained in *QST*[1]), 31 memory channels, two noise blankers, RIT, IF shift, a switchable 20-dB attenuator and the ability to receive any frequency from 50 kHz to 35 MHz are just a few of the special features built into this rig. There are even several versatile scanning features. The transmitting section includes full- or semi-break-in CW, PTT or VOX operation, a speech processor and split-frequency operation using memory channels or both VFOs. A battery backup maintains all memories and operating parameters when power is disconnected from the radio. The TS-140S is capable of operating on USB, LSB, CW, AM and FM.

The TS-140S doesn't talk to you, like some rigs do, but it can send Morse code to tell you its operating mode. When you change modes, the radio sends a single Morse letter to indicate which mode you have selected (U for USB, L for LSB, C for CW, N for CW with the narrow filter, A for AM and F for FM). There are some conditions that even cause a word or two of Morse code to be sent to you. For example, if the microprocessor is reset for some reason, the '140S sends RESET. If you attempt to locate an empty memory channel and all channels have something stored in them, the transceiver sends FULL, and if you try to locate a channel with something in it but there is no information in any memory, the radio sends EMPTY.

An external power supply, capable of producing 13.8 V at 20 A, is required. We used the optional Kenwood PS-430 power supply for the review. Kenwood specifies a supply voltage range of 12 to 16 V dc. We tested the '140 at several supply voltages and found that it worked fine down to about 11.5 V dc. Power output was down by about 10 W with a 12-V supply, but otherwise everything operated normally. This transceiver would be a good choice for someone contemplating mobile or battery operation.

[1]D. Newkirk, "View: DigiVFO," Technical Correspondence, *QST*, Sep 1987, p 43.

Circuit Highlights

The TS-140 uses intermediate frequencies of 40.055 MHz and 455 kHz. The first and second receiver mixer stages use 2SK125 junction FETs to ensure good dynamic range. The transmit circuit uses an IC balanced modulator and a 3SK122 dual-gate FET as the second mixer. The operating frequency is controlled by a microprocessor and a phase-locked-loop (PLL) circuit that includes four loops. A 36-MHz reference oscillator provides the reference signal for all other frequencies generated in the transceiver. This frequency-control technique provides 10-Hz tuning steps and an IF-shift feature that helps eliminate interference.

Six units make up the basic parts of the TS-140. A brief description of each unit shows how they work together in the radio.

- The *Control unit* includes the microprocessor, 36-MHz reference oscillator and four phase-locked loops for frequency control.
- A microphone amplifier and the speech processor make up the *Switch unit*.
- The *Signal unit* contains most of the transmit and receive circuitry, such as signal amplifiers, mixers, detectors, modulators, filters and transmit/receive switching. There is a 2.2-kHz filter for SSB and "wide CW." A 6-kHz filter is used on AM and there is a 12-kHz filter for FM. The review '140 came with the optional YK-455C-1 500-Hz CW crystal filter. All of these filters have a center frequency of 455 kHz, which means they operate at the second IF.

The optional filter was easy to install and the six-step instructions proved completely adequate. The filter plugs into the *Signal unit* PC board, which is the bottom circuit board. The top layer of circuit boards is on a hinged subchassis that simply folds out of the way, allowing easy access, but you do need to be careful not to pinch any wires as you close it. (The instructions include a warning to be careful about this.) A 250-Hz filter is available for those who want an even narrower CW filter. One or the other of these filters can be used in the TS-140.

- The transmitted RF is amplified as it passes through a three-stage final amplifier section in the *Final unit*. The first stage uses a single 2SC1971 transistor as a predrive amplifier. The second stage uses a pair of 2SC2509 transistors, and the final power amplifier includes a pair of 2SC2879 transistors.
- The *Filter unit* removes unwanted spurious high-frequency signals from the transmitter output.
- The *Display unit* includes a fluorescent display tube, LED indicators for various functions and a dc-to-dc converter for powering the display tube. The *Display unit* also includes switching circuits and controls, such as those for the noise blankers, attenuator, AGC, metering, RF and microphone gains and output-power control.

Operating Controls

The front panel of the TS-140 is carefully laid out, and most hams who have had some experience with a modern transceiver should have no trouble figuring out the basic operating controls. In fact, you should be able to get this radio to do some pretty fancy stuff just by reading the labels

Table 1

Kenwood TS-140S 160-10 Meter Transceiver, Serial no. 8101427

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 500 kHz to 30 MHz; transmitter, 160-10 meter ham bands.	Receiver: 50 kHz to 34.9999 MHz. Transmit frequencies (in MHz): 1.600-1.9999, 3.000-3.9999, 6.500-7.4999, 10.000-10.4999, 13.500-14.9999, 18.000-18.9999, 20.500-21.4999, 24.000-24.9999 and 27.500-29.9999.
Modes of operation: USB, LSB, CW, AM and FM.	As specified.
Frequency display: 7-digit blue fluorescent.	As specified.
Frequency resolution: 10 Hz or 100 Hz, operator selectable	As specified.
Power requirements: 12 to 16 V dc (13.8 V nominal) at 1.5 A on receive and 20 A on transmit.	13.8 V at 17 A at 100 W output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: SSB: 110 W PEP on 160 meters; 100 W PEP on 80-12 meters; 95 W PEP on 10 meters; CW: 100 W on 160-12 meters; 95 W on 10 meters; AM: 40 W PEP on all bands; FM: 50 W on 10 meters.	SSB output power varied from a high of 134 W PEP on 20 m to 118 W on 10 m. CW output ranged from 112 W on 40 m to 100 W on 10 m. FM output power measured 52 W on 10 m. The unit will transmit FM on all amateur bands. AM carrier power measured in excess of 100 W on all bands, but the power control should be used to reduce power as specified.
Spurious signal and harmonic suppression: Greater than 40 dB below peak power output.	See Fig 1.
Third-order intermodulation distortion products: Not specified.	See Fig 2.
CW keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	27 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB and CW: (2.2 kHz (bandwidth) less than 3.98 μV for 10 dB S + N/N from 0.5-1.62 MHz; less than 0.25 μV for 10 dB S + N/N from 1.62-30 MHz.	Minimum discernible signal (noise floor), with 500-Hz filter: 1.0 MHz: −118 dBm 3.5 MHz: −137 dBm 14 MHz: −137 dBm
AM: (6.0 kHz bandwidth) less than 39.8 μV for 10 dB S + N/N from 0.5-1.62 MHz; less than 2.5 μV for 10 dB S + N/N from 1.62-30 MHz.	1.0 MHz: −107 dBm 3.8 MHz: −117 dBm 14 MHz: −117 dBm (Test signal 30% modulated with a 1-kHz tone.)
FM: (12 kHz bandwidth) Less than 0.35 μV for 12 dB SINAD from 1.5-30 MHz.	0.3 μV for 12 dB SINAD at 29 MHz.
Receiver dynamic range: Not specified.	Blocking dynamic range†: 3.5 MHz: 115 dB 14 MHz: 114 dB Two-tone, third-order intermodulation distortion dynamic range†: 3.5 MHz: 92 dB 14 MHz: 91 dB Third-order input intercept†: 3.5 MHz: 1.0 dBm 14 MHz: −0.5 dBm
S-meter sensitivity (μV for S9 reading): Not specified.	260 at 1.0 MHz; 29 at 3.5 MHz; 28 at 14 MHz
Squelch sensitivity: FM, Less than 0.32 μV.	0.25 μV min, 1 μV max at 29 MHz.
Receiver audio output: 1.5 W at 8 ohms with less than 10% total harmonic distortion (THD).	2.05 W at 10% THD.
Color: Gray.	
Size (height, width, depth): 4-7/32 × 11-1/16 × 12 in.	
Weight: 13.4 lb (not including the power supply).	

†Blocking dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Two-tone, third-order IMD dynamic range measurements were made at 30-kHz signal spacing instead of the ARRL Lab standard of 20 kHz because these tests were phase-noise limited at closer signal spacings. The third-order input intercept was calculated using the two-tone, third-order IMD dynamic range measurements made at 30-kHz signal spacing.

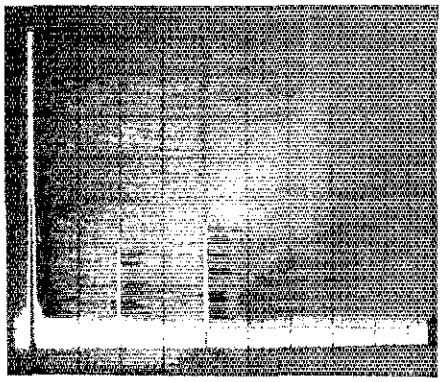


Fig 1—Worst-case spectral display of the Kenwood TS-140S. Horizontal divisions are each 5 MHz; vertical divisions are each 10 dB. Output power is approximately 110 W at 10.15 MHz. All harmonics and spurious emissions are at least 46 dB below peak fundamental output. The TS-140S complies with current FCC specifications for spectral purity.

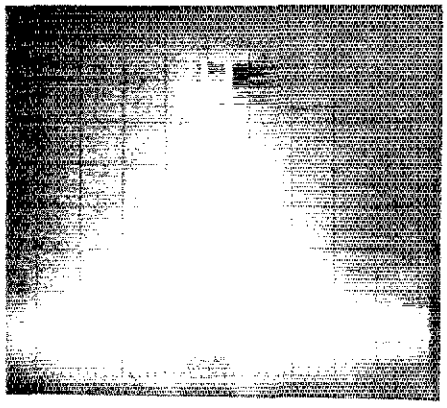


Fig 2—Spectral display of the Kenwood TS-140S during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 30 dB below PEP output, and fifth-order products are approximately 42 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 110 W PEP output on 14 MHz.

on the push buttons, slide controls and knobs on the front panel. A glance at the photo reveals plenty of knobs and buttons, but not so many that you will be overwhelmed by them. In fact, compared to some of the larger rigs available today, you might wonder how a rig could have so many features with so few controls! What isn't immediately obvious is that some of the controls serve more than one purpose. For example, the RIT knob also controls the scan speed when you use one of the radio's scan modes. The small knob labeled M.CH/VFO CH steps through the 31 memory channels in the memory mode. In the VFO mode, however, this knob tunes the '140S in 10-kHz steps.

I won't describe the operation and layout of each front-panel control. Most of

the labels are self-explanatory. I'll describe some of the hidden features and those that may be less obvious, however.

The F.LOCK button prevents you from accidentally changing the operating frequency of the transceiver. M > V means "move the memory frequency into the VFO," while the M.IN button stores the VFO frequency in the selected memory channel.

Several transceiver functions can be changed by holding down one of several buttons at the same time the transceiver is "powered up." The CLEAR button changes between 10-Hz and 100-Hz tuning steps. (This also changes the resolution of the frequency display from 10 to 100 Hz.) Holding the RIT button in when you turn the power on selects 10- or 20-Hz RIT steps. The CW/N control also switches the mode announcements between beep tones and Morse code, and holding the F.LOCK button when you turn power on changes the audible alarm announcements between Morse code and beep tones.

If the 1MHz button is pressed, an LED lights next to the 1MHz marking on the display panel. When this LED is lit, pushing the BAND UP or DOWN buttons changes the operating frequency in 1-MHz steps. You can select 500-kHz steps instead of 1-MHz steps for this frequency-changing feature by holding the 1MHz button in when you turn the radio on. When this LED isn't lit, the BAND UP and DOWN buttons change the operating frequency one ham band at a time.

Holding the AM/FM button in when you turn on the power selects either 9- or 10-kHz tuning steps for the AM broadcast band from 535 to 1605 kHz. It took me a while to figure this one out. To use those tuning steps you must turn the M.CH/VFO CH knob, although I couldn't find any reference to this in the instruction manual. In the AM mode, the main tuning knob changes the frequency in 100-Hz steps even if you have selected 10-Hz tuning steps for the VFOs.

There are so many ways to change the operating frequency of this transceiver that it's hard to even list them all. The main tuning knob is the most obvious way, of course. You can select tuning steps of 10 Hz or 100 Hz, as already mentioned. Either of these steps results in a tuning rate of 10 kHz per knob revolution in the SSB and CW modes (50 kHz per revolution in the AM and FM modes).

If you turn the knob faster than about three revolutions per second, the tuning rate goes into overdrive, though. The tuning rate depends on how fast you turn the knob at this point. I could easily spin the knob fast enough to make the 10-kHz digits fly by, which means you can change frequency by a few hundred kilohertz with little effort. (It's probably easier to turn the M.CH/VFO CH knob, but I nearly always grabbed the main tuning knob by instinct and gave it a spin.)

The hand-held microphone that comes with the '140S is equipped with a pair of buttons marked UP and DOWN. These change the operating frequency one step at a time. (The size of the step corresponds to the main tuning knob frequency step.)

Instruction Manual

Although most hams will have no trouble figuring out how to make the radio work just by reading the front-panel controls, they will definitely need the instruction manual to get full benefit of the TS-140's capabilities. This 43-page booklet includes a complete listing of the transceiver's specifications, along with directions for unpacking the unit and getting it ready to operate.

Five pages in the manual describe the basic operation of the front-panel controls, and two more pages describe the rear-panel connections and controls. There are about three pages listing specific examples of receiver operation, and another three pages dedicated to transmitter operation. Numerous drawings, charts and graphs illustrate these details.

The memory capabilities of this radio are extremely versatile. There are more than four pages in the manual that explain how to program the memory channels and transfer information from the VFOs to memory, from memory to VFO and even from one memory channel to another. This can be a rather complicated process, and even after using the rig for several months, I found myself referring to the instruction manual to be sure I was using the right procedure for operating the memories.

All 31 memory channels can store a single operating frequency and mode. The first 10 channels store no more information than that. The next 10 memories can store separate transmit and receive frequencies, and modes, for split-frequency operation. The last 11 memory channels can store upper and lower frequency limits, allowing operation only within the limits you set. (For example, I set up a series of memories with the Novice bands as frequency limits for the Novice Roundup.) When you reach the end of the frequency range set by one of these memories, the '140S automatically jumps to the other frequency limit. This is a useful feature for contest operation. You could also store the band segments that you are permitted to use, based upon your license class, as a way to keep from accidentally wandering beyond the band edges.

The instruction manual also includes a brief circuit description, information about maintenance and adjustments, and a short troubleshooting section. There are several illustrations and an explanation of how to open the radio and fold out the subchassis to install accessories like the optional CW filter and the computer interface kit.

Computer interface kit? This accessory is mentioned several places in the manual. There is even a space for a 6-pin DIN connector that comes with this option. But nowhere in the manual could I find reference to what you can do with this interface!

The manual includes a listing of the many accessories available from Kenwood, such as power supplies, antenna matching networks, microphones and so on. The last few pages include some information about antennas and a section on installing the rig in a car.

This manual is well written, with clear, easy-to-understand instructions about how to operate the TS-140S. For detailed technical information, there is a separate service manual.

Receiver

The TS-140 receiver is packed with features. The IF SHIFT control is very helpful for reducing interference from a station that is close in frequency to the desired signal. The 20-dB attenuator can also help reduce interference from extremely strong signals. There are two noise blankers in this transceiver. The first noise blanker is intended for pulse noises, such as automotive ignition noise, and the second one is for longer-duration pulses like the over-the-horizon radar "woodpecker" noise. A slide control sets the noise blanker level. The noise blankers were effective against power-line noise, but I did not find any "woodpecker" signals to try them on.

It was fun to use the SCAN feature to have the radio tune various frequency ranges. When I was doing various chores around my shack, I could scan a ham band or a short-wave broadcast band for activity. There is a "scan hold" feature that can be turned on or off by holding the SCAN button when the power is turned on. The instruction manual mentions this feature in two places, but the feature isn't explained. I expected the rig to stop on a signal when this scan hold was enabled. It did not.

Memory channel 30 sets the program scan frequency limits. If you press the SCAN button and memory 30 is empty, the '140S automatically stores 50.0 kHz for the lower limit and 34.9999 MHz as the upper limit. You can store any frequency range that you want to scan in this memory channel. The frequency range is set by using VFO A to store one frequency and VFO B to store the other. Scanning starts with the frequency set by VFO A, so you can have the radio scan up or down in frequency depending on whether you set the upper or lower limit with VFO A. There is no way to reverse the scanning direction unless you reprogram memory channel 30.

Although the TS-140 receiver has excellent specifications, as shown in Table 1, I did notice a few problems. The blocking dynamic range, as measured in our lab tests, was better than 110 dB. In operation, however, I experienced blocking problems quite frequently. While listening to stations that had signal strengths of as much as S9 or stronger, the station might suddenly fade

and almost disappear. I could usually find a signal of 40 dB or more over S9 within about 20 kHz of the station I was listening to when this happened. I would expect a signal this strong to block the receiver if it was within a few kilohertz of the desired signal, but it should have little effect 10 or 15 kHz away. This may be no more than a minor annoyance for casual operating when the bands aren't too crowded. Under contest conditions or on a busy weekend when 15 or 20 meters is open, it can be quite frustrating though.

A front-panel pushbutton selects the 20-dB attenuator. The attenuator helped solve the blocking problem sometimes. It wasn't always an effective way to solve the problem, though, because attenuating a weak desired signal makes it even weaker. Likewise, reducing the RF gain helped sometimes, but not always.

Another pushbutton on the front panel selects FAST or SLOW AGC action. There is no way to turn off the receiver AGC. This isn't normally a problem, although there are times when it's helpful to be able to turn off the AGC.

The frequency synthesizer makes a jump every 50 kHz. This took some getting used to because the receiver makes a small pop every time you tune through 50- or 100-kHz points. I think it is a little more noticeable than with some other PLL synthesized rigs I have used. Several times, I was fooled into thinking I was hearing a weak signal. The PLL jumps were most noticeable when I tried to tune a real signal on a frequency on or near a multiple of 50 kHz. Tuning across the PLL jump seemed to produce a large frequency change because of the extra little pop. Eventually I began to get used to this, and then it didn't bother me as much.

I scanned all of the Amateur Radio frequencies that the '140 covers and found only a few weak birdies. None of them are strong enough to move the S meter, and most of them were *very* weak and disappeared in the noise when I connected an antenna.

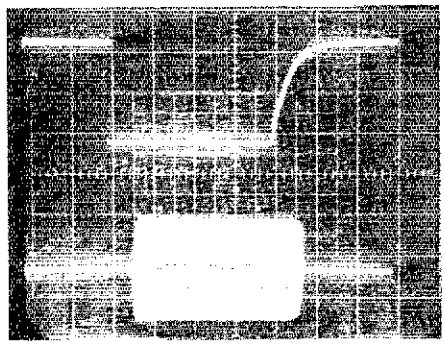
Transmitter

The TS-140 produces more than 100 watts of CW and SSB output power on all bands. The instruction manual tells you to reduce output power to 40 watts or less on AM, and to no more than 50 watts on packet radio, AMTOR or Baudot RTTY. While it's possible to make fine adjustments in power level, the slide potentiometer is very touchy, and that makes it difficult to set a specific power level.

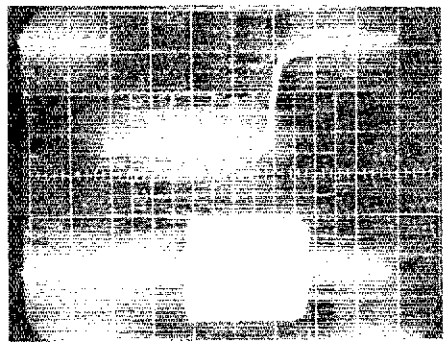
Proper SSB operation requires that you set the meter to measure ALC and adjust the mic gain control so the needle doesn't move out of the ALC range on the meter face. When you turn on the built-in speech processor you should also be sure the meter needle doesn't swing above the ALC range. The mic gain control is another touchy slide potentiometer. I found that I had to keep this control set very close to minimum at all times.

The speech processor is helpful for being heard under weak-signal conditions, but shouldn't be needed most of the time. There is no adjustment for the amount of processing, so you only need to be concerned with the mic gain level and the ALC meter reading.

Fig 1 shows the worst-case spectral output. The TS-140S easily meets FCC (and the manufacturer's) specifications for spurious emissions. Fig 2 shows the spectral output for a two-tone, third-order intermodulation distortion (IMD) test. The '140 can stand improvement here. Other rigs, including others in the Kenwood line, have IMD levels 6 dB or more lower (better) than the TS-140S.



(A)



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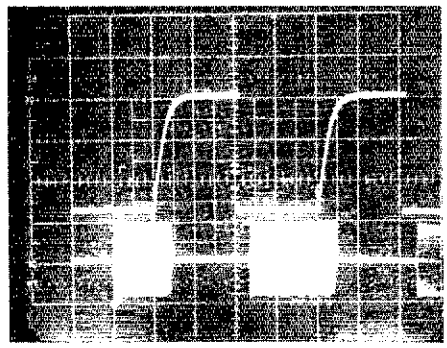


(C)

Fig 3—CW keying waveforms for the Kenwood TS-140S. The photo at A shows the keying waveform in the semi-break-in mode, and the photograph at B shows the keying waveform in the full-break-in (QSK) mode. In each photograph, the lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 10 ms. The photo at C shows shortening of the first dot during semi-break-in operation. In this photograph, each horizontal division is 20 ms.

Fig 3A shows the CW keying waveform using the semi-break-in (VOX) position. Fig 3B shows the CW keying waveform in the full-break-in (QSK) position. Code elements are noticeably truncated during full-break-in operation, and you should adjust your keyer weighting for "normal" sounding on-the-air CW. Fig 3C shows two Morse code dots during semi-break-in operation; note that the first dot (or dash) is shortened a bit when you start to transmit. First dots are not shortened compared to other dots in the QSK mode.

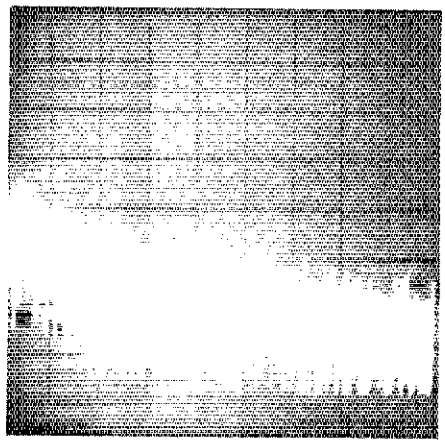
The specifications table lists TR turnaround times. I did not use the '140S on AMTOR, but it should be able to work that mode with no problems.

There are several adjustments you may have to make inside the radio. These adjustments, which involve removing the top and bottom cover and folding open the hinged subchassis, are explained in detail in the instruction manual. I found the CW sidetone level to be a bit weak to suit me. The sidetone level can be increased by adjusting a control inside the '140S. You can also adjust the level of the beep or CW mode and alarm announcements. The microphone sensitivity is set to maximum at the factory, which helps explain why the front-panel control had to be almost at minimum. You can decrease this sensitivity by adjusting an internal control. You can also adjust the modulation level for the rear-panel data communications input. I did not have to adjust that level to operate Baudot RTTY with my AEA CP-1 communications processor (CP). Other CPs may provide different signal levels to the radio, so it's nice to know you can make this adjustment if needed.

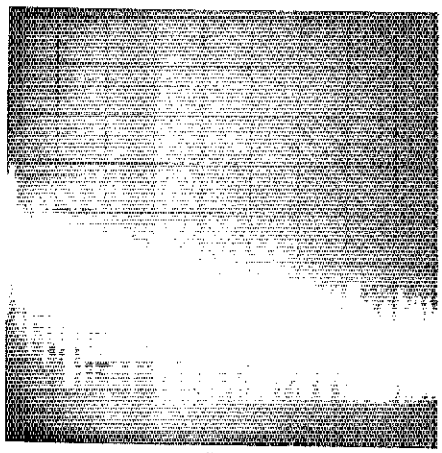
A thermostatically controlled fan cools the final amplifier transistors when they get too hot. This fan is very quiet, and it does not run often under normal operating conditions. In fact, I turned the transmitter on and held the key down (transmitting into my dummy antenna, of course) for almost a minute before the fan turned on, just to verify that it did work.

Split-frequency operation is easy with the '140S. Set the receive frequency in one VFO and the transmit frequency in the other. Then press the SPLIT button and watch for the word SPLIT to appear in the display. When you transmit, the radio automatically switches to the frequency and mode set in the other VFO. It's even possible to operate cross-band, cross-mode in this manner.

A back-panel connector provides ALC input and TR-control relay connections for use with an external power amplifier, as well as a line for an external PTT switch.



(A)



(B)

Fig 4—Spectral display of the Kenwood TS-140S transmitter output during phase-noise testing. Power output is 105 W at 3.5 MHz (A) and 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Phase-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, which would be at the left edge of the photographs, is not shown. These photographs show phase noise at frequencies 2 to 20 kHz offset from the carrier.

I did not use the '140S with an amplifier. There is also an accessory connector for use with the optional automatic antenna tuner unit. There is no provision for using the TS-140 with a VHF transverter.

The KEY jack accepts a standard ¼-inch-diameter phone plug. The dc open-circuit voltage at this jack is 5.5. Be sure to set your keyer for positive keying.

Operating Impressions

The 25 push-button controls are large enough and far enough apart for my clumsy fingers to push without hitting other buttons. Seldom during the review period did I hit the wrong button, even when I just reached without carefully watching where my finger was going.

I actually had the opportunity to operate two different TS-140S transceivers for this review. The first one was a radio that Kenwood engineers brought to ARRL Headquarters for evaluation. The Product Review unit arrived a few weeks later. Both '140s exhibited the receiver blocking that I mentioned earlier, but otherwise performed flawlessly.

I used a TS-140 during the November phone Sweepstakes, the ARRL 10-Meter Contest, the ARRL 160-Meter Contest and the Novice Roundup. On 160 meters, I used a 120-foot random-wire antenna with a homemade matching network. I wasn't able to obtain a good impedance match, and with an SWR of not much better than 3:1 the '140S automatically reduced output power. I was limited to about 15 to 20 watts on that band, but still managed to have fun and contact a few stations.

Received audio quality is excellent, and the transceiver has plenty of volume without distortion—even for a noisy environment. I also received good reports about the transmitted audio, including a couple of reports from people who could make a good comparison between my "live" voice and my "radio" voice.

I used both VOX and PTT on SSB. The VOX GAIN, DELAY and ANTIVOX controls are on the back panel, near the antenna connector and grounding screw. This makes them hard to see and even harder to reach to make adjustments. But once the controls are properly adjusted, there is little need to reset them. The one possible exception to this is the VOX DELAY control, which also sets the hold time for semi-break-in CW operation. I much prefer the full-break-in position for CW operation, so I didn't have the problem of readjusting the VOX DELAY.

ACCessory jack 2 (on the back panel) provides data and TR control lines for use with a CP for radioteletype or TNC for packet-radio operation. I connected the appropriate lines to my AEA CP-1 for RTTY operation. The interface provides tones to the microphone input lines. I set the '140S for LSB operation to use audio-frequency-shift keying. There is no direct FSK feature built in, but the TS-140 did a fine job using LSB in this manner.

Overall, this radio is a joy to operate. Its many features and convenient front-panel layout proved helpful for contest operation. The receiver blocking that I described earlier was at its worst during these contests, however. If you're setting up a station to use primarily for contesting, this may not be the rig you are looking for. For more casual operation, with an occasional contest-operating stint, it's a nice rig.

Manufacturer: Kenwood USA Corporation, 2201 Dominguez St, Long Beach, CA 90801-5745, tel 213-639-4200. Price class: TS-140S, $900; PS-430 power supply, $190; YK-455C-1 CW filter, $130.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

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

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

Sealed bids must be submitted by mail and be postmarked on or before June 27, 1988. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

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

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

ICOM IC-375A 220-MHz multimode transceiver, s/n 01040 (see Product Review, Mar 1988 *QST*). Minimum bid $800.

RF Concepts RFC 2-23 2-meter power amplifier, s/n 2-0254 (see Product Review, Mar 1988 *QST*). Minimum bid $67.

RF Concepts RFC 3-22 220-MHz power amplifier, s/n 3-1016 (see Product Review, Mar 1988 *QST*). Minimum bid $67.

MFJ-931 artificial RF ground (see Product Review, Apr 1988 *QST*). Minimum bid $53.

Ameco PT-3 1.8-54 MHz preamplifier (see Product Review, Apr 1988 *QST*). Minimum bid $79.

RF Concepts RFC 3-312 220-MHz power amplifier, s/n 3-3012 (see Product Review, Apr 1988 *QST*). Minimum bid $158.

Ten-Tec Model 585 Paragon 160- to 10-meter transceiver, s/n 084 with Model 960 power supply and Model 285 500-Hz CW filter (sold as a package only; see Product Review, May 1988 *QST*). Minimum bid $1325.

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

CONDUCTIVE PLASTIC CAN DISCHARGE BATTERIES

☐ Recently, I purchased a pair of lithium cells for backing up CMOS memory. Two ½-inch-long radial leads protruded from each cell. To prevent the cell leads from shorting together against metallic objects in my junk box, I placed the cells, leads first, into the black conductive foam I use to protect static-sensitive integrated circuits.

My haste to protect the cells resulted in their demise! Later, before installing one of the cells in my circuit, I checked its terminal voltage: 0 volts! I thought for a moment—and then I realized that antistatic foam isn't also called "conductive foam" for nothing. An ohmmeter check revealed that the resistance of the foam over a distance equivalent to the cell's lead spacing was about 500 ohms. In effect, I had plugged the lithium cells into a battery *dis*charger.—*Otto Cepella, VE3HCD, Ottawa, Ontario*

☐ The memory backup cell I ordered by mail arrived before I had time to install it in my VHF transceiver, so I put the cell—packing material and all—aside for several weeks. The shipper had placed plastic foam over the cell terminals to protect them during shipment. You guessed it: The foam was *conductive*, and my "new" battery was dead before I could install it!—*Bruce E. Lackey, WB3HAE, Rockville, Maryland*

Editor's Note: It doesn't pay to put a powered-up PC board down on a piece of conductive foam, either: A friend of ours had to replace a 40-pin microprocessor chip after such a maneuver. And conductive foam may not be the only plastic that poses a short-circuit hazard: Conductive plastic-bubble packing material may do in an energy cell or short a live circuit, too.

A ONE-SHOT TIMER FOR BATTERY CHARGING

☐ One of the problems associated with rechargeable batteries is that of charging duration. This is particularly evident when the charging period is longer than the interval between "home from work" and "back to work"! In such cases, another member of the family must remember to unplug the charger at the appropriate time. My solution to this problem is a one-shot timer. Here's how to build such a timer for around $10.

Two parts are required: a 120-V neon lamp assembly and a motor-driven lamp timer capable of a timing interval at least as long as the charging period required by your battery. (Both are available in several forms from Radio Shack®.) The motor in such timers usually actuates a switch that breaks the hot side of the ac line for appliance control. Modify the timer as shown in Fig 1. Open the timer and locate the motor lead connected to the hot side of the ac line (point A in Fig 1). Move this lead to the appliance-socket side of the timer switch, S1 (point B in Fig 1). Next, mount the neon lamp assembly at any convenient place on the timer housing, and connect it between the hot and neutral terminals on the timer's appliance outlet. Reassemble the timer.

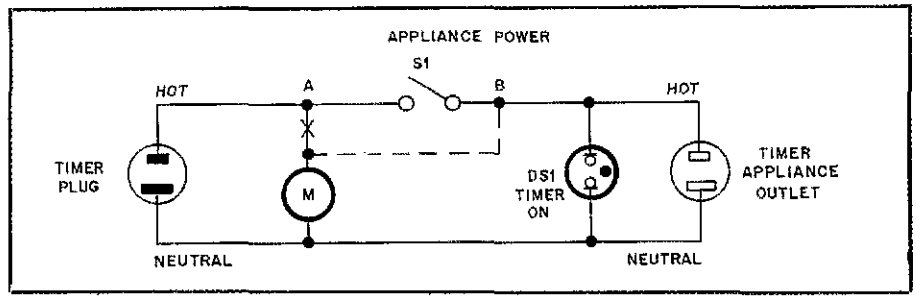


Fig 1—Dennis Cripp's modified timer turns itself and its associated battery charger off at the end of the charging period. Modification of the timer consists of moving the hot motor lead from point A to point B, and installation of a 120-V neon lamp, DS1, between hot and neutral on the timer's appliance outlet.

Connect your battery charger to the timer. Set the timer's on and off actuators to turn on the charger for the charging time required by your battery. To turn on the timer motor and your battery charger, rotate the timer dial until DS1 lights. When the set time has elapsed, your charger *and* the timer motor switch off. Result: a charged battery that won't be overcharged if forgotten.—*Dennis Cripps, N3FIW, Newark, Delaware*

A BURGLAR-ALARM-TAPE ANTENNA FOR 2 METERS

☐ If you're a ham who is also a businessperson, you've probably discovered that being stuck in an office all day can mean doing without the use of VHF Amateur Radio. Privacy is one consideration; fortunately, I have an office all to myself. Aside from this, however, an office building is usually a prohibitively RF-noisy environment—and then there's the shielding effect of concrete and steel! Despite these difficulties, I wanted to install a 2-meter base-station transceiver in my office. An outdoor antenna seemed to be the only means of minimizing the building's RF noise and shielding effects until I discussed the problem with my friends Sam Payne, KB5VC, and Joe Matlock, N5ARY. They suggested using *burglar-alarm tape* for the elements of a 2-meter dipole antenna!

The idea works! I bought a small roll of self-adhesive alarm tape and two of the self-adhesive plastic blocks used for making electrical connections to the tape. I installed the tape on the inside of my office window in a "sideways inverted V" configuration

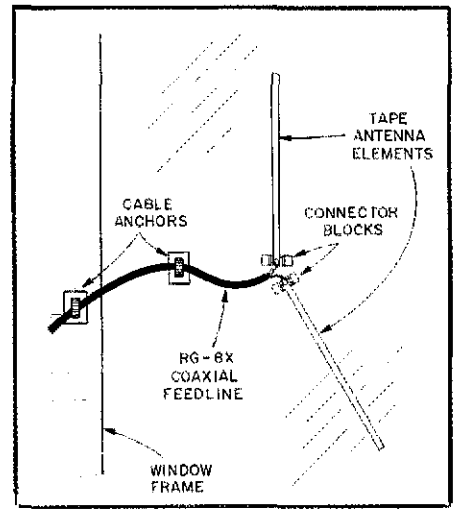


Fig 2—Van Flynn's burglar-alarm-tape antenna. See the text for element lengths and tuning information.

(see Fig 2), beginning with two 19-inch-long elements (the length of both elements must be adjusted, as will be described shortly). One element is vertical. I positioned the second element slightly below the first element at about 135° from vertical.

The dipole is fed by means of RG-8X coax fastened to the connector blocks by means of the block terminal screws. The RG-8X center conductor is connected to the vertical antenna element; the lower antenna element is connected to the RG-8X shield. Nylon tie wraps and self-adhesive cable anchors hold the RG-8X to the window glass and keep most of the coax weight off the element connector blocks.

Tuning the antenna requires a transmitter and an SWR indicator. Use a razor blade to trim the antenna elements until you achieve the lowest possible SWR. (Make your cuts only when the transmitter is *off*.) Tuned in this way, my version of

the burglar-alarm-tape antenna has a vertical element 16¾ inches long. The length of the "ground" element (connected to the coax shield) is 10¼ inches.

The antenna handles 20 W of RF from my transceiver without difficulty. Although I use my tape antenna at the office, this idea may come in handy for apartment or condominium dwellers who are stuck with sealed windows. I've even thought of using a tape antenna in high-rise hotels: It can easily be removed from a window with just a razor blade!—*Van Flynn, N5ARU, New Orleans, Louisiana*

Editor's Note: Hmm, such an antenna may also work well in the 220- to 225-MHz band. Novices, if you'd like to try a 222-MHz version of Van's tape antenna, start with 12½-inch elements and tune the antenna as he describes. I wonder if the self-adhesive copper tape used by workers in stained glass would be suitable for use as antenna-element material? Our next H & K correspondent answers yet another tape-antenna question: What about 440 MHz?

A WINDOW-MOUNTED TAPE ANTENNA FOR 440-MHz MOBILING

☐ How could I have 2-meter and 70-centimeter mobile capability *and* keep my new Camaro from looking like an antenna farm? I tried a dual-band antenna, but it was relatively massive and did not have a low-enough profile. I reinstalled my window-mount 2-meter antenna and devised a 440-MHz antenna—made of self-adhesive copper tape and mounted in the rear window of the Camaro!

See Fig 3. Actually, only the vertical element consists of tape. The end of the coax shield is connected to the car's window-edge ground line; this serves as a ground-plane. Result: a simple 440-MHz antenna that works quite well for local use. It doesn't even look like an antenna when examined closely: Most people think the copper tape has something to do with a car alarm!—*Carl G. Sorensen, KA7ANM, Meridian, Idaho*

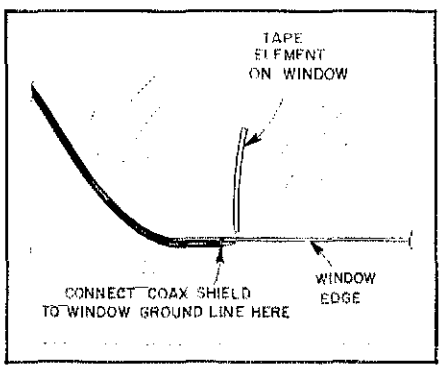


Fig 3—Carl Sorensen's copper-tape antenna works well and unobtrusively at 440 MHz. The tape element may require pruning; see the preceding item ("Burglar-Alarm Tape Antenna") for details on how to do this. Carl reports that later installation of rear-window louvers on the Camaro required only that the antenna be retuned; antenna performance was unaffected.

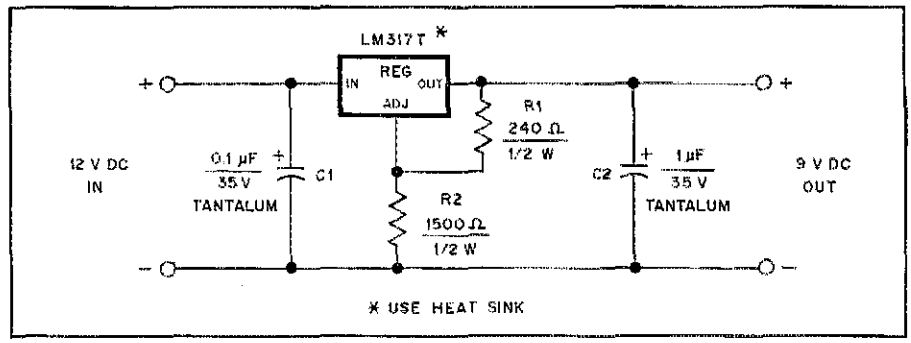


Fig 4—Evan Boden's dc adapter provides a regulated 9-V source for operating his Kenwood TR-2500 hand-held transceiver in the car. See text for information on the connectors he used at the input and output of the adapter, and details on the LM317T heat sink. (Note: The LM317T's mounting tab is electrically connected to its output pin, so take this into account as you construct your version of the adapter. Author Boden did not use an insulator between the LM317T and heat sink because his adapter module is safely insulated in the plastic case of a defunct NiCd battery pack.)

A DC ADAPTER FOR HAND-HELD-TRANSCEIVER MOBILING

☐ My Kenwood TR-2500's battery pack wouldn't take a full charge: one of its cells was reversed, and "zapping" the defective cell made no improvement. What to do with a dead NiCd pack? Turn it into a dc adapter for mobile use! With a pocket-knife, I separated the halves of the battery-pack case. I pulled out the cells, a PC board and a tiny switch. Then I built the circuit shown in Fig 4.

The LM317T regulator dissipates 2 or 3 W in this application, so I mounted it on a heat sink (a 1- × 2-inch piece of 1/8-inch-thick aluminum). I wired C1, C2, R1 and R2 of Fig 5 between the '317's pins and a two-terminal strip mounted on the heat sink. (No large filter capacitors are needed in this application because the input to the regulator is reasonably pure dc.) No fancy installation for this module: I just dropped it into the case!

I used thin microphone cable for the dc connection between the adapter and my car's cigarette lighter, passing it out of the adapter case through the hole formerly occupied by the battery-pack switch. At the cigarette-lighter end of the cable, I installed a fused lighter connector (Radio Shack no. 274-335) equipped with a 2-A, fast-blow fuse. (Note: After I finished constructing the adapter, I realized that I could have left the battery-pack charge connector in the case and used a Radio Shack dc power plug [274-1569] on the adapter end of the 12-V cable.)

Now, when I use the HT in the car, I rest my remaining battery pack and use the transceiver without having to worry when its battery pack will run down! If this idea appeals to you and you *don't* have a defunct NiCd pack, obtain a BT-1 or BT-3 battery case for the adapter and save your NiCds. A note on noise: Using the dc-adapter-powered HT in conjunction with a magnetically mounted "rubber duck" antenna, I've heard no spark plug or alternator noise on transmit and receive in the car.—*Evan H. Boden, N3DEO, Emporium, Pennsylvania*

SMOOTHER RF POWER CONTROL WITH THE ICOM IC-735 TRANSCEIVER

☐ Upgrading from an IC-730 to an IC-735 gave me 160-meter transceive operation and general-coverage receive capability—a worthwhile improvement in the performance of my station. Adjustment of the '735's output power is touchy, however, because the rig's RF POWER control is a small slide potentiometer. I solved this problem by rewiring the '735's SQL (squelch) control—I rarely use the squelch—to act as the RF POWER control. By the same modification, the RF OUTPUT slide control becomes the SQL control.

The IC-735 schematic indicates that although the RF POWER control (R6) and the SQL control (R1a) are both 10-kΩ potentiometers, they act only as variable resistors to ground. (R6 and R1a appear in the lower-left corner of the IC-735 schematic.) Thus, transposing their function entails only the transposition of two wires. (Note: This modification may void the warranty on your IC-735.) Modify the '735 as follows:

(1) Remove the '735's bottom cover. Locate jack 3 (in the upper-right corner of the '735's MAIN circuit board).

(2) Identify pin 6 of jack 3. The wire leading to pin 6 of the associated plug is the wiper (POC) lead of the RF POWER control. (If necessary, you can confirm that this is the POC lead with a digital multimeter: The resistance between the POC lead and ground should vary as you adjust the RF POWER control.) Remember the location of this wire, or mark it so you won't forget.

(3) Identify pin 1 of jack 6. (Jacks 3 and 6 are about 2 inches apart on the MAIN

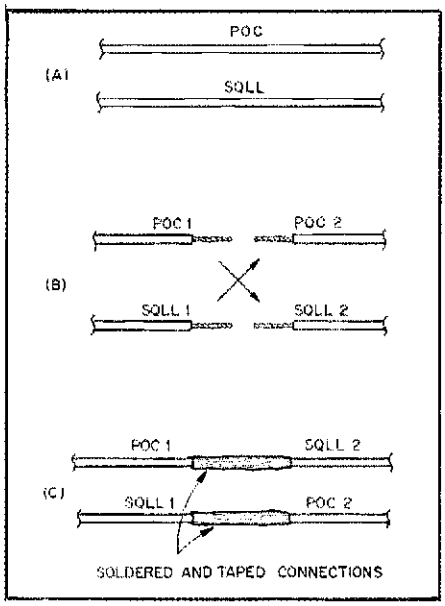


Fig 5—Transposition of the IC-735's POC and SQLL wires for smoother RF-output-power control. This modification exchanges the functions of the '735's RF POWER and SQL controls. See text.

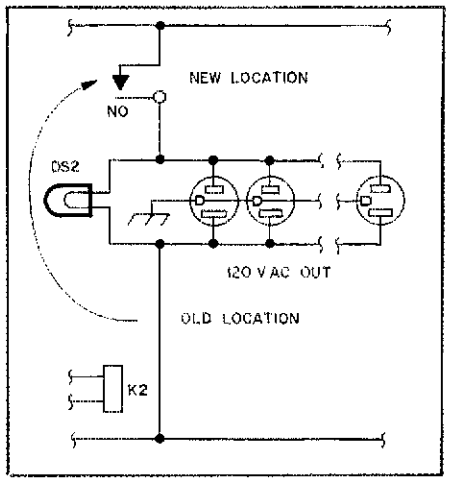


Fig 6—Ken Kopp rightly points out that the Field Day Generator Overvoltage Protector's outlet switching is much safer if done in the *hot* side of the ac line, as shown above. Dan Umberger, W8ZCQ, author of the original hint, drew it that way, too. Hints and Kinks apologizes for the drafting error. DS2 and K2 are components in the original drawing (Fig 1 on page 39 of June 1987 *QST*).

board.) The wire leading to pin 1 of the associated plug is the wiper (SQLL) lead of the SQL control. (If necessary, you can confirm that this is the SQLL lead with a digital multimeter: The resistance between the SQLL lead and ground should vary as you adjust the SQL control.) Remember the location of this wire, or mark it so you won't forget.

(4) Follow the POC and SQLL wires back into the cable harness to a point where they are adjacent to each other. Cut the POC wire and strip the cut ends. Cut the SQLL wire and strip the cut ends.

(5) Transpose the wires as shown in Fig 5, and reconnect them by soldering them together. Tape the connections with electrician's tape and reassemble the IC-735. (As an alternative to electrician's tape, you can use heat-shrink tubing to insulate the connections. If you choose to do this, slip the tubing over the wires between steps 4 and 5, and shrink it after you solder the connections.)

That's it! Now, the SQL ring around the AF gain control adjusts the IC-735's RF output power—smoothly.—*Ted O'Connell, NS6H, Walnut Creek, California*

SAFER OPERATION FOR THE FIELD-DAY GENERATOR-OVERVOLTAGE PROTECTOR

☐ W8ZCQ's overvoltage protector[1] can be made safer by placing the relay contacts that disconnect the ac outlets in the *hot* side of the ac line instead of the neutral side. (See Fig 6.) If the Field Day equipment has been connected to a common ground (a sound safety practice), there may be one or more leakage paths around the relay contacts via equipment ground connections. In any case, opening the *hot* wire to the outlets is preferable for the same reasons that a fuse should be installed only in the hot side(s) of a circuit.—*Kenneth G. Kopp, KØPP, Anaconda, Montana*

[1]Dan Umberger, "Generator Overvoltage Protection for Field Day," Jun 1987 *QST*, pp 39-40.

QUICK POWER SUPPLY FOR 24- TO 28-VOLT RELAYS

☐ Wanting to use a 28-V relay in a project otherwise powered by a center-tap rectifier and three-terminal 12-V regulator, I came up with the circuit shown in Fig 7. Two additional diodes furnish a negative voltage approximately equal in magnitude to the regulator's positive supply. The potential difference between the two supplies is about right for powering 24- to 28-V relays. If the resulting voltage is too high, use a dropping resistor or try moving the positive end of the relay to the *output* of the positive regulator (if there is one in your circuit). Two warnings: (1) Both ends of the relay solenoid, and any associated switching lines, must be kept *above ground* to avoid short-circuiting the secondary of the power transformer. (2) This circuit cannot be used with a full-wave *bridge* power supply. —*Wally Boller, W9OBG, Cheyenne, Wyoming*

SLOWER KEYING SPEEDS WITH A BUG

☐ The dot speed of a properly used semi-automatic hand key ("bug") is usually adjustable by means of a sliding weight. The minimum dot speed of my stock, 1973-vintage Vibroplex bug is 22 WPM—a little too fast for QRN-battered ears in far-off places. What to do?

Clip a spring-loaded clothespin onto the locking screw of the existing dot weight. Presto! In my case, the key's minimum dot speed dropped to about 17 WPM. To slow the dots even more, I slipped the coupling ring from a PL-259 coaxial connector onto the clothespin. Result: dots at a restful 13 WPM.—*Edward Peter Swynar, VE3CUI, Whitby, Ontario*

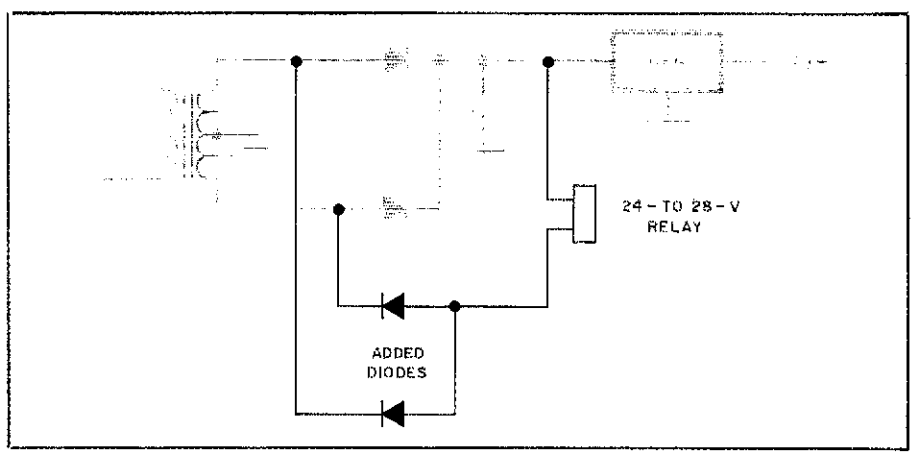


Fig 7—Two diodes add a negative 12-V supply to the positive 12-V power supply shown here. The potential difference between the two supplies can be used to power 24- to 28-V dc relays. The PIV rating of the added diodes should be equal to or greater than that of the diodes in the existing supply; the current rating of the added diodes should be sufficient to handle the current drawn by the relay, plus a safety factor. In this drawing, relay switching is omitted for clarity, and the components of the original 12-V supply are shown in gray. This hint will *not* work with a positive supply that uses a full-wave *bridge* rectifier; see text.

Technical Correspondence

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

TELEPHONE RFI—THANKS!

☐ I experienced telephone RFI, which I minimized by using homemade toroidal filters. Severe interference from a local broadcast station transmitter, however, defied all curative attempts. After reading Matthew Bell's letter[1], I investigated my telephone setup. I found at least 20 wires (of which only two were used) running through each of seven telephone jacks, all of which were dead-ended at the kitchen wall-phone jack. Connecting together all the unused wires and grounding them at the kitchen wall jack eliminated the BCI problem. Thanks so very much, Matthew Bell!—*Ralph C. Williams, W4REO, 4260 Mill Creek Rd, Winston Salem, NC 27106*

YAESU FT-980 BATTERIES

☐ I've owned a Yaesu FT-980 HF transceiver for about 4½ years, and it has given me good service. Within the past six months, however, I noticed that sometimes when I turned on the transceiver, it would come up with garbage in the digital display, and the radio was inoperative. At first, cycling the power off and back on would restore normal operation. As time went on, the problem got worse and worse. Finally, it got to the point where the radio would have to "warm up" for 10 to 30 minutes before cycling power would produce normal operation.

Through investigation, I discovered that power to the CPU was okay. I also found that forcing a reset on the 80C85 IC returned the radio to normal operation. Unfortunately, it seemed that every time I really went to investigate the problem and got the covers off the transceiver, the problem would disappear. At last, just as I was ready to send the transceiver back to Yaesu for servicing, I noticed that whenever I removed the bottom cover, the radio would come up running. When the bottom cover was installed, the transceiver required "warming up" before it would work properly. Then I realized that when I removed the *bottom* cover, I also disconnected the CPU's memory backup battery! I replaced the two AA cells, and the transceiver at once resumed normal operation.

A voltmeter connected across the battery pack I removed read 0.9 V. Apparently, with a low voltage supplied by the backup battery, the CPU reads garbage from the memory on power up, and gets its pointers confused. With the battery removed (bottom cover off), the CPU works okay because it recognizes that the battery is missing and resorts to calling up its default memory parameters. With good batteries present, the CPU recognizes that it should read data from the battery backed-up memory. My recommendation: Change your Yaesu FT-980 memory backup battery about every three years, and you'll avoid experiencing this sort of problem with the rig.—*Joe Mehaffey, K4IHP, 6950 Hunter's Knoll, Atlanta, GA 30328*

RFC DESIGN

☐ I recently decided to revamp my 4-1000, 5-band homemade linear amplifier to add 12- and 160-m operating capability. Most of the input and output circuit changes were straightforward enough, only requiring extra tuned circuits, band-switch contacts and so on.

The real challenge was constructing a plate-circuit RFC that would cover all the bands without exhibiting series resonances on any of them. My conversations with other hams on 160 meters confirm that finding or making the correct plate-circuit RFC is a real problem. One ham went so far as to run the entire output circuit 6 kV above ground, feeding the B+ into the low impedance end via a conventional pi-section RFC!

I read Doug DeMaw's February 1987 article on RFCs[2] with interest. But when I built the unit he described in Fig 7 of that article, I was unable to fit the specific number of turns onto the core he used unless I used no. 26 wire, and the resonances I obtained were different from those that Doug measured. So, I decided to design my own RFC.

Experience dictated that the core material must have good RF properties, so the choice was between ceramic or plastic; PVC was out. I was able to get some 1-inch diameter Delrin® rod from a local plastics supplier. Delrin has a 450° melting point, an excellent dielectric constant, and is easily machinable. I used an 8-inch piece of Delrin because I didn't want the RFC to be taller than the 4-1000 tube. I planned on locating the RFC about one inch from the tube chimney, and in the same axis as the tube to eliminate the possibility of melting the Delrin.

I required a choke that had a total inductance of about 100 μH and exhibited

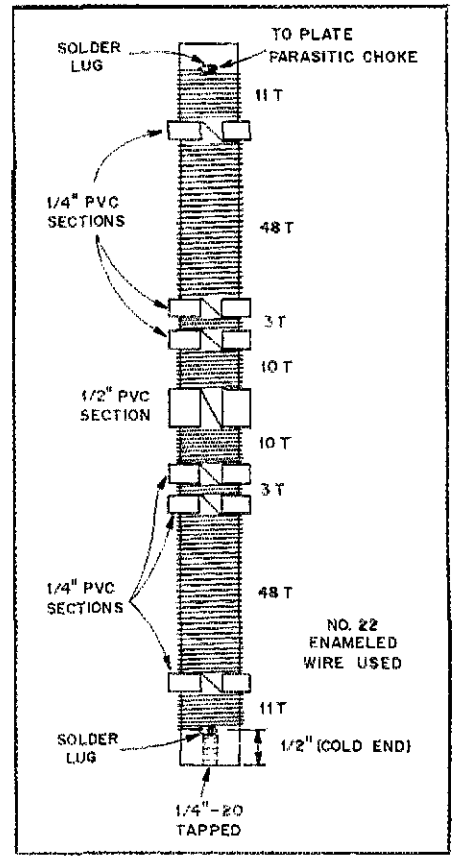


Fig 1—AA6GK's method of constructing a plate-circuit RF choke for a high-power amplifier.

no series resonances in any amateur band or within ±20% of any operating frequency. I figured I needed 150 turns on a 1-inch-diameter solenoid. No. 6-32 holes were drilled and tapped at each end of the rod to accept solder lugs for terminating the coil winding, made of no. 22 wire. The bottom end of the choke is drilled and tapped to accept a ¼-20 machine screw for mounting the choke to the chassis. After winding the choke, I checked it with a dip meter and found nasty resonances at 18 MHz, 28 MHz and higher. In an attempt to move these resonances, I cut ten ¼-inch PVC dividers from ¾-inch-diameter schedule 40 PVC pipe. I put two dividers at the end of my choke and rolled them through the existing winding to the middle of the choke. This nearly eliminated the 18-MHz resonance. (I've found that the presence of the PVC slices changes the choke resonant frequencies as much as 500 kHz.)

Next, I rolled in two more dividers, one from each end, constantly keeping them equidistant from the end of the choke, frequently stopping to check the resonances

[1]M. Bell, "Telephone RFI," Technical Correspondence, *QST*, Nov 1987, p 44.

[2]D. DeMaw, "Under Construction—Part 16: Understanding and Constructing RF Chokes," *QST*, Feb 1987, pp 16-19 and 22. See also Feedback, *QST*, Apr 1987, p 59.

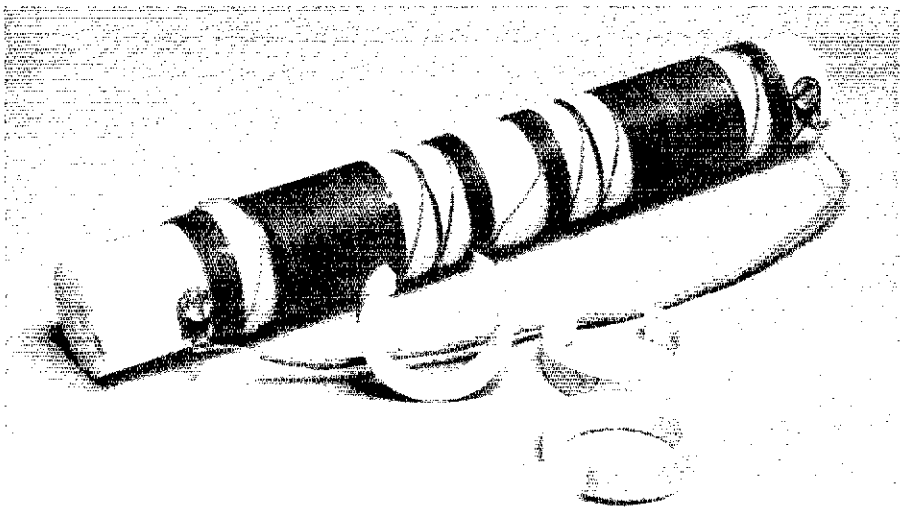


Fig 2—The final version of the AA6GK RF choke. Some of the PVC spacer sections used in the initial construction stages of the choke are in the foreground. The shorting wire across the choke is used when checking choke resonances.

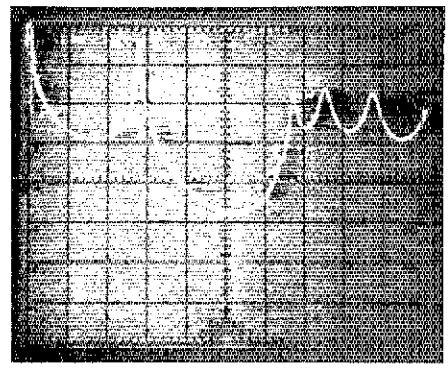


Fig 4—When this photo was taken, a metal plate (simulating a cabinet wall) was moved to within ½ inch of the RF choke body (still mounted on an aluminum plate). Note the shift in the choke resonant frequencies.

with my dip meter. Experimentally, I kept moving the resonances until I came up with the choke configuration shown in Fig 1. This choke was eight inches tall and each winding was separated by a ¼-inch-wide piece of PVC, except the two 10-turn sections were separated by a ½-inch wide section of PVC. That choke showed faint resonances at 18.5 MHz, 34.5 MHz and higher, and had an inductance of 100 μH. Once the choke was completed, I sprayed it with polyurethane varnish, baked it in an oven for 30 minutes at 150°F, and put it into service.

The choke worked perfectly at power levels up to the legal limit on the 10, 12, 15, 20, 40, 80 and 160-meter bands. After a few hours of operation, however, I noticed that the PVC sections were melting because of the heat radiated by the 4-1000. I removed the choke from the amplifier and took out the damaged PVC dividers. (The polyurethane varnish kept the windings from moving.) Then, I liberally applied some quick-curing ("five-minute") epoxy glue to the gaps from which the PVC sections had been removed (see Fig 2) and reinstalled the choke. The choke still performs perfectly after months of use.

Once, I made a mistake and keyed the amplifier into a load with an 8:1 SWR. The plate-circuit RFC arced 1½ inches through the insulation and covering varnish to ground, but was not severely damaged. I applied a dab of red Glyptal™ insulating varnish (every high-voltage rig owner should have some!) to the coil and restored it to working condition.

If you're going to try building a choke such as I've described, first cut the PVC pipe longitudinally. Make sure to cut the ¼-inch slices evenly. Sand the surfaces and deburr them. Bend the slices to make them oblong along the axis of the cut. That way, they'll be concentric when placed on the Delrin rod. Lastly, don't measure the choke resonances until the PVC slices have been removed and the areas coated with epoxy glue.

I've built two other plate-circuit RFCs identical to the one described. The end product is one of trial and error. I simply configured the PVC dividers differently until I placed the choke resonances where I wanted them. If you have some spare time, I'm sure you'll find this to be an interesting experiment.—*Jay Bennett, AA6GK, 196 Nathan Ct, Soquel, CA 95073*

MORE CHOKE INFO

☐ Refer to Figs 3 and 4. A common error that amplifier RF choke builders seem to make is to measure the resonances away from any surrounding metal objects. Since most amplifiers are built in metal enclosures, such a measurement tells only part of the story.

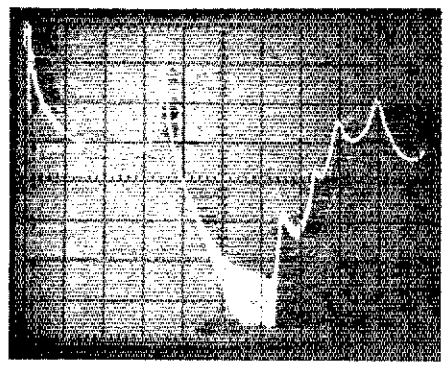


Fig 3—Spectral photo showing the resonances of Jay Bennett's (AA6GK) RF choke. The choke was mounted on an aluminum plate to simulate a chassis. For this photo and that of Fig 4, horizontal divisions are each 5 MHz; vertical divisions are each 10 dB.

RF choke resonances should ideally be measured with the choke mounted where it will be used. (You may even try simulating an environment as was done when the photos in Figs 3 and 4 were taken.) Such a procedure will help avoid the problem of choke resonances—measured away from any surrounding objects—dropping (say, from 35 MHz to 28.5) and destroying the RF choke. As Figs 3 and 4 show, even a 17.5-MHz resonance can be moved to 14 MHz by mounting the choke too close to a metal body.—*Zack Lau, KH6CP, ARRL Lab Engineer*

LIGHT-DIMMER INTERFERENCE REDUCTION

☐ Radio amateurs who've long been cursed with RFI from solid-state light dimmers will be interested to know that at least one domestic manufacturer—Lutron—produces light dimmers that incorporate RFI suppression techniques. The Lutron NOVA series uses toroidal chokes that provide a significant level of RFI suppression.

I bought the Lutron model N-600, which will handle up to 600 watts of incandescent lighting. Temporarily installed in my radio shack, a generic light dimmer produced an S9+ reading at 230 kHz (an arbitrary noisy frequency). The N-600 produced a reading of S3, a difference of about 40 dB. Admittedly, this is not zero, but installing the N-600 some distance away provided a reduction in RFI that is very gratifying. Indeed, I now hear new noise sources, heretofore undetectable through the dimmer din!

You're not likely to find these dimmers at your local discount store, and they are not inexpensive. Check for the availability of these dimmers at a lighting-fixture store and expect to pay about $25 apiece for them.—*Richard G. Brunner, AA1P, 10 Brookside Dr, Foxboro, MA 02035*

DIELECTRIC MATERIAL

☐ The following information refers to my articles published in the February and March 1987 issues of *QST*.[3] G-10 material with a dielectric constant of about 5 is fine for use in the single-stage or cascaded MMIC amplifier, and offers fairly good performance up to several gigahertz. However, the 7-MMIC power amplifier using the MSA-0404s was designed using Rogers Duroid 5880, which has a dielectric constant of about 2.17. This was done to obtain maximum gain and power output at 2304 MHz. Check with local PC board shops for the availability of Duroid material.

Typically, Duroid 5880 material is sold direct from the factory and is available in 12 × 18-inch sheets. Such a sheet costs about $100. Rogers Corporation, the manufacturer of Duroid, recently agreed to sell 6 × 9-inch sheets of 0.031-inch-thick 5880 stock to radio amateur experimenters. The cost for this piece is $25, postpaid. Personal checks are accepted and should be made out to Rogers Corporation. Send all orders to: Rogers Corporation, c/o Customer Service, 100 S Roosevelt, Chandler, AZ 85226. When ordering, specify that you want the 6 × 9-inch sheet of 5880 material, 0.031-inch-thick, double-sided copper. Please include your call sign when ordering.

The 6 × 9-inch sheet of stock is sufficient to make six of the MMIC power-amplifier boards. I strongly suggest the 5880 material be used to guarantee the performance described in the articles.—*Al Ward, WB5LUA, Rte 9, Box 132, McKinney, TX 75069*

COMMENTS ON PHASING RECEIVERS

☐ It was with considerable interest that I read Gary Breed's article, "A New Breed of Receiver."[4] As Gary noted, the concept of a phasing-type, direct-conversion (D-C) SSB receiver is not new, but it deserves continued attention for its high ratio of performance to complexity.

For CW use, even greater simplicity is possible, because unwanted sideband rejection can be confined to a narrow range of audio frequencies, and other interfering signals can be removed with a selective audio filter. These principles were used in a phasing D-C receiver that I designed in 1968 as part of a two-band CW transceiver.[5] (Co-author Rich Klinman's call is now W3RJ).

Audio phase shifting in the transceiver is accomplished using two simple RC coupling networks—one with a series capacitor and a shunt resistor, the other with a series resistor and a shunt capacitor. The networks were designed for ±45° phase shift at 800 Hz. This arrangement produces 30 dB or more of unwanted sideband rejection over a 100-Hz span centered on 800 Hz. The opposite sideband remains at least 10 dB down from peak output at frequencies from 400 Hz to 1600 Hz. When used with an audio filter centered at the same frequency, the results are impressive, with the unwanted sideband being virtually nonexistent.

Without the audio filter, the response to the desired sideband varies by only 3 dB over the entire audio range. Thus, the system works well for SSB reception, with quite a hole punched into signals on the unwanted side of zero beat.

Like Gary, I took the simple RC approach to the RF phase-shifting problem, and found the results to be quite satisfactory. The phasing approach has a theoretical elegance that makes it appealing when compared to the brute-force filter method. I remember working through the math and doubting that the system would really work like the equations said it would—until the thing was built and tested!—*Clifford Bader, W3NNL, 1209 Gateway Ln, West Chester, PA 19380*

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

[3]A. Ward, "Monolithic Microwave Integrated Circuits—Part 1," *QST*, Feb 1987, pp 23-29 and 32, and Part 2, *QST*, Mar 1987, pp 22-28 and 33.

[4]G. Breed, "A New Breed of Receiver," *QST*, Jan 1988, pp 16-23. See also Feedback, *QST*, May 1988, p 44.

[5]C. Bader and R. Klinman, "CW Transceiver for 40 and 80 Meters," *ham radio*, Jul 1969, pp 14-25.

New Products

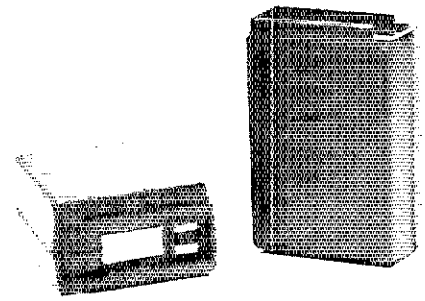
STONE MOUNTAIN ENGINEERING FREQUENCY CONTROL KEYPAD

☐ Mike Huddleston, KJ4LN, of Stone Mountain Engineering has announced the KW-QSYer: a keypad frequency controller for the Kenwood TS-940S, -440S, -140S, -680S and -711A/811A transceivers, and the R-5000 receiver. The KW-QSYer consists of a keypad-operated 8-bit microcontroller that allows direct frequency entry. The unit requires an 8- to 16-V, 100-mA dc supply for operation. The telephone-style keypad is mounted on a sloped panel for comfortable operation.

An internal speaker provides different feedback tones for each keypress. The appropriate optional Kenwood IF-series interfaces are required for use of the KW-QSYer with each radio. The KW-QSYer and its companion models for use with Yaesu FT-757 and -767 series radios, as well as the ICOM IC-735, are available from Stone Mountain Engineering, PO Box 1573, Stone Mountain, GA 30086, tel 404-879-0241. Price: KW-QSYer (and companion models), $89.50 each plus $2.50 shipping. Matching 12-V dc power supply, $10.—*Rus Healy, NJ2L*

REPLACEMENT YAESU NiCd BATTERY PACKS

☐ Own an FT-23R/33R/73R? If you do, you can now get non-Yaesu replacement battery packs that can be charged with standard Yaesu wall or desk chargers. Two packs are available: the FNB-10, a 7.2-V, 600-mAh pack for 2.5-W RF output from the hand-held rig, and the FNB-12, a 12-V, 500-mAh battery for 5-W RF output. The



packs are warranted by the manufacturer for one year. Price: FNB-10, $33; FNB-12, $49. Add $3 shipping per pack. For more information, contact Periphex, Inc, 149 Palmer Rd, Southbury, CT 06488, tel 800-634-8132 or 203-264-3985.—*Rus Healy, NJ2L*

Feedback

☐ Author Jerry Pittenger, K8RA, has informed us of some errors that appear in Part 2 of his article, "An All-Band 1500-Watt-Output 8877 Linear Amplifier," *QST*, Oct 1986, pp 20-26 and 37. Refer to Table 2 on p 26. The outside diameter of L2 should be shown as 3¼ inches. Also L2 and L4 are wound on three (3) T225A-2 iron-powder toroidal cores. Jerry's new address is: 6930 Cook Rd, Powell, OH 43065.

FCC Announces Proposed Rewrite of Amateur Rules (PR 88-139)

By Phil Sager, WB4FDT
ARRL Regulatory Information Branch Manager

Ah, it was so much simpler in the era just after WW II—there were only six basic emissions, good old A1 for CW, A2 for modulated CW, A3 for phone, A4 for facsimile, A5 for television and A0 steady unmodulated carrier (with some FM emissions also allowed). By the 1970s, the formal list had grown to 14, including "P" for pulse emissions. With changes mandated by the 1979 World Administrative Radio Conference (WARC), there were almost 1300 different emission types in the FCC rules! Confusion over emissions is just one of the reasons for this proposed FCC reorganization of the amateur rules.

The amateur rules have not undergone any major reorganization since 1951 (they were called Part 12 then). Those rules were designed for an Amateur Radio Service using vacuum-tube transmitters and receivers and surplus mechanical teleprinters. Given the technological explosion which has occurred since then, and the deregulatory climate we're now basking in, the Commission has decided that the resulting rule additions and revisions have resulted in a patchwork of rules that can be confusing, especially to new amateurs, and it is high time to take another overall look at our rules. The Commission emphasizes that this proposal is a reorganization of the rules, and is not intended to make any substantive changes.

During their review, the FCC decided that many rules were redundant or obsolete. Still others duplicate extensive details that are contained in other FCC rule parts and in the ITU Radio Regulations. In this proposed reorganization, PR Docket 88-139, the total body of the amateur rules has been reduced by roughly 40%. For example, the 27 emission designators presently appearing in Part 97 (there *could* be nearly 1300 under ITU rules) would be reduced to nine familiar terms.

The FCC proposes to restructure Part 97 into six subparts and four appendices. Except for the statement of the basis and purpose of the Amateur Service in 97.1, which remains untouched, the Commission has completely reorganized Part 97.

Although the new proposed rules are too long to reproduce in *QST*, the proposed appendix shows the extent of the reorganization:

Subpart A—General Provisions

97.1 Basis and purpose.
97.3 The amateur radio services.
97.5 Station license required.
97.7 Control operator required.
97.9 Operator license.
97.11 Stations aboard ships or aircraft.
97.13 Restrictions on station location.
97.15 Antenna structure hazard to aircraft.
97.17 Application for license.
97.19 Renewed or modified license.
97.21 Mailing address and station location.
97.23 License term.
97.25 FCC modification of station license.
97.27 Replacement license.

Subpart B—Fundamental Purposes of the Amateur Service

Serving the public:
97.101 Operation during a disaster.
97.103 Safety of life and protection of property.
97.105 Station in distress.
97.107 Communications for public gatherings.
Advancing the radio art:
97.131 Authorized emission types.
Advancing skills:
97.151 Control operator frequency privileges.
97.153 Alien control operator privileges.
Training operators:
97.171 Qualifying for an amateur operator license.
97.173 Examination elements and standards.
97.175 Examination requirements.
Enhancing international goodwill:
97.191 International communications.

Subpart C—Station Operation Standards

97.201 Good amateur practice.
97.203 Frequency sharing.
97.205 Station licensee responsibilities.
97.207 Control operator duties.
97.209 Control point.
97.211 Station control.
97.213 Authorized transmissions.
97.215 Third-party traffic.
97.217 Station identification procedure.
97.219 Prohibited transmissions.
97.221 Restricted operation.

Subpart D—Special Operations

97.301 Auxiliary operation.
97.303 Beacon operation.
97.305 Repeater operation.
97.307 Remote control of an amateur station.
97.309 Remote control of model craft.
97.311 Space operation.
97.313 Earth operation.
97.315 Telecommand operation.
97.317 RACES operation.

Subpart E—Technical Standards

97.401 Purity of emissions.
97.403 Maximum transmitter power.
97.405 Digital communications.
97.407 Spread Spectrum communications.
97.409 Type acceptance of external RF power amplifiers.
97.411 Standards for type acceptance of external RF power amplifiers.

Subpart F—Qualifying Examination Systems

Operator license examinations:
97.501 Examination administration procedures.
97.503 Examination preparation.
97.505 Examination element credit.
97.507 Technician, General, Advanced and Amateur Extra operator examination administration.
97.509 Novice operator examination administration.
97.511 Volunteer examiner requirements.
97.513 Volunteer examiner conduct.
Volunteer-examiner coordinator
97.521 Agreement required.
97.523 VEC qualifications.
97.525 Coordinating examinations.
97.527 VEC question pools.
97.529 Accrediting VEs.
Examination Expense Reimbursement
97.541 Reimbursement for expenses

Appendix 1—Places Where Amateur Radio Services Are Regulated By The FCC.

Appendix 2—VEC Regions.

Appendix 3—Glossary of Terms.
Appendix 4—Frequency Sharing Requirements.

So exactly what new changes have been made? Here is a brief summary:

Emissions: The multitude of designators are now categorized under nine general terms. For example, all telephony emissions are now called simply "phone." Facsimile or television emissions are now called "Image." All data or packet-radio transmissions are called "data." RTTY emission is now defined as single channel emissions for narrowband direct-printing. There is also an emission called "test" which is for on-the-air transmitter testing, direction finding or antenna measurements, where no modulation or information is being sent.

Public Service: The FCC has codified rule interpretations guiding hams in their support of public events. The proposed Part 97.107 sanctions Amateur Radio operator support of public gatherings, such as parades or marathons, where the main beneficiary of the communications is the public. The section goes on to state: "An amateur station may not be used for logistical support of any sponsoring organization."

FCC emphasizes that nothing in the rules prevents amateurs from providing "essential communication needs in connection with the immediate safety of human life and immediate protection of property when normal communications systems are not available." (Proposed 97.103)

Broadcasting: The FCC has also codified its 4-part rule of reason concerning broadcast activities. Amateurs may convey news information *only* when *all* of these conditions are met (1) The information is critical to protecting the immediate safety of life or to the immediate protection of property; (2) The news is directly related to the event; (3) The event is unforeseen; and (4) The news cannot be transmitted by any other means. (97.219[f])

Swap nets: Under this proposal, amateurs are permitted to participate in selling their equipment over the air without fear of being cited by the FCC for business communications. Under the proposed rules, "Communications to inform other amateur operators of the availability of apparatus normally used in an amateur station are not considered business communications." (97.219[c]) In its introduction to the proposal, the FCC explains further that an asking price may be mentioned, "but no subsequent negotiations or bartering may take place. If interest is expressed, the amateur operators would exchange mailing addresses or telephone numbers and finish negotiations using means of communication other than amateur service frequencies." Of course, this exception does not apply to dealers or to what the FCC calls "amateurs who derive a profit by buying and selling amateur radio equipment on a regular basis."

Self-assigned identifiers: According to the proposed 97.217(c) and (g) a self-assigned identifier may be used if (1) the identifier does not conflict with any other identifier specified by FCC rules or by a prefix assigned to another country and (2) the identifier is separate from the call sign by the slant mark or by the word "stroke."

A new section called "frequency sharing" (97.203) emphasizes that no frequency is assigned for the exclusive use of any amateur station. "Each amateur operator must cooperate in the selection and use of amateur service frequencies in order to make the most effective use of the frequencies." (97.203[b])

Nearly 40% of the total body of the rules are proposed to be dropped or greatly simplified. These include the separate list of emissions, alien reciprocal operating privileges, Amateur Satellite Service rules, requirements that examination papers be retained by volunteer examiners for a specified period and the present detailed rules for quiet hours. (The new rules propose simply to state that the Commission may restrict amateur operation as necessary.)

The Commission specifically asks for comments concerning the three-minute "time out" period. This is the period of time after which a remotely controlled station, such as a repeater, must stop transmitting if its control link fails. The FCC believes that this requirement may be too restrictive and requests comments on whether this time limit should be relaxed, and if so, what period of time would be appropriate.

The FCC has included cross references from the current Part 97 to the proposed one and vice versa, making it easy to compare the two.

The FCC is accepting comments in PR 88-139 until August 31, with reply comments due October 31. Copies of this Docket are available from ARRL HQ, attn: Regulatory Information Branch, 225 Main St, Newington, CT 06111. Please send a large self-addressed envelope bearing 85 cents postage.

The New Frontier

(continued from page 80)

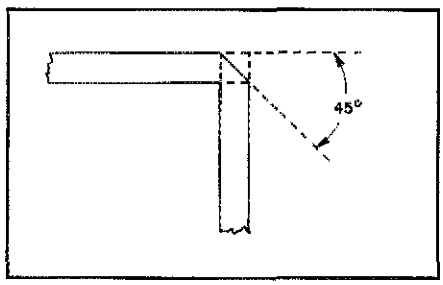


Fig 5—90° microstrip bends can be achieved with minimum impedance discontinuity as shown here.

W, the width of the line; E, the dielectric constant of the board material; H, the thickness of the dielectric; and T, the thickness of the microstrip trace. Calculation of microstrip impedances is quite complex. A BASIC program written for this purpose was listed in the December 1981 New Frontier column (also see the addendum in the April 1982 column). Fig 4 shows how the dielectric constants of some common PC-board materials affect microstripline impedances.

In order to function properly, a microstripline must have a certain minimum-size ground plane under it (dimension G in Fig 3). This dimension varies with the other microstripline parameters from about 3 × W for low-impedance microstrips (30 ohms) to about 10 × W for high-impedance microstrips (120 ohms). This limits the spacing between microstrips if unwanted coupling is to be avoided. Microstriplines may need to be bent to conserve board space. The best way to minimize impedance discontinuity is to bend the line 90° and chamfer the corner at a 45° angle, as shown in Fig 5.

The detailed design of microstripline circuits for specific purposes using unmatched transistors is a very complex subject (too complex to deal with here and now). However, some components (such as MMICs) are now being designed with 50-ohm input and output impedances, so no complex matching is required. Laying out microstripline circuits using these components thus involves only coax-to-microstrip transitions and 50-ohm microstriplines.[1] The information given in this column and the referenced articles should enable you to design, lay out and construct simple 50-ohm microstripline circuits without much pain at all!

[1]A. Ward, "Monolithic Microwave Integrated Circuits," part 1, *QST*, Feb 1987, pp 23-29; Part 2, *QST*, Mar 1987, pp 22-28, 33.

Building Upon a Great Foundation

Stephanie Ann Dougherty, N8FIT, is now studying mechanical engineering at Michigan State University thanks in part to the ARRL Foundation. Learn what your Foundation contribution **really** does "for the advancement of Amateur Radio."

By Mary Schetgen, N7IAL
Assistant Secretary
The ARRL Foundation

To many hams, the ARRL Foundation "helps kids with scholarships or something." If the Foundation means this to you, you're certainly right. But that's only part of the Foundation's mission. Perhaps you once contributed to the OSCAR Satellite Program or the more recent ARRL Scholarship Honoring Senator Barry M. Goldwater. Monies you sent to the Foundation helped to bring these and other programs to life—and your continued support guarantees the funding necessary to create new opportunities and programs to benefit *all* amateurs. That's pretty impressive, but *who* is the Foundation?

Just as the ARRL's strength depends on individual membership, *you* are part of the "foundation" of the ARRL Foundation! A nine-member Board of Directors, composed of at least five ARRL Board of Directors members *and* private industry or retired members, attends to administrative tasks and specific committee assignments to ensure the smooth functioning of Foundation programs. No one is paid for his services and all are active Amateur Radio operators. Organized to operate exclusively for philanthropic, educational and scientific purposes related to innovative ARRL programs, the Foundation is nonetheless a separate, not-for-profit corporate entity. That status means that your donations to the Foundation are tax-deductible, and that monies collected by the Foundation cannot be used for individual gain.

Foundation President Paul Grauer, WØFIR, and wife Helen were especially pleased to meet with the family of the 1987 Grauer Scholarship recipient, Raymond Joe Gomez, Jr, NØGNA. Ray Sr expressed his gratitude for his son's scholarship award by becoming Novice KBØBUJ!

Programs

At this time of year, the Scholarship Committee is busy reviewing the applications and transcripts sent in by students anxious to receive a Foundation scholarship for the 1988-89 academic year. Director Edmond A. Metzger, W9PRN, chairman of the committee, and Honorary Vice-President L. Phil Wicker, W4ACY, will soon report their selections to Foundation President Paul Grauer, WØFIR, who serves ex officio on all Foundation committees. Scholarships currently available include: The ARRL Scholarship Honoring Senator Barry M. Goldwater, K7UGA—$5000; The You've Got A Friend In Pennysylvania Scholarship—$750; The Paul and Helen L. Grauer Scholarship—$500; The Perry F. Hadlock Memorial Scholarship—$500; The Edmond A. Metzger Scholarship—$500; The L. Phil and Alice J. Wicker Scholarship—$500; and The Edward D. Jaikins Memorial Scholarship—$500.

Several new scholarships are in the planning stage, and funds have been established for the proposed Donald R. Reibhoff Memorial Scholarship, the Bill Bennett, W7PHO, Memorial Scholarship and the Dr James L. Lawson Memorial Scholarship. Grateful scholarship recipients, among the brightest and hardest working of Amateur Radio youth in the nation, continually express their thanks for the educational assistance your contributions have made possible. It is a heartening sign that one of our most recent scholarship *recipients* was influential in helping to establish one of our newer scholarships. *Any* individual or club may establish a scholarship, and the Foundation works closely with those setting up criteria for a proposed scholarship. Many contributors, however, prefer to designate their contributions to existing Foundation scholarships that benefit those students living in the contributor's own ARRL Division or Section.

Scholarships are not the only way the ARRL Foundation helps young people. The Victor C. Clark Youth Incentive Program helps schools and clubs by providing matching-fund mini-grants, usually $500 to $1000, to help fund Amateur Radio and scientific projects. Past projects, like the Natick High School RTTY Project and the Council of Eastern Massachusetts Amateur Radio Clubs Boston Museum of Science exhibition, helped show students and the general public the potential of amateur RTTY and packet-radio communications. Serving on the Screening Committee for the Victor C. Clark Youth Incentive Program are Director Ralph V. Anderson, KØNL, Chairman, and Director Rush S. Drake, W7RM.

Remembering the fine humanitarian

spirit of the late ARRL Director W3KT, the Foundation has reactivated the Jesse A. Bieberman Meritorious Membership Grants Program. These grants, funded through direct contribution to the Jesse A. Bieberman Meritorious Membership Fund, are used to provide a one-year, one-time ARRL membership extension to individuals meeting the following criteria: US ARRL membership of 25 years or more, 65 years of age or older and a *known financial need.* Only ARRL Division Directors can nominate individuals for a Meritorious Membership grant. We anticipate the awarding of more Meritorious Membership grants—with your help, the fund will grow, making this possible.

Who pays for Amateur Radio representation at World Administrative Radio Conferences? *You* do, in part—through your contributions to the Foundation's WARC Fund. WARC Fund dollars help pay for the representation necessary for the preservation and expansion of *worldwide* Amateur Radio frequency allocations—without which there would be no Amateur Radio!

As you can see, Foundation contributions have a domestic and international impact, and they come in many forms. By far, the most popular time for making an ARRL Foundation donation is when renewing an ARRL membership: The blue and white renewal form has a space provided for Foundation donations. Memorial contributions, in memory of a Silent Key, are often made by individuals and clubs to support Foundation programs deemed as having been of particular interest to their late friend or club member. Some contributors use trusts or annuities as means of establishing ongoing, tax-sheltered funding for their favorite Foundation scholarships and programs. Bequests have helped establish several Foundation memorial scholarships, and are an excellent way to provide for the Amateur Radio scholarship opportunities of future generations.

Now that you know more about the ARRL Foundation, how can you help? Your tax-deductible donation is always welcome. You can designate it for any program you wish. Another way to contribute to the Foundation that you're part of is to help get the word out about scholarships and programs. Tell your college-bound club members about ARRL Foundation scholarships. Let school clubs know that the Victor C. Clark Youth Incentive Program exists to help youth clubs match funds for Amateur Radio station experimentation and enhancement. Become part of the combined efforts of the many ARRL members dedicated to the advancement of Amateur Radio and help us continue to build upon a great Foundation! QST

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For more information on ARRL Foundation programs write to: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111.

Strays

COUNTY HUNTERS CONVENTION

The County Hunters will hold their 20th annual convention at the Ramada Inn South, Indianapolis, Indiana from July 20-24. All amateurs are welcome to attend and participate. Tours of the Conner Prairie Settlement, Indianapolis Zoo and Indianapolis 500 Speedway will highlight the week. The Saturday banquet will begin at 7 PM with awards. For registration forms and more info, send an SASE to Herb Morgan, WD9GBK, 735 E 50th St, Marion, IN 46953.

OMIK AMATEUR ELECTRONIC COMMUNICATIONS ASSN CONVENTION

The OMIK Amateur Electronic Communications Assn is sponsoring their 36th annual Convention at Hilton Inn Northwest, 2945 NW Expy, Oklahoma City, OK on July 13-17. The Convention will be held from 1-6 PM July 13 and from 8:30 AM-10:30 PM July 14-17. Activities include technical sessions, tours, sightseeing, barbeque, annual meeting and banquet. Transportation available to local attractions upon request. Talk-in on 146.52, 14.285 and 7.240 MHz. Info and reservations from Donald Davis, WA5ZXB, 1732 NE 36th St, Oklahoma City, OK 73111, tel 405-427-8386, days.

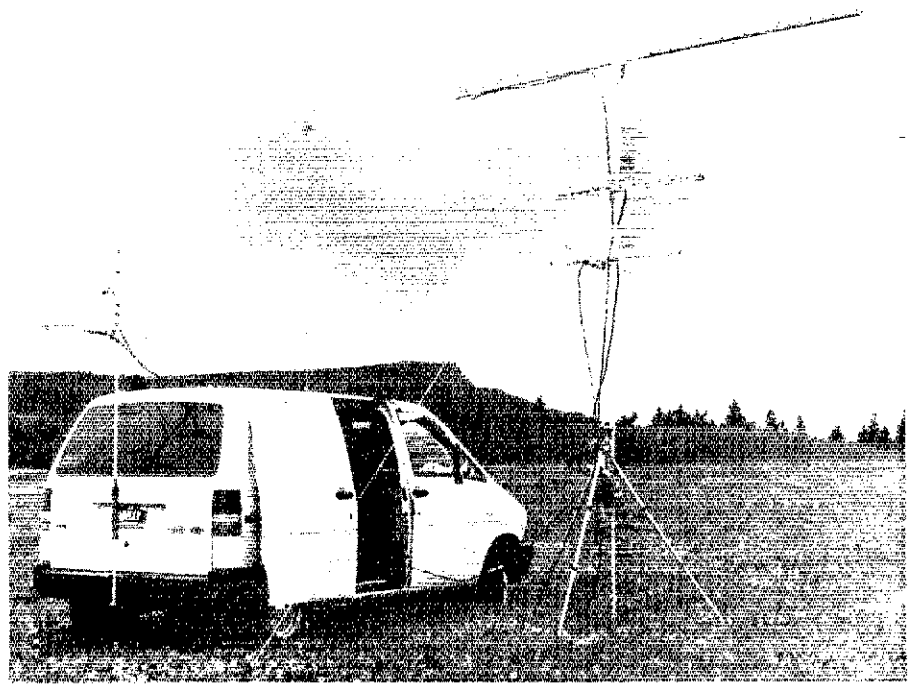
The Adventure of VHF Contesting

VHF/UHF contests are exciting events in Amateur Radio that many hams know little about. Here you can learn about these contests and find out how easily you can participate in them yourself.

By Curt Roseman, K9AKS
23002 Andreo Ave
Torrance, CA 90501

Emil Pocock, W3EP
RR 3, Box 70, Rte 207
Lebanon, CT 06249

Mike Owen, W9IP
21 Maple St
Canton, NY 13617



Hal, WØMXY, visited several rare grid squares in Colorado and New Mexico during the June 1987 ARRL VHF QSO Party. *(photo courtesy of WØMXY)*

During the second weekend in June, the VHF/UHF bands will be buzzing with activity. On that weekend, and several others during the year, thousands of North American hams gear up their home stations or head for portable locations to participate in VHF/UHF contests. Hams are attracted to a variety of exciting aspects of these contests: fast-paced contest activity at times, working intensely to snag rare locations or contacting other stations over distances many people think are not possible on the VHF and UHF bands.

Amateurs of every license class, including Novices, can participate in VHF/UHF contests. You can enjoy VHF/UHF contesting—even if you are just starting as a ham or are an experienced ham who has never operated VHF or a contest before.

In this article, we describe some of the major VHF/UHF contests and discuss basic operating considerations. We also show a variety of operating scenarios, one of which might appeal to you. Maybe you too will be convinced to give this fascinating aspect of ham radio a try!

North American VHF/UHF Contests

What are VHF/UHF contests? Currently there are four general VHF/UHF contests that allow the use of bands from 50 MHz up. Each contest covers a single weekend. Most of the activity is on SSB and CW, and is therefore concentrated at the low end of each band. Some FM activity can be found, especially in California and in cities of the Northeast, but it's strictly simplex. No repeater usage is allowed. As in most contests, the object is to contact as many different stations in as many different geographical locations as possible. The final score is a product of the number of contact points and a multiplier.

Be sure to write to the contest sponsor for the proper logs and entry forms. Write at least several weeks in advance, and enclose an SASE with enough postage for the forms you request. And don't forget to submit the logs after the contest, even if you have a low score. This is an important gesture in support of these contests, and it will help other VHFers become familiar with your call.

Also necessary is a grid-square map. Marking grids on the map as you work them gives you a running picture of your progress in collecting multipliers. Later in the contest, such a map will tell you in what directions you will need to look for new multipliers. (The *North American Grid Square Map* is available from the ARRL for $1.)

There are important seasonal changes in the types of propagation appearing on the VHF and UHF bands. Because of these changes, each of the major contests has a different personality. Here is a summary of features for each event.

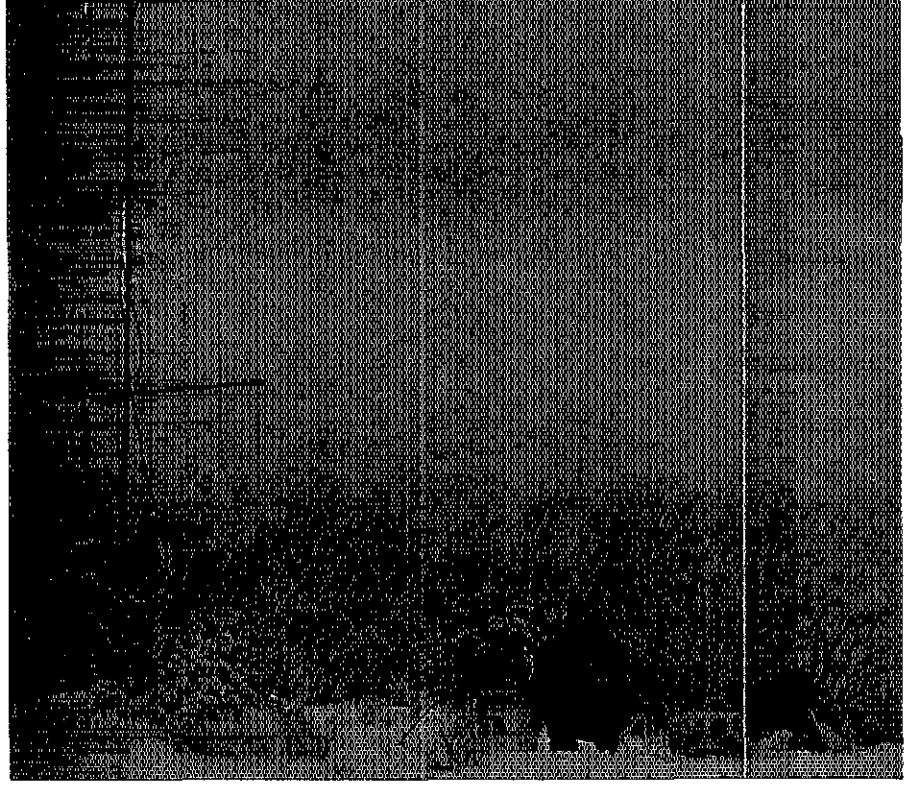
The ARRL VHF Sweepstakes

Held each January, this contest is less likely to experience band openings than the other major contests. Club competition is encouraged, however, and activity levels are quite high in parts of North America. So, it can be a lively contest.

Most years, distances worked in January are in the more or less normal ranges. Such ranges, of course, depend upon equipment, antenna and location. On CW or SSB, a modest station using a 100-watt amplifier and a medium-sized single Yagi antenna might expect to work out to as many as 200 miles on 50 MHz, 300 miles on 144, 220 and 432 MHz, and lesser distances on higher frequency bands. On FM, working distances are much less.

In many areas of North America, these working distances can translate into QSO totals in the hundreds, even for modest stations. The big guns in highly populated areas, operating more than one band, always make more than 500 QSOs in the January contest. In more sparsely populated areas, hundreds of contacts may not be possible. There, the challenge of digging up a few new grid squares or working a new DX station can keep you interested in the contest for hours on end.

Sometimes, enhanced propagation conditions do occur in January. An aurora opening can occur in northern parts of the US and in Canada, and sporadic-E makes an appearance every so often. Stations with medium or high power and good antennas can make many long-distance contacts on meteor scatter, especially on 6 meters. Elsewhere in this issue of *QST* are the results of the January 1988 contest. Check them



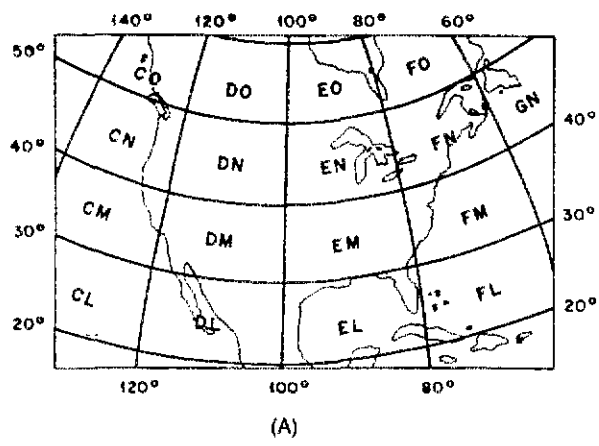
For most people, January is a time to operate from home in comfort. For Jim, WA1QZH, and Clarke, K1JX, it is time for an expedition to the top of Mt Everett in western Massachusetts. Windchill factor? Don't ask!

Grid Squares

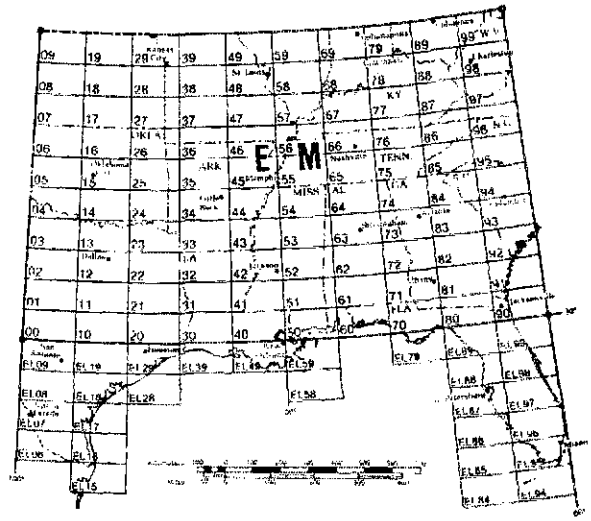
Most North American VHF/UHF contests use grid squares as multipliers, so it's important to understand what they are. The grid square system divides up the entire world into 2 × 1 degree areas. The areas are designated by two letters followed by two numbers, for example EM63. (Smaller areas can be designated by adding two more letters, but this detail is not used in most VHF/UHF contests.)

Fig 1 helps to visualize the grid square system. The first two letters specify the *field*, or 20° × 10° area of the world. The EM field, for example, covers much of the southeastern US. Within fields, the numbers specify the grid square. So, the grid square containing Birmingham, Alabama is EM63, and the grid square for St Louis, Missouri is EM48. (Further explanation of this system can be found in January 1983 *QST*, p 49, and in the January-February 1988 issue of the *National Contest Journal*, pp 19-20.)

The basic operating strategy is to work as many stations as possible, while also finding as many "grids" as possible. The number of grids you can work depends on the band, the time of year and your location. For example, in some regions of the US and Canada, it's possible to work only 10 to 20 grids on 144 or 432 MHz under normal conditions. In other areas, modest stations routinely work 50 to 60 grids on these bands. So, it's important that VHF/UHF contesters fit their goals to their own regional circumstances.



(A)



(B)

Fig 1—The VHF/UHF world is broken up into 20° × 10° *fields* (A) which are then further broken up into 2° × 1° *grid squares* (B).

General VHF/UHF Contests

Contest	1988-89 Dates	Sponsor
June VHF QSO Party	June 11-13	ARRL
CQ Worldwide VHF WPX Contest	July 16-17	*CQ* Magazine
September VHF QSO Party	September 10-12	ARRL
VHF Sweepstakes	January 1989	ARRL

to see what kind of scores were made by stations in your area.

The ARRL June VHF QSO Party

The June VHF QSO Party, which is coming up later this month, may be the best of all the annual VHF/UHF events. The first of the warm-weather contests, it brings out lots of activity—including many portable operations.

The June contest always seems to have good propagation. It's scheduled close enough to the peak of the sporadic-E season so that 6 meters opens in many areas. In a typical June contest, operators in most parts of North America can expect 6 meters to be open for at least five hours, but in good years the band can be open most of the weekend. And, because 6 meters is so good, several DX stations and DXpeditions are usually on for the contest, especially in the Caribbean area.

Excellent tropospheric propagation and aurora also have occurred in several recent June QSO parties. Meteor-scatter contacts can be made by most 6- and 2-meter stations, especially on Sunday morning of this contest.

A year ago, in 1987, the June contest was at its best. Not only was 6 meters open for most of the contest period, but thousands of sporadic-E contacts were made on 2 meters, and, for the first time ever, a sporadic-E contact was made on 220 MHz. Two-meter E-skip occurred across the southern part of the US, from California to Georgia, including many points in between. In the same contest, tropo openings allowed some contacts over distances of 1000 km and more in the Midwest. Take a glance at the results of that contest[1] and the articles on the sporadic E that weekend[2,3] for more details.

Conditions were so good last June that QSO totals reached nearly 1000 for 6-meter big guns. Many modest stations made several hundred contacts because sporadic-E propagation results in strong signals for even low-power stations with simple antennas. Most parts of the continent shared in the riches: In *every* US call area, at least one station made more than 600 contacts on 6 meters.

In June, activity levels and interest are always high. This year, they may be especially high because of last year's experience.

CQ World-Wide VHF WPX Contest

Sponsored by *CQ* Magazine and held each July, the CQ World-Wide VHF WPX Contest comes while the sporadic-E season is still in full swing. At the same time, the CQ contest is late enough in the summer that tropo and other forms of DX propagation are common. As in the ARRL-sponsored contests, low power and portable operations are encouraged. Lots of rare grid squares are put on the air for this one, so even the casual participant can have fun searching for new grids.

This contest differs from the ARRL-sponsored activities because of its international flavor. Significant participation comes from Europe and Japan. The CQ World-Wide VHF WPX Contest is probably the first major attempt to internationalize VHF/UHF contesting (not counting moonbounce). In several parts of the world, especially Europe, VHF/UHF contesting has a long history. Some international participation is found in all of the contests (especially in June), and we can expect more in the next few years when the F-layer MUF is expected to reach 50 MHz.

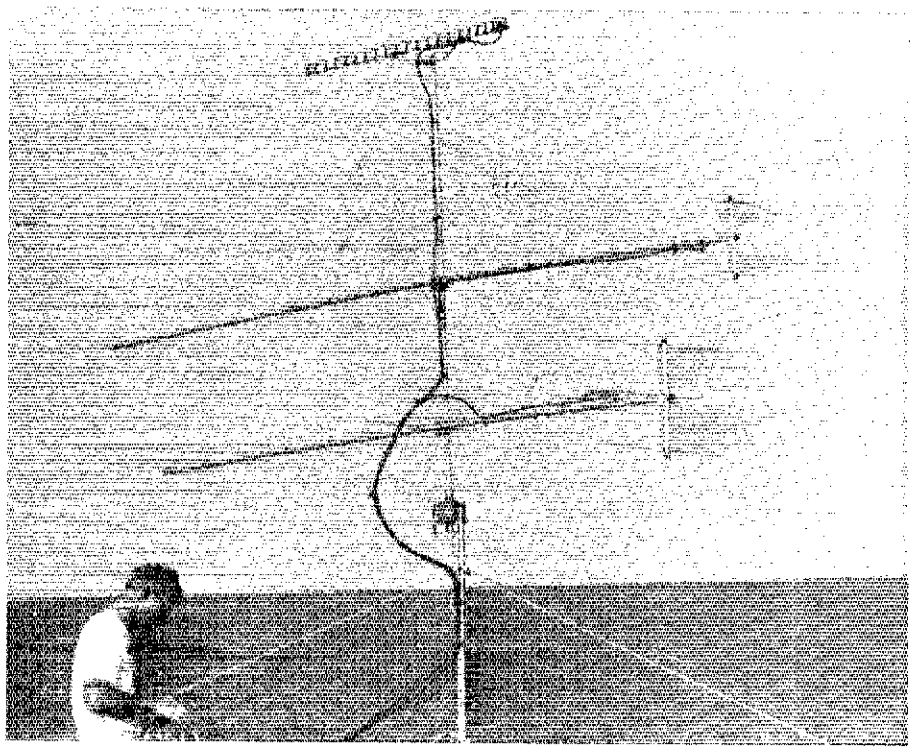
The CQ World-Wide VHF WPX Contest uses grid squares as the exchange. Like the CQ *HF* WPX contests, however, *prefixes* are used as multipliers. Now in its fourth year, this contest is gaining in popularity.

The ARRL September VHF QSO Party

By early September, sporadic E is quite rare, but the probability of aurora is higher for the September event than for any of the other three major contests. Nonetheless, this contest is probably best known for tropo. The chance of tropo in early autumn is high in many areas, especially the East, Midwest and South. Therefore, 6 meters is somewhat less active (though still important), and the September contest favors the bands at 144 MHz and above. In some recent years, tropo conditions have been spectacular, allowing contacts in the 1500-km range as high as 1296 MHz.

For many stations, QSO totals reach well into the hundreds on two meters. Six-meter totals are usually much lower. In fact, for many multiband stations, contact totals on 432 MHz have exceeded totals on 6 meters in recent years. Six meters, however, can be a very good source of multipliers, especially by working meteor scatter on Sunday morning in the September contest.

In terms of weather, especially on the very high mountain peaks, September is the best time of year for portable operation. Lots of rare grid squares are put on the air, including some in remote parts of the western US and the Great Plains. The recently created QRP-portable entry category is gaining in popularity. In September 1987, seven call areas were represented in the top ten in this class. The winner made 348 QSOs (with 85 grids for



Some of the best VHF/UHF sites are in rare grid squares. Here, John, W1XX, puts the finishing touches on antennas atop a motel right on the ocean front at Virginia Beach, Virginia, in rare grid square FM26. Most of FM26 is underlain by water.

[1]Notes appear on page 66.

multipliers)—not bad for a QRP station!

ARRL VHF and UHF Sprints

In addition to the general contests described in the preceding paragraphs, shorter single-band contests are held each spring. A separate four-hour sprint is scheduled for each of the VHF and UHF bands, 50 MHz through 2304 MHz. The 2-meter sprint is held on a Monday evening in April, the 220-MHz sprint on the Tuesday eight days later, and so forth. The 6-meter affair is scheduled on a Saturday evening late enough in May to take advantage of better ionospheric conditions expected in late spring.

In the sprints, activity is packed into a short period, allowing participants to have some operating fun and actually be competitive without committing an entire weekend. Although this year's sprints are over, keep your eye on *QST* for details of next year's events.

Other Contests

Several other VHF/UHF contests are held in addition to those already mentioned. They are more specialized, focusing activity on one band or one type of operation. They include a 6-meter contest held by the Six Meter International Radio Klub (SMIRK) in June; an August 2-meter contest sponsored by the Side Winders on Two (SWOT); the ARRL UHF Contest held in August; the ARRL 10-GHz Cumulative Contest, usually held over two weekends in late summer; and the ARRL International EME Competition held over two weekends in the fall.

Operating Alternatives

You can participate in VHF contests in any of a variety of ways. It's possible to get started in contesting on virtually any VHF/UHF band, with almost any type of station, home or portable. Next, we'll cover four common operating scenarios for VHF/UHF contesting. One of them could be right for you.

Single-Op/Single Band

This is perhaps the easiest way to start learning about VHF/UHF contesting. Simply put together a single-band VHF or UHF station and get on the air. Unless you have a special interest in another band, it's probably best to try contesting on 6- or 2-meter SSB and CW, where the activity levels are highest. In some high-population areas, such as the Boston-to-Washington corridor or southern California, 432 MHz is active enough for the beginner to find a lot of activity.

It's not necessary to spend the entire weekend to make a decent single-band entry in a VHF/UHF contest. Usually there is time to spend with the family, or just being a normal human being! A little knowledge of the best activity times and the times for the best propagation helps in scheduling.

Spend time on the air before the contest to familiarize yourself with propagation conditions and how they change at various times of the day. During the contest, you may be surprised to find that conditions seem better. This is because of increased activity levels—you may hear stations (especially the big guns) out to distances that you did not think possible simply because they are on the air. The accompanying sidebar shows the best times to look for high contest-activity levels.

Best Times to Look for Activity in VHF/UHF Contests

1) *The first two hours* at the *beginning of the contest* (*1900 UTC* on Saturday for ARRL contests). Most everybody with a direct interest in the contest gets on then.

2) *The evening hours,* local time. Why? First, the conditions on most bands are somewhat better after sunset than they are in the heat of the day, and the possibility of sporadic-E peaks in the early evening hours. Also, operating habits and work/family schedules allow more people to operate in the evening. Thus, many casual operators who are willing to "give out a few points" will appear.

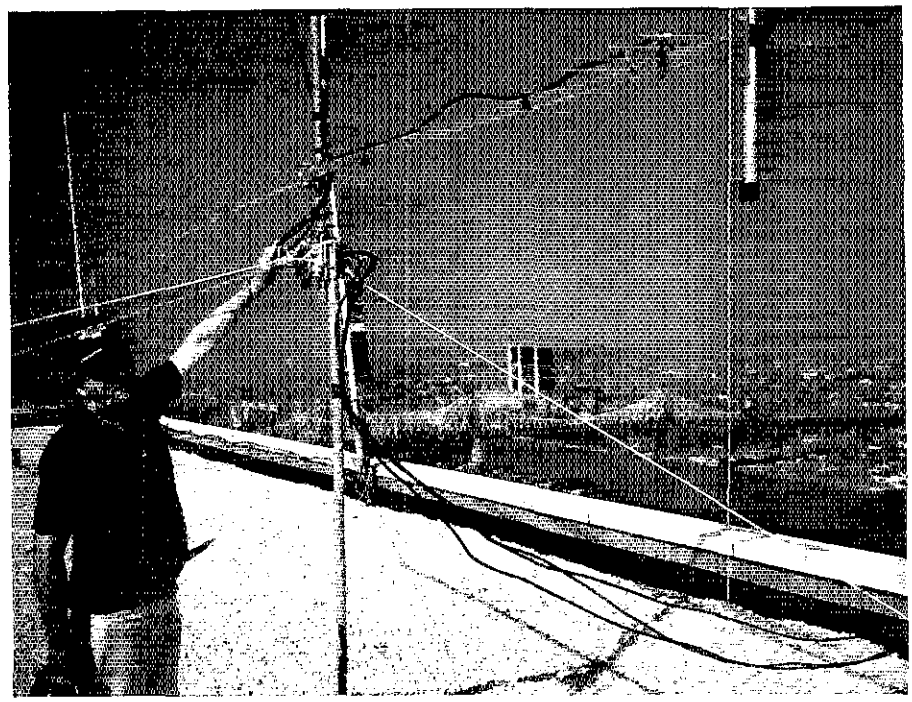
3) *The morning hours* up until noon. The best tropospheric conditions are often experienced in the morning, but conditions may *seem best only after people are up* and on the air. The exception here is the typical peak of 6-meter meteor scatter in the hours just before and after sunrise.

Single-Operator Portable

Many VHF/UHF contesters rarely operate from home. For some hams, the home QTH is located poorly for VHF/UHF work, and a weekend working VHF/UHF DX from a hilltop or mountaintop provides operating excitement not possible from home. For other hams, the attraction is putting rare grids on the air, providing them to others for multipliers and VUCC awards. The easiest portable operations are for a single band, but two or more bands can be set up. If what you read here interests you, see March 1986 *QST* for a detailed "how-to" article on VHF/UHF portable operation.[4]

Portable operators must consider four major factors: power source, rigs, antennas and location. Many rigs will run on 12 volts, so the first two problems can be solved by using your vehicle's battery for power. This approach, of course, limits operation to places where the vehicle can go. A solid-state amplifier capable of bringing power output up as high as the 200-watt range can be easily added to the installation if you want to increase your transmitter power.

Finding suitable antennas and masts is fairly easy, too. A Yagi of reasonable size on any of the bands can be packaged to transport on (or in) virtually any size vehicle. Masts that can be disassembled into 5- or 10-foot sections are readily available. The best installation is a matter of individual taste, but 15- to 25-foot masts are quite manageable. Guy ropes can be used, but guyless installations are possible if a car-top



You can find "mountains" in the strangest places. Karl, W3UBQ, inspects the 2-meter antenna atop the 700-foot United Nations building in midtown Manhattan. This 1987 CQ World-Wide VHF WPX Contest multioperator effort at 4U1UN netted more than 1000 contacts.

carrier or other means of support is available. A limiting factor is your ability to erect and take down your portable antenna when working alone, unless you have ways of enlisting help. Specially prepared short feed lines are best for portable installations.

The ability to rotate your antenna quickly by hand is a real operating advantage. On the VHF and UHF bands, stations sometimes appear—and disappear—very quickly. Being able to get your highly directional antenna onto such stations and work them immediately will bring you QSOs that might be missed by home stations with rotators.

The last important consideration, location, is a topic that often generates hours of discussion among VHF/UHF contesters. For those not desiring to venture too far from home, almost any high spot will do. In flat areas, small rises in the landscape can present excellent VHF/UHF sites. Spectacular sites can be found in more hilly or mountainous areas.

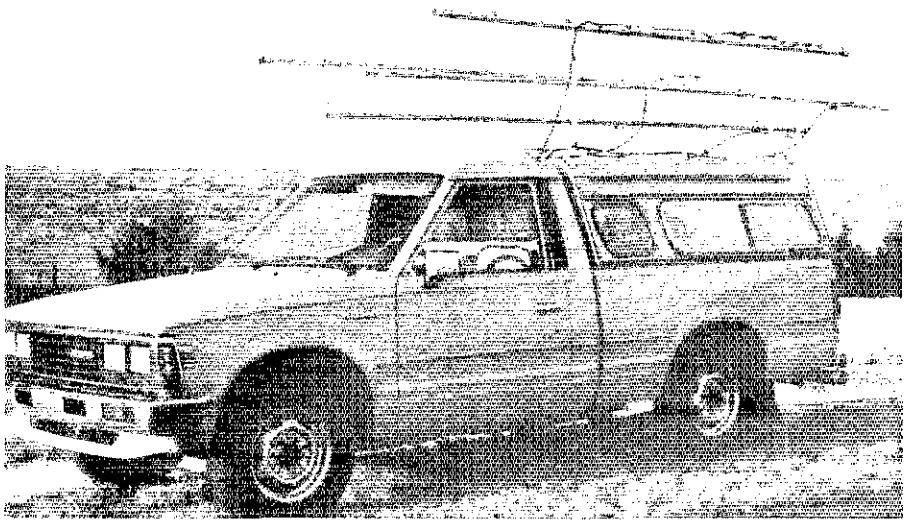
Among the best portable locations are fire-tower sites on hilltops, found in wooded areas all over the continent. For the use of fire towers, and the use of private land, permission to operate must be obtained. Also consider state parks and roadside parking areas for which permission may not be needed. Topographic maps, available at most public and university libraries and at many sporting goods stores, can help you to locate a promising nearby site.

Use your imagination! For urbanites, how about taking the car to the top floor of a multi-story parking building or abandoning the car and operating from the top of a high-rise building? On a college campus, it might be possible to obtain permission to use the roof of a tall dormitory. In rural areas of the corn belt, you could seek permission to operate from the top of one of those magnificent 200-foot grain elevators. And then, there is the possibility of back-packing to the very highest mountain peaks that are not accessible by car.

Perhaps the best stretch of our imagination came the year that we operated the January contest from the press box of the University of Illinois football stadium. We sat there, enjoying a great view of the Illinois prairie in heated comfort, only a short feed line away from our antennas 130 feet above ground.

Don't forget grid squares! You may want to make yourself popular and venture out to a rare one that is within reasonable driving distance. Rare grids include those with little population (especially those with no permanent VHF/UHF hams). Many rare spots are found in the Great Plains, and desert and mountain areas of the continent. Others are rare because they cover very little land, and still others because they are entirely underlain by water. A few very successful grid expeditions have been made by boat. In short, there are rare grids in most parts of the continent that would welcome portable operations during contests.

Perhaps the extreme in portable operation is the grid marathon. Several people have devoted considerable time hopping among several rare grids during contests. Each time one of these stations enters a new grid, it can be worked again for contest credit by others in the contest. These operations are especially popular in the West and the Great Plains. In one such marathon, Dean Lewis, WAØTKJ, operated the September 1986 contest from 18 different grids in Kansas and Oklahoma. He made 275 contacts on four different bands, driving 970 miles in the process. VHF/UHF contesters don't have to be crazy, but it helps.



Dean, WAØTKJ, doesn't like to do things halfway. He mounted gear for 144, 220, 432 and 1296 MHz in his truck and traveled to *18* different grid squares during a September VHF QSO Party. Most people would be ecstatic to just *work* 18 different grids on UHF during a contest...

Single-Operator, Multiband, Home Station

In the major VHF/UHF contests a given station can be worked for credit on more than one band, and multipliers are counted by band, so many hams enter the multiband category. Such entries range from rather casual operators spending a few contest hours hopping among two or three bands, to very serious operators with sophisticated stations working five or more bands and taking very little time for sleep.

For this type of operation it's best to be able to change bands very quickly. Virtually all of the top-scoring single-op VHF contesters can change bands—including amplifiers, preamps and antennas—with the throw of only one or two switches. This

(continued on page 66)

What Equipment Do I Need?

Rather fancy multimode rigs (SSB, CW and FM) are available for several VHF and UHF bands. See the ads in *QST*. Some are even multiband rigs. Don't forget that good older multimode rigs for 50, 144 and 432 MHz are available on the used market. Older-technology rigs made by Kenwood, ICOM, Yaesu and others a few years back can be found for as little as $100 for small portable rigs. If you want a nicer home-station rig, plan to spend $200 to $500, depending on age, condition and features. Most transceivers (even newer models) need a decent receive preamp, commercially available for as little as $30, but otherwise perform reasonably well.

If you already have a good HF transceiver, consider adding a VHF or UHF transverter (transmit and receive converter in one package). Transverters offer good performance and can be less expensive than multimode VHF transceivers, but usually some cabling is required.

One of the great advantages of VHF/UHF operation is the relatively small size of antennas. For 6 meters, a four, five or six-element Yagi at about 30 feet above ground will perform quite well. The size of such an installation is quite small compared to most HF beam installations. For two meters, antennas with booms 15 to 20 feet long (13+ elements), placed as high as possible, will do wonders. Higher-gain antennas, in even smaller space, are possible on the UHF bands.

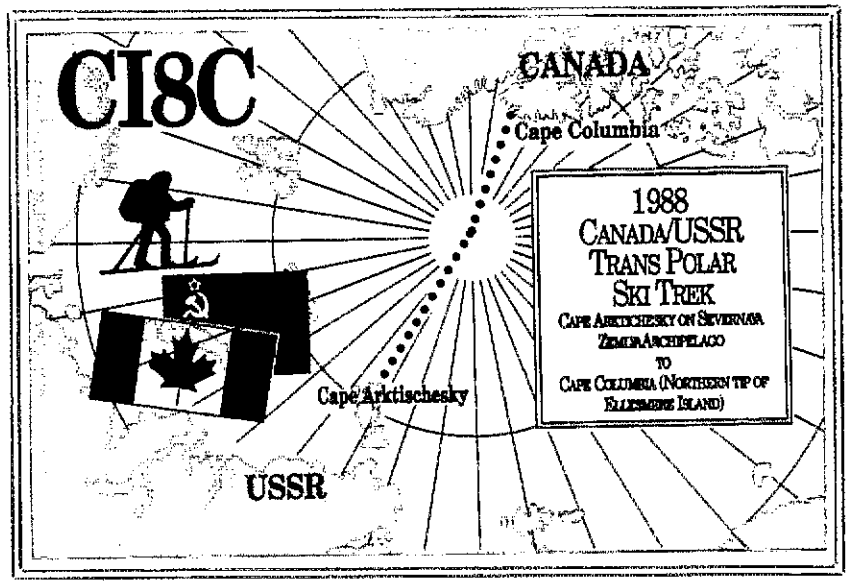
Antennas for most VHF and UHF bands are available on the new and used markets. Considering the number of elements and the gain exhibited by these antennas, their cost is surprisingly low.

It's important to remember that feed-line loss is an important factor at VHF and above. It's best to use low-loss feed line, especially at UHF. If you are not ready to invest in Hardline, Belden 9913 coaxial cable is a good way to start. On 6 and 2 meters, RG-8 will work fine if the feed-line lengths are not too long. Antennas should be horizontally polarized for best DX on SSB and CW.

USSR/Canada Polar Bridge Expedition

The Canadian-Soviet SkiTrek expedition is a unique example of international cooperation through Amateur Radio.

By Tom Atkins, VE3CDM
President, Canadian Radio Relay League
55, Havenbrook Blvd
Willowdale, ON M2J 1A7



The Polar Bridge Expedition, otherwise known as the TransPolar SkiTrek, began its four-month journey across the polar ice cap on March 3, 1988 at 0731 UTC, composed of a group of nine Russians and four Canadians. They started at Cape Arctic, at the Northern tip of Severnaya Zemlya. Their final destination is Cape Columbia, Ellesmere Island, Canada, a distance of almost 2000 kilometers. The trek will take about 100 days.

In March 1987, I received a telephone call from Leonid Labutin, UA3CR, asking for the participation of Canadian radio amateurs in support of this international scientific expedition, which had previously received the approval of both governments. All communications for the expedition would be the primary responsibility of Canadian and Soviet radio amateurs, with help from amateurs everywhere.

In order to facilitate the communications in support of the expedition, a third-party-traffic and reciprocal-operating agreement between Canada and the USSR was specifically negotiated. It became effective October 30, 1987 and lasts until August 1988. This is a historic agreement, the first of its kind involving the USSR. It was jointly signed by senior officials of the Soviet Ministry of Communications, Communications Canada, Dr Dmitry Shparo, UA3AJH, Chief of the Expedition, Chairman Yuri Zubarev of the Radio Sports Federation of the USSR and VE3CDM, the overall coordinator of Canadian amateur communications.

I am being assisted by chief operator Barry Garratt, VE3CDX, who joined the Canadian group in August 1987, and a team of volunteer operators, to carry out this long-term communications assignment. We met with Leonid Labutin and the expedition group in Moscow in late January to finalize communication and safety arrangements.

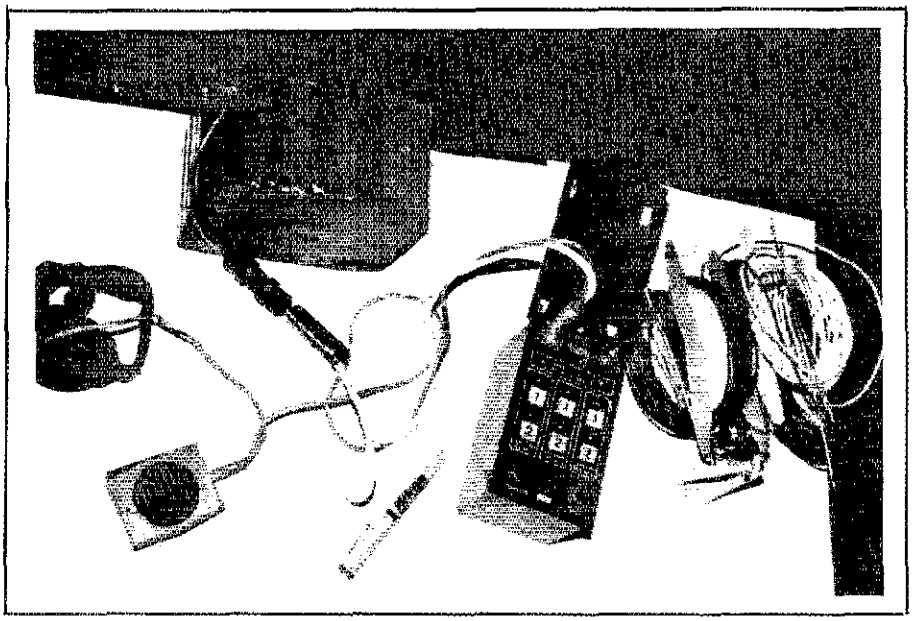
Base Stations Provide Support

The main Canadian amateur base station, CI8C, located at Resolute Bay in the Northwest Territories at 74.43 °N 94.59 °E, is manned by a rotating team of operators including the following: VE3HO, VE1ASJ, VO1QF, VE3XN, VE3ICR, VE3CKP, VE3LVW, VE7HQ, VO1SA, VE3MFT and VE3CPU.

Three of the principal Canadian participants, in March 1988: (l-r) North Pole 28 operator Barry Garratt, VE3CDX/4KØDX; Sridny Island operator Rick Burke, VO1SA/UAØ; and Canadian communications coordinator Tom Atkins, VE3CDM/VE8UA. *(photo by VE3AND)*

The USSR base station, at Sridny Island near the start of the expedition, was jointly manned by Leonid, UA3CR, and Rick Burke, VO1SA/UAØ. As the expedition neared the North Pole in mid-April, control passed to North Pole 28, the floating Soviet scientific station near the Pole where Barry Garratt, VE3CDX, using his USSR call 4KØDX, is working together with Piotr Strezev, 4KØDC. As the expedition starts on its final leg to Cape Columbia, CI8C at Resolute will assume the prime communications responsibility. Canadian operators will be joined by Leonid and Alexandr, UW3GZ. The stream of daily expedition traffic is being handled by the Polar Bridge Amateur Radio network, including stations in Ottawa manned by Ron Belleville, VE3AUM, Garth, VE3HO, in the Niagara Peninsula, Terry, VE8TF, in Yellowknife, UK3KP in Moscow, as well as VE3CDM and VE3QF in Toronto.

All HF and VHF equipment for the Canadian base station was supplied by ICOM, and CI8C is actively operating on all the amateur bands when not engaged in traffic handling. Expedition communications have also used both satellite and



Custom-built Soviet expedition radio, together with microphone, phones and dipole antennas. *(photo by VE3CDM)*

packet modes. All systems have performed extremely well. A special commemorative QSL card will confirm all contacts with CI8C. QSL Manager is David Adams, VE3HBF, PO Box 313, Don Mills, ON M3C 2S7, Canada.

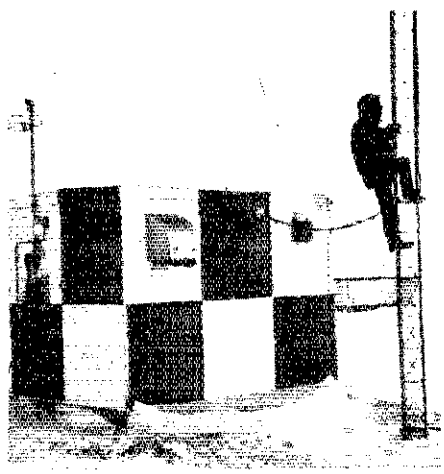
Media Coverage Impressive

Keeping the media informed has been the responsibility of Al D'Eon, VE3AND. Amateur Radio stories and personalities have been featured on local radio and television stations, as well as on national network television, and in daily and weekly newspapers and the major amateur media. The Soviet media have been treating this expedition as an important daily item since the trek began.

For the regular daily communications between the skiers—the "moving group"—and the base stations, a Soviet custom-built 10-watt sideband transceiver is used. It is crystal controlled and works on two selected frequencies in the 20, 40 and 80-meter amateur bands. It is powered by a 12-volt, 50-ampere-hour lithium battery pack. The dipole antennas are supported by aluminum ski poles. The two call signs used by the moving group are EXØVE and CI8UA.

The cooperation and willingness of the Soviets to share their Polar experience and knowledge embodies the best of the spirit of Amateur Radio. Dmitry Shparo, UA3AJH, the leader of the expedition, takes his turn at the end of the skiing line, because he takes responsibility for the well-being of the entire team. Likewise, VE3CDM in Toronto constantly monitors the progress, welfare and needs of the skiers. With the air-drops Christmas comes every two weeks on this journey through a wilderness of solitude where every member of the team is interdependent for survival in a constantly hostile environment.

The main Canadian base station, CI8C, Resolute Bay, Northwest Territories, starts up, February 1988: l-r, VE3HO and VE3CDX at the two HF stations. *(photo by VE3CDM)*



Antenna maintenance at the CI8C radio shack, Resolute Bay airport, is speeded up by the temperature, –2°C! *(photo by VE3CDM)*

Every member is equally important for the success of the expedition regardless of the differences in cultures. Dr Shparo must constantly find a balance between "strong characters" of members drawn from completely different ideologies. "Toughness" takes on a different meaning under these conditions. "Trust" is a more important word when one's survival depends on the cooperation of one's traveling companions.

The navigation component of the expedition, called Project Nordski Comm, is a marriage of existing search-and-rescue technology and good old Amateur Radio ingenuity. It is a truly international project. Using the facilities of SARSAT/COSPAS, the search-and-rescue satellites, as well as the Amateur Radio satellite UoSAT-OSCAR 11 with its "talking computer" on board, it is possible for the skiers to hear their location read to them over the 2-meter FM hand-held transceiver, the ICOM μ2AT, on 145.825 MHz about every 100 minutes. Celestial navigation is also used when possible.

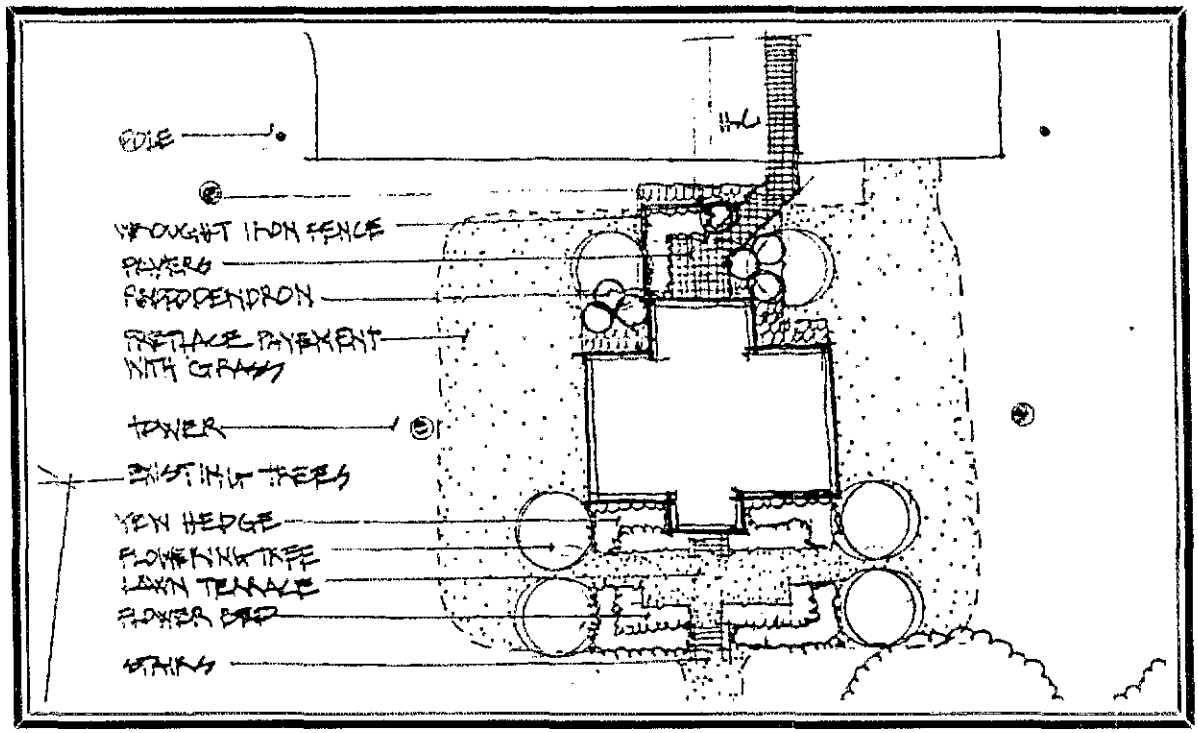
A Truly International Project

As this is written, the group had just about reached the North Pole and were beginning the last leg of this long and perilous journey. This whole project is a team operation, with the Amateur Radio component providing the safety and housekeeping lifeline for the skiers. From the beginning the project has involved many different countries, from the active support and enthusiasm of AMSAT President Vern "Rip" Riportella, WA2LQQ, Richard Ensign, N8IWJ, John Henry, VE2VW, Olle Ekblom, SKØMG, Dr Martin Sweeting, G3YJO, and Mike, GØ/PA3BHF, at the University of Surrey, to the club station UKØKP of the *Komsomolskaya Pravda* newspaper in Moscow and all the amateurs everywhere who have helped by relaying traffic when needed, or standing by patiently awaiting their turn to make contact with the expedition base stations.

It is a truly rewarding experience where the Amateur Radio spirit transcends political or ideological considerations. We are all proud and pleased to have had this most challenging opportunity. We have all made many new friends and learned a little more about how the other person lives!

Tom Atkins, VE3CDM, qualified for a British amateur license in 1950 and holds the call G4ABN. Licensed as VE3CDM in 1968, he is a former President of the Radio Society of Ontario, a founding Director of the Canadian Radio Relay League and its President since 1982. Formerly ARRL Canadian Vice Director and Director, he has been the Canadian IARU representative for the past 10 years and is presently Treasurer of IARU Region 2. A former executive in commercial broadcasting, he recently took an early retirement, does some consulting, but mainly continues to work on behalf of Amateur Radio.

W1AW Renovation Update



The Maxim Memorial Station, W1AW, has a rich and colorful history in serving the Amateur Radio public—through its daily code practice transmissions, amateur news bulletin service and general on-the-air operating. The sidebar by W9BRD is the first installment of "W1AW Vignettes" designed to recapture these glorious events of yesteryear as told by eyewitnesses.

As announced in April *QST*, a goal of $450,000 has been set to completely refurbish W1AW from stem to stern. We are pleased to present some preliminary architectural design work that will reshape the station. This refinishing of the station includes many parts: reconstituting the interior of the building to provide an efficient operating environment for the radio equipment; the extensive electronics expected to be fully computer controlled for operation on all the HF bands, including the WARC bands; three visiting operator studios; updated and expanded antenna configuration; preservation of the exterior of the classic "little brick building"—an international landmark; and complimentary landscaping.

The support of the Amateur Radio community is solicited for this ambitious and necessary project. Please see the information on how you can contribute your share. We thank you for your generous support.—*John F. Lindholm, W1XX, Trustee W1AW*

How to Contribute

W1AW is *your* station. You've been updating your home station periodically, keeping up with the constantly evolving technology of the Amateur Radio Service. After 50 years of nonstop code-practice and bulletin service to the entire amateur community, W1AW now needs to upgrade as well. This is not, however, simply a case of replacing one box for a newer one as you might do in your own shack. This is a massive renovation, inside and out. After years of wear-and-tear, W1AW is in dire need of numerous repairs structurally and technically, just to remain functional. Please help *us* make W1AW a modern station at the cutting edge, one that any ham (and all ARRL members) will be proud of. Here's how to contribute to the Fund Drive:

- **By Mail:** Address all contributions to W1AW Fund Drive, 225 Main St, Newington CT 06111. Please make your check or money order payable to W1AW Renovation Fund.
- **By Phone:** For your convenience, credit-card contributions can be made by calling Jennifer at ARRL HQ, tel 203-666-1541, between 8 AM and 4 PM Eastern Time, weekdays.

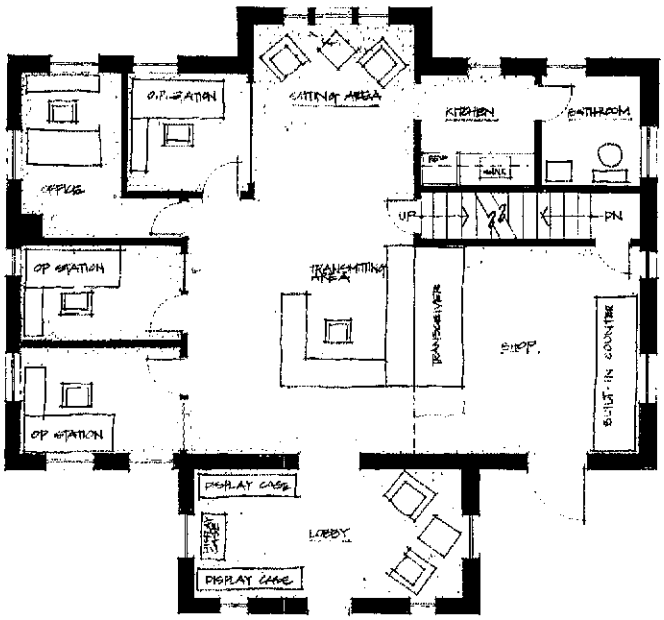
All contributions are tax deductible to the extent allowed by law, as ARRL is a 501(c)(3) tax-exempt organization. Please be as generous as you can to help W1AW maintain its leadership on the frontlines of Amateur Radio technology. *Does your employer have a match-contribution program?* Some major employers will match your contribution. Check with your personnel department to see if this type of program is available to you. Thank you.

Recognition

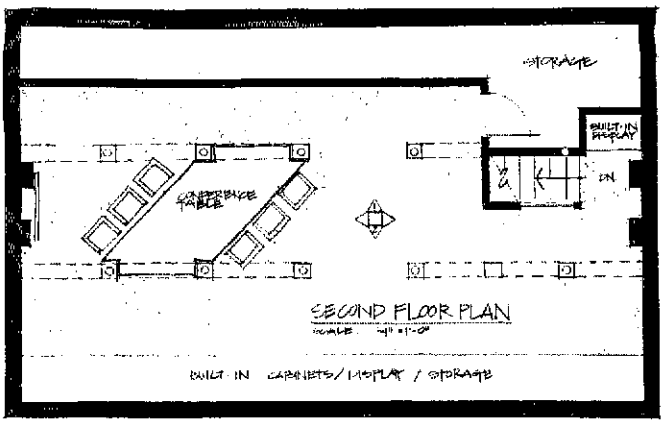
Contributors to the W1AW Fund Drive will be recognized as follows:

- *W1AW Kilowatt Club:* Those contributing $1000 or more.
- *Hiram Percy Maxim Club:* Contributions of $500-$999
- *W1AW Century Club:* Contributions of $100-$499
- *W1AW Booster Club:* Contributions of up to $100

All contributors will receive a handsome certificate, suitable for framing. Members of the *Hiram Percy Maxim and Kilowatt Clubs* will, in addition, have their name and call sign inscribed on a special plaque that will be on permanent display in the renovated W1AW Building. Members of the *Kilowatt Club* will receive a specially inscribed personalized plaque, which you'll be proud to display in your ham shack. In addition, special recognition will be given to those who donate substantially more than $1000.



FIRST FLOOR PLAN



A W1AW Vignette:
Stalking a Phantom at W1AW

My second post-WW II job was a summer stint as staff custodian at W1AW. "Mr Ham Radio," the legendary Ed Handy, W1BDI, met my train in Hartford, fed me my first bowl of clam chowder and helped me secure comfortable quarters on Fern Street—not a bad hillside radio QTH.

W1AW's transmitting equipment had been staff-built to *Handbook* specs: rugged rack construction, with oversized components running cool. There were CW/AM kilowatts on 80, 40, 20 and 10 meters, 50 watts on the new 6-meter band, and a war-surplus 25-watter on 144 Mc. All rigs ran simultaneously on CW bulletin schedules. After radiotelegraphy runs, the 80, 20 and 10-meter gallons were quickly retuned for the voice version, then set back to CW again for the next sequence.

The year 1947, as old-timers will recall, was a period of fantastic shortwave propagation. Record MUFs rose above 50 Mc. day after day; 28 Mc. even stayed open almost around the clock. And there was no TV-oscillator hash, no "woodpeckers"—little spectrum pollution of any kind. Receivers in decent locations could run wide open down to atmospherics. These glorious radio conditions were a key factor in allowing The Bug to crawl out of the W1AW woodwork and rear its ugly head.

The circus began with a phone call from one of our friendly locals. "Hey, Rod, W1AW has a signal outside the band! Just off the low edge of 80. No, it's not *my* heap. Pete hears it, too, and he's twice the distance." The early evening bulletin run was under way. Naturally, any receiver on the premises would be full of birdies, but I could discern an out-of-band signal on the frequency specified. It was umpty-ump dB down, but it was there.

Under the superb propagation prevailing, we had big trouble. Listeners at ARRL's West Hartford lab a few miles away could hear the phantom faintly. Its amplitude varied from barely detectable to totally inaudible. One had to dig for it, but in the quiet winter nights ahead it was likely to be heard far and wide. So we began troubleshooting immediately, confident that the source of heterodyning would be quickly located and eliminated. Hah!

It was easy to establish that running our 3555- and 7210-kc. kilowatts simultaneously produced the spur—sometimes. And sometimes not. Its intermittency thoroughly confused us. A spare receiver was glued to the spur's frequency as we methodically checked every ground and solder connection in both transmitters. Week after week, we gradually replaced all tubes, bypass and blocking capacitors, RF chokes—even resistors. After each new attempt at solution it might be gone for days. But sooner or later it was back, chirping merrily away.

Erudite engineers pondered the problem. "Have you tried this, have you tried that?" Theories grew wildly irrational: nonlinear insulation, cabinet spot-weld mixing—you name it. The thing was eating up man-hours and really wearing us down. We seriously considered running the 3.5- and 7-Mc. transmissions alternately instead of together, or changing frequencies to at least get the birdie inside the band. But it was generally agreed that if one spur was radiating, there undoubtedly were others as yet unnoticed. (Spectrum analyzers, unfortunately, were only laboratory rarities 40 years ago.) We confirmed the phantom as a potential menace because quietly solicited observations on Long Island were affirmative. It was *very* weak, but discernible. One or two new transmitters might clear things up, you say. Might not, too.

The break came one stormy night in February of '48 when I walked over to peak up the 80-meter 250TH grid drive halfway through the scheduled midnight West Coast bulletin run. (In hasty prior retuning, it was easy to overshoot the settings.) As usual, an HRO was monitoring our nasty little friend. One good thing about the awful weather was that high static levels masked weak signals. "Naturally," I thought, "*I'll* be on duty when FCC finally logs you, you little freak." I grabbed the final's grid knob to tweak it slightly. The spurious signal disappeared!

I carefully backed away. We had already pounded the living daylights out the transmitter, jumped up and down on the floor, thumped the walls and ceiling, jarred and jiggled all ac fixtures, ad infinitum, to no avail. Could I now control the bird? Or was this just another frustrating coincidence? I returned pressure to the grid capacitor shaft. Nothing happened. The spur stayed quiet, just teasing again. Before turning away in disgust, I poked the plate tuning knob a few inches away. Back came the bogey! Pressure on the plate tank tuning control keyed the birdie!

Before I left W1AW that night, our nemesis was vanquished. Securely lashing the transmitter's plate tuning capacitor shaft to the cabinet wall wiped it out. Intermittent shaft contact with the panel through an off-center hole had been turning the bird off or on. I left it to others to figure out why. The points of contact were *supposed* to be at common ac/dc/RF ground potential in the first place. I departed Newington for Hartford that snowy night knowing exactly how Wellington felt after Waterloo.—*Rod Newkirk, W9BRD*

"Stalking a Phantom at W1AW" is an abridgment of "The Monster That Attacked Newington: Murphy's 900-lb Canary," Enjoying Radio, *Mar 1987, pp ER0289-0290.*

VHF Contesting

(continued from page 61)

allows them to work a distant or rare station on one band and immediately switch to another band to work that same station.

The basic rule is to work a given station immediately on as many bands as possible. Do not assume that you will hear that station later in the contest—many times it simply does not happen. Similarly, having the ability to listen to more than one band at a time will allow early detection of band openings or the appearance of rare grid squares.

Generally, it takes years to develop the station and the expertise needed to excel in the single-op, multiband category. You can have a lot of fun with a modest station and two or three VHF/UHF bands. This is true even in areas where activity is relatively low, such as many parts of the West. There, the ability to work a dozen grids on one band may not present much excitement for some people, but having the capability to operate on three or four bands increases the interest considerably.

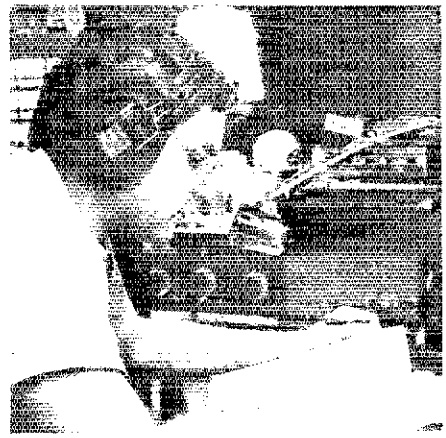
Multioperator, Multi-band

Multioperator VHF/UHF contest operations range from two or three people coming together for a casual weekend of VHF/UHF operating to large, well-disciplined groups that are out to win their regions or a place at the top in national competition. There are many station and operating considerations that lead to success in this category. Among them are the elimination of interference between stations, and the communication between stations. Communication is important for the same reasons that single-op stations need to switch bands quickly—to work a given station on as many bands as possible as quickly as possible.

In every region of the continent, there are multiop groups that have been successful in recent years. Some of them are home stations. For example, Pete Sias, WBØDRL, has put together a big station in central Kansas and regularly invites guest operators over for VHF/UHF contesting. That group placed third in the multiop category in June 1987 and seventh in September 1987.

Many other operations are portable, especially in the summer contests. The W2SZ/1 group has had much success operating from Mt Greylock in western Massachusetts, coming away from many June and September ARRL contests with first-place honors. (It's a bit too cold on Greylock in January for a serious VHF Sweepstakes operation.)

A group from W4BFB has popped up in many contests over the years from various mountaintops in the southeastern US. The W9UD/WØOHU traveling group has operated recent June ARRL contests from hilltops in six different states ranging from Minnesota to Arkansas. Several West-Coast groups take advantage of the many excellent mountaintop sites in that region. A fifth-place national ranking was attained in last year's June contest by a group using the call N6CA. They and other groups have used Mt Pinos in southern California, over 8000 feet in elevation and a very fine VHF/UHF contest site. In a creative effort, Dave Carlson, AA9D, has organized a group that operates contests from Bald Knob, in southern Illinois. The hill itself is an excellent site, but is made better by the fact that antennas are mounted on a 111-foot *cross*. The cross can be seen from miles away, and AA9D's signals can be heard from *hundreds* of miles away!



Big-gun multioperator stations need separate stations for each band and plenty of operators to be successful. Here, Frank, WA2VYA, operates 6 meters at N2SB during the January 1988 VHF Sweepstakes. Operating from the QTH of Rick, WC2K, the N2SB group has "owned" the top national multiop score in the past three January Sweepstakes contests.

Novices Can Enjoy VHF Contests, Too!

Novice Enhancement has opened the door for Novices to participate in VHF contests. Via FM on two bands—1¼ meters and 23 centimeters—Novices can make a few contacts and taste the excitement of VHF contesting.

Contest rules limit FM activity to *simplex*. This means no repeaters, even for soliciting contacts to be made later on simplex. The most popular simplex frequencies are 223.46, 223.50 and 1294.50 MHz, with the majority of activity taking place on 223.50 MHz. Near big cities, and especially on the East and West Coasts, Novices may find stations seeking contacts in the contests. Just monitor the simplex frequencies—if stations are on the air, you'll hear them.

In all ARRL contests, the exchange is just call signs, grid square and acknowledgment. Don't worry if you aren't familiar with grid squares; the other contest participants will gladly explain them. It could hardly be simpler!

Novices aren't likely to break any records, but don't let that stop you from trying. Perhaps a few hours monitoring FM simplex will whet your appetite for the exciting world of CW and SSB VHF operation—just a Technician's ticket away.

Getting Started in VHF/UHF Contesting

Readying a home or portable station for one or more of the VHF/UHF bands is an obvious starting point. There is no substitute for being on the air and getting the "feel" of a band before a contest. But there are additional ways that you can prepare. For starters, read about the results of previous contests. (In recent years, major ARRL contest results have been found in the January, June and September issues of *QST*.) To learn more about VHF/UHF DXing in general, read Bill Tynan's monthly VHF column in *QST*, The World Above 50 MHz. Operating tips can also be found in the regular VHF/UHF Contesting! column in the *National Contest Journal* and in the chapter on VHF/UHF Operation in *The ARRL Operating Manual*.

If there is a ham in your area who regularly participates, get together with him or her for advice on how to proceed. Better yet, if there is a multiop group nearby, see if you can join it for the next contest. Most groups will be happy to include one more person.

Whether you decide to join a group or decide to set up a station yourself, or both, remember that you don't have to be an expert or spend a lot of time to enjoy VHF/UHF contests, and you don't have to win to have fun. A few hours of prime-time operation, perhaps with the goal of working a few new grids, can be very satisfying.

Notes

[1]B. Lunt, "Results, 1987 June VHF QSO Party," *QST*, Sep 1987, pp 78-83.

[2]E. Pocock, "Sporadic-E Propagation at VHF: A Review of Progress and Prospects," *QST*, Apr 1988, pp 33-39.

[3]M. Owen, "The Great Sporadic-E Opening of June 14, 1987," *QST*, May 1988, pp 21-29.

[4]J. Lindholm, "VHF Mountaintopping for the '80s," *QST*, Mar 1986, pp 49-51.

Strays

CALL FOR *QST* ARTICLES

You're on ATV. Can you tell others—in simple, easy-to understand terms—what ATV is and how to join in the fun? Need an Author's Guide? We'd be happy to send you one. In case you're not aware of it, we pay $50 per page published for feature articles. Contact Paul K. Pagel, N1FB, *QST* Senior Assistant Technical Editor, 225 Main St, Newington, CT 06111 or call 203-666-1541.

Happenings

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

ARRL Files Reply Comments to UPS

"There is nothing in the UPS comments which establishes anything unique about 220-222 MHz as a place to implement what the UPS describes as 'an advanced private land mobile telecommunications data network.'" This is one of the key statements in the League's reply comments to the late-filed comments of the United Parcel Service in Docket 87-14, the FCC proposal to remove the bottom 2 MHz from the 220-MHz band from the amateur service.

In fact, UPS says in its comments that this network will take place initially in the 150-MHz band, spaced between wideband FM channels. The only reference to any need for the 220-222 MHz band is that UPS "expects that it ultimately will need to use the channels in the 220-222 MHz band at issue in this proceeding in order to complete implementation of its system."

Our reply comments continue to emphasize that the 220-222 MHz band is critical for the development of packet links and also note that the number of repeater listings for the 220-MHz band in the *ARRL Repeater Directory* has increased from 1173 to 1421, an increase of 18% in one year, showing greatly increased pressure on the 220-222 MHz band segment. Moreover, the number of listed packet-radio links in the 220-222 MHz segement more than doubled in one year. "The doubling of such stations in the band in only one year under the threat of complete disfranchisement attests to the urgent, unique need for that particular segment and the rate of growth of the packet network overall. Second, the nature and degree of loading at 222-225 MHz is such that relocation of the disenfranchised packet links, should 220-222 MHz be appropriated...will not be possible."

Last, we concentrate on the lack of understanding by UPS of the technology and the nature of amateur operation generally. For example, UPS notes in its comments, "the few repeaters which now operate within the 220-222 MHz band could easily be placed in other parts of the spectrum without undue coordination problems." Of course, it is not just repeaters which will be displaced, but rather control links, weak-signal operation and packet links, and we take the opportunity to explain their importance.

We conclude by saying: "All that UPS has offered in this proceeding is a vague statement of support for the proposed appropriation of two megahertz of spectrum which has been repeatedly demonstrated to be of critical importance to the Amateur Radio Service...Nothing submitted by UPS or any other commenter has established that the same goals which might be accomplished at 220-222 MHz could not be satisfied by use of either the 150-MHz band or the 30-50 MHz band."

FCC DENIES PETITIONS

The FCC recently denied a petition by Ben Johnson, NYØO, of Winfield, Iowa, to eliminate the 5-WPM code requirement for Novice and Technician class Amateur Radio licenses.

The Commission, in denying the petition to amend section 97.23 of the FCC Rules, stated that treaty obligations require that "any person seeking a license to operate the apparatus of an Amateur Radio station shall prove that he/she is able to send and receive text correctly in Morse code signals." (These requirements may be waived in the case of stations making use of frequencies above 30 MHz.)

Three reasons were cited for retaining the telegraphy requirement: First, a 5-WPM code requirement *does not* constitute a significant entry barrier to the amateur service; second, knowledge of the Morse code continues to be relevant to everyday operation; and third, a code requirement for every license class is important in maintaining the traditional public-service role of the amateur service in emergencies.

The Commission also denied a petition filed by Dr Howard Elmore McKeathian, N6ELL, of San Bernardino, California, seeking to expand the privileges of Technician class operators. Dr McKeathian requested additional HF frequencies "so that the public needs might be better served by the Technician Class operator and the amateur service made more enjoyable to Technician Class operators." In denying the petition to amend Section 97.7 of its Rules, the Commission stated, "the operator license classes and associated privileges were developed to provide motivation for amateur operators to advance their skills in both communications and technical phases of the radio art and nothing in the 'instant' petition indicates the basic structure of amateur licensing is falling short of its goals."

James M. Fisher, K4GF, filed a petition with the FCC in November 1987 that proposed to limit the broadcast of Amateur Radio information bulletins to 10 minutes during each 24-hour period. The FCC recently denied the petition, saying, "Information bulletin transmissions have served the amateur community by providing an effective means of keeping amateur operators informed about their service. For example, the club station of the American Radio Relay League Headquarters Operators Club, W1AW, transmits concise information bulletins at regular intervals several times each day using voice, telegraphy, and teleprinting."

The Commission concluded "the transmission of information bulletins is not of lesser importance than other types of permitted transmissions, and the imposition of an arbitrary time limit of 10 minutes a day would be an unnecessary restriction on one-way transmissions that assist in keeping the amateur community informed about their radio service."

ANTENNA VICTORY IN NEWPORT BEACH, CALIFORNIA

Amateurs are now allowed towers up to 75 feet high in Newport Beach, California. After nearly three years of discussion, the city council voted (unanimously) to accept the new ordinance, citing PRB-1, the FCC preemption order, as being instrumental in making the vote unanimous.

The new ordinance is still subject to review, but the 75-foot height limitation should stand. The ordinance requires that antennas be lowered to 28 feet when not in use, except vertical "whip" antennas. All existing antennas in Newport Beach are "grandfathered"; however they are required to comply with the ordinance "to the extent that they are capable of doing so without modification." All pre-existing towers must meet the new standards if relocated or expanded.

If the ordinance proves unworkable, or if further research shows it to be out of line with other cities' height limitations, at least four of the council members would be in favor of re-evaluation after the 60-day review period.

AM BAND EXPANSION UPDATE

FCC Commissioner Patricia Diaz Dennis will head the US delegation to the second session of the International Telecommunication Union (ITU) Regional Administrative Radio Conference, to be held in Rio de Janeiro May 23-June 9. It will establish a plan for the broadcasting service in the band 1605-1705 kHz in Region 2.

This second session will plan the use of the 10-channel (100-kHz) expansion of the AM broadcast band, which now ends at 1605 kHz. The new channels are to be used in the US for additional full-time commercial and public-service broadcasting stations, and a travelers information service.

SPECIAL EVENTS COMMUNICATIONS MANUAL AVAILABLE

Are you or your club involved with public-service functions such as parades and emergencies? Have you ever wondered how to coordinate the setting up of a special-event station? If your answer is "yes," the League has a new publication that is just what you've been searching for.

The *Special Events Communications Manual* is now available from ARRL HQ and your local Amateur Radio book dealer for $5 (add $2.50 shipping if ordered from HQ). The publication covers such topics as the legalities of commercial events, working with volunteers, and providing marathon and parade communications. There is even a chapter on working with sponsors and public-safety officials.

One of the main purposes of Amateur Radio is public service, and it's a great way to make our hobby known to the community. The *Special Events Communications Manual* is fully illustrated and contains many photographs of hams in action at special events. Very interesting reading!

H. H. "ROBBIE" ROBINSON, W4QR, SK

Harold H. "Robbie" Robinson, W4QR, 84, formerly W3RE and 2QR, became a Silent Key March 2. Robbie was active in the ARRL and Quarter Century Wireless Association (QCWA), but is probably best known for his partnership in the Gonset Company. Robbie was co-designer of the Gonset line of equipment [that at least *some* of us remember fondly—Ed.]. Robbie also was the founder of the Foundation for Amateur Radio (FAR) in Washington, DC, and was living in Hampton, Virginia.

The Amateur Radio community will miss this pioneer.

QCWA HONORS VIC CLARK, W4KFC (SK)

The late Vic Clark, W4KFC, has been elected to the QCWA Hall of Fame. A plaque was presented to Vic's widow, Hester, WA4PAE, and son Ken, K4OKZ, at a recent meeting of the local Vic Clark Chapter of the QCWA in the Washington, DC area.

BOB HENRY, WØARA, SK

Robert E. Henry Sr, WØARA, 80, owner of Henry Radio, Butler, Missouri, since the 1930s, is now a Silent Key. Bob was first licensed in 1924 as 9ARA and held an EE degree from MIT. His company bought and sold new and used amateur equipment and is well known among amateurs for its "2K" line of linear amplifiers. Henry Radio with stores in Butler and California, is probably *QST*'s longest running advertiser—54 years and still going!

AMBASSADOR WILLIAM J. PORTER, SR, K1YPE, SK

Retired Ambassador William J. Porter, K1YPE, ex-W3AAC, became a Silent Key March 15. He was a career US foreign service officer for over 40 years, serving in many countries, mostly in the Middle and Far East.

Porter was a Political Officer in Jerusalem from 1946-8 during the period that Palestine was partitioned and the State of Israel created. After assignment to Cyprus he served in Morocco, where he operated as CN8EP. In 1962 he became the first US Ambassador to Algeria and operated under the calls FA2VX and 7X2VX. Leaving Algeria in 1965, he was assigned as Deputy Ambassador to South Vietnam and held XV5AA. From 1967-71 Porter served as Ambassador to South Korea (HL9AA) and served as Chief of the US Delegation to the Paris Peace Talks (FØADL) in 1971-2. Prior to his retirement in 1977, Porter served as Ambassador to Canada and as Ambassador to Saudi Arabia (7Z1AB). He was 73 years old and a Life Member of ARRL. The amateur tradition continues with his son, William J. Porter, Jr, KA4NAU.

ARRL BEST SELLERS ANNOUNCED

Here's the top-10 most popular ARRL publications list for 1987.

Title of book	No. Distributed
Repeater Directory	58,733
Tune in the World	57,926
ARRL Handbook	48,173
Tech/Gen License Manual	33,621
FCC Rule Book	28,154
Advanced Class License Manual	14,840
Operating Manual	14,574
Antenna Book	13,208
Net Directory	11,373
Extra Class License Manual	10,388

FCC-Issued Call Sign Update

Amateur Radio operators often wonder what their new call sign will be after passing that all-important exam. Often it is possible to "predict" with some accuracy what that call will be by consulting the FCC list issued monthly. Below is the April 1988 list.

District	*Group "A"*	*Group "B"*	*Group "C"*	*Group "D"*
Ø	WGØL	KEØUK	NØJCX	KBØCFX
1	NQ1N	KC1IY	N1FPV	KA1RUS
2	WF2H	KE2FT	N2IBH	KB2FKF
3	NO3C	KD3HM	N3GCM	KA3SWX
4	AB4HM	KK4ZW	N4SMH	KC4EKF
5	AA5FH	KG5IW	N5MJA	KB5FUB
6	AA6HS	KJ6FF	N6RUN	KB6WSG
7	WM7M	KF7IV	N7KUR	KB7EKE
8	WD8X	KE8QZ	N8JJE	KB8EJW
9	NY9H	KE9JZ	N9HJN	KB9ALH
Guam	KH2I	AH2BY	KH2DG	WH2ALL
Hawaii	**	AH6IY	NH6OW	WH6BXK
Am Samoa	AH8C	AH8AD	KH8AF	WH8AAW
Alaska	**	AL7JS	NL7NE	WL7BQY
Virgin Is	KP2Y	KP2BN	NP2CM	WP2AFZ
Puerto Rico	**	KP4OW	WP4NV	WP4HWT

**—Indicates all Group "A" call signs have been issued for that area. For further information regarding amateur call signs, consult *The FCC Rule Book* or Section 97.51 of the FCC Rules.

N1EOZ JOINS HQ PRODUCTION STAFF

Sheldon (Shel) Ball, N1EOZ, has joined the Production/Editorial staff at HQ as Editorial Assistant. His duties include editing *QST* manuscripts and acting as handling editor for Strays, YL News and Views, 50 and 25 Years Ago, and *QST* Profiles.

First licensed in 1984 as KA1LMG, Shel now holds a General class ticket. He earned a BS degree in Communications Arts and Science from Lyndon State College in Lyndonville, Vermont. Welcome aboard, Shel!

FCC PERSONNEL CHANGES

Michael Marcus has been named Assistant Chief for Technology in the Field Operations Bureau of the FCC. Previously Marcus served as Chief, Technical Analysis Division, Office of Science and Technology. He earned his ScD Degree in Electrical Engineering from the Massachusetts Institute of Technology and has taught courses there in communications technology and policy.

NEW INTERFERENCE PAMPHLET AVAILABLE

The FCC, together with the Electronic Industries Association (EIA), has published a pamphlet, *Consumers Should Know Something About Interference*. This publication is designed to assist *consumers* in the identification and resolution of common problems with interference to home electronic products such as VCRs, TV sets, electronic musical instruments and cordless telephones. The easy-to-understand pamphlet contains step-by-step methods of understanding and resolving interference.

Copies of this publication are available from any FCC Field Office, or from FCC, Public Service Division, 1919 M St NW, Room 725, Washington, DC 20554, or, Executive Director of Consumer Affairs, Electronic Industries Association, 2001 Eye St NW, Washington, DC 20006.

DAYTON AWARD WINNERS ANNOUNCED

The winners of the Dayton Amateur Radio Association, (DARA) have been announced:

Radio Amateur of the Year: Bill Bennett, W7PHO (SK). (Bennett is the first Silent Key to be honored with this, or any, DARA award). Bennett was noted for the creation of the Western Washington DX Club and for the DX Family Hour Net.

Special Achievement: Fred Hammond, VE3HC, for his assistance in getting amateur stations in the Peoples Republic of China on the air, and for his work in setting up his antique radio museum.

Technical Achievement: Lew McCoy, W1ICP. Lew, who was one of the ARRL staff for 28 years, was cited for his simple and easy-to-understand construction projects which helped the budding amateur to more easily understand the technical aspects of the hobby.

OOPS DEPT

Murphy infiltrated the caption of the photo in last month's Happenings column. The position of the hands notwithstanding, the *ARRL Handbook*, Spanish language edition, was presented by ARRL President Larry Price, W4RA, to LMRE President Guillermo Nunez, XE1NJ (right), with Mayor Bob Pinkerton, Jr of South Padre Island, Texas looking on. The photo was taken by N1CIX.

GOLDWATER SCHOLARSHIP FUND CONTRIBUTION

James M. Webster has contributed $100 to the Senator Barry Goldwater Scholarship fund.

ARRL FILES REPLY COMMENTS TO TV ANSWER PETITION

"The sole apparent basis for the TAI (TV Answer) petition is to make an appearance before the termination of Docket 87-14, which will determine the allocation status of the 216-225 MHz band. Ripe for consideration or not (and clearly it is not), TAI filed its premature petition in order to establish a late foothold in the Docket 87-14 proceeding. Considered as a petition, however, it does not disclose sufficient reasons to institute a rulemaking according to Section 1.407 of the Rules, and thus must be dismissed." This was one of the major conclusions of the 14-page reply comments filed by ARRL on May 2 in response to TAI's petition for 500 kHz in the 220-222 MHz band.

Our reply comments question why TAI needs valuable spectrum space for its system. "[T]here are many alternative methods of viewer polling which do not involve the installation of thousands of inexpensively manufactured, high-power radio transmitters at thousands of residences, and the use of valuable spectrum of critical importance to the Amateur Radio Service. TAI's petition does not address the alternatives of two-way cable for cable television and wireline, digital communication methods...or the use of fiber-optic technology."

Our comments also noted that TAI had not demonstrated how its proposed system would be compatible with existing co-channel and adjacent channel users. If such a system did operate in the 220-222 MHz band, the second harmonic would fall within the 440-444 MHz amateur segment which contains numerous ATV and FM repeater systems. Our comments point out that it would be extremely unwise for the Commission to sanction thousands of inexpensive, unmaintained, 50-watt transmitters which could interfere with amateur communications, television receivers and various home electronic equipment.

Our reply comments conclude that the TAI petition is "entirely inappropriate" and must be dismissed or denied.

TELEPHONE RFI FILTER FROM AT&T

Are your transmissions being heard on nearby telephones? There is a modular in-line RFI filter available from AT&T which the company says is guaranteed to work when used in conjunction with an AT&T desk telephone. A similar model is available for wall phones. The filter, model Z-100A, is priced at $17.50 plus shipping and is available from AT&T stores or by calling 1-800-222-3111.

BODONY COURT CASE CITATION

In 1986 Andrew Bodony, K2LE, brought suit in US District Court to overturn denial by the Village of Sands Point, New York, of his application for a building permit for an 86-foot tower, retractable to 23 feet. As detailed in December 1987 *QST*, the court found PRB-1 to be a proper exercise of FCC authority and invalidated the city's 25-foot height limitation as it unduly restricted amateur antennas. This case represents the first time a zoning ordinance was declared invalid on the basis of PRB-1 and it sets an important precedent for radio amateurs fighting unreasonable local zoning ordinances.

For the "legal eagles" in our readership, the prestigious Pike & Fischer Radio Regulations has now published this case. Its citation is: 64 Pike & Fischer Radio Regulations 2d 307.

FCC TAMPA OFFICE MOVES

Effective immediately, the new address of the FCC Tampa, Florida office is FCC, Airport Executive Center, 2203 North Lois Ave, Room 1215, Tampa, FL 33607, 813-228-2872.

Strays

I would like to get in touch with...

☐ anyone with a manual and schematic for a KDK FM-2016A transceiver. Terry Isenhour, WA4OPO, Rte 2, Box 633, Lincolnton, NC 28092.

***QST* congratulates...**

☐ Jim Newcomb on being promoted to National Sales Manager for ICOM America's Amateur Division.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

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

VISUAL BEAM PERFORMANCE—TEST WORKS!

☐ I was impressed by the cover of April 1988 *QST*, so I decided to try this test myself. I don't have a beam antenna, but I figured that it might work using my vertical.

The results were spectacular! The neighbors observed the phenomenon in awe! I got a brightly colored cone because my antenna is omnidirectional.—*John W. Crabill, WA7YVZ, Freeland, Washington*

☐ Works great! I am trying to find the power points.—*Jack Sobel, WØSVM, Chesterfield, Missouri*

☐ The system for visually testing beam antennas which was shown on the cover of April 1988 *QST* should be of interest to all technically minded amateurs. The method, moreover, presents a great challenge for further experimentation.

A question arises around the author's reference to a "horse syringe." There are few horses in Skokie, Illinois, and even fewer horse syringes. A household vacuum cleaner, used in the reverse blower mode, proved to be difficult to control; fortunately, the dye was easily removed from the side of the house! The problem was finally solved with a highly modified grease gun. A poultry baster might also be adapted for the purpose.

I experienced some difficulty with different dyes, and believe that the manufacturer's formulation is critical. In the holiday foods display at our supermarket, I found a packet of Easter-egg dye. Checking the results against more sophisticated field-strength techniques, I have concluded that this was the most satisfactory material.

To learn more about what was happening, I borrowed my wife's chromatograph/mass spectrometer and ran some tests on the other dyes. In almost all samples, I discovered traces of metals. These may have been basic to the colors produced, or perhaps were manufacturing contaminants. The Easter-egg dyes showed no such components and, indeed, the label indicates that this brand is "pure vegetable."

Observations with my surplus Mark 2 magnetometer in the area around the beam reveal that positive correlations exist between variations in the local magnetic field and the formulation of the dye. I have not pursued this line of research fully, but my initial conclusions are that geomagnetic effects can be avoided by using nonmetallic dyes.—*Julian N. Jablin, W9IWI, Skokie, Illinois*

☐ After reading about WBØTUH's experiment using dye in the coax as a measuring device on forward gain and F/B ratio on beams, I decided to give it a try.

After purchasing some RIT™ dye from the local supermarket and borrowing a horse syringe from the horse hospital down the road, I proceeded to follow WBØTUH's directions. I found that it was easier removing the PL-259 from the RG-8U and inserting the syringe. I used one quart of green dye and replaced the PL-259. Now for the great moment! I keyed the transmitter, ran outside and looked upward to the antenna.

Sure enough, there was a beautiful green beam shooting out of the director! The beam was a little broad, but then my KT34A is supposed to be a broadband antenna! What would it do if connected to the amplifier? Going through the same procedure as before, I used one quart each of red, green and blue dye. I again keyed the rig with the amplifier on and ran outside. Lo and behold, there was the prettiest straight rainbow.

Someone else will have to spend some time with this problem since I am spending all of my time trying to get dye off my face and hair!—*Lex Shackelford, W5MUA, Summerfield, Florida*

VISUAL TESTING: "BEST ON APRIL 1"

☐ Following the ingeniously conceived method of Clarence Henderson, WBØTUH (April 1988 *QST*, page 3) for visually testing the performance of my beam antenna, I found enlightening results that confirmed that Henderson's phenomenon is best observed on April 1. Also, at this latitude, the optimum time is 0401Z, but meaningful data can also be obtained at 0401 CST. These narrow time windows were foreseen by the early and unlicensed contributor Loof Lirpa in April 1913 *QST*, page 401.—*Marvin McGarity, W4WU, Birmingham, Alabama*

☐ I must admit that I was really taken in by the April *QST* cover. Shame on you for taking advantage of us who have lived so long and seen so many wonders that we are no longer surprised at anything. When I found out that the effect was best observed on April 1, I nearly fell out of my chair laughing. Thanks for brightening up a long winter!—*Johnny T. Farmer, K5TGY, Little Rock, Arkansas*

NO SUCCESS WITH BEAM TEST

☐ Regarding your April cover, I faithfully followed your instructions on page 3 and I wish to advise you that the test did not work! However, after keying the transmitter, I noticed colored water dripping out the back of the transceiver onto the desk and floor. Could it be that my own SWR is so high that all of the RF is being reflected back down the coax?—*Gene Melton, W5KZZ, Amarillo, Texas*

NEIGHBORS IMPRESSED BY AURORA

☐ Never at a loss in trying something new, I was quick to pick up on the WBØTUH method of visually testing beam antennas. After bending two needles, the third finally did get into the coax. That shielding sure is tough! After injecting the dye, the auroral display was spectacular! My neighbors were impressed. But, now I am receiving reports of crocus flowers wilting, brown patches forming on lawns and evergreens dropping their foliage. The neighborhood cat is losing its hair and won't eat its regular food.

Field testing now has a whole new meaning in Amateur Radio. Let's be careful out there!—*Ernest C. Laug, KA1NGG, Stamford, Connecticut*

ELECTRON EXPERIMENTATION: NOT NEW

☐ Congratulations to WBØTUH on his method of testing a beam antenna visually, as pictured on the cover of April *QST*.

I'm reminded that back in the '30s I used a grid-leak drip pan on my UX-245 TNT oscillator. I put the collected electrons on my antenna to increase radiation efficiency. Alas, progress in electronics eliminated grid-leak drippings so I am now limited to collecting excess micros from the microprocessors at my station. I have a large supply of these, but haven't found a use for them. Perhaps, in combination with some surplus picofarads, a new type remote control capacitor can be devised!—*Jim Gundry, W4JM, Lakeland, Florida*

"BRAVO!"—APRIL "LEAQUE LINES"

☐ Bravo! Bravo! Page 14, "Leaque Lines," April *QST*, was super. We need this type of humor occasionally. This approaches the "Messy Shack Contest" article which appeared in last year's April issue.—*Joseph R. Koval, W3IVG, Hazleton, Pennsylvania*

☐ I always look forward to each year's April *QST*. Once again, you've come through magnificently. A "code-but-no-theory" license, indeed! There's nothing quite like throwing out the baby while keeping the bathwater! But tell me—has your author ever heard of anything called "Novice Enhancement?"—*Phil Karn, KA9Q, Warren, New Jersey*

APRIL "LEAQUE LINES" STINKS

☐ I enjoy a well written April Fool article and I have been taken in on several occasions over the past 50 years. However, I consider your attempt at this annual humor on page 14 of April *QST* an insult and a disgrace to the League. It is simply juvenile and a waste of expensive space in *QST*. I view the cover of April *QST* to be in good taste and appropriate for the occasion. —*John Parrott, Jr, W4FRU, Suffolk, Virginia*

☐ With reference to April *QST*s "Leaque Lines"—April foolish, no. Idiotic, yes. —*Ron Schwendt, N3AR, Douglassville, Pennsylvania*

How's DX?

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

My Trip to the United States

How are W-hams perceived by the DX world at large? That pretty much depends on how we greet the non-W. That greeting may not only be on the air, but can actually be "in-person"—a reciprocally golden opportunity, as related in this issue by Kamal T. Hamzi, EL2AY.

Every Sunday night I've had a 2100Z schedule on 14200 with my New York friend KA2QWZ. With one single contact a few days before leaving for the US, our friendship started. I telephoned him when I arrived in New York last April. His family invited me and my friend Issa to their home in Pine Grove, about a 2½-hour drive out of the city, where they hosted an elaborate dinner, welcoming us with the warmth usually reserved for close family friends.

One of the evening's many highlights included using his station to contact 5L2CE, who then called my wife to report my safe arrival and enthusiastic welcome. The family's hospitality went even further. An elaborate fruit basket and their best wishes awaited me in my hotel room the next day. Although a hectic business schedule kept me from seeing many of the sights of New York, I have an open invitation to come again and explore the many cultural highlights and the bright lights of the city.

After talking to Maryann, WA3HUP, for years, it was a great pleasure to meet her. I was overwhelmed that Maryann and her son Gary would be awaiting my arrival at Harrisburg Airport. She drove me to her home, showed me her radio shack, gave me a tour of the majestic countryside, and escorted me to the QTH of our mutual friend Ruth, WB3CQN. Ruth, who had taken the afternoon off work to meet me, joined us for a delicious meal and a much-too-short visit. That night I flew to Boston and was met by a Liberian friend. The next day, I caught an afternoon flight to Dallas.

In Dallas I was met by my QSL Manager, Carol, N5GAP, a well-known ham to the Liberia Radio Amateur Association. I was surprised to find that she had canceled my hotel reservation, and insisted that I stay with her family in their Arlington home. After a delicious meal cooked by her daughter Susan, we went through a stack of pending correspondence, QSLs, etc.

The next morning I was in for another surprise. In walked a dear childhood friend who I hadn't seen in 10 years, who had left Liberia and settled in Texas, and had been informed by Carol about my arrival. After cooking lunch, Carol encouraged me to make myself at home in her shack. I made contact with EL2CE and EL2EN in Monrovia. EL2EN relayed messages to some of my close friends.

Although Carol tried eagerly to entice me to stay so she could hold a party for me to meet her ham friends, I had to tear myself away from this warm welcome to fly back to Monrovia. Her farewell was mixed with tears. But it also had its moment of true joy. Carol promised to visit Liberia during the climax of our 25th-anniversary celebrations.

Even on board my homebound flight, I was showered with generosity. After an animated conversation with a Massachusetts journalist writing for the Martha's Vineyard *Gazette*, I still receive courtesy copies of this newspaper.

EL2AY (seated) visiting his QSL Manager N5GAP.

TNX 5 AND 9: QSZ?

[The following material is courtesy of W6BDN.]

"Your signal report is S4 + 30 dB." If you don't remember the significance of that report, or if you have come on the scene more recently, it would be well worth your while to dig into the archives and see *QST*, January 1963, page 29. The fine vintage Troster Tip presented there is still just as valid—maybe more so!

I heard a Caribbean station booming in at 5 and 9 on 75 meters. With my situation and location that is very unusual. Locals sometimes lift the receiver off the table, but on 75 anything that qualifies as any kind of DX is usually competing with the noise, and losing. I didn't need him, but I gave a call to celebrate this uncommon event. His reply to my exuberant report was "everybody is always 5 and 9." I passed on a very perfunctory 73 and went QRT. Tears were welling in my eyes, and I didn't want to sob on the air.

Contest operators and busy DX stations do not give signal reports. Instead they transmit ARRL message 59.* This may not be official procedure, but it is quite understandable why they do this: it saves time, simplifies logging and minimizes errors. Because there is usually no place on a QSL card to indicate any messages sent, they put this message number in the (otherwise vacant) signal report box. Since most DXers are contacting DX stations in order to work a *new one*, the transmission of message 59, in lieu of a signal report, is of course quite fitting.

I am very sure that you've heard something equivalent to the following exchange: "I QSL the 5 and 9, you're 5 and 9 also. I got the six in your call okay, what's the rest of it?"..."Please repeat."..."Again?"..."Again?"

A signal report is supposed to indicate how well you are actually receiving the other station. Statements such as "you're 5 and 9 in the clear" or "you're 5 and 9 except for the blankety-blank lightning crashes" are really silly. If you're going to apologize for the QRM or QRN anyway, why not give a more accurate signal report like 4 and 7, or 3 and 5? Or, even 3 and 9? 5 and 9 means a "perfectly readable, extremely strong signal" and nothing less!

*ARRL Numbered radiogram 59: Congratulations on the new arrival. Hope...

LYNX DX GROUP 10TH ANNIVERSARY CONVENTION

If you can make Madrid, Spain June 10-11, plan on a great program at the Hotel Alameda, to include EA8AK, SØRASD OH2BH F6EXV ON4UN EA1RF DJ9ZB, etc. Reservations (1000 pesetas) and info via Enrique Herrera Arce, EA5AD, Apartado 219, 03500—Benidorm, Spain; tel 96-5851142/96-5864510.

VU2TJW/K3TW

Tom Warren has been on the road again, meeting the Colvins at both 9N5QL and W6KG/4S7 (see photo). Tom notes that VU2RBI was married early March but still intends to maintain her position at the National Institute of Amateur Radio in Hyderabad, India. The NIAR annual convention was mid-Feb and Tom guest-operated at their popular special-event station ATØNRO. Cards via VU2APR for that operation. For ATØT/VU2TJW confirmations, please go via KE3A.

THE COLVINS

At the end of February, Lloyd and Iris concluded operation in Sri Lanka as W6KG/4S7 with close to 5000 contacts in 137 countries (40-10 meters), about 50/50 phone/CW. Again

VU2TJW/K3TW with W6QL and W6KG (l-r) meeting in Sri Lanka (see VU2TJW item).

this year they stayed at the QTH of 4S7PVR, using Paul's tribander and the Colvins' ICOM 751A. (Lloyd reports that Paul's wife is a good cook!) This was a happy return for Iris, following her broken leg of a year ago. A happy culmination of the Colvins' visit was their being elected honorary members of the Radio Society of Sri Lanka.

CIRCUIT

☐ **P40P:** N1CIX (JH1VRQ) will be activating Aruba June 15-22, hoping to liven up the All Asian Phone event. Nao will hit 80-10 both phone and CW during the period, handling the cards himself. In addition to P40P, Nao only handles the Aruba log of P40M operated by WR6M in October 1987. (Cards for P40M of February 1986 should go to KB9AW.)

☐ **W5LDH:** This former ARRL Director claims the first 2XSSTV ever from Navassa (N2EDF/NP1).

☐ **Records:** April's issue should have correctly credited the DXCC record-keeping by DXCC country (not prefix) idea to W8KST, who finds it much more convenient to file by country (Abu Ail to Zimbabwe) rather than by prefix (which doesn't group US, for example, together). Matthew finds it so useful that he suggests ARRL produce one in this format.

☐ **S0RASD:** AA4CM reports that cards have been delayed because of printing snags. "Be patient," says manager Luis Casals Rojas, EA3AOC, Box 291, 08700 Igualada, Spain. QST

QSL Corner

Administered By Joanna Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

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

How It Works

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

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

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

Claiming Your QSLs

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

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

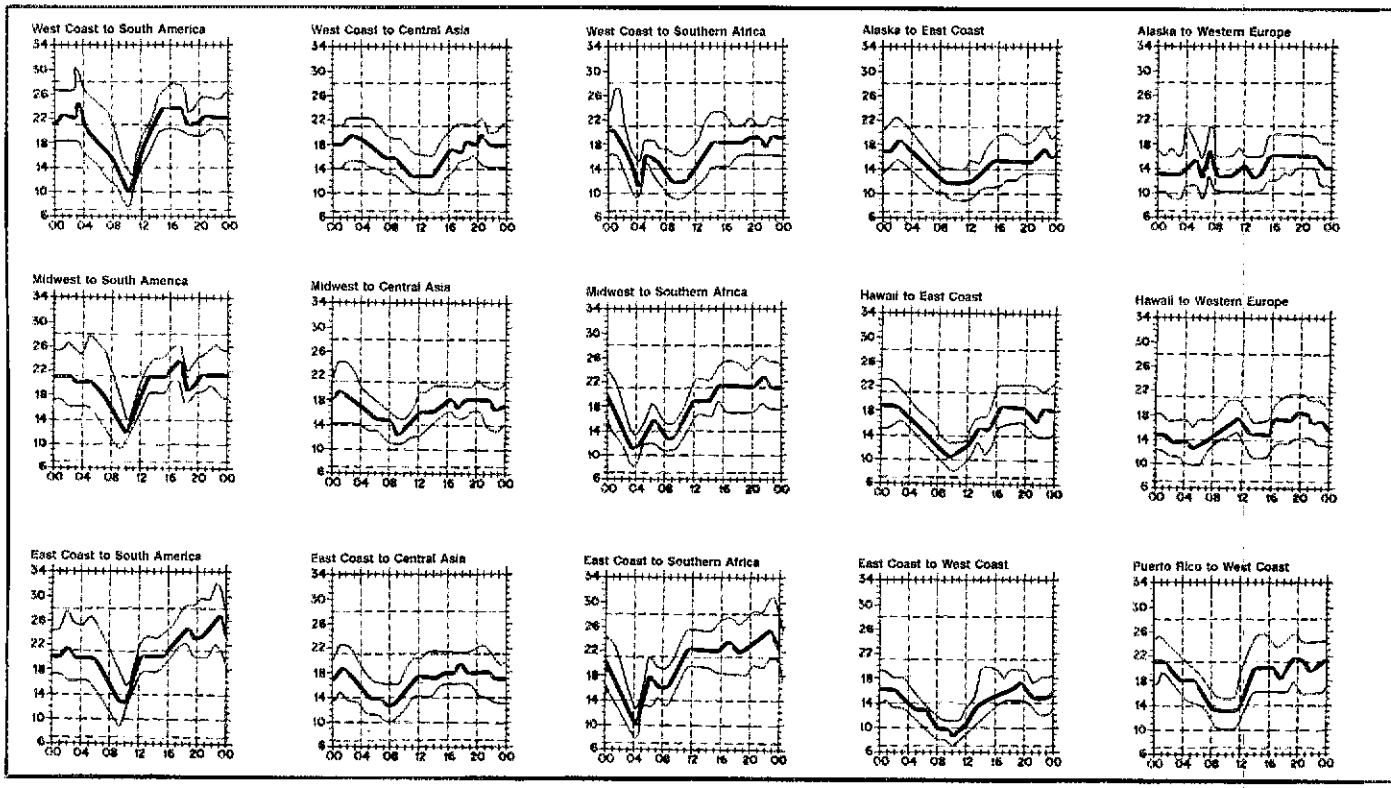
3) A preferred way to send envelopes is to affix a First Class stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

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

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

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). The horizontal axis shows Coordinated

that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

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

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

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

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

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

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

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

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

Don't send your outgoing DX cards to this bureau (see "ARRL Membership Overseas QSL Service" in this column in March 1988 *QST*).

Don't send envelopes to your "portable" bureau. For example, K9CH/4 sends envelopes to the W9 bureau, *not* the W4 bureau.

ARRL DX QSL BUREAU SYSTEM

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

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

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

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, PO Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls*—ARRL Fifth (5th) District DX QSL Bureau, PO Box 44246 Oklahoma, OK 73144.

Sixth Call Area: all calls*—ARRL Sixth (6th) District DX QSL Bureau, PO Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc, PO Box 555, Portland, OR 97207.

Eighth Call Area: all calls—8th Area QSL Bureau PO Box 182165 Columbus, OH 43218-2165.

Ninth Call Area: all calls*—Northern Illinois DX Assn, Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls*—WØ QSL Bureau, Ak-Sar-Ben Radio Club, PO Box 291, Omaha, NE 68101.

Puerto Rico: all calls*—Radio Club de Puerto Rico, PO Box 1061, San Juan, PR 00902.

US Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St Thomas, VI 00801.

Hawaiian Islands: all calls*—John H. Oka, KH6DQ, PO Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls*—Alaska QSL Bureau, 4304 Garfield St, Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St, Stevens Point, WI 54481.

CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1*—A. McLellan, VE1ASJ, Box 51, St John, NB E2L 3X1

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave, Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, PO Box 157, Downsview, ON M3M 3A3.

VE4*—Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5FX, 739 Washington Dr, Weyburn, SK S4H 3C7.

VE6*—Norm F. Waltho, VE6VW, PO Box 1890, Morinville, AB T0G 1P0.

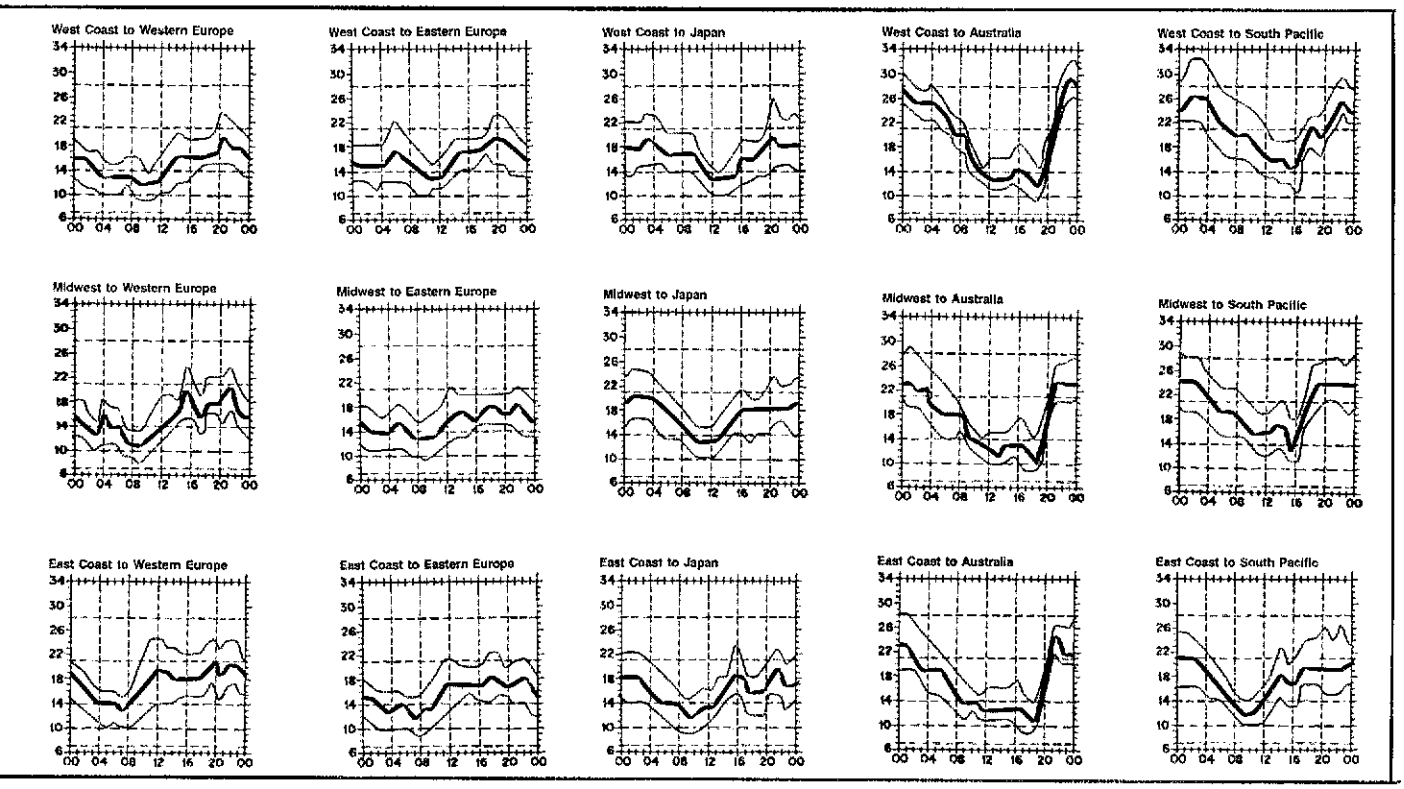
VE7*—Alex Ivsic, VE7CNE, F12 6961 Hall Ave, Burnaby, BC V5E 3A8

VE8*—Rolf Ziemann, VE8RZ, 2 Taylor Rd Yellowknife, NT X1A 2K9.

VO1, VO2—Roland Peddle, VO1BD, PO Box 6, St John's, NF A1C 5H5.

VY1—QSL Bureau, Yukon Amateur Radio Assn, PO Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for further information.



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Data provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for June 16 to July 15, 1988, assume a sunspot number of 105, which corresponds to a 2800-MHz solar flux of 150.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from March 1 through March 31, 1988. An SASE will bring you the rules and application forms for particpation in the DXCC Program.

New Members

Mixed

DK4JL/119 JO1GAZ/125 SM7BLO/174 YV5KKG/110 NN2B/102 NC3C/126 K5AOB/115 WA6HAN/108 WD8PPI/101
DL4FBZ/219 JN3OBF/130 SMØKCR/174 ZL1AAS/330 WA2BOT/277 W3KRB/104 KC5NY/149 WW6J/170 K9EL/313
DL7AIO/108 JA7GB/156 SP5BAK/308 5V7SA/135 WB2IXS/117 AA4UF/102 KF5PE/101 W7XU/110 KA9GZM/101
G4ALR/164 JHØBLI/105 SP5DRM/274 KB1AF/101 WB2PSI/102 AB4ES/113 N5JUJ/109 WA7GCS/106 WA9IIS/103
G4VPM/185 LZ2VU/238 SVØBL/103 KB1KA/152 K3RYA/100 K4ZDT/102 W5NN/167 KA8TGK/106 KØTVY/151
GI4SNC/100 OH6SU/157 VE6EY/100 KY1N/106 KC3J/150 N4NPV/133 W5OBT/104 N8EIH/101 NØGWL/111
IK1GPG/192 OZ4RS/213 VE7CXN/115 N1BYQ/102 N3CHR/110 WA4UCI/113 KB6LOO/102 N8FGL/103 NTØH/102
I6BDS/110 FA3APW/110 VE7EW/109 WA1TRO/102 N3CRN/102 WD4OHD/100 KI6WF/130 NC8I/108 NTØW/182
J87CF/113 SM4BOI/309 YV2EJU/160 KD2BV/100 N3FAS/103

Radiotelephone

CP6PX/108 GØAEB/106 JE3FCT/106 SM4EMO/286 ZP5MSC/155 WA2BOT/276 W4LRE/137 NT5C/101 KA9VRA/104
CT1CVF/128 I1GVX/227 JN3OBF/130 SMØKCR/154 ZP5PMN/109 WB2UMF/105 W4TMN/101 KD6OU/108 WA9CDY/100
EP2DA/126 IK1GPG/190 JA7GB/155 VE7EW/100 5V7SA/135 KA3LHP/102 AA5BE/100 KI6WF/130 KØTVY/151
FD1MVT/103 I7ETU/257 LZ2VU/190 YV2EJU/160 KA1ORB/105 KD3AI/100 N5JUJ/102 WA6HAN/105 KRØI/133
G4ALR/128 J87CF/113 OH2LU/314 YV5KKG/109 KB1KA/152 KJ4SW/138 N5KMR/115 NC8I/108 NJØT/104
G4CVK/108 JH1FTS/109 SM4BOI/308 ZP5CVI/163 KD2NL/106 K4ZDT/102 N5KUZ/108 K9EL/286 WØPUJ/102
G4VPM/145 JA3BOA/274

CW

DJ3TO/109 HB9ALZ/103 I3JEX/120 JK3HGS/123 SP2BKF/189 KY1N/105 WA2DHS/165 KJ4SW/142 W9ROK/104
G3KMA/312 HB9CVO/110 JO1GAZ/103 JH7DIS/110 SP5DRM/165 N1CQO/102 NC3C/105 W8JCC/136 NØGWL/106
G4VPM/139 I2KMG/308 JG2LGM/119 SMØKCR/113 K1TKL/101 AE2L/111 K4HDV/113 K9EL/241

RTTY

DJ2YA/106 GØAZT/108 KP4BJD/104 OE2WJL/103 K4XG/100 WD5DBV/101 ABØY/109

160 Meters

G3KMA/106 OK1PGF/101 SM5JE/101 UZ6LWZ/108 VK9NS/101 N6DX/109 WØJLC/102

5BDXCC

NA2Q WB4UBD HK1BYM KS1J KØSE N4SZ PY2APS OZ1FAO NA2G
DL8YR WB2ABD WA9RCQ N4TX K8PCZ K2KW NX7K EA4KK W6ILH
YU2CCB I4RXB NE4A LZ2VU

Endorsements

Mixed

CX3AN/295 IV3TQE/308 VE4MT/230 W1IKB/323 AA4AV/267 N4BHJ/264 WN4KKN/251 KE7PE/106 W8NHO/126
DJ5YQ/162 I4JBJ/302 XE1XF/281 W1TSP/313 AA4NC/277 N4CRI/286 WN4M/164 KE7PF/113 WB8YFE/149
DK3QJ/272 I5OQV/158 YU2CAY/201 W1VH/311 AA4R/304 N4DAZ/307 K5FNR/229 KX7J/286 AG9S/303
DL2ZAE/220 IK7CJV/270 YV1TO/260 WA1AYS/275 K4AMC/253 N4EOF/151 K5JII/198 N7AYK/253 K9ALP/295
DL6OL/278 JA1NGM/219 ZS1JD/234 WA1LVW/260 K4DLI/299 N4KVF/143 K5MBE/314 N7OT/304 K9GPN/292
EA8ANT/195 JA1SJV/305 ZS6PI/303 WB1BVQ/273 K4JEX/308 N4VG/308 KF5MY/279 NR7B/223 KA9OTD/151
EL2ED/153 JE1TTI/266 9Y4BA/253 W2JAJ/180 K4NYV/311 W4BWR/205 KX5W/250 W7DNY/310 KG9Z/290
F6DYG/300 JA2DN/294 K1AN/233 W2KKZ/272 K4SE/313 W4EJH/301 N5FJ/205 W7QN/254 N9ALC/300
F6FNU/282 JA2IIG/305 K1GW/263 W2SQT/307 K4WMB/321 W4FNS/307 N5GGO/274 AB8Y/309 N9BOK/282
F6IIM/215 JH2UVL/263 K1WVX/227 WA2AOG/290 KA4CMC/152 W4OMY/304 NA5U/275 K8RYU/126 N9CNF/127
G2HIO/177 JI3MZY/153 KA1LR/171 WA2DHS/313 KB4IL/307 W4ROM/201 K6LRN/208 KA8GBB/150 WA9RCQ/292
G3KEC/153 LA8KD/202 KA1WR/148 WA2TMP/270 KB4NJ/168 W4UNP/306 KD6GC/176 KR8N/305 WA9USE/310
GM3AWW/300 LA9HC/312 KB1HY/261 KA3A/255 KB4SRE/127 W4USW/158 N6WK/304 N8EKS/152 WB9HIP/313
HB9AFI/312 OH3SG/299 KB1U/300 KB3OQ/305 KC4DY/305 W4UXI/250 W6CRE/311 NW8F/250 KØNN/290
HB9AOF/157 SM5DUT/179 KC1EL/151 N3CYC/202 KC4GR/250 WA4BEC/308 W6OB/335 W8BIP/310 KRØI/187
I1BWI/294 SM5HYL/301 KE1F/303 N3KR/257 KI4EZ/222 WA4SSI/228 W6ZID/290 W8JCC/171 KSØZ/290
I2SM/346 T3ØOAC/128 KM1R/278 W3HCW/265 KJ4VH/177 WD4AFY/200 WB6FZN/249 W8KDL/197 NØZA/301
IK2EGL/260 VE1ACK/221 N1ALR/291 W3NB/327 KZ4V/280 WJ4T/294 WI6S/150 W8MEP/269 WA0VBW/238
IN3XAI/299 VE2UI/176 W1BDU/149 AA4AM/284

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CP1FQ/285 IK2EGL/232 SMØDJZ/308 KM1R/266 N3ED/310 KC4GR/226 WA4BEC/307 W6OB/271 KR8N/301
CT1AHU/184 IN3XAI/296 SV1VS/178 N1ALR/290 N3KR/177 KD4BY/304 WA4ETN/199 W6QON/149 W8CY/312
CT3BM/300 IV3TQE/308 TU2QZ/128 W1EII/128 W3HCW/264 KD4OM/200 WA4FHQ/306 W8SWM/294 W8GS/273
DK6AY/188 I4CSP/290 VE3HO/315 W1YRC/302 AA4AM/278 KF4NO/282 WD4AFY/200 W8UVJ/166 W8KDL/197
DL6NX/318 I4JBJ/302 VE3BDB/336 WA1AYS/256 AA4AV/246 KI4FW/201 WD4JMC/200 WB6FZN/249 WD8PUG/303
DL6QW/318 IK7CJV/265 VE3HZH/262 WA1LVW/153 AA4DO/177 KI4SR/209 WJ4T/268 K7EG/281 AG9S/300
EA5AD/300 JA1NGM/219 VK4ZM/184 WB1BVQ/272 AA4JO/183 KJ4VH/155 WT4U/217 K7GEX/310 K9ALP/271
EA8ANT/195 JA1SJV/258 XE1XF/278 K2EWB/201 AA4KA/298 KQ4O/309 WW4E/291 K7TUH/175 KD9RD/174
EL2ED/153 JA2IIG/293 ZL1AMO/311 K2MFN/262 AA4NC/250 N4BYU/301 K5CTG/292 KX7J/260 N9BA/309
F6CPO/299 JA2KVD/305 ZP5CDV/273 KA2PHQ/220 AA4NK/153 N4CRI/278 K5MBE/295 N7OT/270 N9BOK/229
F6FNU/282 JH2UVL/184 ZP5FGS/212 KQ2L/310 AA4R/303 N4JA/318 KB5NI/124 NK7Y/260 N9CNF/127
G2HIO/166 JA3JOR/315 ZP5ZR/233 N2FPB/127 AA4VK/311 N4VG/306 KD5RQ/125 W7DNY/307 W9LNQ/316
G3UAS/266 JI3MZY/153 ZS6PI/301 N2KA/309 K4AMC/146 NE4R/311 N5GGO/274 W7DSZ/310 W9NNE/300
G3VOF/308 JA6CNL/302 5B4MF/254 W2KKZ/252 K4DLI/297 W4BWR/197 WB5SSD/305 W7KSK/212 WB9HIP/311
GW4KGR/270 JA6HUG/291 8P6QV/271 WA2C/152 K4II/299 W4EBO/319 K6EV/333 WA7CYY/200 KUØY/250
HB9AOF/151 JA7ZF/318 9Y4BA/252 WA2DHS/297 K4KST/266 W4JFE/317 K6HHD/307 WA7PZO/175 KWØH/177
HB9BGN/303 JAØSC/272 K1GW/230 WA2JUN/309 K4SE/312 W4JZ/290 K6LM/311 WF7B/202 NØZA/288
HB9CZW/161 LA1XDA/157 K1WVX/227 WA2MOE/302 KB4CWO/270 W4KHL/248 K6RK/309 AB8Y/286 WØKXZ/272
HS1BG/254 LU7MAJ/307 K1ZSI/314 WB2P/309 KB4NJ/137 W4OMY/292 N6CGB/152 K8GG/298 WØYK/311
I2GGJ/190 OA4ED/238 KA1FSO/149 KA3A/180 KB4SRE/125 W4WMQ/314 W6CRE/307 K8WWA/269 WA0VBW/210
I2SM/346 PZ1BK/256 KA1LR/171 KA3HXO/287 KC4DY/304 W4ZCB/315 W6MDH/292 KE8AI/125 WDØAQJ/277
I2UPG/269 SM5HYL/291

CW

DJ2YA/212 JA2IIG/257 LA6YN/176 K1GW/181 KA3A/204 KC4DY/130 K5KR/302 N6VR/280 N8BM/267
DL6QW/283 JA2KVD/254 LA8KD/129 K1JA/300 N3ED/265 KC4GR/162 K5MOY/154 W6GO/305 W8LU/290
F6BEE/254 JA3BOE/309 OZ4RS/200 W1FYT/125 W3NB/150 KE4I/305 N5FW/298 W6JTI/174 AG9S/200
F6CZL/235 JA3JOR/277 SMØDJZ/294 W1GL/306 AA4AM/168 KZ4V/253 NF5Z/223 W6UY/285 K9IW/303
F6GID/208 JA5PUL/289 SP5EWY/295 W1GNR/264 AA4NC/175 N4CRI/227 NT5G/202 W6ZID/268 W9LNQ/287
IK2EGL/178 JA6CNL/258 VE1ACK/208 W1TSP/262 K4AMC/230 W4MPY/279 W5ZPA/305 NS7J/298 NØZA/258
I4YNO/216 JA6HUG/253 VE1BLX/280 KB2FD/223 K4II/287 WJ4S/155 K6LM/300 W7IUV/303 WØCAW/255
I5OQV/157 JA7FS/273 VE2AH/205 W2RS/260 K4PB/153 WN4KKN/178 K6RK/283 AB8Y/260 WØYK/300
JA1JWP/304 LA3XI/303 VE3HO/258 WA2AOG/152 K4SE/306 K5JII/173 KI6T/176 K8NA/290 WA0VBW/175
JA2AAQ/297 LA5UF/272 YV1TO/175 WB2P/257

RTTY

W1AX/128 WB4UBD/124 K5KR/141 W5ZPA/160

160 Meters

JA1GTF/158 OZ1LO/158

DXCC Honor Roll

Administered By Don Search, W3AZD

The DXCC Honor Roll is comprised of those call signs that have been credited with at least 308 of the 317 current countries on the DXCC list. Total DXCC credits given, including deleted countries, are shown after each call sign. The large, boldface numbers indicate total DXCC credits not including deleted countries.

Mixed

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JA1BRK/346
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SM7ANB/353
SMØAJU/355
SP7HT/340
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Washington Mailbox

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Autopatches and the Radio Amateur

Radio amateurs in the United States enjoy a great privilege: the ability to interconnect their individual stations and repeaters with the public telephone system. These interconnections are known as "phone patches" and "autopatches." The wisdom of the federal government in permitting and even defending this freedom has been demonstrated time and again. There is no way to calculate the value of the lives and property that have been saved by intelligent use of the phone patch and autopatch facilities in emergency situations. Although greater use of long-distance and mobile cellular phone systems has lessened the reliance on amateur autopatches and phone patches, the public interest has been well served by amateurs with these capabilities. In this Washington Mailbox column, we shall examine amateur phone and autopatches and commonly asked questions associated with them.

Q. As with any privilege, this one can be abused and the penalty for abuse could be its loss for all amateurs. What constitutes abuse of phone-patch and autopatch privileges?

A. In the absence of specific regulations governing their use, the answer depends on one's perspective. Consider these facts: To other amateurs, phone-patching activities that result in unnecessary frequency congestion or which appear as a commercialization of Amateur Radio operation constitute an abuse of this privilege. To the telephone company, which needs to protect its massive investment in capital equipment, anything that endangers its equipment, its personnel or its revenues constitutes an abuse. To the Federal Communication Commission, which is responsible for the efficient use of the radio spectrum by the services it regulates, any radio communication that could be handled more appropriately by wire is an unnecessary use of a valuable resource. To commercial suppliers of radio communication equipment for business purposes, competition from a noncommercial service constitutes a possible threat to their livelihood.

Q. Why are there no specific rules set forth by the FCC concerning the "do's" and "don'ts" of autopatch operation?

A. It is true that there are no specific FCC rules concerning autopatch operation. Autopatch operation is presently subject to reasonable voluntary restraints, thereby preserving most of our traditional flexibility. Do we want to risk forcing our government to define for us specifically what we can and cannot do? Experience has shown very clearly that when specific regulations are established, both innovation and flexibility are likely to suffer.

Q. On our local autopatch, I recently heard someone call a local restaurant and order a pizza. Can this be done on the amateur bands?

A. No! Section 97.110 of FCC rules is there to protect our frequencies from being used for business activities. Section 97.110 states "the transmission of business communications by an Amateur Radio station is prohibited except for emergency communications." While one isolated infraction would not mark the end of the Amateur Radio Service, widespread tolerance of such abuses could attract other business users into our bands.

Q. Section 97.110 states that business communications are prohibited except for emergency communications. How does the FCC define "emergency communications"?

A. Emergency communications are defined by Section 97.3(w) as "any Amateur Radio communication directly relating to the immediate safety of life of individuals or the immediate protection of property."

Q. How about using the autopatch to call a service station to have a tow truck come out and remove a disabled vehicle from the shoulder of the highway? Isn't this facilitating the day-to-day functions of the service station?

A. Calls made concerning highway safety in cases where there is an immediate threat to the safety of life or property are permitted. In fact, this ability to eliminate delay in reaction time is exactly what makes the autopatch so useful in emergencies. The ability to call the police or an ambulance without having to depend on the necessary condition that another amateur is monitoring the frequency can often save precious minutes. The autopatch, when used responsibly, is a valuable asset to the community. One of the basic purposes of the Amateur Radio Service, as a voluntary, noncommercial communications service, is the providing of emergency communications to the public.

Q. Since the Amateur Radio Service is strictly noncommercial, as are amateur autopatches, why does the local telephone company insist on charging our club commercial rates for our autopatch phone number? Don't amateurs have a right to residential rates which are much lower than commercial rates?

A. The telephone company has its own standards for determining line rates and these are not necessarily the same as the FCC's definition of business communication.

Recently, however, several repeater groups in Texas received a favorable ruling from the Texas Public Utilities Commission which required the local telephone company to downgrade the business charges for an amateur autopatch line to that of residential. These cases apply only to specific cases in Texas, but they could set an effective precedent. See March *QST*, p 64, for more infomation.

Q. What is a "reverse autopatch"?

A. With a reverse autopatch, the *third party* initiates the call to a licensed radio amateur over the local repeater's autopatch by first calling the repeater's phone number. With an autopatch, an *amateur* initiates a call to a third party by first accessing the repeater's phone line and making the call.

Q. What about the legality of the so-called reverse autopatch?

A. Section 97.79 of the FCC rules concerning control operator requirements makes it clear that no unlicensed person may be the control operator of an amateur station. Incoming calls on a repeater's reverse autopatch should be answered and screened off-the-air by the control operator (who is a licensed amateur) to ensure rule compliance. Answering a call over the air is prohibited since the call has not been screened by the control operator. Section 98.114(c) states, in part: "The licensee of an Amateur Radio station may not permit any person to participate in traffic from that station as a third party if: (1) The control operator is not present at the control point and is not continuously monitoring and supervising the third party participation to insure compliance with the rules." This section is there to protect our frequencies from being used by nonamateurs. The use of a reverse autopatch is permitted only under strict compliance with the rules.

Phone-Patch and Autopatch Guidelines

Since the Amateur Radio Service is not a common carrier, the handling of routine messages on behalf of nonamateurs is not its primary purpose. However, third-party communications are an incidental part of Amateur Radio and it adds another important dimension to our public-service capability.

It is the policy of the ARRL to safeguard

the prerogative of amateurs to interconnect their stations, including repeaters, to the public telephone system. An important element of this defense is encouraging amateurs to maintain a high standard of legal and ethical conduct in their patching activities. It is to this end that these guidelines have been addressed. These are based on several sets of standards that have been in use for years on a local or regional basis throughout the country. The ideas they represent have widespread support within the amateur community. All amateurs should observe these standards carefully so that our traditional freedom from government regulation may be preserved as much as possible.

1) International phone patches must be conducted only when a special third-party agreement exists between the two countries. The only exception is when the immediate safety of life or property is endangered.

2) Phone or autopatches involving the business affairs of any party must not be conducted at any time. The content of any patch should be such that it is clear to any listener that business communication is not involved. Particular caution must be observed in calling any business telephone. Calls must not be made to place an order for a commercial product or to receive or leave business messages. However, calls made in the interests of highway safety, such as the removal of a disabled vehicle from a hazardous location, are permitted.

3) All interconnections must be made in accordance with telephone company tariffs. These tariffs are available for public inspection at your local telephone company office.

4) Phone and autopatches should never be made solely to avoid telephone toll charges. Also, phone and autopatches should never be made when normal telephone service could just as easily be used.

5) Third parties should never be retransmitted until the responsible control operator has explained to them the nature of Amateur Radio. Control of the station should never be relinquished to an unlicensed person. Permitting a person you don't know very well to conduct a patch in a language you don't understand amounts to relinquishing control.

6) Phone and autopatches must be terminated immediately in the event of any illegality or impropriety.

7) Autopatch facilities must not be used for broadcasting. If a repeater has the capability of transmitting information, such as weather reports, which is of interest to the general public, such transmissions must occur only when requested by the licensed amateur. The retransmission of radio signals from other services, such as retransmissions made directly from NOAA weather radio stations, are strictly prohibited in the Amateur Radio Service by Section 97.113.

8) Station identification must be strictly observed. In particular, US stations conducting international phone patches must identify in English at least once every 10 minutes and give their call signs in addition to the other station's call signs at the end of the exchange of third-party traffic as outlined by Section 97.84.

9) In selecting frequencies for phone-patch work, be considerate of other amateurs. In particular, patching on 20 meters should be confined to the upper portion of the 14.200-14.350 MHz segment in accordance with the IARU Region 2 recommendation.

10) Phone and autopatches must be kept as brief as possible as a courtesy to other amateurs, since the amateur bands are intended to be used primarily for communications among radio amateurs.

11) If you have *any doubt* as to the legality or advisability of a patch, *don't make it.*

Compliance with these guidelines will help ensure that our interconnection privilege will continue to be available in the future, which will help us to contribute to the public interest.

[Note: Questions in this column are typical of those asked of the FCC and other agencies. Questions and answers which appear are prepared by ARRL staff and have been informally reviewed by the FCC's Personal Radio Branch, for agreement with current FCC policy. They do not represent a formal interpretation of the Amateur Radio Service rules by the FCC.]

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for February 13, 1988 through April 8, 1988. An SASE will bring you the rules and application forms.

6 m (50 MHz)

100

290 KA6EYQ
291 AG9S
292 W1EXC

W1JR 275
WA2PDI 175
WB4AYE/6 150
KX4R 150
K5HYE 175
K5IS 150
WD8OXK 125
AG9S 225
W0GN 125
WB0HYV 125
W0JRP 200

2 m (144 MHz)

100

228 WA8EQP
229 NU5F
230 WA1VRH
231 G6IJM
232 DL4OL
233 KX4R
234 WD9IIC
235 W4FF

NE4C 125
AA4FQ 125
W4ZD 225
NU5F 125
W5UUM 125
N8CKH 150
WB8KAY 150
K9MRI 300
G4UXC 125

70 cm (432 MHz)

50

115 WA8OXG
116 KL7WE
117 WA4OFS

W1JR 160
KB5MR 100
KL7WE 80
W8YIO 100
G4NBS 70

23 cm (1296 MHz)

25

G4NBS 40

3.4 GHz

5

WA5VJB 10

5.7 GHz

5

WB5LUA 10

Strays

I would like to get in touch with...

☐ anyone who has a hurricane-tracking program for the Tandy 1000 (IBM-PC compatible) that covers the Caribbean to Northern New England. Douglas Aldrich, KA1BAT, 2 Ledge Rd, Coventry, RI 02816.

☐ anyone who has a manual for any of the following: Heathkit Laboratory Oscilloscope 0-11; Yaesu Linear Amplifier FL DX 2000; RCA Senior Voltohmyst WV-98C. Stephen Bushman, ND9G, 1166 Oakwood Ave, Des Plains, IL 60016.

☐ anyone with a source for a multifeatured terminal program that will run on a Kaypro 2 CP/M Computer and allow use of a TNC, such as the PK-232 or KAM. John Ladd, 10869 Forest Ln NE, Bainbridge Is, WA 98110.

☐ anyone with a schematic for a Hallicrafters S-38B receiver. Robert Everding, N0EVQ, 514 Glenmeadow Dr, Ballwin, MO 63011.

☐ anyone with a manual and/or schematic for a military surplus frequency RTTY converter, type 278/CR. P. H. Lacey, *VE3DIT*, 114 Merner Ave, Kitchener, ON N2H 1X6, Canada.

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

Microstripline Circuitry

Microstrip construction is a technique in which transmission lines are formed by small, flat plates of conductive material supported over a ground plane by a dielectric, as shown in Fig 1. This is commonly implemented using double-sided, copper-clad PC-board material by etching away part of the copper on one side, leaving transmission lines of the required dimensions. It is the most commonly used construction technique for solid-state microwave circuitry.

The evolution of microstrip construction from the more familiar coaxial transmission line is easy to see if you envision slitting a length of coax through the outer jacket and dielectric, then peeling back and flattening the jacket and dielectric, leaving the center conductor lying on the flattened outer layers. If the center conductor is then also flattened, a microstrip transmission line is the result.

Microstripline circuitry bears a visual resemblance to PC boards used at HF and lower frequencies, but is functionally very different. PC boards are usually copper clad only on one side, and the purpose of the unetched copper is solely to act as a conducting medium between components.

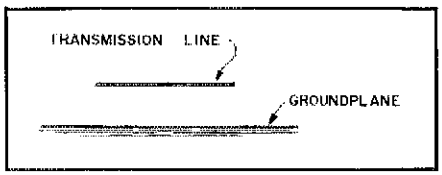

Fig 1—Configuration of a microstrip transmission line.

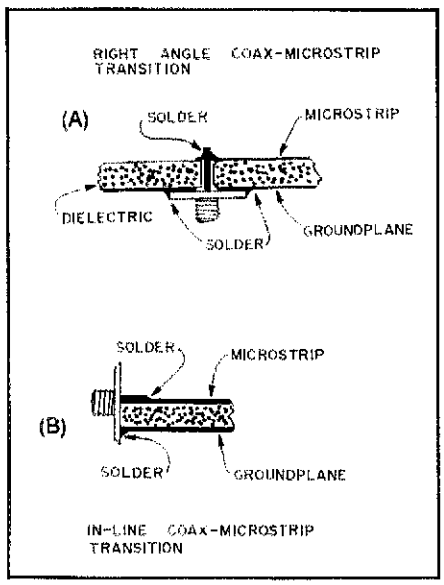

Fig 2—At A, a right-angle coaxial-connector to microstrip transition, and at B, an in-line transition.

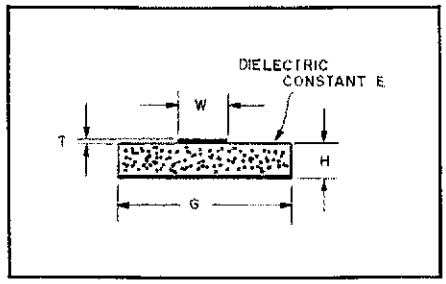

Fig 3—Parameters that affect microstripline impedance.

Microstrip boards have a continuous conductive ground plane on one side of the board. The conductive traces on the other side of the board are circuit elements in themselves, acting as transmission lines, impedance transformers, inductors, capacitors and so on.

Masking and Etching

Despite the functional dissimilarity, microstrip boards are made in exactly the same way as ordinary PC boards. The areas of conductor (usually copper) that are desired on the final board are masked, and the rest of the copper is etched away chemically. Masking may be done in a number of ways. A photographic masking process is often used for very complex boards (such as computer circuits) and can be used for microstrip boards. The disadvantages of this technique are complexity and the need for accurate artwork. Fortunately, most microstripline circuits are geometrically simple—straight lines defining rectangular areas of copper—and simple masking techniques can be used.

I mark out microstripline circuits by first thoroughly cleaning both sides of the copper-clad board with steel wool. Then I apply self-adhesive plastic film to both sides of the board. (Wide masking tape or Scotch® tape can also be used. You can buy self-adhesive film—such as Con-Tact® film—in hardware and department stores.) I then mark the circuit traces on one side of the board, and then remove the masking film from the areas to be etched by cutting along the edges and lifting it away with a sharp knife or razor blade.

The exposed copper can be etched away using commercially available etching solutions (such as those available from Kepro and Radio Shack®), or by making up a solution of ferric chloride (600 g/l) or ammonium persulphate (250 g/l) with water. The etching rate of the ammonium persulphate solution may be increased by adding a very small amount (10 mg) of mercuric chloride to the solution. *Note that all these chemicals are toxic and corrosive, and suitable precautions (rubber gloves and safety glasses) should be used when handling them.*

Etching time can be reduced by heating and agitating the etchant—about 30°C is a good etching temperature. Too much heat may cause the masking to peel off, however. The best simple agitation method is "bubble etching." This is done by placing a large aquarium aeration stone in the bottom of the etching bath and pumping air through it with an aquarium pump. This causes a constant stream of fine bubbles to rise through the bath. The circuit board to be etched is then placed face down in the bath and inclined slightly so that air bubbles are not trapped on its surface. Etching by this method is about ten times faster than just placing the board in an unagitated bath.

Mircrostripline to Coaxial Connector Transitions

There are two ways in which RF connectors can be attached to microstripline circuits without greatly affecting input and output SWRs. One is the right-angle transition shown in Fig 2A, and the other is the in-line transition shown in Fig 2B. The in-line transition is preferred, but the right-angle transition can yield an SWR of less than 1.2:1 up to about 5 GHz. SMA connectors are the easiest to use because of their small size and excellent performance at RF. Also, when using larger connectors (such as type N) you may find that the connector center pin is larger than the microstripline to which it is to be joined!

Microstrip Design

The parameters that determine the impedance of a microstripline (see Fig 3) are:

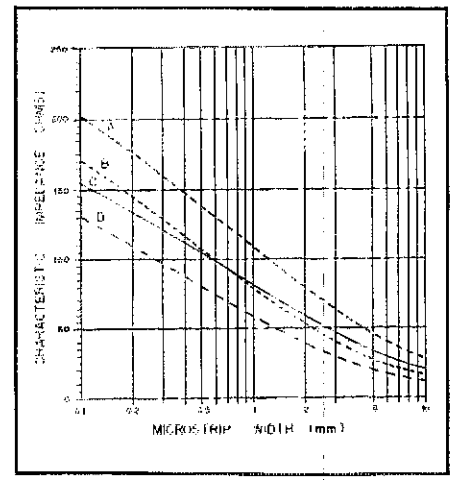

Fig 4—Curves showing characteristic impedance of microstriplines as a function of PC-board dielectric materials. The materials are: A, 1/16-in. Teflon®, E = 2.5; B, 1/32-in. Teflon, E = 2.5; C, 1/16-in. epoxy, E = 5; D, 1/32-in. epoxy, E = 5.

(continued on page 54)

VHF/UHF Beacon Frequencies Proposal

Beacons found within our VHF/UHF bands are beginning to become a source of interference to other weak-signal modes. These proposed changes to the beacon subbands would reduce the possibility of interference.

The Amateur Service Beacon subbands, as they are today, are found in the weak-signal segments of each amateur band between 50 and 450 MHz.

With weak-signal operation gaining popularity, many amateurs are commenting that these automatic beacon subbands are now the cause of serious interference to the EME (moonbounce) activity frequencies and the weak-signal calling frequencies from 144 through 1296 MHz. Amateurs feel that, for the continued growth of weak-signal communications, it is necessary to move the beacon subbands.

Specific comments have been:

- Beacons can be a nuisance to weak-signal communications in areas near the beacon;
- Technology and equipment designs have shown that there is no need to maintain harmonic relationships of beacons for other than construction simplicity; and,
- If the beacon subbands are moved, they should be strategically located so that they establish solid "guard bands" between them and the regular weak-signal operating frequencies.

Since its creation, the ARRL VHF/UHF Advisory Committee has been tasked with reviewing the concerns of users of the VHF-and-above amateur bands. In many cases, committee findings have resulted in the creation or revision of band plans.

In this instance the VHF/UHF Advisory Committee had made a proposal on beacon subband changes and had offered it to the ARRL Board of Directors in July 1987. The ARRL VHF Repeater Advisory Committee and Committee on Amateur Radio Digital Communications have endorsed the VUAC proposal, and submitted it to the Board's Membership Services Committee for formal presentation to the Board of Directors in July.

The Proposal

The beacon subbands proposals have been published in the Minutes of the past two ARRL Board of Directors meetings. The current proposal is as follows:

a. Revise all ARRL Band Plans 144 MHz through 10.5 GHz to include the following automatic beacon subbands as indicated in the sidebar.

b. FCC would be petitioned to amend Part 97 to allow beacon operation on the above frequencies in the 144, 220 and 432 MHz bands. Part 97.87(e) of FCC rules would be amended to read:

The following amateur frequency bands and emissions are available for automatically controlled beacon operation: 28.20-28.30 MHz, 50.06-50.08 MHz, 144.275-144.300 MHz, 220.275-220.300 MHz and 432.300-432.400 MHz. Additionally, all amateur bands above 450 MHz are available for automatically controlled beacon operation.

c. It is recommended that the beacon subbands for frequencies above 450 MHz be incorporated into existing and future band plans (gentlemen's agreements).

The next step in the process is final approval of this plan by the ARRL Board of Directors at their July 1988 meeting. Before making its recommendation, the Membership Services Committee will meet to consider further input. Your opinions and comments regarding the proposal are solicited. Send to: Beacon Frequencies Proposal Attn: Bart J. Jahnke, KB9NM, ARRL HQ 225 Main St, Newington, CT 06111.

ARRL Board Action Concerning Beacon Frequencies

MINUTE 79 of the July 1987 Board Meeting

MINUTE 79) It was moved by Mr. Heyn, seconded by Mr. Haynie, that the ARRL recognize the following segments of the 144-MHz to 10.5-GHz bands as automatic-beacon segments and modify the ARRL band plans accordingly:

144.275-144.300 MHz	1296.300-1296.400 MHz
220.275-220.300 MHz (added at the Jan 1988 Board Meeting)	2304.300-2304.400 MHz
	3456.300-3456.400 MHz
432.300-432.400 MHz	5760.300-5760.400 MHz
902.300-902.400 MHz	10368.300-10368.400 MHz

Counsel is directed to petition the FCC to amend Part 97.87(e) as needed to authorize these beacon segments. On motion of Mr. Hurlbert, seconded by Mr. Frenaye, the matter was REFERRED to the VRAC for further study.

MINUTE 79 of the January 1988 Board Meeting

MINUTE 79) On motion of Mr. Heyn, seconded by Mr. Haynie, the following resolution was ADOPTED:

WHEREAS, the VHF/UHF Advisory Committee recommended that the ARRL Petition the FCC to adopt new band segments for automated VHF/UHF beacons, and

WHEREAS, at Minute 79 of its July, 1987 meeting the Board referred the matter to the VHF Repeater Advisory Committee for its recommendation, and

WHEREAS the VHF Repeater Advisory Committee has now endorsed the VHF/UHF Advisory Committee proposal,

NOW THEREFORE, the Membership Services committee is requested to study, on an expedited basis, the desirability of amending the automatic-beacon band segments above 144 MHz to be the following. [refer to the frequencies above as per the July 1987 Board Meeting minutes]

The committee is further requested to submit its report to the Board or Executive Committee, as soon as possible, with a recommendation as to whether or not any petition to FCC that might be required to implement these segments should include the bands above 450 MHz.

The World Above 50 MHz

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

The Boxes

It's been some time since I last dealt with the various standings boxes and their updating. From some of the mail received recently, some appear to be confused as to when to update each box and the information sought.

First the schedule—the accompanying table lists the month(s) each box appears along with the date updates must be received in order to be sure of inclusion in the next publication. I try to accommodate information received after these dates, if it comes before I finalize the column, but please don't count on this.

Note that, although my deadline date has been progressively moved ahead over the years in order to facilitate earlier mailing of *QST*, I retain the current due dates, for the time being at least. The reason I can do this is that I now have all the current standings on a computer data base, so updating and subsequent re-ranking are relatively easy—a far cry from the days when I used to mail a stack of 3 × 5 cards to HQ. However, regardless of the due dates, it is always appreciated if information is provided ahead of time. In fact, it doesn't hurt to send an update every so often, especially after working something new. Once again, remember the "two-year rule." This policy was established soon after I became the conductor of The World Above 50 MHz in 1976, when I realized that many appearing in the boxes had not been on VHF for 20 years or more. So, even if you haven't worked anything new, but are still active and want to continue being listed, please submit a report at least every two years.

Next, let's talk about the information presented, because it's different for the various boxes. The 6-Meter DX Standing is just what its name says. Listed are total countries worked on 6 meters and those that have been confirmed—plus the same information for 6- to 10-meter crossband countries if not also worked two-way. The reason for this provision is to avoid touching off a "crossband competition." The crossband listings were included only because so many European countries were not allowed 6-meter transmitting privileges. The intention was to reward those European hams who took the trouble to work us via crossband, as well as to illustrate what could be accomplished on the band if only more countries had access to it.

Now that many European countries have granted at least limited use of 50 MHz, retention of the crossband listings merits re-examination. Readers' comments are solicited on this. In the meantime, continue to include crossband totals in your reports, but please delete those countries also worked two-way. The form used for gathering information for the 6-Meter DX Standing is a special one used only for that purpose. In order to prevent the box from gobbling up all of the *QST* space allocated to the World Above 50 MHz, an arbitrary lower limit for US and lower-tier Canadian stations had to be established at 15 countries. This is waived for those with WAC.

Note that there is no states-worked box for 6 meters. Such a box would be immense. Almost one-thousand now have 6-meter WAS and many more are close to reaching that goal. That fact doesn't diminish in any way the pride one should take in working all 50 US states on the band. It still requires a lot of effort and not just a little good luck. I rank it as one of my most treasured awards.

Box	QST *cover month(s)*	*Date information must be received*
2 Meters	Jan and Jul	Nov 5 and May 5
1¼ Meters	Feb and Aug	Dec 5 and Jun 5
70 cm	Mar and Sep	Jan 5 and Jul 5
Microwave	Apr and Oct	Feb 5 and Aug 5
6-Meter DX	Nov	Sep 1
EME Annals	May	Mar 1

The information requested for 2 meters, 1¼ meters and 70 cm is the same for each band: number of US states worked, number of call areas worked and number of grids worked. Note that states are US states, so Baja California or Ontario do not count but Alaska and Hawaii do. When the column was passed to this conductor, there was a listing for call areas in these boxes. This represented only the 10 continental US call areas, lumping KH6 in with W6 and KL7 with W7. Such an interpretation of call areas did not seem appropriate to me, so I changed it. First, I thought that our immediate neighbors to the north and south should be acknowledged since their states/provinces are not counted for "WAS." Therefore, I decided to count all VE and XE call areas along with the ten continental US call areas plus KH6 and KL7. With a number of people involved in moonbounce, where foreign countries can be readily worked, I also decided to add DXCC countries not part of the US, Canada or Mexico. Thus, 4U1UN does not provide a call area separate from W2. With the general adoption of the Maidenhead grid system, and the introduction of VUCC, the 1 × 2 degree grids were added as the final listed information. Despite the fact that the heading for each box carries an explanation of what is sought, many seem to be confused. I hope that this has cleared up that confusion. I have always felt that blank spaces appearing in the boxes do not convey a good impression and certainly do not look very good. Thus, it is asked that all of the indicated information be submitted. With the VUCC now five years old, one would think that every active VHFer would have a count of his grids. Also, please be sure to indicate whether or not EME was used for any of the claimed states, call areas or grids.

In the last year, the boxes for the bands above 902 MHz were combined into a Microwave Standing. This was done in order to further stimulate interest in these bands and recognize the many notable current and future amateur accomplishments in the upper reaches of the spectrum. Information sought is the same as that for the 2-meter through 70-cm boxes, plus the greatest terrestrial distance worked. This was added in order to publicize the potential of these bands. It is also used as a filter to cull out "lab bench"-type contacts.

The box that always seems to provide the biggest problem—in terms of receiving up-to-date information and confusion as to information sought—is the EME Annals. I initiated this box a number of years ago, believing that some record should exist attesting to what amateurs have accomplished via the earth-moon-earth path. I felt that the other boxes, while including moonbounce contacts for state, call area and grid credit, do not provide a very good indication of what can be done on EME, particularly with regard to working other countries or how many total stations are active.

In order to focus on the latter, I established the number of different stations worked as the primary factor and included US states plus foreign countries as the others. No one has written to say that these are not appropriate items to list, although there has been a controversy raging in the EME community as to what constitutes different stations. If four calls are used on one multi-op setup, can four stations be counted? I have avoided taking a firm stand on this but my preference is that working such installations under multiple calls should be considered as working a single station. In the case of family stations, my feeling is that we should apply the same criterion as for any other kind of contact and count each licensee as a separate station. Even though this represents a degree of inconsistency, I believe it a reasonable exception. Furthermore, there are not enough of these to significantly distort the results.

Because of the difficulty of getting updates, especially from some of the more prominent EMErs, I suggested the advisability of dropping the EME Annals altogether. This caused the *2 Meter EME Bulletin* to insert a card for mailing back to me. I must say that the results were

impressive and, as a result of the flood of mail, I was persuaded to continue the box. Nevertheless, most who returned the cards did so as soon as they received them last summer—so, by the time the EME Annals appeared in May, their listings were already considerably out of date. In addition many, including some of the "big guns," still did not submit information. Thus, many prominent moonbouncers are not listed this time around. It is hoped that being dropped plus this reminder will get them back into the fold before publication next May.

It is particularly important that those working EME on some of the less-exploited bands, such as 6 meters, and the various microwave bands submit the called-for information. If they wish to include other, more human interest, information as well, that's fine. If they list the stations worked, I can usually figure out what states and countries are involved. I sort of rebel at this in the case of the 2-meter and 70-cm listings, however, which may contain hundreds of stations. A very few put me to the test on this in the information submitted for the last EME Annals and it certainly made compiling the data a lot more difficult.

I am in the process of developing some new reporting forms, which should be easier and less confusing to fill out. It is hoped to have these for distribution by the time this appears. Please drop me (not ARRL HQ) an SASE for a supply. It is always helpful to me if the information is presented on the appropriate form, but I always try to use it no matter what kind of paper it comes on. However, the easiest reports to mislay are those that are buried in letters containing other information for the column.

You may have noted that I did not mention the VUCC listings which appear every December with updates from time to time. This is because I am not responsible for these. They are compiled from VUCC records maintained at Headquarters.

ON THE BANDS

6 Meters—The news for 6 meters is that world-wide DX is coming back—and maybe faster and better than many dared hope. Both professional and amateur observations point to conditions rivaling those of the peak days of Cycle 21 returning this year or next. One piece of evidence comes from a story carried in the New York *Times* quoting Dr Patrick McIntosh, Director of Solar Physics Research at the Space Environment Laboratory of the National Oceanic and Atmospheric Administration (NOAA), Boulder, CO. Dr McIntosh was quoted as saying that this cycle may peak sooner than previously expected, possibly as early as the end of 1988 and that it may be the most intense since the advent of reliable record keeping in the mid-19th century. That would put Cycle 22 ahead of even the monumental Cycle 19, which occurred in the late 1950s. As good as the last peak in 1979 and 80 was, it was considerably down from that of Cycle 19. If Dr McIntosh is correct, we could be in for 6-meter propagation the likes of which most of us have never experienced and may never again. I can say from my own observation of one plot of data from Boulder, that this cycle seems to be rising faster than did the last one. And those who regularly follow this column will recall that in October 1987, I noted that the new cycle probably began in June 1986, rather than September of that year, as NOAA contends. This would put us one quarter of a year closer to the peak.

Numerous amateur reports from the southern part of the US and the Pacific basin attest to returning F2 and TEP conditions. These accounts are reminiscent of those received in the fall of 1978 which were the prelude to the very exciting years that followed.

From an old West Coast friend who has gone Hawaiian, K6GSS/KH6, arrives word that 6 meters is coming to life in that Pacific paradise. John, who now resides in Kihei on the beautiful island of Maui, writes that, on March 24 at 0850Z, he had a QSO with H44GR on the island of Honiara with 5 × 9 signals both ways. John also heard several unidentified stations conversing on SSB at 50.099 with his beam aimed to the south. Then, one week later, on March 31 at 0320Z (about one hour before sunset in Hawaii), he worked VK9NL/KH1 Howland Island plus nine or more other KH6s, the latter possibly via backscatter.

Another fascinating report is from even farther afield. It's from another old friend, W7KMA, known to many who were active during the last cycle. Tom is currently signing HL9TM Seoul Korea. Last E_s season, using a MMT 50/144 transverter and an ICOM 275 which he picked up at Dayton, some 300 JAs were worked. Since then he has sold that setup to HL9CB, who is located near Pusan, and purchased an IC-575A plus a Mirage A1015. The acquisition paid off for HL9CB just after mid-March when he worked H44, VK6 and P29 stations. At the time Tom was not able to hear any of the DX, but his day in the sun came on March 25 when he hooked up with H44GR plus VK4s FNQ, FXX, FXZ, JH and RO along with VK8s GF, KTM, ZLX and ZS. He notes that these QSOs were made using a 5/8-wavelength vertical, as his 5-element Yagi was down for repair. Tom also worked HL2ASH the same evening and notes that there are about a half-dozen Koreans active on 6-meter SSB with about 15 to 20 more on 51.0 FM. He adds that the above contacts bring him to five countries: BV, H44, HL, JA and VK. In another interesting note, he says that he is also active in 6-meter packet, regularly connecting to JAs on 52.52, 52.56 and 53.44.

From Japan, JA1VOK reports that TEP conditions have been FB in his part of the world. Hatsuo says that on March 12 he worked VK6WD and VK6KXW plus P29PL. The following day he added P29ZEF, and on the 15th P29ZFS. YCØUVO was worked on the 17th and FK1TS, H44GR, and H44GP on the 20th. Not content with those goodies, Hatsuo added VK9LJ Lord Howe on March 21 and T22JJ Tuvalu on the 24th plus YB1CS and several VK4s, 6s and 8s the following day. JA1VOK's VHF column, appearing in the April issue of the Japanese magazine *59*, carries a note that the Singapore Amateur Radio Transmitting Society has been granted a special permit to transmit on 50.125 with 10 W between June 3 and June 12. The call will be 9V1ES and it is expected that the station will work split frequency, listening mostly on 50.110.

Closer to home, K5ZMS reports that late March was very good in his area. On the 23rd seven LUs were workable in San Antonio. The band was obviously open to the Pacific on the 27th as KH6HI was heard with a beam heading of 225 degrees vs the direct path of 270 degrees. The following day, LU8YYO and HC8GR were in with signals up to S9 plus 50, along with many backscatter signals from Arizona, California and New Mexico.

2 Meters and up—It's nice to get some 33-cm news, especially when it involves a new DX record. WB5LUA writes that, on March 22 during one of those famous Gulf tropo sessions, he worked a number of Florida stations on 2 meters, 70 cm and 23 cm, and then, at 1304Z, hooked up with W4ODW EM60 on 903.1 MHz for the first Texas to Florida 33-cm contact and a new world record for the band of 623 miles. Al says that Gene's 10 W was S6 while his 150 W to a 47-element loop Yagi at 90 feet produced S7 signals. WB5LUA also added a new 23-cm grid, EL88, by virtue of a contact with WB4OOJ. In addition, he notes again working W4WSR Jupiter, FL at 1073 miles on 23 cm with 5 × 9 signals both ways.

From VK5LP's column in *Amateur Radio* comes word that the gang down under have been at it again along the south coast of Australia. Eric writes that VK5QR and VK6WG have worked frequently, during the southern hemisphere's summer months, on 2 meters through 9 cm over the 1885-km (1130 mile) path across the Great Australian Bight. Many of the contacts between the two have been on 23 cm and even 13 cm and 9 cm. So far, however, attempts on 5 cm (5.6 GHz) have not borne fruit. Their experience should be a lesson to all of us. They have noted many instances in which conditions were not very good on 2 meters or 70 cm but they could work on the higher bands with quite good signals. Moral: Don't assume that 70 cm must be good before you have a chance of making contacts on 23 cm or the higher bands.

KB9NM announces that the "well traveled W1XX contest team" will again activate 4U1UN during the June ARRL VHF QSO Party June 11 and 12. The gang plans to work all bands from 50 through 2304 MHz, including 70-cm moonbounce. Remember, the UN Building counts as a separate DXCC country.

Speaking of contests, 6-meter operators should remember the SMIRK Contest the following weekend, June 18 and 19. It begins at 0000Z on the 18th and runs for 48 hours.

A sadder note is passed along by W1JR. Joe says that Mel Bear, K6MS, passed away February 2 after a five-year battle with cancer. Mel might be better known by his former call of W6WSQ. He was an early pioneer in meteor-scatter work and had 16 states to his credit on 2 meters. Although a little-known fact, Mel was one of the first to make an E_s contact on 2 meters when he worked W5QNL Texarkana, TX on June 11, 1951. The contact gave him the 2-meter DX record for a few minutes until another 6, a few miles farther west, also made contact. Another of Mel's significant accomplishments was completing the first 1¼-meter meteor-scatter contact. It was with WØEYE, now WØPW, and occurred on August 9, 1968 after two months of skeds.

FM/RPT

Conducted By Stan Horzepa, WA1LOU
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CompuServe ID no. 70645,247

Repeaters Serving the Public

Your repeater is up and running, but it has no direction, no purpose, no people. Is there a cure? Try public service; it is a prescription that has worked successfully to convert dull and unpopulated repeater systems into interesting and popular systems that are useful contributors to their communities. As examples, Mark Cobb, N7FEQ, and Bob Jost, KB6BOK, describe the public-service activity of their respective repeaters in the following stories.

A Public-Service Repeater System

The Truckee Meadows Amateur Radio Association (TMARA) of Reno, Nevada, and the organization's two repeaters (WA7RPS/R), have been very active passing emergency-related traffic in the past year. In December, I started recording the amount and types of events that occurred on the repeater system, similar to the Repeater Log section of FM/RPT. In December, WA7RPS repeaters helped with three medical emergencies and one vehicular emergency. If there is a special form required for reporting public-service events for the Repeater Log, I would be very interested in receiving a couple of month's worth. [Form CD-258 may be used to facilitate submitting reports to the Repeater Log. The form may be requested from ARRL Headquarters by sending an SASE to the attention of the Field Services Department. Also, note that submissions for the Repeater Log should be sent to Luck Hurder, KY1T, at ARRL Headquarters—Ed.]

A lot of the emergency traffic on the TMARA repeaters has been conducted by TMARA vice-president Tim Melarkey, WA7MOF. Tim is a volunteer fireman for the Nevada Division of Forestry. He is also a fire dispatcher for the same agency operating from the East (Washoe) Lake Emergency Communications Center in Washoe Valley, Nevada. (Washoe Valley is approximately 20 miles south of Reno.)

Wherever Tim is, so are his 220- and 440-MHz hand-held transceivers, tuned to the TMARA repeaters. While Tim is at work, repeater users have direct access to the fire dispatch center via Tim and Amateur Radio. If the Nevada Division of Forestry is not the agency needed to respond to an emergency, Tim will call the proper agency via the dispatch center's phone lines. As a volunteer fireman, Tim has notified the family members of victims of automobile accidents via the autopatch as Tim was traveling in the ambulance en route to the hospital.

Sometimes Tim may get an emergency call via telephone and send the fire engines rolling and if he did not receive enough information about the emergency over the phone, he will pick up a ham transceiver and call a ham in the area of the emergency to get a detailed visual observation of the event. If the amateur reports, for example, that a fire is growing fast and is being fanned by high winds, Tim will notify the firemen en route of the conditions and Tim may consider a second-alarm response even before the first engines arrive.

Besides assisting with emergency and public-service events on the TMARA repeater system, Tim's house, which is 1000 feet above the Reno/Sparks Valley floor, is the site of both of the repeaters. From this location, the repeater's coverage is exceptional for 40 miles in all directions. When the mountain snow melts, the 220-MHz repeater will be moved to Peavine Mountain at a height of 3500 feet above the valley to extend coverage into Lake Tahoe and Truckee, California. This coverage will be needed for the 1989 International Special Winter Olympic Games which will be held in Reno and Lake Tahoe on April 1-8, 1989. Tim is communications director for the event, which is expected to draw 1400 special athletes from 30 countries around the world. TMARA will be in cooperation with several other repeater clubs and owners to provide communications for the 8-day event.

The TMARA 443.025-MHz repeater (PL 107.2 Hz) is open at all times and 145.73 MHz is monitored on the remote bases, so if you are in the Reno-Sparks-Tahoe area, please give us a call.—*Mark Cobb, N7FEQ, TMARA secretary-treasurer*

Repeater Finds Lost Students

A fifth grade class from Manchester Gate School in Fresno, California, was on a day-long hike in the Sierra Nevada Mountains east of Fresno. A wrong turn on the trail resulted in the class finding itself several miles from its intended destination. A steady rainfall, heavy cloud cover and impending darkness added to the possibility of spending a cold, wet night on the trail.

Bob Jost, KB6BOK, a parent chaperon on the hike, established Amateur Radio communication with Betty Peters, WB6LYU, and Ed Peters, WB6MCG, on the WB6MCG 224.94-MHz repeater. Betty and Ed contacted park rangers to alert them to the group's location and to request assistance. Following several transmissions to establish the group's location and direction of travel, dwindling batteries in Bob's handheld transceiver reduced communications to listening to the ranger's instructions relayed by Betty and Ed and responding with one "kerchunk" for a yes and two "kerchunks" for a no.

Voice contact with the ranger coming up the trail was established just as darkness fell. The ranger led the group to a parking area and then returned to the trail to escort the two parents to safety. The ranger then contacted Betty and Ed who had maintained telephone contact with the park dispatcher. They contacted the parents waiting in Fresno.

Later that night, one of the cars transporting the students home hit a fallen rock on Highway 180. Betty again contacted the 911 operator to report the road hazard to the California Highway Patrol and relayed another message to the parents. All students and adults arrived safe and sound in Fresno around midnight.—*Bob Jost, KB6BOK*

NEW ENGLAND NOVICE PACKET FREQUENCY

The New England Spectrum Management Council (NESMC) recommends that Novices use 223.58 MHz as their 220-MHz packet-radio frequency.—*Chan Eaton, W1IFL, NESMC Eastern Massachusetts director*

MAGNETIC MOUNT ANTENNA TIP

I just read the April column in *QST* in reference to N7AOU scratching the paint on his lady-friend's car. Whenever I put a magnetic-mount antenna on any car, I always lay a piece of wax-paper on the roof before I set the antenna. No matter how clean you think the car is, there is always just enough dust to scratch a gloss to a satin finish, or worse. When you put down the wax paper first, you won't scratch the paint. The worst that will happen is you'll get a "wax spot" that might look better than the rest of the car, but it won't last; it's not the right kind of wax.

If you leave the antenna on the car for an extended time, change the wax paper every couple of days, especially if it rains. Otherwise, the paper will collect water and could cause a corrosion problem with the antenna base if it is not sealed properly.—*Mike Yetsko, N1DVJ*

REPEATER LOG

According to February 1988 reports received, repeaters were involved in the following public-service events: 701 vehicular emergencies, 24 fire emergencies, 9 alerts/drills, 8 medical emergencies, 8 criminal activities, 2 weather emergencies, 1 public-safety event.

The following repeaters were involved (followed by the number of events): K1FFK 4, N2FLF 5, WA2ZWP 4, W3LIF 3, WD4COL 1, W5FC 35, K5OS 4, WA6BJY 5, WD6DIH 60, KA6EEK 41, W6FNO 459, N6ME 126, WA7RPS 2, K8DDG 4.

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Butane Explosion!

By Jim Edlin, WT5C

Two shattering butane explosions sent up a mushroom cloud and ripped apart the huge Celanese petro-chemical plant seven miles west of Pampa, Texas, killing three workers and injuring another 37, on November 14, 1987. The powerful blasts blew out the windows of more than 80 businesses in Pampa and were loud enough to be heard in Borger, 27 miles away. Combined, the explosions and fire damaged about 25 percent of the 775-acre plant. The heat was of such intensity, and the danger of additional explosions so great, that authorities decided to allow the fire to burn itself out.

A visiting ham from Duncanville, WB5EBF, saw the escaping stream of material from a half-mile away and was the first to call 911 to report the situation. As he watched, the escaping stream caught fire and exploded.

The plant is the largest employer in Gray County, with about 600 workers. Fortunately, only a skeleton crew was on hand that Saturday afternoon. One employee said that if the blast had occurred during regular working hours, a bulldozer would have been required to scrape up the bodies. The potential was there for a much greater disaster.

The authorities' greatest fear was that toxic chemicals would leak into the fire and cause the smoke to become lethal. Another Bhopal, India was in the back of everyone's mind! Roadblocks stopped traffic at Panhandle, 25 miles to the southeast and near Borger to the northwest. Train traffic stopped and 14 trains were routed around the area.

Concerned citizens overloaded the Pampa telephone system; however, telephone service was restored before the emergency was over, so that Amateur Radio operators were not required to handle health-and-welfare messages.

Amateur Radio was the only emergency communication link with the Amarillo Red Cross. HF, packet and 2-meter stations were manned at the Amarillo Red Cross. The 3933 Panhandle Traffic and Emergency Net was activated about 7:30 PM local time for the duration of the emergency. Several other scheduled nets graciously relinquished their time and did not interfere with the emergency operations.

An HF-net control operator from Ohio asked if this was a drill, while expressing the idea that this was the most realistic drill that he had ever heard. He was quickly informed by Panhandle Traffic and Emergency Net Control, WW5Y, that "This is no drill!"

Sandia Labs of Albuquerque, New Mexico, operators of the Pantex Nuclear Weapons Assembly Plant, offered to send the sophisticated fire fighting equipment of Pantex to the scene. The message was passed by Amateur Radio on the 2-meter link. The decision was made, however, to let the fire burn itself out because of the possibility of additional explosions.

Authorities ordered the evacuation of everyone within a five-mile radius of the plant. The Federal Aviation Administration cleared both a five-mile radius as well as a 10-mile-high zone around the plant. Surrounding towns prepared for possible evacuation, which would depend on the direction that the chemical cloud drifted. Amateurs were on hand to provide communications for the evacuation as well as to communicate the location of emergency shelters to the outside world.

Amateur Radio relayed the message to the Amarillo Red Cross for blankets and sanitary facilities to be used if and when the evacuation order came. The Emergency Service Communications van, driven by N5IMO of the PARC, was on the scene, along with emergency generators. Additional hams (including KD5IA and WD5UDX) took four-wheel-drive vehicles and additional communication equipment to the scene.

Panhandle Traffic and Emergency Net Control operators were WW5Y, WD5IZH, W5IEA, and KA5KRP. W5IJQ and KE5Z were Pampa contact stations. Other stations that either acted as relay stations or helped keep the frequency clear were NG5T, KF5OA and WØTY. Net Control of the low-band frequency went from Amarillo to Witchita Falls and then to Denver, Colorado as the band changed over time.

Amateur Radio operators quickly and efficiently tied together the area Red Cross command posts of Amarillo (N5AE), Pampa (W5EIF), Childress (N5CAN) and Wichita Falls (WA5BHX). Amateur Radio was the only communication link between the disaster scene and the Amarillo Red Cross.

The Austin headquarters of the Texas Department of Public Safety was first notified by Amateur Radio. WB5HZQ of the Texas Department of Public Safety Headquarters in Austin was immediately notified by Amateur Radio and stood by for the entire duration of the emergency. W5MVJ, Section Emergency Coordinator for the West Texas Section, reported that the Department of Public Safety in Austin, 500 miles away, received and acknowledged the message within 2½ minutes, a fantastic reaction time for any emergency situation.

A very big THANK YOU! to the Central Gulf Coast Hurricane Net (Net Control WB5CRR) and to the Great Lakes Traffic and Emergency Net (W1GD) for moving from their regular frequency and time slot to allow the Panhandle Traffic and Emergency Net to continue operation on 3.933 MHz. Their cooperation was exemplary and is a tribute to the finest qualities of ham radio.

SPOTLIGHT ON SERVICE

Ham Radio at the Arizona Special Olympics

Bob Braatz, N7FVK, EC, Northern Arizona

The Coconino Amateur Radio Club has supplied complete communications for the Arizona State Winter Special Olympics held in Flagstaff each February, for the past several years. The Winter Special Olympics brings 300-350 mentally handicapped contestants from every county in Arizona to compete in three winter events: ice skating, downhill skiing and cross-country skiing. Since the locations are 20 miles or so from each other, keeping track of what is going on would be very difficult if it were not for our Amateur Radio club establishing UHF, VHF, HF and packet communications capabilities among the various sites as well as for the command post located at the local high school. In addition, this year we also coordinated communications with the school bus dispatcher in order to effect better bus arrival and departure times to and from the various locations.

In addition to a fixed voice communications position at each site, and packet communications at the command post, Nordic and Alpine sites, each site had a rover communicator on foot or skis to relay messages to and from the fixed sites and the Special Olympic Event Coordinators at each site. We had a minimum of 12 Amateur Radio operators on duty from 6 AM to 4 PM on Saturday and 6 AM to 2 PM on Sunday with over 25 local hams providing time, equipment and enthusiasm for the two-day event.

This event gives our club a chance to exercise our Amateur Radio Emergency Service capabilities. In this manner, we can try out new systems and different repeater and packet digipeater locations,

George Wagner, KB7CWR (left), operates the packet station while Bill Schuchman, W7YS, handles messages on UHF and VHF at the command post. *(photos courtesy N7FVK)*

Ken Gardner, KA7VJU, operates from the downhill skiing site at the Arizona State Winter Special Olympics.

and test our operational effectiveness while operating in remote locations with minimal support.

The 1988 Arizona Winter Special Olympics was a success in all ways. We were able to cope not only with two remote portable repeaters dropping out 12 hours before the event, but also with the need to relocate a packet digipeater during the height of opening-day activities.

Christmas Flood Hits West Memphis

By Don Lee, WB5HDZ

Rising early on Christmas morning so as to be the first to view Santa's deliveries, imagine my surprise to find a lake in the front yard! I rushed to the ham shack, turned on the 2-meter rig and heard a familiar voice; Kim Henry, KA5BFC, was asking for help. Just two weeks previously, we had survived a killer tornado, and now, it had rained all night, hard and steady, and the town was flooded. The cry for boats in the middle of town in the early morning hours of Christmas Day was a little more than most of us were able to comprehend at first. You can imagine how the residents felt as they awoke to the sound of water lapping past their beds with the gifts floating in the middle of the room. Water was up to the bottom branches of the Christmas tree.

Activating the emergency net again, the second time in less than two weeks, the amateurs went into action. I couldn't call out on my telephone, so the only communication was once again Amateur Radio. I called a ham in Memphis that happened to be an early riser and asked him to call some hams here in West Memphis (we could receive calls but couldn't call out), and the holiday traffic began...

As everything began to fall into place (remember we had had a "little" practice just 10 days before) the hams went wherever they were needed, if they could find a route that wasn't under water. Sam Lehman, K5VBF, was at the Red Cross Center. Still at the Civic Center, John Woods, WV5J, was acting shadow for Mayor Keith Ingram. Tom Medlin, WA5KUB, was with County Judge Brian Williams at the county seat. Pam Jones, N5ECK, was at the City Hall with John, acting net control, in contact with OES in Conway, Arkansas. From Jonesboro, Arkansas, Tom Merrit, K5MEA, made arrangements for boats to be sent to West Memphis. Mayor Ingraham needed more boats for the rescue program already in action, and requested that OES, Conway help cut through the red tape and get the Coast Guard into West Memphis as soon as possible. Thanks to W5AUU and N5BPU, who helped maintain contact with the State Office of Emergency Services, we were able to obtain the required assistance.

Next, the county informed us that several hundred homes in the farm areas were flooded and as soon as they could be evacuated the victims would be sent to the shelters in West Memphis. Three more shelters were quickly arranged. Jeff, KB5CT, went to the First Methodist Church, and Paul, KA5UMP, joined the crew at Ingram Boulevard Baptist. At this point, our local Amateur Radio communications system was fully implemented. Every emergency operations center had battery power, Amateur Radio equipment and operators.

Things were a mess! Homes were flooded. Cars were completely submerged. We were to learn a few days later, when the waters began to recede, that there had been one fatality.

Signs all over town were proclaiming the Reason for the Season; I'm certain that we all were made very aware of it. We had made it through the month of December—again.

See Field Organization Reports for March 1988 on next page.

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*.

Field Organization Reports March 1988

ARRL Section Emergency Coordinator Reports

Thirty-five SEC reports were received, denoting a total ARES membership of 21,217. Sections reporting were: CO, EPA, GA, IA, MDC, MI, MN, MO, MS, MT, NFL, NH, NM, NNJ, NTX, OH, OK, ORG, PAC, SD, SDG, SJV, SFL, SNJ, STX, SV, UT, VA, VT, WA, WI, WNY, WPA, WTX, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	114	91.00	636	1280
TCC Central				
TCC Pacific	113	90.32	497	958
Summary	227	90.66	1133	2238
Cycle Three				
TCC Eastern	60	96.77	25	50
Cycle Four				
TCC Eastern	109	87.90	499	991
TCC Central	79	84.90	544	1174
TCC Pacific	110	88.71	715	1422
Summary	298	87.17	1758	3587

TCC Roster

KB1AF W1CE W1EFW K1EIC WA1FCD WB1GXZ KN1K KA1MDM W1NJM KT1Q W1QYY KW1U WA2FJJ W2FR W2GKZ NN2H NQ2H KB2HM N2IC W2LWB W2RQ KA2UBD N2XJ N3AZW N3COY N3EMD KK3F N3FM WB3GZU W3OKN W3PQ KQ3T NJ3V AA4AT K4DOR N4EXQ WD4FTK N4GHI K4MTX KB4N WB4PNY K4SCL N4SS W4WQ K4ZK W5GHP K5GM WB5J W5JOV K5MXQ AJ5K WZ5M KA5NNG ND5T N5TC K5TL W5TNT W5QVK KB5UL KB5W W6EOT W6INH N6LHE K6LL WF6O KU6O K6UYK W6VZT KN7B KA7CPT NR7E W7EP W7GHT NN7H W7IGC W7LG KA7MUL K7OVK W7TGU W7VSE KA8CPS WD8LDY W8PMJ NJ8S KA8WNO N8XX WB8YDZ WB9UYU KC0D KA0EPY K0EZ KJ0G N0HFZ AD0A N0IA AI0O KS0U VE3FAS VE3ORN VE6CHK

TCC Certificates Issued

TCC Eastern, Cycles 3 and 4: KB1AF W1CE W1EFW WA1FCD KN1K W1NJM W1QYY KW1U W2FR W2GKZ NN2H NQ2H KB2HM W2LWB W2RQ KA2UBD N2XJ N3COY N3FM W3GL WB3GZU W3OKN W3PQ KQ3T NJ3V AA4AT N4GHI N4SS W4UQ K4ZK W8PMJ KA8WNO N8XX VE3FAS VE3GSQ

For outstanding performance and dependability as substitutes: KB1AJ WB3EPU N4TN W8BO N8GJO.
Certificates issued posthumously to K4KB and W8QHB.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
National Traffic System						
EAN	31	981	31.64	.730	95.2	
CAN	31	681	21.97	.527	100.0	
PAN*	60	474	7.90	.667	95.7	
Region Nets						
1RN	62	428	6.90	.410	88.0	100.0
2RN	61	317	5.20	.390	89.5	100.0
3RN	31	167	5.38	.400	94.0	96.8
4RN						100.0
RN5	62	639	10.30	.457	89.0	100.0
RN6	55	121	2.20	.256		95.1
RN7	62	376	6.06	.538	94.5	96.7
8RN	62	404	6.51	.347	98.3	100.0
9RN	62	252	4.06	.313	85.5	100.0
TEN	71	865	12.18	.427	89.0	100.0
TWN	57	250	4.39	.279	85.6	95.1
ECN						74.2
TCC						
TCC Eastern	114	1280				
TCC Central						
TCC Pacific	113	958				
Cycle Three						
Area Net						
EAN	31	230	7.42	.541	86.6	
Region Nets						
1RN	31	128	4.13	.325	92.6	100.0
2RN	31	128	4.13	.338	98.7	87.1
3RN	30	44	1.46	.186	93.3	96.7
4RN						90.3
8RN						96.7
ECN						83.8
TCC						
TCC Eastern	60	50				
Cycle Four						
Area Nets						
EAN	31	1352	43.61	1.328	98.6	
CAN	31	923	29.77	1.551	100.0	
PAN	29	811	27.96	1.016	93.0	
Region Nets						
1RN						100.0
2RN	49	199	4.06	.473	71.3	100.0
3RN	62	208	3.35	.320	98.9	100.0
4RN	62	640	10.32	.427	91.9	100.0
RN5	62	609	9.82	.640	81.0	100.0
RN6	62	403	6.50	.690	99.0	100.0
RN7	62	393	6.33	.736	96.2	100.0
8RN	58	378	6.52	.453	92.0	100.0
9RN	62	513	8.27	.642	99.2	100.0
TEN	62	618	9.97	.738	83.7	100.0
TWN	56	277	4.95	.428	92.7	98.2
ECN						100.0
ARN	31	106	3.42	.096	100.0	93.5
TCC						
TCC Eastern	109	991				
TCC Central	79	1174				
TCC Pacific	110	1422				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, CT, DE, ENY, EPA, GA, IA, ID, IL, IN, MDC, ME, MI, MN, NC, NE, NFL, NLI, NH, NTX, OH, OK, OR, ORG, SB, SC, SCV, SD, SFL, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA, WTX, WVA.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, upon sending notification of qualifying months to ARRL Public Service Branch, will be awarded a special PSHR certificate from HQ.

163
W4ANK
155
W2MTA
141
W7LRB
137
WA4QXT
13
N4GHI
128
N2EIA
127
N0DPF
126
WX4H
W2QNL
124
WB2OWO
123
WB4DVZ
122
WB1HIH
121
N8GPU
120
K4NLK
119
KA3DLY
KA9FFO
118
KE8PO
116
WA2SPL
K4ZK
115
N3EGF
113
NM1K
N1CPX
112
W7VSE
WB2ZJF
111
N9BDL
109
N4EXQ
K9CNP
108
KD7ME

WA4JDH
WA4PFK
WA9VLC
107
W4JLS
KA9VII
KW1U
W9EHS
W7TZK
106
WD8KQC
WB5SRX
WA9VND
NC9T
105
KA1EXJ
K8TVG
104
VE3ORN
WB2UVB
W9CBE
W9YCV
103
W9JUJ
102
AA4MP
WG7H
KA2UBD
101
KA4TLC
WA2ERT
AG9G
WB1HBB
WF6O
W7TZK
100
KJ4VT
N0FOO
KF5RD
WD8QXT
WB1GXZ
WB6DOB
WD4COL
99
KA1GWE
K2VX
98
WA4LTO
W3FA
KA1FVY
N5AMK
WA1FCD
K8UQY
WA2FJJ

WA0HTN
97
WB7WOW
W4PIM
N8HHH
WB8JGW
96
KD8HB
K5MXQ
95
W6INH
KA4MTX
94
N8HRW/T
93
KT1Q
WB4WQL
92
K4BGZ
WJ7E
KI4QH
WA3WIY
NJ3V
91
N6EQZ
WB4ZTR
K5UPN
90
N6NLW
K6UYK
VE3DPO
89
WB4KSG
N2FIZ
WA4EIC
NN2H
N3EMD
88
KA7AID
W7GHT
NG1A
KB5ADE
87
N3COY
KA9RNY
KA0KPY
W5YQZ
86
WB8SYA
VE3GT
KA8WNO
85
K4MTX

WA4RUE
WA1TBY
KA8WNO
84
KT9I
NJ9S
W1KX
W5VMP
WA3UNX
83
AJ5F
KB4WT
W6VOM
WD4KBW
82
KA7EEE
N2XJ
K3JL
KB1AF
ND2S
81
KA0ARP
KA2INE
K0ERM
K1GGS
WB6QBX
80
AA4TE
W5TZC
N4PL
AA4HT
KD8WX
WB2RBA
K2YAI
79
N7BGW
KA1IFC
N8AEH
KN1K
KA1LJH
KF5BL
78
W0OYH
W1PEX
ND0N
77
N7GGJ
KB0Z
KF4FG
76
WB8R
KA2QOO
75
WB4PNY

K4VWK
N8CEI
74
WD0GUF
K0BXF
KJ9J
73
WA0TFC
KB4LB
WA3UZI
N4GNL
N2ABA/T
72
KB4OPR
KC3Y
71
N3DRM
N1DHT
VE3CYR
N8FWA/T
N4MWR
W4RWB
W4HON
W1RWG
KA8QHC
70
WA3YLO
W3YVQ
W0OUD
69
KA8CPS

WA6QCA
68
KK4FV
N0HWD
N1CVE
67
W7LG
NB1A
WB8KWC
KA1MDM
AI0O
66
N8IBS
KA1KP
N4KRA
N2HXS
WD9DZV
65
K9ZBM
KB4JPN
KA9RII
KI6ZH
N8FXH
W2FR
W2GJ
64
K4IWW
WA7PIN
K8JDI
K4AVX
KA4FZI

KA2ZKM
63
W0UCE
WB0WNJ
WB2QMP
N2DXP
VE3POJ
KB4BZA
KA4HHE
62
N4KSO
KD0NH
K0INI
WA1JVV
AE1T
W2RRX
W8IIO
KD8KU
KD0YL
NS9Q
KA5ZWY
N5KCL
61
N4JRE
WA8DHB
WB2FTX
WB9PFZ
WZ5N
60
WB7EMO
N8EFB

WD8KBW
K1ABO
KC2JW
KA2ZNZ
56
N4MMM/T
W1YOL/T
54
KA9CTW/T
52
N2FOP/T
51
KA1QFV/T
49
KB2BNW/T
KA2CQX/T
KB5DOE/T
48
KA1HPO/T
44
KA1NOI/T
KA8HJK/T
43
N2EVG/T
41
VE2EDO

The following stations qualified for PSHR during the month of February 1988, but were not listed in last month's column: W5AS, WG7H, N8FXH, KE8PO, K8UQY, KA8QHC, KD8WX, KA8WNO.

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the callsign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	555	996	1406	78	3035
WB9YPY	0	1136	109	712	1957
W1PEX	—	451	1403	24	1878
W3VR	296	271	394	51	1012
WD4IIO	468	37	470	25	1000
WA4JDH	2	45	474	7	933
N0DPF	354	106	399	73	932
WB0WNJ	281	105	540	4	930
KA1IFC	0	372	388	20	780
K4SCL	2	347	347	27	723
WX4H	0	333	322	22	677
WA4QXT	67	277	274	36	654
WA0YJX	—	—	—	—	651
KT1Q	2	323	328	4	654
WF6O	0	297	343	5	645
WA2SPL	11	249	328	44	632
AD8I	0	309	309	0	618
W3IWI	0	302	294	8	604
N4GHI	57	248	252	24	581
NJ3V	70	220	270	8	568
N4PL	99	176	265	26	566
W9JUJ	2	298	264	2	566
N6LHE	15	264	273	2	554
WA9VND	8	265	244	22	539
K4DOR	40	222	252	10	524

BPL for 100 or more originations plus deliveries:

KC4DVW	224
KF5RD	198
K4CY	185
WD4KBW	123
WB1HBB	109

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Clearing House Net	31	424	454
Early Bird Net	31	355	—
Empire Slow Speed Net	31	61	371
Gulf Coast Hurricane Net	31	97	4032
Hit and Bounce Net	31	239	627
IMRA	27	1103	1934
Mission Trail Net	31	100	946
Northern California Net	93	320	1037
NYSPTEN	31	54	567
Southwest Traffic Net	31	267	1926
20ISSBN	27	754	334
7290 Traffic Net	51	585	3281
75 M Interstate Sideband Net	31	452	1438

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

Regional Conferences of the IARU

(The following article was submitted by Pedro Seidemann, YV5BPG. Pedro is President of IARU Region 2, and is past president of the Radio Club Venezolano, the IARU member society in Venezuela. He was also a member of the IARU Observer team at WARC-79.)

To a great number of amateurs, IARU may still be only a hazy impression of a worldwide organization existing only on paper and having to do with the ITU in some way. I trust that most readers of this column would not hesitate to state that they know that IARU stands for the International Amateur Radio Union and is thus an Amateur Radio body consisting of one representative Amateur Radio society in each country. Similarly, the ITU is the International Telecommunication Union, an autonomous agency of the United Nations whose membership are governments from around the world that voluntarily coordinate their national communications legislation with the international treaties regulating telecommunications, including organization of the radio spectrum.

This may all sound very dry to thousands of hams who take our operating privileges for granted, yet the need of a worldwide Amateur Radio organization with a voice at ITU is easy to perceive. As a matter of fact, the IARU is older than the ITU (although not older than its predecessor!) and we proudly hold a privileged observer status at ITU meetings.

Since we are spread all over the world, we must somehow get together regularly, mainly in order to coordinate the defense of Amateur Radio through our representation at ITU and through our relations with the various administrations.

So, here come IARU Regional Conferences, about which this article intends to offer some interesting points to all *QST* readers. The IARU has divided itself, much like the ITU, into three regional organizations for the purpose of facilitating administration and communications in person on a more manageable level and recognizing the existence of matters of regional interest. Region 1 is the oldest and largest in number of member societies, representing Europe and Africa. Region 2 covers the Americas. Incidentally, ARRL is not only a member society representing the United States, but it also serves as the International Secretariat of IARU. Region 3 is the youngest of the IARU regional organizations, and covers the vast expanse of Asia, the Pacific Basin and Australasia.

Within the IARU framework, general coordination and policy is set for all by an IARU Administrative Council, consisting of a president, a vice-president and a secretary, plus two regional representatives from each of the three IARU regions.

Now, finally we come to the point of mentioning that each regional organization holds triennial conferences, which are staggered in such a way that each year there is one such conference somewhere. Member societies appoint a Principal Delegate, who has voting privileges at the conference on behalf of his society and any other society whose proxy he may be holding. However, it is permissible and indeed encouraged that societies attend regional conferences with more numerous delegations. Any number of amateurs may come from a society as members of its delegation, and by custom and unwritten rule and sheer need for manpower, everybody who is thus recognized and is willing to work gets an opportunity to participate in conference work.

The conferences offer something for everybody. Amateur Radio activity is very diversified, as *QST* readers well know, and motions are presented covering every imaginable aspect of Amateur Radio. There is a growing need for input from specialists within Amateur Radio. While central attention is given to the defense of Amateur Radio, this broad subject has many ramifications of general, regional and local interest to all.

The regional conferences are not at all dull—after all, we are amateurs and we like to meet each other. This is a wonderful opportunity to meet with colleagues from faraway places and share experiences for mutual benefit. It has become a habit that the host societies try to outdo each other to make attendance a pleasant and memorable experience. This may include such diverse things as operating privileges for foreign participants, social programs, local sight-seeing trips and low-cost lodging.

With the passage of time, and as our worldwide coordination has improved, these conferences have acquired a remarkable similarity in the three regions, although each regional organization is autonomous. The conferences normally begin formally on a Monday, usually with a high official of the country in attendance, and end by Friday in a memorable closing ceremony after the Final Plenary. Incidentally, it is at that Final Plenary that the regional officers and directors are elected for the next three-year period. Many agenda items are spread over a number of Working Groups in Regions 1 and 3. Region 2 assigns all matters to one of several committees, which then report back their findings to the Plenary. It is in these working committees that all participants may find something to do, according to their particular interests and expertise.

Here is a list of some of the conferences that have occurred in recent years or are scheduled for the future:

1985 Region 3 in Auckland, New Zealand
1986 Region 2 in Buenos Aires, Argentina
1987 Region 1 in Noordwijkerhout, the Netherlands
1988 Region 3 in Seoul, South Korea (in October)
1989 Region 2 in Orlando, Florida (in October)
1990 Region 1 in Madrid, Spain

If you have found this brief description of some interest, you may greatly contribute to Amateur Radio by contacting your Member Society (for example, in the USA it would be ARRL, in Canada CRRL, etc) and see about attending the next conference. You will certainly find it educational, interesting and even a great deal of fun. The International Amateur Radio Union needs more amateurs who are willing to familiarize themselves with the intricacies of managing Amateur Radio interests on the international front. In fact, the IARU is us, so your contribution for the welfare of all of us will also be for you. The personal satisfaction of being part of this never-ending challenge is very gratifying.

Exploring Ham Radio

Conducted By Rosalie White, WA1STO
Assistant to the Publications Manager

A Field Day Letter

May 25, 1988

Dear Mike and Susan,

June lurks just around the corner and three months have rushed by since I've written or visited with you! It's been too long; time to plan a get-together. I've thought of an idea to try out on you, so read on at your own risk!

Thinking about how close it is to June, I've been recalling when you two were Field Day co-captains the year the club "went all out." Remember the big 22-transmitter effort; could we forget?! What a lot of work (and fun)—but we walked away with a top-notch score, a befitting reward. Everybody dug in, erecting the screw-in anchor towers and climbing the shaky things to install enormous low-band antennas. (Whoever heard of 2 elements on 40 meters for Field Day, before we used them that year? But then whoever heard of a 22-transmitter Field Day sideshow until then?) We raised two antennas for almost every frequency. The rest of the members plugged away at assembling stations in trailers, troubleshooting the juice flow through the coax, and listening to the generators and mosquitoes hum. Everything played quite well with only a few hitches considering the massive number of tasks involved. And one can't forget when the cows sauntered through the coax, by the dawn's early light! We were half asleep, not sure whether we dreamed it or if Chuck spiked the coffee! Good thing several of us witnessed it, or no one would have believed it!

Remember, for the next five years the three of us did a 180-degree reversal. We operated in the 150-watt, one-transmitter class, revolting against all of the trouble "the big one" caused. Two solar panels, a car battery and an inverted-V, and we relaxed on the back porch, having a great time. The club whittled way back, too, to their previous style Field Day—the four-transmitter, family-fun weekend.

Now what do you think of something completely new and different? Let's choose a state park; I'll ask for approval from the parks department to keep my camper there overnight. I'll explain to them about our terrific hobby, that Field Day is a practice run in emergency communicating and that we wish to set up a station for several hours on Saturday and Sunday afternoons. But wait, before you answer, let me explain the complete newness and "different-ness"! Picture a Field Day publicity stunt! We'll tack up posters at the park entrance, local grocery and gas stations. (You two artists can paint depictions of what we're up to. Hand letter the details of our whereabouts and an invitation to the public to stop by.) When hikers wander past our station, we'll give "inquiring minds" the neat-looking brochures that I can get from the ARRL at the same time I take care of the log sheet needs. Those people intrigued by what they hear can sign a guest log. We'll forward the names to the League; they match up interested people to nearby licensing classes. We'll display a stack of QSL cards for people to rifle through, and tape up a world map to suggest the DX-aspect. Since we're operating a leisurely Field Day in Mother Nature's lap, we'll not mind taking time away from the radio to explain our activity. Novice Enhancement affords a good conversation-opener. Think we can convey even a small amount of the greatness of our hobby?

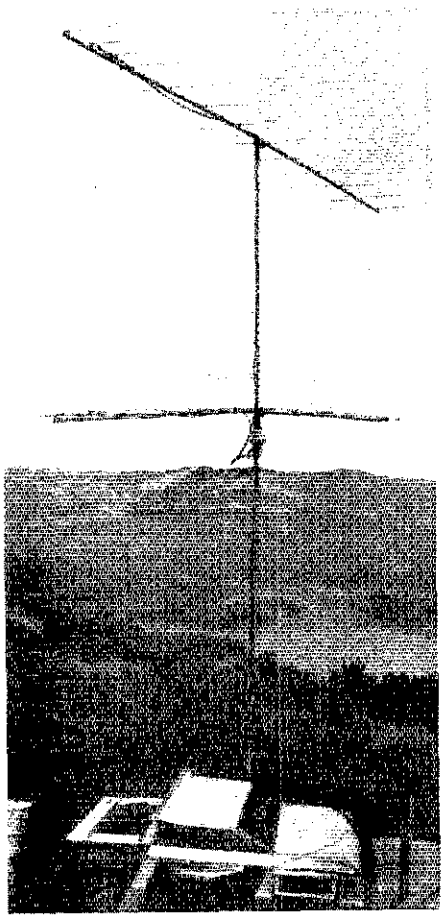
Whaddaya say, YL and OM? Look, Amateur Radio provides us with countless happy hours—more friends than we can keep track of, fun, pride in new skills achieved, fun, challenges of new modes, fun; you both know what to add to this endless list. Why shouldn't we share the hobby with others? Someone shared with us. We must spread the word to make the hobby grow, helping stave off the vultures from our frequencies. At the very least, Amateur Radio represented by friendly people and earning a nice reputation in the general public's eye is a nice second prize. Accomplishing that through Field Day makes such good sense.

So say yes. I'll draft a checklist of who's responsible for what (like the 40-meter dipole coiled up in my garage waiting to see the spruce branches with a backdrop of blue sky. Don't forget the Swedish camp stove that you named "The Torch," Susan, which results in gourmet delights when handled by you, Mike.). How about making it a weekend to remember at the park? Think up a name to call ourselves, like the ones you read in *QST* every year, "Resurrected River Rats," "Surely Temple Solar Society," and "Radio Free Southampton." Let's sked on 3.860 megs at 2230 Zulu next Tuesday and Wednesday to plan the details.

73,
Rosalie

Field Day Essentials

Need Field Day logs and summary sheets? Contact us RIGHT NOW in order to ensure receipt of everything needed. Request "Field Day Contest Forms." See May *QST*, page 87, for Field Day rules. At the same time you ask for logs, inquire about quantities of public relations brochures, such as "Amateur Radio: A National Resource" and "Ham Radio: A Community Resource," and flyers explaining the different Amateur Radio license classes and Novice Enhancement, at no charge. US Call Area maps = $3, World Map = $8 (shipping/handling = $2.50).



Two 2-meter beams grace the foreground of WA6OYS's site overlooking Lake Casitas (CA).

Ol' Sol powers W6TZA's 40-meter-phone QRP effort.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

YLs Around the World

At the New Zealand Women Amateur Radio Operators Silver Jubilee luncheon, Celia Reed, ZL1ALK, and Vicky Shaw, ZL1OC, were made Honorary Life members in recognition of their efforts and tireless contributions to WARO since its origination. Celia was elected to a three-year presidential term and Vicky continues to be the association's award custodian.

Jenny, N5DXD, and Julia, K5JFJ, share their excitement after being elected Secretary-Treasurer and Vice President, respectively, of the Texas YL Round-Up Net at the group's 33-year celebration. YLs from Texas, Arkansas and Oklahoma attended the party, which was held in Denton, Texas. N5BPT was elected president and K5BNQ was selected as Publicity Chairman. Look for the TYLRUN Net, which is open to all YLs, on 3.942 at 1200Z daily.

YL hunters will be pleased to work CT3YD, shown here with her OM, CT3AR. Trudy is active on 14.332.

One of the two "Barbaras" in this photo is N4HPY of Fairfax, Virginia. She is seated to the right of the other Barbara, wife of Vice President George Bush (at the podium). Barbara Holland, N4HPY, who is president of the Northern District of the Virginia Federation of Women's Clubs, was instrumental in having Mrs Bush address the group. N4HPY is a past president of the Vienna (VA) Wireless Society.

MEET THE NOVICES AND TECHNICIANS DAY YL CONTEST

Date/Time: 1700Z-2100Z June 4.
Eligibility: All licensed women operators throughout the world are invited to participate.
Procedure: Call "CQ YL."
Operation: Only frequencies in the HF bands that are open to Novices and Technicians may be used. Suggested frequencies: 80 meters—3.720-3.740; 40 meters—7.120-7.140; 15 meters—21.120-21.140; 10 meters—28.120-28.140 MHz. No cross-band operation. Net contacts and repeater contacts do not count. A station may be worked once on each band for credit. Maximum power is 200 watts PEP. The mode of operation shall be CW.
Exchange: Station worked, RST, name, QTH and license class. Entries in the log must also show time, band and date.
Scoring: (A) 3 points for each YL Novice or Technician worked; (B) 2 points for each YL General or Advanced class worked; (C) 1 point for each YL Extra Class worked; and, (D) Score each band separately. Total score equals the sum of scores for each band worked.
Logs: All logs submitted must show date, time, band, station worked, RST, and the name, QTH and license class of the station worked. Do not send carbon copies of logs. Please print or type. Logs must indicate the name, call sign, address and license class of the operator and must be signed by the operator. No logs will be returned. Logs must show the claimed score and be received by July 7, 1988. Mail logs to YLRL Vice President Carol Shrader, 4744 Thoroughgood Dr, Virginia Beach, VA 23455.
Awards: Top scoring Novice and Technician—YLRL postcards; top scoring General class or higher—YLRL postcards.

Strays

I would like to get in touch with...

☐ anyone with a manual for a Heathkit SG-10 signal generator. Joe Devine, NØEID, 7 Squire Cir, Penfield, NY 14526.

☐ anyone who has a service manual for a Kenwood TR-2400 or a Yaesu FT-230R. Stanley Mills, c/o MFI-WT-Haiti, PO Box 15665, West Palm Beach, FL 33406.

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

Alaska (Fairbanks)—August 27. *Sponsor:* Arctic Amateur Radio Club. *Time:* 9 AM-5 PM. *Place:* Badger Building, Tanana Valley Fairgrounds, College and Aurora Rds. *Features:* exhibits, demonstrations, swap meet, exams, refreshments, children's table, evening dinner. *Admission:* $1 per person, free for those persons under 12. *Tables:* $10 for swap tables, commercial exhibitors negotiable. *Contact:* Joan Soutar, NØAJW, PO Box 81389, Fairbanks, AK 99708, tel 907-479-6224.

British Columbia (Okanagan Valley)—July 8-10. *Sponsor:* Okanagan Ham Fair Society. *Time:* 4 PM Friday to 4 PM Sunday. *Place:* Illahie Beach RV Park, Hwy 97 N, Summerland. *Features:* flea market auction, seminars, packet, refreshments, repeaters. *Talk-in:* 146.34/94 or 146.52. *Admission:* $5. *Contact:* Glenn Borgens, VE7GSB, at 604-492-5684 or write Okanagan Ham Fair, Box 477, Penticton, BC V2A 6K6, Canada, or contact VE7BEE at 604-493-1122.

†**Illinois (Downers Grove)—July 10.** *Sponsor:* DuPage ARC. *Time:* 8 AM-3 PM. *Features:* VE testing-all classes. *Talk-in:* 146.52, 144.65/5.25. *Admission:* advance $2, door $3. *Contact:* Ed Weinstein, PO Box 71, Clarendon Hills, IL 60514, tel (N) 312-985-0527.

†**Illinois (Willow Springs)—June 12.** *Sponsor:* Six Meter Club. *Time:* Gates open at 6 AM. *Place:* 91st and Wolf Road. *Features:* flea market, dealer displays, refreshments. *Talk-in:* 146.52, 146.37/97. *Admission:* advance $3, door $4. *Contact:* Joseph Gutwein, WA9RIJ, 7109 Blackburn Ave, Downers Grove, IL 60516, tel 312-963-4922.

†**Indiana (South Bend)—June 12.** *Sponsor:* Michiana ARC. *Time:* 8 AM-4 PM. *Place:* University of Notre Dame Athletic and Convocation Center, just off Indiana Toll Road, Rte 80. *Features:* FCC exams including walk-ins, free parking, swaps. *Talk-in:* 147.225 repeater. *Admission:* $4 single, $6 family. *Contact:* Joe Mergen, 2030 Trail Ridge N, Mishawaka, IN 46544, tel 219-258-0577.

†**Kentucky (Covington)—June 12.** *Sponsor:* Northern Kentucky ARC. *Time:* (set up at 6 AM), public 8 AM. *Place:* Erlanger Kentucky Lions Park at I-75 to exit 184 B (Route 236 East), go two miles to Dixie Highway (State Route 25 & 42), turn right and go south one mile to Sunset Avenue, turn right on Sunset to end of street. *Features:* ARRL Forums, outside flea market, refreshments, flea market spaces are $4 each (tables not provided), major vendor indoor space is $15 per table (provided). *Talk-in:* 147.855/255 and 147.975/375. *Admission:* advance $4, door $5, children under 13 free. *Contact:* For advance registration and more info WA4BRM, c/o NKARC, PO Box 281, Florence, KY 41042, tel 606-371-8545.

Louisiana (Metairie)—June 18-19. *Sponsor:* Jefferson Amateur Radio Club. *Time:* Saturday 9 AM-4 PM, Sunday 9 AM-2 PM. *Place:* Bonabel High School, 8800 Bruin (next to Kenner city limits). *Features:* New dealers, swapfest, forums, refreshments and nonham activities. *Talk-in:* 146.01/61 *Admission:* $2. *Tables:* $5, each. *Contact:* John Wondergem, K5KR, 600 Smith Dr, Metairie, LA 70005, tel 504-837-1485.

Maine (Bangor)—June 4. *Sponsor:* Pine State ARC. *Time:* Dawn to 5 PM. *Place:* Hammond Street Campground near I-95. *Features:* refreshments, VE exams, PSARC Annual Meeting and Election of Officers, swapfest space (bring tables, chairs), overnight camping with power from June 3 to June 5 ($8.50 per night charge by campground management), food, bathrooms, shower, small store and ample parking are available on premises. *Talk-in:* 146.34/94. *Admission:* $2. *Contact:* Gerry Bell, N1DQX, or Ken Olmstead, KA1NNR, tel 207-989-4322.

Maryland (Frederick)—June 19. *Sponsor:* Frederick ARC. *Time:* 8 AM-4 PM, gates open for exhibitors 8 PM on June 18. *Place:* Frederick Fairgrounds. *Admission:* $3, nonhams and children free, tailgaters $2 extra. *Tables:* 1st $10, each extra $5. *Contact:* Dave Durkovic, N3BKD, 7128 Limestone Ln, Middletown, MD 21769.

†**Massachusetts (South Dartmouth)—June 12.** *Sponsor:* Southeastern Massachusetts ARA, Inc. *Time:* 9 AM-5 PM. *Place:* Take 195 to exit 13, Rte 140 S, at the end of 140, take a left on Rte 6, travel ½ mile, take a right at the intersection onto Rockdale Ave, about 1½ miles, and look for "Hamfest Sign." *Features:* VE exams (appointment only), "Nepra" packet workshop, work HF stations, tailgate sale. *Talk-in:* 147.60/00 for hamfest and 144.89/5.49 for backup. *Admission:* advance free/dealers $8, door free/dealers $10. *Contact:* VE exams & Hamfest info, Pete Kodis, N1EXA, PO Box 9187, North Dartmouth, MA 02747 (SASE, please).

†**Michigan (Midland)—June 11.** *Sponsor:* Central Michigan Amateur Repeater Assn. *Time:* 8 AM-1 PM. *Place:* Midland Community Center, George Street and Jefferson. *Features:* FCC exams, refreshments. *Talk-in:* 147.60/00. *Admission:* $3. *Contact:* CMARA Hamfest, PO Box 67, Midland, MI 48640, tel 517-631-9228.

†**Michigan (Monroe)—June 19.** *Sponsor:* Monroe County RCA Swap & Shop. *Time:* 8 AM-2 PM. *Place:* Monroe County Fairgrounds, Rte M50 and Raisinville Rd. *Features:* VEC testing, QLF contest, dealer displays, trunk sales. *Talk-in:* 146.72, Monroe rpt. *Admission:* advance $2, door $3. Tables: $6 per 8 ft, trunk sales $2 per space. *Contact:* Larry Linder, KB8AIZ, 2001 Ida-Maybee Rd, Monroe, MI 48161, tel (D) 517-265-4200, (N) 313-587-3663.

†**Minnesota (St Paul)—June 3-4.** *Sponsor:* North Area Repeater Assn. *Time:* Friday 6 PM-10 PM, Saturday 6 AM-4 PM. *Place:* Minnesota State Fairgrounds. *Features:* Free overnight parking of self-contained campers on Friday June 3, exhibits, commercial dealers, indoor and outdoor flea market, and amateur license exams. *Talk-in:* 146.76 or 146.85. *Admission:* advance $4, door $5. *Contact:* NARA, PO Box 857, Hopkins, MN 55343, tel 612-566-4000.

†**Missouri (Columbia)—June 4.** *Sponsor:* Central Missouri RA. *Time:* 6 AM-4:30 PM. *Place:* I-70 Dr SW (off Stadium Blvd), to Days Inn University Center. *Features:* forums, VE exams, flea market, refreshments, dealers. *Talk-in:* 146.16/76, 222.42/4.02. *Admission:* advance $2.50, door $3. *Contact:* CMRA, PO Box 283, Columbia, MO 65205, tel 314-445-7030.

New Jersey (Dunellen)—June 18. *Sponsor:* Raritan Valley Radio Club. *Time:* 8 AM. *Features:* refreshments, seller's spots $6 for one space, or $12 for multiple spaces. *Talk-in:* W2QW/R 146.025/625 and 146.52 simplex. *Admission:* $4, spouse and children free. *Contact:* Dave, KA2TSM, at 201-763-4849 or John, WA2C, at 201-968-5070.

New Jersey (Park Ridge)—June 18. *Sponsor:* Gilfer Associates, Inc. *Time:* 10 AM-3 PM. *Place:* Gilfer Shortwave, 52 Park Ave, Garden State Parkway, north exit 172 (Grand Ave), right to railroad tracks, make right (Kinderkamack Rd), to Park Ave, make right. *Admission:* Free admission for visitors, $3 per space for sellers (call early for reservations). *Contact:* Paul Lanmuier, N2HIE, PO Box 239, Park Ridge, NJ 07656, tel 201-391-7887 between 10 AM-5 PM. (Outdoors, rain or shine.)

†**New York (Cortland)—June 18.** *Sponsor:* Skyline ARC. *Time:* 7 AM-2 PM. *Place:* I-81 exit 12, 30 miles south of Syracuse I-81, 40 miles north of Binghamton I-81. *Features:* flea market, refreshments, parking, dealers. *Talk-in:* 147.825/225 449.45/4.45. *Admission:* $4. *Contact:* Bill Ackroyd, 5 Hilton Rd, Dryden, NY 13053, tel 607-844-4815.

New York (Poughkeepsie)—July 9. *Sponsor:* Mount Beacon ARC. *Time:* 7 AM for sellers, 8 AM-3 PM for public. *Place:* Rte 55 exit off of Taconic State Parkway, head west 2 miles, hamfest is on the right. *Features:* free parking, refreshments, auction, tailgating $5. *Talk-in:* 146.37/97 and 146.52 simplex. *Admission:* $4. Tables: $9. *Contact:* Ron Phillips, KB2DVC, 8 Wilmont Ct, Hopewell Jct, NY 12533, tel 914-221-4999.

†**New York (Queens)—June 12.** *Sponsor:* Hall of Science ARC. *Time:* 9 AM-3 PM. *Place:* New York Hall of Science parking lot at Flushing Meadow Park, 47-01 111 St. *Features:* films, ARRL information, tune up clinic, HOSARC'S Exhibit Amateur Radio Station WB2JSM, free parking, refreshment. *Talk-in:* 144.300 simplex link, 223.600 or 445.225. *Admission:* $3 for buyers, $5 per space for sellers. *Contact:* Steve Greenbaum, WB2KDG, tel 718-898-5599 (night only), or Arnie Schittman, WB2YXB, tel 718-343-0172.

†**North Carolina (Winston-Salem)—June 11.** *Sponsor:* Forsyth ARC. *Place:* Dixie Classic Fairgrounds. *Features:* FCC exams (preregistration suggested), refreshments, indoor dealers, free parking, tailgating space, flea market. *Talk-in:* 146.04/64. *Admission:* advance $4, door $5. *Contact:* for preregistration—(SASE) Dave Ward, KA1LVO, 5573 Vienna-Dozier Rd, Pfafftown, NC 27040. Dealer info—Jim Rodgers, N1DRI, Box 11234, Winston-Salem, NC 27116, tel 919-760-2493. Exam info—Bob Gates, KJ4IC, Box 60, Cedar Grove Park, Kernersville, NC 27284.

†**Ohio (Akron)—June 12.** *Sponsor:* Goodyear ARC. *Time:* 10 AM-5 PM. *Place:* Wingfoot Lake Park. *Features:* flea market, picnic areas, playgrounds, cruise-boat and paddle-boat rides, miniature golf, tennis, fishing, refreshments. *Admission:* advance $4, door $5. *Tables:* $6 (advance reservations requested). *Contact:* Don W. Rodgers, WA8SXJ, 161 Hawkins Ave, Akron, OH 44313, tel 216-864-3665.

Ohio (West Union)—June 4. *Sponsor:* Deforest ARC. *Time:* 9 AM-6 PM. *Place:* Adams County Fair Ground. *Features:* flea market, special event station, exams (all classes). *Talk-in:* 147.60/00. *Admission:* $3 at door. *Contact:* Richard Newbauer, KA8EKC, tel 513-544-3653.

Ontario (Burlington)—July 9. *Sponsor:* Ontario Hamfest. *Time:* 8 AM-5 PM. *Place:* Burlington Central Arena. *Features:* commercial exhibits, refreshments, seminars, free parking. *Talk-in:* 21/81, 52 direct. *Admission:* advance $3.50, door $5. *Tables:* 180 tables available. *Contact:* Ontario Hamfest, PO Box 836, Burlington, ON L7R 3Y7, Canada.

Pennsylvania (Harrisburg)—July 4. *Sponsor:* Harrisburg ARC. *Time:* vendors 7 AM, public 8 AM. *Place:* Bressler picnic grounds, take exit #1 off I-283, follow PA #441 North and follow signs to site. *Features:* refreshments, campground, motels and restaurants at exit #1, tailgating $1. *Admission:* $3 at gate, nonham spouses and kids free. *Tables:* available in pavillion, $5 each. *Contact:* Dave Dormer, KC3MG, 131 Livingston St, Swatara, PA 17113, tel 717-939-4957 or BBS 717-737-1654 12 PM-4 PM, 300-1200 baud.

Pennsylvania (Milton)—June 12. *Sponsor:* Milton and Central Susquehanna ARCs. *Time:* 8 AM-5 PM. *Place:* Winfield Fireman's Fairgrounds. *Features:* VE testing (by advanced registration), refreshments, contests, demo BBS, packet radio. *Talk-in:* 146.97, 147.18 and 146.52. *Admission:* $4 at gate, nonham spouses and children free. *Tables:* tailgating $1 for 6-foot table. *Contact:* Jerry Williamson, WA3SXQ, 10 Old Farm Ln, Milton, PA 17847, tel 717-742-3027 or Bob Stahl, KA3PYT, 452 Fourth St, Northumberland, PA 17857, tel 717-473-7050.

†**Pennsylvania (Pittsburgh)—July 10.** *Sponsor:* North Hills ARC. *Time:* 8 AM-4 PM. *Place:* Northland Public Library, 300 Cumberland Rd, take US Rte 19 north to Cumberland Road or PA Turnpike to exit 2, South on US Rte 19 to Cumberland Road. *Features:* VEC exams, refreshments, ARRL table, free dealer and flea market

†ARRL Hamfest

space. *Talk-in:* 147.69/09. *Admission:* free. *Contact:* Bob Ferrey, Jr, N3DOK, 9821 Presidential Dr, Allison Park, PA 15101, tel 412-367-2393. VEC info: John Rosenwald, NM3P, 400 Stevens Dr, Pittsburgh, PA 15237, tel 412-931-2631. (Handicap and wheelchair accessible).

Tennessee (Humboldt)—June 5. *Sponsor:* Humboldt ARC. *Time:* 8 AM-4 PM. *Place:* Bailey Park, 22nd Ave. *Features:* flea market, refreshments, free parking, nonham activities, forums. *Talk-in:* 146.37/97. *Admission:* $1, children and nonhams free. *Tables:* Bring your own, no set-up charge. *Contact:* Ed Holmes, W4IGW, Humboldt, TN 38343, tel 901-784-3490.

Texas (Levelland)—June 18. *Sponsor:* Hockley County Amateur Radio Club. *Time:* Vendors 8 AM, public 9 AM-4 PM. *Place:* South Plains College in the Sundown Room, which is on College Avenue, Highway 385. *Features:* License exams 9 AM and 1 PM, Skywarn, MARS and refreshments. *Talk-in:* 146.28/88. *Admission:* Advance $5, door $6. *Tables:* $2 each. *Contact:* HCARC, PO Box 604, Levelland, TX 79336.

Washington (Wenatchee)—June 4-5. *Sponsor:* Apple City Radio Club. *Place:* Rocky Reach Dam, 7 miles north of Wenatchee, on Hwy 97. *Features:* free camping, RV vehicle space available after 2 PM Friday, license exams at 2 PM Saturday, walk-in applicants welcome, banquet Saturday evening and potluck dinner Sunday afternoon. *Talk-in:* 146.07/67 or 146.49 simplex, 147.98/38 147.68/08 146.30/90 Mission Ridge. *Admission:* Amateurs $5, others $1, under 12 free ($4 prior to June 1). *Contact:* Bob Lathrop, 919 N Woodward Dr, Wenatchee, WA 98801.

Wisconsin (Oak Creek)—July 9. *Sponsor:* South Milwaukee ARC. *Time:* 7 AM-3 PM. *Place:* American Legion Post #434, 9327 S Shepard Ave. *Features:* refreshments, parking, picnic area, also free overnight camping, exams. *Talk-in:* 146.58 simplex. *Admission:* $3. *Contact:* The South Milwaukee ARC, PO Box 102, South Milwaukee, WI 53172-0102.

Wisconsin (Stevens Point)—June 19. *Sponsor:* Central Wisconsin Radio Amateurs Ltd. *Time:* 8 AM. *Place:* Bukolt Park. *Features:* food, refreshments, playground. *Talk-in:* 146.385/985 and 146.22/82. *Admission:* Free. *Tables:* $3. *Contact:* Jim Benak, KA9ACE, 1909 Strongs Ave, Stevens Point, WI 54481, tel 715-344-5943.

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

Strays

***QST* congratulates...**

☐ *QST* Contributing Editor Bill Tynan, W3XO, who retired earlier in the year from the Johns Hopkins Applied Physics Laboratory.

☐ Doug Herman, KDØTG, of Sioux City, Iowa, on being named recipient of the 1988 Outstanding Biology Award and Excellence in Science Teacher Award for Biology.

☐ Joe Connell, WA1UYR, of Westford, Massachusetts on being elected President of the New England Association of Chiefs of Police.

☐ Robert Atkinson, K5UJ, of Hernando, Mississippi on being named Science Monograph Catalog Librarian at the Ralph Brown Draughon Library of Auburn University, Auburn, Alabama.

Coming Conventions

June 3-5
West Gulf Division, Arlington, Texas
July 2-3
West Virginia State, Jackson's Mill
July 9-10
Georgia State, Atlanta
August 5-7
Texas State, Austin

ARRL NATIONAL CONVENTIONS
Sept 9-11, 1988—Portland, Oregon
June 2-4, 1989—Dallas/Forth Worth, Texas

WEST VIRGINIA STATE CONVENTION

July 2-3, 1988, Jackson's Mill

The West Virginia State Radio Council is sponsoring the West Virginia State Convention at Jackson's Mill State 4-H camp. Features include ARRL Forum, flea market, commercial dealers, MARS meetings, technical forums, and annual equipment auction and pizza party. Admission is $4. Certificates are available for contact with W8WVA. Convention talk-in station operating on 145.39/4.79. For more information contact Hal Tate, N8FXH, 121 East Olive St, Bridgeport, WV 26330.

W1AW Schedule

April 3-October 29, 1988 **MTWThFSSn = Days of Week** **Dy = Daily**

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

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

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

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

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

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

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from June 1987 *QST*, pages 9 and 70" 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 70.

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

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

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

CW bulletins are sent at 18 WPM.

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

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

W1AW will be closed on May 30, July 4 and September 5.

Major reconstruction at W1AW is expected to begin during the summer. Some or all of the scheduled transmissions and visitor operating periods *may* be preempted at times. Check W1AW bulletins for up-to-date information.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

WA1HXA, Richard J. Tomlian, Sun City, AZ
W1KQT, Michael J. Hornak, Trumbull, CT
W1MSX, Francis J. Boivin, Lancaster, NH
K1YMY, Richard P. Thull, Rutland, VT
W1ZHC, Alfred T. Sears, Mattapoisett, MA
W1ZNA, Albert M. Royak, Bridgeport, CT
WB2BGV, Vincent Bors, Jr, Elmwood Park, NJ
WA2EUA, William Pederson, Ridge, NY
N2GEL, Thomas B. Baker, Babylon, NY
WA2IOT, Sidney Fisch, White Plains, NY
KD2LG, Alan R. Dillon, Vincentown, NJ
W2LJT, Joseph F. Maul, Long Island City, NY
W2RFV, Clarence H. Wallen, Stratford, NJ
N2SY, Fred Lauterborn, Syracuse, NY
KA2WXH, Herbert K. Brown, Brick, NJ
W2ZQF, Charles McRorie, Schenectady, NY
N3CMR, R. C. Harvey, Pittsburgh, PA
W3MXW, Joseph H. Salamon, Malvern, PA
W3RBH, William H. Callan, Altoona, PA
K3ULQ, Theodore L. Schaeffer, Woodbridge, VA
K3YHT, Samuel T. Beach, North Fort Myers, FL
K4AAM, William G. Barrett, Virginia Beach, VA
KA4AHE, A. Leo Chandler, Ringgold, GA
W4AN, John C. Howell, Griffin, GA
W4BEV, William E. Burnett, Jr, Chattanooga, TN
K4CHN, Dale M. Benedetto, Johnson City, TN
K4CQN, Arthur L. Johnson, High Point, NC
WB4DCS, Albert H. Salter, Summerfield, NC
W4FJA, James F. Mulroy, Jacksonville Beach, FL
WA4GGG, Leo C. Wright, Decatur, AL
KE4JO, Marion S. Ricketson, Saluda, SC
K4LAR, Richard A. Teichman, Atlanta, GA
W4LF, Ernest B. Vordermark, Neptune Beach, FL
K4MAN, Robert M. Springer, Titusville, FL
W4MES, Otto Kosa, Hartwell, GA
K4MIL, Thurston L. Thompson, Athens, TN
N4NFV, Robert B. Martin, Sanford, FL
WB4OCU, Catharine M. Reeve, Mobile, AL
W4OTU, Michael A. Jason, Sr, Inverness, FL
WA4PTD, William J. Luka, Memphis, TN
WB4QID, John L. Farabaugh, Lakeland, FL
*NO4Q, John C. Brown, Eva, TN
N4RBS, Diana C. Commander, Norfolk, VA
K4VKA, Charles L. Fletcher, Kingsport, TN
K5AOY, Marvin D. Cottingham, Bandera, TX
KC5BL, Carl A. Bowen, San Benito, TX
AD5E, Earl C. Demuynck, Senatobia, MS
W5GYW, William C. Bettis, San Antonio, TX
N5IFR, Michael G. Kelly, Albuquerque, NM
W5IGU, Otto H. Richardson, Tijeras, NM
W5NBT, Lloyd O. Blevins, Santa Fe, NM
W5RUH, James P. Kenney, Unionville, TN
K5UCB, James H. Armstrong, Albuquerque, NM
*K5VNV, John M. Marquess, Hungerford, TX
K5VXS, Carthal W. Jeffries, Conway, AR
W5ZWX, Jess B. Strawn, Tulsa, OK
K6AMI, Stanley D. McCauslin, Beaverton, OR
W6BVD, Paul W. Carpenter, Sebastopol, CA
W6DB, Lee V. Krutz, Hemet, CA
KA6DUT, James L. Davis, Jr, Lindsay, CA
N6FCD, William A. Leeds, Los Angeles, CA
W6IBX, Harry A. Miller, Temple City, CA
WB6ILU, Attilio Correnti, Oxnard, CA
KA6IWO, Donald D. Johnson, Lakeport, CA
WA6JTL, Arthur M. Manning, Laguna Hills, CA
WB6KMI, Clarence F. Field, Sonoma, CA
KH6OO, George R. Helmick, Kailua, HI
KB6QDU, Richard L. Benjamin, Kelseyville, CA
W6QLJ, Edwin D. Keating, San Diego, CA
K6QPG, Mary J. Garlow, Fallbrook, CA
W6RLC, Douglas H. Tompkins, Hesperia, CA
W6SKN, Otto J. Peck, Hemet, CA
KD6TZ, Earl E. Hickman, Marysville, CA
KB7CGZ, John Path, Spokane, WA
W7CJC, Stanley L. Rinehart, Indian Valley, ID
W7CTS, Carl H. Hoffman, Ritzville, WA
WB7EMB, David R. Graham, Enumclaw, WA
W7JIY, Arthur R. Dragoo, Redding, CA
W7LJM, Raymond A. Bower, Auburn, WA
K7NXX, Robert D. Barney, Grants Pass, OR
WB7QFK, Hal A. Robertson, Bellevue, WA
KA7SHS, John S. Robertson, Tacoma, WA
AJ7V, Billy W. Allen, Phoenix, AZ
WB7WYB, Earl S. Dietsch, Sequim, WA
W7YC, V. A. Carrougher, Tacoma, WA
W8CBC, Frederick E. Abbott, Coshocton, OH
W8CGN, Paul J. Schwenn, Norwalk, OH
W8GPG, William P. Staubach, Springdale, OH
WA8QJL, Pete Laszynski, Dowagiac, MI
K8SUC, James E. Firestone, Dowagiac, MI
K8ZYR, Graham Broadbent, Muskegon Heights, MI
WB9FOT, Robert R. Miller, West Lafayette, IN
KC9JB, Howard H. Kaufman, Elkhart, IN
W9LIH, Edward Koeman, Hammond, IN
*K9PRB, John M. Burrows, Shorewood, IL
*WB9RKJ, Jan Sager, Mossy Head, FL
KA9SJZ, Daniel R. Davis, Harrisburg, IL
K9YQA, George F. Partridge, Mishawaka, IN
WØABT, Francis B. Steffen, Bowbells, ND
WØEDQ, Donald H. Love, Ames, IA
NØGXX, Roy J. Kleis, St Ann, MO
KAØJXQ, Maurice G. Hill, Lebanon, MO
KAØNSC, Irving A. Walrath, St Cloud, MN
WØNYV, Rex D. Louden, Affton, MO
WAØQEW, Jack E. Stickler, Lebanon, MO
KAØQZA, Lyell Henry, Sr, Ames, IA
WØSFQ, Arthur M. Stout, Manchester, MO
WØUPY, William F. McCarty, Omaha, NE
WØYVH, Charles F. Schimmel, St Louis, MO
WØZZV, William T. Lobb, Warsaw, MO

*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. Canadian reports should be sent to the CRRL HQ address on page 9.

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

June, 1938

☐ The editorial points out that Field Day was created (in 1933) to enhance *international* contacts from outdoor locations, but the proliferation of recent emergencies in which amateurs have performed outstanding primary and backup communications links has put the emphasis on self-powered equipment for *domestic* disaster preparation.

☐ The Board of Directors has approved the holding of a national convention sponsored by the Chicago Area Radio Club Council, the first in a dozen years.

☐ The extended double-Zepp antenna will surely achieve popularity, as W2NB points out it is a simple structure having improved gain and horizontal directivity, all by lengthening the elements to .64 wavelength.

☐ W8BXN's freqmeter/monitor has in addition a 913 cathode-ray tube to display a trapezoidal pattern of his emitted signal.

☐ And George Grammer goes ordinary frequency measurement one better by using a multivibrator to divide the 100-kc. crystal oscillator points and provide a marker every 10 kc. throughout the spectrum.

☐ Canadian amateurs will have an additional 50 kc. (down to 3800) for 75-meter voice operation, since the former 3500-3550 segment was lost at the Havana conference.

☐ The "Hamdom" column relates that while German Nazis were invading Austria, OE3AH (Archduke Anton) was busily engaged in adding multipliers to an already weighty score in the League's DX contest!

☐ The Hiram Percy Maxim Award for 1937 goes to 19-year-old Oscar Short, W9RSO, for overall outstanding performance in various aspects of ham radio.

☐ W2AYN, W2HHG, W6KFC and W7GKZ were the only four to make perfect copy in the A.R.R.L. Copying Bee, a transmitted text comprised of trick letter combinations, misspelled words, figure groups and odd word combinations.

☐ Some commercial telegraph printers render the code for the period (·· ·· ··) as three I's, so the operating companies are asking authorities to change the present comma (·—·—·—) to represent the period, and change the present exclamation mark (——··——) to represent the comma.

☐ W1GBE (his outstanding work on magnetrons still in the future) describes a portable 'phone rig accompanying his hunting trips to the Maine woods, with 120 feet of wire strung up in a tree.

☐ Don Mix applies the principle of ganged tuning in superhets to a multi-stage rig he built, thus providing a simple tracking system which reduces the number of transmitter controls.

25 Years Ago

June, 1963

☐ For his MS degree at Boston University, W4HMK undertook an extensive questionnaire project among the general body of amateurs; among other things, it showed that 69% of active hams regularly read *QST*, compared with 38% for *CQ*, 12% for *73*, and 19% for *Popular Electronics*.

☐ At its annual meeting the Board of Directors charted a four-point program to be presented to the Federal Communications Commission calling for an extension of the existing incentive licensing structure by re-establishment of an advanced grade of license; assignment of band portions appropriate to the higher grades of license; complete review and revision of current written exams; and modification of the Conditional Class rules to limit the term and permit renewal only for handicapped persons or those in the military.

☐ A 15-meter beam for less than $5?? W1ICP did it for his Novice followers, using twin line for elements and bamboo poles for supports.

☐ Lots of us are still building gear, even as complex as sideband rigs, an example being W3TLN's transceiver providing good stability from crystal control and the VXO principle to obtain the desired tuning range.

☐ The V.H.F. Sweepstakes is growing each year; more than 1500 entries were received covering activity in the January event.

☐ W1JPE urges more honesty in signal reports, with special attention to chirps, clicks and overmodulation, so we can clean up the few bad signals on the bands.

☐ Using a salvaged motor from a car broadcast antenna, W1NI has come up with an inexpensive and easily-built method for tuning the mobile antenna from the driver's seat.

☐ K3KRU is pushing for more activity on the microwaves, and describes equipment for 3300 Mc. and adjacent bands with a minimum of hard-to-find components.

☐ April receipts for the Building Fund were the highest of any month, obviously spurred by the matching "challenge" gifts. The building itself is nearing completion and after July 1st the Hq. address will no longer be West Hartford but Newington, Conn.

☐ Reaching the end of his tunable i.f. (for v.h.f. converter use) dial, W2DVG switches in a padding capacitor and gets another 2 Mc. coverage by turning the dial back to 0.—*WIRW*

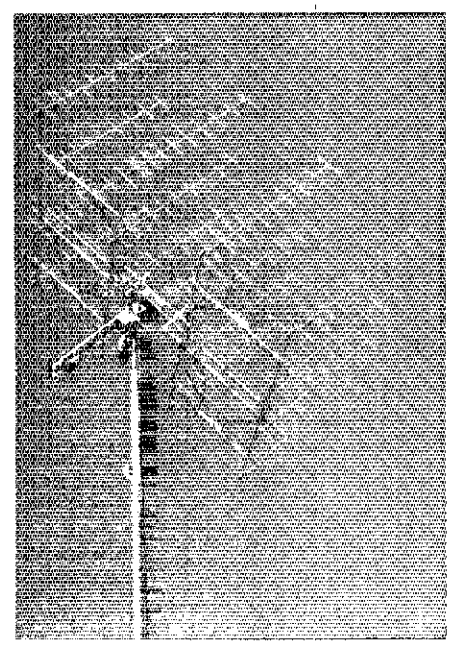
Results, 1988 ARRL VHF Sweepstakes

Rats, Roger, Raucous Robert and Rick Wreak VHF Havoc!

By Billy Lunt, KR1R
Contest Manager, ARRL

and

Mark Gamble, N1FOZ
Contest Assistant, ARRL



Tim's (KL7WE) majestic 432-MHz Yagis hit the moon for all of his contest QSOs.

The VHF contesting year is an interesting study in contrasts. The June and September contests can be filled with so many exciting surprises. Witness the tremendous E-skip of last year's June contest and the magnificent tropospheric enhancement of September 1985 and 1986. This contrasts with the relative sameness of conditions considered the norm for the January VHF Sweepstakes. It becomes a bit trite to report year after year that January conditions were punk. Let's face it, they're always flat in January! That's why it's the perfect contest to promote lots of local activity to push up the club competition aggregate score. Thus, even without propagational enhancement, this keeps things pretty lively at least in the metropolitan areas. Unfortunately for VHF contesting, much of the US and Canada consists of large expanses of territory far removed from high-density population centers.

Those that frequent the major VHF contests throughout the year notice that there is a marked difference in distance that can normally be expected to be worked in January as compared to the other more favorable times in the year. One sometimes wonders why anyone would venture into the VHF ether in January at all.

But it's a long time from September to January. So conditions may not be so hot in the great January VHF gathering, but it can sure get the VHF adrenalin flowing. Besides, it provides a low watermark from which you can do nothing but improve the rest of the VHF contesting year!

The true test is in the enjoyment derived. You may have to dig a little deeper to find some gems of fun, but the true optimist will always find a pearl in the rockpile. Here's just a sample from those who found the VHF Sweeps very much to their liking.

"Best DX: W2DRZ in FNØ2 on four bands, many thanks."— W1QK. "Thanks to W1JR for digging my one watt of 220-MHz RF out of the noise."—N1BUG. "Wow! The pile-ups on 146.55 were worse than most DX crowds."—KA1KPH. "With amazingly high activity level in all directions, I had a ball."—WB2ZSY. "There were many new stations

Affiliated Club Competition

Club	Score	Number of Entries	Single Op Winner
Unlimited Category			
Mt Airy VHF Radio Club	2,181,472	58	WA3AXV
Hampden County Radio Assn	605,029	52	W1RIL
Rochester (MN) ARC	17,352	52	WØVB
Medium Category			
Delaware Valley VHF Society	502,489	11	K2SMN
Rochester VHF Group (NY)	457,408	27	N2WK
SCORE	440,905	7	K2OWR
South Jersey Radio Assn	107,650	16	K2YY
Warminster ARC	78,759	23	KA3FBP
Yankee Clipper Contest Club	68,092	4	W1JR
Granite ARA	60,315	10	NI1W
Six Meter Club of Chicago	44,372	19	K9MBX
Wheaton Community Radio Amateurs	24,133	10	KR9K
AWARE	22,216	11	KB3PD
Rochester ARA	14,048	17	K2JA
Potomac Valley Radio Club	6,396	3	W3GN
Mobile Sixers RC	6,905	12	K3RTU
Ventura County ARC	1,302	4	K6VMN
Local Category			
Murgas ARC	360,288	6	WA2FGK/3 (K2LNS,op)
Suburban ARC	110,195	5	WB2YEH
Crystal RC	108,214	10	N2BJ
Tri County Tri Banders	31,463	4	KC2TJ
Minnesota Wireless Assn	20,406	5	WØUC/9
Fox River Radio League	18,123	6	KA9LDS
Drumlins ARC	13,562	5	KC2GZ
Mount Tom ARA	6,186	3	KA1MDA
Northern Texas Microwave Society	4,288	3	N5WS
Anne Arundel RC	3,776	3	KB3HH
Northern New Mexico ARC	3,641	4	K5MAT
York Radio Club	3,349	10	WA9OHU
Huber Heights ARC	2,076	5	N8CCC
Rochester Repeater Radio Assn	2,075	5	N2GDD

Top Ten

Single Operator		*Multioperator*	
Call	*Score*	*Call*	*Score*
K2SMN	173,500	N2SB	511,086
WA3AXV	169,824	WA2OMY	250,850
WA2FGK/3 (K2LNS,op)	154,775	W1NY	208,917
K2OWR	128,578	WB3CZG	173,440
WA3NUF	116,500	W1XX	159,443
W2DRZ	109,810	W2SZ	152,105
N2BJ	104,468	WAØTKJ	140,174
N2WK	102,300	N2EOC	120,204
WB3JYO	96,710	K1TR	118,473
KC2PX	92,352	VE3LNX	116,116

Division Leaders

Single Operator			*Multioperator*	
Call	*Score*	*Division*	*Call*	*Score*
VE3DSS	15,008	Canada	VE3LNX	116,116
K2SMN	173,500	Atlantic	N2SB	511,086
WB9MSV	46,610	Central	WB9EEA	33,880
WØVB	11,448	Dakota	NØHZO	273
K5UR	31,496	Delta	N4VC	20,070
WD8ISK	76,464	Great Lakes	WB8IFP	52,312
K2OWR	128,578	Hudson	W2SZ	152,105
NØLL	13,725	Midwest	WAØTKJ	140,174
W1RIL	78,078	New England	W1NY	208,917
KE7CX	4,482	Northwestern	WB7PEK	6,800
KB3LY	3,078	Pacific	WA6PWW	6,240
W5FF	3,666	Rocky Mountain	WØKEA	624
K2UOP/4	42,662	Roanoke	WA8DQR	7,056
WW4T	8,256	Southeastern	W4APV	5,472
W6CPL	24,353	Southwestern	W6YLZ	42,240
K5SW	12,802	West Gulf	WD5AGO	7,680

QSO Leaders By Band

Single Operator

50 MHz		*144 MHz*		*220 MHz*		*432 MHz*		*902 MHz*		*1296 MHz*	
K2OWR	224	K2OJL	477	WA3AXV	148	K1FO	219	WA3AXV	28	K2SMN	65
WA1OUB	201	KA1KRJ	457	N3CX	107	WB3ESS	151	W6CPL	27	K2OWR	55
WA2FGK/3 (K2LNS,op)	196	KA2WKA	428	WA3NUF	106	N2BJ	149	W1RIL	26	WA3AXV	49
WA8B	195	WB1BXS	410	W2EIF	105	K2TXB	144	N3CX	24	W1RIL	47
W3WFM	158	K2TXB	406	N2BJ	104	WA3AXV	131	K2SMN	22	K2TXB	47
W2DRZ	150	WA3HMK	398	WA3JUF	100	K2SMN	131	KT2B	22	WA3NUF	46
K3LOM	147	K2SMN	390	K3IUV	97	K2OWR	127	WA2FGK/3 (K2LNS,op)	21	K2JWE	46
WA3AXV	145	WB2QOQ	374	W3CL	97	N3CX	125	WB3JYO	21	KT2B	44
WA1VRH	136	WA3FAE	371	K3ACR	95	KT2B	110	WB2YEH	19	WB3JYO	39
W3IFM	134	N2BJ	370	KT2B	92	W1RIL	106	WA3JUF	18	WA3JUF	37
WB3JYO	132	KC2PX	365	WB2YEH	90	K1RZ	103	KD5RO/2	18	N3CX	36
W2CNS	129	N3AHF	364	N2FY	90	WA3NUF	102	K2GAL	17	N3BBI	34
N3BBI	128	K3NXH	361	K2OWR	87	K3IUV	101	KC2PX	16	WA1OUB	33
WA3YUE	127	N3EAX	354	WA3YUE	87	WA2FGK/3 (K2LNS,op)	101	AB1U	15	KC2PX	32
K3LYB	127	K2OWR	341	AK3O	87	KC2PX	101	WA3NUF	14	N2BJ	32
K1RZ	124	WA1VRH	322	W0RSJ	86	N2WK	99	N2WK	14	W2EIF	32
W1DAT	120	K3EWZ	302	K2SMN	84	W2PAU	93	W0RSJ	14	KB3QM	32
WA3NUF	118	WA2TEO/1	300	WB3IGR	78			WA1MBA	14		
W3IIT	109	KA8IFC	297								

QSO Leaders By Band

Multioperator

50 MHz		*144 MHz*		*220 MHz*		*432 MHz*		*902 MHz*		*1296 MHz*	
N2SB	318	N2SB	679	N2SB	189	N2SB	247	N2SB	29	N2SB	70
W1NY	246	W1XX	523	W6YLZ	142	W1NY	189	WA2OMY	21	WA2OMY	49
N2EOC	228	KA3PLC	497	WA2OMY	141	WA2OMY	159	WB2JHG	20	W1XX	45
W2SZ	220	WA2OMY	488	N2EOC	127	W1XX	131	VE3LNX	16	W1NY	38
WA2OMY	218	W1NY	483	W1NY	122	K1TR	127	K1TR	15	W6YLZ	37
W1XX	174	N1FJV	439	K1TR	106	N2EOC	124	WB3CZG	15	WB2JHG	32
K1TR	172	KA1ZE	426	W2SZ	105	KA1ZE	120	W1XX	13	W3KKN	31
WB3CZG	159	W2SZ	413	W3KKN	101	WB3LJK	112	KA1ZE	11	WB3LJK	29
K2CBA	155	K1TR	411	K3MTK	99	K3MTK	108	WB2PSI	11	WC2F	25
W3KKN	153	WC2F	404	W1XX	98	N1FJV	106	N1FJV	10	WA0TKJ	24
NV2D	140	WB3CZG	397	K3QM	97	K3QM	103	KD2YB	7	W3KWH	23
K3QM	135	N2EOC	383	WB2JHG	78	KA3HTY	95	N0KV/6 (DM03)	2	WB3CZG	22
K3IVO	113	K3QM	340	WC2F	75	WB2PSI	92	WB9EEA	1	W3VIR	21
NR2M	111	WB3LJK	319	KA1ZE	74	W2SZ	91			KA1ZE	19
N2TW	110	VE3LNX	305	WB3CZG	73	W3KKN	91			VE3LNX	17
WB2PSI	106	K3MTK	288	N1FJV	68	WC2F	86			N0KV/6 (DM03)	17
WA0TKJ	105	WB8IFP	280	WB8IFP	68	WB2JHG	85			K1TR	16
W3KWH	100	W3KKN	241	N3CFE	63	K3IVO	85			N1FJV	16
K3MTK	98	WB2PSI	235	WB2PSI	56	VE3LNX	83			N3CFE	16
WA0DCB	96	W6YLZ	231	WA3FOF	53	WB3CZG	81			WD5AGO	15

on. Best tropo contact was K9VGE in Milwaukee with an S8 signal."—N4VC. "Operating 6 bands mobile is a fun way to contest."—WB0HYV/5. "It was my first VHF contest. I was amazed I could work a station 400 miles away. A real gas!"—KK7A. "Pretty good for a January contest."—VE2DUB.

For the sane among us, mountaintopping is in winter hibernation. But who says that there aren't some hams ready for the rubber room? To wit, KF6CU operating from Mt Diablo queried: "Great weather for mountaintoping! Where was everyone?" And NY7C: "Had fun working QRP portable!" Meanwhile the hearty boys at WA6PWW operating from Pacheco Peak found out the hard way that "during the winter months poison oak plants bear no leaves but nevertheless retain their toxins." Scratch! Tenacious grid-hopper KB0ZQ noted from EN24, EN34 and EN35: "Pasta salad, a blinding snow storm, 4-wheel drive, portable 0 on 2 meters; it just doesn't get any better than this."

In the single-op competition, concentrating on 2 meters seemed to pay off for Roger, K2SMN, as he edged out perennial winner WA3AXV by only 4k points. Roger neglected 6 meters to concentrate on 144, while Ron put in a more balanced effort, but was unable to match Roger's superlative 2-meter effort. On UHF, it was a Mexican standoff between these two fine ops with great stations, although K2SMN's super 1296-MHz score may have been the difference. The nature of this contest tends to make the top-ten box an all-East who's who. The score listings tell the whole story of where the geographical competition really takes place.

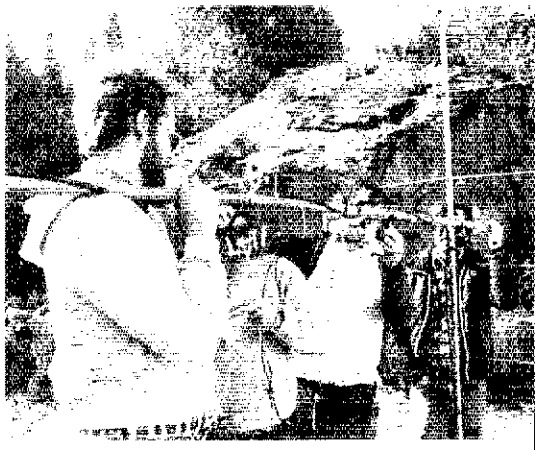
In the multiop category, who else but N2 Sugar Baby, utilizing the super WC2K (ex-WB2NPE) station? Great score, guys! Perennial bridesmaid WA2OMY topped 250k with only three ops, while WA0TKJ and VE3LNX still made the top ten even though somewhat removed from the dense population centers.

The petrol that has traditionally fueled activity in the Sweeps is the club competition. No surprises here as the Mt Airy Pack Rats, Delaware Valley VHF Society and Murgas ARC swept to first-place finishes in the unlimited, medium and local club categories respectively. Some very good club efforts should also be recognized however: the Rochester groups (all of 'em), Hampden County, South Jersey, Warminster, Suburban, Crystal, Wheaton and Six Meter Club of Chicago—just to name a few. "Eyes (no, make that Yagis) right" as we salute all the clubs that made the 1988 VHF Sweepstakes another successful contest.

As always, the Contest Desk is pleased to produce the QSO- and multiplier-leader boxes by band, which always prove to be interesting reading in preparation for the remainder of the 1988 VHF contest season. Don't miss it!—*W1XX*

SOAPBOX

Enjoyed the test very much; this was my first official entry. I can't wait until June! (NA1S). Expedition failure, no one looks in the ocean (KB1QV). Happy to work W2s and W3s with only 10 watts and a 4-el Yagi (AD1C). I only had time for a couple of hours this year, but enjoyed it anyway (K1KA). I finally put my best foot forward and it paid off. 400 watts from my AM-6154 made the difference (WA1NIE). Four grids off the moon! (KA1ONV). Enjoyed the



A little antenna work is good for the soul, at least that appears to be the opinion of the WA6PWW multiop gang.

Multiplier Leaders By Band

Single Operator

50 MHz		*144 MHz*		*220 MHz*		*432 MHz*		*902 MHz*		*1296 MHz*	
WA1OUB	42	KA8IFC	63	WA2FGK/3 (K2LNS,op)	25	K1FO	41	K2SMN	9	K2TXB	17
WA8B	42	WA8MZQ	63	W2DRZ	23	WB9MSV	31	KD5RO/2	8	K2SMN	16
WØUC/9	41	W8ULC	57	WB9MSV	21	WD8ISK	30	WA3AXV	8	K2JWE	14
W2DRZ	39	W2DRZ	53	KB3QM	21	WA2FGK/3 (K2LNS,op)	29	W6CPL	8	WA3AXV	13
K5UR	36	KE8FD	53	WD8ISK	19	W2DRZ	28	N2WK	7	WA2FGK/3 (K2LNS,op)	13
WA2FGK/3 (K2LNS,op)	35	WA3HMK	50	KB8ZW	18	W1JR	27	WB3JYO	7	WA3NUF	12
WD8ISK	33	K1RZ	49	N2WK	18	WB3ESS	27	W1RIL	7	K2OWR	12
W3WFM	33	WA4VWV	49	WA3AXV	18	K4QIF	27	WD8ISK	6	KD5RO/2	11
K1RZ	30	WD8ISK	48	W1JR	18	KB8ZW	26	WA2FGK/3 (K2LNS,op)	6	KB8ZW	11
WB8IGY	30	K5UR	46	VE3DSS	17	N2WK	26	N3CX	6	N2WK	10
KC3CL	30	KC3CL	46	N3CX	17	K1RZ	26	KT2B	6	W1RIL	10
W5FF	30	K3NXH	45	K2SMN	16	K2TXB	25	WB2YEH	6	KT2B	10
W3IFM	30	VE3VAL	45	WB8IGY	16	W2GU	24	AB1U	6	W2DRZ	10
K2OWR	29	WA3FYJ	44	W2GU	15	WA3FYJ	24	W2DRZ	5	K2GAL	10
WA3AXV	28	WB9MSV	44	K2OWR	15	K5UR	24	W1JR	5	WA3JUF	10
KB3QM	27	N3EAX	44	WA3NUF	15	W3IP	24	WQ4V	5	N2BJ	10
K4LHB	26	WA3FAE	44	KD5RO/2	15	K8WW	24	K2GAL	5	W3IP	10
WA3FYJ	26	WA2FGK/3 (K2LNS,op)	43			WA8DXG	24	KC2PX	5	WA1OUB	10
WA1VRH	26	K2SMN	42			KB3QM	23	WA3JUF	5		
W2CNS	26	K2TXB	42			K2SMN	22	WA1MBA	5		
								WA1JOF	5		

Multiplier Leaders By Band

Multioperator

50 MHz		*144 MHz*		*220 MHz*		*432 MHz*		*902 MHz*		*1296 MHz*	
WAØTKJ	63	WAØTKJ	68	N2SB	32	WAØTKJ	37	N2SB	9	WAØTKJ	21
N2SB	48	WB8IFP	63	W2SZ	26	W1NY	36	WB3CZG	8	N2SB	17
W2SZ	42	N2SB	60	WB3CZG	23	N2SB	33	VE3LNX	7	W3KWH	17
W8BI	36	WB3CZG	52	VE3LNX	22	W2SZ	32	K1TR	7	WD5AGO	13
WAØDCB	36	VE3LNX	50	W1NY	22	WB3CZG	28	WA2OMY	6	WB3CZG	12
WB8IFP	36	W3KWH	45	WA2OMY	21	VE3LNX	28	KA1ZE	6	WA2OMY	12
W1NY	35	WA2OMY	44	WB3LJK	20	W3KWH	27	WB2PSI	6	W1NY	11
WA2OMY	34	KV8S	44	N2EOC	20	WA2OMY	25	W1XX	5	WB3LJK	11
W3KWH	34	W2SZ	43	WC2F	19	WB3LJK	25	N1FJV	5	W1XX	10
WB3CZG	31	WB3LJK	43	KA1ZE	18	KA1ZE	25	WB2JHG	4	WC2F	9
N2EOC	31	NR8S	42	K3QM	18	W1XX	25	KD2YB	3	VE3LNX	8
NV2D	30	N4VC	40	W1XX	18	N2EOC	24	NØKV/6 (DMØ3)	2	KA1ZE	7
KA8MRI/9	29	WB2PSI	38	NA2O	18	K1TR	22	WB9EEA	1	WB2PSI	7
WB2PSI	25	WC2F	36	WAØTKJ	17	N1FJV	21			WB2JHG	7
N2TW	25	KA1ZE	36	N1FJV	17	NR8S	21			W6YLZ	7
W1XX	24	W1NY	35	K1TR	17	WB2PSI	20			N1FJV	6
VE3LNX	24	KA8MRI/9	35	WB2PSI	15	N2TW	20			W3VIR	6
K1TR	24	N1FJV	35	KU2A	14	WC2F	18			K1TR	4
W3KKN	23	K3QM	34	K2CBA	13	K3QM	18			NØKV/6 (DMØ3)	4
WA8DQR	23	WB9EEA	34	W3KKN	13	N4VC	18			W3KKN	4
						WD5AGO	18			K2CBA	4

brief lively action in WMA (W1KK). I couldn't find anyone to work 2304 MHz (KH6CP/1). Not too bad...but a real let down from 6 m VUCC in one weekend in the June contest (N1ABY). Better luck next year! (KA1CV). Quiet conditions on 6m, but lots of new calls (N1BZF). Made it through till ½ hour before the end of the contest and then gave up!—the old brain had had enough (NI1W). Lots of easy-to-work grids were missing this time (WA1HYN). Conditions not that great from Vermont making it a slow contest for me. CU in the next one! (K1LPS). A 5/8 whip on a mag mount sticking to a juice can top nailed to a board hung out of a 2nd floor window with connecting coax to my 2-meter H/T allowed me to more than double my 1987 score (N1EIZ). Waited till Saturday AM for wind, low temperatures and snow flurries to come so we could put up 2-meter Yagi. It's the only way to be sure it works good (WA2FUZ). With a sore throat I couldn't do much voice work, but had a great time on CW. I got my furthest DX yet on 2 meters EN91. I was just thrilled to hear that "8" call (KG2H). I really enjoyed the contest until my preamp relay became intermittent! Looking forward to the June contest (N2GHR). My personal observation seems to show that a lot of 3s and 4s had their antennas pointed to the west. They didn't rotate them much to the northeast (WB2CUY). This was more exciting than being at a football game! Even the spouse left me alone! (N2HPJ). Trying to get NN2T to brave the bugs and heat with me in June and finally go portable after three years of running the summer test from the home shack. How 'bout it Butch? (KA2IVS). Sunday eve, prime time—TV won! Where has 144.1 CW gone? (K2GK). My most exciting moment was when the plate transformer of my rig shorted and burst into flames. I bet nobody else had any trouble since Murphy was full-time at my QTH! (N3AHF). My first contact on 432. I put up a temporary antenna so I could check out the transceiver before the warranty ran out. I hoped the contest would give me the chance to work a couple of loud locals. To my surprise, I worked 25 QSOs in 7 grids with a 410B at 4 feet in the spare bedroom (K4BNC). New QTH, new call, new op (XYL), all went well (WC2F). Thank goodness the snowstorm waited until Monday! Lots of activity, no propagation surprises though (K2SMN). Too much line noise (K3ZO). Tough on the receiver front end, being between W3IP and K3IVO (K3YDX). Good party—even though conditions on 6 meters relatively poor, activity on both 6 and 2 meters was very high! (W3HDH). Not bad for a "winter" VHF/UHF contest (KB3PD). Next year a beam! (N3FJQ). Shack temperatures hovering around 38 degrees Fahrenheit didn't stop me from enjoying my 29th VHF SS (K3KEL). Dear Santa, now I know what I should have asked for for Christmas! (NI3J). Worked the contest from my car—TR751 sitting on dashboard and my antenna and mast tied to the side of the carport. This was my first VHF contest worked (KC3ZG). First real try at 6-meter SSB, 10 watts. I had a ball, CU in June (N3FMQ). Flat conditions, but plenty of participants (WA3FAE). Not great, but better than last year (WA4JNE). Conditions weren't very good. I heard a few meteor pings on, I might try a few skeds next year. Still had fun! (WD4AHZ). Where were the CW stations on 6 and 2 meters? (K4SC). Can't wait till June (KK4NZ). Forced to QRT early, due to power-line noise (KN5S). 1½ Qs per hour on 432, not bad, right? (WB5ZDP). Conditions weren't too good, but still beat last year's score! (K5UR). Enjoyed the rise in 902-MHz activity; regretted the drop in 3456-MHz activity (WA5VJB). Sadly: I learned of the tragic death of N5UA shortly after the contest. We shall all miss Dennis here in North Texas.... (K9MK/5). 220 would not work! I did get 2 new Novices to help with logging. I may get pushed out of the way in the future (W5NZS). Lowest score ever! (WB2ODH/6). Not much of a score, but I had a good time. This is my first VHF SS in several years, so I was quite rusty, to say the least (WA6EXV). Where have all the UHFers gone? It was very quiet above 2 meters (WB7PEK). It was better than the September contest, but not much (KC7IJ). Good turnout for a January contest! (WA7VHW). It was like pulling teeth to get a QSO, where was everyone? (KC3CL). I got my new call 10 minutes before the contest started! (WA8B). See ya for the Spring Sprints—73 (N8IAO). Not a lot of time to operate this year but had a good time. Thanks! (N8ERM). 6 meters was dead! This year's score was, however, four times better than last! (KA8ZOK). Fair conditions but the contest ended four hours early when Murphy arrived and I lost the receive changeover relay. Once again, next time! (WA8DXG). When it was good, it was sorta good; when it was bad it was awful (N8FUJ). 23 years a ham, and this is my first VHF contest—I borrowed a rig, had limited time, there were few openings, and I had a ball! (N9JF). Kinda long...wife put me to bed before it ended—I fell asleep at the mike...(N9EVX). First VHF contest; small score—lots of fun. I'll be back! (N9GCF). Sure a lot of people running 1 kW but having receiver turned off! (KG9Z). The strain of getting one more grid as the last QSO is a fun way to wind up a sleepless weekend! (WA9VWV). Hope we get some better E-skip and tropo in June so all those new plaques don't go just to W1s, W2s and W3s! Hi! (WB9MSV). Fun, fun, fun! Not bad for January in Ø land (WAØTKJ). The contest was slow but I got a new state on 6 meters, Rhode Island... Finally! (VE3KKL). Great fun. Antennas just laying on the porch (WA2JXD/VE3). Worked many Europeans on EME who weren't aware of contest and would not send back their grid square! I had fun, though (VE4MA).

cores

all, score, QSOs, multipliers, bands worked (A = 50 MHz; B = 144 MHz; C = 220 MHz; D = 432 MHz; 9 = 902 MHz; E = 1296 MHz; F = 2.3 GHz; = 3.4 GHz; H = 5.7 GHz; I = 10 GHz; J = 24 GHz; K = 48 GHz; L = Light).

nnecticut

IQK 36,501- 448- 69-ABCD
A1VRH 28,396- 458- 62-**AB**
FO 17,958- 219- 41-**D**
1U 16,732- 185- 47-BCD9**E**
1I 15,238- 289- 38-BCD
DH 13,338- 316- 39-ABCD
81BXS 11,480- 410- 28-B
A2TEO/1 9,300- 300- 31-B
EP/1 6,368- 199- 32-AB
U 4,188- 155- 23-BD
A1NLD 2,856- 168- 17-B
1S 2,660- 133- 20-B
6CP/1 2,645- 72- 23-ABCD9E
1GTP 2,125- 85- 25-AB
1K 2,100- 84- 15-BCDE
WVX 1,235- 95- 13-B
AW (KA1CV,op) 1,230- 63- 15-BD
ABY 1,188- 99- 12-A
4FDT/1 572- 47- 11-BD
CPJ 264- 33- 4-C
KB/1 102- 13- 6-BD
IT 96- 27- 3-BD
PPL 64- 32- 2-B
AIM (FN31) 5- 5- 1-B
CV 1- 1- 1-B
ZE (+AC1T,KA1s QAS,RJA,N1FJV, 1W,NM1K,WA1PGT) 109,836- 733-108-ABCD9E
JV (+AC1T,KA1s OAS,RJA,ZE,NA1W, 1K,WA1PGT) 95,535- 713- 99-ABCD9E
3CG (KA1s PFP,RDX,KC1s FR,FT,N1s VD,DFR,DIO,WA1TOU,ops) 8,330- 205- 34-ABD

tern Massachusetts

R 67,122- 416- 99-ABCD9EF
JDF 27,690- 244- 65-ABCD9**EF**
FKF 20,087- 204- 53-ABCD9EF
DHO 8,664- 152- 38-ABCDE
C 8,399- 179- 37-ABCD
Q 3,927- 94- 33-ABCD
GXT 3,240- 87- 24-ABCE
ZI 2,320- 100- 16-ABCDE
AT 1,800- 120- 15-**A**
M 1,332- 60- 18-ABD
X 1,312- 82- 16-AB
ZF 693- 63- 11-AB
LV 680- 66- 10-B
C 296- 37- 8-B
HY 225- 24- 9-ABC
QV (+WA1SKQ,WB1GZK) 928- 51- 16-BD

e

QT 8,820- 158- 45-AB**DE**
TRE 3,278- 115- 28-**ABC**
EX 3,051- 107- 27-AB**C**
AYT 2,682- 149- 18-**B**
SA 1,512- 50- 21-ABD
JG 1,512- 71- 21-ABC
YR 602- 43- 14-B
YB 152- 14- 8-ABCD

Hampshire

OUB 50,840- 521- 82-**ABE**
25,429- 295- 59-ABC**D9E**
24,304- 335- 56-ABCDE
YHO 20,896- 312- 52-AB**C**D
6,786- 124- 39-ABCD9
NE 4,301- 187- 23-B
LK 4,176- 174- 24-B
1,664- 104- 16-B
SM 1,635- 105- 15-BD
NIE 1,530- 102- 15-B
OC 780- 65- 12-AB
RWP 660- 55- 12-B
MR 484- 37- 11-ABCD
HZN 450- 50- 9-B
YL 396- 34- 11-BD
SY 360- 40- 8-BC
IH 238- 34- 7-B
F 1- 1- 1-B
(+K1s AR,BA,DG,N1s AFQ,BEM, s ONB,PBU,K3WM) 118,473- 847-101-ABCD9E

e Island

YN 18,336- 246- 48-**BCD**
(+K1s GX,JX,N4MM,WA6IVC, NM) 159,443- 987-113-ABCD9EF
(K1s AGA,CH,CZD,JI,PEL,KA1s IHT, KM1X,WA1s VEK,VPC,KA2WHG,ops) 9,504- 264- 36-AB

ont

S 1,566- 45- 27-A**B**D
BQ 1,134- 63- 18-A**B**
M
4) 221- 16- 13-AB**C**

rn Massachusetts

78,078- 589- 78-**ABCD9EF**
M 24,752- 325- 56-ABCDE

WA1MBA 19,270- 261- 47-BD9E
K1ISW 15,781- 251- 43-ABCDE
KA1KRJ 10,968- 457- 24-**B**
WB1ETS 7,110- 195- 30-ABCD
W1CJK 4,179- 155- 21-BCD
KA1MDA 3,762- 180- 19-BC
WB1FIP 3,344- 119- 22-ABCD
WB1APD 2,772- 126- 22-AB
N1FGZ 2,670- 135- 15-ABCD
W1UWX 2,160- 99- 15-BCD
W1JP 2,180- 135- 16-AB
N1DOP 2,158- 134- 13-BC
WB1EHS 2,071- 109- 19-AB
N1ABJ 1,932- 131- 12-BC
WA3EEC 1,786- 94- 19-AB
KA1MPS 1,504- 88- 16-ABCD
NA1W 1,170- 108- 10-BD
KA1MP 1,144- 74- 13-ABD
W1NLE 1,143- 127- 9-B
W1NMQ 1,120- 64- 16-ABC
K1NWE 856- 107- 8-B
K1WGN 854- 61- 14-AB
K1WGN 854- 61- 14-AB
K1BXE 714- 77- 6-BCD
KA1JWG 664- 58- 8-BCD
KA1OCL 648- 54- 12-A
WA1POB 608- 76- 8-AB
KA1KPH 576- 74- 6-BD
K1JDL 444- 111- 4-B
K1MAL 400- 100- 4-B
NC1B 390- 65- 6-BD
WA1HFF 378- 48- 7-ABD
WA1JUJ 376- 47- 8-B
KB1MU 348- 87- 4-B
W1FAB 332- 83- 4-B
KB1TH 320- 80- 4-B
WB1DLH 282- 94- 3-B
N1CAS 264- 66- 4-B
W1ALL 192- 48- 4-B
NJ1E 171- 55- 3-BD
N1EIZ 134- 67- 2-B
W1KK 123- 82- 3-BD
KB1AZ 116- 58- 2-B
KA1ONV 96- 24- 2-C
KA1RJB 81- 27- 3-B
NC1W 58- 29- 2-B
WA1EYF 52- 26- 2-B
KA1MEW 30- 10- 3-B
WA1PGT 24- 6- 2-D
W1AIM (FN32) 8- 4- 2-B
KA1CDS 7- 7- 1-B
W1NY (AC1T, K1s TOL,WHS,KA1HTK,N1s AEH,DPM,NC1I,W1KK,WA1sEGR,UQC, KBZK,ops) 208,917-1078-139-ABCDE
K1BE (+KA1KPH) 12,375- 294- 33-ABCD
W1YK (KA1s ODA,RDZ,N1FGX,KA2PZD,ops) 2,210- 98- 17-BD

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Eastern New York

N2BJ 104,468- 760- 91-**ABCD9E**
WB2ROV 8,697- 203- 39-ABCD
WA2BAH 8,108- 175- 42-ABCD
WA2FUZ 8,073- 207- 39-AB
WA2MJP 6,699- 231- 29-B
N2EK 5,200- 200- 26-B
WA2ALV 2,576- 67- 23-ABD
KD2IX 2,244- 126- 17-BD
WB2JVY 1,664- 82- 16-BD
KG2H 1,540- 70- 22-B
WA2RUW 1,330- 55- 19-BC
W2AWF 1,170- 65- 18-B
WA2EHI 976- 51- 16-BD
N2HIG 354- 45- 8-BCD
KA2UOJ 264- 39- 8-BD
KA2TGQ 252- 30- 8-BCD
WA2FWZ 120- 30- 4-B
WA2KFS 46- 23- 2-B
KD2TY 46- 16- 2-BC
N2HOA 24- 5- 3-BCD
N2HNY 24- 5- 3-BCD
WA2HGJ 24- 5- 3-BCD
KB2EJP 4- 2- 1-C
KB2DDQ 4- 2- 1-C
W2SZ (WA1ZMS,KA2FWN,N2GXH,W2ARQ, WA2AAU,WB2KMY,ops) 152,105- 835-145-ABCDE
K2CBA (+KA1OKQ,WA1RKS,WB1BTJ, K2SIG,KA2s DEW,UWI,KB2COM,N2s DU, HOY,WA2EOV,WB2DST) 37,620- 419- 76-ABCDE
N2EUT (+KB2EMV) 1,862- 98- 19-B

NYC-Long Island

WB2CMI 13,899- 303- 41-ABC**D**
WB2ZSY 7,124- 274- 26-**B**
N2GHR 5,523- 263- 21-B
K2KM 5,160- 181- 24-BD
WA2EIO 5,125- 162- 25-BD
WB2CUY 4,140- 171- 18-B**D**
K2OVS 3,750- 100- 20-ABD
NB2T 1,950- 150- 13-B
KA2CKV 1,888- 118- 16-B
N2GZD 1,625- 125- 13-B
N2HPJ 1,272- 106- 12-B
WA2EUS 1,012- 40- 11-D**E**
WA2YEI 464- 58- 8-AB

Northern New Jersey

K2OWR 128,578- 634-106-**ABCDE**
KC2PX 92,352- 648- 96-ABCD9E
K2JWE 49,136- 441- 74-ABDE
KC2TJ 13,899- 276- 41-ABD
N3AHF 12,376- 364- 34-B
WB2QOQ 11,968- 374- 32-B
WA2VUN 9,282- 195- 39-ABCDE
K4BNC 7,918- 189- 37-ABD
WA2UDT 7,688- 182- 34-ABCD
AK2F 7,533- 266- 27-ABC
N2CG 6,201- 127- 39-ABCD
KA2IVS 5,874- 287- 22-B
WB2Y 3,870- 215- 18-BD
K2LME 3,808- 173- 22-B
K2DEL 988- 76- 13-A
WA2UKO 63- 21- 3-B
W1AIM (FN20) 57- 19- 3-B
KB2BBW (FN20) 48- 24- 2-B
KB2BBW (FN21) 28- 14- 2-B
N2EOC (+K2PM,N2CEI) 120,204- 862-108-ABCD
K3QM (+KA3ETI) 80,600- 675- 92-ABCD
NV2D (+KE2AH,N2WM) 32,175- 380- 75-ABCD
WA2CLP (+WB2BXD) 486- 52- 9-BD

Southern New Jersey

K2SMN 173,500- 786-125-ABCD9**EF**
K2TXB 86,172- 657- 86-**BCDE**
WB2YEH 72,127- 493- 79-ABCD9EF
K2GAL 57,333- 448- 87-ABD9E
W2EIF 47,275- 421- 61-ABCD9EF
KA2WKA 30,804- 516- 51-BCD
W2HRW 28,884- 422- 58-**ABD**
K2YY 27,456- 456- 48-ABDE
K3GYS 26,038- 408- 47-ABCDE
W2PAU 24,346- 425- 47-ABD
N2FY 23,782- 365- 47-ABCD
KA2JKI 21,836- 284- 53-ABCDE
K2OJL 15,741- 477- 33-B
WA2ONK 11,968- 326- 31-BD
W2EA 10,362- 258- 33-ABD
KC2J 8,868- 188- 31-ABCDE
WB2VLA 5,439- 182- 21-ABCD
W2EKB 5,060- 214- 22-ABCD
N2HTF 4,828- 256- 17-ABD
N2GBY 4,004- 182- 22-AB
WA2WJL 3,546- 197- 18-B
NX2C 2,546- 136- 19-AB
AB2Y 2,200- 147- 11-BD
WA1KOO/2 2,176- 116- 17-BD
WB2R 2,119- 128- 13-ABC
W2BLV 2,071- 109- 18-B
W2FGY 1,968- 164- 12-B
K2LOO 1,296- 144- 9-B
KA2KFO 700- 100- 7-B
W2FFU 616- 50- 11-BD
W2GGB 612- 121- 4-BC
N2FIZ 610- 61- 10-B
WB2RXM 368- 67- 4-BC
N2DJY 78- 39- 2-B
WA2RHJ 70- 14- 5-A
K3JLA 60- 30- 2-B
W3EIJ 60- 30- 2-B
N2SB (+KA1GD,N2ASC,NF2L,WA2VYA, WB2RVX,WC2K,KM3T,WB8ZAR) 511,086-1569-206-ABCD9EFGU
WC2F (+KA2VAD,KX2G,N2HOX) 87,615- 649- 99-ABCDE
WB2JHG (+KA2JLJ,WB2ONA) 58,014- 434- 66-ABCD9EF
WA3RCA (N2GXL,NG2R,ops) 1,704- 142- 12-B

Western New York

W2DRZ 109,810- 505-158-ABCD9E
N2WK 102,300- 526-124-AB**C**D9EF
KD5RO/2 64,741- 356-101-ABCD9**EF**
K2OS 27,001- 383- 67-A**B**D
WB2JLR 26,624- 350- 64-ABCD9E
WB2KIW 23,288- 307- 66-ABD
WA2KGM 21,240- 327- 59-ABD
NM2J 18,810- 270- 55-ABCDE
K2AN 17,055- 290-450-ABCD
WA2ZNC 14,406- 283- 42-ABCD
KC2GZ 11,264- 250- 44-ABD
K2GK 10,250- 166- 50-ABCD
WA2BPE 8,037- 171- 47-AB
KS2Z 7,074- 222- 27-BCD
WB2MKN 6,576- 202- 24-ABCDE
W2UAD 6,386- 206- 31-B
WB2JFL 6,384- 228- 28-AB
WB2ELB 6,270- 107- 33-BCD9E
KA2ENE 5,628- 228- 21-ABD
W2VO 5,080- 125- 40-ABD
W2VVG 3,456- 144- 24-AB
W2CNS 3,354- 129- 28-A
WA2YTM 3,250- 106- 25-ABCD
KA2JRK 2,672- 139- 16-BD
W2EQW 2,328- 177- 12-ABD
K2MPE 2,324- 78- 28-ABC
WA2URE 2,046- 169- 11-ABD
WB2SUN 1,971- 176- 9-ABCD
KD2TJ 1,926- 102- 18-ABD
K2JA 1,595- 131- 11-ABD
WA2YPT 1,584- 130- 11-ABD
WB2WBT 1,541- 67- 23-AB
KA2KDA 1,392- 112- 12-ABCD
W2WGL 1,365- 65- 21-B
K2SA 1,351- 163- 7-BD
KW2T 1,300- 118- 10-AB9
KA2J 1,298- 109- 11-ABCD
K2KWK 1,250- 116- 10-BC
WB2JSB 980- 68- 14-BD
N2EVG 945- 135- 7-AB
N2BKS 848- 53- 16-B
WB2CHV 847- 112- 7-BD
W2DHV 826- 118- 7-AB
WB2EKP 812- 107- 7-BD
N2GDD 565- 113- 5-B
KA2JQN 528- 79- 6-BC
KB2SE 404- 101- 4-B
KA2UDH 352- 44- 8-AB
K2BWK 328- 82- 4-B
N2JC 325- 65- 5-B
WB2IJA 288- 72- 4-B
N2HJD 280- 40- 7-B
WA2NFY 264- 66- 4-B
WA2ELC 248- 82- 3-B
N3CKH 240- 60- 4-B
KB2UN 224- 56- 4-B
AB2F 222- 37- 6-B
W2PHT 212- 53- 4-B
W2DYY 210- 15- 14-B
KC2JW 195- 65- 3-B
W2HG 192- 48- 4-B
NX2E 177- 59- 3-B
WB2NOJ 153- 51- 3-B
KJ2P 141- 47- 3-B
KD2CU 140- 35- 4-B
N2AL 57- 19- 3-B
KA2PJN 40- 10- 2-C
KA2JQV 36- 12- 3-B
WB2PSI (K2s MP,OEQ,KD2OM,KE2CP,N2s AJK,AJY,AJX,EZY,W2s AV,IMO,WA2s BYP,ZKD,ZON,WB2s KAO,QCJ,WA3VRE, ops) 87,210- 517-114-ABCD9EFIL
N2TW (+AF2K,K2SPO,KB2SE) 37,050- 408- 78-ABCD
NA2O (+WB2IEY,WB3JSU) 28,296- 310- 72-ABCDE
KD2YB 22,746- 352- 51-ABCD9
KU2A (+NA2A) 15,128- 189- 61-ABCD
NR2M (+KB2EMU,N2GZV,NU2U) 5,152- 189- 23-ABCD
N2GXT (KA1PKE,KA2PFD,KB2CEU,KC2KK, ops) 4,617- 171- 27-AB
K2JD (KA2s J,PJN,KB2CNZ,N2s DPF,EH, ops) 1,950- 124- 13-ABCD
WA2AAZ (AB2F,KA2JQV,KB2DSB,N2s CMA,GVS,HJR,WA2s GAI,SOK,ops) 1,080- 104- 10-ABD

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Delaware

KB3QM 90,390- 549-115-**ABCDE**
KB3PD 12,025- 240- 37-BD
KA3KHZ 5,724- 212- 27-B
N3FJQ 384- 96- 4-B
WB3DPJ 332- 57- 4-BC
N3DYC/M 176- 40- 4-BCD
W3LEU 124- 31- 4-B
N3DNX 56- 28- 2-B
N3EQW 7- 7- 1-B
WA3UVR 7- 7- 1-B

Eastern Pennsylvania

WA3AXV 169,824- 786-116-ABCD9EFG
WA2FGK/3 (K2LNS,op) 154,775- 699-151-ABCD9F
WA3NUF 116,500- 658-100-ABCD9EF
WB3JYO 98,710- 576- 95-ABCD9EF
KT2B 80,625- 598- 75-ABCD9EF
N3CX 63,505- 404- 65-BCD9EFG
WA3YUE 53,248- 525- 64-ABCD9E
W8RSJ 51,198- 397- 69-ABCD9EF
WA3JUF 49,134- 402- 57-BCD9EFG
K3LOM 48,240- 584- 67-ABCD
N3EAX 42,104- 484- 76-ABD
AK3O 28,665- 353- 45-ABCD9EF
N3BBI 27,813- 342- 53-ABCE
K3IUV 26,445- 423- 41-ABCDE
KB3HE 23,712- 390- 48-ABCD
WB3DNI 23,392- 372- 34-BCDEF
WB3IGR 21,480- 426- 37-ABCD
WA3AQA 20,984- 373- 43-ABCD
KB3IB 20,580- 305- 49-ABDE
N3ADC 20,304- 367- 48-ABD
WA3HMK 19,800- 398- 50-**B**
W3IIT 19,092- 403- 37-ABCD
WB3ESS 18,842- 217- 39-CDE
WB3LNZ 18,614- 373- 41-ABD
W3CL 17,952- 367- 34-ABCD
K3BPP 17,664- 316- 32-ABCDEF
WB3FAA 16,445- 227- 55-ABCD9E
K3ACR 16,128- 353- 36-ABC
WB3KRW 14,763- 321- 37-ABD
KA3EEO 12,095- 143- 59-ABCD9E
KA3FBP 10,850- 308- 25-ABCD
WB3EPU 10,192- 334- 26-BC
KB3NQ 8,736- 287- 26-BCD
K3DMA 8,064- 273- 21-ABCD
W3GXB 7,896- 237- 24-BCD
K3EWZ 7,852- 302- 26-B
KU3A 7,584- 206- 32-ABD
K3QQ 7,080- 259- 20-ABCD
N3FUJ 6,960- 280- 20-BC
K3EBZ 6,750- 250- 27-AB
W3NSI 6,699- 212- 21-BCD
WA3IWT 5,562- 187- 18-ABCDE
W3CXU 4,986- 177- 18-ABCD
KB3XG 4,864- 209- 16-ABCD
KY3T 4,505- 249- 17-BD
K3GAS 3,345- 167- 15-ABCD
WA3IAC 3,341- 198- 13-BC
KZ3X 2,988- 166- 18-B
KB3QI 2,700- 85- 30-ABC
W3CJU 2,292- 125- 12-ABCD
WB2BJH/3 2,125- 125- 17-B
K3KEL 2,024- 88- 23-B
W3ICC 1,958- 123- 11-BCEF
K3PHY 1,897- 316- 7-BC
W3HK 1,771- 103- 11-ABCD
W3FEY 1,744- 108- 16-B
K3LYB 1,651- 127- 13-A
K3RTU 1,625- 125- 13-AB
N3EPQ 1,620- 135- 12-B
WA3TSW 1,408- 113- 9-BCD
K3VYG 1,400- 125- 8-ABC
WA3JMM 1,386- 139- 7-ABC
W3BRU 1,331- 121- 11-B
KU3V 1,140- 81- 12-BC
WA3TEM 1,608- 141- 8-BC
N3EMQ 1,000- 100- 10-AB
W3AWA 980- 88- 10-ABC
KC3GQ 980- 98- 10-B
N3ELS 920- 184- 5-B
W3GJC 844- 146- 4-BC
WA3NBS 840- 105- 8-AB
N3FJA 833- 49- 17-B
WB3HHO 752- 130- 4-BC
KD3DI 742- 106- 7-B
WA3OTI 720- 66- 9-BC
K3ARR 697- 41- 17-A
W3HMU 676- 97- 4-AC
WA3IMT 660- 60- 11-AB
N3AHP 616- 69- 8-ABC
N3CJH 535- 72- 5-BCD
WA3HIT 504- 78- 4-BC
N2FAM 432- 54- 8-AB
K3ZIG 340- 52- 4-BC
N3BPJ 316- 79- 4-AB
WA3LSI 288- 18- 2-F
AA3B 267- 89- 3-B
KA3NUB 261- 29- 9-B
WB3KEU 260- 65- 2-C
K3DLS 220- 55- 2-C
W3GAD 158- 78- 2-B
KC3ZG 140- 20- 7-B
N3AAT 138- 69- 2-B
W3MXN 126- 63- 2-B
K3WAJ 114- 35- 3-BC
KC3IE 63- 18- 3-BC
KN3W 46- 23- 2-B
WB3KNU 33- 11- 3-B
W3TDZ 18- 9- 2-B
W3AJF 10- 5- 1-C
WD8ESL 10- 10- 1-B
WA3DZT 8- 8- 1-A
WA3CQT 6- 6- 1-A
WA2OMY (+AA2Z,W1OD) 250,850-1094-145-ABCD9EFG
WB3CZG (+WA1MKE,K3MKZ,N3AVC, WA3YON,WB3FYT) 173,440- 758-160-ABCD9EFI
W3KKN (+W3ZD) 83,680- 635- 80-ABCDEF
K3MTK (KA2ORR,KB2EAJ,N2FOB,KA3s PET,QYH,SEG,SIU,N3s FKS,FUU,FUY, WA3s IAO,IJZ,PUL,WB3GBN,ops) 36,800- 593- 46-ABCD
KA3HTY (+KA2TIB) 20,076- 345- 42-BCD
KA3PLC (+WB2LEE,KA3PKN,WA3LFY, WB3EPW) 12,425- 497- 25-B
W3VIR (+WA3NFV) 12,078- 223- 33-ABCDEF
N3CFE (+N3AOG) 11,258- 300- 24-BCDE
WB3IND (+K3JJZ) 10,341- 335- 27-ABC
N3EXA (+KD3GC) 8,832- 293- 24-BCD
WA3FOF (+K3HW) 7,348- 281- 22-ABC
NI3J (+N3ESI) 1,920- 160- 12-B

Maryland-DC

K1RZ 81,396- 542-114-AB**D**E
W3IP 44,863- 337- 91-ABCD9**E**
WA3FAE 18,324- 371- 44-**B**
K3NXH 16,245- 361- 45-B
K3ZO 15,744- 328- 48-AB
K3AKR 6,120- 137- 36-ABCD

W3WFM 5,214- 158- 33-**A**
W3GN 5,148- 147- 33-ABD
W3XO 4,917- 149- 33-AB
W3IFM 4,020- 134- 30-A
KB3HH 2,832- 102- 24-ABD
W3JPT 1,420- 67- 20-ABD
K3YDX 864- 72- 12-B
N3FHD 792- 66- 12-B
W3LMC 693- 63- 11-B
WB1FXX 630- 53- 10-B
WA3GYW 418- 38- 11-AB
N3FKV 414- 46- 9-B
KA3CXG 248- 31- 8-B
W3MSN 133- 18- 7-ABD
WB3LJK (+K3ONW) 86,001- 538-109-ABCDE
K3IVO (N2GTE,K3s TNM,YDX,KA3s SKJ, SKO,WA3TID,WB2s EKH,EVS,ICL,N3DCI, WB6VGI,ops) 22,578- 341- 53-ABD
W3PGA (K3PHH,W3s JDF,JEH,URD,ops) 5,624- 129- 37-ABD

Western Pennsylvania

WA3FYJ 39,528- 302-108-**ABCD**
W3HDH 5,166- 123- 42-AB
KA3LUN 4,978- 131- 38-B
WB3AIT 792- 44- 18-A
W3KJM 592- 37- 16-A
W3KWH (K3TP,KA3s KSD,PBB,PBC,N3s CZZ,EQF,EQP,W3SVJ,WA3s QYV,TTS, WB3EML,ops) *72,226- 378-134-ABCDEI*

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Alabama

WA4NZD 920- 37- 20-ABD
N4AHJ 30- 10- 3-**A**
WB4YRJ 24- 8- 3-A
WA4VUG 12- 4- 3-**B**
WA4QLA 8- 8- 1-A
KK4NZ (+AA4YB,WA4RHK) 408- 34- 12-AB
KB4PNF (+KB4s HYU,LLM,N4MRC) 156- 22- 8-ABD

Georgia

WW4T 8,256- 133- 48-**ABD**
WS4F 7,350- 89- 49-**ABCD9EF**
WD4MBK 858- 33- 13-D

Kentucky

AA4FQ 3,916- 72- 44-**BD**

North Carolina

N2CJP 2,883- 78- 31-**ABCD**
W4FSO 406- 29- 14-B

Northern Florida

W4ODW 5,537- 75- 49-**ABCDE**
WA4JNE 1,092- 52- 21-**AB**
W4APV (+N4s KGV,KHG,WA4BUS,WB9OEP) 5,472- 92- 48-ABCD

South Carolina

WQ4V 17,020- 136- 74-**ABCD9EI**
KJ4BF 2,944- 64- 32-ABCD9E
NB4S 2,370- 67- 30-BD

Southern Florida

WD4MGB 2,296- 82- 28-**ABD**
WD4AHZ 2,024- 74- 22-**BD**
WB4MJE 804- 57- 12-B
W4FF 684- 57- 12-B
K4CF 630- 32- 14-BD
K4SC 495- 33- 15-AB
K1FJM/4 80- 10- 8-AB
K1FJM/M4 15- 5- 3-B

Tennessee

W2GU 19,068- 157- 84-**ABCDE**
WB4JGG 9,621- 146- 61-ABD
KC4YO 3,939- 101- 39-**B**
K4RWP 3,354- 74- 43-ABD
WA4QYK 1,953- 54- 31-ABCD
KI4JU 264- 16- 11-BCD
N4VC (+WB4KNF) 20,070- 183- 90-ABCD

Virginia

K2UOP/4 42,662- 338- 83-**ABCDE**
K4LHB 27,225- 248- 75-**ABCDE**
N4RA 16,182- 223- 58-ABCD
WB4DBB 12,096- 158- 63-ABCD9E
K4QIF 9,548- 109- 44-**BDE**
W4DO 5,928- 131- 38-ABD
K4FTO 3,294- 100- 27-ABD
KF4KI 3,066- 148- 21-B
K3ICH 2,599- 80- 24-ABCD
K9OYD/4 1,530- 45- 17-D
N4SG 1,000- 50- 20-B
KE9A/4 649- 59- 11-B
WA4SBC 512- 21- 16-ABCD
W4KSV 252- 21- 12-B
WA4MMP 40- 9- 4-ABD

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Arkansas

K5UR 31,496- 192-124-**ABCDE**

Louisiana

WB5NAA 5,238- 102- 44-**ABD**
N5HVJ 2,542- 57- 31-ABCD
W5FYZ 1,704- 71- 24-**B**
WA5UFH 756- 36- 21-AB
K5TNP 476- 34- 14-B

Mississippi

W5RCI 4,998- 65- 51-**ABCDEF**

New Mexico

W5FF 3,666- 78- 47-**AB**
K5MAT 2,277- 80- 23-**ABCD**
N5JHV 1,196- 40- 26-**ABD**
N5ACP 736- 35- 16-ABCD
KA5EBL 558- 28- 18-ABD
W5IXR 492- 35- 12-ABC
N5EPA 136- 17- 8-AB
KD5HP 78- 13- 6-B
KN5S 4- 2- 2-AB

North Texas

K9MK/5 7,668- 152- 35-ABD9E
N5WS 3,193- 86- 31-**BE**
WA5VJB 2,675- 42- 25-**ABCD9EGIJ**
WA1EHL/5 2,640- 92- 22-ABCDE
AA5AM 1,995- 78- 21-ABD
WB5ZDP 1,668- 49- 17-D
WG5E 923- 71- 13-B
KF5PE 595- 24- 13-**BE**
KF5DG 516- 43- 12-B
WD5K 168- 28- 6-**A**
W5UOJ 42- 21- 2-A

Oklahoma

K5SW 12,802- 130- 74-**ABCDE**
WB8HYV/5 (EM86) *968- 26- 19-ABCDEF*
WB8HYV/5 (EM16) 768- 23- 16-**BCDEF**
WB5DSH 153- 17- 9-**A**
WD5AGO (+N5HWD) 7,680- 83- 48-BDE
W5NZS (+KB5s FCE,FCH) 510- 24- 17-ABD

South Texas

N5HHS 5,586- 109- 42-**ABD**
WB5OBS 2,232- 62- 24-**BCDE**

West Texas

W5AL 2,048- 52- 32-**ABC**
W8CM 1,140- 51- 20-**BD**

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Los Angeles

W6CPL 24,353- 239- 49-**ABCD9EFG**
WA6RAY 5,238- 158- 27-**ABD**
WA6BIL 3,780- 118- 27-ABCD
N6KV/6 (DM04) 2,166- 57- 19-ABCD9EF
W6PFE 1,683- 74- 17-ABCD
WB6JCD 1,672- 57- 22-ABCD
K9AKS/6 1,215- 81- 15-AB
N4EPY 910- 33- 13-ABCD9EF
KB6JMF 456- 57- 8-B
WB2ODH/6 228- 38- 6-AB
N6IDN 196- 10- 7-**BDE**
W6YLZ (+KA6ZVP,N6s MI,OPR,WA6HXD, WB6YVP,WA8MXA) 42,240- 560- 48-ABCDE
N6KV/6 (DM03) (+AF6Q,N6s DBS,KN, W6OXX,WA6HXM) 16,464- 227- 42-ABCD9EF

Orange

K6CH 11,000- 183- 40-ABDE
K6PVS 6,480- 107- 40-ABDE
WB9AJZ/6 5,400- 133- 24-**BD**
K6IBY 2,001- 65- 23-**ABCD**
K6LMN 1,980- 56- 22-ABCDE
K6PFW 1,440- 70- 18-ABC
K1NKR (+N6IDN) 2,100- 90- 20-ABD

Santa Barbara

*K6VMN 627- 57- 11-**B***
NS6X (DM04) 8- 4- 2-**AB**
NS6X (CM95) 4- 2- 2-**AB**
NS6X (+KB6JVV) 663- 37- 17-ABCD

Santa Clara Valley

KB3LY 3,078- 89- 27-ABCD
W6RXQ 2,210- 55- 26-**ABCDE**
KF6CU 638- 23- 12-**BDE**
WB6VYH 333- 37- 9-**A**
KA6ING 100- 20- 5-A
K6XO 28- 14- 2-B
WA6PWW (+KA6YRK,KB6BA,N6KL,WB6s MRQ,W,ZQZ) 6,240- 161- 32-ABCD
KB6OWL (+WB6s LRV,PFJ) 2,250- 102- 18-ABD

San Diego

WA6BNH 6,132- 113- 28-**BCDEF**
W6OYJ 1,316- 45- 14-**BCDIJ**
K6IAH 96- 24- 4-B

San Francisco

W7KKE 104- 13- 4-**D**

San Joaquin Valley

WB6YIY 2,530- 115- 22-**AB**
N6MQK 1,872- 72- 26-AB
WA6EXV 945- 39- 15-**BDI**
N6POF 440- 44- 10-B
KA6AMD 330- 26- 10-BI

7

Alaska

KL7WE 242- 11- 11-**D**

Arizona

K2DNR 2,373- 84- 21-**ABDEI**
WB7OHF (+KB7CRT) 336- 24- 12-ABCD

Idaho

KK7A 104- 13- 8-B
KC7IJ 20- 5- 4-**A**

Nevada

K7ICW 1,960- 54- 28-**ABD**
NW7O 564- 38- 12-**ABDE**
N7CFC (+KA7WNX,NW7O,WA7JUD) 637- 39- 13-BD

Oregon

KE7CX 4,482- 146- 27-**ABCD**
W7JXU 1,680- 76- 20-ABD
N7DB 696- 54- 12-**ABC**
NY7C 341- 25- 11-ABCD
N6TY (CN85) 200- 25- 8-B
W7UDM 189- 27- 7-AB
NR7F 168- 28- 6-B
N6TY (CN95) 112- 16- 7-B

Utah

WA4GPM 731- 36- 17-**ABD**
KE7NS 507- 33- 13-ABD
WB7ONP 144- 16- 8-ABD

Washington

WB7UUP 4,374- 124- 27-**ABCDE**
NF7X 3,240- 133- 24-ABC
WB7RMJ 1,972- 97- 17-**BD**
WA7VHW 736- 46- 16-B
WB7ATP 234- 26- 9-B
W7IDZ 48- 9- 5-B
WB7PEK (+KA7ICT) 6,800- 156- 34-ABCDE
W7QCV (+WA7ELI) 154- 22- 7-AB

8

Michigan

WA8B 8,190- 195- 42-**B**
KM8U 4,958- 134- 37-B
KB8JI 3,822- 75- 42-**BCD**
KE8BR 3,800- 87- 38-**ABD**
N8CGY 2,624- 81- 32-BD
N8FEH 2,376- 88- 27-B
WB8WAO/8 2,343- 62- 33-ABD
WA8TAQ/8 1,950- 78- 25-B
N8FUJ 810- 45- 18-B
W8IDT 684- 33- 18-B
N8CSY 476- 28- 17-B
KE8IR 24- 8- 3-B
NR8S (+KA8RUN,KB8DSB,N8BWG, WB8WVF) 21,608- 249- 74-ABD
N8ERM (+WB8TGY) 6,672- 117- 48-ABD

Ohio

WD8ISK 76,484- 360-144-**ABCD9EGI**
KB8ZW 49,368- 285-121-**ABCD9E**
W8ULC 30,240- 232-108-ABCD
KC3CL 29,890- 274- 98-ABCD
WB8IGY 29,190- 224-105-*ABCD*
KA8IFC 18,711- 297- 63-**B**
WA8MZQ 14,868- 236- 63-B
N8DJB 10,919- 125- 61-BCD9
KE8FD 8,839- 163- 53-B
WB8TCZ 7,738- 131- 53-ABD
WA8TMK 7,398- 137- 49-BD
K8WW 4,282- 60- 37-ABCDE
W8AC 3,990- 114- 35-B
WA8DXG 3,360- 70- 24-D
WD8CTK 2,914- 86- 31-ABD
K8MR 2,324- 83- 28-B
N8IAO 2,268- 79- 28-BC
W8HBG 1,917- 58- 27-BD
N8CCC 1,862- 74- 19-ABCD
WD8SDL 1,054- 55- 17-BD
WA8RCN 850- 50- 17-B
WA8RMZ 595- 35- 17-B
W8OUD 572- 41- 13-BD
W8ML 160- 27- 4-BCD
W8ILC 40- 13- 2-BC
W3MMM 36- 12- 3-B
KA8IPO 8- 8- 1-B
NO8I 8- 8- 1-B
WB8IFP (+KA8YZK,KB8ATT,KD8FO,W8NJR, WD8ROD) 52,312- 435-104-ABC
W8BI (+KA8s BAI ODX,RIO,KB8s BTL,AXH, KE8CQ,N8s AEG,EEK,FRW,IAW,IVZ,N8ZM, W8ILC,WA8s DQH,NYY,SVV,WD8MSF,ops) 12,760- 180- 58-ABCDE
KA8ZOK (+KB4OZH) 8,874- 147- 51-ABCD

West Virginia

N8FCJ 22,392- 242- 72-**ABCD**
K8UC 6,048- 94- 54-BD
WA8DQR (+K8s DM,JF,LG,WV,N8DIR, WA8YCG,WD8AFJ) 7,056- 147- 48-AB
KV8S (+K8WYH,KA8ZQP,N8FMD,WD8PAD) 5,720- 130- 44-B

9

Illinois

WB9MSV 46,610- 290-118-**ABCD**
KR9K 15,372- 264- 42-ABCD
K9MBX 14,030- 231- 48-**ABDE**
WA9FIH 10,075- 262- 31-ABCDE
W9JGV 9,120- 228- 40-**B**
KA9LDS 8,507- 148- 47-BD
KA9BGC 7,328- 198- 37-B
W9XA 5,143- 119- 37-ABCD
K9YHB 4,872- 162- 24-ABCD
WD9GJK 4,648- 186- 23-ABC
N9AO 2,700- 100- 27-B
N9FXQ 2,232- 124- 18-B
WD9HSY 2,048- 115- 16-ABD
N8HWK 1,956- 139- 12-BCD
K9JAU 1,830- 142- 10-BCD
N9FWW 1,818- 101- 18-B
WD9GIQ 1,380- 82- 15-BC
KS9V 1,288- 121- 8-BC
N9JF 1,260- 45- 28-B
KA9UMG 1,200- 114- 10-ABD
WB9BZE 1,050- 70- 15-B
N9EVX 912- 76- 12-B
W9AVB 696- 110- 8-ABD
KA9TGP 681- 123- 7-BC
WA9CJZ 810- 120- 8-BD
K9EZN 600- 100- 8-AB
K9QYT 791- 103- 7-BD
K9GVN 672- 99- 6-BCD
WA9WXC 640- 59- 10-BC
WA9RIJ 522- 87- 6-AB
K9ZWV 510- 74- 6-ABC
W9NHZ 500- 125- 4-B
K9ZWU 486- 70- 6-ABC
WA9OHU 420- 105- 4-B
WA9COQ 408- 102- 4-B
N9GCF 378- 63- 6-AB
WA9QYX 372- 62- 6-AB
KA9LFD 366- 53- 6-BD
WB9TUF 354- 91- 4-B
K9KPM 360- 60- 6-B
KA9TTY 355- 65- 5-BC
NU9B 340- 85- 4-B
KG9Z 324- 27- 12-B
N9GMM 294- 49- 6-B
W9ZZU 260- 65- 4-B
WA9GQK 249- 83- 3-B
N9HBH 201- 67- 3-B
W9KBU (EN51) 177- 59- 3-B
KC9DS 162- 54- 3-B
KA9RZG 150- 75- 2-B
WA9GCB 114- 38- 3-B
N9GDX 45- 15- 3-B
KA9WZZ 28- 14- 2-B
W9KBU (EN61) 6- 6- 1-B
WB9EEA (+AA9D,N9KC) 33,880- 323- 77-ABCD9EFJ
K9AIFN (+WD9EXD) 7,337- 200- 29-ABCD
KC9BD (+N9HBH) 1,296- 108- 12-B

Indiana

WA4VWV 9,555- 195- 49-**B**
N9GPD 1,288- 46- 28-B
KA8MRI/9 (+KA9DZM,KB9ZBE, WB8UNT) 26,820- 248- 90-ABCD

Wisconsin

K9VGE 22,074- 221- 78-**ABCD**
W9UCI/9 20,114- 182- 89-**ABCDE**
KA9HKL 3,503- 113- 31-B
N9KS 1,850- 68- 25-ABD
W9YCV 966- 42- 21-BD
WA9CKS 836- 44- 19-AB
WA1UJU/9 660- 44- 15-B

0

Colorado

WB5JAR 1,880- 77- 20-**ABD**
NK9P 1,725- 58- 23-ABD
W9KJY 962- 27- 13-**DEG**
W9MXY 663- 34- 13-**ABCDE**
KE5SQ 248- 23- 8-ABD
K9CL 92- 23- 4-AB
WØKEA (+Nøs BRI,DVL) 624- 40- 13-ABD

Iowa

KA9TLJ 5,440- 170- 32-**B**
W9RAP 4,905- 68- 45-**BDE**
K8CQ 2,627- 67- 37-**ABDE**
W9IZ 1,452- 66- 22-B
KD9BT 1,159- 49- 19-ABD
WAØDCB(+WM5Y,AB9W,KA9BSU, NN9K,NØCIH) 22,550- 247- 82-ABCD

Kansas

NØLL 13,725- 150- 75-**ABD**
KØSMI 8,216- 92- 52-**BCDE**
NØFFQ 5,842- 103- 48-ABD
WØRT 5,208- 66- 51-ABD
WBØHYV (EM17) 1,708- 35- 28-ABCDEF
WBØHYV (EM07) 792- 20- 18-ABCDEF
WDØG 608- 38- 16-B
WBØHYV (EM16) 374- 18- 11-ABCDEF
KØVUA 264- 20- 11-BD
WBØHYV (EM29) 176- 8- 8-ABCDEF
WBØHYV (EM19) 168- 8- 8-ABCDEF
WBØHYV (EM28) 168- 8- 8-ABCDEF
WAØTKJ (+KFØM,KXØO,NOØY,WBØDRL) 140,174- 398-218-ABCDEFI

Minnesota

WØVB 11,448- 180- 54-**ABCD**
KØGJX 5,640- 119- 40-**ABC**
WAØBWE 4,736- 108- 37-BD
KCØP 1,241- 70- 17-ABC
WØHU 1,134- 47- 18-BD
KAØUZZ 648- 40- 18-BD
NØCET 357- 51- 7-B
KØTS 312- 51- 6-BD
NØBSG 212- 53- 4-B
NØHJZ 190- 19- 10-AB
KBØZQ (EN34) 152- 17- 8-ABD
WAØWTV 116- 29- 4-B
WAØULE 75- 25- 3-B
NØHBS (EN34) 72- 36- 2-B
KBØBYI 68- 34- 2-B
WBØRHV 66- 33- 2-B
KBØZQ (EN24) 60- 12- 5-B
KDØAB 58- 29- 2-B
NOHZN 56- 28- 2-B
KCØZC 54- 27- 2-B
WAØVHX 52- 26- 2-B
KCØA 50- 25- 2-B
NØHOQ 50- 25- 2-B
WBØEJI 50- 25- 2-B
KCØZ 46- 23- 2-B
KBØZQ (EN35) 44- 11- 4-B
WAØPUJ 44- 22- 2-B
NMØQ 44- 22- 2-B
WØPLD 44- 22- 2-B
NØHBK (EN34) 44- 22- 2-B
WAØVLG 42- 21- 2-B
KAØVRV 38- 19- 2-B
KBØZQ (EN25) 36- 9- 4-B
WDØHEB 34- 17- 2-B
WBØLSG 34- 17- 2-B
WØMN 34- 17- 2-B
KBØNT 34- 17- 2-B
NØHBS (EN33) 32- 16- 2-B
NØHBK (EN43) 32- 8- 4-B
WØSA 30- 10- 3-B
NUØM 30- 15- 2-B
NØHXJ 28- 14- 2-B
NØHBK (EN33) 28- 14- 2-B
NØHCK 24- 12- 2-B
NØHBS (EN44) 24- 6- 4-B
WBØYEE 24- 12- 2-B
NØHBK (EN44) 24- 6- 4-B
KØKTY 22- 11- 2-B
NJØC 20- 10- 2-B
NØISY 18- 9- 2-B
KL7YL 16- 8- 2-B
NØHBS (EN43) 15- 5- 3-B
KØSIR 8- 4- 2-B
WDØETA 5- 5- 1-B
KBØVG 3- 3- 1-B
NØDOS 2- 2- 1-B
KCØRV 2- 2- 1-B
NØIKC 2- 2- 1-B
WDØGNK 1- 1- 1-B
NØHZO(+KCØP) 273- 36- 7-ABC

Missouri

KØIFL 6,545- 89- 55-ABC
N8FOW 6,102- 91- 54-ABD
KAØGGI 4,140- 90- 46-**AB**
WØJRP 2,541- 60- 33-ABC

Nebraska

NØBTN 2,925- 81- 35-BCD
WBØJWQ 1,449- 51- 23-**ABD**
NØAJU 345- 23- 15-AB

VE

Quebec

VE2DUB 8,575- 121- 49-**ABC**
VE2FUT 1,330- 70- 19-B

Ontario

VE3DSS 15,008- 169- 67-ABC
VE3KKL 9,348- 139- 57-ABD
VE3DDW 6,957- 149- 53-ABD
VE3VAL 7,740- 172- 45-**B**
VE3EYR 5,418- 101- 42-ABC
WA2JXD/VE3 756- 42- 14-ABD
VE3DJ 228- 28- 6-BD
VE3PNW 65- 13- 5-BD
VE3FVW 38- 14- 2-BD
VE3UOT (VE3OHG,op) 10- 2- BD
VE3LNX (+VE3s ADJ,DFD,NSQ) 116,116- 552-143-ABC
VE3UOW (VE3s NPB,OIL,PYH,RKS ops) 1,102- 46- 19-BD

Manitoba

VE4MA 286- 13- 11-**D**

Saskatchewan

VE5LY 1- 1- 1-**A**

Alberta

VE6BOJ 138- 17- 8-**B**
VE6AFO 60- 9- 6-BD

British Columbia

VE7ASI 720- 40- 18-**AE**

Checklogs

K1KI, WB1CWZ, WB2GMK

Disqualification

WB2WIK

Results, 1988 Novice Roundup

By Billy Lunt, KR1R
Contest Manager, ARRL

and Mark Gamble, N1FOZ
Contest Assistant, ARRL

This year the Novice Roundup took on a new face. With Novice Enhancement becoming effective in March of 1987, new operating privileges were bestowed upon Novice and Technician class licensees. These new privileges found their way into the 1988 NR. Not only was the classic CW mode used in NR, but also 10-meter SSB, 222 MHz, 1270 MHz, RTTY and packet were available for an added attraction, giving the contest a new and interesting twist. Novice Roundup gives Novices and Technicians nine days of operating while supplying plenty of activity to try out new modes and bands. NR also gives participants the time to experiment with propagation on different bands at different times of the day. By the end of the contest or after 30 hours of operation (whichever comes first), contestants can't help but notice their operating skills and techniques have improved and that they are well on their way to becoming experienced contesters.

The Novice Roundup provides many things for different people. Besides being a fun and challenging contest, NR still remains as one of the most favorite activities among Novices and Technicians for improving and increasing CW speed. Also, like many other contests, new states and DXCC countries are worked, putting the finishing touches on the requirements for that long sought-after award. Many personal achievements are accomplished each year during the NR. The following comments are just a few of such triumphs: "Wow! I had loads of fun during the NR. My biggest thrill was working KL7XM in Alaska. My hand froze up because I got so excited"—KA1QMQ. "Not too many contacts, but I had fun and increased my confidence in CW operation"—KB2DFZ. "I think contesting is an awesome way to improve code speed and general operating skills"—KB2EMU. "I worked my first DX on 15 meters! NR was a great way to get my feet wet. It also helped to increase my code speed to the point that I was able to pass my 13 WPM test with no difficulties"—KA3SKT. "My code speed went from 5 WPM to over 14 WPM during NR. It's time to upgrade!"—N3FTI. "I worked 35 states, 4 VE provinces and 3 DXCC countries during NR. Also, my code speed improved so much, I upgraded to General!"—N4REE. "I was surprised and delighted to find that I had worked all states"—N4QIV. "Everyone told me NR would help my CW speed. Sure enough it did! I hope to take my General soon"—KB5CQR. "After holding a Novice ticket for almost five years, I finally got on the air for the first time. NR opened a whole new world"—KAØQCJ.

There were a total of 363 entries received by the Contest Desk for the 1988 Novice Roundup: of that number, 150 were Novices and 144 were Technicians. Looking through the score listings reveals many familiar and repeat NR participants.

A scan through the Top Ten boxes will show four of 1987's top ten are back again this year. For the Novices, KAØSIX betters his last year's score by 60k and reclaims 3rd place again in '88. KA8JBK increased his score by 70k and moved up the ladder to 4th

Novice Top Ten

Call	Score
W6UE/N (KA6SAR,op)	229,812
WD5JZL/N	106,406
KAØSIX/N	105,264
KA8JBK/N	105,006
KB8BSM/N	98,532
KA8YZJ/N	75,208
KA2YVU/N	74,732
KA9LJO/N	65,925
KB4MUZ/N	63,104
WD4KQN/N	61,200

Technician Top Ten

Call	Score
KAØVYA/T	124,820
KA9CHM/T	95,328
KA9UJE/T	71,676
WA3TIH/T	70,180
NØIPP/T	68,941
N4QIV/T	65,934
WB2VBV/T	62,832
KA8OAT/T	48,528
KAØREN/T	48,440
KB7AXA/T	47,736

Division Leaders

Novice		Technician
Call	Division	Call
KA2YVU/N	Atlantic	KA3ROF/T
KA9LJO/N	Central	KA9CHM/T
KAØUQT/N	Dakota	NØFYR/T
WD5JZL/N	Delta	KB5CQR/T
KA8JBK/N	Great Lakes	KA8OAT/T
WA2FEH/N	Hudson	WB2VBV/T
KAØSIX/N	Midwest	KAØVYA/T
KA1RAZ/N	New England	KA1LDS/T
KAØSVY/N	Northwestern	KB7AXA/T
KA6SHS/N	Pacific	NH6GJ/T
KAØZOS/N	Rocky Mountain	NØIPP/T
KB4MUZ/N	Roanoke	N4QIV/T
WD4KQN/N	Southeastern	N4REE/T
W6UE/N (KA6SAR,op)	Southwestern	KA7WPD/T
KB5ENP/N	West Gulf	N5LAI/T

Fifth-place Novice finisher KB8BSM logging in another contact. Mark also finished first in the Ohio section.

Debi, KBØAOQ/N, from the Colorado Section, smiles for the camera.

The job's never complete until the paperwork is done, as Leroy, KB7AGY/N, learns.

Novice Roundup Experience From Washington

I've been a ham on and off for 26 years, but never have I used CW. I didn't even use my second license (I got computer fever, which has burned itself out). Now I'm on my third call and once again tinkering with transistors. I've also come to realize the terse, economic beauty of CW.

Before NR, I had made only two contacts, both with the same ham (Floro in San Jose, thank you!)

My goal for NR was just to get on the air and see if I could learn something. Little did I suspect, despite all that I've read in *QST* over the years, what would happen to me. My hands got cold and sweaty; my copy speed fell from a solid 11-12 WPM to about 4!; my hand shook and sent wild code through the ether. In a half hour, my body was soaked with sweat. I kept at it though, my code speed increased and my sending was less erratic. All the things I've read about appeared on the air, good and bad turned out true. Some folks were friendly; others business-like, or even abrupt.

I heard a 3-minute CQ, followed by a short string of call signs too fast and blurred for me to follow. Someone answered him, and his sending speed dropped in half!

Several times I heard a signal with a pronounced, slow chirp, but I never got a chance to answer him and tell him he had a big problem.

An Extra in California answered me once (actually I answered his CQ NR), but only sent CA as his QTH—guess he didn't read the rules. I heard another operator asking a different CA ham what his section was; they never did straighten out which section he was in. After the third time of this happening, I managed to straighten out a puzzled ham in the midwest, by telling him "YES" Fresno was in SJV. Seems the California hams don't know much about ARRL sections. Oh, don't mistake me, I made my share of mistakes. Lots of sending errors. It's hard to slow down when sending (unless I'm trying to figure out how to spell my name or something—that at least has gotten better!), and I'm sure I scared off a few newer hams, although I did try hard to go at their pace.

I had one very strange experience. I answered W9GXR (on 3.7 MHz), and he came back with FB DAN, RST 599 5NN WI WI. How did he know my name? At any rate he seemed very business-like and dove right into the next QSO; obviously he was very experienced. I thought that maybe I had worked him before (he was my 16th contact, including the 2 with Floro), but I had not. Had he heard me working someone else? I doubt it, as he seemed to be working by "CQ" and "QRZ." Also it was my first QSO of the day! I can only guess that he has the *Callbook* on hard disk data base (Wow!) and entered my call to come up with my name. A little spooky, though.

Halfway through the week my addiction got the best of me (solder smoke—hopeless—no cure) and I took my EICO 723 transmitter (remember those?!. . . $35 with the 722 VFO at a hamfest) apart and added a QRP switch. It's nice for tuning up without bothering others as much (in case they missed my QRL?). It drops the output to about 2 watts. I wanted to see if QRP can really make it, as I have dreams of home-brewing my next rig. Four days later I forgot to go "QRO" (that's 20 watts out on the 723!), but worked N5KOB in STX using less than 1.8 watts on 15 meters—and got a 579! Later I got a 549 from WD9IQN in IL.—*Dan Winkler, N7IVR/T*

place this year from 6th place in '87. The top two Novice slots for 1988 are held by top-ten new blood. W6UE (KA6SAR/N,op) ran away with 1st place just shy of 230k points. This is a record that will be hard to beat. WD5JZL was the 2nd place finisher with 106k points. In the Technician race, KAØVYA moved from 4th-place Novice in 1987 to 1st-place Technician in '88 by improving his score by 85k for the win. KA9CHM grabbed the 2nd place spot with 95k points. KA9UJE ended up in 3th place just 1k points ahead of 4th place finisher WA3TIH. Last year's 4th place Technician, WB2VBV, tripled his score for '88 but found the competition a lot fiercer this year, slipping to 7th place. Great showing this year from all! Certificates for all Novice and Technician entrants will be out soon. Looking forward to seeing everyone again in 1989!

SOAPBOX

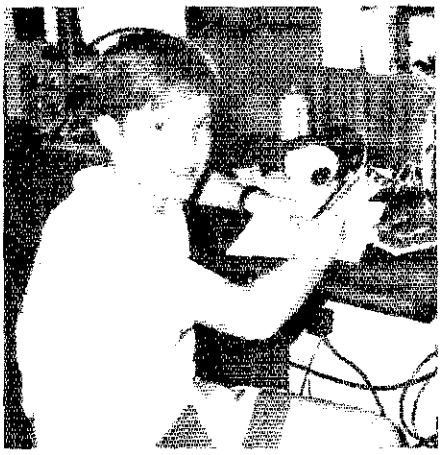
There were plenty of Novices and Techs who were able to copy well over 13 WPM. I was very impressed! (KA1IOR/E). Sure wish I had used CW instead of relying on phone only! (WB1EAD/T). This is the first contest I have entered; I had a great time contacting DX. Some of the pile-ups were unreal, but they sure did add to the excitement of the contest (KA1QFV/T). My first crack at Novice Roundup was fun! Okay, it's not an award-winning score, and I may not have been able to work the full 30 hours allotted, but like I said I had fun! NR was a great opportunity for me as a new Novice to jump in with both feet, get the hang of making contacts, iron out operating procedures and identify minor problems with a newly purchased used rig. Thanks for the opportunity (KB2EAX/N). Enjoyed NR greatly and had a much better time than last year (WA2JUJ/T). Wonderful experience! (KA2IKE/N). On February 7th I had a cold and fever of 104°—that was the day I made most of my contacts! Now I know what the "ham radio" fever is! (KB2BSV/N). Many thanks to all the experienced

Sue, KA3SKT/T, placed second in the EPA section with 13k points.

WD4KQN/N finished in 10th place in the Novice category overall.

In California, Darrel, KB6RXF/N, walked away with the Orange Section win.

Chris, with his broken thumb for all to see, worked exclusively CW for the multiop crew of KBØBFJ/T.



Twelve-year-old Ron, KC4CXQ/N, took first-place SFL.

operators who gave no quarter and forced my copy speed up, while displaying infinite patience with my fist. Be back next year, without the "/N," I hope (KA3SDO/N). Well someone has to have the lowest score. How is 119? (KA3RRS/N). This was the first time I participated in any contest. It was a ball! (KA3FIJ/N). This was my first contest. I didn't exactly set the world on fire, but I had fun (N4NFI/T). Strange NR this year. Fifteen meters was up and that was great, but what happened to 40 meters? Maybe we can trade this portion of 40 meters to the Generals for a portion of 20 meters? CW, of course; that would be super! I tried out SSB on 10 meters for a bit but it's too much work. I can eat and drink and send CW, but I can't eat and drink and talk SSB—Ha Ha! (KA5DIU/N). I am a 16-year-old YL and I received my ticket when I was 14. This is the first year that I have participated in the NR. It really helped my confidence. Next year, I plan to participate more actively (KA5YNL/N). Denise, KB7CNL, and I really enjoyed working the Novice Roundup together. We improved our skills and got to know each other better (KB7DNK/N). What a great contest. I was able to make my QSOs count. They were only two or three minutes each on average. What I especially enjoyed was a QSO with W1AW (KB7AGY/N). Terrific Novice Roundup! I couldn't believe the number of Novices and Techs I heard! (KA8ZUF). I would like to thank Dr Lou Arnold, K9ALP, for helping me get ready for this contest. If I didn't know better, I'd say his name was Elmer (KB8BSM/N). Had fun working the contest QRP. With two hams in the same house it was also a competition to see who would get to use the rig! (KA8NRC/T). There are a lot of good fists out there—excellent future contest operators, but more important, excellent future CW operators (W9GXR). The NR was a great experience for increasing code speed, gaining confidence in CW and phone and meeting friendly, helpful hams. My OM (NYØR) encouraged my full participation by washing dishes for the week—can't we have the NR more often! (KAØVFM/T). I only worked 28-MHz SSB because I didn't have a CW filter at the time (NØIJU/T). NR was fun! My broken thumb didn't slow us down (KBØBFJ/T).

Scores

Score listings indicate call sign, score, number of QSOs, multipliers (number of ARRL Sections + DXCC countries) and total hours.

1

Connecticut

KA1QMQ/N	2,408	43	28	7
KA1QXK/N	320	16	10	11
KA1LYF/T	21	7	3	3
KA1QQJ/T	9	3	3	1

Eastern Massachusetts

KA1PCM/N	48,348	353	79	17
KA1NNI/N	7,440	78	48	17
N1DVH/T	3,729	57	33	11

Maine

WB1EAD/T	2,611	93	27	18
KA1RFD/N	1,188	33	18	19

New Hampshire

KA1LDS/T	14,410	149	55	25
KA2ZHA/N	9,202	107	43	24

Rhode Island

KA1PBO/T	8,136	113	36	30
KA1MOK/N	20	5	2	6

Vermont

KA1RAZ/N	17,632	160	68	7
W1KOO/T (N1s DLE,EOZ,EYD,ops)	1,288	37	23	5

Western Massachusetts

KA1EJK/N	17,160	160	55	22
KA1QFV/T	2,024	92	22	19

2

Eastern New York

KB2DSS/N	20,852	166	61	22
KB2DQE/N	13,104	132	56	26
KB2DSR/N	12,324	158	39	19
KA2VQY/N	8,658	117	37	20
WB2TTG/T	2,688	48	28	22
KB2DHG/N	2,574	66	25	25
KB2EIK/T	2,236	44	26	19
N1DXT/T	1,020	32	20	11
KB2DSQ/N	992	26	16	5
KA2MCU/N	352	16	11	8
KB2EAX/N	200	10	10	16
KB2DFZ/T	174	12	6	7
KB2CCC/T	8	2	2	12
K2YCJ/N (KB2s BQY,DIS,ops)	364	14	13	5

NYC-Long Island

WB2VBV/T	62,832	374	84	21
WA2JUJ/T	22,920	191	60	25
KA2JJJ/T	12,100	121	50	21
KB2DRR/N	9,843	97	51	13
N2HLC/T	5,125	125	41	26
KA2JAK/T	576	18	16	12
KA2IYI/T	341	29	11	5
KA2GRH/N	270	30	9	15

Northern New Jersey

WA2FEH/N	53,546	340	82	30
KB2EOH/N	21,600	240	45	22
N2GMZ/T	8,370	100	45	14
KB2BVP/N	1,152	32	18	10
KA2YYV/N	850	25	17	10

Southern New Jersey

KB2EUC/N	22,297	163	69	13
WB2YEH/T	7,520	80	47	23
KA2AIA/N	5,202	69	34	15
KA2TDC/N	5,162	84	29	26
KA2YKN/T	2,220	46	30	24

Western New York

KA2YVU/N	74,732	542	68	27
KB2EMU/N	26,163	235	57	27
WD6CQV/2/T	17,388	155	54	27
KA2SJG/N	14,852	158	47	14
KA2IKE/N	12,852	126	51	18
KB2DSJ/T	11,430	127	45	23
KB2BSV/N	3,380	65	26	14
KA2WYH/N	2,880	80	18	8
KB2ETB/T	1,334	48	23	25
KB2CHV/T	330	15	11	4
N5LXS/2/T	280	27	10	14
KB2EVL/N	126	21	6	8

3

Delaware

KA3SGF/N	1,302	53	21	4
WA3BZT/T	340	12	10	2

Eastern Pennsylvania

KA3ROF/T	22,876	313	38	26
KA3SKT/T	13,000	125	52	26
N3FTI/T	12,474	142	54	17
KA3QLF/N	11,438	133	43	16
KA3SIO/T	10,575	132	47	9
KA3SDO/N	5,920	80	37	22
N3FSC/T	2,254	95	23	26
KA3QCG/T	555	20	15	9
KA3RRS/N	119	17	7	5
N3FOV/T	70	14	5	4
KA3PQK/N (+WA3MEM)	13,311	131	51	30

Maryland-DC

KA3RFE/N	33,768	252	67	28
WB3CDX/N	13,932	258	54	29
KA3SKF/T	11,970	133	45	18
KA3FNJ/N	11,760	120	49	30
KA3SAO/N	10,058	107	47	28
KA3MMG/N	2,100	30	30	22
KA3SKE/N	18	3	3	11

Western Pennsylvania

KA3RYZ/N	11,342	110	53	15
KA3SHU/N	9,080	101	40	16
KA3PVD/T	6,460	85	38	30
KA3NVZ/N	1,020	30	17	4
KA3ORF/N	936	26	18	7
KA3SJZ/N	374	17	11	7

4

Alabama

KB4TOX/N	11,408	124	46	29
WB4QEE/T	112	12	8	2
KC4BWB/N	72	6	6	2

Georgia

WD4KQN/N	61,200	450	68	28
N4REE/T	9,648	102	48	27
N4NFI/T	2,450	49	25	20
KB4IAT/N	1,218	29	21	4
KB4DNQ/N	946	43	22	22
N4QVB/T	432	18	12	9
KB6IWS/T	300	20	15	6
KC4CVO/N	72	4	4	4

Kentucky

KC4CHL/T	6,612	114	29	18
KA4NKN/T	2,100	42	25	10

North Carolina

KA4OHV/N	35,464	286	62	27
KB4QAL/N	18,036	167	54	26
KC4BIO/T	6,864	87	44	29
KB4YIV/T	3,968	62	32	27
KB4MDZ/T	1,040	27	20	8
KA5WJZ/T	9	3	3	3

Northern Florida

KC4BWY/N	31,560	263	60	27
KB4SQK/N	35	7	5	2
KB4ZWH/N (+K1GTE)	3,234	44	33	22

South Carolina

KB4VZM/T	353	19	11	17
KA4UTZ/N	264	12	11	10

Southern Florida

KC4CXQ/N	10,710	106	51	15
KB4SPA/T	20	4	4	10

Tennessee

KB4ZGT/N	12,098	134	46	14
KA4TTX/N	6,392	73	47	20

Virginia

N4QIV/T	65,934	407	81	30
KB4MUZ/N	63,104	464	68	30
WD4RZV/N	58,500	315	90	29
KA4WYF/T	3,648	57	32	16
KC4AUV/N	1,728	36	24	9
KB4VIR/T	570	30	19	12

5

Louisiana

KB5EPG/T	2,132	82	26	15

Mississippi

WD5JZL/N	106,406	641	83	30
KB5CQR/T	30,150	229	67	30
KB5FDX/N	6,292	78	44	24
N5LRQ/T (+N5KBQ)	15,517	249	59	24

New Mexico

N5JTY/T	38,934	304	83	30
KB5ETW/N	34,176	311	64	23
KB5DMO/N	31,720	262	61	26
KA5DIU/N	18,144	174	54	12
KB5BSI/T	7,348	88	44	8
N5KTP/T	7,296	89	41	14
N5LQO/T	1,349	71	19	10
KA5YNL/N	992	31	16	3
N5JUQ/T	561	33	17	14
KB5DBJ/N	99	11	9	3

North Texas

KB5EQL/T	16,074	153	57	28
KA5MXG/T	2,322	43	27	8
N5KVK/T	7	7	1	4

Oklahoma

KB5ENP/N	6,336	99	32	29
KA5VIL/T (+WB5OSM)	31,020	235	66	19

South Texas

N5KDB/T	17,215	174	55	30
KB5ELV/N	5,957	86	37	30
KA5ZNX/T	2,016	37	24	15
KB5EYK/N	330	17	11	3
KB5EYP/T	24	8	3	3

West Texas

N5LAI/T	37,674	276	69	21
N5KUC/T	12,980	110	59	29
KA5WMU/T	1,144	26	22	3

6

Los Angeles

W6UE/N (KA6SAR,op)	229,812	1205	132	30
KB6QHL/T	2	1	1	2

Orange

KB6RXF/N	58,692	414	73	27
KB6SSD/T	1,904	119	16	15
KB6TIN/T	75	8	5	26

Pacific

NH6GJ/T	176	23	8	8
WH6BKQ/T	143	13	11	9

Santa Barbara

KA6MUV/T	5,365	145	37	7

Santa Clara Valley

KA6SHS/N	23,560	190	62	17

San Diego

KB6PJU/N	31,124	258	62	30

San Francisco

KB7DBT/N	21,228	174	61	29

San Joaquin Valley

KB6EEK/N	4,096	128	32	5

7

Alaska

WL7BKZ/N	11,421	123	47	25

NL7KB/T	476-	18-	14-	5
Arizona				
WA7IYG/N (KA9YAC,op)	25,760-	199-	60-	26
KA7WPD/T	14,440-	361-	40-	21
KB7DOR/N	1,357-	36-	23-	10
KB7DBN/N	1,218-	37-	21-	11
KA7HKS/N	200-	15-	10-	10
Idaho				
KB7AXA/T	47,736-	351-	68-	27
N7KFI/T	250-	17-	10-	4
Montana				
KA8SVY/N	15,390-	135-	57-	26
KA7NCY/T	330-	55-	6-	8
Oregon				
N7JUP/T	9,200-	100-	46-	29
N7JUR/T	4,130-	70-	35-	15
KB7DRD/N	2,231-	49-	23-	10
KB7DRE/N	312-	13-	12-	11
N7JED/T	80-	5-	5-	2
KA7UJW/T	32-	4-	4-	3
KB7DNK/N (+KB7CNL)	3,720-	60-	31-	12
Utah				
KB7AGY/N	31,500-	250-	63-	23
Washington				
KA7UDJ/N	7,056-	84-	42-	19
N7IVR/T	1,748-	36-	23-	28
KB7BTO/T	1,219-	53-	23-	11
KB7DKF/N	1,134-	27-	21-	8
KB7CMR/N	532-	19-	14-	23
KB7APO/T	88-	11-	8-	3
N7JPP/T	10-	4-	2-	5
Wyoming				
KB7AWM/T	37,888-	296-	64-	28
N7JZW/T	98-	9-	7-	9

8

Michigan				
KA8JBK/N	105,008-	721-	74-	30
KA8PKJ/N	23,760-	217-	55-	23
KA8EBE/N	18,914-	193-	49-	26
KB8CFK/N	5,376-	96-	28-	30
N8IJH/T	2,750-	50-	25-	26
KA8QKQ/T	1,080-	60-	9-	17
KB8DKO/N	286-	13-	11-	6
KA8JJN/T	250-	13-	10-	3
KB8DQP/N	160-	8-	8-	3
KB8BMO/N	18-	6-	3-	4
KB8DDK/N (+KB8DDJ)	80-	14-	4-	4
Ohio				
KB8BSM/N	98,532-	642-	92-	30
KA8YZJ/N	75,208-	476-	79-	30
KA8OAT/T	48,528-	356-	72-	26
N8GFK/T	30,432-	320-	48-	24
KA8KSO/N	15,800-	158-	50-	25
N8DAQ/T	14,908-	142-	58-	16
KA8SOJ/N	9,976-	111-	43-	20
KA8HFJ/T	9,800-	98-	50-	18
KA8NRC/T	5,699-	82-	41-	16
KA8VPL/N	4,059-	83-	41-	15
N8HUR/T	1,728-	108-	16-	25
KB8DAE/N	1,652-	59-	28-	25
KA8ODP/T	1,300-	27-	26-	4
KB8DEX/N	768-	31-	16-	29
KB8DRR/N	700-	25-	14-	3
KB8DON/N	616-	44-	14-	22
KA8VAL/T	572-	22-	13-	4
KA8ZHC/T	112-	8-	8-	7
KB2DMZ/N	24-	4-	3-	8
West Virginia				
KA8RLD/N	94,436-	429-	62-	30
KB8DEH/N	49,518-	388-	63-	22
KB8CMR/N	12,816-	161-	38-	30
KB8AOB/N	5,240-	61-	39-	22
N8HTR/T	126-	9-	7-	9

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Illinois				
KA9NGH/N	40,120-	300-	68-	23
KA9UIW/N	20,480-	372-	55-	30
KA9TXG/N	19,680-	179-	55-	13
N9GOE/T	10,011-	110-	47-	15
N9GII/T	2,914-	47-	31-	14
N9GTT/T	2,400-	50-	24-	30
N9GCF/T	1,360-	37-	20-	7
KA9ZLC/N	112-	8-	7-	1
KA9WHK/T	45-	5-	5-	4
KA9ZDT/N	22-	11-	2-	10
KA8ZTJ/N	14-	6-	2-	1
KA9ZJJ/T	5-	5-	1-	1
Indiana				
KA9UJE/T	71,676-	543-	66-	23
KA9LJO/N	65,925-	442-	75-	24
KA9IWP/T	24,640-	224-	55-	25
KA8ZTC/N	20,064-	209-	48-	24
N9FFG/T	3,608-	56-	34-	8
KA9ZRW/N	3,105-	64-	27-	30
KA9YZA/T	120-	7-	5-	2
N9GSM/T	12-	4-	3-	6
Wisconsin				
KA9CHM/T	95,328-	499-	96-	15
KA9ZKL/N	39,660-	331-	60-	28
N9HDE/T	23,220-	217-	54-	22
N9GGY/T	17,584-	157-	56-	30
KA9VTP/N	10,028-	109-	46-	19
KA9ZHO/T	8,084-	94-	43-	21
KA9PAF/N	986-	29-	17-	15
KA9ZWM/N	84-	7-	6-	6
KA9ZHF/T	12-	3-	2-	5

0

Colorado				
N0IPP/T	68,941-	485-	71-	30
KA0ZOS/N	54,303-	394-	69-	30
KA0VFM/T	25,704-	215-	63-	27
KA0YXI/N	17,604-	158-	54-	23
KB0BDO/N	1,900-	38-	25-	11
KA0USE/T	1,064-	75-	14-	26
N0IJU/T	943-	41-	23-	16
KB0AOQ/N	874-	23-	19-	2
KA0NND/T	308-	14-	11-	3
KA0YAA/N	275-	14-	11-	1
K3ZMO/T	100-	20-	5-	9
KB0ADI/N	18-	9-	2-	9
KA0MHR/N	9-	9-	1-	2
Iowa				
WA3TIH/T	70,180-	365-	110-	30
KA0YGX/T	8,404-	97-	44-	15
KB0ATA/T	5,248-	82-	32-	10
N0HJQ/T	552-	28-	12-	18
KB0BDU/N	7-	7-	1-	1
Kansas				
KA0SIX/N	105,264-	602-	88-	30
KA0ITA/N	27,328-	224-	61-	29
N0IQJ/T	16,830-	160-	51-	30
KB0BPR/N	1,342-	31-	22-	12
KB0BTF/N	198-	11-	9-	19
W0LB/T (KA0MIQ,KB0s AVS,BSP, N0s FVR,GAB,HAF,ops)	15,070-	139-	55-	27
Minnesota				
N0FYR/T	14,580-	135-	54-	24
KB0BEJ/T	14,260-	155-	46-	18
KB0BIX/T	9,682-	108-	47-	19
KA0UQT/N	8,400-	105-	40-	16
KA0YEG/N	5,976-	83-	36-	13
KA0ZTE/N	744-	31-	12-	9
Missouri				
WD0BBL/N	50,932-	375-	68-	28
KA0REN/T	48,440-	348-	70-	29
KB0ACF/T	17,024-	152-	56-	28
N0INI/T	3,100-	50-	31-	15
KA0QCJ/N	884-	21-	17-	30
KB0BEP/T	48-	12-	4-	5
KB0BPA/T	9-	3-	3-	2
KB0BFJ/T (+WB0ZNE)	15,456-	181-	48-	26
Nebraska				
KA0VYA/T	124,820-	790-	79-	30
KB0BCQ/N	6,972-	83-	42-	11
N0ILA/T	896-	31-	16-	13

Non-Novices

KA6MSE (KX6Y,op) 38,040, W9GXR 32,452, K9GXU 22,770, KA5GIS/1 20,440, WA9PQY 14,739, KB1VL 12,880, WA1VEK 11,938, KM1X 11,856, KA9UZH 11,780, WB2NRK 11,562, W7HO 10,208, KA1MPF 9,384, K1KI 7,224, KA1ICR 6,696, KA8ZUF/8 6,640, W2MTA 6,498, K1ZZ 5,814, W4YOK 5,100, KY5N 4,028, WB7EMO 3,904, KH6CP/1 3,429, KY3M 3,420, KJ4ND 3,224, W9UDX/4 2,200, KG8J 1,924, NI1Y 1,716, N9CGE 1,656, N3DPV 1,540, KA3VIL 1,500, KJ4KB 1,428, K9OWC 1,197, W6YVK 1,120, NI1L 1,105, WA3EEE 850, K5IS 663, WH6I 627, W1GV 512, N8HYA 390, K8HJI 336, KB6BCZ (+WC6S) 38,324, KA9YAF (+N9NE) 25,925, KB2CFO (+NM2E) 13,056

Checklogs

KA1CLV, KA2GGB, KB2DER, WB2DVU, KA3CHY, W3ARK, WA3EOP, KA5AWP, KB6NYC, W8UQF, WA8HAD, AE7K, KL7GN, KS7L, KBAN, KA8JVK, KE8CP, KE8OM, W8VUV, KA8PBL, W9CUN, N9DMV, WA9S, VE3CNA, VE4AAU, N4RP/C6A, JE4MYY

Announcing the Third ARRL 10-GHz Cumulative Contest

Object: To promote amateur microwave activity.

Region: USA and Canada.

Eligibility: Licensed amateurs operating in the above region.

Rules

1) **Object:** To work as many amateur stations in as many different locations as possible from as many locations as desired on the 10-GHz band.

2) **Contest Period:** 8 AM to 8 PM local Saturday and 8 AM to 8 PM local Sunday for the weekends of Aug 20-21 and Sep 17-18.

3) **Categories:** Entries are not broken down into any categories.

4) **Exchange:** Six-character Maidenhead Locator (see Jan 1983 *QST*, p 49, or write to Special Requests at HQ for a reprint). Signal report is optional.

5) **Miscellaneous**

A) Scheduling contacts is both permissible and encouraged.

B) Stations are encouraged to operate from more than a single location. For purposes of the contest, a change of location is defined as a move of at least 16 km (10 miles). A station may be reworked for additional credit by either end of the contact moving to a new location.

C) Contacts may not be duplicated on the second weekend (that is at least one end of the QSO must be from a different location).

D) Contacts must be made over a minimum distance of 1 km.

E) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period. The intent of this rule is to prohibit "manufactured" contacts.

F) Contacts with aeronautical mobiles do not count.

6) **Scoring**

A) Distance points. The distance in km between stations for each successfully completed QSO is calculated. Distance = distance in km.

B) QSO points. Count 100 QSO points for each different unique call sign worked. Portable indicators added to a call sign are not considered as making the call sign different and unique.

C) Total Score = Distance Points + QSO Points.

D) There are no multipliers.

E) In making the distance calculations, a string (or ruler) and map may be used. However, calculations by computer program are preferred. Several such programs are available on the commercial market, including *The ARRL World Grid Locator Atlas* ($4). For purposes of making calculations, stations are defined as being located in the center of the 6-character locator sub-square (most computer programs make this assumption).

F) Scoring example. On the first weekend, KB9NM operating from Mt Greylock, MA works W1VD (distance 97 km) and W1LJ/1 (distance 107 km).

On the second weekend, KB9NM/1 operating from Pack Monadnock, NH works the following stations: W1VD (154 km); W1XX/2 (205 km); W1LJ (157 km); and AA2Z (147 km).

Distance points = 97 + 107 + 154 + 205 + 157 + 147 = 867

QSO points = 100 × 4 = 400 (W1VD, W1LJ, W1XX, AA2Z)

Final Score = 867 + 400 = 1267

7) **Scheduling and Reporting**

A) Schedules may be set up by use of the HF calling frequency of 3818 kHz on the evenings of Tuesday, Wednesday and Thursday before the contest weekends starting at 7 PM local. Also, 144.230 and 146.55 MHz can be monitored during the contest to arrange schedules with other stations. Paired stations should move off these frequencies once contact has been made.

B) Logs should indicate the exchange information plus distance of contacts in km.

C) Logs must be submitted no later than 30 days after the end of the contest to ARRL Contest Branch, 225 Main St, Newington, CT 06111.

8) **Awards:** Suitable awards will be presented.

9) **Disqualifications:** See Jan 1988 *QST*.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

MAY

31

West Coast Qualifying Run, 10-40 WPM, at 0400Z Jun 1 (9 PM PDT May 31). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

JUNE

10

W1AW Qualifying Run, 10-40 WPM at 0200Z Jun 11 (10 PM EDT Jun 10). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See May 31 listing for more details.

11-12

ARRL June VHF QSO Party. See May *QST*, p 89.

World Wide South America CW Contest, sponsored by *Antenna-Eletronica Popular* magazine, from 1500Z Jun 11 until 1500Z Jun 12. CW only, 160 through 10 meters. No crossband QSOs. Single-operator, single-band or multiband; and multi-operator, single-transmitter classes; SWL. Exchange RST and serial number starting with 001. Work stations once per band. QSO with own country—0 points (multiplier credit only); QSO with same continent—2 points; QSO with different continent—4 points; QSO with South American station (only for DX stations)—8 points. Multiply total QSO points by total number of DXCC countries worked plus total number of different South American prefixes worked on each band for final score. Separate logs per band. Mail logs (with SASE/IRC for results) by Aug 31 to WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

18-19

All Asian DX Contest, phone, sponsored by the Japan Amateur Radio League, from 0000Z Jun 18 until 2400Z Jun 19. (CW contest will be Aug 27-28.) 160 through 10 meters. Entry classes: single-op, single band; single-op, multiband; multiop, multiband. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Multiops may have a maximum of one signal per band. Exchange signal report and a two-digit number denoting the operator's age. YL stations may send 00. Count 1 point per QSO with Asian stations on 7 through 28 MHz, 2 points on 3.5 MHz and 3 points on 1.9 MHz. Multiply by the number of different Asian prefixes (WPX Rules) worked per band. Note: JD1 stations only on Ogasawara count for Asia. Use separate logs for each band. Mark multipliers the first time worked. Provide a complete summary. JARL Asian Countries list: A4 A5 A6 A7 A9 AP BV BY EP HL/HM HS HZ/7Z JA-JS JD1 JT JY OD S2 TA UA/UN/UV/UW-UZ/RA/RN/RV-RW/RZ9-0 UD UF UG UH UI UJ UL UM V85 VS9M/8Q VU XU XV 3W XW XX9 XZ YA YI YK ZC4 5B4 1S 4S 4W 4X/4Z 7O 9K 9M2 9N 9V and Abu Ail. Enclose SAE and IRC for results. Mail logs to arrive by Sep 30 (Nov 30 for CW) to JARL, PO Box 377, Tokyo Central, Japan.

SMIRK QSO Party, sponsored by the Six Meter International Radio Klub, from 0000Z Jun 18 to 2400Z Jun 19. Exchange call sign, SMIRK no. and grid square. No crossband, multi-op or partial contacts allowed. Scoring: 2 points per SMIRK contact made, 1 point per non-SMIRK contact. Total points multiplied by total number of different grid squares equals claimed score. Only new contest log forms acceptable. Provide a legal-sized SASE for copy of log. Certificates issued for high scorers in ARRL sections/foreign state/province/prefecture/UK shire county/region/country. Must be paid-up SMIRK member to receive contest award. Others may exchange SMIRK no. for points. Failure to provide name, call, SMIRK no. on log are grounds for disqualification. Send log requests with SASE and logs (postmarked no later than Jul 6) to Lisa Lowell, KAØNNO, Box 547, Hugo, CO 80821.

22

W1AW Qualifying Run, 10-35 WPM at 1300Z Jun 22 (9 AM EDT Jun 22). See Jun 10 listing for more details.

25-26

Field Day. See May *QST*, p 87.

JULY

Canada Day Contest, sponsored by the Canadian Amateur Radio Federation, 0000Z-2400Z Jul 1. Everybody works everybody. 160-6 meters, phone and CW. Entry classes: single-op, all band, mixed mode; single-op, all band, CW; single-op, all band, SSB; single-op, single band, mixed mode; multi-operator, single transmitter; multioperator, multi-transmitter. Work stations once per mode on each band. No crossmode contacts. Exchange operator's name, RS(T), serial number and province/state/country. Multi-multi entrants use separate numbers for each band. Count 10 points per VE QSO, 4 points for other countries. VEØ counts as Canada and 1 multiplier. 20-point bonus for working any CARF stations using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PEI VE1-NB VE1-NS VE2-8 VEØ VY1; max 26/band, each band). Suggested frequencies: 1.825/1.875 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.125 MHz. Awards. Summary sheets available for an SASE. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest, c/o John Clarke, VE1CCM, 16 Keefe Ave, Sydney, NS B1R 2C7 Canada.

2-3

Activity Day Contest, sponsored by the Colorado Six Meter International Net, from 1400Z Jul 2 until 0300Z Jul 3. All contacts are to be made on 50 MHz. Exchange call sign, first name, grid square and SIN number (if any). Contacts with SIN members count three points, non-members, two points. Multiply total number of states worked by total number of points. Certificates awarded for top scorers. Send logs (and SASE for results) by Jul 31 to NØAKI, 8529 Fenton St, Arvada, CO 80003.

Venezuelan Independence Day Contest, phone, sponsored by the Radio Club Venezolano, from 0001Z Jul 2 until 2400Z Jul 3 (CW—from 0001Z Jul 30 until 2400Z Jul 31). 160-10 meters. Classes: single-operator, single band; single-operator, all band; multioperator, single transmitter; multi-operator, multi-transmitter. Exchange RS(T), QSO number and CQ Zone. Count one point for contacts between stations in same country, three points for contacts on same continent, and five points for contacts on different continents. Multipliers: one for each YV call area contacted on each band; one for each different zone on each band; one for each different country. Multiply total QSO points by total number of multipliers for final score. Plaques and certificates. Be sure to include a summary sheet and signed declaration of rule observance. Mailing deadline for phone is Sep 15; CW, Oct 15. Send to Radio Club Venezolano, Concurso Independencia, PO Box 2285, Caracas 1010-A, Venezuela.

6

West Coast Qualifying Run, 10-35 WPM at 0400Z Jul 7 (9 PM PDT Jul 6). See May 31 listing for more details.

9

W1AW Qualifying Run, 35-10 WPM at 0200Z Jul 10 (10 PM EDT Jul 9). See Jun 10 listing for more details.

9-10

IARU HF World Championship, see Apr *QST*, p 96.

10

ARCI QRP Summer Homebrew Sprint, CW, sponsored by QRP ARC International, from 2000Z Jul 10 until 2400Z Jul 10. Single band or all band. Work stations once per band. Exchange signal report, state/province/country and ARCI number if member or power out if non member. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.060. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. If station worked is using home-brew gear add 5 points per QSO. Multiply QSO points by states/provinces/countries worked per band by power multiplier (4-5 W output ×2; 3-4 W output ×4; 2-3 W output ×6; 1-2 W output ×8; under 1 W output ×10). More than 5 W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Bonus points for using home-brew equipment (HB): add 200 points for each band an HB transmitter used; add 300 points for each band an HB receiver used; add 500 points for each band an HB transceiver is used. Include description of home-brew equipment, commercial equipment and antennas used and indicate which equipment was used on which bands. Awards. Mail entry (SASE for results) before 30 days after the contest to Red Reynolds, K5VOL, QRP ARCI Contest Manager, 835 Surryse Rd, Lake Zurich, IL 60047.

16-17

CQ World-Wide VHF WPX Contest, sponsored by *CQ Magazine*, from 0000Z Jul 16 until 2400Z Jul 17 (48 hours). Use all authorized bands from 50 MHz through 1296 MHz (6 meters through 23 cm). Use all modes, except no repeater or satellite contacts. Classes are: single-operator, single band; single-operator, all band; single-operator, single band, low power; single-operator, all band, low power; single-operator, portable (with temporary power source); multioperator, single band; multioperator, all band; multioperator, portable (with temporary power source); FM only. Low power is defined as 25-W PEP output or less. Exchange call sign and 4-digit grid square. A station in a call area different from that indicated by his call sign is required to sign portable. Count 1 point per QSO on 50 or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 902 and 1296 MHz. Work stations once per band, regardless of mode. Multipliers are the prefixes worked per band. Multiply total QSO points times the total number of prefixes worked (the sum of the prefixes worked per band). Trophies and certificates. Send entries postmarked no later than Aug 31 to be eligible for awards to CQ VHF WPX Contest, c/o SCORE, PO Box 1325, Eatontown, NJ 07724, or to *CQ Magazine*, 76 North Broadway, Hicksville, NY 11801.

AGCW-DL QRP Summer Contest, sponsored by the DL Activity Group CW, from 1500Z Jul 16 until 1500Z Jul 17. CW only, 160 through 10 meters. Classes are: A—less than 3.5-W input (2-W output), single operator; B—less than 10-W input (5-W output), single operator; C—less than 10-W input (5-W output), multioperator; D—QRO stations, more than 10-W input (5-W output), to contact QRP stations only; E—SWL. Class C stations may operate full time; classes A, B, D and E must break for nine hours (may be taken in two parts). 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 con-

(continued on page 104)

Special Events

Conducted By Mark R. Burke, KA1MIS
Contest Assistant, ARRL

Greece: The Radio Amateur Assn of Greece will operate SX1RAAG from **Apr 30** until **Jun 30** to celebrate the 30th anniversary of the foundation of the Society. Operation will be 160-10 meters, both phone and CW. For special QSL card, send QSL via the QSL Bureau or via RAAG of America, PO Box 2325, Long Island City, NY 11102.

Meadville, Pennsylvania: The Crawford ARS will operate W3MIE from 1600 **May 12** until 0400Z **Jul 5** to celebrate the Meadville Area Bicentennial. Suggested frequencies: 3.860 7.230 14.260 21.325 28.325. For commemorative QSL, send QSL and no. 10 SASE to Bill Warren, N3EWP, RD #1, Box 575, Conneaut Lake, PA 16316.

Pasadena, Maryland: The Bay Area ARS will operate N3EKZ **May 28** to commemorate the 144th anniversary of the "What Hath God Wrought" telegraph message from Washington to Baltimore. Suggested frequencies: CW—7.030 7.105 14.030 21.030 21.105. For commemorative certificate, send QSL and SASE to Bay Area ARS, PO Box 805, Pasadena, MD 21122-0805.

Atlanta, Georgia: The Atlanta Radio Club will operate W4DOC 1400Z-2000Z **May 28** during the Georgia Special Olympics. Suggested frequencies: middle of the General phone and CW bands; 10-meter Novice band. For QSL, send QSL and SASE to Club Station Manager, W4DOC, PO Box 77171, Atlanta, GA 30357.

Virginia Beach, Virginia: Award Station N4IBN will operate **Jun 1-31** to commemorate the Bicentennial of the Commonwealth of Virginia. Suggested frequencies: SSB—3.935 7.235 14.335 21.335 28.335; CW—3.735 7.135 14.135 21.135 28.135; FM—146.49. For attractive certificate and QSL, send QSL and large SASE to Dom Tuzzo, N4IBN, 1633 Walsh Ct, Virginia Beach, VA 23454.

Brookfield, Illinois: The Chicago Suburban Radio Assn will operate N9BAT 1500Z-2300Z **Jun 4** from the Brookfield Zoo as part of the West Suburban Council BSA Scout-O-Rama. Suggested frequencies: 7.240 14.260 28.350 146.55. For special QSL, send QSL and no. 10 SASE to CSRA Special Event, PO Box 88, Lyons, IL 60534.

West Union, Ohio: The DeForest ARC will operate KA8URK 1400Z-2100Z **Jun 4** during the West Union Lions Club Horse Show and Hamfest. Suggested frequencies: lower 25 kHz of the General 40, 20, and 15-meter phone bands; Novice SSB—28.365. For special QSL, send QSL and no. 10 SASE to John C Bradford, KA8URK, 247 S Cherry St, West Union, OH 45693.

Grand Forks, North Dakota: The Forx ARC will operate WAØJXT 1600Z-2400Z **Jun 4** for the Northern Lights Council Boy Scout Centennial Camporall. Operation will be SSB in the General portions of each band and 10-meter Novice SSB. For QSL, send QSL and SASE to WDØAQY via *Callbook* address.

Madison, Ohio: The Wireless Institute of Northern Ohio will operate KO8O 2300Z-0300Z **Jun 4** and 1500Z-1900Z **Jun 5** to commemorate Ohio Wine Month. Suggested frequencies: 3.860 (4th only) 7.235 14.235 (5th only). For special certificate, send legal-sized SASE to KO8O—WINO Weekend, 10418 Briar Hill, Kirkland, OH 44094.

Sorrento, Louisiana: The Ascension ARC will operate a Special Event station from **Jun 6** until **Jun 12**, 1500Z-2400Z each day, during its Annual Jambalaya Festival. Operation will be on the 20, 15, and 10-meter bands. Ask operator about special awards and certificates. For QSL, send QSL and SASE to AARC, PO Box 278, Sottento, LA 70778-0278.

Kingston, New York: N2AAK will operate 1500Z-2200Z **Jun 11** to celebrate the 300th anniversary of the founding of the Town of Kingston. Suggested frequencies: 14.275 21.350 28.500. For QSL, send QSL to Gary Ortloff, N2AAK, 51 Melissa Rd, Kingston, NY 12401.

Coronado, California: The Coronado ARS will operate W6MLI **Jun 11-12**, 1500Z-2400Z each day, to commemorate the city's centennial birthday. Suggested frequencies: phone—80 through 10 meters, including Novice SSB. For commemorative QSL, send SASE to Coronado ARS, 638 A Ave, Coronado, CA 92118.

Rock Springs, Wyoming: The Sweetwater ARC will operate N7ERH and N7IQO from 1800Z **Jun 11** until 1800Z **Jun 12** to commemorate the Centennial of the City of Rock Springs. Suggested frequencies: 3.923 7.260 14.300 21.400 28.350. For commemorative certificate, send QSL and 9- × 12-in SASE with two units of postage to Richard A. Auble, N7IQO, 5020 Springs Dr #34, Rock Springs, WY 82901.

Madison, Indiana: The Clifty ARS will operate W9EFU 1500Z-2100Z **Jun 12** from the Clifty Falls State Park to celebrate the graduation of its 1988 Novice class. Suggested frequencies: CW—middle of the Novice 80, 40, and 15-meter bands; SSB—10-meter band. For certificate, send QSL and no. 10 SASE to CARS, PO Box 452, Madison, IN 47250.

Walk Across America: The 96 Over the Hill Gang/Metro-Comm Repeaters will operate WB3JVX and WB2OYQ during the International Peace Walk Inc from **Jun 14** until **Jul 18**. Suggested Frequencies: Repeaters—29.62 224.96 443.05; phone—7.260 14.325. A certificate for working the station on all frequencies. For certificate, send QSL and SASE to PO Box 426, Newcastle, DE 19720.

Coon Rapids, Iowa: The Western Iowa DX and Contest Club will operate KAØHIB 1500Z-2100Z **Jun 18** to celebrate the Quasi-Quicentennial of Coon Rapids. Suggested frequencies: 7.250 14.250 21.350 28.550. For special QSL, send QSL and SASE to KAØHIB, 309 Grove St, Coon Rapids, IA 50058.

Telford, Pennsylvania: The RF Hill ARC will operate W3AI 1400Z-1900Z **Jun 18** to celebrate the dedication of the Indian Valley Public Library. Suggested frequencies: SSB—lower 30 kHz of the General bands; CW—7.125 21.125. For QSL, send business-size SASE to RF Hill ARC, PO Box 29, Colmar, PA 18915.

North Platte, Nebraska: The North Platte ARC will operate WØCXH **Jun 18-19**, 1700Z-2300Z each day, during the Nebraska Land Days celebration at the homesite of "Buffalo Bill" Cody. Suggested frequencies: phone—7.250 14.290 21.400; RTTY—14.090. For certificate, send SASE to NPARC, Box 994, North Platte, NE 69103.

Escondido, California: The Escondido ARS will operate N6WB **Jun 19-25** in conjunction with the 100th Anniversary of the City of Escondido. For large certificate, send QSL and large SASE to Glenn Bodeker, N6WB, 127 Walnut Hills Dr, San Marcos, CA 92069.

Disneyland to Boston: KX6B will operate mobile as part of the support team of "Car #73" in the running of the 6th annual Great American Race. Operation will be from **Jun 20** to **Jul 4** to commemorate the 80th year since the running of the original New York to Paris Great Race. Operations will be daily 1500Z until 2300Z. Frequencies are the lower 25 kHz of the 40, 20 and 15-meter General phone bands and 10-meter Novice SSB. Some evening operation on the 75-meter phone band. Mobile Packet on 145.01 and 2-meter FM on area repeaters. For QSL, send SASE to Dick Raley, KX6B, 2610 Camloop Dr, San Jose, CA 95130.

Gettysburg, Pennsylvania: The Penn-Mar Radio Club will operate W3MUM **Jun 23-25**, each day until 2000Z, from the Living Encampment area during the 125th Remembrance and Re-enactment of the Battle of Gettysburg. Suggested frequencies: phone—25 kHz up from the bottom of the General 80- through 10-meter bands; 28.450. For certificate, send 9- × 12-in SASE to Penn-Mar RC, PO Box 763, Hanover, PA 17331.

Lakeport, California: The Lake Co ARS will operate W6QXN from **Jun 25** until **Jul 4** to commemorate the Lakeport Centennial and LCARS's 20th Anniversary. Suggested frequencies: 80- through 10-meter phone and CW. For certificate, send QSL and large SASE to W6QXN, PO Box 25, Lakeport, CA 95453.

Hamilton, Ohio: The Butler Co VHF Assn will operate W8CCI **Jun 25-26** to celebrate their 30th anniversary. Operation will be 80 through 2 meters. For special commemorative certificate, send QSL and SASE to Tim Johnson, KA8DZU, PO Box 1022, Hamilton, OH 45012.

New York, New York: The Radio Club of Junior High School 22 NYC will operate WB2JKJ 1100Z-1900Z **Jun 27** in recognition of the first day of summer vacation. Suggested frequencies: 7.238 21.395. For incredible QSL, send QSO information to "The Crew at 22" via the *Callbook* address.

Kellys Island, Ohio: Members of the Ohio Underwater Research Assn will operate N8HHG from **Jun 29** until **Jul 1**, 1500Z-0100Z each day, from beneath the surface of Lake Erie aboard various shipwrecks. Suggested frequencies: 7.230 14.245 28.450 146.475. For special photo QSL, send QSL and SASE to Paul Buescher, N8HHG, 1752 Stone Creek Ln, Twinsburg, OH 44087.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **July 1** to make the **September** issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Contest Corral

(continued from page 103)

trolled. 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 separately. 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 after the contest. Send logs (include 1 IRC for results) to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed Rep of Germany.

23

W1AW Qualifying Run, 10-35 WPM at 2300Z Jul 23 (7 PM EDT Jul 23). See Jun 10 listing for more details.

30-31

Florida QSO Party

Venezuelan Independence Day Contest, CW, see Jul 2-3 listing.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by July 1 to make the September issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Robert Pegritz, KC3TI—Summer is finally here with lots of radio activity ahead. Of course, have a great Field Day but do practice safety then and every day as well. In public service, this month will have the St. Andrews Triathlon for everyone above and "below the canal." Hats off to all of the hams who took the week off to help in the McDonald's LPGA Championship. Maybe we'll see familiar faces on the ESPN coverage! AWARE holds their quarterly meeting on June 16th with installation of officers. Note the new net "Western Sussex ARES Net," welcome aboard. Gene Tolpin, KA3SIJ, is enjoying his Extra Class ticket, was a Novice just a heartbeat ago. PSHR-WA3WIY, K3JL. DTN stns 419, Tfc 44 in 23 sessns. DEPN stns 53, Tfc 15 in 4 sessns. West Sussex ARES, stns 10, Tfc in 1 sessns. SEN stns 75, Tfc 1 in 4 sessns. Traffic: K3YBW 53, WA3WIY 51, W3QQ 34, WB3DUG 30, KA3GRQ 29, W3FEG 26, K3JL 15, KC3TI 9.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. We wish all Field Day participants good weather and good fun. Please take care, too — no accidents! Field Day messages to the SM can be sent c/o KB3UD packet BBS if you like, but be sure to use standard radiogram format. The theme of 1988's International Conference on Communications, sponsored by Philadelphia Section IEEE and the IEEE Communications Society, is "Digital Technology Spanning the Universe." KC3LM will chair the June 15 Amateur Radio session, which includes presentations by KB3UD on packet radio and by K3ZKO and K3AFK on ATV. A tour of the Liberty Bell ARA club station will be hosted by KA3HWD. Organized by K3YPO, the session is open to interested Amateurs free of charge. Contact KC3LM for details. Making 1988 Field Day weekend special in EPA is the 125th remembrance of the Battle of Gettysburg. A living-history re-enactment of this event is expected to draw 8,000 participants with perhaps 12,000 family members in tow, and 35,000 spectators per day. Amateur Radio will provide emergency communications. STM KB3UD will manage an NTS packet bulletin board station to handle humanitarian messages for participants camping without ready access to telephones. It has taken tremendous cooperation from many Amateurs and radio organizations to prepare for an event of this magnitude. Eastern PA Section ARRL is proud to be involved and appreciates the cooperation of neighboring Sections. Check the Special Events column for info on W3MUM in Gettysburg. New ORS's: W3GJC, W3KAG, W3ZID, WA3TSW, K3TX. We now have 10 ARES Districts again. Perry and Juniata Counties are the revived Dist. 10, whose DEC is K3AUS. N3FXM is now an OES. KC3QC is our newest Assistant TC. Attention all Assistant TCs: If your radio club doesn't have a TVI committee, please talk to your officers about starting one. This is an important service we should be providing to help our fellow hams. Get a committee together and report its existence to the FCC in Langhorne. Susquehanna Co. ARC's new HF Awards Manager is KA3GHA, who can validate WAS and 5BWAS. Congratulations to WB3EPU, N3COY, and W4UQ on qualifying for TCC certificates in 1988. Traffic: (March): N3AZW 538, N3COY 288, N3DRM 220, W3JKX 132, N3CD 109, KD3AO 97, W3KAG 76, W3IPX 66, WB8KPE 63, W4UQ 62, K3WPI 52, AA3B 43, KB3UD 43, KU3R 37, W3AQN 27, WA3CKA 25, N3EFW 22, W3ZID 16, KO3M 14, W3ADE 12, W3CL 12, W3DP 12, W3FAF 11, W3GJC 10, W3VA 9, KA3RGF 9. NET8 (QNI/QTC/Sessions) EPA 518/173/61, EPAEPTN 566/178/31, MARCTN 155/42/13, MARCARES 59/4/4, SEPATN 113/17/19, D3ARES 72/5/4, D6ARES 72/15/10, D8ARES 77/0/5. PBBS: K3RLI 383, KB3UD 122, AG3F 145, WA7SSO 96, WA3TSW 60.

MARYLAND-DC: SM, Philip Battey, W3FZV-ASM: KX3U. SEC: KN3U. STM: N3EGF. OOC: WB3EFG. ACC: WA3YLO. PIO: N3BMB. SGL: KW3X. TC: W3VVN. March was a busy month of meetings: "Cabinet" meeting of high-ranking officials in the Atlantic Division, a good chance to meet people; the Annual Spring Banquet for all Washington area hams plus others; the Baltimore Hamboree and ComputerFest where there were many many items for sale. All in all, it was a very interesting month and the events demonstrated the dedication of so many hams. Send an SASE to the SM for complete listing of audio/visual programs (video cassettes, 16mm films, slide collections, tape recordings) about ham radio available from ARRL. Recommended reading: "Your Gateway to Packet Radio" available from ARRL. Also "Get *** Connected to Packet Radio." Contact the League for an enhanced version of the "Net Directory" for a buck. It contains much additional operating data. Interested in observer or monitoring work on the bands? Please contact the OOC or SM. Are you interested in combining a sightseeing trip to China with operating BY1PK? Contact the SM. Newly affiliated clubs are the Capital City Amateur Radio Service Youth Ass'n of D.C. and the George Washington University ARC. MSN continues as an excellent training net under the tutelage of KC3Y. Average QNI in March was 12. Thanks to N200EHD who provided D.C. representation in the Bicentennial celebration. The SM had a telephone call from California relative to this! Another California group celebrated the 200th birthday of Samuel F.B. Morse by having his great grandson, W6FZZ, work NN3SI in Washington on April 27. NG1W is a new U.S. citizen. Congrats to K2EB and KC3YY who have nice new equipment. Interested in ANY app't.? Tell the SM. WITH THE NETS: NET/MGR QND/QTC/QNI: MSN/KC3Y/31 46/367. PON/WB3BFK 27/270/22. MDD/W3FA 62/220/573. (TOP BRASS: KC3Y/91, K3GHH/80, WA3YLO/79, W3FA/76, N3EGF/75, NC3V/72) MEPN/N3EGF 29/187/820 HOCARES/WA1QAA 2/4/21. BCN/N3EGF 4/1/27. MAVEN/W3YVQ 1/0/17. PSHR: N3EGF 115, W3FA 98, WA3UZI 73, KC3Y 72, WA3YLO 70, W3YVQ 70, Traffic: W3IWI(PBBS), 604 (BPL), N3EGF 177, KJ3E 169, W3FA 111, NC3V 94, KC3Y 93, KK3F 88, K3GHH 78, K3NNI 76, WA3YLO 63, WA3UZI 63, NB3P 61, KT3T 40, W3YVQ 34, WB3BFK 32, K3ORW 28, W3LDD 24, NC3Z 20, W3FZV 20, KX3U 20, WA3GYW 11, WA1QAA 10, K2EB 8, WA2WDT 3, KC3DW 1.

SOUTHERN NEW JERSEY: SM: Richard Baier, WA2HEB—ASM: N2CER. SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO: VACANT. SGL: VACANT. BM: WB2UVB. OOC: WA2HEB. ATCs: K2JF, KA2RJA & WB2MNF. VE testing June 16, 7:00 PM sharp in the Basement Training Room at the Bellmawr Community Bldg. on Browning Road. For further information contact William Helmetag, WA2VQG at (609) 546-7710 or (609) 939-3032. Old Barney VE session will be held on June 22 at the Ocean County Human Resources Bldg., on Recovery Road, in Manahawkin at 7:00 PM. For information contact Bill Mays, NV2K, at (201) 269-1406. I've been informed that the JSARS VE tests are now held at the AMVETS Bldg. on Rt. 571 in Jackson. When dates are available, I'll pass them along. Field Day weekend is the 25-26 of this month. Please don't forget to take advantage of the bonus points your group can collect by sending me a piece of traffic stating your group's name, FD location, the class you are operating and the number of ARES operators participating. I'll be monitoring 145.07 MHz on packet and I'll be on the section traffic nets throughout FD. BCNU on FD! Until next month, 73. Traffic: WB2ZJF 261, WB2UVB 173, N2FIZ 80, KA2CQX 10, WA2HEB 6. (Feb.) WB2ZJF 279.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. BM: K2KWK. OOC: W2AET. PIO: WA2PUU. SEC: NN2H. SGL: WB3CUF. STM: W2GLH. TC: K2QR. Public Service Honor Roll for March appears in QST's Public Service Column: N2ABA N2EIA N2EVG WA2FJJ N2FOP W2FR W2GJ NN2H N2HXS KC2JW W2MTA WB2OWO KA2QOO WB2RBA ND2S KA2UBD NJ3V K2YAI KA2ZKM KA2ZNZ. March BPL goes to NJ3V. Appointments: (DEC) WA2UFQ Southern; (EC) N2BQV Madison; N2CSG Broome; WA2QDV Orleans; (OES) KB2AUJ WA2HSB WB2OMZ W2OW WA2UFQ. Club officers: Chenango Valley ARA KI2Y N2GVB KA2AOT W2RME; Lockport ARA AE2T WB2BGA WA2WPI K2BXS. Congratulations to W2HJG CVARA's Ham of the Year! GRAM H-O-Y award to WA2JRR. NY2I requests your thoughts on future growth of Amateur Radio. Thom is on ARRL Educational Task Force, see September 1987 QST, page 58. CHUCKLE: Tickles my funnybone to see the SMs claims of "we're number 1" in the Section News columns...Heck, we know where "number 1" is. It's Delaware!! I trust all had a lot of fun working "200" stations. With deep regret, learned of Ed Hart joining the Silent Keys. Ed, as W2ZVW, was first Chairman of NTS Eastern Area Staff; later W5RE SCM of New Mexico. ARES folks take note: Memo of Understanding has been signed by ARRL with the National Weather Service, copies are available from Newington. ALSO, any Local Memorandum of Understanding by your ARES organization must be reviewed and approved by the Section Manager BEFORE the LMOU can take effect as an approved document. To date, NO LMOUs have been received by the SM of WNY. Make sure the SM approves before committing the League's Field Organization to such a document.

Net Name	Mgr	Time	Freq	Mode	QNI-QSP-QND
NYSEMO	N2AGO	099 Sn	3993.5	SSB	100-009-04
NYSR	W2MTA	0930 Sn	3930	CW	015-004-04
NYS/M*	N2EIA	1000 Dy	3677	CW	352-248-31
WDN/M*	WB2OWO	1100 Dy	04/84	FM	393-128-31
NYPON*	KA2UBD	1700 Dy	3913	SSB	677-378-31
Empire SS	W2WSS	1800 Dy	3590	CW	371-061-31
NYSPT&EN	KA2Q	1800 Dy	3925	SSB	537-054-31
Lewis Co	WA2OEP	1800 Sn	7.015	FM	043-000-04
OCTEN/E*	WB2HLY	1830 Dy	34/94	FM	719-104-31
STAR*	NE3B	1830 Dy	13/73	FM	372-054-31
Q Net	N2AGK	1830 Dy	31/91	FM	430-002-31
WDN/E*	WB2OWO	1830 Dy	67/17	FM	556-258-21
NYS/E*	KU2N	1900 Dy	3877	CW	388-228-31
Blueline	WA2SEF	2000 Dy	9313	FM	163-010-31
Tigards	WB2MTA	2000 Tu	04/84	FM	071-004-04
VHF THIN	WB2OWO	2000 Tu	04/84	FM	063-000-05
Blk River	WB2OFU	2100 Dy	6.655	FM	311-007-31
CNYTN*	WA2PUU	2115 Dy	90/30+	FM	276-089-31
OCTEN/L*	WB2HLY	2130 Dy	28/88	FM	274-040-31
WDN/L*	WB2OWO	2130 Dy	04/84	FM	521-190-31

*NTS Net. March Traffic: NJ3V 568, KA2UBD 490, N2EIA 389, W2MTA 384, WB2OWO 383, N2ABA 222, WA2FJJ 220, KA2DBD 215, NN2H 200, WB2QIX 180, WB2IJH 152, N2HXS 143, KA2QOO 131, W2FR 120, ND2S 120, KA2ZNZ 97, KA2ZKM 95, WB2RBA 94, K2YAI 91, KC3BQ 77, N2FOP 76, KC2JW 74, KA2SJG 65, N2EVG 57, WA2JPB 48, W2GJ 40, K2QR 31, KY2V 25, WB2ACV 23, AF2K 10, KE2EA 8, WA2OEP KA2TWY 5.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: N3EMD. BM: KC3ET. TC: N3EMF. OOC: KX3V. ACC: AK3J. SGL: KA3OEM. PIO: N3DOK.

NET	QNI	QTC	SESS	kHz	T/D
WPACW	259	133	31	3585	7:00P/D
WPAPTN	410	93	31	3983	6:00P/D
KFN	203	87	24	3983	1:00P/D
PFN	178	143	31	3958	5:00P/D
WPA2MTN	356	99	31	46.28/88	8:00P/D
NWPA2MTN	612	44	30	44.45/45.13	9:00P/D
WPARTTY	8	4	4	3640	9:00P Sn

I would like to announce a Silent Key, KF3F, Ben Ferer. He was a very talented Amateur. A fighter pilot in WW2 and the Korean conflict, he was also an aerospace engineer, and was a manager of the Goddard Space Flight Center. He was a full Colonel when he retired. He taught Novice and upper grade classes for the Crawford ARC and was a VE. He was very involved in the club activities, and they will miss him very much. New officers for the McKean County Radio Club Pres. N2EUD, VP NJ3K, Sec/Treas. Conemaugh Valley ARC new officers Pres. KA3IUJ, VP WA3BIX, Treas. WB3JSW, Sec. WB3DRV, WA3YOL Trustee. I don't like to harp on certain things, but we need more stations for traffic handling in some areas. It is rather embarrassing when we have to tell someone that we cannot deliver a message after we brag about our ability to handle traffic. If everyone would spend a little time on the traffic nets, we would do well. A great deal of pleasure can be obtained from this part of the hobby. I have found it to be rewarding when you deliver a message to a family member and they ask how you received that message. You could send one back. It's rewarding to know that you have done a good deed. March traffic: N3EMD 309, W3OKN 166, N3FM 155, N3CZW 127, N3AES 121, WA3UNX 116, KC3YE 62, K3SMB 60, KA3OEM 58, W3KUN 52, KC3GO 44, KC3ET 36, W3RUL 32, W3SN 22, KA3EGE 17, WA3DBW 17, KD3AC 15, KA3GXP 14, KA3ANU 14, KC3JQ, K3LTV 11, N3COR 11, WA3QNT 9, WA3TSD 8, W3AHH 4, N3EQP 4, N3AGW 4, N3BDI 2, N3FQQ 2.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ-SEC: W9QBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: K91DQ. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D.

ILLINOIS SECTION NETS.

Net	Freq	Times (Local Illinois)
ISN	3905	1800 DAILY
ILN	3690	1830 & 2200 DAILY
ITN	3705	1900 DAILY
CTN	147.69/09	2100 DAILY
ILARES	3905	1630 1ST & 3RD SUNDAYS

ILLINOIS INDEPENDENT NETS

IEN	3940	0900 SUNDAYS
ILPN	3855	1645 M-F; 0830 SUNDAY
NCPN	3915	0700 MONDAY-SATURDAY
NCPN	7270	1215 MONDAY-SATURDAY

Madison Co. EC NA9X passed along an excellent report from KA9HDZ regarding an in-depth demonstration of PACKET capabilities to regional ESDA officials. The demonstration was presented by KA9HDZ, KE9IC and KD9SG and was well received by ESDA personnel who were impressed with the potential of PACKET in serving their agency in time of need. Keeping our ever increasing capabilities fresh in the minds of those public officials who may some day need them is an important part of ARES preparedness and we should all make the effort to follow the good example of the Madison Co. boys in this regard. There has apparently been some confusion in the Chicago metropolitan area regarding Illinois Repeater Association coordination of PACKET frequencies. IRA lists 145.01,.03, .05,.07, .09 and 147.555 as being coordinated statewide for PACKET use. Individual coordination of PACKET digipeaters is not required due to the shared frequency nature of the mode. In addition to the above frequencies which are set aside statewide for PACKET use, there are a few PACKET systems on other frequencies which have been specifically coordinated for a given part of the state. Thanks to W9YLN and the members of the Moultrie Amateur Radio Club who have added the SM to their newsletter mailing list. The club has been quite active in the past year with a Novice class, antenna projects at their club house, and PR projects including the showing of "*The New World of Amateur Radio*" on the local TV station. W9HBI received a letter of thanks from the Argonne Amateur Radio Club for a presentation on traffic handling he gave at a recent Argonne meeting. We need more well trained traffic handlers and presentations such as HBIs are sure to add to the ranks of net participants. IT'S OFFICIAL!! AA9D submitted the only valid nominating petition for the 1988-1990 Illinois SM term and has been declared elected by Headquarters. Through the years Dave has held Asst. EC, EC, OVS, OES, and ASM appointments and has been active in the Elgin Amateur Radio Society, The Northwest Illinois Emergency Net, and the Chicago Area SKYWARN Assn. Dave is also an avid VHF contester and holds many operating awards including WAC, WAS, and DXCC. His experience and leadership will be a great asset to the Illinois Section. ILLINOIS SECTION TRAFFIC REPORT FOR MARCH, 1988. WA9VLC 216, W9EHS 201, K9CNP 167, NC9T 159, W9HLX 151, KJ9L 126, K9CEW 110, W9HOT 83, N7DOY 80, NN9M 64, WB9TVD 51, W9LWH 46, KA9CTW/T 39, W9OBU 36, W9RTD 15, KA9BBV 14, W9LNQ 12, WD9DZV 11, K9WMP 9, W9HBI 9, W9NXG 8, W9VEY/M 8 WA9RUM 5.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH, KD9ER. SEC: WD9AVQ. STM: W9JUJ. ACC: K9ZBM. TC: K9PS. PIO: KA9LQM. SGL: WA9VQO. BM: N9CJT. NM: ITN KD9DU. QIN KJ9J, ICN KD9ER, VHF W9PMT IWN KA9ERC.

Net	Freq	Time Daily UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300				
QIN	3656	1430/0000/0300	491	288	1350	62
ICN	3705	2315	157	44	737	31
IWN	3910	1922	324	3		
IWN VHF			1889		381	31
VHF NETS			5646	3083	165	

OO reports rcvd from K9FW, K9LMJ, N9GHT, KA9BYN, KA9DZM, WA9VLK. Silent Key: W9HKZ. New Palestine. BPL: W9JUJ, 0/2, R/298, S/264, D/2. Summer has finally made it to Hoosierland! The Spring contest season is behind us...the severe weather should be greatly reduced and we are all thinking about vacation. Please remember that all the commitments you made in the dead of winter need to be fulfilled even when the outside beckons. NCS, EC, VolMons, etc. all

(continued on page 110)

need to keep active during the summer as well. And don't forget your local radio club. If they meet in summer, join them. Club picnics and the like are in full swing and most Field Day plans are complete. This emergency exercise is probably the best way for you to really gauge the readiness of your group, your equipment and your operators. You need to try this exercise to really know what you can do and who can be counted on. And besides all that, it really can be fun! June hamfests include Muncie on the 5th and Michiana in South Bend on the 12th. Next month is the Indianapolis Hamfest and Indiana ARRL Section Convention on July 9 and 10. A full day of convention activity is planned on Saturday the 9th including the banquet that evening. Plan to join the fun! Please remember that you must maintain your ARRL membership to maintain your ARRL appointments. We have openings for DECs and ECs in several areas. Affiliated club officers how about helping find a qualified person in your area? A hearty thanks to all of our Net Managers, both state and local. Thanks for keeping things running so smoothly and thanks for taking care of the many details requiring attention to keep a first-rate net on the air. Station reports for MARCH: W9JUJ (566), NJ9S (240), NR9K (222), KJ9J (204), KA9FFO (130), WA9QCF (92), N9HZ (72), K9WWJ (68), KA9RNY (26), WA9LHX (17), WB9IHR (16), K9ZBM (14), WD9HII (12)

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9ZAG. STM: K9UTQ. ACC: KA9FOZ, BM: WB9JSW. NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. See you June 4th when Wisconsin Chapter 55 of Quarter Century Wireless Association meets for a delicious dinner, delightful meeting and interesting auction at Port Washington Fish Shanty, social hour begins 11:00 AM, guests and visitors are welcome. June 9th through 11th, annual Special Olympics events at Stevens Point needs more communicators to assist, contact W9BCC. June 11th, Wisconsin Nets Association meeting at QTH of WNA's Chairman, N9GJI in Iola. WNA Committee to research better traffic training methods is N9GJI, N9FVN and K9LGU. Traffic handling through packet radio channels is being studied by K9ANV and KA9VII, give them your recommendations. June 16th, exams at Onalaska Community Center, reservations with KV9U. June 18th exams at Menomonie, details from KD9TT. June 19th, Central Wisconsin RA will hold its Swapfest and Family Picnic at Stevens Point's Bukolt Park with free admission, contact N9JW in advance if you plan to take an exam. June 25th, Milwaukee City of Festival's Parade needs more ham communicators, ask EC WB9SMM for details on how you can assist. On June 25th and 26th, earn 100 bonus Field Day points for sending a proper message to me or Section Emergency Coordinator, W9ZAG. Welcome N9GHZ, new PIA and EC of Taylor County. Bruce, N9DGL, WNN NM is moving out of Wisconsin and KA9TTM is our new NM. NS9Q is new NWTN NM. All monthly traffic reports (SARs), net reports, and PSHR reports should now only be sent to our Section Traffic Manager, K9UTQ, in Wisconsin Rapids by the 6th of the month. K9GDF will be working harder on SM duties. Sorry to report Silent Keys WB9GYO, WB9QZA and WD9GFT. Vic, KA9TEP, searched everywhere for the original of the new W/K Club roster he just printed. After a few days Vic found out that his young visiting grandson folded the roster to make a paper airplane, and then took it home for some rigorous test flights. Traffic: WB9YPY 1957, KA9RII 415, W9CBE 344, W9YCV 240, K9GDF 225, KA9VII 164, KA9BHL 127, N9BDL 105, W9DND 101, N9GJI 98, WB9ICH 98, W9UCL 97, WB9NRK 75, K9EP 57, N9BCX 57, W9KLN 57, AG9G 55, W9UW 50, NS9Q 49, KA9KLZ 43, KA9WWT 37, K9FHI 36, W9NGP 36, KA9JJY 32, K9BED 17, W9ODV 15, WD9DNQ 16, KA9USV 12, W9PVD 10, N9BYS 2, (Feb.) WB9NRK 27, N9BYS 15.

DAKOTA DIVISION

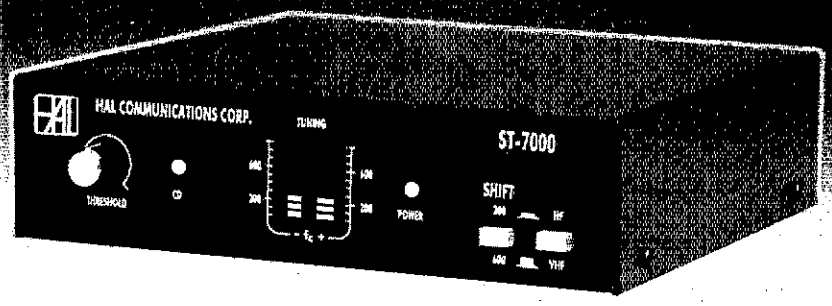
MINNESOTA: SM, George Frederickson, KCØT—This month's traffic, based on reporting stations, was up over both January and February showing March traffic handled at 3,813. I know this would be higher if all stations reported their monthy activity. In any case, it was a good month and thanks to all for their splendid efforts. Thanks to the affiliated clubs that send me copies of their Club Newsletters. I really appreciate getting them and they are FB! The lastest to hit the news stands comes from the Minnetonka Minnesota Amateur Radio Club-The "Tonka Allbander." John Robertson, KAØOSC, says that the "MMARC" is a newer club originally sponsored as a Senior Citizen function but that they are growing younger by leaps and bounds. Congratulations to you and your club, John, and for the fine newsletter. Today was a first this year when my indoor/outdoor thermometer showed exactly the same temperature during the Noon Phone Net. That is, indoors (shack) and outdoors were 73 degrees. Jim Stodolka, WØTIV, advises me that the "Friday Lunch Bunch" has moved to the Mad Mad Mexican Restaurant on East Lake Street, Minneapolis, for their weekly get togethers. The question now is, what effect this experience will have on operating procedures and their on the air decorum? With pleasure we announce the Amateur of the Month for March as Jack Ritter, WØUCE, Big Lake. Congratulations, Jack, keep up the good work. You would have had this award earlier, but the fact you are also a Net Manager required waiting for some break in the action to give us the green light. So, until next time, 73, Jim Swisher, KAØEPY, STM. MN EMERGENCY FREQ 3860 kHz BULLETINS 3860 kHz.

Net	Time	Freq	QNI/QTC/SESS	Net Mgr
MSN/1	6:00 PM	3685	321 170/31	WØUCE
MSN/2	10:00 PM	3685	258/48/31	KDØNH
MSSN	5:00 PM	3710	293/39/31	KAØSBY
(In addition to QTC, MSSN passed 172 training msgs)				
MSPN/N	12:05 PM	3860 kHz	414/244/31	WBØWNJ
MSPN/E	5:30	3860	857/216/31	KCØT
MNAMWXNT	6:00 PM	3860	398/267/27	KØOGI
PAW (PICO)	9:00 AM	3925	No report	WDØBAC

Traffic:WBØWNJ 930, KAØEPY 380, KT9I 366, WAØTFC 352, WØUCE 276, NØFOO 267, KAØSBY 210, KAØARP 173, WØGRW 140, KØOGI 110, NKØL 89, NØHSR 77, WAØONE 67, KCØT 51, KDØCI 47, WBØUKI 45, KDØNH 40, NØJP 39, KØCSE 32, KØQBE 28, WØTIV 27, KAØPDM 23, WDØGUF 22, WØKYG 13, KAØCDC 10, NØHWD 8, Total Traffic 3,813.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Peace Garden Hamfest July 8-10, Grand Forks Hamfest Oct 17. KØCLD now has his repeater at 480 ft, 14 miles south of Minot providing wide-area coverage. TNX, Walt. New Novice-Tech nets Maddock area 28.4 at 9:30 every night, Grand Forks area 28.490 at 9:30 Monday nights. Bismarck received their 200 call W200ZRT they will be joining Grand Forks, Fargo and

HF-PACKET DESERVES A GOOD MODEM



NEW

The ST-7000 HF-Packet Modem From HAL

The HF data communications world is not forgiving. Everything bad can and does happen to your HF-Packet signal. Selective fading, noise, interference, poor tuning indicators, and simplistic phone line modem designs all conspire to destroy the traffic handling capability of HF-Packet. We should be sending data, NOT repeats!

The HAL ST-7000 modem is designed specifically for 300 baud HF-Packet. Techniques developed for our government and military ST-8000 (MD-1232/G) HF modem are now applied to the special problems of HF packet radio. All filters and detectors are optimized for 300 baud HF-Packet, NOT a "do-everything" compromise design.

Two Modes

The ST-7000 transmits and receives two modes for HF-Packet: the "standard" 200 Hz shift, and a more optimum 600 Hz shift. Both shifts are fully supported by separate optimized 6-pole input filters, and a 40 dB AGC system. Our 600 Hz shift mode uses separate 4-pole Mark/Space filters, active detectors, and a 3-pole post-detection filter. The transmit tone generator uses our proven sine-wave synthesizer circuit to assure minimum phase distortion and spectrum splatter.

Finally! A Tuning Indicator That Works

The ST-7000 tuning indicator is a truly unique display of frequency spectra that makes quick work of tuning an HF-Packet signal. No more guessing about your frequency!

Interfaces With All Packet Controllers

The ST-7000 has three different packet controller (TNC) interfaces: RS-232C, TTL, *and* TNC audio. The audio interface connects to *any* TNC VHF radio connector and converts the VHF tones to HAL HF standards. TNC audio is switched to a separate VHF radio connector when the ST-7000 is turned OFF.

Best of all the ST-7000 is completely manufactured in the United States by a company you've known and trusted for 20 years. We do radio data communications, and we do it extremely well!

ST-7000 is available direct from the factory for $349.95. An optional 12VDC, 0.5A power supply is priced at $19.95. Write or call now for your HAL ST-7000.

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URBANA, ILLINOIS 61801
PHONE: (217) 367-7373

Dickinson on the week of Oct 26 to Nov 4. KVØC runs his station on wind power. Jeff wrote a real good article for the CDARC Noiseletter about his experience. Anyone wanting to set up a wind-power station would do well to read it. Fargo had a real good hamfest with over 200 present. Superlink is in operation with Bismarck, Carrington, and Jamestown hooked up this time. Traffic: WØCDO 156, KAØFSM 64.

NET	FREQ	TIME	SESS/QNI/QTC	MGR
Goose River	1.9 MHz	9 AM Sun	4/122/5	WØCDO
WX Nets	3885 kHz	9 AM 12:30, 5:00 PM	68/888/92	WØGFE
Data	3885 kHz	6:30 Da	22/564/24	KAØFSM
North 40	146.64	0300Z Sun	4/66/0	NSØH
Storm Net	3885 kHz	when needed		WCØM

SOUTH DAKOTA: SM: R. L. Cory, WØYMB—ASST SM: NØABE, WAØFPR. SEC: KAØKPY. Don't miss the Black Hills Hamfest on July 1-2-3 at the S. Dakota School of Mines, Surbeck Center in Rapid City. A fantastic program is planned. Novice classes are going well at Aberdeen, and at Rapid City both Novice classes and upgrade classes are in progress. On April 4, the Mobridge ARC traveled to Aberdeen for a joint meeting with the Hub City ARC and a program on WX spotting was put on by a representative of the National Weather Service. We had a great time. Also our congratulations to the Hob City ARC at Aberdeen on their Club affiliation with the ARRL. Mobridge area ARC now have their 2 meter repeater in operation on 147.21/81. Total Traffic count for South Dakota for March was 1697. Pierre Club is having State Centennial cards printed up and will have a station in operation at the Capital Building in November of 88. Traffic: NØDPF 932, KØERM 242, KØAIE 119, KAØKPY 81, WØMZI 46, WBØOMF 33, KDØYL 31, WØYMB 13.

DELTA DIVISION

ARKANSAS: SM, Dale Temple, W5RXU—ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. OOC: NR5Q. BM: W5LL. PIO: K5TML. Repeater Coordinator: WB5FDP. Packet Manager: WD5B. All ARRL Ark Field Appointees are requested to check in to EC net, 3.987.5 Sundays at 5:30. SEC N5BPU net control. ARRL information exchanged after net. Packet Manager Rich, WD5B, generally available for discussions. All club bulletins are requested to be sent to SM, address in QST, affiliated clubs be sure and complete ARRL annual report. Ark Section Nets: OZK 132 QNI, 8 QTC, 272 mins. Mockingbird Net: 816 QNI, 20 QTC, 573 mins. Phone Net 622 QNI, 53 QTC, 1562 mins. Razorback Net 958 QNI, 82 QTC, 546 Mins.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. TC: W5RWF. OOC: KE5QK. Packet: NE5S. The main advantages in being designated an ARRL Affiliated Club are being a part of our National Amateur Radio Fraternity, receiving club mailouts from Headquarters, inclusion in the club computer printouts and an opportunity to help your club treasury through ARRL membership renewals. The basic requirement for designation is 51% or more of your club's members currently as ARRL members and an application to the League. Annual update and renewal is accomplished by a short form to the League certifying the 51% or more ARRL membership. The Louisiana clubs that have renewed for 1987-88 are: Central LA. ARC Alexandria, Radio Amateur Service Club Baton Rouge, Baton Rouge ARC, Southeastern LA Univ. ARC Hammond, Acadiana ARC Lafayette, Jefferson ARC Metairie, St. Mary AR Transmitting Society Morgan City, New Orleans VHF Club, False River Repeater Assoc. New Roads, Iberville Repeater Assoc. Plaquemine, Ascension ARC Sorrento, Springhill ARC and the Thibodaux ARC. If your group is not listed how about reminding your secretary. Remember the Baton Rouge Hamfest at the Holiday Inn South May 21 & 22. The New Orleans Hamfest at the Bonabel High School June 18 & 19. Congrats to the Louisiana Council of ARCs officers elected at the Lafayette Hamfest meeting: Chairman: Al, K5DPG, Vice Chairman: Ed, KB5CX, Sec/Tres: Al, W5OVV and Board Members: Tom, WB5ASD, Phil, WD5DWP, Bob, KB5GQ and Bill, W5RWF. 73 & gl de K5KR.

MISSISSIPPI: SM, Jim Davis, KK5Z—ASM: W5TRD. SEC: KA4PKA. SGL: KA5WRX. PIO: WN5M. STM: KB5W. BM: W5EPW. TC: KF5DE. OOC: KK5K. And welcome to NC5Y, George Tew, as newly apptd ACC; VHF/UHF Coord, N5DWU; Packet Mgr. WA5DVV. Congrats to new hams in Laurel: KB5FHW, KB5FBS and KB5FOX. Tnx to W5EPW (BM Miss ARRL): ARRL regular bulletins: 10, and 4 prop f'cast bulletins. Welcome to new ECs, N5LFA, N5MCZ and WD6GHW; to new DEC, N5BBA. 13 X 15 DECs, and 46 X 82 ECs appointed (tnx to KA4PKA SEC Miss ARRL). Cecil doing FB job as SEC. . . lend him ur support. DRN5 Miss rep 98% by N5AMK, W5HKW, KT5Z, KB5W, WB7COQ, KE5EC, Sessions 62 with 639 QNI. RN5 night time: Sess 62, QTC 609. Rep 100% by N5AMK, KT5Z, W5WZ, KT5W, WQ5H and W5JDH. Miss Lou Emerg Net: (N5EZX) Sess 4 QNI 106. Mag Sec Net (W5YRX) Sess 31 QNI 495 QTC 9. Miss Slo Net (W5YRX) Sess 22 QNI 75, QTC 6. MSBN (KF5DE) Sess 31 QNI 2039 QTC 34. ARRL Info Net (KK5Z) Sess 5, QNI 71. MTN (KB5W) sess 31 QNI 203 QTC 47. Traffic: N5AMK 0-2, S-178, R- 146 D-2, Total 328. W5JDF 0-1, S-26, R-30, D-1, Total 58. KT5Z 0- 1, S-67, R-50, D-2, Total 120. Packet traffic totals from WA5DVV (Totals are all NTS mesgs): N5DWU 4, KF5IZ 5, WA5DVV 254, WB5SXK 6, WB5VCI 1, with active BBS of W5VZF.

TENNESSEE: SM, Harry Simpson, W4MI—ASMs are WA4GLS, W4TYU, K4CXY. In addition, K4CXY is ACC and W4TYU is PIO. NG4J continues her splendid work as STM, W4SGI is BM. K4UVH is SEC, K4LSP is OOC, N4POY is SGL, W4HHK is TC. In addition, there is a host of great Net Managers, including the one to be honored in this edition! Let's talk for a moment about W4PFP and the Tennessee 75-Meter Phone Net: Under the able leadership of W4PFP for lo! these many years, this Net has established many records for check-ins, traffic, Regional Net liaison, etc. The latest shows an entire quarter with every single net covered by its assigned NCS! As a matter of fact, the perfect period covers almost four months, from 7 December 1977 through 31 March 1988. Congratulations to John Fite, W4PFP, and his six NCS, W4NEG, W4TYV, W4IKK, WB4SOA, W4PSN and K4UMW. When space permits, credit will be given to the alternates. DRN5 Net Manager WB5YVD also gives credit to K4WWQ,

(continued on page 116)

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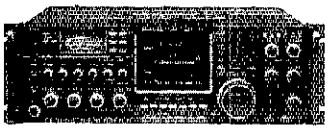

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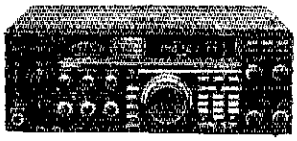

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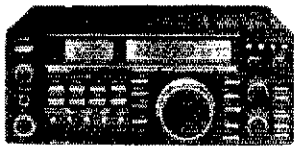

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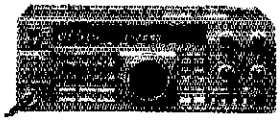

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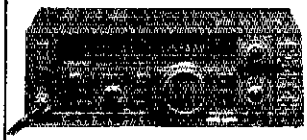

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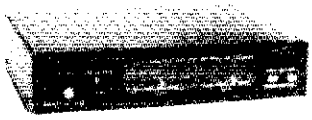

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NG4J and W4VVG for representing TN during 95% of their 62 March sessions, handling 639 messages! June Hamfests include Cleveland and Humboldt. I am in the process of assigning myself and my ASM's to the various 'fests in order to conserve mileage in this state this only a half-state wide, but three states long. Without doubt, the SM and/or at least one ASM will attend every such event. The TN CW Net is coming alive! In case you have forgotten, that it existed, it now runs Mon-Fri at 7 PM Central on 3635 kHz. Checkins are up to an average of 11 nightly, and growing. Join us often and see if you can still copy and send code. Thanks to KA4BSG for running that Net for months on Wednesdays, even when nobody else showed up. That's dedication. Congratulations to Fisherville ARC and President N4DRL for their affiliation with ARRL. Traffic: WA4FMR 129, W4DDK 124, W4TYV 69, W4MI 60, K4WOP 39, KA5KDB 34, W4PFP 18, WA4HKU 14, K4CXY 12, W4MRD 8, WA4GZZ 8, W4EWR 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T-SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. I wish to thank the members of the Kentucky Colonels ARC in Bowling Green for their hospitality during my recent visit to their club. This month was busy with the Mammoth Cave ARC and Lincoln Trail ARC Hamfests. Bars had a fine showing during a weather drill for DES in Frankfort. Their efforts were well received by state officials. Four amateurs have made the Public Service Honor Roll this month. The PSHR is a tough award to receive, but a few hams are getting close.

NET	QNI	QTC	SESS	Manager
MKPN	1492	192	31	WD4RWU
KTN	854	72	31	WB4LBG
TSTMN	394	47	31	KZ8Q
KYN	377	121	62	K4AVX/KZ8Q
KNTN	235	77	39	WA4EBN
NKYEN	132	4	5	W8IIO
SEKEN	92	2	10	K4AVX
WTEN	38	18	5	KA4MTX

Traffic: K4VHF 168, WD4RWU 80, KI4QH 79, WA4EBN 62, K4AVX 60, KA4MTX 51, N4GNL 43, K4HOE 24, KB4UJA 17, KU4A 13, WA4SWF 12, WD4CQF 12, WA4NOG 9, WB4AUN 8. PSHR: KA4MTX 95, KI4QH 92, N4GNL 73, K4AVX 64.

MICHIGAN: SM/SEC, George E. Race, WB8BGY—ASM: WA1LRL. STM: WD8KQC. SGL: N8CNY. TC: W8YZ. OOC: WA2AJQ. Silent Keys with deep regrets: W8QHB, WA8LWO, W8GEW. Each month, with the reporting of Silent Keys, I am reminded of the many years of dedication these operators have given our hobby. Many of these operators, who were licensed in the 30's, 40's, and 50's have been major supporters of our fine MI CW Nets. In the fall of 1935, the Michigan Traffic Net was organized and the call of "QMN" adopted. From a group of twelve stations QMN has grown into one of the finest CW traffic nets in the Country. QMN appeals to good operators - hams who appreciate the snappy relay of third party traffic; hams who know that experience essential to disaster communications can only be gained from actual participation in nets before they are called upon to furnish aid in emergencies. QMN always welcomes additional members. Why not add your call to the list? QMN meets 3 times daily. If you are an EC, you should have your County represented, on a regular basis in QMN. There are literally hundreds of VHF net operations each month in MI. Please report your Net activity to VHF Nets Manager NO8Q by the 5th of each month. Lets get these totals up, so that they reflect our true VHF activity. My thanks to all who made our Diamond Jubilee of Emergency Communications a great success. Hundreds have qualified for the certificate from all over the world. They should be mailed out soon. Wonder how many of us will be around to celebrate the Centennial? On April 3rd, several tornadoes caused damage in lower MI. DEC, N8FTY, reports that the Amateur community responded very well to this situation. Special commendation to NJ8S, N8FRS, WB8TQR and WB8ZIY for operational support during this emergency in the Ann Arbor area. Thirty-five Amateurs were active in this Ann Arbor operation. Please support the following MI area Nets:

NET	Freq	Time/Day	QNI	QSP	Sess	MGR
UPN*	3921	5:00PM Dy	1303	66	35	WA8DHB
MACS*	3953	11:00AM M-Sa	506	125	31	WA8DHB
MITN	3953	7:00PM Dy	742	211	31	WD8EIB
QMN*	3663	6:00PM Dy	1022	128	93	WB8R
SEMTN	145.33	10:15PM Dy	356	88	31	N8HSC
GLETN	3932	8:00PM Dy	1003	43	31	KA9EIZ
WSSBN	3935	7:00PM Dy	811	28	31	W8NDI
VHF Net Reports Totals			646	11	43	NO8Q

*QMN Fast-6:30 PM Dy; QMN Late 10:00 PM Dy.; MAC8-1PM Sun.; UPN-12PM Sun. March. Traffic as follows: N8HHH 405, KA8CPS 385, WD8KQC 189, K8GXV 80,N8FPN 78, N8DSW 63, WB8R 53, WA8DHB 48, K8UPE 45, W8EOI 44, WB8SYA 44, K6HAP 41, W8RNQ 36, W8YIQ 35, NY8W 30, WB8BGY 29, N8CNY 27, W8IHX 27,WD8MJB 26, K8OCP 25, K8ZJU 22, KI8Q 20, KD8LZ 18, W8CUP 17, W8BEZ 17, W8LRM 17, NW8M 16, W8CDU 16, WD8EIB 16, KA8PWM 14, N8FTY 14, W8VIZ 14, W8IDT 13, K8MJK 10, W8URM 10, WB8WJV 8, K8AMU 7, KC8TU 6, N8EXS 5, K8DD 5, W8YZ 4, N8HWO 4, KA8VDX 3. Feb-SAR's, K8DD 1, K8GXV 84. Wanted: Bulletin Manager for Michigan. Experience not necessary, will train. It seems like packet radio would be great tool for this job. Please apply to WB8BGY, MI Section Manager. 73 to all.

OHIO: SM, Jeffrey A. Maass, K8ND (@W8CQK)-Asst. SM: David Kersten, N8AUH (@KB8CI) Phone: (216) 221-6740. SEC: WD8MPV (@ KB8CI). STM: KF8J (@N8ET). BM: W8ZM (@N8NN). ACC:KJ3O (@ KB8CI). TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK.

Net	QNI	QTC	Sess	Time (local)	FREQ	MGR
BN(E)	255	141	31	1845	3.677	WD8C
BN(L)	217	168	31	2200	3.677	K8TVG
BNR	298	82	31	1800	3.605	W8EK
BSSN	228	114	28	0945,1900	3.873	KD8FW
ONN	172	34	31	1825	3.708	WD8KBW
OSN	296	95	31	1810	3.577	N8AEH
OSSBN	2444	971	93	1030,1615, 1830	3.99725	WB8JGW
OSSN	267	117	31	0645 M-F	3.577	KA8GJV
				0800 S-SN	3.577	KA8GJV
Ohio Section ARES Net				1700 Sun	3.675	WD8MPV

Hamfests in June and July: DeForest ARC Fleamarket 6/4; Goodyear ARC Hamfest 6/12; NOARSFEST (Wellington) 7/8; Van Wert ARC Hamfest 7/17; TSRAC (Wheeling) 7/17. Contact Affiliated Club Coordinator KJ3O to list your hamfest on our schedule. Amateur Radio Examinations: Wickliffe 6/4; North Olmsted 6/11; Ravenna 6/11; Maumee 6/11; Dayton 6/18; Zanesville 6/25; Columbus 7/9; Maumee 7/9; Akron 7/30. Contact me or Assistant Section Manager N8AUH (phone number above) for details on any session listed above: we can provide names and phone numbers for VE session contact persons. I am saddened to note the following Silent Keys for March: KB8AZM, WB8IUR, and KD8WN. The W8GZ DX Foundation, commemorating General Loren Windom, W8GZ, has been formed in Central Ohio, with an initial $3500 base from the Windom estate. Tax deductible donations are solicited to help promote DX and DXing: contact KN8Z for information. I attended the Columbus ARA's annual ARRL Night event, which this year featured ARRL Executive Vice President (the title was at one time General Manager) Dave Sumner, K1ZZ. Dave filled in the attendees on the current state of League programs, and fielded questions from the floor. Two of the facts reported: 57,926 copies of the ARRL's Tune In The World were sold in 1987, narrowly losing the sales marathon to the Repeater Directory (58,733 sold); and ARRL dues have not been increased since 1981, and immediate increases are not contemplated. New ARRL Affiliated Clubs: Land of Grant ARC, Bethel OH; and Warren County RACES, Lebanon OH; Congratulations! The Greater Cincinnati ARA is compiling a Cincy Bicentennial Amateur Radio Call Directory, listing over 3200 hams within 25 miles of Cincy. March 26 and 27 saw Ohio and Michigan celebrating the 75th Anniversary of Amateur Radio Emergency Communications with special events stations operating on bands 160-10. Commemorative certificates will be sent to all stations worked during this event, and many commented on the importance of spreading the word about our public service heritage! What is your local club doing to extend our service record? Thanks to SEC WD8MPV for doing a bang-up job of preparing for this event, and for generating a very fine article for submission to QST and the Ohio Section Journal! The Tristate Amateur Traffic Net (TATN), a local NTS net, reported 6662 check-ins and 2146 messages passed during 1987! WD8KBW reports that the Ohio Novice Net (ONN) hasn't missed a session in the past 18 months, an enviable record! KA8HNE hasn't missed checking in on ONN in the past 3 months, still more amazing! Check the times and frequencies for Ohio nets (listed above), and join in the fun! KA8CGF has been elected to take the Net Manager reigns of the mammoth Ohio Single Sideband Net (OSSBN) from Cheppie, WB8JGW, by the time you read this. WB8INY has been named Emergency Coordinator of the Central Ohio ARES (Columbus area), taking the reigns of Ohio's busiest public service organization from Bob Adams, W8BKO. Bob has done a tremendous job over the past years! New appointees: NF8A and KB8CLB: Official Observers; KD8HB Official Relay Station; KE8JD, Official Relay Station and Official Emergency Station: Congratulations! The 108 stations listed below have practiced their traffic handling skills in preparation for disaster, handling a total of 7115 messages during the month of March 1988: Traffic: AD8I 618, K8TVG 478, K8JDI 372, W8PMJ 338, W8ZOL 318, KD8KU 257, K8IOW 252, WD8QXT 248, W8BO 242, WB8JGW 196, KF8J 163, WD8KFN 148, N8GPU 147, KA8GJV 120, WD8IKC 116, W8EK 114, W8QZK 113, N8AUH 111, KD8HB 110, N8HRW 102, N8IIP 101, K8CMR 98, K8DHD 96, WA8HED 95, W8CXM 88, WB8BWY 86, N8GEC 86, N8IBS 84, WA8SSI 83, W8FPA 82, N8AEH 82, K8OZ 72, N8FWA 69, NE8X 67, KA8CGF 65, KD8FW 65, WA8GMT 56, WD8RIB 56, N8EFB 55, K8LQM 48, KE8CV 47, K8ALV 46, WB8HHZ 43, KC3JF 42, W8SKP 40, KD8XL 35, NW8E 35, KA8BNQ 33, KE8S 30, KC8YV 28, N2NS 25, N8HSE 24, KC8JV 23, K8PFD 23, N8GOB 23, KA8YIT 22, K3RC 21, N8ISF 21, K3RC 21, WA8HGH 20, K8VOY 18, KA8OQF 17, NC8Q 17, WD8CTX 17, WA3EZN 16, W8JLW 16, KD8IC 15, N8HBF 15, WB8KWD 14, K8NQN 14, K8EF 13, W8BHL 13, N8ISI 13, N8CW 13, KE8JD 13, WB8PDZ 12, NF8B 12, KA8DRR 12, N8AJU 12, N8CJS 11, W9SWM 11, KE8DQ 11, K8CKY 9, KA8TNT 8, WD8JYE 8, WB8MRL 8, WD8PWG 7, KD8H 6, W8GDQ 6, KA8RIX 6, KA8SOM 5, K8DXZ 5. WD8JAW 5, WD8ATN 4, KA8UVU 3, KB8CZQ 3, KA8MFH 3, WD8CSP 3, KA8SON 3, WB8GDM 3, KB8DYW 3, N8HIL 3, WB8A 2, W8XT 2, WB8AWM 2, KB8DIL 2, KA8VYT 2. WD8DKO 1. (Feb.) AD8I 610, K8ND 42, W8RC 23, KC8UZ 22, WB8A 3.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM & STM: K2ZM. SEC: WA2ZYM. BM: WB2IXR. PIO: KB2TM. TC & OO/RFI: KC2ZO. ATC: WA2VGM. SGL: KB2HQ. NWSLTR ED: WB2NHC. NET REPORTS FOR MARCH(ANI/QSP): CDN 650/98 ESS 371/61 HVN 355/59 NYPON 677/378 NYS/E 388/228 NYS/L 305/190 NYS/M 352/248 SDN 251/84. CLUB NEWS: Albany ARA heard a presentation by KB2HQ on the pending bills in the state legislature and about packet radio. They have new members KB2FEW and KB2FDR. Catskill ARA made plans for upcoming activities including Field Day. Communications Club of New Rochelle is working on the club station. Crystal Radio club heard WA2UGT talk about the horizontal full wave loop. Overlook Mtn ARC is working on plans for several upcoming public service events. PEARL is having their annual dinner/dance on April 16th. Saratoga RACES was treated to a practice drill by WB2NSC with critique afterwards. They welcome new members KB2QB and WB2HIH. Schenectady ARA heard a presentation by Emil Sticht on the technical advances in communications. They report KA2UWI upgrade to Advanced, N2SY SK. West. ARA had a presentation by NI2C on his new equipment. WECA heard about a new kind of antenna and had a presentation by KA2RGI on the Field Organization. Don't forget Field Day! Hope to hear you all on the air on that weekend! Those clubs who do not have newsletters, please have your secretary keep me informed of your activities and the results of your annual elections. N2FTH, NM of HVN is putting out a very nice newsletter via packet! With the high costs, it is one of the few viable alternatives. MARCH PSHR: WB2VUK WE2G N2HIF K2ZVI KB2AYD WA2GYY WB1BTJ. MARCH Traffic: N2HIF 228, WB2VUK 145, NO2H 128, WA2JBO 91, N2FTR 78, K2ZM 77, KB2AYD 54, WA3RKB 53, K2ZVI 52, WA2GYY 42, WE2G 25, WB2BTJ 23, K2HNW 18, KA2NGJ 10, W2CJO 10.

NEW YORK CITY-LONG ISLAND: SM/SEC, Walter M. Wenzel, KA2RGI—ASM: N2GQR. ASM VE: W2NL. ACC: KA2WIJ. STM: K2MT. OOC: NB2T. TC: WA2YNH. BM: W2JUP. PIO: KA2LCC. The following are traffic nets in and around the section that handle NLI messages with the Feb. report figures:

Net	Freq	Time Day	Mgr	Ses	QNI	QTC	QSP
BAVHF	145.350/R	2000 DYL	K2YQK	—	N/A	—	—
NCVHF	146.745/R	1930 M-F	K2HPG	—	N/A	—	—
SCVHF	145.370/R	2000 S-F	KA2JMA	—	N/A	—	—

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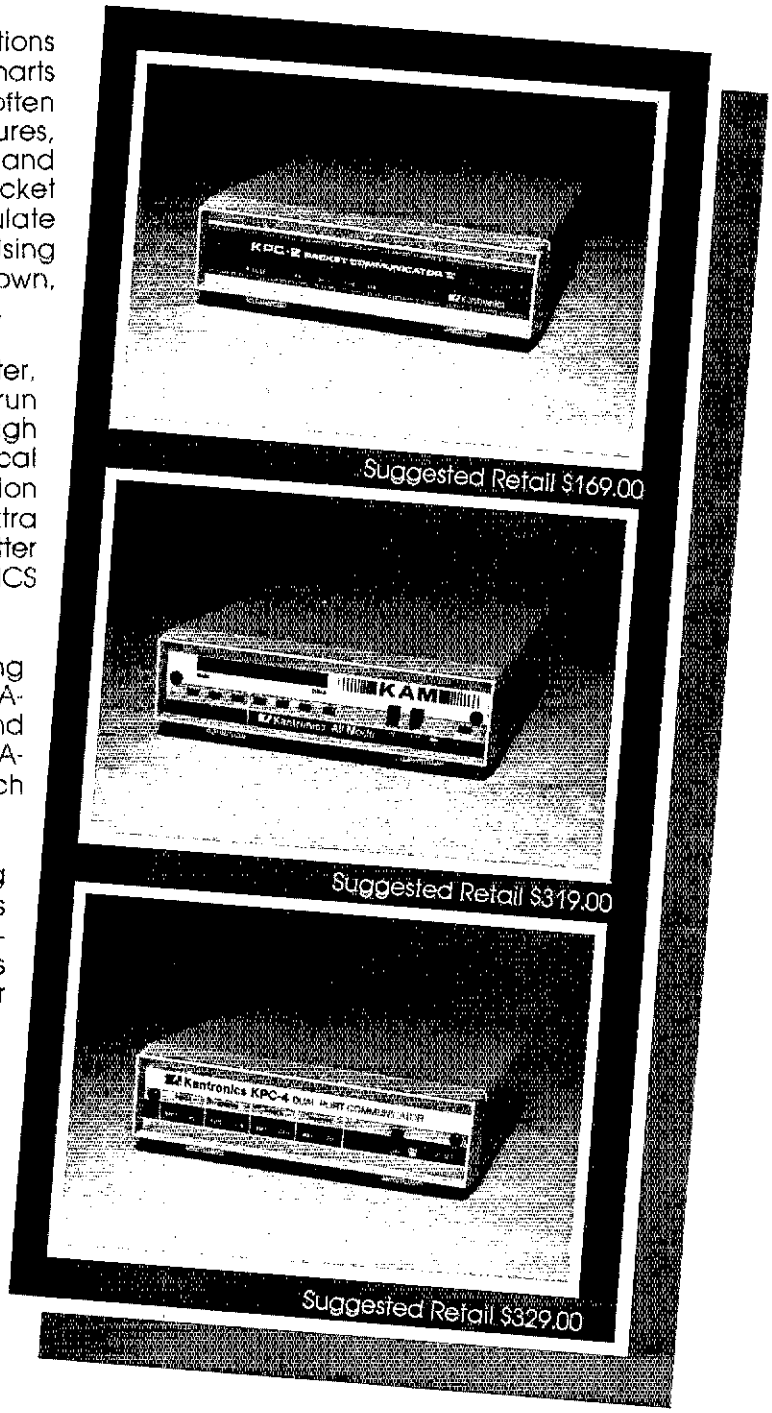
New! KA-NODE If you use a digipeater, you'll really like KA-NODE. Each KPC or KAM can run as a KA-NODE, providing a "circuit path" through several KA-NODES to a CONNECTION with local acknowledgement of packets, a remote station heard log, a KA-NODE heard log, and no extra overhead in the packets (all are pure AX.25). Better yet, KA-NODE KPCs can act as end-user TNCS **simultaneously.**

Exclusive! The KAM and KPC-4, being **true** dual-port TNCs, can act as digipeater or KA-NODE gateways. Connect on one frequency and cross-connect through to the second port! With KA-NODE, the acknowledgements are kept on each frequency.

Exclusive! KAM and KPC-4, again being the only true dual-ports, also support simultaneous operation of both ports!!! You can have a connection on one frequency while another station is digipeating or using your KA-NODE on the other port!

More Punch! And, of course, all KPCs and KAM come with 32K of RAM standard! And they all come with Kantronics Personal Packet Mailbox™.



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UNIT	WEFAX	KA NODE	GATEWAY	32K RAM	PBBS	PSK-MSK
KAM	yes	yes	yes	yes	yes	yes
KPC-4	yes	yes	yes	yes	yes	yes
KPC-2	yes	yes*	no	yes	yes	no
KPC-2400	yes	yes	no	yes	yes	no
KPC-1	yes	yes	no	yes	yes	no

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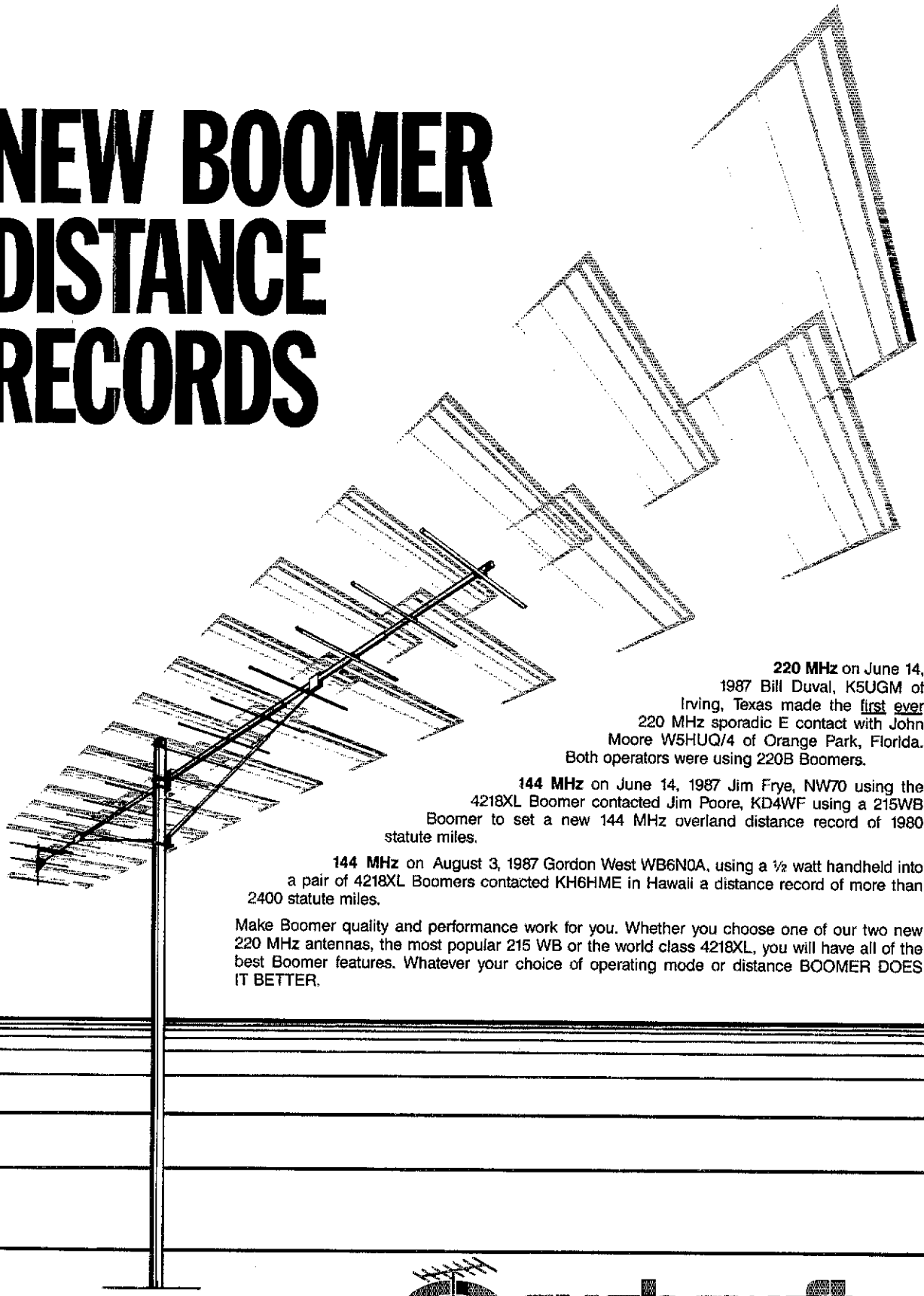
NYPON	3.913	1700	DLY	KA2UBD	29	633	627	578
NYS/M	3.677	1000	DLY	N2EIA	—	N/A	—	—
NYS/E	3.677	1900	DLY	KU3N	29	334	269	222
NYS/L	3.677	2200	DLY	KU2N	29	297	266	219
NLT	28.450	2100	WED	KB2BKE	—	N/A	—	—
ESS*	3.590	1800	DLY	W2WSS	—	N/A	—	—
PNS	145.01	24hr	DLY	AI2Q-4		—		
PNS(alt)	145.03	24hr	DLY	WB2IBO-4			—	

*Independent Net, recognized by NTS, all times are local. Access AI2Q-4 (Packet Node Station) via WB2QBP-2 Net-Rom Node (NRN). If for any reason AI2Q-4 is down, WB2IBO-4 on 145.03 is the offical PNS alternate. Access WB2IBO-4 via K2LSX-7 (NRN) or KA2RGI-1 (Digi). Check into the NYC-LI Ten Meter Net (NLT) for additional traffic handling training. Novices please take note that this net is designed for your participation. EXAM SESSIONS: LIMARC-second Saturday of each month at NY Inst. of Technology, Old Westbury-contact Joe, W2NL (516) 541-2450; SUFFOLK COUNTY VE TEAM-second Saturday of each month at Suffolk County Community College, Selden-contact George, WA2VNV (516) 751-0894; GRUMMAN ARC-second Weds. of each month at Bethpage High School, Bethpage-contact Howard W2QUV (516) 354-6861; GREAT SOUTH BAY ARC-normally fourth Sunday of each month (date shifted for holidays) at the Babylon Town Hall Annex-contact Jim, W2DUK (516) 957-5287. If your group holds regularly scheduled license exam sessions and/or classes let me know at least three months in advance so they can be added to the column before the printing deadline. I want to thank everyone for their assistance and thoughts during the time I was laid up with a broken ankle in April. I can tell you that you never are aware of the importance of your limbs until you injure yourself and can't function normally. On this note, please take care when you do those put-off antenna jobs, and by all means please check to make sure that the ladder you use is rated for the job you are doing and that it is in good condition. Take it from me, learning by experience is no fun. On behalf of Mitch, KB2CLI the Hudson Division Information Coordinator, if you have any information about a VE Session, Hamfest, License classes or Special Club Activities please include him in your mailing so he can add the information into his database on his monthly releases which is sent out within the Division's Packet Bulletin Board Systems each month. SPECIAL REMINDER: If your club is having Field Day this year, PLEASE let me know who the coordinator is and where it is, A.S.A.P., so I can visit and make arrangements for pictures to be taken. The pictures will become part of a Section photo display of Field Day 1988, and we would like to have all of the Field Days represented. SECOND REQUEST: Please let us know if you would like to be a guest speaker at local clubs or if you have had a recent guest speaker that was interesting and you think the person would like to speak at other clubs. Please pass on the name, address, and the subject to me or Rick, N2GQR, so we can contact you or them and possibly add you to the listing that will be passed out to the affiliated clubs very soon. We would also appreciate knowing if you would like your information to be included in the Division Speakers Bureau Listing. NEW APPOINTMENTS: I want to take this time to welcome Jim Heacock, KA2LCC into the Section Leadership as the PIO. Jim's previous experience has been as the PIA for Suffolk County ARC and he has done an excellent job in that capacity and look forward to working with him further in his new position. With this change Rick Ramhap, N2GQR, will be taking over the duties as ASM in charge of administration, replacing John Smale, K2IZ. I want to thank John for all of his hard work, effort, and time that he has put forth over the years in his dedication to Amateur Radio. This does not mean that John will be disappearing from section happenings, but just that his commitments to his family require more of his time at this moment. Traffic: N2AKZ 323, K2YQK 176, KB2BKE 97, KA2ZYX 54, W2GKZ 44, N2HLZ 44, N2HPT 42, K2TWZ 40, NB2D 34, N2GNQ 27, KA2UIU 18, N2HSP 14, WA2UKM 14, KA2JMA 13.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG. ASM: (VE Liaison): N2XJ. ASM (FO Info): NW2L. SEC:N2BMN. STM: KA2F. OO/AAC: KA2BZS. AAC: KY2S. SGL: W2KB. TC: K2BLA. BM: N2CXX. PIO: WB2NQV (PH 735-8550). Appointment endorsements for the next two-year term starting 6/88 are: EC Westwood KC2EV, EC Hasbrook Hts N2FJU, EC Ridgewood NU2D, EC Teaneck WA2ALM; OESs KC2EV, N2FJU,NK2K, NU2D and WA2ALM. New ORS appointments effective 4/88 are: K2TRK, KA2CET, KA2IWR, KA2KJF, KA2PFM, KB2BEA, KB2BLX, KB2BNW, KB2EER, KB2EGP, KB2HM, N2AYJ, N2DZZ, N2FWQ, N2HIM, N2HPZ, N2HVZ, N6GLD, ND2K, NR2N, NZ2Z, W2KB, W2LHJ, W2LOP, WA2ACP, WA2EPK, WA2FPO, WA2KFE, WA2SLR, WA2UZT, WB2HBZ, WB2NSV, WC2R and WD2AFT. Ramapo Mountain ARC has been renewed as a Special Service Club. Congratulations to the following who were newly licensed or upgraded during March sessions conducted by: Ocean/Monmouth ARC (14/21), Major Armstrong Memorial ARC (2/6), Raritan Bay ARC (3/4), NNJ VE Board (11/14), W Morris Wireless Soc. (24/43) and Bergen ARA (24/45). Novice (17): C Mosca, L, Perry, J Farley, B Johnson, J Houten, E Luff, S Myers, D Brovero, P Cunningham, L Hickey, D Joffe, B Leaf, N Nauman, M Nicholson, R Rinderknecht, M Taylor, and M Young. Technician (33): KB2BZK, KB2EHE, KB2ERY, KB2EYT, KA2TNA, A Gindoff, KB2DDE, R Bennett, KB2CYK, KB2CGS, KB2ESF, KB2EUS, KB2EXY, KB2CSI, KB2EYD, KB2FGZ, KA9KJA, KB2MYU, KA2SLO, KA2THJ, J Davis, D Mutterer, F Stigler, S Zlotnick, WB2CUJ, KB2CNL, KB2DOQ, KB2EBP, WB2GFP, H Magers, J Mavrone and F Terranella. General (8): KB2ERZ, WA2OVM, KA2UFO, KB2FCQ, N2GVU, KB2FCX, KB2BWC, KA2HQK. Advanced (15): N2CTJ, N2GBH, N0CVV, N2HOU, N2GMZ, KB2APD, KB2DHJ, KA2ZVS, KB2CVM, WA2LNC, WA3NGT, KA2VAC, N2GWA, N2HSJ and J Tromboni. Extra (5): KB2FAU, KE2EQ, KA2EYH, K3ZXO and WA2NHA. Total applicants (133). Total new or upgrade (78). 58.6% Congratulations to W2QNL, KA2F and WA2EPI who qualified for a special PSHR for making PSHR 12 months straight. Traffic nets and statistics for February, 1988.

Net	Mgr	Freq	Time	Sess	Ses	QSP	QNI
NJM	WB2ZJF	3695	1000	DY	29	74	212
NJPN	W2CC	3950	1800	DY	33	136	365
NJN/E	NZ2R	3695	1900	DY/P	29	139	219
NJN/L	WA2EPI	3695	2200	DY/P	19	33	60
NJSN	KA2INE	3735	1830	DY	28	38	138
OBTTN	KA2F	147.12	2000	DY	29	119	245
NJTTTN	WA2EPI	225.88	2100	DY	29	56	278

NEW BOOMER DISTANCE RECORDS



220 MHz on June 14, 1987 Bill Duval, K5UGM of Irving, Texas made the first ever 220 MHz sporadic E contact with John Moore W5HUQ/4 of Orange Park, Florida. Both operators were using 220B Boomers.

144 MHz on June 14, 1987 Jim Frye, NW70 using the 4218XL Boomer contacted Jim Poore, KD4WF using a 215WB Boomer to set a new 144 MHz overland distance record of 1980 statute miles.

144 MHz on August 3, 1987 Gordon West WB6N0A, using a ½ watt handheld into a pair of 4218XL Boomers contacted KH6HME in Hawaii a distance record of more than 2400 statute miles.

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NJVN/E	WB2FTX	146.895	1930	DY/P	29	90	475
NJVN/L	N2FGC	146.49	2230	DY/P	29	42	282
NNJ/PL	W2QNL	145.01	24 hr	via	WA2SNA-1		

Packet NTS activity for March, 1988: Total 172. WA2SNA-1 auto forward (77) plus liaison (95) by NZ2T (22), W2QNL (40), WB2FTX (33). SAR/PSHR: WA2EPI 132/99, WB2FTX 104/60, KB2BNW 27/50, KA2INE 82/78, W2QNL 235/135, K2VX125/87, N2XJ 218/85, W2RRX 65/74, WB2QMP 109/74, KA2F 136/116, N2DXP 152/61, NZ2R 74/84.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: WBØAVW. SEC: KDØBG. STM: KCØXL. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. PIO: WEØM. WEØM is the new section Public Information Officer. I had a very enjoyable evening talking with the members of the Iowa-Illinois ARC in March. I hope to do more of club visiting in the months ahead. Certificates of Merit were awarded to KAØDNB and WØRPK for their work in converting the donated state terminals to packet use, NØGHT for his efforts in organizing packet traffic handling, and WEØU for his effective training of new hams. New officers of the Turkey Island DX Club are Pres. KØJGH, VP NQØW, and Sec/Treas. NØCF. Congratulations to NØCKD and NØALX who recently became Official Observers and members of the Amateur Auxiliary and to recent upgrades: WBØVLV and KBØAFB to Technician, KBØBFA, NØHXN, and KAØVJX to General, NØGIV and WBØNMW to Advanced, and KØTDO to Extra. Plans are in progress for operating a special events station at each stop for RAGBRAI 1988 in late July. Traffic will be passed on phone, CW and packet. Summer net schedules: Iowa 75-Meter Evening Net M-Sa 6PM on 3970; Iowa 75-Meter Noon Net 12:30 PM Daily on 3970; Iowa Traffic and Emergency Net at 6 PM Sunday on 3970; Iowa Tall Corn Net at 6:30 PM on 3560 and Iowa Code Net M-W-F at 7PM on 3705. Traffic: WØSS 283, KØPT 210, KAØADF 113, WØYLS 94, WBØMCX 66, KØGP 56, WBØAVW 30, W4JL 28, KAØVBA 23, KØBRE 21, KCØXL 20, KCØKZ 11.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Net Manager KSBN/KPN, WØFRC. Net Mgr QKS, open. KS RTTY Mgr, open. District Emergency Coordinators are WØOAG, WBØYJT, WØEB, WØFRC, NKØV. State Govt Liaison NØBLD. Tech. Coord: WBØNQM. Bulletin Mgr: KØJDD. ACC: KØBXF. PIO: WBØWSG. Manager of QKS-SS is WØMYM. Wx Net Manager, WBØYWZ. WAØTKJ 609 Otto, Salina, KS 67401 has been appt the HF/VHF Awards Manager for the Central KS ARC, a Special Service Club. He is responsible for validating WAS, 5-Band WAS and VUCC applications in CENTRAL KS. WØPB has been tracking OSCAR for Skitreck info. KAØZSQ doing a good job as NCS of QKS-SS. Sorry to hear of illness of WDØFIT, an ole-faithful NCS of QKS-SS. Net reports for Feb are as follows: KSBN QNI 1754, QTC 283 in 29 sessions. KPN 408/34/21. KMWN 742/632/29. KWN 984/654/29. CSTN 2072/92/29. QKS 254/109/52. QKS-SS 32/7/11. Still looking for an RTTY Net Manager and Packet Coordinator. All of the stations operating the 200 station calls in KS reported a good number of contacts. Glad to hear of all the clubs taking interest in TRAFFIC HANDLING programs the past few months. Keep it up! This is good training in preparation for EMERGENCY COMMUNICATION. Traffic: WØFRC 407, WØFIR 201, KSØU 183, WØOYM 111, WBØZNY 96, KØBXF 91, NBØZ 65, WØFDJ 62, WØQMT 57, WBØVVR 39, NØBDG 20, WØMYM 20, WØPB 10, WØCHJ 9, WØRBO 3.

MISSOURI: SM, Ben Smith, KØPCK—Elected officers of the Tri-Lakes ARC are Pres: KEØKI; VP: KEØSG. Sec: WAØQHM; and Treas. WBØZVQ. The Christian County Emergency Net meets Wednesdays at 7:00 PM on 147.54 simplex. County EC WA6RRH invites everyone to check in. Silent Key: KØSI. With the death of KØSI, Amateur Radio has lost a very active contributor to our hobby. He would have had his Ham Ticket 30 years in April. Pete enjoyed Amateur Radio in many ways. He had been Missouri STM for five years, MON manager for several years, active on both phone and CW traffic nets, Section and NTS, had 225 countries confirmed, was one of the first around to obtain "Golden Jubilee" and "We the People" awards and 5-Band WAS, plus many other accomplishments. He also found the time to serve as president and in other offices for our local club. He was never too busy for a QSO on VHF. Thanks, Pete, for giving so much to our hobby. John Turner, NDØN, has accepted the position as STM. John is active on both Section Phone and CW nets so it will be easy to turn in your net and traffic reports to him. Ron Helmka, AIØO, is now the MON Manager. Rob has been a member and NCS on this net for several years so the net will continue operation as usual.

Net	Ses	QNI	QTC	Day	Time	Freq	Mgr
MOSSB	31	883	141	DLY	8:00	3953	KØORB
MEOW	31	---	---	DLY	5:30	3953	KØDSO
MON	62	298	243	DLY	7/9:45	3555	AIØO
LOZBC	27	431	0	M-Sa	8:00a	146.73-	NØHVO
HBN	23	404	25	M-F	12:05	7280	KØDSO
RRABN	30	361	7	DLY	8:00	146.79-	KAØLLN
SLAN	4	304	3	M	8:00	146.91-	KØWEX
CMEN	7	144	2	W	9:00	146.76-	KØPCK
PHD	4	127	11	M	9:00	146.43a	WAØKUH
KCARES	7	116	0	Sa	9:00a	146.97-	KØUAA
KCBAR	5	81	5	M	8:00	145.41	KAØSSE
ZAEN	6	79	1	Tu	8:00	147.84+	NOØE
JCRC	6	76	2	W	8:00	147.00-	WØORI
LOZFM	4	73	0	F	9:00	146.73-	NØHVO
KC220	5	48	0	Tu	8:00	224.54-	WAØWPJ
MOFON	5	33	0	W	8:15	224.02-	AIØO
CMYL	4	24	0	M	8:00	146.73-	NØHVO
CARL	4	22	0	Wed	8:30	146.46s	WBØWLU
MARC	4	18	0	Su	8:00	28325	NSØB
MORAT	4	16	2	Sa	8:00a	3930	NOØE

Traffic: WAØYJX 651, AIØO 208, NDØN 182, K2ONP 130, WAØHTN 127, WØBMA 112, K9OCU 94, KØORB 87, WØOUD 42, KØPCK 33, KGØL 30, NIØR 27, WCØAAG 22, KDØAJ 14, WAØKUH 3.

NEBRASKA: SM, Vern Wirka, WBØGQM—The last week of March 1988 was tornado preparedness week in Nebraska. Several Amateur groups throughout Nebraska participated in drills which tested skills and equipment for weather spotting and emergency communications. On March 24, the National Weather Service conducted a test of their warning system across the state. During the March 24 test, State Civil Defense Communications Manager Les Myers, KØSCM, reported 28 check-ins from across Nebraska to WØMAO; the state Civil Defense Amateur Radio Station in Lincoln. Check-ins were

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MRF455, A	Q	60W	11.75	26.50
MRF492	Q	90W	16.00	35.00
SRF2072	Q	65W	12.75	28.50
SRF3662	Q	110W	24.00	53.00
SRF3775	Q	75W	13.00	29.00
SRF3795	Q	90W	15.50	34.00
SRF3800	Q	100W	17.50	38.00
2SC2290	Q	80W	16.75	39.50
2SC2879	Q	100W	22.00	48.00

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MRF150	87.50	2N3553	2.25
MRF174	80.00	2N3771	3.50
MRF208	11.50	2N3866	1.25
MRF212	16.00	2N4048	11.95
MRF221	11.00	2N4427	1.25
MRF224	13.50	2N5109	1.75
MRF226	14.50	2N5179	1.00
MRF227	3.00	2N5589	7.25
MRF237	2.70	2N5590	10.00
MRF238	12.50	2N5591	13.50
MRF239	14.00	2N5641	9.50
MRF240	15.00	2N5642	13.75
MRF245	27.50	2N5643	15.00
MRF247	26.00	2N5945	10.00
MRF260	7.00	2N5946	12.00
MRF262	8.75	2N6080	6.25
MRF264	12.50	2N6081	8.00
MRF317	56.00	2N6082	9.50
MRF406	12.00	2N6083	9.75
MRF433	11.00	2N6084	11.50
MRF450	13.50	2SC730	1.25
MRF453	15.00	2SC1307	3.00
MRF458	20.00	2SC1946,A	15.00
MRF475	3.00	2SC1947	9.75
MRF476	2.75	2SC1969	3.00
MRF477	11.75	2SC2075	3.00
MRF479	10.00	2SC2097	28.00
MRF485	6.00	2SC2166	3.50
MRF485 MP-KEN	18.00	2SC2312	4.95
MRF492A	18.75	2SC2509	9.00
MRF497	14.25	2SC2630	28.00
MRF515	2.50	2SC2640	15.00
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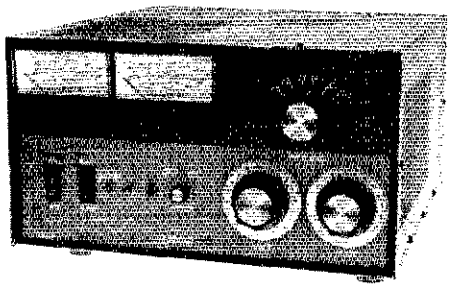

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Dean has cerebral palsy and got started in Amateur Radio with help from the Courage HANDI-HAM System. The HANDI-HAM System is an international organization of able-bodied and disabled hams who help people with physical disabilities expand their world 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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on HF SSB, 2-meter FM and packet. The Blue Valley ARES Net was in operation during the state-wide tornado test March 24 according to the EC for York, Seward and Polk Counties, Jack Crowdell, WAØBOK. The Blue Valley ARES had 20 amateurs participating, representing 9 communities. During the drill, 2 messages were handled for rural fire departments and Civil Defense officials of York and Seward Counties. The Lincoln Amateur Radio Club has been officially renewed as a Special Service Club. Lincoln hosts the central states VHF conference July 16 and 17. Amateur exams are being given in Omaha on the last Monday of odd-numbered months at the Omaha Red Cross, 3838 Dewey Avenue. For Omaha exams, the contact is KMØY. Amateur exams will be given in Lincoln August 13, contact WAØYPY. Traffic: KØDKM 187, WØKK 89, WDØEGK 43, WBØTED 31, WCØO 19, NOØA 19, WAØBOK 16, WBØGQM 16, WØKBS 10, KAØBCB 10, KØUNK 6, WØNIK 5, WDØEWH 4, WØWZR 3, KØTUH 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Dick Pechie, KB1H—STM: K1EIC. SEC: N1DCS. OOC: NA1I. ACC: NK1J. PIO: WA1CMF. TC: W1HAD. SGL: K1AH.

Net	NM	Time	Freq	Ses	QTC	QNI
CN	WB1GXZ	7 & 10 PM DA	3.640	62	197	346
CPN	NK1J	6 PM M-Sat 10AM Sun	3.965	31	429	93
WCN	N1EDD	8:30 PM Da	147.180	31	367	171
NVTN	NM1K	9:30 PM Da	146.880	31	446	164
CSTN	K1CE	24 Hr BBS	145.010			
RTN	KY1F	8:00 PM Da	146.73	31	366	83
CSN	WB1GXZ	7:30 PM M-F	3.720	23	128	40
TMRCN	NM1K			4	446	164

Congratulations to the CT traffic handlers for two record-setting months of representation of our Section to 1RN—Feb/Mar. CPN continued to be a workhorse of a net in 1987 with 3656 QNIs and 1104 messages. FARA members attended a VE Forum at the WECAFEST in Valhalla, NY. Latest FCC and ARRL/VEC thoughts were discussed. CARA again sponsored the 1988 version of our own CT Section QSO Party. Send in those logs! The Cricket Wireless Assoc. meets on the 4th Wednesday in Oct. Feb. Apr. and Jun. at the South Glastonbury Library. Many of the local clubs are planning family cookouts during Field Day 1988. Field Day is always a good time to visit a club in your local area. Southington ARES headed by N1ESB has started an ARES directed net following the SARA Sunday Night Net on 144.5-145.17 MHz. Public events begin to pile-up the public-service chores. RASON handles the Loyalty Day Parade, Rose Arts Race and other events. ECARA has duty during Killingly Springtime Festival. Waterbury ARC will be granting a scholarship to the Waterbury State Technical College. An excellent exhibit of the goodness of our little fraternity! KA1HBV recently travelled with a high school wrestling team to the Soviet Union. Shoreline ARC will join up with the Zygo ARC for a demo at the 1988 Durham Fair in Sept. Tri City ARC will have a station at the Ledyard Fair. Traffic: N1API-4 531, KY1T 503, WB1GXZ 348, W1EFW 344, N1EDD 207, NM1K 131, KA1GWE 109, KA1FVY 100, KY1F 73, KA1KP 68, K1AQE 58, W1YOL 58, KB1ZC 53, WB1ESJ 49, KA1JAN 47, WA1NLD 41, NK1N 38, N1FJW 31, WB1CRH 25, W1BDN 21, W1WP 21, WB2SGI 13, N1BOW 9, W1QV 5.

EASTERN MASSACHUSETTS: SM, Barry Porter, KB1PA—ASM: K9HI. STM: KW1U. ACC: open. PIO: K1HLZ. BM: KB1AF; OO/AA: AG1F; SGL: K3HI; TC: KA1IU. EMass HotlineQ437-0111. Westlink 449-2226.

Net	Mgr	Freq	Time(loc)	Day	Ses	QTC	QNI
EMRI	N1AJJ	3658	1900/2200	DY	48	132	174
EMRIPN	WA1FCD	3880	1730	DY	29	108	119
EM2MN	83/23	2000	DY		31	258	356
NEEPN	K1BZD	3945	0830	SUN	4	17	55
HHTN	NG1A	04/64	2230	DY	23	144	278
EMRISS	N1CVE	3715	1600/2030	DY	46	26	81
CITN	KB1AF	745/045	1930	DY	4	17	56

Spring means flea markets season. It also means time for many club elections. Some clubs are having trouble finding officers. If you get anything from club meetings, why not volunteer for a position? It will help keep your local club healthy. There are many new novices out there looking to join a local club. What is your club doing to recruit these new hams? How about starting a local Elmer program. Having an Elmer will make these new novices get off on the right track and teach them good operating habits. Spring also means many clubs start planning for Field Day and there are many Public Service Events to support. There is a local movement to start a registry of stolen ham equipment, so someone can check to see if equipment for sale is "hot." Any ideas what form this might take? Some have suggested a local packet BBS would be a good place to start. Congratulations to KB1AF, W1CE, WA1FCD, KW1U and KN1K. They have been awarded Trans Continental Corps (TCC) certificates for their active participation in 1987. The TCC is the Heavy-weight division of the National Traffic System. Thank you to all who participate. The Wang ARC repeater (443.825/448.825) WA1GRC/R has changed its PL tone from 77.0 (XB) to 88.5 (YB). Don't forget if your club is looking for a speaker, the section staff and myself are available to speak. KA1IU reports the Assistant Technical Coordinators, especially AE1X have been busy these last few months. KB1AF reports 315 Bulletin transmissions in February. The FCC will be rewriting the Amateur Rules, Part 97. While a hard copy of the proposed revision has yet to be released, it looks like there will be much to comment on. This will be an important opportunity for us to have the rules written in an clear and understandable manner. Have you expressed your opinion on amateur issues to the section or division staff lately? Traffic: WA1TBY 467, KW1U 427, KN1K408, KB1AF 387, NG1A 231, WA1FCD 213, NK1O 161, KA1MDM 160, K1BA 157, K1ABO 131, K1GGS 124, KA1LIH 108, N1CVE 101, W1CE 75, WA1FNM 70, KA1EID 68, N1AJJ 65, NK1Q 55, KA1NOI 40, WA1CRE 29, K1BZD 23, K1SEC 23, NK1L 10, KA1KCU 3.

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVO. STM: WA2ERT. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: KQ1L. ASM/Packet: N1AHH. Phil Young, W1JTH, Bulletin Manager, reports 113 transmissions by 7 bulletin stations comprising 10 ARRL, 5 Maine, 3 propagation, and 2 packet bulletins on CMEN SGN MPSN RACES AEN MENET (packet). As follows:

OBS bulletins transmissions

N1BUG	13	26	SSB	3.940	SGN
W1KX	10	38	SSB	3.940	RCS/MPS

W1VEH ME 9, 10 placed on MENET PBBS

W1JTH2	2	SSB	3.940	SGN

N1EUK	9	19	FM	10/70	ARES
N1BCF	15	24	FM	3,940	MSPN alt
WA1YNZ	2	4	FM	13/73	AEN

Traffic: KA1JOJ 116, ND1A 107, WA2ERT 66, W1JTH 60, W1RWG 48, W1VEH 45, N1BCF 40, W1KX 33, AK1W 29, W1BMX 22, KA1ODT 11, WA1YNZ 10, AJ0C 7, N1BUN 7. PSHR: WA2ERT 101, W1KX 84, W1RWG 71. VE examiners at the Poland Hamfest reported tests given to 40 people with 18 upgrades and seven new Novices. K1MZB on DXpedition to Belize as V31MZ reports 1276 contacts on all bands from Dec 9 through Dec 18 and worked 10-meter contest in the middle of the period. QSL cards may be obtained from KD2EU in Scarborough. W1RWG has not chosen to run for reelection as SM, and W1KX has been declared elected without opposition. The new SM's term begins July 1, 1988. Please send your reports to Bill Mann, W1KX, from that date. Cliff Laverty, W1RWG, thanks the members of the Maine Section for their support and encouragement during his eigth years as SCM and SM, putting the new field organization into smooth running organization. Cliff will make his last official visitation in Aroostook County on Field Day. We regret to report the passing of Joe Cheffalo, W1GAP, an active ham and former merchant marine master.

Net	Ses	Checkins	Traff	Mgr
SEA GULL	25	991	148	K1GUP
PINE TREE				ND1A
AROOSTOOK EMERG	5	84	4	WA1YNZ
MEPUBSVC				KA8UVQ
CENMEEMERGENCY	8	150	7	N1EUK
RACES OXFORD CTY	4	69	24	W1RWG
RACES HANCOCK CTY	4	37	6	WA2ERT
RACES KENNEBEC CTY	4	70	0	KA1LPW
ARES CUMBERLAND	4	63	0	KA1ODT

Keep in mind the upcoming HAMFESTS June 4 Bangor, July 16 Union, August 13 St. Albans, September 10 Windsor.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE-PIO: WB2MBQ. SEC: K1ACL. With the start of the SKITREK polar expedition this month, we have ham activities at both poles! Antarctica added one more Ham when Al, K1OIQ, arrived in March. He is sending back a series of letters about his experiences, and I recommend them as fascinating reading. GSARA pres W1VTP reported on a very interesting "technical seminar" for their March program. W1VTP and W1EHF demo'd cavity tuning and N1IW and KB1QV discussed types of cavities and harness design. This drew many repeater folks and provided a valuable technical service. The CNHARC newsletter (edited by AK4L) had a neat chart of dipole, vert and loop ant lengths for the low bands-just in time for spring! N1EMF reports in the Twin State RC newsletter that the club has a novice class at the Montshire Museum. Congrats to KC1BZ who completed the reg for WAS and K1ACL who completed reg for 5 Band DXCC. Both are members of GBRA. The VE program continues in high gear with the NARC test session. N1AKB reports that 25 of the 42 applicants upgraded and 4 new Novices emerged from the session! (I had a personal interest in one of those upgrades - Dot, KA1LDS, upgraded to General!!). Most test sessions report that a majority of the applicants are walk-in, which makes material planning very difficult. Fortunately, improved methods of handling materials are on the way. I was at the Int. Repeater Soc Fleamarket in Hudson at the ARRL table and had a good time seeing many of you after the long winter. (Incidentally, the most popular pub was the new packet book). Thanks to WA1DXO, W1JY and KX1L and the Manchester 4H Amateur Radio Club for helping out. Dot and I attended the NH Traffic Handlers luncheon in Manchester and had a very enjoyable afternoon. Jim, N1NH, retired after 17 years as NHN NCS and got well deserved recognition for his years of effort. Rich, KB4N, was appointed the new NHN NCS by W1TN - thanks, Jim, and welcome aboard, Rich! The program included presentations on TCC by Marcia, KW1U, EMass STM and on MARS by Hank, K4MH. Inquiries about getting an amateur license continue to come across my desk at a steady rate, and I continue to get reports about people using "Tune in the World" and the Gordon West package for self-study with great success. In addition, spring Novice classes are starting in some areas and we look forward to more new Novices in the next few months. Our celebration of the US Constitution Bicentennial will include W2OONH with the NH Amateur Radio Assoc. operating from Concord State CD HQ during the week of 4-10 of June. If you would like to participate in this event, contact NHARA Pres. Warren, WB1HBB to get on the op schedule. Is your club station going to be on during the Constitution Bicentennial?? A special thanks to Charlie, W1LQQ, in N Conway who is the "sparkplug" for ARRL/VE sessions in the North country. Charlie works the admin. side of the exams in addition to his pursuit of DXCC. His VE crew includes AG1Z,KT1A,W1BPI and W1PNR. Tnx for your special efforts in providing upgrade opportunities in the central NH area! This was the first anniversary of the NH Novice Tfc Net and Chan, KA1OU has been appointed as the new Net Manager. Thanks to WB1HBB, acting NM and congrats to Chan! Another milestone for NHNTN-Pine Isle 4H Ctr Club members Eric KA1OSD and guest op Jeff checked in this month. Welcome aboard! SEC; K1ACL announced the appointment of Dick W4PAS as DEC for W Rockingham Cty. STM; W1TN announced the appt. of KA1HPO as NM of the Merrimac Cty Emergency Net. From the Southegan Valley ARC Newsletter - SVARC net meets on 147.48 (simplex) at 8:00 PM on Monday nights. And finally, NH had 100% representation on 1RN/3 and 1RN/2 for March! Did YOU handle a piece of traffic this month? Traffic: GSFM 160, GSPN 147, NHN 79. W1PEX 1878 (BPL). WB1HBB 227 (BPL), N1CPX 450, K1TQY 203, KB4N 165, W1FYR 96, KK1E 80, W1TN 69, N1ALM 66, KA1LBW 55, N1NH 46, W1UBG 44, W1ALE 44, WA1YZN 43, NE1J 25, KA1OU 24, KI1M 22, KA1QWT 15, KA1HPO 14, KA1OLK 10, KA1QIW 9, KA1PFS 9, KA1JOU 9. KC1AF 8, KA1LMR. N1DQA 5, KA1KFX 1.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: AE1T. STM: KT1Q. SEC: W1KRV. PIO: WA1YOY. The VT Emergency Management Conference recently held in Fairlee provided an excellent opportunity to demonstrate how the Amateur Radio Emergency Service (ARES) is able to support various state and local agencies during disaster operations. SEC Joe Steventon (W1KRV) conducted an outstanding demonstration of how Amateur Radio equipment (ATV/HF/VHF/packet) can be used to enhance local and state communications capability. VT Tech College ARC Club Annual report was submitted to ARRL by advisor KK1U. A new ARRL audio/visual programs catalog is now available. Contact W1CTM for your free copy. Congratulations to WA1JVV (Tom) who has been appointed Net Manager for the VT Traffic Net (VTN) by STM KT1Q. An

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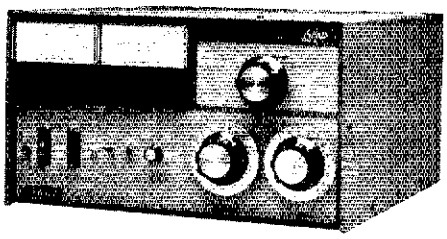

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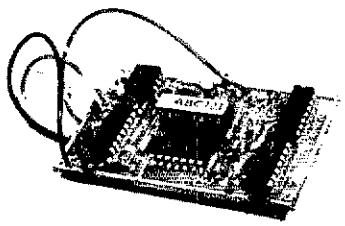

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updated section Net Directory is now available from KT1Q (Ed) or AE1T (Peter). Our section had 87% representation on 1st Region Net (1RN) and 100% on Eastern Area Net (EAN). This consistent performance of our section National Traffic System (NTS) stations is the result of dedicated operators, Net Managers and STM leadership. Ed (KT1Q) and his predecessor, AE1T, deserve credit for a truly outstanding job. The FCC Part 97 rewrite is in progress with comments due 8/1/88. ARRL has copies available. BARC participation in the Novice Roundup gave operators N1DLE/EOZ/EYD a chance to get involved in contesting at club station W1KOO/t. Recent guests at Twin State ARC meetings in Hanover, NH (Montshire Museum...) included SEC and ASM. Rumor has it that W1KRV did some successful ARES recruiting during his visit. Next VE exams will be held by Green Mtn Wireless Society (GMWS) in Rutland on June 4—Contact WA1ZOJ. N1ART (Bert) has been replaced as Rutland County DEC by Russ Flagg (N1FHY). Tnx Bert for ur many years of dedicated service. John (KU1X) is back doing his volunteer hospital work after minor surgery. GMWS is generating a Red Cross Disaster Communications Plan for the Rutland area—contact is N1EWE. The new EC for Rutland City is KA1NZA (Eric). W1KRV indicates all 200+ section ARES members have received ARRL Public Service Communications Manuals. A Bennington County ARES guide has been developed, contact KA1DLK. Results from Ne Division Director's (K1KI) last survey is being tabulated and should be available soon. Field Day is just around the corner (6/25-26) so start ur plans to participate. Good luck to SJRC as they try to make it three years in a row as national champs. N1COE (Jon) has passed the Amateur Auxillary exam and in addition has been appointed as a section Assistant Technical Coordinator. Our section participation in the simulated disaster at Yankee Rowe Nuclear Plant (MASS) included VHF/HF/packet communication links from Windham and Bennington Counties to the State Emergency Management Office in Waterbury. Tnx to all participating stations. Brass Pounders League (BPL) awards were earned by KT1Q & WA2SPL. March traffic: KT1Q 645, WA2SPL 632, N1DHT 161, AE1T 68, WA1JVV 67, NB1A 43, W1KRV 37. March Net report: VTN 31/167/143, TSEN 5/55/5, TSFMN 5/76/9, VSSN 13/46/8, VPEN 4/19/6, CVDXN 3/29/0, CVFMN 4/78/5, CAR 27/592/50, GMN 27/530/35, VPN 4/91/10, BCAN 8/58/0.

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: KA1EXJ. I want to congratulate Joy, KA1EXJ, for a job extremely well done. Her past two years as STM exemplifies the highest degree of support for the National Traffic System. For the past two months, WB1HIH has been preparing for the upcoming Yankee Rowe emergency test. With Jean, KA1IFC, as NCS, the test should run like a clock. The last test was an example of how one should run. The NOBARC group again did their exceptional job handling communications for the ski race down Greylock. WB1HIH, WB2KMY, NJ1K, NM1I, W1YBT and WA1VHC all spent a cold day on the mountain. Brian, NJ1F, has an interesting and informative article in Squelch Tail. His article on interpreting "S" meter readings is well worth reading. The Explorer Post 73 hams provided communications for the St. Patricks's Day Parade in Worcester. Participants were KA1OTR, KA1OTS, KA1QOI, KA1QOZ, N1EXS, N1FBD, N1FBD, N1FIY and N3FSM. CMARA and WPI club members KA1MOW, KA1OSO, KA1OTQ, KA1REI, KA1PZD, N1EHL, N1ENX, N1EKO, NE1C, W1DLR and W1SPG participated. N1FIY and N1FBD did a great job as NCS. The result of the WPI Novice class was twelve new amateurs. A great job! CMARA will be participating in the Amateur Radio Exhibition at the Worcester Museum of Science. Now is the time for all the clubs in the section to start organizing for Field Day. June will be here before we know it. Traffic: KA1IFC 780, KA1EXJ 209, WB1HIH 86, NM1U 53, KB1TH 56, KC1DI 38, WA1YYK 85, K1JHC 64, KA1EKQ 80, KA1QFV 28, NI1V 22, W1ZPB 4, KA1OPN 7, W1UD 330.

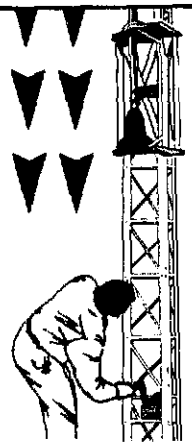
NORTHWESTERN DIVISION

ALASKA: SM: Dianne Marshall, AL7FG—SEC: KL7AF, DEC Interior: NL7HI. A special thanks to Marge Austin, KL7VY, who has been appointed STM. Still looking for volunteers for other appointments. Many thanks to ALSCOM for the grants they have given to support several repeater sites. The KL7GNG packet BBS will soon have a new port on 30 meters. The 146.22/82 repeater near Delta is in (hopefully) and linked to the Fairbanks network (146.28/88, 223.28/68). Westlink is broadcast on the network Sundays 9:00 PM local time thanks to Mike, KL7YV. Coming up; The annual "HIGH POINT" Club Trophy competition, open to all ALASKAN clubs on Field Day; the YUKON 800 boat race June 18th & 19th; the Motley Group Picnic July 22,23,24, 1988 at Byers Lake Campground, mile 147 Parks Highway.

IDAHO: SM, Don Clower, KA7T—SEC: K7REX. STM: W7GHT. OOc: WB7CYO. ACC: N7BI. PIO: WG7E. The WIMU Hamfast this year is going to be at Mack's Inn, ID on Aug. 12,13 & 14th. There will be bus tours to Yellowstone Park. Sounds like fun, see you there. The Eagle Rock ARC in Idaho Falls has an FB newsletter that comes out each month. The April issue is an outstanding issue. Governor Andrus has agreed to make the week of July 2-8 Amateur Radio Week in Idaho. This coincides with our week to use the special "200" prefix in honor of the Constitutional Bicentennial. I will mail to each club a copy of Gov. Andrus' proclamation. You might drop a letter to our Gov. to show your appreciation. See you on Field Day.

MONTANA: SM, Ken Kopp, K8PP-KB7Q and WA7JYU used OSCAR 11's digitalker for high school class project. WA7GVT has easy-to-read 7-state digipeater map for sase. LYARS Pres. W7DXQ oldest club officer with 80 plus years. KE7X leading effort to arrange state-wide Bicentenial 200 QSLs. Hopes to get help from the State. Butte ARC officers: N7GYN/P, N7FMT/VP, WB7BSO/S, WB7SIU/T. OOT W7PX SK April 5. Big Arm Picnic Aug. 14. Information from WB7WVD. WIMU (Aug. 13/14) housing information from "CORRINE" at Mack's Inn (208) 558-7272. Hamfest and exam information via MSN, 3920 kHZ, 0800 Sunday. Change to 0800 brought 30% increase in QNI's Gov. Schwinden asked by Anaconda ARC to again this year proclaim Amateur Radio Week ending with FD. Traffic: W7TGU 617, (PSHR).

Net	Sess	QNI	QTC	MGR
IMN	31	313	103	KA7EEE
MSN	4	86	0	K8PP
MTM	31	1967	94	KF7R



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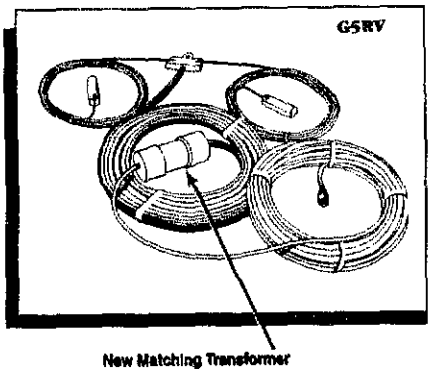

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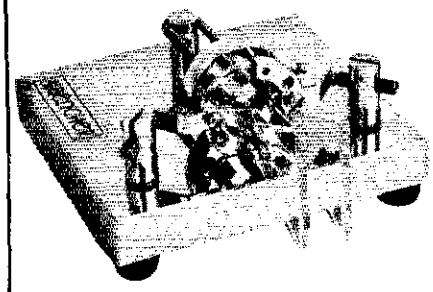

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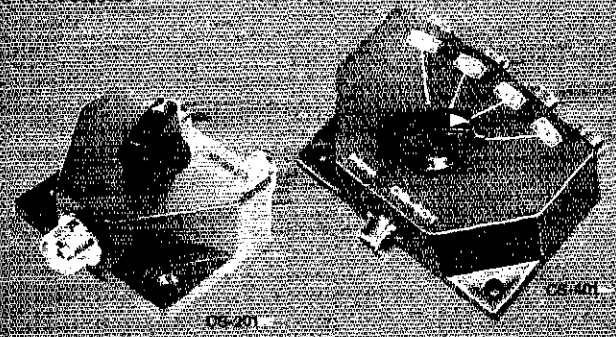

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OREGON: SM, Randy Stimson KZ7T—ASM: KM7R. STM: W7VSE. SEC: W7FBP. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. RFI: AK7T. OO: KA7HJT. STC: N7ENI. My apologies to the Hoodview ARC for listing 1987 officers for 1988. The 1988 officers are Rozy Clulow, KA7CED President, Bill Jager, N7HIL Vice President, Al Peterson, KA7ZEF Secretary, York Leitner KA7FUT Treasurer. There has been a group of hams formed in the Eugene area to help the survivors of Silent Keys, which usually is the wife. The purpose of this group is to offer the survivor help in dealing with the ham gear that has been left. They will inventory and suggest some prices that the person could get. I think this is a great idea, and I am starting one in the Portland area. The Packet network is reaching farther east thanks to Bren, KM7R, and her group. The 220 backbone is in to Pendleton. The Node in PDT and the call is N7ERT-5. This is the Month for Field Day and I would like to remind you that it is not necessarily a contest as much as it is a time to try new ideas and to let the public know what you are doing and what ham radio can do. Traffic (P) = Packet. W7VSE 404, WB7VSN 323, N7BGW 267, WG7H 159, KA7EEE 89, KM7R 70P, W7ODG 54, KZ7T 51P, W7LRB 52, N7CPA 41P, WB7EMO 35, N7APC 29, WJ7E 22, WB7BZM 20P, KA7AID 11, W7LNE 6. Late Feb.: WG7H 174.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. SEC: KA7INX. TC: W7BUN, OOC: N7DVR, SGL: KD7AC, BM: N7CAK, PIO: N7FKV, ACC/ASM: KC7PH. ASM: KD7G. ASM: KA7CSP. ASM: K7OUF. ASM: K7CLL. The first quarter statistics for Washington Section traffic nets are:

NAME	QNI	QTC	Sess
EWTN	175	203	104
PSTS	363	164	180
NTN	3765	321	91
WARTS	9340	579	91
NWSSB	843	53!	60
WSN	1604	488	181

Section Traffic Manager KD7ME reports that "ZIP CODE" addressing of packet NTS traffic enables Washington Section PBBS's to automatically route traffic to the PBBS serving a particular geographic area. 980-981-987 traffic goes to the KE7OM PBBS near Seattle. 982-983 to the KA7VEE PBBS near Everett. 983 (Kitsap-Pierce) & 984 go to the WØLVJ PBBS near Tacoma. 985 to the N7BFG PBBS in Olympia. 986 to K7ZVV PBBS in Longview. 986 (Clark-Skamania-Klititas) to the K7IFG PBBS in Portland, OR. 988 to N7HHU PBBS in Yakima. 990-991-992 traffic to a future PBBS in Spokane. 993-994 traffic to a future PBBS in the Tri-Cities. Packet NTS messages not removed for delivery within 24 hours are taken by a traffic handler to another NTS node for relay and delivery. At present, traffic for eastern Washington ZIP Codes are being forwarded to N7HHU PBBS in Yakima. Outgoing NTS traffic for other states is routed automatically to the Hub PBBS N7HFZ and then to PBBSs in OR and BC or to WB7DCH, the HF Gateway PBBS. Packet radio is a welcome addition to the NTS in Washington Section. Its usefulness for the high-volume traffic loads of fairs and holidays has already been demonstrated. Plan to attend the Apple City Hamfest June 4-5 at Rocky Reach Dam in Wenatchee. There will be equipment displays, swap-shop, and VE testing (Saturday, June 4, at 2:00 PM). Free RV parking and Saturday night banquet. Talk-in 146.67. You can make a contribution to the Bill Bennett, W7PHO, Memorial Scholarship Fund in care of the ARRL. This contribution is tax deductible. Are you ready for Field Day? It's the top non-contest contest of the year with action both on and off the bands. Governor Booth Gardner has declared June 25 as Amateur Radio Day for Washington State. H.B. 1346 (The Amateur Repeater Siting Bill) is now law. Many thanks to the dedicated efforts of all those who made this possible. WB7WOW is running an information net on the 145.25 repeater Friday evenings at 8:00 PM. Don't forget the Puget Sound Novice Net at 8:00 Sunday nights (28.375) and the Sleepy Hollow Net at 9:00 PM (CW) and 10:00 PM (SSB) daily (28.325). The Western Washington DX Club hosts a Ten-Meter DX Net every Thursday at 8:30 PM on 28.315. The BEARS are now sponsoring 4 awards: Worked Five BEARS; Worked Three BEAR Cubs; Zone 3 Award; Puget Sound ZIP Code Award. Complete info from BEARS, Mail Stop 1E-35, 22649 83rd Ave. South, Kent, WA 98032. Public Service Hours: Asotin 2, Benton 16, Franklin 16, King 129, Kitsap 207. Traffic: K7AJT 22, W7APS 5, WA7CBN 164, N7CLL 4, N7DIP 3, N6EQZ 122, KR7F 36, W7GB 103, N7GGJ 163, K7GXZ 277, W7IEU 7, W7IGC 230, KA7IIJ 34, W7LG 219, KA7PMD 12, K7SUX 55, KA7TTY 27, WA7TWB 5, K7UQH 84, WA7YEN 73, Category 2/3, WA7PIN, KD7ME, KD7G, KR7L.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG— ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. Welcome to new ASST SM WB3FCV. Andy will be assisting me with compiling a section data base among other projects. K6APW finds his "new work assignment fun, enjoyable, interesting and very time consuming." Jim says the N6EEG BBS has moved to 14.109 MHz, and they are hoping to find a South American station with which to establish a permanent link. The Contra Costa Communications Club, Inc., meets on the 2nd Sunday of each month for breakfast at 0800, club meeting at 0900, and directors meeting at 1000. They don't mention the location, so try their club net on WD6EZC/R, on 145.11 (-600) at 1930 on Thursdays. The South Bay Amateur Radio Assn meets the 3rd Wednesday of each month, 1930, at the Los Cerritos Community Center, 3377 Rider Av., Fremont. Try 147.015 (-600) Wednesdays at 2030 for more info. Livermore Amateur Radio Klub member K6DZU celebrated his 21st leap year birthday on Feb 29th. Congrats and many more. Mar Traffic: WB6DOB 119, W6VOM 111, K6APW 103, WB6UZX 26.

NEVADA: SM, Joe Lambert, W8IXD-ASM: Curly Silva, K7HRW. Congrats to WADG on its 10th Anniversary. New WADG officers are: Chairman: N7RH, Vice Chairman: KA7KOH, Secty: WA6EAN, Treas: N7DOD and Board Member KD7JP. New SIERA officers are : Pres: WA6RYG, V-P: KE7DY, Treas: NF7V, Secty: N7JUA and Directors: NO7Z, W6FFT, KE7FV, WB7UKH and T.K.Jones. Carl, W7QO is conducting Novice classes in the Minden area. SIERA is now having meetings on the 2nd Tues. of the month at the Minden Library at 1900 hours. FARS is holding a field Day this year in Sunset Park, Section F, in L.V. contact NW7O for info. Everyone is welcome. Dave, W9MPD, has opened Radio World, a ham-oriented store at 1656 Nevada Hwy, in Boulder City. LVRAC's Field Day will be at Cold Creek again this year.

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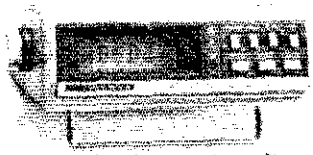

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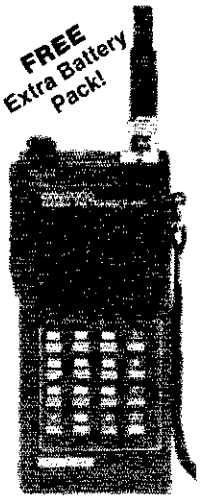

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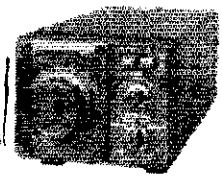

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Contact KE7JX for info. Contact Kay, K7AXT, for info regarding a So. Nev. Chapter of QCWA which he is organizing. SNARS continues to sponsor very successful ham radio classes. For info, contat K7HRW. Don't forget the Reno Hamfest "88" which will be held in the California Building at Idylwild Park in Reno, August 20, 1988. It is cosponsored by the 3 Reno area radio clubs, NARA, SNARS and WADG. For info contact K7HRW.

PACIFIC: SM, Jonathan Starr, AH6GJ— SM's tel: 248-8604. SEC: Wayne Jones, NH6GJ (tel:621-5916). PIO: Katashi Nose, KH6IJ. TC: Army Curtis, AH6P. SGL: Gene Piety, KH6PP. BM: Mel Fukunaga, KH6H. OOC: Randy Leval, AH6GR. ACC: Lee Wical, KH6BZF. STM: Jack Erwin, KH6HIJ. Maui DEC: Mel Fukunaga, KH6H. Kauai DEC: Bill Baisley, KH6S. Hawaii DEC: Chris Stewart, AH6GG. Guam DEC: Robert McFerron, WH2AEN. ECs: NH6M & KH6NP. ARES and RACES participation in the Section is increasing at a phenomenal rate. Please come aboard and help us develop a valuable program. Hawaii ARES message handling class organized by DEC AH6GG; participants NH6IZ, KH9AB, AH6GD, KA2IXG, KH6IMB, NH6OJ, AH6GO, WH6BWJ, AH6IL, WH6BIR, NH6GG, NH6ES, KW7N, KH6QM. Impressive turnout, Chris. Maui Marathon March 13, communications well organized by D.E.C. KH6H along with AH6AM, AH6AZ, WH6BLZ, AH6DV, NH6EV, AH6GE, AH6GJ, AH6GP, AH6GQ, AH6GR, NH6H, KH6HHG, N6HPQ, NH6ID, KH6SQ. Waipahu Great Cane Run on Oahu: KH6HJA, KA2WXU, KH6OV. Thanks to all. Aloha de AH6GJ.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—ASM: N6JTJ. STM: WA6WJZ. SEC: NR6A. DECs: KE6EP, N6AUB, KE6NS. OOC: WY6O. PIO: AA6DX, WA6UZR. ACC, TC: W6RFF. BM: WB5FIX. SGL: N6IG. Welcome to two Affiliated Clubs in the section, the Caltrans RACES Radio Club, N6AAD, President, and Butte Amateur Radio Club, N6AIT, President. The new Butte club meets the third Thursday each month at Chico Community Hospital. Congratulations to River City ARC8 for becoming a Special Service Club. You have been doing an outstanding job for a long time, and now are getting the recognition. Our Bulletin Manager, WB5FIX, is now "Professor" Murdock as he is giving Novice and Technician license classes at Yuba Community College for which credit is given. Having already experienced the need for hams on one wildfire this year, Central Sierra Counties DEC Ron Monet, N6AUB, is anticipating a bad year and asking for all who can to volunteer now so they can get some training before the need becomes acute. Don't forget the Section net the first Sunday of the month at 8:00 PM on 146.085, input up .600 MHz. Traffic: WA6WJZ 128, N6LUY 164, WA6ZUD 82, K6SRF 57, W6CFQ 36, W6RFF 24, WB6SRQ 6.

SAN FRANCISCO: SM, Bob Smith, NA6T— It's never too soon to plan; SFRC's OldTimer's Nite is Oct. 25. Are any other clubs doing the same thing? Newest Packet BBSs in Section: try 144.99 for DXpacket/W6OAT. HARC is meeting at the General Hospital in Eureka, first Tuesday at 7:30. Check the FWRA rptr system for details. SHARC's annual 'picnic BBQ in the Redwoods' is scheduled for 3rd Sunday of August at Benbow Lake. If you're looking for a good time, try Southern Humbolt County in August (146.19/79). REDWOOD VE team is active with upgrade testing in Humboldt County, see Dusty Smith, KB6FIW. CDF/VIP is actively organizing in Humboldt, Mendocino, and Sonoma counties, CDF found out what kind of help the Amateurs' can supply in the fire zone. SCRA/HSC's new BBS is up and running at 707-527-7734 (N-8-1) for AMATEUR RADIO, check it out! Have you ordered your SCRA CLUB MEMBER QSL's? See N1AL for info. Does anyone know the history behind W6ACT and the memorial club station in Cresent City. If you do contact Lindy, WA6ZDO or HY, K6HY in C City. Field Day is getting close, get out and support your local club, WHY STAY HOME IN JUNE? 73, Bob NA6T.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD-SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. ASST. SMs: W6TRP & K6YK. Emergency Coordinators are needed in Calaveras, Madera, Mariposa, and Mono Counties. Contact WC6U or W6DPD if you can serve in one of these positions. Appointments renewed: EC WA6KZV, OBS K6RAU. WO6D is a Silent Key. 1988 officers of the Calaveras ARS are, Pres. KB6IFL, VP WQ6H, S/T KE6OZ. The club meets the third Tuesday, 7:30 PM at the CDF HQ in San Andreas. KB4HTF is Extra. KB6EAH is a General. KB6UNV is Tech. Field Day is this month. Don't forget the various categories of bonus points. There will be a Sierra Hamfest in Reno on August 20, 1988. Look for more information on this one. Traffic for the month of March 1988: N6MXG 32, WA6YAB 12.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W. SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6OML. ASM: N6JQJ & NS6N. ACC: W6MKM. BM:(vacant) OOC:(vacant) The Santa Clara County ARES group assisted in the MEDEX medical emergency drill. A hearty well done to all who participated. . . the Milpitas ARES made good use of their new repeater KA6S/R on 224.72 during the drill. . . our STM, Andy N6JLJ, reports that we are making "good progress on a real packet network." Andy has been very busy with TCP/IP. . . speaking of traffic, yers truly has been doing some traffic DELIVERY and it's a lot of fun! (100% of my own tfc total below is deliveries!) It also happens to be the most important part of NTS, because if no one bothers to actually deliver the traffic, why bother sending or relaying it in the first place? In the future, I will report traffic totals as <call> (<number delivered>) <total> . . . the Santa Clara County ARES/RACES (ably led by DEC Sharon Moemer, N6MWD) and the American Red Cross held a formal opening celebration of the new Communications Center at the Santa Clara Valley Chapter of the Red Cross. This relationship promises to be as beneficial to both organizations as the long standing relationship with the Palo Alto RC chapter. Thanks to Bob Jenkins K6DHO, Ben, WB6FRM, and many other people who worked many hours to pull the facility together. Thanks also to several corporate contributors for their donations to the project. . . N6BIS has received her DXCC. Congrats! It is truly an awningsome achievement!! . . . I met many of you at the ERI. It was an excellent weekend of learning about and discussing the emergency service aspects of Amateur Radio. Thanks to our ASM for training Dave Larton, N6JQJ, and all of you who worked on the ERI. Special thanks to Apple Computers for the use of their beautiful facility in Cupertino where the ERI was held. OO reports: WE6R. Traffic: MAR: KA6ASV (14) 30, KA6SXW (0) 11, KB6IWG (0) 8, N6JLJ (2) 6, WB6W (2) 2, FEB: W6KZJ 95, NR7E 90, KA6ASV (4) 18, KA6SXW 12, N6JLJ 8, WA6HAD 6, KB6IWG 6, JAN: NR7E 62, KA6ASV (8) 26.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W— ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: K4ITL. SGL: KE4ML. PIO: AB4FW. The highlight of the ARRL State Convention held at the Raleigh hamfest was the presentation to STM, Bill Johnson, K4NLK, and former SM, Rae Everhart, K4SWN, of The Order of the Long Leaf Pine by Joe Myers, State Emergency Management Director. This is one of the highest honors which the Governor of North Carolina can bestow. Myers said that Governor James G. Martin, Jr. thanks all of the state's amateurs for being so eager and able to serve our state's citizens through participation in the State Emergency Response Team (SERT), the HAM WATCH program, and the SKYWARN Nets. K4NLK was selected for this honor because of his success in coordinating the NTS program and his efforts in emergency activities as STM. The MAJOR role of the amateur traffic nets in emergency preparedness IS recognized at the highest level of North Carolina State Government!! Traffic nets are the formal training ground of ALL emergency operators. [BT] FARC sponsored Winston-Salem Hamfest June 11. [BT] Field Day is June 25-26. ALL are encouraged to join in this important and enjoyable emergency exercise. Send FD message to SM for bonus points. [BT] The North Carolina ARRL Net meets Thursdays at 2000 local on the Piedmont Costal Repeater Network (linked 2M repeater system). The purpose of this net is to provide a forum and encourage communication within the N.C. ARRL Section. ALL amateurs are invited to participate, especially field appointees (DEC, EC, NM, OBS, ORS, OES, OO, etc.). This is not a check-in net, nor is it a news net (K4MOB's SERA News Net on Wednesdays at 2030 local provides that service, and has multi-state coverage). [BT] Quarterly traffic report:

NET	QNI	QTC	TFC	QND	SES	NM:
NCEN	1953	526	430	1677	91	WB4WII
NCMN	1229	425	379	1266	90	WD4MRD
CN	1889	756	767	3636	182	K4IWW
CSN	691	128	107	1861	91	AA4MP
CNCTN	2282	254	224	1277	91	WA4MNR
PCTN	508	184	151	485	91	AB4EO
RARS	848	97	95	1269	90	K4ABJ
M2MEN	1694	113	104	1006	91	KF4MZ
CFARS	1708	82	85	1738	91	W4EHF
PETN	1093	114	98	1220	85	WB4HRR
THEN	1039	142	121	898	90	N4LUO
R10TN	197	63	54	507	36	AB4FY
Totals	15,131	2,919	2,608	16,840	1,109	

March traffic: K4NLK 378, K4IWW 124, KA4TLC 116, KA4EYF 95, WD4HTE 93, AA4MP 93, AA4TE 74, N9CGD 70, KI4YV 51, N4MQU 50, N4MMM 46, W4LWZ 40, W4EHF 37, N4JRE 36, WA2EDN 31, AJ5F 27, AA4SD 27, N4LST 21, KA4OXF 16, N4UE 16, AB4EO 15, NT4K 14, N4CJJ 11, WD4EQK 10, KB4FKF 4.

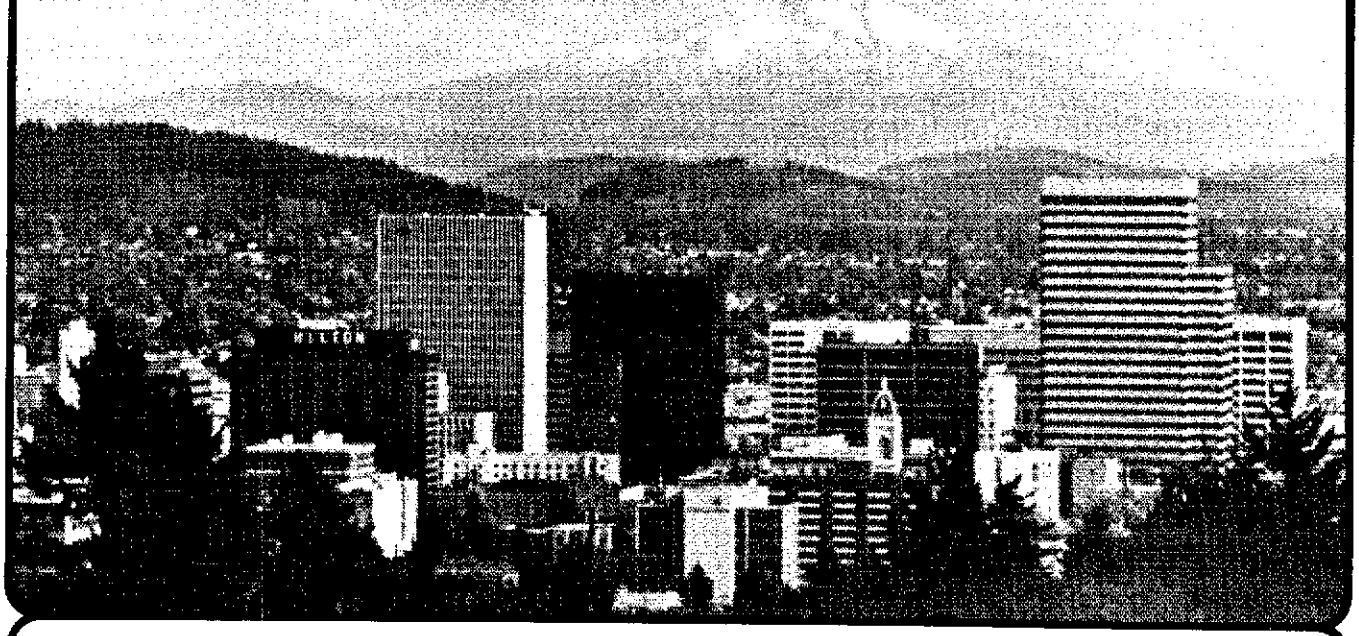
SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— This month I will introduce you to individuals who have volunteered their time to carry on Section level assignments within the SC ARRL Field Organization. WB4UDK is Assistant Section Manager (ASM) and serves as my general assistant, specialist on net operation and "DATA BASE" of information on amateurs in the section. W0IKT is in charge of the Official Bulletin Station (OBS) network which provides a vital communications link for informing the amateur community on latest developments in Amateur Radio, the ARRL and our section as Bulletin Manager (BM). W4NTO, Official Observer Coordinator (OOC), supervises the monitoring work of our section Official Observers (OO), coordinates special Amateur Auxiliary efforts with Regional Monitoring Stations and the Section Manager (SM). KJ4DT is Public Information Officer (PIO) and is responsible for organizing, training, guiding and coordinating activities of the Public Information Assistants (PIAs). K4SUG is appointed Section Emergency Coordinator (SEC) to take care of matters pertaining to emergency communications and the Amateur Radio Emergency Service (ARES). W4ANK is appointed Section Traffic Manager (STM) to supervise traffic handling and coordinating activities of all traffic nets so that connections with other nets will effect orderly and efficient traffic flow. Charged with the daily and orderly operation of our section traffic nets are WA4HNA (SCSSB NET) and KA4UIV (SCNT NET). W4DRF is an Amateur Interference Reporting Station (AIRS) and provides detailed information which is used by the ARRL to protect our allocated bands. I must point out that AIRS is not a section level appointment you request, you must be selected and willing to serve in this capacity. Traffic: W4ANK 163, K4ZN 122, KB4BZA 100, WA4LPV 86, N4MEJ 57, KA4LRM 40, WB4UDK 27, W4DRF 16.

VIRGINIA: SM, Mark Witt, NN4I—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. SGL: W4UMC. POI: AA4VP. TC: WX4C.

VTN	1:00 PM	3907	KB4NGO
VSBN	6:00 PM	3947	KI4BR
VSN	6:30 PM	3680	N4KSO
VN (early)	7:00 PM	3680	N4GHI
VN (late)	10:00 PM	3680	WB4KSG
VLN	10:15 PM	3947	KA4TWI
SVEN	7:15 PM	146.82	NT4S
STARES	8:00 PM	146.97	KI4VT
DEC/EC	9:45 PM(3RD THURS)	3910	KA4NWK

My sincerest thanks to Claude Feigley, W3ATQ, who for four years has led the Virginia Section as SM. Claude leaves a legacy of outstanding appointees with all staff positions filled. His innovations and even-handedness as manager have given a boost to Amateur Radio in Virginia and respect from all who know his work. We will continue to hear from Claude as TC, ORS, OES, and NC8. Thanks, Claude. The Roanoke Mayfest is May 29 and Manassas June 6. I will conduct a meeting for all appointees with reports from the members of the staff who will be attending. Congratulations to the Hampden-Sydeny ARC which is now an affiliated club. The charter will be presented by the SM. I plan to accept all invitations from clubs to speak as suitable schedules can be arranged. When possible, I or a staff member will speak to Amateur Radio classes to provide them with information on the League and the Volunteer Resources Program. Virginia Beach Sep. 17-18. THE VIRGINIA HAM will continue to be published by the SM

1988 ARRL NATIONAL CONVENTION
September 9 - 11



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and edited by PIO Dave Norden, AA4VP. Send your information and articles to him or he will interview you. If you hold an appointment and are not receiving the HAM, please contact me. Use its information to spread the word about Amateur Radio in Virginia. Affiliated Clubs who have not submitted 1988 annual reports are urged to do so immediately. March traffic totals with N4GHI and K4DOR making BPL. Traffic: N4GHI 581, K4DOR 524, N4EXQ 314, K4MTX 313, W4JLS 297, WB4PNY 246, KB4NGO 222, W3ATQ 197, WD4FTK 164, KB4WT 136, WB4ZNB 81, K4BGZ 80, NG2H 76, W4TZC 70, KK4FV 63, WB4KSG 59, WA4LTO 56, WB4ZTR 51, KJ4VT 50, AA4GL 49, N4KSO 48, N6ANQ 37, KB4OPR 31, K4JIM 30, NT4S 29, K4MLC 23, WB4KIT 21, NN4I 19, KK8L 15, K4VWK 14, KI4BR 13, KA4WYF 13, WA4TVS 10, WB4EDB 9, K4GR 9, KI4W 7, N4FNT 5, KB4UED 4, KA8TNF 4, W4YE 4, WA1VRL 3, N4LYO 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8CTO. Rpt. Coord: WD8OZT. Chas H.F. on 4/9 was very successful. Congrats to N8AJC and all who helped. KE8PO is now WD8V, Congrats Ollie. Yours truly is now on packet. Msgs may be sent @ KA8ZXP. Remember WV H.F. at Jax Mill on July 2 and 3.

Net	Freq	Time	QNI	QTC	SessNM	
WVFN	3865	6:00	1258	134	31	W8YP
WVMD	7235	11:45	904	41	31	W8FZP
WVN	3567	7:00	315	98	31	KZ8Q
WVRN	3840	6:30	300	33	31	K8LG
WVNN	3730	5:15	188	56	31	WD8V
Hillbilly	14290	Noon Su	129	8	4	W8YP

Traffic: KA8WNO 452, KE8PO 297, W8YP 227, K8TPF 185, KD8WX 155, W8FZP 115, KA8ZXP 114, K8QEW 91, KE8FI 89, WD8LDY 63, K8UQY 57, N8FXH 49, WD8DHC 39, K8KT 38, NJ8J 23, KA8QHC 22, KA8OGF 20, NC8G 19.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J-ASM: KA0MQA. SEC: WB0TUB. STM: KB0Z ACC: WB0DUV. OOC: KA0CDN/W0JR. TC: W0LJF. SGL: WB0FQB. PIO: N0DZA. BM: K0WOP. The Colorado Section now has a team effort for the leadership position of OOC. KA0CDN & W0IJR. Many of you are familiar with their efforts with the Mile Hi VE Team & Mile Hi DX Club. If you are interested in participating in the OO program, please let them know. The Colo State Convention in conjunction with the ARA/SARES Swap was a hugh success. Attendance was an all time high. Thanks to K0KE-UHF/VHF, WA6ERB- Packet, N0RR-DX, AG0X-ARRL for the excellent forums. The following awards were given out at the convention. ARRL Colorado Section Amateur of the Year, KE6LT. SARES Outstanding Public Service through Media Communications, Paula Woodward KUSA-TV. SARES Outstanding Achievements through Amateur Communications, KA0CDN. ARA Awards Presidents Gavel, WD0HNP, ARA School Awards KA7TYU, KK4VF, W0SM, and to KD0NT & N0FVF for Communications Coordinations of Denver Parades. Congrats to all award winners. Superfest will be held June 10th & 11th at the Larimer County Fairgounds in Loveland. Contact KA0RXJ. Hope to see you there. 73, KQOJ. Nets: CWN; QNI 95, QTC 66, Time 339, 27 sess. COL; QNI 1144, QTC: 44-123, Time 972, 31 sess. HNN; QNI 2490, QTC 151-905, Time 1482, 31 sess. SCTN; QNI 241, QTC 29, Time 273, 25 sess. NCTN; QNI 178, QTC 58, Time 250, 27 sess. Traffic: N0HFZ 331, K0HOA 153, KB0Z 100, WD0BSZ 99, WB0FFV 64, K0INI 54, KA0WIE 46, WB0BLV 26, W0NFW 18, KE0BI 12.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 at 0230 UTC, handled 125 msgs with 236 checkins. NM Roadrunner Net meets daily, 3939 at 0100 UTC, handled 52 msgs with 1532 checkins. NM Breakfast Club meets daily, 3939 at 6:30 AM, handled 186 msgs with 1086 checkins. Yucca 2-mtr Net, 78/18, handled 18 msgs with 376 checkins. Caravan Club 2-mtr Net, 66/06 with 113 checkins. SCAT Net, 66/06 handled 9 msgs with 641 checkins. Info Net 12/72, with 88 checkins. Many of us are looking forward to a great Field Day. Lots of us are also looking for a wonderful time at Ft. Tuthill (Flagstaff, AZ) July 29, 30 & 31. So very sorry to report the passing of W5NV, W7JRJ & K5BZ. They will certainly be missed. Traffic: W5DAD 140, KB5UL 103.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Efforts are underway to fully integrate packet and NTS. If you have any suggestions or wish to help, please contact me. N7JLC now NCS on TWN/D. He indicates we need more Utah representation on TWN/D. Attn RACES ops: An exercise is sked for the week of June 20. Contact ur EC or SEC for info. 73 de NA7G. Traffic: N7JLC 70, NS7K 64, WA7MEL 57, N7ASY 51, N7IUN 40, NA7G 17, W7OCX 8.

WYOMING: SM, Jim Raister, N7GVV—ASM: WA7H. SEC: W7TZK. NM: KC7AR, W7MZW, WB7K. ORS: NN7H. OO: WC7B. (County) EC for the 23 counties are: (1) WA7CJC, (2) WC7S, (3) WB7D, (4) N7ERH, (5) WB7K, (6) KD7SU, (7) WB7ABG, (8) WA7SNU, (9) WB7S, (10) WB7AHL, (11) K7MBJ, (12) W7PIF, (13) NX7Z, (14) WA7DKZ, (15) AA2N, (16) N7BVX, (17) WC7M, (18) W7TZK. (19) NS7R. (20) K7SAR, (21) WB7QPA, (22) WB7CQS, (23) W7ILL. N7JJY reported that a ham traveling on I-25 came upon an accident and using the area repeater contacted N7JJY, who used the local 460 MHz autopatch to contact 911 and the HW patrol. Traffic: W7TZK 253, Nets: Cowboy 22s/762 QNI/11 QTC, Pony Express 4s/200/2, STATE ARES 4s/155/0, 6 ARES 2M held 27 sessions/224 QNI/4 QTC. Watch for WC200M, KT200V, and W200GUX Bicentennial stations July 9-15. Also WY Hamfest in Laramie on July 9, 10, and 11.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W-ASM: W4XI. SEC: KB4GDN. STM: N4RT. ACC: AA4BL. PIO: KB4KCH. SGL: N4FRQ. OOC: KF4VS. TC N4QII. Good luck to all of our section clubs on their Field Day efforts this year. Next month in this report I will detail the new Alabama section emergency plan developed by SEC KB4GDN. Each county in the state will be assigned to a district that will be the responsibility of the DEC. If you are now an EC or DEC, please contact Boyd about the new plan. The Alabama Public Service Commission has ruled there is no applicable rate for amateur radio repeater autopatches in Alabama. A hearing is now being set up to hopefully get a reduced rate for the amateur service. The Alabama Repeater Council has been working hard for this - let's hope we have good news to report. Sorry to report Bill Owens of Huntsville, W4YXW, is a Silent Key. He was one of the original founders of the Huntsville ARC. The Shelby County ARC will operate AC2Ø0T Dec. 10-16 as part of the U.S. Constitution Bicentennial celebration.

NET	Freq	Sess	QNI	QTC	Mgr
AEND	3725	31	133	40	NA4DCS
ATNM	3965	35	3640	85	WO4E

PSHR: WA4JDH, W4PIM, BPL: WA4JDH. Traffic: WA4JDH 933, W4PIM 266, WO4W 7.

GEORGIA: SM: Eddy Kosobucki, K4JNL—ASM & ACC: WA4ABY. SEC: NC4E. STM: WB4WQL. ASTM (Packet): W4QO. BM: WB4ZOJ. OOC: W4TG. PIO: WB4DEB. SGL: WB4UVW. TC: WD4PAH. This is Field Day month. I am hoping that we can once again get the participation we've had in the previous years. The scores have been good so let's keep it up and keep GA on the map. June is also the month for the Albany annual Hamfest. The dates are Friday June 10th and Saturday June 11th, same place as it was last year at the Heritage House. It seems that in the past couple of years that the Sunday attendance has been down for some reason. The only report of a Silent Key I received is Don, W4PVW of Cordele. Our sympathy to his family and friends. The Columbus and Kennehoochee Hamfests were great successes and well attended. NC4E informs me that our ARES membership in the section is pushing a 1000. With over 8500 hams in the section let's register with our DEC or EC and maybe we can get to about 25%. You do not need to be an ARRL member to join ARES but we would like to have you join. W4TG is still needing more OOs. As you well know, we are a self policing organization. If you are interested, contact Harvey. The Augusta Herald recently wrote an FB article on the hobby. Many newspapers and local TV stations can give us a boost. With the GA license tag issue coming before the legislature next year we can use this media publicity. The section nets have an increase in QNI this month. PSHR honorees this past month are: WB4DVZ, WD4COL, WB4WQL, KF4FG, N4MWR, W4RWB, W4HON, KB4JPN and KA4HHE. Once again if you or your group are planning an ARRL sanctioned Hamfest you must get the necessary forms from Mrs. Bernice Dunn at ARRL HQ at least 3 months before the date of the function. Here's hoping to see you in Albany or on the air during FD. 73 & God bless Traffic: WB4DVZ 140, WD4COL 121, WB4WQL 119, KF4FG 62, N4MWR 59, KA4HHE 39, WB4ZOJ 32, W4RWB 27, KB4JPN 25, K4BAI 17, K4EV 15, K4JNL 13, W4HON 10.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI-ASM: KB4LB. BM: N4GMU. ACC: WD4RIQ. OOC: AB6I. STM: AA4HT. SEC: WA4PUP. PIO: WA4PUO. SGL: KC4N. TC: W0RAO. How are your club classes going? Some of you may have already graduated your first group of Novices this year, and if you have I would like to be advised of their names so we may keep account of how many new Novices we can generate this year. For those of you who are still planning to offer a program for prospective Novices, be sure to obtain the new Novice Instructors Guide. It has a complete lesson plan and what needs to be done each week for twelve weeks, leading up to the day that exams are given for the students. Not everyone will pass the same day, and so you need to be prepared to handle the few fast ones who can learn more quickly than others. For them you can try to get their code speed up so they may try for the 13 WPM test at your next VE Exam Session. So, please let me know of your plans and successes and if you have any novel ideas we will be glad to pass them along. It is the addition of new Novices that will keep our ranks growing. At this writing we are still waiting to see what the FCC will do about the UPS and other proposals for "200" I located my letter to the FCC and it was dated March 27, 1987, and we had to do it again! Roy Neal said at the ORLANDO HAMCATION that we would experience some much higher solar flux numbers toward the end of 1988. That will be good for Novice 10 meters. Traffic: WD4IIO 1000, WX4H 677, WA4QXT 654, N4PL 566, K4CY 413, AA4HT 379 N4SS 249, WC4D 213, AA4QC 200, KB4LB 179, WD4IVI 134, WD4IUI 134, N4GMU 118, WA4EYU 114, W4KIX 96, W7YWF 88, N4JAQ 71, N4ADI 65, N4DY 61, NF4O 47, WB4TZR 47, N4QY8 47, N4JHI 45, WB4GHU 44, KA4KAH 43, W4UEA 39, N4COB 30, W4AT 30, KI4CQ 27, N2AOX 26, WD4DTV 24, KI4NN 23, N4NKI 21, KB4WPI 18, WA4SXW 18, N4OZD 13, WA4PUP 12, KJ4HS 10, WD4FJY 10, NQ4P 8, NS4C 8, W8IM 5, KB4HNO 2.

SOUTHERN FLORIDA: SM, Richard D. Hill WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: K4EUK. WD4KBW reports 87 bulletins received and 155 sent by AA4BN 19, W4DL 67, WA4EIC 67, WT4F 16, K4IEK 41, WD4KBW 24, and WA4RLV 8 during February. The March bulletins showed 87 received and 132 sent by AA4BN 21, W4DL 54, WA4EIC 29, WT4F 31, K4IEK 30, WD4KBW 26, and WA4RLV 8. Two Southern Florida hams were featured in local newspapers the last few weeks-WA3TOX had a very nice article and picture in the Bradenton Herald, and KA4YHS had a great article and picture in the Monday Newspaper, a local newspaper in the Delray Beach area. Net only did they get good publicity, but also ham radio in general. Thanks for your efforts! Had the following message from AB4EA/VE3ISD: BT Closing down going home x thank you all for bearing with my poor signals x here most campers first contact with ham radio very positive x if you in Niagara Falls area stay over with us address callbook VE3ISD x see you November 73 BT Eric. Thanks to AB4EA for his extensive efforts in writing some simplified traffic handling instructions for beginners. These will be forwarded to Headquarters. The Everglades ARC Beam reports that their effort in providing communications for the Flamingo Century Bicycle Ride in the Everglades Park was very enjoyable and well supported. The SBARC Spark indicated that their Special Bicentennial Station did a fine business job considering that thay had to contend with contest QRM that same weekend. K4FQU reported in the Fort Myers ARC Modulator that 31 hams assisted with communications for the Pageant of Light Parade-it was the largest parade yet and one of the smoothest. N4NZI also provided the information that each ham wore a red baseball cap with the words "Parade Radio." The QCWA Gator newsletter from Largo notes that the national QCWA net is held each Sunday on 14.347 kHz at 2000 UTC. Each chapter is requested to arrange for volunteers to serve as chapter representatives. The BARS Slant Bars report (tongue in cheek) that "the April issue of QST is out and some of you guys are having trouble finding the "April Fool" gag. For shame!" The Sarasota ARA newsletter indicates that while final results are not in, the hamfest was a success in every way! I can vouch for that!! The Tampa Bay Repeater Association's bulletin, QSP told of two events-Special Event Station, KJ4XP, was operated from the Museum of Science & Industry and communications furnished the Gasparilla Parade-incidently everyone showed up for their assignment in spite

of a rainy cold front moving through! A more recent QSP provided the information that communications were provided for the 1988 Hillsborough County Special Olympics Games at the University of South Florida. Rain was again the order of the day, but all went smoothly including a couple of calls for medical assistance. The Broward ARC bulletin gave information that this year the annual picnic and Field Day are going to be combined and that it will be a Field Day Bar-B-Q. KB4XE said that the Broward ARC was beginning a program which will provide for continuing instruction in all five license classes. KA4KVI from the Broward ARC reports that the Goodyear Company confirmed that it will once again support the 1988 Amateur Radio GRAFF-2 communications demonstration to be held on May 7th. This year the focus will be on simulated emergency communications. The Palmetto ARC's Bug Juice states that everything is running so smoothly, that there is very little to report. The South Florida F.M. Assoc., Inc scheduled a program on Hurricane Floyd given by KB4PWN. Congrats to the South Florida F.M. Assoc. on their recent affiliation with ARRL. Congrats to Miss Phil, KA4FZI, who will become manager of QFN beginning July 1. With this new responsibility she is giving up her work as CW Traffic Nets Editor for Florida Skip. Ed, K4IA will take over as CW Traffic Nets Editor beginning June 1 and will write the column with the information received for May activity. The ARRL Information Net meets each Saturday at 8:00 AM on 3940 kHz-Hope you will check in or listen. Congrats to W4GED who has qualified for Amateur Auxiliary. 73 de WA4PFK. Traffic: W3CUL 3035, W3VR 1012, K4SCL 723, WA9VND 539, KC4DVW 462, W4NFK 436, WA4PFK 424, K4EUK 359, WD4KBW 354, WA4EIC 313, K4ZK 284, WD4CHO 236, WA4RUE 227, AA4BN 217, KK4WR 212, K4IA 211, KA4FZI 200, N4ET 196, W4TAH 170, W4DL 141, WA4RLV 124, WB4AID 124, KJ4WJ 115, KY4U 107, KB4MON 103, KB4LPL 98, W4NVU 90, KI4ZW 89, KB4KXV 86, KA4YHS 81, N4MML 78, AA4ZV 74, KA4NXF 61, KA4AJR 55, W4UIO 52, KA9GYF KF4RL 46, N4ORZ 45, N1EGN 43, W3TLV 37, WT4F 37, KB4UIA 36, W4VQE 36, WA4VWJ 34, K4FQU 31, WD4NXK 31, WB4GCK 27, W1KAM 24, KA4SIH 23, K9EHP 22, WA4HDH 21, KB4UHC 21, WA4LGT 20, KA9AKY 19, N4QER 18, VE3SI 15, WA4HXU 15, N2COI 14, KF4JA 13, KB4TIU 11, W4MPV 10, AA4WJ 9, AB4BC 8, W3IJR 7, NK8O 7, W4DWN 6, AA4CH 6, N4FLG 6, KD4GR 6, W8OM 6, KA4GDU 5, WA1BWV 5, W4MFD 5, N4NZI 5, N4PFQ 4, KA4GDU 4, K4OVC 3, N4SFW 3, N2FEL 3, NX5Q 3, KB4YHS 3, KA9CKQ 2, N4RHJ 2, N4PSV 2, AA4IF 1, W4NSY 1. (Feb.) N4ORZ 58, KC4BBH 4.

WEST INDIES: SM, Antonio J. Purcell, KP4IG—STM: WP4FMH. SEC: KP4JV. PIO: NP4XM. TC: KP4ARY. SGL: WP4CSG. NM-WINC: KP4LP. NM-WINS: KP4DJ. NM-WINE: VP2VI. Congrats to Roberto, KP4LP, and Adrian, WP4FMH, for their respective appointments. Also congrats to Adalberto, NP4XM, section PIO, for his selection as Manager of the Year of PRMA, south region. Special thanks to KP4FFW, KP4EIH, WP4FMH and VP2VI for being NCS of the WINS CW Net on 3710 kHz on behalf of Willie, KP4DJ, NM. Support our Nets: WINC-145.350 MHz daily at 2230 UTC and WINS-3710 kHz daily at 2300 UTC. Traffic: WINS-sessions: 30, QND: 230, QNI: 114, QTC: 45. WINC sions: 31, QNI: 729, QTC 7.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP, NMs: K7POF, K6LL, WB7CAG. Please send all monthly traffic reports to the STM by the fifth of each month. Thanks. So. Mt. Swapmeet another big success. Met numerous section traffic handlers from ATEN and Cactus nets including such stalwarts as K7POF, WK7B, W7OIF and WB7CAG. Also visited with section leaders KX7P, SEC; K7KT, TC; NJ7E, OOC; N7ECE, ACC; and KQ7T, DEC. Swapmeet was hosted by ARA and attendance estimated at over 2,000. South Arizona DX Club members went to Obregon, Sonora for annual ARRL DX phone contest. Joint operation with Obregon amateurs using special call sign 6D2DX for the contest. Host was Tino, XE2FEF, and operation was from his home. Gigantic score was run up; look for final results in Contest Results column when published. AZ operators were: NI7Y, WB7A, N7DD, WØYOY, VE7RG (AZ visitor), and WAØNNC. All were issued individual XE2 call signs by Mexican licensing officials. NI7Y is QSL Mgr. for 6D2DX. Dave Sumner, K1ZZ, Exec V.P. of the League has accepted our invitation to visit Ft. Tuthill Hamfest at Flagstaff, July 29-31. Also understand that ON4UN of low band DX fame will also be with us. On March 14, while backpacking in the Galiuro Mtns. east of Tucson, N7CEE came across a horse- riding group, one member of which had suffered a stroke. Bruce hiked to a nearby peak, and using his 2M H.T. contacted W7JXQ thru the 146.74 repeater. A DPS Medevac team in a helicopter made the evacuation to a hospital less than two hours later. The victim is out of hospital and improving. Great work Bruce and Gerry! W7YS reports VE testing this month in Flag with twelve candidates including four upgrades. Recently elected officers for North Arizona DX Assoc. are: Pres.; NN7A, Sec.-Treas.; KD7XO, Program Dir.; NG7S, and N.L. Editor KR7Y. Congrats to Craig, N7GLT and XYL Bonnie for bringing in a new second harmonic. It's a BOY. Has he started his code classes yet, Craig? SW Division Dir. WA6WZO and your SM visited newly named West Valley ARC in Sun City. This is really a big club now with over 300 members and is ARRL affiliated. Their net meets every Wed. at 7:00 PM on 145.29/144.69 with info from Westlink, W5YI report, and ARRL bulletins. Central AZ, DX Assoc. meets every first Thursday of each month at 7:00 PM at Lunt Ave. Marble Club 2 E. Camelback Road, Phoenix. Dinner is optional at 6:30. AllDx'ers are welcom. (Tnx Short Skip). Yavapai Co. ARES members WC7R, K7OFG, KQ7T, and WF7J participated in recent simulated emergency drill initiated by NOAA National Weather Service. Commendation was received from the Co. Emergency Services Director in Prescott. Congrats. Verde Valley ARC put on live ham radio Demo at a local high school, and as a result over one hundred students signed up for a four-day seminar! Participants were: NZ7I, KC2EN, KQ7T, W7EI, KB7EAD, KB7EDK, N7ACZ, and WI6S. KQ7T set up packet station and worked with W7DC. Great work. Scottsdale ARC participated in a drill, "Mock Airplane Crash," conducted by the Red Cross. They furnished communications between seven sites, including the airport, hospitals and executive terminal. Drill was a great success and as a result the Phoenix Fire Dept. has requested amateur radio assistance on a future drill. Keep up the good work, (Tnx. Desert Aire Waves). That's it. Keep those cards and letters coming in. 73, Jim.

Net	Abbrev	QNI	Traffic	Sess
Southwest Net	SWN	238	125	31
Arizona Cactus Net(HF)	ACN	659	49	31
Arizona Cactus Net(VHF)	ACN	307	97	31
Arizona TFC & Emerg Net	ATEN	1111	189	31

Traffic: W7AMM 223, W7EP 163,W7KCM 150, KE7EO 82, WE7G 70, N7ETP 67, W7LVB 48, W7KXE 40, K7POF 38, W7OIF 32, W7GAQ 14, KD7SK 6.

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—Please make your reservations with Dick, N6ISY, for the SW Division Convention-HAMCON 88- Sept 2,3, & 4 at the Disneyland Hotel. Special Convention rates are available by dialing TOLL FREE 1- 800-MICKEY 1 —SEE U THERE.. The Collector/Emitter News relates that when a lawyer is removed from his job, he is said to be DISBARRED, and when a priest is removed from the order, he is said to be DEFROCKED. You may wonder what about others, like electricians: They are DELIGHTED; musicians: DENOTED; cowboys: DERANGED; models: DEPOSED; judges: DISTORTED; mediums: DESPIRITED; office clerks: DEFILED; bankers: DISINTERESTED and wine merchants: DEPORTED. Some teachers are DEGRADED while song writers are DECOMPOSED. The podiatrist is DEFEATED, the printer is DEPRESSED while the maestro is DISCONCERTED. You can make up you own from here. Fried and Phineas paid a friendly visit to the new FCC office in Cerritos a few weeks ago to visit with Larry Guy, the Engineer in Charge. The FCC move from Long Beach to Cerritos was completed recently, the address is, Cerritos Corporate Tower, 18000 Studebaker Rd., Room 660, Cerritos, CA 90701. (213) 426-4451. The Southern Cal. SIX METER CLUB Newsletter lists new operational repeaters. Mike, KB6GVT, has his repeater coordinated and on the air! Input is 52.180 and the Output is 52.980 with 1A PL that is not usually operative. Ken, N6CRF, is the trustee of the repater at 52.02/52.82. The machine is located on Johnstone Peak and has about 55 watts output. The General Dynamics Swap Meet is held the 2nd Saturday of each month. 7:30 AM to 11:30 AM; take the San Bernardino Freeway to Haven Ave. North to FOURTH, Turn right to the site; 1/2 Block to the right; talk-in 146.91. The report is that this SWAP MEET is grwoing and some nice bargains reported. 1988 North American 50 MHz SSB Directory & Beacon List and 6 meter Repeater Directory publications are $8.00 each or both for $15.00 from Harry A. Schools, KA3B, 1606 S. Newkirk St., Philadelphia, PA 19145. Everything is well at ARES these days, especially since Hank, K6YMJ, and Dennis, KA6GSE, called me about ARRL patches and hats for an Emergency Communications Test operation using Helicopters. The hat design turned out to be very popular with ARES members. I received ten hats from the first test batch and took them down to the Baldwin Hills ARC meeting on April 6th a few days after we received the first batch. It turned out that we had many more ARES customers than hats so the marketing test was a big success. It may be that, almost anything these days with a price tag under five dollars is a real bargain. ARES members please contact your DEC or fellow EC for more information. 73, CU on the Friendly ET Net almost every day. STM News: Sorry no traffic listing last month, however I did send it in. Guess post office got mixed up, however my RN6 reports and public service appeared. Thanks to W6NKE for his help with the missing reports. Ron, WB6VPY, is now the new owner of a new TS 940 with trimmings. N7CZF is now back in the saddle again and going great. Easter was not the usual heavy that it has been in previous years. Guess we are getting lax, let's not let packet out do us. Traffic: N6LHE 554, K6UYK 406, W6TH 290, W6INH 272, K6YBV 42, KI6A 38, K6CL 18, W6NKE 15.

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: Riv. Co. W6LKN, Bob 714- 686-3823. ASM: Org. Co. Ralph, WB6JBI 714-776-9272. ASM: San Ber. Co. Tony, WB6QHB 714-981-1836. ACC, Sandy, WA6WZN, sez start thinking of "Field Day." Your club will train qualified applicants for high playing jobs. Call your Club Field Day Chairperson before 24/26 June. From the BPARC, Observations after listening to 10 meters: there are a lot of new amateurs with a lot to learn about operating an amateur station. Observation after listening to 40 meters. There are a lot of old-time amateurs with a lot to learn about operating an Amateur Radio station. So Cal Six Mtr Club meets Tue 8 PM, PST 50.150 SSB. Vert Polar, Tue 8:30 PM PST, 28.400 SSB. The 10 meter net is also an info net, not only 6 mtrs, but Amateur Radio. Novice and Tech, have a grounding problem, TVI? Check in! SEC: Ken, WA6ZEF, reports from the 2nd Emergency Response Institute indicates a smashing success. SM, Glenn, WB6W, and ASM, Dan, N6JQJ, of the Santa Clara Valley Section; did a fantastic job. The RACES-officer certified training session presented by Stan, KH6GBX, of OES State of Calif was outstanding. From the Orange Section, 9 ARES/RACES members attended. Calls and sponsors as follows: Jim, KA6G, Russ, W6DPJ, City of Anaheim, Mark, KD6KQ, Huntington Beach. Corky, N6HQI, Dave, WA6PMX, ARRL. Brad, N6NLN, Dean, KG6Y8, Fred, KA6IXY, Lee, N6HGT, Joe, W6UBQ, ARRL/Riv Co FD. ASM; Digital, Mike, N6KZB. The mini-node system on 223.42 is completed. Thanks to AJ6F, N6GDM, N6FRW, WB7QKP, KD7XG and K6IYK, the Org Sec BBs have a secure path for inter-region traffic handling. The nodes are vera13, rim2, pine2, pv11 and pv2. The plus is Novices get a chance at BBSs and node experience. With the opening of Fire Season, all packeteers registered in RACES/VIP program are reminded to coordinate their activities with local RACES/ARES officials. Train now and be ready to provide fire camp comm in digital mode! Attention SYSOPs, please submit your tfc totals to N6KZB, need msgs entered, NTS msgs and total msgs forwarded. KD7XG BB March rpt. 702 msgs ent, 106 NTS msgs and 510 msgs forwarded. STM, Dan WF6O, Traffic Happenings: SCN1 ses 31, QNI 297, QTC 299. SCN2 SE- 25, QNI-110, QTC-62. SCNV SE31, QNI 322, QTC 213. Station Totals WF6O 845 BPL, PSHR, AD@A 163, N6QXR 111. KA6HJK 96, PSHR. WA6QCA 81, PSHR. WB6QBZ 68 PSHR, K6ZCE 68. N6GOT 62. W6CPB 30, KB6OJS 28, N6ADV 27, K6DD 25, W6NTN 15, KA6GND 21, W6SX 11, KA6TND 7.

SAN DIEGO: SM, Arthur R. Smith, W6INI-SEC: W6INI. TC: N6JZE. STM: N6GW. WANTED! Volunteers to assist Calif Dept of Forestry at the Del Mar Fair. Contact W6INI, 273-1120, for information. Join ARES thru one of the following nets: *1000 Sun 28.375 MHz Section Net, SSB. *2030 Mon 28.450 MHz Southern Dist Net, SSB. 0830 Sun 146.73 (-) MHz Section Net, PARC Rptr, FM. 1900 Sun 146.52 MHz Section Net (Alt 146.58), FM. *Novice & Technician operators welcome.

Poway ARS will run Field Day without extensive pre- planning, more in line with a real emergency. ARC of El Cajon sponsors an Amateur Radio swap meet on first Sat at Santee Drive-In Theater, Woodside Ave at Hwy 67, 7:00 AM. North Shores ARC's BEAM has been judged "Superior" by the Amateur Radio News Service. Nice going Lenore (KA6UCD). Upgrades: KB6NTW to Extra; N6NYX, N6NZO to Advance; KB6PLF, N6RRT to Tech. N6CQW was given special recognition, by STM N6GW, for his NTS Bulletion Board. ARC of El Cajon has repeater on new frequencies, 147.675 (-). N. County Traffic Net met 30 times with 415 check-ins, handled 109 messgs. Traffic: KI6ZH 90, N4KRA 86, KI6ZM 80, KU6D 34, N6GW 32.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA-ASM/Ventura: N6MA. ASM/Santa Barbara: WB6BYU. ACC. KB5AH. BM: KI6XG. STM: N6WP. OCC: W8AKF. PIO. N6FOU. TC: W6KFV. SEC: WB6IIY. DEC/Ventura: WB6RVA. DEC/Santa Barbara: N6AJA. DEC/SLO: WB6IIY. ANNOUNCING THE SECTION MANAGER'S FIELD DAY TROPHY and NOVICE/TECH FIELD DAY AWARDS program: Beginning with Field Day, 1988 a "rotating" trophy and permanent Plaque will be awarded to the (bona fide) club posting the best Field Day score in class 2a. Rules of competition are tailored to permit larger Field Day efforts to participate. A permanent plaque will also be awarded to the club who's Novice/Tech station posts the best score. In addition, all Novice/Tech operators participating in that station (operating, setup or other ON SITE work contributing to its sucess) will be awarded a certificate honoring their contribution to a winning effort. By the time you read this, all Section clubs should have received detailed rules. If your club has not received a copy of the rules, and you wish to compete for the trophy/awards, please contact me or Bill Hoover, KB5AH, immediately. If you are not one of the Section's fine clubs, call one near you and join in the Field Day fun. ARRL Affiliated Clubs in SBar are listed below. (*indicates recent Field Day activity).

*Conejo Valley ARC	WA6IAX	Thousand Oaks	499-2155
Cal Poly ARC	W6BHZ	San Luis Obispo	
Estero Bay ARC		Morro Bay/Los Osos	528-0107
Hueneme HS ARC	WB6LAN	Port Hueneme	488-4777
*Lompoc ARC		Lompoc	
*Paso Robles ARC	W6LKF	Paso Robles	466-0808
*Poinsettia ARC		Ventura	482-8031
Righetti HS ARC	WB6ZNB	Santa Barbara	937-2638
*Santa Barbara ARC	K6TZ	Santa Barbara	964-7432
*Satellite ARC	W6AB	VAFB/SlaMaria/ Lompoc	866-6112
*Simi Settlers ARC		Simi Valley	527-4200
*Ventura County ARC	_K6MEP	Oxnard	
Sulphur Mt. Repeater Assoc.	WA6ZTT	Ventura Co.	482-4591
*So. Cal. Contest Club		Southern Cal.	818-355-2787
Central Coast ARS	WB6FMC/R	San Luis Obispo	543-8404

Because of Field Day information and Club listings, we're out of space for this month. We'll continue with the Field Organization structure and history next month. DON'T FORGET THE SANTA MARIA SWAPFEST AND BBQ on Father's Day, June 19, at the Union Oil Picnic Grounds south of Santa Maria (talk-in: 146.34/.94). Field Day on June 25 & 26. 73 for now. Traffic: W6NOR 185, N6NLW 154, KB6IEC 39, KB6HGB 22. (Feb.) N6COI 10.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC-Asst. SM: K5MXQ. SEC: W5GPO. STM: W5VMP. BM: W5QXK. PIO: K5HGL. TC: W5LNL. OOC: WB5JBP. ACC: W5URI. SGL: N1CWP. Welcome aboard to the new Bowie Co. E.C. Harold Mayes, K5FVB, in De Kalb. This fills a major long-standing void in our ARES program in far East Texas. Thanks for your help, Harold! The 146.94 machine in Wichita Falls is sporting a new battery back-up power supply, along with improved coverage via antenna improvments. The Lake County ARC in Graham has formed a 10 meter net to aid Novices in CW, and stimulate activity on the band. The Net meets at 2000L each Tuesday on 28.350. The amateurs in the Northwestern part of our Section have received the KFDX-TV "Good Neighbor of the Year" award for outstanding community service, and were described by Wichita County Judge Nick Gipson as "an invaluable communications resource." Congrats to all involved for your dedication to public service work. The Olney repeater, on 147.24 can now be heard loud and clear in ARES Districts 1,2, and beyond, and is an invaluable tool during ARES activities. This fills a void in coverage during SKYWARN and other operations. ACC/W5URI presented the program at the Temple ARC March meeting, and announced that they have been accredited as a Special Service Club, recognizing their activities in public service for the betterment of Amateur Radio. Congrats, Temple!! SSC status requires a club to be active in emergency preparedness, media publicity, technical activities, education, and more. The award is available to any ARRL affiliated club which meets the stringent qualifications. Contact ACC/W5URI or myself for details. Bell Co. ARES provided primary communications for a county evacuation drill, with the sceanario being an "imminent nuclear attack on Ft. Hood" ARES services were requested by County Judge John Garth. The exercise was planned and implemented by Bell Co. E.C. Chuck Button, N5FFY, which involved the establishment of VHF voice and packet links between several key locations. Eight Bell Co. ARES members participated in the test. I want to thank the many clubs who have put me on their mailing list to receive their newsletters, from which the majority of this column is derived. My address is at the bottom of page 8 of any *QST*, and I welcome your news items. Northeast Tfc, & Emer. Net activity for March: QNI 64, QTC 8, in 9 SESS. Mgr, K5UPN. 7290 Net activity for March: QNI 2,281, QTC 565. Public Service Honor Roll (PSHR) for March: KF5BL, W5VMP, KA5ZWY, KB5ADE, K5UPN, KB5DOE, W5YQZ, N5KCL, K5MXQ and WZ5N. Traffic: W5TNT 368, W5YQZ 303, KD5RC 246, K5UPN 241, WZ5N 190, AJ5K 169, KB5ADE 133, W9OYL 128, K5MXQ 128, W5VMP 118, KF5BL 93, KA5AZK 82, KA5ZWY 40, N5KCL 35, KB5DOE 30, KC5NG 20.

OKLAHOMA: SM,Bill Goswick, K5WG-ACC: Ernie Buck, WB5CDW. BM: Howard Baker, W5AS. OCC: W. Goswick, K5WG. SEC: Bennett Basore, W5ZTN. SGL: Larry Hazelwood, W5NZS. STM: Sam Sitton, KV5X. TC: Ken Isbell, W5QMJ. Field Day preparations are being made by many groups statewide. Make plans to participate in the activies in your area. Those of you who handle traffic are reminded to turn in your Station Activity Report to me or the Section Traffic Manager, Sam Sitton, KV5X, by the fourth day of the month so that your traffic totals can be listed here. All field appointees are reminded that regular reporting of your activities to the appropiate section-level official listed above is required in order to retain your appointment. Current League membership is also a requirement for retaining appointments-do not let your membership expire as I am required to cancel your appointments if that occurs. Any field appointees who would like to obtain the ARRL name/call badge for their appointment contact me for the necessary form. Many of the field appointees in the section have obtained the badges and they are very good-looking.Traffic: KF5RD 405, WB5SRX 299, WA5OUV 106, N5IKN 81, K5GBN 45, WA5ZOO 35, KV5X 33, WA5OGC 28, W5VLW 27, W5RB 26. BPL: KF5RD. PSHR: WB5SRX, KF5RD. (Feb.) W5AS 308, BPL: W5AS. PSHR: W5AS.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: WR5O. ACC: WB5YDD. SGL: K5KJN. PIA: WA5UZB. BM: K5CVD. TC: NZ5U. OOC: WA2VJL. SEC: K5DG. ARRL/VEC Mgr WB9IHH requests that all VE teams be more regular in registering scheduled sessions. PIA N5FIX reports Northwest ARS, Houston, will provide communication for a bayou canoe race and for a March of Dimes Walkathon in April. PIA N5KEP reports Laredo ARC busy with plans for license exams. PIA NZ5J, Seguin, reports club active on Docket 87-143. OBS W5KLV back on line after surgery; WELCOME BACK; he reports 9 bulletins and 4 propagation forecasts boardcast on 9 nets. Brazos Valley ARC (Ft Bend and Harris Counties) planning a regular year book with KB5BAY in charge. 7290 Net Manager KA5AZK reports 3281 check-ins in 50 March sessions; 565 messages passed. DEC K5CZA announced appointment of N5HIT as Asst EC in Cameron County; also reports 34 operators assisted in providing communications for Magic Valley Stock Show; WA5ZRP, K5SJA, N5HIT, WA6DYV. WD8DJO, KA5WCQ, WØZNM, KD9CO, N5DCX, KD5IU, and K5CZA worked all five days. CAND ASM WB5YDD reports 681 messages in 31 March sessions; DRN5 represented 100%; STX stations helping were KE5ZV, KD5KQ, W5LKU, NX5V, W5KLV, WA5ZJY, N5DFO, WB5YDD. EC N5KAO, McCulloch County, reports Heart of Texas Ham Operator Group (HOT HOG) active in Texas adopt-a-highway program. N5AMQ reports upgrading to Extra, awaiting new call; that's GREAT. DRN5 NM WB5YDD reports 639 messages in 62 March sessions; STX represented 100% by KE5ZV, KD5KQ, W5LKU, NX5V, W5KLV, WA5ZJVY, N5DFO, WB5YDD. PIO WA5UZB and BM K5CVD have been visiting clubs all over counties surrounding Houston's Harris County; Amateur Radio and ARRL will be gaining by their efforts. Traffic: WB5YDD 316, WB5J 285, WR5O 233, W5CTZ 161, WD5GKH 133, NV5L 78, WA2VJL 54, WB5EPA 49, AC5Z 35, WA5UZB 30, NZ5J 20, W5BGE 19, KB5EKB 9.

WEST TEXAS: SM, Milly Wise, W5OVH—ASM: KA5PTG, KO5D, WD5EFJ, WF5E, N5DO. SEC: W5MVJ. PIO: KE5ZW. ACC: K5IS. OOC: K5KNC. BM: K5VRF. TC: K5CU. STM: AE5I. Have appointed an OOC for this section, Bill Brewer, K5KNC. In attendance at Midland Hamfest were Jim Haynie, WB5JBP, West Gulf Director, all the ASMs from West Texas, also the SEC, PIO, ACC, OOC, Many DECs and ECs. Soon there may be a 40-meter gateway station to link 145.01 to packet in Amarillo. W5AW Big Springs ARC has two-meter beam put up by J. C. & J. L. Stevens. Congrats to new techs John, KB5ECT, & Bucky, KB5DRZ. Emerg Coord ARES Net, Texas State Net on Sun 3873 at 0030 UTC. The Keyer, the new bulletin of Key City ARC Abilene, advises Bill, N5KXX, is upgrading his antenna farm. Dick, W5RPC, getting on packet. STM Gene, AE5I, wrote a good article on packet radio and how to use it. The Comm trailer of Childress ARC is set for FD. Big Spring ARC is trying to upgrade their 146.82 repeater. The 146.62 repeater is back on in Midland. Snyder ARC holding Novice classes with local Boy Scouts attending. The 10 meter freq of 28.454 USB has been designated as common West Texas emerg freq. W5ES, El Paso Amateur Radio Club has graduated 14 new hams and in addition to code and theory, KB5QV and K5CU taught actual construction of dipole antennas etc. New hams with calls in El Paso, KB5ESA, KB5EZV, KB5EZV, KB5FBF, KB5EZU. The Panhandle ARC advises KB5DHE of Booker and KB5FAM of Perryton upgraded to Tech. W5ES members N5LZB Chris; K5TRW, Clay, and KA5WAC, Jeanie, used Amateur Radio to coordinate the apprehension of a suspected motor home burglary they witnessed and reported via ham radio in down town El Paso. Big Bend ARC reports KA5VFV, Roger, upgraded to Gen. His new call N5MGW. 73, Milly, W5OVH.

ETO/QRO

I intended to discuss grid current derived ALC in this QRO but the story below is hot — we'll talk ALC next time.

SPEAKING OF SERIOUS OPERATORS . . .

The NO1Z/KH1 group (including Ron Kessler, 7J3AAB, ALPHA distributor in Japan) has returned safely from Howland Island. Ron traveled by air via Sydney, Nauru and Kiribati; by boat (three days in rough seas) to Howland and back to Kiribati; finally home to Osaka via Fiji, Auckland and Tokyo. Spent $8,000.

TROPICAL PARADISE

In 6 days on treeless rocks — over 100° F during the day, swept by rain and wind, populated by crabs and birds — the group of NO1Z, TR8JLD, VK9NS, VK9NL and 7J3AAB made 27,000 QSO's. That's serious operating, so of course they depended on...

ALPHA POWER

Ron says his two new ALPHA 86's arrived barely in time to take along. He simply plugged them in and they "worked flawlessly" despite the inhospitable environment and a lot of rough handling.

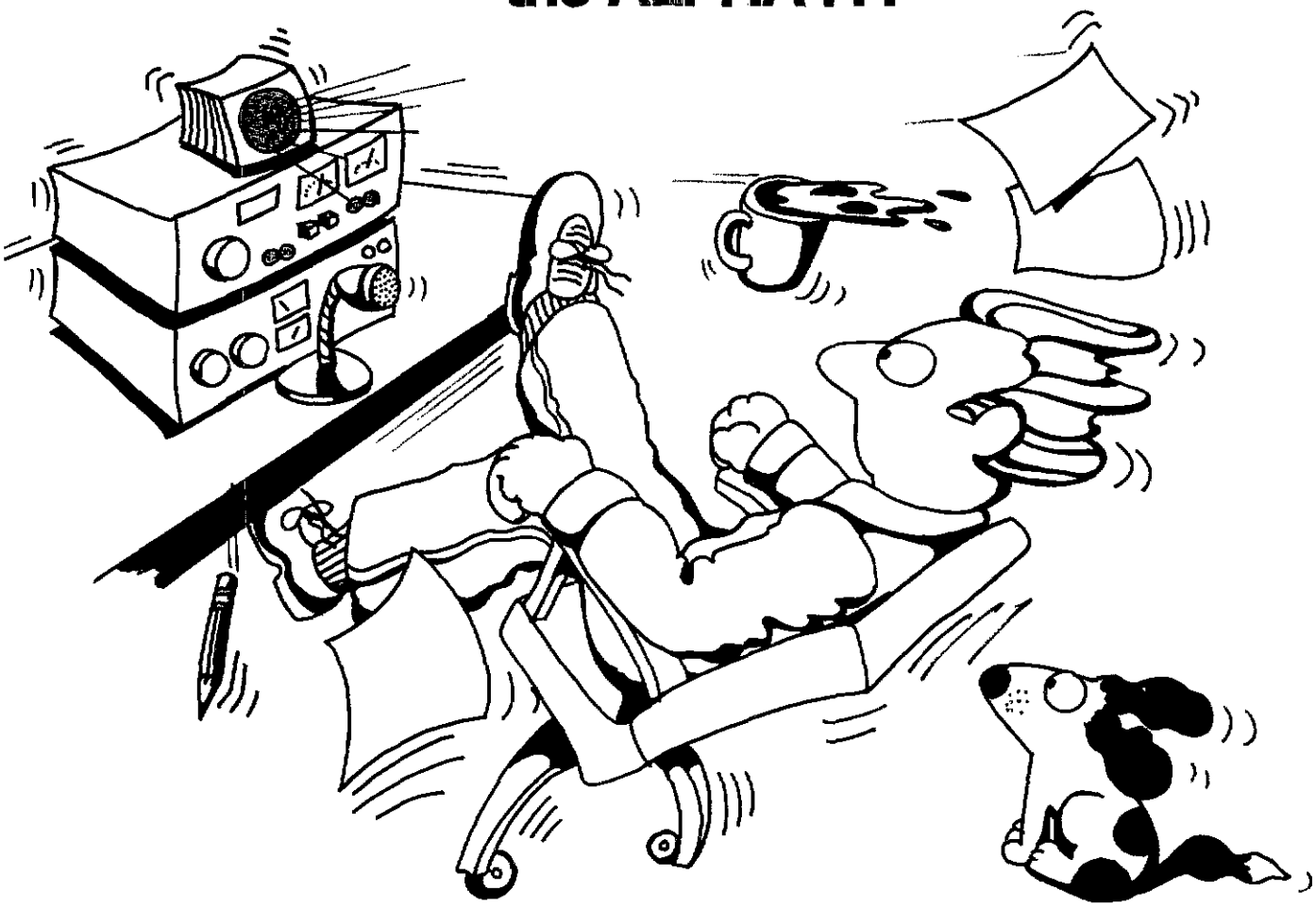
ADVENTURE

Words only hint at the excitement of a major operation like this one. Says 7J3AAB, "No one realizes what's at stake on a DXpedition — you're lucky to get back at all!" By all means take any chance you get to see their video.

73,

Dick Ehrhorn, W4ETO

"... (click) ... just turned on the ALPHA ..."



ALPHA—The Serious Operator's Choice

Contesters take their amateur radio very seriously. Success in long weekends of tough contesting demands a big signal and outstanding equipment reliability—exactly what every ***ALPHA*** linear amplifier is designed and built to deliver.

Respondents to the *NATIONAL CONTEST JOURNAL* 1988 Reader Survey do a lot of operating and they tend to favor the big, intensively competitive DX contests. They average over 12 years of operating experience and 89% hold Extra Class licenses. You'd *expect* them to prefer ***ALPHA*** amplifiers.

But even we were surprised at the *extent* to which these top operators choose ***ETO/ALPHA*** over all other amplifier brands (see table).

Table 4—Comparison of HF Amplifier Manufacturers

NCJ Survey 1988 vs 1981

Manufacturer	*1988*	*1981*
Home-brew	23%	17%
ETO-Alpha	21%	17%
Heathkit	20%	37%
Dentron	7%	13%
Drake	6%	—
Ameritron	5%	—
Henry	4%	3%
Amp Supply	3%	—
Other	11%	4%

Table and operator statistics excerpted with permission from March/April 1988 issue of the NATIONAL CONTEST JOURNAL, published by the American Radio Relay League, Inc.

You don't have to be a contester or a DXer to enjoy the benefits of owning an ***ALPHA***. If you appreciate fine equipment—if you want maximum legal power available whenever (and for however long) you need it—if you want quality and a factory warranty that takes the worry out—isn't a new ***ALPHA*** just what you need?

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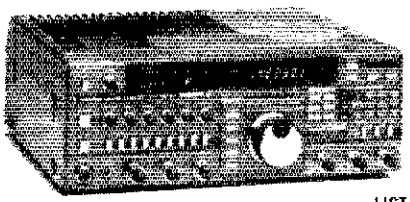
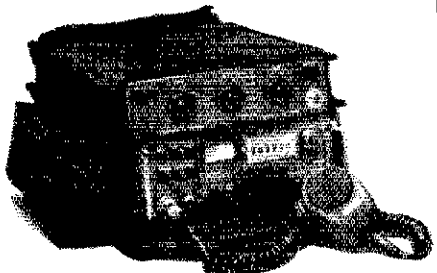


HF Equipment	LIST
FT-767GX 160-10m xcvr/1.1-29.99 MHz Rcvr	$1929.95
SP-767 Speaker w/audio filters	79.95
2M/767 2m module	199.95
6M/767 6m module	199.95
430/767 430-440 module	249.95
440/767 440-450 module	249.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00



FT-70G* MANPACK HF xcvr (*Special Order)	1069.95
FNB-70* Extra 12V, 4 amp-hour nicad	299.95
NC-70* Nicad battery charger/base supply	259.95
CSC-70* Canvas carrying case	89.95
FC-70M* Manual antenna tuner	199.95
FC-70P* Preset antenna tuner	199.95
RSL-70* Whip antenna for FC-70P	27.95
MH-17* Speaker/microphone	31.95
YA-70* Tripod antenna	269.95
YH-70* Telephone-type handset	59.95

FT-757GX MkII 9-band Xcvr/SW Rcvr/mic	$1129.95
FP-757HD Heavy duty supply with fan	299.95
FP-757GX Compact power supply	239.95
FP-700 Power supply	239.95
FRB-757 External relay box	12.95
FC-757AT Automatic ant. tuner w/memory	399.95
FAS-1-4R Remote antenna selector	99.95
MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
GX Turbo/F01 Software; Apple II	59.95
GX Turbo/C01 Software; C64/128	89.95
GX Turbo/V01 Software; VIC-20	89.95
FTV-700 Transverter w/no module	175.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
FT-747GX Transceiver w/hand mic	889.95
FP-757HD Heavy duty supply with fan	299.95
FP-757GX Compact power supply	239.95
FP-700 Power supply	239.95
FM-747 FM unit	44.95
MMB-38 Mobile bracket	16.95
FL-7000 Auto. tune HF linear amplifier	1995.00

Misc. accessories	LIST
SP-102 Speaker with audio filter	$ 99.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	109.95
MH-1B8 Mobile microphone	27.95
YS-60 1.8-60 MHz 2kw PEP wattmeter	99.95
YS-500 140-520 MHz 200w wattmeter	89.95
YH-55 Lo-Z headphones	24.95
YH-77 Lightweight headphones	24.95
FF-501DX Low pass filter	47.95

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HF/726 10-12-15m unit	289.95
6M/726 6m unit	269.95
430/726 430-440 MHz unit (OSCAR)	329.95
440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
AD-2 50w 2m/440 duplexer	41.95
FT-736R 25W 2m/430 full duplex xcvr	1749.95
FEX-736-50 6-meter module	259.95
FEX-736-220 220MHz module	279.95
Other Accessories for FT-736R	Call
FT-211RH 45w 2m FM w/autodialer mic	459.95
FT-311RM 25w 220MHz FM w/autodialer mic	439.95
FT-711RH 35w 440MHz FM w/autodialer mic	479.95
FT-2311R 10w 1.2GHz FM w/autodialer mic	559.95
FT-290R MKII 25w 2m FM/SSB xcvr	599.95
FT-690R MKII 10w 6m FM/SSB xcvr	589.95
FT-790R MKII 25w 430-450 FM/SSB xcvr	799.95
FBA-8 Holder for C-cell Nicads	27.95
NC-26B Wall Charger for FBA-8	11.00
CSC-19 Soft case	10.00
MH-10F8 Speaker/Microphone	29.95
MH-10E8 Hand Microphone	22.95
FTS-7 Encoder/decoder	49.95
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
FTS-8 Encoder/decoder	49.95
FVS-1 Voice synthesizer	34.95
AD-2 50w 2m/440 duplexer	41.95

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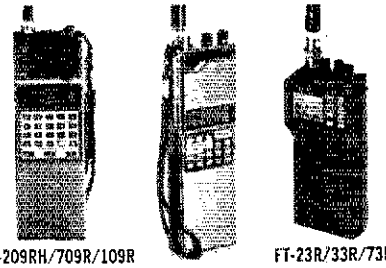

FT-209RH/709R/109R FT-727R FT-23R/33R/73R

Handhelds	LIST
FT-209RH 5w 2m FM HT/TTP/batt/cgr	$389.95
FT-109RH 220 FM HT/TTP/batt/cgr	399.95
FT-709R 4w 440 FM HT/TTP/batt/cgr	389.95
FT-727R 5w 2m/440 FM HT/TTP New CPU!	439.95
FT-23R 2.5w 2m HT	299.95
FT-23R/TTP 2.5w 2m HT w/TTP	334.95
FT-33R 5w 220MHz HT	344.95
FT-33R/TTP 5w 220MHz HT w/TTP	389.95
FT-73R 2w 440MHz compact HT	309.95
FT-73R/TTP 2w 440MHz compact HT w/TTP	349.95

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FBA-5A Alkaline batter holder for 727R	14.95
FNB-3 425ma 10.8v batt (comes w/03 series)	49.95
FNB-3A 425ma 10.8V battery for 727R	49.95
FNB-4 500ma 12v batt (comes w/09-series)	64.95
FNB-4A 500ma 12v batt for 727R	64.95
FTS-6 Encoder/decoder, 09-series	49.95
FTS-7 Encoder/decoder; 03-series	49.95
LCC-6 Leather case; 09-series	39.95
LCC-6A Leather case, 727R only	39.95
MH-12A2B Speaker/microphone	41.95
MH-18A2B Lapel speaker/microphone	41.95
NC-9B Wall charger for FNB-3	11.95
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	11.95
MMB-21 Mobile bracket	11.95
PA-3 Mobile adapter and charger	39.95
TA-2 2m 19" telescoping whip ant	11.95
YH-2 VOX headset	29.95
Other Handheld Accessories	CALL

FRG-9600 FRG-8800

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FRA-7700 Indoor active receive antenna	59.95
FRT-7700 Antenna tuner	64.95
FRV-8800 118-174 MHz VHF converter	129.95
FIF-232C Interface; VIC-20/TI/RS-232	79.95
FF-5 500 KHz low-pass filter for VLF	20.00
DC-8800 DC kit	4.50
FM-W/8800 FM-wide kit	20.00
FRG-9600 60 to 905 MHz receiver	699.95
VU-9600 NTSC video unit	25.00
Catpack software (specify computer)	79.95

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AR-40	CALL	KR5400A	315.00
ALLIANCE		**DAIWA**	
HD-73	$109.00	MR 750 PE	CALL

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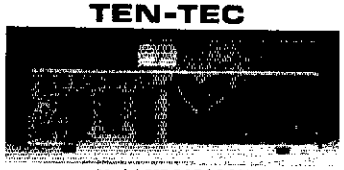

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Thimbles: ¼" (3/16 & ¼" cable).....0.39
Earth Anchor: 4 ft. Screw-in.....13.95
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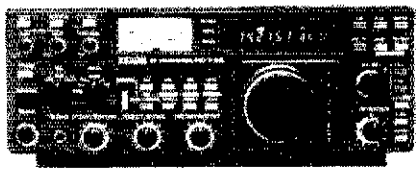
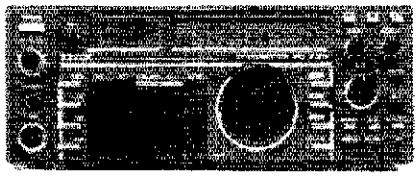
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter	149.00	**139.95**
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	**109.95**
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer	59.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	**1449**
PS-35 Internal power supply	219.00	**199.95**
FL-32A 500 Hz CW filter (1st IF)	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-33 AM filter	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	



IC-735 HF transceiver/SW rcvr/mic	1099.00	**959.95**
PS-55 External power supply	219.00	**199.95**
AT-150 Automatic antenna tuner	445.00	**389.95**
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EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
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PS-15 20A external power supply	175.00	**159.95**
PS-30 Systems p/s w/cord, 6-pin plug	349.00	**319.95**
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A	79.00	
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SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	**139.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	589.00	**519.95**
AH-2 8-band tuner w/mount & whip	659.00	**589.95**
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IC-275H 100W 2m FM/SSB/CW	1399.00	**1229**
IC-375A 25W 220 FM/SSB/CW	1399.00	**1229**
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1249**

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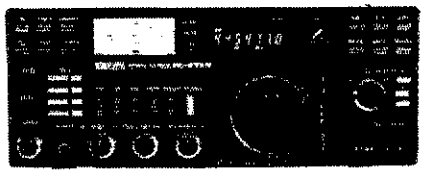
IC-475H 75W 440 FM/SSB/CW	1599.00	**1429**
IC-575A 25W 6 + 10m xcvr w/ps	1399.00	**1249**



IC-471H* 75W 430-450 ... **CLOSEOUT**	1399.00	**989.95**
PS-35 Internal power supply	219.00	**199.95**
AG-35* Mast mounted preamplifier	99.75	

***AG-35 $9.95 with IC-471H Purchase**

Other accessories for IC-471H		
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EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	34.00	
UT-15S UT-15S w/TS-32 installed	96.00	

VHF mobile multi-mode	Regular	SALE
IC-290H 25W 2m SSB/FM **Closeout**	639.00	**549.95**

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IC-27A 25w 2m FM/TTP mic **Closeout**	429.00	**349.95**
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IC-37A 25w 220 FM/TTP mic **Closeout**	499.00	**399.95**
IC-47A 25w 440 FM/TTP mic **Closeout**	549.00	**469.95**
PS-45 Compact 8A power supply	145.00	**134.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, regular mic	429.00	**349.95**
IC-28A 25W 2m FM, **TTP** mic	469.00	**409.95**
IC-28H 45W 2m FM, **TTP** mic	499.00	**439.95**
IC-38A 25W 220 FM, regular mic	459.00	**369.95**
IC-38A 25W 220 FM, **TTP** mic	489.00	**429.95**
IC-48A 25W 440-450 FM, regular mic	459.00	**369.95**
IC-48A 25W 440-450 FM, **TTP** mic	509.00	**449.95**
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-900A Transceiver controller	639.00	**569.95**
UX-19A 10m 10W band unit	299.00	**269.95**
UX-29A 2m 25W band unit	299.00	**269.95**
UX-29H 2m 45W band unit	349.00	**319.95**
UX-39A 220MHz 25W band unit	349.00	**319.95**
UX-49A 440MHz 25W band unit	349.00	**319.95**
UX-59A 6m 10W unit	349.00	**319.95**
UX-129A 1.2GHz 10W band unit	549.00	**499.95**
IC-3200A 25W 2m/440 FM w/TTP	695.00	**579.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	39.00	
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IC-1200A 10W 1.2GHz FM Mobile	699.00	**629.95**
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RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	**1349**
RP-2210 220MHz 25W repeater	1499.00	**1329**
RP-3010 440MHz 10W FM repeater	1299.00	**1149**

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IC-2A 2-meters	289.00	**259.95**
IC-2AT with TTP	319.00	**279.95**
IC-3AT 220 MHz, TTP	349.00	**299.95**
IC-4AT 440 MHz, TTP	349.00	**299.95**
IC-02AT/High Power	409.00	**349.95**
IC-03AT for 220 MHz	449.00	**389.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2AT for 2m w/TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**329.95**

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IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	**419.95**
A-2 5W PEP synth. aircraft HT	525.00	**479.95**
A-20 Synth. aircraft HT w/VOR	625.00	**569.95**

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

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BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
FA-2 Extra 2m flexible antenna	12.00
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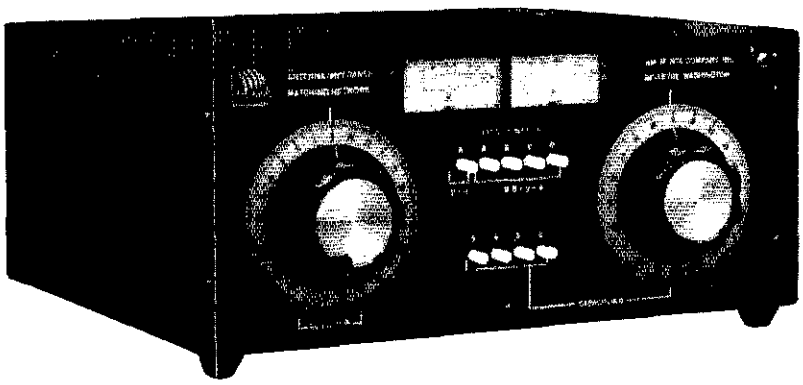

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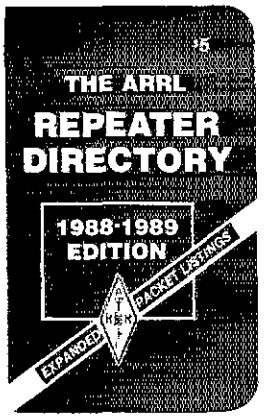

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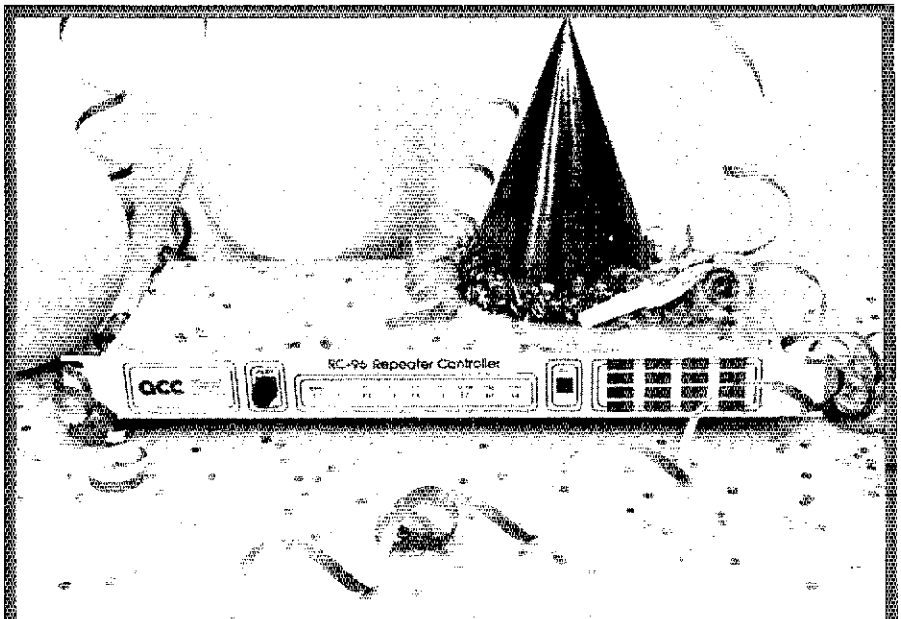

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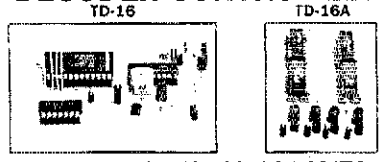

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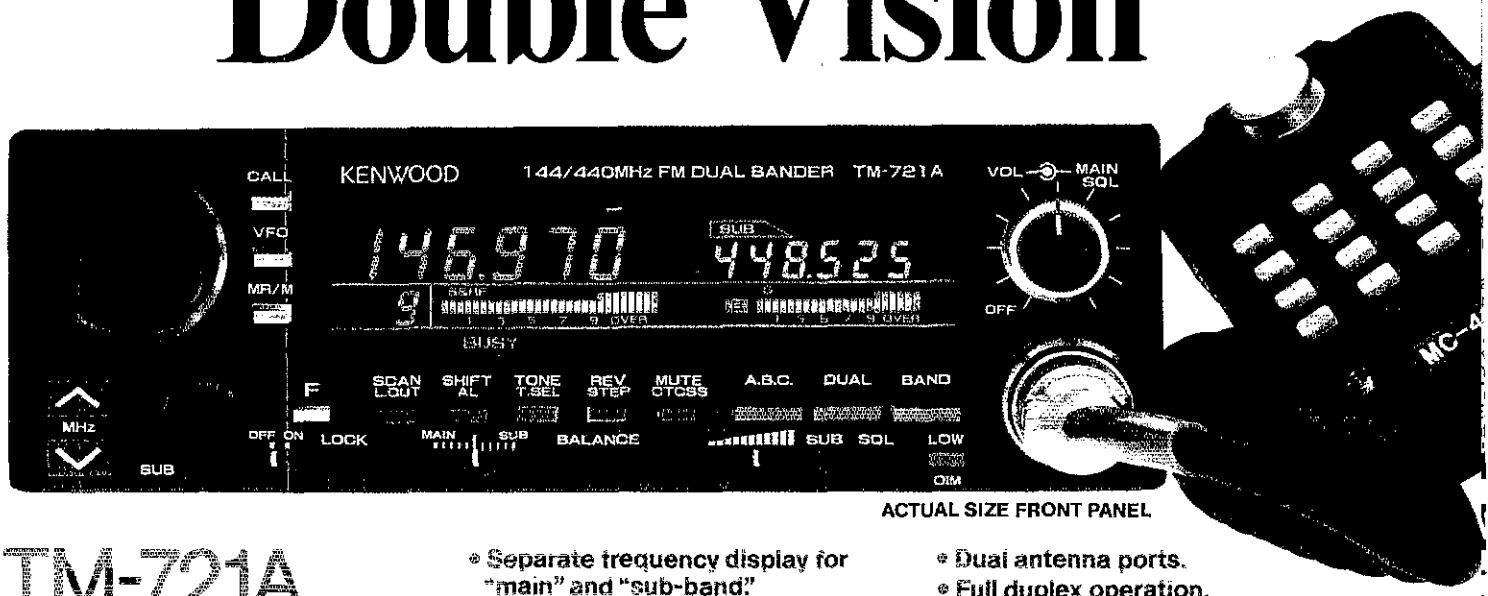

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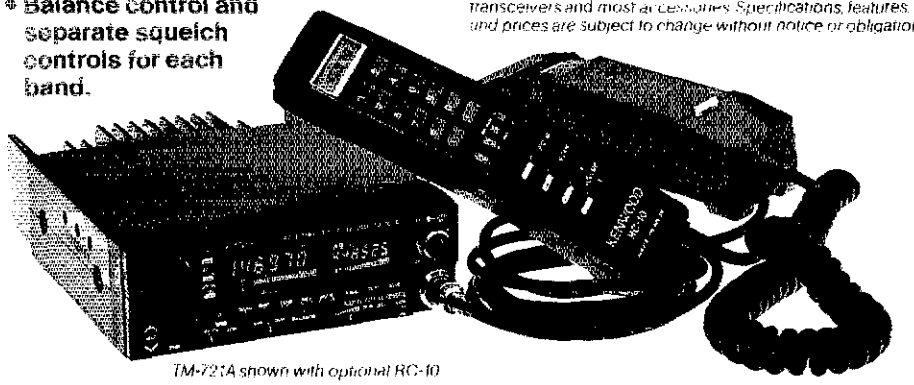

TM-721A shown with optional RC-10

Optional Accessories:
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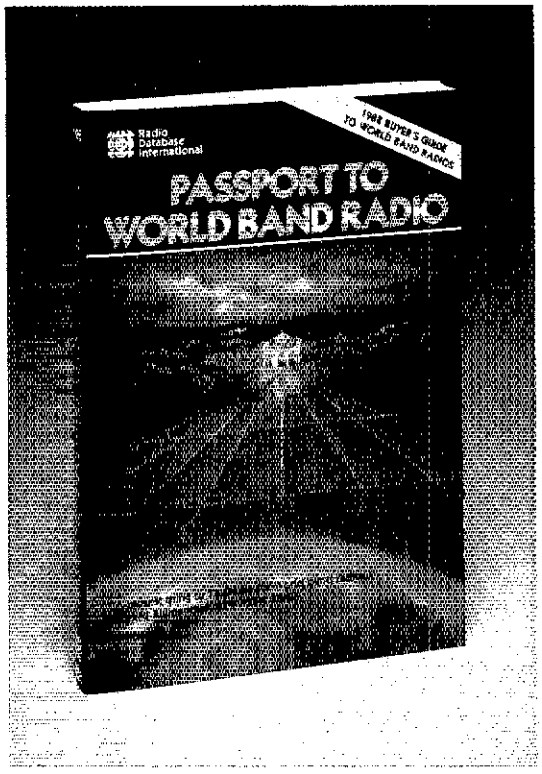

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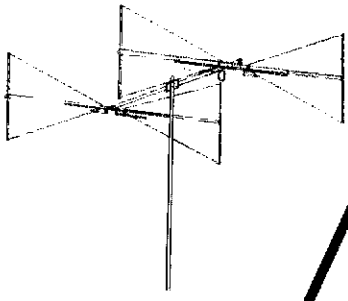

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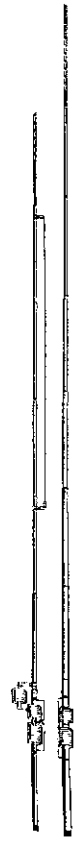

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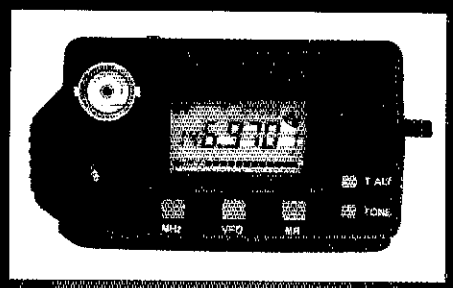
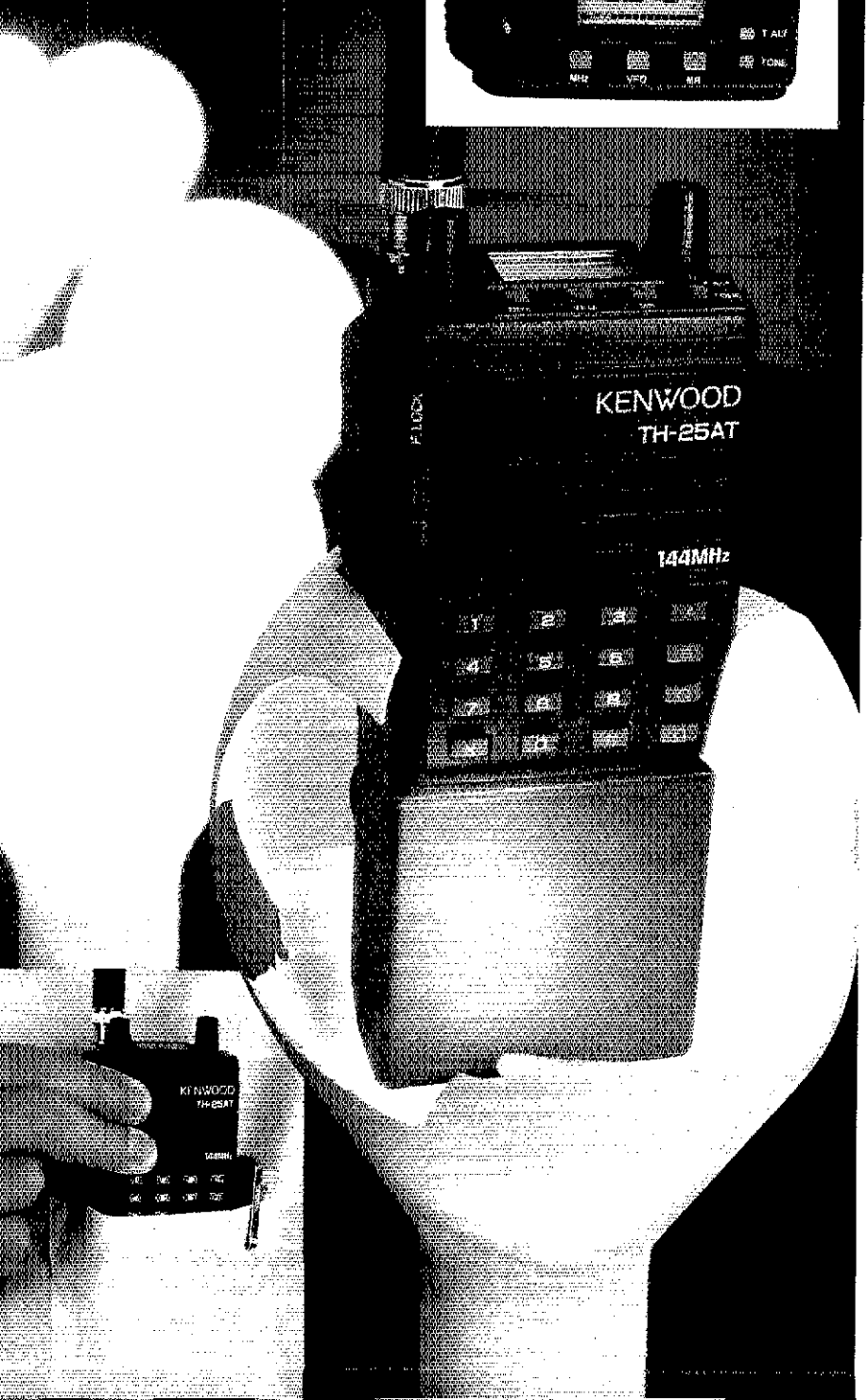


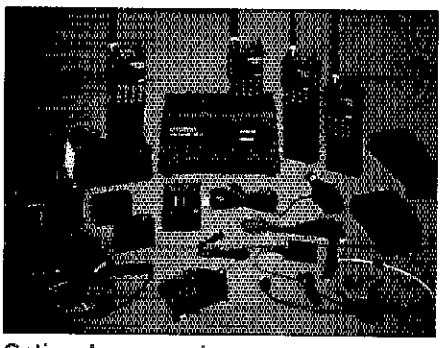


TH-25AT/45AT

New Pocket Portable Transceivers

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

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



Optional accessories:

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

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Depend on Paragon Performance!

Transmitter audio quality that is a pleasure to hear and a receiver that has set new standards for sensitivity and quietness. Receives from 100 kHz to 29.999.99 MHz with two tuning rates. Transmits on all bands from 1.8 MHz to 29.999.99 MHz with 100 watts output. SSB, CW, real FSK and optional FM. Standard equipment includes speech processor, noise blanker, dual VFOs, TX split, RX split and QSK with a changeover time of 30 ms or less. Five i-f filter positions with the 6 kHz AM filter and 2.4 kHz SSB filter, standard. Optional 1.8 kHz, 500 Hz and 250 Hz filters. All are push button selectable in any mode. Passband tuning, notch filtering, audio bandpass filtering, tone control, squelch and more!

Sixty-two programmable memories that store frequency, mode, filter selected, channel number and a 7 character alpha-numeric "tag" for I.D. Scan rate is selectable and as each memory is scanned all of the stored information is displayed (what a light show!). The scanning routine is easily controlled with both individual and global lock-out and reset functions. Alternately, the memories can be tuned with the main tuning knob.

Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in 100 kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement when optional synthesized voice board is installed.

Rear panel controls adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and high speed switching for QSK linears, such as the Titan. Other rear panel connections are included for a transverter, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc and provision for the optional RS-232 control interface.

An absolute delight for the all mode operator.

The construction of the Paragon is impressive too. All of the circuit boards are G-10 glass epoxy and can be removed easily. All aluminum construction and the use of an external power supply, keeps the weight of the Paragon at a svelte 16 lbs.

The Paragon is the result of a three year computer aided (CADEC 4) engineering effort. Much of that effort was invested in improving receiver performance. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

Write for our new full-line catalog.

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TEN-TEC

Highway 411 East
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Harness the Titan Power!

The TITAN has it all! Maximum legal power with ease, all bands 160 through 15 meters (through 10 meters after authorized modification), lightning fast QSK for full break-in CW and the digital modes, plus a two speed blower for quiet operation on phone. This awesome performance from a desk top amplifier is made possible by a pair of Eimac® 3CX800A7 ceramic triodes and an absolute "horse" of a power supply.

The heart of the power supply is our own tape wound, four core, Hypersil® transformer which weighs in at an impressive 41 pounds. This transformer is conservatively rated at 2.5KVA CCS (continuous commercial service) or 9KVA IVS (intermittent voice service). The power supply is housed in a separate utility enclosure for remote operation and is nearly noiseless even at full power.

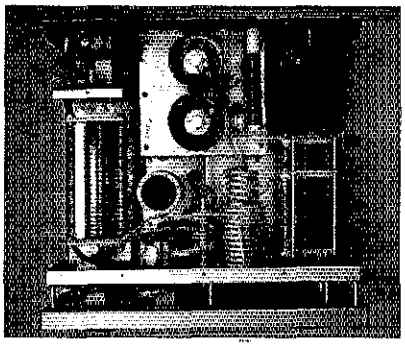
Front panel features include an instantaneous 10 element LED peak output power indicator, a dedicated plate current meter, a multi-meter to read grid current, forward power, reflected power or plate voltage, HI/LO plate voltage select, STBY/OPR switch and power ON/OFF switch. A red LED warns you if grid current becomes excessive and three other LEDs indicate status: WAIT, STBY and OPERATE. Vernier TUNE and LOAD controls, in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The low drive requirement of the Titan (65 watts in for 1500 watts output typical) makes life much nicer for your exciter too. Operating temperatures are significantly lower and component life extended accordingly. This is especially comforting using "keydown" modes such as RTTY. Adjustable ALC is provided for controlling exciter RF output levels.

The Titan has been the subject of two "product review" magazine articles. See QST, April 1986; CQ February 1986.

The Titan is designed to match our 100 watt exciters but it pairs up nicely, no matter what exciter you operate. If you are ready to choose your dream amplifier the Titan has everything but the highest price. Check it out!

Write for our new full-line catalog.



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* Extended receiver range [12]

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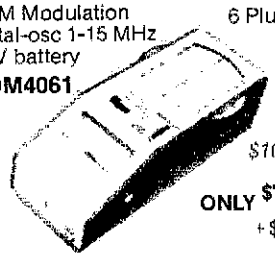

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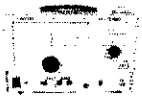
- Measure resonance of antennas and tank circuits.
- Check for Harmonic radiation.
- Use as OSC for Rec. alignment.
- More uses detailed in the RSGB Handbook, pages 18.15 to 18.21.

RF SIGNAL GENERATOR

SG4160



- 100 KHz - 150 MHz to 450 MHz on harmonics.
- RF Output 100 mVs.
- Modulation: Int. - 1 KHz Ext. - 50 Hz to 20 KHz.
- Crystal OSC 1 - 15 MHz.

$219.95 Value **ONLY $149.95** + $4 UPS

RF POWER METER/LOAD

PM330

- 1.8 to 500 MHz.
- 50 OHM-N-J Connector.
- 5W, 20W, 120 Watts.
- Accurate to +/- 10%.

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FREQUENCY COUNTER

FC5250

- 10 Hz to 150 MHz.
- 7 Digit readout.
- Gate 1s & 6 sec.
- Accurate to +/- 1 count.

SENSITIVITY: 25 - 100 mV to 30 MHz; 100 - 300 mV to 150 MHz

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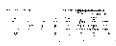
AC Adapter is included with unit.

RF ATTENUATOR DC—500 MHz

RFA8000



- 0 - 81 dB in 1 dB steps.
- Accurate to +/- .3 dB
- Steps 1, 2, 3, 5, 10 and 20 dB
- 50 OHm - ½ Watt Insertion Loss .5 dB.

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- 10 or 100 watt range.
- SWR +/- 5%; POWER +/- 10% accuracy.

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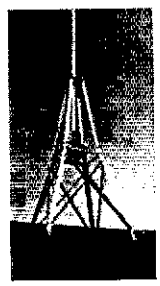
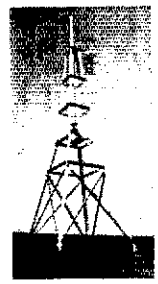
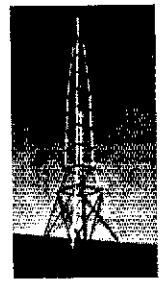
ROOF TOWERS



CR-18



CR-30



CR-45

CREATE ROOF TOWERS CONSTRUCTED OF HIGH GRADE ALUMINUM WITH GALVANIZED STEEL BRACING FOR ADDED STABILITY AND STRENGTH WILL EASILY ACCOMMODATE YOUR ANTENNA REQUIREMENTS. THREE SIZES OF ROOF TOWERS WILL SUPPORT VHF ANTENNAS, HF TRI-BANDERS, AND OSCAR SYSTEMS. ROTATORS EASILY MOUNT INSIDE THE TOWER. AN OPTIONAL THRUST BEARING (#303) IS RECOMMENDED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

MODEL	HEIGHT	MAXIMUM ANTENNA WIND LOAD IN FT 2	BASE WIDTH	MAX. VERT. LOAD LBS.	TOWER WEIGHT LBS.	PRICE
CR-18	5'10"	31 @ 90 MPH	31-1/3"	440	18	129.00
CR-30	9'10"	27 @ 90 MPH	39"	1,322	33	224.00
CR-45	14'9"	23 @ 90 MPH	39"	881	57	328.00
#303TB	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2"					39.00

*GUYING IS REQUIRED ON ALL ROOF TOWERS. UPS SHIPPABLE

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45AG2	top sect. 9'	140.95
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4BTV	4 band trap vert.	89.95
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BM-1	bumper mt.	15.95
SSM-2	stainless ball mt	17.95
SSM-3	spring	16.95
QD-1	quick disconnect	14.95
SGM-2	2mt. 5/8 mag. mt.	28.95
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ALL BANDER	160-10mt. AND MORE!	28.95
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Belden 9913	Low Loss	
Columbia RG213	50 Ω (OHM)	36cts
RG8/U	Foam	30cts
RG 8X	Mini	22 cts
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PL259/Silver		.99/1.39
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BNC(M)-UHF(F)		4.80
Columbia Low Loss	AND MORE!	39cts

KLM

KT34A	triband 4 el	CALL FOR PRICES
KT34XA	triband 5 el	
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2M-22C	2mt. satellite	
435-18C	70cm satellite	
435-40CX	70cm satellite	
432-30LBX	70cm satellite	
2M-13LBA	2 meter	
2M-16LBX	2 meter	

CUSHCRAFT

A4	4 el triband	300.00
A3	3 el triband	224.00
AV5	5 band trap vert	105.00
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416TB	16 el. OSCAR 436 MHz	60.00
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ARX-2	2mt. vert ringo ranger	31.00
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TBR160S	160m add on	47.00
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HY-GAIN

TH7DXS	7 el triband		
TH5MK2S	5 el triband	C	P
EX-14	4 el triband	A	R
TH3JRS	3 el 750W pep	L	I
18AVTS	5 band trap vert	L	C
14AVQS	4 band trap vert		E
V2S	2mt. omni-direct	F	S
V4	70cm omni-direct	O	
HB144MAG	2mt. mag. mt. AND MORE!	R	

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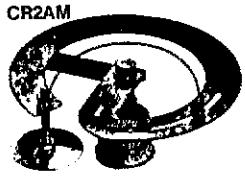
UNTENNA

CR2AM



2½"

CR2AM	PERM MT — CALL —	41.00
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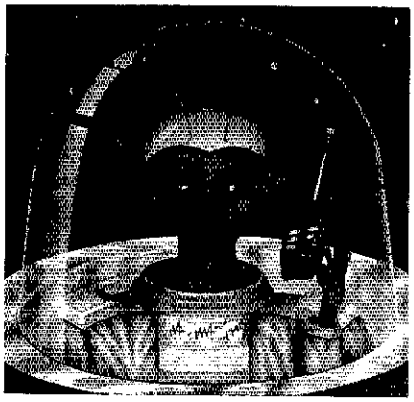
Yaesu's FT-736R. Because you never know who's listening.



Why just dream of talking beyond earth?

With Yaesu's new FT-736R VHF/UHF base station, you can discover some of the best DX happening in ham radio. Via moonbounce. Tropo. Aurora. Meteor scatter. Or satellites.

You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm (430-450 MHz!), with two additional slots for optional 50-MHz, 220-MHz, or 1.2-GHz modules.

Crossband full duplex capability is built into every FT-736R for satellite work. And the satellite tracking function (normal *and* reverse modes) keeps you on target through a transponder.

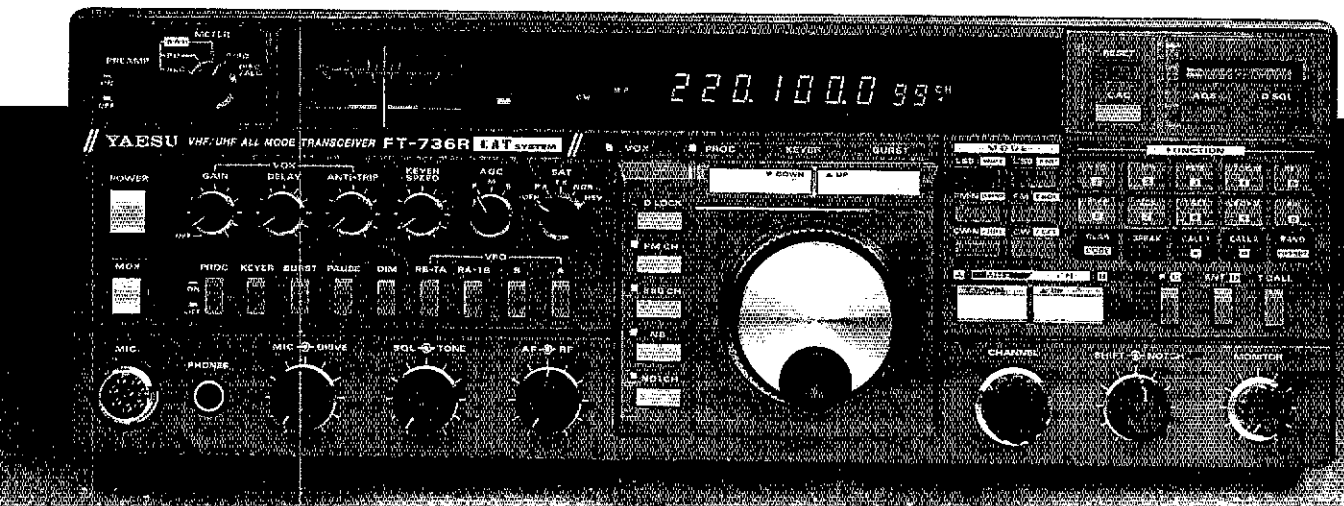
The FT-736R delivers 25 watts RF output on 2 meters, 220 MHz, and 70 cm. And 10 watts on 6 meters and 1.2 GHz. Store frequency, mode, PL frequency, and repeater shift in each of the 100 memories.

For serious VHF/UHF work, use the RF speech processor. IF shift. IF notch filter. CW and FM wide/narrow IF filters. VOX. Noise blanker. Three-position AGC selection. Preamp switch for activating your tower-mount preamplifier. Even an offset display for measuring observed Doppler shift on DX links.

And to custom design your FT-736R station, choose from these popular optional accessories: Iambic keyer module. FTS-8 CTCSS encode/decode unit. FVS-1 voice synthesizer. FMP-1 AQS digital message display unit. 1.2-GHz ATV module. MD-1B8 desk microphone. E-736 DC cable. And CAT (Computer Aided Transceiver) system software.

Discover the FT-736R at your Yaesu dealer today. But first make plenty of room for exotic QSL cards. Because you *never* know who's listening.

YAESU



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Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-736R shown with 220-MHz option installed.

TECH TALK from ICOM

Limelight Views of the IC-781

ICOM's incomparable IC-781 HF transceiver is truly creating widespread excitement in the amateur radio world and requests for additional plain language details continue filling the ICOM company mailbag. Thank you! Responding to your inquiries, this Tech Talk will overview some of the IC-781's most noticeable front panel operating attractions. Future Tech Talks will delve further into special features and circuit designs of this pacesetting transceiver.

So what's behind all the initial view "oohs and ahhs" of the IC-781? In addition to its numerous front panel controls and its five-inch multi-function CRT is a complete station control and monitor center with tremendous flexibility. Despite its sophisticated and futuristic appearance, however, the IC-781 is surprisingly easy to operate. Its special features are simply "called into use" as you desire.

The CRT's top section always displays your present operating frequency (in bold numbers) plus the selected mode, filters, RIT/XIT offset and VFO or memory operation. The alternate VFO's data is displayed below that bold/in use information. Although not readily apparent in ad photos, VFO A and VFO B plus any selected memory can also be set to different bands! A highlighted block in the CRT's lower right area also indicates local or world time right on the screen!

An impressively advanced concept of frequency selection and control is included in the IC-781. Initially pressing VFO A and rotating the main tuning knob selects frequencies in the usual way. Rotating that knob after pressing VFO B, however, lets you select standby operating frequencies on the alternate VFO while continuing an on-the-air QSO with the operating VFO! You can also change band and/or modes on VFO B or load informaton into any memory without disrupting an ongoing QSO! In other words, the VFO A and B buttons electronically shift only the main tuning applications. Totally unique! There's more! Press the CHANGE button and operating/standby VFO content swap positions. You can shift between VFO's and bands for rapid-fire DX'ing in a genuine contest-winning manner.

When split-frequency DX'ing, alternately working two DX pile-ups or lining up sequential contest QSO's, both VFO's contents can be received simultaneously. This dual receive function is activated by pressing the DUAL WATCH button then adjusting the front panel's BALANCE control for a comfortable VFO A/B blend. A single speaker is used for this simultaneous dual reception, and the previously mentioned VFO A or VFO B buttons select which VFO is tuned via the main knob. Simultaneous dual receive within the same mode on different bands like VFO A on 20 meters and VFO B on 15 meters is also a snap; however, greatest sensitivity always coincides with the operating VFO/bold numbered CRT display.

The panoramic display indicates all received signals within a horizontally-marked range of 50, 100 or 200kHz as selected by "F" keys in the CRT's escutcheon. The IC-781's present operating frequency always appears in the spectrum display's center with lower frequencies to the left and higher frequencies to the right of that point. Horizontal marks indicate relative signal strengths, and background noise appears as "grass" along the bottom edge. It also reads your instantaneous signal level during transmissions.

On-the-air activities and DX pile-ups are easily detectable at a glance, and they shift position according to frequency selections on the main tuning knob. Visualize combining this superb asset with the DUAL WATCH and you, too, will echo the slogan **"ONLY WITH AN ICOM!"**

Pressing the CRT estutcheon's "F6" key changes its screen's lower area to indicate memory contents. Consequently, pressing the "F1" key and rotating the main tuning knob scrolls Memory 1 through 99 for reviewing their contents. Additionally, pressing the VFO/MEMO button switches frequency control from VFO to the cursor-indicated memory.

An electronic notepad for memory use can also be called up for use by pressing the "F5" button. Personal memos can thus be included in selected memories by selecting letters via the main knob with one hand while pressing the "F2" (Write) button with the other hand.

The previous functions, incidentally, can even be performed while you are in QSO or not selecting frequencies with the main knob. Visualize the versatility and convenience of this feature for noting schedules or net operations: you enter all details in memory and even program the IC-781 to switch on and remind you of DX activities!

Another press of the "F6" key changes the CRT's lower screen area into video display of printed modes like RTTY or PACKET. An external TU's RS-232 video data is connected to the IC-781's rear input, "F" keys select compatible operating parameters, and you enjoy ultra-deluxe video readouts on the IC-781's screen!

The IC-781's innovative features and designs truly reflect ICOM's dedication to excellence: a proud tradition that is built into every ICOM unit. Tune in with ICOM and join the winning team!

ICOM'S NEW IC-781 ***"The future of amateur communications."***

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

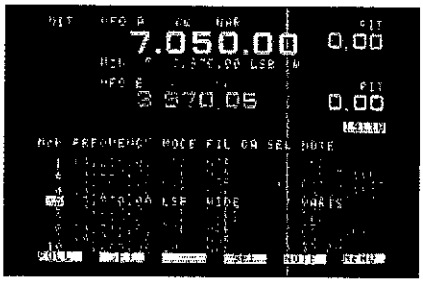
ICOM

IC-781 HF Transceiver

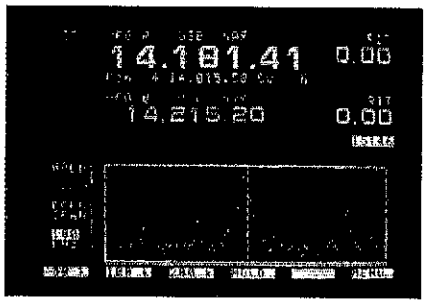
THE FUTURE OF AMATEUR COMMUNICATIONS

Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetting IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pileups with your operating frequency in the center. Selectable horizontal frequency spans of 50, 100, and 200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters are independently selectable!

Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning with **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. **It's DX'ing Dynamite!**

A Total Communications System! Includes built-in 100% duty AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multiscanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

ICOM Dependability. The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

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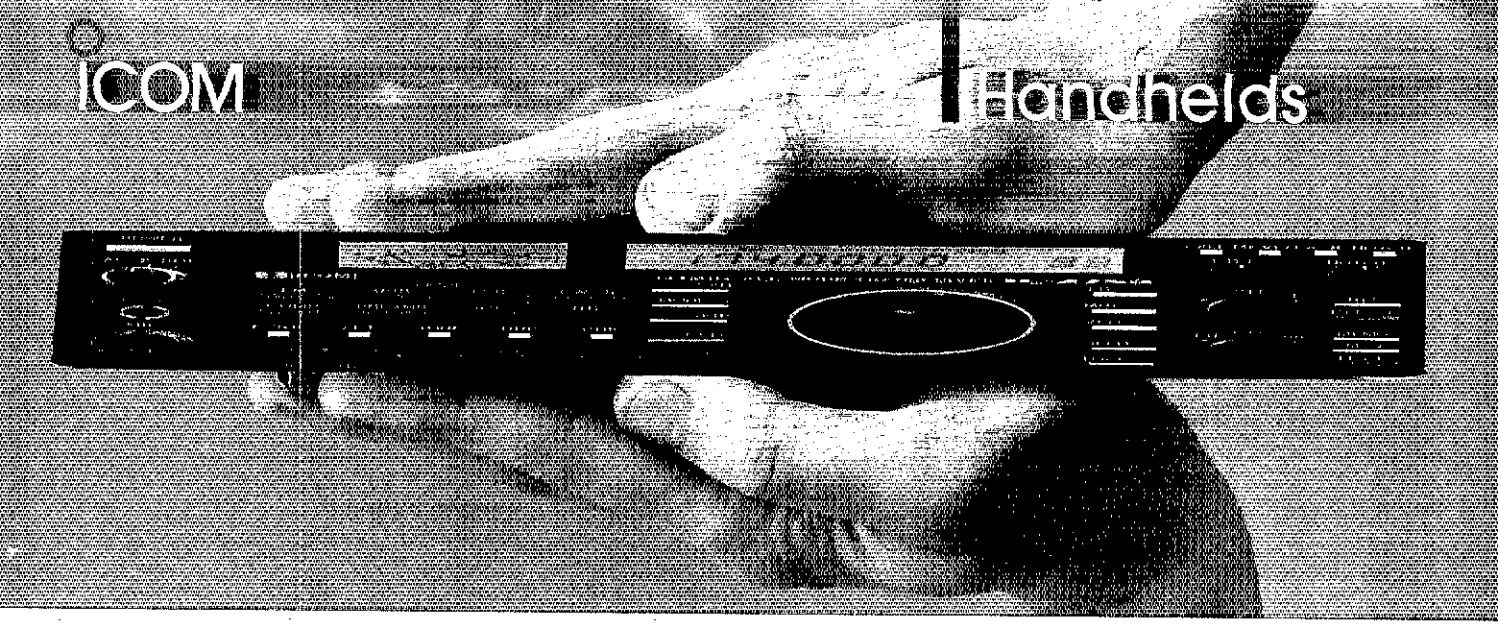
Handhelds



HOW DO YOU PACK 7 WATTS, 20 MEMORIES AND SCANNING INTO A HANDHELD?

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IC-4GAT: 6 Watts 440-450MHz
IC-32AT: 5 Watts Rx 138-174MHz/440-450MHz; Tx 140-150MHz/440-450MHz

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- **Additional Features.** Battery saver, call channel, all subaudible tones, multi-function LCD readout and DTMF pad.
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- **Optional UT-40 Beeper** silently monitors a busy channel for your calls. When the pre-programmed subaudible tone is received, the unit beeps and the LCD flashes.

IC-32AT 2 Meters and 440MHz
IC-2GAT 2 Meters
IC-4GAT 440MHz

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SATURDAY
June 11, 1988
9:00am til 5:00pm

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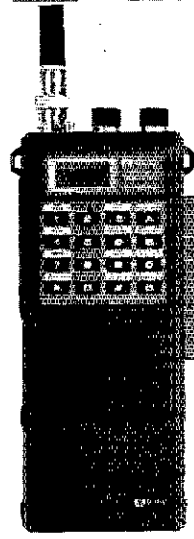

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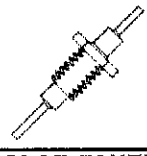

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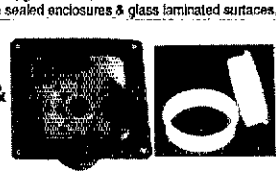

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- KWS-1 Power transformer, 662-0155-00 $175
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(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received June 14 through July 13 will appear in September *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

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PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAQ/6, 146 Coleen Street, Livermore, CA 94550.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS, Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24/hr. Gordon, W6NLG, President. Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.

JOIN The Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 20933 Brant Avenue, Long Beach, CA 90810.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

LITTLE Big Horn Net Sundays: 14.067 MHz, 2200 UTC, 21.176 MHz 2230 UTC. Historians and Native Americans welcome. SASE WA2DAC.

LOUISVILLE HF Society—New club. Novices, Ragchewers, DXers, Contesters Contact N4XM, KD4U, KK4Q for info 502-239-6123.

54th ANNUAL Hamfesters RC Hamfest. New Location—Will County Fairgrounds, Peotone, IL (was at Santa Fe Park). New Date—Sunday, July 31, 1988. Flea market, indoor dealer booths. Exams (pre-register by June 30. Call NF9N, 312-448-9432, for information.) Tickets: $3 advance, $4 at gate. SASE to Hamfesters, 13058 Finch Court, Lockport, IL 60441.

NORTHERN New Jersey—Sussex County ARC Hamfest, Sunday, July 17th. Sussex County Fairgrounds, Augusta, NJ. 8:00 AM. Indoor/Outdoor space. Acres of parking. Refreshments. Talk-in 147.90/30 and 146.52. For information call Donald Stickle, K2OX, 201-663-0677.

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Incomparable Frequency Control. Both the IC-R71A and IC-R7000 feature **direct frequency access** via their front keypad, main tuning dial, optional infrared remote control and/or computer interface adapter. **Flexibility of this nature can only be accomplished with an ICOM!**

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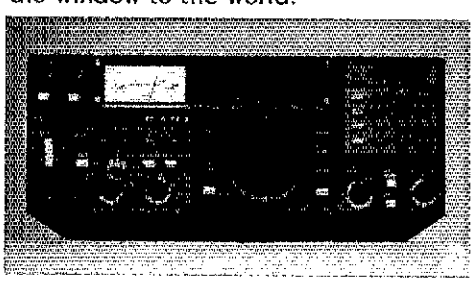

The IC-R71A is a shortwave listener's delight. Its **32 tunable memories** store frequency and mode information, and they are single-button reprogrammable **independent of VFO A or VFO B's operations!** This HF reception is further enhanced by a dual width and level adjustable noise blanker, panel selectable RF preamp, selectable AGC, **four scan modes,** and all-mode squelch.

The IC-R7000 is a high band monitor's masterpiece. Its **99 tunable memories** are complemented by **six scanning modes.** It even scans a band and loads memories 80 to 99 with active frequencies without operator assistance! Additional features include selectable scan speed and pause delays, wide/narrow FM reception, and high frequency stability. Many professional services use IC-R7000's as calibration references.

Options. IC-R7000: RC-12 remote control, EX-310 voice synthesizer, CK-70 DC adapter, MB-12 mobile bracket. IC-R71A: RC-11 remote control, EX-310 voice synthesizer, FM module, CK-70 DC adapter, MB-12 mobile bracket, FL-32A 500Hz, FL-63A 250Hz, and FL-44A filters.

See the IC-R7000 and IC-R71A at your local authorized ICOM dealer.

* Specifications of IC-R7000 guaranteed from 25-1000MHz and 1260-1300MHz. No coverage from 1000-1025MHz

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THANK You for attending Warren Ohio Hamfest. See you August 21, 1988.

BIG BEND Area Texas New Rptr. 146.22/82 Christmas Mountain—Sunday Net 3.922 MHz 0850.

THE NORTH American Ten Meter Youth Net has started on ten meters—28.450 MHz every Sunday at 0:00 UTC. All hams are invited to check in. 73's KA2ZZU.

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COLORFUL QSLs by WA7LNW—Improve your QSL returns! Revolutionary printing process combines brilliant rainbow colors with sparkling metallic inks. The ultimate QSLs! Samples $1 (refundable) COLORFUL QSLs, P.O. Box 5358, Glendale, AZ 85312-5358.

QSLs, QSLs, Rusprint QSLs quantities of 100, 200, 300 or more. Full color of Old Glory and cartoons. Also parchment, golden eagle and others. SASE appreciated. Rusprint, Rt. 1, Box 363-QST, Spring Hill, KS 66083.

EMBROIDERED Emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

POST CARDS QSL Kit—Converts Post Cards, Photos to QSL's! Stamp brings circular. My Type Shop, P.O. Box 172, Leeds, NY 12451.

QSLs by "Sam" (samples $1). Sam's Print/Wheels, P.O. Box 55, Petersburg, NY 12138-9729.

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QUALITY QSL Cards and Rubber Stamps. Send 39 cents postage or SASE for samples. New stock designs or custom cards from your black ink artwork. Sandollar Press, P.O. Box 30726, Santa Barbara, CA 93130.

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QSL's—Quality for less is back! See our display ad in this issue of QST. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

QSL CARDS for Contesters, DX'ers, WAS, WPX, etc. Best quality for lowest price. Call or write for samples. YES QSL's, P.O. Box 811, Plano, TX 75074.

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FREE, 100 QSLs with first order. Samples cost 3 stamps. Gazebo Press, Rt. 4, Box 4148, LaPlata, MD 20646.

REAR WINDOW Callsign . . . 2 inches x 8 inches . . . Adheres to glass! Instant transfer car to car! Your call or repeater frequency in white lettering. Background is black, blue or red. Also available as a Magnetic Sign with lettering black, blue or red. Background in white! Only $8.50 each sign ppd. Sign-On, Dept. T, 1923 Edward Lane, Merrick, NY 11566.

GAIL's QSL's, $6 first 100, $4 thereafter, stamp for samples. KAØYZT, 1150 Muenz, Wright City, MO 63390.

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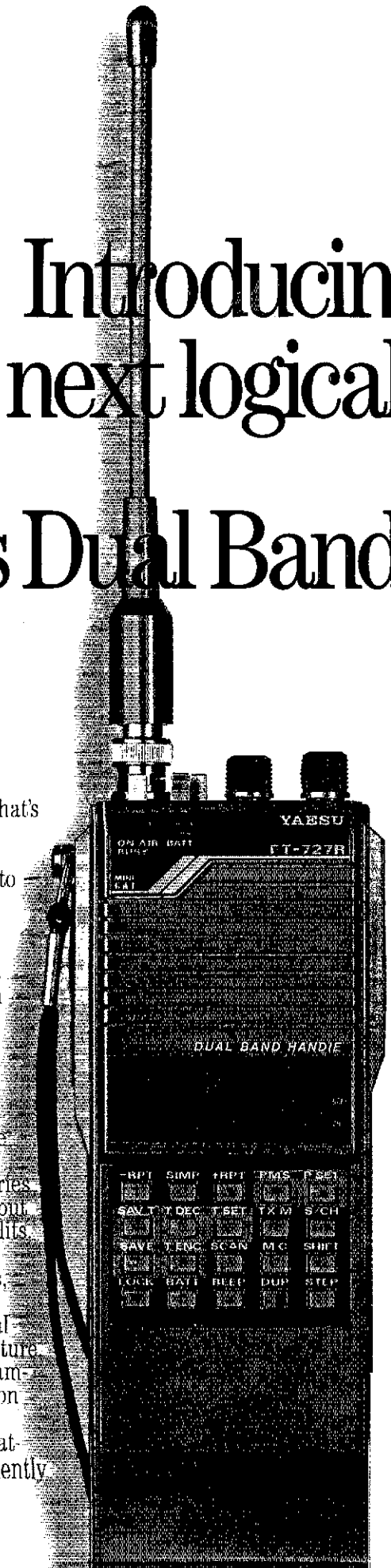

Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

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WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, RI, 02895-0001.

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BUY, Sell, Collect and Restore early tube equipment? Early receivers, tubes and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $10. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

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SELL *QST* Oldest 1931. Some CQ, 73, HR, and Computer Mags. $1 each. Plus shipping, LSASE for list. Robert Willsey, W5VRA, Box 10, Martha, OK 73556.

WANTED Books: Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines or any other related literature. Jim Kreuzer, N2GHD, 6270 Clinton Street, Elma, NY 14059, 716-681-3186.

ELMAC AF-67 Transmitter, PMR-8 Receiver, both mint with pwr. supplies and manuals, best offer. KB6W, P.O. Box 99, Rancho Cordova, CA 95741.

TELEGRAPH Bugs, old keys, keyer paddles sought for private collection. Old Vibroplexes needed. Donations of parts, inoperable items or memorabilia appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

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SHIP'S Medium Frequency Radio Receiver. RCA Radiomarine Model AR-8510. Superregenerative. 15-650 KC, with cabinet good condition. $220. Cohoes, NY, Jim Meaker, tel. 518-235-2892.

WANTED: Old Hi-Fi Gear, Manuals, Literature, Etc. For my collection. Life ARRL Member. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803, 414-545-5237.

WANTED: Lettine 240 Transmitter. David Matson, 6 Hawthorne Street, Acton, MA 01720, 617-263-0661.

WANTED: National HRO-7 and Kenwood T-599. Terry Wolfley, WA4OEA, 731 NE 13th Street, Homestead, FL 33030, phone 305-247-0677.

CLASSIC BC-221 Frequency Meter original condition, spare tubes, calibration book, service manual, regulated supply. $125 delivered 48 states. Walt, K7EC, 702-452-6848.

FIRST EDITIONS—"ARRL Radio Amateur's Handbook" (1926); the "Radio" Handbook (1935); also Sixth Edition of ARRL Handbook (1929) and Second Edition of "Radio" Handbook (1936, W.C. Jones). All in fine condition. Best offers accepted. W8FFN, 206-385-5495.

WANTED—Johnson Ranger in excellent/mint condition-please state electrical, mechanical, visual condition and price. All replys answered. Jerry Brouwer, AB8U, 3041 Rising Springs, Bellbrook, OH 45305.

WANTED: Knight-Kit "Wireless Broadcaster" Phono Oscillator 1957. Lafayette "Wireless Broadcaster" (1962) or Phono Oscillator. *L. Leigh, 274 Delaware Avenue, #610, Buffalo, NY* 14202, 716-852-8660. Need AM "radio station" for apartment bldg.

OLD MILITARY Radios light up my filaments! Always interested in radios, accessories, manuals pre-1955. Special interest in WW2 German, Japanese, Italian items; and US CW-portable equipment. Examples Tom Fud2 KWEA, MBM, DAG, PR-C 1 thru 5, TRC-10, TBY, RAX. Any US manual with info on "enemy equipment". Also: WE 10A, 20A, other old short-wave aircraft radios. Tnx! Hugh Miller, KA7LXY, 6400 Maltby, Woodinville, WA 98072-8375, 206-487-3047 mornings.

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I PAY CASH For vintage audio equipment by Western Electric, Altec, McIntosh, Marantz, Westrex, etc. Randy Nachtrieb, WA6GJA, 6392 Park Avenue, Garden Grove, CA 92645, 714-897-9351.

SALE Pre-1930 QSTs or trade for Callbooks, ARRL Handbooks, or ham memorabilia. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043.

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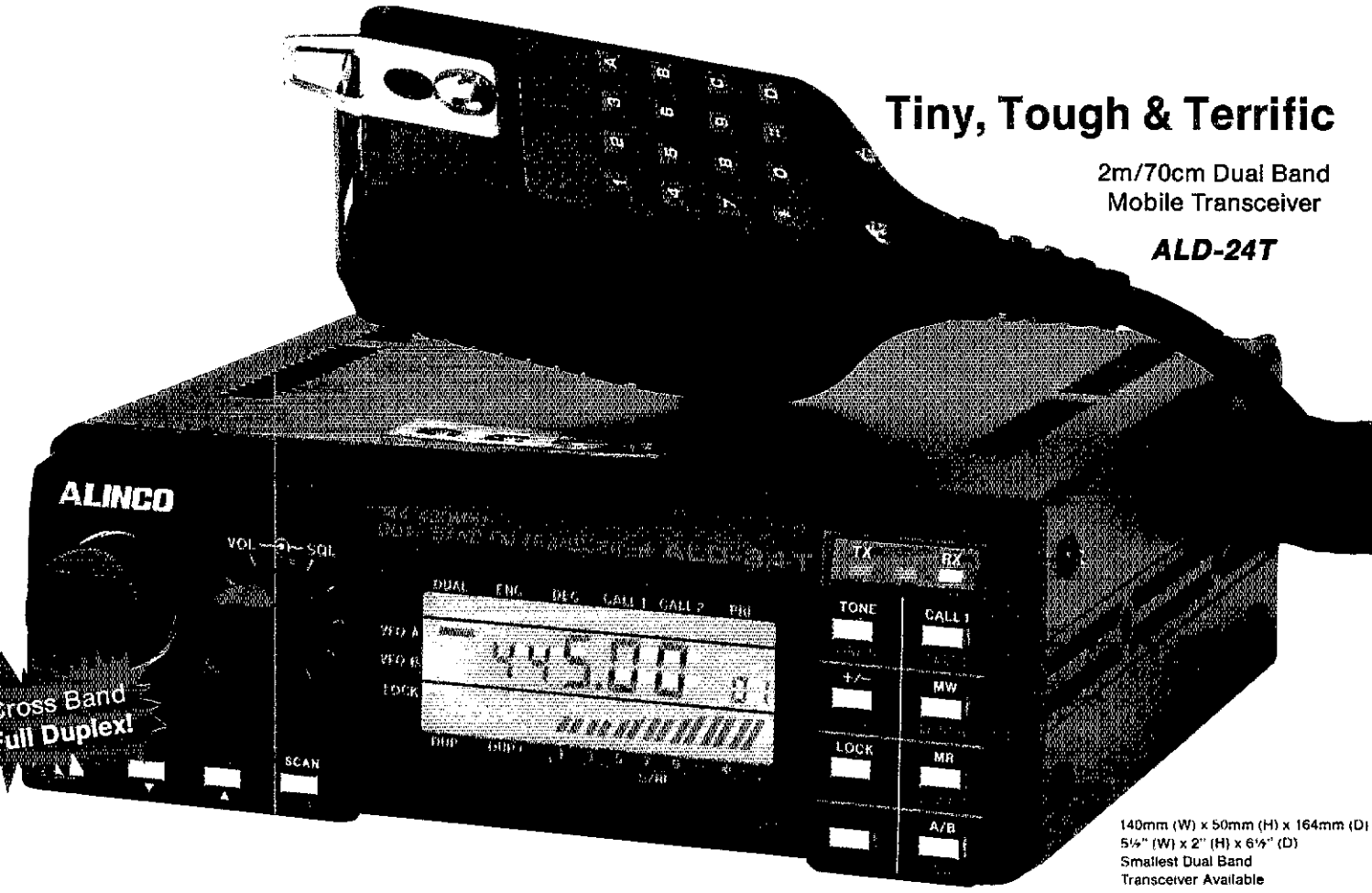

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STAMP Collectors! New Liberia amateur radio set $4, Oman $2. SASE for ham stamp price list. WB4FDT, P.O. Box 833, West Hartford, CT 06107.

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LIMITED Space Dipoles for 160/80, 160/40, 160/30, coax fed, no tuning, maximum power, $59.50...G5RV multi-bander $35, G5RV Junior $32...Postpaid. SASE...Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

HAM TRADER Yellow Sheets. In our 27th year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate—no long wait for results. Send #10 SASE for sample copy. $13 for one year (24 issues). P.O.B. 2057, Glen Ellyn, IL 60138-2057.

AUSTIN, Texas QTH: 4 bedroom, 2 bath, 2000 square foot home: CA/CH, 2 car garage, two fireplaces, large fenced lot with oaks, fully landscaped, garden, near schools, near IBM, TI, 3M, MCC: also convenient to Motorola, Tracor, Lockheed and Sematech. Great elevation, professionally installed 80' Rohn 45G, A4, T2X, 4th bedroom hamshack with 220, 2 phone lines. Call N5CQ, 512-250-9032.

COLLINS 62S1, mint cond., serial #11440, $695. Bill, AA6S, 209-732-7163.

220 MHz Model FT-312RM Now Available

Introducing the only mobiles that double as answering machines.

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With Yaesu's 2-meter FT-212RH and 70-cm FT-712RH, an optional, internal digital voice recorder serves as a convenient answering machine for you and your friends. And that's just the beginning!

High performance mobiles. The FT-212RH features wideband receive coverage of 140-174 MHz (144-148 MHz Tx), while the FT-712RH covers 430-450 MHz. An oversize amber display includes an innovative photo-sensor which increases the display brightness during the day. The function buttons are arranged in a chromatic musical scale—ideal for visually-impared operators. You get 45 watts output on 2 meters, 35 watts on 70 cm.

An autodialer DTMF microphone with 10 memories, each ready to store telephone numbers up to 22 digits long.

And, like our FT-211RH Series mobiles, you'll enjoy surprisingly simple controls, yet highly sophisticated microprocessor-based flexibility. Including 18 memories that store frequency, offset, PL tone, and PL mode (CTCSS unit optional). Band or memory scanning. Offset tuning from any memory channel. Memory channel lockout for scanning. High-low power switch.

All in an amazingly small package, shown actual size below.

Digital voice recorder option. Only Yaesu brings you the advanced technology found in our digital voice recorder option.

You can store messages or your call sign—in your own voice, not a synthesized replica—or give your friends a private code for leaving messages on your radio. All they need is a DTMF microphone! Then you can play back your messages either in-person, or remotely by using another radio with a DTMF microphone. And you've always got security because you can command your radio to respond only to in-person playback requests.

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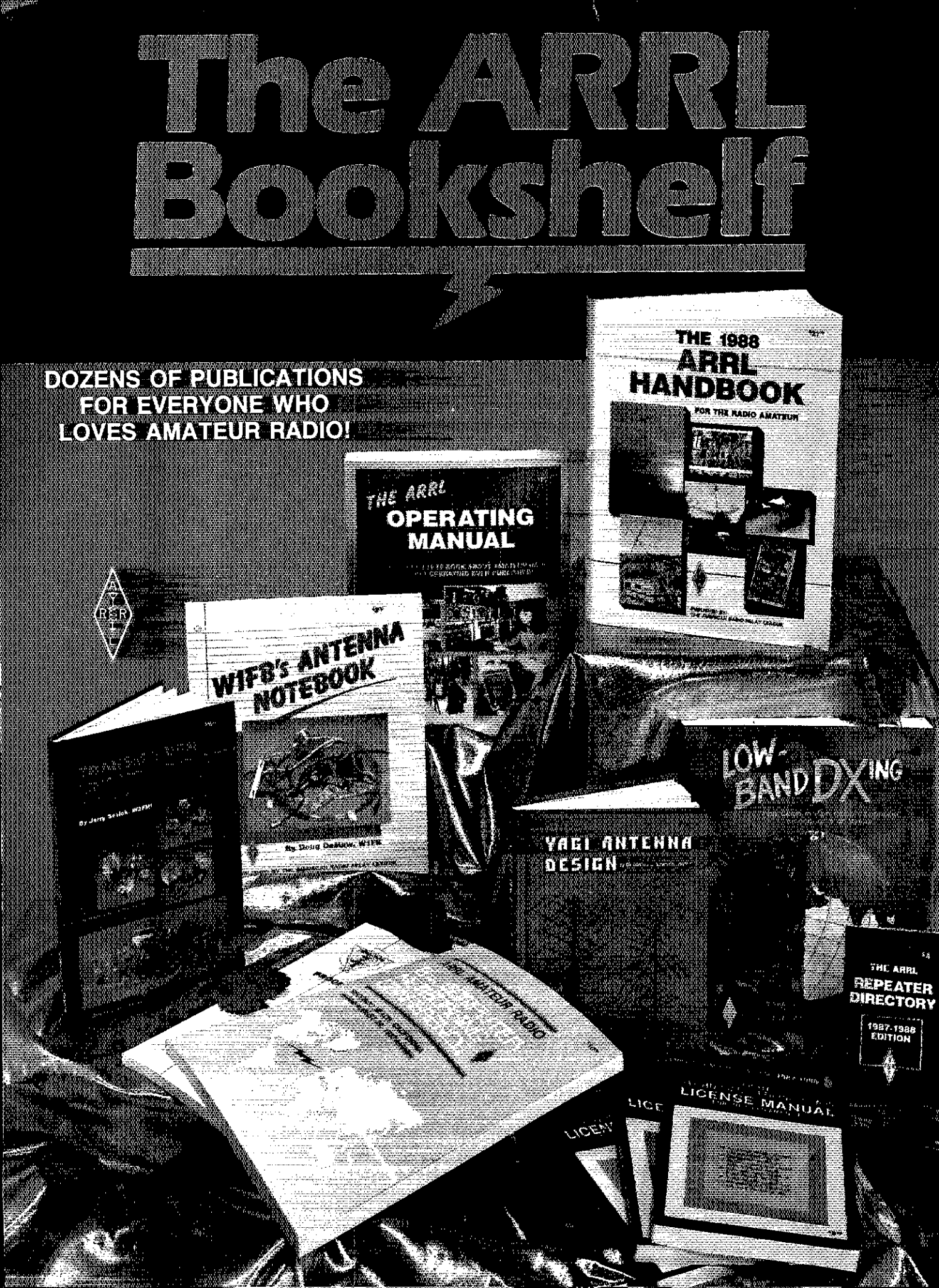
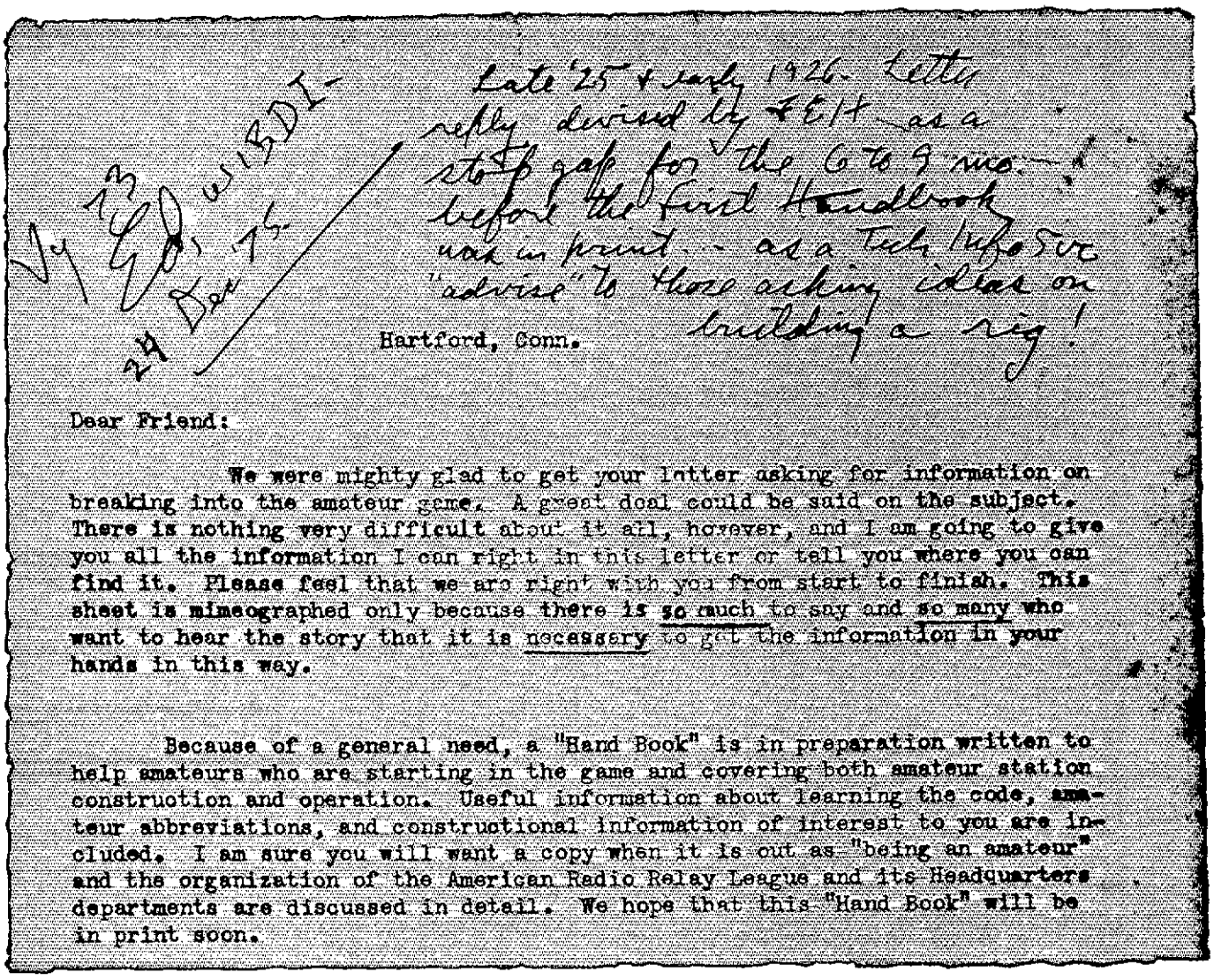
The ARRL Bookshelf





Late '25 + early 1926. Letter really devised by ECH as a stop gap for the 6 to 9 mo. before the first Handbook was in print -- as a Tech Info Svc. "advice" to those asking ideas on building a rig!

Hartford, Conn.

Dear Friend:

We were mighty glad to get your letter asking for information on breaking into the amateur game. A great deal could be said on the subject. There is nothing very difficult about it all, however, and I am going to give you all the information I can right in this letter or tell you where you can find it. Please feel that we are right with you from start to finish. This sheet is mimeographed only because there is so much to say and so many who want to hear the story that it is necessary to get the information in your hands in this way.

Because of a general need, a "Hand Book" is in preparation written to help amateurs who are starting in the game and covering both amateur station construction and operation. Useful information about learning the code, amateur abbreviations, and constructional information of interest to you are included. I am sure you will want a copy when it is out as "being an amateur" and the organization of the American Radio Relay League and its Headquarters departments are discussed in detail. We hope that this "Hand Book" will be in print soon.

FROM 12 PAGES TO OVER 1200!

Sixty-five editions and 5.8 million copies later, we wonder if Ed Handy had any idea what began as twelve mimeographed information sheets would lead to one of the most highly respected publications in the RF design field! But more importantly, *The 1988 ARRL Handbook for the Radio Amateur* is a *basic resource* for *all* radio amateurs as well as technicians and engineers.

What is new in this edition? As usual, "hot topics" that are changing on a day-to-day basis were given top priority on the revision list. Next, we took a close look at those subject areas of interest to the "enhanced Novice" and updated these as necessary. New construction projects range in complexity from a passive CW audio filter to a synthesized computer-controlled receiving converter for 100 kHz to 20 MHz. Other fun projects added to the new edition include a new deluxe memory keyer, balanced QRP transmatch, DTMF (Touchtone®) decoder and QSK 3-watt 160-meter transverter.

The sixty-fifth edition not only will stand on its own as to content but physically as well. Older editions felt and acted like floppy city telephone directories. Now, all *1988 Handbooks* will use the popular and economical hard cover design of the type used to bind *Yagi Antenna Design*.

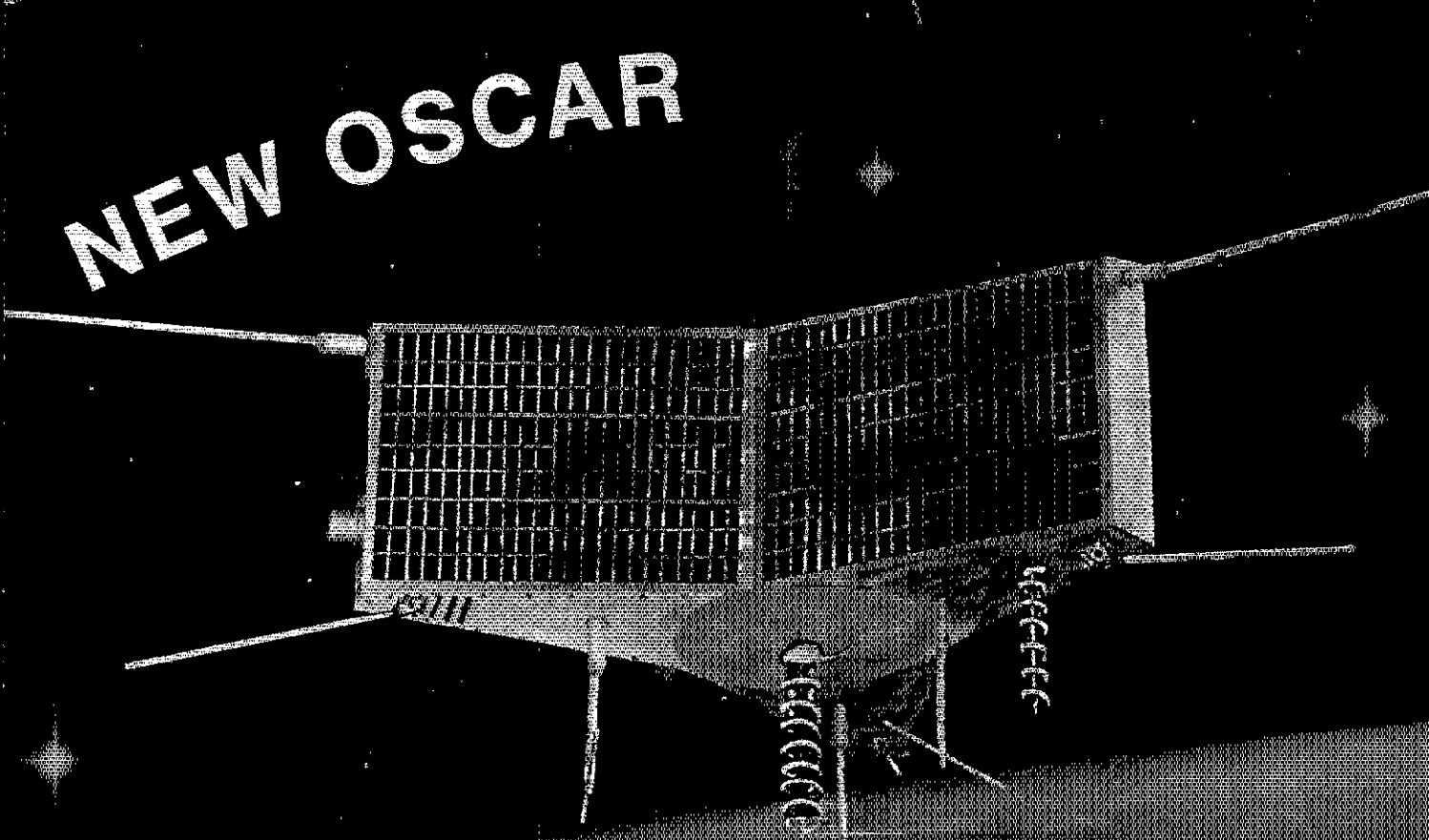
Catch up on the latest technology! Pick up a copy of *The 1988 ARRL Handbook for the Radio Amateur* at your dealer or order directly from League Headquarters. The price is $21 in the US, $23 in Canada and Elsewhere. Please include $2.50 ($3.50 UPS) for postage and handling.

Here is a description of what is covered in the Handbook:

The first 5 chapters serve as an introduction and cover: basics of Amateur Radio, electrical fundamentals, radio design technique and language, and solid state fundamentals. Vacuum tube principles as they pertain primarily to high power amplifier design are also presented in these introductory chapters. There are 12 chapters devoted primarily to these radio principles: power supplies, audio and video, digital basics, modulation and demodulation RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another 4 chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in 2 chapters. The construction and maintenance section has 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll find up-to-date component data that the Handbook is famous for. The final 5 chapters cover how to obtain your license, station design and operation, interference, monitoring and direction finding. An abbreviations list, huge index and etching patterns make up the balance of the book.

The American Radio Relay League, Inc., 225 Main St., Newington, CT 06111 USA

NEW OSCAR



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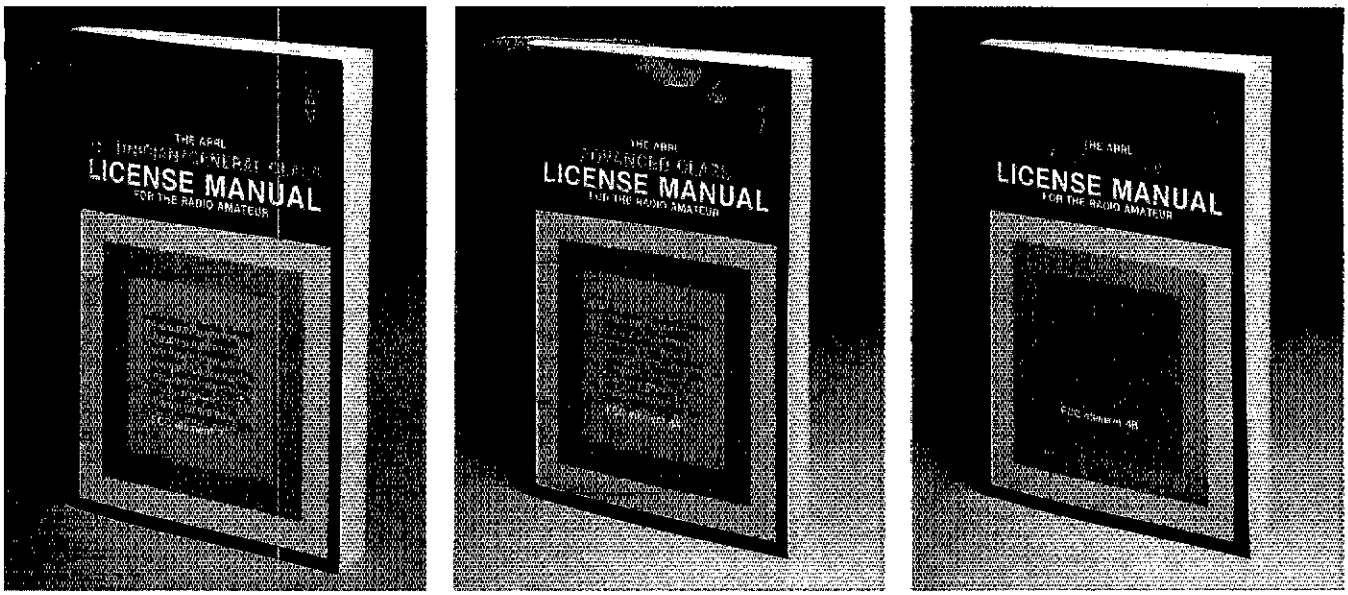
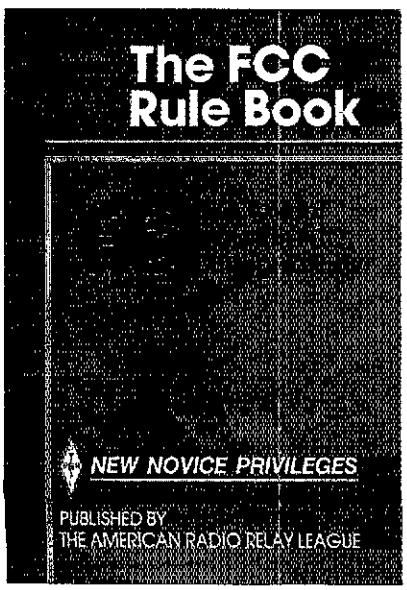


The popular **ARRL License Manual Series.** *The ARRL Technician/General Class License Manual* separates the study material for the Element 3A (Technician) and Element 3B (General) exams for easy study. The material covering the Technician Class is good for exams given through Oct. 31, 1989; the General Class material is good through Oct. 31, 1990. *The Advanced Class License Manual* is good through Oct. 31, 1990 and *The Extra Class License Manual* is good through Oct. 31, 1988.

PASSING POWER!

These publications are just the "ticket" for obtaining your first Amateur Radio license or upgrading to a higher class. *Tune in the World with Ham Radio* is our beginner's package and has been expanded to cover the voice and digital privileges now enjoyed by Novice licensees. Two C-90 cassettes in the kit make learning the code a snap! **The ARRL License Manual Series** covers what you need to know in order to pass the higher class exams. *The FCC Rule Book* has the current FCC regulations that every radio amateur needs, and it has "Washington Mailbox" style rule interpretations found in the popular *QST* column by that name. For code instructions, we have the *Code Kit* (2 C-60) cassettes that cover from 5 to 13 words-per-minute), individual cassettes, and *Morse Code, the Essential Language* which gives tips on learning the code plus its history and usefulness.



Tune in the World with Ham Radio
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Orders must include $2.50 shipping for book rate or $3.50 for UPS.

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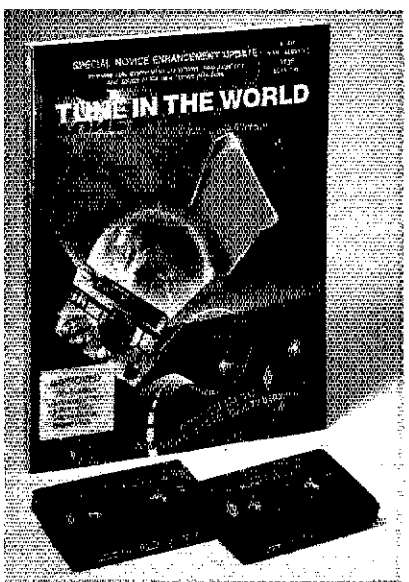
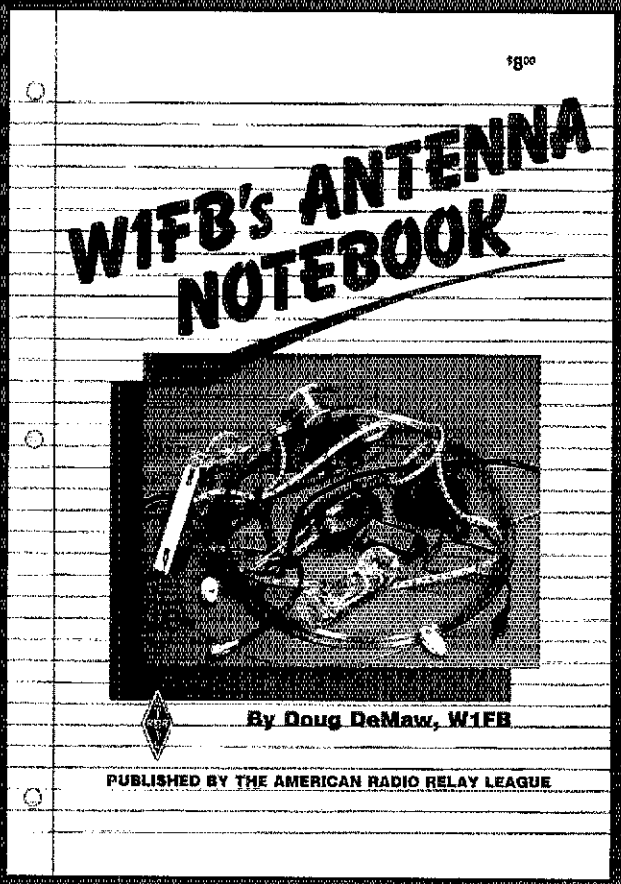


W1FB's Antenna Notebook

Here's a brand new ARRL publication written by Doug DeMaw packed with wire antenna designs you can use. It is based on Doug's experience and reads almost like a novel!

This is one of the most readable books about antennas ever published. It's not really a novel about antennas, but *W1FB's Antenna Notebook* is far from being a dry lecture on the properties of wire and vertical antennas. Instead, we can imagine ourselves being invited over to Doug DeMaw's hamshack to chew the rag about antennas. Have a seat in the easy chair in front of the fireplace while Doug grabs his *Antenna Notebook* off the shelf. Listen intently as we discuss what this new ARRL publication is about.



While the adage, "the bigger and higher the better" might be true for those with unlimited pocketbooks, lots of real estate, and plenty of technical and mechanical knowledge; most of us are constrained in some way, from putting up vast arrays of heavy metal! Wire antennas are inexpensive, can be unobtrusive, and give good performance if designed properly. Verticals don't have to be "equally weak in all directions," and we learn how to overcome this so-called "curse." That bargain coax that you picked up at the local flea market may look good, but is it? The first chapter describes a simple test to find out for sure, as well as telling us about the hidden traps of traps, what conditions cause baluns to do some very nasty things, and a brief discussion on SWR (or VSWR if you prefer.)

The second chapter is devoted to the dipole and its variations: the inverted-V, G5RV, trap dipoles, folded dipoles, multi-band dipoles, and dipole look-alikes. Chapter three covers the care and feeding of end-fed wires. Doug tells how to treat them properly so they won't bite! He will also make your day by telling you how to terminate true longwires—painlessly (so that most of the radiation will be in just one direction.)

During the time that W1FB was *QST* Technical Editor, he lived on a typical suburban lot in Newington, Connecticut. He had a tri-bander for 10, 15 and 20 meters on a 55-foot tower. Since Doug lacked the space to "go out" he decided to "go up" by optimizing his tower and beam for use on the lower amateur bands—especially 160-meters. You'll learn from his experience in one of the most informative chapters on vertical antennas ever written.

Since Doug used to live only 2 blocks from League HQ, he had to cope with over 1 volt of RF at the receiver antenna terminals when W1AW was on the air. With code practice and bulletins being sent on 7 bands, the result was the generation of all sorts of mixing products in many receivers. (This was before the time "bullet-proof" solid-state devices had been developed for receiver front ends.) All of this noise made reception difficult at best! The chapter on Special Receiving Antennas is the result of the author's experience using receiving loops and other types of antennas to overcome this problem. Of course, the antennas described offer a solution to other forms of man-made noise as well.

Wire antennas come in two models: the basic street model, like the dipole, and high performance "off road" configurations. The latter actually provide gain over a dipole in certain directions and are described at length: loops (in almost all geometric configurations,) collinear arrays, and cloud-warmers (for effective short-range communication.)

We know of a local amateur who worked 200 countries from his apartment using a 33-foot end-fed invisible antenna running from the window to a nearby tree. He used a black plastic comb as an insulator on the far end. Chapter 6 is devoted to limited-space and invisible antennas including flag poles, TV antennas (the guy lines are the antenna) and the half sloper.

Need a match? The chapter on matching techniques has circuits ranging from simple L-networks to complete Transmatches.

The final chapter is devoted to measurements. It tells how to build and use such useful devices as field strength meters, SWR bridges, noise bridges, dip meters and a current sampling meter for verticals.

That is *W1FB's Antenna Notebook* in a nutshell. This 122 page publication is available for $8.00 at your dealer or directly from ARRL. Please add $2.50 ($3.50 for UPS) for shipping and handling.

BRAND NEW FROM ARRL

$10.00

YOUR GATEWAY TO PACKET RADIO

STAN HORZEPA, WA1LOU

Packet Radio is fun—there are over 30,000 "packeteers" to prove it, and that number is growing every day. Not since SSB in the early sixties or the repeater boom of the early seventies has there been so much excitement among radio amateurs!

What is packet radio good for and what uses does it have for the "average ham?" How can I be sure I have the proper equipment and how do I set everything up? What are these things called protocols? Where is packet radio headed on VHF/UHF and HF? How has the "braaap" of a packet of data sent to a bulletin board replaced the clatter of a radioteletype machine in the autostart mode? Why is packet great for message handling, especially in emergency situations? What uses can the computer hobbyist, contester or DX'er find using packet? This new 205-page ARRL publication has the answers!

Each of the following chapters is written to make understanding packet radio a breeze: The Radio Hacker, History, Theory of Operation, TNCs, Installation, Selecting TNC Parameters, Operating Procedures, VHF and UHF Communications, HF Communications, Time-Shifting Communications, Public Service Communications, Space Communications, and The Network. In addition, there are these appendices: TNC 1 and 2 Commands, TNC 1 and 2 Control Characters, TNC 1 and 2 Messages, TNC Command Compatibility, ASCII Character Set, Bibliography and Sources, Glossary. Price of *Your Gateway to Packet Radio* is $10 plus $2.50 ($3.50 for UPS) shipping and handling.

ARRL 225 MAIN STREET NEWINGTON, CT 06111 U.S.A.

The New 688-page ARRL Operating Manual is HOT...

On July 8, 1986, a railroad tanker carrying toxic phosporous derailed and caught fire near Miamisburg, Ohio. The success of the Monsanto Amateur Radio Association's emergency plan in helping local authorities deal with this potential disaster is documented in November 1986 *QST*. The photograph above which was taken over the scene by Mike Carter, WD8BSI, shows what could happen in your backyard! Would you be ready for such a situation? The Emergency Communications chapter by Richard Regent, K9GDF, in the new *ARRL Operating Manual* tells how to prepare for such an eventuality. Emergency Communications and efficient message handling go hand-in-hand. Maria Evans, KT5Y, tells all about this subject and how you can become a part of the National Traffic System in the expanded Traffic Handling chapter.

Over forty percent of the radio amateurs licensed today were at one time or still are shortwave listeners. With modern transceivers, it's possible to hear what is going on outside our ham-bands. David Newkirk, AR7M, adds his enthusiasm for this closely related hobby in the SWL chapter. On a related subject, Paul Rinaldo, W4RI, tells us about the characteristics of the Amateur Radio Spectrum and how our bands are assigned.

Most hams are interested in just getting on the air and talking to someone. Even so, ham radio is a lot more than talking into a microphone or pounding a telegraph key. Carol Smith, AI2I, and Bill Jennings, K1WJ, have prepared a chapter on Basic Operating. It is just what the newcomer needs in order to get started, and it's good review for some of us who have been away from ham radio for a while. Almost everyone can qualify for the Rag Chewer's Club Certificate, but do you realize that there are hundreds of Amateur Radio awards from throughout the world? Well you can see dozens of these awards in *full color* along with their requirements in the Awards chapter by Bob Halprin, K1XA.

Clarke Greene, K1JX, tells all about competitive operating. Clarke has won almost every major contest, HF, VHF/UHF, from home and away, using full power and QRP. Now he tells how it's done!

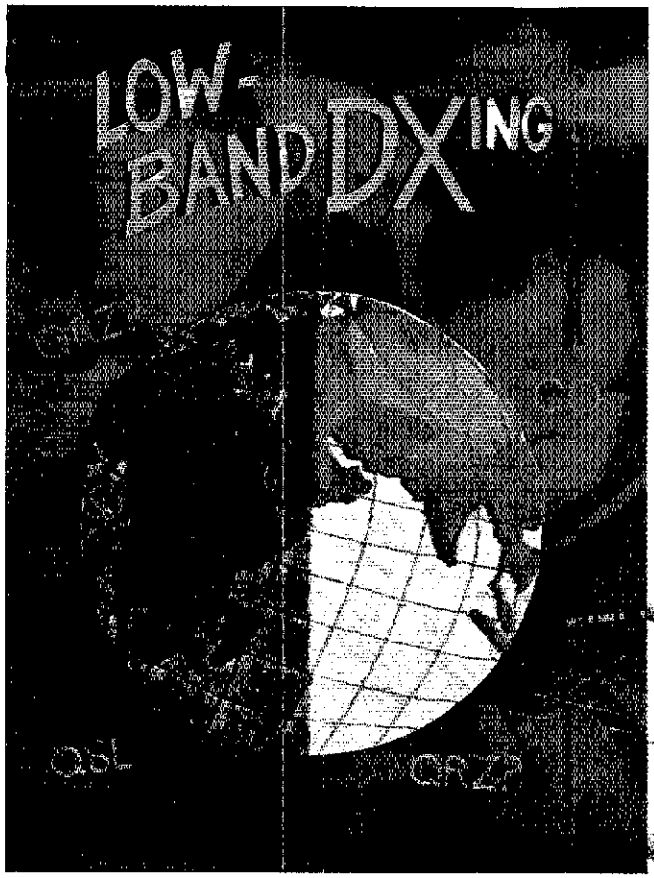
Almost everyone seems to be interested in digital communications these days. Stan Horzepa, WA1LOU, covers Packet Radio in detail; while Larry Wolfgang, WA3VIL, covers RTTY and other digital modes in a separate chapter. If you find SSTV or ATV of interest, Bruce Brown, WA9GVK, has put together a fantastic chapter on Image Communications.

If you still need to work the countries represented by the QSLs below, you're not alone; but you can pickup some good tips on working DX from well-known DXer and author Bob Locher, W9KNI. DX-peditioner Carl Henson, WB4ZNH, gives advice on how to operate from the "rare ones" without catching malaria or worse! You can find out when to work DX at anytime during the sunspot cycle by referring to the propagation tables which were newly incorporated in this edition. You'll also find sunrise-sunset tables for working DXCC countries around the world, and there is a great chapter on Antenna Orientation by *ARRL Antenna Book* editor Jerry Hall, K1TD.

Besides "packet," WA1LOU tells what is new in the area of FM and Repeater operation. This chapter is "must" reading for Novices who want to use repeaters for the first time or for those who want to upgrade their existing repeater operations. There is a lot doing these days on weak signal VHF/UHF work and Mike Owen, W9IP, shows how it's done from moonbounce to meteor scatter. Will you be ready for the OSCAR launch that may take place later this year? Dick Jansson, WD4FAB, captures us with his satellite operating techniques.

You'll also find numerous handy tables and charts in the third edition of *The ARRL Operating Manual*. It is edited by Robert J. Halprin, K1XA, Deputy Manager of Membership Communications at ARRL HQ. The new edition is available at your dealer or from ARRL for $15. (Please add $2.50, $3.50 for UPS for shipping and handling.)

but it's also FUN!



WHEN, WHERE & HOW TO WORK DX ON 160, 80 & 40 METERS

Written by John Devoldere, ON4UN. Published by ARRL

It's the first really brisk day of autumn, and the trees have begun to shed their leaves. It's been crisp and clear for the past couple of days and there is not hint of rain in the forecast, so there should be no QRN. Propagation bulletins are predicting low absorption. It's going to be a great night for Low Band DXing!

This is an over-simplification. Radio amateurs know practically by instinct that 160, 80 and 40 meters "open up at night." But anyone in the Eastern U.S. who has worked Western Australia on 40-meters in the middle of the afternoon or West Coast amateurs who work into the Middle East on 80 meters just after daybreak know that, depending on the time of year, these bands have many secret hiding places for their DX-treasurers! Now, John Devoldere, ON4UN, has put together a treasure map in the form of a 210-page book published by ARRL where he completely explores the 160, 80, and 40-meter bands.

John draws on his vast knowledge and years of experience, as well as that contained in over 500 references which are listed in their own chapter. A large portion of the book is devoted to the design and building of efficient antennas for these frequencies. Receiver, transmitter and transceiver characteristics are also covered. The propagation chapter is the key to understanding when to work DX. The operating chapter tells where to find DX and gives tips on maximizing the effectiveness of your station for low band work. There is also a chapter of interesting and useful BASIC programs. But you don't have to keyboard these programs; there is inexpensive software that can be purchased separately which is available for use on many popular personal computers.

This new ARRL publication is copyright 1987. It is available in softcover only for $10 plus $2.50 ($3.50 for UPS) shipping and handling from ARRL.

ARRL BOOKSHELF

Prices are subject to change without notice. Shipping and handling: add $2.50 for book rate or $3.50 for UPS. Payment must be in US funds.

ARRL, 225 MAIN STREET, NEWINGTON, CT 06111

THE 1988 ARRL HANDBOOK

This is the most comprehensive edition since the *Handbook* was first published in 1926. It is updated yearly to present the cutting edge of rf communication techniques while presenting hundreds of projects the average Amateur Radio operator can build. The 65th edition is packed with information on digital communication modes as well as new power supplies and amplifiers. Ready-to-use etching patterns are provided for many projects. This *Handbook* belongs in every ham shack.

Hardcover only #1658 $21 US, $23 elsewhere

ANTENNA BOOKS

THE ARRL ANTENNA BOOK represents the best and most highly regarded information on antenna fundamentals, transmission lines, and propagation. 328 pages copyright 1982.

Paper #4149 $8 US, $8.50 elsewhere

W1FB's Antenna Notebook Practical wire and vertical antenna designs ..... **#0488 $ 8**

TRANSMISSION LINE TRANSFORMERS, cover baluns, use of ferrites, and other aspects of antenna transmission line design and operation. 128 pages ..... **©1987 #0471 $10**

ANTENNA COMPENDIUM Packed with new material on quads, yagis and other interesting topics.

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HF ANTENNAS FOR ALL LOCATIONS G6XN's look at antennas with practical construction data.

©1982 264 pages #R576 $15

YAGI ANTENNA DESIGN by Dr. James L. Lawson, W2PV. Over 210 pages of practical theory and design information.

©1986 #0410 $15

PASSING POWER! - THESE PUBLICATIONS WILL HELP YOU THROUGH THE EXAMS

Beginning with **Tune in the World with Ham Radio** for the Novice and progressing through the critically acclaimed **ARRL License Manual Series** for the Technician through Extra Class; you will find passing each exam element a snap! There are accurate text explanations of the material covered along with FCC question pools and answer keys. The latest edition of **The FCC Rule Book** is invaluable as a study guide for the regulatory material found on the exams and as a handy reference. *Every* amateur needs an up-to-date copy. **The ARRL Code Kit** has a booklet and two C-60 cassettes to take you from 5 to 13 WPM quickly. **Morse Code the Essential Language** has tips on learning the code, high speed operation and history. If you have a Commodore 64™ or C 128 computer, **Morse University*** provides hours of fun and competition in improving your code proficiency. **First Steps in Radio** from **QST** presents electronic principles for the beginner.

*MORSE UNIVERSITY is a trademark of AEA, Inc.

Tune in the World with Ham Radio 1987 edition
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Book only ..... **#0399 $12**
Cassettes **$10**

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Extra Class ..... **#0178 $ 5**
FCC Rule Book 7th Ed. ..... **#0453 $ 5**

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Morse Code: The Essential Language covers sending, receiving, high speed operation and history ©1986 ..... **#0356 $ 5**

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OPERATING

The ARRL Operating Manual 688 pages packed with information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF, contesting, DX traffic/emergency matters and shortwave listening.

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The RSGB Operating Manual The third edition published in 1985 is packed with practical operating tips, techniques and tables ..... **#R69X $12**

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HOLA CQ Learn to communicate with Spanish-speaking radio amateurs. 90 min. cassette and 15 page text. **#901N** **$7**

Passport To World Band Radio 350 pages of information and listings of shortwave broadcast stations with frequency, times, and languages. 1988 ed. **$15**

PACKET RADIO/COMPUTERS

Computer Networking Conferences 1-4 from 1981-1985 Pioneer Papers on Packet Radio .. **#0224 $18**

5th Computer Networking Conference Papers ©1986 ..... **#033X $10**

6th Computer Networking Conference Papers ©1987 ..... **$10**

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RSGB Amateur Radio Software Contains 85 BASIC programs, 6 in assembly language covering CW, RTTY, Amtor, Packet, Antenna Design, Satellite Predictions, Distances, Bearings and Locators ... **$15**

Your Gateway to Packet Radio How to get started, equipment you need and more ..... **#2030 $10**

DX

The Complete DX'er by W9KNI ..... **#2083 $10 US, $11 elsewhere**

DX Power by K5RSG ..... **#T740 $10**

DXCC Countries List — free shipping .. **#0291 $ 1**

Low Band Dxing ©1987 ..... **#047X $10**

QRP

QRP Notebook by Doug DeMaw, W1FB. An exciting book for the low power enthusiast and experimenter. Copyright 1986, 12 pages ..... **#0348 $ 5**

VHF-UHF, MICROWAVE, SPACE

RSGB VHF/UHF Manual ..... **#R630 $23**

RSGB Microwave Newsletter Col. ..... **#R000 $12**

21st Central Sts. VHF Conf. ..... **#VHSC $10**

Microwave Update 1987 Conf. ..... **#0682 $10**

Mid-Atlantic VHF Conference ..... **#MID1 $10**

The Satellite Experimenter's Handbook by Martin Davidoff, K2UBC, 208 pages, copyright 1985. **#0046 $10 US, $11 elsewhere**

AMSAT NA 5th Space Symposium ..... **#0739 $12**

INTERFERENCE/DFing

Radio Frequency Interference ..... **$ 4**

Interference Handbook (Radio Pubs) **$10**

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OTHER PUBLICATIONS

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MFJ TUNERS

The world's most popular 3 KW roller inductor tuner with cross-needle meter gives you the widest range matching network available for coax, balanced lines and random wires *plus* you get antenna switch, dummy load and balun – all at a super price . . .

The MFJ-989B is a compact 3 KW PEP roller inductor tuner with lighted Cross-Needle SWR/Wattmeter that handles the highest power of any MFJ tuner! Its roller inductor allows you to get your SWR down to the absolute minimum. And you get other outstanding features like an antenna switch, dummy load, balun and more -- all at an outstanding price.

At only 10¾x4½x15, the MFJ-989B matches the new, smaller rigs.

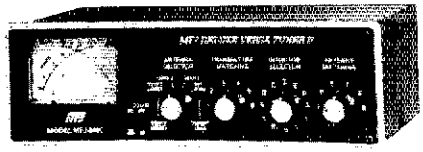
Why can you get your SWR down to minimum every time? Because the MFJ-989B has a roller inductor with 3-digit turns counter plus a spinner knob for precise inductance control. And because it has the widest range matching network available for coax, balanced lines and random wires. And it covers 1.8 to 30 MHz continuously.

MFJ-989B **$349.95**

The MFJ-989B's 2-color, lighted Cross-Needle Meter not only gives you SWR automatically with no controls to set but also forward and reflected power at a glance!

Plus . . . 6-position antenna switch, 50 ohm dummy load, 4:1 balun for balanced lines, ceramic feed-through, and flip-stand for easy viewing. Meter light requires 12 V

MFJ's Best VERSA TUNER II



MFJ-949C **$149.95**

MFJ's all-in-one Deluxe Versa Tuner II gives you a clutter-free shack and all the features you could ever want at a super price. Here's what you get: coax/balanced line/random wire 300 watt tuner for 1.8-30 MHz, Cross-Needle SWR/Wattmeter, 50 ohm dummy load, 4:1 balun and 6-position antenna switch . . . all in a compact 10x3x7 inch cabinet that matches the smaller new rigs.

You can tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A lighted Cross-Needle meter gives you SWR, forward and reflected power -- all at a glance. A 6-position antenna switch lets you select 2 coax lines, direct or through tuner, random wire/balanced line and dummy load. 1000 volt capacitors, efficient airwound inductor, heavy duty switches.

MFJ's smallest VERSA TUNER

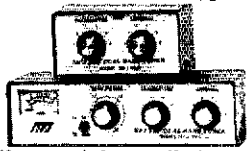
MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP Versa tuner -- when both your space **and** your budget is limited. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced and coax lines continuously 1.8-30 MHz. **Excellent for matching solid state rigs to linears.** Efficient airwound inductor. 4:1 balun.

144/220 MHz VHF TUNERS

MFJ-920 **$49.95**

MFJ-921 **$69.95**



MFJ's newest VHF tuners cover both 2 Meters and the new Novice 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. MFJ-921 has SWR/Wattmeter.

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**

The MFJ-941D is MFJ's best selling 300 W PEP antenna tuner! Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, balanced and coax lines.

SWR/Wattmeter reads forward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 11x3x7 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**

Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C **extends your antenna bandwidth** and eliminates the need to stop, go outside and readjust your mobile whip.

You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8x2x6 inches uses little room. **SWR/Wattmeter and convenient placement of controls make tuning fast and easy while in motion.** 300 watts PEP output, efficient airwound inductor, 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

MFJ-1702, $19.95. 2-positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701 **$29.95**

MFJ-1701, $29.95. 6-positions. Unused positions grounded. For desk or wall mount.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

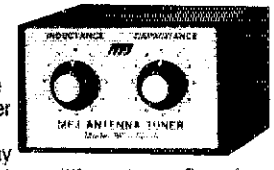
The MFJ-962B lets you use your barefoot rig now and have the capacity to add up to a 1500 watts PEP linear amplifier later. Its small size -- 10¾x4½x15 inches -- matches the new compact rigs.

A lighted Cross-Needle SWR/Wattmeter makes tuning a snap and gives you SWR, forward and reflected power -- all at a glance.

6-position antenna switch handles 2 coax lines, direct or through tuner, wire and balanced lines. 4:1 balun, efficient airwound inductor with heavy duty ceramic switch, 6 KV capacitors. Flip-stand tilts tuner for easy viewing.

MFJ's Random Wire TUNER

MFJ-16010 **$39.95**



You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. Handles 200 watts. Ultra compact 2x3x4 in.

MFJ Artificial RF ground

$79.95 MFJ-931

You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise. The MFJ-931 also lets you electrically **place a far away RF ground directly at your rig** -- no matter how far away it is -- by tuning out the reactance of your ground connection wire.

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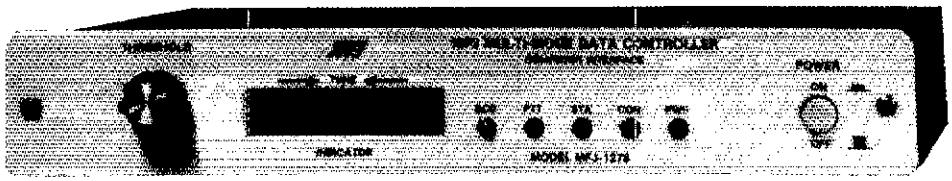

MFJ *shatters* the 6 mode barrier *and* the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable $249.95

Amateur radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

Plus you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

You'll find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

A high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

All you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

You can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

Packet

Packet gives you the fastest and most reliable error-free communications of any amateur digital mode.

With MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

Extensive tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

Hardware DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

A hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

Good news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

Baudot RTTY

You can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

A high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

You can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

You get both the American Western Union and the international CCITT character sets, Autostart for unattended reception and selectable "Diddle".

A receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

ASCII

You can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

CW

You get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

A huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

You can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

A tone Modulated CW mode turns your VHF FM rig into a CW transceiver for a new fun mode. It's perfect for transmitting code practice over VHF FM.

An AFSK CW mode lets you ID in CW.

The CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

You also get a random code generator that'll help you copy CW faster.

Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

Any Epson graphics compatible printer will print a wealth of interesting pictures and maps.

Automatic sync and stop lets you set it and leave it for no hassle printing.

You can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

Pictures and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

You can transmit FAX pictures right off disk and have fun exchanging and collecting them.

Slow Scan TV

The MFJ-1278 introduces you to the exciting world of slow scan TV.

You'll not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

You can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

You can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

You can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

The MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

You'll score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

You get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

Message memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

You get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

A weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

More Features

Turn on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

***Plus** . . .* printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

Get yours today and join the fun crowd!

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WANTED: Coils and Dials HRO 60, E, F, AD. Dial only General Coverage. D. Frank, 700 N. 117th, Seattle, WA 98133.

CIPHER MACHINES, manuals and anything else related to secret communications wanted; especially equipment. WB2EZK, 17 Alfred Road, Merrick, NY 11566, 516-378-0263.

WANTED: 10M FM Repeater Info. KA4RPZ, Box 3035, Greenville, NC 27836.

TRANSFORMERS Wound—Peter Robson Co., 18 Washington Trail, Hopatcong, NJ 07843.

GET Your "FCC Commercial General Radiotelephone License". Electronics Home Study. Fast, inexpensive! "Free" details. Command, D-170, Box 2824, San Francisco, CA 94126.

"MILL". Remington MDL-150 Manual Typewriter with Telegrapher's Keyboard (all capitals, slashed zero) E/C, $90/BO. Cohoes, NY, Jim Meaker, tel. 518-235-2892.

HAM RADIO Repair, HF-VHF-UHF, all brands, nationwide service. FCC Commercial License #PG18-31833. Mike Koss, W9SU, P.O. Box 18495, Indianapolis, IN 46218-0495, 317-547-1398.

WANTED: Ten-Tec 2510 Mode B Satellite Station. NH6OM, 46-306 Kalali Street, Kaneohe, HI 96744-4129.

WANTED Acopian Power Supplies Models 1.5EB100; 6EB100 and 65ED05. Send card or call collect Bob, KI4MB, 6608 N 18th Street, Arlington, VA 22205, 703-533-0650.

BLEEDERS: 200K/50W, 3/$15 postpaid. Paladino, 906 Hester, Harrison, AR 72601.

KENWOOD TS130V, CW Filter, SP120 speaker, PS20 power supply, MC50 mike, mint cond., $450. AA6S, 209-732-7163.

ESTATE Sale of W5ACE. Beautiful hilltop home with 8 acres timberland near Hot Springs National Park, AR. 5 steel towers installed, 2-100 ft. with 10 mtr. & 20 mtr. beams, 2 rhombics, 1000 ft. open wire. Excellent DX location, satellite, many extras. Asking $95,000. Verda Cuga, P.O.B. 88, Royal, AR 71968, tel. 501-991-3354.

APARTMENT Dwellers/Portable Antenna. Also affordable books, equipment, antennas. SASE for information. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 312-482-9310.

CODE TUDOR, as described in August 1987 CQ. Learn or practice code on your IBM-PC or compatible. Send $9.95 to Archway Data Systems, Box 55, Edison, NJ 08818.

LAKEFRONT QTH in Upper Michigan on large lot in Ottawa National Forest. Shack away from house with two towers. Excellent well water! Many extras! Available after June 15, 1988. NE8Y, 906-265-5362.

WANTED—Sets of books—Rider/Hayden-Basic Electricity, Basic Electronics, Basic Industrial Electricity. N4EM, Molyneux, 205-342-9041.

YAESU FT-101 Xcvr, Microphone, Speaker, etc. $350 plus shipping. WA2PVN, 95 Somerset Avenue, Bridgewater, NJ 08807, 201-725-6788.

WANTED: Legal limit HF Amplifier, mint. Write AE1Q, Don Smith, 99 West Street, Braintree, MA 02184.

FAREWELL to American friends. JA1DNQ/KD2HB and his family's leaving with wonderful memories for Japan after 5 happy years in Chappaqua. Hate to leave but no choice for brown bagger. Miss you all and God Bless America. JA1NDQ/KD2HB.

VIBROPLEX Keys, SASE #10. L. Matho, 2303 Nordok Place, Alexandria, VA 22306.

FLORIDA Home 2/2 cul de sac Tower, Telrex 4-Element Tribander, 2 meter Ringo Star, 5 bander vertical all tile all features—$77,000. KA4LWW, 305-793-0355.

FOR SALE: Robot 800CH, Mint, I ship. N2AWK, 914-965-4068.

FREE to a good shack. 19ASR and 12KSR Teletypewriters. The 19 works great; the 12 is old. Also spare parts and TTY Scope. All or nothing. Must be pick up in Southern NY and Northern NJ. Would consider accepting a Communications General Coverage Receiver for above, if offered. WA2TEQ.

FOR SALE: Kenwood TR7850, excellent condition, aligned, $175. Dan, KB3ZE, 11 Longview Drive, Irwin, PA 15642, 412-863-1633 evenings.

MICROWAVE Parts—for 2.3, 3.4, 5.6, and 10 GHz: Solid State Xtal controlled oscillators (bricks); $40. Isolators, circulators, and interdigital filters with SMA, N, and WG connectors; $5-$10. Downconverters and upconverters; $35. Also: 3.4 GHz, 5 watt GASFET amps; $125. Xtal controlled 10 GHz FM "gunnplexer" modules; $90. Call for info or SASE for list. Bob Seydler, N5KET, Rt. 2, Box 2170, Boerne, TX 78006, 512-249-2152, or Alan Dickinson, N5BHX, 512-344-9575.

SWAN 250 six meter transceiver with preamp. 117XC power supply mike and manual-$275. Mickey Johnson, KB5AMZ, 504-833-5607.

FOR SALE: C64 + 1702 color monitor + C2N cassette + AEA MBA-TOR = $250. Heath IO-101 vector scope = $100. Heath IG-82 generator = $35. Model 28 KSR + 3 SPD gearbox + complete set new manuals + ribbon reinkers + spare parts = $200. Tube caddy full + mostly new tubes = $50. Clegg FM-88 with 800 channel scanner = $175. All equipment like new, shipping extra. Call Dan, work 313-752-8675 or home 313-247-0444 or write WA8GQL.

KENWOOD: TS430S Xcvr $650, PS430 power supply $110, AT230 tuner $150, Cushcraft AP8 $110, AEA KT-2 $50, Dynascan 2803 Multimeter $65. KA1DZP, Dave Smith, RR 2, Box 403, Gorham, ME 04038, 207-892-9201.

TEN-TEC 2 KW antenna tuner model 229, new never used, $175. Plus UPS shipping. K4IZU, 521 Fieda Road, Memphis, TN 38119, 901-685-5574.

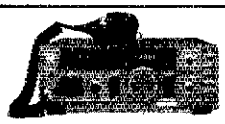
FOR SALE—Kenwood R599B/T599B/ Remote Speaker, $250 or best offer. Clipperton Amplifier, new tubes, recently completely reconditioned, $400 firm. N3ED, Box 32, Archbald, PA 18403.

KENWOOD

TS-940S
NEW Top-of-the-Line
HF Transceiver
- 100% Duty Cycle
- 40 Memory Channels

CALL FOR SPECIAL PRICES!!

TS-440S NEW!
CALL FOR SPECIAL SALE PRICE



TS-140S
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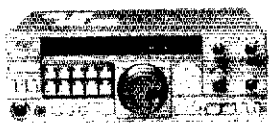

TS-711A **TS-811A**

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TW4100A
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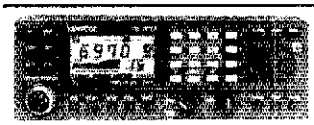
TR-751A
All Mode 2m Mobile



COMPACT 2M FM MOBILE

TM 2570A (70W) TM 3530A (25W)
TM 2550A (45W) TM 221A (45W)
TM 2530A (25W)

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TH 205 AT
High Tech 2M
HT XCVR

TH215A
2m HT XCVR
TH-25AT
TH21BT, TH31BT
TH41AT Also In Stock-
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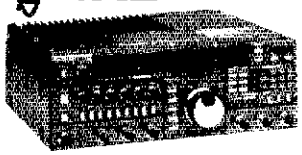
YAESU



FT 767 GX HF/VHF/UHF
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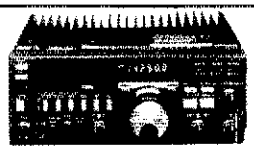

FT-757GX/II
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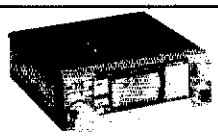
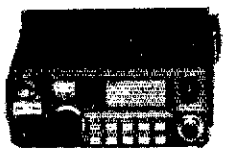


FT2700RH NEW 2M/70cm
Dual Band Transceiver
Full Duplex-Cross Band
Operation
CALL FOR PRICE-SAVE $$!



NEW FT290R 2m Portable
NEW FT690R 6m Portable
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NEW HIGH
Tech HT's
5W Output

New!
FT727 RH
2m/70 cmHT
- 5w Output
- 10 memories
- Battery saver

Call For Sale Prices

FT 23R 2m HT
FT 73R 70 cm HT
- compact size
- 10 memories
- up to 5W output W/FNB 11

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ASTRON POWER SUPPLIES

Heavy Duty- High Quality - Rugged - Reliable
- Input Voltage:105-125 VAC Output:13.8 VDC ± .05V
- Fully Electrically Regulated 5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
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- A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

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IC-761 New HF XCVR
- Built-In AC Power Supply
- Built-In Automatic Tuner
- PBT Plus IF Shift
- QSK Up To 60 WPM

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IC735 NEW General Coverage
Ultra Compact
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IC-27A	IC-27H
IC-28A	IC-28H
IC-37A	IC-47A
IC-38A	IC-48A

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IC02AT - 2mtr
IC03AT - 220 MH
IC04AT - 70cm
High Tech
HT XCVRS

NEW
IC-μ2AT
2m HT

- micro design covers 140-163 MHz
- 10 mem. w/scan
- LCD Readout

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General Coverage HF Transceiver
Microprocessor Controlled Multi-Scan
62 Memories Call For Special Sale Price

561 Corsair II	$ CALL
950 Power Supply	$ CALL
229 2KW Tuner	$ CALL
425 Titan Amplifier	$ CALL

MIRAGE

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23A	2M	Yes	2W	30W	$129
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

rlc 2-317 2M
30W in = 170W out
LIST $299.00

Model	Band	In-Out	List Price
2-23	2M	2-30W	$112.00
2-217	2M	2-170W	$299.00
2-117	2M	10-170W	$299.00
2-417	2M	45-170W	$299.00
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

Call For Sale Prices

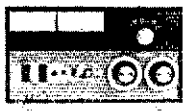
AMERITRON

AL80A

AL80A	$985.00	ATR10	$325.00
AL84	479.00	ATR15	380.00
AL1200	1825.00	RCS4	134.50
AL1500	2370.00	RCS8V	134.50

CALL FOR SALE PRICES!

AMP SUPPLY



Model	List	Model	List
LK450	$899	LK450NT	$1199
LK500ZC	$1395	LK500NT	$1595
LK800A	$2695	LK800NT	$2995
LK550	$1895	AT 3000	$ 499

CALL AND SAVE $$$$$

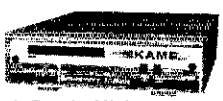
PK-232 Packet Controller.....$299.95
144 MHz Isopole.....$49.95
440 MHz Isopole.....$59.95
Other AEA products also in stock call!!!

ALINCO

ELH-230S	CALL	ALR-22T	CALL
ELH-230D		ALR-22HT	
ELH-260D		ALR-72T	
		ALD-24T	

Other items in stock - call!

Kantronics



KAM All Mode Terminal Unit.....$289.95
KPC II Packet Controller.....$159.90
KPC 4 Node Controller.....$299.90

MFJ

1270B/1274 TNC Units	$129.95/159.95
1224/1229 Interface	$89.95/$159.95
202/204 Antenna Bridges	$59.95/$79.95
250 Oil Load	$39.95
260/262 Dry Loads	$29.95/$59.95
407/422 Elect. Keyers	$69.95/$119.95
901/941D Tuners	$59.95/$99.95
949C/989 Tuners	$139.95/$299.95

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Tuner

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- Built-in Antenna Switch/Balun

New-RF Power Monitor System $249.95
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Voice Keyer

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- Essential For Contesting
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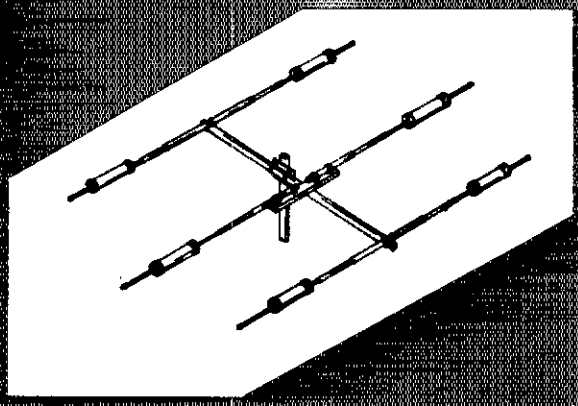
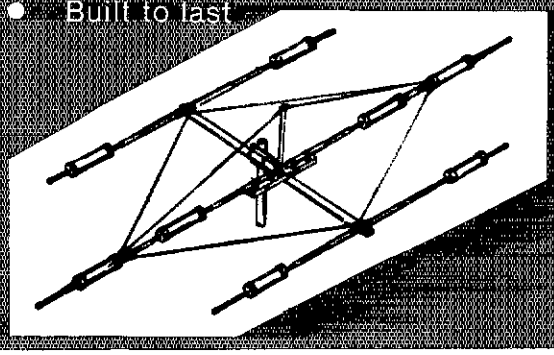
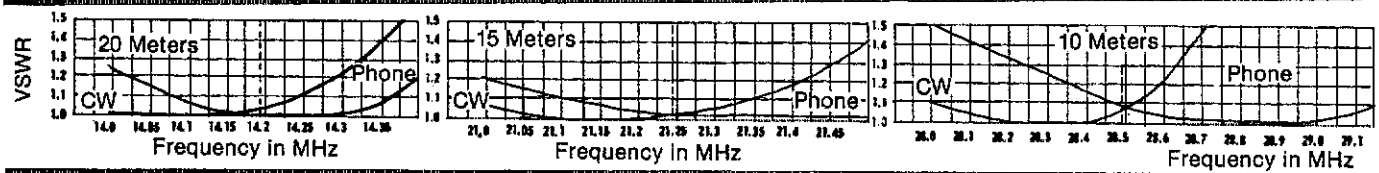
LOOK WHAT THE MOSLEY TA-33 OFFERS



- 3 Element full power
- All stainless steel hardware
- Ease of assembly
- No balun required
- Now a 2 year limited warranty
- Now a standard 2" mast adapter
- Built to last



- Expandable to 30 or 40 meters
- Superb front to back ratio
- Excellent gain
- Outstanding SWR



SPECIFICATIONS:

Forward gain	
Front-to-Back Ratio	
Power rating CW	1KW
SSB	2KW P.E.P.
Feedpoint Impedance	52 ohm
VSWR HT Resonance	1.5 to 1 or better
Matching System	Mosley
Number of Elements	3
Longest Element	28'
Boom Length	14'
Mast Size	1¾" or 2"
Turning Radius	15.6'
Wind surface area (ft sq ft.)	5.7
Wind load (EIA standard 80 mph)	114 lbs.
Assembled Wt.	39 lbs.
Shipping Wt.	44 lbs.

- Used around the world
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- A great antenna for the new solid state rigs

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Mosley Electronics, Inc. 1344 BAUR BOULEVARD ST. LOUIS, MO. 63132 1-314-994-7872

DAIWA MT20A Handheld 2M Transceiver and Accessories Wanted; LA20 "Booster", Battery Cases, Etc. Also need Eastman 35mm "Dayload" Developing Tank. G. Rose, 524 N. Quaker Lane, Alexandria, VA 22304, 703-370-1880.

FOR SALE: TRS-80 Model III, Single Disk Drive, 48K, RS-232, with Instruction and Service Manuals. Like new in original box, $275. WB8CFO, 216-447-9738.

WANTED For Cash—Two Meter or 220 MHz Crystal Controlled Transceiver such as Clegg or Midland. Call Stan, K2IRS, 914-354-4999 or write 34 Bridle Road, New Hampstead, NY 10977.

NEED 117X or 117XC Power Supply. Russell Farniof, 3225 S. Manitoba, Tucson, AZ 85730, 602-722-9286.

KENWOOD TS-440S w/AT-440 and YK-88C 500 Hz installed. Original cartons and manual. Mint! Very little use. $890. You ship. Available after June 10, 1988. NE8Y, 906-265-5362.

POCKET-COMPUTER PC1270A for tracking any satellite or orbital object with Keplerian elements. Weight 3 oz., size 5.3 × 2.7 × 0.4 inches! Uses exchangeable 4, 8 or 16K RAM cards. Calculates many vital values fast. Program included. Printers and cassette interfaces available. SASE please. Manfred Mueller, KG6EF, 4914 Commonwealth Avenue, La Canada, CA 91011.

ULTIMATE Antenna Site: 8600' elevation, 25 miles west of Denver; 3 element 40M, tribander, dipoles. Spacious mountain home with five bedrooms, three baths, two fireplaces, solar, two acres, assumable 8-3/4% loan. Consider trade in San Diego area. Jim Griffiths, KB3EI, 303-838-6651.

WANTED: HW-9, all bands, to replace HW-8. Write Herb Ley, N3CDR, P.O. Box 2047, Rockville, MD 20852.

FOR SALE: Set of bound *QSTs*. Write for details. Dex Deeley, 8 Briar Circle, Rochester, NY 14618.

FOR SALE—Ten-Tec 579, Century 22, 50 W, 6 band CW xcvr and 979 power supply and 225 crystal calibrator, new $390. U-110 alliance rotor, new $35. Acoa quad for 2 meters, $110. PK64A with HFM installed plus PK64 Packrat Packet Controller $150, MFJ Packet Controller $60. You pay shipping. KB4PQ, 407-574-2496.

SEQUIM, WA. Outstanding ham QTH with marine and mountain veiws. 50 foot selfstanding tower with tribander and rotor. 2 bedroom, 2 bath, 1440 square foot home, 588 square foot garage and ham shack, 192 square foot storage shed on 1/3 acre lot located 150 feet from the beach on the Strait of Juan DeFuca with beach privileges. Sunland and Dungeness golf courses nearby. $77,500. W7EST, 206-683-6450.

SALE—TS520-$350, SB220-$250, Freq. Counter-$115, Tri-Bander-$100, TR22-$80, HA460-$80, Rohn 60' Tilt Tower & Rotator-$550. All excellent. Call WA3EPS, 215-657-2221.

WANTED: General Coverage Battery Receiver; Sony ICF6700, CRF, Toshiba RP-F11, Grundig or Zenith "Oceanic" 7000. Wade, 657 14th Avenue, Prospect Park, PA 19076.

KENWOOD TR-7400A, 2M, 35W, W/PL, original accessories, PS-8, mint $225. Drake TR-4, AC-3, good w/manual $150. Motorola HT220 slimline PL 147.360, 145.450 rpt, clean w/manuals, rapidcharger, +extras $130. WA2OFZ, 718-274-3823.

NATIONAL SW-3 Wanted. WØGYA, 400 4th Street SE, Altoona, IA 50009.

YAESU FT101E/FR101 Rcvr. with Spkr-Filters-Fan-Service Manual, $800. Call Fred, W1NHS, 203-795-5478 after 6PM.

SWAN 350, 400 Watts PEP. SSB/CW 80-10, $200. Absolutely firm, you ship. JP Woodward, WB9CYI, Box 408, Algonquin, IL 60102, 312-658-6436.

WANTED: Crystal and one tube radio circuits and parts. William Gilbert, 33 Main Street, West Sayville, NY 11796.

SELLING: Kenwood TS430S with MC42S up-down mike; MFJ 949C antenna tuner slight mod; homebrew 8044 keyer. WØJDH, 327 NW 6th Street, Valley City, ND 58072.

WANTED: Low Band (HF) Amplifier—in reliable working condition. Contact: Randy Hyatt, KC3CH, day 215-564-3072, evening 215-446-4826.

DRAKE TR-7, w/PS-7, CW, SSB and AM Filters, Noise Blanker and Frequency Counter Display. Just been refurbished, like new. Operator and Service Manual included. $750, will ship. Robert Sanford, KB5VI, 3639 Valley View Lane, Flower Mound, TX 75028.

KENWOOD TS-820S Transceiver with External VFO, CW Filter, $475. KB1RZ, 207-353-6360.

SUPERFAST MORSE Code Supereasy. Subliminal cassette, $10. Learn Morse Code in 1 Hour. Amazing new supereasy technique, $10. Both, $17. Moneyback guarantee. Free catalog: SASE. Bahr, 2549-G5 Temple, Palmbay, FL 32905.

75A-4, NC303 Wanted. State model, condition, price and telephone. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528.

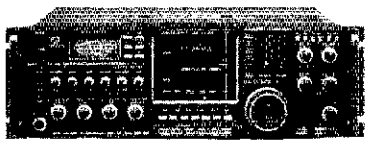
DRAKE: T-4XC, AC4, $225. R-4C w/CWF, $260. SB-220, $425. Complete station, $880. Stan, 501-741-1825.

WANTED: Equipment and Related Items. The Radio Club of Junior High School 22 NYC, Inc. is a non-profit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please contact WB2JKJ using the callbook or telephone 516-674-4072, 24 hours, seven days a week. Thank you!

WANTED: MFJ-16010 BT Super Antenna Tuner and MFJ-8043 IC Deluxe Electronic Keyer. WØSZF, 308-345-3010.

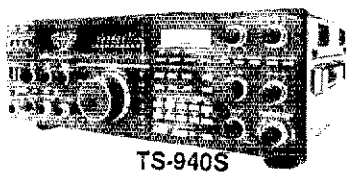
WANTED: Ex WAG, RCAF, WWII, would like to add to small collection Marconi R-1155 and possibly T-1154, clean, reasonable. Ed English, W6WYQ, 1841 Pinecove Drive, San Luis Obispo, CA USA 93401, 805-543-0543.

ICOM KENWOOD YAESU



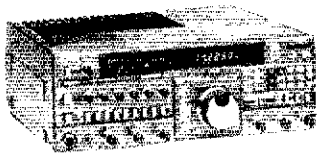
IC-781

HF Equipment	List	Juns
IC-781 New Deluxe HF Rig	$5995.00	Call $
IC-761 Loaded With Extras	2699.00	Call $
IC-735 Gen. Cvg Xcvr	1099.00	Call $
IC-751A Gen. Cvg. Xcvr	1699.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1199.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	999.00	Call $
VHF		
IC-275A All Mode Base w/PS	1299.00	Call $
IC-275H All Mode Base 100w	1399.00	Call $
IC-28A FM Mobile 25w	469.00	Call $
IC-28H FM Mobile 45w	499.00	Call $
IC-2AT FM HT	319.00	Call $
IC-02AT FM HT, HP	409.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	639.00	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-48A FM Mobile 25w	509.00	Call $
IC-4AT FM HT	349.00	Call $
IC-04AT FM HT	449.00	Call $
IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	649.00	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta.	1399.00	Call $
IC-38A 25w FM Xcvr	489.00	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	349.00	Call $
IC-03AT Deluxe HT	449.00	Call $
1.2 GHz		
IC-1271A All Mode 10w	1269.00	Call $
IC-1200 FM, 10w Mobile	699.00	Call $
IC-12AT Deluxe 1w HT	473.00	Call $



TS-940S

HF Equipment	List	Juns
TS-940S/AT Gen. Cvg Xcvr	$2449.95	Call $
TS-830S Xcvr	1199.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1379.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	929.95	Call $
TS-680S HF Plus 6m Xcvr	1099.95	Call $
TL-922A HF Amp	1649.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	999.95	Call $
R-2000 150 kHz-30 MHz	749.95	Call $
VHF		
TS-711A All Mode Base 25w	1029.95	Call $
TR-751A All Mode Mobile 25w	649.95	Call $
TM-221A Compact FM 45w	439.95	Call $
TM-2530A FM Mobile 25w	479.95	Call $
TM-2550A FM Mobile 45w	499.95	Call $
TM-2570A FM Mobile 70w	599.95	Call $
TH21-BT FM, HT	279.95	Call $
TH-215A, 2m HT Has It All	379.95	Call $
TH-25AT 5w Pocket HT NEW	349.95	Call $
TM-721A 2m/70cm, FM, mobile	649.95	Call $
UHF		
TS-811A All Mode Base 25w	1,229.95	Call $
TR-851A 25w SSB/FM	749.95	Call $
TM-421A Compact FM 35w	449.95	Call $
TH-415A 2 5w 440 HT	399.95	Call $
TH-41BT FM, HT	399.95	Call $
TH-45AT 5w Pocket HT NEW	369.95	Call $
TW-4100A, 2m/70cm FM	599.95	Call $
TH-55 AT 1.2 GHz HT	TBA	Call $
TR-50 1w 1.2GHz FM	629.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	499.95	Call $
TH-31BT FM, 220 MHz HT	299.95	Call $
TM-321A Compact 25w Mobile	449.95	Call $
TH-315A Full Featured 2.5w HT	399.95	Call $



FT-767GX

HF Equipment	List	Juns
FT-747 GX New Economical Performer	$889.95	Call $
FT-757 GX II Gen. Cvg Xcvr	1129.95	Call $
FT-767 4 Band New	1929.00	Call $
FL-7000 10m 160m Solid State Amp	1995.00	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	759.95	Call $
FRG-9600 60-905 MHz	699.95	Call $
VHF		
FT-212RH NEW 2m, 45w mobile	459.95	Call $
FT-211RH FM Mobile 45w	389.95	Call $
FT-290R All Mode Portable	599.95	Call $
FT-23 R/TT Mini HT	344.95	Call $
FT-209RH FM Handheld 5w	389.95	Call $
UHF		
FT-712RH, 70cm, 35w mobile	499.95	Call $
FT-711RH FM Mobile 35w	449.95	Call $
FT-73 R/TT Mini HT	349.95	Call $
FT-709RH FM HT 4w	389.95	Call $
VHF/UHF Full Duplex		
FT-736R, New All Mode, 2m/70cm	1749.95	Call $
FEX-736-50 6m, 10w Module	259.95	Call $
FEX-736-220 220 MHz, 25w Module	279.95	Call $
FEX-736-1.2 1.2 GHz, 10w Module	539.95	Call $
FT-690R MKII, 6m, All Mode, port.	569.95	Call $
Dual Bander		
FT-727R 2m/70 cm HT	439.95	Call $
220 MHZ		
FT-109 RH New HT	399.95	Call $
FT-311 RM Mobile	499.95	Call $
Repeaters		
FTR-2410 2m Repeaters	1269.95	Call $
FTR-5410 70cm Repeaters	1289.95	Call $

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TH-31BT, Pocket Sized
220 MHz w/DTMF

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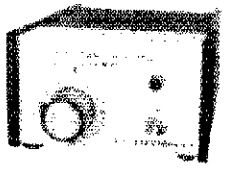

TVC-4G
Regular ~~$99~~
$89 *delivered, "till June 1.

70 CM ATV DOWNCONVERTER
FEATURES: Contains sensitive GaAsfet preamp & mixer - Tunes 420-450 MHZ down to ch. 2, 3, or 4. 120 Vac or 12 Vdc. Cabinet 4x2.5x7". Ready to go.

WHAT IS REQUIRED: It's EASY! Just connect your TV set, 70 CM antenna and coax to the TVC-4G and get ready to watch live action color video and sound.
ATV APPLICATIONS: See the shack, home video tapes, computer video, Space Shuttle, weather radar and other public service events. Many areas have ATV Repeaters; see ARRL Repeater Directory & 1988 Handbook chapters 20 and 7.
CALL (818) 447-4565 or write for our *spring* catalog. Give your amateur call if also interested in our transmitting equipment. We have all your ATV needs: antennas, downconv., transmitters, etc., 70, 33, & 23cm.
*Includes UPS surface shipping in contiguous USA.

GE TERMINET 30 with manuals, $475. Altair 8800B Turnkey Computer with 5-1/2 disk drive and manuals, $485. KZ1S, RR 5, Box 201, Asheboro, NC 27203, 919-857-2851.

AEA PK-232, perfect condition, $225 postpaid. KI4SU, 216 Harrogate, Longwood, FL 32779, 407-682-5431.

MUST SELL. Kenwood TS530S, Swan 500CX, SS16 Special Pwr. Supply-Speaker plus spare tubes, Amp LA1000 Linear. Viking Phone Patch. K6TSV, 714-544-4973.

HALLICRAFTERS SX-140 80-6M Receiver, mint, $100; S-38C General Coverage, $50. Frank, 201-862-8575.

AM-6154 SSB/CW 2 meter amp. 10 to 400 plus watts, with relays, $350. Mirage B-3016 FM/SSB 2 meter amp/preamp 10 in 160 out, $160. Mint. KB4FQ, 919-844-3895.

WANTED: 10-meter converter, preferably broadband type. N9ALD, P.O. Box 9302, Green Bay, WI 54308-9302.

THINKING of moving to Florida? How about buying a home complete with tower, beam, rotator and transceiver, ready to go? If interested write or phone me. Bill Harper, W4MVF, Melbourne, FL, 305-254-2666. Pls. no collect calls.

CX7, Modified to "B" by W8CXS; better than new, $1000. 7583B, 32S3, 312B4, 516F2 all R/E, 1972 vintage, $1850. James Craig, 32 Birchwood Drive, Rye, NH 03870, 603-964-6858.

ANTENNA: WRL 40-foot rigid tower, rotor, TH3/MKZ triband beam. Best offer. George Harmon, WA3DEY, Suburban Philadelphia 19046, 215-947-1839.

FOR SALE: Complete fastscan ATV station. New color camera with zoom lens. Very reasonable. W9OBG, 1-303-352-0530.

FOR SALE: Radio Shack Coco with Hamsoft and N4EJI SSTV Attachment and Software, $150. AEA CP-1, $85. Heathkit HR10B Receiver, DX60B Transmitter with VFO, IG-18 Audio Generator, Eico EMC801 Tube Tester, $50 each. EMC801 RES/CAP Bridge, Mercury 151 Signal Generator, $20 each. Shipping extra. Paul Cournoyer, N2FPB, 33 Northway Ests., Ballston Spa, NY 12020, 518-899-6856.

TEN-TEC Century 21-570, mint, with 276 calibrator, manuals. Great Novice rig, $200. WA7GVT, 406-365-2261.

WANTED any National NCX-5, NCX-500, NCX-1000, etc. Any Galaxy Transceivers working or not. KA7NOC callbook or 208-536-2982.

FOR SALE: 6 meter AM transmitter. 829B final-811 modulator and supply with manual $50. William Kimball.

CRYSTALS FOR Builders, Experimenters, Conversions, Ancient Rigs. FT-243's made to order. Write for listings-circuits. Stamps or SASE. "Crystals Since 1933". W0LPS. See May issue classified. C-W Crystals, Marshfield, MO 65706.

SmaRTTY for IBM compatible with RS232 port TU. Store incoming text to printer or disk. Send text from keyboard, preloaded buffers or textfiles. Split screen. Turbo Pascal programming $20. InTeleSoft, 304 Pine Grove Circle, West Monroe, LA 71291, 318-388-1682.

MACKET: MacIntosh Packet Program, $39.95. For details write to S. Fine Software, P.O.B. 6037, State College, PA 16801.

R-390A Receiver Parts: Info SASE. CPRC-26 military manpack radio, 6 meter FM, with antenna, crystal, handset: $22.50, $42.50/pair, $97.50/six. Military-spec TS-352 voltohm/multimeter, leads, manual: $12.50. $4.50/piece shipping, $9 maximum. Baytronics, P.O. Box 591, Sandusky, OH 44870.

WANTED—Drake RV-7 or RV-76. Marc, N4EM, 205-342-9041.

WANTED: Heathkit HG-10 VFO, in kit, partially assembled, or in working condition. Write R.W. Beekmann, 300 Terrace Drive #91, Flushing, MI 48433.

WANTED: 500 Hz Filter for TS-830, YG-455C, Collins Filter also considered. Don Belcher, 8730 Sheridan Road, Melbourne, FL 32904, 407-723-9460.

SELL: 2KW Amplifiers, reliable excellent condition. Heath SB-220, 80-10 meters. Dentron Clipperton-L 160-10. $450 each or make offer. W1KM, 617-428-4205.

DEAD BATTERY??? NiCds/Packs/Inserts/Rebuilding. Pager (1.3V 150 mah) $3.75, Cells (all sizes) "Write." Replacement packs: Yaesu FNB2 / Wilson BP4 / Maxon CP0500 $23.95, Santec 142 $21.95, Motorola Rapid/Chg: HT220 Slim/225 mah $31.95, HT220 Omni/450 mah $37.95. GE/RCA/Johnson-Write. Replacement Battery Inserts: ICOM BP2 $17.95, BP3 $16.95, BP5 $23.95, BP7 $30.95, BP8 $30.95. Kenwood: PB24 $19.95, PB25/25H/26 $24.95. Azden 300 $19.95. Tempo S1/270 mah $21.95, S1, 2, 4, 5, 15/450 mah $22.95, Ten-Tec 2991 $24.95, Santec: KTBP $16.95, KTBP2 $21.95, Rebuilding: (send your pack), Yaesu: FNB3 $34.95, FNB4 $37.95, Standard: BP11 $27.95, Install inserts above: add $3. SASE info. In PA add 6%. Add $2 shipping. Cunard Associates, Dept. A, RD 6, Box 104, Bedford, PA 15522.

TS-820-S with CW Filter, $450. KL7OD, 907-451-6945.

TWO Meter Amplifier: AM-6154, converted $275. TR-9000 (problem above 146) $200. Stan, 501-741-1825.

MODULATION Transformer Wanted. State model, condition, price, and telephone. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528.

WRITTEN EXAMS Supereasy. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $5 each. Advanced, Extra: $10 each. Moneyback guarantee. Bahr, 2549-G5 Temple, Palmbay, FL 32905.

HEATHKIT HW-8 QRP Transceiver and Matching Power Supply, $95. KB1RZ, 207-353-8360.

ROSS'$$$$ New Specials: Kenwood TS-140S $799.90, TS-440SWAT $1199.90, TW-4100A $499.90, TM-2530A $394.90. AEA PK-64A/WHFM $199.90, MP-64 $99.90, MP-20 $79.90. ICOM IC-37A $409.90, IC-471A/W AG-1 $759.90, IC-471H/W AG-35 $969.90, IC-3200A $529.90, 04AT $349.90, IC-290H $496.90. Yaesu FT-270RH $309.90, FT-726R $769.90, FT-736R $1499.90. All LTO (limited time offer). Looking for something not listed?? Call or write. Over 8780 ham-related items in stock for immediate shipment. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, P.O. Box 234, Preston, ID 83263, 208-852-0830.

WANTED: Receivers: ICOM IC-745, ICOM IC-R7000, Bearcat DX-1000. Monitors: Heath EVW-3 Imp. Scope, SB-620 Spect. Anal., SB-610 Monitor, a 500 MHz to 1 GHz Scope without the use of sampling. Filters: Receiver audio output filter—tunable. Pre Amps: Receiver RF Pre Amps—tunable. Wattmeter: B&W 334A dummy load wattmeter. Write to: J.L. Courtney, P.O. Box 391, Canal Winchester, OH 43110.

WANTED: FT-301, any model. Need not be working. W7LJI, 503-686-8879.

MacINTOSH Ham Software. DX Helper™ gives bearings/distance, lat/long, sunrise/sunset, grayline, predicted MUF. Shows locations on rectangular or great-circle map centered on your QTH. Includes IRC requirements, third-party agreements, and time zone. Universal call sign and oblast identifier. Prints beam heading chart for all DXCC countries. SASE for info or $24.95 from R. Stegemeyer, P.O. Box 1590, Port Orchard, WA 98366.

KENWOOD 530SP, CW Filter, excellent condition, manual, factory pricing, $575. N2AJV, 201-681-0448.

WANTED: Atlas SSB's 215X, 210X. Neal Kearns, 6 Fawn Lane, Corte Madera, CA 94925, 415-927-1154.

WANT Hallicrafter SX-117 Receiver in any condition, for parts use. Need coils. Joseph Karr, N9FAU, 3800 Cheyenne Court, Racine, WI 53404.

COLLINS KWM-380, all updates, speech processor, noise blanker, 140 Hz filter, WARC, Superb condition, spotless, in perfect calibration, $2275. W3ALZ, 301-384-2969.

SELL Military Frequency Meter 20-480 MHz Model TS-323/UR exc. cond. $49. New Dentron 9 MHz Generator Board, contains 9 MHz SSB Filter IF/AF Mic, Amplifier, Circuits $69. HW9 6 bands installed $165. All with books. N6GO, 5408 Simpson Avenue, North Hollywood, CA 91607, 818-766-4010.

TEKTRONIX 100 MHz Dual Trace Scope Model 2335. Very good cond. with two Tektronix Probes $1000, Tempo 2020 HF Transceiver excellent cond., no mic. $350. Call John, after 6 PM, 718-217-0122.

DIGITAL Automatic Displays. All Radios. Grand Systems, POB 3377, Blaine, WA 98230.

REPLACE Rusted Metric Screws and Bolts with Stainless Steel. Small Quantities, Free Catalog. Elwick, Dept. 689, 230 Woods Lane, Somerdale, NJ 08083.

DRAKE Station. TR7, PS7 with Fan, MS7, SP75, NB, AUX7, RV7, Filters, Desk Microphone, Service Manual. Mint condition. All for $1500. UPS shippable in original cartons. W7LJI, 503-686-8879.

SPAULDING 64 ft. self supporting tower, recently hot dip galvanized, better than new, $700. Richmond, Virginia, 804-272-6393 between 4 & 8 PM.

WANTED: Morsemaster II, PC Board, Kit or Wired. KØAKG, P.O. Box 285, Griffin, GA 30224.

SELL: 2 Ritron Handheld. On 43.00 MHz, 5 Watt, Chargers, Carry Cases, 2 Channel Capable, Channel Guard, $650. Make offer. Joe, KB5DTS, Box 7516, Huntsville, TX 77342, 409-291-3116.

MacINTOSH Satellite Tracking and Propagation Software. MacTrak™ displays graphic maps (rectangular, polar, great circle), views from space, schedules, windows. Also tracks Sun and Moon. Compatible with KLM/Mirage rotor interface. Shows gray line, sunrise/sunset, bearing/distance, MUF vs. time, areas of world "open". SASE for info or $49.95 from R. Stegemeyer, P.O. Box 1590, Port Orchard, WA 98366.

WANTED: Funct. & Sweep Gen.: Heath EU-81A, IG-1271, IG-1273, IG-52, IG-1275. Stereo Amp: Heath AA-2004, AA-15, AA-1506, AA-1640, AA-2005A, AA-29, AA-1515, AA-1219. Power Supplies: Heath IP-17 or IPW-17 or IP17A, IP-2700, IP-2701, IP-28, IP-2718, IP-15, IP-18, IP-2715, IP-12. Noise Gen.: Noise Generators for the 5 Hz to 2 GHz range. Video: video cameras as used in closed circuit TV. Write to: J.L. Courtney, P.O. Box 391, Canal Winchester, OH 43110.

ROSS'$$$$ Used June Specials: Kenwood TR-9500 $459.90, R-599D and T-599D $549.90, TS-700A $309.90. Yaesu YO-901P $379.90, YO-100 $169.90, FP-757HD $199.90. ETO 76 $299.90, 76A/W 38874 $1999.90. Looking for something not listed?? Call or write, we have over 300 used items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, P.O. Box 234, Preston, ID 83263, 208-852-0830.

HARNESS The Sun. Small solar panels chargers. Send SASE. B.E.A.M. Solar & Electronics, N2ZY, 6205-11th Avenue, Brooklyn, NY 11219.

KENWOOD TS830S purchased new and used only five months, $750. NH6NG, POB 177, Hanalei, HI 96714, 808-826-6198.

WANTED: ICOM 28A in good shape. WAØNRF, 218-724-1007.

DRAKE WANTED: FS-4 Frequency Synthesizer, 2-C Receiver, 2-NT Transmitter, 2-CS Speaker, 2-CQ Q-Multiplier, 2-AC Calibrator, 2-NB Noise Blanker. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

DRAKE AMPLIFIERS. Have two, one must go! L-4B for $695. L-7 for $895. Both absolutely mint condition, full output. WØUDZ, 320 Roxbury, Colorado Springs, CO 80906, 719-576-8844.

WANTED—FTV-250 2M Transverter. Also reel to reel tape recorder. Write Tony Stalnaker, WA4LPJ, 2358 Old AL Road, Thomaston, GA 30286.

ON SMITH Mountain Lake, Virginia. Unique house on 2 acres with 80 ft. waterfront in cove. It has 3 bedrooms, 1½ baths, living room and kitchen in octagon. Total sq. ft. 1800. Concrete base for tower. $129,000. Photos upon request. W2FOR, 703-297-5791.

ESTATE of W0PT. Heathkit battery eliminator $30. Heathkit capacitor checker model IT-28 $25. Heathkit VTVM IM-28 $20. Heathkit dual meter FWD and SWR HM-2140 $30. Heathkit station monitor, clock, patch, fwd and SWR SB-634 $75. Kenwood power supply PS-30 $95. Collins speaker for 75A4 $15. Hygain antenna rotator Ham IV, near new $200. Antenna rotator CD 45-11 $25. Ameco pre-amp PT-2 $50. MFJ 721 CW/SSB filter $20. Remote coax switch Amentron RCS-4 $70. Coax switch B&W 550A $12.50. Hallicrafter TO keyer $25. Vibroplex key, chrome base $25. Transportation prepaid 48 states. Fred Alden, W8JTD, 1-719-593-0984.

SINGER-GERTSCH service monitor FM7/DM3 AM-FM, 20-1000 MHz, deviation and modulation meter, refurbished, $595. R-1000 $250. Wanted: Sams CB books, Bearcat scanner for parts. Bob, N7IYI, P.O. Box 763, Wilsonville, OR 97070, 503-245-7678.

WANTED: Yaesu FT-2 or Regency HR-212. W8IQ, 2376 Dana Street, Toledo, OH 43609-1532.

YAESU FT-727R For Sale with Tone Board and Lapel Mic., $300. Bob, N5GSE, 713-434-0425.

WANTED: Heathkit HDA-4040-1 and HDA-4040-2; Swan Model 55 Swantenna with Control Unit. K5JWK, 6302 Robin Forest, San Antonio, TX 78239.

RUBBER Stamps—Self-Inking 3 line $13.75, regular 1 line $3.25, 2 line $5.25, 3 line $7.50. "KK", W3ZVK, Box 94, Berwyn, PA 19312.

WANTED: Motorola HT-90, 4 Watt, UHF, PL, Charger. WA0NRF, 218-724-1007.

DXERS'S Delight! Spectacular views from new contemporary vacation rental home on Garden Island of Kauai. Three bedroom, golf course, QTH fully equipped, with secluded beaches nearby. Write NH6NG, POB 177, Hanalei, HI 96714.

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COMMODORE/AMIGA Chips. Factory fresh, low, low prices (eg. 6510/6526-$8.95, 6581-$10.95, 82S100/PLA-$11.95, 325572-$9.95, 8722-$19.95, 901 ROM Series-$9.95 and many others)...We ship worldwide...Visa/MC...new "Commodore Diagnostician", a fantastic new way to diagnose and fix C64's, etc.-$7.95...Heavy Duty C64 Power Supply $27.95 +pp...Commodore Repair. We are the largest Authorized Service Center in the country. Low prices (eg. C64-$39.95 parts/labor). Fast turnaround...Kasara Inc., 32 Murray Hill Drive, Spring Valley, NY 10977, 1-800-248-2983 (nationwide) or 914-356-3131.

VERTICAL PHASING: Switchable phased array instructions and Hybrid, 160-40M. Info: $1, SASE. Ground Radial Wire for Verticals or Slopers, improves performance, new #16 bare solid copper, 1000 feet, $33. Includes shipping USA: Davis, P.O. Box 230-Q, Carlisle, MA 01741. 617-369-1738.

TRADE for Collins S-Line with VHF, less amplifier. Have Lotus 1-2-3, DBase II, many others; Hercules color graphics board, Hayes SmartComm II & III with Smartcom 1200B board for PC. IBM Quietwriter I, pin feed, options, Epson PX-8 Geneva laptop. Also looking for 6-meter amp using 8877. I'll pick up within 250 miles of Washington, DC. Call Dave Mann, N4CVX, 703-437-8624 eve or 202-373-4408 days.

MAST; Heavy duty but light weight 6061-T6 seamless aluminum mast. Outside diameter 2.25 inches, wall thickness 0.50 (that's right, half an inch). Length 12 feet. Weight is only 35 pounds! Lighter, stronger than steel. Never rusts, $150. Solid aluminum lighting arrestor point with stainless steel tip, 1.25 inch diameter, inserts in top of mast, $30. Fred Munzenmayer, KB2BF, Box 88, Grenloch, NJ 08032, 609-228-4580.

YAESU FT-901DM HF Transceiver. features FM, electronic keyer and memory channel, excellent, $535; Yaesu FT-727R dual-band HT, new CPU, accessories, mint, $360. Ron, N8IMZ, 614-774-2233 evenings.

1988 CALLBOOKS: $23 any mix. $4/order shipping/handling, USA only. Century Print, 6059 Essex, Riverside, CA 92504-15522.

ESTATE of W2LCQ. Yaesu FRG-7700 Gen. Cov. Rec. Reasonable offer. SASE for other buys. Widow needs money. Ted Petrucci, W2EYJ, P.O. Box 388, Jefferson Valley, NY 10535.

YAESU FT203R, TTP/encoder, AC charger, mint, $195. Heath HW32A 20 meter single-bander SSB xcvr., modified for CW, full-band coverage, AC supply, $150. WA2HGJ, 914-354-1815, 2 Pearl Drive, Monsey, NY 10952.

WANTED: Manuals for RCA Supercartones, models CACA6 and CAFA7. John Ritter, N3EYY, 4850 Connecticut Avenue NW, Apt. 1126, Washington, DC 20008, 202-686-7172.

SELL: AEA PK64A/HFM packet $175, ICOM IC-271A 25W 2M Xcvr $525, Hallicrafters SX115 Receiver $250, Spectrum Communications 450/2M Repeater Circuit Boards TX/RX $50 each and RF Power Amplifiers $35 each, VHF Engineering ID $25 and Cor $10, Radio Shack Color 3 computer with RS-232 interface $150, ICOM 251A 2M 10W Multimode Xcvr $300. Floyd Chowning, K5LA, 915-751-6204 after 5:30 PM, 5637 Prince Edward Avenue, El Paso, TX 79924.

WANTED: Collins KWM-2 and KWM-2A and associated accessories. Also interested in any other Collins equipment. Call or write. John Kardanow, 950 Union Valley Road, West Milford, NJ 07480, 201-728-7938.

ANTENNA Parts Catalog, low costs: dipole/radial wire, insulators, center feeds, coax, connectors, relays, vertical phasers, plus more. $1, plus 45 cent stamp info. Wire for dipoles, slopers, loops, new #14, multistranded copper, non-stretch, flexible. Best available. Low cost, 275 ft. increments. Minimum 275 ft.: $29, includes UPS shipping/USA. Davis, P.O. Box 230-Q, Carlisle, MA 01741, 617-369-1738.

HAM WANT ADS: Free Advertising, Free copy, wide distribution, bi-monthly, send your ad for free subscriptions, free limited time. Communications Exchange Sheet, P.O. Box 754, Concord, MA 01742.

SCHOOL CURRICULUM For Ham Radio by Carole Perry, WB2MGP. 26 lesson plans, code practice oscillator, audio cassette and VHS video tape. Suitable for all school grade levels with pull-out lessons. Can be used as separate course or as part of Social Studies or Science program. Also suitable for summer camp program. Media Mentors Inc., 718-983-1416.

PACKET RADIO Amateur. Announcing a new heavy duty C-64 Commodore replacement power supply especially for the Packet Radio Amateur. The new higher amperage output will now allow for 24 hour continuous "Packet" operation without voltage change or failure which the existing unit can succumb to. This PS is an exact physical replacement and will not run hot. $27.95 +pp...Visa/MC...Kasara Inc., 32 Murray Hill Drive, Spring Valley, NY 10977, 1-800-248-2983 (nationwide) or 914-356-3131.

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HOSS-TRADER ED says, "Shop around for the best price then telephone the HOSS last for the best deal." New Amp Supply Linear 2500 Watts, Tubes, Hypersill Transformer regular $1199: cash $1079. New 45 Watt Azden PCS-5000 $349. New ICOM 2AT Handy Talkie $269, ICOM 02AT 5 Watt Handy Talkie $329, ICOM 735 Transceiver regular $1099: cash $899. New Wm. Nye 3 KW Antennas Tuner MBV-A regular $675: cash $549. ICOM 2 Meter 28-A regular $469: cash $399. Visa/Mastercard Accepted!!!!! Moory Electronics, P.O. Box 506, DeWitt, AR 72042, tel. 501-946-2820.

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WANTED For Summer of 1988: Instructors in Electronics, Ham Radio, and Computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

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USAF MARS: The Military, with a long history of support for Amateur Radio, is continuing expansion of existing USAF MARS CW NETS and needs volunteer proficient CW operators. Requirements include USA citizenship, a qualified FCC amateur license and 12 hours minimum quarterly participation. This is a unique opportunity to contribute your talents to a significant and worthwhile activity without military obligation in support of an official Military operation. Interested parties are requested to provide a brief CW background profile to: Louis Skipper, W6KF (AFN6CW), Mgr. 725 North "O" Street, Livermore, CA 94550-2059.

Rob, WA3QLS

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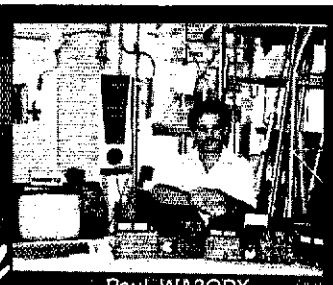

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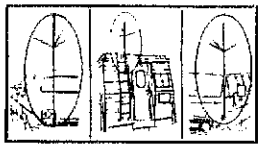

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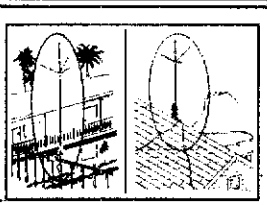

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WRIGHTAPES: (Since 1976) Unconditionally guaranteed Morse Code Practice on 60 min. cassette tapes. Beginners 2-tape set 5 WPM $7.90. Also 3, 4, 5, 6-8, 10, 9-11, 12-14, 14, 16-20, 22, 24-28 WPM. Specify Plain Language or Code Groups. Also plain lang. only 30-35, 35-40, 45-60. FCC type tests: 5-6, 11-12, 11-17, 13-14, 20-24. Call signs: 12-15, 20-24. Nos.: 5-22, 13-18, 18-24. Check, M/C, Visa $3.95 ea. PPD 1st class USA. Can. Printed texts add $.50 per tape. **Call anytime.**

3.95 3.95

Instant Service

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1.2 GHz
GaAs Pre-Amps — 20 Watt Output M57762
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UHF — VHF Transistors
Tower Mounted Ant. Change-Over Relays

900 MHz
Pre-Amps — Exciters — Power Amps — Modules
GaAs UHF — VHF Pre-Amps $19.00 — $49.00

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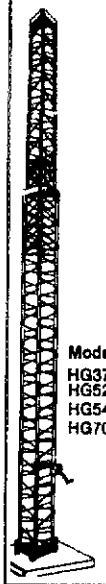
Advertising Manager
Angela Beebe, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!



hy-gain

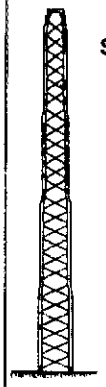
CRANKUP SALE!

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
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN

Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$379
HBX48	48 ft	10 sq ft	303	$489
HBX56	56 ft	10 sq ft	385	$569
HDBX40	40 ft	18 sq ft	281	$459
HDBX48	48 ft	18 sq ft	363	$559

***Your Total Delivered Price Anywhere In Continental 48 States. Antenna Load Based on 70 MPH Wind.**

ROHN

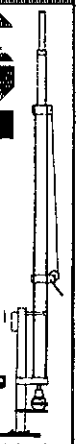
Guyed Tower Packages

- **World Famous Rohn Quality and Dependability**
- **Rugged high wind survival-provides safe installation**
- **Multi purpose towers satisfy a wide range of needs**
- **Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.**

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$ 699	$1239	$1529
60'	769	1399	1719
70'	829	1539	1879
80'	989	1719	2079
90'	1069	1999	2249
100'	1149	2179	2439
110'	1359	2329	2839
120'	1429	2499	3039

US TOWER CORPORATION



These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting-
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant.load*	Sale price
MA40 mast	21'	40'	10 sq ft	$629
MA550 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX555	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

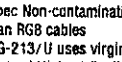
***Note-towers rated at 50 mph to EIA specifications**

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

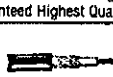
RG-8X



$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

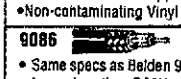
9086



$.39/ft $379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX®



Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft.
½" LDF4-50 Andrew Heliax®	$1.79/ft
⅞" LDF5-50 Andrew Heliax®	$3.99/ft

Select connectors below.
Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$25	$25	$33	$33
½" Heliax®	$29	$29	$29	$29
⅞" Heliax®	$55	$55	$55	$55

COAX CONNECTORS

Amphenol Silver PL259	$1.25
UG21B N Male	$2.95
9086/9913 N Male Connector	$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga	$.10/ft.
¼ mile 18ga copper-clad steel wire	$30
Dog bone end insulator	$.79 ea.

Van Gorden

1:1 Balun	$15	Center Insulator	$8
Dipole Kits		D80 $31.95/D40 $28.95	
Short Dipole Kits		SD80 $35.95/SD40 $33.95	
All-band Dipole w/ladder line			$29.95
G5RV all band antenna			$49.95

ALPHA DELTA

DX-A 160-80-40 Sloper	$49

CUSHCRAFT

A3 3-el Tribander	$259
A4S 4-el Tribander Beam w/S S. Hdwre	$349
A743 & A744, 30/40 mtr KIT for the A3 & A4	$ 89
AP8 80-10 mtr Vertical	$139
AV5 80-10mtr Vertical	$119
D40 40mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$339
A50-5 5-el 6 mtr Beam	$ 98
215 WB NEW 15-el 2 mtr Beam	$ 89
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$129
3219 19-el 2 mtr Beam	$109
220B 17-el 220MHz Beam	$109
424B 24-el 432MHz Beam	$ 89
ARX2B 2 mtr Vertical	$ 45

hy-gain

CALL FOR SPECIAL PRICES!

- Discoverer 2-el 40-mtr Beam
- Discoverer 3-el Conversion Kit
- EXPLORER-14 SUPER-SPECIAL
- QK710 30/40 mtr. Add-On-Kit
- V2S 2-mtr Base Vertical
- V4S 440MHz Base Vertical
- TH5MK2S Broad Band 5-el Triband Beam
- TH7DXS 7-el Triband Beam
- TH3JRS 3-el Triband Beam
- 205BAS 5-el 20-mtr Beam
- 155BAS 5-el 15-mtr Beam
- 105BAS 5-el 10-mtr Beam
- 204BAS 4-el 20-mtr Beam
- 64BS 4-el 6-mtr Beam
- 12 AVQ 20-10 mtr vertical
- 14 AVD 40-10 mtr vertical
- 18 AVT/WB 80-10mtr Vertical
- 18HTS 80-10 mtr Hy-Tower Vertical
- 23BS 3-el 2 mtr Beam
- 25BS 5-el 2 mtr Beam
- 28BS 8-el 2 mtr Beam
- 214BS 14-el 2-mtr Beam
- 2BDQ 80/40 mtr Trap Dipole
- 5BDQ 80-10 mtr Trap Dipole
- BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

6BTV 80-10 mtr Vert	$149	5BTV 80-10 mtr Vert	$129
4BTV 40-10 mtr Vert	$99	G7-144 2-mtr Base	$129
G6-144B 2-mtr Base	$89		

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Highest Q Tuning Circuits

HF2V 80-40m Vertical $129 Delivered
- Full Legal Power
- Automatic Band Switching

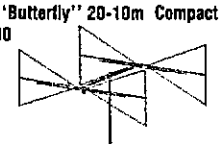
Accessories:

RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
20m Add-on Kit	$39
17/12m Add-on Kit	$27

HF6V HF2V

FREE UPS on ACCESSORIES when purchased w/antenna

HF5B "Butterfly" 20-10m Compact Beam $199.00



- Unique Design Reduces Size
- Turns w/TV Rotor
- Boom Length 6 Feet
- No Lossy Traps
- Element Length 12.5 Feet

FREE UPS Shipping in Continental USA

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam	$399.95
KT34XA 6-el Broad Band Triband Beam	$589.95

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call

ROTOR CABLE

Standard 8 cond cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

20G	$48.00	45G	$133.00
25G	$56.00	55G	$165.00

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$1049.
FK2558	58 ft.	13.3 sq. ft.	1099.
FK2568	68 ft.	11.7 sq. ft.	1149.
FK4544	44 ft.	34.8 sq. ft.	1389.
FK4554	54 ft.	29.1 sq. ft.	1469.
FK4564	64 ft.	28.4 sq. ft.	1579.

25G Double Guy Kit	$279.
45G Double Guy Kit	$299.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$ 15/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$ 29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$ 45
1/4 CCM Cable Clamp (1/4" Cable)	$ 55
1/4 TH Thimble (fits all sizes)	$ 45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2 "12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.32/ft
HPTG4000 Guy Cable (4000 lb rating)	$.52/ft
HPTG6700 Guy Cable (6700 lb rating)	$.72/ft
9901LD Cable End (for 2100/4000 cable)	$9.95
9902LD Cable End (for 6700 cable)	$11.95
Socketfast Potting Compound (does 6-8 ends)	$16.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
18 in Wall	$49	$89	$129	$149
25 in Wall	$69	$129	$189	$249

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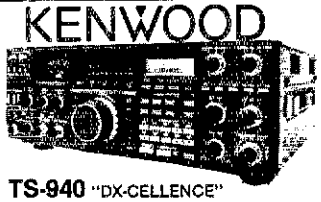
KENWOOD



TS-940 "DX-CELLENCE"
- All Band, All Mode Transceiver
- Direct Keyboard Entry
- Engineered for the DX-Minded and Contesting Ham
- Its Got It All!

YAESU

FT-767GX HF/VHF/UHF BASE STATION
- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

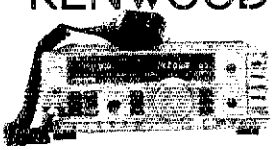
ICOM

IC-761 HF "PERFORMANCE" RIG
- 160-10M/General Coverage Receiver
- Built-in Power Supply and Automatic Antenna Tuner
- SSB, CW, FM, AM, RTTY
- QSK to 60 WPM

ALINCO

ALD-24T DUAL BAND MOBILE
- 140-149.995 MHz/ 440-450 MHz
- 25 Watts on Both Bands
- Crossband Full Duplex
- 21 Memory Channels
- CTCSS Encoder/Decoder, Standard

KENWOOD



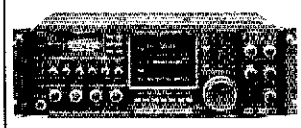
TS-140S AFFORDABLE DX-ing!
- HF Transceiver With General Coverage Receiver
- All HF Amateur Bands
- 100 W Output
- Compact, Lots of Features

YAESU

NEW!

FT-736R VHF/UHF BASE STATION
- SSB, CW, FM on 2 Meters and 70 cm
- Optional 50 MHz, 220 MHz or 1.2 GHz
- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz • 100 Memories

ICOM



IC-781 NEWEST SUPER RIG
- 5 Function Display Screen
- Built-in Spectrum Scope
- 150 Watts Output
- Built-in PS and AT

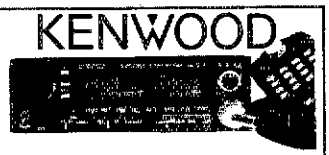
concepts

2m and 220 MHz Amplifiers GaAsFET Receive Pre-Amps and High SWR Shutdown Protection

MODEL	144 MHz	SALE PRICED
2-23	2 in/30 out	
2-217	2 in/170 out	
2-117	10 in/170 out	
	220 MHz	
2-22	2 in/20 out	
2-211	2 in/110 out	
2-312	30 in/120 out	

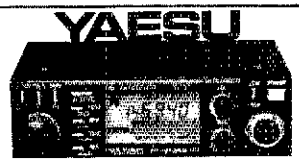
CALL

KENWOOD



TM-721A DELUXE FM DUAL BANDER
- 2 Meters (138.000-173.995 MHz) 70 cm (438.000-449.995 MHz) Receiver Range
- 45 Watts on 2 Meters 35 Watts on 70 cm
- 30 Memory Channels

YAESU



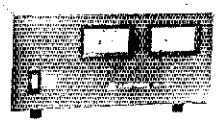
FT-212RH
THE "ANSWERING MACHINE" MOBILE
- Rx: 138-174 MHz
- Tx: 144-148 MHz
- 45W Output
- Digital Voice Recorder
- FT-712 RH for 70cm

ICOM

IC-900 SIX BANDS IN ONE MOBILE
- Remote Controller, Interface A Unit, Interface B Unit, Speaker, Mic and Cables
- Six Band Units to Choose
- 10 Memories Per Band
- Programmable Band Scan
- Fiber Optic Technology

SALE

ASTRON



Power Supply

• RS7A . . . $48	• RS35M . . $149
• RS12A . . . $68	• VS35M . . $165
• RS20A . . . $88	• RS50A . . $189
• RS20M . . $105	• RS50M . . $215
• VS20M . . $125	• RM50A . . $219
• RS35A . . $133	• VS50M . . $229

KENWOOD

TH-25AT
POCKET-SIZED AND POWERFUL
- Frequency Coverage: 141-163 MHz (Rx), 144-148 MHz (Tx)
- Front Panel DTMF Pad
- 5 Watts Output
- 14 Memories
- TH-45AT Available for 440 MHz

YAESU

FT23/73R
- Super "Mini" HT's
- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 2W Battery Pack or Optional 5W Pack

ICOM

IC-μ2AT
IC-μ4AT
MICRO HT'S FOR 2M, 440
- Pocket Size HT Fun
- Ten Memories
- LCD Readout
- Wideband Coverage
- Up to 3 Watts Output
- 32 Built-in Subaudible Tones

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MFJ-1278
MULTI-MODE DATA CONTROLLER
- Packet, RTTY, ASCII, CW, WEFAX, SSTV, Contest Memory Keyer
- Precision Tuning Indicator
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CIRCLE 89 ON READER SERVICE CARD

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other guys are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100 kHz straight through to 30 MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board. I can't wait to tell my buddies I worked England on a repeater!

And with the money I saved when I bought my FT-747GX, I got a second ten-meter antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense."

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847. Prices and specifications subject to change without notice.

YAESU

"They laughed when they saw my radio. Then they saw my logbook."

KENWOOD

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NEW!

Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

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

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

- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.
- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

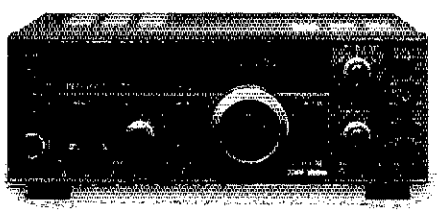
Optional Accessories:

• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** desk mics. • **PG-2S** extra DC cable • **PS-430** power supply • **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit • **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.

TS-680S

All-mode multi-bander

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



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

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