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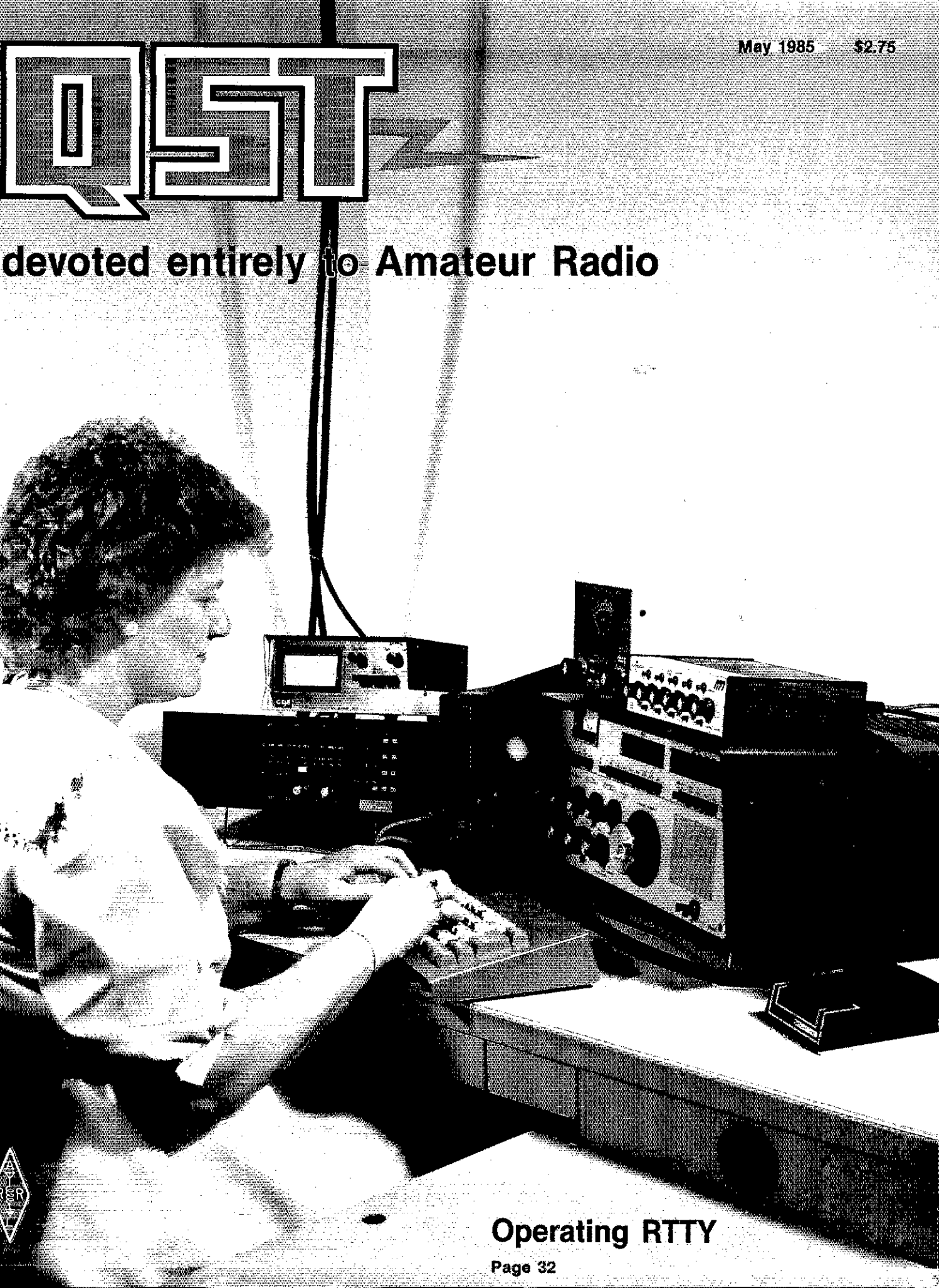


Operating RTTY

Page 32

the tempo S-15

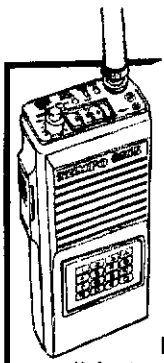
...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

...the kind of hand held most people want...simple, rugged, reliable, easy to use. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry.

Consider these features before you decide on any hand held:

- 5 watt output (1 watt low power switchable)
- 10 MHz frequency coverage: 140-150 MHz (For export only: B version 150-160 MHz, C version 160-170 MHz)
- Electrically tuned stages. Receiving sensitivity and output power are constant over entire operating range.
- Three channel memory. (1 channel permits non-standard repeater offsets. 200 micro amp memory maintenance (standby)).
- A new "easy remove" battery pack
- One hour quick charge battery supplied (450 ma/HR)
- Plug for direct 13.8 volt operation
- Speaker/microphone connector
- BNC antenna connector and flex antenna
- Extremely small and light weight (only 17 ounces).
- Ample space for programmable encoder.
- Fully synthesized
- Extremely easy to operate
- Its low price includes a rubber antenna, standard charger, 450 ma/HR battery (quick charge type) and instruction manual.

OPTIONAL ACCESSORIES: 1 hour quick charger (ACH 15) • 16 button touch tone pad (S 15T) • DC cord • Solid state power amplifier (S-30 & S-80) • Holster (CC 15) • Speaker/mike (HM 15)



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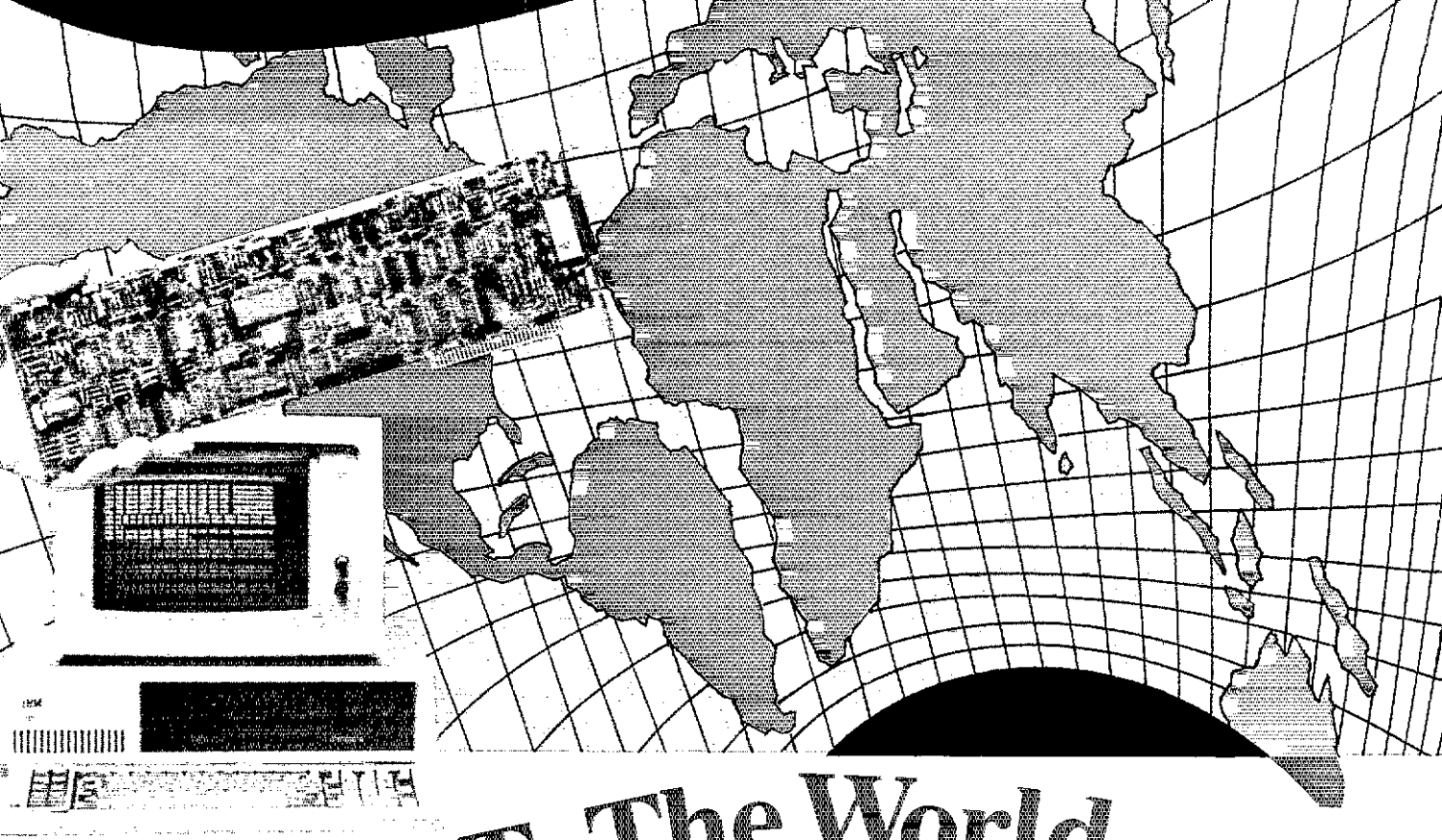

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Now, the world is your forum by plugging the HAL Personal Computer Interface 2000 radio modem into your IBM PC. You now make your PC even more valuable by being able to "speak to the world." The PCI circuit board includes the high-performance, no compromise RTTY and CW circuitry for which HAL is known around the world. From our proven sensitive and selective RTTY demodulator to the advanced CW receive circuit, the PCI-2000 offers system performance previously available only in our dedicated terminals. The PCI-2000 comes as a fully-integrated package with hardware, software, and many operator aids. Full-feature programs on computers can be very difficult to use and HAL has "gone the extra mile" to be sure that our system is friendly to you! From the custom keyboard overlay to the help menu, status line, and comprehensive manual, we think you will agree that the PCI-2000 is just the sort of fun-accessory you and your PC deserve. Some of the more outstanding PCI-2000 features are:

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NEW!
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IC-735

Ultra-Compact

The new ICOM IC-735 is what you've been asking for...the most compact and advanced full-featured HF transceiver with general coverage receiver on the market. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine or base station operation.

More Standard Features

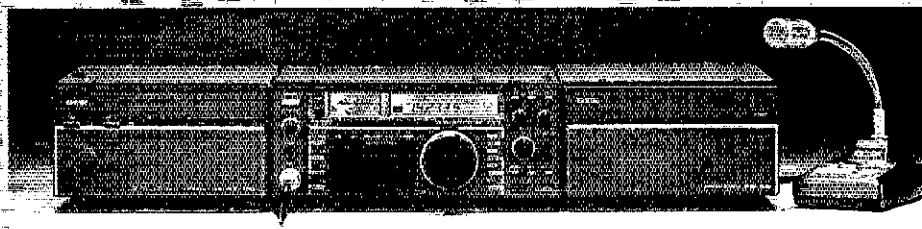
Dollar-for-dollar the IC-735 includes more standard features. FM built-in, a 500Hz CW filter FL-32, an electronic CW keyer, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.

Superior Performance

It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Fron[t] Panel

The large LCD readout and conveniently located controls enable ea[sy] operation, even in the mobile environme[nt]. Controls which require rare adjustm[ent] are placed behind a hatch cover on [the] front panel of the radio. VOX contr[ol], mic gain and other seldom used cont[rols] are kept out of sight, but are immedia[tely] accessible.



Options. A new line of accessories is available, including the AT-150 electronic, automatic antenna tuner and the switching PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 at your authorized ICOM dealer. For superior performa[nce] and innovative features at the right pr[ice] look at the ultra compact IC-735.

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May 1985 *Volume LXIX Number 5*

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OUR COVER
With technology expanding so rapidly, many of us could use a refresher course in RTTY operating. You'll find it beginning on page 32.

CONTENTS

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THE FANTASTIC DOCTOR DX™
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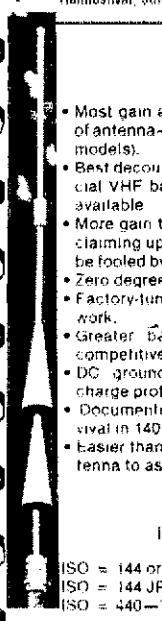

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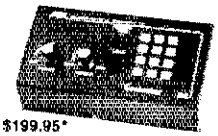

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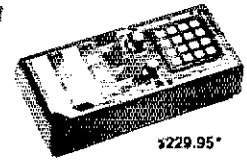

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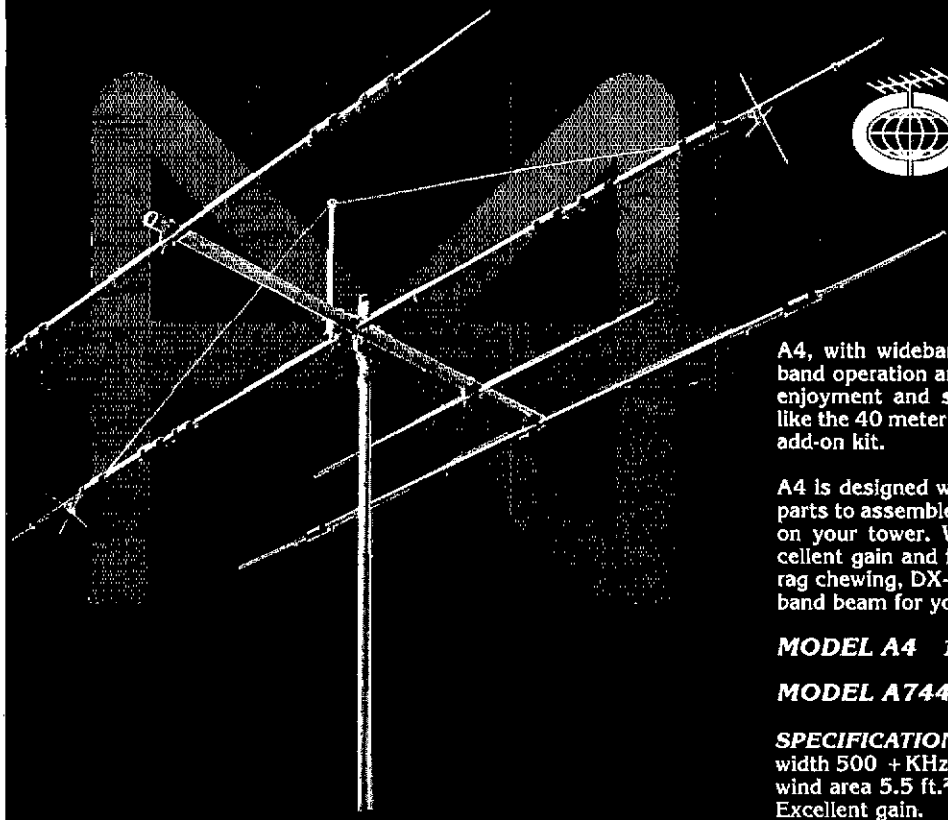

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A4, with wideband performance, easy installation, 4 band operation and moderate price will give you more enjoyment and satisfaction from your hobby. You'll like the 40 meter operating possibilities with the A744 add-on kit.

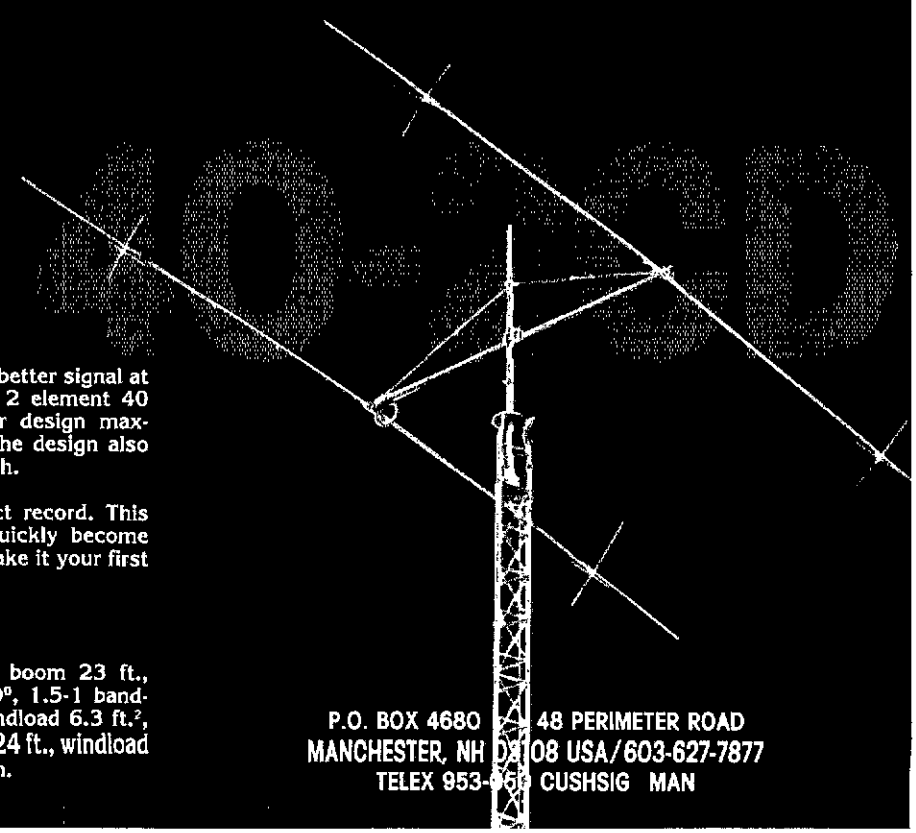
A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

MODEL A4 10, 15, 20 METERS

MODEL A744 40 METER ADD ON KIT

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

MORE CONTACTS, MORE SATISFACTION WITH *CUSHCRAFT BEAMS*



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

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

MODEL 40-2CD 40 METERS

SPECIFICATIONS boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.

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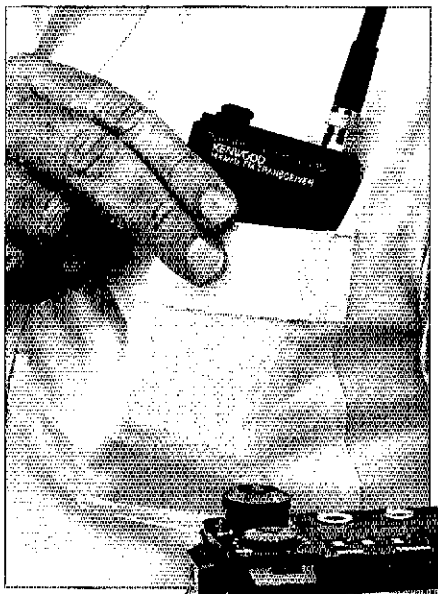
- **Expanded frequency coverage (TH-21AT/A).** Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31AT/A: 220.000-224.995 MHz in 5 kHz steps.
  TH-41AT/A: 440.000-449.995 MHz in 5 kHz steps.



- **Repeater offset switch.**
  TH-21AT/A: ±600 kHz, simplex.
  TH-31AT/A: −1.6 MHz, reverse, simplex.
  TH-41AT/A: ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

See your authorized Kenwood dealer and take home a pocketful of performance today!

- **Easy-to-operate, functional design.** Three digit thumbwheel frequency selection and handy top-mounted controls increase operating ease.

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8** soft case for TH-21A/31A/41A
- **SC-8T** soft case for TH-21AT/31AT/41AT
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **Service manual**

More information on the TH-series HTs is available from authorized Kenwood dealers.

KENWOOD

Note: Specifications guaranteed for the 144.000-148.000 MHz Amateur band only. TH-21AT shown. Standard versions TH-21A/31A/41A without DTMF pad also available. Specifications and prices are subject to change without notice or obligation.

TRIO-KENWOOD COMMUNICATIONS
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Compton, California 90220

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Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

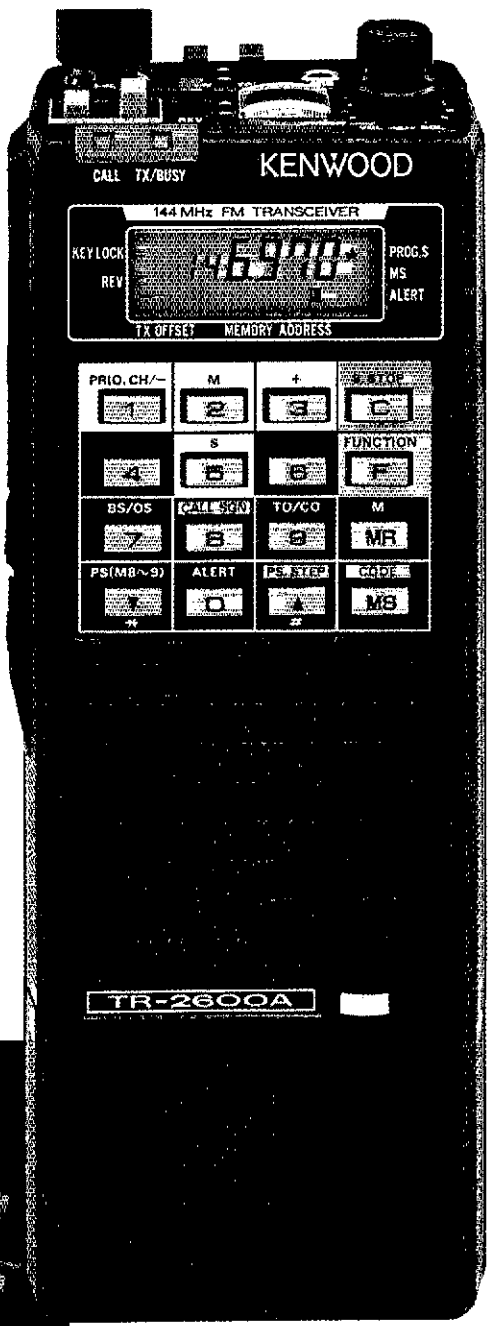
- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz; transmit capability is 142-149 MHz, (TR-3600A covers 440-450 MHz).
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.

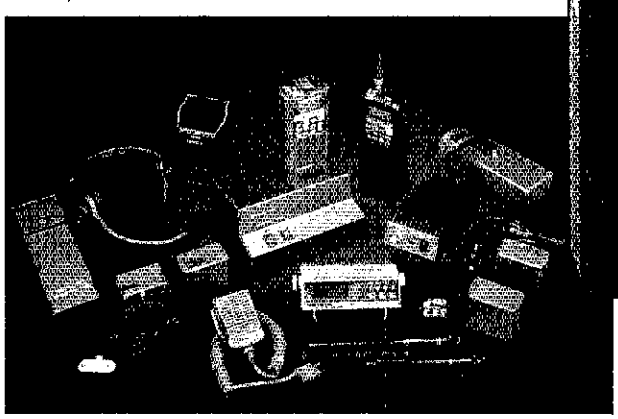
The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handfull"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- ST-2 base stand
- MS-1 mobile stand
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3, 5 telescoping antenna
- CD-10 call sign display

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.





KENWOOD

TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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Vice Director: Thomas W. Comstock, N5TC, 1700 Dominik, College Station, TX 77840 (409-693-1181)

*Executive Committee Member

Section Managers of the ARRL

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

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British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave., Vancouver V6R 2R4 (604-224-5226)
Manitoba — Jack Adams, VE4AJE, 227 Davidson Ave. E., Dauphin R7N 2Z4 (204-638-9270)
Maritime-Nfld — Donald R. Welling, VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6 (506-696-2913)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J0H 1Y0 (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd., Regina S4S 5B1 (306-586-4963)

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Western New York — William Thompson, W2MTA, RD 1—Rock Rd., Newark Valley 13811 (607-642-8930)
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South Dakota — Fredric Stephan, KCØOO, Box 771—Wind Cave Ranch, Hot Springs 57747 (605-745-6667)

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Missouri — Benton C. Smith, KØPCK, 3301 Sinclair, Rte. 3, Box 196-A, Columbia 65203
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Idaho — Lemuel H. Allen, W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — L. C. "Les" Belyea, N7AIK, P.O. Box 327, Belgrade 59714 (406-388-4253)
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Santa Clara Valley — Rodney J. Stafford, KB6ZV, 5155 Shadow Estates, San Jose, CA 95135 (408-274-0492)

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Los Angeles — John V. Walsh, N6UK, 1260 E. Sierra Madre, Glendora, CA 91740 (818-335-0038)
Orange — Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Byron W. Looney, K6FI, 6540 Buckley Dr., Cambria 93428

West Gulf Division

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Oklahoma — Dave Cox, NB5N, 1812 S. Umbrella Ct., Broken Arrow 74012 (918-250-2285)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

"It Seems to Us . . ."

Shuttle Mission 51-F Takes Shape

Just before press time, we received some good news—and some bad—from NASA in Houston concerning the sequel to Owen Garriott's historic Amateur Radio operation from space.

The bad news is that it will not be possible to complete, in time for this mission, the Shuttle modifications that would have permitted antennas to be mounted in the cargo bay. This scrubs any possibility of a 28-MHz downlink, such as had been envisioned when the January *QST* cover article was prepared.

The good news is that, despite this setback, plans are moving forward for Tony England, WØORE, to operate on 2 meters using the same window-mounted antenna that was used by W5LFL in December 1983, during the STS-9 mission.

Tony's mission is designated 51-F, and is now slated for launch on July 15 (although that date, like all Shuttle launch dates, is subject to change). It is scheduled to last seven days, and because of other mission requirements it probably will not be possible for the Amateur Radio antenna to be used until midway through the third day. Accordingly, Tony's operating time will be more limited than Owen's and it is unlikely that there will be much opportunity for random contacts. The focus will be on making contacts with youth groups through Amateur Radio clubs and other groups who want to assist in exposing young people to this exciting aspect of Amateur Radio and the nation's space program. In addition, time will be devoted to experimental transmissions of slow-scan television from the spacecraft, to test this mode as a possible backup to NASA's own video links.

At this writing we're still awaiting formal confirmation from NASA Headquarters, but it's not too early to think about how you'll tune into the next radio amateur in space!—*David Sumner, K1ZZ*

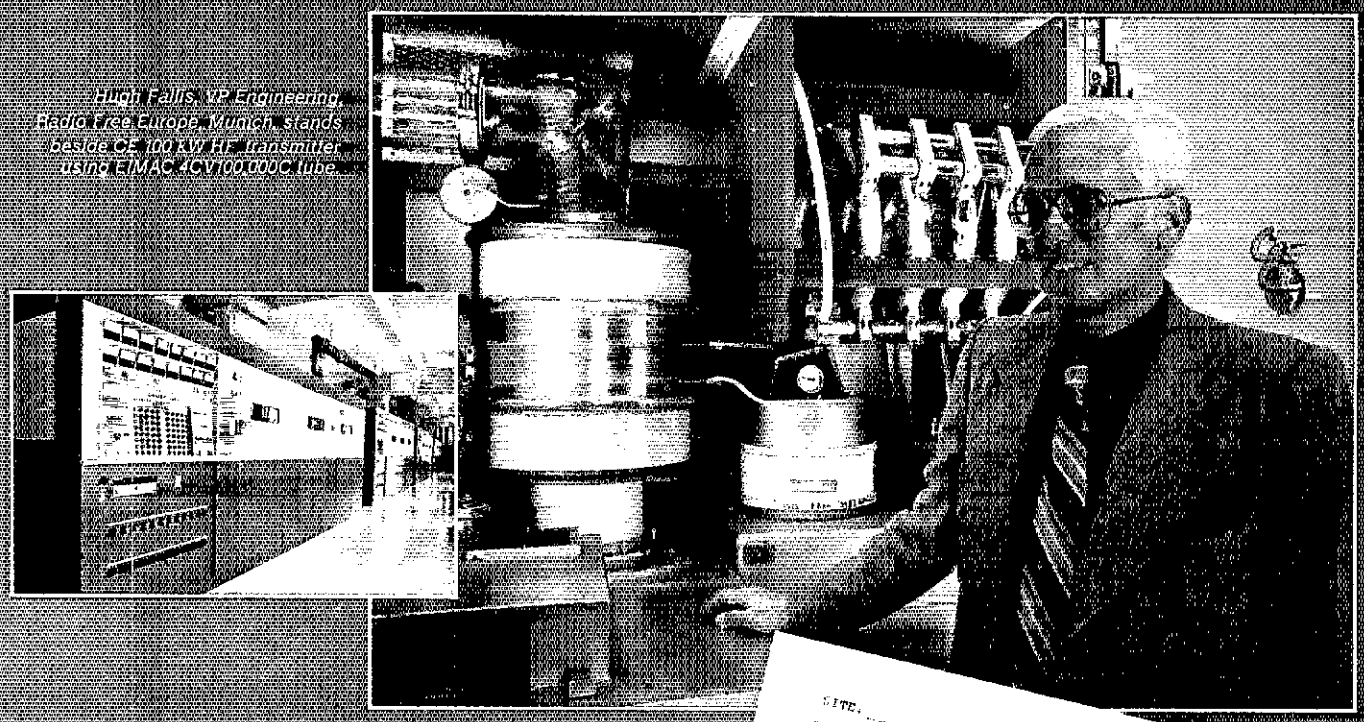
Are You Ready For 24 MHz?

There are promising signs that General, Advanced and Extra Class licensees may gain access to the new WARC band at 24.89-24.99 MHz very soon—in a matter of weeks, if that long. Remember how quickly things happened when the 10-MHz band was opened back in 1982? Then you know it's time to turn your antenna plans into reality!

While this isn't the best part of the sunspot cycle for us to be trying out a new band at the high end of the HF range, there are a lot of reasons why 24 MHz should hold particular interest. For one thing, unlike the other HF bands it has no harmonic relationship to any television channel below Channel 7. This means that some hams in fringe areas who have been plagued with TVI problems in the past should be able to operate here problem-free. For another, the 24-MHz band is just 7.5% removed in frequency from the CB band, which means that CB antennas should work fine with just a little lengthening or tweaking. Finally, the band should provide lots of interesting sporadic-E propagation, and there should be plenty of that this spring. Usually the sporadic-E excitement is found on 50 and 144 MHz, it being a bit more rare there than on the HF bands where we take it pretty much for granted; but with the novelty of a new band to learn about and enjoy, there should be lots of activity to hold our interest.

The power, emission and license class limits that will apply to this 100-kHz-wide band will not be known until FCC actually releases it for our use; check W1AW and your other usual sources of up-to-date, accurate information. Finally, a word of caution: The band will not be exclusively ours worldwide until July 1, 1989. Until then, we must avoid interfering with the few Fixed Service stations that may continue to operate in the band. For this reason, in accordance with Minute 77 of the October 1984 Meeting of the Board, ARRL will not be granting contest or awards credits for 24-MHz contacts until the Board has determined what policy should be adopted. If you have any comments or suggestions, please address them to the Membership Services Committee, c/o ARRL Headquarters.

According to the International Amateur Radio Union, there are now about four dozen countries that permit their amateurs to operate at 24.89- 24.99 MHz. Let's hope the U.S. will be joining them soon!—*David Sumner, K1ZZ*



Hugh Fallis, VP Engineering, Radio Free Europe, Munich, stands beside one of 12 HF transmitters using EIMAC 4CV100,000C tubes.

EIMAC tubes provide long life for Radio Free Europe Service.

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

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

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

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

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

SITE: Biblis

TYPE	IN SERVICE		SPARES		REMARKS
	Serial	Hours	Serial	Hours	
4CV10000	A6M-413	62650			
	A6M-415	59879			
	B6G-265	61823			
	B6G-270	59636			
	B6M-597	62456			
	B6R-896	59246			
	B6E-283	51892			
	B6J-368	64300			
	B6T-890	59472			
	B6Q-624	64066			
	B5Q-185	62354			
	B6J-761	55907			
	B6J-371	59991			
	J6A-2	57805			
	D6V-815	42279			
	F3Q-730	59386			
	D6V-815	41416			
	B6G-275	47349			
	J6A-7	59067			
	B6G-266	57026			
	B6M-1297	57869			
	B6C-161	26683			
	J6A-6	11754			
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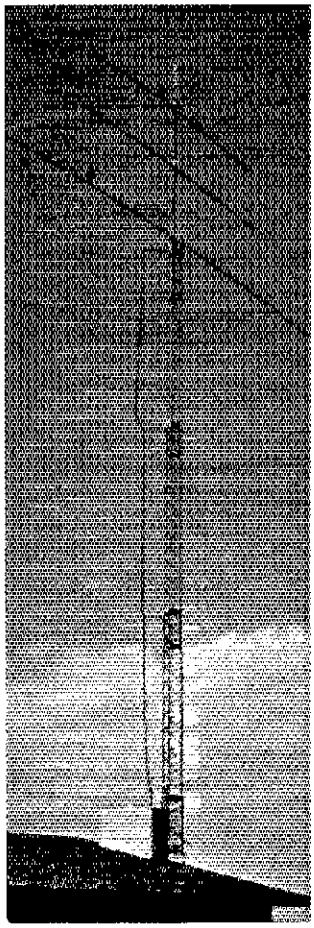
UP FRONT in QST

RF Bio-Effects Rule: Are Amateurs Safe?

This fall, the FCC will be looking very closely at the biological effects of RF energy when it licenses stations or authorizes RF-emitting equipment (General Docket 79-144). The major criterion is whether a given station or equipment exceeds ANSI standards, and thereby would expose workers or the public to excessive levels of RF energy. In a related document, the FCC proposed that the Amateur Radio Service be excluded from the provisions of this rule, citing evidence submitted by ARRL that **amateur RF energy levels do not normally pose a hazard** to the public. See this month's Happenings for details.



Cable-TV Leakage Levels to be Raised?

CATVI is in the amateur picture again, this time because of FCC efforts to update rules governing the cable television industry. Of particular concern to amateurs is an FCC proposal to **increase the authorized cable signal-leakage levels** in the 54-216 MHz spectrum. For details, see this month's Happenings.

Third-Party Rules Tightening Proposed

The FCC has moved to close a loophole in the Rules concerning third-party messages. Basically, the Commission proposed changes in Part 97 to **prohibit participation in third-party communication by any amateur whose license has been revoked or suspended** (PR Docket 85-51). In taking this action, the FCC cited instances in the past in which individuals whose privileges had been terminated took advantage of the Rules by participating in third-party communication from stations licensed to amateurs in good standing. The proposal also seeks penalties against amateurs who knowingly allow a disqualified person to participate in third-party communication. The ARRL Executive Committee has given the League's endorsement to the change. Details are in this month's Happenings.

Jim Neiger, N6TJ, used this antenna array at W6YA to make a clean sweep on his way to becoming the Southwestern Division winner on CW during the 1984 ARRL November Sweepstakes. Of course, the Newport, California, amateur had help from some friends: Note the plastic owls attached to the 20- and 10-meter booms to scare real birds away. See the SS '84 Results, beginning on page 74 of this issue, to see how others fared in the contest.

A three-alarm fire in a Palo Alto, California, apartment complex in early March brought local amateurs out in a hurry. Among them was Rick Joslin, WB5VUL, shown here talking with some of the victims. Rick headed up an American Red Cross Disaster Services action team, offering alternate housing and other assistance to those displaced by the fire. During the emergency, he stayed in constant contact via 2 meters with Ted Harris, N6IIU, Director of Disaster Services for the Palo Alto Red Cross. *(WA6AOD photo)*

We're Listening!

As you look through this issue, you'll notice there's a different format for columns. It's designed to be a cleaner, more modern design, and to save some space for the most important part of the column—the text. Speaking of which: In response to those who've told us they have a hard time with the small print in *QST*, we've eliminated most of it. The result is a *QST* that's a bit easier to read and more pleasant to look at.

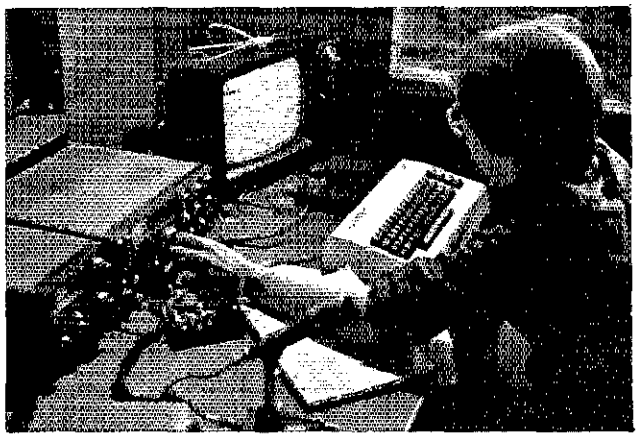
During a swing through Milwaukee recently on a concert tour, recording star Ronnie Milsap, WB4KCG (left), stopped by a local radio station for a chat with fellow ham Dick Stout, KD9IV, a morning talk-show host. Although most of the talk was about music, Dick didn't let the opportunity go by without getting in a plug for Amateur Radio. Ronnie told listeners that he used Amateur Radio in his spare time to relax, preferring to work European amateurs on 80 meters.

By year's end, Ralph Ernstein, W6SPQ, will have invested 50 years in Amateur Radio. Judging by the size of his radio collection, he certainly has a lot to show for it. Licensed in 1935, the Northridge, California, amateur credits his brother with sparking an interest in radio. Ralph amassed much of the more-than-250-piece collection—many dating to pre-1925—while working for many years in electronics-related fields. Others were donated or acquired through swap meets and ads he placed in several club bulletins.

Most of the technical details of AMSAT's first packet-radio satellite have been worked out. That's the result of the March design-review meeting on the full-service **Packet *Communications Satellite* (PACSAT)** project held in Rosslyn, Virginia. Among the many participants (shown above, l-r) were WA9FMQ, of VITA; NK6K, of AMSAT; WA7GXD, of TAPR; G3YJO, of UoSAT; WA3ZIA, of AMSAT; and K8KA (standing), of ARRL. Scheduled for launch in early 1987, PACSAT will provide an effective means of using packet radio to communicate worldwide. One question that does remain is **finding major sources of funding for the project.** Ideas are welcome, and should be forwarded to Dr. Gary Garriott, VITA PACSAT Project Officer, 1815 North Lynn St., Arlington, VA 22209.

Space Shuttle Audio to be Retransmitted

Interested in finding out what happens aboard upcoming Space Shuttle missions, but don't want to wait for the 6 or 11 o'clock newscast? The Goddard ARC, WA3NAN, at the NASA Goddard Space Flight Center in Greenbelt, Maryland, retransmits live audio during Space Shuttle flights. Coverage begins about an hour before liftoff and ends about an hour after landing. WA3NAN is not on the air during Astronaut sleep periods, however. Tune in to 3860, 7185 and 14,295 kHz. Washington, DC-area listeners may also monitor 147.45-MHz FM. WA3NAN operates under a blanket waiver of Section 97.113 issued by the FCC for the duration of all Space Shuttle flights (see November 1983 Happenings for details of the waiver, and It Seems To Us, this issue, for more on the next ham/astronaut mission).



With the welcome return of warm sunshine, it's a good time to get some exposure for your club and for Amateur Radio. Last year, members of the McMinnville (Oregon) ARC set up a booth at the Yamhill County Fair, where they had the chance to reach many hundreds of visitors. One club member, Todd Carlson, WB7RPJ, put on a good show for passersby, working a Georgia station on RTTY and a Russian amateur on CW. The club also enlisted some prospects for their fall Novice class. *(KC7YN photo)*

Folks at the Squire Senior Center in Newton Square, Pennsylvania, stay fairly active these days, particularly with a little help from K3PAQ (second from left), K3TCG and WB3BDP. Since the Center opened, in April 1984, the trio has helped in setting up and maintaining the station, and teaching beginners. Recently, W3ZK (left), the oldest resident at the Center, joined the group. He was first licensed in 1913.

League Lines

On March 29, the ARRL filed its comments in opposition to MM Docket 85-38, the cable TV deregulation docket. This proposal, if adopted, would delete quality performance standards for cable television systems and increase permissible signal leakage levels in the 54-216 MHz band. The League's comments stated, in part, that an increase in signal leakage levels sends the wrong message to those cable companies that are not complying with the present rules. The League also pointed out that the Commission's analogy of CATV emissions to RF emissions from computers was invalid. For example, computers may be switched on and off, but a leaky cable is constant. Copies of the ARRL comments in this proceeding are available from Hq. for a large s.a.s.e. with 56 cents postage affixed. Details will appear in next month's QST.

The FCC tackled Federal preemption in residential zones "head on" at its regular Open Agenda meeting March 28, 1985. Under discussion was the petition of United Satellite Communications, Inc. (USCI) requesting preemption of local zoning regulations that unreasonably interfere with the right to construct and use receive-only satellite earth stations. The Commission adopted a Notice of Proposed Rulemaking (NPRM in CC Docket 85-87) and **proposed** the following rule: "State and local zoning or other regulations that discriminate against satellite receive-only antennas in favor of other communications facilities are preempted unless they have a direct and tangible relationship to reasonable, valid, demonstrable and clearly articulated health, safety or aesthetic objectives and constitute the least restrictive method available to accomplish such objectives." While this NPRM deals only with satellite dishes, it is believed that FCC action is a good omen toward favorable action on amateurs' own preemption proposal, PRB-1, later this Spring.

In view of diminished federal resources, Uncle Sam has made it "perfectly clear" that we are to resolve our own operating matters. Writing or calling the FCC about every questionable on-the-air event or dreaming up abstract regulatory hypotheticals is precisely the wrong way to show the FCC that we have the maturity and good judgment to deal with our own affairs. The best approach is to contact your ARRL Section Manager (see p. 8), who is the chief administrator of the Amateur Auxiliary in your section/state. Created by formal agreement between the FCC and ARRL, the Amateur Auxiliary to the FCC's Field Operations Bureau addresses both maintenance monitoring, through an enhanced Official Observer program, and amateur-to-amateur interference, handled by specifically authorized Local Interference Committees. Your Section Manager can unleash the Amateur Auxiliary problem solvers to bring about direct, cooperative solutions.

The Publications Office reports that there are some problems with the newly revised DXCC Countries List Booklet. Some bad copies have already been shipped -- If you have a bad copy, send it back to ARRL Hq., and we will replace it free of charge.

W1AW Field Day bulletin schedule -- To give Field Day groups extra opportunities to copy the W1AW Field Day Message, four additional bulletins will be transmitted. An extra CW bulletin will be run at 1400 UTC (10 A.M. EDT), and an extra phone bulletin at 1500 UTC (11 A.M. EDT) on both Saturday and Sunday mornings. See April QST, page 73, for a detailed bulletin schedule.

Packet Radio during Field Day -- Field Day groups that complete one or more QSOs via packet radio during the Field Day period will qualify for 100 additional bonus points. The repeater provision (Rule 7C) is waived for packet radio QSOs. A packet station does not count as an additional transmitter. Indicate packet radio QSOs on the summary sheet as a separate "band." Complete Field Day Rules appear in this issue.

Remember the bonus points for Field Day publicity! It's not too soon to start planning. This year the ARRL Development Office would like Field Day groups to pay special attention to television and radio, and we would like to receive videotapes and audio cassettes of Field Day coverage. Don't forget cable television -- local access channels may be the perfect place for more than a 30-second spot.

Job Opening at ARRL Hq. -- Repeater Directory editor Jim Clary, WB9IHH, has moved to a new position in the Volunteer Examiner Department, thus creating an opening at Hq. Primary responsibility is editing the Repeater Directory, with additional responsibilities as staff resource person regarding repeater coordination and FCC Rules as they affect repeater operation. Candidates should have a Technician class (or higher) amateur license, good oral and written communications skills and a familiarity with repeater operation and coordination. If you are interested in this position, contact Bruce Hale, KB1MW, Manager, Regulatory Information Branch, ARRL Hq.

A Simple 435-MHz Transmitter

Step up to UHF! Try this simple construction method for your next project.

By John C. Reed,* W6IOJ

The OSCAR 10 435-MHz uplink has increased interest in UHF transmitters. If you are a do-it-yourselfer, you may be considering building one of your own. If you're concerned about tackling a UHF transmitter project, don't be. This 15-W transmitter is easier to build and make work than one operating at a lower frequency! In addition, all parts are readily available—most from Radio Shack, and a few by mail order.[1] The transmitter uses a variable-frequency crystal-controlled oscillator (VXO)/tripler section having 145-MHz output, and a UHF assembly consisting of a tripler and three amplifier stages. The UHF assembly features the use of a novel glue-down stripline technique that is as effective as etched-circuit-board striplines and much simpler to construct. Included in the package is a dummy load that also serves as a power-measuring device and a sampler for frequency-spectrum evaluation.

Glue-Down Stripline Construction

The three-stage 435-MHz amplifier chain employs stripline circuitry. Generally, etched PC board is used for making striplines; excellent examples of this technique are described in the Motorola *RF Data Manual*.[2] Etching PC boards can be a messy operation, and mistakes or changes require new etched circuit boards—a particular concern with multistage circuitry.

The glue-down stripline method solves these problems. Strips of the required size are cut from double-sided glass-epoxy PC board using the same dimensions as those called for with etched PC-board striplines. One side of the stripline is smeared with glue and firmly pressed against the PC board used for mounting the components. Parts can be soldered to the stripline immediately without waiting for the glue to dry. Dc isolation can be provided by filing a groove in the stripline and soldering the dc-blocking capacitor across the groove. Changes can be made within minutes by lifting the glue-down stripline with a knife and replacing it with one of the desired dimensions.

This approach really makes building UHF hardware a pleasant experience! Tests indicate that the glue-down stripline performance is equivalent to that of etched-stripline circuitry.

Circuit Details

Refer to Figs. 1 to 3. A varactor-tuned

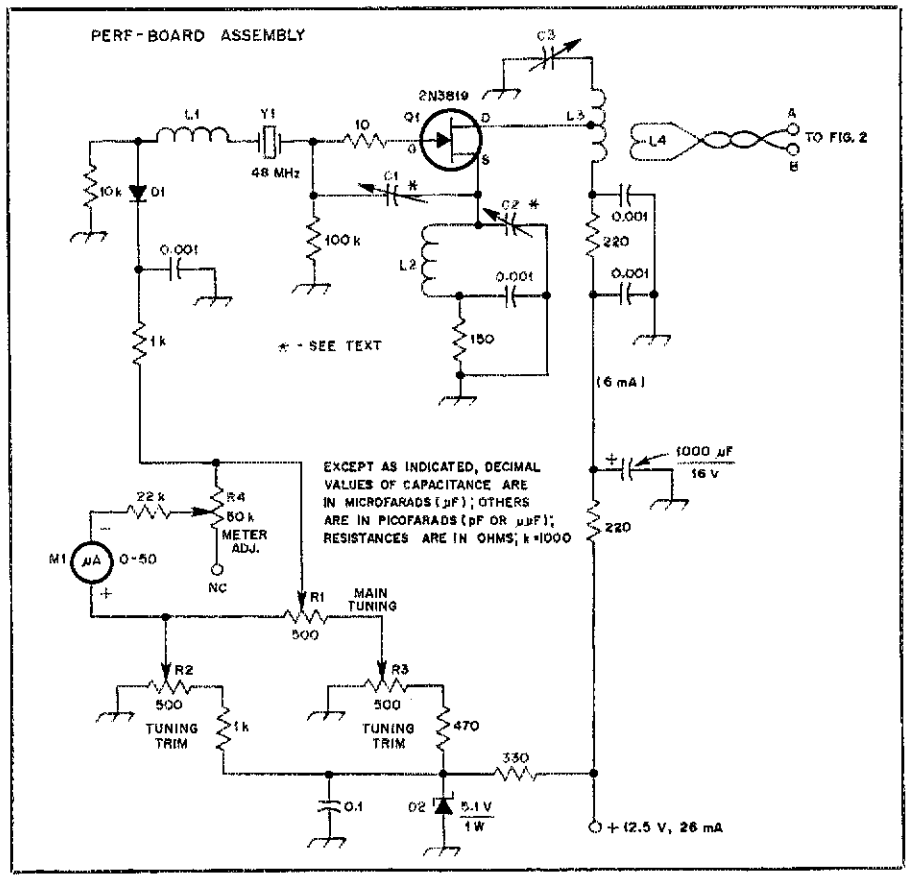


Fig. 1—Schematic diagram of the VXO. Unless otherwise noted, all resistors are ¼ W, 5%; values are in ohms. Fixed capacitors without polarity markings are disc ceramic, 50 V.

C1, C2, C3—5- to 60-pF trimmer (RS 272-1340 or equiv.).
D1—1N4001 (RS 276-1101).
D2—1N4733 5.1-V/1-W Zener (RS 276-565).
L1—27 turns no. 26 wire, 5/16-inch dia on Plexiglas form.
L2—15 turns no. 26 wire, ¼-inch dia on Plexiglas form.
L3—4 turns no. 14 wire, ¼-inch dia, ½-in long, tap at 2 turns.
L4—1 turn no. 22 stranded hookup wire wound on end of L3.
M1—50-μA panel meter (RS 270-1751).
Q1—2N3819 (RS 276-2035).
R1—500-Ω, 10-turn potentiometer, TRW7400 or equiv. (Meshna SP264A-27).
R2, R3—500-Ω trimmer potentiometer (RS 271-226).
R4—50-kΩ trimmer potentiometer (RS 271-219).
Y1—48.381-MHz third-overtone (International Crystal Mfg. Co., Inc.).

[1]Notes appear on page 45.
*770 La Buena Tierra, Santa Barbara, CA 93111

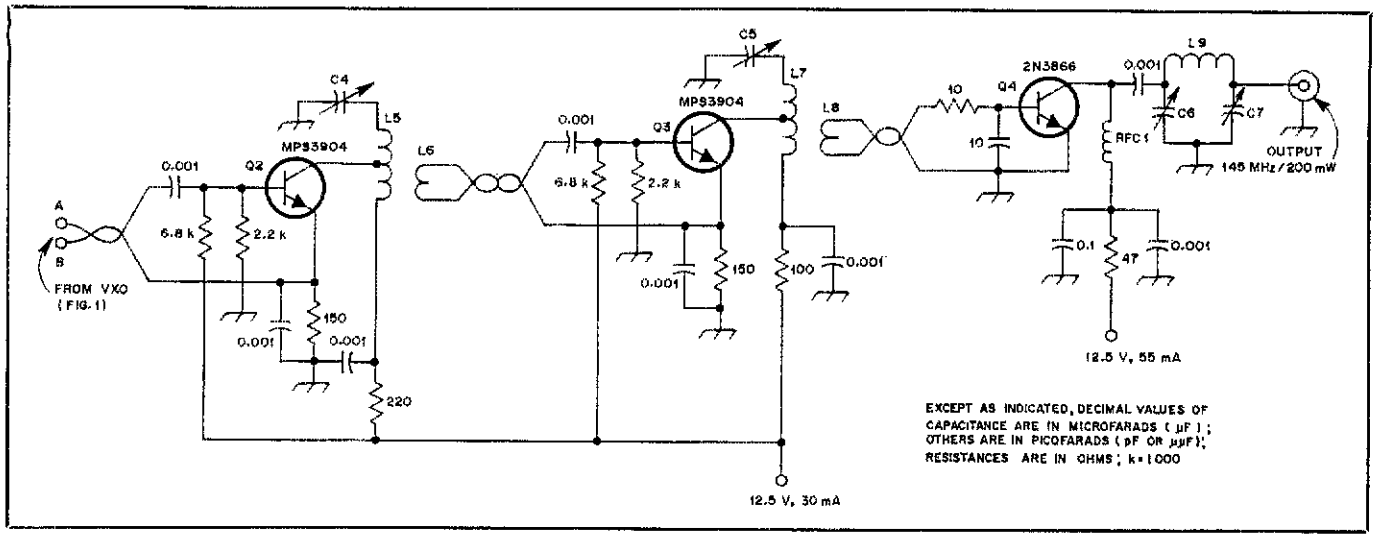


Fig. 2—Schematic diagram of the VXO amplifier. Unless otherwise noted, all resistors are ¼ W, 5%; fixed capacitors are disc ceramic, 50 V.

C4-C7, incl.—5- to 60-pF trimmer (RS 272-1340).
L5, L7—4 turns no. 14 wire, ¼-inch ID, ½-inch long, tap at 2 turns.
L6, L8—1 turn no. 22 stranded hookup wire wound on end of L5 and L7, respectively.
L9—5 turns no. 14 wire, ¼-inch ID, ½ inch long.
Q2, Q3—MPS3904 (RS 276-2016).
Q4—2N3866 (RS 276-2038 or order from MHz Electronics).
RFC1—14 turns no. 30 wire wound on ½-W, 1-kΩ resistor.
VXO cabinet—3 × 5¼ × 5-7/8 inches (RS 270-253).

VXO/tripler is chosen as a signal source because of its simplicity. Reasonable care in mounting the parts results in a T9 signal having acceptable stability. The circuit is built in a 5 × 3 × 6-inch cabinet. A front-panel tuning knob rotates a 10-turn potentiometer, and a 2¼-inch panel meter is used as the frequency indicator or "dial." Varactor-diode voltages are adjusted so the potentiometer tunes the crystal from 48.333 MHz to 48.355 MHz, producing an output tuning range of 435 to 435.2 MHz.

This VXO is essentially a VFO that is synchronized with the crystal. The free-running frequency is determined by the gate and source tuned circuits; the relationship between the two establishes the varactor-tuning sensitivity. Optimum crystal synchronization depends upon maintaining a low-C input circuit. Stray capacitance is minimized by mounting the parts on perf board, securing components with push-in terminals and attaching the perf board to the chassis with ¾-inch standoffs. Crystal lock-up is also sensitive to abrupt turn-on. This is avoided by using a filter with a long time constant that consists of a 1000-μF capacitor shunting a 220-ohm resistor, placed in series with the 12.5-V line. The tuning diode is a 1N4001 operated in the reverse-bias mode to function as a varactor. Tuning range is a function of the L1 value. L1 should be tailored so the potential applied to the varactor is in the range of 0.3 to 2 V when covering the desired frequency band. The VXO upper-frequency limit will be lower than that of the marked crystal frequency; 25 kHz has been allowed for this offset.

A 500-ohm, 10-turn potentiometer is chosen simply because of its availability on the surplus market. The single limitation of the potentiometer is that the wire-wound configuration creates approximately 100-Hz tuning steps; consequently, the VXO output sounds like that of a synthesizer. This VXO has proven to be quite effective and reliable.

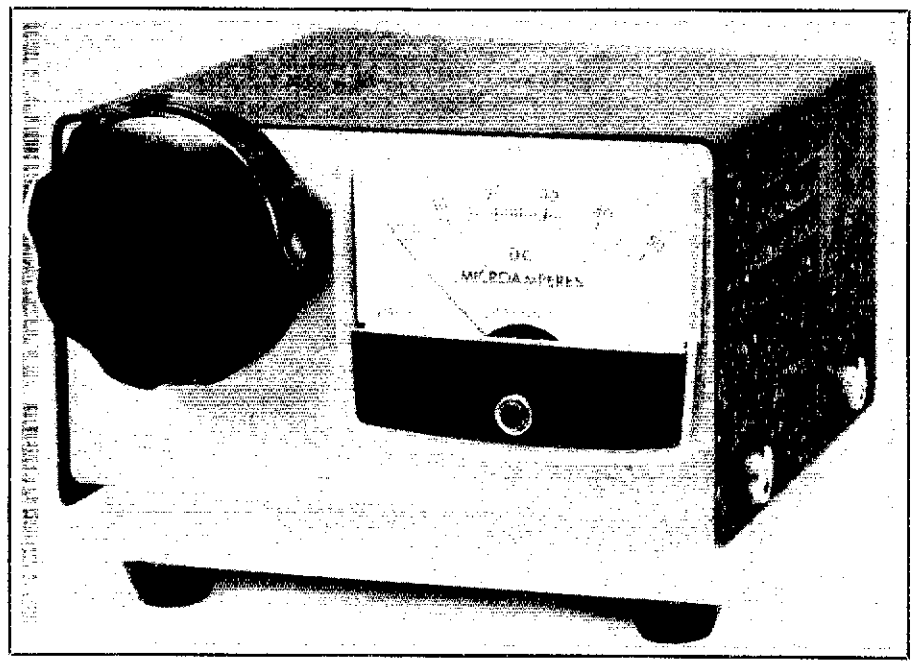


Fig. 3—The VXO assembly.

The low-level 145-MHz VXO signal is amplified to produce a final output of over 200 mW. Two narrow-bandpass stages are used to filter the VXO fundamental and second-harmonic components. These stages are followed by a relatively wide-band output stage. Link coupling between stages allows several inches of coupling variance, simplifying layout considerations. The three stages are mounted on a 3- × 5-inch circuit board. Parts are secured with push-in terminals, and a ¼-inch-diameter circle of foil is removed around the terminals. Double-sided PC board is used with components mounted on both board sides to provide maximum isolation between stages. Spurious responses at the output are less than −40 dB.

The UHF assembly (Figs. 4 to 6) contains a tripler and three 435-MHz amplifier

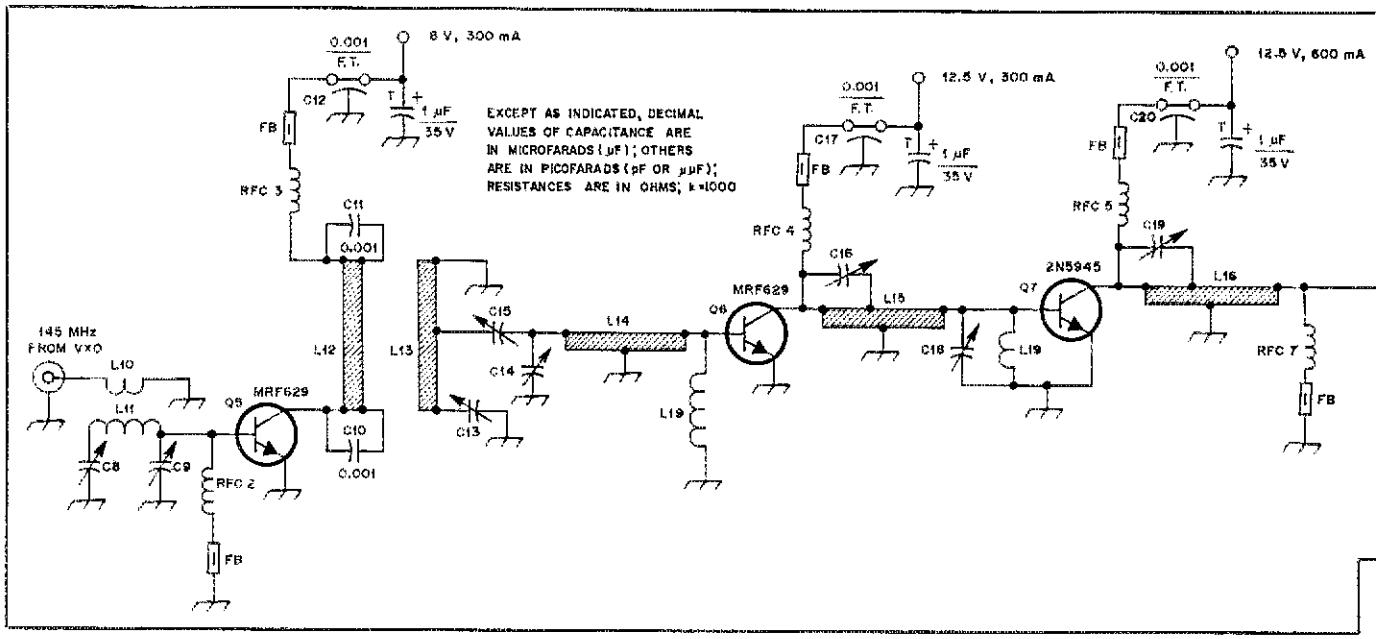


Fig. 4—Schematic diagram of the UHF assembly. Unless otherwise noted, fixed capacitors are disc ceramic, 50 V (RS 272-126 or equiv.). Tantalum capacitors are Radio Shack 272-1434 or equiv.

C8, C9, C13-C16, C18, C19, C21-C24—5- to 60-pF trimmer (RS 272-1340).
C10, C11, C25, C26—0.001-µF, 50-V disc ceramic (RS 272-126).
C12, C17, C20, C27—0.001-µF feedthrough (Meshna H-30).
FB—Ferrite bead (RS 273-098).
L10—1 turn no. 22 stranded hookup wire wound on end of L11.
L11—5 turns no. 14 wire, ¼-inch dia, ½-inch long.

Note: L12-L18, inclusive, are stripline inductors made from 1/16-inch-thick, double-sided G-10 glass-epoxy PC board (Meshna PCB-28). L14-L18, inclusive, are glued to the PC mounting board with Scotch® 3M Super Strength Household Cement.

L12—¼- × 1½-inch copper S bracket; spaced ¼ inch above the PC mounting board
L13—¼ × 2-inch copper S bracket; spaced ¼ inch above the PC mounting board and 1/16 inch from L12; tap at 3/16 inch from S bracket.
L14—3/16 × 1 inch.
L15—3/16 × 1¼ inches; file groove for pad ¼ inch from end.
L16—3/16 × 1¾ inches; file groove for pad ¼ inch from end.
L17—3/8 × 3¾ inches, folded to conserve

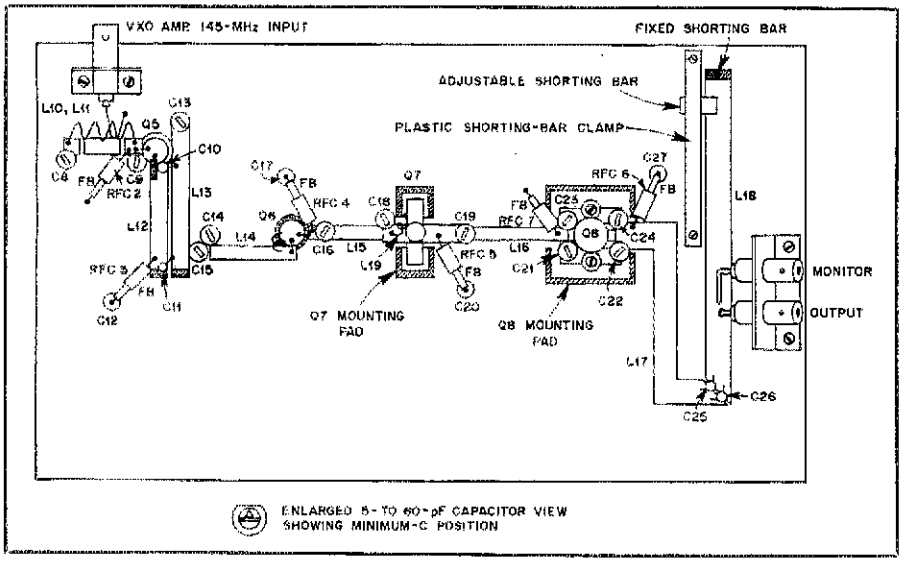
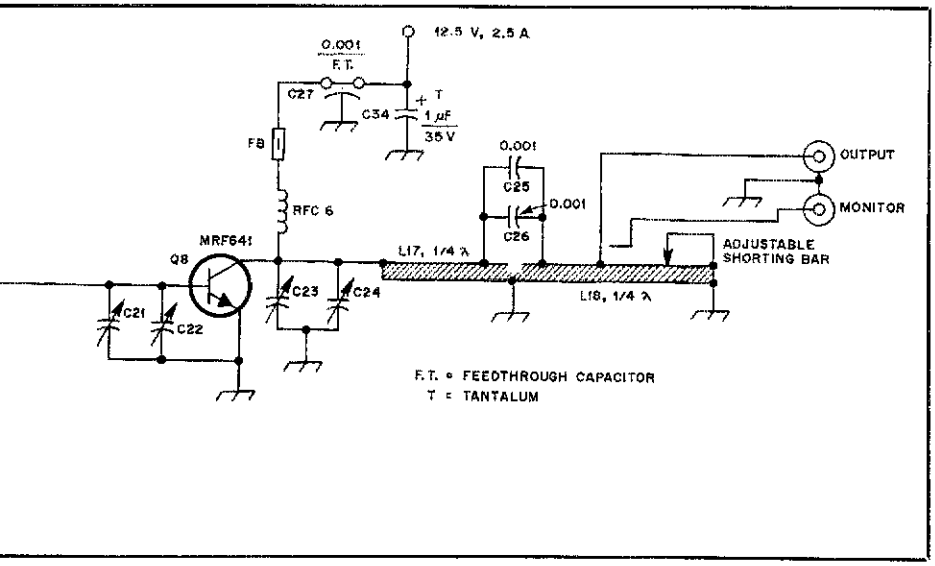


Fig. 5—Pictorial diagram of the UHF assembly layout. The 1-µF bypass capacitors are mounted on the opposite side of the board.

stages mounted on a 6¼- × 11-inch double-sided PC board. The MRF629 used at tripler Q5 is a 2-W, 500-MHz device. This transistor has two unusual features. First, the emitter is tied to the TO-39 case; in most applications, soldering the case to the PC board provides adequate heat sinking. Second, it contains Faraday-shield diodes between the collector and emitter for the purpose of isolating the base input from the collector.

When operated below the rated voltage, the diodes function as varactors, and the transistor then operates as an effective frequency multiplier. The manufacturer (Motorola) claims this feature minimizes the "witchcraft" usually associated with solid-state frequency multipliers. In the circuit, the third harmonic is picked off by a pair of ¼-inch-wide striplines placed ¼-inch above the base-mounting board. The first stripline is untuned and connected directly to the collector of Q5. The second stripline is inductively coupled to the first and tuned as a relatively high-Q circuit for discriminating against outputs other than the third harmonic. With more output than necessary to drive the following stage, the resulting light coupling maintains optimum selectivity.

Impedance transformation to the base of Q6, the second MRF629, is accomplished by L14/C18 with C18/C19 controlling the coupling and drive from the tripler. Similar coupling arrangements are made for Q7. In this case, L15 and L16 have ¼-inch pads at the end to accommodate connections for the transistor collector, a choke and a series capacitor. The pads are made by filing a small groove in the stripline, eliminating about 1/32 inch of the copper. The striplines raise the stud-configured Q7 above the main circuit board by the stripline thickness. The two emitter connec-



space (see pictorial) to 2¼ × ¾ inch.
L18—3/8 × 4½ inches, fixed shorting bar at end. Sliding ¼-inch-wide shorting bar allows 2-inch adjustment. BNC output is 1-1/8 inches from open end. BNC monitor output 1¾ inches from open end consists of a ½-inch length of no. 22 wire spaced 1/32 inch above and parallel to the stripline.
L19—2 turns no. 24 wire, 1/8-inch ID, 3/16-inch long.
Q5, Q6—MRF629 (MHz Electronics).
Q7—2N5945 (MHz Electronics).
Q8—MRF641 (Westcom).
RFC2-7, incl.—14 turns no. 30 wire wound on a ½-W, 1-kΩ resistor.
Misc.—Base mounting board, 6¼ × 11-inch double-sided G-10 glass-epoxy PC board (Meshna PCB-28).

tions are accommodated by gluing two 3/8-inch-square PC pads to the mounting board. Three sides of both pads are grounded by soldering copper strips around the edges. A similar arrangement is used in mounting Q8. In this case, the pads are 7/16 × 1-1/16 inch in size.

The final output transistor, Q8, is coupled to the antenna with two ¼-wave striplines. Significant losses are avoided in the low-Q striplines by using low-impedance lines of approximately 25 ohms. This makes the high-voltage junction point about 150 ohms. The antenna is matched by tapping into the final shorted ¼-wave section. Output resonance and loading can be optimized for a variety of antenna loads by means of an adjustable shorting bar. This sliding shorting bar is a ¼-inch, S-shaped piece of copper bent to make a firm connection to the stripline when the other S-shaped side is clamped to the mounting board.

Alongside the antenna connector is a second output connector holding a short length of wire in close proximity to the stripline. This is a pick off used to permit monitoring of the output—which is especially useful when optimizing tune-up variables. Although the Radio Shack 5- to 60-pF miniature capacitor is an excellent component, its current-handling capability can be exceeded in the final-amplifier section. This problem has been avoided by using two capacitors in parallel at the base and collector of Q8. It is necessary to maintain the capacitor pairs close to the same value for maximum protection.

Q7 and Q8 require heat sinks. The stud of Q7 is fastened to a 1/8-inch-thick, 1- × 5½-inch aluminum plate, and the mounting base of Q8 is fastened to a similar plate measuring 1¾ × 5½ inches. It is important that the transistor/heat-sink interface places the transistor at the proper height. One of the chief causes of transistor failure is stress at the connecting tabs. Aluminum shims between the heat sink and the mounting board are used to achieve the proper height. Silicon heat-sink compound is used at the transistor/heat-sink interfaces. Heat sinking is increased further by fastening an aluminum U-shaped chassis to the heat sinks. The U-shaped chassis is the size of the mounting board and is ¾-inch deep.

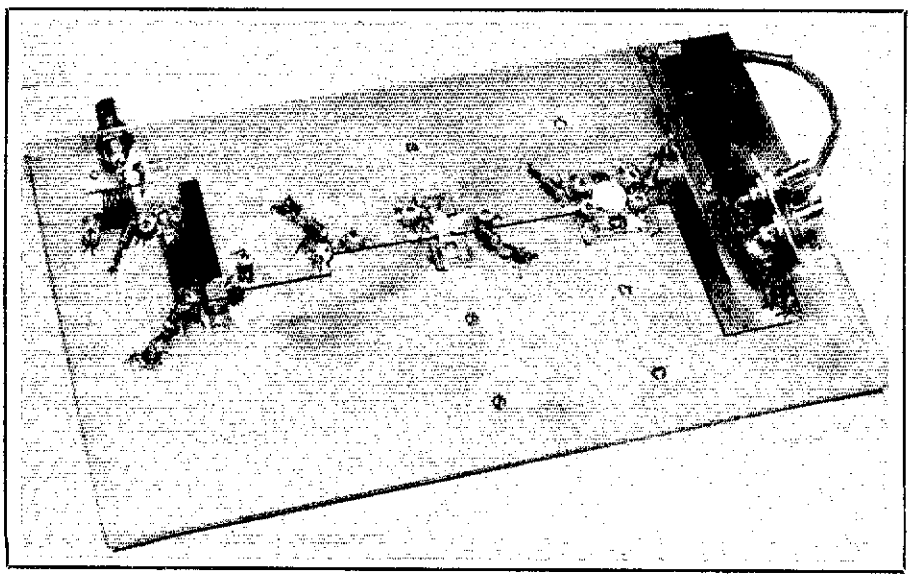


Fig. 6—The UHF assembly.

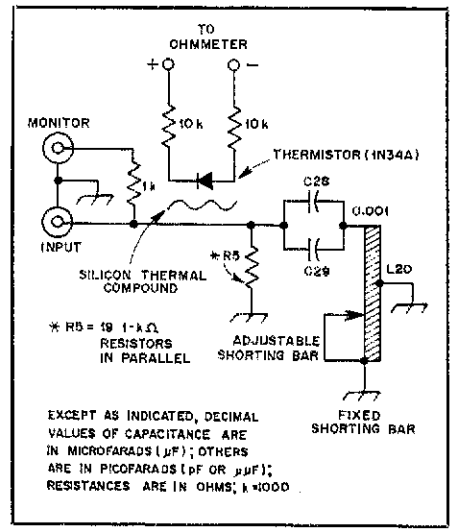


Fig. 7—Schematic diagram of the dummy load/power-measuring assembly.
C28, C29—0.001-µF, 50-V disc ceramic (RS 272-126).
D3—1N34A (RS 276-1123); used as thermistor.
L20—1/16 × 3/8 x 3½-inch stripline glued to 3½ × 6-inch PC-board base, fixed shorting bar at end. Adjustable shorting bar permits 1½-inch adjustment.
R5—19 1-kΩ, ½-W resistors (RS 271-023).
Misc.—Thermal compound (RS 276-1372).

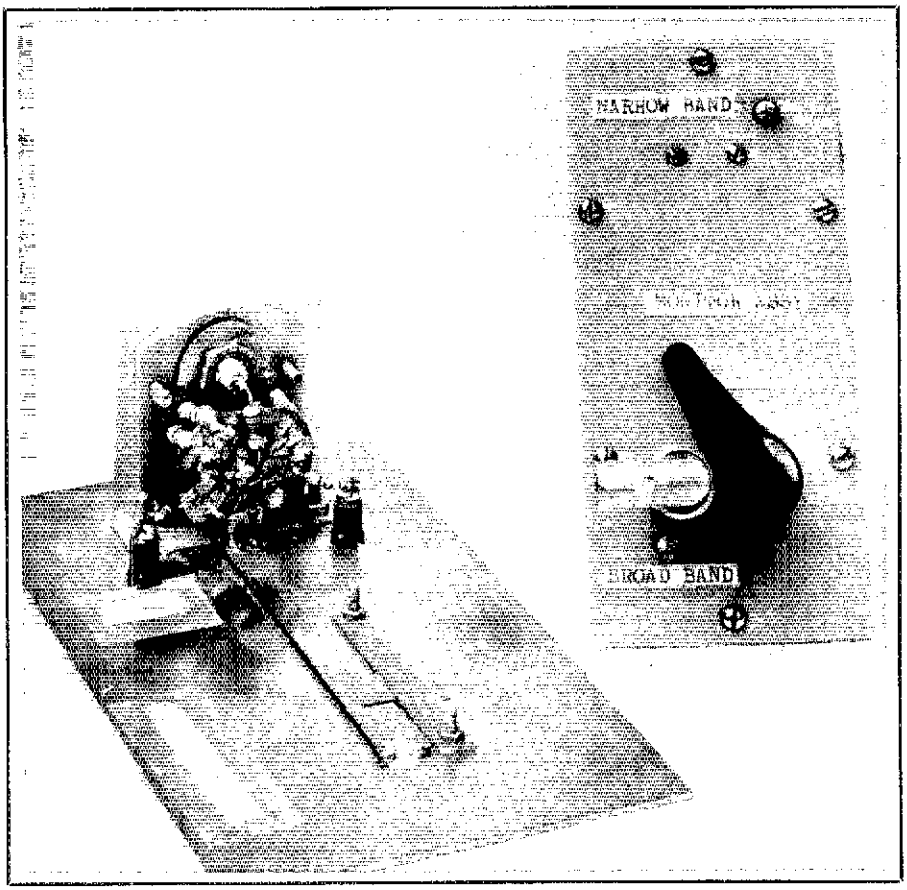


Fig. 8—The dummy load and monitor assemblies

C30—25-pF miniature variable (Johnson 9M25 or equiv.). A Radio Shack 272-1340 5- to 60-pF trimmer can be used.
C31, C32—0.001-μF, 50-V feedthrough (Meshna H-30).
C33—0.001-μF, 50-V disc ceramic (RS 272-126).
L21—3/8 × 2 inches. Copper S bracket at end spaces L21 3/8 inch above the mounting board.
L22—3/8 × 2 inches; tap at center. Copper S bracket at end spaces L22 3/8 inch above mounting board and 1/8 inch from L21.
Misc.—2¼ × 4¾-inch single-sided PC mounting board.

changes from 3 MΩ to 100 kΩ after 59 seconds of power input.

The monitor assembly (Figs. 8,10) uses two striplines. The first is loaded with the input power, while the second is inductively coupled to the first and tuned through the 435-MHz region. A 1N34A diode tapped into the second stripline presents a relative power indication as picked off from the narrowband tuned circuit. Another 1N34A diode reads the broadband input.

Alignment and Operation

I used my old homemade receiver and its 100-kHz marker generator for calibrating the VXO frequency. First, a reference was established by shorting L1 and assuming the crystal is operating at its marked frequency. I then noted the frequency offset when removing the short and applying 2 V to the varactor diode. By pruning L1 and adjusting the source tuned circuit, the VXO

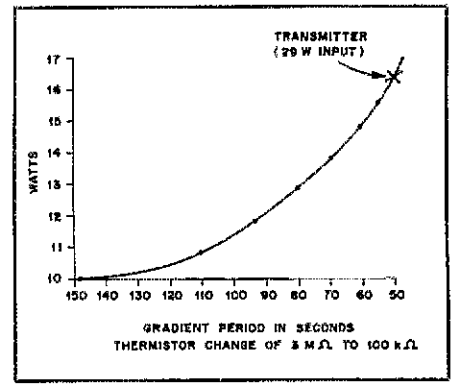


Fig. 9—Power-measurement calibration graph.

One safe-handling consideration concerning the 2N5945 is that torque applied to the stud nut is specified at no more than 5 in-lb for repeated assemblies. Having no torque wrench, I simply used caution when I tightened the nut.

Test Equipment

In developing this project, I used no esoteric test gear—a Heath GDO for evaluating the VXO resonant circuits, Lecher wires for confirming the 435-MHz harmonic of the UHF tripler and a dummy load/power-measuring assembly. Not having the use of a spectrum analyzer for a project of this type is a serious limitation. The problem was resolved by using high-Q tuned circuits in conjunction with a 1N34A detector. Tuned circuits were made to cover the frequencies near 145 and 435 MHz. Use of a peak detector alone, though, can be misleading, as it will read the sum of all signals, including harmonics and spurious responses.

The dummy load (Figs. 7,8) is made of 19 1-kΩ, ½-W resistors connected in parallel and clustered in a tight circle around a BNC connector. The resistors are soldered to 1-inch-diameter copper discs. There is a 20th resistor connected to the center plate, but returned to a second BNC connector rather than the common plate. This second BNC connector is cabled to the 435-MHz tuned circuit/peak-detector diode. It is used to optimize the transmitter performance at the desired frequency. At 435 MHz, there is reactance associated with the dummy load; this is tuned out with a ¼-wave stripline connected to the center plate. With 15 W applied to the load, it can be operated continuously with forced-air cooling. Without such cooling, the center plate reaches a temperature of about 100°C in one minute.[3]

Power measurements are made by calibrating the dummy-load temperature gradient with a dc input and operating at ambient conditions with no forced-air cooling (Fig. 9). This information is then compared to the temperature gradient caused by the RF power applied to the load. The reverse resistance of a 1N34A diode is used to measure the temperature gradient. With 15 W into the dummy load, the resistance

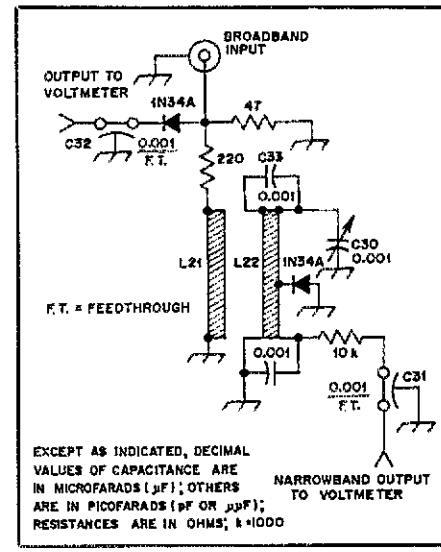


Fig. 10—Schematic diagram of the UHF narrowband pick-off.

(continued on page 45)

How to Perform AC-Circuit Analysis

Here's a pathfinder to help guide you through the ac-circuit jungle —and the FCC Extra Class exam.

By Frank W. Napurano,* K2OKA

When working with dc circuits, we can directly apply the basic arithmetic operations. Solving ac-circuit problems is a bit different. If there is an impedance consisting of a resistance and an inductance in series, for example, we cannot disregard the fact that the voltage across the inductance will be 90° out of phase with the current and that the resistive voltage drop will be in phase with the series current. Similarly, we must take into account the 180° phase difference between capacitive and inductive voltages.

When we work with parallel ac circuits, things start to get unpleasant! Now we have several branch currents that are out of phase with one another in addition to out-of-phase voltages that may be present within the parallel branches. There must be a better way! There is—it's called complex notation, or complex numbers.

Learning to use complex notation may be a little slow going at first, but once you've mastered the method, ac-circuit calculations will become quick and easy. In addition to making your calculations quicker and easier, complex numbers completely analyze an ac circuit including phase angles without graphs or guesswork. Also, when ac problems get complex (more than one reactance per branch in a parallel circuit, for instance), it's the only way to solve them.

Complex Numbers

A complex number treats not only real numbers, such as positive and negative numbers, but also "imaginary" numbers.[1] An imaginary number is one that does not reside on the real axis (positive and negative numbers are on the real or X axis). Imaginary numbers exist on the Y axis, which is displaced 90° from the real axis. In electronics, the letter "j" designates the imaginary, or Y, axis. Plus j is at +90°, and −j is 270° (see Fig. 1). The positive real axis has a factor of +1. That being the case, 180° will then have a factor of −1. The letter j signifies a rotation of 90°; the rotation of 90° is equal to multiplying by j. For example, a complex scalar (sometimes called a "vector") rotation to +90° from the real axis equals $1 \times j = j$. Further rotation to 180°, equals $j \times j = j^2$. However, 180° = −1; therefore, j^2 always equals −1. At 270°, we have $-1 \times j = -j$, and 360° = $-j \times j = -j^2 = -(-1) = +1$.

Fig. 1 shows the real and imaginary axes (the real axis is horizontal, and the imaginary axis vertical). In electronics, magnitudes of resistance are marked off on the 0°, or real, axis since resistive voltages are in phase with the current. Inductive reactances, X_L, reside on the +j axis because the voltage across an inductor leads the current through the coil by 90°. In a similar way, the −j axis signifies capacitive reactance, since capacitive voltage lags the current. When we speak of reactive currents instead of voltages, the reverse is true: IX_C on the +j, and IX_L on the −j axis.

Form of a Complex Number

Complex numbers take the form R ±jX, where R is the magnitude of the real or resistive term and +jX is the magnitude of the reactive term. This is called the *rectangular-coordinate* form because it designates a magnitude by a set of numbers that define a rectangle.

A second form of complex notation is termed the *polar-coordinate* form because it gives an angle and magnitude (expressed as a radius) of the term. Thus, polar coordinates describe the magnitude in a circular form. As you will learn, we can convert from rectangular to polar form, and from polar form back to rectangular. In rectangular form, a complex number is readily added or subtracted; in the polar form, it is a simple matter of multiplying and dividing.

An Essential Tool

Complex numbers become an essential tool when dealing with complex ac circuits.

[1]An imaginary number is an indicated *even* root of a negative number. There is no factor that will yield a negative quantity when the factor is multiplied an even number of times. Thus, the square root of a negative number does not exist; for example, $(-2) \times (-2) = +4$. With complex numbers, however, we must deal with the even roots of negative numbers. This is accomplished as

$$\sqrt{-4} = \sqrt{4} \times \sqrt{-1} \quad \text{where } \sqrt{-1} = j$$

In pure mathematics, the letter I is used to indicate an imaginary number. In electronics, so as not to confuse the imaginary symbol with the symbol for current, we use the letter j. Any good algebra text will afford the interested reader much more information on imaginary numbers.

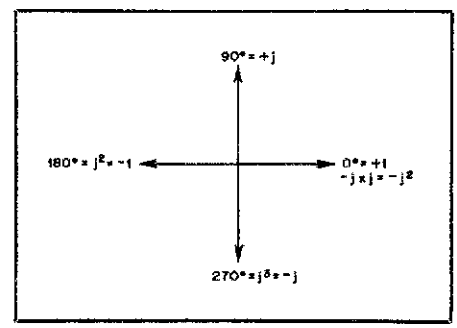


Fig. 1—The real axis is horizontal; the imaginary axis is vertical.

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We are all familiar with the formula for finding ac impedance:

$$Z = \sqrt{R^2 + X^2}$$

This is the "square-root-of-the-sum-of-the-squares" formula, known also as the Pythagorean theorem. This formula is part of complex numbers, but it doesn't go nearly far enough. For example, suppose you are faced with a parallel ac circuit that contains more than one reactance in each branch or two parallel branches containing more than one reactance in each, separated by a series-reactive branch? It would not be possible to solve these problems without complex numbers. Additionally, the FCC syllabus for the Amateur Extra Class examination includes reference to complex numbers.

Fig. 2 shows several series impedances and their rectangular notations. This is called the rectangular form because a number such as 5 +j10 describes the two scalars along the sides of a rectangle: 5 ohms on the real axis and 10 ohms on the +j axis (5 +j0) + (0 +j10) = 5 +j10. Note that a series circuit containing several reactances is easily reduced to rectangular form by inspection.

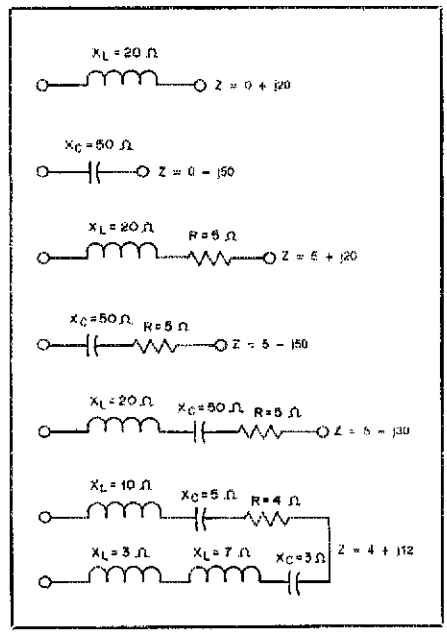


Fig. 2—Several types of series impedance and their rectangular form of notation.

Addition and Subtraction of Complex Numbers

As suggested earlier, the rectangular form lends itself to addition and subtraction. The rules are simple: add or subtract the real and j terms separately. Examples:

(5 +j10) + (2 +j5) = 7 +j15
(5 +j10) + (2 −j6) = 7 +j4
(5 −j10) + (2 −j6) = 7 −j16
(5 −j10) − (2 −j6) = 3 −j4

Multiplication and division are also possible using the rectangular form, but this becomes cumbersome. For instance, it is not possible to divide a real number by an imaginary number. You must first rationalize the fraction by multiplying both the numerator and denominator by the complex conjugate number. Multiplication isn't as bad, but it does increase the chances of errors. It's common practice, therefore, to use the polar form for multiplication and division.

Polar Form

The polar form uses the square root-of-the-sum-of-the squares formula:

$$Z = \sqrt{R^2 + X^2}$$

Polar form = $Z \angle\theta$

where
$Z = \sqrt{R^2 + X^2}$
θ = the angle whose tangent = X/R

Fig. 3 shows the method of converting from rectangular to polar forms. First, use the familiar impedance formula to find the magnitude of the complex number.

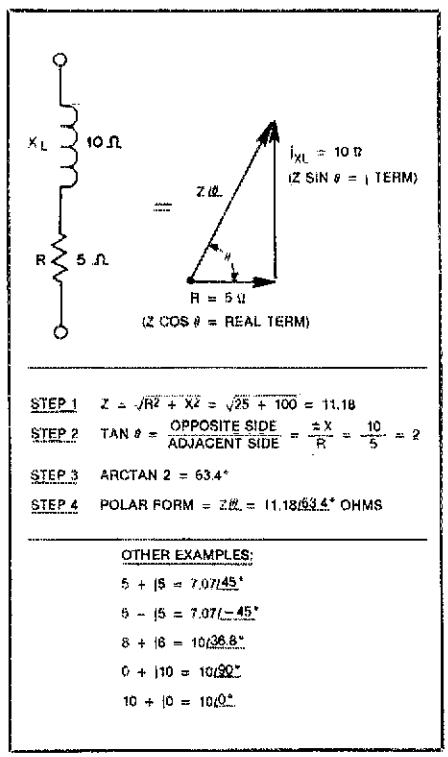


Fig. 3—The method used when converting from rectangular to polar representations.

Second, find the tangent of the phase angle, being careful to observe the sign of the reactive term. A negative reactance (capacitance) will yield a negative tangent and, thus, a negative phase angle. Then, find the angle that this tangent represents (arctan).

Multiplication of Complex Numbers

Multiplication of complex numbers is a simple process in the polar form. Rule: Multiply the magnitudes, and add the angles. Examples:

$(5 \angle 30°)(6 \angle 40°) = 30 \angle 70°$

$(5 \angle 30°)(6 \angle -40°) = 30 \angle -10°$

$(5 \angle -30°)(6 \angle -40°) = 30 \angle -70°$

Division of Complex Numbers

Rule: Divide the magnitudes, but subtract the angle of the divisor from the angle of the dividend. Examples:

$$\frac{100 \angle 75°}{20 \angle 50°} = \frac{100 \angle 75° - 50°}{20}$$

$$= 5 \angle 25°$$

$$\frac{100 \angle -20°}{10 \angle 30°} = \frac{100 \angle -20° - 30°}{10}$$

$$= 10 \angle -50°$$

$$\frac{100 \angle -20°}{10 \angle -30°} = \frac{100 \angle -20° - (-30°)}{10}$$

$$= 10 \angle 10°$$

Converting from Polar to Rectangular Form

The polar form of a complex number is convenient for multiplication and division, but for addition and subtraction we need the rectangular form. Therefore, converting from polar to rectangular form is a common operation. Referring to Fig. 3 again, you will note that the real term is equal to Z cos θ, and that the j term is equal to Z sin θ. Multiplying the magnitude by the cosine of the angle gives us the real term, and multiplying the magnitude by the sine of the angle yields the reactive, or j, term. Example from Fig. 3:

Polar: $11.18 \angle 63.4°$
Step 1: cos 63.4° = 0.4477
Step 2: sin 63.4° = 0.8942
Step 3: real term = Z cos 63.4°
= (11.18) (0.4477) = 5.005
Step 4: j term = Z sin 63.4°
= (11.18) (0.8942) = 9.997
Rectangular: Z = 5.005 +j9.997
= 5 +j10

Other examples:

$100 \angle 30° = 86.6 + j50$

$100 \angle -30° = 86.6 - j50$

$100 \angle 45° = 70.7 + j70.7$

$100 \angle -90° = 0 - j100$

Working with Complex Numbers

Now that we know something about complex numbers and the j operator, let's put them to work for us. You will find that

complex numbers provide a very thorough analysis. Our analysis will take the form of $Z_t = Z_1 + Z_2 + Z_3 \ldots$, for series impedance, and $Z_t = Z_1 \times Z_2 / Z_1 + Z_2$ (product over sum) for parallel impedances.

Series AC-Circuit Analysis

Refer to Fig. 4.

Step 1: Arrange each impedance in its complex form and add algebraically.

Step 2: Find the tangent, and note the sign of reactive component, $-X/R$.

Step 3: Find the angle corresponding to the tangent. Note the negative angle.

Step 4: Calculate the magnitude of the scalar in polar-coordinate form. Include the angle from Step 3 and you have the impedance in polar form.

Step 5: Find the total current.

Step 6: Calculate the voltage drop across R (ER).

Step 7: Calculate the voltage across the capacitor (X_{C1}).

Step 8: Calculate the voltage across the inductor (X_{L1}).

Step 9: Calculate the voltage across the inductor (X_{L2}).

Step 10: Calculate the voltage drop across the capacitor (X_{C2}).

Step 11: Find the cosine and sine of each voltage phase angle.

Step 12: Use the sine and cosine to convert each voltage polar form to rectangular form, and add them algebraically. The answer must equal the applied voltage.

Step 13: Calculate the power consumed. Since power is consumed only in a pure resistance, power is equal to voltage times current times the cosine of the angle theta, or current squared times resistance.

Step 14: Show a scalar diagram of the circuit just analyzed (Fig. 4).

Series-Parallel AC-Circuit Analysis

Now, let's look at a series-parallel circuit. We will use the product-over-sum method (see Fig. 5). ($Z_1 \times Z_2 / Z_1 + Z_2$). We can save a lot of time if we immediately put our impedances into both rectangular and polar form.

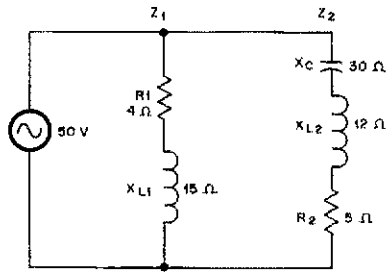


Fig. 5

$Z_1 = 4 + j15 = 15.5 \angle +75°$ ohms

$Z_2 = 5 - j18 = 18.7 \angle -74.5°$ ohms

$Z_1 + Z_2 = (4 + j15) + (5 - j18) = 9 - j3$

$Z_1 + Z_2$ in polar form =

$9.5 \angle -18.4$ ohms

Find the total impedance:

$$Z_t = \frac{Z_1 \times Z_2}{Z_1 + Z_2}$$

$$\frac{(15.5 \angle 75°)(18.7 \angle -74.5°)}{9.5 \angle -18.4°}$$

$= 30.5 \angle +19°$ ohms

Find the branch currents:

$$I_1 = \frac{E}{Z_1} = \frac{50 \angle 0°}{15.5 \angle +75°}$$

$= 3.2 \angle -75°$ A (inductive)

$$I_2 = \frac{E}{Z_2} = \frac{50 \angle 0°}{18.7 \angle -74.5°}$$

$= 2.7 \angle +74.5°$ A (capacitive)

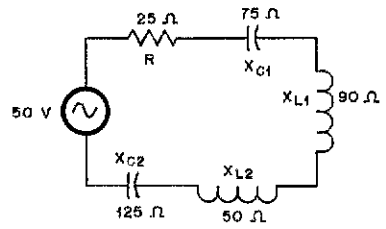
Find the line current (total current):

$$I_T = \frac{E}{Z_t} = \frac{50 \angle 0°}{30.5 \angle +19°}$$

$= 1.64 - 1.64 \angle -19°$ A (inductive)

Find the voltage across X_{L2} and X_C:

$E_{L2} = I_2 X_{L2}$



STEP 1
R = 25 + j0
XC1 = 0 − j75
XL1 = 0 + j90
XL2 = 0 + j50
XC2 = 0 − j125
Z = 25 − j60

STEP 2 TAN θ = ±X/R = −60/25 = −2.4

STEP 3 TAN−1 (ARCTAN) = −67.38°

STEP 4 Z = √(R² + |X|²) = √(25² + 60²) = 65 ∠−67.38 OHMS

STEP 5 I = E/Z = 50 ∠0° / 65 ∠−67.38° = 0.769 ∠+67.38° AMPERES

STEP 6 ER = IR = (0.769 ∠+67.38°)(25 ∠0°) = 19.23 ∠+67.38° VOLTS

STEP 7 EC1 = IXC1 = (0.769 ∠+67.38°)(75 ∠−90°) = 57.68 ∠−22.62° VOLTS

STEP 8 EL1 = IXL1 = (0.769 ∠+67.38°)(90 ∠+90°) = 69.21 ∠+157.38° VOLTS

STEP 9 EL2 = IXL2 = (0.769 ∠+67.38°)(50 ∠+90°) = 38.45 ∠+157.38° VOLTS

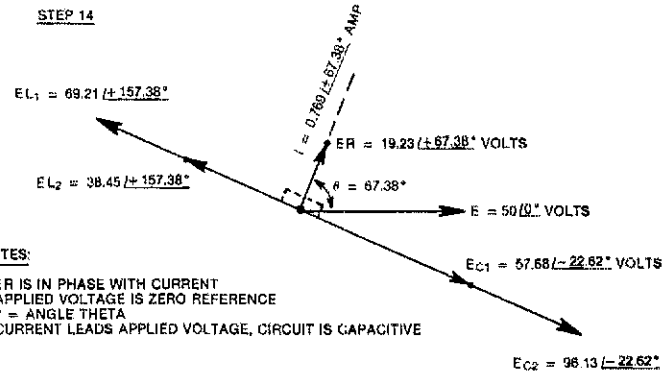
STEP 10 EC2 = IXC2 = (0.769 ∠+67.38°)(125 ∠−90°) = 96.13 ∠−22.62° VOLTS

STEP 11
COS (+ 67.38°) = 0.385 SIN (+ 67.38°) = 0.923
COS (− 22.62°) = 0.923 SIN (− 22.62°) = −0.385
COS (+ 157.38°) = 0.923 SIN (+ 157.38°) = 0.385

STEP 12
ER = 19.23 ∠+67.38° = 7.40 + j17.49
EC1 = 57.68 ∠−22.62° = 53.24 − j22.20
EL1 = 69.21 ∠+157.38° = −63.88 + j26.65
EL2 = 38.45 ∠+157.38° = −35.49 + j14.80
EC2 = 96.13 ∠−22.62° = 88.73 − j37.01
RECTANGULAR = 50 − j0.27
POLAR = √(50² + 0.27²) = 50.0007 VOLTS

STEP 13 POWER CONSUMED = E × I × COS θ = 50 × 0.769 × 0.385 = 14.80 WATTS
ALSO, POWER = I²R = (0.769)² (25) = 14.78 WATTS

STEP 14



NOTES:
- ER IS IN PHASE WITH CURRENT
- APPLIED VOLTAGE IS ZERO REFERENCE
- θ = ANGLE THETA
- CURRENT LEADS APPLIED VOLTAGE, CIRCUIT IS CAPACITIVE

Fig. 4—Analysis of series ac circuits.

$= (2.7 \angle +74.5°)\ \ (12 \angle +90°)$

$= 32.4 \angle +164.5°$ V

$E_C = I_2 X_C = (2.7 \angle +74.5°)$
$(30 \angle -90°) = 81 \angle -15.5°$ V

Parallel Circuits Containing More Than Two Branches

When analyzing parallel ac circuits that have more than two branches (see drawing below). It is more convenient to solve for branch currents rather than using the product-over-sum formula twice. Since the applied voltage is common to all branches, it is a simple matter to find each branch current, add them vectorially, and then use total current to find impedance.

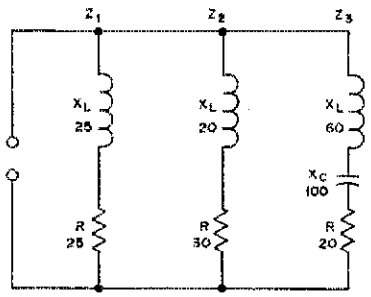


Fig. 6

$Z_1 = 25 + j25 = 35 \angle +45°$ ohms

$Z_2 = 30 + j20 = 36 \angle +34°$ ohms

$Z_3 = 20 - j40 = 45 \angle -63°$ ohms

Note: If the applied voltage value is not given, any convenient value may be used. In this case, we'll use 100 V.

$$I_1 = \frac{100 \angle 0°\ V}{35 \angle +45°} = 2.9 \angle -45°$$

$= 2.1 - j.21$

$$I_2 = \frac{100 \angle 0°\ V}{36 \angle +34°}\ 2.8 \angle -34°$$

$= 2.3 - j1.6$

$$I_3 = \frac{100 \angle 0°\ V}{45 \angle -63°} = 2.2 \angle +63°$$

$= 1.0 + j2.0$

$I_{Total} = (2.1 - j2.1) + (2.3 - j1.6)$
$+ (1.0 + j2.0) = 5.4 - j1.7$

$I_T = 5.4 - j1.7 = 5.7 \angle -17.5°$ A

$$Z_{Total} = \frac{E_{applied}}{I_{Total}}$$

$$= \frac{100 \angle 0°}{5.7 \angle -17.5°}$$

$= 17.5 \angle +17.5°$ ohms

Working with Rectangular Form

It is quite possible that you may be handed a problem on an exam and be expected to solve it using the rectangular form. The following example shows how to manipulate the rectangular form in order to multiply and divide. Notice how unwieldy this form becomes. This is the same problem as the one in Fig. 5.

Problem: Find the total impedance of the parallel circuit shown in Fig. 5.

Solution:

Given $Z_1 = 4 + j15 \quad Z_2 = 5 - j18$

Multiply $Z_1 \times Z_2 = (4 + j15)(5 - j18)$

$= 20 - j72 + j75 - j^2\,270$

Combine terms (Note $j^2 = -1$)
$= 20 + j3 - (-1)(270)$

Product $= 290 + j3$

Add $Z_1 + Z_2 = (4 + j15) + (5 - j18)$
$= 9 - j3$

$$Z_t = \frac{Z_1 \times Z_2}{Z_1 + Z_2}$$

$$= \frac{290 + j3}{9 - j3}$$

Rationalize fraction

$$\frac{290 + j3}{9 - j3} \times \frac{9 + j3}{9 + j3}$$

$$= \frac{2610 + j870 + j27 + j^2\,9}{81 + j27 - j27 - j^2\,9}$$

Divide and combine terms

$$\frac{2610 + j897 + [-1\ (9)]}{81 - [-1\ (9)]}$$

$$= \frac{2601 + j897}{90} = 29 + j10$$

Proof Compare to Fig. 5

$29 + j10 = \sqrt{841 + 100}$

$= 30.6 \angle 19°$ ohms

References

N. M. Cooke, *Basic Mathematics for Electronics*, second ed. (New York: McGraw-Hill, 1960).

B. Grob, *Basic Electronics*, second ed. (New York: McGraw-Hill: 1965).

Frank Napurano has been licensed since 1955, and holds an Advanced Class license. He also has an FCC First Class Radiotelephone ticket. Frank is a graduate of the RCA Institute Electronics Circuits and Systems Program, and the Cleveland Institute of Electronics Broadcast Engineering studies. Employed by the New Jersey Public Broadcasting Authority as an engineering supervisor, his duties include the maintenance of all studio equipment and the supervision of five maintenance engineers.

Strays

ARTICLES NEEDED

☐ *Amateuradio*, an ARRL newsletter of Amateur Radio and community services, is in need of articles, photos and editorials that will help convey to nonhams, particularly federal legislators and regulators, what radio amateurs are doing on behalf of their communities. Send material to the attention of E. Karpiej, KA1DTU, ARRL Hq.

***QST* congratulates...**

☐ ARRL Delta Division Director Clyde Hurlbert, W5CH, on being selected by *Who's Who in American Law* for inclusion in their next directory of biographical sketches of prominent lawyers.

☐ Former ARRL Technical Department Manager Doug DeMaw, W1FB, on being elected Chairman of the Lake County (Michigan) Board of Commissioners.

☐ Arnold Chase, WA1RYZ, of West Hartford, Connecticut, for putting WTIC-TV on the air and, in the process, creating a new home for the W1NI/Repeater.

☐ Bradley Wells, KR7L, of Seattle, Washington, on earning honorable mention in the 1984 *Writer's Digest* Writing Competition.

☐ the following radio amateurs on 50 years as a member of ARRL:

- Donald Eberlein, W6YHM, of Los Gatos, California
- Tom C. Walker, VE2BF, of Lachine, Quebec
- John L. Robertson, W5OB, of New Orleans, Louisiana
- John Kerr Tutton, VK3ZC, of Hawthorn, Victoria, Australia
- James Boles, W4ERV, Checy, France
- Warren M. Woolery, WØSFF, Crookston, Minnesota

I would like to get in touch with...

☐ anyone with a manual for a P & H Electronics Spitfire, Model LA-500M. Bob Elton, NI2B, 15 Pilgrim Rd., Scarsdale, NY 10583.

☐ anyone with a copy of Vol. 9 of the *CREI Advanced Electronic Engineering Technology Home Study Course*. W. C. Small, KR6A, 26530 Parkside Dr., Hayward, CA 94542.

☐ anyone with information on installing the 8950 MOD on a SWAN 500CX transceiver. Jim Pershing, N3CNU, 257 Spring Valley Rd., Jeannette, PA 15644.

☐ anyone with a recording of Sputnik I signals (Oct. 1957). G. W. Burrell, WB2SZM, 279 W. Craig Hill Dr., Rochester, NY 14626.

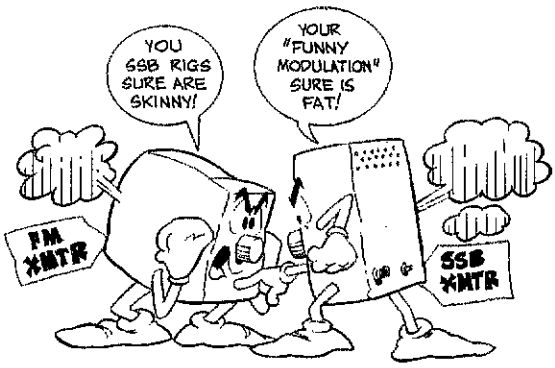
☐ anyone with information on eliminating interference to electronic ignition systems from mobile operation on HF bands. Daniel B. Courtney, K4HDV, 2210 21st St. West, Bradenton, FL 33505.

☐ AACS alumni for CW net on ± 14,105 kHz, 1700 UTC Monday, Wednesday and Saturday. Gordon G. Bandow, N7FYD, E. 12014 Lenora Dr., Spokane, WA 99206.

☐ anyone using an AIL 124 power oscillator. Don Galarneau, W7KCK, 7117 N. Seward, Portland, OR 97217.

• *First Steps In Radio*

Understanding FM Transmitters



Part 17: Odds are, you'll operate VHF or UHF FM someday, so why not learn how frequency modulation works.

By Doug DeMaw,* W1FB

FM stands for *frequency modulation.* Its cousin is *phase modulation,* or PM. Either method of modulation will permit reception of the transmitted energy by an FM receiver. This month, we'll concentrate on FM and PM transmitters. FM receivers will be addressed in a later installment of this series.

Creating an FM Signal

Two ingredients are necessary to generate an FM radio signal. First, we must have a *carrier* frequency. Second, we need some AF (audio frequency) energy to modulate the carrier. If we allow the audio frequency signal to vary the frequency of the carrier, we'll have an FM signal.

Assume that you're examining the transmitter carrier, as displayed on an oscilloscope (Fig. 1A). Next, suppose a steady audio tone, such as 1 kHz, is generated. It will also appear as a sine wave (Fig. 1B). Note that A and B are on vastly different frequencies, as shown in the illustration. When the 1-kHz audio frequency is applied to the RF carrier, we find a waveform such as that in Fig. 1C.

What is happening here? When the audio energy is applied to the RF carrier, the carrier frequency increases (goes higher in frequency) during half of the audio cycle (positive), and it decreases (shifts lower in frequency) during the negative half of the audio cycle. The RF cycles occupy less time (higher frequency) during the positive period of the modulating cycle, and occupy more time during the negative cycle.

Deviation is the term used for a shift in the RF carrier frequency. Deviation is proportional to the amplitude of our modulating signal; that is, the lower the audio level, the smaller the amount of deviation (frequency swing). Conversely, the higher the audio level, the greater the deviation.

Unlike AM transmitter output, the output from an FM transmitter does not change amplitude during modulation. Rather, the carrier frequency of the FM transmitter swings above and below some center carrier frequency during modulation, but the carrier amplitude remains the same.

Phase Modulation (PM)

The major difference between FM and PM is the method of creating the deviation. Frequency modulation takes place in an oscillator stage. Phase modulation occurs after the oscillator. See Fig. 2.

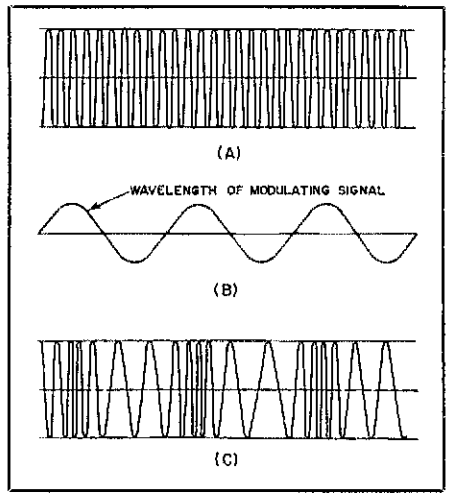


Fig. 1 — A graphic representation of FM (and PM). The unmodulated carrier is illustrated at A. The audio-frequency waveform is shown at B. When the modulating energy at B is applied to the RF energy at A, we obtain the display shown at C. (See text).

Another difference is how the frequency of the modulating signal affects the deviation. In FM, the deviation does not change if you change the modulation frequency, assuming the signal level is the same. In PM, on the other hand, the deviation increases with modulating frequency with the signal level held constant.

FM Sidebands

FM signals usually occupy a much wider bandwidth than do AM or SSB signals. Commercial FM stations have peak deviation of 75 kHz, while most amateur and commercial land-mobile FM stations use 5-kHz deviation. These extremes represent wide-band and narrow-band FM, respectively. A peak deviation of 15 kHz was the standard many years ago, but it was abandoned in favor of 5-kHz peak deviation to conserve frequency spectrum in the crowded commercial and amateur bands. In amplitude modulation, there is one set of sidebands, one above, the other below, the carrier frequency. In FM and PM, there can be one, three, five or more sets of sidebands.

The number of sideband pairs that occur during FM or PM operation depends on the ratio between the audio modulating frequency and the carrier-frequency deviation. That ratio is called the *modulation index.* Expressed mathematically:

$$\chi = \frac{D}{m} = \phi \qquad \text{(Eq. 1)}$$

where

χ = modulation index
D = peak deviation (half the difference between the maximum and minimum values of the instantaneous frequency
m = modulation frequency in hertz
ϕ = phase deviation in radians (a

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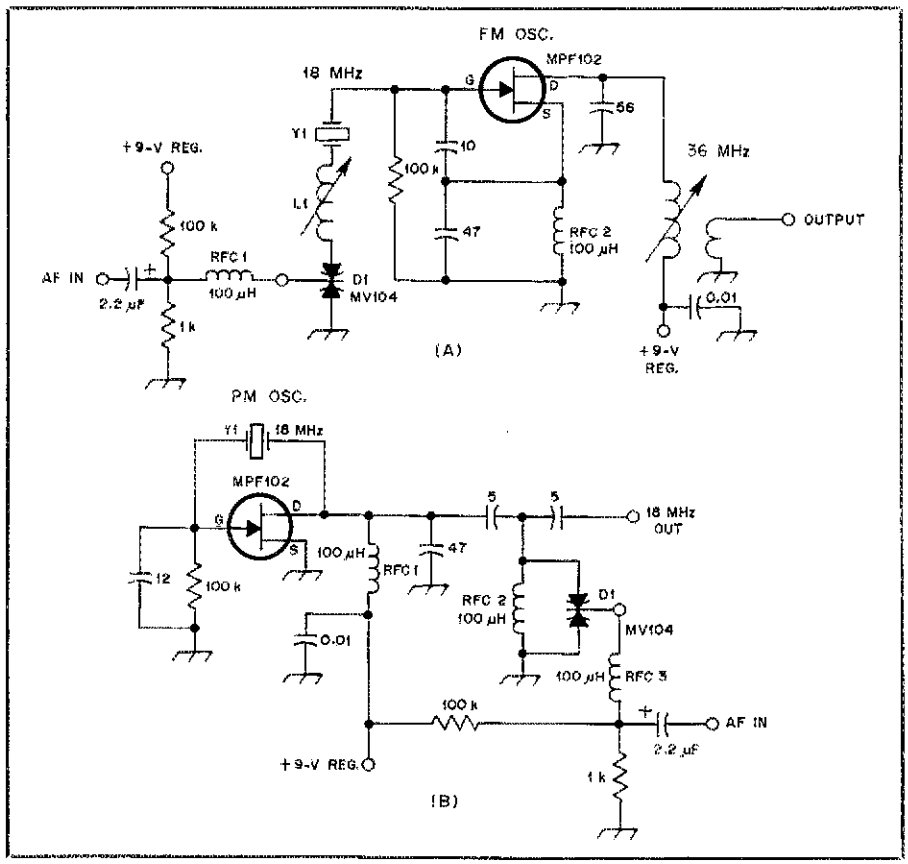

Fig. 2 — Examples of oscillators used for FM and PM generators in a crystal-controlled system. At A, the internal capacitance of D1 changes in accordance with the audio voltage impressed upon it. This change in capacitance causes the crystal frequency to shift above and below the frequency for which it is cut, thereby causing FM. The circuit at B shows how we might generate a PM signal. When audio energy is applied to D1, the phase of the oscillator signal is shifted instantaneously, which results in a frequency shift above and below the frequency of Y1.

radian = $180/\pi$ or approximately 57.3 degrees)

Therefore, if our maximum deviation were 5 kHz (5000 Hz) either side of the center carrier frequency, and the modulating frequency were 1000 Hz, we would obtain the following for the modulation index:

$$\chi = \frac{5000}{1000} = 5 \qquad \text{(Eq. 2)}$$

In the case of PM (with constant amplitude into the modulator), the modulation index is constant, irrespective of modulating frequency. In other words, if a 1-kHz tone causes a 500-Hz deviation, a 2-kHz tone of the same amplitude causes a 1-kHz carrier deviation. In an FM (or PM) system, the ratio of the *maximum* carrier-frequency deviation and the *highest* modulating frequency is called the *deviation ratio*.

The bandwidth of an FM signal depends on the amplitude of the sidebands farthest from the carrier frequency. For a complex waveform such as voice modulation, a good rule of thumb is that the bandwidth is twice the deviation, plus twice the highest modulating audio frequency. Thus, an FM transmitter with 5-kHz deviation modulated by a voice with an upper limit of 3 kHz will have a bandwidth of approximately 16 kHz.

Audio for FM Modulators

To obtain maximum effectiveness from our FM signal, we must ensure that ample audio is available. The average audio level may be increased by means of clipping. This will give the FM signal more apparent volume at the receiver. A simple circuit for creating a clipped and filtered modulating voltage is shown in Fig. 3. Q1 amplifies the audio energy from the microphone. This amplified audio is passed to the speech *clipper* (D1, D2), where the positive and negative peaks of the audio sine wave are squared or clipped. R1 sets the amount of clipping. The clipped audio would cause distortion if it were applied directly to the modulator, so we must filter it first. C1, C2 and R2 of Fig. 3 serve as a simple filter that restores the audio waveform to a sine-wave shape.

Some audio power is lost in the filtering process, so we have added Q2 for the purpose of building up the audio level to a sufficient value for modulating the transmitter. The deviation (frequency swing) of the transmitter signal is determined

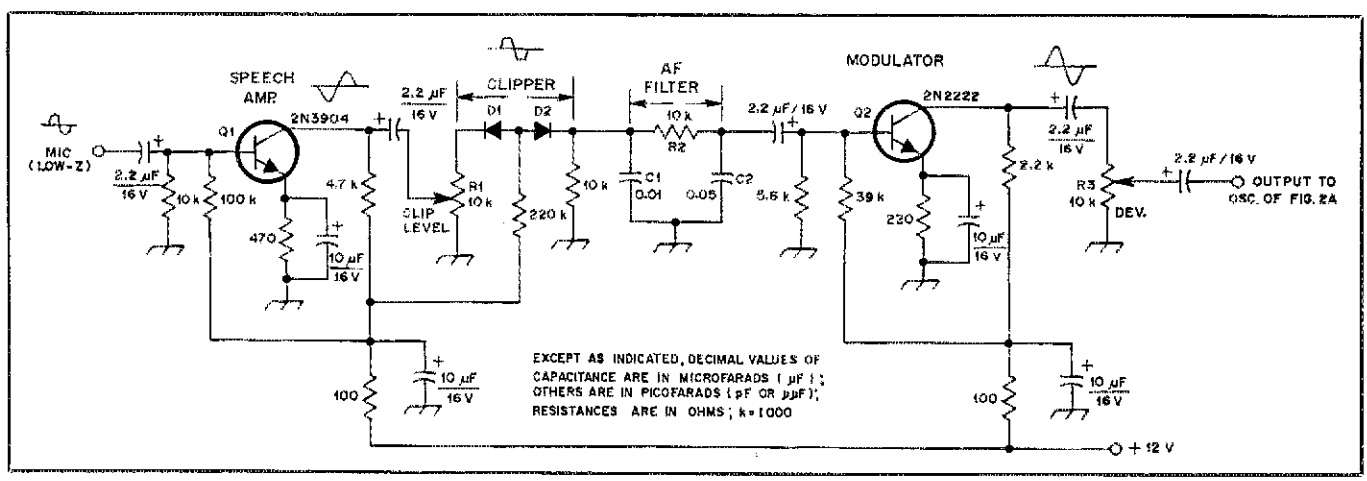

Fig. 3 — Circuit for a simple audio channel that might be used in an FM transmitter. Observe the changes in wave shape as the signal passes through the circuit. Note also the changes in audio signal amplitude. A detailed description of how this circuit operates is given in the text.

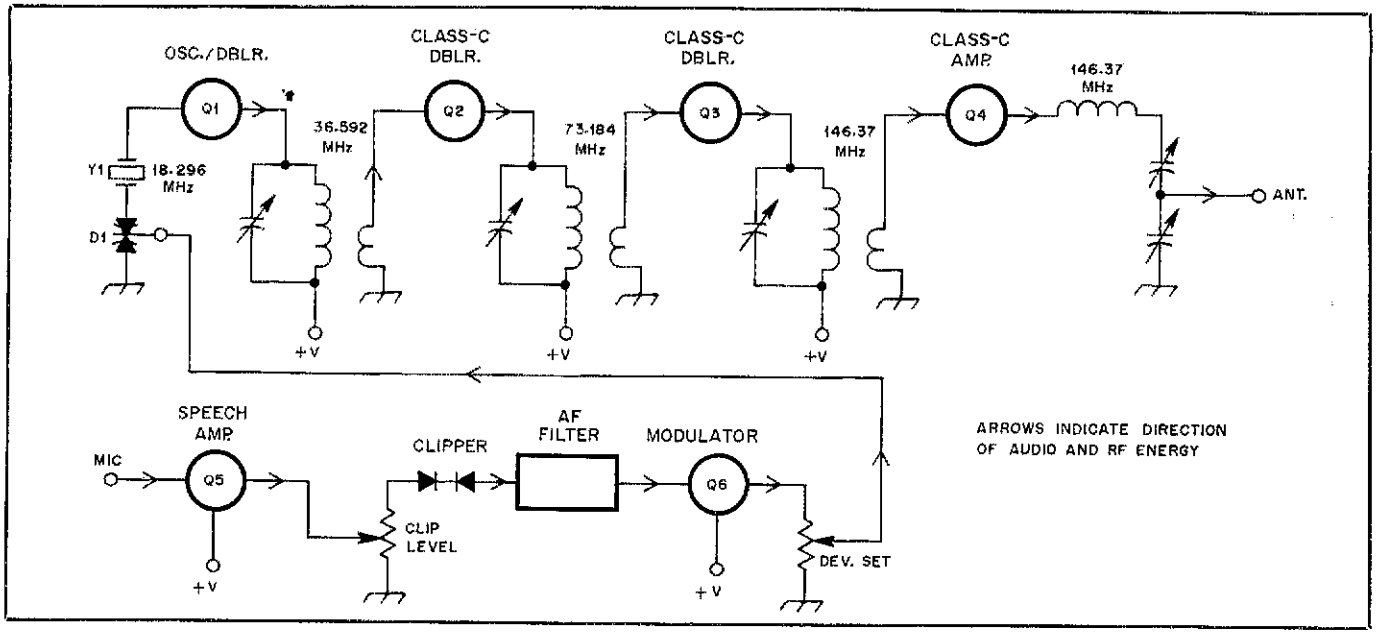

Fig. 4 — Hybrid block diagram of a composite FM transmitter. The frequency of Y1 is multiplied by a factor of eight as the various doubler stages amplify the signal. Similarly, the deviation at Y1 is increased by a factor of eight during the multiplication process. Class-C stages are used throughout the transmitter RF section.

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by the setting of R3.

Composite FM Transmitter

How do all the circuits we have discussed fit together? We can consider a typical setup for an amateur FM transmitter, as shown in Fig. 4. This diagram shows the direction of flow (arrows) for the audio and radio frequencies. Consider Q1 the oscillator of Fig. 2A. Q5 and Q6 represent the circuit in Fig. 3. You can see that the oscillator also functions as a frequency doubler. This frequency-doubling action also increases the deviation by a factor of two. The deviation is also doubled in the Q2 and Q3 stages. In this circuit example, the deviation is increased from Q1 to Q4 by a factor of eight. Therefore, in order to have, say, a 5-kHz deviation at 146.37 MHz, we would need only 0.625 kHz of deviation at 18.269 MHz. It is easy to shift the frequency of Y1 that small amount when using D1 as a voltage-variable-capacitor (VVC) diode. The audio energy impressed on D1 causes its internal capacitance to change during the audio cycle, thereby causing the transmitter to swing above and below the carrier frequency.

Use of FM or PM results in perhaps the simplest type of voice transmitter. Very few parts are necessary compared to an SSB transmitter, and we can use class-C transmitter stages without worrying about distortion of the transmitter signal. (Class-A or class-B linear amplifiers are required for SSB transmitters, and their design is somewhat more complicated, to say nothing of the additional components needed.)

Wrap-Up

The aspects of frequency and phase modulation covered in this installment are those you'll be most likely to encounter when taking your amateur license tests. To be fully prepared for exam day, be sure to obtain a copy of the appropriate *ARRL License Manual*. Also, a great deal more about FM circuits and operation can be found in the League publications, *Understanding Amateur Radio* and *FM and Repeaters for the Radio Amateur*.

Glossary

carrier — the RF output from a transmitter, without modulation. It contains no signal information.
clipper — a circuit that limits the peaks of a waveform by clipping or squaring the otherwise rounded positive and negative peaks of a sine wave.
deviation — the amount of frequency swing above and below the FM transmitter carrier frequency when modulating voltage is applied to the low-level RF energy.
FM — frequency modulation.
modulator — a circuit designed to add information to a carrier.
modulation index — pertains to an FM or PM transmitter. The ratio between carrier-frequency deviation (in hertz) and modulating frequency (also in hertz).
PM — phase modulation.
sidebands — bands of frequencies that appear above and below, but close to, the carrier frequency during modulation.
VVC diode — voltage-variable-capacitor diode. The diode internal capacitance changes as the voltage applied to the diode is varied. Sometimes called a *varactor* diode.

Strays

I would like to get in touch with...

☐ anyone with a service manual for an Ohio Scientific Color Monitor, Model DC13 PF 5. Richard Neiswonger, WA6AGL, 6052 Ocaso Ave., Buena Park, CA 90620.

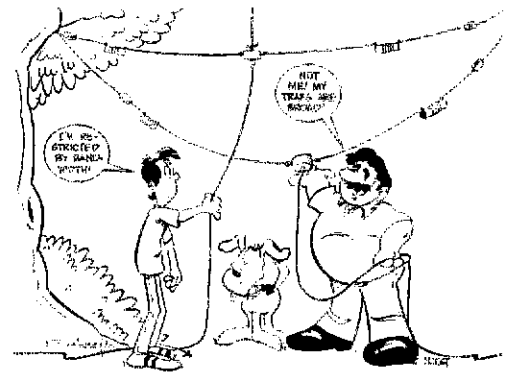
☐ anyone who has troubleshooting data on the Heath SB-102 transceiver. Bruce Chadbourne, KD2CZ, 304 Riverglen Rd., Liverpool, NY 13090.

☐ anyone with a circuit diagram for an RIT control on a Swan HF-700S transceiver. Paul Schweikert, W8KND, 560 Stanley Rd., Akron, OH 44312.

Multiband Trap and Parallel HF Dipoles—A Comparison

Traps have a decided effect on antenna beamwidth and performance. KA3BLO describes his tests and provides performance data for trap and fanned, parallel multiband dipoles.

By John Grebenkemper,* KA3BLO



Are you interested in operating on several HF bands with the same antenna? If so, among your choices are trap and parallel dipoles. They are easy to construct from wire and can be fed with 50-ohm coaxial cable. Unraveling the mystery of how these multiband wire antennas work has revealed some limits on freedom for the designer.

The WARC bands at 10, 18 and 25 MHz pose a challenge to the amateur who wants to operate on all the HF bands with a single antenna. This article describes the performance of trap and parallel dipoles. The solutions apply also to trap and parallel verticals. We'll center our attention on bandwidth (the range of frequencies over which the antenna SWR is less than a specified value). We'll identify some rules of thumb for optimizing the design of trap and parallel dipoles, and discover some limitations of these antennas. Some of these restrictions aren't apparent until we consider the relatively close-spaced WARC bands.

The amateur HF bands and the related percentage bandwidths are given in Table 1. We will define percentage bandwidth as the width of the band divided by the band center frequency. This number is a measure of the width of the band, independent of the frequency, and can be used to determine whether a given antenna can cover an entire band. It allows us to study a specific antenna, and then extrapolate the results to other bands by scaling the parameters. For instance, a half-wavelength wire dipole in free space constructed from no. 14 wire will have a 2:1 SWR bandwidth of 4.3% in a 50-ohm system on 80 meters. On 10 meters, the bandwidth increases to 5.6%. The 3:1 SWR bandwidth will be 7.3% on 80 meters, increasing to 9.5% on 10 meters. In going from 80 to 10 meters, we have made everything about eight times smaller, with the exception of the wire size. A smaller ratio of antenna length to diameter increases the bandwidth. A simple wire dipole will cover any amateur band except 80 and 160 meters with less than 3:1 SWR at the antenna feed point. The dipole bandwidth shown in Table 1 is the theoretical 3:1 SWR bandwidth of a free-space dipole constructed from no. 14 wire. Trap dipoles and parallel dipoles have less bandwidth.

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Table 1
Percentage Bandwidth for the Amateur HF Bands

Band (m)	Frequency (MHz)	Bandwidth %	Dipole Bandwidth (%) at 3:1 SWR
160	1.800- 2.000	10.5	6.8
80	3.500- 4.000	13.3	7.3
40	7.000- 7.300	4.2	7.9
30	10.100-10.150	0.5	8.2
20	14.000-14.350	2.5	8.6
17	18.068-18.168	0.6	8.9
15	21.000-21.450	2.1	9.1
12	24.890-24.990	0.4	9.3
10	28.000-29.700	5.9	9.5

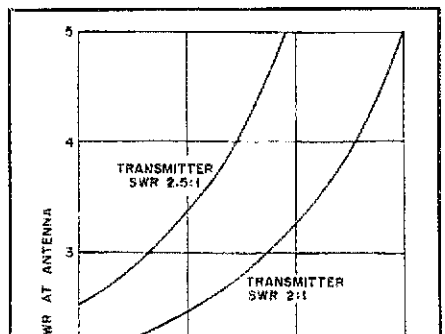


Fig. 2—Circuit of the trap dipole used in these tests. One set of traps was made from coaxial cable. The other was formed with lumped L and C components.

Most modern transmitters have transistors in the final amplifier, generally eliminating the need to tune the output amplifier. The transmitter must work into a load with a low SWR. If no Transmatch is used between the transmission line and the transmitter, the SWR at the input of the line must not exceed the SWR rating of the transmitter. Operating a solid-state transmitter into a load with excessive SWR can result in reduced output power, possible increased harmonic radiation and excessive heat generation in the output transistors. In some cases, these conditions can destroy the transistors!

Because of transmission-line loss, the SWR at the equipment end of the transmission line is lower than is the SWR at the antenna feed point. Fig. 1 shows the SWR required to achieve a 2:1 and 2.5:1 SWR at the input of the line as a function of the transmission-line loss. A line with more loss will show a greater bandwidth at a given SWR. However, such a system radiates less power.

One hundred feet of RG-58 cable will have a loss of 0.8 dB at 80 meters, increasing to 2.5 dB at 10 meters. A similar length of RG-8 will have a loss of 0.4 dB at 80 meters, increasing to 1.2 dB at 10 meters. Line losses of this magnitude will increase the *apparent* bandwidth of the antenna. The exact increase depends on the type of coaxial cable, the line length and the operating frequency. Because of this loss, I feel that the antenna bandwidth is best specified as the bandwidth between the 3:1 SWR points at the antenna.

I made a number of measurements of SWR performance of trap and parallel dipoles. The same test setup was used to

compile this data. All of the SWR measurements were made in a 50-ohm system while using a Bird 4381 computing SWR meter. The transmission line was 75 feet of RG-8X, and the SWR measurements were corrected for line loss. A line choke made from 12 Amidon (Fair Rite) FB-77-6301 ferrite beads over a short length of RG-58 was used at the antenna feed point to limit currents on the outer conductor of the cable. Small changes in the length of the transmission line did not affect the SWR.

The measurements of antenna bandwidth for the trap and parallel dipoles were made in the 10-meter band. Dipoles were constructed from no. 14 stranded copper wire. The antenna under test was a half wavelength above earth ground. The results are presented in percentage bandwidth, or percentage change in frequency, and can be scaled easily for any HF band by

$$f = \frac{C_f \times \%f}{100 + 1} \text{ MHz} \qquad \text{(Eq. 1)}$$

and

$$C_f \left[\frac{\%f}{100} + 1\right]$$

$$BW = \frac{C_f \times \%BW}{100} \text{ MHz} \qquad \text{(Eq. 2)}$$

where

f = frequency
%f = percentage change in frequency
BW is the bandwidth
C_f is the center frequency

Throughout this article, I have referred to the antenna resonant frequency as the point at which the antenna SWR is minimum. Strictly speaking, the antenna resonant frequency is the point at which the antenna is purely resistive and the reactance is zero. However, the antenna resonant frequency and the minimum SWR frequency are generally quite close.

Trap Dipoles

A trap dipole contains one or more parallel resonant LC traps within the antenna. At the trap resonant frequency, the antenna sections beyond the trap are decoupled from the rest of the antenna. At frequencies below the trap resonant frequency, the trap acts as a loading inductor. The antenna becomes inductively loaded, and the overall length is shorter than that of a similar unloaded antenna.

Recent articles in *QST* describe a trap constructed entirely from a length of coaxial cable.[1,2] The equivalent circuit of such a trap is a parallel resonant LC circuit. The cable shield forms the inductor and the inner conductor-to-shield capacitance forms the capacitor. The resonant frequency of a coaxial trap may be computed by

$$f = 440 \sqrt{\frac{9\,P\,D + 20\,N}{N^3\,D^3\,Q\,P}} \qquad \text{(Eq. 3)}$$

where

f is the resonant frequency in megahertz
D is the diameter of the coaxial coil in inches
P is the pitch of the coaxial coil in turns per inch
Q is the capacitance of the coaxial cable in pF/ft
N is the number of turns in the coaxial coil

This equation is similar to the one given by Noble, but the variables are defined differently.[3] Typical values of P and Q are given in Table 2. The results using this formula are within a few percent of the data given by Johns (see note 1). I have found that in winding coaxial traps, it is important to use cable with known parameters, such as RG-58A. Some brands of cable, such as RG-58, do not have the same parameters as Mil Spec coaxial cable, and the trap resonant frequency will not be the predicted value. I have seen RG-58 cable with capacitances varying from 20 pF/ft to 47 pF/ft.

[1]Notes appear on page 31.

Table 2
Comparison of Capacitance Per Foot for Three Common Styles of Coaxial Line

Cable Type (MIL-C-17D)	Pitch, P Close-Wound Turns (Turns/inch)	Cable Capacitance, Q (pF/ft)
RG-174	9	30.8
RG- 58	5	28.5
RG-58A	5	30.8

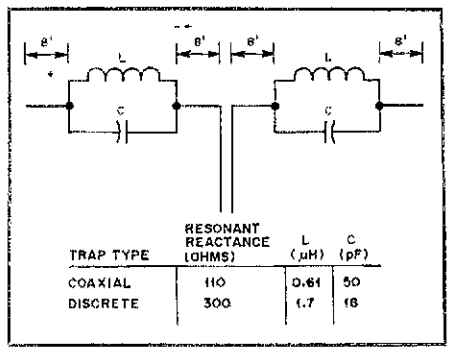


Fig. 2—Circuit of the trap dipole used in these tests. One set of traps was made from coaxial cable. The other was formed with lumped L and C components.

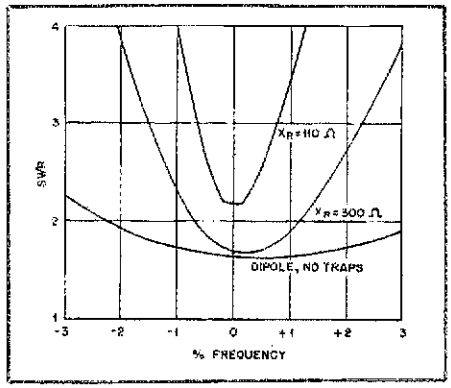


Fig. 3—SWR for a wire dipole, a dipole with coaxial traps, and a dipole with discrete L and C traps.

A test setup for measuring the performance of the inner section of the trap dipole is shown in Fig. 2. The inner and outer sections of the trap dipole were 8 feet long. The outer section was selected to be this length because at 10 meters an 8-foot wire has a fairly low impedance. This represents a worst-case situation for the trap, since it will need to isolate the high impedance at the end of the inner section from the low impedance of the outer section. Varying the length of the outer section of the trap dipole had a negligible effect on the results.

Two types of traps were used: A coaxial-cable trap was constructed by winding 3½ turns of RG-58A coaxial cable on a form 1¾ inches in diameter. Each trap was resonated at 28.85 MHz by varying the spacing of the turns. This coaxial trap will have a resonant reactance of approximately 110 ohms. The resonant reactance of a trap is the reactance of the trap inductor at the trap resonant frequency.

A discrete component LC trap was constructed from a coil and capacitor. The coil had an inductance of 1.7 μH and the capacitor was 18 pF. This trap was also resonant at 28.85 MHz. This trap had a resonant reactance of 300 ohms.

The performance of these traps and of a simple wire dipole is shown in Fig. 3. Both trap antennas yield substantially narrower bandwidths than does the wire dipole. Of the two trap antennas, the coaxial version has the narrowest bandwidth (only 1.6% at the 3:1 SWR points). A dipole constructed with coaxial-cable traps would achieve a 3:1 SWR over a small part of most amateur bands. The discrete-component trap achieves a bandwidth of 3.9% at the 3:1 SWR points.

The prime reason the traps differ is the resonant reactance. The magnitude of the impedance of these two traps, as a function of percentage frequency, is shown in Fig. 4. The curves are based on the assumption that the traps have no losses. Trap losses will only affect this curve near the resonant frequency.

The 2:1 SWR points occur when the trap impedance has decreased to approximately 15 kilohms, and the 3:1 SWR points occur at a trap impedance of 7 to 8 kilohms. The loading of the antenna ends (by the trap impedance) can change the antenna feed impedance substantially. It is readily apparent that the bandwidth of the inner section of a trap dipole is limited by the impedance of the trap.

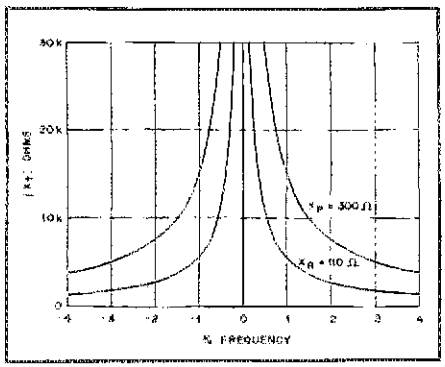


Fig. 4—Impedance magnitude for a parallel-resonant LC trap. Curves are based on X_L at resonance of 110 and 300 ohms.

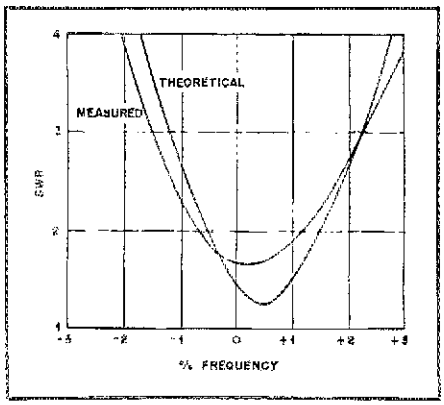


Fig. 5—Measured SWR of a 10-meter trap dipole. Dipole length was 16 feet. No. 14 wire was used; the center frequency was 28.85 MHz; and the antenna height was a half wavelength.

Changing the length of the inner section of a trap dipole will shift the resonant frequency of the dipole. When a simple wire dipole length is increased by 1%, the resonant frequency decreases by 1%. The inner sections of a trap dipole will always show a smaller shift in resonant frequency for a 1% change in length. Changing the length of the inner section of the coaxial-trap dipole by 1% will change its resonant frequency by only 0.12%. The discrete-component trap dipole would show a 0.33% change in resonant frequency for a 1% change in length of the inner section. This effect is a function of the resonant reactance of the trap. The trap pulls the antenna resonant frequency toward the trap resonant frequency. The antenna bandwidth does not change substantially for small changes in length.

Theory of Trap-Dipole Performance

The feed impedance of a trap dipole can be derived from the feed impedance of a short dipole. The mathematics of the trap-dipole feed impedance is given in Appendix A. The computation of the feed impedance assumes that the dipole is in free space, less than a half wavelength long and that the traps are lossless and nonradiating. All of these assumptions are good for typical ham-band antennas.

Fig. 5 shows the theoretical and measured SWR of the inner section of a 10-meter trap dipole. Each side of the inner dipole section is an 8-foot length of no. 14 wire. The inductive reactance of the traps at resonance is 300 ohms. The theoretical and actual responses are in good agreement; the theoretical response has a lower minimum SWR. This difference is probably due to the antenna radiation resistance being modified by the ground. The frequency of minimum SWR differs by about 0.5% from the predicted value, which is equivalent to a change of less than 1 inch in the length of the dipole. The bandwidths of the two antennas are nearly the same. Considering this and other results, I believe the theory described in Appendix A can make a good prediction of the trap-dipole feed impedance.

Using this theory, we can predict the SWR response of the inner and outer sections of a trap dipole. This allows us to select the resonant reactance of the traps to achieve optimum bandwidth on all bands. If we select a trap resonant reactance that is too low, the inner sections of the dipole will have insufficient bandwidth. If we select a trap resonant reactance that is too high, the outer sections of the trap dipole will have insufficient bandwidth.

Fig. 6 shows the 2:1 and 3:1 SWR bandwidths of the inner section of a trap dipole as a function of the trap resonant reactance. The computations were performed for a 20-meter dipole constructed from no. 14 wire. The curve remains essentially unchanged for other wire dipoles in the HF bands. For large-diameter wire or higher frequencies, the bandwidth is slightly increased.

As expected, the bandwidth increases as the trap resonant reactance increases. A trap with a 110-ohm resonant reactance should have a 3:1 SWR bandwidth of 1.4%; this is consistent with the measured value of 1.6%. Since the measurements were made in the 10-meter band, one would expect the measured value to be slightly greater.

The computations of antenna impedance can also be used to predict the bandwidth of the outer section of the trap dipole. Fig. 7 is a plot of the antenna percentage bandwidth for a 3:1 SWR as a function of the resonant frequency of the entire antenna; it is expressed as a percentage of the resonant frequency of the trap. Consider, as an example, a 40/20-meter trap dipole operated with a trap resonant frequency of 14.2 MHz and designed so that on 40 meters the resonant frequency is 7.1 MHz. For this antenna, the antenna resonant frequency of the outer section would be 50% of the trap resonant frequency.

This function is plotted for a trap resonant reactance of 100 to 1000 ohms. It is possible, using this curve and Fig. 6, to select an optimum trap resonant reactance to give maximum bandwidth on both the higher and lower operating frequencies of the antenna. This value is between 500 and 600 ohms, and will achieve a 3:1 SWR bandwidth of about 4%. If the inner section should have a greater bandwidth than the outer section, the trap resonant reactance must be increased. The opposite condition can be achieved by decreasing the trap resonant reactance.

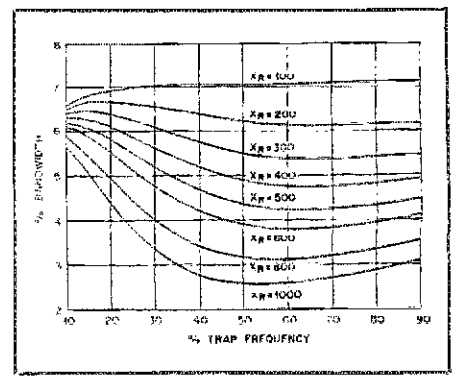


Fig. 7—Theoretical bandwidth of the outer section of a trap dipole. XR is the percentage of the trap resonant frequency. Percentage bandwidth is for the 3:1 SWR points of the antenna.

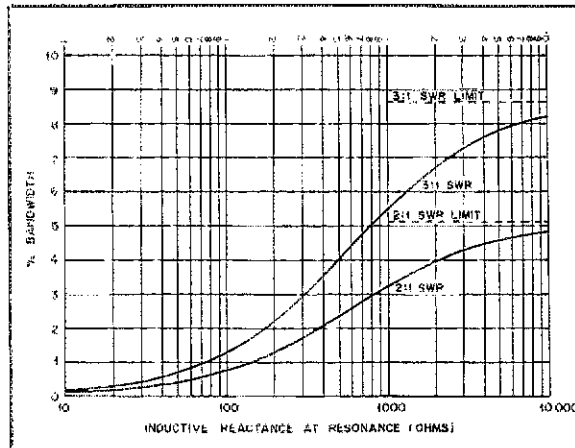


Fig. 6—Bandwidth of the inner section of a trap dipole as a function of the X_L of the trap at resonance. The 2:1 and 3:1 SWR curves are for the percentage bandwidth for an SWR less than 2:1 and 3:1. Tests were made at 14 MHz, using no. 14 wire.

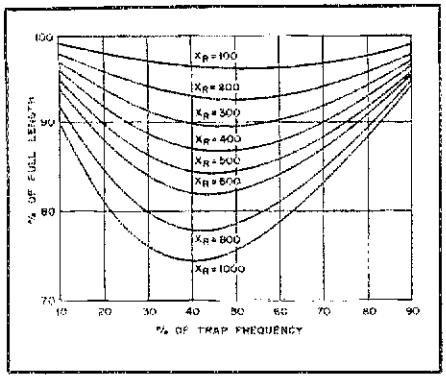


Fig. 8—Percentage shortening for a trap dipole as a function of resonant frequency of the antenna outer section. XR is a percentage of the trap resonant frequency.

Multiple-trap antennas will decrease the antenna bandwidth of the outer sections because of the inductive loading of each trap. Using the formulas given in Appendix A, one can compute this effect. The effect can also be estimated by determining which trap has the greatest effect on the bandwidth. The overall antenna bandwidth will certainly be no greater than that. In general, it is best to design trap dipoles with the minimum trap resonant reactance required to achieve the desired bandwidth on each band.

A formula for predicting the length of the section that must be added to a trap dipole to achieve resonance at the desired frequency is given in Appendix A. Fig. 8 is a plot of the percentage the trap dipole is shortened because of the inductive loading of the traps. To determine the length that must be added beyond each trap, we need to know how much the antenna is shortened as a percentage of full length. This number is multiplied by the length of one half a dipole (determined from 234/f[MHz]), and the length of the inner section is subtracted from this value. The resulting length is added to the outside end of each trap. If A is the length of the inner section of the trap dipole, and B is the length of the outer section, then

$$B = \left(\frac{\%\ \text{full length}}{100}\right) \times \frac{234}{f} - A \qquad \text{(Eq. 4)}$$

As an example, let's use these graphs to design an 80/40-meter trap dipole. The first thing we need do is select the trap reactance. We want the dipole to cover the entire 40-meter band and the 75-meter phone band. The 40-meter band has a bandwidth of 4.2%. Look at Fig. 6. We see that the trap resonant reactance required is 550 ohms. The trap resonant frequency is 7.15 MHz, and the length of each leg of the inner section of the trap dipole is 32.7 feet. The 75-meter section of the dipole is centered at 3.9 MHz. This is 55% of the trap resonant frequency. In consulting Fig. 7, we see that the antenna bandwidth for a 550-ohm trap resonant reactance on 75 meters is 4.1%. This is equivalent to a bandwidth of 160 kHz. The trap dipole will cover most of the 75-meter band with less than a 3:1 SWR.

The antenna length can be determined from Fig. 8. The length of the total dipole will be 84% of the length of a full-size 75-meter dipole. One side of a full-size dipole, resonant at 3.9 MHz, is 60 feet; 84% of this is 50.4 feet. The length of the inner section of each side is 32.7 feet. Therefore, the length of the outer section is the difference between these two lengths, or 17.7 feet.

The Parallel Dipole

The ARRL Antenna Book states that several half-wavelength dipoles may be connected in parallel to form an antenna that is resonant on each band.[4] I decided to make measurements on a two-element parallel dipole to determine exactly the effects on resonant frequency and bandwidth. One dipole was cut for the center of the 10-meter band and had a length of 8 feet on each side. The other dipole was suspended 2 inches above the 10-meter dipole. The length was adjusted while measuring the SWR of the combination antenna across the 10-meter band. The antenna bandwidth and resonant frequency were then computed for each length of the adjustable antenna. The results were surprising.

When the adjustable antenna was longer than the 10-meter dipole, the resonant frequency of the 10-meter dipole increased by 2.5% over the single-antenna value. This is equivalent to saying that the antenna needed to be lengthened by 2.5% in order to keep the resonant frequency constant. If the antenna spacing was decreased to 1 inch, the resonant frequency increased by 3% over the single-antenna value. When the adjustable antenna was shorter than the 10-meter dipole, the resonant frequency of the 10-meter dipole was the same as the single-antenna value. When the two antennas were equal in length, the resonant frequency decreased by 1%. This is expected since it is equivalent to having an antenna with a larger diameter.

The antenna bandwidth, as a function of length of adjustable antenna, is shown in Fig. 9. When the adjustable antenna was more than 50% longer than the 10-meter dipole, the 3:1 SWR bandwidth was 3.5%. As the two antennas became closer in length, the bandwidth decreased dramatically. But when they were equal in length, the bandwidth jumped to greater than 11%. As the adjustable antenna was shortened to a length less than that of the fixed antenna, the bandwidth decreased to the expected 10% value of a wire dipole on 10 meters. The 2:1 SWR curve followed a similar pattern. Decreasing the antenna spacing had no effect on bandwidth.

I also made measurements when the two dipoles were oriented at an angle relative

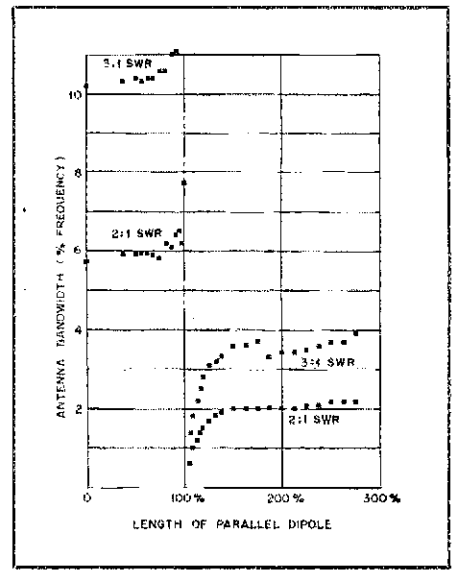


Fig. 9—Bandwidth of a 10-meter dipole in parallel with an adjustable-length dipole. The dipoles are 2 inches apart and made from no. 14 wire. (see text)

to each other. When the two dipoles were at right angles, there was no interaction between them. They acted as if they were two independent antennas. However, there was interaction between the dipoles when there was a 45° angle between them. In this case, the shorter dipole showed an increase in resonant frequency and a decrease in bandwidth. The changes weren't as great as when the antennas were parallel.

From this data, we can make several observations about parallel dipoles. First, the shorter dipole will have little effect on the longer one. Second, the shorter dipole should be lengthened by several percent relative to its stand-alone length. Third, the bandwidth of the shorter dipole will be significantly decreased because of the presence of the longer dipole.

I have also constructed several parallel dipoles with more than two elements. In general, I find that the lengths of all of the shorter dipoles need to be increased by several percent. The 3:1 SWR bandwidths of the shorter dipoles are always less than 3.5%. On a 40, 30, 20 and 10-meter parallel dipole, I measured a 3:1 SWR bandwidth on 20 meters of less than 2%.

Conclusions

Both the trap and parallel dipole antennas are useful in certain circumstances. The trap dipole is more versatile because it allows the designer some control over the antenna bandwidth. With the parallel dipole, the designer has no control over the antenna bandwidth.

A trap dipole is designed and adjusted from the higher frequencies to the lower frequencies. The highest-frequency section is cut first and adjusted for the desired resonant frequency. The length of any section of the antenna that terminates in a trap is not critical because the trap tends to pull

the antenna resonant frequency toward the trap resonant frequency. The trap resonant reactance is selected to give the desired bandwidth in the band for which an antenna section is terminated by a trap. The trap is then added to the antenna, and the next section of the antenna is added beyond the trap. This section is then trimmed to give the desired antenna resonant frequency. This process is repeated for each lower frequency band added to the antenna.

I avoid using coaxial-cable antenna traps. Their resonant reactance is generally too low to yield satisfactory bandwidths for full coverage of most amateur HF bands. The resonant reactance of coaxial traps constructed from 50-ohm coaxial cable is in the range of 100 to 200 ohms. The antenna designer is better off using a discrete component trap where he can select the desired resonant reactance.

Parallel dipoles should be adjusted from the lower to the higher frequencies. We know from measurements that the shorter elements have a negligible effect on the longer elements. Therefore, cut the first element to the lowest frequency band and adjust the length to the desired resonant frequency. Then add the next-lowest frequency element; make sure it is cut about 3% longer than it would be for a single dipole. Adjust the length to the desired resonant frequency. Continue adding elements in ascending frequency order. There is no adjustment available for the antenna bandwidth: You have to take the bandwidth you get!

Acknowledgments

I hope this article has answered some questions about parallel and trap dipoles. I would like to thank Dick Simpson, W6JTH, and Jim Treybig, W6JKV, for reviewing the text.

APPENDIX A

The complex impedance at the input of a lossless antenna consists of a resistive component called radiation resistance, and a reactive component called antenna reactance. For the purpose of this discussion, we will talk about the antenna impedance of the vertical antenna above an infinite lossless ground plane. The results may be converted to a dipole in free space by doubling both the radiation resistance and the antenna reactance.

In deriving these equations, we made several assumptions:

1) The length of the radiating section of the vertical is not much greater than a quarter wavelength.

2) The length of the vertical is much greater than the diameter.

3) All traps are lossless and do not radiate.

4) A trap below resonance doesn't significantly distort the current distribution on the wire sections of the antenna. This assumption implies that the trap reactance is not too great.

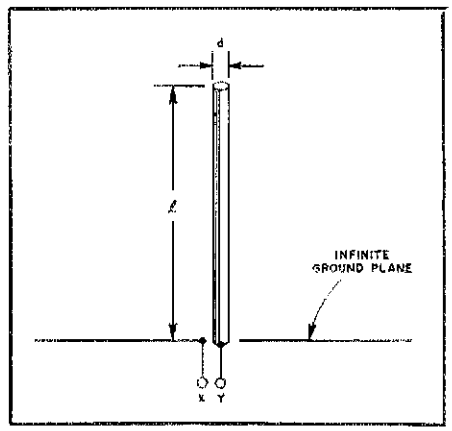


Fig. A1—Vertical antenna above an infinite, lossless ground plane. Impedance is measured at X-Y.

5) This is a theory based on observations.

A diagram of our model is shown in Fig. A1. The vertical has a length of (ℓ) feet and a diameter (d) inches. The antenna is driven between the conductor and the ground plane.

As long as $\ell >> d$, the radiation resistance of the vertical is only a function of ℓ. Hall gives a good power-law approximation of the radiation resistance.[5] This equation is reasonably accurate for antenna lengths of up to approximately 3/8 wavelength.

$$R_a = 1618 \frac{(f\ell)^{2.736}}{984} \qquad \text{(Eq. A1)}$$

where f is the frequency in megahertz.

A number of authors have presented formulas for computing the reactance of an antenna.[5-8] Their formulas all have roughly the same form, but their results may differ by 50%. I prefer the following format, which is within reasonable agreement of the experimental data given by Jasik.[8]

A vertical above a ground plane acts as a transmission line with a varying characteristic impedance. The characteristic impedance increases as the distance from the ground plane increases. Kraus[9] states that we can replace this varying impedance with the average impedance of the antenna given by

$$Z_k = 60 \left[\ln \frac{24\ell}{d} - 1 \right] \qquad \text{(Eq. A2)}$$

The antenna can then be treated as an open-circuited transmission line with characteristic impedance, Z_k. From this we can compute the reactance of the antenna. However, we have to take into account the end effect of the antenna. We know from experimental results that a resonant quarter-wavelength vertical is about 5% shorter than a physical quarter wavelength. Using this knowledge, we can then approximate the reactance of a vertical antenna as

$$X_a = -Z_k \cot \left[2\pi \left(\frac{f\ell}{936} \right) \right] \qquad \text{(Eq. A3)}$$

The reflection coefficient and standing-wave ratio may be then computed from

$$\varphi = \frac{R_a - 50 + j X_a}{R_a + 50 + j X_a}$$

$$SWR = \frac{1 + |\varphi|}{1 - |\varphi|} \qquad \text{(Eq. A5)}$$

So far, these results are for a vertical with no traps. Fig. A2 shows the diagram of a trap vertical. The antenna diameter is still d, but the length is now broken up into a lower section of length A and an upper section of length B.

The trap is a parallel resonant LC circuit, with its reactance given by

$$X_t = \frac{X_o \left(\frac{f}{f_o} \right)}{1 - \left(\frac{f}{f_o} \right)^2} \qquad \text{(Eq. A6)}$$

where

f_o is the resonant frequency of the trap in megahertz

X_o is the resonant reactance of the trap in ohms, and is given by

$$X_o = 2\pi f_o L \qquad \text{(Eq. A7)}$$

assuming that f_o is in megahertz and L is in microhenrys.

At or near trap resonance, the radiation resistance is determined solely by the length of the lower section, A. The trap acts as an open circuit and prevents current from flowing into the upper section. Therefore, the radiation resistance can be computed by setting ℓ = A.

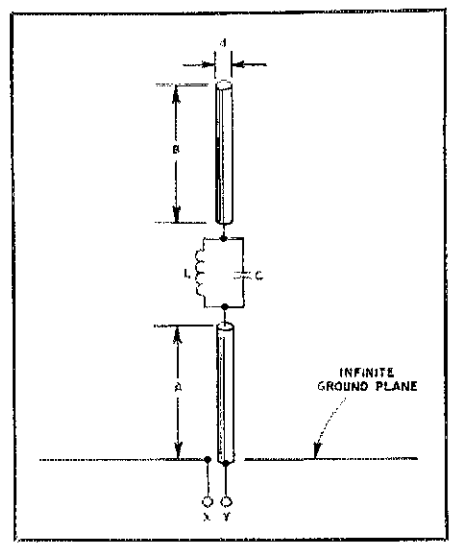


Fig. A2—Trap vertical above an infinite, lossless ground plane. Impedance is measured at X-Y.

Below trap resonance, the radiation resistance is determined by the total length of the vertical. The trap acts as an inductive loading element. This affects the antenna reactance, but has a minimal effect on the antenna radiation resistance. Therefore, the radiation resistance can be computed by letting $\ell = A + B$.

It is obvious that there must be a transition region between these two conditions. However, this theory is not capable of handling that region. For my computations, I have assumed that if the trap reactance is less than 2000 ohms, the radiation resistance is computed from the total length of the antenna. If the trap reactance is greater than 2000 ohms, the radiation resistance is computed for the lower section only. This seems to work okay when compared with experimental results.

Computing the reactance of the trap dipole is more complicated. If we know the reactance of an antenna, we can compute its equivalent length ℓ', which is given by

$$\ell' = \left(\frac{936}{2\pi f}\right) \tan^{-1}\left(-\frac{Z_k}{X_a}\right) \quad \text{(Eq. A8)}$$

I have assumed that the domain of the inverse tangent is from $-\pi/4$ to $+3\pi/4$. For some antenna reactances this will result in a negative equivalent antenna length.

To compute the antenna reactance we may follow this procedure:

1) Compute Z_k based on the length of the antenna used to compute the radiation resistance.

2) If $X_t < 2000$ ohms, compute the antenna reactance for section B.

3) If $X_t < 2000$ ohms, add the reactance of the trap to the reactance of section B. If $X_t > 2000$ ohms, then X is just the reactance of the trap alone.

4) Compute the equivalent length of this reactance.

5) Add the length of section A to the equivalent length.

6) Compute the antenna reactance of the sum of these two lengths.

This procedure may be applied iteratively to successive traps. When working with a multiple-section trap, always start at the trap near resonance and work toward the transmission line. If no trap is near resonance, start at the end of the antenna and work toward the transmission line. Expressed mathematically, this procedure yields the following sets of equations:

For $X_t > 2000$ (trap near resonance)

$$R_a = 1618\left(\frac{fA}{984}\right)^{2.736} \quad \text{(Eq. A9)}$$

$$Z_k = 60\left[\ln\left(\frac{24A}{d}\right) - 1\right] \quad \text{(Eq. A10)}$$

$$\ell' = A + \frac{936}{2\pi f}\tan^{-1}\left(-\frac{Z_k}{X_t}\right) \quad \text{(Eq. A11)}$$

$$X_a = -Z_k \cot\left[2\pi\left(\frac{f\ell'}{936}\right)\right] \quad \text{(Eq. A12)}$$

for $X_t < 2000$ — trap not near resonance

$$R_a = 1618\left[\frac{f(A+B)}{984}\right]^{2.736} \quad \text{(Eq. A13)}$$

$$Z_k = 60\left\{\ln\left[\frac{24\cdot(A+B)}{d}\right] - 1\right\} \quad \text{(Eq. A14)}$$

$$\ell' = A + \frac{936}{2\pi f}\tan^{-1}\left\{-\frac{Z_k}{X_t - Z_k \cot\left[2\pi\left(\frac{fB}{936}\right)\right]}\right\} \quad \text{(Eq. A15)}$$

$$X_a = -Z_k \cot\left[2\pi\left(\frac{f\ell'}{936}\right)\right] \quad \text{(Eq. A16)}$$

These equations have been used in a computer program to predict the performance of several trap dipoles. In all cases tested, the predicted and the measured antenna SWR are in good agreement.

We can also predict the length that needs to be added to a trap dipole to bring it into resonance on a lower band. Given the model in Fig. A2, this length is

$$B = \frac{936}{2\pi f}\tan^{-1}\left\{\frac{Z_k}{X_t + Z_k \tan\left[2\pi\left(\frac{Af}{936}\right)\right]}\right\} \quad \text{(Eq. A17)}$$

Most of these equations are rather complicated, but they can be solved on a programmable calculator or a home computer. I have written a program which uses these equations to compute the SWR of a trap dipole. The program is written in HP BASIC 2.0 for execution on an HP-9836 computer. HP BASIC cannot be run directly on most home computers, but would have to be translated into a simpler form of BASIC. However, if anyone is interested in a copy of the computer listing, I will send it to them if they include a business-size s.a.s.e. with their request.

Notes

[1]R. Johns, "Coaxial Cable Antenna Traps," *QST*, May 1981.
[2]D. DeMaw, "Lightweight Trap Antennas—Some Thoughts," *QST*, June 1983.
[3]F. Noble, Technical Correspondence, *QST*, March 1984.
[4]G. Hall, ed., *The ARRL Antenna Book*, 14th ed. (Newington, CT: ARRL, 1982).
[5]G. Hall, "The Search for a Simple, Broadband 80-Meter Dipole," *QST*, April 1983.
[6]R. B. Dome, "Impedance of Short Horizontal Dipoles," *QST*, Jan. 1976.
[7]D. Kozakoff, "Designing Small Vertical Antennas," *QST*, Aug. 1976.
[8]H. Jasik, *Antenna Engineering Handbook* (New York: McGraw-Hill, 1961) Chapter 3.
[9]J. Kraus, *Antennas* (New York: McGraw-Hill, 1950).

KA3BLO earned his BSEE degree at Tufts University (1967) and his MSEE at Stanford University (1969), where he also obtained his PhD in electrical engineering (1977).

He obtained his first amateur license in 1961, and has directed most of his amateur activity toward Field Day from remote mountaintops in California. John has served as an ARRL TA for five years. He is a manager in Development Engineering at Tandem Computers, Inc. Previously, he designed microwave receivers. He also has worked in the area of X-ray astronomy.

Strays

I would like to get in touch with...

☐ anyone with information on modifying the Heath SB-220 linear amplifier for use on 160 meters. Hal Parks, WB2BNH, 24 Caryl Ave., 6-C, Yonkers, NY 10705.

☐ amateurs using a TRS 80 Model 100 computer with a Kenwood TS-430S transceiver. William R. Ames, KB1LG, 5 Turkey Roost Rd., Sandy Hook, CT 06482.

☐ anyone with information on modifying the Yaesu FT-227RA 2-m FM transceiver to receive outside 144-148 MHz. Joseph R. Koval, W3IVG, 705 W. 12th St., Hazleton, PA 18201.

☐ anyone with schematic diagrams for converting a Clegg VHF Interceptor (6 and 2 meters) to NBFM and for an Allied 2517 and 2518, and an SSB adaptor for an IC-245. Tony Bodo, WA9YOZ/9, 2696 Benton St., Lake Station, IN 46405.

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

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

- "A Repeater Operating Program in BASIC" by John L. Sundstrom, WAØLIS
- Two new dual-gate GaAsFETs and reading sources for power amplifiers highlighted by Geoff Krauss, WA2GFP, in the VHF+ Technology column
- A look at "Broadband Antennae Employing Coaxial Transmission Line Sections" by Bill Conwell, K2PO.

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

An RTTY Operator's Guide

You've just bought a computer, worked out the details of interfacing it with your radio and are ready to get on RTTY for the first time. But just as you start to hit the keys you freeze up: "I don't know the operating procedures!"

By Bill Snyder,* WØLHS

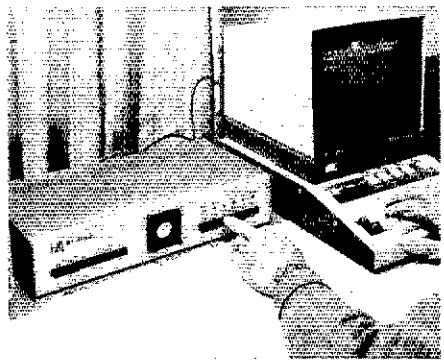
Since 1953, when frequency-shift keying was first allowed on the high-frequency bands, a small group of radio amateurs have been enjoying the wonders of amateur radioteletype (RTTY) operation. This group has been like a cozy club with limited membership, partly because you had to own a machine to belong. In the first few years, printers were in short supply and extremely hard to obtain, so few hams could join the club.

Inexpensive computers have changed all that. Now, because it is easy to get on the air with a home computer and a simple interface, thousands of hams are discovering the joys of worldwide printed communications. Most newcomers are amazed that they can communicate without high-powered amplifiers and sophisticated equipment. Even if they cannot type well, they can still enjoy the excitement of a "new" mode.

So, with this influx of newcomers "diddling and chirping" on the bands, I would like to share a few basic RTTY-operating hints I have gleaned from over 31 years of operating RTTY. Most of these suggestions have been sifted out of the many letters I received from old-timers while I was DX editor of an RTTY publication.

There are two basic types of RTTY used today. In one system, each station takes a turn at transmitting. This system uses the Baudot code, although some stations now use ASCII, too. Each character in the Baudot code consists of five elements, either a *mark* tone or a *space* tone, precisely timed so the five elements fit in the interval of one letter at the transmission speed in use. Some stations use the American National Standard Code for Information Interchange (ASCII), a 7-element code commonly used to transfer information between computers or computer equipment.

The second type of RTTY is called AMTOR, Amateur Teleprinting Over Radio. With this system, the transmitting station waits for a confirmation report after every three characters. The switching time between stations for this acknowledgment is very critical. AMTOR stations require some type of computer control, so you will only be working other computerized systems on this mode.



For many, the heavy, loud RTTY teleprinters of days gone by are appropriate only for museums. All-electronic systems tied in to personal computers are rapidly taking over.

Sideband Selection

If you are using audio-frequency-shift keying (AFSK), make sure you are operating on the proper sideband. Today, all ham transmissions in the HF bands are on the lower sideband, with the mark tone higher in frequency than the space tone. RTTY equipment manuals usually explain which sideband to use, but in one's haste to get on the air this little item has been overlooked more than once. Some of the older books tell you to transmit on the upper sideband on 80 and 40 meters, but this practice is no longer followed.

Some modern transceivers have two positions on the sideband-selection knob, labeled NORMAL and REVERSE. This labeling may cause some confusion. Check the manual for both your transceiver and the RTTY equipment to determine which setting to use. On 80 and 40 meters, normal SSB operation uses the lower sideband, so setting the selection switch to NORMAL will put you on the lower sideband for RTTY operation. Upper sideband is used on the other HF bands, however, so you will have to set the switch to the REVERSE position to select the lower sideband for RTTY operation on those bands.

If you are not using the correct sideband, your signal will be "upside down," (the *space* tone will be the higher-frequency tone), and other operators will have to change their normal operating setup in order to copy your signals. If other operators switch their modems to work with inverted tones, it will probably affect their transmitter mark-space tone relationships; you may then have to switch your system to copy them. So be sure you always select the lower sideband and transmit signals that are "right-side up."

Transceiving

Almost all Baudot and AMTOR operations are done on the same frequency. If everything is going properly, you should not have to touch your receiver dial when you ask the other station to transmit. There have been a few DX stations who have used split-frequency techniques, but that is the exception. On AMTOR, you must be zero-beat to make the systems link properly. If the two stations are not aligned perfectly, or one of them is drifting, the master calling station should use only the RIT or CLARIFIER knob to make any necessary fine-tuning adjustments.

Keyboard Use

It is considered poor practice to use the letter "O" in place of a zero. It is good practice to insert more than one space between words when conditions are marginal, but it is not necessary under good conditions, although some operators do it habitually.

In the days when almost everyone used surplus teletypewriters, it was customary to send the "LTRS" character as a "diddle" during pauses between typing, to make certain that the transmitting and receiving stations remained synchronized. The letters key does not advance the carriage, and so the print head stands still and does not waste paper during these idle moments. The letters key clears the possibility of text being garbled by numerals and punctuation. There are still a few of these machines being used, so adapt your computer operating to

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those using the machines. They will appreciate it.

The use of a "diddle" character has dropped considerably in the past few years. With the type-ahead buffers on today's computer systems, there is a lot less "dead air" time to fill. These buffers also make good typists out of some real poor ones, and I speak from personal experience on that!

At one time it was stylish to see how many parentheses you could put around a single 73 when signing off, for example: ((((((((((((((((((((((((((73)))))))))))))))))))))))))) Lately, however, this practice has fallen into disfavor. It does help use up printer ribbons faster, but doesn't really add any information to the contact. I recently heard one old-timer say, "Someone should give a prize to the station who has put the most parentheses around 73—and abolish the practice forever."

Error Interpretation

Now and then you will receive the figures case instead of letters. This is caused by the computer or machine missing the signal to shift back to letters after receiving one or more "figures" characters. The Baudot code was established for use with the mechanical Teletype® machines, which have only three rows of keys instead of the standard four rows that computers and typewriters have. To transmit numbers or punctuation marks using the Baudot code, you must shift to the upper case, or FIGS mode, type the corresponding letter, and then shift back to the LTRS mode. If the LTRS character is missed, you will have a printout with numbers and punctuation instead of letters. Table 1 shows the correspondence between letters and figures. You can use this table to help you decode the upper- and lower-case mistakes you see on the screen or paper.

The RY and QBF Keys

There are two keys on almost every RTTY keyboard that should be used with caution. These culprits are the RY key and the Quick Brown Fox (QBF) key. The RY key is used to send a string of alternating letters R and Y, usually a full line of about 64 characters. Some computer programs include the RY feature on a function key. The QBF key sends the message, THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG'S BACK. 0123456789. The QBF message can be used to test the printer to make sure all of the letters in the alphabet are printing properly.

The use of RY goes back to the early days. In order to set the mechanical machines, it was necessary to send a string of Rs and Ys while the receiving operator adjusted a knob called the "rangefinder." The military and commercial services also used RYRYRYRYRY as a channel-holding signal during idle periods. They even typed the line over and over without sending a line feed, in order to save paper. The letters R and Y both alternate between mark and space tones in the Baudot or Murray code, so it was natural to use these letters for the range-setting operation. Table 1 lists the Baudot code.

Table 1
ITA No. 2 (Baudot) Code

Combination No.	ITA No. 2[1] Code Bit No. 43210	Letters Case	Figures Case ITA No. 2	Figures Case U.S. TTYs[2]
1	00011	A	—	—
2	11001	B	?	?
3	01110	C	:	:
4	01001	D		$
5	00001	E	3	3
6	01101	F	[3]	!
7	11010	G	[3]	&
8	10100	H	[3]	# or motor stop
9	00110	I	8	8
10	01011	J	BELL	'
11	01111	K	(	(
12	10010	L	)	)
13	11100	M	.	.
14	01100	N	,	,
15	11000	O	9	9
16	10110	P	0	0
17	10111	Q	1	1
18	01010	R	4	4
19	00101	S	'	BELL
20	10000	T	5	5
21	00111	U	7	7
22	11110	V	=	;
23	10011	W	2	2
24	11101	X	/	/
25	10101	Y	6	6
26	10001	Z	+	"
27	01000	← CR (Carriage return)		
28	00010	= LF (Line feed)		
29	11111	↓ LTRS (Letter shift)		
30	11011	↑ FIGS (Figure shift)		
31	00100	SP (Space)		
32	00000	BLK (Blank)		

Notes

[1]1 represents the mark condition (shown as Z in ITU recommendations) which is the higher emitted radio frequency for FSK, the lower audio frequency for AFSK, 0 represents the space condition (shown as Z in CCIR documents). Bits are numbered 0 (least-significant bit) through 4 (most-significant bit). The order of bit transmission is LSB first. MSB last.

[2]Many U.S. teletypewriters have these figures case characters.

[3]At present unassigned. Reception of these signals, however, should not initiate a request for repetition.

The mechanical printers also need a test signal that can check the operation of the code bars and vanes that decode the electronic signal pulses. The Quick Brown Fox sentence contains all the letters and numerals, so it is just right for this purpose. With computer systems, there is little need for such testing, so this key is almost unnecessary.

Use the RY sequence sparingly. RYs have a musical sound that is easily recognizable and useful for tuning a signal in properly. This makes it good for arousing attention when you are sending a CQ or when calling another station on schedule, but it is unnecessary during routine contacts. Don't use RY when you are working DX. In fact, don't use it at all if you can help it. Just forget that feature came with the unit.

Calling CQ

The general CQ, like RY, has a recognizable, musical sound. Take advantage of this fact, and send CQ in a pattern something like this:

CQ CQ CQ CQ CQ CQ CQ CQ DE WØLHS CQ CQ CQ CQ CQ CQ DE WØLHS

There are enough CQs in a row to create the musical pattern, and the call sign sent once will not disturb the recognizable sound of the transmission. If your computer system has a CQ key with a pattern similar to this, use it; if not, store a CQ message in one of the message memories.

Many operators add their name and QTH to the last line of the CQ. This is a good idea, but keep it simple. Since I live in North Dakota I always add my QTH, because there are lots of hams who need my state for WAS.

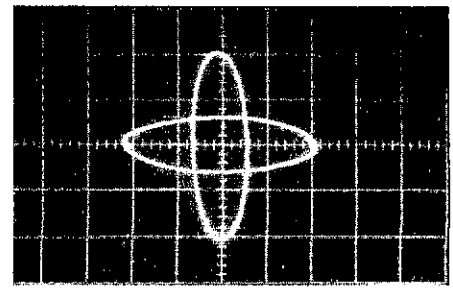
You should not corrupt a CQ by getting tricky with added punctuation and/or fancy screen displays. This would destroy the musical pattern, and you lose the advantage of having a casual listener being able to recognize the general call and tune you in.

I have seen all kinds of arty CQs in my years of RTTY operation. Some, I must admit, are very clever. But if you want to attract attention, you can't beat the musical notes of a repeated CQ. Leave all the CQCQCQCQCQCQCQ; SEEKYOU, SEEKYOU; C-Q-C-Q-C-Q; and other fancy stuff in the dummy load. Don't clutter the airwaves with it.

Tuning Indicators

There are a number of tuning indicators on the market, but for my money you can't beat an oscilloscope. It doesn't have to be much of a scope to serve as an RTTY tuning indicator. Old oscilloscopes, often found on sale at flea markets, usually can do the job without modification. Many modems (we used to call them terminal units or TUs) have outputs for scope connection, so adding one is not difficult. With the scope you can instantly tell whether you are in tune with the other station, whether your equipment or the other operator's is drifting, and whether or not the other station is transmitting upside-down tones.

To hook up a scope, your modem must have separate mark- and space-tone outputs. One tone goes to the vertical scope plate, while the other goes to the horizontal. When you are tuned in properly, you will see two ellipses, which look like crossed bananas, on the screen. If your modem



does not have outputs for a scope, use the easy-to-build audio tuning aid described recently in *QST*.[1]

Calling Another Station

You have just heard 9K2KA in Kuwait calling CQ. He is booming in with an S9 signal, and this would be a new country for you. So you jump in and excitedly run a full string of RYs to get his attention, then you send his call 10 times to make sure he knows you are calling him, and then sign your call 15 times just to be sure he gets it right! But, alas, when you stand by after doing all that, you find Adnan working another station. And chances are, you will have a bunch of RTTY DXers angry with you for being so long-winded.

Keep your calls short. Forget the RYs, and send the other station's call sign only once and your call no more than five times. Then listen. If she or he doesn't answer, try another one by five call. The DX station has a better chance of picking out someone to answer if she or he has a pile of short calls rather than long-winded strings of RYs and call signs. I have seen rare DX stations go QRT because of such bedlam getting on their nerves. I have worked a number of DX stations by sending my own call three times. It works, but only if everyone keeps their calls short. One hog can take up the whole mud puddle and wreck it for everyone!

Line Feeds and Other Things

When another station answers your call, gives you a report and then turns transmission back to you, what should you do? Always send a line feed (LF) and a carriage return (CR) first. This will put the receiving computer and/or printer into the letters case, and eliminate the possibility of part of your message being garbled by numbers and/or punctuation marks.

Next, send the other station's call and your call once each. On your first exchange, send your name and QTH message from the computer memory, but on subsequent transmissions do not send this line—it is unnecessary. If you have a type-ahead buffer on your system, you can compose some of your reply before it is actually transmitted. This saves time, especially if you are not a fast typist.

Do not send a string of carriage returns to clear the screen. The other operator may be copying on a printer, and multiple carriage returns will waste a lot of paper. The last two characters of each transmission should be carriage returns, however. The purpose of this is to move the other station's printer (or screen cursor) to the left side of the page, and thus avoid leaving the print head or cursor stranded in the middle of a line of type.

Date and Time Generators

One of the little "goodies" of the computerized RTTY station is the date and time generator. Unless you are bragging to the world that you have one of these gadgets in your tool kit, don't use it! When computers first started to show up on the ham bands, it was considered quite classy to put the date and time on every transmission, but that is old hat now, and mostly a waste of time. There are legitimate uses for including a date and time in your transmission, such as for message-storage operations on a "mailbox" system, and for auto-start timing, so let that be your guide.

Signing Off

You have now completed your QSO with 9K2KA and are about to sign off. What prosign do you use? The standard prosigns mean the same thing on RTTY as they do on CW, and should be adequate:

K—invitation to transmit.

KN—invitation to the addressed station only to transmit.

SK—signing off. End of contact.

CL or CLEAR—I am shutting my station down.

SK QRZ—signing off and listening on this frequency for any other calls. (The idea is to indicate which station "owns" the frequency).

Some operators use some other combinations:

SK KN—signing off, but listening for one last transmission from the other station.

SK SZ—signing off and listening on this frequency for any other calls.

Frequency "Ownership"

Frequency ownership is not a good phrase, but I am using it here to describe an unwritten rule for all of Amateur Radio. Prior use of a frequency gives you a right to continue using it. If you called CQ on an unused frequency, or have made another contact on the frequency prior to this one, you should be able to stay on frequency to work other stations if you wish. Many times it is not clear which station in a QSO has these prior rights, and this lack of knowledge has occasionally resulted in some unpleasant confrontations. Other times, operators assume that since they have the more powerful transmitter or better antenna system, they can take over the frequency. This is poor operating practice; courtesy should be the rule. It is common courtesy on RTTY to ask if the frequency is busy either by sending "QRL?" or by asking in clear text.

AMTOR is another story. If you eavesdrop on an AMTOR QSO, it is quite difficult to ascertain just which station is the master station and which is the slave. AMTOR operators should include both call signs in every exchange, so other amateurs can determine the identity of both stations.

Calling one of the two "chirping" stations when they finish a contact and break the link can be a race. The first person to get the called computer to recognize their SELCALL (SELective CALLing) code gets the contact. Once the link is established, it becomes a two-way contact. No three-way contacts or roundtables will work with AMTOR, unless the stations all use the broadcast mode. But that defeats some of the best error-correcting properties of AMTOR.

Some indication of who "owns" the frequency is in order with AMTOR operation. Use QRZ and your SELCALL code if you are going to stand by for calls, and send QRT if you are leaving the scene after the contact.

Mailboxes and Auto-Start Operation

While on the subject of frequency ownership, we should examine auto-start and/or mailbox operation. Recently, during an international RTTY contest, I found a clear frequency, queried twice to see if it was busy, then called CQ CONTEST. I got an answer from a European station, and we exchanged contest messages. Then, just as we were about to sign, a U.S. station plopped on the frequency and said, QSY, QSY, YOU ARE RIGHT ON TOP OF W7***'S MAILBOX.

We operate on a first-come, first-served basis on the ham bands. I realize there are skip-distance problems that will inadvertently cause QRM to other stations, but we learned to live with this years ago. Because auto-start and mailbox operations must necessarily operate on fixed frequencies, I believe subbands should be allocated for these operations. Then, the general conversational RTTY contacts will not bother the automated operations, and vice versa.

The calling frequency for AMTOR operation on 20 meters is 14,075 kHz. For the past few years this has been a general calling frequency for European AMTOR operation. It is both an auto-start and Forward-Error-Correction (FEC) calling channel. Call CQ on this frequency in Mode Bc (FEC), wait for a Mode A (ARQ) answer, then move to another frequency for the balance of the contact. This frequency is also used by CW operators, so now and then the modes clash. I was once told by an irate CW operator that we were not to operate RTTY below 14,080 kHz. To try driving us off the frequency, he deliberately held his dot key down for about five minutes. It was like a range war between the cattlemen and the sheep herders!

Of course when an AMTOR system receives interference, it just keeps on chirping until the QRM stops, then it continues transmitting from the buffer and goes

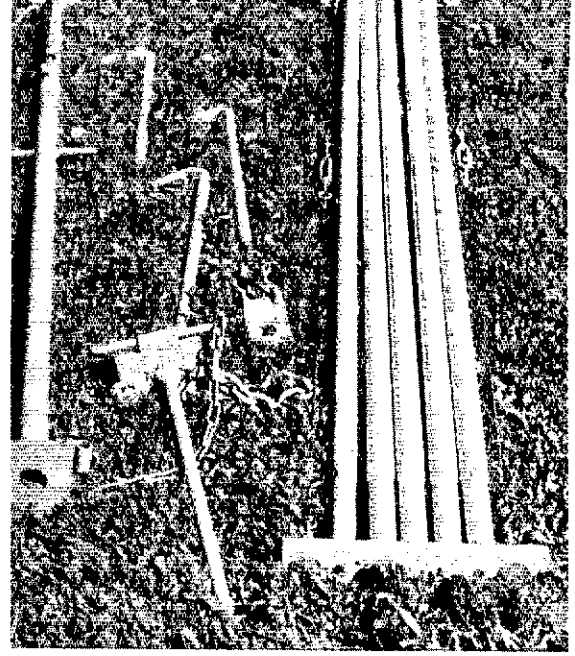
(continued on page 36)

[1]A. Lescard, "A Passive RTTY Scope Adapter," *QST*, Aug. 1984, pp. 36-37.

Try This Field-Day Antenna Support

A maze of guy wires + no natural support structures = an unnecessarily complicated Field Day operation.

By John W. Merlyn,* WD5FZD



The trees are never in the right places at Field Day time, right? This problem affected me for several years, during which I threaded my way between 100-foot guy lines that kept my 20-meter antenna in place. I knew there had to be a better way to do the job!

I tried a 30-foot pole mast because it could be erected by two people—or by one person if the need arose. The design objective was to make the support as portable as possible. This would make it useful also for vacation trips that included ham radio. I used the first version of the portable mast during Field Day a year ago. It was used again this year, after some modifications. It worked great!

Construction Notes

Fig. 1 shows the general detail of the parts. Dimensions are provided where necessary. Most of the measurement figures are not critical, so you may want to depart from the design shown here to make the support structure fit your exact needs. Some welding is required. A welding shop in your region should be able to handle the assignment at reasonable cost.

I used six Radio Shack heavy-duty TV masts for the pole. The masts are made of 16-gauge steel and are 5 feet long. One mast section was altered, but the remaining five were left as is. Normally, the swaged end of the mast is at the top of each section, following erection. I reversed this format and had those ends at the bottom.

The modified mast is cut off about 1 inch above the swaged part, as illustrated in Fig. 1A. The swaged piece is then welded to the steel plate of Fig. 1A. A hole is cut in the plate under the swaged section of the mast to permit the T-bar (Fig. 1B) to be dropped

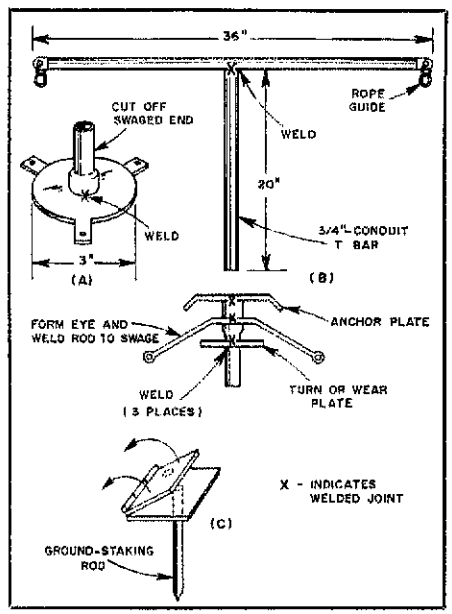


Fig. 1—Details of the various parts for the portable antenna mast. Dimensions are not critical.

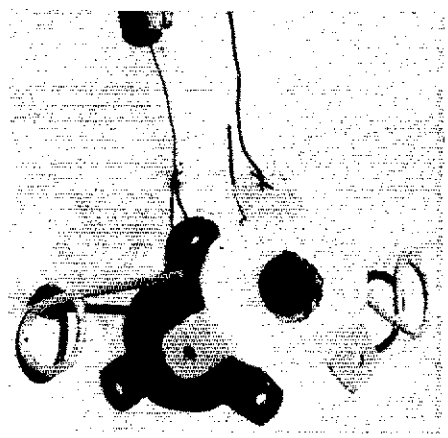


Fig. 2—A hole is cut in the anchor-line plate to allow the T bar to slip into the mast tubing

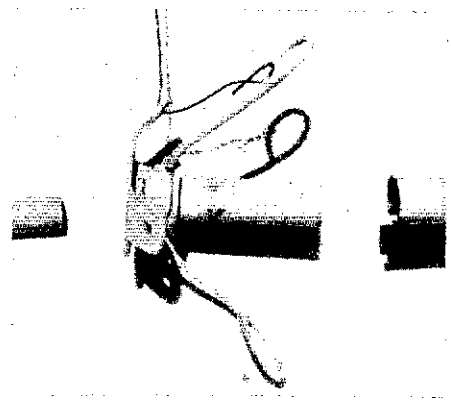


Fig. 3—The T-bar tube is at the left. The center unit is the anchor-line assembly. The masting is at the right.

Fig. 4—Bottom plate hinged unit. The ground-staking pin is at the lower center.

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into position. Holes are drilled in the three tabs (Fig. 1A) to accommodate guy wires. After drilling the holes, bend the tabs as shown in Fig. 2.

I wanted to be able to rotate the anchor plate from ground level by means of the anchor ropes without twisting the pole. The lower drawing of Fig. 1B gives details of the antenna-line eyelets formed at the ends (Fig. 3). This is welded to the swaged section of Fig. 1A, as shown. Ropes for turning the antenna are connected to the two eyelets.

Two people were required to erect the first-run structure. The second person had to hold the base of the mast in place as the completed structure was pulled aloft. I simplified this procedure by placing a hinged plate at the bottom of the support mechanism (Fig. 1C and Fig. 4). A staking rod (Fig. 1C) is welded to the hinged plate to permit anchoring the hinged plate into the ground. The hinge is created by welding two 3/8-inch pipe nipples to the bottom plate of the hinge. A third nipple is welded to the top section of the plate, forming a hinge. An L-shaped hinge pin slips into the 3/8-inch nipple stock. A small chain is welded to the pin and the bottom plate of the hinge assembly. This arrangement permits me to pull the hinge pin from ground level.

Nylon rope is used for all guys and lines. Fig. 5 shows hooks of three different shapes. The different shapes help me identify where the various guy lines connect to the system. The two hooks on the left have 1-inch-radius bends and attach to the antenna center support. In the middle of the picture, three hooks with 1½-inch-radius bends are shown. These connect to the three anchor lines. The pair of hooks on the right in Fig. 5 have 3-inch-radius bends and pass through the antenna end insulators. The guy-line anchors shown in Fig. 6 are made of steel rod.

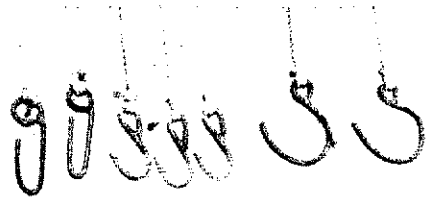


Fig. 5—Hooks for the guy lines (three sets needed). The hooks are shaped differently to help identify the guy-line sets. Each set is a different length. The large-radius hooks at the right go into the antenna insulators.

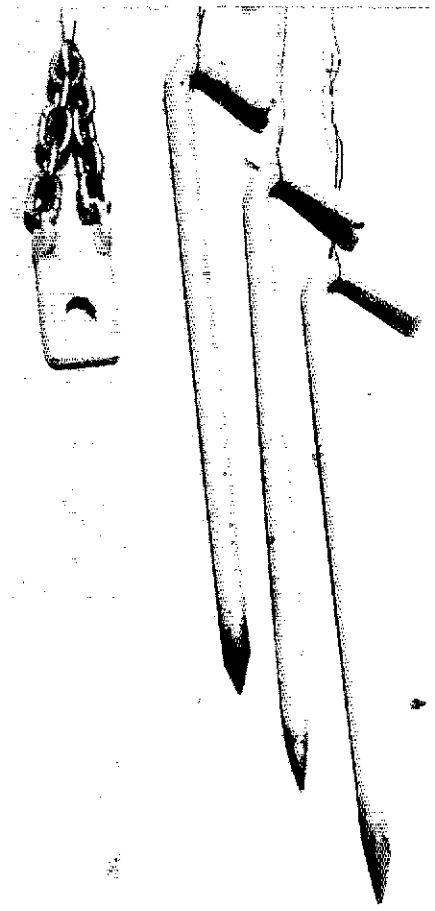


Fig. 6—Guy-anchor stakes (right) and a stake puller (left). In hard soil, use a bumper jack to extract the stakes from the ground.

Erection and Use

Drive the bottom plate with the staking rod into the earth. Put the mast sections together and insert the pin in the hinge. Be sure that all the parts shown in Fig. 1 are in place before raising the overall support structure. One person can walk the pole erect while another assists by pulling the guy lines. Install the ground-anchor pins and attach the guy lines. Following this procedure, the antennas can be pulled aloft. You may pull up two to four antennas, depending on your needs. I'm sure you'll find this portable "tree" a welcome addition to your Field Day and vacation outings.

(continued from page 34)

merrily on its way. I didn't appreciate what I thought to be deliberate interference, though, so I called the dot maker on CW and tried to explain the use of the frequency by AMTOR stations. My "opponent" answered caustically that he would QRM any FSK station who attempted to use the 14,075-kHz frequency, and with that he promptly started calling CQ DX. Darned if he didn't raise a Japanese station!

As the use of RTTY spreads around the world, I believe we should create, by gentlemen's agreement, subbands for each of the CW, AMTOR, RTTY and automated modes of operation. Then we should publicize these subbands so that every ham would have some idea of where to operate with the least friction between modes. One of the problems, however, is that all countries do not allow the various modes to use the same bands as the United States does.

Signal-Strength Reports

If you give another station a signal report of RST 599 or RST 519, it means you are copying him solid. If he gives you a like report, then it is unnecessary to repeat everything twice. Give honest reports—if the copy is solid, the readability report is 5. Adapt your operating technique to the reported conditions. If copy is marginal, repeats or extra spaces are in order. But with solid copy, you can zip right along. It's that simple.

Contests

RTTY contests are fun. The pace is much slower than the frantic operations on CW and SSB, but they are very enjoyable. If you are not entering the contest because you feel your typing is not up to speed—perish the thought! Jump right in and join the fun!

I will caution you to read the contest rules carefully and do as they say. Recently one top DXer had his potentially winning score tossed out of the competition because he did not log the time the other stations sent to him. The rules called for both times sent and received to be logged.

RTTY contests are run on a gentlemanly basis, and renewing friendships is part of the excitement. So there is nothing wrong with pausing for a chat after the contest exchange has been made. There are enough contests during the year to make each one a special event for all entrants.

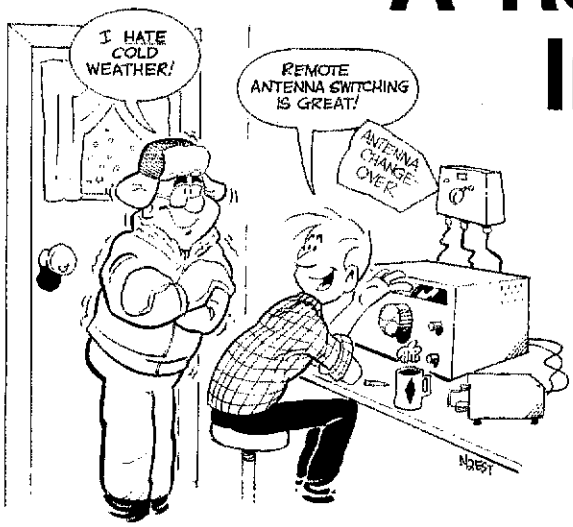
DX Operations

Chasing DX is just as much fun on Baudot or AMTOR as it is on the other modes. The leading DXers using this mode have a country count of about 240, so there is still room at the top! Less than 100 DXCC certificates with a RTTY endorsement have been issued by the ARRL, but the pace is picking up. Many countries have only one active RTTY station, so the chase is quite spirited. When a new country appears on the screens, word spreads like wildfire. Avid DXers begin alerting each other with the news. This great spirit of cooperation is one of the really rewarding facets of RTTY DX operating.

Conclusion

I hope these few little operating hints will help you get more enjoyment out of pounding the "green keys" as they were known in the early days of RTTY. Ever since I put that old Model 12 Teletype® machine on the air during the first weekend of FSK ham radio in 1953, RTTY has been a great source of enjoyment for me. I hope it will be just as much fun for you.

A Remotely Switched, Inverted-L Antenna



Cover two parts of a single band, or more than one band, by means of remote switching in the antenna system. Relays, a dc power source and a control cable will get the job done.

By Doug DeMaw,* W1FB

Too many feed lines coming into your shack? Tired of going outdoors in the rain or cold weather to switch antennas manually? Few of us have a one-antenna station these days, owing to the varied interest in operating modes and frequencies. Being an "all bander" usually requires two or more antennas, along with the countless feeder cables that must be routed into the ham radio station. The exception, of course, is when a trap antenna or a dipole with tuned feeders is used.

I needed a single antenna that would cover 160 and 80 meters by means of remote switching. Furthermore, I required an impedance match at both ends of each of those bands. The thought of a single coaxial feed line was appealing, so I developed the system described here. Most of the parts are available from Radio Shack; substituting equivalent components is okay. The antenna is a simple inverted-L, or Marconi. But the control techniques we shall discuss can be applied to all manner of switching circuits, provided the switching is done at low impedances (under, say, 500 ohms).

Inverted-L Antenna

There is nothing new or exciting about the antenna shown in Fig. 1. It is a proven design favored by DX chasers on 160 and 80 meters. The polarization is vertical, and the angle of radiation is favorably low. Its simplicity makes it appealing to urban dwellers who have limited real estate. The only complication to the system is a need for a ground-radial system. The greater the number of in-ground or on-ground radials, the lower the radiation losses and the higher the feed impedance will be. In other words, the better the ground system, the higher the antenna efficiency. Ideally, you would install 120 radials, and each would be 130 feet or greater in length. For most of us, this is impossible or impractical. Good results have been had with only a few short radial wires or with no radials. In the latter case, ground rods were used near the antenna feed point, and the water pipes, chain-link fence or whatever could be used were substituted for a ground screen. I recommend that you use what is available and see how the antenna works in your location.

In Fig. 1, note the use of an antenna trap (L3) for 80 meters. L3 is built in accordance

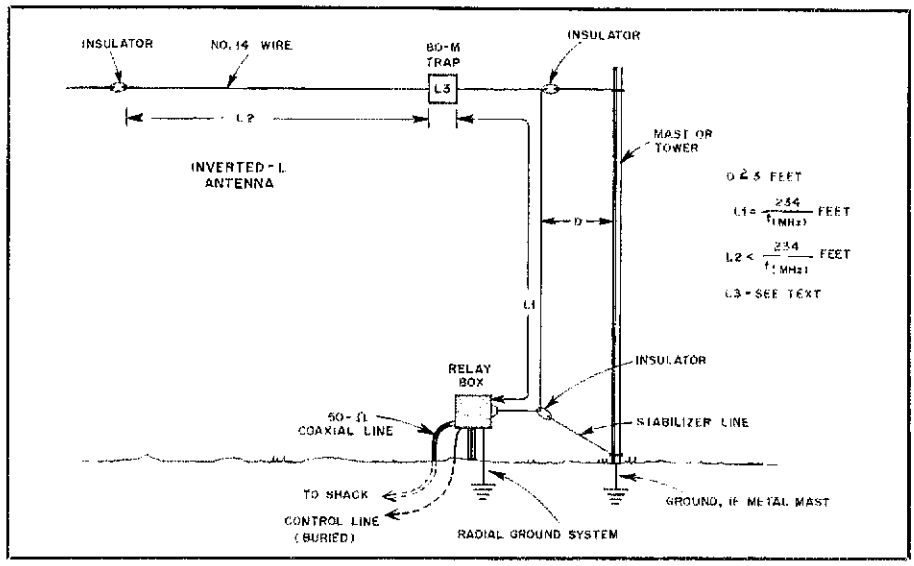


Fig. 1—Details of the W1FB two-band inverted-L antenna for 80 and 160 meters. An 80-meter trap is used (L3) to divorce L2 from L1 during 75- or 80-meter operation. A relay box (weatherproof) houses the control relays and the two matching inductors. See the text for data on the ground system.

*ARRL Contributing Editor, P.O. Box 250, Luther, MI 49656

with a design that appeared in a recent *QST* article.[1] Any properly designed 80-meter trap can be used. The portion of the antenna (L1) between the trap and feed point is ¼-wavelength at your preferred 75- or 80-meter frequency. L1, L2 and L3 are combined to provide a ¼-wavelength system at 160 meters. L2 is adjusted for overall antenna resonance in your favorite part of the 160-meter band. The longer the vertical portion (L1) of the antenna, the better. This will be dictated by the height of your mast or tower.

I wanted to use the upper and lower ends of both bands. This made it necessary to develop a remote switching/matching system I could control from the radio room. The necessary components are housed in a homemade, weatherproof wooden box. I buried the control cable and feed line, but both can be laid on top of the ground as a temporary measure.

Coil and Relay Circuit

Two DPDT 12-V relays are used (K1 and K2 of Fig. 2). L1 and L2 are small coils of heavy-gauge wire. They provide a means to tap the feed line at a 50-ohm point.

To use general-purpose relays, we must isolate them from ground. This will prevent arcing to ground at the higher power levels. The relays are mounted on a small piece of Plexiglas affixed to the interior of the outdoor housing by means of an aluminum L bracket. The field coil of each relay is RF-isolated from the control line and ground by an RF choke inserted at each side of each field coil, as shown. D1 and D2 are used to suppress transients when the relays are de-energized: When the field collapses, a voltage spike results. D1 and D2 clip the spikes. Both relays are effectively "floating" at RF when wired as shown in Fig. 2.

The 12-V-dc control line at each relay is bypassed by means of 0.01-μF ceramic capacitors. These measures, and having the feeder and control cable in the ground (or on the ground), keep RF energy from entering the ham shack via these lines.

K1B and K1C, in the nonenergized state, provide operation on 75 or 80 meters. When K2 is nonenergized also, one coil tap on L1 is selected. The second coil tap on L1 is selected when K2 is activated.

When I wish to operate in the 160-meter band, I energize K1. This places L2 in the matching circuit. Again, two coil taps are available (L2) by using K2 in the energized or nonenergized states. A simple procedure, eh? For the most part, it's a basic "go, no-go" arrangement.

Tapping the Coils

The best way to adjust the system is to decide first the matter of antenna resonance at our favored part of each band. Two simple methods of adjusting the system are available: Use a dip meter coupled to a small two- or three-turn link between the feed point and the ground system. Adjust the length of L1 (Fig. 1) for resonance in

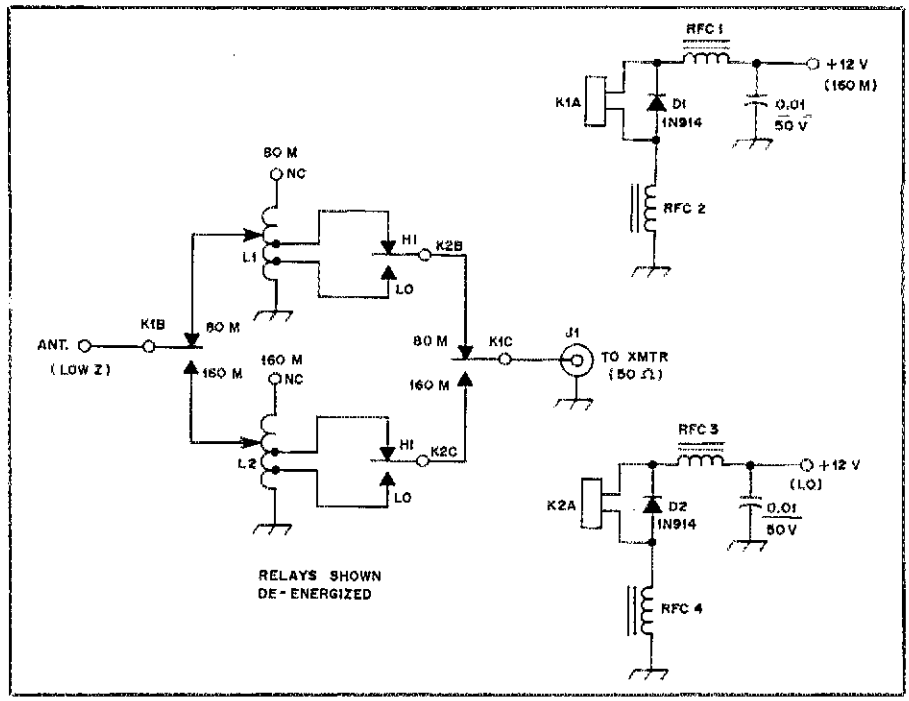


Fig. 2—Control circuit and matching system for two-band (two frequencies per band) operation with the inverted-L of Fig. 1. K1 selects the band to be used, and K2 selects the coil taps for various parts of the bands. K1 and K2 are floating at RF by means of RF chokes. D1 and D2 (RS 276-1122) suppress voltage spikes when the relay field coils are de-energized. Coil-tap adjustment is described in the text. K1 and K2 are RS 275-218 units or equiv. L1 is 2½ inches in diameter and 3 inches long; it has 8 turns of no. 10 or 12 solid-copper wire. L2 is the same diameter, but is 6 inches long; it has 15 turns of no. 10 or 12 copper wire. Miniductor stock can be used in place of homemade coils. Coils made from ¼-inch-OD copper tubing are recommended for minimum loss and high-power operation. J1 is an SO-239 jack (RS 278-201). RFC1-RFC4, inclusive, are 100-μH chokes (RS 273-102 or equiv. low-dc-resistance units).

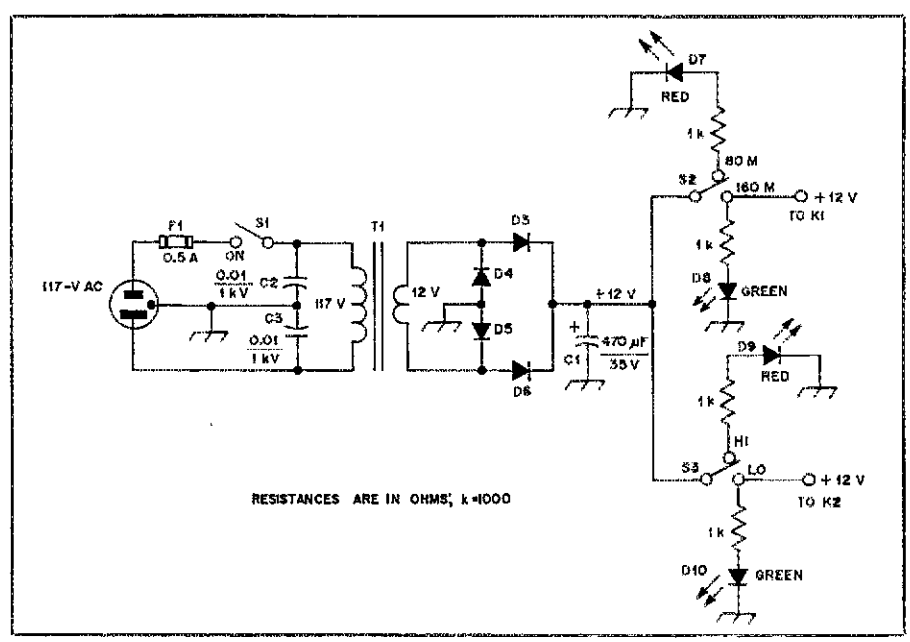


Fig. 3—Schematic diagram of the dc power supply. It can be housed in an RS 270-253 cabinet (5¼ × 3 × 5-7/8 inches).

C1—RS 272-1018.
D3-D6, incl.—1-A, 50-PRV diode (RS 276-1101).
D7, D9—Red LED (RS 276-041).
D8, D10—Green LED (RS 276-022).
F1—0.5-A fuse (RS 270-1282) in RS 270-739 clip holder.
S1—SPST toggle (RS 275-324).
S2, S3—DPDT toggle (RS 275-326).
T1—12.6-V, 450-mA transformer (RS 273-1365).

[1] R. C. Sommer, "Optimizing Coaxial-Cable Traps," *QST*, Dec. 1984, p. 37.

the CW or phone bands on 80 meters. Repeat the procedure on 160 meters by adjusting the length of L2 of Fig. 1.

Alternatively, you may connect an SWR indicator between the antenna feed point and the 50-ohm feeder (do not include the matching network). Adjust L1 and L2 of Fig. 1 for the lowest SWR (it will not be 1:1). The lowest SWR condition will occur at resonance, where the feed impedance is purely resistive.

Next, connect the relay-coil network of Fig. 2. Adjust the coil tap on L1 (Fig. 2) for an SWR of 1:1 at 75 or 80 meters. Now, energize K2 and make a second coil tap on L1 for some other part of the 80-meter band. It may be necessary to adjust the number of L1 coil turns (arrow near top of coil in Fig. 1) while selecting taps. Once the proper taps are determined, solder them to the coil.

The same method is followed in setting up L2 for 160-meter operation. It may be necessary to have the coil taps near one another, or they may be two or more turns away from each other. It will depend on how far apart your chosen operating frequencies are within a band.

The antenna of Fig. 1 is resonant at only *one* frequency in each band. The second coil tap chosen for L1 and L2 of Fig. 2 will simply provide an impedance match to the feed line. However, you will not notice a difference in performance from one end of the band to the other—at least not by ear or when observing your receiver S meter!

Relay Control Box

Fig. 3 shows a simple power supply you can build for your remote switcher/matcher. C2 and C3 may be hard to locate, even though they are standard values. The power supply will function properly without them, but they should be included if you have them.

All of the LED indicators and the associated current-limiting resistors can be eliminated if you do not wish to have a status indicator for the band in use, or the coil tap you have chosen. The cost of these visual indicators is small, so I recommend that you include them.

The control line from the power supply to the remote-control box at the antenna can be a three-wire cable with vinyl outer jacketing. The control wires should be no. 24 gauge or heavier in order to minimize the voltage drop to the relays. The greater the control-cable length, the more significant this becomes. The open (antenna) end of the control cable should be sealed to prevent moisture from entering it.

Final Remarks

The concept introduced here is by no means limited to this type of antenna system. In some matching networks, it is necessary to include variable capacitors that need to be adjusted for various parts of a given amateur band. I have found that small 1-r/min, geared clock motors work nicely for adjusting capacitors remotely. A reversible motor is best, since it makes tuning quicker and less complicated. The torque on the motor can be reduced when using large variable capacitors. Simply loosen the tension on the capacitor rotor bearings, but not so much that the rotor will creep after it is set (without the motor coupled to it).

Relay switching is not satisfactory at high impedances. There is too much RF voltage present under that condition, and the relays will surely arc or burn up at the higher power levels. Good luck in figuring out new remote-control techniques!

New Books

WORLD-WIDE SUNRISE/SUNSET TABLES

by J. Devoldere, ON4UN, P.O. Box 41, B9000 Ghent, Belgium. Soft-bound, 6½ × 8¼ inches, 130 pages. $10 airmail delivery (banknote or international money order only).

John Devoldere, ON4UN, has established himself as an expert on 80-meter DXing. His accomplishments are well known and recognized worldwide. Is there anywhere he has not worked on the 80-meter band?

Those who chase DX on the 160, 80 or 40-meter bands soon learn that the time around sunrise and sunset provides enhanced propagation. This enhancement can be dramatic. Wise low-band DXers take advantage of this to increase their DXCC country or contest multiplier count.

There are two propagational peaks (short path) for east-west (plus or minus 45 degrees or so) great-circle paths. The first peak occurs around sunset at the western end of the path. The second peak occurs around sunrise at the station on the eastern end of the path.

For north-south paths, neither sunrise nor sunset produces pronounced peaks. Usually, the peak for these paths occurs around local midnight. That means I don't need the information in this book to tell me when to try an 80-meter schedule with a friend in Ecuador. If I want to work Hong Kong, however, knowledge of sunrise and sunset times will be very useful in setting a schedule or operating time.

This is the second and completely revised edition of the sunrise/sunset tables that first appeared in 1977. This new book lists sunrise and sunset times at half-month intervals for 502 areas of the world. These areas include all DXCC countries, and many different locations in large countries. For example, there are 100 listings for the USA.

The formulas used to compute the tabulated values have been refined since the first edition. Times listed will be very close to actual sunrise and sunset times at the given locations. It is not necessary to know sunrise or sunset time to the exact second. There are other ways of determining this—these tables are more accurate than most and they are easy to use. Three pages of instructions, complete with examples, tell how to use the tables in the book.

Does it work? You bet it does! I know this to be true from years of contesting experience. Last year, I decided to try some casual operation (no schedules) for a few weeks in November and December on the 40-meter band. My reward? Just as the table showed it might happen, I enjoyed a number of juicy DX QSOs (such as FO8, KH8, UAØ, VK2 and VK3) and added a number of stations in my SWL log including UH8, VU2 and VS6). My modest 40-meter station is far from world class!

Be sure to include the coordinates (latitude and longitude) of your QTH when you place an order. That way you will receive a large (8½ × 11 in), personalized sunrise/sunset table for your location. You will also receive a personalized printout listing beam headings and great-circle distances to 502 locations from your QTH.

With the present decline of the sunspot cycle, the low frequencies will become more important to the DXer and contester. To achieve DX success on those bands, you will need good operating practice and equipment and the right antenna. The *World-Wide Sunrise/Sunset Tables* will be one of the most important tools in your shack.—*Chuck Hutchinson, K8CH*

Next Month In *QST*

With the Field Day, summer vacation and fox-hunting seasons on their way, what better time to build a new 2-meter portable antenna. An article in June *QST* provides the details; you need only provide the inexpensive materials and some enjoyable labor.

Elsewhere in June *QST* you'll find:

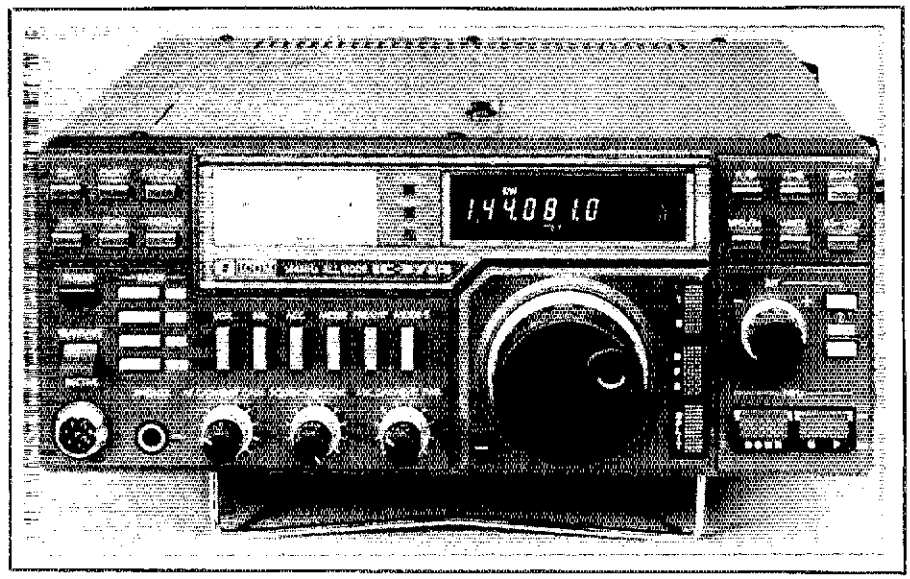
- a practical article on the many uses of surplus ac and dc wall transformers
- a look at the latest proposal that Novices be given 220-MHz phone privileges
- a colorful article showing how owners of IBM PCs can capture four-color weather-satellite pictures
- the latest word on the upcoming ham/astronaut Space Shuttle mission.

Please note: Although we try our best to include, in the next issue, all the items we've advertised, from time to time we have to postpone publication for a month or two. If the item you're particularly interested in doesn't appear "next month," it most likely will be in the following month's issue.

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

ICOM IC-271A 2-Meter Multimode Transceiver

The VHF/UHF crowd is indeed fortunate that ICOM has more than a passing interest in multimode operation for the bands above 50 MHz. ICOM's current offering of VHF boxes includes not one, but two 2-meter base-station multimode rigs. The IC-271 is offered in two different versions in the U.S. marketplace. The IC-271A features SSB, CW and FM operation from 143.8 to 148.2 MHz, 25-W output, 32 memories, a scanning system, and built-in subaudible tones. It may be powered from one of two optional power supplies: the IC-PS15 external power supply (common to all other ICOM transceivers) or the IC-PS25 internal supply. The IC-271H offers the same features as the IC-271A, except power output is 100 W.



ICOM IC-271A 2-Meter Multimode Transceiver, Serial No. 02468

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 143.800 to 148.200 MHz.	As specified.
Mode of operation: FM, USB, LSB, CW.	As specified.
kHz per turn of knob: Not specified.	FM — 50 or 250; SSB/CW — 2 or 50.
Frequency display: 7-digit luminescent.	White fluorescent, 5/16-inch-high digits.
Frequency resolution: 100 Hz.	As specified.
S-meter sensitivity (μV for S9 reading): Not specified.	21.
Transmitter output power: 1 W to 25 W, adjustable.	2 W to 30 W.
Harmonic suppression: Greater than 60 dB.	70 dB (see Fig. 1).
Spurious suppression: Greater than 60 dB.	70 dB (see Fig. 1).
Third-order IMD: Not specified.	−28 dB worst case (see Fig. 2).
Receiver sensitivity: SSB/CW — less than 0.5 μV for 10-dB S+N/N; FM — less than 0.3 μV for 12-dB SINAD; less than 0.6 μV for 20-dB quieting.	Noise floor (MDS) dBm: −138. Blocking DR (dB): 108. Two-tone, 3rd-order IMD DR (dB): 84. Third-order intercept (dBm): −12. Receiver quieting (μV for 12-dB SINAD): 0.16.
Squelch sensitivity: SSB/CW — less than 0.6 μV; FM — less than 0.4 μV.	Min. 0.15 μV; max. 0.36 μV.
Receiver audio output at 10% THD: More than 2 W.	2.65 W.
Color: Two-tone green.	
Weight: 11.4 lb without internal power supply.	
Size (HWD): 4-3/8 × 11-1/4 × 10-3/4 in.	

Frequency Control

The IC-271A shares many of the elaborate frequency-control features found on other ICOM HF and VHF transceivers. There are two built-in VFOs, a scanning feature that allows scanning of selected portions of the band or preset memory channels, RIT, and complete flexibility in selecting standard repeater offsets or programming oddball ones.

The MHz UP and DOWN switches in the lower-right-hand corner of the front panel move the transceiver frequency up and down in 1-MHz steps. Once you're in the right MHz range (for example, 144 MHz for SSB and CW operation or 146 MHz for repeater operation), you can use the main tuning knob to tune around at several different rates. On SSB or CW, normal tuning is in 10-Hz steps at 2 kHz per knob revolution. If you spin the knob quickly, the rate steps up to about 5 kHz per revolution in 100-Hz steps. Normal tuning in the FM mode is 5-kHz steps at 250 kHz per revolution. When the TS switch is pressed in any mode, the tuning switches to 1-kHz steps. For SSB or CW, the TS feature is handy for large frequency excursions, while for FM it is useful for tuning odd splits or working in the lower simplex area.

Like most HF rigs these days, the IC-271 has two built-in VFOs. These VFOs may be used to operate SPLIT—one for transmit, and the other for receive—or they may be used independently; the effect is the same as having two radios in one box. The VFOs need not be set to the same part of the band or to the same mode.

The dial-lock switch disables the tuning knob to prevent accidental frequency changes. This feature is especially handy during mobile operation.

Another feature of the '271 not always found on VHF radios is RIT. Its range is ±9.9 kHz, and the control knob has a prominent place next to the main VFO knob.

Repeater offsets are handled by the +DUPLEX, −DUPLEX and OW (offset write) buttons. Pushing the +DUPLEX button automatically shifts the transmit frequency up 600 kHz from the displayed receive frequency. The −DUPLEX button moves the transmit frequency 600 kHz down. With the IC-271 in the FM mode, you can press the OW button and change the offset from 600 kHz to anything you like.

Memory and Scanning

When the M/VFO switch is pressed the main tuning knob also controls the elaborate memory system incorporated in the IC-271. There are 32 memory channels available. Each memory stores not only the frequency, but also the mode of operation and any information on repeater splits. For example, memory 1 might store 144.200 USB, while memory 2 could store 146.520 FM (simplex) and memory 3 could store 146.940 FM (duplex, −600 kHz transmitter offset). The possibilities are endless. Memory information may be written right from the VFO dial with the WRITE switch. Similarly, you may turn frequency control over to the VFO at the memory channel selected by pressing the M>VFO switch.

The scanning functions are everything a VHF operator could want. There are three scanning modes. The first, activated by the SCAN button, checks all programmed memory channels for activity. If activity on the channel opens the squelch, scanning will stop and you can press the SCAN switch again to remain on that channel. If you do not press the switch, scanning resumes after

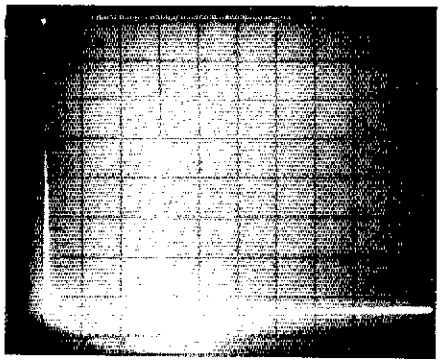


Fig. 1—Spectral display of the IC-271A. Horizontal divisions are each 50 MHz; vertical divisions are each 10 dB. Output power is approximately 30 W on 144 MHz. The fundamental has been reduced in amplitude approximately 30 dB by means of notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The IC-271A complies with current FCC spectral-purity specifications.

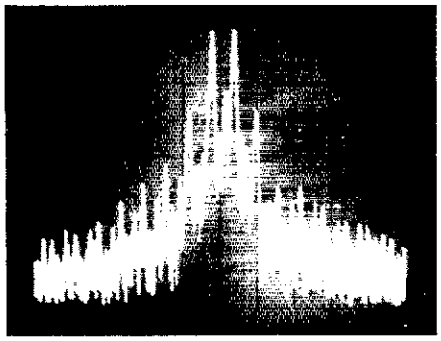


Fig. 2—Spectral display of the IC-271A during two-tone IMD testing. Third-order products are approximately 28 dB below PEP, and fifth-order products are approximately 42 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 28-W PEP output on 144 MHz.

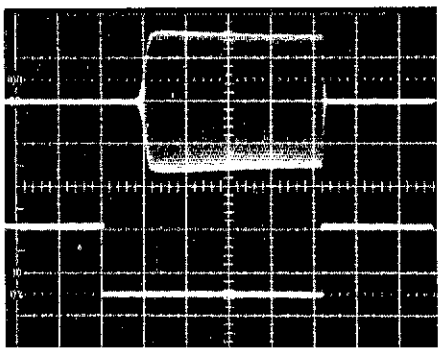


Fig. 3—CW keying waveform of the IC-271A. Upper trace is the RF envelope; lower trace is the actual key closure. Each horizontal division is 5 ms.

about 10 seconds. The second scanning mode, activated by the MODE-S switch, scans only those memory channels with the specified mode (for example, only those channels with FM). The third scanning function scans those VFO frequencies between specified start and stop points. For example, you might want to let the transceiver scan 144.080 to 144.250 MHz if you anticipate a band opening, but don't want to sit next to the rig and turn the knob all evening.

Receiver

The IC-271 has several useful receiver features. The SQUELCH control works in all modes. Besides the obvious uses on FM, it allows you to leave the receiver tuned to the SSB calling frequency, 144.200 MHz, with the squelch on and the volume control turned up. You can go about your business, and if you hear the squelch break, you can then go into the shack and find out who's on frequency. The PREAMP switch turns on an optional preamplifier (the review unit was not equipped with this feature).

The noise blanker is sometimes effective against pulse-type interference such as automobile ignition noise. Unfortunately, with the noise blanker in operation the dynamic range is reduced and strong local signals create noise and spurious signals that mask weaker signals.

Two choices are afforded by the AGC switch—FAST and SLOW. The slow position offers a hang-type AGC that is appropriate for strong-signal SSB. On weak signals and on CW, the faster AGC setting is preferable.

Transmitter

While most multimode VHF radios offer 10-W output, the IC-271A offers at least 25-W output on all modes. The extra 4 dB or so is useful if the transceiver is used barefoot, and 25-W is just about right for a solid-state power amplifier requiring high drive power or a triode tube amplifier using an 8874 or a 3CX800A7. You must be very careful, however, when using this transceiver with a run-of-the-mill solid-state power amp that requires 10-W drive or with a tube amplifier using a tetrode such as a 4CX250 or 4CX1000A. Excessive drive will cause unwanted splatter and could damage the amplifier.

A panel on the top cover provides access to the VOX controls. There are separate delay controls for CW and SSB. The sidetone monitor level control is also located under this cover.

ICOM has included a subaudible tone encoder on the '271. Any tone between 1 and 55 Hz can be chosen by pressing the tone SELect button and turning the main tuning knob until the correct tone number appears on the display.

Operation

I enjoyed using the IC-271 for almost a year. During this time, I operated it on FM, both on simplex and through local repeaters. It took a little getting used to, but I quickly learned how to set up the transceiver for almost any type of duplex FM operation. The memory features enhance the radio's desirability—after the initial setup, there is very little to do but recall your most-used channels.

The IC-271 "holds its own" at the weak-signal end of the band. The receiver was sensitive enough to hear plenty of signals around New England, in Canada and down into the Washington DC area. There are no provisions for a narrow-bandwidth CW filter, and this hurt during weak-signal work. Most of the time I used the rig barefoot or with a Mirage B215 power amplifier, and had many enjoyable contacts. Under strong-signal conditions, the receiver held up as well as can be expected for a synthesized multimode rig. Two strong local stations caused synthesizer noise problems—problems not normally encountered when I use my clean, non-synthesized IF transceiver and transverter.

I found two inconveniences on the IC-271 that were present on earlier ICOM rigs, but which have been cleaned up on the latest ICOM HF transceivers. First, there is no way to key an external power amplifier directly from the rear panel of the '271. There is a multipin accessory socket that makes available +8 V at 5 mA on transmit — enough to turn on a suitable switching transistor. It is inconvenient, however, to have to build an amplifier interface for a "full-featured" transceiver.

The other inconvenience I found was that not all electronic keyers will key the '271. The ICOM will only key if the KEY terminals are brought within 0.4 V of ground. Keyers with reed relays in the output will do this fine. Some keyers that use transistor switching will work; others will not. Also, the key jack accepts a 1/8-inch mini phone plug instead of the almost universally accepted ¼-inch plug.

Digital Display Problems

We examined two IC-271A transceivers during the review—serial nos. 01276 and 02468. During the initial lab testing, we noticed that the frequency display on no. 01276 was intermittent. This problem cleared itself up for a while, but after a few months the display quit altogether. Lab examination revealed that ICOM had placed a foil shield around the rear of the display, perhaps to keep noise from the display from getting into the receiver. This foil shield did not have an insulated backing, and it touched the exposed leads of several components on the display board. R26, a 2.2-ohm, ¼-W resistor, burned and scorched the foil. We replaced R26, but the multivibrator circuit (consisting of T1, Q12 and Q13) still did not function. We returned that transceiver to ICOM for repair. It is interesting to note that this foil shield is not present in no. 02468.

The IC-271A is an impressive radio. While it has some faults, it is worth considering if you're in the market for a multimode radio for 2 meters. Price class: IC-271A, $700; IC-PS15 external power supply, $150; IC-PS25 internal power supply, $100. Manufacturer: ICOM America, Inc., P.O. Box C90029, Bellevue, WA 98009, tel. 206-454-8155.—*Mark J. Wilson, AA2Z*

TEN-TEC CENTURY/22 HF CW TRANSCEIVER

☐ I've always tried to dismiss the overworked expression, "good things come in small packages," but the Century/22 fits that description nicely. This is particularly true if we consider some specific areas of need in amateur communications—the beginner's first station, the RV enthusiast's portable rig, or the QRPer's home rig or camping station. This compact equipment should appeal also to those who are just plain "wrung out" from paying high prices for QRO transmitters and the high-power accessories that go with them.

I found it refreshing to fire up with only

20 W of RF output power on the CW bands. Signal-strength comparisons between the 20 W and 100 W from my main station transceiver were not in the least significant. Most stations contacted reported that they could detect no audible change in signal strength, owing to the AGC action of their receivers. S-meter comparisons, however, did show a few-dB-less signal from the Century/22. However, this small reduction in signal power did not impair my ability to effectively work DX when using a triband Yagi on 20 and 15 meters. My 80-meter full-wave Delta loop provided excellent coverage on 80 and 40 meters with the little 20-watter.

The Century/22 is an updated version of the popular Century/21. The '22 is more compact (volume about the same as a shoe box, without the power supply) than is the Century/21. To me, the new unit looks much better: The front and rear panels are beige, and the cabinet is charcoal gray; black knobs with chrome inserts are used on the controls.

The transceiver covers six bands: 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 21.0-21.5 and 28.0-28.5 MHz. Although it is designed for CW operation only, other modes can be monitored with the receiver.

Other features include RIT (±2 kHz), a pulsed crystal calibrator (pulsing helps to identify the calibrator signal) and a four-pole, variable band-pass audio filter. I found that the filter works very well in reducing QRM and elevating weak signals above the noise. Filter "ringing" is minimal, even in the most selective mode.

Performance Notes

A direct-conversion (synchrodyne) receiver is used in the Century/22. This means that single-signal reception is not possible, as with a superheterodyne receiver, and that a CW signal can be tuned in above and below the signal frequency. In the case of a superheterodyne receiver with an IF filter, a CW signal can be tuned in on only the upper or lower sideband without resetting the sideband-selection switch. Had I not known that the Century/22 had a direct-conversion receiver, I would have been certain I was operating a conventional "superhet"—that is, until I discovered a beat note on both sides of the incoming signal zero beat. Normally, this is not an inconvenience, but when the QRM gets heavy (and close by), you may experience more QRM than with a conventional receiver.

I was favorably impressed with the smoothness of the audio-derived AGC. Gone were the loud clicks and thumps that are characteristic of some of the earlier Ten-Tec gear that used audio-derived AGC. I have built many a direct-conversion receiver with audio AGC, but I have not achieved the smooth operation I find in the Century/22.

As on earlier Ten-Tec transceivers, the PTO shaft floats above ground. If you touch the metal insert in the main tuning knob, you'll notice a slight frequency shift. Simply keep your fingers off the insert to prevent this from occurring.

Receiver sensitivity appears to be more than ample for the HF bands. I was able to copy any signal that could be dug out of the noise with my $1200 transceiver. Local-oscillator stability is good, with about 100-Hz maximum drift during the first 15 minutes of operation. After that, the drift is minimal, as the VFO moves up and down no more than 20 Hz (typical of most LC local oscillators).

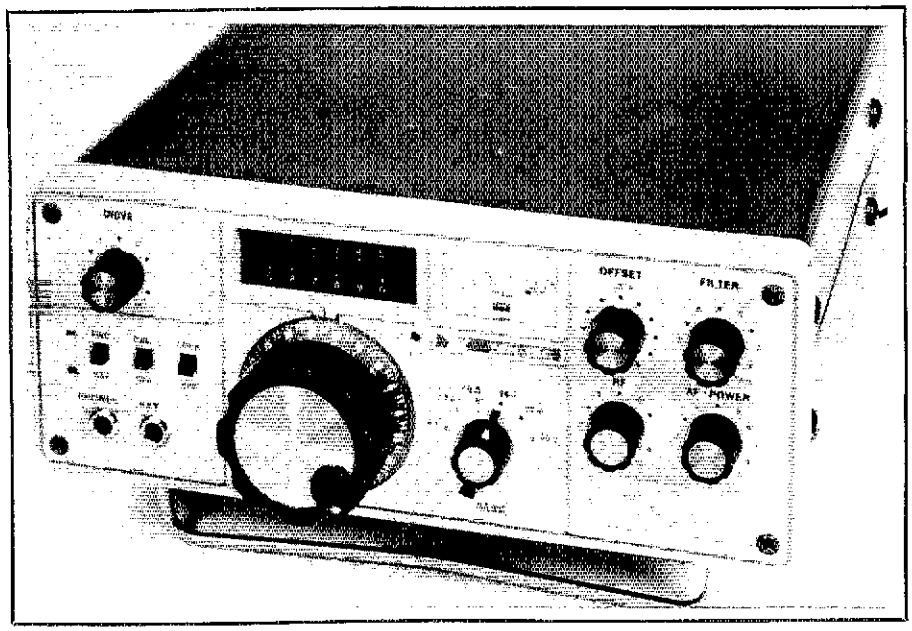
I received good reports concerning the quality (shaping) of the CW note from the transmitter. No buzz or clicks were reported. Similarly, no one could detect chirp on the signal. The QSK (full break-in) feature was a bit hard for me to get used to, since I am not a QSK enthusiast. Hearing noise and signals between words when transmitting was distracting at first. But after two days of QSK operation, I learned to like it better than the break-in delay feature of my other transceivers. If you like to handle CW traffic, you will definitely enjoy QSK operation! It is great also for contesting and nonmonologue ragchewing.

There is an S meter for observing the relative strength of received signals. The meter does double duty by providing relative RF output and SWR readings.

True QRP (less than 10-W dc input to the PA stage) can be realized with this transceiver by simply reducing the amount of RF drive by means of the front panel DRIVE control. I had an enjoyable time (and many QSOs) while operating at 1 W output.

General Impressions

A Model 679 keyer was added to one of the two Century/22 transceivers on hand for review. This optional accessory consists of a PC board, a speed control and 3-circuit jack that you wire into the '22. The keyer speed control and the paddle-input jack mount on the rear apron of the rig. Labeled mounting

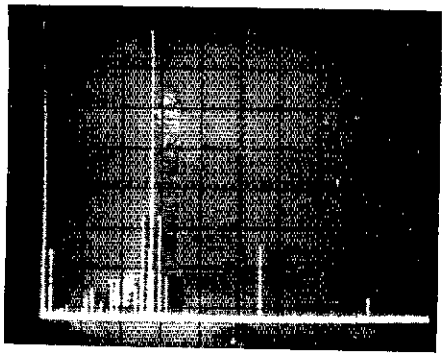


Ten-Tec Century/22, Serial No. 579-0004

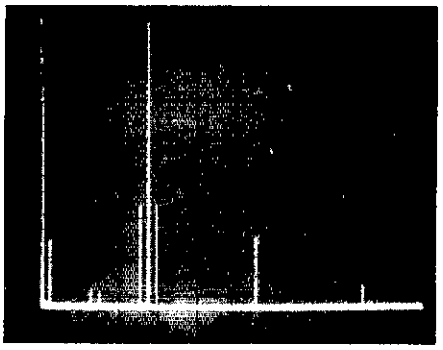
Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 21.0-21.5 and 28.0-28.5 MHz, plus 40-kHz overrun on each end of tuning range.	As specified.
Mode of operation: CW on transmit; CW and SSB on receive.	As specified.
kHz/turn of knob: 17.	As specified.
Tuning steps: Not specified.	1-kHz increments, analog.
Backlash: Not specified.	Nil.
S meter sensitivity (μV for S9 reading): not listed.	Filter out (filter in): 80 m, 17 (48); 40 m, 13 (34); 30 m, 14 (40); 20 m, 22 (54); 15 m, 15 (50); 10 m, 16 (42).
Transmitter output power: 20 W all bands.	As specified.
Receiver AGC: Not listed.	Audio derived.
Receiver type: Direct conversion with RC active audio filter.	As specified.
Receiver sensitivity (3.5 to 28.5 MHz): 0.5 μV for 10-dB S + N/N.	

	80 m	*20 m*
Noise Floor (MDS) dBm:	−131	−128
Blocking DR (dB):	112	109
Third-order intercept (dBm):	82	81

Receiver selectivity: 750-Hz center frequency, 200-Hz bandwidth, variable skirt selectivity.	As specified.
Audio output 1 W @ < 2% THD.	1.4 W @ 10% THD.
Color: Two-tone — beige panels, charcoal gray cabinet.	
Size (HWD): 4 × 10 × 10.5 in.	
Weight: 6 lb.	

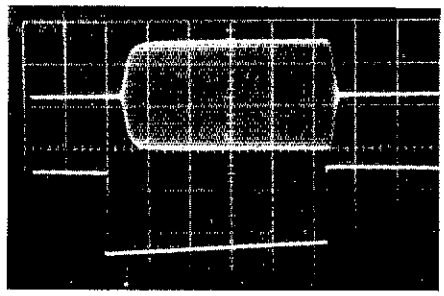


(A)

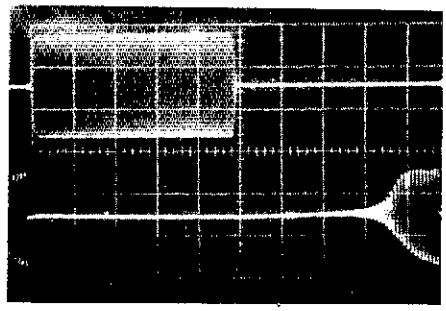


(B)

Fig. 4—At A, worst-case spectral display of the Century/22. The crystal calibrator was on during this measurement. Vertical divisions are 10 dB each; horizontal divisions are 5 MHz each. Output power is approximately 23 W at a frequency of 14 MHz. All spurious emissions are at least 48 dB below peak fundamental power. The Century/22 complies with current FCC specifications for spectral purity. At B, all conditions are equal, but the calibrator has been turned off.



(A)



(B)

Fig. 5 — CW-keying waveforms of the Century/22. At A, the photograph shows the characteristics of the leading and trailing edges of the RF waveform; the lower trace is key closure, and the upper trace is the RF envelope. Horizontal divisions are each 5 ms. At B, RF output (upper trace) versus receiver recovery time (lower trace) in QSK operation. Each horizontal division is 20 ms.

holes are provided for these two items; simply push out the plastic plugs sealing the holes and insert the potentiometer and jack. There's even a label on the inside chassis telling you where to mount the keyer board! The keyer works well and has the feel of a Curtis Keyer, but is composed of a 7476NA IC and five transistors.

The various modules that make up the Century/22 appear to be built on high-quality glass-epoxy circuit board rather than on phenolic material. The transmitter RF power board is made of double-sided PC material, providing a ground plane for improved stability.

With a minimum number of "bells and whistles," the rig should be excellent for beginners and persons with disabilities. There is no tuning required when changing bands. All you need do is change the band-switch setting and adjust the DRIVE control until the ALC LED illuminates, at which point the DRIVE control should not be advanced further.

If I were to be picky about the overall package, I might say that the instruction manual is a tad short of necessary data. For example, the review unit arrived with a 2.5-kHz offset between transmit and receive. I wondered why no one was answering me! Nothing was found in the book to indicate the cure. Luckily, I spotted an arrow on the photographic view of the bottom side of the Century/22. It pointed to a TX OFFSET PC-board control on one of the circuit boards. I adjusted it while listening to my main station receiver, then checked the signal from my station transmitter. I adjusted the control for a 700-Hz offset between receive and transmit with the Century/22. The transmit signal was then 700 Hz lower than the beat note during receive. I think some troubleshooting data should be included in the manual, along with a more definitive explanation of the various functions of the unit. Also, there was no schematic diagram sent with the equipment. A letter to Ten-Tec requesting one brought a quick response.

All in all, I would definitely recommend this transceiver to anyone who likes to operate CW. It is small enough to tuck under your arm and take along on trips or to a friend's house. It could be a fine rig for Field Day as well. It operates from a 13-V dc supply. The Ten-Tec 979 ac-operated 13.5-V dc supply (5A) is available for fixed-station use. It also is a compact unit. The Century/22 is available from Ten-Tec Corporation, Hwy. 411 East, Sevierville, TN 37862, tel. 615-453-7172. Price classes: Century/22, $390; Model 979 power supply, $90; Model 679 internal keyer, $27.—*Doug DeMaw, W1FB/8*

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 minimums and reflect a discount from our purchase price.

Sealed bids must be submitted by mail and be postmarked on or before May 27. 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 a tie, the highest bid bearing the earliest postmark will be declared the winner.

Please clearly identify the item you are bidding on, using the manufacturer's name, item model number and other identification number if so specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the winning bidder, FOB Newington. Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St., Newington, CT 06111.

Yaesu FT-757GX HF transceiver, s/n 3N040531; Yaesu FP-757FX power supply, s/n 3M020142 (as a package only—see Dec. 1984 *QST*). Min. bid $680.

Yaesu FT-980 HF transceiver, s/n 3G020161, with XF8.9-kHz filter; MD-1B microphone; Apple computer interface FIF-65, s/n 0535 (as a package only—see Nov. 1984 *QST*). Min. bid $992.

ICOM 751 HF transceiver, s/n 1982; FL-52A filter; SM-6 microphone, s/n 20504795; PS-15, s/n 11319534 (as a package only—see Jan. 1985 *QST*). Min. bid $1009.

Kantronics Interface II w/Kantronics Apple software, s/n 34869 (as a package only—see Sept. 1984 *QST*). Min. bid $160.

Info-Tech M107 RTTY modem. Min. bid $130.

HAL CRI-100 RTTY modem. Min. bid $150.

MFJ 1224 RTTY modem. Min. bid $67.

MAXCOM 200 Antenna Matcher, center section only (no dipole antenna—see Nov. 1984 *QST*). No min. bid.

Amateur Radio Software

Kantronics AMTOR 64, s/n 36192. Min. bid $47.

Kantronics Hamtext C64, s/n 33842. Min. bid $51.

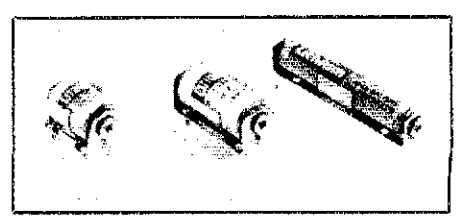
New Products

CYLINDRICAL LITHIUM-BATTERY HOLDERS

☐ An assortment of battery holders for use with cylindrical, 3-V lithium cells is available from Keystone Electronics Corp. These holders are designed for battery-backup-power applications, and can mount directly on PC boards.

Holders are available in aluminum or steel, with or without lugs that can be soldered to a PC board. The aluminum holders have brass, nickel-plated contacts, while the steel units have stainless-steel contacts. These holders accept 1/3N, 1/2A, 2/3A, 1/2AA and CR-2N batteries.

For more information, contact Keystone Electronics Corp., 49 Bleecker St., New York, NY 10012, tel. 212-475-4600.—*Paul K. Pagel, N1FB*



Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

MATCH YOUR RF PROBE TO YOUR METER

☐ An RF probe for use with a high-impedance voltmeter is very handy in the shack; it can be used when tuning and checking the operation of oscillators and low-power transmitters. I prefer the fast response of an analog meter for stage tuning, but a digital meter is easier to read when measuring mixer injection level or verifying oscillation.

There is some measurement inaccuracy when an RF probe designed for use with an 11-MΩ voltmeter (as shown in Fig. 1 and many ARRL publications) is used with a meter having a different input impedance (Z). If the meter Z is near 11 MΩ, say 10 MΩ, the probe accuracy is within 1%, which is usually acceptable. Those who wish, however, can reduce the probe error. I decided to modify my probe so that it is most accurate with a 10-MΩ digital meter and accept less accuracy with an 11-MΩ analog meter.

Fig. 2 shows the probe and meter circuit. RF voltage is applied between the probe tip and ground. During the half cycle that forward biases the diode, the capacitor charges to the peak value (V_{PK}) of the applied voltage. During the next half cycle, the diode is reverse biased, and the capacitor discharges through R1 and the voltmeter resistance (R_M). The two resistances form a voltage divider that converts V_{PK} to V_{RMS}, which is shown on the meter. For a 4.7-MΩ probe and an 11-MΩ meter input Z:

$$V_M = \frac{R_M}{R1 + R_M} V_{PK}$$
$$= (0.7006)\ V_{PK} \qquad \text{(Eq. 1)}$$

where
V_M = measured voltage (across the meter)
R_M = meter Z
R1 = probe Z

Under these conditions, the measured voltage is almost exactly V_{RMS} (which is 0.707 times V_{PK}), but consider the tolerance of R1: A 4.7-MΩ, 5% tolerance could measure from 4.465 to 4.935 MΩ.

The probe can be matched to the input Z of any meter by varying the value of R1. In order to preserve the $V_{PK} - V_{RMS}$ conversion, the total resistance of the probe and meter must be 1.414 times the Z of the meter. This means

$$R1 = 0.414\ R_M \qquad \text{(Eq. 2)}$$

For my 10-MΩ meter, R1 should be 4.14 MΩ. I use a series combination of 3.9 MΩ and 240 kΩ for R1. The probe is constructed as shown in recent ARRL *Handbooks*.

Keep the limitations of the probe in mind during its use: A single 1N34A diode has a 60-V PIV rating. Since the signal $V_{PK\text{-}PK}$ appears across the diode, do not try to measure more than 30 V_{PK} (21 V_{RMS}) with a probe using the 1N34A. The voltage rating of the probe can be increased by adding a second diode in series with the first (at point "X" in Fig. 1), but the accuracy at low voltages decreases when multiple diodes are used.

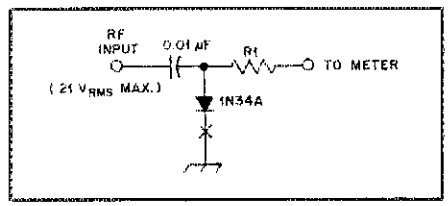


Fig. 1—A schematic of the RF probe shown in many ARRL publications. R1 is 4.7 MΩ in the standard probe, but may be varied to match different meter impedances (see text). The probe voltage rating can be increased by adding diodes at point X, using a single diode with a higher PIV rating or with a voltage divider (Fig. 3).

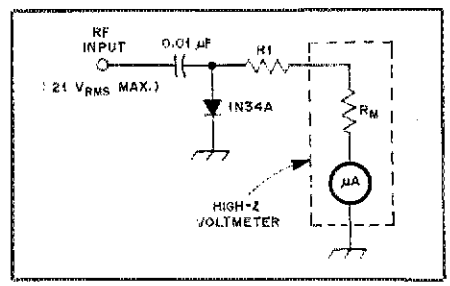


Fig. 2—The equivalent circuit of a probe and voltmeter.

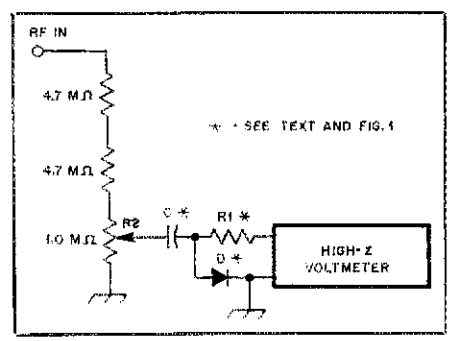


Fig. 3—A 10:1 resistive divider to extend the range of an RF probe. To calibrate the divider, apply 10.0 V dc across the input, short the capacitor in the RF probe and adjust R1 until the meter reads exactly 1.0 V. Remove the short from the RF-probe capacitor before use.

[Higher voltages may also be measured by using a resistive divider (Fig. 3). Resistors that provide a large portion of the network resistance should have 1% tolerance. Consider Mr. Mann's 3.9-MΩ plus 240-kΩ network: The 3.9-MΩ resistor should have a 1% tolerance, while a 10% tolerance is acceptable for the 240-kΩ component—10% of 240 kΩ is only 0.58% of the 4.14-MΩ network total.—Ed.]

Although theory says that the change in measurement with the new resistors should be very small, it was larger than I expected. This is probably a result of changing from a 10%-tolerance, 4.7-MΩ resistor in the original probe to a 5%-tolerance resistor in the new one. I assume (my DMM does not read resistance greater than 2 MΩ) that the 4.7-MΩ resistor was toward the high side of the tolerance range, while the new resistors are very close to the calculated values. I am satisfied with the results of the change. —*Steven E. Mann, N4EY, Winston-Salem, North Carolina*

HYPODERMIC NEEDLES AS TEST PROBES

☐ Hypodermic needles of various sizes can be used to great advantage as test probes. The slenderness of the needle allows penetration into areas of tightly packed components that are normally inaccessible. The beveled point can make contact with exposed wires, components or solder joints that conventional thick probes cannot reach. Insulated conductors can be tested by piercing the insulation.

Male and female miniature connectors can be tested with reduced danger of accidental short circuits by using needle probes. A small needle may be inserted into a female contact for measurements. A large needle will slip over a male contact. Needles may be attached to conventional probes with an alligator clip, or holders can be fashioned for custom-made needle-tip probes.—*Maurice Sasson, M.D., W2JAJ, Bronx, New York*

[Editor's Note: In some states, hypodermic needles are available by prescription only. If you wish to use them for test probes, ask your physician for them. Remember that the needles are *very* sharp, and exercise appropriate care in their use and storage.

As an alternative, most hobby shops carry brass rod and tubing and steel piano wire that can be made into probe tips. These materials are less brittle than hypodermic needles; they can be formed into special shapes and sharpened as required. Use heat-shrink tubing to insulate all but the very tip of the probe for work in areas of tightly packed components.

Miniature connectors with separate pins that are inserted in the connector body after soldering are often available. Buy some extra pins, male and female, and make test probes from them.]

A HOME-BUILT SPINNER KNOB

☐ A search of the local parts sources and several ham flea markets failed to produce the spinner knob and ¼-inch-shaft panel bushing needed to install a roller inductor in my latest construction project. Consequently, I developed my own hardware.

A ¼-inch phone jack, with the contacts removed, serves as the panel bushing. The spinner knob came from a small bait-casting reel at the local fishing-tackle repair shop. Begin the installation by threading the end of the inductor shaft for a ¼ × 28 nut. Next, file flats on opposite sides of the threaded shaft to fit the hole in the reel handle. Install the phone jack/panel bushing, insert the

shaft, place the reel handle and secure it with an acorn nut for appearance.—*Charles Barnhart, W9ARC, Mobile, Alabama*

RFI AND TOUCH-CONTROLLED LAMPS

☐ I have found a simple cure for those touch-controlled lamps that turn themselves on and off during nearby radio transmissions. In my case, 40-meter operation gave the most trouble, with 75-meter operation a close second. Higher frequencies presented no problem. (I use a ground-mounted vertical antenna for 80, 40 and 15 meters, and the lamp is approximately 150 ft from the antenna. An ac-line filter at the lamp did not eliminate the problem.)

A 1-kΩ resistor (in series with the signal-input lead to the encapsulated circuit that operates the lamp) cured the problem for me. I suppose the required resistor value would vary with the RF-field intensity and frequency.—*John M. Adams, W7OTC, Sun City, California*

KEEPING MAGAZINES IN ORDER

☐ Some publishers print a short diagonal stripe on the binding of each magazine issue so a continous stripe is formed when all issues of a particular volume are arranged in order. This makes it easy to spot missing issues and refile those that have been taken out for reference. With a ruler and marking pen, you can apply this idea to any group of magazines or books. Simply arrange the magazines in proper order and mark a diagonal line across the bindings. You could mark each year separately or mark an entire shelf at once. —*Leonard Nielsen, NØAMJ, Yankton, South Dakota*

TAKE A BITE OUT OF CRIME

☐ Although the incidence of mobile-rig theft has waned somewhat, I still worry about leaving my 2-meter mobile rig exposed when my car is parked all day at the train station. Here is a solution to the worrisome problem.

I asked my wife to cut a piece of black velvet for me, which I simply drape over my floor-mounted radio when leaving the car. The black material absorbs light and gives little or no reflection. I am surprised how well the rig "disappears" when viewed through the car window. This solution works very well with black floor mats. It is no longer necessary to put the rig in the trunk when leaving the car—at most, I disconnect and stow the antenna.—*Lewis I. Hegyi, N2BPO, Cinnaminson, New Jersey*

☐ To my great consternation, there was absolutely no place to install a 2-meter mobile rig in my new Dodge Caravan. I solved the problem by building a center-mounted storage cabinet to fit between the front seats. The cabinet is large enough to ensure adequate ventilation, and has two adjustable tension hinges to hold the open swing top at a proper angle for operation.

Figs. 4 through 6 show my installation. The dimensions are not included, as they must be determined by the builder for each situation. Take care to mount the rig sufficiently far back in the cabinet so that the microphone and cable clear the box front when the top is closed. Provide openings in the side and back for ventilation. (The side ventilation holes in my box are shown in Fig. 5.) I do not close the box when operating, only when leaving the car.—*Warren Johnson, N4GHK, Alexandria, Virginia*

Fig. 4—N4GHK's crime-preventing mobile cabinet. Spring-tension hinges hold the open lid at a comfortable angle.

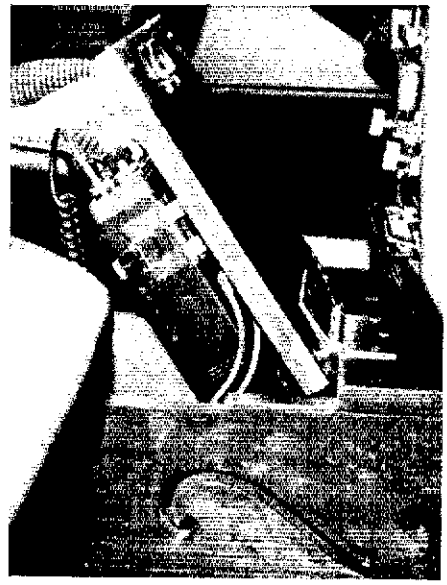


Fig. 5—Ventilation holes in the cabinet sides and back provide air flow to cool the radio.

Fig. 6—The closed cabinet provides no temptation for radio thieves.

(continued from page 18)

can be made to cover the desired 26- to 48-kHz offset range while varying the varactor voltage within the range of 0.3 to 2. The VXO amplifier trimmer capacitors are tuned for maximum 145-MHz output into a 50-ohm load. A VHF pick-off similar to the UHF pick-off is used to ensure alignment at 145 MHz.

Peak voltage rating for all the UHF transistors is 36 V, and it is difficult to exceed this value when they are connected to the low-Q stripline circuitry, regardless of load mismatch. Many transistor failures are caused by self-oscillation at lower frequencies, and the 1-μF capacitors across the 0.001-μF feedthrough capacitors are there to prevent this from occurring. One source of failure is an accidental transient short of the collector to ground. This can result in a high-voltage spike capable of destroying the transistor. It's possible to exceed the maximum rated current during tune-up. Start the alignment at a reduced voltage level while monitoring the current for each stage.

All trimmer capacitors in the UHF assembly will be near minimum value except for C12. All should be adjusted for maximum 435-MHz output except for C19. This capacitor is adjusted to the minimum value that produces the desired drive.

When tuned for maximum efficiency, the output is over 16 W with a final-amplifier efficiency of 56%. While not outstanding, it is acceptable, considering that the power-measuring method is likely pessimistic.

Results

I have had consistent access to OSCAR 10 with the transmitter connected to a 7-turn helical antenna similar to the one described in the ARRL *Handbook*. There is 25 feet of mini RG-8 foam coaxial cable (Radio Shack RG-8M) between the transmitter and antenna. The homemade receiver uses an MRF901 preamplifier connected to a four-element Yagi. Satellite operation is great for the experimenter—you don't have to rely on someone else's report for a signal evaluation! Give this transmitter a try and have some fun!

Notes

[1]International Crystal Mfg. Co., Inc., 10 N. Lee, P.O. Box 28330, Oklahoma City, OK 73126; John Meshna, Jr., Inc., P.O. Box 62, E. Lynn, MA 01904; MHz Electronics, 2111 W. Camelback Rd., Phoenix, AZ 85015; Westcom, 1320 Grand Ave., San Marcos, CA 92069.

[2]Motorola Semiconductor Products Inc., Box 20912, Phoenix, AZ 85036.

[3]F = (9/5 × C) + 32.

Technical Correspondence

Conducted By Jerry Hall, K1TD
Associate Technical Editor

RADIATION HAZARDS

☐ Dr. Ian White, G3SEK, and Roger Blackwell, G4PNK, have drawn attention to the paper presented by Henryk Cichon, SP9ZD (a member of the IARU Region 1 EMC Working Group) and Hubert Trzaska (of Wroclaw Technical University) at the fifth EMC Symposium at Zurich a few months ago, "RF Hazards and the Radio Amateur." White and Blackwell, whose work in this field is well known, write:

"The Polish authors have measured E fields around a number of typical amateur HF stations, and their conclusions agree rather well with our own (*Rad Com*, Feb. 1982), which were based on VHF/UHF measurements. At HF you are likely to be in the near field of your antenna, so E-field RF exposure limits are an appropriate basis for comparison. The present or proposed limits in Western countries are currently about 500 V/m at 3.5 MHz, decreasing as (1/f) to about 60 V/m at 28 MHz, and staying at that lower value through 144 MHz. SP9ZD's measurements are as follows:

"1) On 14-28 MHz, 500 W into a three-element trap tribander 5 m above the roof ridge produced E fields of 1-2 V/m in the attic and 0.5 V/m upstairs. Fifteen centimeters away from the transmitter, and all along the feeder, the E field was 25 V/m, dropping off rapidly to 0.5 V/m at distances more than 1 m.

"2) On 3.5-28 MHz, 500 W to a trap vertical on a flat roof produced 150-250 V/m on both lower floors. The shack was on the ground floor, and fields of 0.5 to 1 V/m on both the ground floor and the first floor were mainly from feeder radiation; up to 60 V/m was observed at 15 cm from the feeder or the rig. (So it seems that G6XN is right — it is very difficult to keep stray RF currents off the feeder of a 'ground plane' antenna with radials — G3SEK.)

"3) In contrast, 150 W on 3.5 and 7 MHz to a trap dipole fed with a balun produced only 2 to 5 V/m around the transmitter and feeder.

"4) The worst case reported by SP9ZD was that of a 42 m (138 ft) long-wire antenna strung between two five-story steel/concrete buildings. Part of the antenna was vertical, 1 m away from the wall, and led down to the shack on the first floor. With 100 W on 3.5-28 MHz, E fields of 20 V/m were measured in parts of both buildings. On 3.5 MHz, the transmitter case felt 'hot' when touched, and the E field close to the surface of the metal case was 1 kV/m.

"The situations reported by SP9ZD are representative of a wide range of amateur HF stations, so what can we learn from them? In most cases the E fields were well below the Western limits, and even below the much more restrictive Polish limits, so normally there seems little cause for concern about RF hazards from amateur HF stations, especially when the limited duty cycles of amateur transmissions are taken into account. However, severe symptoms of 'RF in the shack' (sometimes indicated by tingling sensations when touching supposedly grounded metal objects) ought to be eliminated. RF in the shack isn't contributing to the strength of the signal—except in TV and hi-fi sets—and it may be hazardous."

What could be a potential but seldom-recognized RF hazard has also been brought to my notice by Bill Hall, G6ZRB. He recently attended a local society meeting with someone who had just passed the Radio Amateur Examination and arranged for another amateur to demonstrate to him two-way operation on his 144-MHz, 25-W mobile equipment. While the demonstration took place, G6ZRB stood beside the car with his head only a few inches away from the antenna. That night he awoke with violent head pains above his right eye, which persisted until noon the next day. He wondered if this could have been induced by the RF radiation.

While it would be near to impossible to say definitely whether or not this was the case, undoubtedly it is unwise to stay with your eyes only a few inches from a 144-MHz, 25-W transmitting antenna. It is now usually recognized that hand-held transceivers with "rubber duck" antennas pose a potential hazard if the RF output is more than about 7 W because of the proximity of the antenna to the eyes, which are the most sensitive organs to nonionizing radiation.

I do not recall having seen any previous comment on potential risk to a spectator watching operation from a stationary vehicle. While the chances are that G6ZRB's head pains were not caused by RF, it seems worth warning people not to stand so close to a VHF antenna radiating more than a few watts. —*Adapted from the Dec. 1983 Technical Topics column of* Radio Communication, *the journal of The Radio Society of Great Britain.*

THE WINDOM J-L REVISITED

☐ A new version of the Windom J-L, which outperforms the original on the 30-meter band, has recently been developed and tested.[1] The original Windom J-L antenna was configured as a standard Windom (fed with a single-wire, horizontally polarized) for the 30-meter band. This newer version is a half-wave, inverted-J vertical radiator.

My major reason for experimenting with a different configuration was to improve communications with Africa, Asia and South America from my station. (The original Windom J-L at my location favored a bidirectional pattern aimed at Europe and Oceania.) Also, I was not pleased with the radiated signal in the favored directions. By comparison, the inverted-J section of the original antenna performed quite well on the 20-meter design frequency. I thought conversion of the Windom J-L into a vertical radiator on the 30-meter band would produce a lower radiation angle and omnidirectional radiation pattern. The difference with the change is spectacular, especially on 30 meters, but also on 80 and 160 meters.

[1]R. R. Schellenbach, "A New Antenna Twist —The "Windom J-L," *QST*, Jan. 1984, pp. 37-39.

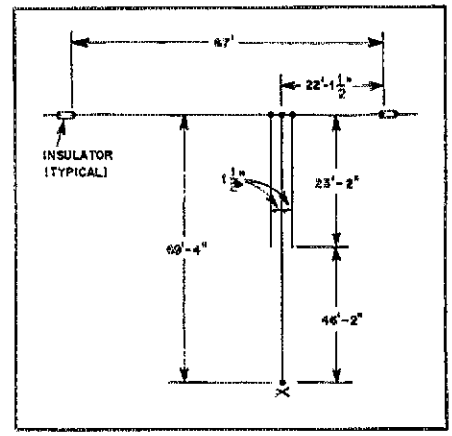


Fig. 1—The new Windom J-L antenna at full size, a configuration for mounting at a height of approximately 67 feet. The antenna is fed against ground at point X, where a Transmatch may be used (see Table 1).

Table 1
Approximate Feed-Point Impedances of the Windom J-L

Band	Impedance (ohms)	Band	Impedance (ohms)
160 m	30-40	30 m	1000+
80 m	1000+	20 m	600
40 m	600	15 m	600

Two formats for the new Windom J-L are presented. Both were assembled and tested with practically the same on-the-air results. Fig. 1 depicts a multiband Windom J-L at a height of approximately 67 feet. Fig. 2 shows the antenna configuration for mounting at 58 feet above ground. Both versions are fed directly by a multiband Transmatch connected at point "X" in each figure. An appropriate Transmatch is necessary because this antenna is capable of radiating on all HF amateur bands. Feed methods are left to the requirements of the individual. Table 1 shows the feed-point impedance for each band.

The Windom J-L now operates as a quarter-wave inverted L on 160 meters, a half-wave inverted L on 80 meters, a half-wave regular off-center-fed Windom on 40, 20 and 15 meters and as a half-wave inverted J on 30 meters.

Similar to the original Windom J-L, this version requires an effective ground system for efficiency and to prevent unwanted RF in the shack. My installation incorporates a remote Transmatch, well separated from the

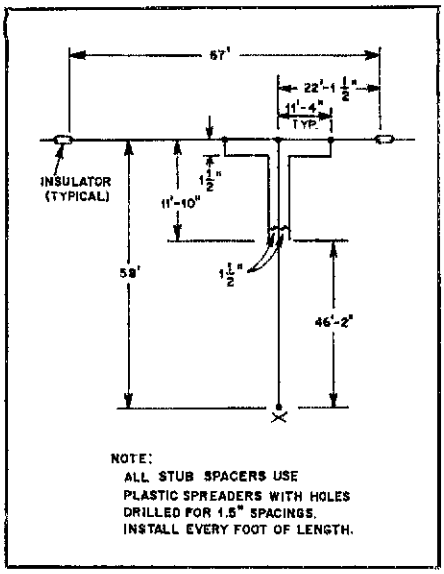


Fig. 2—A reduced-size version of the new Windom J-L antenna for mounting at a lower height than that of Fig. 1. The antenna is fed at point X.

base of the antenna. Coaxial cable is used from the station to the Transmatch; this helps reduce stray RF in the shack.

With the advent of decreasing solar activity, the HF bands above 14 MHz are becoming less productive for DX operation. The yeoman tasks for communicating will fall upon the bands at 10 MHz and below. The reconfigured Windom J-L is more compatible than its predecessor with developing propagation conditions.—*Richard R. Schellenbach, W1JF, 12 Whitehall Ln., Reading, MA 01867*

BALANCED ANTENNAS

☐ I have received a number of letters about the balanced-T antenna tuning unit (ATU) I briefly described in a previous Technical Correspondence item (May 1981 *QST*, p. 43). This subject has recently come to light as a result of remarks I made on the Teleconference Radio Network (June 21, 1984). My apologies to those who wrote me earlier, and to whom I did not reply.

There were questions about the terms "virtual ground," "balanced" and "unbalanced," as applied to circuits. Let me discuss the subject of "virtual ground." An equivalent circuit for a balanced antenna fed with a balanced feeder can be depicted as: (1) a balanced antenna fed by a balanced generator (with neither terminal grounded) matched to the antenna impedance; or (2) two current generators oppositely phased, (180°-phase difference) each matched to half of the antenna impedance. If the antenna is a balanced dipole, neither half of the antenna is grounded. The current generators of case two, which are in series, may be either isolated from ground or grounded at the series connection. Since the systems are electrically equivalent, the case with a physical connection to ground is equivalent to the case where there is no connection to ground (except for the advantage that a true ground removes any dc charge on the antenna). Therefore, the circuit that has no connection to ground can be visualized as connected to a virtual ground.

In antenna modeling, the virtual image of a monopole antenna of an electromagnetic ground plane (EMGP) loop or of a half loop can be replaced by a real image, which is the other half of the antenna. Each half of the antenna, therefore, is balanced with respect to a virtual ground, which for the monopole or half loop corresponds to a perfectly conducting ground plane.

In the balanced T-match ATU of my *QST* Technical Correspondence, the real ground connection is made through the transmitter side of a balun. The inductor, L1, does not have a grounded center tap, but the circuit is balanced; currents flowing in each half of the inductor behave as if there is a center tap connected to ground. Since there is no center tap, the circuit is balanced with respect to a virtual ground — as is the antenna.

Components that are suitable for an unbalanced T-match are suitable for the balanced version. That is, each section of C1 and C2 should be 200-350 pF, and L1 should be 25-28 μH, depending on the range of antenna impedances to be matched and on the frequency of interest. The larger inductor and capacitor values are needed to match extremes in impedance variation for operation on the 160-meter band. The balun, T1, has a 4:1 impedance ratio.

A balanced ATU can be used to tune unbalanced loads without reconnection. Ground one of the ATU terminals and feed the unbalanced antenna from the other terminal. A wide range of balanced and unbalanced antenna impedances can be matched in this way. The balun stays cool with maximum legal input, and the balanced antenna is properly fed.—*John S. Belrose, VE2CV, ARRL Technical Advisor, 3 Tadoussac Dr., Aylmer, Quebec, Canada J9J 1G1*

STRAIGHT-LINE FREQUENCY, ANYONE?

☐ I write because of a statement in W4RHZ's article, "Shapes of Variable Capacitor Plates," in October, 1984 *QST*. He says, "For most Amateur Radio work, we are dealing with relatively small tuning ratios, such as from 7.0 to 7.4 MHz. In this narrow band, it is possible to make your own SLF capacitor by selecting a semicircular-plate capacitor ... Draw the general shape of an SLF capacitor plate onto the rotor and stator plates of your capacitor. Then, carefully cut or file the plates to shape." Let us hope we can rescue some perfectly good variable capacitors from such an unkind fate.

The essential point, which neither W4RHZ nor Dr. Ghirardi in the 1933 "A Radio Physics Course" bring out, is that a given capacitor shape is valid only for the frequency ratio for which it is designed. This was well understood in 1933. Example: From a National Company advertisement in the 1936 *Handbook*, "Plate shape is straight-line frequency when the frequency range is 2:1."

Over the frequency range 7.0 to 7.4 MHz, a frequency ratio of about 1.06 to 1, the plate shape that would produce perfect straight-line-frequency tuning is so near to straight-line capacitance that the eye could hardly see the difference. Putting it another way, to cover any of the amateur bands, a tuning capacitor having straight-line-capacitance (semicircular) plates will give excellent straight-line-frequency tuning. Even on the band of widest frequency ratio, 3.5 to 4 MHz (about 1.14 to 1), the departure from straight-line-frequency will hardly be noticed. So don't chop up those capacitor plates!

As a matter of interest, nearly all of National Company's SLF capacitors were shaped for a 2:1 tuning ratio. The very common "Midline" or "Centraline" plate shape was most nearly SLF at a tuning ratio of about 1.65:1. For the standard broadcast band, with its tuning ratio of 3:1 or even more, it is very rare to find a tuning capacitor giving true SLF tuning, although they do exist. Most broadcast-band capacitors are a compromise between cost, compactness and an artistic dial, and they give crowded tuning at the high-frequency end.

The discussion of bandspreading that appears in older editions of *The ARRL Handbook*, at least into the early '70s, is excellent, and will give excellent results when a straight-line-capacitance variable tuning capacitor is used. The one exception is that using a fixed capacitor in series with the tuning capacitor to restrict its frequency coverage will upset the frequency linearity.

One other minor point: If you should get into a situation where you really do have to modify the tuning curve of a variable capacitor, usually only the rotor plates have to be shaped.—*Jim Lomasney, WA6NIL, 2501 Waverly St., Palo Alto, CA 94301*

Feedback

M1 of Fig. 3 in "Learning to Use Field-Strength Meters," March 1985 *QST*, page 27, should be a 0-1 mA meter.

With reference to the Technical Correspondence column in February 1985 *QST*, Art Rideout, WA6IPD, points out a fallacy in the Editor's Note, page 43, beginning at the bottom of column 2. Because of its small wire size, an average RF choke connected in series with the third (ground) wire of the ac line would not maintain ground integrity. The choke, if wound of no. 12 or no. 14 wire, would be too large for the electrical box, and in any event the scheme would be a violation of the National Electrical Code.

In the February 1985 *QST* article, "Six Winners Emerge from ARRL Antenna Competition," information on page 45 should indicate that the size of Robert T. Hart's loop is 8 feet in circumference, rather than 6 feet in diameter.

Errors appear in Fig. 3 of "First Steps in Radio," March 1985 *QST*, page 35. The two transformers should be shown with a 12-0-12 V secondary for T1 (24-V CT) and 18-0-18 V for the T2 secondary (36 V CT). In Fig. 5, page 36, no connecting dot should be shown at the R1-D1-transformer lead junction; R1 and D1 are series connected. Also, the negative dc output lead should be removed from the C1-C2-transformer lead junction and connected to chassis ground.

In the April Product Review of the Heath SW-7800, several words were inadvertently dropped from the text. The bottom of the first column on page 45 should read: "Checks of components and solder connections revealed nothing that could cause the problem. Tests with a signal generator showed ..."

Happenings

Conducted By Bruce S. Hale, KB1MW
Manager, Regulatory Information Branch

- *Cable Television Deregulation*
- *Third-Party Participation*
- *ARRL Files Comments on 10, 24 and 902 MHz*

RF Bio-Effects Rule Adopted; Amateur Radio Exemption Proposed

The Federal Communications Commission has adopted a Report and Order that implements the requirements of the National Environmental Act of 1969 that the Commission consider the biological effects of radio-frequency (RF) energy when licensing stations or authorizing RF-emitting equipment. The action, in General Docket 79-144, will have no noticeable effect on most amateur operations; nonetheless, the subject is pertinent to all radio amateurs. Effective October 1, 1985, FCC actions, including the licensing of certain transmitting facilities mentioned below, will be considered "major actions" if the operation would result in exposure of workers or the public to high levels of RF energy. The provisions of the new rule will apply only to radio and television broadcast stations authorized under Part 73, experimental broadcast stations and low-power TV stations authorized under Part 74, transmitting satellite-earth stations authorized under Part 25, and experimental radio stations authorized under Part 5.

High levels are those which exceed the "American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz" (ANSI C95.1-1982).[1] Designation of an action as "major" means an applicant must file with the Commission a factual "narrative statement" dealing with prevention of excessive exposure. The FCC's Office of Science and Technlogy is preparing a technical bulletin for release in August or September that will help licensees comply with the new rule.

Amateur Radio stations are mentioned in a Further Notice of Proposed Rulemaking (NPRM) in the same docket. This Further Notice seeks comments on whether certain RF sources should be "categorically excluded" from consideration under this new rule. On page 4 of its Further Notice, the Commission states, " ... we propose to exclude the amateur radio service from the provisions of this rule amendment. In comments filed in this proceeding by the American Radio Relay League, evidence was presented that amateur operations, because of their intermittent nature and relatively low power levels, do not normally present a hazard to the public from RF radiation."

The Further Notice also proposes exclusions for other radio services. Among them would be land-mobile, microwave point-to-point, aviation, marine (other than shipboard satellite terminals) and certain low-powered broadcast equipment. Comments on the Further Notice of Proposed Rulemaking in General Docket 79-144 are due on or before June 19, 1985. Any replies to comments must be filed on or before July 19. An original and five copies of all filings are required and must be sent to The Secretary, FCC, Washington, DC 20554.

One of the concerns raised by ARRL and others throughout this proceeding was the adoption or proposal of RF exposure standards by various state and local jurisdictions. The League contended that state and local regulation is largely because of the lack of a federal standard. The League and other communications industry representatives have been calling for the issuance of a Commission policy statement on federal preemption. The policy statement is necessary, according to preemption advocates, because state or local RF exposure standards may adversely affect operations and public availability of interstate telecommunications services.

According to its Report and Order, the Commission gave the federal preemption matter "serious consideration." However, it does "not believe it is necessary at this time to resolve the issue of federal preemption of state and local RF radiation standards." The FCC pledged, however, that "Should non-federal RF radiation standards be adopted, adversely affecting a licensee's ability to engage in Commission-authorized activities, the Commission will not hesitate to consider this matter at that time."

The ARRL's select Committee on the Bio-Effects of RF Energy is studying the Commission's actions and preparing recommended ARRL comments for consideration by the League's Board of Directors.—*W. Dale Clift, WA3NLO*

CABLE TELEVISION DEREGULATION PROPOSED

The FCC has informed the public of its intent to reevaluate and update the rules governing cable television operation to reflect the current state of technology in the cable industry. In a Notice of Proposed Rulemaking in Mass Media Docket 85-38, released February 20, the Commision proposes, in part, to increase signal leakage levels from 20 to 50 microvolts per meter at a distance of 3 meters in the 54-216 MHz spectrum. Additionally, the FCC proposes to preclude local and state governments from the use of technical standards in franchising agreements that are more strict than those specified in bulletins published by the Office of Science and Technology.

According to a news release, the reasons for the Commission's actions include competition from other video services and maturation of the cable industry over the past decade. The news release also stated that present cable leakage levels were far more conservative than those for computers, television receivers, intrusion alarms and auditory training devices (Part 15).

The FCC particularly sought comments by March 29 on the proposed leakage levels at 54-216 MHz because this band is "especially critical because it provides the spectrum for VHF-TV, FM Broadcast, aviation, amateur radio operators and VHF land mobile operations." ARRL comments opposing the proposed relaxation of leakage standards are summarized in League Lines, this issue.—*Katherine Hevener, WB8TDA*

MORE ON THE REPEATER-COORDINATION DOCKET

The moratorium on new repeater operation imposed by PR Docket 85-22 may be gone, but the Commission doesn't want the Docket to be forgotten. A copy of an undated letter from Ray Kowalski, Chief of the FCC Special Services Division, arrived at ARRL Hq. recently. Sent by the FCC to all frequency coordinators listed in the 1984-85 edition of the ARRL *Repeater Directory*, the letter says, in part: "We invite you to consider the matters raised in this proceeding and to file written comments." A copy of the NPRM and the Order rescinding the moratorium were also sent with the letter.

ARRL *Repeater Directory* editor Jim Clary, WB9IHH, mailed a copy of the NPRM to frequency coordinators soon after it was received at ARRL Hq., but this action by the FCC indicates that the Commission is actively seeking, in this proceeding, comments concerning ways to solve repeater-to-repeater interference problems. Details on the NPRM and the moratorium are in the Happenings column in April 1985 *QST*. Copies of the NPRM may be obtained from ARRL Hq. by sending a large s.a.s.e. with 56¢ postage. Comments are due by July 1, 1985—formal

[1]Copies of this standard are available from ANSI, 1430 Broadway, New York, NY 10018, tel. 212-354-3300.

comment requires the filing of an original and five copies to: The Secretary, FCC, Washington, DC 20554. Single copies of comments will also be considered.

ARRL FILES REPLY COMMENTS IN 84-960, REQUESTS EARLY ACCESS TO 24 MHz

On March 12, 1985 the ARRL filed reply comments in PR Docket 84-960, the proposal to allocate frequencies at 10, 24 and 900 MHz to the Amateur Service on a primary basis. For details on the proposal, see Happenings, December 1984 *QST*. League comments request expedited implementation of the 24-MHz allocation, given the fact that 44 other countries have already authorized amateur use of 24.890 to 24.990 MHz. If some portions of the proposal to allocate new frequencies to the Amateur Service are considered controversial, ARRL comments request that the 24-MHz allocation be considered separately, in order to expedite amateur access to the 24-MHz band.

COMMISSION PROPOSES BAN ON THIRD-PARTY PARTICIPATION BY EX-HAMS

In a Notice of Proposed Rulemaking in PR Docket 85-51, the FCC proposes to amend Part 97 to specifically prohibit participation in Amateur Radio communications by anyone who has had his or her Amateur Radio license revoked or suspended. Section 97.79(d) permits an unlicensed person to *participate* in Amateur Radio communication: "The licensee of an amateur radio station may permit any third party to participate in amateur radio communication from his station, provided that a control operator is present and continuously monitors and supervises the radio communication to insure compliance with the rules." Individuals who have had their amateur licenses revoked or suspended have taken advantage of this provision. When Calvin Plageman, ex-WD6DSV, asked the Commission if he could "operate as a third party in the presence of a licensed operator," Robert Foosaner, Chief of the FCC Special Services Division, replied,

> Section 97.70(d) of the Amateur Rules allows a licensed amateur to permit a third party to "*participate* in amateur radio communication from his station." This rule exists to allow persons who are not licensed Amateur Radio operators to experience the benefits of this service and to stimulate their interest in Amateur Radio. Accordingly, it permits incidental communication by nonamateurs over amateur stations under certain very limited conditions. You, on the other hand, were formerly a licensed amateur who forfeited the right to operate an amateur station. Therefore you are not in the class of persons intended to be exposed to Amateur Radio by virtue of Section 97.79(d). Hence you are prohibited from communicating over Amateur Radio under any and all circumstances.

To clarify this policy, the FCC proposes to amend Section 97.114 to state specifically that the licensee of an amateur station may not permit an individual who has had his or her amateur license revoked to participate in amateur communications. Any amateur allowing such an individual to participate from his or her station would be in violation of Part 97 and could receive a Notice from the FCC.

Comments on this proposal are due by May 14, 1985, reply comments by June 17, 1985. Formal comment requires the filing of an original and five copies to The Secretary, FCC, Washington, DC 20554. A single copy will be considered informally.

Are You a Lawyer?
Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League has initiated a Volunteer Counsel Program, designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help. If you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St., Newington, CT 06111.

If you live in one of the following ARRL Sections, your legal experience is especially needed: North and South Dakota, Arkansas, Mississippi, Maine, Rhode Island, Alaska, Idaho, Montana, Nevada, North and South Carolina, West Virginia, Utah and North Florida.

MOBILE RADIO BAN DEFEATED IN ARIZONA

In February, a proposal was introduced into the Arizona state legislature that would have prohibited the operation of mobile communications equipment, including Amateur Radio equipment, in a moving vehicle. Arizona amateurs and other users of mobile radio equipment, including AT&T, responded quickly to the challenge, and the bill was killed.

Designated S.B. 1346, the proposed legislation stated, in part, "A driver of a vehicle shall not operate a car telephone unless the vehicle is stationary and at a location which does not interfere with other traffic. For the purpose of this subsection, 'car telephone' means a device which is attached to a vehicle and in which sound is converted into electrical impulses for transmission without a wire and includes citizen band radios or other similar mobile radios."

The bill also proposed to prohibit operating a motor vehicle equipped with a television receiver visible to the driver.

The proposed legislation would not have applied to authorized emergency vehicles, vehicles operated by an employee of "a political subdivision" of the state or vehicles operated outside the boundaries of an incorporated city or town. In a letter to Arizona Section Manager Jim Swafford, W7FF, State Senator Jack Taylor said the bill would not come up for consideration in the Transportation Committee during the current session.

FCC CENSURE-Y CLUB

Eugene Sykes, W4OO—On February 15, 1985, a jury in the U.S. District Court for the Southern District of Florida returned a verdict against Eugene C. Sykes in the case of U.S. vs. Eugene C. Sykes. The U.S. had brought suit against Sykes to collect a fine of $550 imposed by the FCC for excessive power operation in the amateur Novice bands.

Sykes, W4OO, an Extra Class amateur, was caught operating on a Novice frequency with excessive power by Commission personnel on May 27, 1982. The FCC monitored him because of complaints that he had been causing malicious interference to another amateur operator. Engineers from the Miami field office and the Ft. Lauderdale monitoring station found that Sykes was operating with more than 540 watts on a frequency limited to 250 watts. As a result, the Commission imposed a $550 fine for his willful violation of Section 97.67 of the Amateur Rules. Sykes refused to pay, and the Commission referred the matter to the U.S. Attorney for the Southern District of Florida to file suit to collect the fine.

The trial in the Sykes case was held in Miami on February 13 and 15, 1985, with U.S. District Judge Lenore Nesbitt presiding. Judge Nesbitt will determine the amount, including any court costs, that Sykes will have to pay.

ARRL ASKS FCC TO CLARIFY VEC "SUCCESSFUL COMPLETION" RULES

Under the VEC Program, when a candidate passes an examination to upgrade, he or she is issued a Certificate of Successful Completion. The Certificate allows the amateur to operate with upgraded privileges until the new license arrives from the FCC. League staff have been informed by the Gettysburg FCC office that the Successful Completion Certificate is not sufficient to entitle a person to take the next higher class of license examination. A candidate must either wait for his or her new license to arrive before testing for a higher class license, or retake the element already passed, as well as the examination for the higher class of license.

A letter from ARRL Legal Counsel Chris Imlay, N3AKD, dated March 15, asks the FCC to clarify this situation. When the FCC gave amateur examinations, the Interim Operating Permit was sufficient evidence that a candidate held the class of license shown on the permit. The letter states in part, "It would not seem that one who earns upgraded privileges should be denied the ability to further upgrade his/her license class because of administrative delay in issuing a permanent license to that individual. Rather, the Successful Completion Certificate should do what it purports to do—offer evidence that a person has passed the exam elements for the class of license shown on the Certificate."

FCC CHICAGO DISTRICT OFFICE MOVES

Effective March 4, 1985, the new address for the FCC Chicago District Office is: Park Ridge Office Park, Room 306, 1550 Northwest Highway, Park Ridge, IL 60068. The new telephone numbers are 312-353-0195 and 312-298-5171 for a recording. The Chicago District Office will share this location with the

William F. Fenn, N4TS, latest $1000 contributor to the Goldwater Scholarship Fund.

Be a Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution *now.*

If your contribution is $25 or more, we will list your name and call in *QST.* If your contribution is $100 or more, in addition to your name and call appearing in *QST,* you will receive a signed photograph of the Senator, suitable for display in your ham shack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST.*

We welcome all contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being? Please make your check payable to the ARRL Foundation Goldwater Scholarship Fund, and send to ARRL Foundation, 225 Main St., Newington, CT 06111.

Recent contributors of $25 or more include the Keystone VHF Club.

Regional Office. Public inquiries concerning telecommunications matters, complaints of electronic interference and schedules for radio operator examinations should be directed to the above address. Office hours are 8 A.M. to 4:30 P.M. local time.

JOIN THE ARRL "ALL-RISK" HAM RADIO EQUIPMENT INSURANCE PROGRAM

A special enrollment period is in progress until June 1 for the ARRL "All Risk" Ham Radio Equipment Insurance Program. All ARRL members may enroll with guaranteed acceptance regardless of any previous loss experience.

Insured equipment and accessories are covered for loss because of theft or damage caused by fire, lightning, collision, short circuiting or other electrical problems, tornado, floods and other natural calamities.

Coverage is extended to include equipment at home, in the car, or at a Field Day or Hamfest site. Furthermore, if new equipment valued up to $1000 is purchased or acquired during the policy year, that equipment is covered at no additional cost until the next renewal of the policy. Loss or damage to antennas, towers or rotors is not covered.

The most outstanding feature of the program remains the cost. This comprehensive insurance program can be purchased for an entire year for only $1 per $100 of replacement cost value. Other policies on the market can cost up to $8 per $100 of replacement cost, with an added premium for mobile and computer equipment.

Complete details about the coverage provided by the ARRL "All-Risk" Ham Radio Equipment Insurance Program will be sent to League members. Simply write to ARRL Insurance Program, Information Services Department, ARRL Hq., 225 Main St., Newington, CT 06111. To save time, an application is provided on page 161 of this issue. Simply complete the short application, and mail it with your first annual premium check to the ARRL Insurance Administrator: Albert H. Wohlers and Co., ARRL Group Insurance Plans, 1500 Higgins Rd., Park Ridge, IL 60068, tel. 312-698-2221.

ROBERT YORK CHAPMAN, W1QV, STEPS DOWN AS ARRL FOUNDATION PRESIDENT

At the annual meeting of the ARRL Foundation in Hartford this past January, Robert York Chapman, W1QV, for health reasons, declined to run for reelection as President of the Foundation. Mr. Chapman has served the League as New England Division Director from 1965 to 1975 and as founding President of the ARRL Foundation. He will continue to serve the Foundation as industrial director.

ARRL Midwest Division Director Paul Grauer, WØFIR, has been elected to the office of Foundation President. Paul is a long-time League Director and supporter of the Foundation.

In other issues, the Foundation Board authorized a grant of $10,000 to AMSAT as matching funds for the AMSAT Phase III-C satellite launch fund. The Board welcomed new directors Tom Frenaye, K1KI, and Linda Ferdinand, N2YL, ARRL New England and Hudson Division Directors, respectively.

Chapman Elected President Emeritus

In a separate move, the ARRL Foundation Board elected Robert York Chapman, W1QV, to the office of President Emeritus, in recognition of his outstanding record of support for the Foundation and for Amateur Radio—*Richard Palm, K1CE*

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Southern Texas, Colorado, San Francisco, Sacramento Valley, Los Angeles, Georgia, West Virginia and Washington Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

A petition, to be valid, must contain the signatures of five or more Full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition.* It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters, but are not required. The following form is suggested:

(Place and date)

Field Services Manager, ARRL
225 Main St., Newington, CT 06111

We, the undersigned Full members of the ... ARRL Section of the ... Division, hereby nominate ... as candidate for Section Manager for this Section for the next two-year term of office

(Signature ... Call ... City ... ZIP ...)

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 P.M. Eastern Local Time, June 7, 1985.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before July 1, 1985. Returns will be counted August 20, 1985. SMs elected as a result of the above procedure will take office October 1, 1985.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1985.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in October *QST.* An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by appointment by the Field Services Manager.

You are urged to take the initiative and file a nominating petition immediately.

Richard K. Palm, K1CE
Field Services Manager

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Kentucky Section by the petition deadline of December 7, 1984, as a result of notices in the October and November *QST,* nominating petitions for this Section are herewith resolicited. See the above notice for details on how to nominate.

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two-year term of office July 1, 1985:

Uncontested

Maryland-DC—John Barolet, KJ3E
New Hampshire—William Burden, WB1BRE (W1NH withdrew his two petitions in favor of WB1BRE)
Rhode Island—John Vota, WB1FDY
San Joaquin Valley—Charles P. McConnell, W6DPD

SECTION MANAGER APPOINTMENT

In the Santa Barbara Section, Byron W. Looney, K6FI, has been appointed to complete the term (until December 31, 1985) of Ernest L. Kapphahn, WB6HJW (resigned).

AUDITED ARRL FINANCIAL STATEMENTS RELEASED

The audited financial statements reprinted below set forth the League's financial condition as of December 31, 1984, as compared to a year earlier. The statements show an after-tax net gain of $61,866 on total revenues of $6,684,493 for the calendar year 1984.

The financial statements and supplementary financial information will appear in the 1984 *Annual Report,* which will be available in May. Affiliated clubs that return the request form sent to them in April will be receiving a copy of the *Annual Report* as soon as it is received from the printer; members may obtain a copy for a $1 postage and handling fee.

Price Waterhouse

ONE FINANCIAL PLAZA
HARTFORD, CT 06103
203-525 4600

February 27, 1985

To the Board of Directors of
The American Radio Relay League,
Incorporated

In our opinion, the accompanying balance sheet and the related statements of revenues and expenses and changes in general fund balance and of changes in financial position present fairly the financial position of The American Radio Relay League, Incorporated at December 31, 1984 and 1983, and the results of its operations and the changes in its general fund balance and of changes in its financial position for the years then ended, in conformity with generally accepted accounting principles consistently applied. Our examinations of these statements were made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Our examinations were made for the purpose of forming an opinion on the basic financial statements taken as a whole. Schedules I - II are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the examination of the basic financial statements, and in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Price Waterhouse

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
BALANCE SHEET

	December 31, 1984	December 31, 1983
Assets		
Current assets:		
Cash and short-term investments (including time deposits of $100,000 in 1984 and $220,000 in 1983)	$ 1,065,693	$ 948,350
Accounts Receivable (less allowance for doubtful accounts of $26,500 in 1984 and 1983)	467,093	419,506
Due from brokers for securities sold	-	150,000
Accrued interest receivable	40,327	52,356
Inventories	241,659	235,188
Prepaid expenses	49,133	38,466
Due from life membership assets	-	179,516
Total current assets	1,863,905	2,023,382
Life membership assets:		
Due from (to) current operations	47,935	(179,516)
Accrued interest receivable	84,086	104,266
Marketable securities, at cost	3,643,013	3,794,753
Life membership plaques	8,093	4,216
	3,783,127	3,723,719
Regular portfolio marketable securities, at cost	1,199,367	673,356
Fixed assets:		
Land and Buildings	1,154,093	1,148,930
Furniture and equipment	1,061,370	942,295
	2,215,463	2,091,225
Accumulated depreciation	(1,060,653)	(837,401)
	1,154,810	1,253,824
Other assets	45,114	42,980
Total assets	$ 8,046,323	$ 7,717,261

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
BALANCE SHEET
(Continued)

	December 31, 1984	December 31, 1983
Liabilities and General Fund Balance		
Current liabilities:-		
Accounts payable:		
R. R. Donnelley & Sons Company	$ 284,484	$ 91,772
Other	178,034	109,438
	462,518	201,210
Accrued liabilities	338,346	254,604
Due to brokers for securities purchased	-	257,130
Deferred membership fees and subscriptions - current portion:		
Life members	324,258	298,802
Term members	1,152,887	1,205,174
Current portion of mortgage note payable	29,573	26,970
Income tax payable	86,892	216,156
Due to life membership assets	47,935	-
Total current liabilities	2,442,409	2,460,046
Deferred membership fees and subscriptions - non-current portion:		
Life members	3,458,869	3,353,036
Term members	320,473	112,536
	3,779,342	3,465,572
Mortgage note payable	37,905	67,479
Loan payable	36,500	36,500
Reserves:		
For promotion of amateur radio overseas	5,594	5,594
For Colorado Convention Fund	5,471	5,177
For Project Goodwill	20,136	20,219
For H.P. Maxim Award	21,258	21,571
	52,459	52,561
General fund balance	1,697,708	1,635,103
General fund balance and reserves	1,750,167	1,687,664
Total liabilities and general fund balance and reserves	$ 8,046,323	$ 7,717,261

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
STATEMENT OF REVENUES AND EXPENSES AND CHANGES IN GENERAL FUND BALANCE

	Year ended December 31, 1984	Year ended December 31, 1983
Revenues:-		
Publications:		
Advertising-QST magazine	$ 1,975,111	$ 2,071,876
QST newsdealers sales	142,779	133,188
Standard Handbook sales	543,861	416,289
Booklet sales	573,627	539,133
Booklet advertising sales	16,929	14,371
Tune in the World sales	134,023	125,676
Tune in the World advertising sales	10,216	12,425
Call Directory sales	93,575	68,993
QEX income	18,011	14,414
ARRL Letter	16,606	18,845
	3,524,740	3,415,210
Other:		
Membership dues (including membership subscriptions to QST magazine)	2,776,554	2,766,888
Membership supplies sales	138,004	131,469
Interest, dividend and royalty income	208,144	184,932
Revenue from donated equipment, materials and supplies	22,533	-
Increase in cash surrender value of life insurance	2,134	2,226
Contributions	680	4,021
H.P. Maxim and other awards income	500	19,375
Cash discounts taken	4,485	3,182
Overseas QSL service income	26,250	31,911
Gain on sale of investments	4,638	19,663
Legal defense contributions	-	1,602
Examination fees	17,736	-
RSGB membership dues	1,723	-
	3,203,381	3,165,269
Total revenues before deductions	6,728,121	6,580,479

Deductions from revenues:		
Discounts allowed	8,419	37,444
Exchange and credit card collection charges	19,758	17,830
Sales returns and allowances	15,451	16,490
Total deductions from revenues	43,628	71,764
Total revenues, net	6,684,493	6,508,715
Expenses:		
Operating expenses	6,199,343	5,685,456
Administrative expenses - other expenses authorized by the Board of Directors	336,392	309,780
Total expenses	6,535,735	5,995,236
Excess of revenues over expenses before income tax	148,758	513,479
Income tax on unrelated business income	(86,892)	(211,409)
Excess of revenues over expenses	61,866	302,070
General fund balance:		
Beginning of year	1,635,103	1,353,604
Reserve for H.P. Maxim Award	739	(20,571)
End of year	$ 1,697,708	$ 1,635,103

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
STATEMENT OF CHANGES IN FINANCIAL POSITION

	Year ended December 31, 1984	1983
Financial resources were provided by:-		
Excess of revenues over expenses	$ 61,866	$ 302,070
Add (deduct) income charges (credits) not affecting working capital:		
Depreciation	240,472	212,527
Decrease in reserves	(102)	(2,534)
Increase in cash surrender value of life insurance	(2,134)	(2,226)
Working capital provided by operations	300,102	509,837
Increase in deferred membership fees and subscriptions - non-current portion:		
Life members	105,833	253,821
Term members	207,937	-
Total	613,872	763,658
Financial resources were used for:		
Additions to furniture and equipment	140,720	197,165
Reduction in non-current portion of mortgage note payable	29,573	26,970
Increase in life membership assets	59,408	289,394
Increase in marketable securities	526,011	88,199
Decrease in deferred membership fees and subscriptions - non-current portion:		
Term members	-	185,469
	755,712	787,197
Decrease in working capital	$(141,840)	$ (23,539)
Changes in components of working capital		
Increase (decrease) in current assets:		
Cash and short-term investments	$ 117,343	$(305,636)
Accounts receivable, net	47,587	43,248
Due from brokers for securities sold	(150,000)	150,000
Accrued interest receivable	(12,029)	19,674
Inventories	6,471	(38,114)
Prepaid expenses	10,667	16,259
Due from life membership assets	(179,516)	179,516
Total	(159,477)	64,947
(Increase) decrease in current liabilities:		
Accounts payable	(261,308)	237,550
Accrued liabilities	(83,742)	(122,061)
Due to brokers for securities purchased	257,130	(257,130)
Deferred membership fees and subscriptions - current portion:		
Life members	(25,456)	(7,020)
Term members	52,287	17,448
Current portion of mortgage note payable	(2,603)	(2,374)
Income tax payable	129,264	(6,777)
Due to life membership assets	(47,935)	51,878
	17,637	(88,486)
Decrease in working capital	$(141,840)	$ (23,539)

See accompanying notes to financial statements.

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED
NOTES TO FINANCIAL STATEMENTS

NOTE 1 - SIGNIFICANT ACCOUNTING POLICIES:

The American Radio Relay League, Incorporated (the League) is a not-for-profit, tax-exempt organization formed to promote interest in amateur radio communication and experimentation. The League publishes documents, books, magazines, newspapers and pamphlets necessary or incidental to its purpose.

The following is a summary of significant accounting policies consistently followed in the preparation of the League's financial statements. Certain reclassifications of 1983 amounts have been made to enhance comparability with the 1984 presentation.

Income Recognition

A portion of the revenue from membership fees and subscriptions applicable to acquisition costs is recognized at the time the memberships and subscriptions are received. The remaining portion is included in revenues on the straight-line basis ratably over the applicable membership or subscription period.

The League recognizes income on donated capital based on the fair market value of the item at the date of donation.

Deferred Life Membership Fees

By-laws of the League provide for a paid-up life membership in the League upon payment of a fee of twenty-five times the annual dues rate. Life membership fees received are deferred and invested to produce income to defray the cost of servicing life members. Deferred life membership revenues are amortized to current revenues and funds are transferred to current operations based on a rate designed to offset the costs of servicing the life membership.

Income Tax

The League is required to pay federal income tax on unrelated business income. Such income is derived primarily from net income earned on advertising placed in its QST Magazine.

Investments

Marketable securities are carried at cost.

Inventories

Inventories are carried at the lower of cost or market, cost being determined using the first-in, first-out method.

Fixed Assets

Fixed assets are recorded at cost. Depreciation is computed on the straight-line method for assets purchased prior to January 1, 1981. For assets purchased after that date, an accelerated depreciation method is used. Buildings are depreciated over a 40 year life. Furniture and equipment are depreciated over their useful lives ranging from 3 to 20 years.

NOTE 2 - INVENTORIES:

Inventories are comprised of the following:

	December 31, 1984	1983
Standard Handbooks	$ 71,194	$ 51,541
Booklets	90,720	112,465
Tune in the World booklets	23,715	19,798
Membership supplies	56,030	51,384
	$ 241,659	$ 235,188

NOTE 3 - INVESTMENTS:

	December 31, 1984		1983	
	Cost	Market	Cost	Market
Life membership portfolio	$ 3,641,013	$ 3,384,485	$ 3,794,751	$ 3,447,748
Regular portfolio	1,199,367	1,244,682	673,356	704,895
	$ 4,842,380	$ 4,629,167	$ 4,468,109	$ 4,152,643

Investments are comprised of the following:

	1984		1983	
	Cost	Market	Cost	Market
Bankers' Acceptances	$ 379,812	$ 392,344	-	-
Certificates of deposit	485,000	485,000	$ 50,000	$ 50,000
Preferred stocks	207,347	130,340	207,347	135,525
Common stocks	366,361	447,583	136,599	169,023
Corporate bonds	1,548,711	1,334,504	1,698,546	1,448,228
Government agency and other issues	1,827,955	1,812,202	2,175,617	2,149,867
Other investments	27,194	27,194	-	-
	$ 4,842,380	$ 4,629,167	$ 4,468,109	$ 4,152,643

The (decrease) increase in unrealized depreciation in the market value of investment securities for the years ended December 31, 1984 and 1983 was $(102,253) and $56,355, respectively.

NOTE 4 - LONG-TERM DEBT:

On March 1, 1977 the League signed a $225,000 mortgage note payable bearing interest at 9.25%, the proceeds of which were used to finance a building addition. The note is secured by property, building and related equipment having a net book value of $1,154,810 at December 31, 1984. Monthly installments are $2,882, including interest through March 1, 1987. Required principal payments are $29,573 in 1985, $32,428 in 1986 and $35,477 in 1987.

NOTE 5 - LIFE MEMBERSHIP ASSETS DUE TO CURRENT OPERATIONS:

As of December 31, 1984 and 1983, life membership assets included ($47,935) and $179,516, respectively, (due to) advanced from the League's operating funds.

NOTE 6 - RESERVES:

Reserves are established for purposes specified by donors or

the League's Board of Directors. Such reserves are administered by designated officials of the League in accordance with the directions of the donors or Board of Directors.

	For promotion of amateur radio overseas	For Colorado Convention Fund	For Project Goodwill	For OSCAR Station Construction	For H.P. Maxim Award
Balance, December 31, 1982	$ 6,075	$ 4,896	$ 21,426	$ 1,127	$ 1,000
Contributions					20,571
Income earned		281		78	
Expenditures	(481)		(1,207)	(1,205)	
Balance, December 31, 1983	5,594	5,177	20,219	-	21,571
Income earned		294			1,226
Expenditures			(83)		(1,539)
Balance, December 31, 1984	$ 5,594	$ 5,471	$ 20,136	$ -	$ 21,258

NOTE 7 - PENSION PLAN:

The League has a noncontributory group annuity retirement plan which covers full-time employees. The League's policy is to fund pension cost accrued. The total pension expense for 1984 and 1983 was $188,400 and $168,765 respectively, which included amortization of past service cost over a 30-year period. Accumulated plan benefits as of June 1, 1984, the most recent actuarial valuation date, are as follows:

Actuarial present value of accumulated plan benefits:

Vested	$ 266,596
Non Vested	138,799
	$ 405,395

At June 1, 1984 and June 3, 1983, net assets available for plan benefits at contract value (as reported by the insurer, including $171,782 in 1984 and $156,382 in 1983 payable to the insurer by the League) are $330,741 and $161,874. The assumed rate of return used in determining the actuarial present value of accumulated plan benefits was 7.5% in both 1984 and 1983.

NOTE 8 - DEFERRED LIFE MEMBERSHIP FEES:

The following is a summary of deferred life membership fees and subscriptions activity:

	December 31, 1984	December 31, 1983
Current portion	$ 324,258	$ 298,802
Non-current portion	3,458,869	3,353,036
Total	$ 3,783,127	$ 3,651,838
Beginning balance	$ 3,651,838	$ 3,390,997
Additions:		
Membership fees received	85,593	264,038
Investment income	349,230	337,039
	434,823	601,077
Deductions:		
Net transfer to revenue	298,692	294,661
Administrative Expenses	4,842	45,575
	303,534	340,236
Ending balance	$ 3,783,127	$ 3,651,838

NOTE 9 - RELATED PARTY:

The Canadian division of the League is incorporated as the Canadian Radio Relay League (CRRL). The operations of CRRL are reflected in the League's financial statements. CRRL collects membership and subscription fees and sells League publications. The proceeds from these activities are remitted directly by CRRL to the League. For the years ended December 31, 1984 and 1983, the League incurred $20,986 and $19,978 respectively in expenses pertaining to the operation of CRRL's Headquarters in Canada. On February 7, 1985, the League made a $10,000 interest free loan to CRRL for the purchase of equipment to facilitate the transition of CRRL from a division of the League to an autonomous corporation. In 1985, CRRL began purchasing League publications for the purpose of reselling them to its members.

SCHEDULE I
ADDITIONAL INFORMATION

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

OPERATING EXPENSES

	Year ended December 31, 1984	Year ended December 31, 1983
Publications:		
QST magazine	$ 1,157,275	$ 1,107,475
Standard handbook	170,021	113,034
Booklets	172,495	174,047
Tune in the World production costs	54,071	48,747
Advertising production costs	13,704	12,394
Advertising production costs credits	(10,711)	(8,654)
Call directory expenses	78,314	50,402
QEX production and other costs	11,064	13,262
ARRL Letter	18,526	22,149
Packet radio newsletter	2,113	-
	1,666,872	1,532,856
Salaries	2,068,313	1,892,745
Membership supplies	49,941	49,010
Postage	186,455	156,468
Forwarding expenses:		
QST subscriptions	291,266	312,408
QST newsdealers	2,552	7,341
Other publications	152,218	151,790
	446,036	471,539
Telephone and telegraph	51,614	47,224
Office supplies and expenses	145,707	128,435
General expenses	-	76,335
Laboratory expenses	23,201	12,126
Legal and professional fees	152,278	90,950
Stationery, printing and forms	203,816	175,994
Promotion and support	30,599	44,839
Payroll processing expense	3,060	2,497
Light, heat and water	55,925	56,020
Employee insurance and pension costs	275,876	256,820
Other employee expenses	26,692	-
Insurance	15,951	16,236
Interest expense	9,802	12,176
Temporary employees	29,516	-
Travel expenses:		
Business	46,717	46,513
Membership contacts	40,501	38,619
Overseas	5,337	14,926
	92,555	100,058
Automobile expenses	652	1,223
Building maintenance expenses	66,895	48,541
Property taxes	51,495	47,719
Payroll taxes	141,616	115,289
Sales and use taxes	1,125	807
Depreciation	240,472	212,527
Awards	12,758	10,484
Headquarters station expenses	9,389	5,698
CRRL Headquarters expenses	20,986	19,978
Provision for doubtful accounts	16,189	19,486
Electronic data processing	645	4,252
Unemployment compensation	134	2,884
Overseas QSL service	27,397	32,384
Distribution of films	4,987	5,926
Computer supplies and maintenance	23,109	25,427
Dues - region 2 and 3	25,370	-
House advertising preparation	8,707	10,503
Miscellaneous	6,423	-
Product review	4,084	-
Subscriptions	2,701	-
	$ 6,199,343	$ 5,685,456

SCHEDULE II
ADDITION INFORMATION

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

ADMINISTRATIVE EXPENSES - OTHER EXPENSES AUTHORIZED BY THE BOARD OF DIRECTORS

	Year ended December 31, 1984	Year ended December 31, 1983
Division Directors expenses:		
Atlantic	$ 6,058	$ 7,993
Canadian	6,688	7,928
Central	4,801	5,799
Dakota	1,544	2,793
Delta	1,081	2,317
Great Lakes	5,792	4,071
Hudson	3,958	4,986
Midwest	5,922	5,000
New England	6,835	7,803
Northwestern	11,343	9,628
Pacific	7,996	8,272
Roanoke	8,314	8,423
Rocky Mountain	4,952	3,435
Southeastern	7,789	5,890
Southwestern	9,586	7,994
West Gulf	6,456	6,224
	99,115	98,556
Board of Directors meetings	51,299	51,214
Executive committee	16,250	12,361
President's expenses	19,517	19,555
Other committees	6,365	4,692
Advisory committees	1,046	244
National traffic system	7,656	9,021
Officers' expenses	19,589	27,631
Strengthening CRRL	1,523	2,040
Membership affairs committee	4,933	5,521
Management and finance committee	11,414	9,448
Plans and programs committee	3,222	26
QSL Manager expense	1,531	2,106
Ad hoc committee on biological effects	1,099	1,129
Digital Communication Committee	10,447	5,054
Section level expenses	67,792	55,122
Committee to study monitoring and licensing activities	1,603	2,486
Forward Planning Committee	6,271	3,574
New Orleans World's Fair	5,720	-
	$ 336,392	$ 309,780

Moved and Seconded ...

The following is a correction to Minutes of Executive Committee No. 416, November 19, 1984

Minute 4 is amended by deleting the text and substituting therefor the following:

4) Mr. Sumner and Mr. Imlay were excused from the room, at 2:20 P.M. Mr. Price continued in the Chair and Mr. Nathanson acted as recording secretary.

Mr. Metzger reported, as requested in Minute 81 of the Second 1984 meeting of the Board, for the Management and Finance Committee.

In response to the charge of the Committee of the Whole, Mr. Price distributed copies of the evaluation prepared of the performance of the General Manager for 1984. After extensive discussion, Mr. Price further distributed copies of a report he had previously submitted to the Management and Finance Committee.

On motion of Mr. Turnbull, it was voted to adopt the Report, resulting in a salary adjustment for the General Manager effective January 1, 1985 and in a further charge to the President and Management and Finance Committee to repeat the evaluation process in November 1985.

Next, Mr. Metzger outlined the necessity of additional funding for the Management and Finance Committee in view of the relocation study for which preliminary planning must soon begin. On motion of Mr. Milius, it was voted that additional funding of no more than $7500 is allotted to the Committee.

At 3:00 P.M. Mr. Sumner and Mr. Imlay rejoined the meeting, and Mr. Nathanson departed, owing to travel commitments. Mr. Sumner resumed as recording secretary.

MINUTES OF EXECUTIVE COMMITTEE No. 417 March 23, 1985

AGENDA

1. Approval of Minutes of November 19 meeting.
2. FCC matters
   2.1 Report of the President and Secretary on recent meetings with FCC personnel
   2.2 ARRL position with respect to MM Docket No. 85-38, cable-television leakage standards
   2.3 ARRL position with respect to PR Docket No. 85-51, third-party participation in amateur communications
   2.4 ARRL position with respect to PR Docket No. 85-21, proposal to leave the waiting period between examination attempts to the discretion of the VEC
   2.5 ARRL position with respect to PR Docket No. 85-23, amendment of Part 97 to conform to Part 2 Table of Frequency Allocations
   2.6 Review of reply comments in PR Docket No. 84-874, radiolocation at 1.9-2.0 MHz
3. Local antenna/RFI matters
4. IARU matters
   4.1 IARU Proposal No. 180, concerning the admission of the Kuwait Amateur Radio Society
   4.2 IARU Proposal No. 181, concerning the admission of the Brunei Amateur Radio Transmitting Society
   4.3 Plans for joint meeting of ARRL Board with IARU Region 2 Executive Committee, in Hartford, July 27
5. Recognition of new Life Members
6. Approval of conventions
7. Date and place of meetings for the remainder of 1985
8. Affiliation of clubs
9. Report on other Board action items
10. Discussion of enhanced Novice privileges, with Travis Brann, WA5RGU, of Kantronics, representing Amateur Radio industry
11. Progress report on Development Program
12. Minute 90, October 1984 Board Meeting (EC study of ARRL's spectrum-management activities) and preliminary discussion of ARRL position with respect to PR Docket No. 85-22, relative status of coordinated and uncoordinated repeaters
13. Other business

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 9:02 A.M. Eastern Standard time, Saturday, March 23, 1985, at the Marriott Hotel, Bethesda, Maryland. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Leonard M. Nathanson, W8RC; Executive Vice President David Sumner, K1ZZ, Directors Thomas B. J. Atkins, VE3CDM, Paul Grauer, W0FIR, William J. Stevens, W6ZM, and Hugh A. Turnbull, W3ABC; and Secretary Perry Williams, W1UED. Also present were Directors Mary Lewis, W7QGP and Edmond A. Metzger, W9PRN, Vice Director John C. Kanode, N4MM, and Counsel Christopher D. Imlay, N3AKD.

1) On motion of Mr. Stevens, the Minutes of the November 19, 1984, meeting were approved as amended by the Secretary.

2.1) Mr. Price reported on a series of meetings between ARRL and FCC in the previous three days. He and Mr. Williams had visited Chairman Mark Fowler, Commissioner Dennis Patrick, Field Operations Bureau Chief Richard Smith, Private Radio Bureau Chief Robert Foosaner, Chief Scientist Robert Powers and Special Services Division Chief Ray Kowalski. Among the subjects covered was the League's study of feasibility concerning ARRL assistance to FCC in the issuance of callsigns as initiated by Minute 52, ARRL 1985 Annual Meeting. Following the report, on motion of Mr. Stevens, it was voted that the study of this issue be continued, looking toward the preparation of recommendations to the Second Meeting of the Board in July.

2.2) The Commission recently released a Notice of Proposed Rule Making, MM Docket 85-38, which proposes to (1) delete technical rules governing the quality of television pictures and (2) ease leakage restrictions in the 54 to 216 MHz band from the present limit of 20 microvolts per meter at 3 meters to 50 microvolts per meter at 3 meters, a standard presently applying to home computers. On motion of Mr. Grauer, it was voted that the League file, by the deadline of March 29, comments regarding the second issue in the Docket only, in opposition to any easing of the leakage restrictions.

2.3) Next, the Committee discussed the Notice of Proposed Rule Making in PR Docket 85-51, which proposes to prohibit third-party participation in amateur radio by any person whose license has been revoked, is under suspension, was voluntarily surrendered in lieu of disciplinary action or who is under an Order to Cease and Desist. On motion of Mr. Stevens, it was voted to file comments expressing ARRL's support for the proposed rule.

2.4) The Committee then discussed the Notice of Proposed Rule Making in Docket 85-21, which would leave the waiting period after amateur examination failure up to the VEC. It would also continue to require public notice of an examination opportunity only for those sessions that would serve five or more applicants. On motion of Mr. Grauer, the Committee ordered that comments be filed asking the Commission to require a waiting period of 27 days after failure, and to require advance public notice of every examination opportunity (even those serving a single disabled person at his home) in the interest of preserving the integrity of the system.

2.5) Following discussion of FCC's proposals to grant amateurs access to the microwave bands in PR Docket 85-23, on motion of Mr. Stevens, it was voted to file comments urging the Commission to implement the planned allocations as soon as possible, but to continue our opposition to footnotes placed against the 10- and 24-GHz bands and against the 220-MHz band which would reduce the status of the Amateur Service relative to other services in the band.

2.6) The Committee reviewed a draft of Reply Comments in Docket 84-874, FCC's proposal to add a primary allocation of 1.9-2.0 MHz to the nongovernment radiolocation service rules in Part 90, and, on motion of Mr. Turnbull, authorized a filing of reply comments along the lines presented in the draft.

3) The Committee reviewed the report of Counsel on local antenna and radio-frequency-interference matters.

4.1) On motion of Mr. Grauer, the vote of ARRL was cast in favor of admitting the Kuwait Amateur Radio Society into membership in the International Amateur Radio Union (IARU).

4.2) On further motion of Mr. Grauer, a similar vote was cast in favor of the Brunei Amateur Radio Transmitting Society's membership.

4.3) The Chair announced plans for a joint meeting of the IARU Region 2 Executive Committee with the ARRL Board of Directors on July 27-28, 1985, immediately following the Second Meeting of the ARRL Board.

5) On motion of Mr. Atkins, the names of 69 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in *QST*. The Committee was in recess from 12:05 to 12:18 P.M.

6) On motion of Mr. Atkins, the Committee approved the holding of the following ARRL conventions:

Texas State	May 31-June 2, 1985	Dallas
Kansas State	October 12-13, 1985	Concordia
Florida State	March 7-9, 1986	Orlando
Texas State	July 11-13, 1986	San Antonio

7) The next meeting of the Executive Committee was scheduled for May 18, 1985 at Rochester, New York. Meetings were also tentatively set for August 24, 1985, in Scottsdale, Arizona, and November 23, 1985 in Hartford.

8) On motion of Mr. Grauer, the affiliation of the following clubs was approved (Category I unless otherwise noted): Allen County Team for Interference Verification, Ft. Wayne, IN; Anchor Bay Amateur Radio Club, Gualala, CA; Chico State Amateur Radio Society, Chico, CA (Category III); Condor Repeater Association, Thousand Oaks, CA; Eastern Michigan Contest Club, Adrian, MI; Electchester VHF Club, Inc., Bayside, NY; Laurel Amateur Radio Club, Laurel, MS; Oklahoma Independent ARC, Ponca City, OK; Radio Amateur Service Club, Baton Rouge, LA; St. Barnabas Amateur Radio Club, Livingston, NJ; St. Croix Amateur Radio Club, St.Croix, VI; Short Mountain Repeater Club, Inc., McMinnville, TN; 67 Repeater Group, Gadsden, AL; Southeast Missouri ARC, Jackson, MO; Treasure Coasters Repeater Assn., Inc., Vero Beach FL; Ukiah Amateur Radio Club, Ukiah,CA; West Central Louisiana ARC, Leesville, LA; Zygo Amateur Radio Club, Middlefield, CT.

With this action, the League has the following number of active affiliated clubs: Category I, 1737; Category II, 11; Category III, 172.

9) Mr. Sumner reported that the second prototype design of the convention badge for ARRL officials had been approved and 250 blanks were on order. The Committee was in recess for lunch from 1:08 to 1:33.

10) At this point, Travis Brann, WA5RGU, of Kantronics, representing the Amateur Radio industry, and William Lazzaro, N2CF, ARRL Development Manager, joined the meeting at the invitation of the President. There followed an extensive discussion of the philosophy of enhancing Novice privileges as one means of improving growth in the Amateur Service. Mr. Brann left the meeting, with the thanks of the Committee for his contributions, at 2:35 P.M.

11) Next was a progress report by Mr. Lazzaro on the various facets of the campaign to increase membership in the League. Mr. Lazzaro departed from the meeting and Director Gay Milius, W4UG, joined the group at 3:48. On motion of Mr. Stevens, it was voted that, in view of the success of the "Convention Special" free-book membership promotion at the ARRL Southeastern Division Convention in Miami earlier this year, the Executive Vice President is instructed to include a similar promotion for all ARRL Division Conventions for the balance of the year.

12) There followed a discussion of ARRL's spectrum-management activities, as ordained in Minute 90 of the October 1984 Meeting of the Board, especially focusing on the Notice of Proposed Rule Making, PR Docket 85-22, regarding the relative status of coordinated and uncoordinated repeaters. On motion of Mr. Turnbull, the Executive Vice President was asked to prepare an options paper concerning Docket 85-22 and circulate it by May 7, for discussion at the May 18 meeting of the Committee. On further motion of Mr. Turnbull, it was voted that ARRL seek a 45-day extension of time for comment in the docket beyond the present deadline of July 1, so that the full Board may discuss the issue at its Second Meeting on July 25, 1985.

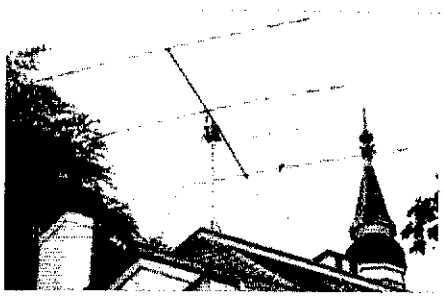
13) Mr. Turnbull, as Chairman, presented the final report of the Ad Hoc Committee on a More-Continuous Washington Presence. On motion of Mr. Stevens, the report was accepted and its recommendations (including transfer of the "Washington Oversight" function to the Executive Committee and dismissal of the Ad Hoc group) were adopted. On motion of Mr. Nathanson, the Committee adopted the

(continued on page 73)

How's DX?

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

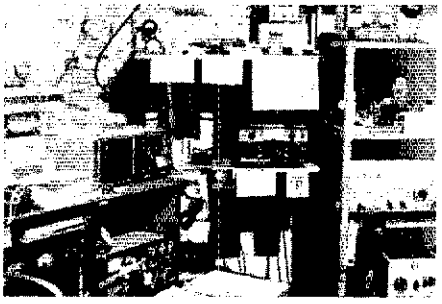
ON4NC



Honor Roll member C. J. Wolf, ON4NC, has a *very* extensive CW background. Christian's father (born in 1866) could read Morse code and get the news from Paris (Eiffel Tower) around 1912; at the time, Christian was 7 years old. In 1925, Christian built his first receiver, and the first hams he heard were on 180/200 meters. The ON4NC license was acquired in 1930, when he became very interested in 28 MHz. One of his memorable thrills was hearing the first real opening to the USA in the fall of 1935. On CW, he contacted W1DF on Oct. 19, 1935. (W1DF went on to become the Technical Editor of *QST*.) Christian later made the first 10-meter CW contact between Belgium and the Belgian Congo, with OQ4CJJ, in Leopoldville, June 10, 1936. (OT ON4AU had made a previous crossband QSO, 20 to 10 meters.)

From the very beginning, DX was Christian's main object. He held DXCC pre-WW II, and in 1948 he started all over again. He had the good fortune to be active at the time of some rare, deleted countries, such as Goa (CR8) and French India (FN8). Christian has been chasing DX ever since, and now has over 360 countries confirmed.

An exciting event occurred in 1960—the Belgian Congo acquired its independence from Belgium. Their RTT (equivalent to the U.S. FCC) gave ONs permission to pass along to hams in the Republic of the Congo (now called Zaire) any kind of messages to be relayed to Belgians who were there; wives and parents were even allowed to speak to other members of their families. It was quite dramatic at times, Christian recalls.



ON4NC, with XYL Monique, uses a TH-4 to radiate signals from this tidy TS-820 station at his home in Melle, Oost Vlaanderen, Belgium.

ON4NC continues to work many W stations, but regrets that 10-meter propagation doesn't currently support this type of activity regularly. Although he is not as active as previously (the shack is on the second floor of his home), he does conduct regular schedules on phone with the U.S.

Ham radio is certainly a family affair for ON4NC, with his son holding the call ON5NC. And, he notes he hasn't given up on getting his grandchildren interested in his lifelong avocation.

Always a gentleman DXer, Christian pays special homage to his XYL, Monique, for her understanding and patience over those many hours of getting all those countries!

THAILAND

We have received a detailed report from our sister society for Thailand. The following is the gist of the February 4 letter from HS1BG and HS1AMH.

"1984 was a fruitful year for the Radio Amateur Society of Thailand, one in which RAST worked toward full recognition and legalization of Amateur Radio by the Royal Thai Government—culminating in the lifting earlier this year of the ban on the service. During the ban, RAST had maintained Thailand's international status by applying for (and receiving) permission from their PTT to operate during major contests—demonstrating that Amateur Radio is very much alive in Thailand. In order to achieve that goal, club members worked to set up the club's own HF station, located at the Asian Institute of Technology campus at Rangsit (45 km north of Bangkok). The Society kept up ties in the international area through correspondence with the IARU as well as the ARRL and other major societies.

"In 1984, RAST celebrated its 20th anniversary with a daylong display of various aspects of the hobby. There was an exhibition by the Communications Authority of Thailand that demonstrated its international data-access facilities. Videotapes gave guests and visitors a glimpse of fox hunting in China (de JARL) and an overview of the hobby (de ARRL). The high point was November 11, 1984, when Minister of Communications Mr. Samak Sundharavej promised to do his best work for the legalization of Amateur Radio.

"The President of the Asian Institute of Technology gave permission for setting up a club station on the campus. Several RAST members spent many weekends constructing a six-element tribander. The final configuration at the club station comprises two antenna masts (about 40 feet high)—one supporting a rotary, and the other to allow a 40- and 80-meter dipole to be suspended. Equipment contributed by club members includes a Drake 4 line, as well as JA transceivers. A Collins 30L1 and assorted test equipment completes the picture. Big plans are afoot. A full-size beam for 40 is in the planning stages.

"Public Service is a strong part of the HS picture, with RAST participating in activities allied with the United Nations Children's Emergency Fund.

"In December of last year, at the Society's annual meeting, HS1WB was reelected RAST President. Other officers are Vice President HS1DS, Second Vice President HS1YL, Secretary-General HS1BG and Treasurer HS1DC."

Every DXer offers good wishes to RAST for their reemergence into today's Amateur Radio.

UA SATELLITES

In November 1984, the RS-9 beacon (29,402 KHz) went on the air, transmitting telemetry information analogous to that sent from orbit by the Soviet RADIO series of satellites. At the end of the year, the repeater was switched on, translating the band segment 145,860-145,900 kHz to 29,360-29,400. Many Moscow-area hams (UK3A, RS3A, RA3AHM, RA3AMM and others) have already made initial contacts via this repeater. The transponder is switched on around the clock, but the "robot" is on the air irregularly, transmitting its own CQ on 29,320 kHz, announcing at that time the frequency on which it should be called. *(tnx W4KM)*

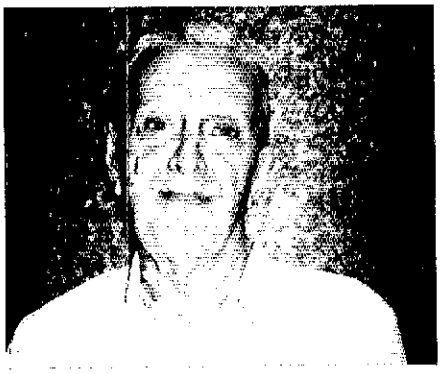
RED ALERT

It was the spring of 1984. Declining Cycle 21 was riding a plateau with the solar flux hovering in the 120-130 range. There were openings on 20 meters over the pole on most evenings. As sunrise swept across the USSR, I was scanning the band looking for the needed, more obscure, Republics. Since many of those stations seem to be equipped with that ubiquitous "40 watts to a 2-element quad," the upper end of the band (where there is less QRM) was a logical hunting ground.

"A QSO between what sounded like two high school kids caught my attention. One was clearly U.S., the other uncertain. Some sixth sense beckoned me to tarry. Their signals were rather weak, and they weren't signing their calls very often. The prefix of the alleged non-W station eluded me.

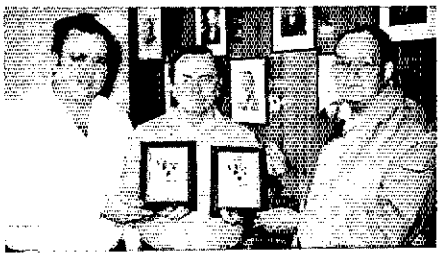
The U.S. voice asked, "How far north of Norway are you located?" The light flashed and the horn resounded, decisively switching my status from yellow to red alert. How far *north of Norway* are you? On my map there isn't much up there (and I needed both of 'em!).

They chit-chatted for quite a while. It was enjoyable learning about Spitzbergen, but I got a little edgy as propagation deteriorated. When



Whatever happened to that super CW op, YN1AA? Here's Jim Parker, these days masquerading as N4JTZ in Miami. *(W1YL photo)*

Same calls and QTHs; different times: Val, KH6QI, of Honolulu, lived in Homestead, Florida (the *current* QTH of your DX editor) many years ago and holds the call your editor *originally* held in Hawaii several decades ago!



K1DRN (left) and his dad, W1HGA (right), receive the first two DXCC Honor Roll plaques to be issued, while visiting W3AZD at ARRL Hq. in mid-February. Verne, Sr. shows up at 309 on the Honor Roll, with "junior" at 314—both phone totals.

they signed, a moment of hesitation allowed me to see how large a crowd they'd drawn. Apparently I was the sole eavesdropper, and thereby conditionally checked Svalbard off the list of my needed ones.

Prodded onward by my success, I continued tuning and caught the end of a faint QSO. A quick, reflexive call. If JW is good, JH must be even better! I still chuckle at myself for that one.—*Marty Levin, W6BDN*

THE CIRCUIT

☐ **XT:** The new name for Upper Volta is Burkina Faso, as confirmed by their Washington Embassy. [The old days *were* simpler—Ed.]

☐ **J4ATC:** Work this station last March? If was a special call assigned for use at the Annual Conference of the International Federation of Air Traffic Control Associations in Athens, Greece. Both W1BFA and PAØGJA were licensed to operate the facility. Ernie's address is Ernie Bracy, W1BFA, Box 88, Readfield, ME 04355.

☐ **A22:** AK1E notes the closing down of A22ME and A22TE late February, with Mel returning to the States to work in the VOA studio in DC. Cards for the operation (1983-1985) are available from AK1E. A22 will still be active via A22CA, A22DX, A24DM and A24AS—all confirmed by AK1E. (A24DM is able to work RTTY for those needing this mode.) Many more new hams are receiving tickets in Botswana and will be active from their homes shortly.

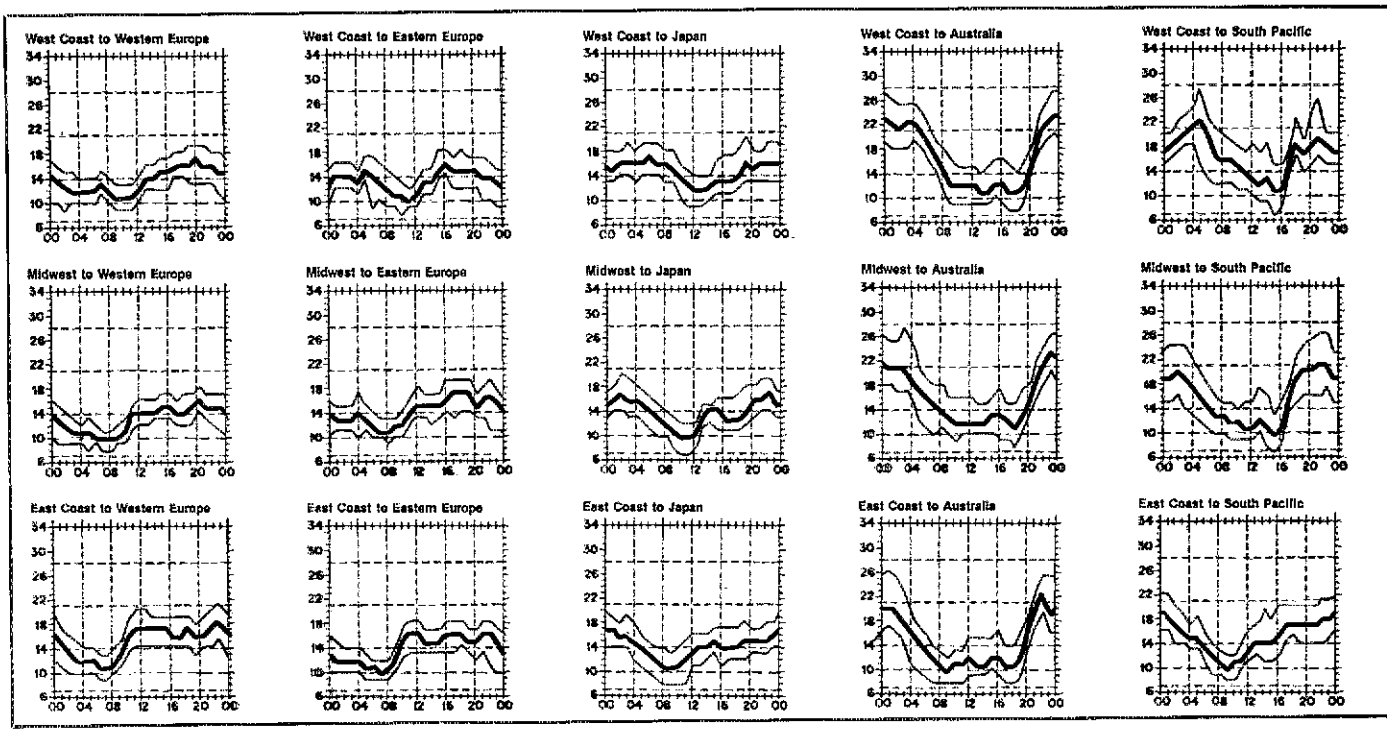
☐ **Kure:** If you worked KH6JFI/KH6 or /KH7 on the following date/times, send your s.a.s.e. to Ron Harburg, 2457 Aumakua St., Pearl City, HI 96782-1047: 26 Jan. 1978 0147Z to 08 Feb. 2159Z; 7 Dec. 1978 0546Z to 8 Dec. 1828Z; 21 Nov. 1979 0342Z to 22 Nov. 0215Z.

☐ **DX Convention:** This year's Pacific Northwest Convention is scheduled for July 27-28. More details soon.

Troster's Tips for Easy Listening

Is the skip moving with you or against you? If a DX station is weak and he is not yet working many stations in your general area (if any), consider whether the skip is moving so that communication will get better between you, or whether it will decline. If you decide the skip is with you, hang in there and keep calling. If the skip is "going out," or against you, and you want to continue calling anyway, try changing your calling tactics. (Ahhh, but *sometimes* the skip seems to come back a little later.)

More next month from W6ISQ.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as

☐ **Help:** N8BC (ex-W8GQU) is looking for FB8WX (7/79), YJ8BW (3/67) and 7Q7JO (2/66).

☐ **Advice:** From the Winter 1984 issue of the *Northern California DX Foundation Newsletter*, by renowned DXer OH2BH: "A traveling DXpeditioner is one who should behave like an ambassador for our fraternity. He should never fail on his QSO target, but should not be found wanting in his diplomatic behavior either."

QSL Corner

Administered By Joanna Hushin, KA1IFO

Here is some information for those of you who would like to QSL direct to the station location or to a QSL manager. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

EL2CJ (JF2QHC)
FG0IFT (W0RLX)
FM5WD (W3HNK)
G5DWY (WA7OGU)
HC1BW (KT1N)
TR8DM (F3CY)
TR8JYC P.O.B. 2127, Libreville, Gabon
YB0AFA (WA7OGU)
V3DN (WB6ZTI)
ZC4MR (G4SDJ)
ZF2HI (KZ2E)
ZF2HJ (KA2TPA)
3C1BC (K4PHE)
3C1YL (N4NX)
8P6NW (KA9EBM)
9G1LR (WA7OGU)
9N38 (W1GAY)
9N1AW (W1GAY)
9N1NFO (W1GAY)

QSL Manager Volunteer

AC2F

Special Notes

☐ N2DWK is not the manager for C73AA.

☐ K9MX is not the manager for J73PP.

☐ There is no QSL bureau on Cape Verde (D4); cards go direct to the *Callbook* address of the station worked.

☐ 9M2FK: YU1HA (ex-YU4HA) notes that he still handles cards for this station (for contacts after Jan. 1, 1972) and also for HS9FK. Ivan has changed his address, however, so please note that he can be reached at Ivan Gorsek, YU1HA, Trg Narodnog Fronta 1/5, 34000 Kragujevac, Yugoslavia.

☐ KX6PO: According to QSL Manager W4FRU, no logs have been received for a couple of years. If you know how to extract a confirmation, please communicate with K4LVZ, who is anxious to know.

☐ Zaire: Dan (AK1E) also notes that cards for 9Q5ET will be available from him, but it may take a bit of time. Many problems exist in the bush in Zaire, so, please, be patient.

☐ HC1BW: KT1N is the manager for HC1BW, Orbra Bliss of Quito. For all contacts write to Roy Gould, KT1N, P.O. Box "DX," Stow, MA 01775.

☐ Help: Can anyone supply working QSL routes for 7P8WU or PY1EFM/PY0? Thanks.—KB3OM.

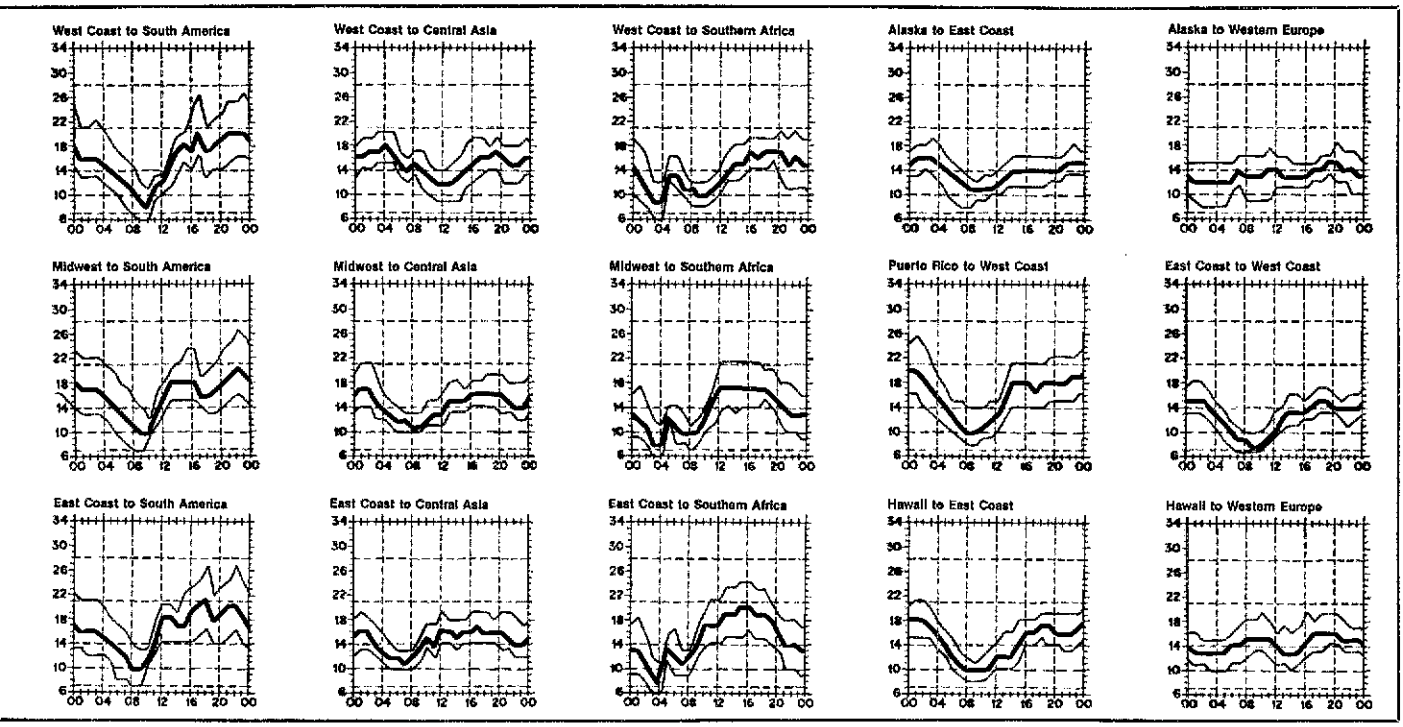
☐ QSL Corner, December 1984, page 61, contains information and addresses for the ARRL Incoming Bureaus. March 1985 *QST* contains information on the operation of the ARRL Outgoing Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

Dynamic NK4U ran the QSL Bureau booth at the Miami Hamboree. Nancy manages the ARRL QSL Bureau for all two-letter "4" prefixes on behalf of the Sterling Park (VA) Amateur Radio Club. *(W1YL photo)*

Helpful Information

An amateur sends in an s.a.s.e. to his call area QSL bureau to claim his QSL cards. That amateur places two First Class stamps on the envelope. He has just wasted 5¢ because the Post Office charges 22¢ for the first ounce and 17¢ for each additional ounce.

A good rule to go by is to place 22¢ on the s.a.s.e. and add 17¢ stamps for each additional ounce of cards you wish to have sent to you from the QSL bureau. It goes like this: 1 ounce = 22¢, 2 ounces = 39¢; 3 ounces = 56¢; 4 ounces = 73¢, etc. *(tnx K3WKK)*



The lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35, and January 1979 QST, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for May 15 to June 15, 1985, assume a sunspot number of 29, which corresponds to a 2800-MHz solar flux of 86.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL *DXCC List*. You may also submit cards to endorse your awards in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from February 1 through February 28, 1985. An **s.a.s.e** will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DK1EI/213 GU4XEA/127 JA4FWM/291 OH2BJG/110 TF5BW/103 KC2PX/165 K4LW/257 WW4E/316 KA9ACS/101
DL1MAJ/263 HKØHEU/294 LA9SN/176 OK1OFA/100 VE3NUP/109 K3QMX/253 KA4EQW/231 WW4J/109 KU9T/103
DL8XL/312 IN3RZY/275 LU1CLA/126 SM4NLL/105 ZP5LOB/114 KA3KZF/102 N4IQN/103 NR6E/153 W9AUO/142
DLØEB/112 JH1IED/271 OA8CP/104 SP3BYZ/106 7P8CI/105 W3GIS/102 NN4S/105 KW7Z/103 WB9ZGY/157
G3NOB/154 JP1EVN/118 OE2SNL/122 SV1PL/249 AB1N/104 W3KYN/101 WA4CTC/182 NG7K/103 KØWWX/323
GM5EMM/101 JJ3UJC/105 OE1ZOS/115 SV1UG/106 W1JBW/330 W3YJN/109 WA4EVB/104 K9LA/225

Radiotelephone

CP5AI/171 GI4NKF/100 JA4FWM/284 VU7WCY/101 5N8HEM/110 KC2PX/165 N4DDW/102 KJ6V/100 KU9T/100
DK8JB/114 HK8AQN/105 JA9RFN/115 YB3CDL/108 7P8CI/105 WB2ODH/113 N4IQN/103 WD6EKR/259 N9EJL/128
DL1MAJ/181 HKØHEU/294 KL7XO/108 YC2BGZ/111 KA1FSO/108 K3QMX/253 NI4M/104 NG7K/103 W9PVD/101
EA5EBT/102 I1WZT/226 LA9SN/162 ZD9BX/138 KA1GIP/100 W3EMV/109 WW4E/288 N8DJS/100 WB9ZGY/153
EA7CWC/139 JA1VYQ/109 LU1CLA/100 ZF2GE/125 W1YWP/102 KA4CIZ/123 NE5I/108 WD8JYF/140 KØTDO/101
F3DE/149 JP1EVN/117 OE1ZOS/115 ZP5LOB/114 K2DUX/154 KA4EQW/111 W5DZF/115 K9LA/110 WØLEC/141
G3NOB/128

CW

DL1MAJ/136 HB9BMU/104 JR3WXA/108 6Y5HN/102 KQ3E/136 WU4E/103 NE5I/104 N7AIH/114 K9BQL/102
DL5YBU/112 I5EFO/101 OE2SNL/118 KB2MX/104 W3CEI/100 K5WGQ/104 WD5DEQ/109 W7KT/120 K9LA/115
G3FXA/199 IK5DEY/131 SM6OLL/105 KE3A/131 KA4EQW/191 KA5GHR/103 KO7S/101 W8PCS/101 W9LT/180
G3NOB/105 JA2HMF/116 YU3DV/100

RTTY

VK5RY/102 WB4UBD/101 WA6PJR/101

160 Meters

W2FCR/100 W9CG/100

5BDXCC

G3FXA KC8CY KB3PY KB5EK K7RLS ZL4BO W8JXM YU7GW KØWWX
W2FV UA4HAU NK4L N6AN SP6FER NR4K KQ1F HA5XW DJ8FW
WD4RCO

Endorsement

Mixed

CT1YH/188 IT9AUA/326 SM6CWK/337 K1FI/309 W2UP/274 K4TP/190 W5PD/225 AI8S/308 N9BAF/231
DJ1IK/280 JA1AAT/333 SP6FER/282 K1ZSI/327 W2VP/230 KA4UPI/138 W5RJC/312 K8ICE/251 W9KXW/300
DJ5IO/320 JA1CJF/324 VE7AAQ/350 K1ZZ/318 WA2LWA/150 KB4FO/194 K6IR/325 K8UNP/180 W9LT/347
DJ8NKA/326 JA1QQP/290 XE1MDX/288 KT1J/256 WB2PMP/301 N4EED/151 W6INH/281 KD8HX/150 W9MMJ/230
DK2UB/209 JF1WQC/181 XE2AQ/240 W1AXA/357 WB2YQH/329 N4FKZ/EA4/149 W6JD/307 KD8V/280 WA9MAG/301
DL1FBW/133 JG1TSF/289 YU1NZW/270 W1HGA/329 AD3Z/315 N4SU/362 W6MEL/279 KN8Z/330 KØARR/203
DL3ZA/331 JA3AAW/332 YU2CAL/295 W1ODY/322 AE3Y/288 NK4L/276 W6NVN/157 W8CD/247 KFØH/306
DK5IZ/198 JR3WXA/153 YU2CKH/229 WA1EOT/315 K3UA/319 W4NZR/198 W6OMM/315 W8ZN/125 NØOA/329
DL3KD/189 JA4RF/323 YU2QK/253 WA1FCN/257 KC3X/293 WA4SAC/151 W6SC/338 WB8UZT/210 ND0F/200
DL7NB/322 JA7FS/323 YU3LF/249 KA2CDE/253 KF3C/249 WB4MAI/294 K7CU/277 K9BQL/207 WØEU/163
EA1BC/347 JA8GRR/200 YU3UAR/230 KC2UF/250 KQ3E/139 WD4NBX/300 K7NO/313 K9BWQ/321 WØGK/176
G3BKG/125 JA9GPA/294 ZL2ASM/285 KR2J/202 W3LB/330 WB4OSN/310 KC7JO/274 K9LHA/304 WØLYI/321
G3DOG/330 OE6MKG/319 ZS2U/259 N2CGB/280 WB3DNA/300 WC4B/200 N7TT/333 K9LJN/225 WØMJA/225
G3SJH/320 OH2LU/325 ZS6RM/352 W2AAN/254 AA4BK/193 WF4I/227 W7HRD/288 K9SM/340 WØPAH/335
HB9AJY/210 PY1QQ/229 4X4FQ/347 W2HZ/337 AA4CM/299 KE5AX/289 W7MCU/250 KD9FB/127 WØSMV/324
I2LLD/322 PY1LW/306 6Y5AG/158 W2IQB/314 AA4NA/304 NJ5X/205 WB7BWZ/133 KG9J/293 WØTU/203
I8TOH/175 SM6AVM/252 K1DRN/338 W2SR/299 K4AEB/321

Radiotelephone

CE3TZ/226 G3RUR/250 OE2GKL/319 K1DRN/338 N2CGB/280 N4FKZ/EA4/139 NJ5X/205 N7TT/292 KD9CN/129
CP8HD/215 G3SJH/320 PT2PT/169 K1QMV/326 W2HZ/327 KC4LQ/252 W5HJA/343 WB7BWZ/132 KD9GJ/221
CT1UA/318 HA5XW/215 SM6AVM/252 K1ZSI/312 W2IQB/297 NK4L/270 W5PD/200 AI8S/306 KG9J/288
DF2AL/263 HK3YH/255 VE3ZN/229 KA1HBV/176 W2VP/228 W4DPS/333 W5RJC/301 K8UNP/168 N9BAF/230
DJ2AA/329 IK1AAW/212 VE7AAQ/331 KT1J/253 AE3Y/199 WA4PMF/154 W5WJQ/294 KD8V/270 W9LQ/333
DJ4ZD/223 I2EOW/224 XE1MDX/288 W1HGA/329 KA3BTH/240 WA4QQV/277 AE6T/249 KN8Z/329 W9LT/321
DJ8NKA/326 I8IGZ/150 XE2AQ/184 WA1EOT/301 KA3DLT/148 WB4FQX/241 K6IR/325 N8DBI/229 KØWWX/317
DL4YAH/306 I8TOH/175 YV3AZC/297 WB1BVQ/242 KB3PD/156 WB4LND/239 W6MEL/226 WD8DXN/193 KK6L/228
DL7NB/311 JA1AAT/330 ZS6BBP/325 KA2CDE/253 AA4MM/335 WB4MAI/271 K7DS/300 K9BQL/200 WØLYI/311
DL8XL/309 JG1TSF/266 ZS6RM/346 KC2KU/270 AA4NA/231 WC4B/125 KC7JO/273 K9BWQ/321 WØRHZ/200
EA1FP/165 JH1IED/271 6Y5AG/157 KC2UF/249 K4AEB/319 WF4I/227 KC7XB/201 K9LHA/301 WAØGUD/249
F6FWW/269 LU8DPM/250 K1CMI/317 KG2U/300 KV4JC/146 WZ4I/297 KM7U/171 K9SM/327 WBØDHS/204
G3DOG/313 OE1PPC/134

CW

CT1YH/154 I4YNO/149 XE1OX/149 AE3Y/213 AA4NA/204 WB4MAI/249 W6JD/272 K8PXG/225 KG9J/239
DF9HE/193 I5JRR/164 XE2AQ/177 KC3X/232 AA4V/212 WB4OSN/286 K7CU/190 KD8V/250 WB9EEE/179
DJ2AA/251 JG1TSF/237 YU1NZW/234 N3KR/227 K4AEB/240 K5KV/266 K7NO/241 W8CD/232 KI6J/149
DK6NC/208 PY2FK/210 ZS2U/145 AA4CM/290 KG4O/125 KC5M/188 N7TT/185 W8ZN/143 NØOA/152
DL7NB/254 VE4ADG/126 KE1K/176 AA4M/280 WA4RRB/204 WB5ZDP/126 AI8S/273 KC9T/236 ND0F/133
HB9AJY/201 VE7AAQ/277 W2SR/279

160 Meters

N4WW/144

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
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London, ON N5X 1G3, Tel. 519-433-1198

Edmonton Papal Visit

January 1984: The Pope is coming! 250,000 people are expected to attend the open-air mass that will be celebrated just outside of Edmonton, Alberta. Members of Northern Alberta ARC are sure they can help. Club officials checked it out, and it turns out that several committees preparing for the Pope's visit have been looking for communications. The amateurs learn that the medical committee will need a communications system capable of operating on several channels. They offer their help to the medical committee, and are accepted.

Spring 1984: The work begins. An ad calling for volunteers is placed in the club newsletter, but response is slim. A telephone campaign, however, nets 40 of the 55 operators needed. Sixty percent of the operators own hand-held transceivers; most of the rest own mobile rigs. All the radios will have to operate for 12 hours or more without a break. Extra batteries, some fitted with voltage regulators, will be needed. Getting these becomes a project in itself.

June 1984: Visit organizers are becoming worried. Can the amateurs really do what they say they can do? For instance, when an ambulance is dispatched to someone requiring medical aid, can the amateurs have an operator there? Will relief operators be on hand? It becomes apparent that 55 operators won't be enough. There will have to be 80 regular operators and lots of relief operators. The call goes out for additional operators. Amateurs from as far as 200 miles away from Edmonton sign up.

July 1984: For the day of the visit, Edmonton police want 10 amateurs to monitor vehicle traffic within the city. Then, the ushers, who will be responsible for lost and founds, crowd control and dispatching golf carts to people not needing an ambulance, ask for help. They can use up to 150 radios! The amateurs decide to help.

August 1984: Visit organizers are predicting that 1000 people could need medical attention during the visit. Eighty doctors, 200 nurses, 160 St. John's Ambulance workers and 60 amateurs will be on site. The huge spectator area will be divided into 24 "pods." Each pod, the size of a football field, will have its own medical team and amateur operators. Operators will be assigned to one of three nets, each having its own frequency and net control. Additional frequencies will be set aside for medical consultations and general traffic among the amateurs. In an emergency, members of the medical team and an amateur will rush over to help; the operator will provide communications for the pod doctor.

September 1984: The system has been tested twice; both went well. DOC ran a check to uncover possible intermod problems and to recommend some frequencies. One small shift in frequency, one cavity in a transmission line, and it worked. The only problem was the noise, as all 15 net control operators, amateur and commercial, were crammed into a 60-foot trailer. Then, the PA system was turned on. Loud! Headphones soon became standard equipment. Now, there's a new problem. Before and during the visit, highways in the area will be closed. Access to the site will be by bus or a five-mile walk. There will have to be sleeping and eating accommodations for the amateurs. The amateurs arrange to bring trailers and RVs onto the site.

September 16-17, 1984: The night before the Papal visit. Pods close to the altar are full, and it's only 7 P.M. Amateurs respond to the first calls for help as morning comes. It's been cold and windy. People who stayed overnight are cold and stiff, but don't realize they have a problem until they try to move. More calls, especially to help older people. The Pope arrives, and the mass moves along. The planning pays off; everything is under control. The Pope leaves, and the amateurs have time to reflect. There were calls for allergic reactions, hypothermia, a heart attack and some broken bones—but only 102, not the 1000 that had been predicted. Amateurs helping the ushers had found 20 lost objects and 25 lost people. That had gone well, too, in the single-largest public-service event in which Alberta amateurs had ever been involved. *(Compiled from material written by Glenn Fritz, VE6AFF)*

CRRL NEWS

☐ Recently, DOC asked CRRL to review several hundred new questions for the technical portions of DOC Amateur Radio exams. Surprise, surprise. The questions were all multiple-choice! DOC did not indicate when the multiple-choice questions will be phased in or what percent of the technical portions of exams will eventually become multiple-choice.

☐ CRRL is starting an "Elmer" program. Every week, CRRL receives several letters from people who want to become radio amateurs. All who write are sent an information package, the name of a nearby club and, when possible, the name of a nearby amateur who has agreed to let himself be contacted and is willing to invite prospective amateurs to his station and show them what Amateur Radio is all about. What CRRL needs is the names of more such amateurs — probably *your name* — particularly if you live in one of the less-populated areas of Canada. Can you help? If so, send a note to the CRRL Headquarters office in London, Ontario.

☐ What is the present state of CRRL membership? CRRL membership did decline somewhat during the first part of 1984, but later increased — for a net gain of 5.7% and a total membership of 5120 by the end of the year. To all who joined CRRL during the recent membership campaign, thanks for your support. Please call on your volunteer CRRL reps and workers whenever you need assistance. If you have the time and inclination, contact your CRRL Regional Director or Section Manager and ask how you can become part of the team. It's *your* League.

☐ FCC's Notice of Proposed Rule Making on repeater coordination is of more than passing interest to Canadian amateurs. One question that was asked was "Should there be a single repeater coordinator for the U.S.?" Many repeater-coordinating groups along the Canada-U.S. border are bi-national, and at least one, the Western New York-Southern Ontario Repeater Council, has a frequency coordinator (responsible for coordinating repeaters in Canada and the U.S.) who is a Canadian. Would FCC be prepared to uphold coordinations made by a Canadian? What if a coordinated repeater in Canada and an uncoordinated repeater in the U.S. interfered with each other? Would FCC uphold the right of the Canadian repeater to remain in operation and take the U.S. repeater off the air? It all needs thinking about. CRRL will be making FCC aware of these "wrinkles" before things get too far along.

RSO-CRRL '85

Plans are well under way for the RSO-CRRL '85 Convention, to be held in London, Ontario, on September 27-29. The "Friday-Night Eyeball" will feature music and Ontario wine and cheese. The Saturday and Sunday programs will feature top speakers from Canada and the U.S. By press time, the following were confirmed: AMSAT's John Henry, VE2VQ, on satellite communications; *QST* author Richard Miller, VE3CIE, on VHF/UHF propagation; IARU President Richard Baldwin, W1RU, on international Amateur Radio; PACSAT Project Manager Harold Price, NK6K, on digital communications; *CQ* author Tony Ward, VE3IAT, and the CANAD-X group on operating from exotic parts of the world; former *QST* Technical Editor Doug DeMaw, W1FB, on homebrew design and antennas; *TCA* Contributing Editor Michael Ross, VE2DUB, on microwaves; CRRL Counsel Bob Benson, Q.C., VE2VW, on Amateur Radio and the law; *Radiosporting* Editor Yuri Blanarovich, VE3BMV, on contesting; CRRL Past President Mitch Powell, VE3OT, on teaching Amateur Radio; and more. The Saturday banquet will feature a cabaret show; at midnight, amateurs will assemble in solemn conclave for initiation into the Royal Order of the Wouff Hong.

RSO-CRRL '85 is *not* a local convention. It's a convention for you, whether you live in Victoria or Saint John's. Why not check out the airline seat sales as they come up, or the cost of

rail or bus transportation? Getting to London can be cheaper than you think.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the British Columbia Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this *QST*.

A petition, to be valid, must carry the signatures of five or more Full Members of the League residing in the British Columbia Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be *on the petition*.

Petition forms (FSD-129-C) are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)

The Secretary, CRRL
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full Members of the League residing in the British Columbia Section, hereby nominate . . . as Section Manager of this Section for the next two-year term of office. (Signatures . . . Calls . . . Addresses, including postal codes . . .)

A Section Manager must be a resident of the Section, a licensed amateur holding a Canadian Amateur Certificate or higher and a Full Member of the League for a continuous term of at least two years immediately prior to the receipt of nomination at the CRRL Headquarters office.

Petitions must be received at the CRRL Headquarters office before 1600 EDT Friday, June 7, 1985.

If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, there will be a balloted election. Ballots will be mailed from the CRRL Headquarters office before July 1, 1985. Returns will be counted after August 20, 1985. A Section Manager elected as a result of these procedures will serve for a two-year term that will begin on October 1, 1985.

If no valid petition is received by June 7, 1985, the Section will be resolicited in October 1985 *QST*. A Section Manager elected after resolicitation will serve for 18 months.

You are urged to take the initiative and file a nominating petition immediately.
Harry MacLean, VE3GRO
CRRL Secretary

NOTES FROM ALL OVER

☐ Going abroad this summer? For information on how to obtain an amateur licence or operating permit for most foreign countries, contact Naralon Thorn, VE3LRU, at Foreign Licensing Informaton, CRRL, London.

☐ Prefix hunters, take note! To commemorate the 100th anniversary of Parks Canada, Canadian amateurs may use the following special prefixes from June 29 to August 29: XO1 and XO2 in Newfoundland and Labrador, XK1 in the Yukon, and XJ1 through to XJ8 in the remainder of Canada.

☐ Congratulations to Ray Thornton, VE3RT, and Frank Rapp, VE3RZ, who were both recipients of IEEE 1984 Centennial Medals. Congratulations also to Jim Swail, VE3KF, who was invested into the Order of Canada for his work in designing aids for the blind. Jim, who is blind himself, won a *QST* Cover Plaque Award for his fine article in March 1983 *QST*. He works at National Research Centre, Ottawa.

☐ Seven-year-old Randy McLellan asks us to make a correction. His father, CRRL Director Andy McLellan, VE1ASJ, has a son and a daughter, not two daughters as reported in February *QST*.

IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

The International Amateur Radio Union — since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

FRANCE

The REF (Reseau des Emetteurs Francais), the French Amateur Radio society, will be celebrating both its 60th anniversary and that of IARU during the national meeting of REF in Chateauroux, France, May 25-27, 1985. A philatelic exposition about Amateur Radio and Amateur Radio communications will be held during those three days. Special commemorative covers will be available, as follows: No. 1—an illustrated envelope for a period of two months from the Chateauroux Post Office. No. 2—the same envelope but with a big illustrated postmark for two days of the conference, from a special post office in the meeting building. No. 3—a deluxe illustrated philatelic parchment (limited edition), the original handmade by the last French parchment worker. This parchment will also have the special illustrated postmark. Each envelope will cost 6 IRCs, and the parchment 15 IRCs. For shipment at the end of May, send your orders, with payment, to FE1135, Mr. Raymond Aupetit, 14 Residence Bois Boutin, 16340 L'Isle d'Espagnac, France.

TURKEY

It appears that after much work by the Turkish National Society (TRAC), Amateur Radio licenses are now being issued by the Turkish government. The first license was issued to Dr. Unal Akbal, the General Secretary of TRAC, who formerly used the call sign TA1UA but will now sign TA1A. There is only one class of license, permitting all-mode operation on all bands, including 10, 18 and 24 MHz.

THE UNITED NATIONS AT 40

On October 24, 1985, the United Nations will celebrate the 40th anniversary of the coming into force of the United Nations Charter, signed in San Francisco in 1945. To celebrate this event, and in the spirit of developing friendly relations among nations, the United Nations Staff Recreation Council Amateur Radio Club is sponsoring the "UN at 40 Award."

This award is available to any Amateur Radio station (or SWL) that has contacted (or heard) two of the three Amateur Radio stations operating with the UN prefix during the anniversary year of 1985. Any band, any mode, with 4U1UN in New York, 4U1ITU in Geneva and 4U1VIC in Vienna. Send a list of stations worked—including date, time, mode, report and band—signed by the applicant and certified by an official of an Amateur Radio Club, along with $5 U.S. or 10 IRCs (of which $4 will be donated to UNICEF), no later than February 1, 1986 to United Nations Staff Recreation Council Amateur Radio Club, United Nations, Room DC1-0724, Box 20, New York, NY 10017.

A January 1985 visitor to the International Secretariat in Newington, Connecticut, was Mr. Erlangga Suryadarma, YBØBZZ (center), a member of the executive committee of the Indonesian Society. Here, he presents IARU Secretary Dave Sumner, K1ZZ (right), with a copy of *CQ Nusantara*, the journal of the Organisasi Amatir Radio Indonesia (ORARI). Looking on is ARRL Secretary Perry Williams, W1UED. *(N1CIX photo)*

Washington Mailbox

Conducted By Katherine Hevener, WB8TDA
Information Services Assistant, ARRL

Amateur Radio—Don't Leave Home Without It

Most of your ham radio activity will take place in the comfort of your ham shack. However, routine commutes, contests, picnics, vacations, etc., frequently present opportunities to operate from different locations. This month, we will see how Amateur Radio fits in to your travel plans.

Q. What is the difference between portable and mobile operation?

A. According to Section 97.3(1), portable operation is defined as "Radio communication conducted from a specific geographical location other than that shown on the station license"—a vacation site, for example. Mobile operation is "Radio communication conducted while in motion or during halts at unspecified locations"—at a traffic light, for example.

Q. Do I have to indicate that I am operating portable or mobile?

A. No, but many people do simply to avoid unnecessary "DX pileups."

Q. May I operate from a location other than that shown on my station license for an extended period of time without modifying my ticket?

A. Yes. However, you are responsible for making arrangements to receive your mail, as the FCC will send it to the mailing address shown on your station license (97.43). So, if you have any doubts about receiving your mail promptly, you should submit an application for modification of your station license to the FCC in accordance with Section 97.95 of the rules.

Q. I'm planning to take a commercial flight to Las Vegas. May I operate "aeronautical mobile" while in the skies?

A. Federal Air Regulations (FAR) rule 91.19 prohibits the use of portable electronic devices—including Amateur Radio equipment—aboard commercial aircraft. Rule 91.19 applies to both receiving and transmitting on board. The airline company (not the pilot), in special cases, may allow aeronautical mobile operation. These cases are the exception; don't expect that you'll be granted permission to operate aboard a scheduled airline flight. The captain has no legal authority to allow passengers to operate hand-held radios on board commercial airliners. But, the captain must be advised of any special grants, and "approve" the portions of the flight in which the hand-held radio may be used. If you are granted permission to operate your equipment on board the aircraft, you must comply with all the following special conditions:

(a) The installation and operation of the amateur mobile station shall be approved by the master of the ship or captain of the aircraft; (b) The amateur mobile station shall be separate from and independent of all other radio equipment, if any, installed on board the same ship or aircraft; (c) The electrical installation of the amateur mobile station shall be in accord with the rules applicable to ships or aircraft as promulgated by the appropriate government agency; (d) The operation of the amateur mobile station shall not interfere with the efficient operation of any other radio equipment installed on board the same ship or aircraft; and (e) The amateur mobile station and its associated equipment, either in itself or in its method of operation, shall not constitute a hazard to the safety of life or property (97.101).

It is important to note that operation usually will not be permitted during takeoff and landing. Hams operating without the captain's knowledge are in violation of Rule 91.19 and endanger the lives of the passengers.

Q. I am going to be sailing to several areas next year. What are the provisions regarding maritime operation?

A. Even though your voyage may take you through international waters (those outside the jurisdiction of any country), Section 97.101 applies to your operation since you hold an FCC amateur license. You should be familiar with the rules regarding the installation and operation of a radio station onboard a U.S. registered vessel. As long as you are sailing or are anchored in international waters, you may operate with your FCC license. For informational purposes, you may wish to identify as "maritime mobile" followed by the ITU Region number, 1, 2 or 3. It is important to note that you are permitted to operate only on those amateur frequencies specifically allocated to the Region you are in at the time of operation (97.95). As soon as you enter the territorial waters of another country, you may operate *only* if you hold a license or permit issued by that country.

Q. Within the next few years, I plan to visit several foreign countries. Is it possible to operate my amateur station while visiting?

A. If the particular country you are planning to visit holds a reciprocal-operating agreement with the U.S., permission to operate should be readily obtainable from that foreign government. Procedures vary from country to country, however. For information on operating in specific countries, contact the Information Services Department, ARRL, 225 Main St., Newington, CT 06111.

Q. What if I am visiting a country that does not have a reciprocal-operating agreement with the U.S.?

A. Many countries that do not have a reciprocal-operating agreement with the U.S. may still permit U.S. amateur operation within their boundaries. Again, ARRL Hq. is a good source for more information.

It is important to note that attempting to operate in another country without permission may seriously jeopordize the possibility that other U.S. amateurs will be granted such privileges. *Always* go through proper channels when seeking foreign operating privileges. *Never* make careless assumptions.

Q. How can I find out which countries share reciprocal-operating agreements with the U.S.?

A. You may obtain this information from your FCC Field Office or from the Information Services Department, ARRL.

Q. Will I be issued a special call sign for use during my stay in each country?

A. This varies from country to country. Some will issue your station a special call sign when authorizing your station operation. For example, in New Zealand, you will be issued a ZLØ call sign. In other countries you will use your own call with a suffix, such as "K1ET/C6A" in the Bahamas, or with a prefix, such as "G4/W1OD" in the U.K. The important thing to remember is that reciprocal-licensing procedures vary greatly from country to country, and that application must be made to each country in which you plan to operate. Allow plenty of time for the processing of these applications.

Q. What frequencies and privileges may I use when operating under a foreign operating permit?

A. When a foreign country permits operation within its boundaries, the frequencies and emissions used will be prescribed by that country's government.

Q. May I operate my station in countries in which I have not applied for a reciprocal-operating permit?

A. With the exception of Canada, which shares an automatic reciprocal-agreement with the U.S., you may *not* operate your station without permission from the government of that country (97.95[b]). However, as long as the control operator is present to ensure compliance with that country's rules, you may *participate* as a third party in the rare cases in which such operation is permitted.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

Conducted By Bob Atkins, KA1GT
103 Division Ave., Millington, NJ 07946

Microwave Ferrite Devices

A number of very useful passive microwave components are based on the use of materials known as ferrites. Such devices as isolators, phase shifters and circulators are all ferrite-based components. This month we will take a look at these ferrite devices and their basic principles of operation.

Ferrites are ferromagnetic materials formed by replacing some of the iron atoms in a form of iron oxide (known as magnetite) with other metal atoms, such as nickel, cobalt or manganese. The important property of ferrites is that they possess unpaired spinning electrons, which can interact with electromagnetic waves passing through them. Without going into too much detail, the spinning electrons have a magnetic moment along their axis of spin. In the presence of an external magnetic field, the spinning electrons do not align themselves along the fixed axis, but rotate or precess around it. The frequency of precession, called the gyromagnetic resonant frequency, is a function of the applied magnetic field.

Circularly polarized microwave energy has a rotating magnetic field. If the direction of field rotation is the same as the direction of electron precession, energy may couple from the microwaves to the ferrite. This energy can couple into the ferrite structure and eventually be dissipated as heat. Thus, the microwave energy is attenuated when passing through the ferrite. The interaction is at a maximum when the frequency of the rotating magnetic field component of the microwave energy is the same as the frequency of precession of the electrons in the ferrite. If the direction of the rotating magnetic-field component of the microwave energy is opposite to that of the electron precession, there will be little or no interaction between the two. Thus, the interaction of a ferrite material with circularly polarized radiation is very much a function of the direction of polarization. It is this anisotropic (unequal) interaction that is at the heart of ferrite microwave components.

Ferrite components may be coaxial or waveguide in construction. I will describe a couple of waveguide structures here, but the principles apply to both. As mentioned above, it is an interaction between circularly polarized energy and the ferrite that is the basis of operation of these devices. Most waveguide systems use rectangular waveguide, which transmits linearly polarized energy. However, even in rectangular waveguide, a circularly polarized magnetic field exists in places.

There is a vertical plane of circular polarization at a position approximately halfway between the center of the waveguide and the waveguide wall. Ferrite material placed at this position will interact with microwaves in the waveguide. However, energy propagating in one direction will interact with the ferrite much more than does energy propagating in the opposite direction (because of the different directions of circular polarization interacting with the ferrite). Such a device is an isolator, has the property of

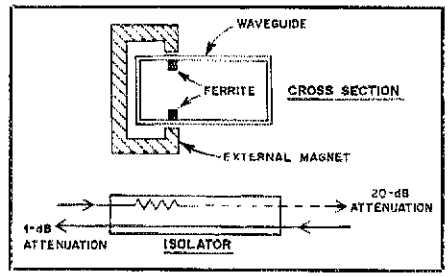


Fig. 1—A waveguide isolator.

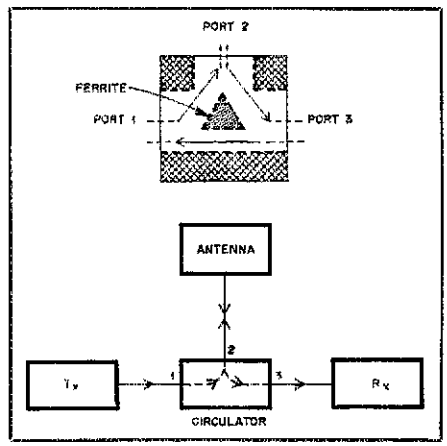


Fig. 2—A three-way waveguide circulator.

allowing energy to pass through in one direction with very little attenuation (<<1 dB), but has a high attenuation for energy passing through in the other direction (20-30 dB). Such devices are frequency sensitive, since the frequency of maximum interaction of the ferrite with the microwave energy is governed by the strength of the external magnetic field.

A schematic of an isolator is shown in Fig. 1. Isolators are very useful when connecting a microwave generator that is sensitive to load impedance to a variable load. Power reflected from the load is absorbed by the isolator and is therefore prevented from reaching the generator.

At frequencies removed from resonance, the dominant effect of ferrite materials on microwaves is that of phase shift. The phase shift may be reciprocal or nonreciprocal, depending on the location of the ferrite material in the waveguide. A very useful device that makes use of the nonreciprocal effect is the circulator. There are many types, one of which is the three-port circulator shown in Fig. 2. Energy entering port 1 is transferred to port 2, with very little appearing at port 3. Similarly, energy entering port 2 appears at port 3, and energy entering port 3 appears at port 1.

Such a device may be used to connect a separate transmitter and receiver to an antenna without the need for relays. Circulators are often used as diplexers in radar systems. Another use for circulators is injection locking a free-running oscillator. In this case, the free-running oscillator is coupled to port 1, and an antenna to port 2. The output from the oscillator is therefore transferred to the antenna. A low-power (perhaps 20 dB lower than the free-running source, depending on the system), highly stable (xtal-controlled) oscillator is coupled to port 3, and its output is therefore coupled only to port 1, the free-running oscillator. If the two oscillators are close enough in frequency for injection locking to occur, the free-running oscillator will lock to the xtal oscillator frequency, and its noise bandwidth will also equal that of the xtal-controlled source.

This has been a very brief outline of ferrite devices. If you keep an eye open at flea markets, they can be found and utilized in amateur microwave systems. The photograph shows what to look for. On the left is a K-band isolator (note the large external magnet); on the right is an X-band 3-port circulator (there is a small magnet within the body of the device).

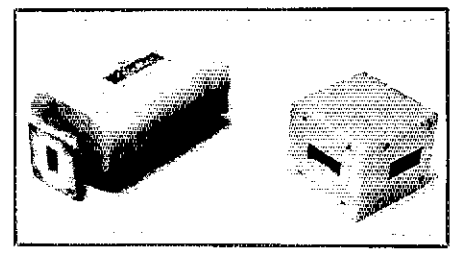
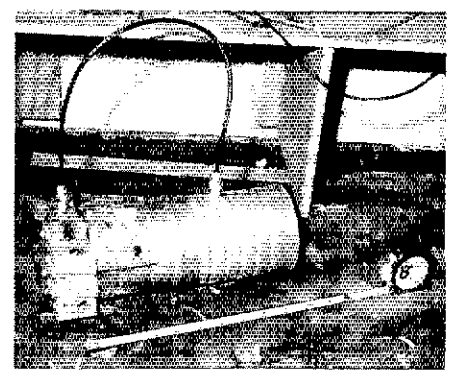


PHOTO FEATURE

From time to time, I receive photos of microwave activity from around the country. When space permits, I will print these photos here so we can all see what's going on. This month's photo, from WA8VFA, is of a self-contained 2.4-GHz ATV transmitter with a coffee-can antenna. The transmitter consists of a free-running oscillator using a single MRF901. The parts cost of the transmitter is about $5 (who says microwave equipment has to be expensive!).



On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

Computer Nets

Milwaukee-area amateurs have a 2-meter FM net that K9IZV calls to order each Thursday at 9 P.M. on 31/91. The purpose of the net is to exchange information, ask questions, solve hardware problems and give technical talks — all on the subject of computers. Each session has about 30 computer owners representing eight different computer manufacturers. Over 140 different stations have checked in so far. It's not unusual for several enthusiastic operators to ask questions and share interesting comments. This net is an important resource to instruct, inspire and encourage both new and seasoned amateurs.

There are several computer nets already in operation on the HF bands with operators willing to give you tips and guidelines in reply to your questions. Pertinent information about such nets appears in this column and in the ARRL *Net Directory*. The current edition of the *Net Directory* is available for the asking. It lists over 1200 public service nets by location and frequency, as well as many computer and maritime service nets. This directory is also packed with information on all the basics of traffic handling and net operation. You may obtain your copy by sending a 9- by 12-inch s.a.s.e. with 90 cents U.S. postage to ARRL Net Directory, 225 Main St., Newington, CT 06111.

Perhaps you are interested in the idea of a local 2-meter computer net and could coordinate others to get activity started. If you get a computer net going in your area, send the information to the conductor of this column (WA1LOU). The net will be publicized here, and the information will be passed on to the editor of the *Net Directory*. And if someone in your area starts a computer net, lend your support — the encouragement may make a difference. — *Richard R. Regent, K9GDF, Wisconsin Section Manager*

SPRING SYSTEM COMPUTER INFORMATION MEETINGS

Spring Computer Info Net is called every Monday at 7:30 P.M. EST/EDST by net control KA3LUN on the Sharon (Pennsylvania) repeater, AF3P, operating on 145.30 MHz. With five satellite receivers, the repeater has extended coverage throughout Northwestern Pennsylvania and Northeastern Ohio, so you can expect a lot of computer information changing hands each week.

AMATEUR RADIO BULLETIN BOARD SYSTEM

Amateur Radio Bulletin Board System (BBS) is run by Pat O'Farrell, K7NTV, and provides extensive ham radio files and messages and a unique ham radio magazine bibliography with over 3000 entries from eight magazines. The BBS is operational weekdays, from 6 P.M. to 7 A.M. PST/PDST, and 24 hours a day on weekends and holidays. Call 509-697-7298 and send three carriage returns to allow K7NTV's modem to detect your data rate (300 or 1200 bauds).

ELMER

Elmer is a ham radio BBS in Fort Rucker (Alabama) run by system operator (SYSOP) Richard Pitts, WA6LMM/4. The board operates at 300 bauds (7- or 8-character bits, stop bit, no parity) and is available weekdays, from 1 P.M. to 9 A.M. EST/EDST, and 24 hours a day on weekends at 205-598-6079.

MICHIGAN BOARDS

Fenton BBS has a large Amateur Radio section, with areas devoted to news from ARRL, packet radio, DX, ARES, space, swap and shop, and more. A program area for ham radio applications is forthcoming. The BBS supports 300 and 1200 bauds, and operates 24 hours a day, seven days a week. Call 313-629-2854.

The Flint BBS is run by and for hams, with areas devoted to messages, programs, news and other ham-related topics. Telephone 313-238-4984 to access the bbs. N8DYB is SYSOP.

PACKET UPDATE

Heath has introduced a packet-radio terminal node controller (TNC) that is based on the Tucson Amateur Radio (TAPR) TNC design. The Heath version is smaller than the TAPR TNC, yet it provides the same features. To facilitate building the kit, the parts are mounted on an adhesive strip in their order of assembly (Heath Company, Benton Harbor, MI 49022).

The firmware of GLB's PK1 TNC has been updated to version 3.7. Consult the PK1 manual on how to obtain the latest version (GLB Electronics, 1952 Clinton St., Buffalo, NY 14206).

According to *Packet Software Approach Newsletter* No. 6, Bob Richardson, W4UCH, has updated his AX.25 software to version Dash 2, which makes it easier to connect a modem to a TRS-80 computer running his TNC emulation program (by eliminating the external port encoder/decoder (Richcraft Engineering Ltd., 1 Wahmeda Industrial Park, Chautaqua, NY 14722-1065).

WANG PCS II

Bill Giel, KD1O, wants to get in touch with anyone using a Wang PCS II (with twin disk drives) for RTTY or CW. Bill has written a propagation-forecasting program that incorporates MINIMUF 3.5 with a database of over 300 locations for the PCS II, and will provide free copies to those who send a blank 5¼-inch, hard-sectored diskette and a self-addressed, stamped disk-mailer to Bill at 524 Valley Ave., Yonkers, NY 10703.

PX: Commodore 64

Program Number 56 Fix

The PX Library staff recently had some problems photocopying PX program number 56, lines 460 and 470. The correct listings of the troublesome lines are

```
460 READ DD$(I)
470 NEXT I
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PX Guidelines

Here are some guidelines for submitting programs for the PX library. The program listings should be printed directly from the computer; they should not be transcribed from the computer. Handwritten listings should be used as a last resort. To facilitate photocopying, the program listings should be printed using a fresh printer ribbon. Also, the program listings should be printed on white paper, page sized to 8½ by 11 inches with at least ¼-inch margins at the top, bottom and sides of each page.

Six for the 64

This installment of PX offers six programs for the popular Commodore 64 computer.

First, Art McLeod, KR5T, submitted program number 68 with the self-explanatory title of "Learn Code."

After you learn the code, program number 69 will help you pass the Novice exam by randomly quizzing its user with 60 Novice questions. It was written by John Bonar, NA2C. The s.a.s.e. for this program should include 73 cents postage.

Once you get your license, you will want to put up some antennas. Jaime E. Vega, HI8JEV, submitted two programs. Program number 70 assists in the design of a three-element antenna; program number 71, a four-element antenna.

Bob Unsworth, W6MTJ, submitted program number 72, for designing a helical antenna.

After you put those antennas to good use, program number 73 will come in handy. Written by Bonnie Mason, WB2WSY, it generates QSL cards.

To obtain a listing of any PX program, send a business-size s.a.s.e. with 39 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower-left-hand corner of the s.a.s.e. Please do not send correspondence other than PX requests to Dept. PX.

VE PX

CRRL members can obtain listings of PX programs by sending a business-size s.a.s.e. to CRRL, P.O. Box 7009, Stn. E, London, ON N5Y 4J9. Use a separate s.a.s.e. for each program request and write the PX program number of the desired program at the lower left-hand corner of the s.a.s.e.

Strays

I would like to get in touch with...

☐ any amateurs using an Apple *IIc* computer to work RTTY. James Hughes, W3HGM, Box 243, Grove City, PA 16127.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to P.O. Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

A Banner Year for Meteors?

This may be an especially good year for the "ping jockeys"—VHF operators who make meteor scatter, or MS, one of their principal pursuits. As mentioned in last month's column, Michael Owen, W9IP, believes this may indeed be "a year to remember." He bases his contention on the fact that several comets are approaching our part of the solar system. Since comets are accompanied by clouds of particles, and it is particles traveling through space crashing into the earth's atmosphere that are responsible for the ionization we know as meteor pings, it stands to reason that there may be some really interesting meteor showers in the months to come.

Meteor showers are named for the area of the sky, the constellation, from which they appear to come, not for the comets that provide the particles. Thus, the Perseids shower, so familiar to VHFers, appears to emanate from the constellation Perseus. Few of us are aware, however, that it is the Swift-Tuttle comet that furnishes the numerous particles that produce this shower. Probably the best known of the comets is Halley's. As almost everyone has heard by now, it is due to visit the inner portion of the solar system over the next few months, putting on a spectacular visual show as it approaches the sun.

Last month's column contained W9IP's reminder that the Eta Aquarids Shower is due in early May. Mike pointed out that this shower is caused by particles traveling in the same orbit as Halley's comet but somewhat ahead of it. This is the first of the showers that he believes will be particularly productive for MS operators this year. W9IP further notes that its particles approach the earth almost head-on and thus slam into the atmosphere at higher-than-customary velocity. As a result, they ionize the atmosphere at a greater altitude than is the case with many of the other showers. Thus, the Eta Aquarids should be particularly productive for better-than-average MS DX. The shower is expected to peak about 1300Z Saturday, May 4, with east-west paths favored for us in North America.

Besides the Eta Aquarids in May and the Perseids in August, there are other meteor showers that W9IP believes bear more than mere watching this year. The October 3 Draconids, a product of the Giacobini Zinner comet, provides another potentially good opportunity. This comet will have passed the earth's orbit only 29 days before we arrive at that point in space, so there should be a substantial quantity of particles still around when we get there. That should mean lots of meteors. Mike warns, however, that the peak of this shower will last only a hour or so, and will probably occur about 1600Z, favoring northwest-southeast paths. Eleven days later, on October 20, particles accompanying Halley's comet should produce the Orionids shower. W9IP notes that this close proximity of comets provides a similar situation to that which made the 1966 Leonids shower so spectacular, with over 150,000 meteors per hour.

W9IP has developed a computer program, which runs on the IBM® PC, that predicts the optimum times and directions for most of the major showers. It is an extension of an earlier program originally developed by W1JR. Mike says that for $5 to cover his cost he will be happy to send a disk to anyone wishing to try the program. His address is Michael R. Owen, 21 Maple St., Canton, NY 13617.

This may be an MS year we will long remember. It should not only be great sport for experienced ping jockeys, but also serve as an ideal opportunity for newcomers to get their feet wet in this fascinating and productive propagation mode.

ANOTHER ROUND OF VHF CONFERENCES COMING UP

As well as being the time of year for improved VHF propagation, we are also into the season for VHF conferences. These gatherings provide an ideal opportunity to meet fellow VHFers, exchange ideas and hear of the latest in techniques.

☐ First up is the West Coast Conference. It will be held May 3-5 at the Hilton Hotel in Sunnyvale, California. The program includes speakers on antennas, amplifiers, preamps, ATV, packet radio, and gear for 23 and 13 cm. Also included are antenna-gain and noise-figure competitions, and a flea market. Lodging reservations may be made directly with the hotel at 408-738-4888. Be sure to mention the conference for the special $55 per night rate.

☐ Next on the list is the Eleventh Annual Eastern VHF Conference, set for May 17-19 at Rivier College, Nashua, New Hampshire. The program features a Friday night hospitality room and technical talks by well-known VHFers during the day on Saturday. Also scheduled are antenna-gain and noise-figure events, as well as a Saturday evening banquet. Until May 5, conference registration is $13.50, and $14 for the banquet. Both should go to David Knight, KA1DT, 15 Oakdale Ave., Nashua, NH 03062, with checks payable to the "Eastern VHF/UHF Conference." Accommodations are available at the college dormitory at $16.50 per person per night or $28 double. Those wishing these accommodations should include payment along with their preregistration. There are also a number of hotels and motels nearby.

☐ The granddaddy of the VHF conferences, sponsored by the Central States VHF Society, will be held in Tulsa, Oklahoma, July 26-28. One thing guaranteed by this year's president, Charlie Calhoun, WØRRY, is that there will be no snow for the antenna-gain contest. The affair will be held at the Sheraton Inn Skyline East, just off I-44 and 10 minutes from the Tulsa International Airport.

An impressive lineup of speakers, including WA4GPM of Varian on cavity amplifiers, WA4MVI on E_s propagation, W4WD on automation in the ham shack, WB5MPU on automating the OSCAR station, WB5LUA updating the 1296 transverter design, K2UYH on 10 GHz, N6TX on antenna systems and W4HHK discussing 2304. In addition, W3IWI or NK6K from AMSAT will update plans for the exciting new PACSAT satellite project. K6MYC and WØPW may also be present to give what are always interesting and informative talks. This conductor will have a few minutes on the program to sample the group's thoughts on some of the operating issues currently before us, such as the proposed revisions to EME sequencing and reporting standards.

It is planned to continue the practice begun last year of publishing a *Conference Proceedings* so all of the technical papers are documented both for attendees and those who are unable to make the Conference. Another event initiated last year, the Friday evening indoor flea market, which proved very popular, will also be included. If the 1984 event was any indication, this may be the finest collection of VHF-related goodies one can expect to see anywhere. Of course, there will be noise-figure and antenna-gain events, and the fine Saturday evening banquet. Once again, WB5LUA is in charge of corralling a stable of first-class VHF-oriented items. I am sure Al would be grateful for any help he can get in this regard, so anyone who may have something to donate is encouraged to do so. As is usually the case with Central States conferences, there is a fine women's program in the works. This year, Pam Marshal, N5KW, and Mrs. WØRRY, DeEdra Calhoun, are in charge of lining up a great series of tours and events for those who prefer not to attend VHF technical talks. Contact WØRRY at 1119 Calleen Dr., Sapulpa, OK 74066, for further details.

ON THE BANDS

6 Meters—Once again, WA5IYX comes up with another of his extensive reports on E_s and F2 conditions as seen from his San Antonio QTH. As would be expected, Pat found E_s occurrences in February considerably down from January, with the 6-meter totals dropping from nine separate openings during eight days of January to three openings during a like number of days during February. However, the total number of minutes of openings for the two months was identical at 445. This disparity was due to a massive event that took place February 3 in which 6 meters was open for over three hours, beginning at 2350Z. Despite the long opening, only a handful of stations were heard.

The true extent of the opening can be gleaned from Pat's FM broadcast observations. That band opened as early as 2140Z with low-end-of-the-band stations in the Maryland/DC area. It closed at 0150 February 6 with Mexican stations. In between, FM signals from the Mid Atlantic states and across the Northern tier of states to Minnesota were received. Frequencies up to the high end of the band, and into the airport VORs above 108 MHz, were open. Similar results were noted on TV Channels 2 through 6. WA5IYX makes the point that, during most of these winter openings, conditions, as indicated by TV and FM observations, were much better than would be inferred from listening only to 6 meters. The moral to this observation is that the band is open more than we think. The only way to take advantage of it is to make some noise. As they say on TV, "Be there!"

WA5IYX's eternal vigilance paid off again in

early March with reception, on the 8th at 0245Z, of the 50.099-MHz HC2FG beacon. Pat says that the signal was in for 40 minutes and peaked S9. From the lack of TV signals, it appeared that the propagation mode was entirely F2. This conclusion is interesting in light of the fact that the solar flux for that day was only 69.

From *Six News,* published by the U.K. Six Metre Group, comes confirmation that 25 Norwegian hams have been granted 6-meter operating privileges. Apparently, they are restricted in their hours of operation, as the British still are. In addition, they are limited to 25-W ERP. It is reported that some contacts between Norway and the U.K. have already taken place, with LA8AK working G4IJE on February 4 and G4DGU on the 12th, both via MS.

2 Meters—WA1JXN writes that his trip to the Bahamas was a great success despite problems with high winds and power-line noise. The antenna he used this time was similar to that employed on his previous visit—an array of four KLM 16-LBX Yagis. But this time, he had modified them to "18-LBXs" by adding two additional directors to each, making the booms 34 feet long. Even with this additional boom length and the aforementioned wind, they held together very well. The system must also have worked electrically, as Lance racked up EME contacts with well over 50 stations, and completed WAC by virtue of a contact with ZS6ALE. He also did well on MS, working WA3HMK and K3HEC in Pennsylvania, K2TXB and WB2NPE New Jersey, WA1OUB New Hampshire, WA4NXY Tennessee and WB3LJK Maryland. Tropo conditions for WA1JXN/C6A were also very good, producing contacts with K5SM Louisiana, KA1BXB Connecticut, K2TXB New Jersey, a number of stations in Virginia, the Carolinas and Alabama, as well as numerous Georgia and Florida 2-meter operators. Lance expresses his thanks to VE7BQH for providing a 0.2-dB MGF-1202 preamp and for arranging the skeds, as well as to W5HUQ for handling liaison on 20 and 75 meters.

1¼ Meters—K4HWG has made it known that a new beacon has just been put into operation by Woodbridge Wireless, Inc. The beacon, which signs the call WB4FQR, is located at Woodbridge, Virginia (near Washington), in grid square FM18, and runs 13 W to an omni antenna on 220.055. Reception reports are invited and may go to the *Callbook* addresses of K4HWG or WB4FQR.

The Higher Bands—A note from WD4MBK fills us in on how the East Coast 70-cm Net has been going. Over its five-and-a-half-year history, the net has had 290 different stations check in from 24 states. Charles says, however, that although check-ins have generally been holding up well over the past few months, those from the Northeast have fallen off dramatically. He wonders if part of the cause for this may be the late hour (2330 Eastern time) that the net looks for stations in that direction. Consideration is being given to splitting it into two parts, with one net control, K4CAW, taking check-ins from the North beginning about 2100, and the other, WA4ZIA simultaneously collecting the Southern contingent. Of course, two closely spaced but separate frequencies would be used. A time would be provided when the two halves of the net would join and relay sked information and news of general interest. Charles would appreciate opinions on this approach. His address is Charles Osborne, 1427 Robin Hill Dr., Norcross, GA 30093.

VE4MA says that he has been having quite good success on 23-cm EME with 90 W to a 9-foot TVRO dish. So far, he has worked VE7BBG, K2UYH and OE9XXI. The current project is completion of an OZ9CR six-tube amplifier. Next, Barry has plans for 13 cm.

EME Annals

Figures are number of different stations (not total QSOs), number of U.S. states, number of DXCC countries all worked via EME. Compiled March 16, 1985. Deadline for next update is March 1, 1986. Beginning with the next appearance of the EME Annals, stations not heard from over a two-year period will be dropped from the list. Minimum numbers of stations worked to qualify for list for each band are noted. These can be expected to change, depending on activity levels and available *QST* space.

The Beginnings

January 27, 1953: first amateur reception of echoes from the moon—W4AO and W3GKP. Frequency used: 144 MHz.
July 27, 1960: first amateur two-way contact via the moon—W1BU and W6HB. Frequency used: 1296 MHz.
April 11, 1964: first 144-MHz two-way moonbounce contact—W6DNG and OH1NL.
May 20, 1964: first 432-MHz two-way moonbounce contact—W1BU and KP4BPZ (followed shortly by a number of other contacts from KP4BPZ using the 1000-ft dish at Arecibo, Puerto Rico).
March 15, 1970: first 220-MHz two-way moonbounce contact—WB6NMT and W7CNK (followed by a contact the next day between WB6NMT and K2CBA).
October 19, 1970: first 2304-MHz two-way moonbounce contact—W3GKP and W4HHK.
July 30, 1972: first 50-MHz two-way moonbounce contact—K5WVX (now K5CM) in conjunction with W5WAX (now K5SW), and WA5HNK in conjunction with W5SXD.

Current Standings

6 Meters

(No min. no. stations worked)

K5WVX	2	2	1
WA5HNK	2	2	1
WB6NMT	2	2	1
VP2EME	2	1	1
W7FN	1	1	1
K6MYC	1	0	1
K6HCP	1	0	1

2 Meters

(Min. no. stations worked, 20)

K1WHS†	552	48	61
VE7BQH†	443	50	54
WA1JXN/7†	344	50	43
SM7BAE†	306	50	65
W5UN	266	—	40
WA4NJP	235	—	36
SM2GGF	222	—	31
UA1ZCL	200	—	25
KI7D	194	—	24
WA9KRT	186	—	32
OZ1EME	175	38	35
YU3USB	170	—	42
WB5LBT	162	—	38
W7FN†	161	45	24
OH7PI	160	—	42
W7HAH†	159	44	27
WA4LYS†	159	40	43
KB8RQ	156	—	28
N4GJV	154	43	32
WA6MGZ†	150	46	33
N7NW	150	—	—
JA6DR	138	—	25
W5LUU†	136	30	31
K1FO	132	35	20
K1MNS	132	—	34
KR5F	130	28	28
KX0O	125	—	25
W5HM	123	—	21
WA0LPK/KL7	119	49	11
F6CJG	118	—	62
Y22ME	118	—	58
WA4MVI†	115	24	20
SM4IVE	110	—	45
UA3TCF	110	—	40
SM4GVF	110	—	—
KB7Q	105	32	24
WA1JXN/C6A†	102	32	26
F6BSJ	99	—	55
YU3ZV	97	—	52
WA2GSX	93	—	18
SM2GVF	90	—	44
WA3VSJ	88	38	27
PA0VST	87	28	24
WB8PAT†	87	27	28
K7KOT	86	—	17
KG6DX	83	22	27
WA8ZHE	83	—	26
DL8OAT	82	—	52
VE1UT	77	47	20
W0RWH	75	12	20
VE2DFO	71	22	13
KB7WW	69	23	21
K9XY†	68	28	16
W7UBI	67	36	7
K1GVM	64	48	17
N6AMG†	64	27	24
K5GW	63	34	14
K6MYC/KH6	60	—	14
W1JR	57	19	18
WB0OMN	57	18	27
KE5C	57	—	17
PA2VST	57	—	—
WB8ART	57	—	—
K2QR	56	21	15
W5UWB	56	20	17
N7WS	56	—	17
KD7GK	56	—	15
G5CSZ	55	39	11
K4PKV†	54	32	12
WA4CQG	54	—	17
K2OS	53	—	15
ON7RB	50	—	38
W8IDU	49	29	12
WB5LUA†	49	29	12
DK1PZ	48	—	12
WD4DGF	48	—	—
WA7KYZ	45	29	8
W9BOZ	43	19	11
SM2ILF	40	—	25
W2CNS	40	—	15
W0SD	39	21	11
I2MBC	39	19	11
K7NII	38	24	5
K3VGX	38	18	7
W7CI	38	14	4
UB5JIN	38	—	36
K5BMG	37	24	9
DJ5MS	37	—	—
WA3USC	36	15	10
KD9Z	36	—	7
K3MD	35	15	8
WA7BJU	34	27	2
AB3D	34	19	9
W7JF	34	18	6
SM2JAE	34	—	19
K2RTH	33	19	6
SM5CFS	33	—	—
WB2LSP	32	19	7
K9KFR	32	13	10
K5UGM	31	20	8
KA0Y	30	21	6
K5MB	30	14	4
OH5IY	30	—	29
JA0JCJ	30	—	10
N2MB	29	17	7
W5FF	28	22	6
W4WD	28	18	8
WD8ISK	28	—	18
WB9VEM	27	24	3
WB4EXW	27	17	8
4U1ITU	27	7	11
DL8GP	26	—	—
UA3MBJ	26	—	—
WD5AGO	24	12	11
K5FF	23	20	5
W4DFK	23	14	6
OZ1GFX	23	7	9
K6PVS	22	—	9
I4EAT	21	12	7
K9TI	20	—	11

1¼ Meters

(No min. no. stations worked.)

K5FF	33	23	4
W1JR	26	—	3
W5FF	25	21	3
K9XY	16	16	3
WB5LUA	16	14	3
W0VB	6	5	1
WB6NMT	3	3	1
N6AMG	3	2	1
K7NII	2	1	1
W4WD	2	1	1
W7CNK	1	1	1
K2CBA	1	1	1
WB2BYP	1	1	1

70 cm

(Min. no. stations worked, 20)

K2UYH†	268	44	41
DL9KR	225	42	35
I5MSH†	200	8	37
W1JR†	171	45	31
K3NSS†	167	25	20
W6ABN	142	21	13
WB5LUA	129	48	29
N4GJV	129	32	28
F9FT†	126	12	40
DL7YC	109	—	—
YU1AW	107	—	26
VE4MA†	106	31	26
W5FF†	100	48	19
HB9AB	100	—	—
G3LTF	98	32	36
W0RRY/5	89	11	8
OE9XXI	89	—	—
SM3AKW	87	—	—
VE7BBG	86	39	21
JA9BOH†	86	19	18
K4QIF	86	19	15
W4WD†	75	35	22
F2TU	75	—	—
WA1RWU	75	—	—
K5FF†	73	37	19
W5HUQ/4	69	32	20
W0RAP†	65	27	21
K1FO	65	21	21
OK1KIR	64	—	32
SM6CKU	63	—	—
G3SEK	62	17	19
I2COR	61	—	—
KL7WE†	59	27	15
K8WW†	57	20	20
W1ZX/3	57	—	—
K0TLM	53	30	12
K3QCQ	50	—	16
ZL3AAD	43	—	—
JA4BLC	43	—	—
KU4F	42	—	—
W1UHE	41	—	—
DJ9DL	40	—	—
DL7QY	39	—	—
WB3ESS	36	—	13
WB4IZR	36	—	—
AD1C	35	20	12
W0YZS†	34	18	12
K0KFR	32	13	10
DL6WU	30	—	—
ON4DY	29	13	13
DL7VX	27	—	—
W3CCX†	25	11	12
ZE5JJ†	25	9	13
KH6IHP	23	13	8

23 cm

(No min. no. stations worked)

K2UYH	46	—	20
OE9XXI	46	—	—
G3LTF	35	—	18
SM6CKU	25	—	—
VE7BBG	20	—	—
OK1KIR	20	—	—
WB5LUA	19	4	12
K4QIF	18	—	—
SM4DHN	14	—	—
N6CA	9	—	4
DL7YC	7	—	—
I2COR	6	—	—
SM6FHZ	5	1	5
YU1AW	5	—	5
G4CCH	5	—	5
W2NFA	4	2	3
W1BU	4	2	2
PA0SSB	4	2	3
VE4MA	3	1	3
WB6IOM	2	2	2
HB9RQ	2	2	1
W6HB	1	1	1
KH6UK	1	1	1
W1FZJ/KP4	1	1	1

13 cm

(No min. no. stations worked)

W4HHK	2	2	1
WA4HGN	2	1	2
DF0EME	2	1	2
W3GKP	1	1	1
OE9XXI	1	0	1

†Worked all continents

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247

220 and 450: Is Anybody Up There?

Recently, I received a letter from J. H. Stafford, NJ8F, who suggested that there was a need for increased repeater activity on 220 and 450 MHz, as an alternative to 2 meters. In most areas, 2 meters is full. Frequency coordinators are hard-pressed to assign new repeater pairs because all the pairs are assigned. In fact, some coordinators have "closed shop" as far as new 2-meter repeater assignments are concerned. To escape from the madding crowd, 220 and 450 provide attractive oases.

"Staff" points out that "one can accumulate an awful lot of radios to get on all of these bands. Is there a good way to determine the activity on 220 or 450 before spending the cash to buy radios for these bands?"

Scanners and Repeater Directories

There are a number of ways of measuring the level of this activity without purchasing a transceiver. The best way is to monitor the band with a scanner. Many scanners cover the 450 ham band, and a few also cover 220. If you don't own a scanner, perhaps you can borrow one for a week or two.

There is one caveat to 450 monitoring. Although you may monitor activity on 450, whether that activity is accessible to you is another matter because many 450 repeaters are private. And a private repeater is one that is probably closed to you. So, if your interest in 450 runs high, contact some of the hams you have monitored on that band and find out whether the repeater they use is private.

Another way of measuring this activity is to consult the latest edition of the *ARRL Repeater Directory*.

Do It Yourself

If you discover that the local activity on 220 and 450 is low, don't let that stop you from moving up from the 2-meter crowds. Your move up increases the activity on the band, and once you discover the joys of UHF and near-UHF, you can convince your friends to move up, too. Soon, the level of local activity will increase, and you will not have to worry about having purchased a transceiver you never use; you will have solved the activity problem yourself.

MICHIGAN AND TEXAS GO 20

Michigan and Texas have adopted 20-kHz channel spacing for repeaters in the 146-148 MHz range. The plan was overwhelmingly approved at the December meeting of the Michigan Area Repeater Council (MARC) and by an 8 to 1 margin at the February 16 general meeting of the Texas VHF-FM Society. MARC and the Society, the respective frequency coordinating bodies of Michigan and Texas, studied the plan for over a year before adoption. MARC plans to have all repeaters on 20-kHz-spaced channels by May 1986, while the Texas VHF-FM Society expects it to take several years for full implementation of the plan.

REPEATER LOG

According to reports received in February, repeaters were involved in the following public-service events: 10 weather emergencies, 1 criminal emergency, 6 medical emergencies, 218 vehicular emergencies, 7 fire emergencies, 7 public safety events, 60 drills and alerts and 5 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 20, WB2FKZ 2, W2VL 17, WA2ZWP 3, N3BFL 11, NN4N 8, WB4QES 18, WB4UDS 3, WD6AWP 3, KH6HHG 3, W7EX 162, W7HSG 1, K8DDG 12, KD8GL 9, WD8IEL 14, WA8ULB 22, W8VTD 6.

Strays

YOUTH-, COMPUTER-ORIENTED SLIDES NEEDED

☐ Have any slides showing junior or senior high school students learning about Amateur Radio? Or any slides showing amateur use of computers? The ARRL Development Office is looking for such slides for use in its programs. All subjects need not be licensed amateurs, but the emphasis should be on *people*, not equipment. Send all slide candidates to the ARRL Development Office, c/o Hq.

UNIQUE JOB OPPORTUNITY

☐ Are you an RF and/or digital design engineer with a hankering for a unique challenge? The Arecibo Observatory, operator of the famous 1000-foot dish in Puerto Rico, is seeking an engineer for a group leader position to address a broad range of technology supporting research programs in radio astronomy, planetary radar and atmospheric science. The work at the Arecibo site involves a wide variety of equipment ranging from high-power transmitters to digital signal processors and cryogenically cooled receivers. Send resume to Jon Hagen, KP4I, Head, Electronics Dept., Arecibo Observatory, P.O. Box 995, Arecibo, PR 00613.

***QST* congratulates...**

☐ Al Hamilton, AG1F, of Beverly, Massachusetts, on receiving a $1000 award from the GTE Volunteer Initiatives Program payable to the HANDI-HAM Courage Center.

☐ Don McDaniel, KJ3Q, of Lower Burrell, Pennsylvania, on receiving the Western Pennsylvania DX Association's outstanding DXer award.

☐ ARRL Treasurer Jim McCobb, K1LLU, of Boxford, Massachusetts, on being appointed Executive Vice President and Treasurer of the Andover Savings Bank.

☐ A. J. F. Clement, W6KPC, of McFarland, California, on being named a Fellow of the Radio Club of America.

☐ G. Graham MaConomy, W6BUK, of Hemet, California, on 60 years as a member of the ARRL.

I would like to get in touch with...

☐ anyone with information on the bootlegging of my call sign by an operator identifying himself as "Steve" Robert Wanderer, KT2D, 32 Shore Rd., Wayne, NJ 07470-6321.

☐ any amateurs interested in a guided tour of Europe. Betty Strattan, W2PVS, Box 3, LaGrangeville, NY 12540.

☐ anyone interested in forming a trivia net. Shawn Sabo, KB4KGB, 1555 Mill Run Ct. Lawrenceville, GA 30245.

Correspondence

Conducted By Bruce Kampe, WA1POI
Information Services Assistant

AMATEUR RADIO'S FUTURE GROWTH

☐ Re: Correspondence by Mr. Steir, March 1985 *QST*. I make this urgent request: Please! Stop beating that poor dead horse with that "no-code" stuff and get on with the recruitment of new amateurs. The majority of the Amateur Radio fraternity has spoken in favor of code as the *basic* requirement for licensing, and the FCC has so ruled. Therefore, a continuing attitude of opposition toward the code requirement is only counteractive to the recruitment of new amateurs.

Because CW is the most basic form of communication, continuously used around the world by many thousands of amateurs, this mode should be honestly presented to prospective amateurs as a positive, efficient and basic communication method along with the other modes, rather than characterized as being a "sincerity test" or an obsolete "slide rule."—*Thomas F. Aughenbaugh, NY6Q, Big Bear Lake, California*

☐ Re: "It's Later Than We Think," in March 1985 Correspondence, I submit that anyone capable of learning the basics of BASIC for any "simple computer" set-up can also learn the basic basics of the Morse code in much less time than it takes for all those discussions of its (presumed) merits or demerits to take place.

It's just a matter of exploding the myth and not making it sound more difficult than it actually is!

If we keep listening to all the doomsayers these days, we may indeed end up missing what Amateur Radio is *really* about.—*F. Paul Kosbab, NF4E, Tulsa, Oklahoma*

☐ I suppose that sooner or later we will have to have a "no code" license. It is better to give penicillin to a pneumonia victim than to let him die as a result of a "no pills" principle. The pill may be bitter, but if we don't swallow it, we may end up with a dead patient. No more ham radio.

Although I am a CW operator and very much enjoy tapping out the code with an old-fashioned electronic keyer (would you believe a Hallicrafters T.O.?), I know we need a "no code" license if I am to be able to continue to do so.

We might encourage a "digital" license that would convey privileges for CW (using newfangled equipment or, if the operator wants, old keyers), Baudot, ASCII and AMTOR, but *no* voice privileges. Think of all the computer whiz kids that would go for this. No code knowledge would be necessary for such a license; of course, one could still learn it if one wanted.

I do not want to see ham radio die, and all my operating privileges whisked away from me, because of an insistence that everyone must have code proficiency and be able to send with a brass pounder.—*Stan Gibilisco, W1GV/4, Tavernier, Florida*

☐ I have noted all the comment lately about the drop in the ranks of licensed amateurs. I believe I know a source of at least some of the drop-outs. They may be folks who "moved up" from CB, only to find they really didn't have an interest in serious radio. They disposed of their equipment, and let their licenses lapse. Since those licenses are of the "five year" type, now is about the time that they would be expiring.

As for getting new blood into our community, I agree that the rules and requirements must be upgraded and updated. I really do not think that code is a deterrent to the "children's band" mentality; Amateur Radio has enough of that sort even *with* the code requirement.—*David J. Mann, NB7X, Portland, Oregon*

☐ What we can strive for is diversity. More power to anyone who wants to operate RTTY, AMTOR, OSCAR, or whatever. Let's keep our options open. CW and computerized modes have a special ability to cut across the lines of age, sex and nationality, and for this reason they are valuable. Those who favor no-code are actually suggesting less diversity, even though they may not intend it so. Arguments in favor of a particular mode based on efficiency are beside the point. We do what we do not because it is efficient, but because we like it.

One way to encourage newcomers is to clean up our act. Some of the conversation we hear on the 75, 40 or 2-meter bands is neither morally nor intellectually uplifting. If our image is one of profane bigotry, it isn't surprising that we don't attract as many recruits as we'd like.

Another problem is the cost of amateur gear. The cost of our hobby makes it much more attractive to the wealthy older person than to the young or less well-to-do.

Finally, it seems to me that what Amateur Radio once offered was romance. The hum of a blower, the glow of an 813, the soft pulsation of a mercury-vapor rectifier, the feeling of solidity in a 75A-4; these were the intangibles that drew us in years ago.

I think OSCAR and EME are among the best things we have going today, because they preserve some of that same feeling; the feeling of being on the very edge of things, of achieving something uncommon.

If this is the way we can make our hobby appear, our future will be secure.—*Clarence Wager, K6TBW, Tuolumne, California*

☐ Why CW at all? Because I have proven to myself time and time again that Morse code gets through adverse conditions (QRM, QSB, QRN) more effectively than any other mode available to Amateur Radio.

By the way, I am one of the "young troops" that *supposedly* can't be recruited to Amateur Radio because of the "code barrier." I was first licensed at age 17, and had enough desire to get the code down. Did you ever consider that the youngsters you've tried to interest, who have given excuses such as "I can't learn the code" or "I don't want to learn the code" simply aren't interested in Amateur Radio? The amateur service does not interest everyone the way we would like.—*Jim Holman, KU3J, Jacksonville, Arkansas*

☐ As a recently licensed amateur, I have a perspective on increasing our ranks that I have not seen reflected in your column.

The "no-code" license is neither the problem nor the solution. Greater dedication to public service, while commendable, will do little to increase the popularity of our hobby.

The first and greatest problem I faced was finding ham radio. This may sound absurd to the old timer who knows everyone who's anyone in every club in his area. The problem is that hams talk to hams, and not to the general public. If the flyers for hamfests were posted on the street corners or announcements published in newspapers or broadcast via public events spots of local radio stations, or if they were held in shopping malls rather than in out-of-the-way racetracks or in the basements of churches or exhibition halls with no public access, more of the non-ham public would attend and get bitten by the bug.

Another way to reach the public, particularly the youth, is through computer magazines. An article in *RUN* magazine about a "Morse code" tutor program was one of the greatest influences on my decision to go for a license. The bright, technically oriented young people are the ones we most want to attract to Amateur Radio and the computer magazines are where we are going to find them.

Of course, once we have their interest we have to hold it. Maybe we can make the Novice bands a protected area where Novices can have a chance to discover what the hobby is all about without getting knocked aside in the rush. A little cooperation from the CRRL in discouraging phone nets below 3750 kHz would also help immensely.

If Amateur Radio is to be a living, growing hobby, we must bring ourselves to the public at large, and we must establish better ways for nurturing newcomers in our hobby. —*Alan Taylor, KA2WIJ/KT, Forest Hills, New York*

[Editor's Note: In March Correspondence, three letters discussed the future growth of Amateur Radio under the heading, "IT'S LATER THAN WE THINK." Those three letters triggered many more responses than we could print; some are presented above. All the responses made reference to the code requirement, and most discouraged *any* change of that requirement, which is consistent with past opinion polls.]

HOMEBREW HIGHER FREQUENCIES

☐ Congratulations on printing the fine detailed construction article by "Chip" Angle, N6CA in April 1985 *QST*. As we move into the higher and higher frequencies, we need more information of this type. While some commercial gear is available for 1269 MHz, many of us would prefer to build our own. If we are to increase the occupancy of these higher frequency bands, equipment must be made available, and for the present, most of it will be "homebrew." Keep up the good work.—*Jim McKim, WØCY, Salina, Kansas*

Silent Keys

Administered By Marvis Bogatz

It is with deep regret that we record the passing of these amateurs:

WA1ASH, Edward F. McQuillen, Manchester, NH
W1DIA, Horace U. Ohm, Marblehead, MA
W1FRE, Jerome "Jerry" Erickson, Proctorsville, VT
KA1FYO, Charles T. "Chuck" Hamilton, East Stoneham, ME
W1GDU, W. Ward Nipper, Peace Dale, RI
W1HSC, Warren E. Cann, Hampton Beach, NH
KA1LXO, Donald W. Behnken, Norwalk, CT
W1OHU, Wallace K. Edwards, Underhill, VT
W1ROS, Paul D. White, Norwich, CT
W1RYB, Albert E. Johnson, Dorchester, MA
W1UFH, George E. Demers, Little Compton, RI
WA1WHT, Charles F. Bryan, North Port, FL
W2DMO, Walter H. Borneman, Lynbrook, NY
W2JUO, Howard C. Schubert, Sr., Leonia, NJ
W2KVS, Edmund A. Krampert, Ramsey, NJ
WA2OZN, Anthony C. Degutis, Basking Ridge, NJ
W2TBO, Adelbert G. Freeland, Seneca Falls, NY
K2UJA, Arthur R. Mason, Oceanport, NJ
WB2WTR, Howard E. Moore, Jr., Mount Holly, NJ
WB2YXS, Alfred G. Soeffing, Dingmans Ferry, PA
W2ZK, Amory H. "Bud" Waite, Venice, FL
KA3AJO, Walter E. McCabe, Jr., Owings Mills, MD
W3CQA, Charles W. Hackenyos, Philadelphia, PA
W3DNP, Walter Hambleton, Milford, DE
WB3FQL, Robert W. Warrington, Harrisburg, PA
WB3HPI, George A. Hoffman, Harrisburg, PA
W3JKM, William E. Lynch, Upper Darby, PA
WA3OBD, Robert W. Funk, Sharpsville, PA
W4ALW, Walde H. Nilsson, Sr., Simpsonville, SC
N4BGW, John Durkovic, Cape Coral, FL
W4CLJ, Jesse R. Price, Sr., Orlando, FL
K4DID, Thomas H. Donaldson, Kannapolis, NC
WA4DSC, Charles E. Gorkes, Sarasota, FL
W4DUW, Jack R. Patterson, Huntsville, AL
KB4GRT, Garland Smith, Parksley, VA
W4HAQ, Frank Wells, Darlington, SC
WB4IRX, Peter P. Forst, Jr., Hollywood, FL
WA4JQE, Herbert W. Mills, Owensboro, KY
K4KJK, Harold A. Loring, Charlotte, NC
K4MPP, James R. Spurlock, Princeton, KY
KF4NF, Robert Mader, Englewood, FL
W4PMJ, Harold M. Rosser, Sr., Belton, TX
K4QOC, Woodrow "Woody" Mitchell, Montgomery, AL
K4QP, John P. Sweeney, Summerdale, AL
WD4RHO, Charles W. Greig, Lighthouse Point, FL
NF4W, Anthony D. Tartaglia, Titusville, FL
W4YO, Fred J. Wadford, Jr., Palm Harbor, FL
N5EZQ, Donald F. Berry, Jackson, MS
WD5FSH, W. Thomas Rothwell, Jr., Chapel Hill, NC
W5MYM, Francis B. Kaczorowski, Truth or Consequences, NM
W5VCU, Helen Sadler, Mound, TX
W5VHT, Richard J. Bozeman, Sr., Marshall, TX
W5VYT, Charles S. Stuttle, Little Rock, AR
W6AVZ, Clifford Van Ciel, Salinas, CA
W6ECB, J. Frank Irwin, Myrtle Beach, SC
N6EPG, Wayne Heck, Davis, CA
W6FC, Gerald A. Whittaker, Santa Rosa, CA
W6ING, Douglas M. Smith, Woodland Hills, CA
W6IPP, James E. Kavan, Encinitas, CA
W6IY, Edgar L. Parkhurst, Salinas, CA
W6KB, Lloyd E. Martin, Salinas, CA
W6LFT, John H. Morecroft, La Crescenta, CA
W6MOF, John E. Hurtt, Santa Rosa, CA
W6MUF, Eric T. Ledin, Pebble Beach, CA
W6MZV, Richard J. Best, San Rafael, CA
W6NWQ, Robert L. Surtees, Carmel, CA
WB6PKM, Warren W. Griffith, Salinas, CA
W6RJV, Octa E. Williams, Montgomery Creek, CA
*WB6RTE, Verner W. Huntus, Eureka, CA
K6SOP, Stephen J. Geng, Thousand Oaks, CA
N7AN, Clarence H. Stevenson, Graham, WA
N7BOR, Robert E. Scharping, Jr., Mesa, AZ
W7BXL, Wallace C. Klocker, Helena, MT
W7DJU, Willis D. Marshall, Bellingham, WA
N7DSE, Donald R. Tyler, Kingman, AZ
W7EZ, Earl L. Eggers, Eugene, OR
W7QKU, Donna L. Gettman, Oregon City, OR
W7RCF, Nels P. Nelson, Jr., Phoenix, AZ
KA7RQS, Patrick J. Moehrle, Sumner, WA
W7URG, Eldridge "Wally" Fosberg, Manchester, WA
K7UZR, Mortimore Dunning, Moses Lake, WA
NC7V, Charles Billings, Clark Fork, ID
K7WL, Wallace H. Leland, Phoenix, AZ
K7WT, Wilbur E. Talbott, Eugene, OR
WB8CJU, Laurence E. Pennell, Van Wert, OH
KD8GR, William H. Macintosh, Lorain, OH
W8HXR, Jerrold A. Swank, Washington Courthouse, OH
WA8MCH, Stephan G. Stith, Centerville, OH
W8RYH, Harry G. Wayne, Southfield, MI
K8TAK, James W. Whipple, Midland, MI
W8UB, Emery V. Qualman, Port Clinton, OH
W8YAA, Roger R. Day, Findlay, OH
K9BZL, David C. White, Athens, GA
N9EEP, W. Fleming "Brownie" Brown, Chicago, IL
W9GXQ, John Alexander, Rockford, IL
WØBE, Robert W. Schoening, Minneapolis, MN
KØBQH, Rolf Nyflot, Florissant, MO
KØBWA, Ralph L. Anderson, Holyoke, CO
NØBXP, Harold G. O'Brien, Minneapolis, MN
KØDFJ, Elmer L. Burt, Salina, KS
KAØKDK, Harry M. Matthews, St. Joseph, MO
KAØTMI, Henry F. Dove, Sr., Atchison, KS
WØVFI, Ben O. Edwards, Kansas City, MO
KH6HRF, Sherman A. Manchester, Jr., Coronado, CA
KH6IU, Reginald G. Field, Honolulu, HI
KP4DGT, Jorge A. Lugo, Rio Piedras, PR
VE7HA, Patrick W. Larkin, North Vancouver, BC
VP5RJ, Robert J. McElvy, Lake Park, FL
VP9CX, Athol J. Moulder, Warwick West, Bermuda
VP9GK, Van M. Richardson, Hamilton, Bermuda

Feedback: Laurence E. Pennell was listed in the Silent Keys column of the February issue with the incorrect call sign of KA9NSF. The correct call sign is WB8CJU.

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

May 1935

☐ After several years of comparative quiet, 10 meters is alive again, thanks to pioneers like W2TP, W4TZ, W6CAL, W6VQ, W9GFZ and W9NY. W1DF recounts some of the recent DX, largely with VK and ZL stations.

☐ CT2BK, a popular contact for several thousand Ws, describes his antenna setup, with particular attention to the calculations for the great-circle path; he feels antenna orientation was responsible for the strong signal from his '46 output tube.

☐ *QST* is now published in four editions—central, eastern, western, southern. Only the Station Activities columns for each area are included, releasing a bit of space for another feature article or two, and permitting "local" one-edition advertising at reasonable cost.

☐ Technical Editor James Lamb reports on interesting technical features of some of the latest manufactured ham-band superhets—Hallicrafters Super Skyrider, Hammarlund Super Pro, National HRO, RCA ACR-136, RME9D, for examples.

☐ Separately, Jim points out that we bandy about words like selectivity and sensitivity without really knowing what they mean. He illustrates, with example graphs, the several definitions of selectivity measurements.

☐ And some still prefer to build their own, largely for reasons of pride. W9ERU describes his improved version of the original single-signal superhet, which he feels holds its own against any commercial product.

☐ Though not all the logs are in as yet, the 1935 DX fray appears to have smashed all records. W1SZ, W2BHZ, W3SI and W6GRL are among the top scorers. And last autumn's SS similarly broke records; W9HKC's 113,000 points topped 'em all, yet he used only 20 watts. W9AUH worked 68 of 69 possible sections, missing only the Philippines.

☐ General Electric has developed a new line of tubes with metal instead of glass enclosures. Advantages in ham use are shorter leads and better stability through inherent shielding.

☐ A survey through *QST* shows amateur activity as 10% exclusive 'phone, 46% telegraphy only, and the rest a combination of both. Less than 5% of interest is in 28 Mc. and above, most of that concentrated in 5-meter 'phone.

☐ The Editor decries the amount of bootleg activity on 5 meters, and applauds F.C.C.'s actions in warning some of the less-scrupulous mail-order houses that their ads for such gear must include a caution that a license is required.

☐ Progress in legitimate 5-meter DX continues, helped by improvement in design of gear. Ross Hull likes the new 955 pentode "acorn" tube for efficient receiving circuitry. Copper-tube "plumbing" is the "in thing" for transmitter circuits.

☐ The Hq. staff now totals 30, with seven having more than 10 years service. The crew has built cabinets for a museum display, and now solicits donations of old gear for exhibition in the Hq. offices.

25 Years Ago

May 1960

☐ You probably won't want to duplicate the 13-tube receiver built by W9BIY and W9IHT to cover 3.5 to 30 Mc., but there are plenty of useful ideas to inspire some ham construction of your own.

☐ Harmonics from Novice rigs continue to be a problem. W1ICP once again outlines the causes and provides dope on simple filter remedies.

☐ U.h.f. pioneer W5AJG has long used the ARC-5 surplus rig to set 144-Mc. DX records, and now goes one step further by revamping it to handle the output of a small sideband exciter.

☐ W2AOE proposes a 4-kc. separation fixed-channel system for sideband use on 75 meters, which he says can avoid the "present cacophony of whistles, pops, squeals, moans and semi-coherent speech."

☐ FCC records show the number of amateur licensees passed the 200,000 mark last year, a growth of some 15,000.

☐ W3IMP describes his "1MP" sideband exciter, a 3-tube filter rig stripped to essentials. It can help anyone to a good start on that mode—economically, too, being built largely from odds and ends of surplus.

☐ The Editor says we are rightfully proud that we are permitted a full kilowatt input, but points out how silly and destructive it is to use such power for local traffic nets or ragchews. Besides, the law says that minimum power must always be used.

☐ W1DGL reports last autumn's Sweepstakes results, with nearly 100 participants working all sections. W9IOP topped the scores, just nosing out W4KFC.

☐ Hams in U.S. Armed Forces in Morocco used their CN8 calls, along with native licensees, to provide vital emergency communications after an earthquake leveled the city of Agadir.

☐ For Field Day, W9DWD built a portable mast of three 8-foot wood poles (such as come in rolled rugs) joined by short lengths of pipe.

☐ Seven Kansas City hams collaborated to design a grounded-grid linear using a 4XC1000A, and then each built one for his home station. Particular attention was paid to control and protective circuits.—*WIRW*

Coming Conventions

ATLANTIC DIVISION/NEW YORK STATE CONVENTION
May 17-18-19, Rochester

The 1985 Atlantic Division/New York State Convention/Rochester Hamfest has been expanded to three days. The flea market opens at noon Friday, and will operate continuously through Sunday afternoon. Commercial exhibits open Saturday at 8:30 A.M. and Sunday at 9:30 A.M. Site of the big weekend is the Monroe County Fairgrounds, East Henrietta Road (Rte. 15A) and Calkins Road. Hotel headquarters is the Rochester Marriott Thruway, Both locations are near NY Thruway exit 46.

Volunteer license examinations will be conducted on Saturday and Sunday. Advance registration was necessary (see March 1985 *QST*, p. 73), but space may be available for last-minute registrants. Check with Chairman A. G. deBlieck, KW2X, 59 Bay Knoll Rd., Rochester, NY 14622.

Programming begins at 10 A.M. Saturday. Groups presenting programs are SAYLARC, NTS, WDN, NYPON, NYS, NYSPTEN and Navy MARS. Feature programs will be Antennas and Towers by Gerry King, VE3GK, and an Instructor's Forum by John Foss, W7KQW, ARRL Training Program Manager. Highlight of the day will be a League Forum presented by Directors Turnbull, Ferdinand, Atkins, Nathanson, Stevens and Grauer. Also present will be League Executive Vice President Dave Sumner and ARRL President Larry Price. The sixth annual W2RUF Memorial Code Contest will be held at 2 P.M. The annual banquet will be on Saturday. Presentations will be made to the Code Contest winner and to the Amateur of the Year.

Registration is $4 in advance, $5 at gate. Banquet $12. Flea market permits $2 per parking space. For tickets, write to Rochester Hamfest Tickets, 174 Croydon Rd., Rochester, NY 14610. For all other information, call 716-424-7184 or 716-424-1100 during business hours. Computer bulletin board, 300 bauds 716-424-7136.

ALABAMA STATE CONVENTION
May 18-19, Birmingham

The 1985 Alabama State ARRL convention will feature a giant indoor flea market, manufacturer and retail exhibitor's booths and lots of interesting forums. FCC exams will be given on both days, free of charge. Admission is $4 per person for both days. A homebrew contest and CW contest will also be a part of the proceedings. There are several motels in the immediate area of the convention site, the Birmingham-Jefferson Civic Center. Make reservations as early as possible. The convention headquarters hotel will be the Hyatt, across the street from the Civic Center. There will be an information station operating on 34/94 to assist those needing directions. Flea market tables can be occupied on Friday from 4 P.M. to 10 P.M. for those wishing to set up early. A banquet and entertainment will be held on Saturday night, with cash bar open at 6 P.M. Tickets should be purchased ahead of time. For more information on convention tickets and motel accommodations, write to BirmingHAMfest '85, P.O. Box 603, Birmingham, AL 35201.

NORTHWESTERN DIVISION CONVENTION
May 31-June 2, Seaside, Oregon

The 1985 ARRL Northwestern Division/Oregon State Convention, cosponsored by the North Coast Repeater Association and the Oregon Tualatin Valley Amateur Radio Club, will be held at the Seaside Convention Center. Hours are 5-8 P.M., Friday, 8 A.M.-5 P.M. Saturday, and 9 A.M.-2 P.M. Sunday. Preregistration is $5 per single ($7 at the door); $2 for teens with parents; children 12 and under free.

Seminars: antennas, DXpedition, packet radio, computers and Amateur Radio, power supplies, NiCd batteries and much more. Banquet speaker will be Dave Bell, W6AQ. Dave, a film producer, was 1984 Dayton Ham of the Year. Topic will be "The King and I" (his visit with JY1, King Hussein of Jordan). M/C is Rush Drake, W7RM, Northwestern Division Vice Director. Talk-in on 52 and 144.85/5.45. For more information and/or reservations, write to Doc McLendon, W7GWC, P.O. Box 920, Seaside, OR 97132.

TEXAS STATE CONVENTION
May 31-June 2, Dallas

The ARRL Texas State Convention and the 8th Annual Ham-Com Convention will be held at the Northpark Inn Convention Center in Dallas. The convention will feature manufacturers' and dealers' exhibits as well as an indoor, air-conditioned flea market. There will be a full slate of programs, covering everything from DXing to the latest word on the Volunteer Examiner program. Programs will be given by visiting experts as well as local authorities on all areas of Amateur Radio. The ARRL forum will feature ARRL President Larry E. Price, W4RA. John Foss, W7KQW, ARRL Training Manager, will conduct a Training Seminar for instructors in the area. A full slate of programs for YLs includes a tour and luncheon. The convention begins Friday at 7 P.M. with a Ham-Com Party featuring an authentic Texas Western band. Preregistration prices are $6 single, $8.50 family. Flea market tables $10 each. For more information, write to Ham-Com, Box 25028, Dallas, TX 75225, or call 214-521-9430.

DAKOTA DIVISION CONVENTION
July 5-7, Rapid City, South Dakota

The Black Hills Amateur Club will celebrate its 50th anniversary by sponsoring the 1985 ARRL Dakota Division Convention at Howard Johnson's, I-90 exit 59. Registration will be Friday 4-7:30 P.M. Please bring your QSL card for display. Social Hour is at 7:30 P.M. at Howard Johnson's.

Saturday will bring exhibits, registration, indoor flea market, free tables while they last. Along with the regular forums there will be women's activities and fun activities for the whole family. VE exams (limited walk-ins) will be given at 1 P.M. The 7 P.M. banquet is "all you can eat," so come hungry.

The 8:30 Sunday brunch (all you can eat) will be followed by the ARRL forum. Exhibits will be open.

Preregistration and banquet (before 6/10/85) $18. Preregistration (before 6/10/85) $6.50. Additional banquet tickets $12.50. Sunday brunch tickets $6.75 (children 12 and under $3.75). Registration (after 6/10/85) $7.50.

For information, tune in the SD-Evening Net on 3870 kHz or call 605-787-5243 or 605-343-6791. Talk-in on 16/76 and 34/94.

The SDSM&T is also having a reunion at this time, so plan your vacation in the beautiful Black Hills, and catch the activities and attractions. Make checks payable to Black Hills ARC, c/o Gene F. Bauer, KXØU, 713 Blaine Ave., Rapid City, SD 57701. Confirmation by return mail. Indicate if you desire information on motels or campgrounds.

†May 4-5—South Carolina State, Greenville
†May 18-19—Alabama State, Birmingham
†May 18-19—Atlantic Division/NY State, Rochester
†May 31-June 2—Northwestern Division, Seaside, OR
May 31-June 2—Texas State, Dallas
July 5-7—Dakota Division, Rapid City, SD
July 6-7—Georgia State, Atlanta
July 13-14—Indiana State, Indianapolis
July 19-21—Iowa State, Des Moines

ARRL NATIONAL CONVENTIONS
October 4-6, 1985—Louisville, Kentucky
September 5-7, 1986—San Diego, California
July 10-12, 1987—Atlanta, Georgia

†At press time, Amateur Radio exams are scheduled to be given at these conventions. For other exam opportunities see Hamfest Calendar.

Hamfest Calendar

Administered By Marjorie C. Tenney, WB1FSN
Convention/Travel Coordinator

[*Attention*—The deadline for receipt of items for this column is the 15th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

Colorado (Boulder)—May 5: The Longmont ARC will hold the annual Boulder Spring Hamfest on Sunday, from 9 A.M. to 2 P.M., rain or shine, at the Colorado National Guard Armory, 4750 N. Broadway. Admission donation will be $3 per family, and there is no seller's charge. We suggest sellers bring their own tables. If any seller needs more than one, contact the organizers in advance. There will be three technical seminars: 9:30 A.M., repeaters; 10:30 A.M., packet radio; and 11:30 A.M., Amateur Radio satellite communications. In addition to the big hamswap and technical seminars, there will be technical demonstrations and equipment testing. Food and drink available. Talk-in on 16/76 and 52. For more information, contact William Currie, WDØEHJ, 1232 E. Fourth Ave., Longmont, CO 80501, tel. 303-776-2829.

Connecticut (Southington)—June 2: The 2nd Annual Radio and Electronics Flea Market sponsored by the Southington ARA will be held at Southington High School, Pleasant St., from 10 A.M. to 3 P.M. Admission $1. Tables are $7 advance, $8 at the door. Tailgating $5. Talk-in on 146.88 and 145.55 simplex. (Barry Electronics will be there.) For advance table reservations, send check or money order payable to Southington Amateur Radio Association, P.O. Box 873, Southington, CT 06489, with an s.a.s.e. Cut off date for advance reservations is May 24. Refreshments will be available.

Connecticut (Newington)—June 9: The Newington Amateur Radio League (NARL) will hold its second annual flea market at Newington High School, Willard Ave. (Rte. 173), on Sunday, from 9 A.M. to 2 P.M. (dealers 8 A.M.). Tables $8.50 (after May 31, $10). Tailgating $5, weather permitting. Tours of ARRL Hq. FCC exams may be given. Admission $2. Talk-in on 52 or W1AW/R 145.45 and 224.840. Contact for table and FCC exam information, Tom Namnoum, KM1O, 55 Spruce St., Newington, CT 06111, tel. 203-666-1615.

Georgia (Hartwell)—May 18-19: The Anderson, Hartwell and Toccoa Amateur Radio Clubs will hold the 6th Annual Lake Hartwell Hamfest at the Lake Hartwell Group Camp, located on Hwy. 29, 4 miles north of Hartwell. Features include free admission, free camping and free flea market space. Activities include a left-footed CW contest, horseshoes and many other activities for the whole family. Campgrounds open at 6 P.M. Friday. Talk-in on 19/79, 93/33 and 895/295. For further information, contact Ray Pettit, WB4ZLG,

†ARRL Hamfest

Rte. 1, Dooley Dr., Toccoa, GA 30577.

†**Georgia (Fort Oglethorpe)—June 8-9:** The North GA Hamfest, sponsored by the John Ross ARC, will be held at Lakeview-Fort Oglethorpe High School (new location, just off I-75), Saturday 9 A.M. to 5 P.M., Sunday 9 A.M. to 3 P.M. No admission charge. Forums, xmtr hunt, satellite TV demo, computers. FCC/VE exams both days, 9 A.M. Talk-in on 144.75/5.35, 223.34/4.94 and 52 simplex. For further information, contact Maxine Barrett, N4ECA, 702 Chickamauga Ave., Rossville, GA 30741, tel. 404-866-2302 (days).

Idaho (Idaho Falls)—May 11: Eagle Rock Radio Club is sponsoring a swapmeet from 10 A.M. to 4 P.M. at the Booneville County Court House. Admission is free; tables are available at $5 each. DX, OSCAR and Shuttle presentations. Talk-in on 04/64. For further information, write to ERRC, Rte. 2, Box 411, Idaho Falls, ID 83401; please include s.a.s.e.

Illinois (Chicago)—May 15: The Chicago Amateur Radio Club (CARC) Mini-Hamfest will be held on Wednesday, from 6 P.M. to 10 P.M., at the Edgebrook Golf Course field house, 5900 N. Central Ave. (north of Elston Ave., south of Devon Ave.). For more information call 312-545-3622.

†**Illinois (Tilton)—May 19:** The Illiana Repeater System, Inc. 10th annual hamfest will be held at the UAW Civic Center. Talk-in on 22/82. Address all inquiries c/o Barbara Tolson, WD9AFF, P.O. Box G, Catlin, IL 61817.

†**Illinois (Knoxville)—May 19:** The Knox County ARC, Inc. hamfest will be held at the Knox County Fairgrounds (right at Exit 51—I-74), rain or shine. Tickets $2 advance, $3 at gate. Camping available. For advance tickets or further information, contact Keith Watson, 119 South Cherry St., Galesburg, IL 61401.

†**Illinois (Princeton)—June 2:** The Starved Rock RC hamfest will be held at the Bureau County Fairgrounds. Grounds open at 12 noon, Saturday; exhibit building gates open at 6 A.M., Sunday. Advance registration, $2.50 (May 20 deadline) at the door, $3. Swap and shop, exhibits, demonstrations. FCC/VEC exams. No preregistration required. Bring original license, plus a copy. $4 fee required. Registration for hamfest not required for taking exams. For details on exams, furnish s.a.s.e. to Denny R. Chestney, kM9L, 1212 Dogwood, Bloomington, IL 61701. Nominal fee for overnight camping. Exhibit space and/or sales space for rent to dealers. ARRL Hq. representative will be Jim Clary, WB9IHH. Talk-in on 12/72, 07/67 and 52 simplex. For further information, send business size s.a.s.e. to George E. Keith, W9QLZ, RFD 1, Box 171, Oglesby, IL 61348.

†**Illinois (Willow Springs)—June 9:** The 28th annual hamfest sponsored by the Six Meter Club of Chicago, Inc. will be held at Santa Fe Park, 91st and Wolf Rd. (SW of Chicago), on Sunday from 6 A.M. to 4 P.M. Advance admission is $2, at the door $3. Large swap and shop, displays in pavillion, refreshments available, plenty of parking, Air Force MARS meeting. Talk-in on 37/97 and 52. Further information and reservations from Val Hellwig, K9ZWV, 3420 South 60th Ct., Cicero, IL 60650.

†**Indiana (Evansville)—May 19:** The Tri-State Amateur Radio Society (TARS) Hamfest will be held at the Vanderburgh County 4-H Center. ARRL/VE license exams will be given for all classes. Exam registration 30 days in advance guarantees seat at testing; limited number of walk-ins accepted. General admission is $3. Inside dealer tables are $7.50 each; outside flea market tables are $3 (bring your own tables). Food available. Talk-in on 15/75. For information and registration forms contact: Mike Anderson, KA9LQM, P.O. Box 3284, Evansville, IN 47732.

†**Indiana (Terre Haute)—June 2:** The 39th Annual Wabash Valley Amateur Radio Hamfest will be held on Sunday at the Vigo County Fairgrounds, located on US 41, ½ mile south of I-70. Open Saturday for overnight campers ($5 fee), open Sunday 8 A.M. Free outdoor flea market, covered flea market, $3 for 12 × 12 space. Some ac and tables available on first-come basis. Food and refreshments, giant shopping mall nearby. Advance tickets $2 (3 for $5) or $3 at gate. Children under 12 free. Talk-in on 25/85 and 52 simplex. For tickets and information, send s.a.s.e. to WVARA Hamfest, P.O. Box 81, Terre Haute, IN 47808.

†**Indiana (Wabash)—May 19:** The 17th Annual Hamfest sponsored by the Wabash County ARC will be held at the Wabash County 4-H Fairgrounds on Sunday, from 6 A.M. to 4 P.M., advance admission is $2.75, at the door $3.25. Large flea market, overnight parking available, food available all day. License exams, 8 A.M. to 12 noon. Talk-in on 63/03, 34/94 and 52. Further information and reservations from Don Spangler, 235 Southwood Dr., Wabash, IN 46992, tel. 219-563-5564.

†**Iowa (Sioux City)—May 4:** Where: The Oasis—Sioux City Airbase. When: Saturday, from 8 A.M. to 5 P.M. What: The Siouland ARA Mini-Convention—including indoor flea market (tables $5 each); full-line dealer exhibits; technical programs; 10% consignment table; ladies craft table; coffee, cookies, lunch available on premises. Flea market closes and cash bar opens at 5 P.M. Banquet at 7 P.M. Admission $3 at door, $2 in advance. Banquet $10 at door, $8 in advance. Motel rooms available at Travelers Inn. Rates—$22.42 single, $31 double. Also Motel 6 nearby. Deposit required for late arrival (after 6 P.M.). For motel reservations contact Jim Rhodes, KCØXU, 429 E 26th, So. Sioux City, NE 68776, tel. 402-494-1856. For further information, advance registration or to reserve flea market tables, contact Loren Barbee, WBØYOW, 1015 16th St., Sioux City, IA 51105, tel. 712-258-4829.

†**Kansas (Pittsburg)—May 19:** The Pittsburg Repeater Organization will hold its annual hamfest from 10 A.M. to 5 P.M., in Lincoln Center, Lincoln Park. A flea market and covered dish dinner will be held. License exams will be given. Talk-in on 34/94. Please notify PRO if you plan to take an exam or wish a table reserved for the flea market. Admission is $5 per ham and includes chicken and pop for your family. Please bring a covered dish. For more information, write to Steve Cooper, PRO Hamfest, P.O. Box 1303, Pittsburg, KS 66762.

Maryland (West Friendship)—May 26: The Maryland FM Association's annual hamfest will be held on Sunday at the Howard County Fairgrounds (about 30 miles west of Baltimore on I-70) from 8 A.M. to 4 P.M. Admission donation $3; tables (inside in advance) $6, day of hamfest if available $10. For table reservations and hamfest information, contact: Craig Rockenbauch, WA3TID, 429 Severnside Dr., Severna Park, MD 21146, tel. 301-987-6042 (6-10 P.M.) Commercial vendors must have proper tax license certificates available. Items offered for sale must be Amateur Radio related.

Massachusetts (Dalton)—May 19: The first 1985 flea market sponsored by the Northern Berkshire ARC will be held on Sunday, at the Dalton American Legion, Rte. 9. Free overnight camping permitted from Saturday night at 6 P.M. Admission is $1. A few tables available free on a first-come basis. Flea market breakfast and lunch concession provided by the Dalton American Legion. Talk-in on 146.91 Mount Greylock.

Michigan (Cadillac)—May 11: The Wexaukee ARA will hold its 25th annual "Swap Shop and Computer Fair" on Saturday, at the Wexford Civic Arena. Talk-in WA8SUE /R 37/97. Camping available. Transportation provided for anyone wishing to fly in. For information contact Wexaukee ARA, Box 163, Cadillac, MI 49601.

†**Michigan (Midland)—June 1:** You are invited to attend the 11th annual Midland Hamfest on Saturday, from 8 A.M. to 2 P.M. (setup 6 A.M.), at a new location—the Midland Civic Arena. Tickets $3 in advance, $4 at the door. Tables $6 full table, $3 half table. Trunk sales $3. Free parking/handicapped parking. Refreshments on site. FCC exams: Send Form 610, check for $4 (payable to ARRL/VEC), s.a.s.e. and copy of current license to W8NDI, by May 1. Talk-in on 60/00 and 52. For advanced tickets and reservations, contact: Raleigh L. Wert, W8QOI, 309 E Gordonville Rd., Rte. 12, Midland, MI 48640, tel. 617-631-5591.

Michigan (Grand Rapids)—June 1: The Independent Repeater Association of Grand Rapids will hold its annual Hamfestival from 8 A.M. to 4 P.M., at the Wyoming National Guard Armory on 44th St., west of US-131. Admission $3.50. Many interesting programs and entertainment for the non-hams. Indoor swap area. Free table space for all sellers. Dealer set-up at 6 A.M. Advanced table reservations accepted. Talk-in on 165/765. For more information, call Paul Gardner, WD8IZB, tel. 616-538-8241, or write to IRA, 562 92nd St., S.E., Bryon Center, MI 49315.

†**Michigan (Chelsea)—June 2:** The Chelsea Communication Club hamfest will be held at the Chelsea Community Fairgrounds. Admission is $2.50 in advance, $3 at the gate. For further information, contact William Altenberndt, WB8HSN, 3132 Timberline, Jackson, MI 49201, tel. 517-764-5785.

†**Minnesota (St. Paul)—June 1:** "Amateur Fair" sponsored by the North Area Repeater Assn. will be held in the Dairy Bldg. and surrounding area at the Minnesota State Fairgrounds. Flea market from 6 A.M. to 5 P.M., indoor activities from 8 A.M. to 5 P.M. Flea market, exhibition and sales, local club activities. Talk-in on local repeaters. For further information, write to NARA, P.O. Box 857, Hopkins, MN 55343.

Missouri (Kansas City)—May 18: NARA-FEST is a special computer hamfest for Commodore Computers and others. Seminars on computer subjects and topics. A major feature will be a Commodore Computer Ham Radio Program Exchange at the Lodge at Bennet Springs State Park. For further information, send s.a.s.e. to Northland ARA, P.O. Box 6710, Kansas City, MO 64123.

†**Missouri (Salina)—June 2:** The Central Kansas ARC Inc. will sponsor a hamfest at the 4-H Bldg., Kenwood Park. Admission is $3. For further information, contact Jim McKim, 1404 So. 10th, Salina, KS 67401.

New Hampshire (Nashua)—May 17-19: The 11th Annual Eastern VHF/UHF Conference will be held at Rivier College. The program features a Friday night hospitality room, technical talks by well-known VHFers on Saturday, noise figure and antenna gain measurements, and other activities. To preregister, send $13.50 to David Knight, KA1DT, 15 Oakdale Ave., Nashua, NH 03062 before May 5. Registration at the door $20. Saturday banquet $14, also payable by May 5. Housing available in college dorm rooms: $16.50, single; $28, double, includes a buffet breakfast. Those wishing dorm accommodations include payment at time of preregistration. Make checks payable to "Eastern VHF/UHF Conference." For further information, contact: Lewis D. Collins, W1GXT, 10 Marshall Terr., Wayland, MA 01778, tel. 617-358-2854 (6-10 P.M.).

†**New Jersey (Paramus)—May 19:** The Bergen ARA is holding a Ham Swap'n Sell on Sunday, from 8 A.M. to 4 P.M. at Bergen Community College, 400 Paramus Rd. Tailgating only. Bring your own tables. Sellers $4/buyers free. Amateur license exams to be given. Thousands of spaces. Talk-in on 79/19 and 52. For more info, contact Pete Adely, K2MHP, 13-30 Edward St., Fairlawn, NJ 07410, tel. 201-796-6622, night only.

New Jersey (Stirling)—May 19: TCRA Hamfest sponsored by the Tri-County Radio Assn. will be held rain or shine on Sunday, from 9 A.M. to 4 P.M., at Passaic Valley Community Center off Valley Rd. Indoors, refreshments, rest rooms, free parking. Tables $10, registration $2.50. Restricted tailgating, by reservation only, please. All reservations from Dick Franklin, W2EUF, P.O. Box 182, Westfield, NJ 07090, tel. 201-232-5955 or 270-3193.

†**New York (Rome)—June 2:** Rome Ham Family Day sponsored by the Rome RC, Inc. will be held at Beck's Grove on Sunday. Flea market opens at 9 A.M., dinner at 5 P.M. Admission $3 (dinner charge additional). Flea market, QRP contest, Quest Quiz (electric and electronic test), programs for the ladies and children, Rome RC "Ham of Year for Central NY Award" at dinner. Talk-in on 28/88. Further information from Ken Kinne, N2DLG, RD 1, Blossvale, NY 13308, tel. 315-336-7065 or any club member on 28/88 or 34/94.

†**New York (Melville)—June 9:** Long Island Hamfair sponsored by LIMARC will be held on Sunday at the Electrician's Hall, 41 Pinelawn Rd., from 9 A.M. to 4 P.M. General admission is $3, $2 after 1 P.M. Table space sold only in advance from Hank Wener, WB2ALW, 53 Sherrard St., East Hills, NY 11577-1712. 4 × 6 table space available at $10 or your own for $6. Contact Hank at 516-484-4322 (nights to 11:30 P.M.). League officials will be on hand to help you with any problems. The VHF tune-up clinic will be on hand to check frequency output and PL level.

†**Ohio (Medina)—May 12:** Medina County Hamfest, sponsored by the Medina Two-Meter Group will be held at the Medina County Community Center Bldg., Lafayette Rd., State Route 42 SW. Doors open to public from 8 A.M. to 2 P.M. Building and flea market setup at 7 A.M. Refreshments and free parking. Tickets $3 in advance, $3.50 at the door. Tables $6 and flea market space $2. Talk-in on 63/03. For table reservations and advance tickets, write P.O. Box 452, Medina, OH 44258, or tel. 216-725-5021.

†**Ohio (Oak Harbor)—May 19:** The Ottawa County ARC and Sandusky Valley ARC will be holding their annual hamfest at the Ottawa County Fairgrounds located on SR 163, about 2 miles east of Oak Harbor and 9 miles west of Port Clinton. Admission is $3. For further information, contact Raymond Kruse, K8IDA, 18980 W SR 51, Elmore, OH 43416, tel. 419-862-2619.

Ohio (Athens)—May 19: The Athens County ARA sixth annual hamfest will be a little different this year—a combined Ham and Computerfest. It will be held at the Recreation Center on East State St., from 8 A.M. to 3 P.M. Admission is $3. License exams—all levels—will be given. Mail a completed FCC Form 610 and check for $4 (payable to ARRL/VEC) to John Cornwell, NC8V, 101 Coventry Ln., Athens, OH 45701. All forms must be received by April 19. Free, paved outdoor flea market space for tailgaters bringing their own tables the day of the event. Indoor space only available by advanced registration. Contact Joe Follrod, NE8R, 15 Roy Ave., The Plains, OH 45780, tel. 614-797-4874. Talk-in on 34/94. For further information, write to Carl J. Denbow, KA8JXG, Chairman, ACARA Hamfest Committee, 63 Morris Ave., Athens, OH 45701.

†**Ohio (Columbus)—June 2:** The 5th Annual Hamfest sponsored by the Battelle ARC—W8CQK, will be held in the Ganyard Bldg., Franklin County Fairgrounds, from 8 A.M. to 3 P.M. Admission $2 in advance and $3 at the door. Tables $3 in advance and $4 at the door. Talk-in on 37/97. Info from Bill, W8LLU, tel. 614-261-7053 or Kevin, WA8OHI, tel. 614-766-5313. Advance sales, send s.a.s.e. to Bill Welch, W8LLU, 396 Brevoort Rd., Columbus, OH 43214.

Oklahoma (Wagoner)—May 25-26: The Green Country Hamfest sponsored by the Broken Arrow ARC and Tulsa ARC will be held at Western Hills State Lodge on Sat. from 9 A.M. to 5 P.M. and Sunday from 9 A.M. to noon. Open at 7 A.M. for dealer and swap table setup. Admission on Sat. $2.50 in advance, $3 at door; on Sunday $1. Tables $10 at door if available and includes one admission or $7 with preregistration. Flea market, dealer displays, food, ARRL/VEC testing. Talk-in on 52 Simplex. For further information, write Broken Arrow ARC, P.O. Box 552, Broken Arrow, OK 74013 or David Horn, tel. 918-492-4286. Room reservations at Western Hills, tel. 918-772-2545.

†**Pennsylvania (Beaver)—May 12:** The first annual Tri-State Hamfest sponsored by the Beaver Valley ARA will be held at Bradys Run Park, Beaver County. The park is located on PA Rte. 51, 3 miles north of PA Rte. 60. Forums, walk-in license testing and refreshments will be available. Large indoor tailgate area available free of charge. Gates open at 7 A.M. Admission $3 per person, children under 12 free. Overnight camping and hotel accommodations in the immediate area. Talk-in on 144.71/5.31. For more information or advance tickets, contact Don Washburne, WB3HWB, 207 Hall Rd., Aliquippa, PA 15001, tel. 412-774-7079.

†**Pennsylvania (Wrightstown)—May 19:** The Warminster ARC Hamfest will be held at the Middletown Grange Fairgrounds, Penns Park Rd. (about 15 miles north of Philadelphia). This is an indoor/outdoor event, with food and drink available. Admission $3, nonhams free. Indoor spaces with table and electricity $5, each space; outdoor vendors, tailgating $5 each space. Gates open at 7 A.M. Talk-in on 69/09 and 52. Computer hardware and software vendors welcome. For info call or write Bill Cusick, W3GJC, Apt. 706-Garner House, Hatboro, PA 19040, tel. 215-441-8048.

Pennsylvania (Pittsburgh)—June 2: The 31st Annual Breeze Shooters Hamfest will be on Sunday, from 9 A.M. to 5 P.M., at the White Swan Amusement Park, PA Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport. Free admission and flea market; family amusement park. Awards for youngest and oldest ham and 10-meter mobile check-in. Registration is $2, 3 for $5 or 7 for $10. Under-roof tables for vendors by advance registration. Mobile talk-in on 28/88 or 29.000 MHz. For further information, contact John Colbert, K3SDL, 1831 Highland Ave., Irwin, PA 15642, tel. 412-863-5167 (evenings only).

Quebec (Tracy)—May 26: The Quebec provincial hamfest will be held on Sunday at the Tracy Curling Club. Admission $4, table (8 ft) outdoor, $5; indoor, $6, limited quantity. Please reserve before May 20. Doors open at 9 A.M. (8 A.M. for exhibitors). For more information, write to Sorel-Tracy ARC, P.O. Box 533, Sorel, PQ J3P 2L5, Canada.

Tennessee (Humbolt)—June 2: The Humboldt ARC will sponsor its annual hamfest from 8 A.M. to 4 P.M. at Bailey Park, 22nd Ave. Admission $2. Flea market, ladies activities, parking for RVs (electricity provided, water close by). Talk-in on 37/97. Food and refreshments. For further information, contact Ed Holmes, W4IGW, 501 N 18th Ave., Humboldt, TN 38343.

Utah (Tooele)—May 17-19: The Cedar Mountain ARS (Tooele/Dugway Group) is sponsoring a hamfest-swapmeet-campout-hoedown to be held at the Little Sahara Recreational Area, approximately 85 miles south of Tooele off U.S. Hwy 6. VE testing conducted on a walk-in basis, 10 A.M. to 4 P.M., Saturday. Send Form 610 and photocopy of existing license (no fee) to Ed Allen, WB7UAO, 863 Buzianis Way, Tooele, UT 84074. Many activities planned, ladies crafts, games for kids, and pot luck dinner Saturday evening. No registration fee. Plenty of camp sites. Talk-in on 7.272 MHz and 52. Call 801-882-1783 or 237-5866 for more information.

†**Virginia (Roanoke)—May 26:** Mayfest '85 sponsored by the Roanoke Valley ARC will be held at the Roanoke Civic Center and Coliseum, from 8 A.M. to 5 P.M. Advance registration is $3.50, at the door $4. Programs for women and children, code proficiency tests, eyeball QSO room, amateur exams. Inside and outside flea market. Talk-in on 385/985 and 52 simplex. For further information and registration, contact Bill Johnson, W4NLC, Chairman, 5129-D Overland Dr., Roanoke, VA 24014, tel. 703-989-5374.

Washington (Yakima)—May 18-19: The Yakima ARC (W7AQ) will hold the Central Washington State Hamfest at the Hobby Bldg., Central Washington State Fairgrounds, on Saturday from 9 A.M. to 5 P.M. and Sunday, 7 A.M. to 2 P.M. Breakfast and lunch available. Registration is $4 in advance, $5 at the door. Activities include regional dealer's displays and a free swap and shop with plenty of tables. Talk-in on 01/61 and 34/94. For preregistration, contact Tom Plaisance, P.O. Box 9211, Yakima, WA 98909.

Wisconsin (Jackson)—May 4: The Milwaukee RAC Annual Spring Dinner Party will be held on Saturday, at noon, at Heidels' Restaurant near Jackson. Advance reservation required. For more detailed information and reservation form, send an s.a.s.e. to Milwaukee Radio Amateurs Club, N50 W16328 Pin Oak Ct., Menomonee Falls, WI 53051. All interested persons are invited.

Wisconsin (Wauwatosa)—May 9: The Milwaukee Radio Amateurs' Club annual auction of equipment and parts is Thursday, at 7:30 P.M., at the Wauwatosa Savings & Loan Bldg., 7500 West State St. Free admission; no sales charges. No flea market dealers. Please tag all gear to be sold with seller's name and minimum opening bid. Auctioneer is Travis Baird, WØVQD. For further information, write to Milwaukee Radio Amateurs' Club, N50 W16328 Pin Oak Ct., Menomonee Falls, WI 53051.

Wisconsin (Stevens Point)—June 16: Central Wisconsin Radio Amateurs, Ltd., will sponsor its annual swapfest and family picnic in Bukolt Park. Swapfest will feature volunteer exams (advanced registrations only), dealers, food, refreshments and fellowship. Tables and tailgating available for $2. For further information, contact Jim Benak, KA9ACE, 1775 Strongs Ave., Stevens Point, WI 54481, or Gene Santosky, K9UTQ, 1220 18th St. South, Wisconsin Rapids, WI 54494 for exam registration (before May 16).

Affiliated Clubs in Action

Conducted By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

CLUB CHALLENGE FOR THE '80s—UP AND RUNNING

February 1985 introduced a new opportunity for your affiliated club to contribute to its treasury as well as to the growth of Amateur Radio. This is the "Club Challenge for the '80s." Under this program, whenever someone becomes a new ARRL member, your club is eligible for a $5 rebate from the member's dues. To be reimbursed, your club's unique four-digit ID code *must* be written on the membership application when it arrives at Headquarters.

If you need your club's ID code, give us a call at 203-666-1541 during working hours. Ask to speak with the Club Program staff.

This is an excellent way to build your club's finances. Even if the new ARRL member is not a member of your club, you're still entitled to the $5 rebate. Just publicize that four-digit ID code.

Your club might want to make a mass mailing to the amateurs in your immediate area. If so, stress both the benefits of joining your club and the benefits of joining the ARRL. Your club will profit in two ways from such a mailing: increased membership and $5 for every new ARRL member who signs up as a result of the mailing. If you need sample text for such a mailing, or if you need a list of amateurs in your area, write to the Club Program, ARRL Hq.

ANNUAL REPORTS

Just a reminder: If you haven't sent in your club's 1985 annual report, please do so. We need an up-to-date listing of your club to know where to send mailings, such as *Field Forum*, the new affiliated-club newsletter. If you need a 1985 Club Report form, drop a note, again to the Club Program, ARRL Hq.

The Detroit ARA recently celebrated 50 years of ARRL affiliation. ARRL First Vice President Leonard Nathanson, W8RC (right) presents the League certificate of appreciation to W8CAT (center), the original DARA club secretary, and W8SS.

Affiliated Club Coordinators

Need information about clubs in your Section? The Special Service Club program? Program ideas? Help with a special project? Coordination with other clubs? Do you have a question about *any* aspect of the ARRL Affiliated Club program? Get in touch with your Section's Affiliated Club Coordinator (ACC), listed below. He or she is prepared to answer these and any other club-related questions you may have.

If no ACC is listed for your Section, contact your Section Manager, listed on page 8.

Alaska—Will Darsey, AL7AC
Arizona—Robert Warner Drake, N7ECE
Arkansas—Morris Middleton, AD5M
Colorado—Darla Richardson, WBØDUV
Connecticut—John Minehan, KG1M
Eastern Massachusetts—Lew Nyman, K1AZE
Eastern New York—Richard S. Moseson, N2BFG
Eastern Pennsylvania—Mark J. Pierson, KB3NE
Georgia—Sandy Donahue, WA4ABY
Illinois—Sharon Harlan, WB9SFT
Indiana—Ron J. Koczor, K9TUS
Iowa—Dan Bureman, WBØQAM
Kansas—Robert M. Summers, KØBXF
Los Angeles—Royce Bell, KX7Q
Louisiana—Lionel Oubre, K5DPG
Maine—Paul E. Gooch, Jr., KA1EIW
Maryland-DC—Ron Rosenwald, KA3DRO
Michigan—Stanley J. Briggs, K8SB
Minnesota—Robert McDaniel, KBØRZ
Mississippi—Don Elder, KC5VD
Missouri—Maria L. Evans, KT5Y
Montana—Margie Huddleston, WB7TWG
Nebraska—Larry Lehmann, KCØDA
New Hampshire—Peter Cantara, KI1M
New Mexico—Hugh Winter, W5HD
NYC & LI—Heywood Gerstner, WB2IAP
North Carolina—Mary E. Weddle, WC4T
North Dakota—Glenn Nickel, WDØDAI
Northern Florida—Roy Mackey, N4ADI
Northern New Jersey—James A. Greer, KK2U
Northern Texas—Steve Muncy, WA5QFD
Ohio—Michael Bokulich, K8US
Oklahoma—Billy Foster, NJ5Y
Pacific—L. Roger Wical, KH6BZF
Rhode Island—Michael S. Bilow, N1BEE
San Diego—Richard Leffler, WA6COE
San Joaquin—John Rosa, N6ECH
Santa Clara—Edwin D. Stephenson, W6MKM
South Carolina—George J. McCulloch, WA3WIP
Southern New Jersey—James Eckersley, K2IXE
Southern Texas—Ed Larose, KS5V
Tennessee—O. D. Keaton, WA4GLS
Utah—Jurgen C. Eckhoff, KB7XO
Vermont—Geraldine Preston, KA1AKI
Virginia—John Humphrey, WD4KQJ
Washington—Eva Anderson, WB7QNS
West Virginia—Robert Morris, WA8CTO
Western New York—Edwin J. Holdsworth, N2EH
Wisconsin—Greg A. Miller, KA9FOZ

YL News and Views

Conducted By Jean Peacor, K1IJV
Country Club Dr., Monson, MA 01057

An Exam to Remember

For Alice Hawley, of Horseheads, New York, December 7, 1984 is a day she'll never forget. For that matter, the FCC examiners in Buffalo, New York, are still in a state of surprise.

There's nothing quite like a cold winter day in Buffalo. It was on just such a day that Alice kept her appointment with the FCC to sit for her Extra Class examination. At the age of 76, Alice took and passed the exam—her score, 100%.

To quote the *Elmira Star Gazette:* "If President Reagan is the Great Communicator at the age of 73, what is Alice Hawley of Horseheads at the age of 76? The Federal Communications Commission said Alice just might be the oldest person ever to earn the extra class radio license."

It would be interesting to learn about others in their 70s who have passed the Extra Class exam. Has Alice set a record?

Alice is a retired secretary of the Hilliard Corporation. Six years ago, a friend gave her a book to read about Amateur Radio, and she became KA2DNK with a Novice license in December 1978. She went on to pass the General exam in 1981 and the Advanced in June of 1984, keeping the same call. She spent much of 1983 and 1984 studying with good friends Fay, WB2FWR, and Lewis Schlick, WA2ZOB, who were also upgrading. Having passed the Extra exam this past December, she is now NI2E (a call she's enjoying on CW).

Alice Hawley, NI2E—did she set a record?

Alice's Commodore 64 computer is connected to her rig, so she can receive CW printouts and RTTY, and take advantage of the Amateur Radio bulletin boards in the area. The automodem connected to her computer enables her to send printed messages, such as manuscripts, by long-distance telephone. A recognized artist and portrait painter, Alice teaches oil painting when not on the air, and is presently writing a book entitled *How to do Portraits.*

Swimming and camping are Alice's other hobbies. She likes to travel and has a motor home, although she mentioned that when she becomes 77 in June her travels may be somewhat more restricted.

Alice is the only licensed ham in her family. With a son in Rochester, New York, and a daughter living in Germany, she can see just how great it could be if they became licensed. Amateur Radio has been a great source of enjoyment to her. She favors the 80- and 40-meter bands, and is inclined to operate on or around 7.200 MHz.

She is a member of the Chemung County Civil Defense Chapter of New York State Disaster Preparedness Commission, the Rookies Amateur Radio Association and the East Coast Amateur Radio Service (ECARS) net.

Hats off to Alice Hawley, NI2E, who may have set a record at age 76! It also would be interesting to know the statistics of those passing the Extra Class exam at 100%. There isn't a ham among us who wouldn't enjoy having such memories.

LORE PHIPPEN—A FULL-TIME HAM

Jack Phippen met and married Hannelore (Lore) while stationed in Germany with the USAF as an electronic technician. He brought Lore back to the United States in 1967. They now live in Boise, Idaho.

Lore's interest in Amateur Radio surfaced in 1980. With encouragement from KE7H, Lore began learning Morse code. Try as she might, she just couldn't get that CW. Then she and Jack went to work on it together. They became Novices in March 1981—Lore, KA7KAI, and Jack, KA7KAH. They upgraded again in October of the same year. Lore was hooked—line and sinker! She kept upgrading until she got her Advanced, in 1983.

For a long time, Lore remained a true CW operator. She feared that her English might not be understood on SSB. She conquered that fear by realizing that being understood on CW might be just as difficult because of her English spelling. All fears were quickly dispelled once she gave SSB a try and found she had no problem being understood.

Lore earned ARRL's WAS/CW award in 1982, and needs only six more states for 5BWAS. She is active in AF MARS as AFA5QB, and is a member of YLISSB, DRN-7, Idaho Farm Net, Century Club, OMISS and the Sauerkraut Runde (a German-speaking roundtable).

Traffic handling has become her true joy. For her, calling a mother, father or wife and giving them good news from a son, daughter or loved one who might be in Korea, Germany or any corner of the world is a wonderful feeling.

Traffic nets are at their busiest during the holiday season. Lore bravely accepted a Monday night Net Control schedule for DRN-7 during this busy season. In her words: "I jumped in with both feet and almost drowned—hi!" In reality, the traffic got handled, which was the main objective, and she's found the net members to be an extremely helpful group. She sends many messages for patients at a local Veterans Medical Center, and is active on the Idaho Civil Defense Net.

Lore and Jack never have to flip a coin to see who uses the rig—Lore loves to operate; Jack enjoys the engineering. Other interests include skiing, camping, fishing and yard work, but only when radio time permits. Jokingly, Lore says she is a full-time ham and part-time housewife.

Lore Phippen, KA7KAI, jumped into traffic handling with both feet.

Dot Bedford, K4AOH, winner of the YLRL Anniversary Party Gold Cup. See this column, next month, for the contest results.

COME ALIVE IN '85

The Young Ladies Relay League's (YLRL) 10th International convention will be held in Las Vegas, Nevada, June 20-23, 1985 at the Sahara Hotel. Deluxe accommodations and RV parking are available for reasonable rates. Planned activities include a Hoover Dam tour and Lake Mead cruise, a breathtaking desert tour, gala stage show, cocktail party, luncheon buffet, awards banquet, DX YL show, slide shows and business meetings. A convention station will be operating on 14.288 MHz. For complete details and information packet, send a business-sized s.a.s.e. with 39 cents postage to Jan Weaver, N7YL, 2195 East Camero Ave., Las Vegas, NV 89123.

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

INSTRUCTORS' FORUMS

On May 18, your League begins a series of instructors' forums to be held throughout the United States over the next three years. The first forum will be held at the Atlantic Division/New York State Convention at Rochester. The second will be held in Dallas June 1 in conjunction with HamCom. We are anxious to meet our 7000 registered instructors.

In each forum, for about three hours, we'll discuss various topics relating to ham radio courses. The topics include solving your problems in teaching, evaluating the qualifications of prospective instructors, evaluating instructional material, use of audiovisuals, the League's support of training programs, instructors' field organizations, relationships with schools and colleges, use of computers in ham radio instruction, advisability of continuing promotion of courses ending with Novice examinations, availability of equipment for new hams and whatever other training-related subjects anyone wants to discuss.

Your input is essential if our new training program is to succeed. And, hopefully, you will find the solutions to your most pressing training problems.

Questions, Questions, Questions

Seldom, if ever, do two instructors or two clubs have exactly the same difficulties. The purpose of these forums is to learn what *your* problems are and to suggest ways to solve them. Here are some of the most frequently asked questions: How can we organize and publicize a course? How can we find or train competent instructors? Can we find enough instructors so that we needn't "burn out" a willing one? How can we use the new series of ARRL *License Manuals* and *Instructor's Guides* to the greatest advantage? Where's the best place to find classroom space? What kind of "props" will we need, and where can we find them? What are the most successful methods for maintaining student interest? What is necessary in after-course follow-up to be sure the new ham gets, and stays, on the air?

How about audiovisuals? Are they worth the tremendous amount of time and money required to produce them? Would a new series of videotapes be valuable?

Should an instructor's field organization be established? Should section training coordinators be appointed? Would *you* like to be a training coordinator?

Recent experience, once again, has underlined the importance of working with local schools and colleges in publicizing Amateur Radio and instituting ham radio courses. Such courses usually are taught by an instructor from the local radio club. Your League is working on new material to inform teachers at all levels of the value of Amateur Radio to their students. Have *you* found teachers, principals, professors and deans to be receptive? How were the ham classes received by the students? The faculty? The administration?

A feeling among many hams is that computers have siphoned off many youngsters who otherwise would have been interested in ham radio. Are computers a sufficient attraction to make their use in the course an incentive for youngsters to enroll and thus obtain a ham license? What are the most effective ways to integrate computers into ham radio instruction?

As you probably know, about half the Novice licensees never upgrade or renew their licenses. Many never even get on the air. Should your League continue to encourage courses ending with the Novice license? Or should we design new courses to go through to the Technician or General level? Licensees of these classes have a far better longevity and activity record.

Another major factor in encouraging newcomers, especially youth, to enter ham radio is the availability of a club station. If such a station is available, newcomers can operate that station as soon as they receive their licenses, even though they might not have enough money to buy components for their own stations. Has the availability of a club station been an encouraging factor in your area? Is lack of money a substantial barrier to many who would otherwise become hams? If so, how can your League and your club diminish the effects of that problem?

The number of hams enrolled or desiring to be enrolled as instructors has reached the point where it has become necessary to devise a way to screen applicants. What criteria should we use in evaluating applications for instructor certification? Should we consider length of time as a ham, license class, teaching experience, age, academic background and/or other factors? Should we develop an apprentice-instructor program?

A Whole New Approach

Your League's new series of *License Manuals* and *Instructor's Guides* represents an approach totally different from anything the ARRL has ever tried before. A great deal of effort has gone into preparing this material. This money comes to a large extent from your dues; it must be spent long before any income results from the miniscule sale price of the books. Is the new program a sufficient improvement over the old to justify this expense? (Many members greatly underestimate the cost to your League of preparing this new material.) It's your money, and your League intends to spend it in a manner that will most benefit *you* in particular and Amateur Radio in general. But doing that is next to impossible without *your* input.

These forums represent your best opportunity to express your opinions where they really count. If you have a particular problem not mentioned here, write or telephone us at ARRL Headquarters. We then can include it on the agenda we mail to instructors in the general area of the convention and make it available at the convention registration desk. Thus, all instructors attending the forum will be able to ponder your problem before the meeting and offer their suggestions.

But, above all, instructors, be sure to attend the forum. No charge will be made beyond the convention registration fee. We'll do our very best to make it worth your time.

(continued from page 54)

draft "Policy Governing ARRL Contacts with Federal Government Officials" prepared by the Ad Hoc Committee, with the policy to be affirmed by the Board in July. Mr. Turnbull, as Chairman, presented the final report of the Ad Hoc Committee on the Goldwater Scholarship. On motion of Mr. Atkins, the report was accepted; the function of scholar selection was transferred to the Standing Committee on Volunteer Resources; and the Ad Hoc Committee was dismissed. On motion of Mr. Grauer, oversight of the Humanitarian Award was also transferred to the Volunteer Resources Committee. There being no further business, the Committee adjourned at 5:10 P.M.

Respectfully Submitted,
Perry Williams, W1UED
Secretary

LIFE MEMBERS ELECTED
March 23, 1985

Mark Aaker, NT6G; John Altieri, NQ6T; Dorian R. Anderton, WA6FGV; Francis L. Barnes, WA5GDF; Leroy Bell, Jr., KA4WZD; Harold Bolnick, KJ6Y; William E. Bradley, WA4LLJ; Thomas A. Brouillette, WD9FHL; R. W. Brunkow, K7NHE; Stephen J. Bushmaker, KAØOLD; Merrill A. Card, KB6TO; Robert L. Chilcote, WA4FLR/DA2QE; Glenn J. Christman, WD8OMW; Charles B. Colligan, KC5YC; Albert N. Copper, III, N8ECQ; William J. Creighton, Jr., WD4GOZ; Rick D. Davis, WD8JJA; Gregory B. Dunn, WBØNHA; Martin Durket, Jr., KB6VN; James N. Forest, N6HMA; Evelyn Garrison, KA7LPK; Anna Godrie, KA1GWE; Brent H. Gourley, KE4MZ; Richard M. Grotkier, WB2MMD; James S. Hatch, KA1CXN; Paul Hawryluk, WB2ITW; Thomas R. Herring, KI4KP; Lloyd D. Hicks, KB9RA; Gary Hilker, K9LJN; Alva A. Hollon, Jr., WA4BED; S. Frederick Hopkins, NS4J; Jon C. Huish, KA7KHU; Tokuzo Inoue, JA3FA; Gary W. Jacobs, WA4GBG; David C. Johnson, W2BN; Roy L. Johnson, NQ4D; John T. Kreider, WA4YOG; Martin T. Lillard, KA6HIK; Milton W. Lowrey, N5BLU; Terrie Frances Maguire, WB6MRZ; Leslie J. Main, Jr., KA8PFI; Julius J. Marold, WB2TZK; J. Mark McDonough, WB5TSE; Jane McIver, WA4JXJ; William D. Menges, KC8QC; Richard E. Morris, KE4TE; Jack A. Olsen, K7EQL; Carol A. Park, N6IFD; Oliver B. Pettibone, III, KC3EQ; William D. Phifer, WA6ATX; Edward C. Pienkowski, W8BEB; Charles J. Rabley, WA8RUO; T. S. Rappaport, N9NB; Walter H. Rieke, K7KYW; Mark Rosenwald, N2EBA; Quentin J. Schultze, KX8X; Russell E. Scott, KL7EM; Ron Silvia, WB1HGA; Charles T. Snellings, WB7ONU; Edgar P. Snyder, KS9Q; Frédric John Stephan, KCØQO; Carl O. Stephenson, W5CEP; Shelby E. Summerville, KI4DC; Rita J. Vandyke, KB4DCD; Carlos R. Vest, W4ZHH; Michael D. Vicari, WB6WAJ; Jeannine R. Wangler, KA5UYL; Thomas Windhorn, N1CWU; Steven R. Wood, N6JIG.

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*.

Contest Guidelines	Jan. 1985, p. 72
License Renewal Information	Jan. 1985, p. 45
Major ARRL Operating Events and Conventions — 1985	Jan. 1985, p. 46
MARS Information	April 1984, p. 86
QSL Bureaus	
Incoming	Dec. 1984, p. 66
Outgoing	March 1985, p. 61
QST Abbreviations List	Jan. 1984, p. 53
Third-Party-Traffic Countries	Oct. 1984, p. 73
U.S. Amateur Frequency and Mode Allocations	Jan. 1985, p. 45

Results, 51st Annual ARRL November Sweepstakes

By Mike Kaczynski,* W1OD and Edith Holsopple,** N1CZC

Last year's Golden Anniversary of the ARRL November Sweepstakes will long be remembered as the "year of the broom," because of the special award offered to entrants who worked a "clean sweep" (worked all Sections) during the contest period. This extra incentive seems to have paid off, as 417 out of 1995 entrants (almost 21%) hit the mark. In contrast, activity was down this year (1984), with 1661 entries received. Lack of activity made a sweep a bit harder to come by: Only 11.3% of this year's entrants (187, to be precise) managed a sweep. Of those, 100 were on CW, and 87 on phone.

Yes, folks, activity was down, but Sam Morse can be proud—phone entries, which normally outnumber CW entries by between 100 and 200, had the edge by only three this year! CW is not dead: When the going gets tough, CW gets through. This year, brass pounders numbered 829, compared to 943 last year. Even though there were fewer people to work on CW, competition was awesome! Randy, K5ZD, skippered N5AU to a first-place berth for the fourth time in a row, edging out W7NI (flown by Tree, N6TR) by a mere 19 QSOs (a difference of only 0.791 Q/hour).

Surprisingly, neither Randy nor Tree managed a sweep in pursuit of their first- and second-place finishes, respectively, on CW. Randy missed North Dakota (where was North Dakota?) and Tree missed VE1. It just goes to show you that a sweep isn't mandatory to win in SS—but it helps!

Phone competition (for top spot, anyway) wasn't quite as fierce, with KP4BZ running away from the rest with 1948 QSOs (but no VE8). Stateside, N6BV *did* get a sweep, but fell 30 QSOs short of besting WA7NIN (operated by W6OAT). K4VX, operated by KRØY, was only 10 contacts behind.

VE8/VY1 contacts were to be had on both modes this year, with two stations on the air each weekend. Brass pounders were blessed with 558 QSOs from the Yukon/Northwest Territories Section, while phone operators had only 198 reported QSOs to compete for.

With the exception of low-power stations K1ZM, KY2P, KM1C (operated by W1PH) and multiop K1KI, the Northeast wasn't the area of the country to be in to make the Top Ten. Propagation gave stations in the South, West and Midwest a slight edge—to be expected. Old Sol loses his spots, but participants didn't seem to mind that much. After all, the most important part of a contest isn't to win, but to have a good time (although winning is fun, too!).

Even if you couldn't get on for the entire contest, Sweepstakes serves as an opportunity for operators of moderately equipped stations to make a lot of contacts, or work those few remaining states for WAS. It's amazing what can be done with 100 W and a dipole or two.*This is what sets Sweepstakes apart from many other contests: You don't need a really big station to do well. In fact, several Section winners ran low power and a moderate antenna farm (dipole/tribanders at about 40 feet).

Unlimited-class affiliated-club competition took on a new meaning this year, as the Northern California Contest Club challenged any club to beat their all-out effort. The Mad River Radio Club accepted the challenge, but their 5.466-megapoint, 82-entry aggregate couldn't top the whopping 104 entries put together by NCCC, which totalled 7.6 M. Good show, guys!

In the medium category, two Texas clubs took advantage of propagation to top the list. The Texas DX Society put together 47 scores for a 5.53-M aggregate, followed very closely by the 4.87-M, 46-entry combined total of the North Texas Contest Club. Third and fourth spots were also hotly contested, with the Potomac Valley Radio Club narrowly defeating the Colorado Contest Conspiracy at the 3.5-M level.

The Rubber Circle Contest Club dominated the Local Club Category, putting together 10 entries for a total of 1.309 million points. Thanks to all club members who got on to add to their aggregate club score. These added QSOs made SS more interesting for everyone who participated.

On another note, several people have asked what type of computer-generated reports are acceptable. For log sheets, the answer is quite simple: Computer-generated logs should contain the same columns of information (and in the same order) as official ARRL log blanks. We suggest 50 QSOs per page, as it makes things much easier at our end. Dupe sheets should provide us with an alphanumeric sort of the call signs worked during the contest. These should be readable. If the order of the sort is not obvious, please provide us with a key so we can figure out who you worked. Computer-generated summary sheets are acceptable, but make sure that all information appears in the same order as our official summary sheet—this sheet contains all the information that we need to properly calculate and list your score. Be sure that your return address appears on the summary sheet. If you leave out some vital information, you could end up listed with the checklogs!

Several clubs have not read the club competition rules as outlined in the January issue of *QST*. Specifically, the secretary (or another officer) of each club wishing to enter the affiliated-club competition must send us a complete list of all club members meeting the distance and attendance requirements. Besides listing all club members, the secretary's letter must indicate which level of competition the club wants to enter. This list is due at ARRL Hq. by

Code-man NX4N beat out the other NFLers with 1001 QSOs and 144,144 points.

Top Ten Single Op

Phone		*CW*	
KP4BZ	283,240	N5AU (K5ZD)	173,302
WA7NIN (W6OAT)	246,568	W7NI (N6TR)	170,528
N6BV	242,128	K4VX (KRØY)	169,608
K4VX (KRØY)	240,204	WA7NIN (W6OAT)	168,128
K5RR (N5RZ)	239,316	N2IC	166,352
K5LZO	239,020	KØRF (WØUA)	163,984
N5AU (WB5VZL)	238,872	N5JJ	163,984
W7RM (W7WA)	238,724	K5RX (N5RZ)	163,836
KØGU	238,132	K3LR	162,948
N5DU	237,540	K5GO	162,208

Top Ten Low Power

Phone		*CW*	
K4XS	198,172	K7JA	136,456
KE5CV	173,752	K1ZM	133,200
K7OX	172,272	KY2P	129,794
W4MM (N4FD)	147,898	KZ6E	129,352
K5ZD	142,704	K9GL	125,504
WØIJR (KØEU)	138,460	K4XS	123,808
K2PLF	138,408	N7TT	120,768
N7TT	135,716	KY7M	120,472
K3WUW	133,776	KM1C (W1PH)	120,012
WC4E	131,400	WØIJR (KØEU)	119,732

Top Ten Multioperator

Phone		*CW*	
KN6M	229,548	N6BT	165,316
K5CM	211,492	WB8JBM	150,088
KØUK	200,392	AC9C	144,540
KJ9D	194,176	KJ9D	144,152
K5QY	193,392	N4KG	140,748
K5RVK	191,068	KZ5M	138,972
K1KI	176,806	WØAIH	132,312
N5JJ	171,088	KA5W	129,796
NDØE	169,460	KØVVY	123,432
KE5IV	168,128	ABØS	122,932

*Contest Manager, ARRL
**Assistant Contest Manager, ARRL

Affiliated Club Competition

	Score	Entries	Phone Winner	CW Winner
Unlimited Category				
Northern California Contest Club	7,607,843	104	WA7NIN	WA7NIN
Mad River RC	5,465,897	82	K8AZ	K3LR
Medium Category				
Texas DX Society	5,531,704	47	K5LZO	K5GN
North Texas Contest Club	4,865,122	46	K5RR	N5AU
Potomac Valley RC	3,585,098	42	W3YY	W3LPL
Colorado Contest Conspiracy	3,437,724	34	KØGU	N2IC
Yankee Clipper Contest Club	2,748,671	40	K1VUT	K1EA
Murphy's Marauders	1,828,043	26	W1WEF	K1TO
Grand Mesa Contesters	1,145,122	15	KØUK	KØUK
Frankford RC	698,142	13	K3WW	W2GD
Kettle Moraine Radio Amateurs	659,896	21	W9XT	W9XT
South Jersey Radio Assn.	583,843	18	WA2VYA	K2YY
W/K ARC of Greater Milwaukee	475,508	12	N9AW	W1ZT
Radio Club of Tacoma	432,082	13	W7BUN	KT7G
Local Category				
Rubber Circle Contest Club	1,309,170	10	—	W7RM
Kansas City DX Club	925,202	10	KMØL	KMØL
Eastern Iowa DX Assn.	880,346	8	—	NØGA
Central Arizona DX Assn.	794,994	9	K7OX	K7OX
Dixie DX'ers	766,622	9	WZ4F	K4JPD
Southern California Contest Club	675,668	8	W8AKS	W6YA
Central Virginia Contest Club	621,060	9	W4MYA	W4MYA
River City Contesters	588,634	10	KV6H	KV6H
Lincoln ARC	544,098	5	KØSCH	
Central Indiana Contesters	430,600	3	—	—
Morton Area DX Assn.	429,272	4	—	—
Central Florida DX Assn.	410,914	3	—	—
Mississippi Valley DX/Contest Club	371,506	7	—	KMØR
Murgas ARC	354,888	10	WB3EMG	K3OX
Twin City DX Assn.	350,556	3	—	—
Rochester (NY) DX Assn.	319,026	6	AF2K	W2TZ
Reading RC	317,646	6	WA3SPJ	K3DTD
Western Pennsylvania DX Assn.	312,832	5	—	—
Lynchburg ARC	294,948	6	AA4FF	AA4FF
Schenectady ARA	282,224	4	—	—
Central Michigan ARC	278,960	9	KC8CY	W8VPC
Eastern Michigan ARC	278,724	6	—	N8CQA
Sevier County ARC	271,810	3	—	—
Ashtabula County ARC	256,895	4	AI8S	—
Eastern Connecticut ARA	251,018	4	W1ODY	—
Long Island Mobile ARC	247,761	6	KS2G	K2AU
Contest Assn. of South Texas	247,644	4	—	—
Willamette Valley DX Club	231,638	4	—	AG7M
Rip Van Winkle ARS	222,582	5	—	—
Rockford ARA	218,902	10	K9LJN	K9LJN
Northern New Mexico ARC	196,936	4	N5EZA	—
Central Kentucky DX Assn.	196,186	3	—	—
Ill. Wind Contesters	194,286	4	—	K9GL
Northrop RC	186,596	10	K6HRT	K6HRT
Ventura County ARC	185,808	4	K6VMN	—
Utica ARC	184,904	7	NA2A	NA2Q
AR Transmitting Society	183,036	3	—	—
Western AR Assn.	182,614	3	—	—
OH-KY-IN ARS	165,346	5	—	—
Fort Wayne RC	163,360	3	—	—
Order of Boiled Owls—NY	155,028	4	K2SX	—
Penn Wireless Assn.	153,316	4	—	K3TX
Saginaw Valley ARA	138,664	4	—	—
Albuquerque DX Assn.	133,098	3	—	—
Boulder ARC	126,604	3	—	—
Zygo ARC	125,374	6	W1ECH	W1ECH
Fox River Radio League	122,768	3	—	—
Athens County ARA	120,252	5	NE8R	—
West Park Radiops	104,040	8	KC8F	W8IDM
Western Washington DX Club	101,922	4	—	—
Valley RC of Eugene	97,980	3	—	—
Norwood ARC	96,860	3	—	—
Motor City RC	82,926	3	—	—
Four Lakes ARC	80,052	3	—	—
Rappahannock Valley RC	72,630	4	—	—
West Allis RAC	54,750	3	—	—
Wichita ARC	50,056	4	—	—
L'anse Creuse RC	44,272	3	—	—
Falmouth ARA	37,448	3	—	—

KZØI (foreground), KNØD, (left) and KSØD teamed up to operate KSØT/VE4. Their team effort logged 427 CW QSOs and 68 Sections.

the SS mailing deadline.

That's it for this year. Thanks to WA8MAM for our parting thought: "While I was hastily preparing for SS on Saturday, my wife said: 'Take it easy! It's only a game.' I had to correct her. SS is more than a game, more than endurance, more than skill, more than luck, more than interesting, more than fun, and more than enough reason to do it again next year. See you then!"

CW SOAPBOX

Wish I could have spent more hours. I was using a cliff-hanger's sneaky dipole, which compounded the fun (W2DUN). Easiest sweep ever. I was surprised to have VE8QST return CQ on 40 m (W2GD). Several firsts and a last! First time on 160 and 80 meters, first time duping with a computer during the contest, first time over 100 QSOs, last time with my trusty TS-520S . . . ordered a TS-830 (KT2D). How come each year I miss one Section, and it's always a different one? (WA2TBA). Where are VE8s and KL7s? Having circuit breakers pop in my amp is scary (K1SEC). I thought VT was rare. Where on earth is North Dakota? (WB1GQR). How about a class for manual operations? There is no way to compete with computerized stations' automated sending, receiving, logging, etc. (K4VRT). The low-power class is getting to be a joke. The band is covered by spurious signals or just plain rotten signals from too many synthesized rigs that are very poor (K4XU). Fifteen meters was great! We made five QSOs before noticing that we were using the dummy load (NØIN). My 50-foot tower came down in a gale 24 hours before SS. What a frantic repair job! I got the beams back up with the aid of 2 × 4s only one hour after the contest began (W6JTI). I hope we don't ship a case of California champagne to MRRC. Those guys were everywhere (W6SZN). Happiness is working the 74th section with one minute remaining in the contest (K9LJN). CW SS without a filter is cruel and unusual punishment (N9CIQ). Fifteen was poor here. Ten wasn't open at all. Come back, sunspots (NØEOB). The best part was hearing VE8QST call me 15 minutes into the contest (K1JB). Forty meters was phenomenal to the west coast. Even the low-power stations were S9 (N3AM). I could score much better if my next-door neighbors wouldn't watch TV while I operate on 7 MHz (KKØQ). I didn't plan to participate, but on listening, I reacted like the proverbial firehouse horse hearing the fire alarm (W2GND). I can't conceive that the CW speed merchants will place at the very top of this contest. They have written off literally hundreds of casuals and part-timers who cannot or will not copy their 45-WPM machine-sent exchanges. The sad thing is that not only have they missed out of QSOs with these people, they've probably driven many of them out of the contest altogether (W4UQ). I must be crazy to try SS with 250 mW. I would like to know if anyone has ever entered with a power level of under 500 mW, and what their score was. I am deeply grateful to all who showed their courtesy by patiently working my weak signal. My first SS 'test was a wonderful experience (KA1CV). Combine 100 W, a vertical and my QTH on Adak Island in the Aleutians (2000 miles west of Seattle) and I am happy some of you even heard me (WB6CEC/KL7). I have never met a nicer group of hams than those at VE4UM (KK9W/VE4). In the '60s, after a 48-hour contest, I would wish there were more hours. In the '70s, SS was just right, and I was glad to see the end of a 48-hour 'test. Now SS seems to never end. For me, stamina is inversely proportional to age (K3WUW). This year, I had to choose between a date with a female friend or CW SS. I just hope the points I missed in SS get credited to my social life (KA8NCR). I thought I had Murphy beat for once until I got a call with about 6 hours to go saying that we were interfering with the campus security police repeater. Fortunately, reducing my power allowed me to finish the 'test without being arrested, hi (AG1M). I couldn't believe how easy it was to get a sweep on code this year (KU8E).

PHONE SOAPBOX

What a way to spend a weekend—little food, little sleep, subjected to 24 hours of ear-splitting, mind-numbing racket . . . I loved it! (WD5GSL/WBØTEV). A new form of Murphy has appeared in contesting—the software bug (KØMPH). My thanks go to my wife, without whose moral support and encouragement I would not be able to do as well (WD8MGQ). It was hard to believe that the rig was putting out less than 2 W. Very few needed repeats. I averaged over 115 QSOs per hour (W6JVA). Our check of 19 gave most ops a bit of disbelief. The club was licensed in 1919. Next time I'll use my check of 59. The novelty ended after the first 100 repeats (N4FD). I nearly quadrupled last year's score. Imagine what could be done with a real antenna! Watch out next time, WA2STM (N2DRR). It was super to hear plenty of 160-meter SSB activity (W2GD). I'm still waiting for 10 meters (KZ2I). Moral for this year's SS: Don't hook up a CQ tape machine a half hour before the contest! RF got into everything, including my logging computer (WA2TBA). I was thinking about retiring from SS. After this year's miserable conditions, I'm

Division Leaders—CW

Division	High Power	Low Power	Multioperator
Atlantic	K3LR	K3WUW	K3UA
Canadian	VE7QO	VE3IRF	VE3ART
Central	W9RE	K9GL	AC9C
Dakota	NØBSH	KØJL	KØVVY
Delta	K5GO	K4XU	KY5M
Great Lakes	K8CC	K8EE	WB8JBM
Hudson	W2GD	K1ZM	N2EKS
Midwest	K4VX (KRØY)	KØRWL	ABØS
New England	K1EA	KM1C (W1PH)	K8KA
Northwestern	W7NI (N6TR)	N7TT	AG7M
Pacific	WA7NIN (W6OAT)	N6MG (KD6PY)	N6BT
Roanoke	N8II (KC8C)	KD8G	K4IX
Rocky Mountain	N2IC	WØIJR (KØEU)	KØUK
Southeastern	K1ZX/4	K4XS	N4KG
Southwestern	W6YA (N6TJ)	K7JA	KE6PY
West Gulf	N5AU (K5ZD)	N5JB	KZ5M

Division Leaders—Phone

Division	High Power	Low Power	Multioperator
Atlantic	K3ZO	K3WUW	K3TUP
Canadian	XN7WJ (KE7V)	VE7GDX	VE3GAS
Central	K9ZO	K2PLF	KJ9D
Dakota	WBØMWJ	KØFZG	KØVVY
Delta	N4ZZ	W9OBF	WA5TCL
Great Lakes	AI8S	WD8MGQ	WB8JBM
Hudson	W2ARQ	WA2STM	N2WT
Midwest	K4VX (KRØY)	WØHBH	KØWA
New England	W1WEF	KG1D	K1KI
Northwestern	W7RM (W7WA)	N7TT	WA6PVA
Pacific	WA7NIN (W6OAT)	K6TMB	K6ZM
Roanoke	W3YY	WC4B	KC4DY
Rocky Mountain	KØGU	WØIJR (KØEU)	KØUK
Southeastern	KP4BZ	K4XS	W4AQL
Southwestern	W7FGT	K7OX	KF6OG
West Gulf	N5AU (WB5VZL)	KE5CV	KN6M

now thinking about it seriously. I still can't believe that I couldn't find a KH6 anywhere in a kilo QSOs worth (WB1GQR). Do VE8s really exist? N7DF should go back up to VE8-land (WB3EMG). Conditions in MD were BAD (K3TM). The last time I entered this contest was in 1956 when I won the East Florida Section with 107,000 points as K4GHA (N4DVW). The contests were excellent. Murphy was QRT. Maybe next year I'll get brave and go QRO with the big boys (K4XS). I enjoyed CW weekend more, but didn't send in an entry. I operated mobile 10 W through AZ, NM, TX and LA. I worked 220 guys, but hadn't made preparations to keep a log (N4BP). I hope you award a separate class for all the A precedents. It's a jungle without a kW (WA1MKE). From KT7G's reaction on finding I was in SD, you'd swear he'd just been told he'd won a million bucks. I just about fell off my chair laughing (KØJV). I've heard lots of complaints of bands in bad shape, but they can't be too terrible if my "clothesline" antenna and I managed to snag 60 Sections in just over 12 hours of operating (N2BFG). It is unclear when the Purdue University ARC was first licensed. We do know that the club was active in the teens. This year, we used a check of 10 for the Big Ten conference we belong to. After having to repeat the exchange so often, we surely won't try that again! (W9YB)! With all these new calls, dupe sheets are impossible (WA4RRD). Is this the year I finally win the VA Section on phone (W3YY)? I wished I had conditions to VE8. Activity was really good on the low bands. I'll probably go low power next year (KP4BZ). Big beams on 40 and 80 are fun . . . except when it rains (KN6M). Is there an antidote for SS addiction? (K6SG). Were the bands that bad or was it me? My amp died twice. I ran out of coffee. I had a ball (WB8JKR). This was my first real attempt at SS in 25 years. What a blast (K9OSH).

SCORES

CW scores are listed first, followed by phone. Within each call area, scores are listed by ARRL section. Within each section, single operator scores are listed first in descending numerical order, followed by multioperator scores. Each line score lists call sign, final score, number of QSOs, number of sections worked, hours operated and output power used (A = 150 watts or less, B = more than 150 watts). Example: in Connecticut, K1TO worked 1008 stations in 73 sections for a final score of 147,168 points. He operated for 24 hours and used more than 150 watts.

CW

1

Connecticut

K1TO	147,168	1008	73	24-B
K1RM	138,084	933	74	24-B
W1WEF	136,160	920	74	23-B
K1XA	129,210	885	73	24-B
W1OD	104,160	744	70	24-A
W1GNR	92,710	635	73	24-B
W1ECH	91,080	660	69	24-A
K8HVT	89,180	637	70	21-B
K1DW	83,980	646	65	23-B
W1BIH	74,000	500	74	12-B
N1CC	73,000	500	73	16-A
K1BV	69,756	506	69	15-B
W1ACR	62,080	485	64	20-B
K1YRP	59,340	430	69	14-A
KG1D	56,592	393	72	14-A
WA2WIP	46,766	349	67	12-A
KB1H	39,600	300	66	12-B
K1NYK	37,430	305	63	10-A
WB9IHH	21,114	207	51	4-B
W1PMR	20,800	200	52	9-A
KA1CV	18,100	181	50	24-A
K1CC	13,892	151	46	2-B
W1HV	13,112	148	44	7-A
KW5E/1	11,868	129	46	8-A
K1WA	9384	102	46	4-A
WB1DQT	3,904	56	28	13-A
KA1DBK	1936	44	22	7-A
W1TKG	1716	39	22	8-A
K8KA/1 (+AA2Z, KE3Z)	122,494	839	73	24-B

Eastern Massachusetts

K1VUT	119,428	818	73	24-B
WA2TBA	108,624	744	73	24-B
K1XM	93,860	669	70	14-B
W1FM	86,478	609	71	23-A
W1IHN	79,520	560	71	14-B
WB1CNM	74,408	524	71	23-B
N1CWU	71,070	515	69	23-A
W8PS	57,720	481	60	21-A
W1KEE	54,600	390	70	20-A
W1AX	48,326	331	73	9-B
W1TR	35,358	249	71	10-B
KT1O	31,842	251	61	11-B
K1UCA	28,656	199	72	22-B
K1CB	27,956	241	58	6-B
KQ1F	27,028	233	58	15-B
KC1F	26,520	221	60	6-B
N1CRD	22,156	191	58	8-A
KA1DWX	16,128	168	48	4-B
W1SR	13,000	130	50	4-A
W1WAI	12,220	130	47	2-B
K5MA	11,610	129	45	2-B
W1PLJ	9072	108	42	12-B
KB1KM	8320	65	64	16-A
W3OD	7826	91	43	3-A
KN1K	6336	72	44	5-A
K2PNK	5260	75	35	6-A
W1TUM	4760	68	35	6-A
KB1GN	3782	61	31	5-A
W1OPJ	1044	29	18	6-A
KA1LON	2	1	1	1-A
K1AR (+K1DG)	111,000	750	74	16-B
K1SLC (+KV1Y)	66,776	491	68	22-B
W1BK (+N1CW)	32,208	264	61	22-B

Maine

K1JB	84,212	589	74	18-B
W8ROE	58,624	458	64	20-A
W1KX	13,260	130	51	4-A
WB1GLH	5986	73	41	4-A
K1BZ	360	15	12	1-A

New Hampshire

KM1C (W1PH, opr.)	120,012	822	73	22-A
KA1O	67,000	500	67	23-A
W1JY	48,000	375	64	21-B
KA1JOD	26,908	217	62	16-A
K1GQ	22,032	216	51	3-B
KB1T	17,496	182	54	6-A
K1TR	4940	65	38	2-A
KA1LBM	3024	54	28	16-A
W1UCI	2208	48	23	4-A

Rhode Island

K1IU	81,840	620	66	15-B
KM1X	81,216	564	72	18-B
K1VSJ	24,888	204	61	10-B
W1RFQ	2888	38	36	5-A
KM1G/1	950	25	19	2-A
W1OP (N1s AKO, BBM, W1GS KW1Z, KA1s KGD, KML, WA1s JHV, RKL, TAQ, KA6CPJ, oprs.)	26,724	262	51	17-A

Vermont

WB1GQR (KT2E, opr.)	82,320	568	70	22-B
W1KQ	43,100	350	63	16-B
W3SGH	11,938	127	47	7-A
K2LE/1	2544	53	24	1-B
WA1GUV	1892	43	22	1-A

Western Massachusetts

K1EA	155,490	1065	73	24-B
KB1W	68,060	629	70	15-B
N1CKW	34,450	265	65	11-A
WB1HIH	13,630	145	47	4-A
KV1W	5904	81	36	9-A
K1IJU	750	25	15	1-A

2

Eastern New York

W2YV (KQ2M, opr.)	153,476	1037	74	24-B
K1ZM	133,200	900	74	24-A
K2SX	115,884	783	74	19-B
W2ARQ	84,140	601	70	24-B
K2UF	54,940	410	67	19-A
WA2STM	51,876	393	66	9-A
W2DW	46,008	353	68	10-B
W2LMO	41,730	321	65	23-A
AA2Y	22,280	210	53	9-A
N2ETF	17,582	145	59	6-A
WA8MAZ	3648	57	32	1-A
N2EKS (+W2CS)	90,958	623	73	22-A
KW2D (+KC2KK)	72,660	519	70	21-A

New York City & Long Island

K2AU	99,258	699	71	21-B
N2MG	83,780	590	71	24-A
K2YGM	46,800	360	65	11-B
W2LPA	28,656	242	59	11-A
NG2G	28,320	236	60	10-B
W2DUN	25,680	230	58	16-A
W2GKZ	24,360	203	60	10-B
W2KTF	21,004	178	59	5-A
W2AYJ	9690	101	48	3-A
N2FBV	5852	77	38	21-A
K2HVNIM	3300	50	33	2-A

Northern New Jersey

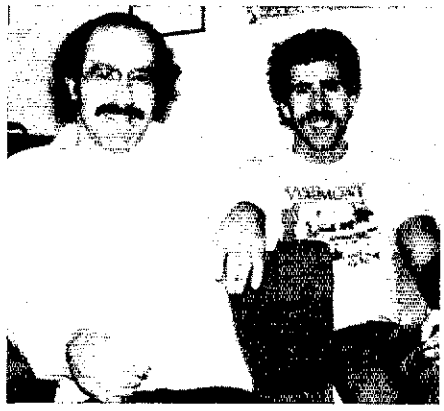
W2GD	156,884	1058	74	23-B
W2RQ	156,104	1048	74	24-B
KZ2S	142,524	963	74	24-B
KY2P	129,794	889	73	24-A
KY2H	65,274	473	69	22-A
WB2EZG	53,406	387	69	14-A
KW4E/2	40,690	313	65	18-A
W2KWW	29,484	254	58	13-A
WA2ASG	26,130	195	67	15-A
W2TI	20,900	190	55	7-A
KC2GE	19,720	170	58	9-A
K2JT	10,492	122	43	2-A
KT2D	9960	111	45	9-A
WA2UDT	9644	118	42	4-A
K2VX	1764	42	21	1-A

Southern New Jersey

K2YY	193,432	834	74	24-B
N2MM	101,500	725	70	21-B
WA2VYA	99,572	682	73	22-B
W2PAU	54,740	391	70	16-B

This was the first November SS for KA9OOO. John operated phone from Illinois.

KK9W/VE4 enjoyed operating CW from the VE4UM clubroom. Note the easy access to the refrigerator from the operating position. (photo by KX9G/VE4)



Mitch, WB2JSJ (left), operated phone and Jay, KT2E, operated CW, winning VT on both modes from WB1GQR.

N2RF	38,060-	310-	63-14-A	
K2HPV	33,020-	254-	65- 9-A	
NC2V	21,924-	203-	54-10-B	
NF2C	11,960-	130-	46-14-A	
W2BLV	11,336-	109-	52- 6-A	
N2EZ	8160-	102-	40- 9-A	
W2GND	4320-	54-	40- 4-A	
W2EA	2448-	72-	34- 3-A	
AB2Y (WA2VYA, opr.)				
	9-	3-	3- 1-B	

Western New York

W2TZ	104,448-	766-	68-18-A
W2CXM (AG1M, opr.)			
	68,704-	616-	72-24-B
K2MQY	64,400-	460-	70-21-A
W2HPF	63,900-	450-	71-13-B
WA2FQE	35,788-	283-	68-20-A
NA2Q	31,034-	263-	63-14-A
WB2YOH	29,200-	200-	73-14-A
K2XU	28,800-	240-	60- 8-B
W2FXA	27,690-	195-	71-10-A
W2HQ	25,376-	208-	61- 6-B
KK2B	23,364-	198-	59-12-A
W2GT	18,370-	167-	55- 4-A
WA2PNQ	7020-	90-	39- 6-A
KA2OUO (+ KA2RSY)			
	74,620-	574-	65-24-B
KW2J (+ W2IMO)			
	66,500-	475-	70-24-A
W2OW (N2HR, NE2W, N6IN, oprs.)			
	24,522-	201-	61-10-B

3

Delaware

K3WUW	114,108-	771-	74-21-A
KQ5G	60,720-	460-	66-20-A

Eastern Pennsylvania

KH6CP/3	98,112-	672-	73-24-B
KJ7K	76,452-	554-	69-24-A
WA3JLD	74,340-	531-	70-23-A
K3TX	68,608-	512-	67-15-B
KC3M	66,528-	462-	72-18-A
WA3GLX	60,166-	449-	67-16-A
K3OTD	55,488-	408-	68-16-A
AA3B	54,912-	416-	66- 9-B
K3OX	54,808-	403-	68-11-B
N2EY/3	48,512-	379-	64-17-A
K3WW	43,400-	310-	70- 8-B
W4UQ	38,780-	277-	70-12-B
AG3G	37,820-	308-	62-21-A
N3CXB	33,184-	244-	68- 7-B
W3ARK	32,890-	253-	65-10-A
WA3MVP	30,800-	275-	56-11-B
W3ADE	26,556-	242-	59-12-A
N1KR	27,280-	220-	62-11-A
W3CNS	27,032-	218-	62- 7-A
WA3YON	23,836-	202-	59-14-A
W3EFY	20,900-	190-	55- 8-A
KB3JK	19,936-	178-	56-11-B
KO3N	19,928-	188-	53- 9-B
KB3GL	12,280-	125-	49-13-A
W3KV	11,766-	111-	53- 3-A
N3CZB	10,200-	100-	51-12-A
KS3F	8820-	105-	42- 9-A
W3CEI	8916-	91-	38- 4-A
W3HMR	5412-	82-	33- 8-B
N3BNA	3172-	61-	26- 6-A
W3FAF	1400-	35-	20- 1-A

Maryland-DC

W3LPL	158,544-	1078-	74-24-B
K3ZO	138,232-	934-	74-24-B
K3NA	136,510-	935-	73-24-B
KA1GD	128,168-	866-	74-22-B
K3ZZ	115,778-	783-	73-24-B
K3TM	112,420-	770-	73-24-A
KC3X	87,264-	606-	72-22-A
W3HVQ	77,560-	554-	70-15-B
K2ITG	73,584-	511-	72-22-B
W3UJ	63,758-	449-	71-14-B
N3AM	58,290-	435-	67- 8-B
W3EE	34,580-	268-	66-13-A
W3FG	33,428-	274-	61- 7-A
WB3BRF	30,240-	240-	63-14-A
K3SA	11,610-	129-	45- 2-B
WA3VPL	9600-	120-	40- 6-A
W3FA	9348-	123-	38- 3-A
N3RI	2800-	56-	25- 2-B
W3FQE	264-	12-	11- 1-B

Western Pennsylvania

K3LR	162,948-	1101-	74-24-B
KF3M	112,712-	772-	73-22-A
K3VK	105,552-	753-	74-24-A
K3MC	81,082-	571-	71-24-A
W3GNR	64,224-	448-	72-21-A
N2MAG	60,480-	432-	70-11-A
KG3V	59,616-	414-	72-18-A
W3HDH	24,800-	200-	62- 4-B
WA3WAW	17,760-	148-	60- 8-B
W3NGO	10,944-	114-	48- 6-A
KA3GXP	1900-	50-	19- 3-A
K3UA (+ W2UP)			
	118,408-	811-	73-19-B
WB3KKX (+ N8EKE)			
	72,520-	490-	74-16-B

4

Alabama

K4GSK	42,228-	306-	69-15-A
N4KG (KC4ZV, KD4HA, oprs.)			
	140,748-	951-	74-24-B

Georgia

K4BAI	135,124-	913-	74-24-B
WB4UIH	48,842-	363-	67-17-B
K4UEE	22,638-	191-	59- 5-B
K4JPD	22,400-	200-	56- 5-A
W4MM (N4FD, opr.)			
	17,928-	166-	54- 3-A
N4UZ	16,524-	153-	54- 5-B
WB4DPM	12,503-	125-	50-13-B
NQ4I	12,384-	129-	48- 6-B
KI4Y	9212-	94-	49- 7-A
KI4RE	8712-	99-	44-14-A
AA4GA	5180-	70-	37- 2-A
W4AQL (N4CXF, WB3FHO, oprs.)			
	23,184-	207-	56-10-A

Kentucky

N4TY	121,978-	859-	71-24-B
K4FU	99,752-	674-	74-22-B
WM4T	96,360-	660-	73-24-B
K3PI	89,180-	637-	70-24-B
WB4FQT	89,060-	610-	73-24-A
WB4PRU	87,552-	608-	72-20-B
WA4LSO	48,720-	406-	60-16-A
KF4AV	41,844-	317-	66-15-B
W4PDZ	12,936-	147-	44-16-A
WA4JAV	11,172-	133-	42- 6-A
N4XM (+ KD4U)			
	101,376-	704-	72-21-B
AA4RX (N4JLU, WK4D, oprs.)			
	94,024-	644-	73-24-A

North Carolina

AA4NC	108,856-	722-	74-22-A
N4KMY	105,704-	724-	73-24-B
NK4Q	43,056-	312-	69-21-A
K4JEX	22,990-	208-	55- 5-A
W4HWT	13,188-	157-	42- 6-B
KB4FWU	912-	24-	19- 2-A

Northern Florida

NX4N	144,144-	1001-	72-24-B
K4XS	123,808-	848-	73-24-A
N4SA	120,916-	817-	74-17-B
K4VRT	38,052-	302-	63-14-A
WC4E	32,492-	246-	66- 6-A
W4WKQ	22,268-	199-	56-12-B
KA4YIW	10,656-	111-	48-15-A

South Carolina

AE4Y	85,460-	645-	74-21-B
N4WI	56,414-	421-	67-19-A
N4EE	30,988-	254-	61-16-A

Southern Florida

K1ZX/4	145,760-	985-	74-24-B
K1SSH	81,736-	601-	68-22-B
WD4AHZ	68,018-	479-	71-24-A
K4MF	58,646-	413-	71-20-A
KW1K	43,344-	344-	63-24-A
N6FIY/4	32,256-	252-	64-21-A
KO4D	31,964-	262-	61-15-A
N4GVT	15,582-	147-	53-12-A
N4KB	128-	8-	8- 1-A

Tennessee

N4ZZ	154,216-	1042-	74-24-B
K4LTA	131,838-	903-	73-24-B
K4XU	98,420-	665-	74-16-A
N4TG	89,712-	623-	72-23-B
K3CQ	88,560-	615-	72-24-B
K4OAO	86,762-	611-	71-20-A
WM4Z	74,606-	511-	73-20-A
AA4DO	59,340-	430-	69-18-A
NF4F	25,194-	221-	57-10-A
AA4DL	16,660-	170-	49-10-A
W4FLW	7030-	95-	37-10-A
K4XO	1200-	25-	24- 1-A

Virginia

AA4FF	107,004-	723-	74-24-A
W4MYA	100,156-	696-	73-17-A
K2NA	94,900-	650-	73-24-A
W4YE	90,820-	620-	73-19-A
WC4B	88,280-	620-	72-24-A
KG4W	79,108-	566-	69-24-A
K4POL	74,928-	548-	68-12-B
K4BAM	64,810-	455-	71-20-A
N3OS	59,280-	420-	67-17-A
K4FPF	52,026-	377-	69-17-A
KX4V	50,544-	351-	72-13-A
K4JSI	46,860-	355-	66-16-A
AA6DX	41,080-	316-	65- 9-A
KA4RLJ	37,572-	303-	62-13-A
K4OD	36,660-	262-	70- 8-B
K4JM	36,224-	263-	64- 6-A
WD4ELJ	34,020-	270-	63-14-A
WB4LNT	33,040-	280-	59-16-B
KA4ERP	21,576-	188-	58-11-A
K4FJ	20,800-	200-	52- 5-A
N3MA	15,264-	159-	48-12-A
K4TM	8200-	100-	41- 2-A
K4DHB	1440-	30-	24- 4-A
K4IX (+ N4BRA, W8RJL, W4HIR)			
	80,496-	559-	72-24-A
WI4B (+ WB4WDM)			
	45,136-	384-	62-19-A

5

Arkansas

K5GO	162,208-	1096-	74-24-B
W5KL	21,816-	202-	54- 7-B
K5FUV	11,778-	128-	46-10-A
W5JE (WA8VJF, opr.)			
	3720-	62-	30- 2-A
W4OGG/5	1500-	30-	25- 3-A
KY5M (+ AD5M, AE4W, K5SVS, KA5KNO, KB5QL, KC5ZV, WA6VVT, WB5LRP, WD4BIV)	55,614-	403-	69-21-B

Louisiana

K5GA	153,328-	1038-	74-24-B
K5MC	88,724-	594-	73-23-A
W5WG	44,240-	316-	70-21-A
KA3BER/5	40,040-	308-	65-12-A
N5ATW	6624-	92-	36- 3-A

Mississippi

W5VSZ	73,700-	550-	67-12-B
AE5H	42,800-	300-	71-14-A
W5UO	29,056-	227-	64-11-A
N5XA	9600-	100-	48- 3-A

New Mexico

AI9X	106,416-	739-	72-24-B
KT5X	103,248-	717-	73-22-A
K7UP	89,424-	621-	72-22-A
KI3L	28,320-	240-	59- 6-A

Northern Texas

N5AU (K5ZD, opr.)			
	173,302-	1187-	73-24-B
K5RX (N5RZ, opr.)			
	163,836-	1107-	74-24-B
K5MR	157,620-	1085-	74-24-B
KN6M/5	135,124-	913-	74-24-B
K5RR (NR5K, opr.)			
	121,212-	819-	74-24-B
N5JB	114,256-	772-	74-24-A
WA7RKJ	103,806-	711-	73-24-A
K5KJ	103,230-	698-	74-21-B
W8PU/5	102,098-	719-	71-22-B
K5NW	92,856-	636-	73-14-B
K4VUD/5 (KY5N, opr.)			
	89,206-	611-	73-24-B
KE5C (WB5VZL, opr.)			
	84,420-	609-	70-24-A
KW5P	81,896-	552-	74-24-A
N5EG	69,420-	534-	65-11-B
KV5Y	65,240-	488-	70-17-B
W1AEL	50,432-	394-	64-12-B
NA5F	33,600-	280-	60-16-A
W5AH	24,860-	226-	55- 6-B
KD5PJ	22,642-	202-	56-10-A
KB5UL	20,460-	155-	66- 8-A
AA5C	12,096-	126-	48- 6-A
KA5PVB	468-	18-	13- 8-A
KA5W (+ KM5X)			
	129,796-	877-	74-24-B
N5RM (+ K5MM)			
	121,180-	830-	73-24-B
KM5R (+ KA5FSJ, KA5LAQ, N5HHE, NE5V)	75,776-	512-	74-15-B
KC5EA (+ N5AU)			
	75,336-	516-	73-10-B
NN5E (+ KC5DXI)			
	73,432-	548-	67-22-B
KB5UT (+ KM5K)			
	54,270-	405-	67-20-A
NA5S (+ KE5CV)			
	52,932-	401-	66-14-B

Oklahoma

N5CG	126,622-	891-	71-23-B
KM5H	112,332-	759-	74-24-A
K7CW	74,908-	559-	67-14-B
KO9X	10,164-	128-	42-14-A
N6IN (+ W3AS)			
	75,482-	517-	73-11-B
K5CM (+ N5KW)			
	20,020-	182-	55- 8-B

Southern Texas

N5JJ	163,984-	1108-	74-24-B
K5GN	160,728-	1086-	74-24-B
K5LZO	158,856-	1079-	74-24-B
NA5R	150,684-	1018-	74-24-B
N5OU	150,368-	1016-	74-24-B
NR5M (NM5M, opr.)			
	144,540-	990-	73-24-B
KN5H	121,472-	832-	73-23-B
K5TSQ	118,140-	805-	74-17-B
KG5U	117,384-	804-	73-22-B
K5WA	111,836-	768-	73-19-B
K2TNO	108,144-	751-	72-17-B
W5ASP	104,192-	704-	74-24-B
K3ZMI	80,884-	554-	73-22-A
K5TU	73,730-	505-	73-13-A
NJ5O	61,344-	432-	71-19-A
W5SG	61,060-	430-	71-16-A
W5HNS	57,960-	414-	70-16-B
KC5CP	39,054-	283-	69-17-B
WB5UCL	38,400-	300-	64-12-A
AD5Q	37,332-	306-	61- 5-B
K5DX	29,524-	242-	61- 8-B
W5NR	29,440-	230-	64-11-B
W5VX	23,744-	212-	56- 4-B
KK8L	20,720-	185-	56- 5-A
WB5GMB	7650-	85-	45-10-A
K5CI	1232-	28-	22- 4-A
WD8DKJ/5	384-	16-	12- 2-A
KZ5M (+ K5VWW, N5GTH)			
	138,972-	939-	74-24-B
K5GB (+ KA5QAA, Neb			
	65,320-	460-	71-18-B
KN5A (+ NR5M)			
	57,664-	424-	68-18-B

6

East Bay

N6BV	153,476-	1037-	74-24-B
W6RGG	114,996-	777-	74-24-B
K6HIH	85,120-	608-	70-21-B
W6OSP	75,740-	541-	70-23-A
VE2AOS/W6	64,610-	497-	65-15-B
AA6UO	52,904-	389-	68-12-A
K2GMY	49,680-	360-	69-21-A
N6EK	43,128-	356-	69-24-A
K6PJY	42,880-	335-	64-13-A
K6MBV	35,092-	283-	62-20-A
K6CSL	32,452-	266-	61-23-A
AK6T	17,596-	166-	53- 9-A
NB6L	8800-	100-	44- 5-B
W6BSY	8600-	100-	44- 7-A
K6ARE	2900-	50-	29- 6-B
K6SIK	756-	21-	18- 3-A
KB6CDP	476-	34-	14- 4-A
K6ZM (+ N6OPI			
	113,664-	768-	74-24-B

Los Angeles

W6UE (WA6OTU, opr.)			
	101,178-	693-	73-13-B
N6HC	59,640-	440-	68-12-B
NE6I	51,322-	383-	67- 8-B
K6EID	37,398-	271-	69-21-A
W6OES	7392-	88-	42-18-B
N6AA	6438-	87-	37- 2-A
WR6DIB	4466-	77-	29- 7-A
WB6QLM	2494-	43-	29-11-A
WA6HQS	532-	19-	14- 5-A

Orange

K7JA	136,456-	922-	74-24-A
KZ6E	129,352-	874-	74-20-A
NX6M	18,444-	174-	53-18-A
K6HRT	14,500-	145-	50- 8-A
W6XD	4544-	71-	32- 2-A

Pacific

AH6AZ	38,870-	299-	65-16-B
KH6SP (WB3HVS, opr.)			
	17,496-	162-	54- 7-A
AH6EK	600-	20-	15- 2-A
KJ6W/KH2	390-	15-	13- 1-B

Sacramento Valley

AI6V	117,530-	805-	73-24-B
AJ6V	116,382-	797-	73-23-B
W6TPH	101,908-	698-	73-21-B
KV6H	101,380-	685-	74-23-B
N6GG	98,988-	678-	73-24-A
KF6A	60,186-	449-	67- 8-B
W6EGX	35,742-	259-	69-14-A
W6YKM	34,710-	267-	65- 4-B
NB6G	32,596-	281-	58- 6-B
K6BPB	30,660-	256-	60-20-A
N6JM	24,780-	210-	59- 9-A
K6SG	17,498-	182-	54- 4-B
N6CHU	17,490-	159-	55-16-A
W6NKR	16,864-	136-	62-10-A
N6ESV	14,700-	150-	49-18-A
NU6O	8600-	100-	43- 5-A
WD6EIW	840-	30-	14- 7-A
N6GJC	120-	10-	6- 3-A

San Diego

W6YA (N6TJ, opr.)			
	147,112-	994-	74-24-B
NI6W	139,416-	942-	74-24-B
N6ND	93,440-	640-	73-17-A
AA6EE	39,942-	317-	63-10-A
W6JXA	33,408-	261-	64- 9-A
WB6FHK	27,240-	227-	60-18-B
W6JVA	9720-	108-	45- 7-A
K6ZH	4180-	65-	32- 2-A
KE6PY (+ WB6QTC)			
	31,000-	250-	62-14-A

San Francisco

W6BIP	97,680-	680-	74-18-B
WA6AUE	91,022-	641-	71-24-B
W6JTI	74,124-	522-	71-24-A
K6LRN	50,786-	354-	72-15-A

San Joaquin Valley

WC6H	141,036-	966-	73-24-B
N6BJQ	52,272-	363-	72-11-A
W6SX	12,780-	142-	45- 3-A
WC6U	12,220-	130-	47-11-A
KA8UOC/6	90-	5-	5- 2-A

Santa Barbara

W2KVA/6	76,396-	538-	71-21-B
WA6FGV	58,344-	429-	68-22-A
W6TKF	34,944-	273-	64-12-A
WA5VGI	25,420-	205-	62-16-B
NS6X	2812-	52-	28- 5-A

Santa Clara Valley

W6XX	156,732-	1059-	74-23-B
N6TV	143,664-	984-	73-24-B
K6XO	133,998-	913-	73-24-B
N6AUV	129,500-	875-	74-24-B
NU6S	127,576-	862-	74-24-B
AA6T (SM0DRD, opr.)			
	120,815-	865-	73-24-B
W6SZN	118,920-	790-	74-24-B
N6MG (KD6PY, opr.)			
	114,108-	771-	74-24-A
N6XI	112,184-	758-	74-19-B

N6SJ	98,124-	663-	74-24-A
W6IO	87,764-	593-	74-23-A
N6NE	85,968-	597-	72-19-B
WB6DSV	78,258-	536-	73-17-A
N6RZ	68,880-	492-	70-19-B
N6ZB	66,220-	473-	70-19-A
N8CQ	64,232-	434-	74-17-B
WC8I	60,820-	433-	70-20-B
N6NF	57,856-	452-	64-10-A
K6QMB	52,576-	424-	62-17-A
AD8E	50,922-	369-	69-14-A
N56V	43,810-	337-	65- 9-B
N6OM	41,480-	305-	68-14-B
N6QW	32,604-	254-	63- 8-B
W6KZJ	30,504-	246-	62-15-B
W6CF	9600-	100-	43- 2-B
K6AYB	9180-	102-	40-15-A
K6MA	1404-	39-	18- 1-A
WA6AZP	1224-	34-	18- 6-A
K6KFPW	374-	17-	11- 6-A
K6BWP	128-	8-	8- 7-B
N6BI (+ WA6VEF)	165,316-1117-		74-24-B

7

Alaska

KL7UR	17,920-	160-	56-20-B
AL7BK	10,868-	143-	38-13-A
AL7CQ	5100-	75-	34-10-B
WB6CEC/KL7	4506-	88-	27-12-A

Arizona

K7OX	143,560-	970-	74-23-B
KY7M	120,472-	814-	74-24-A
W7ZMD	83,512-	572-	73-20-A
W7FGT	78,256-	536-	73-24-B
N7CIX	77,928-	573-	68-19-A
N7CW	69,000-	500-	69-12-A
W7YS	58,504-	412-	71-16-A
KC7V	56,560-	404-	70-17-A
KA7TCI	39,942-	317-	63-23-A
N7CPL	20,412-	189-	54- 6-A

Idaho

K7QO	124,704-	866-	72-23-B
W7ZRC	107,184-	744-	73-23-A
AD7L	28,644-	231-	62-16-A
WB7TJI	17,172-	159-	54- 8-A

Montana

KS7I	83,300-	595-	70-21-B
K6PPI7	73,730-	505-	73-21-B
WA6SDE	2100-	42-	25- 8-A

Nevada

WA7NIN (W6OAT, opr.)	166,128-1136-		74-24-B
NF7P	143,136-	994-	72-23-B

Oregon

W7NI (N6TR, opr.)	170,528-1168-		73-24-B
AI7B	105,266-	721-	73-19-B
K7KJM	88,340-	631-	70-24-A
W7TC	57,562-	436-	66-23-A
W7YAQ	51,000-	375-	68-11-A
WB7UFJ	24,882-	209-	59-17-A
W7GUR	2352-	49-	24- 5-B
AG7M (+ oprs.)	116,900-	800-	73-21-B

Utah

K7EA	22,329-	183-	61- 7-A
K7UM	20,000-	200-	50- 7-A

Washington

W7RM (KB7G, opr.)	152,586-1031-		74-24-B
K7LXC (W7WA, opr.)	127,260-	860-	74-23-B
N7TT	120,758-	816-	74-24-A
K7HBN	102,808-	724-	71-23-B
W7HUN	89,562-	649-	69-24-B
KR7G	73,780-	527-	70-19-B
KT7H	58,344-	429-	68-17-A
W7LKG	53,170-	409-	66-21-B
K8ZL	39,432-	318-	62-20-A
WB6WUM	23,880-	199-	60- 9-B
N7ETC	20,400-	200-	51-14-A
N7EPD	10,908-	133-	41- 7-A
W7BYK	6600-	100-	33- 5-A
K7WA	2070-	45-	23- 1-A
W7DRA	330-	15-	11- 4-B
KC7YE	140-	10-	7- 2-A
KE7C (+ WB7OJV)	113,472-	786-	72-24-B
KT7G (+ K7LXC)	105,120-	720-	73-24-B
N6AX (KA7THJ, KA7DGV)	78,336-	544-	72-24-A

Wyoming

WA8MAM	108,040-	730-	74-24-A
NC7O	11,374-	121-	47-12-A

8

Michigan

K8CC	148,964-	993-	74-24-B
WA8RBR	138,604-	923-	74-24-B
W8UA	89,280-	620-	72-14-B
K8MW	87,746-	601-	73-23-A
W8VPC	79,200-	550-	72-20-B
W8RC	70,148-	494-	71-11-B
KS8O	63,420-	453-	70-24-B
KN8P	61,080-	430-	71- 8-B
K8RDJ	57,120-	408-	70-22-B
K8SIA	52,578-	381-	69-12-B
KO8M	48,888-	388-	63-21-A
K8OT	47,196-	342-	69-20-B
K8CV	44,144-	356-	62-20-A
W8TJQ	41,610-	285-	73-16-A
KA8NCR	39,296-	307-	64-13-A
N8CQA	32,860-	265-	62-16-A
NJ8M	31,808-	284-	56-11-A
W8EGI	31,360-	245-	64-11-B
K8DD	30,210-	265-	57- 6-A
K8JLB	22,686-	198-	57- 6-A
WA8VEB	22,464-	208-	54- 6-A
WA8YPY	19,764-	183-	54-14-A
KD8TM	10,800-	108-	50- 8-B
W8TKW	8190-	117-	35-10-A
W8PVI	8008-	91-	44-10-A
N8BTU	5332-	86-	31- 7-B
AD8W	900-	30-	15- 3-A
KD8QK	816-	24-	17- 4-A
K8JRK (+ K8JM, KT8Y, K8FC)	102,200-	700-	73-23-B
KA8POG (+ WB8VYN)	12,728-	148-	43-24-B
K8DAC (KY8C, K8CQF, N8FAU, oprs.)	2550-	51-	25- 4-A

Ohio

K8NZ	138,132-	934-	74-24-B
WB8N	132,312-	894-	74-24-B
KU8E	127,872-	864-	74-24-B
W8LNQ	126,800-	850-	74-22-B
K1LT	123,136-	832-	74-20-B
WD8IXE	114,700-	775-	74-23-B
K8EE	102,816-	714-	72-23-A
KV8Q	96,944-	664-	73-24-A
N8ET	96,852-	662-	73-22-B
K8AZ	85,556-	586-	73 24-A
KA8ETK	80,454-	583-	69-24-A
K3JT	80,088-	564-	71-24-A
K8BL	72,940-	521-	70-16-A
KR8Y	72,360-	540-	67-21-A
WB8PHI	66,912-	492-	68-16-B
K8MR	63,000-	450-	70- 7-B
N8CSL	62,376-	452-	69- 9-B
AD8P	59,714-	409-	73- 8-B
N8JR	58,368-	456-	64-17-A
WB8JAY	56,156-	434-	67-18-A
W8UPH	57,684-	418-	69-13-B
W8IDM	56,440-	415-	68-17-A
AA8S	56,064-	384-	73-14-B
WB8RTJ	49,404-	358-	69-18-A
K8DB	45,016-	331-	68- 7-B
W8IQ	42,504-	322-	66- 9-A
W8VQI	28,792-	236-	61-12-A
KF8K	26,429-	181-	70-20-A
N8EKS	20,412-	162-	63-14-A
KS8S	19,764-	183-	54- 3-B
AF8C	19,030-	173-	55-13-A
W8TO (K8EM, opr.)	18,032-	161-	56- 7-A
WR2D	15,600-	150-	59-11-A
N8FU	9000-	100-	45- 5-A
WB8PN	8944-	104-	43- 6-A
KN8Z	8428-	100-	43- 4-B
N8FCO	5610-	86-	29-14-A
WA2AZG	5112-	71-	36- 4-A
KB8WC	4292-	74-	29- 3-B
WA8BIN	3304-	59-	28- 2-A
KC8F	2500-	50-	25- 6-A
WB8JBM (KC8s MK, XK, KW8N, N8s ATR, DGJ, DMM, WD8IJP, oprs.)	150,088-1028-		73-24-B
W8LT (NZ4K, KA3GZS, WD8LXX, KD8NS, oprs.)	120,768-	818-	74-23-B
W8UPD (KA8HVZ, WD8RDW, oprs.)	34,000-	250-	68-14-A
W8YX (NI8S, KA8UUB, oprs.)	2236-	44-	26- 3-A
W8DXT	1536-	32-	24-15-B

West Virginia

N8II (KC8C, opr.)	136,224-	946-	72-24-B
KD8G	115,632-	792-	73-24-A
KB8FJ	22,000-	200-	55- 4-B

9

Illinois

K9GL	125,504-	848-	74-24-A
K9ZO	122,688-	864-	71-24-B
KM9P	118,002-	831-	71-24-A
K9BG	107,494-	757-	71-19-B
K2PLF	99,968-	704-	71-23-A
K9JU	97,920-	680-	72-23-A
N9NA	96,792-	654-	74-20-A
N9EP	94,176-	654-	72-22-A
WB9JKI	76,728-	556-	69-19-A
WD9GYX	47,916-	383-	66-16-A
N9CW	47,388-	359-	66-15-A
WA9AVL	46,230-	345-	67- 9-A
KA9QYA (K9BQL, opr.)	45,152-	332-	68-15-A
W9QWM	33,604-	271-	62-15-A
K9WA	32,026-	239-	67- 5-A
NA9O	30,996-	246-	63-20-A
K9PPW	28,800-	225-	64-11-A
K9BGL	27,348-	258-	53- 5-B
K9UQN	27,028-	233-	58- 7-A
W9HBI	25,850-	235-	55-10-B
WB8RFB	24,300-	225-	54-13-A
WB9OEP	23,896-	206-	58-13-A
W9ZEN	21,960-	175-	57-10-A
W9REC	14,640-	120-	61-10-A
AK9Y	12,382-	151-	41- 6-A
KB9PC	12,298-	143-	43- 4-A
KA9OYT	9102-	111-	41- 9-A
WA9MRU	8988-	107-	42- 3-A
N9DQK	7920-	90-	44-12-A
W9AGM	2100-	50-	21- 2-A
AC9C (+ NA9D)	144,540-	990-	73-24-B
K9LJN (+ AK9N, KU9G, NA9J)	80,960-	545-	74-24-A
N9AX (+ KG9Z)	45,126-	327-	69-23-A
WA9AWO (+ KA9P, KK8C, N9s BMA, DMT, WB9TBU, WD9HZF)	29,700-	225-	66-21-A

Indiana

W9RE	150,664-1018-		74-24-B
KE9I	114,108-	771-	74-24-B
W9LT	106,992-	743-	72-23-B
N8DE	94,868-	641-	74-20-B
W9JOO	75,816-	556-	68-24-A
K1FJ	56,440-	415-	68-24-A
W8UT	27,648-	216-	64-12-A
W9QLW	17,700-	150-	59- 8-A
N9ACD	13,916-	142-	49- 7-A
KA9SAD	6544-	84-	33- 4-A
W9CM	920-	40-	23- 1-A
KJ9D (+ KK9V)	144,152-	974-	74-24-B
N4FKF (+ KA9ORN, N9EUK)	34,596-	279-	62-20-B

Wisconsin

W1ZT	118,944-	826-	72-24-B
W9XT	111,880-	765-	73-24-B
W9OP	98,400-	700-	71-24-B
N9AW	97,090-	665-	73-22-A
W2WOE	90,312-	636-	71-22-B
W9GHY	74,060-	529-	70-21-A
KZ9K	71,120-	508-	70-24-A
N9KS	66,048-	516-	64-17-B
WA4TWB	56,304-	414-	68-18-A
AJ9U	50,680-	382-	70-22-A
WB9HRO	47,740-	385-	62-18-A
WA1UJU/9	47,616-	372-	64-17-A
N9CIO	46,410-	357-	65-11-A
W9HE	39,910-	307-	65-10-A
K9GDF	35,620-	274-	65- 5-A
W9GMV	35,518-	301-	59-10-A
N9EJL	29,788-	244-	61-11-B
KW9E	22,680-	210-	54-11-A
KB9W	21,504-	192-	56- 6-A
WA9TZE	18,128-	171-	53- 5-A
K1TMM	16,324-	154-	53-11-A
WB9HGS	14,504-	148-	49-12-A
KD9GS	14,400-	150-	48-15-A
K9KR	8858-	103-	43- 7-B
K9OSC	7548-	102-	37- 4-A
KD9ET	5250-	75-	35-10-A
WB9IXS	2600-	50-	29- 1-B
K9BED	2350-	47-	25- 7-A
N9EZ	2288-	44-	26- 1-A
W9KHH	1848-	44-	21- 3-A
WB9AZH	572-	22-	13- 3-A
WBAIH/9 (K9s FVF, TG, KM9O, W9HW, WA9RBW, oprs.)	132,312-	894-	74-24-B

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Colorado

N2IC	166,352-1124-		74-24-B
K9RF (W9UA, opr.)	163,984-1108-		74-24-B
W9YK	159,100-1075-		74-24-B
KC9D	123,408-	857-	72-24-B
W9IJR (K9EU, opr.)	119,732-	809-	74-24-A
W9KEA	108,484-	733-	74-24-A
AD9O	94,908-	669-	71-24-A
NI9E	92,862-	693-	67-18-B
W9ETT	87,408-	607-	72-22-A
KB3EI (WB7OFL, opr.)	87,220-	623-	70-23-B
W9CP	85,492-	638-	67-14-A
K9BN	82,656-	574-	72-20-B
K0ZK	82,416-	606-	68-14-B
AC0S	73,220-	523-	70-13-B
K1XE	70,858-	499-	71-18-A
KJ0G	56,740-	581-	70-22-B
KS0E	51,200-	471-	65-24-A
N9CNV	54,786-	397-	69-19-A
KR0U	43,776-	342-	64-17-A
W9RSG	30,500-	250-	61-12-A
W9RLX	28,672-	224-	64-10-A
N9ST	20,416-	176-	58- 5-A
W9SG	13,303-	126-	53- 5-A
AI9ZR	9030-	105-	43- 4-A
W9IZV	4992-	64-	39- 6-A
K9MWM	1600-	32-	25- 7-A
K0UK (+ KD7EY, N0ZA)	109,372-	739-	74-24-B
WB0TG (+ WB0MZT)	1820-	35-	26- 4-A

Iowa

N0GA	134,320-	920-	73-24-B
W0EJ	130,962-	897-	73-24-B
KF0H	128,188-	878-	73-22-B
K0LUZ	109,908-	774-	71-24-A
K0JGH	99,504-	691-	72-24-B
NG0W (KJ0D, opr.)	96,912-	673-	72-24-A
K0IS	94,320-	655-	72-24-A
KC0XK	65,548-	489-	66-20-B
NE0P	44,238-	303-	73-24-A
WB0IOG/0	22,800-	190-	60-12-A
N0WA	5040-	72-	35- 7-B
W0JTC	3360-	60-	28- 4-A

Kansas

KB0G	107,892-	729-	74-24-A
K0VBU	107,744-	728-	74-24-A
N7DF	49,200-	410-	60- 8-B
W0AWP	33,358-	269-	62-23-A
N0FMR	19,440-	180-	54-11-A
WA0CFZ	14,640-	240-	61-22-B
W0YRN	7560-	90-	42-13-A
KF0M	2812-	52-	28- 3-B
N0CLV	2000-	50-	20- 5-A
WA0HWH	850-	25-	17- 4-B
KA0ITA	98-	7-	7-19-A
AB0S (+ K0WA)	122,932-	842-	73-24-B

Minnesota

K0JL	92,592-	647-	72-22-A
K3WT	74,580-	565-	66-20-A
WA0QIT (N0EOB, opr.)	74,244-	538-	69-21-A
K0FZG	69,414-	503-	69-24-A
K0MPH	51,348-	389-	68-13-A
K0VW	41,990-	323-	65-14-A
W0TIV	23,760-	198-	60- 7-A
N0BSH	22,040-	190-	58- 4-B
W0YHE	20,160-	180-	56-13-A
WA0WWW	7800-	100-	39- 3-A
KA0TII	108-	9-	6- 9-A
WB0HRX (+ WB0FBN)	71,016-	538-	68-18-B

Missouri

K4VX (KR0Y, opr.)	169,808-1146-		74-24-B
KM0L	138,752-	924-	74-24-B
K0RWL	113,960-	770-	74-24-A
W0HBH	105,080-	710-	74-24-A
KS7T	83,300-	595-	70-21-B
N0EVC	65,440-	440-	63-17-A
K0DEQ	52,220-	373-	70-10-B
KM0R	37,760-	295-	64-12-B
AK0M	14,382-	141-	51- 4-A
WD8ARX	11,858-	114-	52-12-A
KA0P	3000-	50-	30- 2-A
W0EEE (KA0RBL, WB0YKG, oprs.)	15,000-	150-	50-13-B

Nebraska

KB0CM	106,704-	741-	72-21-B
KV0I	93,860-	659-	70-22-A
K0SW	11,340-	126-	45- 8-A

North Dakota

KK0Q	20,458-	193-	53- 8-A
K0FRP	6825-	92-	36- 3-A
W0LHS	4416-	48-	56- 4-A

South Dakota

K0JV	35,464-	286-	62-14-A
K0VVY (KA0XX, KB0QA, KD0GV, N0FLZ, WD0s CXU, HFK, oprs.)	123,432-	834-	74-24-B

VE

Maritime-Newfoundland

VO1QU	38,556-	357-	54-18-A
VO1QST (VO1AW, opr.)	29,500-	250-	59- 9-B
VE1BEI	17,808-	159-	56-11-A

Quebec

VE2AQP	53,064-	402-	66-19-B

Ontario

VE3IRF	67,160-	460-	73-23-A
VE3QST (VE3OT, opr.)	55,752-	404-	69-24-B
VE3CWE	21,252-	161-	66-10-B
VE3DAP	10,082-	71-	71- 5-A
VE3OMU	9064-	103-	44-18-A
VE3ART (VE3s ABG, GAS, QB, oprs.)	116,480-1164-		70-21-B

Manitoba

VE4VV	56,100-	425-	66-17-A
VE4AEX	32,774-	193-	59-23-A
KK0W/VE4 (+ KX0G, VE4s ALZ, AMC, IY, RM, VE4UM club)	88,050-	629-	70-24-B
K6GT/VE4 (+ KK6C, KN6D, KZ6I)	58,072-	427-	68-23-B

Saskatchewan

VE5AAD	19,950-	175-	57-12-A
VE5AA (VE5s BAF, BBQ, BEL, GK, ZU, oprs.)	46,800-	390-	60-18-A

Alberta

VE6CB	15,288-	147-	52- 8-A
VE6BND	14,382-	141-	51-12-A

British Columbia

VE7QO	67,640-	628-	70-20-B
VE7YU	62,646-	469-	67-18-A
VE7IN	59,520-	485-	64-18-A
VE7ESN	20,682-	217-	54-24-A
VE7DVV	15,158-	143-	53-20-A

Yukon-NWT

VE8QST (WA3PWL, opr.)	63,756-	449-	71-19-B
VE8JG	8720-	109-	40-11-A

Phone

1

Connecticut

W1WEF	186,886-1256-		74-24-B
W1ODY	110,538-	801-	69-23-B
K1RM	107,748-	738-	73-15-B
K1WA	94,856-	668-	71-18-B
KA1YR	84,700-	605-	70-18-B
K8HVT	78,798-	671-	69-17-B
KA1VC	75,624-	548-	69-15-B
KG1D	61,028-	418-	73-16-A
N1CC	58,220-	410-	71-13-A
K1NYK	57,200-	440-	65-12-B
K1BV	56,280-	402-	70-12-B
K1YRP	32,452-	266-	61- 9-B
W1ECH	18,800-	200-	47- 5-A
K1EM	18,156-	178-	51- 4-B
W1PMR	12,040-	140-	43-10-A
W1BIH	11,952-	83-	72- 4-B
WB8TOA	11,676-	153-	38- 6-A
K1DII	8712-	99-	44- 3-A
W1TKG	8312-	83-	32-10-A
WB1OQT	5162-	89-	29- 5-A
KA1JTH	4950-	75-	33- 9-B
KB1N	3416-	61-	28-10-B
AA2ZI	2350-	47-	25- 1-B
K1IN	1900-	50-	19- 2-A
KH6WZ/1	1378-	53-	13- 4-A
K1KI (+ W1OD)	176,806-1211-		73-24-B
KB1H (K1GX, WA1s DLP, HYN, RLV, oprs.)	107,640-	780-	69-19-B
K1DW (+ K1NCD)	71,856-	498-	72-18-B

Eastern Massachusetts

K1VUT	140,420-1003-		70-24-B
N1AU	74,120-	545-	68-16-B
KQ1F	58,680-	419-	70-14-B
W1FM	58,650-	425-	68-16-A
WA2TBA	45,480-	379-	60-13-B
W1TR	42,194-	289-	73-14-B
KB1GN	27,280-	235-	58-12-B
KA1EKR	15,336-	142-	54-14-A
K5MA	12,986-	151-	43- 4-B
KA1OR	12,852-	153-	42- 9-A
W3OD	8736-	112-	39- 4-A
KB1KM	7688-	62-	62-18-A
W1PLJ	6468-	98-	33-12-B
W1TUM	5372-	79-	34- 5-A
W1SR	4620-	70-	33- 3-A
WA1REI	3672-	58-	27-10-B
KC1F	3120-	80-	26- 1-B
WA1EOT	2128-	56-	19- 1-B
N1CRD	1786-	47-	19- 2-A
K1AGM	1440-	36-	20- 5-A
K1UCA	1352-	26-	26- 5-B
KQ1V (+ KA1KEO)	51,240-	420-	61-16-B
W1TKZ (K1s BA, UR, KA1s JWE, IU, KB1EB, N1s ADY, CGF, CPE, DEZ, WITTY, WA1YOJ, WB1BUM, oprs.)	24,544-	208-	59-22-B
W1BK (K1TXH, N1CW)	19,690-	179-	55- 9-B

Maine

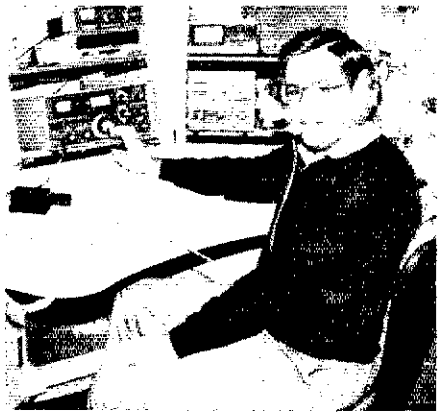
K1JB	75,600-	525-	72-15-B
N1AFC	13,416-	158-	43-10-A
KA1TJ	9200-	100-	46- 9-A
WB1GLH	270-	15-	9- 1-A
KB1CV (+ KA1OR)	52,536-	398-	66-21-B
KB1JF (+ KA1s CNG, JGF, W1XX)	27,702-	243-	57-16-A

New Hampshire

KM1C (WB8BTH, opr.)	136,368-	947-	72-24-B
AF1T	93,240-	668-	70-17-B
AK1K	50,694-	357-	71-21-A
KU2W/1	39,786-	349-	57-18-A
KA1CRP	10,944-	114-	48- 9-A
K1GQ	8400-	100-	42- 4-B
AC1J	7826-	93-	41- 5-A
W1UCI	2400-	50-	24- 5-A

Rhode Island

KM1X	91,908-	666-	69-17-B



VE4ALO comprised half of the operators from MB in the phone portion of SS. He made over two-thirds of the contacts from that Section with his four-element, four-band Yagi.

Ernie, with his new call sign, VE7 "Great DX," was the top BC, low-power, phone station for the second year in a row.

K1VSJ 63,656- 436- 73-15-B
K9SBI1 23,540- 214- 55-10-B
W1RFQ 2312- 34- 34- 3-B
W1OP (N1s AKO, BBM, KA1DUV, WA1s RKL, TAQ, JHV, WA6PCJ, oprs.) 51,188- 382- 67-24-A

Vermont

WB1GQR 153,446-1051- 73-23-B
W1KQ 22,880- 260- 44- 9-B
W3SOH 13,200- 150- 44-10-A

Western Massachusetts

N3ADQ 31,416- 237- 68-23-A
KV1W 26,640- 222- 60-13-A
N2CJJ/1 16,536- 156- 53- 8-A
WB1FXF 12,136- 148- 41- 9-A
N1CKW 10,904- 116- 47- 7-A
WB1EYL (+ KA1KVF) 38,068- 306- 62-12-B

2

Eastern New York

W2ARO 93,832- 634- 74-24-B
WA2STM 86,940- 630- 69-16-A
KC2AG 75,824- 548- 69-24-B
K2UF 49,312- 358- 67-16-B
N2DRR 30,380- 245- 62-15-A
N2BFG 29,520- 246- 60-12-A
W2DW 27,022- 229- 59- 6-B
WA2ZWS (WB2QEU, opr.) 13,456- 116- 58- 5-A
KD2IX 180- 15- 6- 5-A
WA2UKP (+ WA2JOK) 87,448- 643- 68-22-B
KC2KK (+ KW2D, WA2UYM) 52,632- 387- 68-16-A

New York City-Long Island

K5ZG 52,650- 405- 65-18-A
NG2G 32,745- 272- 59-10-B
K2SX 26,904- 236- 57- 5-B
K2RYI 7128- 99- 36-10-A
K2AU (N1EE, opr.) 6400- 100- 32- 2-B
K2LJH 6232- 82- 38- 6-A
K2HVN 5916- 87- 34- 3-A
W2GKZ 5700- 75- 38- 4-B

Northern New Jersey

WA2UDT 54,372- 394- 69-11-A
KC2GE 26,536- 218- 62-12-B
KB2ZQ 22,386- 211- 53-18-A
W2GD 17,952- 187- 48- 4-B
KW4E/2 7800- 100- 39- 5-A
N2WT (+ N2CWC) 141,474- 969- 73-24-B
W2RQ (+ KS1G) 41,520- 346- 60- 5-B
K2MFF (KA2s QEI, RRR, VLP, N2BTJ, W2VY, WA2FYP, oprs.) 38,072- 296- 66-24-A

Southern New Jersey

WA2VYA 112,752- 783- 72-23-B
KZ2I 72,144- 501- 72-24-A
NC2V 69,444- 482- 71- 7-A
WA2WJL 42,240- 320- 68-16-A
W2HRW 40,128- 304- 66-23-B
W2FGY 27,730- 235- 59-16-B
N2DMK 23,320- 220- 53-16-A
WA2LBT 12,576- 131- 48- 7-A
W2ORA 12,584- 143- 44- 7-A
N2EZ 8820- 126- 35-11-A
KA2KFO 7954- 97- 41-18-A
KD2AE 5776- 76- 38- 6-B
W2BLV 3290- 47- 35- 2-A
N2AWC 620- 31- 10- 2-A

Western New York

AF2K 63,000- 450- 70-22-B
NA2A 55,338- 401- 69-20-B
WA2PNQ 40,704- 318- 64-22-A
KB2NU 40,066- 299- 67-14-B
WB2SZY 26,432- 224- 59-12-A
WA2FQE 24,244- 209- 58-20-A
W2HQ 22,236- 218- 51- 5-B
W2VDX 20,184- 174- 58-11-B
WA2WPI 15,300- 153- 50-13-A
WB2YQH 13,056- 96- 68- 8-A
K2XU 11,956- 122- 49- 4-B
W2FXA 9782- 73- 67- 7-A
NA2Q 7980- 95- 42- 4-A
KA2KDA 1598- 47- 17- 8-A
W2OW (K2OC, KA2CDE, KB2KW, KD2GB, N2HR, N6IN, NE2W, WA2GBJ, WA3WKA, oprs.) 96,740- 691- 70-23-B
WA2ZXS (KA2s NIL, TWY, KB3RG, N2s DUG, EUV, FAO, FEC, N3DLL, N5BGY, WA2TDN, WB2HLY, WD6CQV, oprs.) 49,280- 352- 70-24-B

3

Delaware

K3WUW 133,776- 929- 72-22-A
N8NA 3640- 70- 26- 2-A
K2IQ/3 (K2OZV, KA2s CFH, MTB, KD2EE, KKs 2B, 2G, WA1LLC, WA2AZA, oprs.) 51,000- 375- 68-24-A
K3QIO (+ KA3LLL, WB3LLI) 31,374- 249- 63-23-A
K2GEI/3 (WA2NXK, WB2s ANM, ONA, oprs.) 11,088- 126- 44-14-A

Eastern Pennsylvania

WA3SPJ 99,718- 683- 73-19-B
KS3F 94,080- 672- 70-19-B
WB3EMG 90,812- 622- 73-21-B
WB3FAA 70,488- 518- 68-18-B
KJ7K 61,880- 455- 68-18-A
W3IQS 59,780- 427- 70-18-A
KB3YJ 43,792- 322- 68-17-A
K3WW 39,468- 286- 69- 8-B
N3DRF 32,096- 272- 59- 9-B
W3ARK 30,134- 247- 61-11-A
K3TX 28,396- 229- 62-10-B
KC3M 27,316- 201- 68-10-A
W3EFY 25,546- 241- 53-13-A
N3BNA 20,880- 174- 60- 8-A
WA3YON 20,696- 199- 52-11-A
W3KOK 15,224- 173- 44-18-A
KA3KTG/PA 14,382- 153- 47-13-A
KC3LY 12,314- 131- 47-15-A
KH6CP 6090- 87- 35- 2-B
KB3QI 5976- 83- 36- 4-A
AG3G 2006- 59- 17- 4-A
W3HMR 900- 30- 15- 2-B
N3CZB 552- 23- 12- 2-A

Maryland-DC

K3ZO 177,244-1214- 73-24-B
K3ZJ 145,336- 982- 74-24-B
K3ZZ 137,900- 985- 70-24-B
KA1GD 134,784- 906- 72-15-B
K3NA 130,072- 916- 71-21-B
N3RL 116,920- 790- 74-17-B
K2ITG 102,346- 701- 73-21-B
WA3EKL 80,208- 567- 72-24-A
N3AOE 64,124- 446- 72-24-A
W3DOI 46,364- 346- 67-17-B
K4CGY 42,380- 326- 65-15-B
WB3BRF 36,836- 287- 64-19-A
W3JPT 34,650- 275- 63-15-A
K3TM 32,944- 284- 58- 7-B
KR3M 32,332- 274- 59-24-A
W3FQE 26,280- 219- 60-15-B
K3ZNV 16,600- 166- 60- 5-B
KC3D 9438- 121- 39- 3-B
N3API 8200- 100- 41- 9-A
W3UJ 8024- 118- 34- 4-A
W3EVQ 5016- 76- 33-18-A
KN3T 2052- 38- 27- 1-B
W3GNQ (+ KJ4U, KF3P) 156,140-1055- 74-24-B
W3HVQ (KA3FSH, N3EBR, oprs.) 105,560- 754- 70-23-B

Western Pennsylvania

WA3WAW 70,992- 522- 68-20-B
K3UA 43,112- 317- 68- 3-B
K3LR 12,330- 137- 45- 2-B
W2UP 9752- 106- 46- 2-A
W3QII 6916- 91- 36- 7-A
K3RYA 2700- 50- 27- 2-A
WA3PCX 696- 29- 12- 3-B
K3TUP (+ KJ3L, N3BJ) 152,208-1096- 74-24-B
WB3KKX (+ N8EKE) 78,144- 528- 74-13-B
W3GQ (+ N3ASF) 11,592- 126- 46- 3-B

4

Alabama

N4KG (KC4ZV, opr.) 220,816-1492- 74-24-B
WZ4F 217,686-1491- 73-24-B

Georgia

K4JPD 182,592-1268- 72-24-B
K4BAI 149,760-1040- 72-24-B
W4MM (N4FD, opr.) 147,898-1013- 73-22-A
N4DVW 123,808- 848- 73-17-B
AA4GA 103,740- 741- 70-20-A
NN4K 70,584- 509- 68-14-B
KI4RE (KB4LIT/AT, opr.) 36,332- 293- 62-19-A
WA4BSN 28,248- 204- 66-13-B
K4UEE 12,960- 135- 48- 2-B
KI4Y 6132- 73- 42- 5-A
W4AQL (KB4IHN, N3BLO N4s CXF, JVY, WA4ABY, WD4OLP, oprs.) 132,880- 910- 73-24-B

Kentucky

AA4RX 111,328- 784- 71-16-B
WB4FOT 84,208- 583- 71-20-B
KI4DC 68,724- 498- 69-13-A
KF4ZY 34,404- 282- 61-20-A
N4TY 16,128- 168- 48- 4-B
WA4YOF (+ N4IWO) 22,920- 191- 60- 6-B

North Carolina

N4KMY 126,000- 900- 70-24-B
K4JEX 76,734- 609- 63- 8-B
WD4SKH 42,642- 309- 69-17-A
KA1JTZ 16,204- 181- 42-16-A
WB4HRR 10,480- 131- 40- 9-A
N4KVF 8800- 100- 44- 7-A

Northern Florida

K4XS 198,172-1339- 74-24-A
WA4JXI (WA4SVO, opr.) 170,090-1165- 70-24-B
KQ1Y 167,170-1145- 73-24-B
N4SA 145,854- 999- 73-17-B
WC4E 131,400- 900- 73-19-A
NU4Y 120,912- 816- 66-16-B
W4IIR 35,600- 250- 71-18-B
W4WKQ 30,996- 246- 63-11-B
N4BP 22,000- 200- 56- 6-A
N4MS 19,920- 166- 60-10-B

South Carolina

N4DT 75,480- 539- 70-14-B
WD4EOG (WA1MKE, opr.) 50,552- 356- 71-21-A
K4ADI 41,990- 323- 65-14-A
WA4JJZ 32,240- 248- 65-19-A

Southern Florida

K1ZX/4 118,800- 825- 72-13-B
WA4FSP 72,940- 521- 70-24-A
WA4FIB 54,102- 381- 71-17-A
KI4JB 19,292- 182- 53-14-A
WK4F 9000- 75- 60-16-B
KO4D 2600- 50- 26- 5-A

Tennessee

N4ZZ 222,688-1508- 74-24-B
WM4Z 98,784- 688- 72-20-A
N4TG 66,400- 600- 72-18-A
K3CQ 58,796- 453- 66-13-B
NF4F 34,710- 267- 65-13-A
WA4RDD (WA4ZZU, opr.) 19,080- 159- 60-24-A
WI4FLW 12,650- 115- 55-11-A
K4JHT 4640- 58- 40- 6-B
K4XO 480- 20- 12- 1-A
KB4FHE (+ KB4IHU, WZ4E) 33,408- 288- 58-10-B
WB4YLC (KB4HOB, KY4A, N4HBD, WA4ZWH, WD5FUN, oprs.) 32,896- 257- 64-15-B

Virginia

W3YY 193,596-1326- 73-24-B
W4MYA 175,232-1184- 74-24-B
KG4W 148,000-1000- 74-21-B
KD4NI 144,576-1004- 72-24-B
AA4FF 87,756- 618- 71-19-B
WC4B 78,936- 572- 69-24-A
AI2C 71,102- 487- 73-13-B
WD4ELJ 41,728- 326- 64-15-A
N4KWX 41,210- 317- 65-24-A
W4XD 37,642- 319- 59-10-B
W4NND 30,916- 262- 59-18-B
KI4GM 30,500- 305- 50-11-B
K4OD 26,980- 230- 63- 7-B
AA6DX 26,672- 256- 56- 7-A
WB4LNT 27,848- 236- 59-13-B
N4EHJ 24,516- 227- 54- 5-B
WB4BVY 21,320- 205- 52- 7-A
KF4FP 16,240- 145- 56-11-A
W4YE 15,600- 150- 52- 4-A
N3JT 9522- 69- 69- 8-B
N4JGM 8664- 114- 38- 8-A
K4WHN 7004- 103- 34- 7-A
KA4ERP 7004- 103- 34- 4-A
KA4ERK 6478- 79- 41- 8-A
WA4LYH 2500- 25- 25- 7-A
KC4DY (+ AB4U, KA4ZPT, KB4GTR, N4s FHL, JED, VG, W4YV, WY4D, NJ8Z) 119,564- 842- 71-24-B
WI4B (+ WB4WDM) 86,416- 481- 68-18-A
KA9X (+ KN4DPF) 462- 21- 11- 3-A

West Indies

KP4BZ 283,240-1848- 73-24-B

5

Arkansas

W9OBF 103,680- 810- 64-24-A
WA0WJF 62,790- 455- 69-16-A
K5FUV 49,400- 380- 65-13-A
W5EU 4686- 71- 33- 4-B
WA5TGL (+ N5DZQ, WA5ZGI) 129,352- 874- 74-21-B
KY5M (+ KA5s KNO, NLY, PGA, PTY, SKU, KB5QL, KD5FS, KE5IN, N5s AJO, GGG, GPT, NI5D, WA5VVT, WB5s GFA, LRP, TSH, WD5s BIV, BZO) 118,624- 785- 74-24-B

Louisiana

N5ATW 78,540- 561- 70-19-A
N5CEW 216- 12- 9-12-A
W5GAD (KA5s CSI, MSD, SSW, KB5s GQ, VC, XZ, KE5JP, N5s FTT, GWF, NE5O, W5FUW, oprs.) 78,960- 584- 70-23-B

Mississippi

W5VSZ 92,300- 650- 71-10-B
N5DSK 53,856- 374- 72-12-A
AE5H 34,844- 281- 62- 9-A
KC4WQ 9000- 100- 45-13-A
W5THT 4484- 72- 31- 8-B

New Mexico

KI3L 137,344- 928- 74-19-B
N5EZA 42,636- 323- 66-21-A
N5EPA 41,052- 311- 66-18-A
WB5TXJ 29,512- 238- 62-19-A
K5QQ 17,160- 185- 52- 7-A
NM5S 10,000- 125- 40- 7-A
AI9X 9522- 69- 69-12-B
K7UP 5508- 81- 34- 5-A

Northern Texas

K5RR (N5RZ, opr.) 239,316-1617- 74-24-B
N5AU (WB5VZL, opr.) 238,872-1614- 74-24-B
K5MR 208,312-1394- 74-24-B
K5RX 203,056-1372- 74-22-B
KE5OV 173,752-1174- 74-24-A
WD5GSL (WB0TEV, opr.) 168,848-1085- 73-24-B
K4VUD 155,252-1049- 74-24-B
K5ZD 142,704- 991- 72-22-A
N5JB 74,550- 525- 71-18-A
K5NW 72,600- 550- 66- 7-B
W5LMG 68,396- 503- 66-22-B
N4QS 58,364- 427- 66-16-B
KC5YB 49,000- 350- 70-10-A
KA5W 44,484- 337- 66-15-A
W5LKP 41,400- 300- 69-13-B
N5EG 35,616- 318- 56- 4-B
N5UA 29,146- 247- 59-14-A
KB5UT 17,100- 171- 50- 9-A
K2SCU/5 14,960- 136- 55- 5-B
KN6M/5 (+ KM5X, WA7RKJ) 229,548-1551- 74-24-B
K5QY (+ KM5K) 193,382-1343- 72-24-B
W5AH (+ KY5N) 148,828-1011- 74-24-B
K5KJ (+ NR5K) 128,848- 877- 74-21-B
KC5EA (+ N5AU) 77,472- 538- 72-12-B
NN5E (+ KC5DX) 75,936- 516- 73-11-B

Oklahoma

KM5H 109,354- 749- 73-22-A
K5DEC 24,318- 193- 64-17-B
KD5RO 19,810- 185- 53-12-B
WA8SNN/5 16,170- 165- 49-12-A
NM5E 3960- 110- 36- 8-A
K7CW 3050- 61- 25- 3-A
K5CM (+ N5s CG, KW) 211,492-1429- 74-24-B

Southern Texas

K5LZO 239,020-1615- 74-24-B
N5DU 237,540-1605- 74-23-B
WS4Q 233,396-1577- 74-24-B
NR5M 226,144-1528- 74-24-B
KZ5M 203,056-1372- 74-24-B
KB5FU 181,114-1309- 73-24-B
KC5CP 178,784-1208- 74-24-B
KG5U 178,192-1204- 74-24-B
NA5R (KN5H, opr.) 154,660-1045- 74-18-B
KD5SP 148,296-1002- 74-21-B
K5WA 135,124- 913- 74-15-B
KE5FI 126,576- 879- 72-16-B
K5TSQ 97,920- 680- 72- 8-B
K5BZU 97,828- 661- 74-16-B
K5DX 97,160- 694- 70-15-B
AD5O 89,034- 627- 71-16-B
WA5IYX 56,800- 420- 70-22-A
K5RPC 47,596- 326- 73-16-B
W5ASP 47,302- 353- 67- 7-A
W5JWM 40,920- 330- 62-17-B
KC5M 24,522- 201- 61- 9-A
W5DOZ 20,708- 187- 62-20-B
WA5ABR 19,690- 179- 55- 8-A
K5YCP 12,992- 112- 58- 9-A
NA5C 6840- 90- 38- 2-B
WD8DKJ/5 3960- 66- 30-14-A
W5LLU 2346- 51- 23- 8-B
K5CI 480- 12- 10- 2-A
N5DC 28- 14- 1- 2-B
K5RVK (+ KC5M, KF4VS, W5ASP) 191,068-1291- 74-24-B
N5JJ (+ NM5M) 171,088-1156- 74-14-B
KE5IV (+ K5DX, KA5SBS) 168,128-1136- 74-24-B
K2TNO (+ Net, KA5PJG) 167,388-1131- 74-24-B
K5VWW (+ K5GN) 164,280-1110- 74-23-B
WA2PRB (+ WA5ZUP) 152,588-1031- 74-24-B
N5EA (+ Net) 83,580- 597- 70- 8-B
N4BOS/5 (+ NJ5O) 77,616- 539- 72-23-B
K5GB (+ KA5QAA, Net) 55,200- 400- 69-18-B
N5HHD (+ N5AF) 12,780- 213- 60-19-A

6

East Bay

N6BV 242,128-1636- 74-24-B
VE2AQS/W6 123,580- 835- 74-19-B
W6BSY 104,784- 708- 74-23-B
W6RGG 72,380- 520- 70-15-B
W6EEN 57,620- 430- 67-20-B
K6PJY 54,940- 410- 67-20-A
K6HIR 48,620- 374- 65- 7-B
WB6FCR 45,628- 374- 61-16-A
K2GMY 45,184- 353- 64-22-A
K6SIK 41,814- 303- 69-18-A
W6OSP 30,326- 257- 59- 5-B
N6GRM 26,105- 255- 56-19-A
KN6S 27,730- 235- 59- 7-B

AK6T 19,890- 195- 51- 9-A
WA6BOB 19,788- 184- 51- 7-B
K6CSI 15,660- 174- 45-23-A
KB6CDP 9360- 134- 35-11-A
N6RO 5928- 76- 39- 1-B
KS6Q 5056- 79- 32- 6-B
K6ZM (+ N6TV) 155,198-1083- 73-24-B
N6EK (+ logger) 840- 35- 12- 2-A

Los Angeles

N6HC 133,152- 912- 73-21-B
WB6QPO 117,648- 817- 72-23-B
K6EID 84,672- 568- 72-23-A
W6NOL 64,400- 460- 70-22-A
WB4KS/6 62,968- 463- 68-21-A
NE6I 18,620- 190- 49- 4-A
WB6BXP 14,382- 187- 43-13-A
N6AA 11,808- 123- 48- 2-B
WB6DIB 9440- 236- 40- 9-B
WD6NFD 6384- 84- 38- 9-A
W6CN 3362- 41- 41- 4-A
WB6OLM 3136- 56- 28- 7-A
W6OES 18- 3- 3- 3-A
W6VPZ (AJ6F, K6KH, KE6FY, KF6JP, N6AXQ, N6DMV, W6CN, WN6CND, W6PUW) 68,728- 486- 71-23-B

Orange

K6HRT 59,930- 461- 65-14-B
W6TCO 35,872- 304- 59- 9-B
K6RUB 10,286- 278- 37- 7-A
NX6M 8584- 116- 37-20-A
N6IGM 3740- 55- 34- 7-A
KF6OG (+ N6RJ, NV6K, WA6OWM) 132,624- 921- 72-24-B
WA6JBT (+ KA6FBI, N6s AWF, DJW, DJX, ELA, NC6H, NR6C, WA9JBR, WB6QKB) 84,280- 602- 70-20-B

Santa Barbara

K6VMN 89,688- 606- 74-21-B
N6MB 73,128- 554- 68-19-B
W2KVA/6 71,284- 502- 71-22-B
NV6L 68,408- 503- 68-19-B
WA6FGV 62,376- 452- 69-22-A
W7CB/6 35,264- 304- 58- 6-B
KD6LD 25,422- 223- 57-19-B
NS6X 24,800- 200- 62-16-A

Santa Clara Valley

K6HNZ 179,524-1213- 74-24-B
N6NF 174,384-1211- 72-23-B
W6XX 159,248-1076- 74-17-B
K6LY (IK6EJ, opr.) 121,910- 835- 73-19-B
WB6KBZ 118,104- 798- 74-24-B
K6KLY 106,872- 732- 73-21-B
N6CQ 105,140- 751- 70-21-B
KY6I 88,652- 599- 74-24-B
N6QW 81,468- 558- 73-18-B
WC6I 64,170- 485- 69-18-B
K6IMB 63,474- 447- 71-18-A
W6SZN 56,984- 419- 68-10-B
N6XI 54,270- 405- 67- 6-B
N6AHA 47,752- 378- 63-11-B
KJ6V 47,124- 374- 63-18-B
N6KT 32,120- 292- 55- 8-B
AJ6V 30,800- 275- 56- 9-B
K6MA 28,910- 245- 59- 8-B
WB6DSV 27,378- 232- 59- 6-A
KB6WP 25,800- 215- 60-16-B
KD6XY (KA6ING, opr.) 22,116- 194- 57-11-A
W6REC 14,800- 148- 50-10-A
W6CF 7200- 100- 36- 3-B
K6VGW 2392- 46- 26- 2-A
WA6AZP 1050- 35- 15- 5-A
AG6D (+ N6YK) 151,848-1026- 74-24-B
N6AUV (+ W1NG, WB6DSV, AJ6V) 148,148-1001- 74-24-B
K6XO (+ Net) 111,228- 784- 71-24-B
W6YX (SM0DRD, WA1LTJ, oprs.) 76,396- 538- 71-24-B
N6RZ (+ WA6OCV, W6NV, N6TU) 63,756- 483- 66-15-B

San Diego

KZ6X 151,848-1026- 74-24-B
W6SRP 41,480- 305- 68-16-A
N6ND 24,192- 216- 56- 6-A
K6ZH 23,100- 210- 55- 9-A
WA6IJFY 19,700- 197- 50- 9-B
AA6EE 14,448- 168- 43- 7-A
W6JXA 13,720- 140- 49- 8-A

San Francisco

WA6AUE 81,648- 567- 72-18-B
K6LHN 43,030- 331- 65-15-A
WA8LLY 24,416- 218- 56-12-A
KK1A/6 22,684- 214- 53- 9-A
W6BIP (+ WA6DJI, WA6PYN) 95,816- 684- 72-21-B

Sacramento Valley

AI6V 194,916-1317- 74-24-B
KV6H 106,142- 727- 73-23-B
K6SG 89,392- 604- 74-18-B
KF6A 79,094- 557- 71-17-B
NB6G 73,128- 554- 66-15-B
N6ESV 48,006- 381- 63-22-B
N6GJC 29,120- 260- 56-18-A
WD6EIW 22,968- 198- 58-12-A
N6JM 15,582- 147- 53- 9-A
N6GG 4320- 72- 30- 2-B
WA6ZGK (+ WB6UHQ) 12,936- 147- 44-13-A

San Joaquin Valley

WC6H (NU6S, opr.) 179,228-1211- 74-24-B
K6GSS 107,136- 744- 72-22-B
N8BJQ/6 26,796- 231- 58-17-A
WA6SLF 13,348- 142- 47-11-A
N6EE 8036- 98- 41- 4-B

Pacific

AH6FL 37,964- 312- 61-17-A
AH6AZ 32,816- 293- 56-16-B
KH6SP (WB3HVS, opr.) 23,868- 221- 54-11-A
W2HPF/KH6 20,300- 203- 50-10-A
AH6EK 2976- 82- 24-12-A

7

Arizona

K7OX 172,272-1164- 74-24-A
W7FGT 150,936-1089- 72-24-B
KY7M 124,616- 842- 74-19-B
N7CIX 34,220- 290- 59- 8-A
KC7V 22,302- 189- 59- 5-A
W7ZMD 3760- 50- 26- 2-A

Idaho

KD7EJ 6052- 178- 34- 7-A
W7ZRC 4800- 80- 30- 2-A
WB7SBZ 2300- 50- 23- 6-A

Montana

KS7T 78,672- 596- 66-21-B
W7YB (KD7JZ, opr.) 50,924- 439- 58-11-B
KC7OD (+ KC7OA) 18,974- 179- 53-12-A

Nevada

WA7NIN (W6OAT, opr.) 246,968-1666- 74-24-B
WB0WNH 12,096- 144- 42-12-A
WB7VVH 9204- 118- 39- 9-B

Oregon

AG7M 179,568-1247- 72-24-B
K7KJM 75,840- 540- 73-24-A
W7YAQ 54,610- 455- 71-16-A
AI7W 42,240- 330- 64-21-A
K7GWK 35,164- 298- 59-24-B
KB7WY 31,800- 265- 60-21-A
N7ENU 22,672- 218- 52-15-A
W7GUR 7220- 98- 38- 5-B
WA6PVA (+ NI7T) 157,472-1064- 74-24-B
KA7KDU (+ N7FNW) 95,328- 662- 72-23-B
KD7WD (+ K7FD, KA7QPP, WA7WNQ) 67,592- 476- 71-23-B
WA7PZW (KA7s SEU, SEV, KD7AD, WA7IZU, oprs.) 24,598- 251- 49-24-A
KC7YQ (+ 1 opr.) 23,940- 210- 57-24-B
WB7TXM (WB7NML,KA7PGB oprs.) 16,224- 169- 46-23-B

Utah

KB7EB 161,136-1119- 72-23-B
W7GXC 28,200- 235- 60- 6-A
WA7OCC 11,088- 132- 42- 4-A

Washington

W7RM (W7WA, opr.) 238,724-1613- 74-24-B
N7TT 135,716- 917- 74-24-A
KG7KU 114,736- 808- 71-24-B
W7BUN 103,368- 708- 73-20-B
KT7G 54,120- 451- 60- 9-B
WA7PVE 51,680- 380- 68-16-A
K7WA 6300- 90- 35- 5-A
W7DWW 6156- 81- 38- 9-A
WB7WOU 5460- 91- 30-15-A
W7LKG 4424- 79- 28- 4-B
K7QLG 4290- 65- 33- 3-A
KA7CXU 2288- 52- 22- 3-A
WB7SQU 726- 33- 11- 5-B
WA7RDJ 140- 10- 7- 1-B
K7ATD 72- 6- 6- 1-B
K7LXC (+ K7HBN,K7SSI 163,746-1037- 74-24-B
KE7C (+ KO7I, N7FUH, WB7OJV) 148,740-1005- 74-23-B
KC7RN (+ KB7G, KT7H, K7UU) 98,640- 686- 72-24-B
WB7DK (15 oprs.) 46,540- 358 65-24-B

Wyoming

WA1UZD 69,000- 500- 69-21-A
KB7M 54,924- 398- 69-18-B
KB7WN 19,764- 183- 54-10-A
NC7O 192- 12- 8- 1-A

Alaska

AL7CO 9900- 110- 45-10-B
AL7GG 2016- 56- 18-11-A
WB6CEC/KL7 1120- 40- 14- 8-A

8

Michigan

WD8MGQ 125,060- 846- 74-24-A
N8CXX 113,368- 766- 74-19-B
N8DET 89,352- 612- 73-21-B
W8UA (K8CC, opr.) 62,832- 476- 66- 8-B
N8BIU 62,270- 479- 65-20-A
KB8LM 49,842- 351- 71-22-B
KC8CY 42,880- 320- 67-21-B
KO8M 38,350- 295- 65-16-A
AD8W 36,704- 296- 62-19-B
KB8CU 35,328- 276- 64-18-A
KS8Q 33,524- 289- 58-20-B
K8CC 33,360- 278- 60- 3-B
K8CV 31,742- 269- 59-19-A
NE8T 30,114- 239- 63-12-A
W8KCI 27,108- 251- 54-10-B
W8VPC 25,134- 213- 59-13-A
W8PLP (KD8ID, opr.) 23,928- 216- 54-17-A
KD8QK 20,034- 189- 53-14-A
KC8LO 19,140- 174- 55-19-A
N8CEO 17,264- 166- 52-12-A
WB8GUS 17,248- 178- 49-18-A
K8DJR 16,740- 155- 54-10-A
KA8SMA 15,456- 168- 46-17-A
WA8RRR 13,152- 137- 48- 2-B
WB8VMN 11,266- 131- 43- 5-B
K8SIA 10,584- 108- 49- 4-B
K8KUH 9100- 130- 35-10-B
W8EGI 8200- 100- 41- 5-A
KD8TM 5148- 78- 33- 4-A
N8ESK 4544- 71- 32- 9-A
K8DD 3248- 58- 28- 1-B
WD8CRY (+ AC8W, KC8A, KD8SF, K8AOM, K9EC, N8CGA, WD8LCD, WD9INF) 157,916-1067- 74-24-B
W8SH (+ KN8P, KN8R, WD8JQI, oprs.) 119,584- 808- 74-24-B
W8UM (KA8IJA, KB8U, KC8ES, KM8I, N8DKJ, N8EPO, oprs.) 98,904- 612- 71-23-B
KA8POG (+ KA8SYB, N8GBZ, WB8VYN) 43,200- 360- 60-24-B
KI8Z (+ KA8s GNU, IZU, N8EKH, WB8WXE, WD8LSV) 34,568- 298- 58-16-B
WA8MTX (+ KA8s NCR, RNE, UAR, KD8KA, KK8X, N8GAI, oprs.) 72,746- 223- 51-24-B
K8DAC (K8CQF, KY8C, N8FAU, KC5MP, oprs.) 1680- 40- 21- 4-A

Ohio

AI8S 134,680- 910- 74-24-B
K8AZ 121,910- 835- 73-21-B
N8RA 106,216- 748- 71-23-B
KU8E 105,704- 724- 73-19-B
W8FN 100,940- 721- 70-19-B
K8MR 99,456- 649- 72-14-B
N8LL 76,072- 544- 69-18-B
KB8OW 71,400- 510- 70-16-B
NE8R 63,190- 445- 71-21-B
KB8IZ 60,828- 411- 74-11-B
N8ATR 57,188- 397- 72-17-B
W8UPH 56,012- 418- 67-18-B
WD8IVL 52,394- 391- 67-19-A
K8BL 47,360- 370- 64-14-A
N8ET 46,364- 346- 67-10-B
AD8P 44,200- 325- 68- 6-B
KA8ETK 43,772- 353- 62-17-A
KJ3T 41,724- 342- 61-16-A
K1LT 35,588- 287- 62- 5-B
AA8S 35,584- 278- 64-12-B
N8AVK 34,880- 249- 70-19-B
WD8BKT 31,374- 249- 63-20-B
KN8Z 29,697- 253- 57- 4-B
N8BJV 25,636- 221- 58-14-A
N8DDL 25,172- 217- 58-14-A
KF8R 24,120- 201- 60-14-A
K8NZ 22,500- 215- 50- 6-B
N8EKS 22,302- 189- 59-11-A
KC8JH 20,246- 191- 53- 3-A
W8DXT 19,548- 181- 54-18-B
NC8V 16,758- 171- 49- 8-A
AD8C 15,960- 150- 53- 5-B
W8ILH 13,974- 137- 51- 6-B
KD8QZ 13,264- 141- 47-16-A
KC8F 12,300- 123- 50- 7-A
N8CSL 12,052- 131- 46- 5-B
K8PSR 11,933- 118- 42- 6-B
KC8YR 11,352- 132- 43-16-A
KA8NIE 10,692- 99- 54-13-A
KI8Q 9882- 103- 47-17-A
N8FU 9306- 99- 47- 5-A
N8EYQ 8954- 121- 37- 9-A
W8IMF 5822- 71- 41- 7-B
WA2AZG 4850- 75- 31- 2-A
KA8RXO 4600- 92- 25- 5-A
KA8NDC 4440- 74- 30- 6-A
KD8PL 4422- 67- 33- 4-A
WB8WWK 3480- 80- 29- 4-A
W8VZE 3078- 57- 27- 3-A
W8TO (K8EM opr.) 2050- 41- 25- 1-A
WD8IDM 2048- 32- 32- 3-A
WD8KTM 396- 22- 9- 1-A
AF8C 390- 15- 13- 2-A
WB8JBM (KC8MK, KC8XK, KW8N, N8DCJ, N8DMM, N8ATR, WD8IJP, oprs.) 164,834-1129- 73-24-B
W8LNO (+ KA3GZS, NZ4K) 129,352- 874- 74-24-B
W8LT (K8EM, N8DJR, KD8NS, WC8IXE, oprs.) 128,480- 880- 73-23-B
WA8BIN (+ K8WW, K8NZ) 107,568- 747- 72-22-B
WA8EZV (+ KA8s IYR, UTK, KC8XX, N8s ASV, OBY, W8LKX, WD8s NMT, NMV, NNB) 85,820- 613- 70-24-B
WA8SBC (WB8PHI, N8FCZ, oprs.) 66,504- 489- 68-22-B
WB8JKR (+ WB8CCL) 64,800- 450- 72-21-B
KB8WC (+ N8BZA) 59,360- 424- 70-15-B
KC8PQ (+ N8DPD, KB8IZ) 54,760- 370- 74-20-B
W8EDU (KB3YE, N8CNU, WB8BTO, oprs.) 42,382- 359- 59-21-B
N8BZA (+ KB8WCI 35,028- 278- 63- 6-B
KD8KU (+ KA8MRG) 19,376- 173- 56-18-A

West Virginia

KD8G 118,428- 834- 71-24-B
K8BS 48,574- 319- 73-19-A
W8VEN 25,560- 213- 60-19-B

9

Illinois

K9ZO 188,296-1276- 73-24-B
K2PLF 138,408- 948- 73-23-A
AC9C 129,640- 926- 70-16-B
AG9E 88,608- 624- 71-22-A
KC8JT 55,476- 414- 67-19-B
K9LJN 51,220- 394- 65-13-A
WB8JKI 43,560- 330- 66-12-B
WA9DRE 38,220- 294- 65-15-B
K9BGL 35,148- 303- 58- 4-B
K9QH 30,856- 266- 58-20-B
NA9D 24,864- 259- 48- 4-B
WB9TOC 22,388- 193- 58-15-A
KA9QYA 22,140- 205- 54-12-A
NA9J 15,816- 154- 52-12-B
KA9OOO 15,180- 165- 46-20-A
N9NA 11,172- 114- 49- 4-B
N9CIW 10,120- 110- 46- 5-A
KY9F 9348- 123- 38- 9-B
W9REC 7912- 86- 46-11-A
W9QWM 7488- 104- 36- 6-A
KB9PC 7420- 106- 35-10-A
W9HBI 4950- 75- 33- 5-B
KA9OYT 4472- 87- 26- 4-A
WD5GYW 2538- 47- 27- 9-A
K9UON 2380- 90- 23- 1-B
WB9HAD (+ KA9SDC) 104,720- 748- 70-14-B
WA9AVL (+ N9CXQ) 88,324- 622- 71-17-B
WA9AWO (+ KA8MUT, KA9JJV, KC9XG, KK9C, N9s BY, DMT, WB9s ACQ, TBU, WD9JHP + loggers) 27,700- 247- 50-24-A

Indiana

W9RE 92,272- 632- 73-11-B
N9QX 83,766- 566- 74-22-B
KB8O/9 78,524- 586- 67-19-B
K9UWA 55,728- 387- 72-10-B
W9JOO 49,956- 382- 69-20-A
N8DE 33,924- 247- 66- 7-B
N9DYE 16,328- 157- 52-17-A
KD9LG 10,296- 132- 39-11-B
KA9LPN 728- 56- 13- 7-A
W9TDU 540- 20- 16- 2-A
KJ9D (+ KK9V) 194,176-1312- 74-24-B
W9YB (KA9s IKK, RAV, SIG, KK9W, KS9I, KC9RG, K9FN, N9NB, N9NC, oprs.) 158,212-1089- 74-23-B
N4FKF (+ KA9ORN) 70,850- 545- 65-22-B
N9DUE (+ KE9I) 49,818- 361- 69-24-A

Wisconsin

N9AW 80,928- 562- 72-18-A
W9XT 67,728- 498- 68-10-B
WA1UJU 65,650- 505- 65-22-A
K9OSH 52,536- 398- 66-22-B
N9KS 40,430- 311- 66-16-B
AJ9U 35,200- 275- 64-14-A
W9GMV 34,160- 260- 61-14-A
K9KR 31,388- 266- 59-13-B
WB9IXS 21,420- 210- 51-15-B
K1TMM 20,240- 184- 55-10-A
KB9DZ 15,416- 164- 46-14-A
WB9LLW 13,724- 146- 47-10-A
K9GDF 12,900- 129- 50- 3-A
W9FSH 10,580- 115- 46- 7-A
W9HE 10,272- 107- 48- 5-A
WA9TZE 7790- 95- 41- 5-A
KD9GS 6768- 94- 36-12-A
W9VTL 4420- 65- 34- 8-A
WB9AZH 2700- 54- 25- 2-A
WB9HRO 2544- 53- 24- 4-A
WD9DUE 1426- 31- 23- 3-A
W9KHH 90- 9- 5- 1-A
W9AIH/8 (K9s FVF, TG, WA8HBW, oprs.) 143,664- 984- 73-24-B
K9FYZ (+ N8AKC, N8BSH) 109,908- 774- 71-23-B

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Colorado

K0GU 238,132-1609- 74-24-B
W0YK 209,864-1418- 74-24-B
W0PSY 181,004-1223- 74-24-B
KY0S 174,936-1182- 74-24-B
NI0E 166,648-1126- 74-24-B
W0IJR (K0EU, opr.) 138,460- 989- 70-24-A
KB3EI 124,560- 866- 72-24-B
K5IE 123,440- 860- 72-24-A
W0OSK 120,450- 825- 73-22-B
KB4B (WB0IWL, opr.) 114,756- 786- 73-10-B
WJ0ETT 84,000- 600- 70-17-B
N0EKK 79,832- 587- 68-16-A
WB0GOO 73,556- 518- 71-19-B
K7AYC 71,442- 567- 63-24-A
K0FRP 70,176- 516- 68-13-A
KC0HH 61,336- 451- 68-16-A
KC0WP 52,832- 387- 68-22-B
W0IZV 48,374- 361- 67-20-A
WA0BBI 44,516- 359- 62-10-B
WA0OR 43,884- 318- 69-15-B
AC0S 41,976- 318- 66- 8-B
KC0D 40,080- 334- 60- 8-B
KC0T 39,496- 306- 58-24-A
KC0NY 33,390- 265- 63-21-A
AD0O 21,632- 208- 52- 9-A
K9MWM 16,112- 152- 53- 6-B
KE0U 11,970- 133- 45- 8-A
K0VVV 7872- 96- 41- 3-B
N0ST 2304- 48- 24- 1-A
WB5G 416- 16- 13- 1-A
K0UK (+ KD7EY, N8ZA) 200,392-1354- 74-24-B
ND0E (+ KA0BAD, W0KEA) 169,460-1145- 74-24-B
KG7Z (+ N0DWR) 118,406- 811- 73-21-B
KJ0G (+ K0GAS) 105,848- 744- 71-24-B

Iowa

KF0H 185,148-1261- 74-24-B
W0FJ 158,952-1074- 74-24-B
KC0XK 84,240- 585- 72-21-B
NE0P 47,736- 351- 68-24-A
KC0GM 42,780- 310- 70-18-A
W9NZW 34,398- 273- 63-18-B
W0PPF 28,842- 253- 57-22-B
WB9IOG/0 23,668- 194- 61-15-A
K0EVC 17,388- 167- 52-17-A
WB0FBP 7080- 100- 35-15-B
KA9GUJ 1092- 42- 13- 2-A
W0IO (N0EBA, KA0PFC, KD0RT, KA0SJV, oprs.) 56,816- 424- 67-16-B

Kansas

N7DF 111,754- 787- 71-11-B
KD0FH 63,918- 477- 67-17-A
KB0G 52,500- 375- 70-10-B
N0CLV 41,184- 307- 66-16-A
WB0YJT 19,204- 297- 66-21-A
WA0HWH 13,794- 277- 61-17-A
K0VBU 25,704- 189- 68- 8-B
KD0MC 12,500- 125- 50-15-A
K0WJL 7744- 94- 38- 1-B
N0FMR 5256- 73- 36- 5-A
K0WA (+ AB0S, KB0EO) 161,856-1124- 72-24-B
AC0E (+ KA0RID) 3534- 93- 38-10-A

Minnesota

K0FZG 64,722- 483- 67-22-A
WB0DHS 34,304- 255- 67- 6-B
K0MPH 31,720- 260- 61- 7-A
W0TIV 23,760- 198- 60- 7-A
AC0W 19,890- 195- 51-14-A
K0VW 17,600- 200- 44- 9-A
KS0T 16,328- 157- 52- 8-A
W0YHE 13,700- 137- 50-10-A
KD0QJ 12,800- 150- 42- 8-A
WA0NWW 11,524- 134- 43- 6-B
K0UL 7144- 94- 38- 1-B
NF0J (+ WB0YUC) 16,356- 167- 49-10-B

Missouri

K4VX (KR0Y, opr.) 240,204-1623- 74-24-B
KM0L 157,388-1078- 73-24-B
W0HBH 92,204- 623- 74-20-A
K0RWL 62,308- 421- 74-13-A
WD0BBN 15,190- 155- 48- 8-B
WA0ITU 3840- 64- 30-10-B
KA0P 1640- 41- 20- 2-A
K9UCU 1008- 36- 14- 2-B
W0EEE (KA5SLN, KA5OKO, KA6s GCR, JJX, RBL, SFI, WB0YKG, WD0ELL, oprs.) 81,322- 557- 73-24-B
KM0P (+ KM0R) 58,584- 392- 67-13-B

Nebraska

K0SCM 165,710-1135- 73-21-B
KV0I 144,004- 973- 74-24-B
KC0SV 34,020- 270- 63-13-B
K0SW 29,800- 200- 52-12-A

North Dakota

WA0QVC 47,428- 334- 71-16-B
WA3PWL/0 7616- 112- 34- 3-A

South Dakota

WB0MWJ 93,632- 634- 74-17-B
K0JV 31,320- 261- 60-12-A
K0VVY (KA0s IXX, PMJ, KB0QA, KD0GV, N0s AIT, FLZ, WD0HFK, oprs.) 93,840- 690- 68-23-B

VE

Maritime-Newfoundland

VO1QU 14,040- 156- 45- 5-A
VE1BEI 3744- 88- 44- 8-A
VO1QST (VO1AW, opr.) 6192- 88- 36- 6-B

Quebec

VE2YM 20,024- 182- 66-12-B
VE2DRN 6670- 63- 45- 7-A
VE2FTU 5600- 80- 30- 7-B
VE2MAB (VE2s DWT, ESP, FUI, GBA, GOG, GOJ, GOP, GOT, HAX, HDN, KB, TD, VST, YW, oprs.) 17,542- 179- 49-24-A

Ontario

VE3AXV 15,386- 157- 49- 8-A
VE3CWF 14,394- 124- 58- 8-A
VE3ST 6901- 72- 41- 4-A
VE3GAS (+ VE3OB) 75,072-1104- 68-14-B

Manitoba

VE4ALO 42,900- 325- 66-17-B
VE4AMC 16,430- 156- 53-11-A

Saskatchewan

VE5AG 52,096- 407- 64-14-B
VE5TO 8610- 105- 41- 8-A
VE5AAD 1520- 40- 19- 8-A

Alberta

VE6CB 23,760- 216- 55- 8-B
VE6AGV 11,266- 131- 43- 9-B
VE6ATT 18,920- 172- 56- 9-A

British Columbia

XN7WJ (KE7V, opr.) 151,996-1027- 74-24-B
VE7VX 26,120- 301- 60-18-B
VE7GDX 35,456- 277- 64-18-A

Yukon-NWT

VE8IG 10,720- 134- 40-12-A
VY1CW 3712- 64- 29- 4-B

Checklogs

KF3M, KB8GBH, WA6OTU

Field Day Rules

1) **Eligibility:** Field Day is open competitively to all amateurs in the ARRL Field Organization (plus Yukon and NWT). Foreign stations may be contacted for credit, but are not eligible to compete.

2) **Object:** To work as many stations as possible and, in so doing, to learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness and to acquaint the public with the capabilities of Amateur Radio.

3) **Dates:** June 22-23, 1985.

4) **Field Day Period:** From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations who do not begin setting up until 1800 UTC Saturday may operate the entire FD period of 27 hours. Others must begin their setup no earlier than 1800 UTC Friday, and may operate no more than 24 consecutive hours; i.e., once on-the-air FD operation has started, it must end 24 hours from that point.

5) **Entry Categories:** Field Day entries are classified according to the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for purposes of determining transmitter class. Switching devices prohibited.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations, and must use no facilities installed for permanent station use, nor any structures installed permanently for FD use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for one reason or another, operate a transmitter or receiver from commercial mains for one or more contacts will be listed separately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position (Novice bands only) without changing its basic entry classification. This station (including antennas) should be set up and operated by Novice and Technician licensees and should use the call sign of *one* of the Novice/Technician operators.

(Class B) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A. One- and two-person Class B entries will be listed separately in the results.

(Class C) Mobile: Stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

(Class D) Home station: Stations operating from permanent or licensed station locations using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points.

(Class E) Home stations—emergency power: Same as Class D, but using emergency power for transmitters and receivers. Work stations in Class A, B, C, D and E.

Send For Your FD Package

Send Hq. a 9- × 12-in self-addressed envelope with 3 units of First Class U.S. postage or three IRCs for the official Field Day Entry Package. This package includes 1 Publicity Kit, 1 Field Day Summary Sheet, 1 large dupe sheet with instructions and a check list to ensure that your entry is complete. If you require more dupe sheets, indicate so in your request and affix 1 unit of additional First Class postage to your s.a.s.e. for each two additional dupe sheets requested.

6) **Exchange:** Stations in any ARRL Section will exchange their Field Day operating class and ARRL Section (see page 8 in any *QST*). For example, if your club group was planning to operate in the three-transmitter, Class A category from Missouri, you would send "3 A Missouri." Foreign stations send RS(T) and QTH.

7) **Miscellaneous Rules:**

A) Operators participating in FD may not, from any other station, contact for point credit the FD portable station of a group with which they participated.

B) A station used to contact one or more FD stations may not subsequently be used under any other call during the FD period. Family stations are exempted.

C) Each phone and each CW segment is considered as a separate band. All voice contacts are equivalent, and RTTY/ASCII is counted as CW. A station may be worked once on each band. Cross-band contacts are not allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts.

8) **Scoring:** Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts count one point each, and CW contacts count two points each. Power multipliers: If *all* contacts are made using an output power of 5 W or less **and if a power source other than commercial mains or motor-driven generator is used (e.g., batteries, solar cells, water-driven generators), multiply by 5.** If any or all contacts are made using an output power of 150 W or less, multiply by 2. Multiply by 1 if any or all contacts are made using an output power over 150 watts. Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the FD period must be charged from a power source independent of the commercial mains.

A) **Bonus Points:** The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Just check the box on the Field Day summary sheet to indicate that you qualify for the bonus, and attach the necessary proof.

Note: An additional 100 points may be earned for making one or more contacts on packet radio (see number 8, below, for details).

1) 100% emergency power: 100 points per transmitter for 100% emergency power. *All* equipment and facilities at the FD site must be operated from a source independent of the commercial mains. Example: A club operating in Class 3A, using 100% emergency power may claim 300 bonus points.

2) Public relations: 100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation conducted from a public place (example: a shopping center). Evidence must be submitted in the form of a clipping, a memo from a BC/TV station stating that publicity was given or a copy of material that was sent to news media for publicity purposes.

3) Message origination: 100 points for origination of a message by the club president or other FD leader, addressed to the SM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the FD period, and a fully serviced copy of it must be included with the FD report. The message must be in standard ARRL message form or no credit will be given.

4) Message relay: 10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the FD report.

5) Satellite QSO: 100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision of Rule 7C is waived for satellite QSOs. A satellite station does not count as an additional transmitter. On the summary sheet, show satellite QSOs as a separate "band."

6) Natural power: FD groups making a minimum of five QSOs without using power from commercial mains or petroleum derivitives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane or grain alcohol. This includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not wish to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

7) W1AW message: A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over W1AW on its regularly announced frequencies just before and during FD. See League Lines, this issue, and April *QST*, page 13, for FD Bulletin Schedule. This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your FD report.

8) *Packet Radio:* 100 points can be earned by completing at least one QSO on packet radio during the FD period. The repeater provision of Rule 7C is waived for packet radio QSOs. A packet station does not count as an additional transmitter. On the summary sheet, show packet radio QSOs as a separate "band."

9) **Reporting:** Entries must be postmarked by July 23, 1985. No late entries can be accepted. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets *or* an alpha-numeric listing of call signs worked per band and mode. This list may be computer-generated. Incomplete or illegible entries will be classified as checklogs. A copy of FD logs should be kept by your FD group, but should not be sent in unless specifically requested later by ARRL.

10) **Disqualifications:** See January 1985 *QST*, page 72.

Rules, 1985 IARU Radiosport Championship

The format of the 1985 IARU Radiosport Championship is exactly the same as for last year's event. To run up a big score this year, it's important that you strike a balance between a large QSO and multiplier total. Ten meters doesn't have very good propagation in July. Nevertheless, during this portion of the sunspot cycle, don't overlook 10 as a source of a few multipliers. The lower bands (160, 80 and 40 meters) have been hot recently, so don't be put off by the QRN on those bands. Patience and good operating during this event will reward you with some extra multipliers.

For those not familiar with ITU zones around the world, a map of ITU zones is available from ARRL/IARU Hq. Send an s.a.s.e. or 1 IRC for the proper forms (including the map) early so you'll have them in time for the contest. Good luck!

Rules

1) **Eligibility:** All licensed amateurs worldwide.

2) **Object:** To contact as many other amateurs in as many parts of the world as possible using 1.8 through 148 MHz.

3) **Date:** Second full weekend of July (July 13-14, 1985).

4) **Contest Period:** 0000 UTC Saturday until 2400 UTC Sunday, with single-operator stations operating a maximum of 36 hours.

5) **Categories:**

A) Single operator: phone-only, CW-only and mixed-mode sections. One person performs all operating and logging functions. Use of spotting nets is not permitted. Off-times must be at least 30 minutes. All operators must observe the limits of their operator's license at all times. Single-operator stations are allowed only one transmitted signal at any given time.

B) Multioperator: Single transmitter, mixed mode only; must remain on a band at least 10 minutes at a time. Only one transmitted signal allowed at any given time. All operators must observe the limits of their operator's license at all times.

6) **Contest Exchange:** All stations send signal report and ITU zone. The *complete* exchange must be logged for each valid QSO.

7) **Valid Contact:** The same station may be worked once per frequency band. Cross-mode, crossband and repeater QSOs do not count.

8) **QSO Points:**

A) Contacts within your ITU zone count one point.

B) Contacts within your continent (but different ITU zone) count three points.

C) Contacts with a different continent count five points.

9) **Multipliers:** ITU zones worked on each band.

10) **Scoring:** Multiply total number of QSO points by the sum of ITU zones worked on each band for the final score.

11) **Reporting:**

A) All entrants are encouraged to use forms available from IARU/ARRL Hq. (s.a.s.e. or 1 IRC).

B) Logs must indicate times in UTC, bands, calls, complete exchange. Multipliers and off-times should be clearly marked in the log. Cross-check sheets (dupe sheets) are required if more than 500 QSOs total are made.

C) Entries must be postmarked within 30 days after the contest (by August 14, 1985). Any entry received after mid-October 1985 may not be in time to be included in the printed results.

12) **Awards:** A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode and multioperator entrant in each ARRL Section, each ITU zone and each DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs (1000-QSO sticker also) or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU society.

13) **Conditions of Entry:**

A) Each entrant agrees to be bound by the provisions of this announcement, by the regulations of his licensing authority and by the decisions of the IARU/ARRL Awards Committee.

B) Disqualifications: An entry may be disqualified if the overall score is reduced by more than 2%. Score reduction does not include correction of arithmetic error. An entry *will* be disqualified if more than 2% of duplicates are left in the log, or if the log shows excessive operating time (single-operator stations). A penalty of three QSOs will be assessed for each duplicate QSO found during ARRL/IARU log checking or for each miscopied call sign. See January 1985 *QST*, page 72, for complete details.

Prefix/ITU Zone

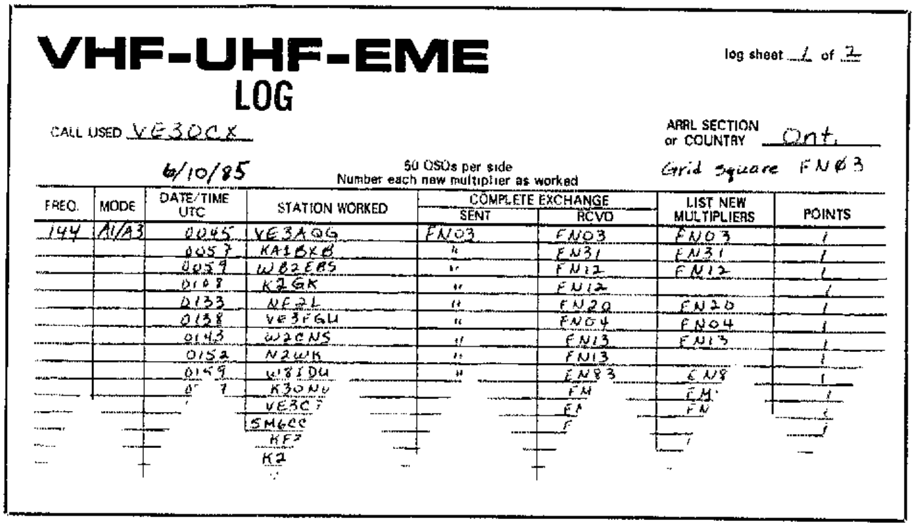
A2	57	FG	11	JX	18	PJ	11	UC	29	VU7	49	3X	46
A3	62	FH	53	JY	39	PY	13, 15	UD	29	VU7	41	3Y	67
A4	39	FK	56	W1	08	PYØ	13	UF	29	XE	10	4S	41
A5	41	FM	11	W2	08	PYØ	15	UG	29	XF4	10	4U1ITU	28
A6	39	FO	10, 62, 63	W3	08	PZ	12	UH	30	XT	46	4U1UN	08
A7	39	FP	09	W4	08	S2	41	UI	30	XU	49	4W	39
A9	39	FR	53	W5	07	S7	53	UJ	30	XV	49	4X, 4Z	39
AP	41	FS	11	W6, 7	06	S9	47	UL	30	XW	49	5A	38
BV	44	FW	62	W8, 9	08	SM	18	UM	31	XZ	49	5B, ZC	39
BY	33, 42, 43, 44	FY	12	WØ	07	SP	28	UO	29	Y2-9	28	5H	53
		G	27	KC4	67, 69, 70, 71, 72, 73, 74	ST	48	UP	29	YA	40	5N	46
C2	65	GD	27			SU	38	UQ	29	YB	54	5R	53
C3	27	GI	27			SV	28	UR	29	YI	39	5T	46
C5	46	GJ	27	KC6	64, 65	T2	65	VE1	09	YJ	56	5U	46
C6	11	GM	27	KG4	11	T30-1	62	VE2	04, 09	YK	39	5V	46
C9	53	GU	27	KG6/KH2	64	T32	61	VE3	04	YN	11	5W	62
CE	14, 16	GW	27	KHØ	64	T5	48	VE4, 5	03	YO	28	5X	48
CEØA	63	H4	51	KH1	61, 62	T7	28	VE6, 7	02	YS	11	5Z	48
CEØX	14	HA	28	KH6	61	TA	39	VE8	02, 03	YU	28	6W	46
CEØZ	14	HB	28	KJ/KH3	61	TF	17		04, 75	YV	12	6Y	11
CM, CO	11	HBØ	28	KL	01, 02	TG	11	VK1, 2, 3, 5, 7	59	YVØ	11	7O	39
CN	37	HC	12	KM/KH4	61	TI	11	VK4, 8	55	ZA	28	7P	57
CP	12, 14	HC8	12	KP4	11	TI9	11	VK6	58	ZB	37	7Q	53
CR9	44	HH	11	KP6/KH5	61, 62	TJ	47	VK	60	ZD7	66	7X	37
CT	37	HI	11	KS6/KH8	62	TK	28	VK9	60	ZD8	66	8P	11
CT2	36	HK	12	KV/KP2	11	TL	47	VK9	54	ZD9	66	8Q	41
CT3	36	HKØ	11, 12	KW/KH9	65	TN	52	VK9	55	Z2	53	8R	12
CX	14	HL, HM	44	KX	65	TR	52	VKØ	68	ZF	11	9G	46
D2, 3	52	HP	11	LA	18	TT	47	VKØ	60	ZK1	62, 63	9H	28
D4	46	HR	11	LU	14, 16	TU	46	V2A	11	ZK2	62	9J	53
D6	53	HS	49	LX	27	TY	46	V3	11	ZL	60	9K	39
DJ	28	HV	28	LZ	28	TZ	46	V4	11	ZM7	62	9L	46
DU	50	HZ, 7Z	39	OA	12	UA,UN, UV,UW, UZ1,3,4,6 19,20,29,30		V8	54	ZP	14	9M2	54
EA	37	I, IT	28	OD	39			VP2E	11	ZS	57	9M6, 8	54
EA6	37	IS	28	OE	28			VP2V	11	ZS3	57	9N	42
EA8	36	J2	48	OH	18	UA, UN, UV, UW, UZ1P 75		VP2M	11	1S	50	9Q	52
EA9	37	J3	11	OHØ	18			VP5	11	3A	27	9U	52
EI	27	J5	46	OJØ	18	UA, UN, UV, UW, UZ2 29		VP8	16	3B6, 7	53	9V	54
EL	46	J6	11	OK	28			VP8	73	3B8	53	9X	52
EP	40	J7	11	ON	27	UA,UN,UV, UW,UZ9-Ø 20-26, 30,35,75		VP9	11	3B9	53	9Y	11
ET	48	J8	11	OX, XP	75, 05			VQ9	41	3C	47		
F	27	JA	45	OY	18			VR6	63	3CØ	52		
FT8Z	68	JD	45	OZ	18			VS6	44	3D2	56		
FT8W	68	JT	32, 33	P2	51			VU	41	3D6	57		
FT8X	68	JW	18	PA	27	UB, UT, UY 29				3V	37		

Rules, June VHF QSO Party

Grid-square fever is catching on! As you will recall, last year's announcement for the June VHF QSO Party requested entrants to indicate their preference for multipliers for use in the 1985 event. The results, reported in September 1984 *QST*, left little doubt for the Ad Hoc Committee for VHF/UHF Contesting. Thus, the stage has been set for this year's June VHF QSO Party.

Multipliers for this year's contest will be grid squares (2° × 1° Maidenhead grid-square locators) worked *per band*. See Rules four and five. Information on determining your grid-square locator can be found in January 1983 *QST*, beginning on page 49. Grid-square maps are available from ARRL Hq. for $1. Here's a chance for you mountain-toppers to seek out those rare grid squares and be "King of the Hill."

Official summary sheets and log sheets are available from ARRL Hq. for an s.a.s.e., and all entrants should send for a set. Good luck from FN31!


VHF-UHF-EME LOG

log sheet 1 of 2

CALL USED VE3OCX

ARRL SECTION or COUNTRY Ont.

6/10/85

50 QSOs per side. Number each new multiplier as worked

Grid Square FN03

FREQ.	MODE	DATE/TIME UTC	STATION WORKED	COMPLETE EXCHANGE SENT	COMPLETE EXCHANGE RCVD	LIST NEW MULTIPLIERS	POINTS
144	A1/A3	0045	VE3AQG	FN03	FN03	FN03	1
		0057	KA1BXB	"	FN31	FN31	1
		0059	WB2EBS	"	FN12	FN12	1
		0108	K2GK	"	FN12		1
		0133	NF2L	"	FN20	FN20	1
		0138	VE3FGU	"	FN04	FN04	1
		0143	W2CNS	"	FN13	FN13	1
		0152	N2WK	"	FN13		1
		0159	W3IDU	"	FN83	FN83	1

Properly completed sample log sheet.

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies above 50 MHz.

2) **Contest Period:** Begins 1800 UTC Saturday, June 8 and ends at 0300 UTC Monday, June 10.

3) **Categories:**

(A) Single operator: One person performs all operating and logging functions.

(1) *Multiband.*

(2) *Single band:* Single-band entries on 50, 144, 220, 432, and 1296-and-up categories will be recognized both in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters.

4) **Exchange:** Grid-square locator (see Jan. 1983 *QST*, page 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal reports is optional.

5) **Scoring:**

(A) *QSO points:* Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count three points for each 1296-MHz QSO. Count four points for each 2.3-GHz-or-higher QSO.

(B) *Multiplier:* The total number of different grid squares worked *per band*. Each 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) *Final score:* Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score (see scoring example)

6) **Use of FM:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This prohibits use of all repeater frequencies. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

7) **Miscellaneous:**

(A) Stations may be worked only once per band for credit, regardless of mode. Crossband QSOs do not count.

(B) Partial QSOs do not count. Both calls, the full exchange and acknowledgment must be sent and received.

(C) Fixed, portable or mobile operation under one call from one 2° × 1° grid square only is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) Only one signal per band (6, 2, 1¼, etc.) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least 1 km).

(F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:** Entries must be postmarked no later than 30 days after the end of the contest (July 10, 1985).

9) **Awards:**

(A) Single operator

(1) Top single operator score in each ARRL Section.

(2) Top single operator on each band (50, 144, 220, 432, and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced. [Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.] For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator Section leader *and* endorsement stickers for 50 and 220 MHz.

(B) Top multioperator score in each ARRL Section where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

10) **Disqualifications:** See January 1985 *QST*, page 72.

Scoring Example

Band (MHz)	*QSOs*	*QSO Points*	*Grid Squares*
50	25 (×1)	25	10
144	40 (×1)	40	20
220	10 (×2)	20	5
432	15 (×2)	30	10
1296 +	6 (×3)	18	3
Totals	96	133	48

Final score = (QSO points) × (total no. grid squares): (6384 = 133 × 48).

Public Service

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

Intermediate- and Long-Range Disaster Communications

Intermediate- and long-range disaster communications link a disaster area with the outside. The Amateur Radio Service must be prepared to provide these communications when other communication facilities are inoperative or overloaded. Generally, the need for the Amateur Radio Service is greatest during the first 72 hours and until other communication services can be brought in or normal services can be restored.

High-precedence Emergency and Priority traffic require immediate delivery and response. For this traffic, direct point-to-point contact is mandatory. Welfare traffic is lower in precedence but the need is real. Every possible effort should be made to accomplish timely delivery by systematic distribution of outgoing Welfare messages and systematic collection of incoming messages.

Thoughts on Direct Communications

When the need for disaster assistance exceeds local capability, responsible officials in the disaster area must have direct communications with appropriate officials outside the disaster area for the initiation and coordination of disaster relief, since these officials may need to talk directly with each other. There is also the need for passing formal written traffic, especially when summary, situation and damage reports require commitments of personnel/materiel.

Therefore, predisaster arrangements should include fixed Amateur Radio stations at locations easily accessible by responsible officials. A Red Cross facility that can be quickly activated to handle direct communications when other communication facilities are unavailable or overloaded is an example. Also, these same fixed stations will be available, at all times, to allow a prompt response to a request for direct communications from another locality where a related disaster may have occurred.

All it takes, then, to initiate a direct circuit is a contact by the station in the disaster area with any outside station having access to normal communication facilities (usually telephone; toll call, if necessary). The officials responsible for activating the outside station of the necessary point-to-point circuit can then be reached through this station.

Stations for the direct service must have adequate HF equipment and efficient antennas for the intermediate- and long-range contacts, have good VHF and UHF capability, and, of course, have emergency power for operation when commercial power is unavailable. In addition to voice and CW modes, provisions for automatic high-speed modes are highly desirable.

Many smaller communities and less populated areas do not have sufficient resources, and there is always the possibility that disaster damage may make the fixed station inoperative. So, in addition to the fixed stations, ARES predisaster arrangements, at least on the district or section level, should include one or more "response" teams with mobile and/or portable equipment, which, ideally, can go anywhere at a moment's notice to provide intermediate and long-range communications during the first 72 hours of a disaster situation.

All this is a big order since, in most cases, ample transmitter power, efficient antennas and operation on at least the 3.5, 7 and 14-MHz bands are required. It is understandable that the EC may throw up his hands and say, "Sounds good on paper but ..." However, before we become pessimistic, let us pursue the matter a bit further.

Some groups and clubs have, by determined effort, produced multiband mobile units capable of quick and substantial response to disaster situations. Some of these have been pictured and publicized in *QST* and *Worldradio*. It can be done.

Every year, in the paragraph entitled "Object" in the Field Day Rules published in *QST* there appears the statement: "A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness ..." Field Day results show that this challenge is often met, and demonstrate that amateurs can produce portable stations capable of long-range communications at almost any place and under almost any conditions.

It is regrettable that these skills and equipment are usually allowed to gather dust between the annual Field Days, when they could be kept and integrated into the ARES preparedness program through cooperative action by the EC and the Field Day enthusiasts.

Should an ARES support plan, authenticated by the Section Emergency Coordinator, be made a requirement to qualify as a Special Service Club? This may sound a little extreme, but emergency and disaster communications are a major part of Amateur Radio public service, which is primary justification for the existence of the Amateur Radio Service. Is it too much to ask that Special Service Clubs contribute significantly in this way?

The National Traffic System (NTS) is designed for the daily collection of messages from, and the distribution of messages to, many widespread points of origin and delivery throughout the United States and Canada. To do this requires, generally, that messages be relayed from one to seven times (or more) with elapsed times of from a few hours to a day or more between origination and delivery. Obviously, NTS is not designed to handle large volumes of high-priority emergency and disaster traffic that does not need collection or distribution, but needs immediate delivery. Nevertheless, the NTS operation can contribute if its role in emergency communications is understood.

NTS nets collectively are in session much of the day and evening and are thereby frequently available for help in establishing the initial contact, mentioned previously, through which responsible officials can be reached from the disaster area for activation of an outside station. This would allow direct communications necessary for disaster-relief traffic. Independent nets and monitoring services are also often available for the initial contact. Net times and frequencies are listed in the *ARRL Net Directory*, which can be used as a quick reference of those nets that can be accessed from your particular locality by judicious choice of time and frequency.

While the NTS is not designed to provide direct communications, it does produce operators who are competent in handling formal written traffic, and who practice on-the-air discipline—exactly the kind of operators needed. NTS and ARES officials need to cooperate in urging NTS operators to sign up with their Emergency Coordinator now, before the disaster occurs, so that the NTS operator can be included in predisaster plans for the operation of the point-to-point stations. In this way NTS operators can make more important contributions to Amateur Radio intermediate- and long-range disaster communications when the disaster occurs near where they live.

It cannot be assumed that the number of available NTS operators will be enough to meet the demand, so a training program and practice in handling formal written traffic should be an important part of ARES predisaster activities. Once a week, or even once a month, participation in an NTS local or Section net to originate/send and/or receive/deliver messages is a good way for ARES operators to maintain competence in formal traffic handling.

Welfare Traffic

It is important to discriminate between the two types of Welfare traffic. Effort should be directed toward the origination of personal Welfare dispatches from the disaster area in preference to the handling of inquiries addressed into the disaster area from the out-

side. Welfare traffic from the disaster area is one-way, more efficient and results in more timely delivery of the information to the concerned people. Inquiry messages, if (and when) delivered into the disaster area, require an answer (often very time consuming) and then a reply to the inquirer, which takes still more time. All too often by the time the reply reaches the inquirer, normal communications have been restored, and he has already obtained his answer by other means.

The precedence of Welfare traffic is lower than that of any other disaster communications. Even so, with intelligent planning, personal Welfare dispatches can be originated and sent during some of the early stages of disaster relief, as well as later, without jeopardizing the efficient and timely handling of higher-priority disaster communications.

Outgoing

Many survivors in the disaster area are anxious to let relatives and friends know about their situation, but usually normal communication facilities (telephone and telegraph) are not available to them. In many cases personal Welfare message service can be provided at shelters and relief centers with relatively little extra effort. An Amateur Radio station is already furnished to the center to provide communications for setting up the shelter and for coordinating the movement of people and supplies to the shelter in many instances. Initially the Priority traffic load may be heavy, but after a while things should settle down. The amateur station will have slack time during which Welfare traffic can be sent without affecting the primary mission of the shelter station. The Welfare traffic could be sent to NTS liaison stations located near the disaster area, allowing VHF/UHF simplex to be used in most cases.

A simple way to make the service available is to hand out a message blank (with content and instructions designed specifically for this service such as an FSD-244) to the survivor at the time his shelter registration forms are completed. The survivor would then be directed to the radio desk to have his message sent, or to obtain additional blanks if he needs to send more messages.

Similarly, Welfare traffic may be originated from mass casualty centers and hospitals that treat the injured, with suitable modification of specific procedures.

Another variation of Welfare traffic results when brush and forest fires expand to the extent where it is necessary to bring in fire fighters from many parts of the country. These fire fighters are often isolated in camps where only limited official communications are available. In addition to responding to official needs, Amateur Radio can provide much-needed and appreciated public service by sending personal Welfare messages from the fire fighters to their families and relatives during lulls in official traffic.

Welfare traffic from a disaster area is traffic originating from a single locality and the "collection" function of the NTS is not needed. For efficient and timely delivery, the collection function of the NTS operation could be bypassed. The traffic would be cleared by the NTS liaison station directly to destination area and region nets insofar as propagation permits. It is worth mentioning that, if routed in the manner described in the preceding paragraph, traffic originated at fairs and special events would provide good practice for handling outgoing disaster Welfare traffic.

By spreading the traffic load in this way, both net-wise and time-wise, large volumes of traffic can be cleared without overloading any net or inter-net liaison station. As a result, bottlenecks are minimized, the number of relays reduced and chances are proportionately lessened for errors. The operation is more efficient and more timely delivery is achieved. In most cases, there should be no need to activate extra net sessions or additional liaison between nets.

Incoming

Experience has shown that disasters usually trigger a large quantity of personal-inquiry traffic from concerned relatives and friends throughout the country. Because of the problems involved, some of which have been outlined in the preceding discussion, amateur operators might avoid actively soliciting inquiry traffic. While this inquiry traffic might be discouraged, it cannot and should not be ignored. If and when unsolicited messages are accepted it is imperative that the inquirer understand that delivery and reply are uncertain and cannot be guaranteed, and why.

Inquiry traffic requires the collection phase of the NTS operation, but since it is directed to one locality (the disaster area), the distribution phase might be bypassed. TCC and other NTS liaison stations could clear their traffic directly to NTS liaison stations in or near the disaster area, insofar as propagation permits. The "disaster" liaison stations could act as "holding" stations until the time comes when the inquiry traffic can be handled in the disaster area without compromising higher-precedence traffic.

Predisaster Arrangements

For the Amateur Radio Service to be able to make a timely response to disaster communication needs, particularly during the first 72 hours, predisaster arrangements are a real challenge. Effective predisaster arrangements result from collaborative effort by ARES officials (SEC, DEC, if any, and ECs), STM and NTS officials, and the appropriate officials of served agencies, such as American Red Cross, Salvation Army, APCO, NCS, FEMA. These people need to know and talk with each other, to define anticipated needs and appropriate communication systems and procedures.

Predisaster actions include the selection, usually by the STM, of strategically located NTS liaison stations capable of accessing the NTS at region level and higher. This should include briefing the operators regarding plans and procedures for handling Welfare traffic.

Predisaster activities by ARES operators should include training and practice in handling formal traffic. ARES operators should know enough about the NTS to be familiar with the NTS operation. NTS operators should prepare themselves by participating in the local ARES activities to the extent necessary for them and the EC to know where and how they will contribute if a disaster occurs. The effectiveness of predisaster planning depends on participation in predisaster activities by every operator intending to serve.

The need for Amateur Radio in disaster communications is great. Rarely are there enough prepared operators, particularly if the communication crisis persists for much time. Don't wait until the disaster occurs to volunteer. Do it now, so that you will be one of those who are really prepared.—*Gordon M. Wenz, N6GW*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For February, 38 SEC reports were received, denoting a total ARES membership of 18,865. Sections reporting were: ALB, AR, AZ, CO, EMA, ENY, EPA, ID, IN, KS, ME, MI, MN, MS, NE, NFL, NYC/LI, OH, OK, ONT, PAC, SC, SCV, SD, SDG, SFL, SJV, SNJ, SV, TN, UT, VA, WA, WI, WMA, WNY, WPA, WV.

Reports were not received by the following Section Emergency Coordinators: BC, MAN, MAR/NFD, QUE, SASK, DE, MDC, MD, LA, KY, NNJ, IA, MO, CT, NH, RI, VT, AK, MT, OR, EBAY, NV, SF, NC, NM, WY, AL, GA, WIN, LAX, ORG, SBAR, NTEX, STEX.

SEC monthly reports for May should be received at ARRL Hq. no later than June 12. Reports received after the 12th will be entered as time permits.

Transcontinental Corps

May reports submitted for this column should be received at ARRL Hq. no later than June 12.

February 1985

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

1	2	3	4	5
Cycle Two				
TCC Eastern	106	88.7	493	524
TCC Central	84	92.8	452	452
TCC Pacific	112	87.5	492	—
Summary	302	89.7	1437	976
Cycle Four				
TCC Eastern	No report received			
TCC Central	62	91.1	286	296
TCC Pacific	112	92.9	1278	—
Summary	174	92.0	1564	296

TCC Roster

W1AF, AA4AT, N1BHH, KA8CPS, KC3DW, KA1EPO, KK3F, WA2FJJ, WD4FTK, N4GHI, WB3GZU, KB2HM, K8OZ, W8PMJ, KT1Q, W8QHB, W1QYY, KW1U, KB3UD, AF8V, N2XJ, WB8YDZ, W4JL, WA4JTE, WF4X, N5AMK, N5BT, W5CTZ, N5DFO, W5KLV, KD5KQ, WB5OXE, K5UPN, W9JUJ, KA0EPY, ND5T, KT6A, VE6CHK, KU6D, KR7L, K6UYK, K6YBV, KF7R, WB7WOW, KB7FE, K7OVK, KD7EY, WA0OYI, N5BB, WB5CIC, W5GHP, K5GM, K5OAF, N5TC, K5TL, KV5X, KW9J, WB9NVN, WB9UYU, KB9X, W0HI, KS0U, W6NL, K6LL.

TCC Talk

Very poor propagation during February on both 20 and 40 meters—this probably accounted for some of the missed skeds. (Joe Teaster, N5ANK, Director, TCC/c2)

National Traffic System

NTS reports for the month of May should be received at ARRL Hq. no later than June 12.

February Reports

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP
7 — % REP. TO AREA NET

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	28	1275	45.5	.897	90.5	
CAN	28	1163	41.5	.743	100.0	
PAN*	56	635	11.5	.419	95.8	

Region Nets

1RN	56	1169	20.8	.684	96.7	100.0
2RN	54	715	13.2	.487	86.8	89.3
3RN	28	511	18.3	.600	95.0	96.4
4RN	56	1022	19.7	.520	78.0	100.0
RN5	56	999	17.9	.610	98.0	100.0
RN6	56	319	5.7	.309	100.0	91.0
RN7	56	425	7.6	.447	86.5	98.2
8RN	56	506	9.0	.467	95.8	100.0
9RN	No report received					100.0
TEN	56	673	12.0	.502	82.0	100.0
ECN	No report received					64.2
TWN	49	232	4.7	.310	82.0	98.2

TCC

TCC Eastern	106	1017
TCC Central	84	904
TCC Pacific	112	492

Cycle Three

Area Net

EAN	28	466	17.0	.819	81.6	

Region Nets

1RN	28	164	5.9	.370	77.4	100.0
2RN	27	336	12.4	.785	79.3	53.6
3RN	No report received					100.0
4RN	No report received					35.7
8RN	No report received					100.0
ECN	No report received					100.0

Cycle Four

Area Nets

EAN	28	1907	68.1	1.709	87.5	
CAN	28	930	33.2	1.152	98.8	
PAN	28	853	30.5	1.020	99.4	

Region Nets

1RN	48	669	13.9	.610	91.3	96.4
2RN	27	475	17.6	—	86.2	60.7
3RN	56	361	6.5	.520	98.2	96.4
4RN	No report received					100.0
RN5	56	635	11.3	.592	86.9	100.0
RN6	56	525	9.3	.741	98.4	100.0
RN7	56	349	6.2	.604	91.0	100.0
8RN	53	473	8.9	.441	89.0	82.1
9RN	56	512	9.1	.470	89.0	96.4
TEN	56	351	6.3	.355	75.7	100.0
ECN	No report received					89.2
TWN	56	420	7.5	.364	100.0	98.2

TCC

TCC Eastern	No report received	
TCC Central	52	582
TCC Pacific	112	1276

Sections*
Summary
Record

*PAN operates both cycles one and two.
†TCC functions not counted as net sessions.
‡Section and local nets reporting (239): WAEN AENX AENR AEND AENV AENB AENZ AENK AENW ATNM (AL), APSN ATN (ALB), ACN SWN ATEN (AZ), BCEN (BC), NCN SCN/1 SCN/2 SCN/V RTT/V SCN/SB NCTN (CA), DTN DEPN SEN (DE), TPTM VEN CFRN FMTN GCVTN GN LSTTN NFPN SVTN QFN FMSN QFNS FPTN FAST TPTN FPON SEFTN SWFTN PEN PRVAN SPARC PBTN ENMC (FL), GSTSN GCN GTN GSN (GA), ITN ISN ILN (IL), ICN IRN QIN ITN (IN), ICN TLCN (IA), KSBN KPN KWN KMWN CSTN QKS QKS-SS KS- RTTYN (KS), MKPN KTN KYN KNTM KYPON CARN NKARC TSTMN WTEN 3ARES 7ARES 11ARES BARES (KY), AEN CMEN MPSN PTN RACES SGN YEAR (ME), MEPN (MD), EMRI WMN WMFN WMTN EMRIPN EMRISS EM2MN HHTN CITN NEEPN (MA/RI), MACS MITN UPN QMN MNN (MI), MSN/1 MSN2 MSSN MSN/RTTY MSPN/N MSPN/E MNAMWXNT PAW (MN), MON/MON2 MOSSB MEOW NEMO MTTN PTN PHD MOFON (MO), IMNS CCEN (MT), NCW MNARES EN2ARES WNN N160MN MARES220 MARES2M N75M BRARES PV2MARES CC2NARES MSN SBARES HCARES NNN NCN BVARESN NMPN N40MN PVARCN SBARES6NM (NE), WARES (NV), NHN GSFM MSOVTP (NH), NJM MCN SJVN SJVN220 NJN/E NJN/L MSWW ARC NJPM NJN NJPN NJSN NJM (NJ), SCVHFTN NYPON NYS/M NYS/E NYS/L CNYTN WDN/M WDN/E WDN/L OCTEN/E OCTEN/L ESS QNET NYSPTEN MFN BSN BRVSN BAVHFTN NLICW (NY), NCEN NCNM CN CSN CNCTN PCTN BARS SCSSBN CNN LC2MN GPD2MN A2MN THEN PETN CFARS M2MEN (NC/SC), NON STN (OK), OPN OSN OSN2 OSND OLN KTN TIN (ONT), PTTN WCN OARES OHNN SOFM BSN PDXARES LBLARES OSN THN (OR), PTN (PAC), EPA EPAEPTN PTTN ATN D3ARES D5ARES D6ESN D8ARES PWA/ARES MARC/ARES MARCTN PFN (PA), QSN (QUE), TNCWNTS TNPNTS TNVHF NTS TRSY (TN), TSN NET DFW TTN TEX (TX), BUN UCN DCESN (UT), VTN VSN (VT), VTN VSBN VSN VN/E VN/L VLN STARES SVEN SSN (VA), EWTN NTN NWSSBN PSTS WARTS WSN (WA), WINC WINS (WIN), WVN WVRN WVMDN WVFN WVNN WVARN (WV).

Public Service Honor Roll
February 1985

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points, no max.; (9) Participating in a public service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

May reports submitted for this column should be received at ARRL Hq. no later than June 12. PSHR reports should be listed separately from Section News reports.

919
KA8CPS
701
W9HLX
573
W8QHB
526
AF8V
507
N1NH
324
K7VW
189
W7LRB
171
KA1EXJ
161
WB2OWO
154
WQ1DXT
W9YCV
153
WB5SRX
152
KA1BBU
151
KA3DLY
148
K5CXP
144
WB2IDS
139
KA0EPY
KC9CJ
133
132
KA2UBX
131
130
K4SCL
AL7W
129
KD8KY
127
KA8CPS
126
N4PL
125
K4WWQ
VE4AJE
124
WB8RFB
KD8VF
KB7FE
KB0Z
122
N1BGW
121
K4ZK
120
K4JST
119
KD7ME
118
WX4H
KW1U
WB1GXZ
117
WD8MIO
WA2FJJ
115
WB2EAG
W0IKT
114
WB7WOW
113
W9JUJ
WF4X
112
WB1HIH
111
KB1PA

W7VSE
110
WA4PFK
AF8V
K2GCE
109
W4PIM
108
AA4AT
107
W0OYH
106
N1CPX
WB6TIF
N2XJ
W2PKY
105
AA4HT
WA4CCK
WD8LDY
104
WA4JDH
KA4SSA
KA0ODQ
KB1AF
WA2ERT
KA1T
KB4WT
W4ANK
103
WD4KBW
KD7EY
KC2TF
102
WA1FCD
W9FZW
K2YQK
KT1Q
WB2ZCM
101
KZ8Q
KT5Y
KC4VK
N1BYS
N4GHI
AG9G
W2MTA
100
N8AEH
K4KFU
K4IWW
WB4WII
99
N1AKS
KC3LY
98
N8FCQ
KB3UD
K4KDJ
N4EXQ
KB4GPN
WD8KQC
AK1E
W6INH
97
K5UPN
KA1GWE
K0SI
N6CVF
KK3F
KJ3T
N5AMK
WD4ALY
N7CSP
96
KF8J
KA6BNW
WB9ICH
KC3Y
KV5X
W2YJR
95
K2ZVI
WD8OUO
KG2D
K3JL
94
W4CKS

N9BDL
W6VOM
WA6ZUD
93
KJ9J
WB2MCO
N6AWH
K4NLK
AE1T
WB2VUK
92
KA2BHR
KA2F
VE3BDM
KA0ARP
WB4ADL
91
WB0TED
WB4HRR
90
W9DM
N3COY
K8ND
AG2R
89
WA1YNZ
N2CER
VE3DPO
KB9LT
KA0BWM
88
NB0D
KA4EYF
87
WX4I
KB5EK
W1TN
W2BIW
86
WA7MEL
KA2MYJ
85
WD5GKH
AE5I
84
WD9FRI
KD8RD
W5CTZ
K2YAI
WA0TFC
KA8GJV
83
KV2U
WA4QXT
K0GD
N1DBH
N1ARI
82
KA1KPS
N8EVC
KA4GUS
W9NXG
81
W3YVQ
WD9DNQ
WD9IID
WA4EIC
WD8RHU
WB7CAG
KB4IVV
80
KY1E
ND0N
KA9FFO
79
KA9PKG
KA5SPT
KF7R
78
WB2UVB
WB4FDT
K2GXT
WY4T
W0MDT
77
N0CLS
W6RNL
KW9D
W8QHB
K4ZN

76
KB5UL
WB4YQP
K4VWK
KY4U
KJ3E
75
WD0BOX
VE3WM
W4FY
WA4EYU
K7OVK
KA1KTH
74
WB6QBZ
ND2S
N1BJW
N5BT
73
N4KSO
K4VWK
N7BGW
KS5V
W1KRV
72
W7LNE
KA8OMM
WB4TZR
KA4BCM
N0DZA
71
KC3AV
VE3KK
KP4DJ
VE3GT
KA0BCB
WB1GLH
70
K7GXZ
KL7IJG
K2ZM
KU2N
WA2KOJ
W9HLX
69
W5KLV
KA4MTX
KC0OO
N0EVC
WA8GMT
KB4LB
KR4V
68
NI0R
N8EFB
W0FRC
67
KA2DQA
WB4IXA
AK2E
WD0GUF
K8JDI
VE2EDO
KA2OPG
KB4BZA
66
WD8KBW
WA6QCA
K3NNI
WD4HBP
WA3UNX
NT4S
65
AI0O
KR7L
N5DFO
KA7KAI
W4FMZ
64
WD4NYL
KA5AZK
NC0R
WA4RNP
KA4SKV
WB0WNJ
WA1TBY
KA2AQV
63
WA4JTE
WD6BZQ

W2UYE
KA1AMR
WA7GQO
WA7VTD
N4JRE
WA4MNR
62
W4HON
AA4GL
W1KK
WB8JGW
WB7WVD
WD4BSC

KD4KK
KA4YEA
61
AF3S
WA8DHB
KN1K
60
KA6HJK
NS5J
WD8EIB
K0PCK
VE2FMO
KA7AID

KG9B
59
KA4RSC/T
58
N4LFX/T
57
K5OAF/T
W1YOL/T
56
W0OUD/T
55
WD5EEH/T

53
KA1HPO/T
52
WB1CBP/T
51
N6FWG/T
50
WA2MGV/T
42
N9EJO/T
41
KA9RII/T

Brass Pounders League
February 1985

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

May reports submitted for this column should be received at ARRL Hq. no later than June 12. BPL reports should be listed separately from Section Traffic reports.

Call	*Orig.*	*Rcvd.*	*Sent*	*Dlvd.*	*Total*
W4DUG	3354	54	3366	3	6777
W3CUL	709	2712	3021	79	6521
N1BBT	1105	1056	1227	997	4385
KW1U	9	1199	1051	17	2266
N0BQP	29	1299	164	698	2190
KA9CPA	23	1140	122	763	2048
WF4X	5	884	824	17	1730
WD4IIO	654	157	695	105	1611
WA8HJZ	2	1115	28	455	1600
W3EGK	0	718	720	4	1442
W9JUJ	0	690	674	12	1376
W3VR	212	421	394	12	1039
WA1TBY	18	469	483	11	981
WX4H	10	489	464	19	972
KA8CPS	34	407	407	71	919
W4NFK	28	419	430	16	893
WA4JDH	2	435	412	3	853
KA1EXJ	43	353	326	70	791
N4PL	134	229	349	72	784
N1BGW	55	358	307	63	783
WB2OWO	42	318	294	60	714
WA9WYS	11	327	366	3	707
AA4AT	38	340	321	7	706
KC2TF	0	332	353	2	687
N4GHI	48	294	326	17	885
W7VSE	1	325	338	10	674
WD4KBW	62	333	261	13	669
K2LP	0	350	318	0	668
W0BMA	36	296	207	28	667
WA4STO	22	310	315	19	666
WB2IDS	48	275	250	90	663
KA1BBU	191	124	207	110	632
N4EXQ	17	289	279	39	624
K2GXT	340	24	217	22	603
K4KDJ	259	39	273	29	600
KN1K	1	360	225	7	593
WD8MIO	39	346	165	28	578
W8QHB	0	274	299	0	573
W4LX	279	8	284	0	571
KF4JA	20	268	255	23	566
W8BO	0	247	275	14	536
WB4ADL	30	247	219	33	529
AF8V	11	270	231	14	526

BPL for 100 or more originations plus deliveries:

W4PKP	110	WB5SRX	111
AA4FG	340	W1FYR	107

Independent Nets

May reports submitted for this column should be received at ARRL Hq. no later than June 12.

February 1985

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

1	2	3	4
Amateur Radio Telegraph Society Clearing House Net			
Early Bird Net	31	—	1281
Empire Slow Speed	28	131	465
Golden Bear Amateur Radio Net	28	71	1765
Interstate SSB Traffic Net	26	238	2045
Midwest RTTY Net	51	61	270
Mission Trail Net	28	96	938
NYSPTEN	28	65	588
West Coast Slow Speed	28	206	421
75 Meter Interstate SB Net	28	405	1116
7290 Traffic Net	45	585	3006

Contest Corral

Conducted By Edith Holsopple, N1CZC
Assistant Contest Manager, ARRL

MAY

1

West Coast Qualifying Run, 10-35 WPM, at 0400Z May 2 (9 P.M. PDT May 1). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award or endorsement.

ARRL Spring Sprint, 432 MHz, from 7 P.M. to 11 P.M. *local time.* Single-operator only. Exchange grid-square locator (see Jan. 1983 *QST*, page 49) and call sign. Signal reports are optional. Count 1 point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Sprints are separate contests; there is no accumulation of scores. FM restrictions: Retransmitting either or both stations or using repeater frequencies is not permitted. Only these recognized simplex frequencies may be used: 144.90 to 145.10; 146.49 .55 and .58; and 147.42 .45 .48 .51 .54 and .57 MHz. This restriction prohibits use of all repeater frequencies, including 146.76 and .94. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts. Use of the national calling frequency, 146.52 MHz, is prohibited. A station may be worked for credit only once per band, regardless of mode. Crossband QSOs do not count. Stations are allowed only one transmitted signal at any given time. A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest. Entries for each contest must be postmarked by June 20. Submit separate log and summary sheets for each Sprint entered, and mail separately. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log. Include dupe (cross check) sheets with entries of more than 100 QSOs. Use the official entry forms, available from ARRL Hq. for an s.a.s.e. Disqualifications for excessive duplicate QSOs and/or excessive call-sign or exchange errors.

CW QRP Party, April *QST*, page 83.

1-31

Indiana Month of May Contest, sponsored by the Southern Indiana QRP Group, from 0000Z May 1 until 2400Z May 31. Single operators; no cross mode, 30 meters or repeater QSOs. Work each station once per band per mode. Exchange RST, state, province or country; name and county for IN stations. Certificate for working all counties; certificates for all Novice and Technician stations reporting 33 or more CW contacts. Other certificates are also offered. Send copies of log, dupe sheet and score sheet (and any inquiries) to be received by June 30. Mail to Russ Ryle, N9DHX, P.O. Box 2466, Bloomington, IN 47402.

4-5

Florida QSO Party, see April *QST*, page 83.

County Hunters SSB Contest, see April *QST*, page 83.

8

W1AW Qualifying Run, 10-35 WPM at 0200Z May 9 (10 P.M. EDT, May 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See May 1 listing for more details.

9

ARRL Spring Sprint, 1296 MHz. See May 1 listing for more details.

11

DIG VHF QSO Party, see April *QST*, page 83.

11-12

A. Volta RTTY DX Contest, see April *QST*, page 84.

CQ-M Contest, see April *QST*, page 84. *Note:* Serial numbers will be exchanged this year instead of Oblast numbers.

Fiestas Marineras International Contest, sponsored by the Radioamateurs Group of El Palo, from 1200Z May 11 until 1200Z May 12. Work each station once per band, 80-10 meters, phone only. Exchange a 3-digit QSO number beginning with 001. Count 1 point for contacts between two stations of the same country; 2 points for contacts between stations of different countries but of the same continent; 3 points for contacts between stations of different continents. Use the official DXCC Countries List for the classification of countries and continents. Awards. Logs must include call, name and address of participant. Separate pages by band. Do not include the time of the QSOs. Send logs to be received by June 15 to P.O. Box 6037, Malaga, Spain 29080.

18

ARRL Spring Sprint, 50 MHz. See May 1 listing for more details.

Armed Forces Day. This year marks the 36th anniversary of communications tests betweeen the Amateur Radio community and the Military Communications System. Special commemorative QSL cards will be issued to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day CW and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate.

Crossband Radio Contacts. The military-to-amateur crossband operations will be conducted from 1300Z May 18 until 0245Z May 19. Military stations will transmit on military frequencies and will announce the specific amateur band frequencies being monitored. Limit contacts to three minutes. The following stations will transmit on the designated frequencies: *AIR*, Washington, DC: LSB—4025 kHz, 7315 kHz; CW—6995.5, 13,997.5 kHz; RTTY—7306.5 kHz, 13,986.5 kHz; USB—14,408 kHz. *NAM*, Norfolk, VA: varied emissions—14,400 kHz. *NAV*, Cheltenham, MD: RTTY—7372.5 kHz; SSTV—14,389.5 kHz. *NMH*, Alexandria, VA: CW—4015 kHz; LSB—7346.5 kHz; RTTY—14,440 kHz; USB—20,937.5 kHz. *NMN*, Portsmouth, VA: varied emissions—7393 kHz. *NPG*, Stockton, CA: LSB—4001.5 kHz, 7301.5 kHz; CW—4010 kHz, 6970 kHz, 7365 kHz, 10,259.5 kHz, 13,975.5 kHz, 20,998.5 kHz; RTTY—13,927.5 kHz; USB—14,375 kHz, 21,460 kHz. *NPL*, San Diego, CA: RTTY—7382.5 kHz; SSTV—14,385 kHz. *NZJ*, El Toro, CA: RTTY—7375 kHz; USB—14,480 kHz. *WAR*, Fort Meade, MD: LSB—4028.5 kHz; CW—6997.5 kHz, 14,403.5 kHz; USB—13,992.5 kHz, 20,995.5 kHz; RTTY—13,514 kHz.

CW Receiving Test. Conducted at 25 WPM. A 10-minute call-up will begin at 0250Z May 19, followed by the text at 0300Z. The following stations will transmit the message on the indicated frequencies: *AIR*, Washington, DC: 6995.5 and 13,997.5 kHz. *NAM*, Norfolk, VA: 4005, 7393 and 14,400 kHz. *NAV*, Cheltenham, MD: 7372.5 and 14,389.5 kHz. *NPG*, Stockton, CA: 4010, 7365 and 13,927.5 kHz. *WAR*, Fort Meade, MD: 4028.5, 6997.5 and 14,403.5 kHz.

RTTY Receiving Test. Transmitted at 60 WPM using 170-Hz shift. A 10-minute call-up will begin at 0335Z May 20, followed by the text at 0345Z. Stations and frequencies are the same as for the CW receiving test (see above).

Submit CW and RTTY test messages exactly as received. Indicate time, frequency and call letters of station copied. On the same page as the message text, include your name, call sign and complete mailing address. Entries must be postmarked by May 25. Stations copying *AIR* send entries to Armed Forces Day Test, 2045CG/DONJM, Andrews AFB, DC 20331-5000. *NAM, NAV* and *NPG* entries go to Armed Forces Day Test, 4401 Massachusetts Ave., NW, Washington, DC 20390-5290. *WAR* entries go to Armed Forces Day Test, Commander, USAISC, ATTN: AS-OPS-CM, Ft. Huachuca, AZ 85613-5000.

18-19

Michigan QSO Party, sponsored by the Oak Park ARC, from 1800Z May 18 until 0300Z May 19, and 1100Z May 19 until 0200Z May 20. Work stations once per band and mode. MI-to-MI QSOs allowed. Work portables/mobiles again as they change county. No repeater QSOs. Exchange signal report, QSO number and QTH (county for MI stations, state or country for others). Suggested frequencies: CW—1.810 3.540 3.725 7.035 7.125 14.035 21.035 21.125 28.035 28.125; phone—3.905 7.280 14.280 21.380 28.580 50.125 145.025 146.52. Count 1 point per phone QSO and 2 points per CW QSO. MI stations multiply by sum of states, countries and MI counties worked (max. 85). Others multiply by number of MI counties worked (max. 83). QSOs with club station W8MB count five points. VHF-only entrants may add multipliers from each band for total multiplier. Mail logs by July 1 to Mark Shaw, K8ED, 3810 Woodman, Troy, MI 48084.

19

Abegweit Award Contest, sponsored by the Prince Edward Island ARA, from 1200Z until 2400Z May 19. VE1 and VO1 stations must confirm contacts with Prince, Queens and Kings Counties. All other VE/W stations must confirm contact with any three PEI stations, regardless of the county. All DX must confirm contacts with any two P.E.I. stations, regardless of the county. Frequencies: CW—3.700 7.100 14.050 21.100; phone—3.800 7.200 14.250 21.300. Awards. Send a copy of your log (certified by two other Amateurs) to P.O. Box 1232, Charlottetown, PE C1A 7M8, Canada.

20

W1AW Qualifying Run, 10-35 WPM, at 2000Z (4 P.M. EDT) May 20. See May 1 and 8 listings for more details.

25-26

CQ World Wide Prefix Contest, CW. See March *QST*, page 83 for details.

World Telecommunications Day Contest, phone & CW, sponsored by Liga Amadores Brasileiros De Radio Emissao (LABRE). CW from 0000-2400Z May 25 and phone from 0000-2400Z May 26. 160-10 meters. Single op/single transmitter/all bands, Multiop/single transmitter/all bands, and club competition. Work stations once per band. Exchange signal report and ITU zone. Contact your own country for zone credit, not QSO points. For stations between different continents, count 2 points for each QSO on 10/15/20 meters and 4 points for contacts on 40/80/160. For QSOs with different countries on the same continent, count 1 point on 10/15/20 meters and 2 points on 40/80/160. Multipliers are ITU zones on each band. The final multiplier is the sum of multipliers worked on each band. Total QSO points from all bands times the final multiplier equals the claimed score. Awards. Keep a separate log for each band/mode and include a summary sheet. Entries must be postmarked by July 31. Include s.a.e. and 5 IRCs for results, and mail to LABRE, ITU Contest Committee, P.O. Box 07-004, 70000, Brasilia (DF), Brazil.

28-29

CLARA AC/DC "Mystery" Contest, sponsored by the Canadian Ladies ARA, from 0000Z May 28 until 0000Z May 29. Work each CLARA station twice, once on CW and once on phone, or the same mode on two different bands. No cross-mode or repeater contacts. Exchange name, serial number starting with 001, RS(T), QTH and if a CLARA member. Three "mystery" stations will be operating. Suggested frequencies: CW—3.690 7.035 14.035 21.035 28.035; phone—3.900 3.775 7.150 14.280 14.160 21.300 28.588 28.488. CLARA members count 1 point per contact with non-members, count 2 points per member contact and count 3 points for CW contacts. Non-members count 2 points for each CLARA contact and 3 points for CW contacts. Multiply points by the number of Canadian provinces and territories worked for the total score. The Contest Manager will add 10 points to the base score of each log for every "mystery" station worked. Mail logs to be received before July 15 to Muriel Foisy, VE7LQH, RR 1, Pender Island, BC V0N 2M0, Canada.

JUNE

1

New York State QSO Party, sponsored by the Salt City DX Assn., from 1600Z June 1 until 0400Z June 2. Work the same station on each band and mode for QSO points. Exchange: RS(T) and QTH, (county for NY stations; state, province or country for others). Count one point for phone QSOs and two points for CW QSOs. For the final score, NY stations multiply total QSO points by number of states, provinces and countries worked; others use NY counties for multipliers. Suggested frequencies: phone—1.835 3.905 7.280 14.295 21.380 28.580 MHz; CW—1.810 3.540 7.035 14.035 21.035 MHz; Novice—25 kHz up from lower band edges. Awards. S.a.s.e. for results. Mail before July 15 to John Bonar, NA2C, 177 Milnor Ave., Syracuse, NY 13224.

Hootowl Sprint, sponsored by the QRP ARCI, from 0200Z until 0800Z June 1. CW only. Power level must not exceed 5 W. Work each station once per band. Exchange RST; state/province/country; membership number for members, power output for others. Each member-contact counts 5 points; each nonmember W/VE counts 2 points. Each nonmember DX contact counts 4 points. QSO points (total all bands) times total no. of states, provinces and countries (an s/p/c may be worked for multiplier credit on more than one band)

times power-multiplier times bonus-multiplier equals claimed score. Multipliers are 4-5 W output, ×2; 3-4 W output, ×4; 2-3 W output, ×6; 1-2 W output, ×8; Less than 1 W output, ×10. Bonus multipliers: if 100% natural power with no storage, ×2; if 100% battery power, ×1.5. Suggested frequencies: 1.810 3.560 7.040 14.060 21.060 28.060 50.360; Novices and Technicians—3.710 7.110 21.110 28.110. Entrants are encouraged to use sponsor's summary sheets. Separate logs by band. Certificates. Mail logs by July 1 to KA5NLY, P.O. Box 55010, Little Rock, AR 72225.

4

West Coast Qualifying Run, 10-35 WPM, at 0400Z June 5 (9 P.M. PDT June 4). See May 1 listing for more details.

8-9

World Wide South America Contest, sponsored by *Eletronica Popular* magazine, from 1500Z June 8 until 1500Z June 9. CW only, 80-10 meters. No crossband QSOs. Single operator, single band or multiband; and multioperator, single transmitter classes. Exchange signal report and serial number. Work stations once per band. Count two points each for QSOs with South American stations, and multiply by total South American prefixes worked per band. SA stations multiply by DXCC countries in each band. Mail logs by July 31 to WWSA Manager, P.O. Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

GARTG-RTTY Contest, part 3 (of 5) sponsored by the German AR Teleprinter Group. HF portion is from 1200Z to 1600Z June 8. VHF portion is from 0700Z to 1100Z June 9. Score HF and VHF portions separately. HF bands are 80 and 40 meters; VHF frequencies are 144, 432 and 1296 MHz. No repeater QSOS. Exchange RST, QSO number, name and QTH; VHF add grid locator. Work each station once per band. Count 1 point per QSO; Points on VHF are per kilometers worked. Count 1 point on 144 MHz, 2 points on 432 MHz and 3 points on 1296 MHz per kilometers worked. Total of QSO points is the final score. Classes: A—more than 200-W input; B—less than 200-W input; C—SWL; D—VHF. Logs must include all information. Mail (to be received within 20 days) to Wolfgang Puenjer, DL8VX, P.O. Box 90 11 30, D-2100 Hamburg 90, Fed. Rep. of Germany.

VK/ZL RTTY DX Contest, sponsored by the Australian National AR Teleprinter Society, from 0000Z June 8 until 0000Z June 10. No more than 30 hours of operation permitted for single-op stations. Multiop stations may operate the entire 48-hour period. Use 80-10 meters. Classes: A—single op; B—multiop; C—SWL. Exchange signal report, CQ zone and time (UTC). Determine QSO points from CARTG zone chart. Multiply QSO points by number of countries worked, then multiply that total by the number of continents (max. 6) worked. Add 100 bonus points for each VK/ZL worked on 14 MHz, 200 on 21 MHz, and 300 on 28 MHz. Work stations once *per band. Countries* defined as DXCC countries, plus VK, ZL, JA, VE, VO and W/K call areas. Logs must be received by September 1 by W. J. Storer, VK2EG, 55 Prince Charles Rd., Frenchs Forest, N.S.W. 2086, Australia.

13

W1AW Qualifying Run, 10-40 WPM, at 0200Z June 14 (10 P.M. EDT June 13). Refer to May listings for more details.

22-23

Field Day, see page 81 for the rules.

25

W1AW Qualifying Run

Special Events

Conducted By Edith Holsopple, N1CZC
Assistant Contest Manager, ARRL

Centralia, Illinois: The Centralia Wireless Assn. will operate WD9FTR from 1700 to 2400Z **May 4** from the Okaw Valley Council Scout Show to celebrate the 75th anniversary of the Boy Scouts of America. Operation will be on the General portions of the phone bands on 80-15 meters, and 2-meter FM and CW operation in the Novice bands. For a certificate, send a large s.a.s.e. to CWA, P.O. Box 1166, Centralia, IL 62801.

Dickson, Tennessee: The Volunteer ARC will sponsor NY4N **May 4** in honor of Old Timer's Day in Dickson County. Frequencies: 3.980, from 1200 to 1400Z; 14.275, from 1400 to 1800Z; and 146.520 and 145.11, from 1200 to 1800Z. For a commemorative certificate, QSL to P.O. Box 74, Burns, TN 37029.

Detroit, Michigan: L'Anse Creuse ARC members will operate W8PBO on 7.240 phone 1300-2300Z **May 4** and 1300-2300Z **May 5.** These transmissions will be made from a train excursion traveling from Toledo, Ohio, to Durant, Michigan in celebration of Train Days. For a certificate, send a large s.a.s.e. to L'Anse Creuse ARC, P.O. Box 72, Utica, MI 48087.

Shelton, Washington: The Mason County ARC will operate **May 4-5** in celebration of the City of Shelton's Centennial. KB7MJ and W7KTI will operate phone on 3.900 7.230 14.270 21.350 28.600 MHz; KN7D will operate RTTY on 14.090 MHz; and K7UAR will operate packet on 145.01 MHz. Certificates for a QSL card and a 9- × 12-inch s.a.s.e. to Loren Mercer, KA7GSV, 2213 Olympic Hwy. North, Shelton, WA 98584.

Moscow, Kansas: Sand Hills ARC will operate KZØM to commemorate May Day. Operation will be from 1800Z **May 4** until 1800Z **May 5,** 80-10 meters, phone and CW, up 10 kHz from the lower edges of the General frequencies. QSL for s.a.s.e. via Box 88, Moscow, KS 67952.

Spartanburg, South Carolina: The Spartanburg ARC will sponsor the Spartanburg Spring Fling using club call K4JLA. Operation will be 1500-2200Z daily, **May 4-5.** Phone operation will be on 40-15 meters, up 10 kHz from the lower edge of the General portion of the bands, and CW on 7.115 MHz. Send a large s.a.s.e. to Spartanburg ARC, 104 Garner Rd., Spartanburg, SC 29303.

Ogden, Utah: The Ogden ARC will operate W7UR from Promontory Point, Utah to commemorate the 116th year of the driving of the Golden Spike connecting the East and West railroads. Operation will be 0001-2400Z **May 10** on 3.970, 7.270, 14.280 or 21.375 MHz. QSL cards for an s.a.s.e. to OARC, P.O. Box 3353, Ogden, UT 84409.

Fairfield, Connecticut: The Greater Fairfield ARA will operate WB1CQO during the 50th annual Dogwood Festival, from 1300 to 2200Z **May 11.** Frequencies: 3.975 7.235 14.330 21.420 MHz. Send an s.a.s.e. for certificate to FARA, P.O. Box 1364 SM, Fairfield, CT 06430.

Owensboro, Kentucky: The Owensboro ARC will operate K4HY from 0000Z **May 10** to 0530Z **May 11** to celebrate their International Bar-B-Q Festival. Frequencies: phone—7.245 28.540 28.815 MHz; CW—7.125 MHz. Certificate for s.a.s.e. via Ray Tate, N5EKG, 1615 East 23rd St., Owensboro, KY 42301.

Van Nuys, California: Fire Service Recognition Day will be celebrated by KF6XX operating at Fire Station 88 from 1700 to 2200Z **May 11** on 15 and 20 meters, phone. Certificates for a QSL sent to KF6XX, P.O. Box 939, Camarillo, CA 93010.

Memphis, Tennessee: Memphis Radio Relay Club will operate 1300-2300Z **May 11** and 1300-2300Z **May 12** during the annual Memphis-in-May Festival. Frequencies: phone—3.925 7.280 14.295 MHz. QSL information will be given on the air for certificate.

Fairmont, West Virginia: Mountaineer ARA will operate club radio W8SP from 0000Z **May 17** until 1800Z **May 18** on the middle phone and Novice bands on 80-20 meters in celebration of the Three Rivers Coal Festival. Commemorative certificate for QSL card via John Mason, KA8RHJ, 1314 Locust Ave., Fairmont, WV 26554.

Gillette, Wyoming: The Campbell County ARC members will be active from 2400Z **May 17** until 2400Z **May 19** to commemorate shipping 100 million tons of coal from Campbell Co. in 1984. Operation will be on phone and CW in the lower 40 kHz of the General class bands and in the Novice bands. Certificate for s.a.s.e. to CCARC, P.O. Box 3842, Gillette, WY 82716.

Delavan, Wisconsin: The Lakes Area ARC will operate WB9PZH from 1700 to 2400Z **May 18** to commemorate Delavan as the 19th Century Circus Capital of the Nation. Operation will be 25 kHz up from the low end of the General phone bands on 15, 20 and 40 meters. For QSL and certificate, send a large s.a.s.e. to Pete Vogt, WB9PZH, Rte. 2, Box 233, Elkhorn, WI 53121.

Manassas, Virginia: The Ole Virginia Hams ARC will be sponsoring a special-event station at the Manassas Battlefield Park on **May 18,** from 0800Z until 2000Z. Suggested frequencies: Novice—3.725 7.125 21.050 MHz; CW—3.650 7.050 14.050 21.050 MHz; phone—3.950 7.290 14.290 21.390 MHz. QSL via OVHARC, P.O. Box 1255, Manassas, VA 22110.

Millington, Tennessee: W4ODR will operate from Naval Air Station Memphis **May 18** from 1400-2200Z, in celebration of Armed Forces Day. Approximate frequencies: phone—7.230 14.280 21.370 146.52-MHz simplex; CW—21.145 28.145 MHz. Certificates will be mailed to *Callbook* addresses, or are available via W4ODR, P.O. Box 54278, Naval Air Station Memphis, Millington, TN 38054.

Kansas City, Missouri: Northland ARA will sponsor a special-event station in conjunction with NARA's Computer Hamfest. Operation will be from 0300Z **May 18** until 0400Z **May 19** on 3.963 MHz and 25 kHz up from the General phone band edges on 20 meters, and in the RTTY portions of 80 and 20 meters. Computer certificate for an s.a.s.e. and QSL card via NARA, P.O. Box 6710, Kansas City, MO 64123.

Lima, Ohio: Amateurs of Lima and Allen Co. will operate on **May 18-19** to commemorate the discovery of oil in Lima. Operators will sign /OIL and will be in the Novice or General portions of the bands. S.a.s.e. for certificate to Northwest Ohio ARC, P.O. Box 211, Lima, OH 45801.

Pittsburgh, Pennsylvania: To celebrate the Boy Scouts Allegheny Trails Council Diamond Jubilee, W3SGJ, KA3KSD and WA3BKD will be operating from three Skill-O-Rama campsites around Pittsburgh. Operation is planned for 1400-2400Z **May 18** and 1400-1700Z **May 19** in the General and Novice bands, 5 kHz up from the low ends. Business-sized s.a.s.e. and QSL for special certificate to WA3BKD, RD 3, Box 368, McDonald, PA 15057.

Langhorne, Pennsylvania: Penn Wireless Assn. will operate W3SK from 1400Z **May 18** until 0200Z **May 19** and intermittently the preceding week to celebrate their 20th anniversary. Suggested frequencies: phone—3.98 7.28 14.28 21.38 28.58 144.12 146.52 MHz; CW—3.54 3.745 7.04 7.145 14.04 21.04 21.195 28.04 28.195 MHz. Certificate for QSL and a large s.a.s.e. to P.O. Box 734, Langhorne, PA 19047.

Didcot, Great Britain: Members of the Vale of White Horse ARS will operate GB4GWR from **May 18** to **June 2** to celebrate the 150th anniversary of the Great Western Railway. HF and VHF operation will take place from a living steam museum. QSL via the bureau.

Milwaukee, Wisconsin: Members of the Wisconsin Nets Assn. will hold a QSO party from 1500 to 2300Z **May 19** to celebrate its 25th anniversary. Approximate frequencies: CW—1.810 3.675 7.075 14.075 MHz; phone—1.840 3.975 7.275 14.300 MHz. Exchange RST and state; WI stations send net affiliated with. Count 1 point per phone contact and 2 points per CW contact, and send logs to Dick Hugi, KC9CJ, 2962 North 60 St., Milwaukee, WI 53210.

St. Louis, Missouri: The Jefferson Barracks ARC will sponsor station KØZFK on **May 19,** from 1400-2200Z, to celebrate their 25th anniversary as a club. Operation will be on 10-40 meters in the phone portions of the General bands. Commemorative certificate for a QSL and s.a.s.e. via Jefferson Barracks ARC, c/o Carl H. Hohenberger, WBØBZP, 5266 Parker Ave., St. Louis, MO 63139.

Englewood Cliffs, New Jersey: Members of the Upper School ARC will operate KC2JJ from 1200 to 2300Z daily, **May 20-24,** from Ralph Mason YMCA Camp, Blairstown, commemorating Environmental Education Week. Phone frequencies on all bands, and CW operation in the Novice bands. For a special QSL, send an s.a.s.e. with your QSL to Upper School ARC, Charlotte Place, Englewood Cliffs, NJ 07632.

Pasadena, Maryland: The Bay Area ARS will commemorate Samuel F. B. Morse Day on **May 25.** Operating calls and CW frequencies: KM3I—35 kHz up from the low end of the General bands on 15, 20 and 40 meters; KA3HKB—35 kHz up from the low end of the Novice bands on 15 and 40 meters. For a special certificate, send your QSL and a large s.a.s.e. to BAARS, P.O. Box 805, Pasadena, MD 21122-0805.

Section News

The ARRL Field Organization Forum

Coordinated By Steven Ewald, WA4CMS

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — ASM: VE6AMM. SEC: VE6XC. STM/NM/DEC: VE6ABC. Our best goes to the new Brooks ARS club who have signed up with ADS Communications. A 60 ft Delhi tower is to be shipped to them for a new reptr. Plans are forming for a rptr at ADS Hqs.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — British Columbia Emergency Net during these horrible band conditions now meet twice per night 3650 kHz at 1700 PST and at 1900 PST. Also the Assistant Net Manager monitors 3650 kHz from early AM till net times. Call and give him five minutes to arrive at the radio. British Columbia Public Service Net meets on 3758 kHz running two hours. VE7DDF, Ford, Assistant Net Manager, filling in for Net Manager VE7QC, Sil, who has been Net Manager for over twenty nine years. Sil is very sick in Trail Hospital. It is nice to hear VE7WT Kirby back as NCS on BCPS net after many months being in hospital. BCPS reports for February High 240 Low 130 Total 5070, with average night 181. VE7IK Frank is still in hospital. Thanks to two meter he does keep in contact with the outside. 73. Traffic: VE7BNJ 269, VE7CDF 73, VE7EIR 13, VE7FB 12, VE7EGN 10. VE7FSP 9, VE7BZI 14.

MANITOBA: SM, Jack Adams, VE4AJE — SEC: VE4FK, NMs VE4LB, VJ, AFO, TE, ANR. It is indeed with sadness that I report the passing of VE4JA - Jack became a Silent Key on February 27 & will be missed by many Amateurs & friends. Band conditions have been trying but dedication has been good. Net & traffic report MEPN QNI 1080 sessions 28 QTC 11 - MMWN - QNI 524 session 28 QTC 30 MTN QNI 237 sessions 28 QTC 40 WRS QNI 340 sessions 8. Traffic: VE4RO 49, AJE 39, AFO 32, TE 30, AAD 20, NE 11, BI 7, FK 7, PG 6, DT 6, CR 4, MP 3, ADS 2, AET 2, DS 2, MG 2, HK 1.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. Congratulations to the Ontario Trilliums who are celebrating their 20th anniversary this month with a special dinner in Scarborough on the 11th. The OVMARC's "gang of four" VE3FSN VE3KLX VE3LAR VE3KJQ are pleased to announce the following graduates from their course: VE3PAA VE3PAB VE3PAM VE3PAW VE3OWW VE3OWY. Last year's graduates VE3OMA and VE3OMM have upgraded to advanced. VE3EGO has completed building his IBM PC and is now busy trying to get his TNC going on the PC for packet radio. Interest and activity in NAPLPS is high in the Hamilton Guelph Ottawa Napanee and Belleville areas. With the interest in packet radio in the section, an NTS packet net would be useful — any takers? Regretfully I report that VE3DCQ has become a Silent Key. Our sympathies to xyl VE3BFI and family. With the increase in postal rates, I have noticed a reduction in the number of club bulletins I receive monthly. Your club bulletins are necessary for the success of this column and I would appreciate receiving as many as possible so I can share your activities with other within and outside the section. VE3JFN presented an interesting talk on "old time ham radio" to the Oxford Co. ARC, complete with photos, samples and all. Ted has been a ham for 51 years. Don't forget that Field Day will be held on the weekend of June 22-23. VE3WM has been reappointed EC for the London and Middlesex Counties. VE3HGA is the new president of CLARA — their AC/DC "Mystery" Contest is scheduled for the 28th and 29th of this month. VE3SB enjoyed some of the best diving waters yet in the Cayman Islands. Some of the RSO Bicentennial Award winners were: VE3CLT VE3DWE VE3BJK VE3EHG VE3IHB. VE3DAP captured the Pennsylvania QSO party Canadian Division plaque with VE3KK the runner-up. Traffic: VE3DPO 224, VE3KK 221, VE3GT 212, VE3GNW 122, VE3AWE 89, VE3KCZ 71, VE3FGU 58, VE3BDM 53, VE3WM 49, VE3GFN 44, VE3AJN 37, VE3WV 36, VE3KLX 22, VE3BUO 20, VE3EWD 19, VE3KXB 18, VE3DZH 12, VE3OER 11, VE3WG 5. (Jan.) VE3KXB 41.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. NMs: VE2EDO and VE2FSA. Change of call: VE2APR is now VE2VK, VE2AGQ now VE2FT. UMS presented "50 years an amateur" certificates to: VE2IJ, IG, DW and EVW. Congrats to all. Lecons de code morse: lundi au jeudi sur VE2BG de 8-9 hrs. mardi et jeudi sur VE2TA de 9-10 hrs. lundi. mercredi et vendredi sur VE2REL de 9-10 hrs. Avec regret je dois vous annoncer le deces de VE2AMG. Traffic: VE2EDO 59, VE2BP 47, VE2EC 38, VE2EKC 32.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — SEC: VE5CU. STM: VE5HG. TC: VE5GF. OBS: VE5JA. BM: VE5WM. NMs: VE5EX VE5NJ VE5AEM VE5AEJ VE5BAF. Net reports Prairie Weather Net: 28 sessions, 578 QNI; RARA-2 meter 28 sessions, 443 QNI, 2 QTC; Saskatoon 2 meter 28 sessons, 257 QNI; SK Phone Net 28 sessions, 1456 QNI, 51 QTC. Congratulations and welcome to VE5JA on his appointment to Official Bulletin Station. Listen for weekly CRRL bulletins on the SPN 3753 kHz. Check ins to the SPN has been very good in spite of some tough nights on the band. Traffic: VE5AGM 2, VE5BAF 20, VE5HG 26.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PO. PIO: N3DIP. PSHR: K3JL. Congratulations to Bob WA3EWK and Bill KA3IFM on upgrading. New club for Sussex Co. HAMS are starting a new club the NANTICOKE AMATEUR RADIO CLUB. A.W.A.R.E. club is offering Extra and Advanced classes in June. DTN QNI 363, QTC 51, time 509 min. in 20 sessions. DEPN QNI 59, QTC 8, time 105 min. in 4 sessions. SEN QNI 33, QTC 7, time 73 min, in 4 sessions. Late reports: DTN QNI 434, QTC 57, time 627 min. in 23 sessions. SEN QNI 53, QTC 7, time 105 min. in 5 sessions. Traffic: W3QQ 181, W3PQ 69, WB3DUG 51, WA3WIY 30, WA3ZBI 23, K3JL 21, N3AXH 19, W3FEG 12, KC3FW 6, KA3IXV 6, KC3JM 7, K3ZXP 5.

EASTERN PENNSYLVANIA: SM, Jim Post, KA3A — Local Nets:

ATN	146.67	2000R	W/F	48	18	8 KC3LY
D3ARES	145.37	1930R	M	81	43	4 W3VA
D2ARES	145.45	2000R	Th	55	0	4 WA2OOB
D5ARES	146.865	2100R	S	50	2	4 N3BFL
D6ESN	147.00	2000R	Tu/Th	102	26	4 WA3CKA
D8ARES	147.30	1900R	Tue	46	1	4 WA3JRL
PWA/ARES	146.715	2000R	Sun	74	0	4 KA3JOI
MARC/ARES	147.060	2030R	Sun	77	11	4 N3DSX
MARCTN	147.060	2030R	M/W/F	233	41	13 KA3HBK

ASM: KC3LM, K32FD, WA3PZO, KA3GJT, SEC: WA3PZO, ACC: KB3NE, PIO: W3AMQ, TC: W3FAF, STM: KB3UD, N3BFL, K3MWA, KB3LR, WA3JRL, N3AIA. Welcome to our new EC for Union and Snyder Counties - Don, WB3GDH. Election results - Tamaqua W3VA, Pres. K3BWE, V.P., KA3NAE, Sec, W3EEK, Treas. Reading Radio Club KC3QB, Pres. W3WJC, V.P., W3UQC, SEC, WB3AAK, Treas. Directors - WA3KBH, WB3FPL, WA3SPJ, W3CAC, WB3KCD. Mid-Atlantic Radio Club-Pres. KA3IME, V.P. WA3PZO, Sec. KC3BP, Treas. WB3ELA. Thanks to the HAMS that participated in the York County flood watch, under the direction of Chris, N3CFV. They were — N3CAR, N3EQB, W3AQN W3SST, W3AXC, N3CSV, K3GDI, KA3CST, KB3JA, KA3MIL, N3ATI, WB3FHA. From KC3M, West Branch ARA held volunteer exams. VEs were Steve, KO3B, Bud KC3Q, Jack KC3M and Paul W3ICG. Upgrades were Eric N3DLJ, Gen to Ex. Dave WB3AMO, Gen to Adv. Frank WA3QDN and Ray KA3BJP, Tech to Gen and Mike, KA3LWR, Bob KA3NUF, Terrance KA3FXB, Novice to tech congrats to all. Traffic: KA3DLY 358, N3COY 299, KB3UD 269, W3KAG 150, W3KAG 150, W3IPX 144, N3AIW 142, KA3IME 137, W3AQN 130, W4UQ 101, WB8KPE 98, WA3EHD 88, N3CD 85, AA3B 80, WA3GLX 72, KC3LY 69, N3AZW 67, W3JKX 45, W3ADE 43, W3TWV 41, W3VA 36, WA3CKA 24, KA3A 22, K3QXC 21, W3FAF 17, K3MWA 10.

MARYLAND-DC: SM, Karl R. Medrow, W3FA — OO reports designed to be helpful to others were received from K3CRP and KA3R. The Section needs a technical man to solve the VCR interference problem! KA3IID KC3D WB3KJT KG3M KC3NS and the OOs mailed reports. CD 210s no longer last between QCD bulleting! Make it a radio-gram. N3EGF, N3BGD Generals and Tech N3EGF are recent upgrades from VE testing. Congrats! KC3Y is busy taking MSN reports on the air. W3LDD and KB3NL make short informal reports. KC3DW advises re the W C 2 Mtr Net and W3OYY reports the goings on of the MDC PON. WB3FUE is the link between KA3HUT and the Salisbury ARES Net. WB3BFK has the WR PON — a good outlet covering Northwestern MD, W. Virginia and VA mainly — plus the SNOWBIRDS in Florida! KJ3E steers the MEPN and the rest of us are in there some where! W3YVQ has RACES geared up to cover the state and reports the Red Cross Disaster team is organized in Balto County. N4DLA finally had a QSO on 2-Meter AM! N3EBQ sure has Northeast hopping. KA3CDQ is heading up the Special Event doings at Upper Marlboro. KK3F's new antenna makes his presence known! KC3AV had enough left over for PSHR! KA3EWV tried his keyboard at high speed but W3QQ topped him! W3DQI's traveling days are not over! K3NNI is back to work full time with all 4 bypasses working FB. N3DE has a natural tail end suffix. WA2ERT is a scouter. K3MR knows when to help and does! W3FZV worked the QCWA QSO party. Newsletters appreciated from: SoMdARC, FAR, Delmarva ARC, Md Mobileers ARC, Feedback Laurel ARC, Columbia ARA, Ham Arundel News Anne Arundel ARC. With the nets: Net/Manager Sessions/TFC/QNI Average. MEPN/KJ3E 31/210/32. Top Ten N3EBQ KA3CDQ WA2ERT KJ3E W3FA KB3WL WA3DUM KK3F KC3PW and W3YVQ. MSN/KC3Y 28/78/12. WR PON/WB3EFK 19/25/13.5. MDC PON/W3OYY 4/4/14.5. WC 2 Mtr/KC3DW 4/1/14.2. Wicomico Ares/KA3HUT 3/1/13. Traffic: KK3F 405, KC3DW 331, KC3Y 238, W3FA 146, KA3EWV 140, N3DE 136, KC3AV 123, KJ3E 117, K3NNI 95, WA2ERT 84, WB3KJT 49, N4DLA 45, N3EBQ 38, W3YVQ 32, WB3BFK 25, W3DQI 20, W3FZV 18, KA3IID 17, KB3NL 10, WB3FUE 9, K3MR 7, KC3D 6, W3LDD 4.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: W2IJX. SGL: W2XQ. PIO: VACANT. BM: WB2UVB. OO/RFI: KB2MY. As of this writing (early March), we are in need of a Public Information Officer (PIO) in our section due to the resignation of WB2RVE, who resigned after taking a position in Wyoming. I'm sure you'll all join me in wishing Bob and his family the best of everything in their new QTH. PLEASE TAKE NOTE, effective immediately, address all matters concerning repeater coordination to: Frequency Coordinating Committee, P.O. Box 954, Valley Forge, PA 19481 Attn: K3ZFD. The Penn-Jersey Repeater Council is no longer in operation. At a recent SNJ staff meeting held in Westhampton, WB2UVB was appointed a special EC for the SKYWARN program. Considering the various kinds of crazy weather we get throughout the year, the National Weather Service keenly recognizes the valuable service we amateurs can provide. For more details, please contact your local EC or WB2UVB. Traffic: N2CER 174, WB2UVB 141, WA2MGV 22, WA2CUW 12, KA2CQX 10.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — Club officers: Greater Adirondack Repeater Association WB2JAB WA2SEF WA2GIU WB2ZIY; Liverpool ARC WA2MQM W2GLN WB2YGN KA2DVV. Congrats to NA2C LARC Ham-of-Year and WA2AIV GRAM Ham-of-Year; GARA Outstanding Service Award to N2DGD and KB2VG for their efforts with Mt. Morris 93/33 repeater. BPL to K2GXT WB2IDS WB2OWO. Public Service Honor Roll: KA2BHR KG2D KA2DQA WA2FJJ K2GXT WB2IDS WA2KOJ W2MTA KU2N WB2OWO ND2S KA2UBX W2UYE K2YAI. Hamfest Calendar: Owego May 4, Rochester May 18-19, Rome June 2, Cortland June 15, Batavia July 14, Newark Valley Traffic Handlers August 10, Trumansburg August 24. Former SCM WNY W2RIZ received 50 year plaque. THANKS to KB2XI retiring EC Wayne County. Appointments: (EC) KD2CO Wayne Co., (PIA) WA2OEP, (ORS) K2IUT. OBS reports: WB2DSR WA2ZPE.

NYS/1*	3677	1000/Dy	WB2EAG	362	338	28
WDN/M*	04/64	1100/Dy	WB2OWO	312	087	28
Mike Farad	3925	1300/Dy	VE2FMQ	249	093	28
NYPON*	3913	1700/Dy	WA2KOJ	721	618	28
NYSPTEN	3925	1800/Dy	W2MTA	588	065	28
ESS	3590	1800/Dy	W2WSS	465	131	28
OCTEN/E*	34/94	1830/Dy	WB2HLY	770	132	28
Q Net	31/91	1830/Dy	KA2CMQ	363	007	28
WDN/E*	04/64	1830/Dy	WB2OWO	576	201	28
Blue Line	93/33	1900/Dy	WA2SEF	234	015	28
NYS/4*	3677	1900/Dy	WB2MCO	450	404	28
JCARCN	10/70	2000/Dy	WA2WAX			
OARCN	25/85	2000/Wed	K2VTT	051	000	28
BRVSN	055/655	2100/Dy	WB2OFU	336	008	28
CNYTN*	90/30 +	2115/Dy	WA2PUU	308	061	28
OCTEN/L*	28/88	2130/Dy	WB2HLY	284	030	28
STAR*	99/39	2130/Sat	TBA			
WDN/L*	04/64	2130/Dy	WB2OWO	508	193	28
NYS/5*	3677	2200/Dy	WB2MCO	299	215	28

*NTS Net. SEC W2BCH reminds us that the Western New York Emergency Coordinators Net meets every third Sunday at 8 P.M. on 3955 kHz. KA2UBX announces start of New York Training Net NYTN on 3720 kHz at 8 P.M. Monday through Friday, both beginners and experienced traffic handlers are needed to develop techniques. Atlantic Division Convention at Rochester on May 18 and 19 should prove interesting and different in programming this year...hope to see you there. KB2KW is experimenting on 147.075/675 in Southern Tier. STAR net continues to look for a Net Manager. Traffic: WB2OWO 714, WB2IDS 663, K2GXT 603, WA2FJJ 413, W2MTA 363, VE2FMQ 320, KG2D 216, WA2KOJ 193, ND2S 180, KU2N 160, KA2BHR 151, KA2UBX 151, WB2QIX 122, K2YAI 109, KA2DBD 99, W2ZOJ 83, W2UYE 82, AF2K 59, KA2DQA 57, KX2T 51, W2HYM 50, WA2SMZ 43, KA2PHP 37, W2GJ 35, N2EVG 30, WB2KCT 23, WB3CUF 17, WA2RXO 15, K2IUT 13, WA2OEP 12, WB2NAO 10, KA2QIK 8, K2VR 8, W2PPS 6. (Jan.) W2GJ 11.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: WA3UFN. STM: AC3N. PIO: WB3IZJ. SGL: K3HWL. TC: K3LR. OO Coord: KJ3Q. BM: WN3VAW. New appointment WA3UFN as SEC, all ECs should send their reports to him monthly. All appointees should report monthly to the section level coordinator designated to receive their reports. To hold an appointment, monthly reports are required. We will be having a new ACC in the near future. We have a Silent Key, W3OIB. Our sympathies are with his family. PACKET RADIO: I have attended two demonstrations given by Bob Hoffman, N3CVL, and Terry Ward, WA3VQJ. N3CVL is with the Computer Department of the University of Pittsburgh, and WA3VQJ is with Digital Equipment. They set up three stations for the demo and the results were very impressive. I think that they would be glad to pass any info to anyone asking. They would like to have more activity in the section for testing and operating. Clubs having VE exams should give WN3VAW their schedules so that he can have bulletin stations pass it along. To those wanting more on PACKET radio, the League pub., *Gateway*, has very much info on what is happening around the country. The result of the PA-QSO Party are out. I don't have room to put the winners here but congratulations to all and especially Doug, W3HDH, for all the time and effort he puts into the event. Also after the ill-mannered letters he received from Tennessee by the so-called gentleman who claims a frequency. We have constant interference on our nets, but don't call names — we just move to a clear spot. Traffic: W3EGK 1442 (for BPL), AC3N 315, KQ3T 203, W3OKN 194, WA3DBW 184, W3NEM 164, KA3ETC 155, WA3UNX 105, K3SMB 97, W3KMZ 68, W3NGO 66, K3NPW 65, KB3NV 64, N3FM 54, KR3P 50, W3KUN 48, WA3QNT 46, W3RUL 43, KC3JQ 31, W3MML 29, KA3LGU 27, KQ3M 23, K3LTV 22, W3SN 20, N3WS 20, KA3COX 20, WB3GUK 19, KC3HR 19, WN3VAW 18, WB3GVI 18, KB3DT 14, W3ZX 10, KA3EGE 5, N3KB 3.

CENTRAL DIVISION

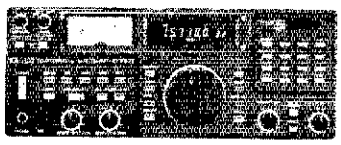
ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OOC: W9TT. BM: K9ZDN. SGL: W9KPT. ACC: WB9SFT. TC: N9RF. ASM: K9ORP.

Net	Freq.	Times (Z WIN)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	488	201	52
ITN	3705	0100 Dy	274	88	28
ILPN	3915	2230 Dy (X Sn)	698	63	26
NCPN	3915	1300 Dy (X Xn)	430	78	24
NCPN	7270	1815 Dy (X Sn)	315	104	24
IEN	3940	1500 Sn	106	—	4
IARES	3915	2230 1 + 3 Sn	56	—	2
ISN	3905	0000 Dy	476	186	26

Illinois was represented 89% to 9RN by stations K9AZS WA9BFV K9SVE N7DOY/9 N9DR KA9EWN KZ9I W9INZ KW9J KD9K WB9NVN W9NXG KA9PKG K9QEW N9TN KB9X and KC9YN. Illinois was represented 100% to D9RN by stations W9NXG K9AZS WB9ODN KW9J W9HLX WB9NVN WB8RFB and WD8AHO. D9RN was represented 100% to CAND. Illinois stations were N9DWN WB9NVN W9HOT W9NXG and WB9RFB. Hello and Goodbye!! This month we welcome N9RF on board as Illinois first Technical Coordinator. Ed is well qualified to hold the post as he is an Illinois Registered Professional Engineer and holds a BSEE and a 'first phone'. Ed is also the TC for Illinois Army MARS. If you are interested in one of the newly created Asst. TC station appointments, give Ed a shout. He'll need our assistance with the recent decision to move RFI cases from the OO area to the TC area. In addition to his technical pursuits, Ed is also active in the Chicago Area SKYWARN Assn., and the Northeast Illinois Emergency Net. On the other side of the coin, this month we say goodbye and THANKS! to WD9EED who has resigned as PIO. Don was instrumental in getting the PIA program started in the Illinois Section and has recruited a fine bunch of PIAs who are helping to keep our activities before the public media. 73, Don! W9IL invites us all to attend the Centralia Wireless Assn. Hamfest on May 5. This issue should 'hit the stands' just days before the fest, so hope to see you there! There will be ARRL VEC exams given, with reservations due by April 5. Walkins may be permitted if time and space allow, but advanced registrations will determine this. REPORTING: Traffic handlers please note that a detailed breakdown of traffic by send. .rcvd. .orig. .deld. . is no longer required UNLESS you qualify for BPL. This should speed up end of the month traffic on the nets. Also, radiogram reports are preferred over the CD-210 as it exercises the nets once a month with a heavier than normal traffic load, prmotes contact between local nets and NTS nets, and saves you 22 cents in the process! TRAFFIC: W9HLX 712, WB8RFB 201. W9HOT 180. W9NXG 170, KB9X 91, KA9EWN 56.

6 STORE BUYING POWER

ICOM R-71A



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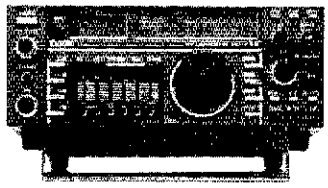

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TODAY'S MOST ADVANCED TRANSCEIVER

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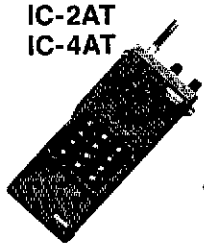

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COVERS BOTH 2 METERS and 70CM

NEW!

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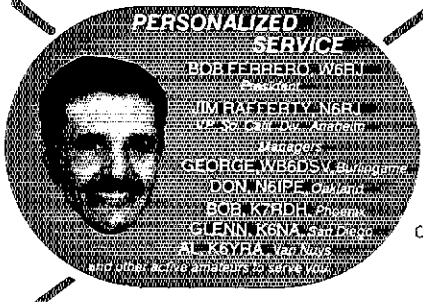

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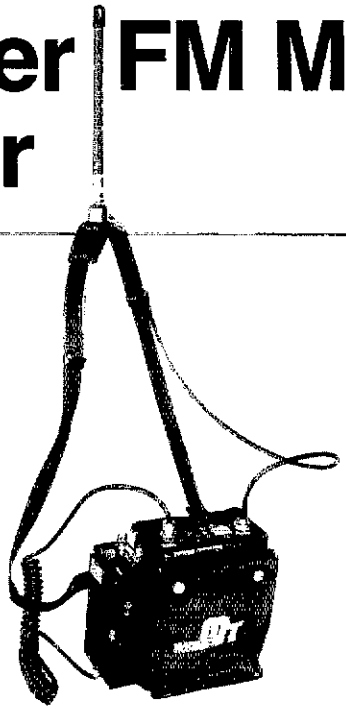
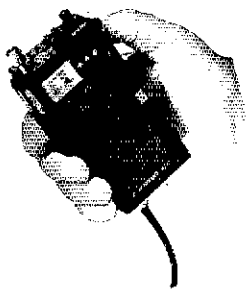
Prices, specifications, descriptions subject to change without notice. Calif. and Arizona residents please add sales tax.

New 2 Meter FM Multipurpose Transceiver

Hand held MT-20A unit for Hi/Low 1.5/150 mW use with BA-2 Nicad Rechargeable Battery.



MULTIPURPOSE TRANSCEIVER



Portable transceiver puts out 10 Watts...Ideal for amateur participation events such as emergencies ...athletic events...marathons.

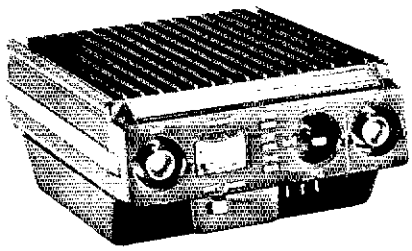
The new MT-20A transceiver can be used as a 10 W portable unit with carrying case, LA-20 Linear Amplifier and rechargeable Nicad Battery.

Easy to read thumbwheel digital switches provide complete coverage of the 2 meter band in 5 kHz steps.

In **mobile** operation, the MT-20A transceiver pr vides 20 W output when used with the LA-20 Linea Amplifier and plugged into the vehicle cigarett lighter through an SD-1 adapter.

Use hand held transceiver for all functions.. Thumbwheel Frequency Selector...Built-in S Mete ...Microphone...Speaker.

For **base** operation, the MT-20A transceiver provides 20 W output with the LA-20A Linear Amplifier, or can be used with any linear amplifier connected through the SD-1 Adapter.



MT-20A **SPECIFICATIONS**

■ General

Frequency	: 144-148 MHz in 5 kHz steps
Emission type	: (FM)
RF output impedance	: 50ohm unbalanced (BNC socket)
Power source	: 8.4V DC (5.5-11V DC)
Current drain	: 150mA Max. on reception 25mA on reception with no input signal 550mA Max. on transmission
Dimensions/weight	: Main unit (without battery pack) 118mm(H) x 60mm(W) x 38mm(D)/250g Battery pack (Model BA-2) 40mm(H) x 60mm(W) x 33mm(D)/120g
Repeater device	: Built-in : - 600kHz transmit down shift switch + 600kHz transmit up shift switch
Illuminated Dial	

■ Receiver

Circuitry	: Double-conversion Superheterodyne
Sensitivity	: Better than 1μV for 30dB S/N
Selectivity	: Greater than ± 7.5kHz/ - 6dB Greater than ± 15kHz/ - 60dB
Image rejection	: Better than - 60dB
Audio output	: 200mW (8 ohms)

■ Transmitter

RF output power	: High 1.5W Low 150mW
Modulation	(FM)
Spurious emission	: Better than - 60dB
Microphone	: Electret condenser Microphone, built-in (impedance 2K ohm)

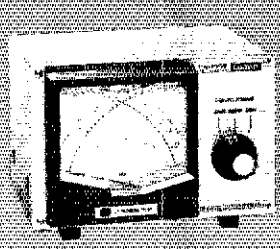
The new LA-20 2 meter linear amplifier provic 20 W (at 13.8 VDC) of stable transmitting pov using high performance transistors.

LA-20 **SPECIFICATIONS**

■ General

RF output power	: 20W (13.8V DC - 1.5W input) 10W (9.6V DC or Nicad - 1.5W input)
Power source	: 13.8V DC—DC power supply 9.6V DC—Nicad battery, Model BA-4/BA (Optional)
Dimensions/weight	: 53mm(H) x 100mm(W) x 140mm(D) 550g (Without Nicad battery)

SWR & POWER CROSS NEEDLE METERS



Top Quality
CN-720B
Frequency Range: 1.8-150MHz
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)

CN-620B
Frequency Range: 1.8-150 MHz
Power: 3 Ranges (Forward, 20/200/2000 W)
(Reflected, 4/40/400 W)

CN-630
Frequency Range: 140-450 MHz
Power: 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)

	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W

All Models Back Lit, with mobile bracket.

	CN-520	CN-540	CN-550
Frequency Range:	1.8-60 MHz	50-150 MHz	144-250 MHz
Power Range:	200/2000 W	20/200 W	20/200 W

COAXIAL SWITCHES
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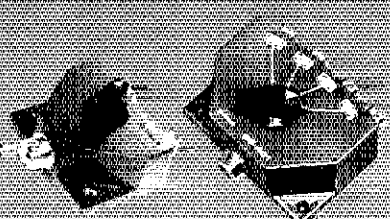


	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency:	600 MHz	1.3 GHz	600 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1:1.2				
Insertion Loss:	Less than 0.2 dB				

POWER SUPPLIES

PS-310M Max 31A/Continuous 24A
3 VDC-14.6 VDC Variable

PS-310MD Max 31A/24A Continuous 13.8 VDC Fixed
Plus sub-DC outlets.
Max 5.6A/5A Continuous 3 VDC-14.6 VDC

PS-560MD
Max 56A/44A Continuous Plus sub-DC outlet 10.6/10A 1 VDC-15 VDC

Advanced Multi Torque Antenna Rotator

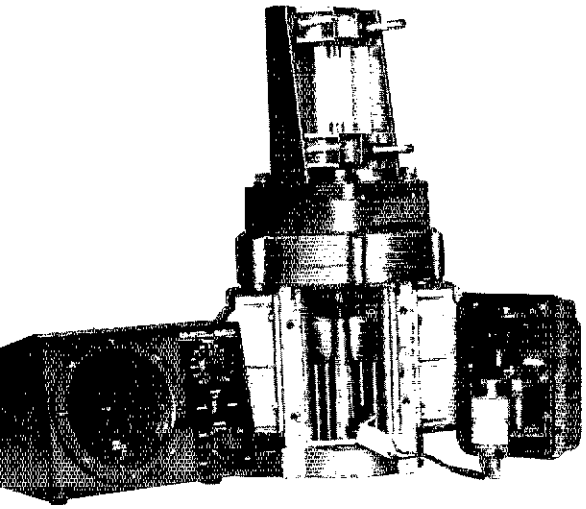
MULTI TORQUE ROTATOR

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

The main frame and reduction gear train have been designed to withstand maximum wind loading.

Maximum brake power is 18,300 lbs/in when 4 motors are installed.

Low voltage (24 VAC) motors...Low cost 6-wire control cable.



The rotator frame can house up to 4 motors to increase torque and load capacity.

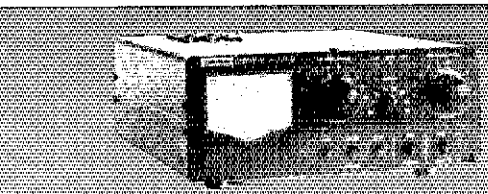
Specifications

■ Rotator Unit

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 lbs/inch (700 kg/cm) 5,200 lbs/inch (6,000 kg/cm)	220 lbs/inch (250 kg/cm) 1,700 lbs/inch (2,000 kg/cm)
	2 motor	1,200 lbs/inch (1,400 kg/cm) 9,600 lbs/inch (11,000 kg/cm)	440 lbs/inch (500 kg/cm) 3,500 lbs/inch (4,000 kg/cm)
	3 motor	1,800 lbs/inch (2,100 kg/cm) 13,900 lbs/inch (16,000 kg/cm)	650 lbs/inch (750 kg/cm) 5,200 lbs/inch (6,000 kg/cm)
	4 motor	2,400 lbs/inch (2,800 kg/cm) 18,300 lbs/inch (21,000 kg/cm)	870 lbs/inch (1,000 kg/cm) 7,000 lbs/inch (8,000 kg/cm)
Rotation angle		375 degrees	
Permissible mast size		1½ ~ 2½ inch (38 ~ 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)	
Continuous running		5 minutes Max. permissible	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

■ Controller Unit

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	180 mm (W) x 125 mm (H) x 175 mm (D)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set



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	CNW-518	CNW-419	CL-680 (no metering)
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Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10-250 ohm

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Max. Output Power:	30 W plus	30 W plus	60 W plus

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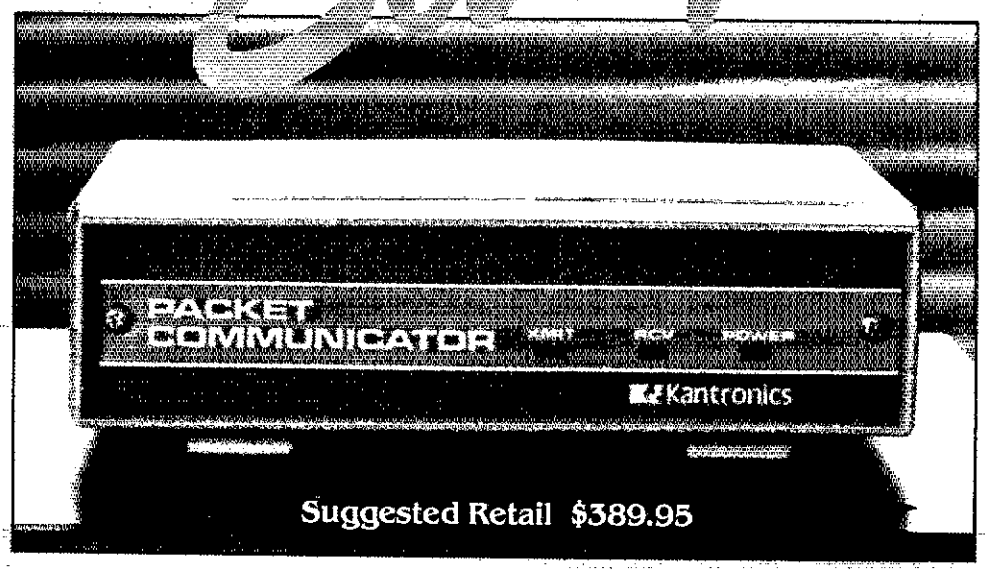

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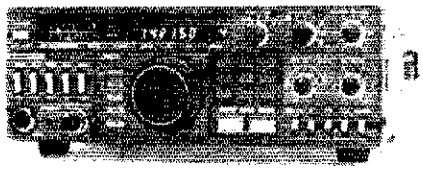

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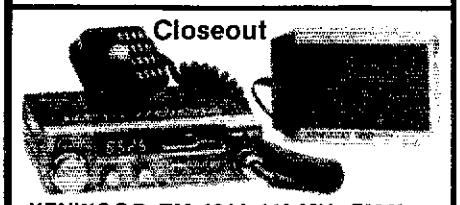

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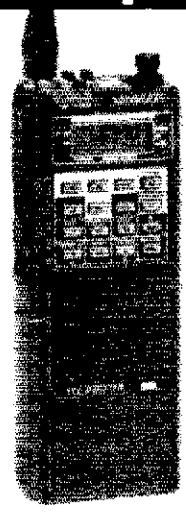

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INDIANA: SM, Bruce Woodwad, W9UMH — SEC: WB9ZQE. STM: W9JUJ. SACC: K9TUS. STC: K9PS. SGLC: WA9VQO. SOBC: KC9TA. SPIO: K9DIY. SRC: N9WB. SHC: WA9FUD. SOOC: KJ9G. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC. February Net Reports:

Net	Freq.	Time Daily UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3239	375	2288	84
QIN	3658	1430/0000/0300	618	417	1925	84
ICN	3708	2315	160	53	800	28
IRN	3629	0000	197	108	1091	28
IWN	3910	1310	1658	0	404	28
IWN VHF	Bloomington		1020	0	280	28
IWN VHF	Kokomo		946	0	189	28

Hoosier VHF Nets for February, QNI 7417, QTC 257, Bulletins 182, QTC 10, 111 in 222 sessions for 28 nets. 9RN cycle four QNI 599, QTC 512, QTR 1099, IN 100% Stns. N9AEI W9EI N9HZ KJ9J W9JUJ WA9QCF WB9UYU K9WWJ. D9RN 599 messages in 1371 minutes. IN, 100% Stns. K9CGS, W9JUJ, N9DWU. CAND 1163 messages in 28 sessions. D9RN 100%. Stns. N9DWU, W9JUJ, K9CGS Appointments: Emergency Coordinator KA9ECY for Spencer County, NB9L for LaGrange County, WB9WMO for Montgomery County, WD9ART for Lake County, W9BTZ for Noble County. Silent Keys: WA9EBW and W9LYB both of Fort Wayne. This month we have experienced a snow emergency in most countries with people in shelters in many places and several medical emergencies. We followed that with the worst flooding in 30 years. Congratulations and thanks to all who helped. K9LSB has resigned as Assistant Repeater coordinator for 29/52/220 repeaters. WA9CWE has resigned as Assistant Repeater coordinator for 440 MHz. Any one interested and qualified for either position please let me know. The Month of May Contest from May 1 to May 31 sponsored by the Indiana QRP Group will award 33 in state and out of state certificates. Contact N9DHX for more information. There will be amateur testing at both the Evansville (KD9JB ARRL) and Wabash Hamfests (N9AEI DeVry). Congratulations to KA9BID on being chosen Sugar Creek Repeater Association "Ham of the Year".
Traffic: W9JUJ 1376, KD9DU 345, KJ9J 237, W9CNE 167, KM9B 142, WB9UYU 128, WA9YIF 118, KA9FFO 105, N9AEI 102, WD9DWD 84, KB9HH 82, W9EI 72, KI9R 68, WA9QCF 66, KW9D 57, K9ET 56, N9HZ 50, K9DFK 49, W9UMH 45, W9JZV 36, WB9AWI 32, WD9HII 28, N9DHX 28, W9QYY 28, W9PMT 27, K9KTB 25, KD9ER 25, KW9C 18, WA9OKK 16, KA9EIV 15, K9TKE 13, WB9VPG 12, K9BRF 11, W9BTZ 10, KK9N 10, K9PS 10, W9KT 10, WA9CHY 9, W9URS 9, W9PRD 8, WB9OZZ 8, W9BDP 7, K9CGS 6, N9DYC 6, W9OZJ 6, W9ZGC 6, W9EHY 6, K9OUP 5, K9DIY 5, WD9CIV 5, WB9IHR 4, WA9JNC 4, WD9ART 3, KA9LAU 2, WB9AJY 2, WB9TOW 1, W9UPI 1, W9XD 1.

WISCONSIN: SM, Richard R. Regent, K9GDF — ACC: KA9FOZ. BM: KA9CPA. OO/RFI: NC9G. PIO: K9ZZ. SEC: W9OAK. SGL: AG9V. STM: K9UTQ. TC: K9GDF. The Milwaukee School of Engineering RC welcomed 800 visitors to their second Annual Swapfest. K9AKG, Ole, got to repair a friends 1912 Edison phonograph. WB9JWT, Roger, reports the Milwaukee Area Net meets on 50.115 MHz SSB, Mondays and Fridays at 9 P.M., for the purpose of traffic handling, general information exchange and grid hunting when conditions are right. Net Manager WB9JWT has around 18 checkins, sometimes a few from outside of Wisconsin, and welcomes newcomers. Any clubs want to plan for operating a booth at this year's State Fair? Welcome new Manitowoc EC WB9MFB. K9GDF talks VEP at Kettle Moraine RAC meeting and visits Racine Megacycle ARC to hear W9YCV give traffic talk. Sorry to report WB9MVZ and WD9AOD Silent Keys. BPL to KA9CPA and WA9WYS. Operating mobile packet radio is becoming second nature for WB9WRW of Milwaukee, who uses a TRS-80 Model 100 portable computer, AEA PKT-1 packet controller and a IC-2AT to make QSOs while mobile. Ron assures everyone that he types into memory and reads received messages only at stop signs, but loves to hit the return key while driving to send packets!

BWN	3984	6 A.M.	WD9IID	1057-1197-24
BEN	3985	Noon	WB9ESM	683-300-28
WSBN	3985	5:30 P.M.	WA9ZTY	855-387-28
WNN	3723	6 P.M.	KA9OBP	163-21-27
WSSN	3645	6:30 P.M.	N9BDL	160-5-28
WIN-E	3662	7 P.M.	WB9ICH	234-179-27
WIN-L	3662	10 P.M.	KC9CJ	129-42-28
NWTN	34/94	6:30 P.M.	W9JSF	426-68-28
WCWTN	31/91	6:00 P.M.	N9DHT	491-58-28
XPO	3925	12:30 P.M.	K9AKG	274-22-20

Traffic: KA9CPA 2048, WA9WYS 707, KC9CJ 385, W9YCV 292, K9GDF 214, WD9IID 213, KA9BHL 175, W9UCL 133, WB9ICH 128, N9BDL 123, K9UTQ 118, W9DND 89, W9ODV 87, WD9FRI 83, K9AKG 82, WA9ZTY 75, W9JSF 73, N9DHT 70, W9FDY 53, KA9RII 53, N9BCX 51, KG9B 48, K9FHI 35, WD9DNQ 31, WB9JSW 29, N9DCF 28, K9JPS 25, KA9JJY 25, KA9BHK 24, N9DIJ 20, KA9NOT 7, WB8RGE 6, KV9U 6, W9UW 5, W9NGP 5, KZ9V 3, AG9G 0. (Jan.) KZ9V 13.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT — SEC: KAØARP. STM: KDØCI. Even as I file this report, we are in the midst of the worst winter storm to hit Minnesota in quite sometime. 3929 kHz has been a continuous source of amateur activity since 1930Z on March 3 with KAØARP, KCØT and WBØHOX acting as NCS during the storm alert. Activity has been tremendous and I hope to have a complete report in next months column. The Midwinter Madness was well attended and, no doubt a big success again for the Robbinsdale ARC. The Mora Vasaloppet received substantial support from area amateurs again in covering this yearly cross country ski event. KAØEVR was the coordinator in arranging amateur coverage with WAØJQD acting as NCS. KCØT has announced the appointment of KBØRZ to the Affiliated Club Coordinator post. This leaves only the State Government Liaison post to be filled. Anyone interested in becoming SGL contact KCØT. NET NEWS: As promised, some changes on MSN/RTTY. WAØLUT has been appointed net mgr relieving KBØTF. My thanks to KBØTF who helped get the net started. The net has moved to 3620 kHz and the new time is 7 P.M. on Tues, Thurs and Sat for now. Acitivty will increase the nights the net is on, so lets get into it folks! The CW nets continue to come thru for us in spite of the band conditions. WØEHI requests any CW operators who would like to help out on the CW nets, they are needed. Contact WØEHI if you want to help. Minnesota has established an MSO, thanks to the combined efforts of

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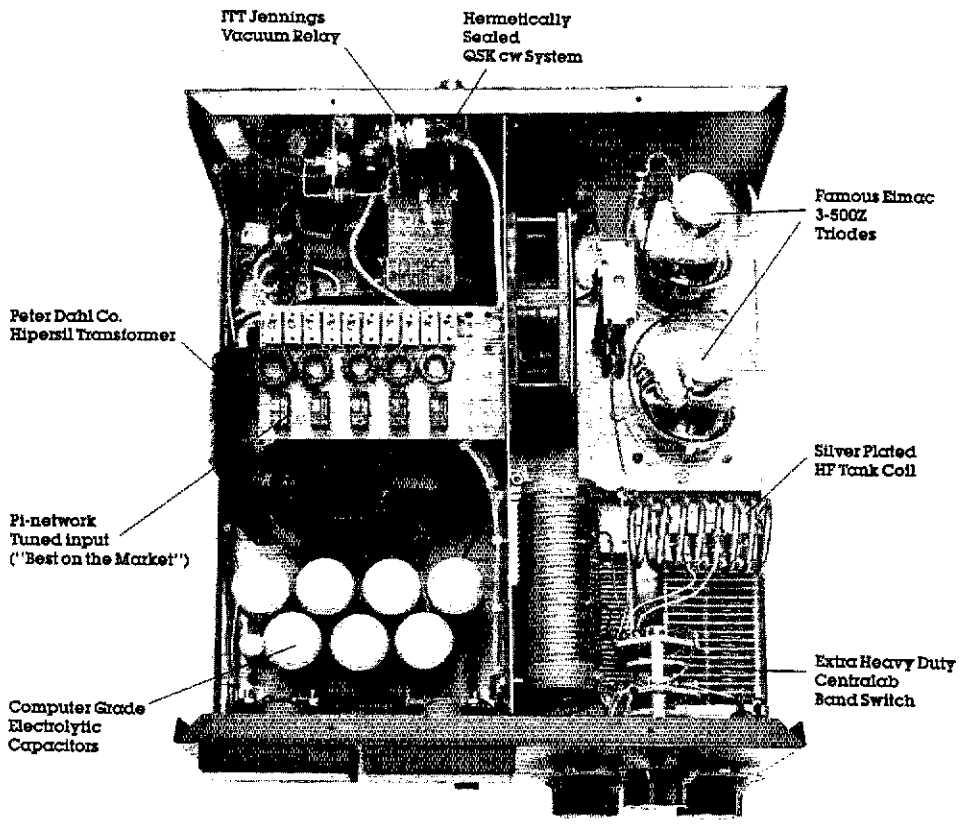

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KBØMB and KAØEPY. The MSO is set up on 3629 kHz, more details forthcoming. Our section "Ham of the Month" award for February goes to NØCLS. My apologies to the following whose reports did not appear in the December traffic listings: NØCLS, WDØHDD and WBØWNJ. Also, KØCVD was listed as N8CVD in the column. These stations contributed to the fine totals we had during Dec and they deserve recognition. Their totals appear below. NØBEI/PIO is looking for information from clubs; his main areas of interest include hamfest schedules as well as exam scheds. My compliments to NØBEI on the outstanding display he designed for the Midwinter Madness for our ARRL Section structure. It was indeed a work of art! Thanks to all who contribute to our public service efforts. If you're interested in helping, we can use you. Contact any of our section appointees.

Net	Freq.	Time	Mgr	QNI/QTC/Sess.
MSN/1	3685	6:30P	WØEHI	237/64/28
MSN/2	3685	10:00P	KAØEPY	195/40/28
MSSN	3710	6:00P	KAØODQ	268/25/28
MSN/RTTY	3620	7:00P	WAØLUT	54/5/10
MSPN/N	3929	12:00P	WBØWNJ	567/92/28
MSPN/E	3929	5:30P	WDØBGS	1048/142/28
MNAMWXNT	3929	6:15P	WDØBAC	354/223/22
PICONET	3925	9:00A	WDØBAC	3723/449/152

Traffic: WAØTFC 447, KAØEPY 262, WDØBAC 243, WBØWNJ 207, KT9I 157, WØEHI 147, KAØARP 107, KAØODQ 83, WAØONJ 83, WDØHDD, WAØONE 71, KDØCI 68, NØCLS 50, WØDM 48, WBØHOX 40, KBØWV 40, WDØGUF 33, WDØBGS 30, WØHZU 30, WDØCGM 29, KCØT 28, NØBEI 26, KØOGI 22, WBØFMI 18, KAØAJF 15, KØCVD 15, KAØBFP 27, NØJP 9, WAØMJF 8, WAØFFU 7, NØEWA 6, NØEXP 6, NØFPB 5, NØFKU 4, WØJCE 4. (Jan.) NØJP 17. (Dec.) NØCLS 184, WBØWNJ 158, WDØHDD 120, KØCVD 111, KCØT 61.

NORTH DAKOTA: SM, Joe Gregg, KNØA — Spring thunderstorm season will very soon be upon us, so now is the time to plan SKYWARN activities. Many areas have extremely well organized groups, but every city in North Dakota needs more activity. In many instances, amateur operators are the eyes and the ears of the National Weather Service. In this respect, every single individual is important. Every ham's first thought, when he or she hears about threatening weather, should be, "How can I help?" Don't turn off your rig. If you are worried about lightening, hook your home 2-meter rig to a quarter-wave mag mount stuck to a cookie sheet; use your hand-held or get in your car and be a spotter. Remember, your help is needed badly!

SOUTH DAKOTA: SM, Fredric J. Stephan, KCØOO — For the month of February we received individual station reports from NBØD WBØOMF WAØVRE WØYMB WØRWE KØAIE WØHOJ and net reports from SDEN BHN BCN CCEN NJQ net and the Walworth Co. Emergency net. By now everyone in this section has had fair opportunity to express any views on traffic, traffic handling, emergency communications and nets. Here are some curious statistics from several recent surveys: To begin with, 88.8% of S.D. hams are not interested in traffic or traffic nets in any way shape or form. Of those particular S.D. hams, 62% refuse to handle any traffic at any time. Out of those who are interested in traffic, 84% feel that it is alright for "independent" nets to take NTS traffic out of DTEN for their own purposes. 78% think they deserve ARRL credit for handling traffic, even though all their traffic handling practices might be contrary to all ARRL guidelines. 77% do not believe in practice for emergency communications; that they are already well prepared for any disaster. 71% do not understand how NTS and or DTEN REALLY work. 99% of the above mentioned S.D. hams are strictly phone operators who rarely use the CW mode. 98% are over the age of 40. These were small surveys and perhaps not highly accurate. It does, however, reflect some basic sentiments of some S.D. amateurs. If you wish more general or specific information about the subject, read the articles in the back of the *Net Directory*. I have ordered extra copies of this as well as the *The Public Service Communications Manual*, and various related publications from ARRL Hq. If you want any of them, just holler. I will send them free of charge. Good Hunting... DX... KCØOO.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF — SEC: N5BPU. STM: AE5L. TC: W5FD. ACC: AD5M. PIO: K5DW. SGL: W5LCI. Repeater Coordinator: WB5FDP. I certainly enjoyed seeing each of you at the Arkansas ARRL State Convention and Hamfest last month. Remember that I cannot put your activity or news in this article unless I hear from you. Keep me up to date with what is going on in your group. Several of the affiliated clubs in the section have not updated their status with ARRL in almost 3 years. You stand to lose your affiliation if you don't keep things current. If you have any questions about your club, contact Morris Middleton, AD5M, the Affiliated Club Coordinator for Arkansas. I hope to see each of you at the Rogers Hamfest provided I don't have a schedule conflict.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR — SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. OO/RFI WB6TPG TC: N5JM. Acadiana ARA election of officers: Pres: Jim NF5I. V. Pres: Scott KA5ROO. Sec: Buttons K5EZP. Treas: Don KA5RAU. Their '85 Lafayette Hamfest and ARRL State Convention was absolutely tops. June N5HBG and her friendly bunch of Cajuns deserve a well done. Bob W5OB, an Old Old Timers Director is sporting a new ARRL 50 year pin. Charlie WA5RBQ is sporting a new ARRL 50 year pin. Charlie WA5RBQ is very active DXing on AMTOR. Have you seen the new Louisiana Council of Amateur Radio Clubs (LCARC) Directory. It's a first class publication containing a directory of La. hams, a list of the repeaters, club info and more. The LCARC Chairman is Al Oubre K5DPG who is also the ARRL Club Coordinator as well as the La. repeater coordinator. The purpose of the Council is to promote amateur radio in Louisiana and encourage cooperation among the many La. clubs and organizations. Hats off to Al W5OVV who did much of the hard work as Council Secretary. The Council works best when every club is a member. Is yours? Do you want to be an ARRL volunteer examiner? Simple. Just notify ARRL Headquarters, and they will send you an application and reference material. Traffic: W5GHP 125, KE5PP 64, AC5R 42, N5ANH 30.

MISSISSIPPI: SM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. VHF Coord. NF5Q. Congrats to Laurel Club and their recent affiliation. K5MOH has good momentum going for the club. Keep up the good work. New appt: KE5WP now EC for Claiborne Cty. WD5IKD now AMSAT Coord. for the state. New upgrade: WB5ADC now Extra. New call signs: N5GDO now KE5WO, N5GDV now KE5WP. This is the time of the year to be prepared for severe wx. Need to dust off our emergency procedures and par-

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CC-1 Conv console 29 m
TC-2 2m Xmit conv 229 m
R-7 SW Receiver 699 c
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T-4XB Transmitter 189 mwfcv
T-4XC Transmitter 249 mwfv
TR-4 Xcvr 229 mc
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AC-3* AC supply 59 mf
AC-4* AC supply 89 mwfc
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TR-5 Xcvr 399 mc
TR-7 Xcvr 569 mwf
TR-7/1.8 KHz 599 v
TR-7/AUX-7 599 m
TR-7/NB 619 w
TR-7/300/500 Hz 619 mf
TR-7/300/500/1.8/nb 669 v
PS-7* Power supply 189 mwf
*Not sold separately
PS-75 Power supply 99 m
WV-4 VHF wattmeter 49 m
MN-4 Ant tuner 69 v
7000E Terminal 249 w
ML-2 2m FM Xcvr 69 m
TR-22 2m FM port 69 m
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Alpha 76PA Linear 1499 v
Alpha 374A Linear 1599 m
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CT-2200 Terminal 499 c
KB-2100 Keyboard 99 c
DS-2000 Terminal 149 m
DS-3000KSR Term vers 2 389 m
DS-3000KSR Term vers 3 489 e
ARQ-1000 Error terminal 689 m
CWR-6700 Rcv Telereader 169 m
HENRY
2KD-5 Linear $689 f
ICOM
IC-701 Xcvr w/ps $489 mw
IC-720 Xcvr 569 w
IC-720A Xcvr 659 mv
IC-740 Xcvr 569 w
IC-740/FM Xcvr 589 f
IC-740/internal ps 649 m
IC-740/FL-44/CW filt 679 f
IC-740/ssb/cw/mk/fm/kyr 729 m
IC-740/ps/2 cw filts/kyr 769 m
IC-751/ps/2 cw filts 1149 m
PS-15 Power supply 99 wc
PS-20 Power supply 159 mv
EX-2 Relay box 29 m
AT-100 Ant tuner 229 me
Spkr/patch; 701 89 m
R-70 SW Rcvr 399 c
7072 Xcv interface 69 c
IC-551 6m Xcvr 299 m
IC-21A 2m FM Xcvr 89 f
IC-22S 2m FM Xcvr 99 m
IC-25A 2m FM Xcvr 199 mc
IC-215 2m FM port 99 m
IC-230 2m FM Xcvr 69 m
IC-251A 2m Xcvr 369 mcv
IC-280 2m FM Xcvr 149 v
IC-47A 440 FM Xcvr 319 w
IC-471A 430 Xcvr 549 m
IC-490A 430-440 Xcvr 389 f
SM-2 Desk mic 25 f
SM-6 Desk mic 25 m
IC-2AT 2m FM HT/TTP 159 m
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TS-520SE Xcvr 449 m
TS-520SE/cw filt 469 m
VFO-520S Remote VFO 99 m
TS-530S Xcvr 489 m
TS-530S/CW filter 519 m
TS-530S/cw/ssb filts 549 m
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TS-700A 2m Xcvr 299 mce
TS-700S 2m Xcvr 369 f
TS-700SP 2m Xcvr 399 m
TM-201A 2m FM Xcvr 239 m
TW-4000A 2m/440 FM 399 m
TR-7600 2m FM Xcvr 129 c
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800H/800CH kit Term 349 c
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276 Calibrator 19 f
579 Century/22 Xcvr 269 m
579/226 calib 289 m
Triton II Xcvr 269 mf
540 Xcvr 289 m
546 Omni-D Dig Xcvr 389 v
546C Omni-D series C 589 m
560 Corsair Xcvr 769 mw
580 Delta Xcvr/cw filt 429 m
283 Remote VFO 129 m
252G Power supply 79 wfv
252M/O Power supply 79 f
262G Power supply 89 mfc
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FTDX-570 Xcvr 289 m
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FT-101B Xcvr 389 w
FT-101B/cw filter 419 m
FT-101E Xcvr 449 f
FT-101EE Xcvr 399 ce
FT-101EX Xcvr 389 m
FT-101F Xcvr 449 f
FT-101Z analog/CW/fan 469 m
SP-101B Speaker 19 m
FT-301DIG Dig Xcvr 289 f
FT-301AD Dig Xcvr 329 f
ERB Ext relay box 19 f
FT-7 20w Xcvr 289 c
FT-77 Xcvr 419 fc
SP-901P Spkr/patch 49 m
FC-102 Ant tuner 189 m
FT-980 Xcvr 1089 ce
FL-2100 Linear 349 f
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FTV-650 6m Xvtr 139 m
FT-726R w/HF module 759 m
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FT-620B 6m Xcvr 289 fc
FT-221 2m Xcvr 239 w
FT-221R 2m Xcvr 289 m
FT-227RB 2m FM Xcvr 149 w
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(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

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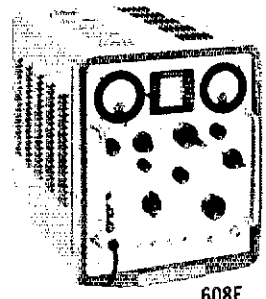
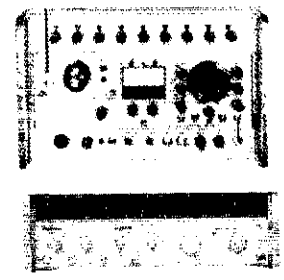


608E



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ticipate if necessary. Affiliated Clubs are reminded to send in their annual reports to maintain their affiliation. Also to participate in the recent new programs to obtain new memberships. Good reports on successful VE sessions. Exam sessions are becoming more frequent as we become more familiar with the system. Keep up the good work. CAND (W5KLV) sess 28, QTC 1163, DRN5 (WB5YDD) sess. 56 QTC 999, MTN (K5OAF) sess. 28 QNI 120, QTC 39, MSBN (KW5T) sess 28 QNI 2143, QTC 78, MMN (WB5RMW) sess 27, QNI 507, QTC 7, GCSBN (W5JHS) sess. 28 QNI 1143, QTC 7, MLEN (KE5WP) sess. 3 QNI 46, QTC 0, CAEN (NF5Q) sess. 4 QNI 102, Traffic: N5AMK 337, KT5Z 129, W5WZ 82, K5OAF 73, W5LBG 38, KW5T 15.

TENNESSEE: SM, John C. Brown, NO4Q — ASM & ACC: WA4GLS. OO/AA: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. The Volunteer ARC of Dickson will be running on OLD TIMERS special events station again this year. Say they will be giving out a very nice "Commerative Certificate." Look for them on 75M, 20M and two frequencies on 2M. This is age and not amateur. I know we have just appointed the youngest net manager (age 15) for the section ever. Don't know about for ARRL. He is Mark Rose, N4IGF for the West Tennessee WX Net which meets everyday at 0230 UTC on 146.37-146.97 collecting and forwarding wx data to the Memphis area ex station. This is very useful data as the same wx later moves across TN. Congratulations are in order for N4IGF. His father did call the evening session of the TN phone net and just happens to be a minister. Don't think I have mentioned it but KY4R, Asst. NM, has been keeping the home fires going on the TN RTTY net while the regular net manager is in Florida. It can be said that he has been doing a mighty fine job, and the RTTY net is still growing and doing well. The 1985 hamfest season is already into full swing and Oak Ridge by and Knoxville up next. Your Section Manager has not been advised of the firm dates for all for the year. Please drop me a line or radiogram and let me know. Also would like for all to drop by the ARRL booth and say HI if nothing else is on your mind. At least one or more of the section staff will be at all section hamfests. I don't know if you noted at the beginning of this report but the title of the OO/RFI for W9FZW has been changed to OO/AA. The RFI part of his job has been moved over to the Technical Coordinator's position. This is a ARRL-wide change and not just in the this section. We had three to make the CW "Honor Roll" this month; W9IMI W4DDK and NG4J. Sure would like to see more calls in there. Section traffic is as follows: LF Sessions 79, QNI 3274, QTC 183; VHF Sessions 94, QNI 2037, QTC 693; CW sessions 49, QNI 238, QTC 163; RTTY sessions 25, QNI 162, QTC 44. CUL. Traffic: W4DDK 167, W9FZW 166, K4WWQ 160, KA4RSC 88, W3HET 35, K4WOP 30, NN4S 28, W4TYV 24, W4PFP 19, W4PMP 13, KE4LS 12, WA4GZQ 12, K4JGW 12, W4PSN 10, KB4UQ 9, WB4YPO 8, WA4HKU 6, K4UMW 6, W4EWR 5, N4KQX 3 WB4DYJ 2.

GREAT LAKES DIVISION

KENTUCKY: SM, Rosie Percifull, KA4SAA — SEC: WA4JAV. STM: KA4BCM. PIO: K4TAJ. OO: N4GD. BM: WA4AGH. Freq. Coord: WA4YOF. WA4JTE, Dale Bennett of Columbia, has been appointed the Assistant SM for Kentucky. WB4NHO, Steve Morgan of Owensboro, has been appointed an Assistant Division Director. Other ADDs are W4BAZ, J. B. Wathen in Louisville; K4DZM, Joe Miller in Louisville; K4FU, Hank Zimmerman also in River City; KZ4G, Dave Vest in Flatwoods; KA4GFU, Ann Sloan in Paducah; WM4T, John Thernes in Highland Park; and W4ZVL, Tom Westerfield in Hopkinsville. FEB NET REPORTS: MKPN 1416 140, KTN 1293 77, KYN 114 46, KNTN 278 67, KYPON 62 6, BARES 84 8, CARN 139 14, NKARC 69 4, TSTMN 667 60, WTEN 34 2, 3ARES 37 3, 7ARES 66 2, 11ARES 47 8. Traffic: WA4JTE 400, WD4IYI 103, KA4SAA 148, KA4MTX 69, WD4BSC 58, WB4ZDU 39, KA4BCM 33, KA4SKV 29, K4MHL 26, WA4SWF 26, W4WOV 24, WD4CQF 18, WD4IXB 15, KA4GBZ 12, WA4AVV 9, K4HOE 9, WD4CJQ 8, N4JLT 7, W4PKX 6, WA4YPQ 2.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WB8BGY. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: W8YZ.

Net	Freq	Time	QNI	Tfc	Sess	Mgr
QMN*	3663	1800**	929	229	87	W8UE
MITN*	3953	1900	636	187	30	WD8EIB
MACS*	3953	1100**	555	127	31	K8LNE
UPN*	3922	1700	1225	84	35	WA8DHB
160	1950	2000	411	51	31	WB8EMV
WSSBN	3935	1900	1132	33	31	WB8EYM
GLETN	3932	2030	264	9	17	WB8AXI
MNN*	3722	1730**	21	0	11	KA8TPX
VHF nets 16 rpts			1229	34	96	W8CUP

*NTS nets. Times local. **QMN late net, 2200; MNN late, 2000; MACS Su, 1300, ARES net Su, 3932, 1730, ARRL Info Net/Traffic Workshop, 3953, 1600 Sundays. 3932 is MI HF emer. freq, 1832 alternate. Silent Keys, with deep regret: W8CQ, K8DBA. All those who have not done so, please start doing so immediately: using my new address, that is. See page 8 of this magazine. New officers for the Cherryland ARC: Pres. KD8RV; V.P. KA8UCQ; Sec'y KA8QVH; Treas. W8IAS; Rec. Sec'y/Ed. N8DBK. It seems to be time once again to issue some words of caution to clubs and ARES groups, to anyone who operates a repeater that is used for public service. In many instances, funding from local government agencies is available for equipment purchase and upkeep in exchange for guarantees of amateur operator availability in emergency situations. Housing and tower space often similarly can be provided. Great. These deals can be awfully tempting, especially for smaller, less affluent groups. And usually they work out well. The hams have the routine use of a reliable repeater at little or no cost, and when the balloon goes up they pitch in and do what they most probably would do anyway. Ideal? Sure, unless people in the funding agency decide they don't like the nature of the "routine" communications, or develop personal conflicts with members of the amateur group and start trying to dictate what can and cannot be done with "their" equipment. Anticipate these problems, solve them in advance. Have a clear understanding or else - the best advice I can give - don't bother. Februaruy produced three BPLs for MI traffic folks. Is Valentines Day bidding to rival Christmas? For this really sweet occasion, how about some nice new gushy ARL numbers, huh? Traffic: KA8CPS 919 (BPL), W8QHB 573 (BPL), AF8V 526 (BPL), WD8KQC 335, WD8OUO 111, WD8RHU 94, K8EQO 93, W8RNQ 73, WB8MTD 71, K8GXV 68, WA8DHB 53, K8OCP 47, W8SCW 44, K8UPE 35, WB8SIW 32, W8VIZ 32, KI8Q 30, N8CNY 28, W8CUP WD8EIB W8YIQ 27, W8IHX KV8U 22, W8URM 20, WB8WJV K8ZJU 16, WD8PAF NJ8R 10, WA8LXY 8, N8FGL 6, KA8VOZ 2.

OHIO: SM, Jeffrey A. Maass, K8ND — ASM: KF8J. SEC: K8AN. STM: WB8MZZ. ACC: K8US. BM: W8ZM. TC:

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TA-33	235.00
TA-40KR kit	89.95
CL-33	265.00

MISCELLANEOUS ANTENNA SUPPLIES

ALPHA-DELTA

Transi-traps:

LT 200W	$18.95
HT 2KW	29.00
RT 200W D1x	28.95
HV 2KW D1x	31.95

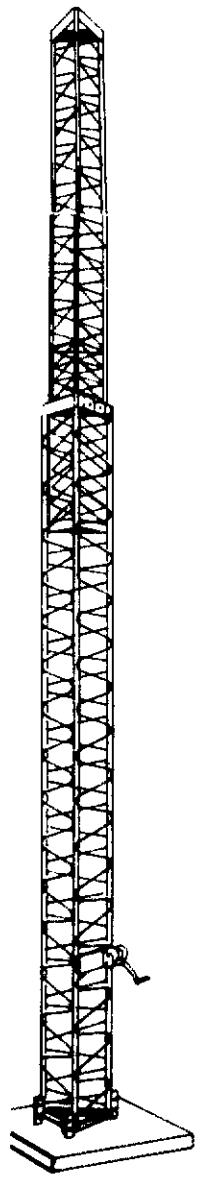
AMERITRON RCS-8 remote coax switch, 5 pos. $119.95

HI-Q

1:1 Balun	$11.95
Ctr. insul	6.50

COAX-SEAL $2.00/roll

7" end insul.	4.95/pr
⅛" nylon rope	0.05/ft.



TOWERS

UNR-Rohn
FREE-STANDING:

Today's best buy in towers. Rated at 10 & 18 sq. ft.

HBX-40	$198.00
HBX-48	265.00
HBX-56	335.00
HDBX-40	249.00
HDBX-48	325.00

FOLD-OVERS:

FK2548	$849.00
FK2558	910.00
FK2568	959.00
FK4544	1169.00
FK4554	1259.00
FK4564	1349.00

Fold-overs shipped freight prepaid. Prices 10% higher in western states.

GUYED TOWERS:

25G section	$47.50
25AG3 top	59.90
25AG4 top	64.00
45G section	109.00
45AG3 top	116.00
45AG4 top	116.00
TB-3 bearing	49.00

Guy wire, turnbuckles, bases, rotor plates, & other accessories in stock!

Hy-Gain
CRANK-UPS:

Hy-Gain is now the name in crank-up towers. Shipped freight prepaid!

HG-37SS	$739.00
HG-52SS	1075.00
HG-54HD	1675.00
HG-70HD	2675.00

WIRE AND CABLE

ROTOR CABLE:

Std (6-22, 2-18)	$0.19/ft
Hvy (6-18, 2-16)	0.34/ft

ANTENNA WIRE (solid):

12 ga. Copperweld	$0.12/ft
14 ga. Copperweld	0.10/ft
450 ohm ladder line	0.10/ft

COAX: 95% + shielding

RG-213/U	$0.29/ft
RG-8/U	0.28/ft
RG-8/U foam	0.27/ft
RG-8X	0.16/ft

BELDEN

RG-213/U	$0.40/ft
RG-8/U	0.32/ft
RG-8/U foam	0.35/ft
RG-8X	0.18/ft
RG-11A/U	0.36/ft

SPECIAL!!

BELDEN 9913 low loss 50 ohm coax: $0.39/ft

Offer expires June 1, 1985.

ROTORS

TELEX/Hy-Gain

CD45II	$145.00
HAM IV	229.00
T2X	269.00
HDR-300	515.00

KENPRO

KR-500 elev.	$159.00
KR-5400 az-el	259.00
KR-5600 az-el	319.00

Prices subject to change without notice. Minnesota residents add 6% tax.

VISA/MASTERCARD

KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

Net	QNI	QTC	Sess.	Time(Local)	Freq.	Mgr.
BN	331	238	58	1845,2200	3.577	WD8KFN
BNR	296	214	28	1800	3.605	W8EK
BSSN	350	257	51	1915	3.885	N8AKS
ONN	119	26	22	1830	3.708	KD8VF
OSN	347	171	28	1810	3.577	N8AEH
OSSBN	2355	900	84	0130,1815, & 1845	3.9725	WB8MZZ
OSSN	143	88	28	0646	3.577	KA8GJV
O6MN	290	13	30	2100	50.16	WD8CTX

I hope that you've all recovered from Dayton, and are ready for May's hamfests: Medina on May 12 and the Athens and Sandusky County/Ottawa County hamfests both on May 19. The Tour of the Scioto River Valley is a 210-mile, two-day bicycling event that covers Columbus to Portsmouth and back on May 11-12. Over 4500 bicyclists from all states and several countries will make the trip in 1985. The Central Ohio ARES provides administrative and medical communications support with over 100 Amateurs and a linked repeater system, and traffic handlers provide their services to those cyclers who wish to send Mothers' Day greetings back home. Last year's event was described in detail in *QST*, September 1984, page 74. If you would like to assist, contact W8BKO for details. I want to thank everyone associated with the 1985 ARRL Ohio State Convention in Sharonville for the hospitality shown me and for the excellent job of planning. If you missed this one, mark February 21-23, 1986 on your calendar! There has been a recent surge in the number of Amateurs upgrading, as shown by the reports thereof in the many club newsletters which I receive. The following list is from one month's listings: N8GGV WB8YSO N8EPA KA8VJG WD8RMG WD8RWX KA8VQY KA8VLC WA8ONU KA8AVO KA8UPK KA8UPY KA8RJY WD8RGS WA8WEQ N8FWX KA8TXJ KD8SI. Congratulations to all: is it your turn to meet the VE? K8AN and the Triple States RAC (TSRAC) are promoting a proposal to give Novices phone and RTTY privileges on 28.2 to 28.3 MHz, as a way to increase the amateur ranks. Recent appointees: ORS-KA8OQF N8CJF KA8KHS K8TVG WD8JYE K8LQM W8QZK KA8ICB KD8IC NC8Q. ORS and OES-NE8X WB8HHZ. WB8ZZR has been named EC for Clinton County. Congratulations all! Have you considered serving amateur radio? We particularly need applicants for the Official Observer (OO), Official Bulletin Station (OBS), and Public Information Assistant (PIA) appointments. For information on ARRL Field Organization appointments, contact me at the address given on page 8 of this issue of *QST*.

Local Nets	QNI	QTC	Sessions
ALERT	35	5	4
BRTN	243	109	28
COARES	105	10	3
COTN	348	258	28
DAEN	191	21	19
Highland ARA	79	6	3
Lucas County	292	95	27
Medina County	313	87	28
NCTW	35	12	15
RARA	55	0	4
TSRAC	1063	75	38
Tristate	424	124	28
Van Wert AEN	36	3	
WCTN	251	51	28

Traffic: WD8MIO 578, W8BO 536, W8PMJ 459, K8JDI 326, WD8KFN 280, KD8KY 252, WB8MEK 228, K8OZ 222, W8JMD 191, K8ND 168, WD8RAO 153, KF8J 157, W8BDMF 154, W8QZK 147, KD8VF 147, K8NIO 134, N8FCQ 132, N8AEH 129, KA8KHS 109, W8SKP 106, WB8KWD 101, KA8GJV 98, W8EK 96, N8EPB 92, KD8SS 88, N8EVC 85, WD8RIB 84, K8TVG 82, WD8KBW 81, WA8GMT 76, KA8CGF 71, NJ8P 71, K8CMR 58, KD8IC 56, WD8JYE 53, W8CXM 51, WB8JGW 51, NC8Q 50, K8AN 48, N8FPH 48, K3RC 45, N8CW 43, NE8X 43, KA8ICB 42, K8EF 40, K8CKY 39, N9EJO 39, K8VOY 39, WB8BWY 36, WD8RGS 36, K8DXZ 35, N8FNP 33, WB8HHZ 30, WA8HED 27, K8LQM 26, WB8HMI 24, W8FUP 22, K8NJQ 22, KA8RJY 20, WB8MRL 19, N2NS 19, WA8HGH 18, KA8TXJ 17, W8IQ 16, WB8NHV 15, WA8SSI 15, AB8P 14, WD8CTX 13, WD8OYK 12, KA8OQF 10, W8BHL 10, KA8GGV 10, KA8RBQ 10, WD8CSP 9, N8AJU 8, W8RG 7, W8OQL 6, WB8RSM 6, W8ZM 6, N8AKS 5, WB8NTR 5, N8CDN 4, WD8EKI 4, WB8TRK 4, KC8WH 4, W8DYF 4, KA8MFG 3, KA8MPH 2, N8CXI 2, K8DL 1. (Jan.) W8PMJ 232, W8EK 110, W8BJGW 74, N8CJS 27, KC8WH 7, N8AJU 6, KA8OOF 5, N8CXI 1. (Dec.) W8PMJ 560.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — STM: WB2MCO. SEC: AK2E. ACC & EC: N2BFG. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ASM: K2ZM.

Net	Time/Day	Freq.	Net Manager
EPN	2200Z	3.904	KC2TF
ESS	2200Z	3.590	W2WSS
NYS/E/L	2300/0200Z	3.677	WB2MCO
NYS/M	1400Z	3.677	WB2EAG
NYPON	2100Z	3.913	WA2KOJ
CDN	2230Z	146.34/94	WB2ZCM
HVN	2330Z S-S-M	144535/135	N2BDW
HVN	2330Z T-F	146.37/97	N2BDW
SDN	0130Z	147.66/06	K2ZVI
SCRN	0000Z	147.735/135	KV2U

Nets: CDN: QNI-476 QC-151; EPN: QNI-170 QTC-107; ESS: QNI-465 QTC-131- NYPON: QNI-721 QTC 616; NYSE: QNI-450 QTC-404; NYSL: QNI-299 QTC-215; NYSM: QNI-382 QTC-339; SND: QNI-262 QTC-178; Ulster RACES: QNI-35 QTC-8. Club news: AARA planning annual dinner. SARA reports new members KA2WHG KC2VP WA2OIO KA2VAH WA2TCY KA2VAR WB2AIL W2QYA KA2VNP; upgrades N4KFY KA2VZW; Silent Key KA2AMP. CCNR had show on ARRL Hq. Rip Van Winkle ARS is running Novice class. WARA had speaker on microwave QSB. SARATOGA RACES provided comm. during telephone outage. AK2E report Greene Cty net with QNI 84. February BPL-KC2TF Jan. PSHR-KV2U. Feb. PSHR: WB2EAG W2PKY KC2TF WB2ZCM W2YJR K2ZVI WB2MCO WB2VUK W2BIW KA2MYJ KV2U K2ZM AK2E KA2OPG KA2AQV. Traffic: KC2TF 637, WB2EAG 333, WB2VUK 292, W2PKY 284, K2ZM 257, WB2MCO 207, WB2ZCM 200, KA2MYJ 137, W2YJR 133, KA2AQV 102, W2BIW 102, K2ZVI 93, K2HNW 78, N2ZWI 70, KV2U 44, AK2E 30, WA2YBM 27, KA2OPG 24, AA2Y 23, N2BFG 18. (Jan.) KV2U 56, AA2Y 19.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — ASM/ACC: WB2IAP. SEC: KA2RGI. OO: NB2T. TC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYX. The following are traffic nets in and around the section:

NLI CW*	3630 kHz	1900/2200	N2AKZ mgr
NCVHF	6.745 rpt	1930 m-f	K2MT mgr
BAVHF	6.67 rpt	2000 m-f	WB2BNA mgr
SCVHF	5.37 rpt	2030 m-f	W2GZD mgr

Our numbers talk

424B

SUCCESS

BOOMERS WIN
1983 Central States VHF Conference, Antenna Contest

144MHz BOOMER	1st Place
	2nd Place
220MHz BOOMER	1st Place
432MHz BOOMER	1st Place
	Commercial

BOOMERS WIN AGAIN
1983 EME CONTEST WA1JXN
1st PLACE 2 METERS
WITH 12 X 32-19
PLUS
1st TO WORK SPACE SHUTTLE

They have talked to winning scores in many important amateur activities including the 1979, 80, 81 June VHF contests, 1981 Central States antenna measuring contest, 1981, 82 EME contests, 1982 Rocky Mountain antenna measuring contest and many more. Now there are three new numbers: the 424B, 24 elements for 432 MHz; the 410B, 12 elements at 432 MHz; and the 416TB, 16 elements at 435 MHz for satellite communications.
The new Boomer models feature insulated elements, stainless steel hardware, N type connector, T match feed and trigon reflectors.

THREE EXCITING NEW BOOMERS

HIGHEST GAIN BOOMER XL

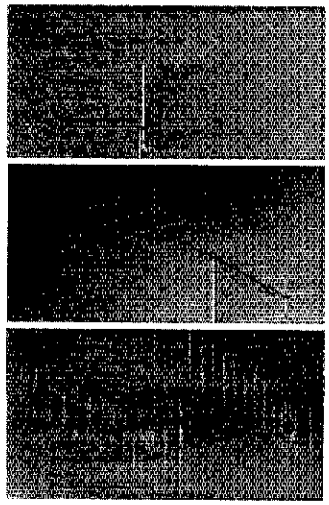
Boomer XL is "the antenna for 2 meter DX" with higher gain and cleaner pattern this antenna is designed to perform and survive in harsh environments. It has 18 elements on a 28.8 ft. 8.8 m tapered boom.
MODEL 4218XL 144-145 MHz

WIDEBAND BOOMER 215WB

Featuring the latest in wideband technology. The 215WB is high performance across the entire 2 meter band, for FM, SSB or CW. It features 15 elements on a 15 ft. 4.57 m boom.
MODEL 215WB 144-148 MHz

FM BOOMER POWER PACK

A combination of 215WB Boomers vertically polarized with support boom, power divider, and interconnect harness. Like all boomers it features all stainless steel hardware. You'll easily work those distant repeaters.
MODEL 230WB 144-148 MHz



OSCAR BOOMERS

Enjoy the thrill of OSCAR 10 with a Cushcraft antenna system, featuring the fabulous 416TB BOOMER, giving more performance through better electrical design and superior construction.

Order a complete package as shown left: 416TB, A144-20T and A14T-MB. For less than $200.00* you'll enjoy the thrill of worldwide OSCAR communications.

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Manchester, NH 03108 USA
TELEPHONE 603-627-7877
TELEX 953-050 CUSHSIG MAN

ESS	3590 kHz	1800		W2WSS mgr
NYS/M	3677 kHz	1000		WB2EAG mgr
NYS	3677 kHz	1900/2200		WB2EAG mgr

*Denotes section net, all times are local, please try and help out by checking in whenever possible. There was a meeting held at my QTH, with all of the appointees listed at the heading of the column, also in attendance was WA2DHF Vice Dir., we have asked Joe Kolb, W2NL to set up a "board" of one member form each club for a "V.E." board, to help with any problems that might come about in the V.E. program. If anyone is interested in doing demonstrations of amateur radio for schools please contact K2IZ. LIMARC will sponsor exams on the second Sat. of each month at the N.Y. Inst. of Technology, Route 25A Old Westbury. For futher info contact *Bob Reed, WB2DIN*, 2970 Valentine Pl., Wantagh, NY 11793. If your club or group is planning any type of activity (flea mkt, exam,...etc,...) please send the info to Woody, WB2IAP, he is keeping the master schedule of events in the section, and he publishes it in his monthly newsletter to all Affiliated Clubs. Please try and get the info to him by the 15th of the month. Radio Central ARC celebrated their 8th anniv. in Feb. Their club paper also lists tracking data, provided by KA2MUM, for OSCAR-10 for a one month period. W2GZD has been appointed by KA2RGI as Central Suffolk DEC and KA2JMA has been appointed EC for Town of Brookhaven. Congrats to members of Gt. South Bay ARC who upgraded, WA2SUB to Extra, KA2RGI, KA2UAS and N2FIF to Gen. LIMARC will hold its Bowling Party on Sat. Sept 7 at 2100 local at Wantagh Lanes. Please make reservations with N2FP, Jay. If any club is in need of a speaker, Norm, W2JUP, has a very interesting talk on Packet Radio. WA2ATL has been appointed EC for Islip Town. LIMARCs indoor flea market was a great success; hopefully larger indoor facilities can be found in the future. Traffic: K2YQK 294, K2GCE 214.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — ASM: K2BJG. SEC: WB2VUF. STM: W2XD. BM: W2FMN. RCC: W2CC. PIO: WB2NQV. RC: AD7I. ACCs: KK2U KY2S, NMs: W2CC KB2HM WB2RMI WB2ANK WB2PKB WB2QMP W2RRX W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1600 Dy	28	183	104
NJPN	3950	1800 Dy 0900 Su	31	307	162
NJSN	3735	1830 Dy	28	260	68
NJN/E	3695	1900 Dy	28	239	165
NJN/L	3695	2200 Dy	25	129	46
NJVN	49/49	2230 Dy	28	301	203
OBTTN	147.12	2000 Dy	Late		
TCETN	147.255	1930 Dy	Late		
NJRTTY	147.51	Autostart	28	225	351

Upline — Amateur Radio News call 201-735-8550. I guess some of my reports are falling through the "cracks" of the floor in Newington — no PSHR reports in the April issue. I'm checking it out! My new address is: P.O. Box 167, Ridgewood, NJ 07451. The Fort Monmouth ARA is conducting amateur radio classes at the MARS radio station, Bldg 682, every Tuesday at 7 P.M. for futher information contact Gerald G. Silverman, WB2GYS, club president. Congratulations to Ada Myers, XYL of W2SVJ who passed her Novice exam. Tri-County Radio Association Flea Market is May 19th. Ramapo Mountain ARC reports their "packet" repeater is back on the air and K2MRG & K2BJG will demonstrate "Packet Radio" at their April meeting. Amateur classes continue at our Lady of Perpetual Help School, Rm 107, Franklin Ave., near High Mountain Road, Oakland, NJ. This is an ongoing program. NNJ VE Board is offering Amateur License exams on April 13th, May 11th, June 8th and July 13th. Watch this column for later dates. Exams will be conducted at Union College in Cranford, NJ. Contact Carl Felt, N2XJ, for info. FCC Form 610 applications are exempt of the $4.00 fee. RAVEN Notes: WA2JVP upgraded to General and is now on the low bands with a TS-430S. K2SE has been certified at the Metroplex Club as a VE. CGNS Ed — we need more like you! KA2OHN is now KD2KD. Jersey Shore CHAVERIM reports two new members: WB2CDG and KA2WPO. On the 24th of February they had an interesting meeting involving "Zoning Amateur Antennas" by attorney Busch. Traffic: N2XJ 442, AG2R 226, KA2F 294, W2UH 55, W2RRX 37, W2XD 38, W2CC 10.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. SGL: AKØQ. BM: KØIIR. TC: KØDAS. ACC: WBØQAM — Thanks for your comments on the Section Newsletter. Congratulations to Extra Upgrades: NØBKB, NØCAZ, WA4VWV, General NØEFM, NØFYA and to Tech KAØKLC. CVARC has new officers which include WBØOET, NIØZ, WBØOAV, NØCS. The NWS invited the ARRL to participate in the Proclamation signing, for "Tornado Preparedness Week". Those who participate with SKYWARN should be congratulated and the other should offer help.

75M Phone	3970	1830-2300	M-S	2044	304
TLCN	3560	2330-0300	Dy	322	225
ICN	3713	7PM	M-W-F	75	37

Congratulations to WØSS for being selected as "Engineer of the Year" at Rockwell, Int. KØEVC received ARRL/25 year Pin. New QCWA/Iowa Net meeting at 3900/Sunday/2230 check'em out. Let me have your FD reports for bonus points. The State Convention will be July 19, 20, 21-See you there. The Cedar Rapids Hamfest changed to Aug. 4th, to avoid conflicts with others, watch for further info. KØTFT lost house and belongings to house fire. KØGP NCØR honored with PSHR. Bring a new kid to club meeting. See you on FD! Traffic: WØSS 201, WAØAUX 162, KØGP 129, NØCWW 94, KAØADF 91, WDØFWB 81, KCØXL 75, WØYLS 60, KAØX 58, WØBW 57, KØCY 57, NCØR 55, WØHTP 51, WDØHNB 37, KØBRE 35, WBØAVW 32, KØPT 31, W4JL 30, NØETQ 9, NØEFG 8, KDØBG 8. (Dec) KCØXL 81.

KANSAS: SM, Robert M. Summers, KØBXF — We all wish Mike, WAØLBB, the very best and hope by the time we read this he is out of the hospital and back on the air. The sun is shining and the birds are telling me it's time to till the garden cause they want that early worm. I guess this will mean a few of us will be getting real busy sooner than we think, but don't forget to report at the end of each month. Signals by either radio or club bulletins accepted. Net activity for FEB. KSBN QNI 1272 QTC 110. KPN 382/27. KWN 881/650. KMWN 676/624. CSTN 2068/83. QKS 150/68. QKS-SS 42/16. KS-RTTY 18/2. For your info the QNI on RTTY are WØCHJ ROY RBO KØEQH PFU KSØU WDØEUF KAØJRQ NØFWX KCØWO W7FK. Why not join the gang each Sunday at 1 P.M. 7073 kHz. Word from WØMYM that the HBN has also moved to 3880 kHz due to long skip problems. New repeater at Greenleaf WØFDJ/R 147.66/.06. WØKL reports ARES standing at 895 registered. The season for concern is on us so be prepared to act accordingly if requested to perform emergency communications. Contact your EC and volunteer to assist with communication co-ordination efforts in your area. If you are not aware of who your EC is contact WØKL or your

SM, KØBXF. Traffic: WØFRC 233, WØKL 204, WØQBK 178, WØFIR 140, ACØE 102, WØFDJ 91, WØOYH 72, KSØU 58, KØBXF 50, WØMYM 17, NØBDG 14, WØPB 12, NBØZ 8, WØRBO 7, KAØE 6, WØCHJ 6, WBØZEN 41. (Jan.) WAØOWH 3.

MISSOURI: SM, Ben Smith, KØPCK — SEC: WBØTOK. ACC/PIO: KT5Y. STM: KØSL. Bulletin Manager: WBØTEG. SGL: KA6CSJ. OO/RFI Coordinator WBØRHK. TC: K4CHS. Missouri ARRL Section Officials, WBØRHK, WBØTEG, KT5Y and KØSI attended the February PHD Club meeting. On May 18 the Northland Amateur Assn. will sponsor an educational and ham software exchange at Bennet Springs. Other activities are a Breakfast *8:00 to 9:30*, program exchange 10:00 to 4:00, 2 meter bunny hunt, tours of the state park, trout fishing contest and a Dutch BBQ at 6:00 P.M. For more information contact the Northland Amateur Radio Assn., P.O. Box 6710, Kansas city, MO 64123. KØCS, Sec. of the Kansas City DX club and Contest Coordinator has been appointed to be on the ARRL Contest Advisory Committee by Midwest Division Director, WØFIR. It is great to see all of the Missouri stations active on the region and the area nets of NTS. During January nine different stations from Missouri checked into TEN and five into DTEN. These stations bring traffic back to the section and local nets which give more section stations an opportunity to handle traffic Silent Key, WØLRU, of the Kansas City area.

Net	Ses	QNI	QTC	Day	Time PM	Freq MHz
MON	56	376	241	Dly	7:00/9:45	3.585
MOSSB	28	872	121	Dly	6:00	3.963
MEOW	28	637	38	Dly	5:30	3.963
ZAEN	4	147	30	Tue	8:00	147.84/.24
MTTN	25	88	28	Mon-Sat	6:30	3.370
PTN	12	37	22	MWF	9:00	21.114
HBN	24	256	13	Mon-Fri	12:05	3.880
PHD	4	137	11	Mon	9:00	146.43
MOFON	4	27	4	Wed	8:15	222.42/4.02
BRABN	22	337	3	Dly	8:00	146.39/.79
ARESN	4	51	2	Sat	9:00	147.855/255
CMEN	4	73	1	Wed	9:00	146.16/.76
LOZFM	4	78	0	Sun	9:00	146.13/.73
JOCCN	4	78	0	Sun	9:00	146.13/.73
TCN	4	53	0	Thu	9:00	147.09/.69
LARES	5	50	0	Wed	8:00	146.10/.70
SARN	4	27	0	Thu	9:00	146.43/7.03
IFN	3	23	0	Wed	7:30	147.84/.24
LOZCW	4	17	0	Sat	9:00	3.707

Traffic: WØBMA 667, KØSI 206, AIØO 162, KT5Y 132, NDØN 121, KØPCK 116, NØEVC 87, K2ONP 71, KØDSQ 60, KCØAS 58, KØORB 37, KYØU 33, WØOUD 31, NØSS 31, NIØR 31, NØBKE 27, WBØCBJ 25, WAØKUH 21, K9OCU 18, NP4D 9.

NEBRASKA: SM, Vern Wirka, WBØGQM — SEC: NØAIH, Jim Sanford. STM: WDØEGK, Jerry Kohn. The quick response of expert traffic handlers was very much appreciated by a Red Oak, Iowa family following the March Earthquake in Chile. Lloyd McElhaney, KØDKM, picked up a piece of health and welfare traffic from WØNRR. The traffic was an inquiry about the Red Oak, Iowa family relatives in Chile. KØDKM passed the traffic to NØAIM on the Tenth Region Net. KØDKM received word just two hours later that the persons in Chile were all right. The information was then provided to a very happy Red Oak, Iowa family. The Nebraska City repeater is now on 146.13/73. The change from 146.10/70 solves some interference difficulties with RTTY activity on 146.70 MHz. The Central Nebraska Amateur Radio Club repeater is back in full operation. The repeater sustained damage to two cavities when vandals fired a high powered rifle bullet through the cabinet that housed the repeater. The two cavities had to be replaced. A new net is being called Sunday evenings at 1930 local time on the Boelus, Nebraska 147.84/24 repeater by Fritz Thavenet, WBØMSU. The operators of the Boelus repeater are looking for signal reports, especially to areas north of the repeater site. The annual AK-SAR-BEN Radio Club auction will be May 19 at the Radial Social Hall (1516 Northwest Radial) in Omaha. Remember to preregister early for the Midwest Division Convention to be held in Omaha September 6-7 & 8 at the Holiday Inn Convention Center (72nd & Grover). Traffic: WBØTED 145, KØDKM 135, WØKK 89, KAØBWM 27, WDØBOX 20, WAØBOK 17, KAØBCB 12, WBØGMQ 6, KAØELI 6, WBØGQM 5, KØFRU 4, KØODF 4, WØNIK 4, KAØJLH 3.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Kaczur, K1WGO — STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: KA1ML. TC: W1HAD. PIO: KX1B. SGL: K1AH.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3840	1900/2200	231	304	K1EIR
CPN	3965	1800 M-S	121	320	KA1BHT
NVTN	22/88	2130	33	235	WA1EMI
WCN	78/18	2030	266	491	WB1GXZ
RTN	13/73	2100	50	226	KA1JAN

Greetings — Spring is here! This is Field Day and antenna season. Please enjoy but most of all be careful. On Feb. 3 TFC was handled via packet from SEC KA1ECL and on the same day KA1FTT played the Westlink tapes before the regular session of WESCON. This will be a regular event on Sundays. CN is running two slow(er) (13 WPM) speed sessions at 10:00 PM, Fridays, and 7 P.M., Saturdays (local Time). Improve your sending and receiving speed and also support your section CW Net by joining in. Congrats to W1DPR on his good work as Net Control of the Travel Assistance Net on Dec. 5. The Traffic Handlers Dinner will be held in April. The date and time will be announced. The FCC has issued an order which rescinds the repeater moratorium which was imposed by the NPRM in PR docket 85-22. Congrats to Mary, WB1GXZ, once again for 100% representation to FRN. The New England Spectrum Management Committee is actively developing an overall policy for coordination of frequencies within and across borders into adjacent areas. Please help with information comments and suggestions in the Conn. section by contacting WA1DCP, our Connecticut committee member. Tom, K1KI has mailed a newsletter to all ARRL members in the New England Division with news comments and a request for volunteers to work with the field organization. Please complete the questionnaire and return it to Tom so he can represent our views at the July ARRL board meeting. Our section Technical Coordinator W1HAD is accepting applications for Assistant Technical Coordinator. If interested please contact him as soon as possible. OBS reports: KA1XZ 8, KA1XG 4, W1NU 4, K1VKO 4, KA1FT 4, 73's. Traffic: WB1GXZ 413, W1EFW 359, KA1GWE 168, KA1KTH 145, W1BDN 113, N1BOW 103, KA1JAN 96, W1WP 93, W1YOL 79, KA1BHT 71, N1DBH 59, K1AQE 58, KA1KPS 56, KA1XG 36, KA1EGE 22, WA1NLD 13, W1CUH 9.

EASTERN MASSACHUSETTS: SM, Luck Hurder, WA4STO — ASM: K9HI. STM: KW1U. SEC: W1IAY. OOAUX: KA1KE.

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Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.
"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.
Automatic CR/LF: While transmitting, CR/LF automatically sent every 64, 72 or 80 characters.
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LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.
WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.
CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for Tuning:** Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.
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BM: W1HH. ACC: K1AZE. TECH: KA1IU. PIO: WA1IDA. SGL: K1BCN.

Net	Mgr.	Freq.	Time(Loc)/Dy	QTC	QNI
EMRI	N1AJJ	3658	1900/2200/Dy	711	390
EMRIPN	N1BGW	3880	1730/Dy	653	315
EM2MN	KA1AMR	63/23	2000/Dy	732	504
NEEPN	K1BZD	3945	0830/Sn	16	70
HHTN	WB1CMQ	04/64	2230/Dy	458	438
EMRISS	KA1EXJ	3715	1600/2030/Dy	201	238
CI2MN	N1BYS	645/045	1930/Dy	225	310

Congrats once again to N1BBT/MM for another job extremely well done — and to all who assisted Brian in his efforts. Each of you who handled even a few of the many messages between the MMA cadets and their families shoreside was a very important link in the overall effort. It was interesting to watch packet stations who don't normally participate in traffic nets suddenly pick up messages for delivery. FB! Thanks to Falmouth ARA, Wellesley ARS, Sturdy Memorial ARC, Cape Ann ARA and Lawrence ARF for their newsletters which I can certainly use for this column. All clubs and individual amateurs are encouraged to send me any news regarding their activities. Congrats and thanks go out to all clubs who are sponsoring classes and exams for their fellow amateurs. I had the pleasure of attending SEMARA's first exam session and was impressed with their dedication and their show of professionalism. If SEMARA's sessions are any clue, it is safe to say that amateurs are now in excellent control of their own upgrading destinies. Bulletin Manager W1HH looking for many more OBS appointees. How about it, all of you with RTTY capabilities? Won't you consider contacting W1HH or myself for more info on how you can easily be of service to other amateurs in your community? Ditto for those of you with expertise in technical matters; we need you to field questions from others who are having many different sorts of difficulties. Contact KA1IU or myself for info. Traffic: N1BBT 4385, KW1U 2266, WA1TBY 981, KA1EXJ 791, N1BGW 783, K2LP 668, WA4STO 666, KA1BBU 632, KN1K 593, KB1AF 341, WA1DXT 337, KA1AMR 332, K1GRP 278, WA1FCD 270, N1DDC 224, N1AJJ 205, N1BHH 194, KB1PA 162, N1BYS 150, W1TKZ 138, W1GE 112, WA1FNM 101, W1ZHC 93, WB1CMQ 92, K1ABO 90, KA1EID 73, K1LCQ 70, N1ER 69, K1BZD 49, WA1LPM 40, WA1SNH 29, W1QLL 19, KY1B 17, KA1DJV 19, WA1PID 15, KY1K 9. (Jan.) K2LP 736, KA1LKA 61, WB1CMQ 40, KA1DJV 15.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. The Maine Cabinet, section field leadership, meets 1st Sunday each month at 9:30 A.M. on 3940 kHz. Meeting planned for ½ hour then open to questions from membership as a forum. Your participation is invited. The Section Manager is eager to accept club invitations. He will be in Presque Isle for Field Day. The hamfest held at Abbott for years will be at St. Albans August 9, 10, 11 with VE test on 10th. Novice classes being held by PAWA and by W1RWG. KA1IJI & XYL proud parents for 3rd time. Radio comms for 4th annual Skowhegan road race Feb 9 provided by KA1FXI KA1FXH KA1EMK KA1C KA1DDA KA1AVU WA1YRO N1BLZ for ninety entrants. PSHR: WA1YNZ 89, KY1E 80, N1BJW 74, WB1GLH 71, KL7IJG 70, WB1CBP 52 (novice). Traffic: KA1JOJ 125, WB1BYR 111, N1BJW 110, W1ISO 105, WB1GLH 100, N1BLZ 96, AK1W 94, KY1E 75, KA1JPR 71, KL7IJG 64, W1RWG 53, W1KX 51, KA1AVU 46, W1BMX 46, WA1YNZ 39, KB1PB 31, W1JTH 21, WB2CBP 21, W1GCB 13, N1BME 12, KA1ENL 11, W1AHM 11, KA1FTL 7, W1OTQ 6, KA1ENM 3. (Jan.) WB1BYR 56.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: Open. NH had 98% representation on FRN. Great going everyone. GBRA plans trip to ARRL Headquarters. Contact KA1JLK for details. KX1L vacationing in DC. June 1 Special Event station W1GUA will operate from Fort #4 at Charlestown NH from 10 A.M. to 5 P.M. local. Contact WB1GXM for more details. Next CVFMA amateur exam is June 8. W1ANF KA1MNK KA1HNU K1CAU KA1MKH WA1DHH KR1D N1APM WA1EZE KR1L KA1JF W1NH enjoyed the Sunday morning breakfast meeting in Raymond. N1NH and W1FYR made BPL. KA1LLP won ICOM 2AT at Rivendell Radio Store's new location. KA2PJB/1 now Lt. Col. in Air Force at Pease AFB. On Sundays at 5 P.M. the Keene Machine links to NYC and Florida. By the time you read this, Spring will be here. Enjoy. Traffic: N1NH 507, N1CPX 334, AK1E 319, K1PQV 160, W1FYR 143, W1TN 142, N1AKS 131, W1MHX 105, K1UWB 71, N1ALM 53, KK1E 48, N1BVI 47, W1ALE 41, KV1S/4 34, K1TQY 33, KA1HPO 28, KA1GOZ 23, WB1GXM 16, KA1QF 1.

VERMONT: SM, Ralph T. Stetson, III, KD1R — Next Exams in Windsor, VT June 8 sponsored by CVFMA contact WB1GXM with SASE for information. Feel free to drop WB1AJG an SASE for information on the next CVARC exams. To all of you who up-graded at Milton: Congratulations KA1MNH, KA1EYX, KA1KLJ and the rest whose calls I don't know, Good Job. I hope that by now you have your Field Day 85 plans in motion. If your group would let me know where you will be set up I will try and visit as many FD sites as possible. Let's get in there and support your local club on this one. After all the most fun of FD is the sharing of less than ideal conditions (Black Flies and all). The CD Workshop at Waterbury went off well. By the time you read this we will have had our second meeting and you will be hearing of any and all developments through your Local Clubs first. Special thanks to Ed N1QG and the Airborne ATV group, the Packet Radio interest was well represented by KC2JO and company. Two super demos, something your club program person might want to keep in mind for upcoming programs. Net Reports: VTN 28/140/126, VSSN 12/28/11, VSSB 27/372/84, VTFD 4/66/13, CAR 24/898/35, VTPN 4/81/5, CVFM 4/62/6, VTFMN 27/332/57, GMN 28/350/30. Traffic: KT1Q 408, W1KRV 172, AE1T 152, N1COB 59, N1ARI 57, W1OAK 36.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — STM: W1UD. TC: KA1JJM. OO/RFI: N1CM. SEC: WB1HIH. Great job by W1YBT arranging communications for Bay State Winter Games at four sites. N1DAY back to work as OO/AA after nice visit to Capetown and Brussels. Silver Snoopy award presented to N1AFY for work with astronaut program. HCRA classes have almost 100 students. Regret to learn of WA1UQV and N1AJZ recent Silent Keys. Congrats to KA1KRJ on upgrade to Extra. Montachusett ARA getting ready for Field Day. If your club making its plans yet? VEs in New England gave 27 exam sessions in first 5 months of program. Almost one exam per month per state. PSHR: WB2HIH W1KK KA1T. Traffic: KA1T 386, W1SJV 182, KA1EKQ 154, W1UD 129, W1KK 117, WB1HIH 72, W1JP 63, WA1OPN 27, W1ZPB 15, WB1FSV 13, K1JHC 8, WB1HKN 8.

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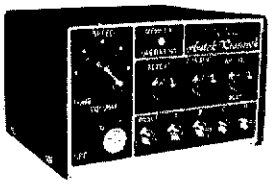

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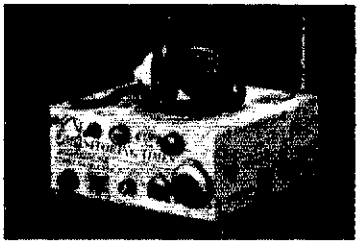

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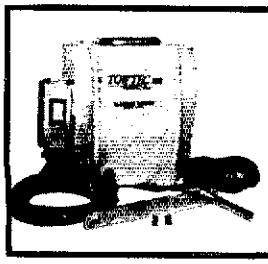

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NORTHWESTERN DIVISION

IDAHO: SM, Lem Allen, Jr., W7JMH — SEC: KD7HZ. STM: W7GHT. PIO: WB7PFO. OO/RFI: KU7Y. Club News: Voice of Idaho Club new officers are Pres. AC7R, VP N7FYZ, Sec-Treas N7FZA, Membership Dir WB7DOW, Tech Dir KI7B, Chm of Bd W7ZPC, Dir WB7USD. ARRL Matters: All amateurs are encouraged to renew ARRL membership, or join the League through the local amateur radio club. All clubs in Idaho are urged to build membership, increase activity — especially public service activity — and affiliate with ARRL, develop a program of teaching and examining and become a Special Service Club. People and Things: W7EYR got his amateur license 50 years ago on April 6 — Congrats, Bud! KA7NKW upgraded to General. W7JKB is in hospital again with a leg problem. W7JMH and N7DYU spent 4 days in Twin Falls making measurments for KEEP radio. W7IWU and Edna back from trip to Yuma. KK7X out of hosptial, looks and feels great! W7JMH as new FT 757 GX. The ham community is saddened by the deaths of Henry Bowden, W7HDB, on Feb 9 and Joan Gabica, W7DRZ, on Feb. 19. They will be missed. Net Reports:

				Ses	QNI	QTC
FARM	3937	lsb	7P Da	28	1622	39
ICD	3990	lsb	810A M-F	20	826	15
IMN	3635	cw	8P M-F	17	160	59
NW TFC	146.98	FM	Da	28	192	14

GENERAL: Did you ever try a backyard SET? Move your battery powered rig out in the yard on a card table and set up an emergency antenna of some sort. Then try to contact as many local hams and adjacent communities as you can. Fun, informative and very valuable experience you can draw from in future! Traffic: KA7KAI 140, W7GHT 42, W7JMH 36.

MONTANA: SM, Les Belyea, N7AIK — Members of the Hellgate ARC will appear in a nation-wide ARRL TV public service spots in early June prior to Field Day. This was put together by KA7MMY from Missoula. The following upgraded at the Great Falls VE exams, K7SQZ to Adv., KA7QVY to Gen, KA7TZO to Tech. The next exam session in Great Falls will be May 11th contact N7AD or WB7TNH. Butte upgrades are KA7INW & KA7SVS to Adv, KA7SBB to Tech. Next Butte exam will be June 15th, contact K7KOR. 1985 officers for the Lower Yellowstone group are KC7AA-pres., WB7QZU-vp, N7DYE-sec'y/trs. N7CGC, KA7BNE and WB7TWG gave a Ham Radio demonstration to a 4th grade class of gifted students and the North Park school in Billings. WA7GQO has been elected manager for the Montana Traffic Net. PSHR - WA7GQO, KF7R, WB7WVD.

Net	Ses.	QNI	QTC	Mgr.
IMN	17	160	59	KY7I
IMNS	7	18	15	KY7I
MSN	4	80	0	K0PP

Traffic: WB7WVD 100, KF7R 35, N7AIK 25, WA7GQO 23, WA7TUW 1.

OREGON: SM, William R. Shrader, W7DMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. STC: N7ENI. Upgrades: KA7UFG (small list). WA7OTI was honored with special membership by the Rogue Valley ARC for long years of service to the club. WA7CZA and XYL are the proud parents of a new daughter. KE7DL has a new advanced call and is also the new president of the Sunset Empire ARC. N7ENH is engaged to be married. KA7IPS helped organize a high school speech tournament at McMinnville H.S. which included 500 students from 43 Oregon schools. KA7MDM and KA7KDU had a QSO from McMinnville to Amity via the Russian RS-7 satellite. So. Ore. ARC officers: N7EZY, Pres.; KA7CZG, V. Pres.; KA7QPS, Sec.; KA7NCJ, treas. Central Oregon ARC officers: WB7PII, Pres.; WB7SOZ, V. Pres.; N7CSH, Sec/Treas. 1988 National ARRL Convention will be held in Portland at Jantzen Beach Red Lion. WB7SIC is overall Chairman. Congratulations to all! If you need info on antennas, listen into the Antenna Net on 7229 kHz at 9 PM (0500Z) daily. Need ECs for Linn, Wasco, Dechutes, Crook, Malheur, Harney, Baker and Wheeler counties. If interested contact N7CPA. Traffic: W7VSE 674, AL7W 165, W7LRB 160, N7FLC 140, WB7OEX 69, N7BGW 54, KX7W 53, WA7VTD 46, KA7AID 40, W7LNE 25, KX7T 24, W7FDU 18.

WASHINGTON: SM, Joe Winter, WA7RWK — STM: K7GXZ. SEC: W6IIH. BM: KD7G. TC: K7UU. PIO/SGL: W7CKZ. OO/RFI Coord: KC7FA.

Net	Freq.	Time(Z)	QNI	QCT	Mgr.
EWTN	146.04	0030/0430	33	60	WA7CBN
NTN	3970	2000	1156	74	W7UU
NWSSB	3948	0130	461	52	W7HFN
PSTS	145.33	0030/0630	157	111	W7IEU
WARTS	3970	0100	2772	168	W7SFT
WSN	3590	0130/0545	318	114	W7GB

Are you ready for Field Day? Time is getting short! Remember the dates are June 22-23, 1985 the fourth weekend in June. The Mike & Key Electronics Flea Market in Puyallup appeared to have a record attendance. I talked with hams from Oregon, Estrn. WA and B.C. Congrats to the M&K for a great event. The first Hamfest this year is the Yakima HF May 18-19. Greater attendance is expected because of the pent-up desire to attend hamfests due to the cancellation of the Skagit and Vancouver HFs. The WA SEC is holding the annual ARES noon EC meeting in Yakima on Sat. May 18th at a restaurant yet to be determined. So all ECs. and RACES ROs. contact W6IIH and join this important meeting while also enjoying the HF. The next event is the NWtrn. Div./OR. St. Convention May 31 - June 1 & 2 Seaside, OR. This popular event has something for everyone. Call Al 1-503-228-8647 Days or Doc 1-503-738-6461 eves. The Lower Columbia ARA has been active by providing communications for the Special Olympics held at three separate schools in the Longview area. They have also challenged the Clark Co. ARC and Tri-Cities ARC to an inter-club contest on Field Day. A good idea that many clubs could adapt for greater fun during Field Day. The Rebel's annual Banquet was held in Tacoma March 16th. Plan to attend the June BBQ at Indian Hole Campground near Morton contact K7TVO & WA7FNC for info. The Olympia ARC is becoming increasingly active. They sponsor a 220 MHz repeater and are pursuing a coordinated freq. for a 2-meter machine. They are very successful with their license classes and are now scheduling license Exams. Tech. thru Extra on May 18th and June 29th. Additionally they are furnishing commns. for the Capitol Bicycle Club, a Poker Run in June, helping with a road rally and a Bike-O-Thon. Many of the 75 members are ready to participate in emergencies with ARES. Good Show! The Chehalis VARS is conducting an upgrade exam session April 27th. Lewis Co. EC KA7EOV attended an all day emergency exercise in preparation for two county exercises this summer involving ARES & RACES. Traffic: WB7WOW 484, N7CSP 374, KD7ME 370, KR7L 220, K7GXZ 103, KR7F 90, W7LG 72, W7GB 55,

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4/85

W7IEU 41, WA7BDD 19, K7AJT 18, K7CTP 17, KD7G 16, KD7TJ 16, N7FXM 12, K7OXL 10, W7AIB 2.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN. SEC: W6LKE. STM: NI6A. The only "official" OOs in the section now are K6ARE and W6RGG. None of the others have submitted their qualification exams to Hq. and are therefore no longer eligible to participate in the program. I am now privileged to receive the Benicia ARC newsletter, "The Logbook." The club has been around for sometime but this is their first try at a club publication. Although no one is listed as editor, the news is gathered by N6LEU N6KVI and KE6IA. The club meets on second Wednesday of each month at the West End Hose Company, Solano and Hastings, Benicia, at 7:00 P.M. Their 1985 officers are Pres KG6LV, VP KA6VVJ, Treas KA6IXG, Sec N6LEU. The club net is on 145.575 each Monday at 8 P.M. LARC welcomed new members K2BIO K6MYH and WB6FJC. Their member WA6OHB recently upgraded to Extra. MDARC welcomes W6OVJ N6JTK KA6ZBN WA6UPU K6LXW KG6HU K2BIO K6ED KB6UY AK6T WB6WLU Carson Taylor and R.L. Robinson as new members. Traffic: W6VOM 120, WB6DOB 65, WB6UZX 29. (Jan.) WB6DOB 162, W6VOM 132, NV6T 81.

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: K7HRW. STM: W7BS reinstated, did not resign as I thought he had, sorry Dick. We're still plugging to let it be known that HOOVER DAM FIFTIETH ANNIVERSARY WILL BE CELEBRATED IN SEPTEMBER. NNARA has selected Buttermilk Mountain for their Field Day site. WB5VDV now KE7CC. K7HRW reports 375 check-ins on NV weather net, KA7EUA CHOP, FB. WA7GAE off the air for couple months, staking a new claim on Round Mountain. W7HQT is a Silent Key. All who knew Joe will miss him very much; he was 99 years young. TC K7ICW reports KD7YZ and NK7Q may have made first two-way contact via PACKET RADIO (any challengers?). W7HP worked GW3YDX on 160M using CW. VE given at CES with 37 candidates and a 50% upgrade CHOP was NK7N ex N7BIG. Traffic: W7PBV 2.

PACIFIC: SM, James Wakefield, AH6CO — 11 Oahu hams participated in communications for the 2nd annual St. Francis Hospice 10 K Run. Stations were manned by AH6DJ and KH6s LT, JUZ, WG, BIO, CIZ, IS, UM, HJA and BI as NCS. HIJ has an "Eave" logwire nearly invisible. KH6B has a new QTH — one acre at 1000 ft. Kauai gave communications for "off road dirt bike race" and Capt Cook Parade and stood by for weather watch on 15 February. WH6ASO (Hawaii West) has a new TH6DXX and a new Ten-Tec HT. HARC VEC had 18 applicants for testing and Koolau had 9. KH6DQ asks for all who expect cards to send him an envelope. He will discard in the near future. Let's all plan on Field Day and watch the date this year. Aloha. Traffic: KH6B 128, KH6HIJ 47, KH6S 37, KH6RQ 2.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — STM: WA6WJZ. OO: NY6Z. SEC: WA6ZUD. ASM: W6RFF. Winter storms continue to keep most of us indoors. Time to plan for summer activities and work on WAS, DXCC, etc. Jim Wilmeth, WA7QQR, former EC, Amador County was honored by Pac. Div. Dir. Stevens with certificate of merit recently. Others honored include: KF6GY WA6ZGS WB6RFI KE6NS WA6WIY WA6ESA and N6FGR. Congratulations to these shakers and movers in Amador County. Don't miss the North Hills A.R.C. Swap Meet, 5/5 and Placer County Fairgrounds, Roseville, CA, all day. Volunteer Examiner Program progressing well in section. I still am not receiving notices of all exams. Please help by sending me info regarding them. I receive some 15-20 requests per month for exam info. HELP. No upgrades or new calls to report this month. Traffic: N6CVF 381, WB6CLD 250, WA6WJZ 53, K6SRF 52, WD6BZQ 47, WA6ZUD 15, KA6PDG 8, WB6SRQ 5, WA6ERZ 3.

SAN FRANCISCO: SM, Bob Smith, NA6T — Glad to see Bob, K6TP, is out of the hospital and on the road to recovery at home. MARC is organizing the EC plan for the county with quite a few drills. If you are interested in EMERGENCY COMMUNICATIONS contact Nels, N6AQY, for further information. W6LQY, Bill, and WB6RHP, Warren, facilitated a rescue near SEA RANCH to a successful conclusion. The vehicle rolled 200 ft. down a cliff, but the driver was safe. FWRA is moving the 146.01-61 repeater to Garberville to further upgrade the FWRA Reptr. System. All reptrs. in Del Norte, Humboit, and Western Trinity counties are under new Co-ordination — The Pacific Amateur Repeater Operators Coordinating Committee, PAROCC for short. This Coordinating group should be more suited to REAL NORTHERN CALIFORNIA. SFRC has been very active with Walk-a-thons, Bike-a-thons, and TX hunt planning, as well as VE Test plans — get out and help with the activities. REDXA had a good showing at the Fresno DX convention. Traffic: W6IPL 454, W6RNL 108, N6FWG 60, K6TWJ 34, KK1A 26.

SAN JOAQUIN VALLEY: SM, Charles McConnell, WD6PD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. Appointments renewed: PIA KV6W and WB6MDN; TC WA6EXP. WB6SUP is the new EC for San Joaquin County due to the resignation of KA6FCH. WB6ITM and WA6MNQ have qualified as members of the Amateur Auxiliary of the FCC Field Operations Bureau as Official Observers. W6IRQ and KF6ZQ (ex WA6VIS) are Silent Keys. Congrats to recent upgrades: Advanced-WD6AFC; General-N6JQX, KB6GZG, KA6ILO; Technician-KB6GYO, KB6HBF, KB6GWT, KB6CZF, KB6HIY, KB6EHI, KB6EAL, KB6EBH, and KB6GXX. W6FAH and KB6YC are chasing DX on 80 meters. W6TRP has an IC 751. KB6GXX has a TR 7400A. K6PDE, WB6SPT, and K6SEA are on RTTY. N6OZ has a Model 32 RTTY machine. KG6FX has an IC 3AT. Now is the time to start planning for Field Day, June 22-23, 1985. Traffic: N6AWH 266, W6DPD 34, W6SX 6, WA6YAB 4.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — BM: W6BCY. PIO: N6BIS. TC: K6HLE. SEC: K6ITL. ACC: W6MKM. ASM: NS6N. STM: W6PHT. AA6PZ recently spoke to SCCARA about charging NiCad batteries and how to keep them in good shape. KA6NDX recently called W6ASH requesting help in an attempt to contact the son of a friend who had just passed away. The only information known was that the son was vacationing in the big island of Hawaii. The name and age of the son were the only other items of information known to 'NDX and 'ASH. W6ASH was on HF within minutes and, with the assistance of W6JZU, was talking with amateurs in Hawaii in an attempt to locate the hotel where the son was vacationing. Within 8 hours the son was located and making arrangements to return home. A good example of how amateur radio can be of use for public service. WB6OQS once again turned out a large number of amateurs to assist the March of Dimes in its annual Walkathon. Over 60 amateurs participated in this years event. ASN NS6N

and N6BWX gave an interesting presentation to the Gabilan ARC on "Gray Line Propagation." The new officers for the Gabilan club for 1985 are: Pres.: NJ6L, VP.: KA6VVE, Sec/Treas. K6JHK; and handling Publicity/Newsletter is KB6CDB. KB6CDB is also a Public Information Assistant for the southern part of the section and is doing a good job getting publicity for amateur radio in San Benito and Monterey Counties. PIO N6BIS is busily working on getting the Section Speakers Bureau in full swing. If you're interested in giving non-technical talks to schools and service clubs in your area, let N6BIS know. N6FAD recently gave such a talk to the Santa Cruz Yacht Club. WD6CHD has turned over the editorship of the SCCARA newsletter to WB6WKM. WB6WKM has been very active in amateur radio since becoming licensed in 1977. He is an avid DXer and is currently the Secretary for the No. Cal. DX Club. The new editor of the NCDXC bulletin is WA6O. He has plans to include some ARRL information in the DX bulletin. KA6ZAK is the new editor of the No. Peninsula Electronics Club bulletin. Speaking of bulletins, one of the most difficult jobs in an amateur radio club is to edit or write the club bulletin or newsletter. One of the ways you as a club member can contribute is to send information to the editor. A short paragraph or two about some technical problem that you have encountered and solved can be a valuable piece of information when shared with the other club members. SEC K6ITL had a recent meeting with over 20 of the ECs and DECs in the section to cover some topics of interest to those involved in emergency communications. He plans to have the meetings quarterly. The section still needs more people who want to become involved in handling traffic. If you think you might be interested, talk to STM W6PHT. KB6FKL, the 13 year old son of KB6GPR, recently upgraded to General. He won't stop there however, because he has a 20 wpm certificate and will soon be testing for Advanced and Extra. WA6VFD is the new Emergency Coordinator for Cupertino. Traffic: W6YBV 164, W6KZJ 108, W6ZRJ 14. (Jan.) W6ZRJ 26.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. SGL: AB4W. May is the month for the League Planning Meeting. Mark your calendars now for May 11-12 sponsored by the Raleigh ARS. Everyon eis invited to attend the LPM at the Ramada Inn, Apex, NC. Clubs send a representative. For more details contact W4TZU or K4HF. Cape Fear ARS, WB4YZF, scored a MAJOR victory with county government officials regarding antenna restriction ordinance. Amateurs need quick action on PRB-1 proposal. State government agencies mailed letters to FCC supporting Leagues position on same. Just a note of sincere THANKS to every amateur in section for a FB job well done. Within last year the traffic totals have increased 10%, SAR reports have increased 20%, ECs have increased 10%, amateur radio clubs affiliating with ARRL have increased 10%, ORS increased 50%, OES increased 50%, OO increased 67%. This indicates more interest in section participation and you volunteers make it all possible and worth it all. Congrats to NJ4L our new NM for CN/GNL, VHF Contest and Field Day are just around the corner. Make your plans now to participate and enjoy the fun. W4NC now conducting FOXHUNTS. Does you club have a special project? Amateurs in Asheville alerted when huge rockslide closed I-40. This natural disaster is one reason we amateurs prepare to be ready. Hamfests: Durham, May 18. Traffic: WD4LRG 298, K4NLK 260, N4JRE 202, KA4EYF 193, WB4N 167, WB4WII 162, KB4IVV 101, WB4HRR 87, K4SWN 85, WA4SRD 66, N4LFX 65, K4IWW 63, NJ4L 61, KA4YMY 56, WA4MNR 55, NT4K 48, WD4CEB 40, K4YJB 37, NE4J 36, N4JEO 36, WB4DAR 34, KU4W 26, WD4HTE 22, WB4CYN 20, N4UE 19, K4QXA 18, N4CJJ 15, N4KYD 11, WA4PID 11, WR4E 9, K4GI 9, WB2RQF 7, WD4BCX 4, W2JDB 3, WA4TTS 2. (Jan.) NJ4L 70.

SOUTH CAROLINA: SM, James G. Walker, WD4HLZ — I have just read, "Dangerous Precedent". The article describes a cease and desist order issued by the FCC to an amateur in our section. I believe any one of us could find outselves in a similar situation just by building a state of the art VHF/UHF amateur station. Lets pick our equipment — 1) transceiver, 2) legal limit amplifier, 3) 100 foot tower, 4) Heliax transmission line, 5) 22.24 dB stacked array and 6) preamp for weak stations. We calculate the ERP and find it to be about 40,000 watts. You have assembled a station with an ERP 3-4 times greater than most commercial FM stations and placed it in the middle of a residential area. The trouble now begins — "BLANKING". FCC Rules state that the commercial station must solve the "blanking" problem. For amateurs, the rules do not cover that situation even though we can operate at must greater ERP. Section 97.67(a) mandates use of the minimum power necessary for the communications in progress. If we abuse the Rules by insisting that we have the right to operate "LEGAL" limits, the FCC will answer with a limit on ERP. Traffic: K4ZN 362, K4WJR 238, W0IKT 237, W4ANK 156, W4NTO 124, KA4LRM 73, KB4BZA 72, K4ZB 45, W4FMZ 34, K4FRX 31, WB4UDK 24, WJ4P 20, WD4FJP 15, KA4YEA 8, W4DRF 2.

VIRGINIA: SM, Claude Feigley, W3ATQ — STM: WD4ALY. SEC: WB4UHC. ACC: WD4KQJ. OO: W4HU. BM: AB4U. SGL: W4THV.

VTN	1 P.M.	3907	AA4AT
VSNB	6 P.M.	3947	WB2OMZ
VSN	6:30 P.M.	3680	KB4WT
VN (EARLY)	7 P.M.	3680	N4GHI
VN (LATE)	10 P.M.	3680	KR4V
VLN	10:30 P.M.	3947	KA4IUM

The K4KDJ annual Valentine massacre has come and gone and as a result AA4AT N4GHI N4EXQ and K4KDJ made BPL. It is with great sorrow that I report KB4OG as a Silent Key. Tucker was a very reliable traffic handler and active both in his club and Emergency Service Nets. He will be missed by all. The Vienna Wireless Society reports a successful VE exam with 61 taking the exams and 54% passing. NK4U, two prefix QSL bureau, requests all DXers to send in an envelope with postage for their cards at once. The Bureau will be forced to destroy all unclaimed cards in the near future. If clubs within a 200 mile radius of N. Va. will send their exam dates to NK4U, she will publicize in that area. By this time, all affiliated clubs should have submitted their annual reports to Hq. If your club has not done so, please do so at once. K4JST has taken over as 4RN cycle 4 manager until a permanent mgr. is appointed. N4GHI has taken over Gil's spot as VN mgr. It is still not too late to qualify for the Va Phone 50th anniversary check in on 3947 at 4 or 7:30 P.M. W4WWQ reports Lynchburg club has a digipeater atop Tobacco Row Mt. with coverage into the Richmond and Greensboro areas with 12 stations active. Also the Tidewater area is becoming active with stns operating Packet both VHF and

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  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibility.
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug.
- TL-922A linear amplifier (not for CW QSK).
- SM-220 station monitor (not for pan-adapter).
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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HF. Several are using the TAPR TNC with good results. Plan now to attend the Division League Planning meeting May 11-12 at Raleigh. All affiliated clubs should be represented. Upcoming hamfests, Manassas, June 2, Berryville Aug. 4. Traffic handled 5707 with 39 stations reporting. Traffic: AA4AT 706, N4GHI 685, N4EXQ 624, K4KDJ 600, W3ATQ 469, K4JST 297, WA4CCK 284, AA4GL 243, WD4ALY 243, WD4OCW 203, KB4WT 151, KR4V 148, K4JM 142, WB4PNY 97, K4AXF 96, KA4IUM 88, WB4FDT 86, WY4T 75, NT4S 51, WB4KIT 49, K4ECD 44, K4MTX 42, K3RZR 34, K4GR 31, WB4EDB 27, WB4UHC 21, N4KSO 19, NW4O 18, N4FNT 18, N6ANQ 17, K4MLC 17, W4LXB 15, WA4TVS 12, W4TZC 11, KI4LO 9, K4VWK 9, W4PVA 8, WB2OMZ 4, N4LE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Rpt Coord: WD4KHL. KD8RD has been appointed an OBS. New ORSs are KZ8Q and WD8LDY. KD8RD has been re-appointed NM for WVNN. New net time is 5:30. Was nice to see everyone at Fayetteville H. F. on 2/24., very nice affair again this year.

Net	Time	QNI	QTC	Sess.	NM	Freq.
WVFN	6:00	1074	180	28	N8AJC	3865
WVMD	11:45	1047	80	28	W8FZP	7235
WVRN	6:30	318	75	28	KD8RD	3640
WVN	7:00	253	126	28	W8LYV	3567
Hillbilly	Noon Sn	143	25	4	W8YP	14290

Traffic: WD8LDY 307, KZ8Q 191, K8TPF 160, KD8RD 122, W8YP 100, WA3NUI 90, W8FZP 89, W8JWX 84, K8UQY 81, KD8G 71, KA8OMM 70, NC8G 39, K8QEW 39, K8KT 38, KA8OGF 29, W8CAL 18, WA8KCJ 10.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQØJ — SEC: WBØFQB. STM: WDØAIT. OO/AA: NCØF. ACC: WBØDUV. PIO: KAØPYH. SGL: WDØGQL. TC: KOØP. BM: WØMDT. With electrical storms, spring floods and the tornado season about to begin, we are reminded of the SWN and KØQBA who has resigned as the SWN Coordinator after many thousands of hours of dedicated work. KAØCZW is taking this large job over as SWN Coordinator. . . and we wish him the best in this endeavor. My thanks to the Aurora Repeater Association for hosting a very find State Convention, and particularly to the many members who pitched in many manhours to make a successful event. Congratulations go to WBØTWE for the fine coordination of the Health Fair. . . and a big thank you to the many amateurs throughout the state who helped with communications. VE test schedules for: May 4th Ft. Collins (NØEEE), May 9th Aurora (KQØJ), May 18th Littleton (WDØAIT). June will have tests in Boulder (WBØZID) and in Loveland for Superfest. Name droppers: Colorado VE Teams across Colorado for donating their time to conduct test sessions. 73, KQØJ. Nets: COL: QNI 846, QTC 74-Inf 108, Time 920, 24 sess. CWXN: QNI 2414, QTC 2757, Time 2520, 28 sess. CWN; QTC 55, QNI 121, Time 495, 25 sess. HNN; QTC 190, QNI, 1782, Time 1428, 28 sess. NCTN; QNI 208, QTC 59, Time 243, 22 sess. Traffic: NØBQP 2190, WAØHJZ 1600, KØRXK 460, WØACH 272, KBØZ 148, NØDZA 136, WØMDT 125, KD7EY 123, WDØAIT 72, WDØBSZ 66, AIØW 18, WØHOP 14.

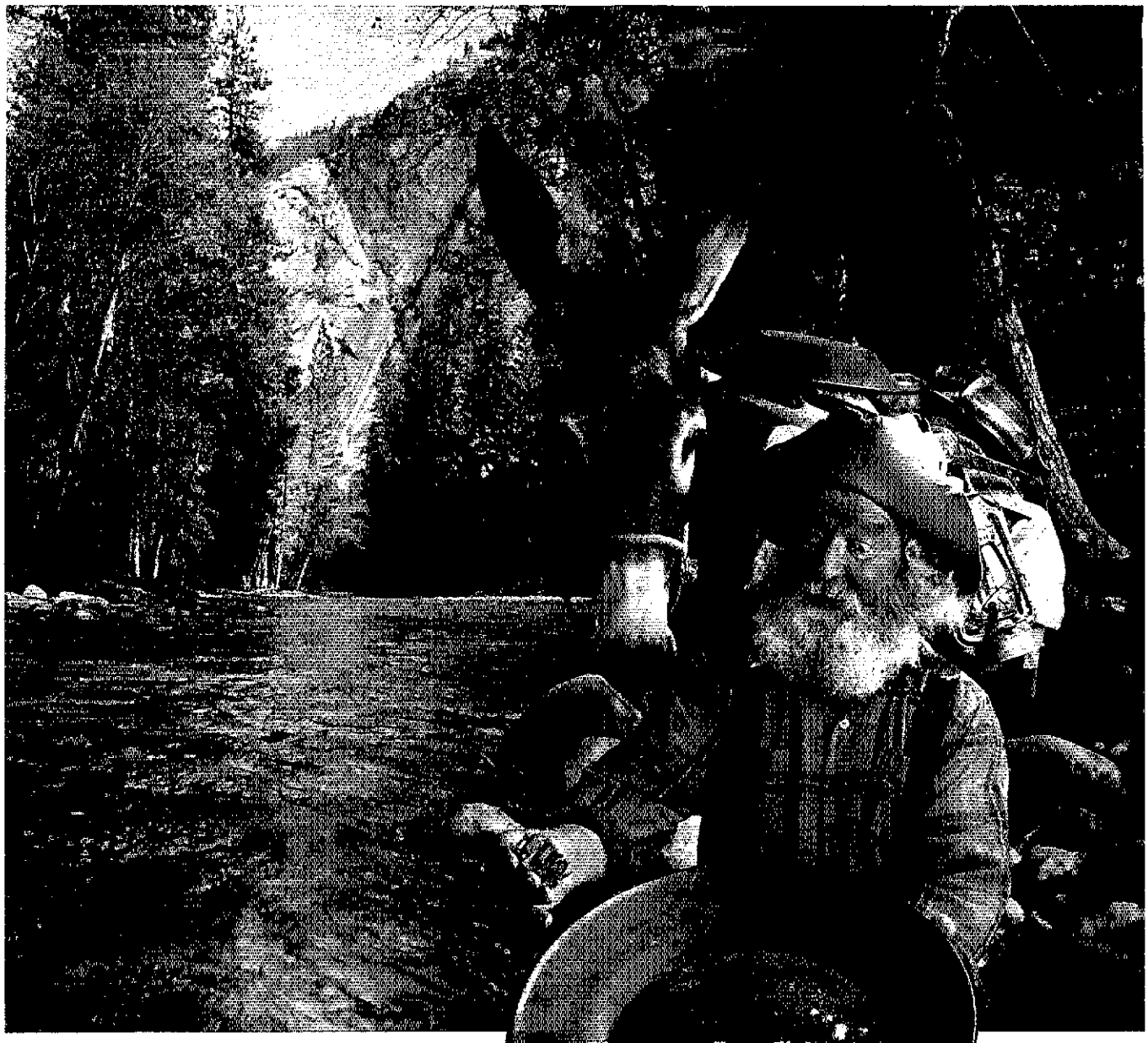
NEW MEXICO: SM, Joe T. Knight, W5PDY — ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 180 msgs with 178 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 62 msgs with 1096 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 120 msgs with 870 stations in. Yucca 2-mtr Net 78/18 & 93/33 handled 22 msgs with 343 checkins. Caravan Club 2-mtr Net 66/06 handled 11 msgs with 132 checkins. SCAR 2-mtr Net 66/06 handled 12 msgs with 549 checkins. Earlybirds, 0 msgs with 379 checkins. Vy sorry to report the passing of W5RYD & WØRRU. They will certainly be missed. W3YK reports 11 signed up for VE exams in Alamogordo and hopes for some walkins. VE exams will be given at the Bean Feed April 27. Traffic: ND5T 544, W5DAD 184, W5ENI 92.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XQ. PIO: N7BHC. TC: K7RJ. EXAMS: N7IE. Congrats to new officers of OARC: pres-KC7UB, vp-N7EZC, secy-KA7QPC, treas-N5CT and directors KA7PMZ as KA7KMO. Utah VHF Soc. also has new officers: pres-K7JL, vp-WA7GIE, sec/treas-N7BMG, rptr eng-WA7FFM, freq coord-WB7TSY; best wishes to all. Promntory rptr 4.89/5.49 probably getting new ACC controller and autopatches to SLC, Ogden and Tooele. Looks like KN7U spending a lot of time on BBS's and is trying to drum up business for some radio BBS's. Packet has grown about 200% in last 3 months, now 12 stns on in section and looking toward establishing some VHF links. WA7MEL's new Corsair sounds real good on BUN. Dallas has been doing a lot of 160 mtr DX and WAS hunting. Time to start thinking about FD. Lets get some record participation from the section this year. Traffic: K7HLR 322, WA7WIB 96, WA7KHE 69, WA7MEL 55, WA7JJL 49, W7OCX 7.

WYOMING: SM, Dick Wunder, WA7WFC — ASM: Steve Cochrane, KA7AWS. STM: Jim Anderson, W7TVK. Wyo. Hamfest is July 13 & 14 at Douglas. Recent upgrades include WB7NHR to ADV. KI7IWW to EXTRA, KA7HEK to GEN, & KA7SGQ to TECH. New NOVICES include Sandy Wunder, KA7USF, and Hal DeBacco, KA7USG. Congrats to all. Would like to congratulate Ralph Sims, W7COK, on his appointment as State RACES Officer. WY Cowboy Net: 19 sessions, 789 QNI & 6 QTC. WY Jackalope Net: 24 sessions, 467 QNI. Sheridan Co. ARES Net: 4 sessions, 30 QNI. Casper Emergency Net: 4 sessions, 167 QNI. Laramie sponsored an Exam this month and had a success rate of just over 50%, thanks to all who assisted with the exam. Traffic: WB7NHR 273, W7HLA 42, K7SLM 16, W7SQT 9.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP — STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/RFI: K4ELV. Due to business and personal commitments our Section Emergency Coordinator has decided to step down; Carl has given the section 30 months of excellent service and he will be missed. By the time this issue comes off the press I hope to have found a suitable replacement for this very important section level appointment. From Montgomery the MARC officers are: Pres., K4BTB Jim; V.P., AA4BL Wayne; Secy/Treas., KA4WZI Bob. The Alabama Repeater Council voted to go along with the 20 kHz spacing in Alabama that has started in the northwest and is spreading across the country. This month the Ala State ARRL Convention will be held at the Birminghamfest on 18 and 19. Hope to see all of you there. On Sat there will be an ARRL meeting and on Sun we will have an ARES section meeting with some 'ime set aside for the ATNM, AENB and AEND nets. CAND reports 1163 messages in 28 sessions with DRN5 rep 100% by W4CKS, WX4I and



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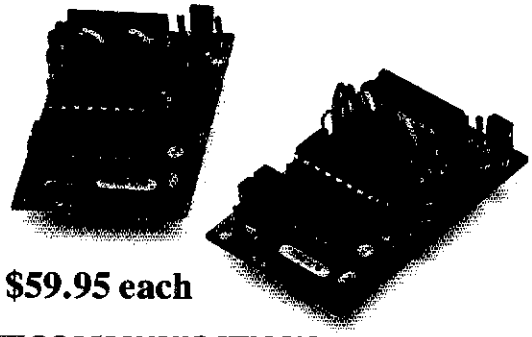

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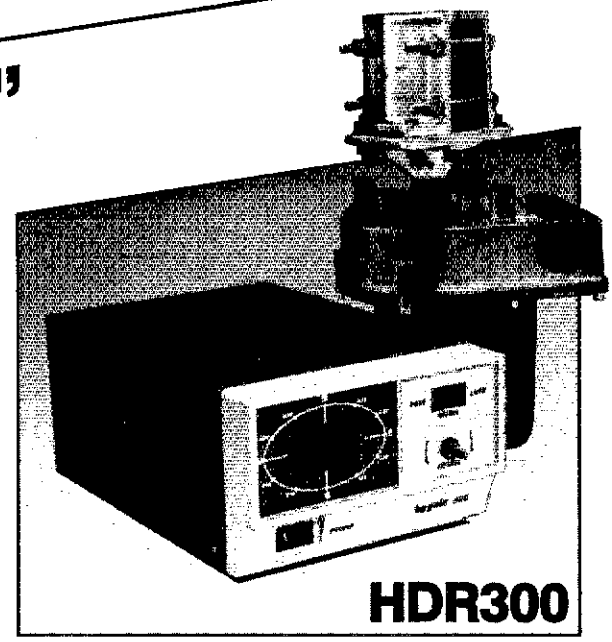


In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

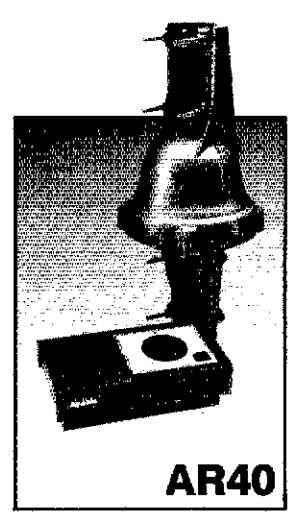
HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

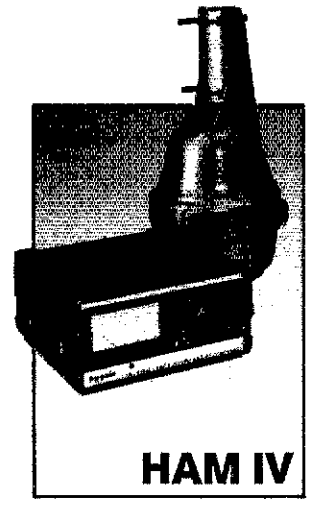
HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

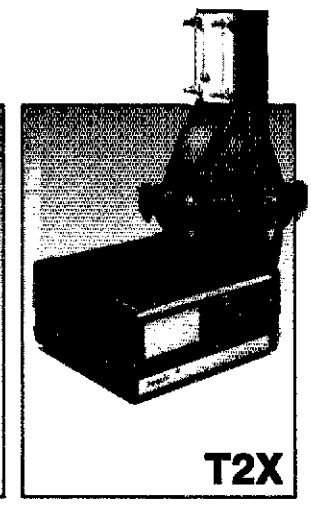
T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.







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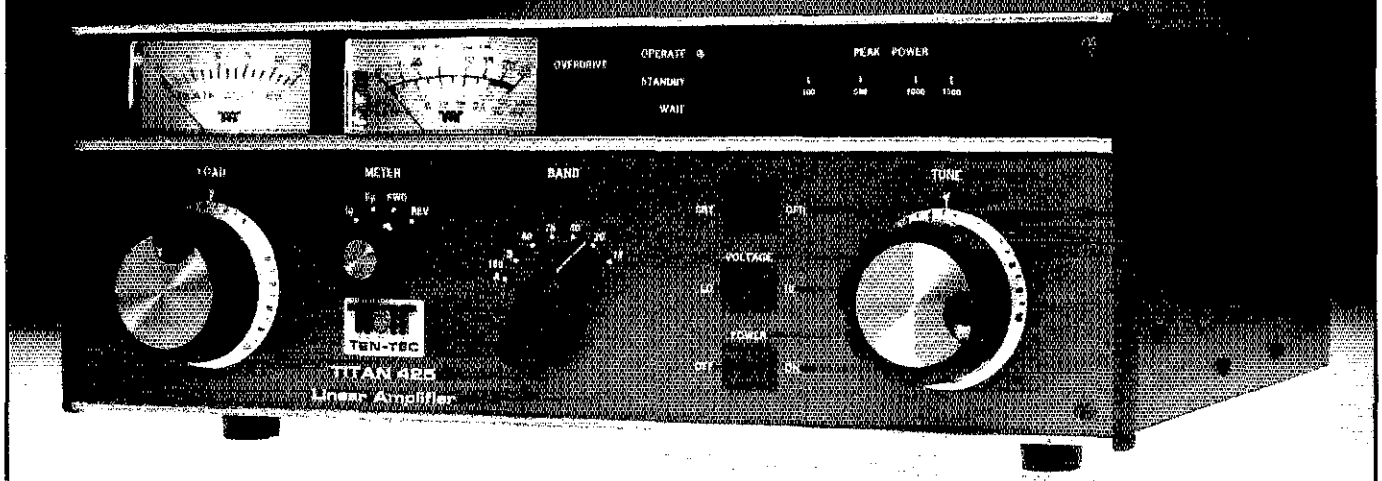

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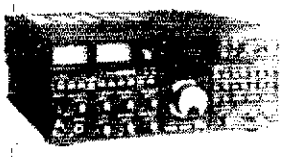

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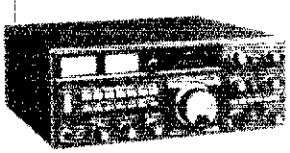

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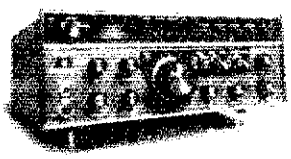

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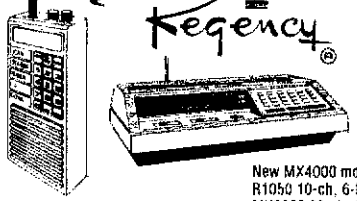

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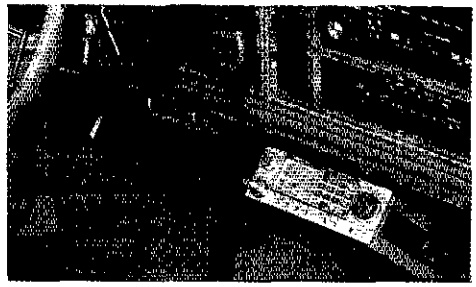
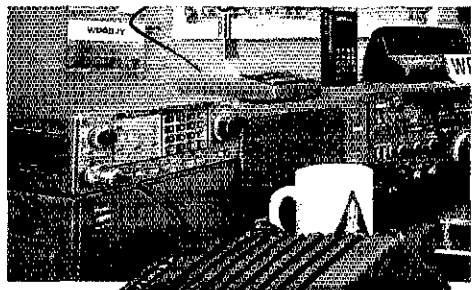
The exceptional front-end selectivity and sensitivity, coupled with Kenwood's excellent audio section, gives you lots to hear! Compact design makes this transceiver at home in the shack or on the go!





- **Large, easy-to-read backlighted LCD readout.** Indicates receive/transmit frequency, frequency offset, sub-tone selection, memory status. An LED readout indicates S & RF units, REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **Programmable scanning, with center-stop tuning.** Microprocessor technology allows you to scan the entire 2 meter band, or just a small portion of it. Scanning stops on the center frequency during band scan—**a Kenwood exclusive!**
- **21 Multi-function memory channels.** The TR-7950/7930 "remembers" frequency offset, and optional subtone channels. Memories 1-15 are for simplex and "normal" repeater operation. Memory pairs 16/17 and 18/19 are for "odd-ball" splits. Memories "A" and "B" store upper and lower band scan limits. The radio "beeps" when memory channel 1 is selected.
- **Extended frequency coverage.** Covers 142.000-148.995 MHz in 5-kHz steps. Repeater offsets are automatically selected in accordance with the ARRL 2 meter band plan. The front panel "OS" key may be used to allow manual changes in offset.
- **Multi-function keyboard.** The 16-key DTMF pad can also be used for direct frequency entry, subtone selection, memory address and scan programming. The keyboard is illuminated for night time use.

TR-7950 optional accessories:

- TU-79 three frequency tone unit
- PS-430 power supply
- KPS-12 fixed-station power supply for the TR-7950
- KPS-7A fixed-station power supply for the TR-7930
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone
- MC-46 16-key autopatch UP/DOWN microphone
- SWT-1 2 m, 100 W antenna tuner
- SW-100A/B power meters
- PG-3A noise filter

Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output.

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NW4X. DRN5 reports 999 messages in 56 sessions with AL rep by NW4X, WA4JDH, W4CKS, KC4GS, WX4I, WB4IXA, WD4NYL, WA4RNP. Traffic: WA4JDH 853, *W4ZJY 167, W4CKS 146, NW4X 120, WX4I 87*, WB4IXA 76, KB4GPN 52, WD4NYL 46, WA4RNP 32, K4AOZ 30, K4HJX 22, WD4DGH 8, WB4TVY 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO/RFI: W4RZL. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. The section Hamfests for May are: Albany on the 4th & 5th followed by Hartwell/Toccoa on the 18th & 19th. Support your Ga section events because most repeaters operate because of profits gained by these events. Am really amazed of the continous growth of the West Ga ARS. U hams in the vicinty who aren't members need to attend one of their FB meetings. Many tnx to all the instructors & VE's who dedicate themselves to the growth of this vy FB hobby. It's up to each of us to keep up the progress. It's vy gratifying to receive cards & letters from out of state hams who used repeaters as they traveled thru the Ga section. They say that "Ga Hams are always helpful & friendly" Tnx to MATPARC for getting behind the ARRL goals to increase the number of Hams as well as ARRL members. This is the real spirit of Amateur Radio. A lot of the section clubs holding two meetings a month, one business & a social where the whole family can get together. Try this, maybe the XYL will let u go to more Hamfests. Traffic reports continue to rise each month. If u handle any please report it to the STM, K4VHC, by the 5th of the month. The ARRL has issued a challenge to it's affiliated clubs to keep the ARRL healthy & robust. They have begun a club competition to see which club can recruit the most NEW ARRL MEMBERS. For each new member that a club recruits that club will receive a $5.00 commission. I am sure that ur club treasury can use a few bucks. Traffic: W4PIM 229, N9ECB 87, K4VHC 58, W4JWO 55, WD4NGI 53, W9NXC 36, K4EV 23, WB4NTW 20, K4BIA 20, N4BWS 18, W4BIA 13, KF4FG 12, N1BKC 9, N4UZ 8, NØEGW 7, KA4ATM 5.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X — For the second month in succession they failed to include our BPL list in the BPL column and these people deserve the recognition thus denied. For December the stations listed handled the amount of traffic shown: WD4IIO 2538; WX4H 1552; N4PL 1247; WF4X 1127; WF4Y 910; WA4QXT 910; WB4TZR 733; KB9LT 500; WB4ADL 449; KC4VK 416; AA4FG 391; N4IYU 390. All earned BPL and our thanks for all that work. I have started sending in duplicate lists of the monthly traffic report and marking one for the "BPL COLUMN" in the hopes of preventing this problem in the future! During the Annual Directors Meeting, the Field Organization was changed to delete the RFI function from OO/RFI Coordinators job and re-name this position as the Official Observer Coordinator and the RFI function/responsibility was assigned to the Technical Coordinators job and a new field appointment, the Assistant Technical Coordinator (ATC) was created: The ATC will assist the TC at the local level in resolving RFI problems and providing technical assistance to his club members. Traffic: WF4X 1730, WD4IIO 1611, WX4H 972, N4PL 784, WB4ADL 529, WF4Y 390, AA4FG 340, WA4QXT 321, KB9LT 297, KC4VK 280, AA4HT 264, KD4KK 205, WD4MLQ 174, WA3EYU 163, KB4LB 137, WB4TZR 133, WD4HBP 125, K4VND 122, W4GUJ 122, WA4NDA 107, NF4O 105, N2AMG 102, N4JAQ 101, W4KIX 93, N4EDH 92, WA4PUP 84, WD4IUI 76, KI4CQ 76, W4MGO 73, KC4FL 66, WB4YQP 64, NY4E 42, KB4FIY 41, WB4FJY 39, N4DY 38, N4JHI 23, N4ADI 19, NQ4P 19, N4ENL 18, KF4GY 17, WX4J 15, NS4C 15, WA4SXW 14, WB4AWG 14, WD4EQB 14, KB4LHP 13, WA4PUO 10, W8IM 9, NA4F 7, KE4PO 3. (Jan.) WB4FJY 22.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. PIO: W4WYR. SGL: KC4N. OO/RFI: W4SS. WA4EIC reports total bulletin activity of 126 bulletins received and transmitted this month. Bulletin stations reporting were WA4EIC 35, WD4KBW 27, K4IEK 24, AA4BN 14, KA4GUS 12, and AA4MI 14. Lou, N4KNP, EC of Collier County sent me a copy of the report outlining the work done by the local hams during the forest and brush fires there. Look for the writeup elsewhere in *QST*. Hams assisting were; WD4AOW KA4EGP WB8RAZ WD4AQV WD4EEG W9OAO N8DIQ N4KB KB4OA WD4HWN KM1W WB8PSS WB4RZI and N4KNP. The Ft Myers City of Palms Hamfest was great as usual. It was a real pleasure to get to meet WA4HDH for the first time at the hamfest. Doc has been a member of QFN for many years and is the Tuesday night NCS. W4LLA handled 20 phone patches this month. KA4FZI, KY8Y, K4OVC, KF4JA and W4UIO all reported participating in the Edison Parade of Lights. I know there were many others who helped with the parade, but I don't have alist of the calls. W4UIO also reports he is active with the marine weather station and is a SWFTN NCS. WD9AEP reports the following stations manning W4LX at the Southwest Florida Fair in Lee County — KA4YHE KA4YHF KA2IXV WB8SNT NX4X K4JLL KC4XF KB4BLN N8EL KA4RWV W4PKP K4OVC KF4JA and the following include XYLs K4IKX WD9AEP WV4F K9ALX WD4MCC WD4CHO and W4UIO. WD4KBW was busy at Pioneer Park Days collecting traffic. The Tampa Amateur Radio Club thanks all stations who assisted with the Florida State Fair traffic — especially W3CUL W3VR WF4X WA4JDH W4NFK and WD4KBW. KA4GUS has been appointed an Official Bulletin Station and will help serve southeast Florida through the Southeast Florida Traffic Net. 73 de WA4PFK Traffic: W4DUG 6777, W3CUL 6521, W3VR 1039, W4NFK 893, WD4KBW 669, W4LX 571, KF4JA 566, N4KFU 466, K4ZK 356, K4SCL 352, WD9AEP 334, WA4PFK 311, K4EUK 308,KJ3T 258, K4IA 248, W4PKP 220, K4JLL 215, WA4EIC 202, KA4GUS 180, W4YCL 161, WB4WYG 157, KI4ZW 154, N4KB 150, WA4RUE 99, WB2NVJ 99, KF4RL 91, KA4NXF 89, KA4YHS 74, WA4HXU 72, KB4FBX 65, KY4U 59, KY8Y 55, KM4Y 52, W4LLA 49, W1NJM 42, AA4BN 39, W4UIO 38, KA4FZI 33, K5IHH 32, WB4AID 30, W3TLV 30, K2GQU 29, K9ALX 29, W4SME 28, K4JI 27, KA4SIH 24, WD4NXK 24, K9EHP 22, KA9AKY 21, AF3S 17, AA4MI 14, K4FQU 13, K4IRT 12, WA4YNO 12, N4ILN 12, WV4F 11, W4WYR 10, N4JOA 10, W4ESH 9, W4MFD 8, KD4GR 7, KB4ABT 7, W4MPV 6, WK4F 6, KA4KDD 5, WD4MCC 5, K4OVC 4, NX4X 3, KA4GDU 3, KB4AXD 2, KB4ELQ 2, N4KNP 1, KA4EBO 1. KB4KB 0. (Jan.) W4NFK 102, WA4RUE 44.

WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7:00 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2250 UTC). This is my last report as on April 1st the new Section Manager for West Indies, Carlos Flores, NP4KA, will start his term. I wish to express my gratitude to all the colleagues who have given to me their wholehearted assistance and cooperation during the past two years, especially to those who served as net controls and net managers. The best of my wishes and luck to NP4KA in

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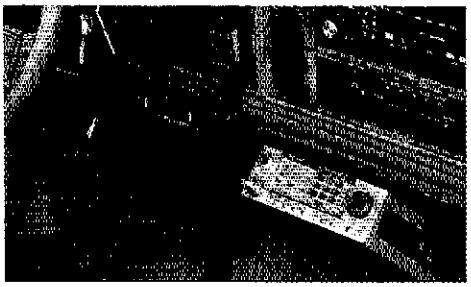
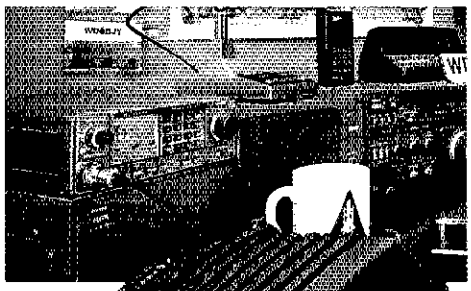
The exceptional front-end selectivity and sensitivity, coupled with Kenwood's excellent audio section, gives you lots to hear! Compact design makes this transceiver at home in the shack or on the go!





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- **Programmable scanning, with center-stop tuning.** Microprocessor technology allows you to scan the entire 2 meter band, or just a small portion of it. Scanning stops on the center frequency during band scan—**a Kenwood exclusive!**
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- KPS-12 fixed-station power supply for the TR-7950
- KPS-7A fixed-station power supply for the TR-7930
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone
- MC-46 16-key autopatch UP/DOWN microphone
- SWT-1 2 m, 100 W antenna tuner
- SW-100A/B power meters
- PG-3A noise filter

Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output

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

More TR-7950/7930 information is available from authorized Kenwood dealers.

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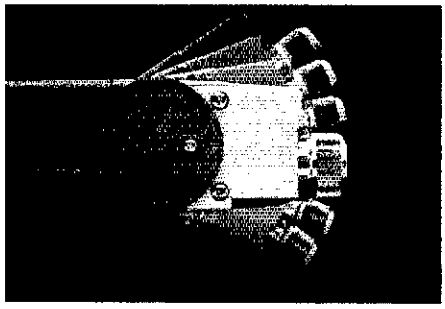

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  Program your transceiver to respond only to a specific digital code—much more secure than CTCSS.
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  The "Priority Watch" mode lets you keep an eye on an important channel when monitoring other frequencies.
- **Extended frequency coverage on 2 m.**
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  TM-411A covers 438-450 MHz

Optional accessories:
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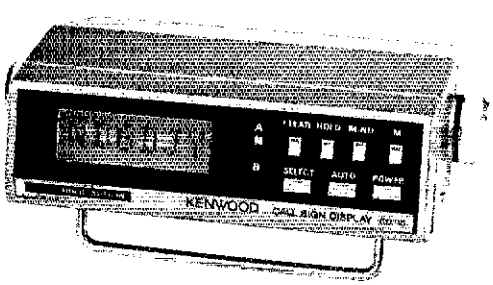
CD-10 DCS call sign display
CD-10 maximizes your use of Kenwood's new signalling concept, Digital Code Squelch. DCS uses a data string to open squelch on a receiver that has been programmed to accept the transmitted code. The transmitting station's call is programmed in ASCII. The CD-10 displays the station's call sign, and stores it in memory. Twenty calls may be stored. The CD-10 may be used with **any** receiver to display calls heard.



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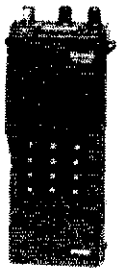

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2 meter all mode with many new features. Available with higher power.

IC-271A ..... Sug. Ret. $699
IC-271H ..... Sug. Ret. $89[illegible]

Call for Your Low Price!

ICOM

IC-471A/H

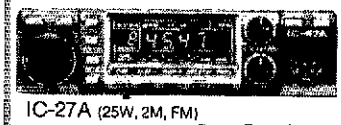
All mode, 430 - 450MHz continuous coverage. Now available with higher power.

IC-471A ..... Sug. Ret. $799
IC-471H ..... Sug. Ret. $1099

Call for Low, Low Price!

ICOM

NEW ICOM VHF/UHF MOBILES



IC-27A (25W, 2M, FM) ..... Sug. Ret. $369
IC-27H (45W, 2M, FM) ..... Sug. Ret. $409
IC-37A (25W, 220MHz, FM) ..... Sug. Ret. $449
IC-47A (25W, 70cm, FM) ..... Sug. Ret. $469

Call for YOUR Low Price!

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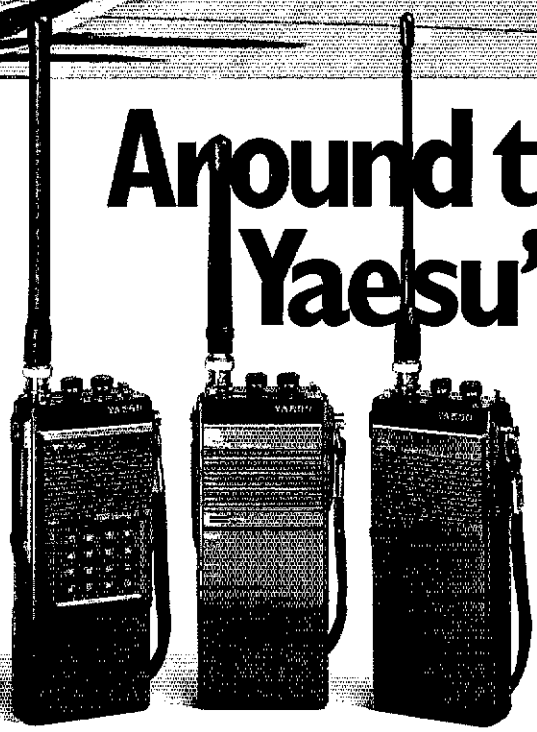
Around the corner Yaesu's VHF/UHF



Whether it's for working your favorite repeater or working an exotic land, Yaesu's got the choice in VHF and UHF radios that you need.

In fact, you'll discover that our VHF/UHF line is as diverse as your operating needs.

So when you want to make your VHF/UHF operation complete, just look to Yaesu for the solution.

For your hand. We're constantly raising the standards in handheld radio technology. And our 5-watt, 2-meter FT-209RH and our 4-watt 440-MHz FT-709R are no exceptions.

In fact, you won't find a more flexible, easy to use HT design anywhere.

Each rig gives you a battery saver that really helps conserve your battery power.

Two microprocessors make for a wider range of scanning functions. And complete storage capability in each of the ten memory channels.

Even an optional plug-in tone encode/decode module is available.

And best yet, these two high-powered HTs fit very comfortably in your hand, thanks to an ultra-slim and lightweight design.

However, if you're looking for a more basic and inexpensive handheld alternative, we've got your bases covered too.

We give you a choice of three bands of operation: the FT-203R for 2 meters, the FT-103R for 220 MHz, and the FT-703R for 440 MHz.

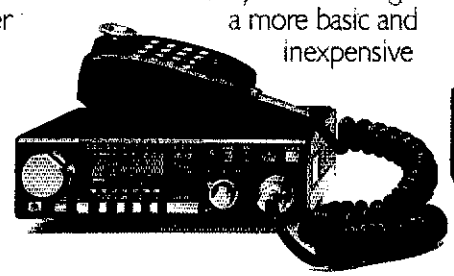
Each of these lightweight rigs features 2.5 watts of power and an optional DTMF keyboard.

Over land. Our two mobiles give you a lot of power in very small packages.

The FT-270RH is a 2-meter, 45-watt rig that conveniently packs its 45-watt punch into just about any small space in your car.

The FT-2700RH is a 25-watt FM dual-bander that lets you operate on 2 meters or 440 MHz. Or combine the two for cross-band, full-duplex, telephone-style operation.

Either way, both rigs are simple to operate. You get ten memory channels. Flexible band-scanning functions. Dual VFO capability.

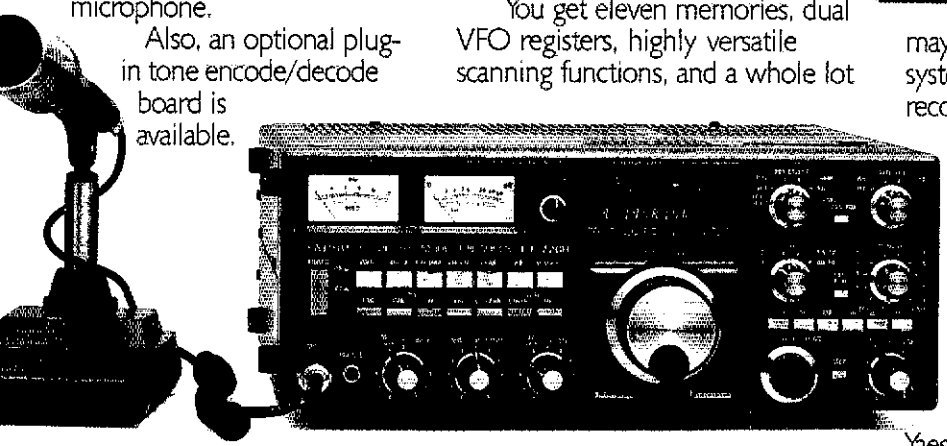


Around the world.
ne gets you there.

With a clean, uncluttered LCD display for easy readout.

You don't even have to take your eyes off the road to determine your operating frequency and memory channel. An optional voice synthesizer announces them both at the push of a button on the microphone.

Also, an optional plug-in tone encode/decode board is available.



Across the world. We've got the world's most popular link to OSCAR 10, the triband FT-726R.

And talk about DX. You'll be making worldwide contacts in true 20-meter style. With excellent signal quality too.

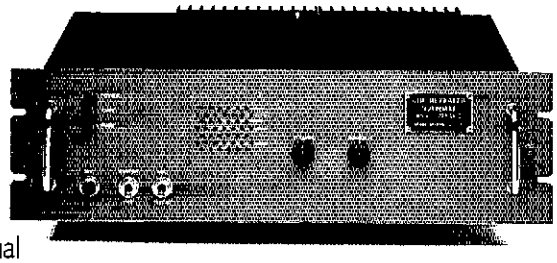
And better, you can work the world from just about anywhere. Including apartments and antenna restricted neighborhoods.

The FT-726R is a 2-meter, 10-watt rig with cross-band capability. To assemble the core of your earth station, simply plug in two optional modules, one for 435-MHz operation, another for cross-band duplex.

You get eleven memories, dual VFO registers, highly versatile scanning functions, and a whole lot more to make the FT-726R a highly worthwhile investment.

Tie it all together. Finally, if you're looking for a repeater system, we've got just the repeater and intelligent controller that you need.

We'll help fine-tune your system to fit your individual requirements. No matter what they may be. Just write us with your system specifications, and we'll recommend the required hardware.



What's more, you can rest assured that our repeater system is proven and reliable. In fact, it's been used extensively in both amateur and commercial applications.

Yaesu gets you there. So when you're ready to get out on VHF/UHF, go with Yaesu. You'll discover a new world of innovation.

YAESU

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(513) 874-3100

NEW!

ICOM Dual Bander

IC-3200A

The Most Compact Dual Bander at the Smallest Price

Finally there's a compact full featured 25 watt FM dual bander that's simple in design and operation, plus very affordable...the IC-3200A.

Dual Bands. The IC-3200A covers both the 2-meter (140.000–150.000MHz) and 70cm (440.000–450.000MHz) bands. The IC-3200A also features fully programmable offsets in 5KHz steps for MARS and CAP repeater operation.

25 Watts. The IC-3200A delivers 25 watts of output on both bands. Or the low power can be adjusted to one to ten watts.

Compact. The IC-3200A is only 5½"W x 2"H x 8½"D.

Simple to Operate. With only 14 front panel controls, the IC-3200A is by far the easiest dual bander to use.

Memory Lockout. For scanning only certain memory channels, ICOM utilizes a memory skip (M SKIP) function.

10 Tunable Memories. To store your favorite frequencies, 10 memories are provided. Each memory will store the receive frequency, transmit offset, offset direction and PL tone. Each memory can be tuned up or down when selected, yet automatically returns to the original frequency when reselected. All memories are backed up with a lithium battery.

Scanning. The IC-3200A has four scanning systems... memory scan, band scan, program scan and priority scan.

Other Outstanding Standard Features:

- New LCD display, easy to read in bright sunlight
- Tone encoder (all PL/subaudible tones built-in)
- IC-HM14 mic with up/down scan and DTMF
- One antenna connector (Duplexer already installed!)
- Variable tuning increments 5 and 15KHz (2-meters) 5 and 25KHz (70cm)
- Frequency dial lock
- Dual VFO's
- Mounting bracket

Optional Accessories. An optional IC-PS30 system power supply, voice synthesizer and IC-SP10 speaker are available.

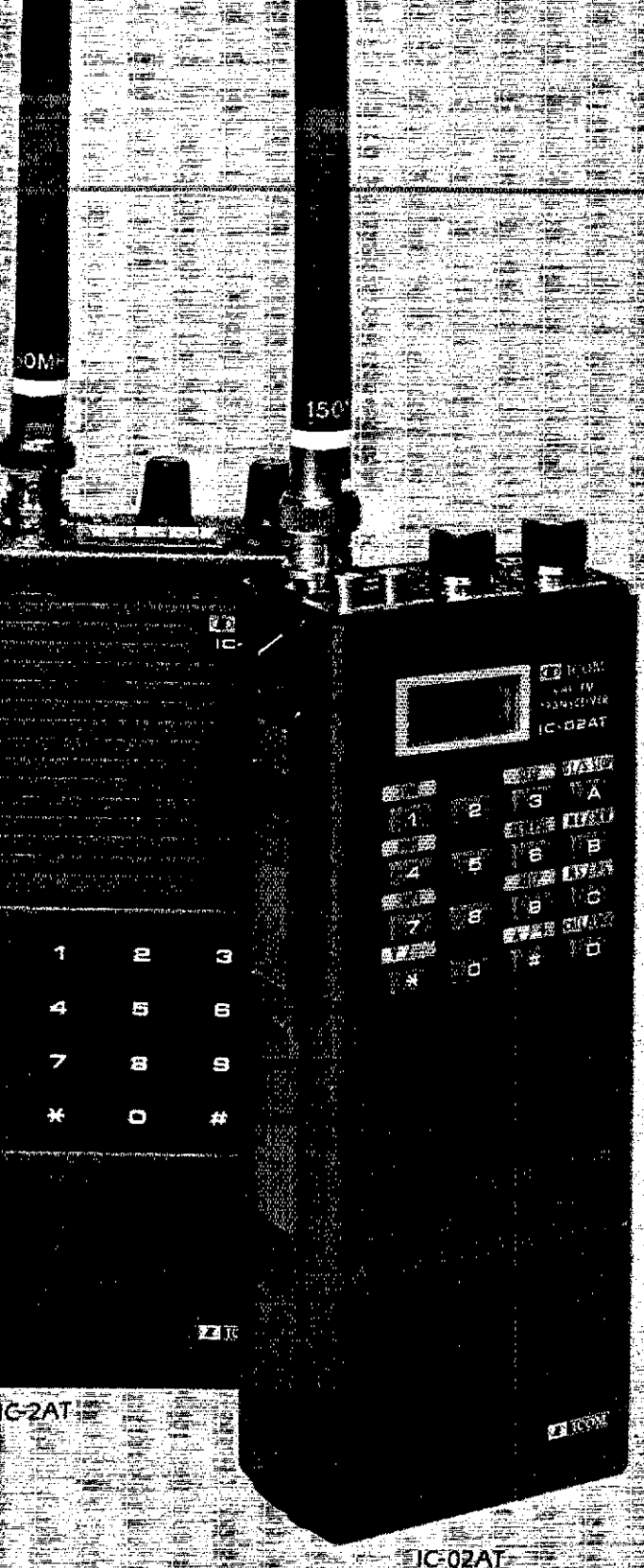
See the IC-3200A at your local ICOM dealer for the best buy on a full featured dual bander.

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

IC-02AT



ICOM 2-Meter Handhelds

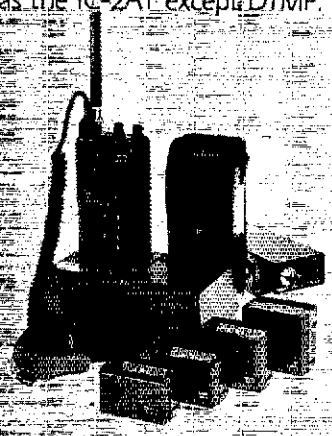
If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

Frequency Coverage. The IC-02AT covers 140.000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz...both include frequencies for MARS operation.

IC-02AT Features. ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.



Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAh IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

Often imitated, never duplicated.

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First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

KENWOOD

the excellence in amateur radio

TR-9130

TR-9130 2 meter all mode

The TR-9130 is a compact rig that gives you 25 watts of RF power on all modes!! You can select your tuning steps from 100-Hz, 1-kHz, 5-kHz or 10-kHz. With six memories, you can program your favorite frequencies. (FM 1-5 Simplex or ±600-kHz offset, memory 6 non-standard offset, all six for simplex, any mode) Dual digital VFO's, and transmit frequency tuning enhance OSCAR operations. Internal battery back-up (9 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours, in case you operate mobile and base! Other convenient features such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in, sidetone, high performance noise blanker HI (25) LOW (5) power switch (FM/CW) RF gain control, and RIT circuit further enhance this expressive package!

Optional accessories:

- KPS-7A AC power supply
- PS-20 AC power supply (TR-9500 only)
- BO-9A system base with memory back-up supply
- SP-120 external speaker
- TK-1 AC adapter for memor back-up
- SP-40 mobile speaker
- SP-50 mobile speaker
- SW-100 A/B power meters
- MC-55 Mobile Mic w/time-o timer

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz in steps of 100-Hz, 1-kHz, 5-kH 25-kHz or 1-MHz.
- CW-FM Hi = 10 W, Low = 1 W SSB 10 W.
- Automatic band/memory scan Search of selected 10-kHz segments on SSB/CW.
- 5 memory channels.

TW-4000A

TW-4000A
FM "Dual-Bander"

KENWOOD'S TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in one compact package. It covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, and the 70-cm band (440.000-449.995 MHz), all in a package only 6-3/8 W x 2-3/8 H x 8-9/16 D inches. RF output power measures 25 watts on either band. The TW-4000A features a large, easy-to-read LCD display, front panel illumination for night operations, 10 memories with OFFSET recall and lithium battery backup, programmable memory scan, band scan in selected 1-MHz segments, priority watch function, common channel scan, dual digital VFO's, repeater reverse switch, GaAs FET front ends, rugged die cast chassis, beeper" through speaker, a mobile mount, and a 16-key autopatch UP/DOWN mic.

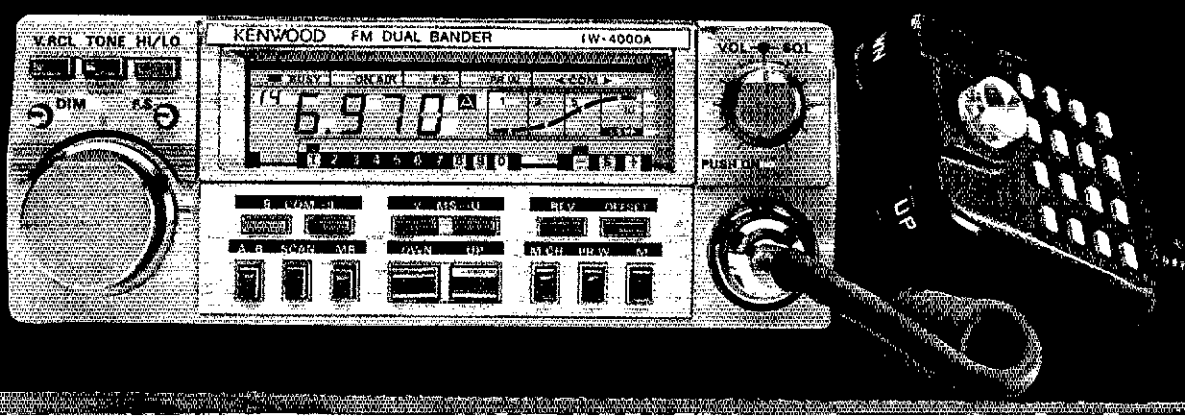
The new optional VS-1 voice synthesizer has everyone talking! A voice announces the frequency, band, VFO A or B, repeater offset, and memory channel number when these functions are selected.

Other TW-4000A optional accessories:

VS-1 voice synthesizer, TU-4C programmable two-frequency CTCSS encoder, KPS-7A fixed station power supply, SP-40 compact mobile speaker, SP-5 compact mobile speaker, MA-4000 dual-band mobile antenna with duplexor, MC-55 mobile microphone with time-out timer, and a SW-100B SWR/power meter.

More information on the TM-201A/TM-401A and TW-4000A is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street Compton, California 90220.

Specifications and prices are subject to change without notice or obligation



KENWOOD

pacesetter in amateur radio

TS-711A/TS-811A

Multi-function all-mode 2 m and 70 cm transceivers.

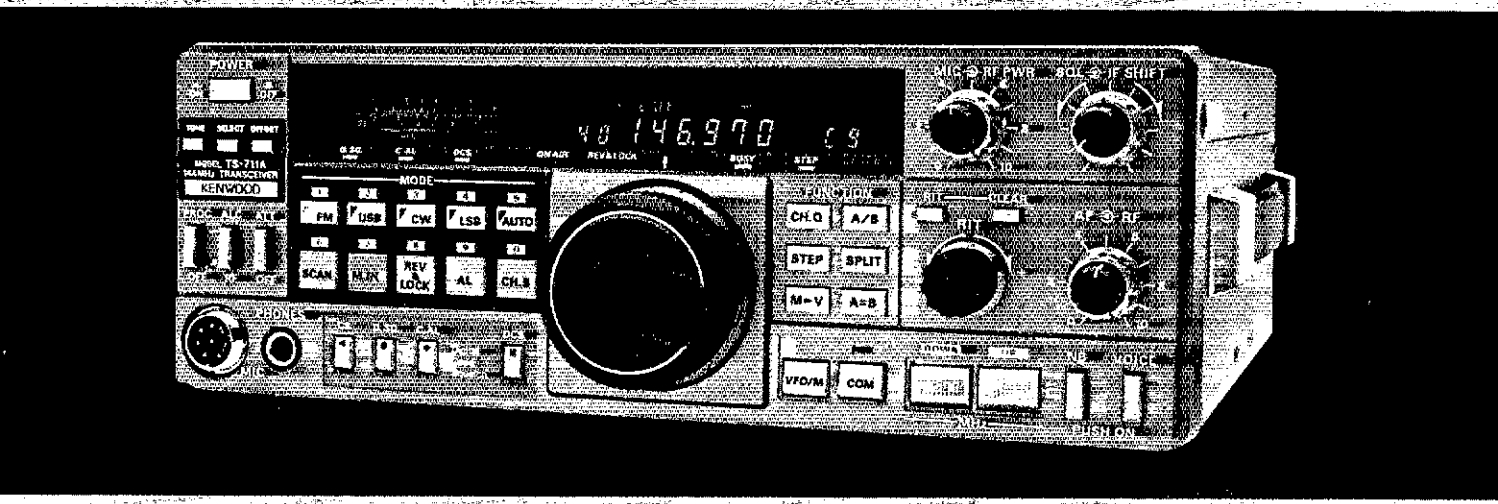
The TS-711A 2 m (142-149 MHz) and TS-811A 70 cm (430-450 MHz) all-mode transceivers are perfect base station units, designed to complement your present HF station. Both feature Kenwood's innovative D.C.S. circuitry. Built-in dual digital VFO's provide commercial-grade frequency stability through the use of a TCXO (Temperature Compensated Crystal Oscillator). The new fluorescent multi-function display shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, call sign code, and memory channel. 40 multi-function memories store frequency, mode, repeater offset and tone. They have programmable scan, memory scan, and mode scan. The Auto-mode function automatically selects the correct mode for the frequency being used. When a mode key is depressed, an audible "beeper" announces mode identification in International Morse Code.

The TS-711A/TS-811A also feature all-mode squelch, noise blanker, speech processor (SSB, FM), IF shift, RF power control, alert, and a unique channel "Quick-Step" tuning that varies tuning characteristics from conventional VFO feel, to stepping action when CH.Q switch is depressed.

Combine all these features with built-in AC power supply and a hefty 25 watts RF output power and you have your ideal base station.

Optional accessories:

- CD-10 Call sign Display
- TU-5 CTCSS Tone Unit • VS-1 Voice Synthesizer • MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Desk Mic
- SP-430 External Speakers
- MB-430 Mobile Mount
- PG-2J DC Cable



TS-670

TS-670 All-mode "Quad Bander"

The TS-670 "Quad Bander" is a unique all-mode transceiver that covers the 6 meter VHF band and the 10, 15 and 40 meter HF bands. FM operation may be added with the optional FM-430. Key features include dual digital VFO's, 80 memory channels, memory scan, and programmable band scan. Direct keyboard frequency selection allows you to enter a frequency to either VFO or to a memory channel using the 10-button key-pad on the front panel. The 2-color fluorescent tube display indicates frequency to the nearest 100 Hz (10 Hz modifiable) and includes LED indicators that signal the specific functions in use. The optional GC-10 general coverage receiver unit allows continuous tuning from 500 kHz to 30 MHz. The VS-1 voice synthesizer unit is another popular option available. All this plus IF shift, all-mode squelch, CW semi-break-in with side tone, narrow-wide filter selection, noise blanker, and RF attenuator make the TS-670 "Quad Bander" the next transceiver you should own!

Optional accessories:

- GC-10 General Coverage Unit, 500 kHz to 30 MHz • VS-1 Voice Synthesizer • FM-430 FM Unit • YK-88C 500 Hz CW Filter • YK-88A 6 kHz AM Filter
- PS-430 DC Power Supply • KPS-7A DC Power Supply
- MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Multi-Function Desk Mic
- VOX-4 vOx Unit

More information on the TS-711A/TS-811A and TS-670 is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut St., Compton, CA 90220.

Specifications and prices are subject to change without notice or obligation

his term and at the same time let him know my disposition to help and assist him as needed. My special gratitude to KP4DJ for his support and consistency in his duty as Net Manager of WINS. A visit to Virgin Islands is scheduled in March to the new affiliated club by myself and NP4KA to coordinate our assistance and cooperation with them. The P. R. Amateur Radio Club had its first exam session under the ARRL VE program and plans to make a monthly session the last Saturday of each month. KP4DJ reports the following totals for WIN; QND 262, QTC 13, QNI 61, 23 sessions. KP4ABK reports the following totals for WINC; QND 420, QTC 29, QNI 471, 28 sessions. Traffic: KP4DJ 60.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich H. Holzer, N7EH — STM: W7EP. NMs: WB7CAG K6LL KA7HEV. Well the results are in and W7FF will take over as the new SM for Arizona on the first of April. I would like to thank all who have helped me and the League during the last 4 years. I encourage everyone to give W7FF your support and make the AZ section the best in the ARRL. Please ensure that your club newsletters get sent to W7FF. Arizona Cactus Net: QNI 625, QTC 114. SWN: QNI 178, QTC 180. ATEN: QNI 1016, QTC 119. PSHR for Feb.: KB7FE and WB7CAG. Traffic: KB7FE 415, W7EP 142, K6LL 64, W7LVB 64, WB7CAG 54, KA7HEV 28, K7JKM 21, K7POF 17, W7KXE 16, WB3LQQ 15, WA7KQE 11, K7NMQ 3, W7DQS 12, KA7KHU 2, WA7NXL 2.

LOS ANGELES: SM, John V. Walsh, N6UK — ASM: N6ZH. STM: W6INH. SEC: N6UK. ACC: KX7Q. OO/RFI: K6BMG. Time is running out for "early bird" registrations for the Southwest Division Convention aboard the R.M.S. Queen Mary, August 9, 10 and 11. "Birds" get more prizes and better seats. To qualify you must register by May 31. Advanced registration closes July 15. K7UGA will be guest speaker at the banquet and K6DUE will MC. Contact Hamcon, P.O. Box 91313, Long Beach, CA 90809. EB registration $5, advance registration $6, and banquet tickets $25. Plan on being at the best yet. ARES and LA County Fire Dept. have put the wheels in motion. Earthquake 85 was the maiden shakedown event. Thanks to NR6O AK6Y WA6LAU and WB6FRM for moving quickly to make the ARES participation a reality and to N6ZH W6EJJ and WA6WZO for their long-term support of the project. Tournament of Roses Radio Amateurs (TORRA) are setting a torrid pace. Plans for next year are in the mill. WB6OJK is rallying the forces for the next T of R event. Opening net was March 21. Los Angeles Area Council of Amateur Radio Clubs has started an ambitious revitalization program under the guidance of KN6H. The council deserves the support of clubs within the section. Next meeting is May 7 at DWP. Clubs — send a rep — help promote the interests of Amateur Radio within the section. For monthly License Exams contact San Fernando Valley ARC, 5311 Corteen Pl., N. Hollywood, CA 91607. Contact Greater Los Angeles Amateur Radio Group for current VEC program info. Call (818) 762-5095 (day) or (818) 892-2068 (after 6 P.M.) Traffic: K6YBV 425, W6INH 404, W6ORF 27, K6CL 10, WD6FWZ 8, K6DD 4.

ORANGE: SM, Sandra Heyn, WA6WZN — ASM/SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO Cord: W6RE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. This is my last report as Section Manager. I wish to thank the tremendous support that the clubs and field organization volunteers have given me. I especially wish to thank ASM/SEC W6UBQ who is your new Section Manager as of April 1st. W6UBQ has announced appointments ASM N6BVU and SEC AE6N. Also congrats to new ORS N6LNI. SB Dist #6 EC WD6CHR appointed K6EPS AEC for Apple Valley, in addition to WA6BRI (Hesperia), WA6JOA (Wrightwood), N6JPI (Luceme Valley), N2BVH (G.A.F.B.), and deputy EC K6BET. Morongo Basin ARC awarded amateur of the year to WB6PAH. Pres WA6ZJQ has appointed WD6CVC for the remainder of the term as treas of the Lake Elsinore Valley ARC. K1BM is heading up educational program while KA6BJO is heading up the examination program for the So. Orange ARES group. Fullerton Radio Club held successful star party at WA6UKZ property in Borrego Springs that included kite flying organized by KD7X. N6GUH and W6OAK is teaching classes for the Yucaipa Valley ARC. Anyone interested in new So CA 6 Mter Group should contact K6GSX K6PHE or K6JZK. The Calif Division of Forestry held local appreciation dinners for VIP (Volunteers in Prevention) members. Anza ARC new club officers: WB6NSX pres, K6VDS vp, and WA6EDJ secy/treas. The Orange County Amateur Radio Emergency Services Group chaired by WB6ORK is developing an emergency frequency plan. N6BVU and WB6UCK have compiled a list of calling freq for So CA. W6MEP/Rpt 147.24 (+.60) now located on Mt. Wilson has become an open repeater with WestLink played Friday thru Monday 9 P.M. and code practice after 10 P.M. For info on Tournament of Roses Radio Association (TORRA) contact WA6AAD or WB6OJK; the new TORRA net meets 7:30 P.M. on both 145.18 (−) and 147.27 (+). Hope to BCNU at the Southwestern Division Convention August 9-11. PSHR: WB6TIF KA6BNW WB6QBZ WA6QCA KA6HJK.

Net	Freq	Time	QNI	QTC	NM
SCN/1(20+)	3598	7 P.M.	268	185	WB6TIF
SCN/2(13−)	3598	8:15 P.M.	161	42	WB6TIF
SCN/V(FM)	146.645	9 P.M.	386	311	WA6QCA
RTTY/VHF	145.12	10 A.M.	410	118	KA6HJK

Traffic: WB6TIF 217, WA6QCA 200, KA6HJK 166, ADØA 126, N6GOT 84, KA6BNW 74, WB6QBZ 43, K6ZCE 34, W6CPB 15, KB6CYD 15, N6FRW 14, W6TKV 4, KA6HMS 2, WA6WZO 3, WA6WZN 1. (Dec.) WA6QCA 912.

SAN DIEGO: SM, Arthur R. Smith, W6INI — ACC: WA6COE. TC: N6NR. BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: KG6LF. Congratulations to KG6LF on his appt to Emerg Comm Adv Comm. 1986 ARRL National Conv will be in San Diego Sept. 5-7. Plan your vacation now! Asst Tech Coord is new appt available. This will expand the Section's technical plans by giving needed assistance to TC N6NR. Contact him or SM W6INI (273-1120) for info. Official Relay Station appts available for operators handling written message traffic regularly. Details from N6GW (222-5575). SANDARC Vol Exam Coord can be contacted at 619-465-EXAM. Mail to: POB 5023 La Mesa, CA 92041. New club officers: North Shores ARC Pres KW6V, VP NQ6D, Sec KA6FAC, Treas KA6UCD; San Diego Rptr. Assn Pres W6RHV, VP WA6URS, Sec W6OGC, Treas N6ICC. Fire season is with us again. Volunteers needed to take part in Red Flag Patrols during exceptionally high fire hazard weather. Contact W6INI. NCTN met 27 times, handled 112 msgs. ARES CW net met 4 times, QNI 18. Traffic: KB6AI 123, N6GW 38, KM6I 10, WA6IIK 2.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC —

NEW!

uniden®

Bearcat®

Regency®

Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new scanners and scanner accessories from J.I.L., Regency and Uniden/Bearcat. Chances are the police, fire and weather emergencies you'll read about in tomorrow's paper are coming through on a scanner today.

NEW! Regency® MX7000-H

List price $699.95/CE price $449.00

10-Band, 20 Channel • Crystalless • AC/DC

Frequency range: 25-550 MHz. continuous coverage and 800 MHz. to 1.2 GHz. continuous coverage

In addition to normal scanner listening, the MX7000 offers CB, VHF, and UHF TV audio, FM Broadcast, all aircraft bands (civil and military), 800 MHz communications, cellular telephone, and when connected to a printer or CRT, satellite weather pictures.

NEW! Regency® MX5000-H

List price $599.95/CE price $354.00

Multi-Band, 20 Channel • No-crystal scanner Search • Lockout • Priority • AC/DC Selectable AM-FM modes • LCD display World's first continuous coverage scanner

Frequency range: 25-550 MHz. continuous coverage.

Never before have so many features come in such a small package. The *Regency* MX5000 mobile or home scanner has continuous coverage from 25 to 550 MHz. That means you can hear CB, Television audio, FM broadcast stations, all aircraft bands including military and the normal scanner bands, all on your choice of 20 programmable channels.

NEW! Regency® MX4000-H

List price $629.95/CE price $394.00

Multi-Band, 20 Channel • No-crystal scanner Search • Lockout • Priority • AC/DC Selectable AM-FM modes • LCD display

Bands: 30-50, 118-136, 144-174, 440-512, 800-950 MHz.

The *Regency* MX4000 is gives coverage in the standard VHF and UHF ranges with the important addition of the 800 MHz. and aircraft bands. It features keyboard entry, multifunction liquid crystal display and variable search increments.

NEW! Regency® Z60-H

List price $379.95/CE price $249.00

8-Band, 60 Channel • No-crystal scanner

Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.

Cover your choice of over 15,000 frequencies on 60 channels at the touch of your finger.

NEW! JIL SX-400-H

List price $799.95/CE price $499.00

Multi-Band, 20 Channel • No-crystal Scanner Search • Lockout • Priority • AC/DC

Frequency range: 26-520 MHz continuous coverage. With optionally equipped RF converters 150KHz.-3.7 GHz.

The *JIL* SX-400 synthesized scanner is designed for commercial and professional monitor users that demand features not found in ordianary scanners. The SX-400 will cover from 150 KHz to 3.7 GHz. with RF converters. Order the following RF converters for your SX-400 scanner. **RF-1030-H** at $259.00 each for frequency range 150 KHz. - 30 MHz. USB, LSB, CW and AM. (CW filter required for CW signal reception); **RF-5080-H** at $199.00 each for 500-800 MHz.; **RF-8014-H** at $199.00 each for 800 MHz.-1.4 GHz. Be sure to also order **ACB-300-H** at $99.00 each which is an antenna control box for connection of the RF converters. Add $3.00 shipping for each RF converter or antenna control box. If you need further information on the JIL scanners, contact JIL directly at 213-926-6727 or write JIL at 17120 Edwards Road, Cerritos, California 90701.

SPECIAL! JIL SX-200-H

List price $499.95/CE special price $189.00

Multi-Band - 16 Channel • No-Crystal Scanner

Frequency range 26-88, 108-180, 380-514 MHz

The *JIL* SX-200 scanner tunes military, F.B.I., Space Satellites, Police and Fire, Drug Enforcement Agencies, Defense Department, Aeronautical AM band, Aero Navigation Band, Fish & Game, Immigration, Paramedics, Amateur Radio, Justice Department, State Department, plus other thousands of radio frequencies most other scanners can't pick up. The SX-200 has selectable AM/FM receiver circuits, tri-switch squelch settings - signal, audio and signal & audio, outboard AC power supply - DC at 12 volts built-in, quartz clock - bright vacuum fluorescent blue readouts and dimmer, dual level search speeds, tri-level scan delay switches, 16 memory channels in two channels banks, receive fine tune (RIT) ± 2KHz., dual level RF gain settings – 20 db pad, AGC test points for optional signal strength meters. All in all, the *JIL* SX-200 gives you more features for the money than any other scanner currently on sale. Order your *JIL* SX-200 scanner at this special price today.

Regency® HX1000-H

List price $329.95/CE price $209.00

6-Band, 30 Channel • No Crystal scanner Search • Lockout • Priority • Scan delay Sidelit liquid crystal display • Digital Clock

Frequency range: 30-50, 144-174, 440-512 MHz.

The new handheld *Regency* HX1000 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 30 channels at the same time. When you activate the priority control, you automatically override all other calls to listen to your favorite frequency. The LCD display is even sidelit for night use. A die-cast aluminum chasis makes this the most rugged and durable hand-held scanner available. There is even a backup lithium battery to maintain memory for two years. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery. Order your *Regency* HX1000 now.

Bearcat® 100-H

The first no-crystal programmable handheld scanner.

List price $449.95/CE price $229.00

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. Wow...what a scanner!

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

QUANTITY DISCOUNTS AVAILABLE

Order two scanners at the same time and deduct 1%, for three scanners deduct 2%, four scanners deduct 3%, five scanners deduct 4% and six or more scanners purchased at the same time earns you a 5% discount off our super low single unit price.

NEW! Regency® HX2000-H

The World's First 800 MHz. Handheld Scanner

List price $569.95/CE price $359.00

7-Band, 20 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC Sidelit liquid crystal display • Memory backup

Bands: 118-136, 144-174, 440-512, 800-950 MHz.

The HX2000 scanner operates on 120V AC or 6 VDC. Scans 15 channels per second. Size 3" x 7" x 1½"

OTHER RADIOS AND ACCESSORIES

RD55-H *Uniden* Visor mount Radar Detector..... $119.00
RD95-H *Uniden* Remote mount Radar Detector.... $139.00
BC 300-H *Bearcat* 50 channel scanner $344.00
BC 20/20-H *Bearcat* 40 channel scanner $274.00
BC 210XL-H *Bearcat* 18 channel scanner..... $209.00
BC 260-H *Bearcat* 16 channel mobile scanner... $274.00
BC 201-H *Bearcat* 16 channel scanner $189.00
BC 180-H *Bearcat* 16 channel scanner $164.00
BC-WA-H *Bearcat* Weather Alert™ $39.00
DX1000-H *Bearcat* shortwave receiver..... $499.00
PC22-H *Uniden* remote mount CB transceiver $99.00
PC55-H *Uniden* mobile mount CB transceiver $59.00
Z10-H *Regency* 10 channel scanner $149.00
Z30-H *Regency* 30 channel scanner $169.00
Z45-H *Regency* 45 channel scanner $199.00
MX3000-H *Regency* 30 channel scanner..... $219.00
C403-H *Regency* 4 channel scanner..... $69.00
R106-H *Regency* 10 channel scanner $99.00
HX650-H *Regency* 6 channel handheld scanner... $99.00
HX-650P-H HX650 with batt., case, crystal certs.... $124.00
RH250B-H *Regency* 10 channel VHF transceiver... $379.00
RPH410-H 10 ch. handheld no-crystal transciever... $399.00
BC10-H Battery charger for *Regency* RPH410..... $79.00
EC10-H Programming tool for *Regency* RPH410.... $20.00
SMRH250-H Service man. for *Regency* RH250.... $20.00
SMRU150-H Service man. for *Regency* RU150.... $20.00
SMRPH410-H Service man. for *Regency* RPH410... $20.00
B-4-H 1.2 V AAA Ni-Cad batteries (set of four)..... $9.00
A-135C-H Crystal certificate $3.00
FB-E-H Frequency Directory for Eastern U.S.A.... $12.00
FB-W-H Frequency Directory for Western U.S.A.... $12.00
A60-H Magnet mount mobile antenna $35.00
A70-H Base station antenna..... $35.00

Add $3.00 shipping for all accessories ordered at the same time.
Add $12.00 shipping per shortwave receiver.
Add $7.00 shipping per scanner and $3.00 per antenna.

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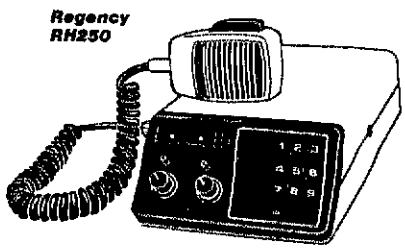

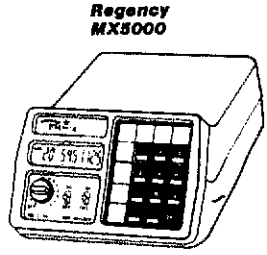

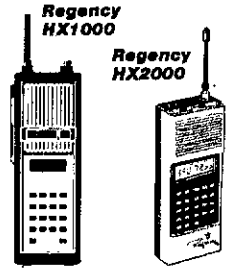

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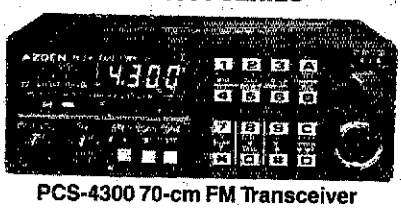

PCS-4300 70-cm FM Transceiver

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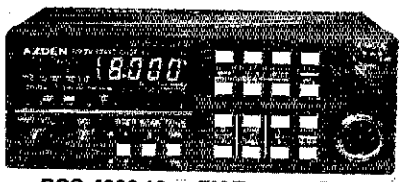

PCS-4800 10-m FM Transceiver

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220.000-224.995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440.000-449.995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50.000-53.995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28.000-29.990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 KHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; autoresume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
- **TWO PRIORITY MEMORIES:** Either may be instantly recalled at any time. COMPARE!
- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
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ASM/ACC: NI5V. STM: AE5I. BM: W5QXK. SGL: W5UXP. RFI: WB5JBP. PIO: N5FDL. Congrats to Hal Bell, N5ANO, *Key City* ARC *"Ham of the Year." New officers-Panhandle* ARC: Pres/WA5UMY, VP/KA5OFA, Treas/W5CBT, Pub/WB5IZH, Editor/WD5ILA. A weather-watch symposium entitled "Panhandle Weatherwatch 85" was held in Amarillo on March 30th. The meeting involved ARES, NWS, Public Safety officials and the news media. A SKYWARN program was featured at the Key City ARC in Abilene March 11th. Several SKYWARN classes are scheduled around the D/FW Metroplex this spring. I hope you can attend one of these forums as the technology and reporting procedures are constantly being updated. An HF rig has been installed in the NWS office in Ft. Worth. This will be an invaluable tool in the reporting of weather from areas of our section out of VHF coverage. Look around 7213 kHz when wx activity is in our area. New EC for Grayson Co. is Mike Mitchell, KA5SLL. Many thanks for many years of public service to Jerry Hancock, WB5SBO. PSHR for Feb. KB5UL KA5AZK K5UPN WD5EEH KA5SPT N5BT AE5I. Traffic: K5UPN 310, N5BT 308, KB5UL 301, W9QYL 155, KA5AZK 131, WB4HML 62, AC5Z 57, AE5I 57, KA5SPT 47, W5QU 45, NJ5Q 43, NI5V 33, W5ERT 29, WD5EEH 24, KA5RYF 24, WA5EZI 16, N5GRZ 10, K5PC 7, K5SOR 3.

OKLAHOMA: SM, Dave Cox, NB5N — SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. All affiliated clubs should have sent in their 1985 Annual Report by now. If not, please do so immediately to maintain your active status. The Tulsa ARC has received their Special Service Club designation. Congratulations for being the first in the OK Section to qualify for that prestigious position. Hats off to CORA and Joe Harding for the C & E's 10th anniversary. Wheat Straw ARC celebrated their 25th anniversary in style at a fabulous banquet complete with all the trimmings. Broken Arrow ARC has brought back the monthly sidewalk sale, 2nd Sat. every month. QCWA Chapter #63 will help man the ARRL booth this year at Ham Holiday. Southwestern part of Section is now enjoying ARRL/VEC exams thanks to Lawton-Fort Sill ARC volunteers. If any area still needs help getting exams scheduled contact NB5N. New appointments: Assistant TC K5WG; EC KB5ZC, Okmulgee Co. Traffic: WB5SRX 277, W5AS 248, K5CXP 168, KB5EK 145, N5GTP 94, W5REC 83, KV5X 79, WB5LSW 69, KA5FUU 66, KD5SQ 64, WA5OUV 62, W5VXU 61, W5RB 51, KC5OU 50, NR5L 41, NB5N 38, WD5IFB 37, NQ5W 32, K5GBN 31, WD5JCE 28, K5ENA 25, W5VOR 25, W5VLW 24, NG5O 23, WA5OGC 22, K5CAY 17, WA5ZOO 16, N5PT 12, KX5W 11, ND5S 5.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — SEC: KA5KRI. STM: K5QEW. ASM: N5TC. AD W5OVH appointed Bulletin Manager for this section. Beaumont ARC officers for 1985: Pres. WA5VUX; V Pres. KA5UJC; Secy. WA5MPN, Treas, KA5LAR. Rio Grande Valley Amateurs busy with public service activities: Citrus Parade in Mission in Feb, Brownsville Air Fiesta (airshow) and RGV Livestock Show in Mercedes in early March. South Texas Amateur Rptr Society (Harlingen) Pres K5RAV announced agreement with Texas DPS for properly trained amateurs to be "extra eyes" on RGV highways; labeled STARCOM, members will use the multiple autopatch system of the 147.99/.39 machine to relay pertinent information to DPS offices in Cameron and Hidalgo counties in accordance with procedures specified by DPS. CAND Mgr W5KLV reports DRN5 represented 100% by Southern TX stations W5KLV N5DFO WB5YDD N5EFG KD5KQ WB5EPA WB5FQU N5AMH N5CRU WB5MYR. DRN5 Mgr WB5YDD reports Southern TX represented 100% by W5LKV W5CTZ KD5KQ N5DFO W5GKM WB5EPA WB5FQU W5URN N5AMH N5CRU WB5YDD. OBS N5DFO reports 10 ARRL bulletins, 4 propagation forecasts, 2 CRRL bulletins, 4 DX bulletins and 8 satellite bulletins given 13 readings on 8 nets. OBS W5KLV reports 9 ARRL bulletins, 4 DX bulletins, 5 CRRL bulletins and 25 satellite bulletins given 124 readings on 7 nets. Traffic: W5CTZ 396, W5KLV 370, NS5J 176, WB5EPA 164, KS5V 158, N5DFO 122, N5GKM 118, WB5FQU 106, WD5GKH 48, W5AC 38, W5BGE 29, K5HZR 27.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old 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. Box AA, Mamaroneck, NY 10543 for details.

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).

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

THANK YOU for attending Warren, Ohio Hamfest. See you August 18, 1985.

ATTENTION MORSE Telegraphers - Join Morse Telegraph Club. Meet old friends, swap experiences. Morse Telegraph Club is national. There is a Chapter near you. When and where do we meet? Contact John Holman, W3INV, 1 Beth Circle, Malvern, PA 19355. 215-644-2471.

ATLAS 350XL Owners Group. Free newsletter. Send QSL with rig s/n and SASE. Know people who repair them? Information to share? Questions? Rod Sharp, N5NM. Box 2169, Santa Fe, NM 87501.

HAMFEST-The Annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 5. FCC booth, large flea market and many exhibitors. Take exit 308 off I-57 to Rt 45 South 1 mile. For further info contact Don Kerouac, 1377 Circle Dr., Kankakee, IL 60901.

THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

1985 BLOSSOM BLAST, Sunday Oct. 6, 1985. Write "Blast" Box 175, St. Joseph, MI 49085.

FREE QRP Info Kit. Send S.A.S.E. with two first-class stamps (U.S.) or three IRCs (DX) to: ARP ARCI, P.O. Box 354, Carlisle, PA 17013.

CQ CONTEST: VHF'ers please note! The first annual CQ World Wide VHF WPX Contest is July 20-22, 50 thru 1296 MHz. For details, logsheets, etc., write to SCORE, P.O. Box 1161, Denville, NJ 07834 or to CQ Magazine. We need your entry to make this a success!

NORTHERN NEW JERSEY - Sussex County ARC Hamfest, July 20. 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.

FIRECRACKER HAMFEST - The 11th Annual North West Pennsylvania Hamfest in Crawford County will change its date this year. The Hamfest will be held on Sunday, July 7, 1985, 8:00 AM to 4:00 PM. at the Crawford County Fairgrounds, Meadville, PA. Come spend the holiday with us in Crawford County. For more information, write to the Hamfest Committee in care of Crawford Amateur Radio Society, P.O. Box 653, Meadville, PA 16335.

ARRL LONG ISLAND Hamfair sponsored by LIMARC will be held on Sunday, June 9, 1985 at the Electricians Hall, 41 Pinelawn Road, Melville, Long Island. Hours are from 9:00 AM to 4:00 PM. General admission is $3 per person. $2 after 1 PM. Table space sold only in advance from Hank Wener, WB2ALW, 53 Sherrard St., East Hills, NY 11577-1712. 4' × 6' table space available at $10 or your own for $6. Contact Hank at 516-484-4322 at nite to 11:30 PM.

FLEA MARKET & FCC Examinations. May 11, June 8, July 13, August 10 & September 14. Novice thru Extra Exams given, information call 408-255-9000. Foothill College, Los Altos, CA W6NLG.

ANNUAL EVANSVILLE TARS Hamfest May 19, 1985. Vanderburgh County 4-H Fairgrounds. Open at 6:00 AM CDT. All indoor dealer space - Flea Market space inside or outside Hamfest Admission $3 per person. Indoor tables $7.50 each. Outdoor Flea Market spaces $3 (bring your own tables). VE/ARRL testing on Hamfest grounds. Write for full details. Talk-in on 147.75/.15. For table reservations and/or information contact: Mike Anderson, KA9LQM, Post Office Box 3284, Evansville, IN 47732.

COLUMBUS, OHIO Hamfest - 5th Annual - Sunday, June 2, 8 AM to 3 PM. Admission $2 in advance and $3 at the door. Tables $3 in advance and $4 at the door. Location - Ganyard building on Franklin County Fairgrounds. Talkin - 146.37/97. Info - Bill, W8LLU, 614-261-7053 or Kevin, WA8OHI, 614-766-5313. Advance sales - send SASE to Bill Welch, W8LLU, 396 Brevoort Rd., Col., OH 43214. Sponsored by the Battelle Amateur Radio Club - W8CQK.

17th ANNUAL WABASH County Hamfest. May 19th, 1985. 4-H Fairgrounds, Wabash, IN 6:00 A.M.-4:00 P.M. Contact Don Spangler, W9HNO, 235 Southwood Drive, Wabash, IN 46992 219-563-5564.

TCRA HAMFEST Tri-County Radio Association - rain or shine. Sunday May 19 Passaic Valley Community Center off Valley Road, Stirling, NJ 9 AM to 4 PM. Indoors, refreshments, rest rooms, free parking. Tables $10 registration $2.50. Restricted Tail-gating, by reservation only please. All reservations Dick Franklin, W2EUF, 201-232-5955 or 270-3193 P.O. Box 182, Westfield, NJ 07090.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: wil give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — 1) Famous KØAAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. State your sample wants. 37c self addressed business size envelope required. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

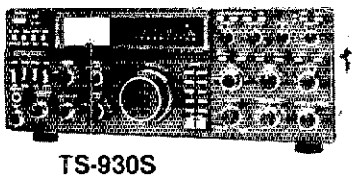
QSL's by W4TG: Prices from $16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST custom QSLs, large cut catalog and samples $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

PICTURE QSL cards of your shack, etc. from your photograph or black ink art work. 500 $22; 1000 $32.50. Send stamp for illustrated literature. Generous sample pack $1; half pound of samples $2. Custom printed cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, PA 19140. Phone: 1-215-228-5460.

KENWOOD SALE!



TS-930S

Top of the Line HF Transceiver
TS-930S w/Antenna Tuner List $1799
TS-930S w/o Antenna Tuner List $1599

- General Coverage Receiver
- Superior Dynamic Range
- All Solid State—28 VDC Final
- QSK CW
- Optional Automatic Antenna Tuner
- Dual VFO w/8 Memories
- Dual Mode Noise Blanker
- RF Speech Processor
- Built-In AC Power Supply
- MUCH, MUCH MORE

CALL FOR SPECIAL SALE PRICES!

TS-430S

Most Advanced, Compact HF Transceiver $899.95

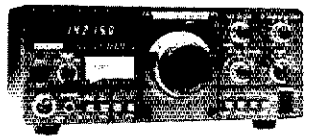
- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM
- 10Hz Dual Step Digital VFO
- Eight Memories w/Lithium Back-up
- Memory and Band Scan
- IF Shift—Notch Filter
- Speech Processor
- Narrow/Wide Filter Selection
- IF Shift
- Full Selection of Options Available

CALL FOR SPECIAL SALE PRICE!

TS-830S—TS-530S 160-10 Meter HF Transceivers

- All Solid State Except Driver and Final Amplifier
- Wide Dynamic Range
- Variable Bandwidth Tuning (TS-830)
- IF Shift
- RF Speech Processor
- Adjustable Noise Blanker
- Full Selection of Optional Crystal Filters
- Built-In AC Power Supply

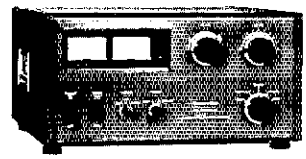
TS-830-S List $949.95 TS-530S List $739.95
CALL FOR SPECIAL SALE PRICES!



TS-130SE Compact 80-10 Meter Transceiver

- All Solid State
- 100W Output
- IF Shift
- Speech Processor
- Noise Blanker
- Narrow SSB/CW Filter Option

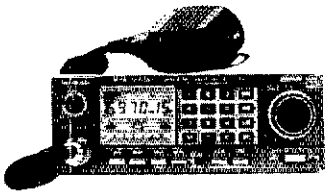
TS-130SE List $629.95
CALL FOR SPECIAL SALE PRICES!



TL-922A Linear Amplifier

- 160-15 Meters
- 2KW PEP Input Power
- Pair of Rugged 3-500Z Tubes Included
- Compatible with all Kenwood Transceivers and Many Others
- Built-In 110V-220 VAC Power Supply

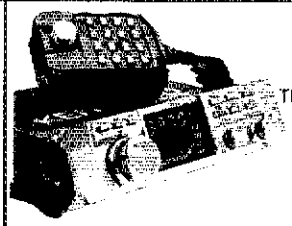
TL-922A List $1229.95
CALL FOR SPECIAL SALE PRICES!



TR-7950/7930

- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- 45 Watts (TR-7950) 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

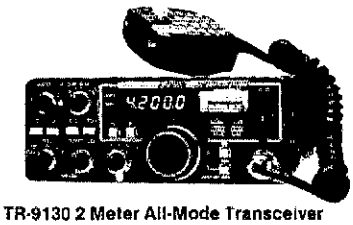
TR-7950 List $399.95 TR-7930 List $359.95
CALL FOR SPECIAL SALE PRICES!



TM-211A/TM-411A 2m/70cm FM Transceiver

- 25W Output
- Priority Watch
- Ultra Compact
- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

TM-211A List $369.95 TM-411A List $449.95
CALL FOR SPECIAL SALE PRICES!



TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
- Memory and Band Scan
- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List $529.95
CALL FOR SPECIAL SALE PRICES

TR-2600A
New High Tech Compact 2m HT

- LCD Readout
- 10 Memories w/Lithium Backup
- Band And Memory Scan
- Built-In 16 Key Tone Pad
- Extended 140.000-148.995 Frequency Coverage

List $329.95
CALL FOR SPECIAL PRICE!

TW-4000A Dual Bander
2m and 70cm FM in One Compact Package!

- Big LCD Readout
- 25W Output—Both Bands
- 10 Memories w/Scan and Back-up
- Dual VFO
- GaAs FET Front End
- 16 Key Up/Down Mic

VS-1 Voice Synthesizer and Other Accessories in Stock—CALL FOR SPECIAL PRICES!

R-2000 Receiver

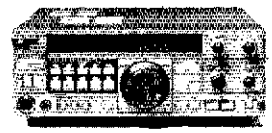
R-600—R-100S—R-2000 Receivers in Stock!
CALL FOR SPECIAL SALE PRICES—SAVE $$

TH-21AT/41AT
New Pocket Size 2m/70cm HT

- 1W Output
- 16 Key Tone Pad
- Optional Headset Available

List $229.95 (2m) $239.95 (70cm)
CALL FOR SPECIAL PRICES!

TS-711A (2m)
TS-811A (70cm)
All-Mode, Multi-Function Transceiver



- Dual VFO
- 40 Memories
- Memory & Band Scan
- 25W Output
- Built-In 120 VAC Power Supply
- Nose Blanker

TS-711A List $699.95 TS-811A List $899.95
CALL FOR SPECIAL SALE PRICES

TS-670 Quad Bander—All-Mode Transceiver
6m, 10m, 15m, and 40 m

- Dual VFO
- IF Shift
- 10W Output
- 80 Memories
- Noise Blanker
- VOX, Narrow Filters, AC Supply and Other Accessories Available

TS-670 List $699.95
CALL FOR SPECIAL SALES PRICES!

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special KENWOOD Sale Prices and Save $$$!!

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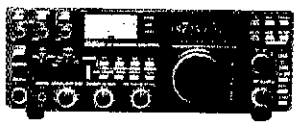
ICOM SPECIALS



IC-751
Plus 2 Bonus Items
- PS-35 Internal AC Supply
- SM-6 Desk Microphone

Regular $1598.50
$1399 Save $199.50

IC-27A, IC-27H,
IC-37A, IC-47A
All Now Available
Call For Special Sale Prices!
Save $$$!

IC271A/H 2 mtrs
IC471A/H 70 cm
Perfect Oscar Equipment
Call For Special Prices!

Repeaters
RP310 440 MHz.....$899
RP1210 1.2 GHz.....Call

IC-2AT $219
IC-3AT $239
IC-4AT $239

All Accessories in Stock!

BP2 Battery Pack	$39.50
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC35 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95

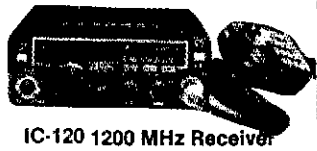
IC-745
List Price $999
Compact General-Coverage
Full-Feature HF Transceiver
Call For Special Low Price!

IC730 80-10m mobile unit
Special Price $589

IC505
6m multimode
List $449
Call For Special Price

IC-290H 2 mtrs
IC-490A 70 cm
All-Mode Transceiver
Call For Special Price

IC-02AT
New 2m HT
Call! For Your Special Price!

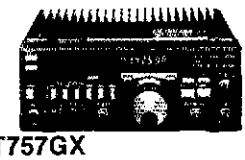


IC-120 1200 MHz Receiver
List $499 Call For Price

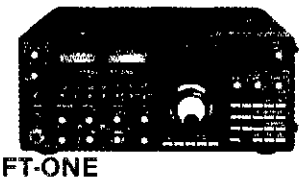
R71 Receiver
Call For Special Price

YAESU SPECIALS

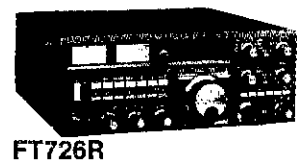
FT980 CAT SYSTEM
AC Power Supply, Full Break-in CW, SSB/AM/FM/FSK, RF Speech Processor
List Price $1659
CALL FOR SPECIAL PRICE



FT757GX
with General Coverage RCVR includes CW keyer, AM/FM, CW filter
List Price $859
CALL FOR SPECIAL PRICE



FT-ONE
With Four Free Filters
List Price $3074
Call For Your Special Sale Price



FT726R
(Optional modules for 6m, 430, 440 MHz)
Great for Satellite Work
List $899.00
CALL FOR SPECIAL PRICE

FT-270RH
New 45 watt 2M mobile.
List $439
Call For Your Special Sale Price

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Perfect Mobile Rig
List $599
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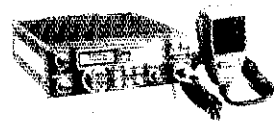

FT-230R 2mtr FM.....List $359
FT-730R 440 MHz FM....List $399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory of Up/Down Scan

Call today for Special Discount Price & Save $$

VHF/UHF Multimode Portables

FT-690R 50MHz.....List $379
FT-290R 144MHz.....List $399
FT-790R 430MHz.....List $399

Call today for Special Discount Price & Save $$

FT-209RH
NEW High Tech 2mtr HT
5 Watt Output
NOW IN STOCK
CALL FOR YOUR SPECIAL PRICE

FT-203R/TT
NEW 2mtr HT w/VOX* & Touch-Tone Pad
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YH-2 headset required for VOX operation.....$19.95

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OTHER SPECIALS

MIRAGE AMPLIFIER SALE!

B1016
$249

Model	Band	Pre amp	Input	Output	DC Pwr	Sale Price
[illegible]	6M	[illegible]	[illegible]	[illegible]	[illegible]	$249
[illegible]	2M	No	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B108	2M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B1016	2M	[illegible]	[illegible]	[illegible]	[illegible]	$249
B3016	2M	[illegible]	[illegible]	[illegible]	[illegible]	$199
[illegible]	[illegible]	No	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D24	440	No	[illegible]	[illegible]	6A	$179
D1010N	440	No	[illegible]	100W	[illegible]	$289

RC 1 Remote Control for Mirage Amplifiers $24
MP 1 and MP 2 Peak Reading Wattmeter $99

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

CP1-20 $219 CP1-64 $219
MP-20 $129.95 MP-64 $129.95
VIC-20 MBAText $79 C-64 MBAText $79

All AEA Keyers, Antennas & Accessories In Stock!

KANTRONICS

The Interface Reg. $169 95 Sale $129 95
The Interface II Reg $269 95 Sale $239 95
CHALLENGER $89 95 UNIVERSAL TU $189.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

TEN-TEC SALE!

CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!

425 Titan New 3KW amplifier in stock-only $2195!

TEN-TEC
New 2M HT
Full Featured!
List $319 Sale $279.95!

4229 2KW Tuner Kit $189.95!

ASTRON POWER SUPPLIES

Heavy Duty High Quality Rugged Reliable

- Input voltage 105 125 VAC Output 13.8 VDC ± .05v
- Fully Electronically Regulated—5mv Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M Series with Meter A Series Without Meter

Model	Cont Amps	ICS Amps	Price
RS4A	[illegible]	[illegible]	$ 39
RS7A	[illegible]	[illegible]	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	[illegible]	135
RS35M	[illegible]	35	149
RS50A	[illegible]	50	199
RS50M	37	50	279

MODEL RS-50A

AMERITRON AL-80

SALE $599!

AL-80 1000W Output (single 3-500Z) $589
AL-84 600W PEP Output (4-6MJ6 Tubes) $379
AL-1200 1500W Output (3CX-1200 tube) $1399
RCS-8 5 Pos Remote Antenna Switch $119
ATR-15 1500W Antenna Tuner $289

HAL SALE!

NEW RTTY/CW COMPUTER INTERFACES

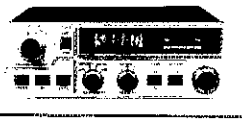
CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

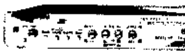
SANTEC

ST142 $249
ST222 $279
ST442 $289
LS202 $229

KDK FM2033

List $339 Sale $259





MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941D 300 W Tuner	$99.95
989 Deluxe 2KW	$299.95

OSCAR/VHF DX EQUIPMENT

TRANSCEIVERS

KENWOOD

TR9130 2m All Mode 25W	$CALL
TR711A 2m Base 25W	$CALL
TR9500 70cm All Mode	$CALL
TR811A 70cm Base 25W	$CALL

ICOM

IC290H 2m All Mode 25W	$469
IC271A 2m Base 25W	$599
IC271H 2m Base 100W	$789
IC490A 70cm All Mode 10W	$579
IC471A 70cm Base 25W	$689
IC471H 70cm Base 75W	$949

YAESU

FT290R 2m All Mode 2W	$349
FT726R Triband All Mode	$779
726/70 70cm module	$269
726/SU Duplex Module	$95
FT790R 70cm All Mode 1W	$349

TEN-TEC

2510 Satellite Station	$439

ROTORS

Ken Pro KR500 Elev Rotor	$189
Ken Pro KR400 Azim Rotor	$149
Alliance HD73 Azim Rotor	$99
Hy-Gain Ham 4 Azim Rotor	$219

AMPLIFIERS

MIRAGE

B108 2m 80W out/10W in	$159
B1016 2m 160W out/10W in	$249
B3016 2m 160W out/30W in	$199
D24 70cm 40W out/2W in	$179
D1010N 70cm 100W out/10W in	$289

THL CORP.

HL110V 2m 100W out/3-10W in	$219
HL160/25 2m 160W out 25W in	$269
HL160V 2m 160W out/3-10W in	$289
HL45U 70cm 45W out/10W in	$179
HL90U 70cm 90W out/10W in	$319

ANTENNAS

CUSHCRAFT

A144-20T 2m 20el cir pol	$75
416TB 70cm cir pol	$59
PS4 70cm Circularity Switch	$69
AOP1 2m/70cm Oscar Pack	$149

KLM

2m-14c 14el 2m w/cir switch	$89
2m-22C 22el 2m w/cir switch	$119
435-18C 70cm w/cir switch	$119

HARDLINE & HELIAX

½" Aluminum Hardline	$.79/ft
½" LDF-50 Heliax	$1.69/ft

OSCAR PACKAGE DEALS

PACKAGE #1

Ten-Tec 2510 Satellite Station	List $489
THL HL45U 70cm 45W Amplifier	List $199
THL HRA-2 2m Mast Mount Preamp	List $159
Cushcraft AOP-1 Antenna Package	List $219
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $1533
PACKAGE PRICE—ONLY $1249 DELIVERED!
SAVE OVER $300!!

PACKAGE #2

Yaesu FT290R 2m Transceiver	List $399
Yaesu FT790R 70cm Transceiver	List $399
Mirage D24 70cm 40W Amplifier	List $210
THL HRA-2 2m Mast Mount Preamp	List $159
Cushcraft AOP-1 Antenna Package	List $219
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $1853
PACKAGE PRICE—ONLY $1499 DELIVERED!
SAVE OVER $375!!

PACKAGE #3

Kenwood TR9130 or Icom IC290H	List $549
Kenwood TR9500 or Icom IC490A	List $649
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $2428
PACKAGE PRICE—ONLY $1999 DELIVERED!
SAVE OVER $450!!

PACKAGE #4

Yaesu FT726R VHF/UHF Duplex Xcvr	List $899
430/726 70cm Module	List $289
SU/726 Sat Duplex Unit	List $109
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $2527
PACKAGE PRICE—ONLY $2125 DELIVERED!
SAVE OVER $425!!

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We can substitute items and make any changes needed to fit your requirements. Please call for our Special Sale Prices and SAVE $$$.

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QSL samples — 25¢ Samcards — 48 Monte Carlo Dr., Pittsburgh, PA 15239.

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FREE, 100 DELUXE QSLs with first order of 100 or more. Samples 25 cents. Gazebo Press, Rt. 4, Box 4148, LaPlata, MD 20646.

ENGRAVING. CALLSIGN/name badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

LETTERING & TEXT for QSL Pasteup and Label usage. Stamp brings circular. LABELCRAFT, P.O. Box 412, W. Sand Lake, NY 12196.

NEW 3-D designs, including Space Shuttle, samples 50¢, 3-D QSL Co., P.O. Box D, Bondsville, MA 01009.

QUALITY QSLs, Samples 50¢. OLDE PRESS, WB9MPP, Box 1252, Kankakee, IL 60901.

QSL's $12.95 UP, WA4PRE, Jim's Printing Service, 2155 Young, Memphis, TN 38104 S.A.S.E.

DAYTON HAMVENTION . . . We'll be there (Booth #229). Drop by and chat with Lola and Me. We look forward to visiting with old friends and meeting new ones. 73, Wayne QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Radios, parts, books, magazines before 1928. W6ME 4178 Chasin Street, Oceanside, CA 92054.

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin, TX 78745.

WANTED; old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

MANUALS for most Ham gear made 1937/1972, plus Kenwood. Our 1985 catalog is $1 USA and required for ordering. Over 2,000 models listed. HI-MANUALS, P.O. Box E802, Council Bluffs, IA 51502-0802.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: PRE-1923 radios, pre 1940 T.V. Entire collections bought. Top cash paid immediately. Phil Weingarten, 67-61 Alderton St., Flushing, NY 11374, 718-896-3545.

WANTED: radios, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201. 818-242-8961.

MICROPHONES used in radio/TV broadcasting prior to 1960 wanted for archive. Write: James Steele, NAB, Box 39190, Washington, DC 20016.

WANTED: EARLY telegraph instruments for my collection. Landline keys, spark keys, miniature keys, call boxes, sounders, meters, etc. Any instruments made in California. Pre-1910 books, catalogs, and franks. Larry Nutting, WD6DTC, 5957 Yerba Buena, Santa Rosa, CA 95405.

SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model No., SASE. Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

AMATEUR RADIO exhibit of National, Hallicrafter and other early receivers including broadcast. Early parts and tubes. Spark and tube type transmitters, telegraph station and keys. Write: Bruce Kelley, W2ICE, RD #3, Holcomb, NY 14469.

WANTED: OLD tubes, amplifiers, speakers, Western Electric, RCA, Cunningham, Deforrest, McIntosh, Marantz. 713-728-4343. Maury, 11122 Atwell, Houston, TX 77096.

WANTED: COMMERCIAL amateur equipment made before 1940. Especially Collins 30A/B/G transmitters, National SW2/5, AGS/X. State cost and condition. Buehlmann, N4IQA, 1314 Chaney Road, Raleigh, NC 27606.

NCL-2000 LAST PRODUCTION parts, tank coils, bandswitches, relays, switches, matched 8122s, etc. SASE for price list. Maximilian Associates, 11 Plymouth Lane, Swampscott, MA 01907.

WANTED: INVADER; HT-32B; HX-500; GSB-100; GSB-101. Must be mint without mods. K9ZTV. 709 S. College, Aledo, IL 61231.

COLLINS KWS-1 #1216, 75A4 #3900 3 filters, SC-101 (complete), $12 95; 180S-1 ant. tuner $135; 302C-1 wattmeter, $95; KW-1 Serial No. 1, $3900; mint KWM-2 (with DX Eng. proc., noise blanker), 312B-5, 516F-2, $700; 51J-4 #6773 (with cabinet, 3 filters), $295; all units restored to original factory specs. Prefer pick-up on larger items. WA2OAX, Ira D. Lipton, M.D., 8 Rose Hill Road, Suffern, NY 10901. 914-357-8282.

WANTED T1 Audio Transformer for old Johnson Pacemaker SSB rig, Jim Hall, W4BLX, P.O. Box 97, New Hope, VA 24469, 703-363-5797.

SP600JX6 manual wanted. Copy of original is fine. State price in response. Write: W. S. Baker, K2LZF, 1388 Ridge Road, Lansing, NY 14882.

QSTs - have every issue from Nov. 1932 through Nov. 1964 excepting May 1947. All in very good to excellent condition. Best offer. FBF, 15 Belton St., Arlington, MA 02174.

MFJ TUNERS

QUALITY TUNERS THAT DELIVER MORE PERFORMANCE, MORE FEATURES, MORE VALUE FOR YOUR MONEY.

MFJ-941D 300 WATT VERSA TUNER II

$99.95 (+$4) **MFJ's fastest selling tuner packs in plenty of new features.** **New styling!** Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output.

Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black, 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4)
5x2x6 in. **Use any transceiver**, solid state or tube. Operate all bands with one antenna.

OTHER 200 WATT MODELS:
MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4) **MFJs best 300 watt Versa Tuner II. Matches everything** from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10) and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors, 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10) **Meet "Versa Tuner V". It has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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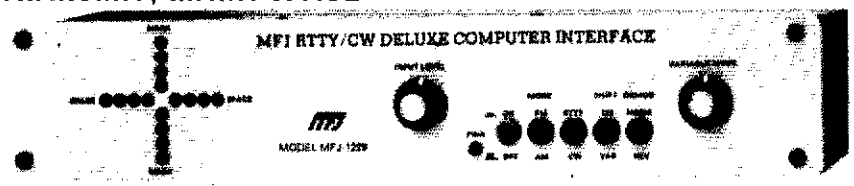
NEW FROM MFJ

MFJ'S MOST ADVANCED RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE HAS FM, AM MODES, LED TUNING ARRAY, RS-232 INTERFACE, VARIABLE SHIFT TUNING, 170/850 Hz TRANSMIT, MARK-SPACE DETECTION.



MFJ RTTY/ASCII/CW software on tape, cables for C-64/VIC-20.

MFJ-1229
$179.95

Engineering, performance, value and features sets MFJ's most advanced RTTY/ASCII/AMTOR/CW computer interface apart from others.

FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

AM (non-limiting) mode gives superior performance under weak signal conditions or when there are strong nearby stations.

Crosshair mark-space LED tuning array simulates scope ellipse for easy, accurate tuning even under poor signal-to-noise conditions. Mark and space outputs for true scope tuning.

Transmits on both 170 Hz and 850 Hz shift.

Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input.

Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

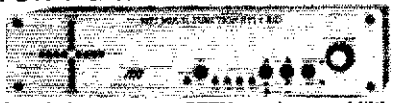
Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12½x2½x6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

MFJ MULTI-FUNCTION TUNING INDICATOR

MFJ-1221
$79.95



Greatly improve your RTTY copying capabilities. Add a crosshair LED Tuning Indicator that makes tuning quick, easy with pin-point accuracy. **Add** mark and space outputs for scope tuning. **Add** LEDs that indicate 170, 425, 850 Hz shifts. Great for copying RTTY outside ham bands. **Add** sharp mark and space filters to improve copy under crowded/weak conditions. 170, 425, 850 Hz shifts. **Add** Normal/Reverse switch to check for inverted RTTY without retuning. **Add** output level control to adjust signal into your terminal unit. **Add** a limiter to even out signal variation for smoother copy.

Unit plugs between your tuner and receiver. Mark is 2125 Hz, space is 2295, 2550 or 2975 Hz. Measures 10x2x6 in. and uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, $9.95.

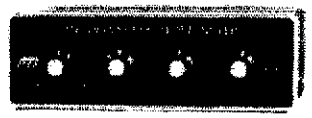
24/12 HOUR CLOCK/ID TIMER

MFJ-106
$19.95

Switch to 24 hour UTC or 12 hour format! Battery backup. ID timer alerts every 9 minutes after reset. Red .6 in. LEDs. Synchronizable to WWV. Alarm, Snooze function. PM, alarm on indicators. Gray/Black cabinet. 110 VAC, 60 Hz.

MFJ ELECTRONIC KEYER

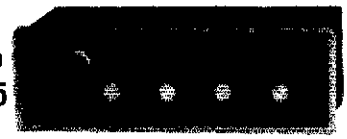
MFJ-407
$69.95



MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

MICROPHONE EQUALIZER

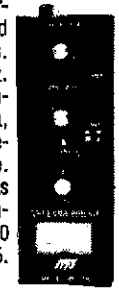
MFJ-550
$49.95



Greatly improves transmitted SSB speech for maximum talk power. Evens out speech peaks and valleys due to voice, microphone and room characteristics that make speech hard to understand. Produces cleaner, more intelligible speech on receiving end. Improves mobile operation by reducing bassy peaks due to acoustic resonances. Plugs between mic and rig. 4 pin mic jack, shielded output cable. High, mid, low controls provide ±12 db boost or cut at 490, 1170, 2800 Hz. Mic gain, on/off/bypass switch. "On" LED. 7x2x6 inches. 9 V battery, 12 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ ANTENNA BRIDGE

MFJ-204
$79.95



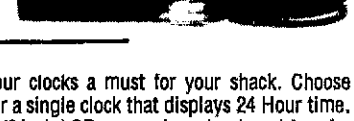
Trim your antenna for optimum performance quickly and easily. Read antenna resistance up to 500 ohms. Covers all ham bands below 30 MHz. Measure resonant frequency of antenna. Easy to use, connect antenna, set frequency, adjust bridge for meter null and read antenna resistance. Has frequency counter jack. Use as signal generator. Portable, self-contained. 4x2x2 in. 9 V battery or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 15, 10 meters from apartments, motels, camp sites, vacation spots, nearly any electrically clear location where space for a full size antenna is a problem.

A telescoping whip (extends to 54 in.) is mounted on self-standing 5½x6¾x2¼ inch Phenolic case. Built-in antenna tuner. Field strenght meter, 50 feet RG-58 coax. Complete multi-band portable antenna system that you can use nearly anywhere. Up to 300 watts PEP.

MFJ-1621
$79.95



MFJ 24 HOUR LCD CLOCKS

$19.95

MFJ-108

$9.95

MFJ-107

Huge 5/8 inch bold black LCD numerals make these two 24 Hour clocks a must for your shack. Choose from a dual clock that features seperate UTC and local time display or a single clock that displays 24 Hour time. **Mounted in a brushed aluminum frame,** these clocks feature huge 5/8 inch LCD numerals and a sloped face for across the room viewing. Easy set month, day, hour, minute and second function. Clocks can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 inches; MFJ-107, 2¼x1x2 inches. Battery included.

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WANTED: Old Hallicrafters and National equipment for *our School - This equipment to be used for kids that are on Probation with the Courts* - This equipment can be JUNK — also want someone to DONATE our school old QST's - Ham Radio - from 1930 to 1950's. Thompson 159 S. Yuma St., Denver, CO 80223.

WANTED: Old keys for my telegraph and radiotelegraph key collection. I am looking for each make and model of bug manufactured before 1935. Vibroplex, Martin Boulter, Thomas, D&K, etc. Also all spark and Boston key models. Need sideswipers, Omnigraph, Cricket, cable keys and pre-1900 landline (keys, sounders, pocket sets, etc.) Neal McEwen, 1128 Midway, Richardson, TX 75081. Visitors welcome. 73 de K5RW.

WANTED: COLLINS transmitters pre WWII including 30W, 30FX, 32A, 32B, 45A. Parker, W1YG, 203-434-7783, 813-262-2568.

VINTAGE STATION would like to sell complete. Heath HX-10 transmitter (Marauder); HA-10 linear (Warrior); 1 kW - covers ten meters; Collins 75S-3 receiver; all in functional condition - with all original manuals and approximately 2 sets of extra tubes for HX-10. $600 for complete station. W. G. Schenk, Jr., W2MSU, 621 93rd Ave. North, Naples, FL 33963.

HALLICRAFTERS TRANSMITTER large table - top model, 814 tube in final $175. Meisner Signal Shifter, late model $75. Hammarlund HQ-170C with speaker $125. Hallicrafters SX-101 $75. Heath AT1 transmitter with SWR $50. Broadcast radio: Majestic console $150. RCA 810 tubes condition unknown $20 each. K4UJZ, R. Olmsted, RT-11 Thompson Lane, Murfreesboro, TN 37130. 615-893-5344.

FROM THE ESTATE of George Grammer, W1DF: QST for Dec. 1915 (Vol. 1 No. 1) Oct. 1916, May 1917, June 1917, July 1917, August 1917, June 1919, July 1919 and 1961 through 1975. QST hardbound copies 1920 through 1967. ARRL Handbooks 1940 through 1964. Proceedings of the IEEE 1931 through 1965. Prefer to dispose in lots rather than single issues. LC c/o ARRL, 225 Main St., Newington, CT 06111.

ANTIQUE RADIO BUFFS - Join an international club of fellow enthusiasts. For information on membership, quarterly journal, and June Convention write ARCA, 81 Steeplechase Road, Devon, PA 19333.

ANTIQUE RADIOS for starting collectors. SASE for list. W9REW, 4811 Forest Ave., Ft. Wayne, IN 46815. 219-749-5222.

NATIONAL NC-300 with matching speaker, 6 meter Converter and manuals. Mint condition. Best offer. K8OK, 616-532-5196.

WANTED - WW2 Japanese military radios in original condition. Also USA BC779, etc. Please write details to Mr. Tajima, JA1DNQ/KD2HB c/o Toshiba, 111 Business Park Drive, Armonk, NY 10504.

BUILDERS-COLLECTORS - Selling 50 year collection tubes, capacitors, meters, steatite insulators, transformers, relays, switches, chokes, coils, pictures. Advise needs with SASE for lists. W2ER, Fairline, East Quogue, NY 11942.

WANTED: HEATHKIT AT-1 Transmitter, National SW54 receiver & Viking Ranger. Must be in operating condition. Contact: K2MMT, Peter Brandenberg, 58 Indian Hill Road, Mt. Kisco, NY 10549. MCI: 227-8520. Tele: 914-273-6300 days. 914-241-4666 evenings.

NEED COLLINS Parts: kc dials for 32V and 75A-2; kc dial for KW-1. Mine have discoloured. 353C-31 and 353C-14 mechanical filter plug-ins for 75A-1; 35C-2 LPF; spinner knob for 75A-4 (don't need the 4-1 reduction gear); skirted knob for 62S-1 freq. select control; 55G-1 preselector; F455FA08 or F455FA05 filters; want original and unmodified 310B-3 exciter; looking for 32V-2 transmitter in good shape for local (more or less) pickup within an hour's drive of Hartford or ??? Have you anything to trade? Contact AC1Y c/o ARRL Hq. or call 203-667-2494 days 8-4.

FOR SALE - Hallicrafters 2-36 vintage UHF receiver: $100. John Hill, K2YY, 609-235-2777 or 212-683-2273.

SELL: IRE/IEEE Proc. Jan. 1928 thru Dec. 1972. Best offer. WA2DWV, RD 1 Box 3, Freehold, NJ 07728.

SELL: GONSET G-50 $55, Heathkit Shawnee $55, Heathkit Seneca $55, Heathkit RF Gen IG-102 $30, EICO Sweep 360 $30, Audio Gen TS382 $30, Cushcraft ANT. 6M 5 el $15, plus UPS. All picked up $190. WA2DWV, RD 1 Box 3, Freehold, NJ 07728.

General

MICROWAVE MODULES, new, cheap, MMT 1296/144G $269, MMX 1268/144 $175, MMT 432/28-S $229, MMT 220/28 $199, MMT 144/28 $159, MMC 144/28HP $69. Heliax, ½" Andrew LDF4-50, 1000' reel $900. Water coolers for 3CX100 style tubes $7.50. Hans Peters VE3CRU 416-759-5562.

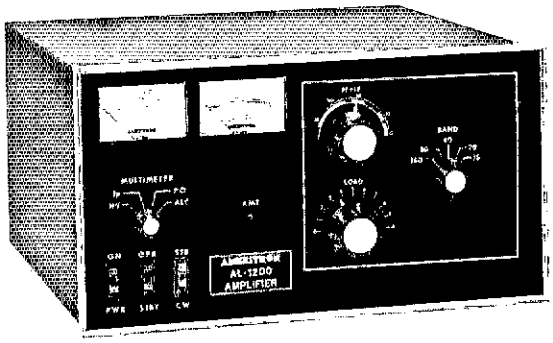
CANADIANS: COMPLETE ham station: Heath HW101 transceiver i/c LP filter, HP23C ACP/S, HS1611 speaker, SB650 digital display, SB610 monitor scope, Spare tube set I/C CRT, Turner desk mic, mobile mike. $375 complete. Also available, Ameco PT2 transceiver preamp $45, Autek QF1 audio filter $40, MFJ941B antenna tuner 2 i/c swr bridge $50, spare tube set for Collins KWM2 $35. All excellent working order with manuals and cables. Will packship CNX/UPS collect. Monty Hart, VE3TA, 61 Scott Crescent Barrie Ontario CANADA L4N4W2. 705-737-2252.

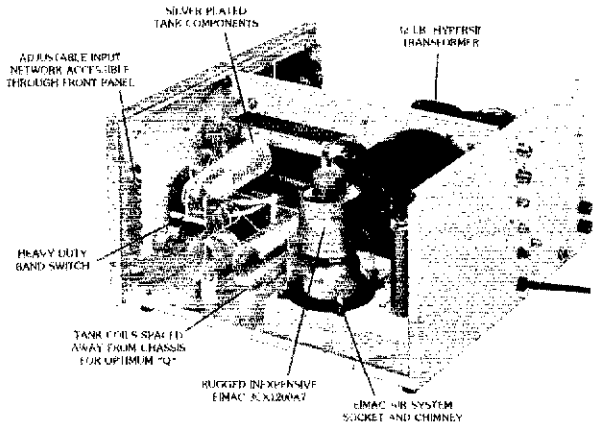
WANTED: YAESU FP-501 Power Supply. Write John Matthew, 1564 132-B Street, Surrey, British Columbia, CANADA, V4A 6J2.

TELETYPEWRITER parts, supplies, gears. Toroids. S.A.S.E. list.Typetronics, Box 8873, Ft. Lauderdale FL 33310. Buy unused parts, cash or trade.

AMERITRON AL-1200 LINEAR AMPLIFIER

WITH THE NEW EIMAC 3CX1200 CERAMIC TUBE





1500 WATTS OUTPUT, ALL MODES 160 THROUGH 15 METERS

- Pi-L network with heavy duty components.
- High efficiency bias setting for RTTY/CW.
- ALC compatible with all popular transceivers.
- Peak-reading output meter.
- 32 lb. Peter Dahl hypersil transformer.
- Bridge rectifier supply with computer grade capacitors.
- Inexpensive, instant warm-up tube.
- Full shielding for minimum TVI.

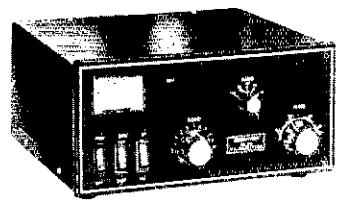
AL-80 COMPACT KILOWATT LINEAR AMPLIFIER

The **Ameritron AL-80** incorporates the rugged 3-500z triode in a class AB_2 grounded grid configuration. It has individually tuned, broad band pi network inputs that present a 50 ohm load to the transceiver.

Frequency coverage is 1.8 - 21.5 MHz amateur bands.

Power input is 1500 w PEP SSB, 1000 w CW and RTTY.

Size: 12"W × 7"H × 14½"D Wgt.: 45 lbs.



AL-84 900 W LINEAR AMPLIFIER

The **Ameritron AL-84** is an economical amplifier using four 6MJ6 tubes to develop 400 watts output on CW and 600 watts PEP on SSB from 160 through 15 meters. Drive required is 70 w typical, 100 w max. The passive input network presents a low SWR input to the exciter. Power input is 900 watts.

Size: 11½"W × 6"H × 12½"D Wgt.: 24 lbs.

Available at your dealer — Send for a catalog of the complete AMERITRON line.

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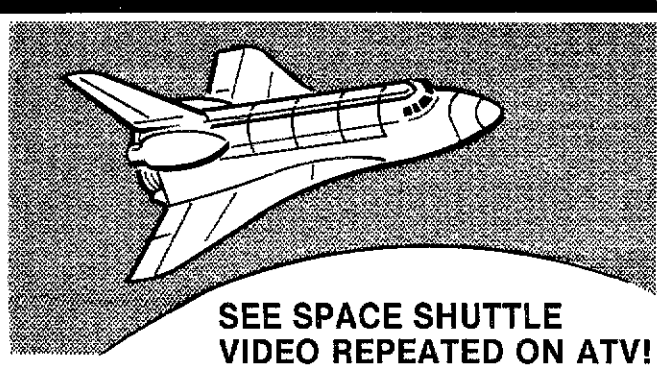

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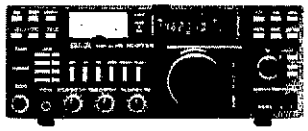

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IC-3AT
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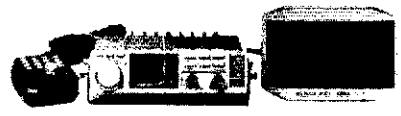

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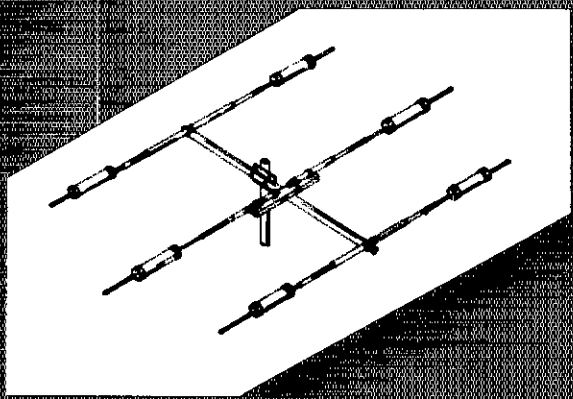

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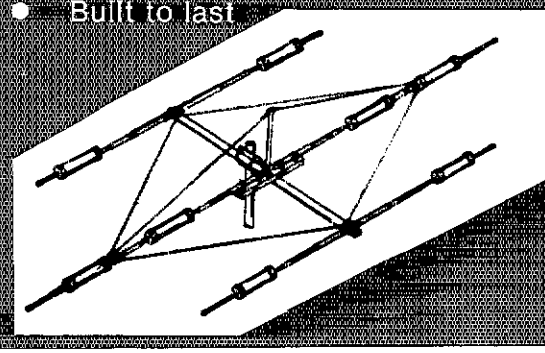

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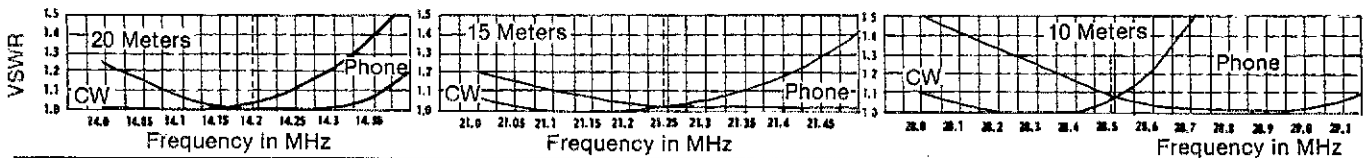

SPECIFICATIONS:

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		1½" or 2"
Turning Radius		15'6"
Wind surface area (in sq ft.)		6.7
Wind load (EIA standard 80 mph)		114 lbs.
Assembled Wt.		39 lbs.
Shipping Wt.		44 lbs.

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NEW VE PROGRAM Questions. . . Booklet contains the current FCC Amateur Radio Operator Study Guide and all 1600 *actual* test questions for *all* ham classes (Novice through Extra Class.) $3 postpaid. Volunteer Examiners needed. Be the testing authority in your area. Unique program. W5YI Report; PO Box -10101; Dallas, TX 75207.

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WANTED: IC-202, 402. Yaesu FT-290. Also need all types of microwave components. Contact Microwave Book Editor, ARRL Headquarters.

COLLINS GEAR: KWM-2A (w/NB,Q-Mult), 516-F2/PM-2 ac/dc power supplies, 312-B5 External VFO, 180-S antenna tuner, DL-1 dummy load, CP-1 Crystal Pack, manuals, 200+ new tubes, cables, spares. Dengel, WB2HED, 212-884-7064.

SELL ICOM 740, 500 Hz CW filter; built-in Curtis Keyer; internal AC supply; mic. Absolutely mint condition — hardly used. $700. Contact Microwave Book Editor, ARRL Headquarters.

SALE - SWAN 100MXA, Kenwood R-1000, TR-7400A, Tektronics, Elmac, K5SBR, 713-520-8531.

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COMPLETE TWO-METER Repeater with Advanced Computer Controls RC-850 controller, full telemetry, link radio and many other extras for sale. Excellent condition. Doug Zastrow, WB0UPJ, 1702 Alaska, Norfolk, NE 68701. Phone 402-379-3166 days, 402-379-1166 evenings.

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WANTED - 2-Meter Duplexer, with or without repeater, in good condition. Prefer Sinclair, Wacom or comparable manufacturer. Turner Johnson, WB4TVY, 205-222-5112, Covington Amateur Radio Club, 106 South Ridge Road, Andalusia, AL 36420.

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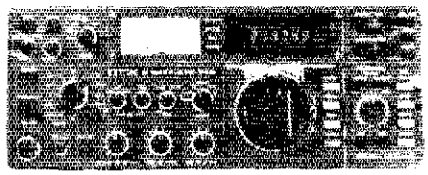
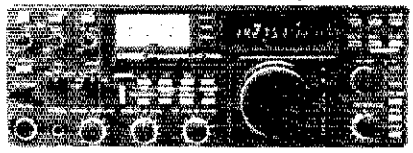


HF Equipment	Regular	SALE
IC-740* 9-band 200w PEP xcvr w/mic	1099.00	869.95

***FREE PS-740 Internal Power Supply & $50 Factory Rebate** - until gone!

PS-740 Internal p/s ....(Special!)	$159.00	99.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
*Options also for IC-745 listed below		
IC-730 8-band 200w PEP xcvr w/mic	829.00	569.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	1349.00	799.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	999.00	779.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
*See IC-740 list above for other options (*)		



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/740/745/751	Regular	SALE
PS-15 20A external power supply	149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	

ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock (Closeout!)	99.95	79.95
HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	1299
VHF/UHF base multi-modes	Regular	SALE
IC-551D 80 Watt 6m transceiver	699.00	599.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
AG-20 Internal preamplifier*	56.95	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	759.95
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	969.95
AG-35 Mast mounted preamplifier*	84.95	

For a Limited time!
With the purchase of IC-271A/H or IC-471A/H get the matching Preamp* for just $1.00 extra.

Common accessories for 271A/H and 471A/H	Regular	SALE
PS-25 Internal power supply for (A)	99.00	89.95
PS-35 Internal power supply for (H)	160.00	144.95
PS-15 External power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for PS-15/CF-1	6.50	
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	479.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25w 2m FM w/TTP mic	369.00	319.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	359.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	299.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-3200A 25w 2m/440 MHz FM xcvr	549.00	489.95
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
ML-12 10w amplifier	339.00	299.95
6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers		
Deluxe models	**Regular**	**SALE**
IC-02AT for 2m	349.00	289.95
IC-04AT for 440 MHz	379.00	319.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts SALE	359.95
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier SALE	79.95
SS-32M Commspec 32-tone encoder	29.95

Shortwave receivers	Regular	SALE
R-71A 100 kHz-30 Mhz digital receiver	$799.00	659.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 kHz-30 Mhz digital receiver	749.00	569.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12V DC option	9.95	
MB-12 Mobile mount	19.50	

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GRID-SQUARE BEARINGS printout. 1100 grid squares computed from your QTH. Contains Grid, Bearing, Distance, Reciprocal Bearing. $5.50. Send your latitude and longitude to KD8SI, 2648 North Aragon Ave., Kettering, OH 45420.

WANTED: LIKE-NEW 810 and 4-1000A transmitting tubes. Description, history, and price to Charles Frodsham, KØAYS, P.O. Box 7, Beloit, KS 67420.

WANTED: PANASONIC multiband radio RF-2200 KBØW 916-272-7203 days.

FOR SALE: R-392 surplus receiver. Excellent mechanical and electrical condition. $175 plus shipping. Excess tubes also. Send for list. Joseph Pinner, 1500 Goodyear Blvd., Picayune, MS 39466.

WANTED: DRAKE RV-75 VFO have RV-7 and $100 or? WB4ZCD, 606-441-9684 weekends.

COMMODORE 64 PROGRAM turns computer into sophisticated memory keyer. See March QST ad for more details. Send for complete description or $15 for cassette and interfacing directions. K4ORQ, 120 Elk Rd., Bristol, TN 37620.

FOUR ANTENNAS for sale, all for pick-up only. Southern New Jersey area. 3 element Kirk helically wound 40 meter beam, cost over $600 new. Never assembled, $400. Hy-Gain 402BA 2 element 40 meter beam, $135. Wilson 4 element 20 Meter Monobander, $125. Home Brew 5 element on 15 meters, 4 element on 10 meters, on common 30 foot boom. Works great. $100. Also for sale, Collins 75S3-B receiver with 200 Hz. CW filter, Excellent condition: $500. Rycom 2174A-610 VLF receiver, range 0-290 kHz.: $125. Call John Hill, K2YY, 609-235-2777 or 212-683-2273.

APPLE II-C RTTY Software - Features include 60,000 character save buffer, save to disk, text editor, type ahead buffer, print, logbook, all from one menu. $19.95 or info S.A.S.E., K5HI, 2215 Goldsmith, Houston, TX 77030. 713-661-5859.

COMMODORE OWNERS: IMCT (International Morse Code Trainer) V1.4 for the 64 or unexpanded VIC. Menu-driven + documentation + random tests + (1-25 WPM) + adjustable pitch + enter characters and hear the Morse sound. 64 also has the following: 9 step by step lessons + user-defined tests + straight key simulator. 20 version $9.95, 64 version $14.95. Pa. add 6%. AC3L SOFTWARE, P.O. Box 7, New Derry, PA 15671.

SPRING CLEANING? Don't put that old 930s or PL-259 out in the trash. Contact WB2JKJ and the Crew At The Core Of The Big Apple. We will give it a good home.

COLLINS WANTED: 55G-1 preselector for 51S-1; F455FA08 or F455FA05 filter; 310B-3 in good condition, unmodified; 32V-2 transmitter in good condition (pickup within appx. one hour's drive of Hartford, CT); SM-1, SM-2 and MM-2 mics; round emblem 302C-3 wattmeter; multimeter for 30L-1; skirted tuning knob for 62S-1 transverter; knob for multimeter switch on 30L-1; 35U-1 LPF for 75A-4. Anyone have info on SC-301 station control which was designed for the S-Line, mid-1960's?? Please contact AC1Y c/o ARRL Hq. or 203-667-2494 days 8-4.

TEST EQUIPMENT for sale CSC Digital Readout Capacitance Meter (mint) $100 - Dual Trace adapter by RCA for single trace scope (mint) $50 - 10-4565 Heathkit scope $100 - EICO capacitance meter $20 - Knight Signal Tracer $20 - phone 806-273-5540 or Ron Gandy, 821 Jackson, Borger, TX 79007.

DON'T DELAY - Send your QSL today to WB2JKJ and the Crew at Junior High School 22 on Manhattan's Lower East Side and we may send you our QSL Of The Week Award.

WANTED: C D Control for Ant Rotor, K4NBN. "No Bad News."

CENTURY-21, factory inspected $150. Doug Frick, 6 W. 9th, Pottstown, PA 19464.

NEW VFO for FT77 plus frequency controlling mic. for sale. (FV700DM, MH1-B8) includes manuals. Transceiver was stolen. K9QLS, 312-469-6044.

WANTED - GENRAD 1330A Bridge Oscillator and any RF bridge. Dave Burns, 4109 Queen Mary Drive, Olney, MD 20832.

KENWOOD TS520SE w/CW filter $380. DG5 Digital Display $150. VFO520S Remote VFO $90. MC50 mic $30. Radio Shack DX300 General Coverage Receiver $180. Heathkit HD1418 Active Audio Filter for CW/SSB/RTTY $60. All above with boxes and manuals. Also Hallicrafters S20R General Coverage Receiver. NJ5O 409-297-6674.

TRADE OR SALE for ham equipment: xmitting and receiving tubes. W5VCF, Rt. 3, Box 118-A, Roswell, MN 88201.

IBM-PC RTTY/CW. CompRtty II is now available! This new version of the CompRtty communications program for the IBM-PC is better than ever. Virtually any speed ASCII, BAUDOT, CW (automatic receive speed). Text entry via built-in text editor! 10,000 character transmit/receiver buffers! Split screen display with movable split! Hardcopy, diskcopy, break-in buffer, received string search autostart/stop, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Ideal for traffic handling. Requires 128k, PC-DOS, serial port and RS-232C compatable TU. $65. Include call with order. David A. Rice, KC2HO, 7373 Jessica Drive, North Syracuse, NY 13212.

KENWOOD TS830S, VFO-230 digital, mint condition, both $775. Will ship in original boxes. J. E. Rehler, Box 2888, Corpus Christi, TX 78403. 512-884-1961, 512-854-4341.

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_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
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_____	_____
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ALPHA 77SX $3500. Kenwood TS-930S, AT-930, YG-455CN-1, YK-88C-1 $1000. KQ9W.

IC-211 2-meter all-mode transceiver, 10 watts, built in AC PS, hand mike, IC-SM2 desk mike, manual, original packing. All very good condition $275 plus shipping. Bill, WØBPP, 816-431-2466.

TEN-TEC ARGOSY with 225 Power Supply 217 CW filter and more. New condition $425. Drake TR4C, spare parts, new Drake finals, etc. $25. WB4ZCD, 606-441-9684 weekends.

FOR SALE: Drake B Line AC4, MS4, acc crystals, mint cond. $375. Drake TR4 & p.s. mint $200. Heath SB200 mint new finals $300. Collins DI1 dummy load $50. Collins 312B3 speaker $35. New Grandmaster memory keyer $65. Vibroplex bug $25. HAL KB-2100 new $85. TR2600A new, leather case extra batteries $300. Robot 70E80 SSTV works great B.O. New Morgan dipole 80-10 HD $65. Call 617-438-1765. WA1TQQ, Guy S. Quartarone, 14 Cedar Way, Stoneham, MA 02180.

WANTED: UNIDEN CR-2021 Receiver. WB2IMB, 205 Herbert St., Syracuse, NY 13208.

YAESU FT-101-EE for sale. Original box. Manual. Asking $365. W1JEC. Tel. 704-697-9829.

**MINT: TS-700A 2M/All-Mode, $225; MN-2000, $145; Dentron 160-10AT Super-Tuner, $95; HW-8, $85; DX-60B, $35; SP-100, $22; Shure-444, $25. U-Ship. AA6EE, 619-789-3674.

SELL: TS-820S transceiver $500. W2WHK, 716-692-5451.

LINEAR BUILDERS send SASE for list of goodies - Vacuum Caps, Transformers, Tubes, W6RW, 8600 Skyline Drive, Los Angeles, CA 90046.

SELLING TEN-TEC Omni-A 545 used very little with manual and original shipping $300. Also v.g. homebrew antenna tuner 160-10 with roller inductor $80. WØJDH, 327 NW6, Valley City, ND 58072.

FOR ATLAS 350XL; 305 Aux. VFO and 311 X-tal Osc. with eleven x-tals installed, Marine & WWV, $125 each. Unused Kenwood DFC-230 for, TS-120, 130, 530, 830 $150. I ship All M.O. or good check. Gene, KA3AHL, 165 Benziger, S.I.N.Y. 10301.

FIELD DAY for Apple II + /E/C. Other contests too! Walk away from Field Day with the paper work done. Accidental power failure - no problem $19.95. Demonstration disk $3. KBØVT, P.O. Box 1185, Des Moines, IO 50311, 515-274-2094.

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SELL - SONY 2001 and AC PS, good condition, $75 plus shipping. David Schwartz, W1GAJ, 1183 Southeast St., Amherst, MA 01002.

SELL: ICOM IC-751 with PS-35 internal PS and FL-52A CW filter. Very low hours. $1000. K4RKI, 919-467-8416.

DRAKE TC-2, TC-6, SC-2, SC-6, CPS-1 ps supply, CC-1 console. 300 watts on 6 & 2 metres $525; Drake UV-3 144-220 & 440 MHz trcv. UMK remote head $475; Drake AC-4, AC-3, DC-3 supplies $165; NC-240 rcvr $287 or trade; HT-220 UHF $225 or trade for 440 rig; 1 kW ARCOS 6-metre amp $525; Heathkid 220 amp $535 or trade for 757-GX; 107 Yaesu 240 watt solid-state hf trcvr, 160 thru 10 FTV-107R transverter with 432 and 435, FP-107 internal ps, scan 160 to 432 MHz. WB8VYF, 513-875-2992.

DISPLAY, COLLECT, United States postage stamp commemorating Amateur Radio. Issued 1964 on 50th anniversary ARRL. $1. Beautiful set six communication-electronics stamps $3. Both include Showgard mounting, story. WD8MNQ, 8490 Beck, Lake, MI 48632.

AWARDS DIRECTORY $1 brings information. Refundable. Updated monthly. Computerized. Worldwide. List your Awards free. Over 1000 now in files. KBØZP, RR #1d, Cumming, IA 50061.

WANTED: Clean operable HG-10B or HA-5 VFO by rockbound Novice with Drake 2NT. KAØRKJ, Ed Kelly, 2109 Buena Vista Drive, Greeley, CO 80631. 303-330-7323.

VHF WANTED: Heathkit SB-110A or Swan 250-C, 210 external VFO, six meter SSB transceivers. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

SWAN 500 MINT, ps, manual, $275, W2HKE, Howard, 215-399-8977.

MADISON TUBES: GE6146B $9.95; 12BY7A $5; 572B $62; Eimac 3-500Z $99.95; 4-125A $35; 807 $7.50; 6CL6 $1.95; 3E29/829B $15; 832A $5; 4D32 $60; 6L6M $12.50; 6161 $60; 4X150D $35. All guaranteed, prices FOB Houston. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-800-231-3057 (U.S.); 1-713-658-0268 (Texas). Mastercard/VISA/COD.

TEMPO BLACKFACE w/power supply, excellent, D-104 mike. All $300. KAØPGO, 314-392-3793.

SELL: SB-104A, mf, SB-604 spkr, HP-1144A p.s. $450. SB-102, SB-600 spkr, p.s. $250. All excellent condx. K1EWY, 203-569-3765.

SWAN 350 SSB transceiver - p.s. spkr mic. A1 $250. K2CSA, 201-928-3002.

WANTED: 2-3 sections of Rohn 11 tower. State price and condition. KA9FCZ via Callbook.

MADISON GOODIES: Bird 43, elements - stock; Belden 9913 solidcenter lowloss 50/ohm 50¢/ft; 8267 RG213 52¢/ft; 8214 RG8 foam 43¢/ft; 9258 RG8X 19¢/ft; 8000 14ga stranded antenna 13¢/ft; dogbone insulator 75¢; Amphenol *PL259 silverplate $1.25*; SO239 $1.25; UG176 adaptor 30¢; 2900 (SO239-BNC) $4; 4400 (SO239-N) $6; 8261 Nmale $3; 8297 Nfem $3; 83-10 (RCA-SO239) $3. Bird - call quote; prices FOB Houston. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268 (Texas). 1-800-231-3057. MASTERCARD/VISA/COD.

R4C/T4XC/AC4, excellent, many extras. $400. U-ship. Don Weyel, 806 Wyoming Ave., Erie, PA 16505, 814-833-7250.

FOR SALE: Two 3-1000Z good $45 each; two 3-400Z good $30 each with shields and sockets. Lee L. McKee, WØBX, 1820 Briarwood, Muscatine, IA 52671. 263-8398.

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PRE-TUNED FIVE-EIGHTS wave two meter magnet mount antennas. $19.95 complete plus $3 shipping. Write for catalog page. George Shira, Rt. #7, Box 258, Anderson, SC 29624.

WANTED - MINT Collins 30S-1. S. King, W8POZ, 1970 Alhambra, Ann Arbor, MI 48103. 313-761-1269.

FOR SALE: TS930S, matching speaker, with mic. excellent condition. Used only twice. $1400. Lee Bessinger, KA4KGF, Ocala, FL 1-904-351-4869 after 5 P.M.

VIBROPLEX BUG $35. Kenwood TR-9000 multi-mode 2-meter with 85-watt amp, $395. Ten-Tec 12-volt, 18-amp supply, $75. Heath SW-717 general coverage receiver, $35. Heath VTVM, never used, $45. MFJ Econo-Tuner, $30. MFJ CWF-2 CW Filter, $10. Turner AMM-46 Dual Impedance Mic, $20. You ship all. KD8LF, 419-726-2467.

HAMSWAP NEWSLETTER - Buy/Sell/Trade Ham/Computer related equipment. Now taking Free Ads. Phone number must be included in ad. HamSwap, P.O. Box 420171, Sacramento, CA 95842.

WANTED: MILLEN 90811. 829B amplifier. 10 and 2 meter coils. Will consider Millen 90810. W6VDR 24 Goya, Fairfield, CA 94533-1008.

HEATH SA-2500 automatic antenna tuner, $475. Dragon 64 kbyte color computer with software, $100. Videx APSIO parallel/serial card for an Apple II computer, unused, $150. VIC-20 computer with 16 kbyte expansion module, Kantronics Hamtext, software, manuals, mint condition, $150. Purchaser pays shipping. Paul K. Pagel, N1FB, 4 Roberts Rd., Enfield, CT 06082. Days: 203-666-1541; evenings before 9 P.M. Eastern, 203-745-1029.

KENWOOD TS-830S like new $680. WØWTM, 10746 Brookmere, St. Louis, MO 63123. 314-849-2334.

SALE: 10 METER FM transceiver, $50; RTTY ASCII keyboard with Xitex and T.V., $75; SSTV keyboard, $40; TS-820S, $475; 2000 volt power supply, $125. W2WHK, 210 Utica St., Tonawanda, NY 14150. 716-692-5451.

NEEDED: NEW or USED equipment. Donations to International Youth Network, tax deductible. All-band XCVRS, 2M/70CM, HF linear amplifier, 2M HTs, scanner, multimeter, antennas, tower. Write: LEGACY, L. Brown, N4LLY, Route 4, Box 265, Bedford, VA 24523.

ESTATE SALE: SB-110 w/HP23 6M $175; HQ180A $135; 51J no cabinet $145; HA5 VFO $40; HW101 w/HP23 $175; 4-400A new $35; 4-250A new $30; 4-65A new $20; Squires SSR1A $150; HO-10 scope $60; HX50 xmtr $125; DX100 $65; SR42 w/VFO $25; HA2 HA6 $95 each; Gonset 2M amp 500W $325. List of odds and ends S.A.S.E. John Kakstys, 18 Hillcrest Ter., Linden, NJ 07036, 201-486-6917.

PARENTS, GRANDPARENTS - Know a child who would like international summer experience and work toward getting ham license? Write: LEGACY, Ira Kaufman, 1141 No. Glebe Road, Arlington, VA 22201.

HYGAIN TH3MK3, EZ-Way 50 foot crankdown tiltover tower. You disassemble $300; BK #1477 15 MHz triggered dual trace scope 6 months old. I ship $300. FT-757GX, MH-1, FRB757 $650. I ship. KMØQ, Eldridge, IA 319-285-7010 after 7 PM.

COMPLETE REPEATER System consisting of: M.C.S. Mark-3CR Repeater/Microprocessor, with autopatch, power transfer, T.T. mic., matching MCS PA-75 amplifier. Wacom WP-641 Duplexer, G.L.B. GaFET Helical Preselector, Hustler G7-144 vertical ant., 7/8" hardline w/conn, and emergency battery backup system with charger. Cost over $4500, sell for $2150 (firm). Excellent condition, set up on 147.69/09. Contact Gary Fay, NØEKB/4, 704-553-8608 after 6 P.M. E.S.T.

MOTOROLA IMTS Base Station VHF Amplifier 250 Watts output continuous for 10 watts in. In 6-foot fully metered cabinet rack with power supply, line amp. $300 shipped FOB W3QMU, Lawrence S. Higgins, 2522 Old Hickory Trail, San Antonio, TX 78230, 512-341-2910.

RETIRE TO the beautiful Texas Hill Country. One-year-old brick home, 2260 sq. ft. on one and one-half acre. Located on the beautiful banks of the Guadalupe River, Hunt, Texas. Ham station includes Yaesu FT980, Alpha 77 with new spare tube. Ten-Tec Corsair station, Remote VFO, speaker supply, tuner, etc. 80 ft 45G Rohn Tower, TB6EM Tetrex beam, 19,000 ft radial wire down. Hy-Gain 18 HT High Tower Vertical. Dual antenna, all bands. Price $110,000, W5NTJ, 512-238-4797 after 6:00 P.M. CST.

WANTED: DENTRON MLA-1200 amp. Wanted: Dentron MLA-2500 amp. Power transformer. WA7SFY, Dick, 509-234-5406, P.O. Box 73, Connell, WA 99326.

IC 271-A, PS-25, AG-20, HM7 mike $500. N7EU, Bill, 206-821-6027.

SELL: MOSLEY 6-402, 2 ele. 4 mtr beam. Asking $195. KV2I, 201-337-8845.

STATION FOR SALE: Kenwood 520. Sure 444 mic, Kantronics Mini-Terminal T/R RTTY/CW, MFJ 941-C Tuner, QF-1 SSB/CW Filter, manuals, all in very good condition. Asking $575. Gene, WA2FLN, 914-576-0440.

RACAL RA 6217E receiver $700, Murch UT-2000 trans match $100, Bearcat 220 scanner $200, Bendix Micromatch 711N wattmeter $50, Heathkit station monitor SB-614 $50, Heathkit hamscan SB620 $40, SB301 and SB401 with speaker $200, Optoelectronic FC50C freq. meter $75. All with manuals. K4HPD, 305 W. Gravel Lane, Romney, WV 26757, 304-822-4274.

450 MOTRACS, U64LHT, 60 watt PL, with elements, with reeds, with all accessories, $75 each or both/$100. RCA 500 2M receiver, rack-mount, 4-freq., solid-state $50. RCA Super Fleetfone 2M receiver deck, solid-state, w/COR and timeout timers, $25. Mike, K7DOU, 801-544-1400 eves.

ROHN TOWERS - Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributor for Heliax antenna cable. Hill Radio, 2503 G E Road, P.O. Box 1405, Bloomington, IL 61701-1405, 309-663-2141.

SWAN 100MX, solid-state HF transceiver, $275. Swan ST-3B tuner, $75. Collins F455FA21 mechanical filter, new, $45. Mike, K7DOU, 801-544-1400, eves.

HEATHKIT HR-1680, HX-1681, P.S.-23, manuals. $275 Will separate or trade. Want P.S. for SB-104 and G.C. rcvr. Jim, KAØFWK, 316-725-3798.

SELL: DRAKE R-4C N.B., 1st I.F. SSB filters, all Sartori mods $400. T-4XC, AC-4 $250. Both high serial. Datong Speech Processor $90. All pre-paid. KS9K, 414-554-9170.

FT-101-E, mint, C.W. Filter, YC-601 Display, Speaker Cabinet, $550. SP-901-P Patch, $40. R-174 Receiver 1.5-18 MHz, $60. SSTV H-Brew Monitor, $60. Jim, NC9H, (WA9WJV) 219-925-3219 evenings 46706.

KENWOOD TS-180S w/DFC, PS-30, VFO-180, SP-80, AT-180, MC-50, PC-1, factory aligned. All manuals and orig. boxes. AEA CP-1 w/AEASOFT MBATEXT cartridge for C-64. Butternut HF6V. All or part. WA5JXY, 915-594-7219.

DRAKE TR5, PS75 pwr supply $450. ICOM 740, FM $585. Azden PCS-4000 $195. All mint, manuals. Joe DiLiberti, W3GHI, 39 Second Ave., Secaucus, NJ 07094, 201-864-2589.

WANTED: 12 VDC DowKey relay, with auxiliary contacts. Buy contacts and coils separately if available. Reihl, 545 Ridge, Wilmette, IL 60091.

HEATH SB303 and SB401 with transmitter crystals for independent operation. Manuals and cables. Absolutely mint condition. Best offer. K8OK, 616-532-5196.

IC-R70 like new. Make offer. Patrick Matthews, White Oak, SC 29176.

KENWOOD 820S with MC-50 microphone. Excellent condition. Will ship, $530. KB4JRO. 615-482-5811.

TEMPO FMH-2 Two-Meter Handie-Talkie plus many extras, all for $89. WD6CQE. Lyle Lunsford, 901 N. Palisade Dr., Santa Maria, CA 93454, 805-922-6575.

KENWOOD 820 TRANSCEIVER with digital readout, CW and SSB filters. Kenwood VFO-820. MC-50 mike. All in mint condition. Extension feet, test and patch cords. Special and original control knobs. Operation and service manuals. Beam headings from your location. $685. C. Kline, WDØDJP, 1307 S. Lincoln, Longmont, CO 80501. Phone 303-776-9177.

FOR SALE: ICOM 730, IC-PS15, MFJ filter, table mike. Mint condition, $550. KA1MEQ, 413-498-2005 evenings.

REPLACE RUSTED Antenna Bolts with Stainless Steel. Small quantities, free catalog. Elwick, Dept. 545, 230 Woods Lane, Somerdale, NJ 08083.

WANTED - HEATH QM-1, IN21, DC1, LSC1, LSC2, EICO 1180. WØRIY.

KENWOOD TS830 mint cond. Less than ten hours use. Two CW filters, orig carton and manual. I still want it but going 12 Volt/MM2. $675. I ship UPS insured. Rob Singler, WD6K, 93 Rose La., San Rafael, CA 94901. 415-459-3243.

ROSS $$$$ NEW May Specials: If this month's special is not what you are looking for send Call letters name & phone # for personal price quote. Over 6,500 ham related items in stock ICOM # IC-471H $929.90, IC-45A $299.90, IC-745 $768.90, IC-04AT $309.90, IC-02AT $284.90, Kenwood # TS-930S $1339.90, TH-21AT $197.50, TR-8400 $379.90, TR-7950 $356.90, TS-530S $559.90, TR-2600A $???.??, VFO-230 $139.90, TW-4000A $489, TS-780 $759.90, TR-7930 $309.90, Yaesu # FT-208R $219.90, FT-757GX $779.90, FT-708R $219.90, FRG-7700 $369.90, FRG-8800 $589.90, FRG-7 $239.90. All major lines stocked. L.T.O. Mention ad. Prices cash, FOB Preston. Closed Monday and Saturday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

FREE SHIPPING, Continental USA. Mini-Quads HQ-1 $139.95, Butternut HF6V/HF2V's $106.50, Mosley TA33's $239.95, Amp-Supply LA-1000A amplifiers $379.95, stamp for flyer, Don, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047, 716-947-4840.

ROSS $$$$ USED May Specials: (over 200 used items in stock) Kenwood TS-820S $499, TS-820 $439.90, TS-180S $429, VFO-820 $129, Drake R-7 $769, Collins KWM-2 $399.90 Robot 800 $299, Yaesu FT-301D $339.90, FT-901DM $579, ICOM IC-245 $169, IC-751/W FL-32 $999. If this month's special is not what you are looking for send SASE, Call letters name & phone # for used list. Over 6,500 NEW ham related items in stock. Mention ad. Prices cash, FOB Preston. Closed Monday and Saturday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830.

SB-200 EXCELLENT. $300 postpaid; Drake C-Line, $485; winged S-line, $550; 500 pF/15 kV vacuum variables, $55. Wanted: Amprobe, HP calculators, 6M Yagis. Paul Husby, WØUC, 1697-C Fulham, Lauderdale, MN 55113. 612-642-1559.

FOR SALE: Brand New Kenwood TS-430S. 1 YK 88CN-88SN-1PS-430. 1 MC-60A, 1 SP-430, 1 PC 1 A Dentron antenna-matching. Package deal only $1000. 201-473-0966, M. Bein, 26 Lenox Ave., Clifton, NJ 07012.

HEATH HW-5400 transceiver with 5401 Power Supply, 5400-2 SSB Filter, factory alignment, $495. KD6JD, 805-965-7541.

EIMAC SK-506 chimneys (FOR 4-1000A) - $48 ea. SK-2216 chimneys (FOR 8877) - $45 ea. Jennings RB2A vacuum relays, DPDT - $68 ea. Johnson counter dials #116-208 - $19 ea. B&W Counter dials - $29 ea. Rotary inductors 21 µH, 3 kW - $78 ea. Centralab TX-capacitors 858-1000 pF-5 kV - $4 ea. 857-100 pF-15 kV - $8 ea. Collins MM-281 microphone - $35. A. Emerald, 8956 Swallow, Ftn. Vly., CA 92708.

DIGITAL AUTOMATIC DISPLAYS. All transceivers. Six ½" digits. 5" wide by 1¼" by 9" cabinet. Send $1 for information. Grand Systems, POB 3377, Blaine, WA 98230. Canadians VE7LB.

HEATH SB-200 $309. Includes shipping. K1BW, 203-848-3796.

FT-ONE in excellent condition with all filters, etc. $1475. George, WB1FXI, 413-739-8247.

CRYSTALS: FT-243's Made to ordered frequency. See March classified. 160M $3.95, 80M $2.95. 4001 to 8700 kilocycles. Novice-General, including 40M and multipliers from 40M - $2.50. Sockets 60¢. Postage-airmail 30¢ per crystal. "Crystals Since 1933." WØLPS. Stamp or long SASE for 1700-60,000 listings-circuits. C-W Crystals. Marshfield, MO 65706.

DENTRON AMPLIFIER MLA-2500 $500. RME receiver with Speaker, Sideband Adapter $65. Lafayette receiver, speaker $35. 417-869-6884, Chuck Graves, KØRFQ.

FTDX560, $256 including matching speaker, mike, and free delivery. Good condition, I use it regularly. John Christensen, W9TVA, Apt. 6J, 2800 Indian River Blvd., Vero Beach, FL 32960, 305-569-4887.

FOR SALE: Heath HW-101/P.S./mic and SWR/Wattmeter. Just factory aligned and tested. $275. Dan, KA9CAQ, 812-963-6882.

SELL KENWOOD "Twins" (T-599D & R-599D) $400 including UPS, or best offer. W4TG, Box F, Gray, GA 31032.

ICOM 2AT, 2 batt. packs $160, ICOM 25A $225, Regency Scanner R-106 $95, in boxes - 5862 W. Skyline Dr., LaPorte, IN 46350, KA9JYO, 219-326-8648.

HY-GAIN EXP-14 tribander with 30/40 meter element attachment. Brand new, in unopened cartons! Will sacrifice at $250 plus shipping via UPS. Also have 600 feet of 4000 lb. Philystrand cable with potting connectors, turnbuckles, etc. All brand new, at half price. Call for complete information. Ed Schneider, K2RCO, 28 Orchid Road, Levittown, NY 11756, 516-796-8825.

DRAKE R4-A $160. I ship, 312-847-4130, KA9RXI.

KENWOOD TS-520SE, DG-5, AT-200, MC-50, SP-520 with hd spkr. Original boxes. Will not separate. $600. I ship. 312-847-4130 KA9RXI.

Jobs for Hams

WANTED FOR Summer of 1985: Instructors in electronics, Ham Radio, and computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

SUMMER CAMP Counselor, General or better, teaching Novice & DXing programs to boys in private N.H. summer camp. Top equipment, triple beam tower, established ham program plus AM station. Approx. June 17 to Aug. 17th. Winter offices Camp Cody, 5 Lockwood Circle, Westport, CT 06880, Dr. Stolz, 203-226-4389.

COUNSELOR - HAM RADIO; H.S. Grad., College Student, Adult. Children's summer camp; varied activities; 6/24-8/22 or any part thereof. Northeastern Pennsylvania 2½ hrs. N.Y.C. Apply: Camp Wayne, 570 Broadway, Lynbrook, NY 11563, 516-599-4562.

COUNSELOR: OPERATOR with General license to teach Ham Radio at Pennsylvania co-ed camp. Have completely equipped Ham station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

ENGINEERING, TECHNICAL and PROFESSIONALS needed in Maine. Maine Professional Engineering Group, 1 Long Point Road, Belgrade Lakes, Maine 04918.

TRANSMITTER ENGINEER: Experienced in VHF and microwave maintenance. Three-bedroom home provided for residence at easily accessible site overlooking Pacific Ocean. EOE send resume and requirements to Chief Engineer, KVIQ-TV6, 1800 Broadway, Eureka, CA 95501.

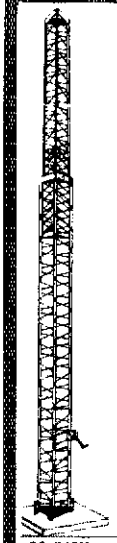
ADVERTISING DEPARTMENT STAFF

Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Lindy Messmer, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!

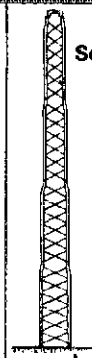


hy-gain
CRANKUP SALE!
All Models Shipped Factory Direct—Freight Paid*!

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	$749
HG52SS	52 ft	9 sq ft	$1099
HG54HD	54 ft	16 sq ft	$1699
HG70HD	70 ft	16 sq ft	$2699

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	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States Antenna Load Based on 70 MPH Wind.

Tri-Ex®
These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

BUTTERNUT ELECTRONICS CO.
HF6V $129 Delivered (Cont. USA)
- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160HD $49

New 80/40 Meter Vertical Antenna HF2V $129 Delivered (Continental USA)
- Optional 160 Meter Resonator Kit Model TBR 160S $49

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

RG-213U
$.29/ft $279/1000 ft
Up to 500 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

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	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
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™
Lowest Loss for VHF/UHF!

- ½" Alum. w/poly Jacket . . $.79/ft
- ½" LDF4-50 Andrew Heliax ™ $1.69/ft
- ⅞" LDF5-50 Andrew Heliax ™ $3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 . . . $1.25 UG23D N Female $2.95
UG21B N Male $2.95

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld	$.10/ft
450 Ohm H.D. Line	$.16/ft
18 Ga. Copper coated steel wire ¼ mile long	$30
H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun	$11
Van Gorden Center Insulator	$6

HUSTLER
6BTV 80-10 mtr Vert $129
4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base $119

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!

CUSHCRAFT
MULTI-BAND HF ANTENNAS

A3 3-el Tribander $219 A4 4-el Tribander $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit $754

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	040	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	220FB	$219
A449-6	$ 29	ARX2B	$ 39

MINI-PRODUCTS HQ-1
LIST $182.50 SALE $159
- Wing Span - 11 ft
- Wind Area - 1.5 sq ft
- Boom - 54 in. long
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS
Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
RT 200W Deluxe UHF Type	$29
RT/N 200W Deluxe N Type	$32
HV 2KW Deluxe UHF Type	$32
HV/N 2KW Deluxe N Type	$35

HY-GAIN
Discoverer 2-el 40-mtr Beam	**$319**
Discoverer 3-el Conversion Kit	**$199**
EXPLORER-14 SUPER SPECIAL	**$309**
QK710 30/40 mtr Add-On Kit	$79
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$189
TH2MK3S 2-el Triband Beam	$179
205BAS 5-el 20-mtr Beam	$349
155BAS 5-el 15-mtr Beam	$199
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$259
64BS 4-el 6-mtr Beam	$69
66BS 6-el 6-mtr Beam	$139
18HTS 80-10 mtr Hy-Tower Vertical	$439
LC-160 160-mtr Coil Kit for 18HTS	$49
214BS 14-el 2-mtr Beam	$49
2BDQ 80/40 mtr Trap Dipole	$69
5BDQ 80-10 mtr Trap Dipole	$129
BN86 80-10 mtr KW Balun W/Coax Seal	$22

MOSLEY
Pro37 7-el Triband Beam	$469
CL-33 3-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40 mtr Kit for TA33	$119

KLM
KT34A 4-el Broad Band Triband Beam	$539
KT34XA 6-el Broad Band Triband Beam	$689
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14 el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16 el 432 MHz Beam	$69
435-40CX 435 MHz Satellite Antenna w/CS-2	$159

ROTORS & CABLES
Alliance HD73 (10.7 sq ft rating)	$109
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating) . . .	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
Kenpro KR-500 Heavy duty elevation rotor	$189
KLM EL-3000 Moon Tracker Elevation Rotator	$369

Standard 8 cond cable $.19/ft
(vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft
(vinyl jacket 2-#16 & 6-#18 ga)

SOUTH RIVER ROOF TRIPODS
HDT-3 3 ft Tripod . $19 HDT-5 5 ft Tripod $29
HDT-10 10 ft Tripod $49 HDT-15 15 ft Tripod $69
Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS
10 ft Stack Sections

20G $39.50 25G $49.50
45G $112.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399
25G Foldover Double Guy Kit			$219
45G Foldover Double Guy Kit			$249

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE
3/16" EHS Guywire (3990 lb rating)	$.15/ft
1/4" EHS Guywire (6000 lb rating)	$.18/ft
5/32" 7 x 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.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" EE (1/2" Eye & Eye Turnbuckle)	$9.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$10.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE
HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Sockefast Potting Compound	$14.95

GALVANIZED STEEL MASTS
Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 In Wall	$29	$49	$59	$79
.18 In Wall	$39	$69	$99	$129
.25 In Wall	$69	$129	$189	$249

TEXAS TOWERS

VISA MasterCard

Div. of Texas RF Distributors Inc.
1108 Summit Ave., Suite 4 • Plano, Texas 75074

Telephone (214) 422-7306

Store Hours: Mon-Fri: 9am - 5pm
Sat: 9am - 1pm

(Prices & Availability Subject To Change Without Notice)

MISSOURI RADIO CENTER

KENWOOD

TS-430S Most Advanced, Compact HF Transceiver

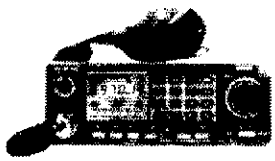
- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM
- 10Hz Dual Step Digital VFO
- Eight Memories w/Lithium Back-up
- Memory and Band Scan

KENWOOD

TS-930S Top of the Line HF Transceiver

- General Coverage Receiver
- Superior Dynamic Range
- All Solid State—26 VDC Final
- QSK CW
- Optional Automatic Antenna Tuner
- Dual VFO w/8 Memories
- Dual Mode Noise Blanker

KENWOOD



TR-7950/7930

- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- Automatic Offset
- Built-in Encoder
- Memory or Band Scan

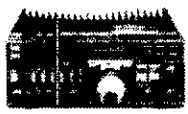
KENWOOD

TR-2600

2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built in Sub-tone Encoder

YAESU

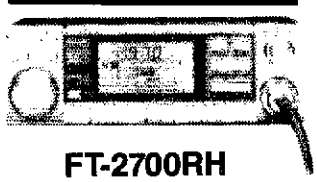


FT-757 GX

Compact General-Coverage Receiver

- General-Coverage Receiver
- USB/LSB/CW/AM/FM
- Dual VFOs
- Memory/Band Scan
- Speech Processor
- CW Filter and CW Keyer included

YAESU



FT-2700RH

Dual Bander

- VHF FM
- 144/430 MHZ
- 25 WATTS

YAESU

FT-209RH

- 5 Watts
- 10 Memories
- LCD
- Compact

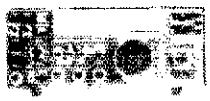
YAESU

FT980

CAT SYSTEM—ComputerAided Transceiver

- Wide Dynamic Range
- General Coverage
- Low Noise Front End
- 10 Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!

ICOM



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All ham band HF transceiver. 16 memories. 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

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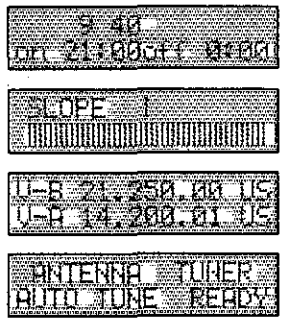
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.



Optional accessories:

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

- **Built-in FM, plus SSB, CW, AM, FSK.**
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
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- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.

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

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