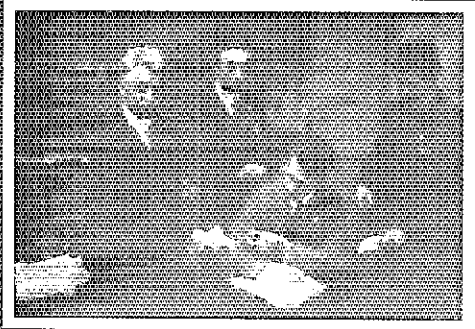
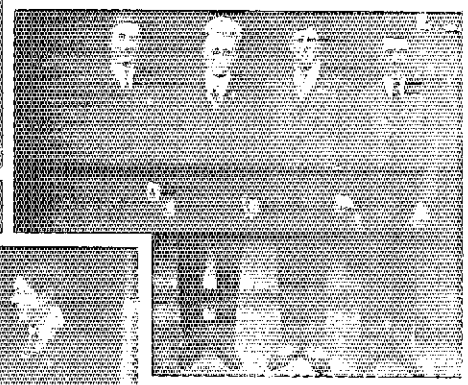


QST

devoted entirely to Amateur Radio



Happy 60th Anniversary, IARU!

HENRY

REPORT #2

New models reflect our policy by design. Technology moves fast. At Henry Radio we keep up with a steady flow of new models, some for amateur use, some for commercial use, some for industrial use and some for scientific research.

Here are three new models for this month:

- *New UHF model 3004 1500 watts output at 440 mHz.
- *New VHF model 3002 1500 watts output at 144 mHz.
- *New HF 5K Classic, 3.5 to 30 mHz (not for sale to U.S. amateurs)

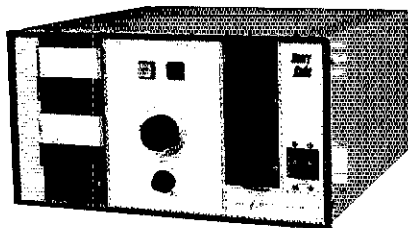
These three added to the already broad line of amplifiers we offer means that we can now cover two mHz to 500 mHz and power outputs as high as 10,000 watts depending on frequency. This may be the most complete line of power RF amplifiers available in the world.

Let us know your requirements. We want to help you.

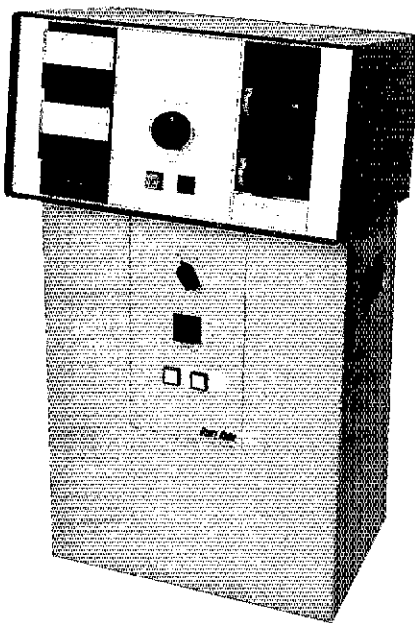
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse"; built to last along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through 15 meters (export models include 10 meters).

2K Classic "X"...We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable...the last amplifier you may ever need to buy.

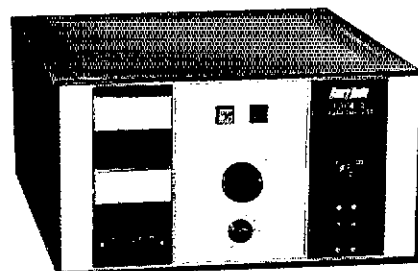
3K Classic...uses the superb Eimac 8877 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.



2KD Classic...a desk model designed to operate at 2000 watts effortlessly, using two Eimac 3-500 Z glass envelope triodes, a Pi-L plate circuit and a rotary silver plated tank coil. We challenge you to find a better desk model for even a thousand dollars more



2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a 1/4 wave length strip line design for extreme reliability. It provides 2000 watts



input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier uses a 1/2 wave strip line and offers all of the same specifications as the 2002A.

1002-A A rack mount 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for 1/2 power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a rack mount half-power version of the 2004A. Covers the 430 to 450 MHz band using a 1/2 wave strip line design.

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

We stock these plus many other fine names
AEA • ARCO • AARL • ASTRON • B & K • B & W • BIRD •
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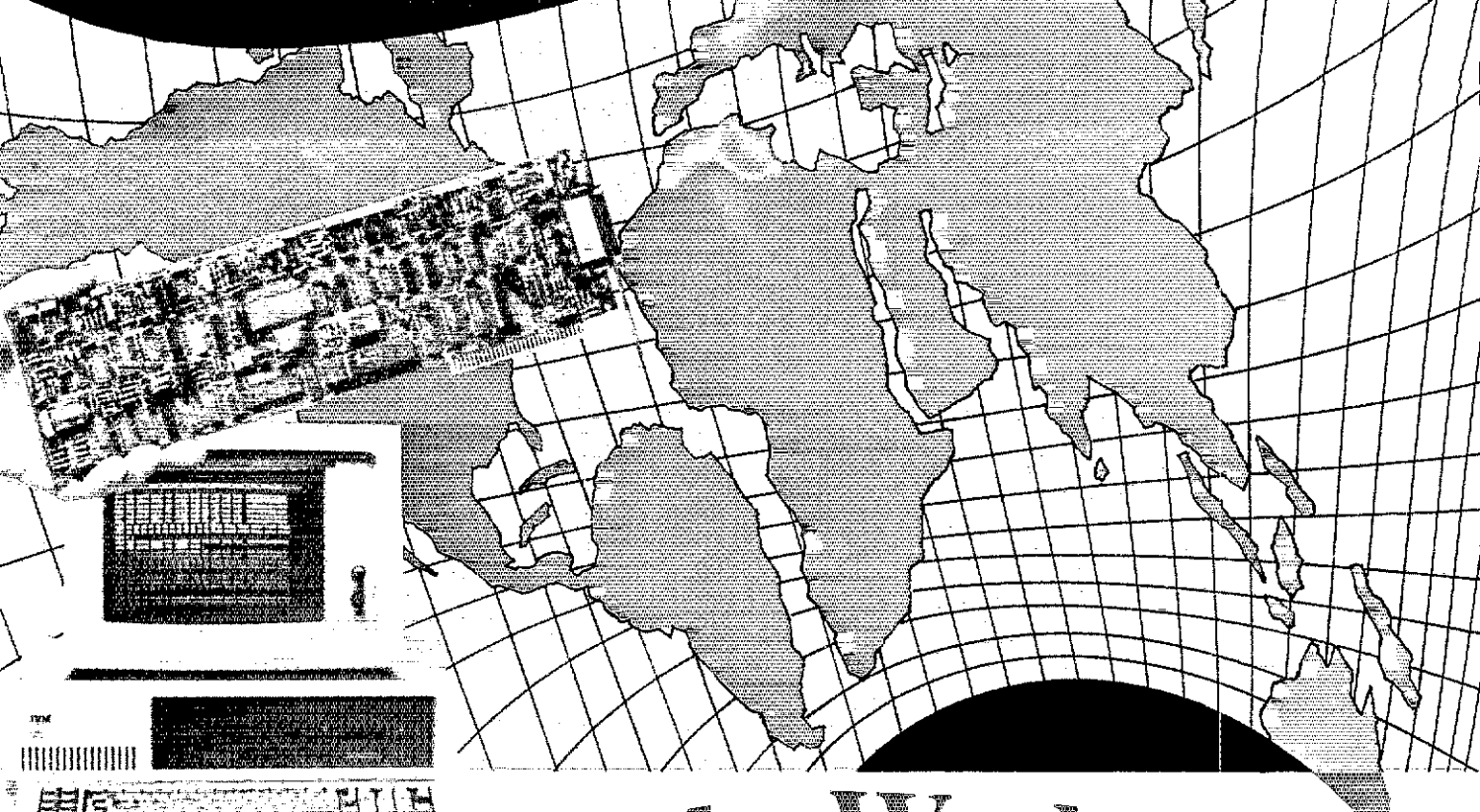


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HENRY

REPORT #2

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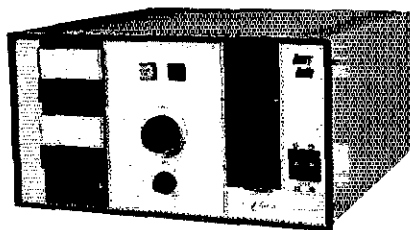
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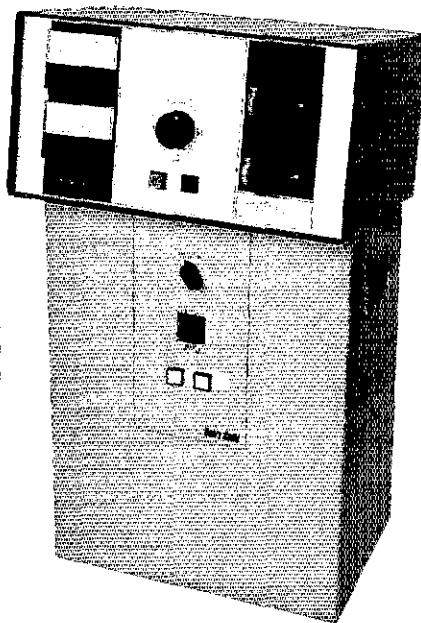
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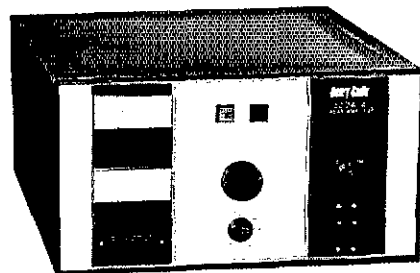
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OUR COVER

June 1925 QST reported the momentous event—the founding of the IARU in Paris on April 17 of that year. Clockwise, from the top: delegates gather for a group portrait; four members of the IARU executive committee (f8GO, u1AW, g2NM and u1BHW); Amateur Congress President M. Belin, flanked by u1AW and g2NM; newly elected IARU President Maxim signs up to become the member no. 1 of the IARU.



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Because:

- You want to recreate the thrill of your first ham contact!
- You'd like to learn something new!
- You want to send error-free messages on HF/VHF/Satellite in spite of QRM!
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- No VHF line-of-sight path to Joe? Again, no problem! Digipeat through other stations to Joe!
- Joe's not there? Store a message at his station!
- RTTY is too slow? "Packet away" at up to 1200 baud or more.

In Packet Radio, your station is a radio, a computer terminal, and a TNC (Terminal Node Controller, hopefully the AEA PKT-1). You type and the TNC sends short bursts (packets) of two-tone modulation called AFSK. The other station decodes them and displays them on his monitor screen. He then sends to you.

There is a lot of activity—local clubs, voice nets, mailboxes/bulletin boards, links between bands, long range (dig) repeaters and chained digipeaters, voice nets, search/rescue and emergency work, newsletters, satellite communications, technical development of new equipment and software, etc. 220 MHz will be very important to packet radio. Help us populate it and "Save the Band"!! We need your help and participation.

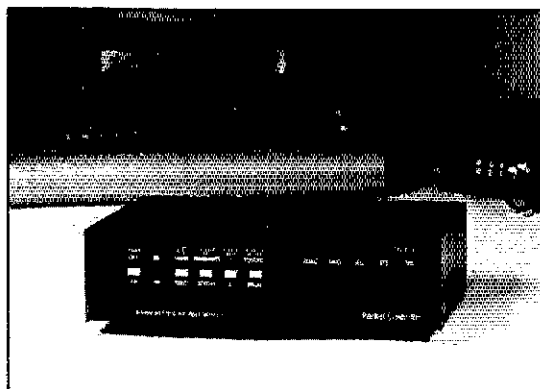
Packet radio is:

- Standardized—your station can talk to any other packet station.
- Popular—fast growth over the last year to about 2000 stations in the U.S.
- Multi-frequency—10.147, 14.103, 145.832, Oscar 10, 145.01 (and other local 2M frequencies) are being used now.
- Public Service—traffic handling, search and rescue, public events, emergency service.
- Multimode—conventional radio, meteor scatter, but no EME/moonbounce yet (will you be first?).
- Simple—you control the PKT-1 by typing 5-6 simple one- to four-letter command words on the terminal or computer. Several of them are shown in the above monitor screen simulation, which shows a connect via digipeaters, and an interchange between two stations.

It's easy to get going. You probably already have the radio, and the computer or terminal. You'll need to operate your computer in RS232C mode using "communications terminal" software that is free or cheap. We can usually furnish information on what to use for popular computers. The rest of the software is resident in the PKT-1 (you will need to buy a PKT-1). And you need a MIC connector to connect to the (furnished) radio cable you'll plug into your radio MIC jack. And "BRAAP," you're on the air with "Packet Racket."

You're likely aware of Packet Radio already. If not, read WB4GXD's three excellent tutorial articles in the Sept. and Oct. '83 and Jan. '84 issues of 73. Clip the coupon below, and we'll send articles, a reading bibliography, product literature on our PKT-1 Packet Controller, answers to commonly asked questions about packet radio, lists of packet clubs in your area, sample packet newsletters from the ARRL and clubs, AEA dealer locations, packet videotape and audio cassette loan info, voice net info on HF/VHF where you can listen and ask questions, a blow-by-blow description of how easy it is to get started, a free AEA Packet Lapel Button, AND WE'LL PUT YOU ON OUR PACKET MAIL LIST to ensure you'll get further mailings!!!

See your favorite AEA dealer, clip and send the coupon, or call John Gates, N7BTI (the AEA Packetman) at (206) 775-7373.

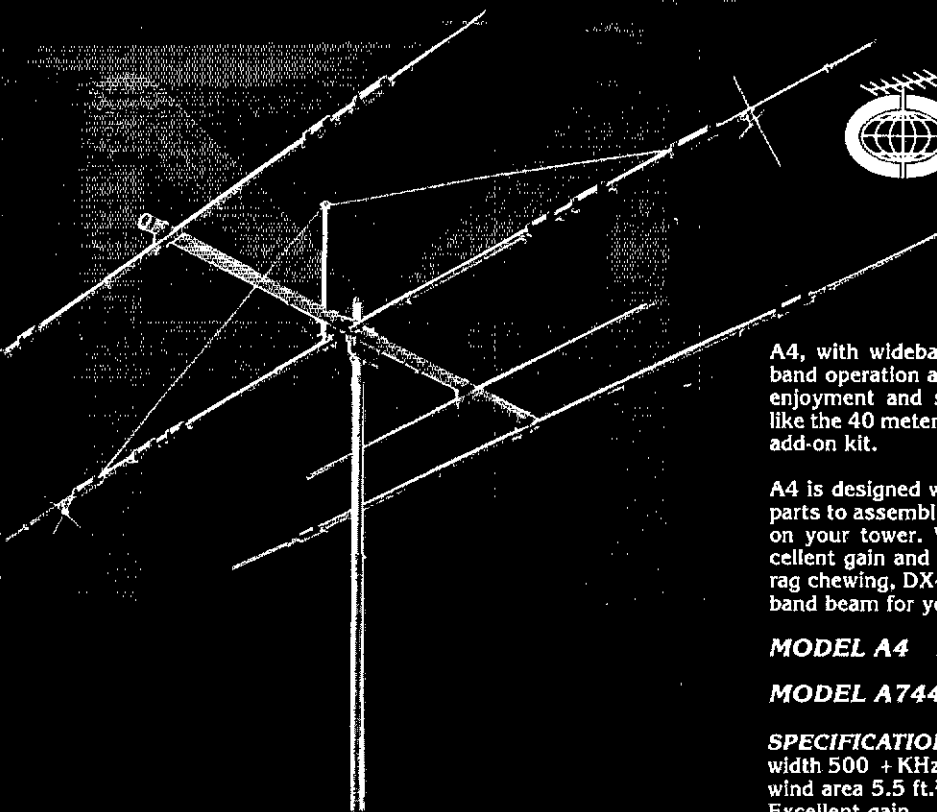


AEA Packet Radio
RAM length is 2000
cmd: connect to N7ML via KB7G, K6RFK
cmd: *CONNECTED TO N7ML**
Hi Mike - have you seen the great new AEA
PKT-1?
YES JOHN - LOOKS GOOD K
Bye Mike sk
cmd: *DISCONNECTED**
cmd:

AEA INC., P.O. BOX C-2160, LYNNWOOD, WA 98036
OK AEA, send packet information to:

Name _____ Date _____
 Street _____
 City, State _____
 Zip _____ Call me at _____

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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.

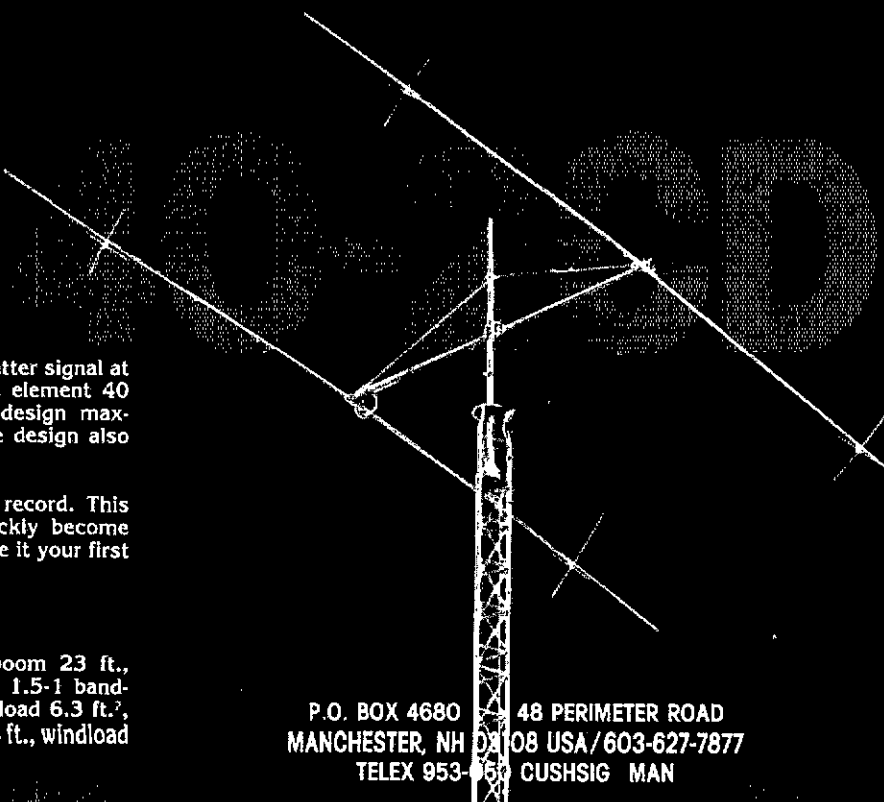
A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

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

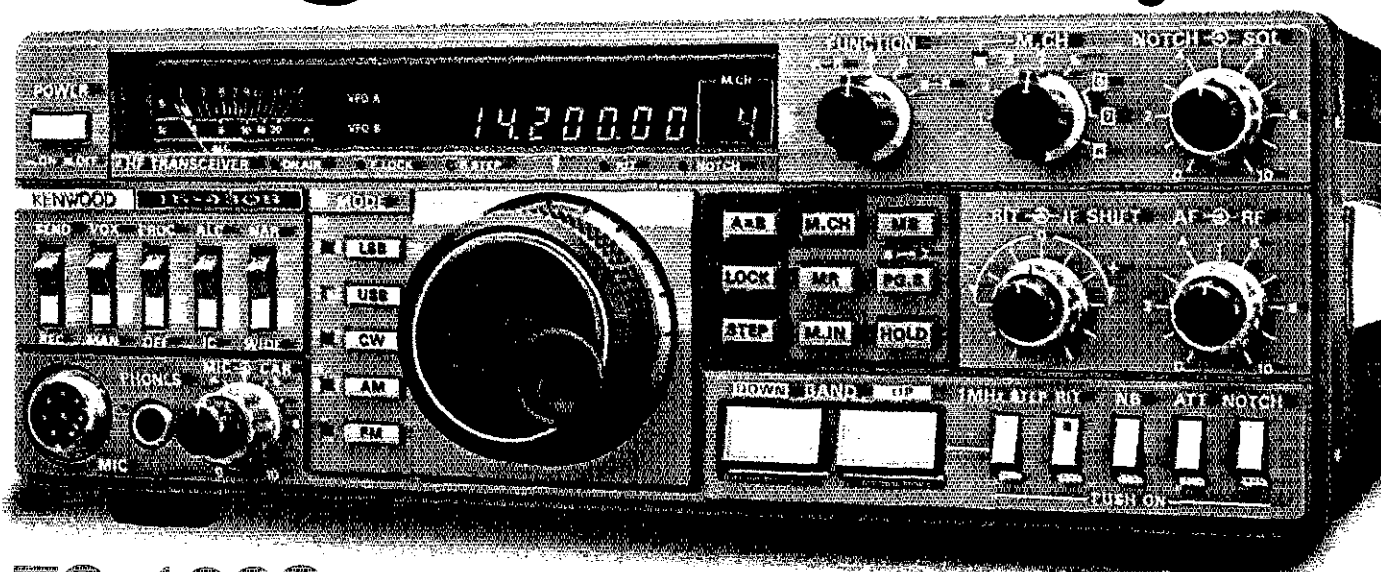
SPECIFICATIONS boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.

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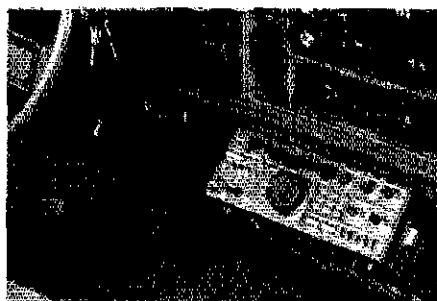
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“Digital DX-terity!”



TS-430S

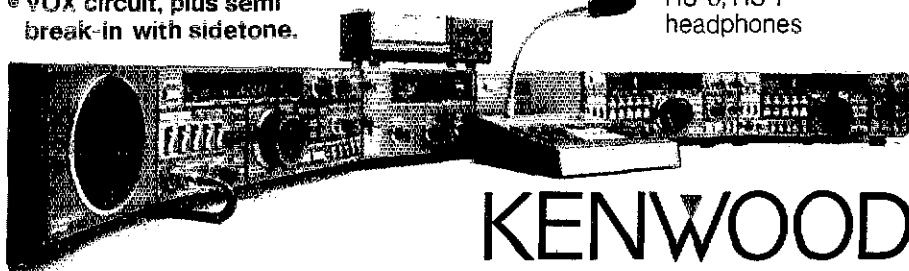
Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



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

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

- Optional accessories:**
- PS-430 compact AC power supply
 - SP-430 external speaker
 - MB-430 mobile mounting bracket
 - AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands
 - AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands
 - AT-230 base station antenna tuner
 - FM-430 FM unit
 - YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters
 - YK-88SN (1.8 kHz) narrow SSB filter
 - YK-88A (6 kHz) AM filter
 - MC-42S UP/DOWN hand mic.
 - MC-60A deluxe desk mic., with UP/DOWN switch
 - SW-2000 SWR/power meter
 - SW-100A SWR/power/volt meter
 - PC-1A phone patch
 - HS-4, HS-5, HS-6, HS-7 headphones



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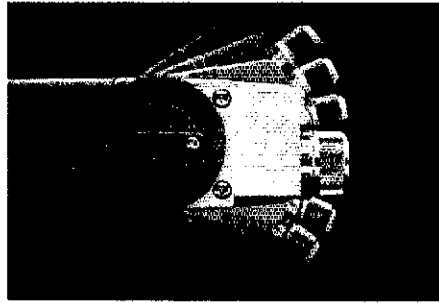
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Incredible Flexibility!

TM211A/411A

The TM-211A 2 m and the TM-411A 70 cm transceivers combine ultra-compact size with an impressive array of features to give you maximum flexibility in mobile operations. The TM-211A and the TM-411A may be stacked for even more operating flexibility!



- **External speaker.**
A high-quality external communications speaker is provided for the best sound quality.
- **5-channel memory with multiple scanning functions.**
The transceiver can scan the memory channels or can be programmed to scan all or a portion of the band.
- **25 watts high power.**
5 (adjustable to approx. 15 watts) low.

- **7-position, tilting control panel.**
The unique control panel is designed to increase operating and installation ease. The panel may be moved to provide the best viewing angle and handiest access to controls.
- **DCS—Digital Code Squelch.**
Program your transceiver to respond only to a specific digital code—much more secure than CTCSS.

- **Priority Watch.**
The "Priority Watch" mode lets you keep an eye on an important channel when monitoring other frequencies.
- **Extended frequency coverage on 2 m.**
TM-211A covers 144-148 MHz—includes most MARS and CAP frequencies.
TM-411A covers 438-450 MHz

Optional accessories:

- CD-10 call sign display • PS-430 DC power supply • KPS-7A power supply
- MC-55 (8 pin) mobile microphone with time-out timer • MA-4000 dual band mobile antenna with duplexer
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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.



More product information is available from authorized Kenwood dealers.

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THE AMERICAN RADIO RELAY LEAGUE, INC.



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

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

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

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

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"It Seems to Us..."

The 60th Anniversary of IARU

In every walk of life, achievement results in great part from the ability of leaders to have a vision of the future, from their ability to look beyond today's petty problems and see what might be.

Thus it was that in 1924 Hiram Percy Maxim and ARRL realized that Amateur Radio had become international in scope, and that there ought to be an international organization to take advantage of the progress and to tackle the problems that would surely attend such a growth. So in March 1924, Mr. Maxim met with a group of talented amateurs in Paris, and made preliminary plans for an international organization to be known as the International Amateur Radio Union, with a Congress to be held in April 1925 to effect the permanent organization. Present at the 1924 meeting were enthusiastic representatives from France, Great Britain, Belgium, Switzerland, Italy, Spain, Luxembourg, Canada and the USA.

During the Easter holidays of April 1925, the Amateur Radio representatives of 23 countries met again in Paris to officially create the International Amateur Radio Union and to adopt a constitution. The original IARU differed a bit from what we have today, but the goals were much the same — to promote and coordinate Amateur Radio worldwide, to encourage fraternalism and to represent Amateur Radio at international conferences. In the original organization, individual amateurs became members of IARU, and Mr. Maxim was member number one. While most of the 23 countries represented at the first meeting were from Europe, there were also representatives from North and South America, and from Japan.

On April 17, 1925, the constitution of IARU was unanimously adopted, and on April 18, at the final plenary session (by which time 25 countries were in attendance), all actions of the organizing Congress were approved, and the International Amateur Radio Union was born.

As an aside, it is fascinating to note that two individuals who participated in those 1924/1925 meetings are still alive and are active radio amateurs. One is Dr. Giulio Salom, I0ACL, operating on the air regularly from his homes in Venice and Rome. We met him last year at the Region 1 IARU conference in Cefalu, Sicily, and he is a hale and hearty 82 years of age. Dr. Salom is a physical sciences and law graduate, and served for 30 years in the Italian Navy. The other IARU pioneer is Jean Wolff, LX1JW, who is a familiar figure at Amateur Radio meetings throughout Europe and in the USA. He

served the U.S. Army with distinction in WW II, and was a member of the Luxembourg telecommunications administration. He, too, is in fine health and is a great source of knowledge about Amateur Radio through the years.

Although IARU started out life with individual memberships, it was later changed to a union of member-societies, and now has 121 national societies as members, with two more applications pending. As a result, IARU represents the international interests of one and a half million radio amateurs.

The history of IARU has been that of gradually increasing effectiveness, and there are clear signs that the effectiveness has increased markedly in the past decade. The Union has grown from one whose emphasis was largely on the issuance of WAC certificates and the reporting of DX exploits, to one whose primary emphasis is on the preparation for international telecommunications conferences.

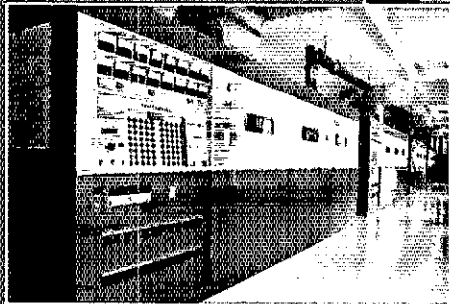
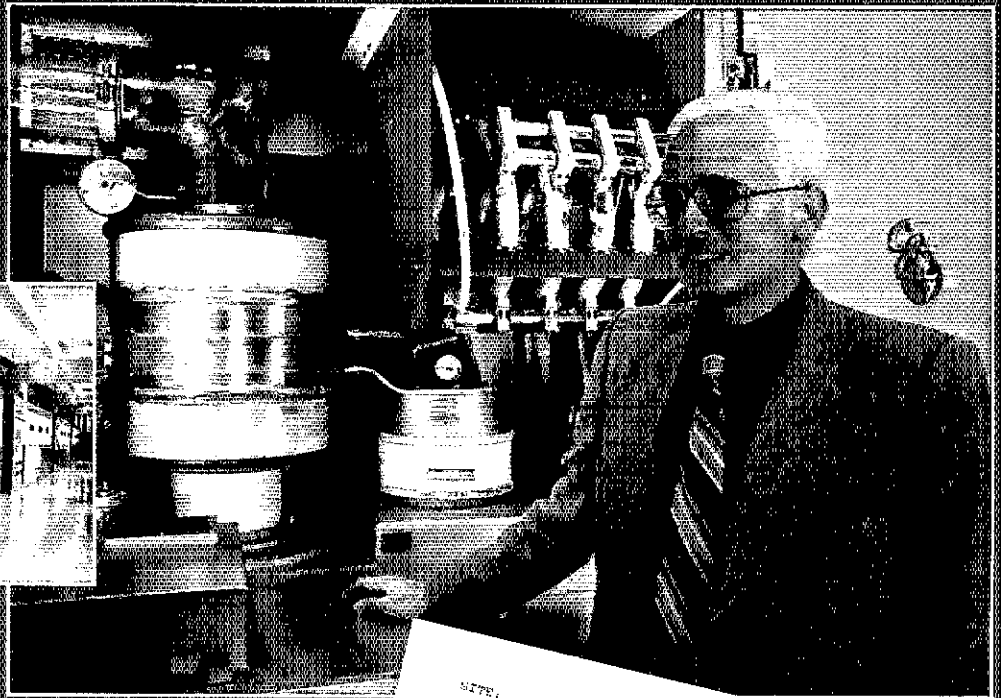
And yet, back in 1925, in the earliest days of international radio regulation of any sort, when international DX was still a rare occurrence, those men of vision who put together the first IARU constitution recognized that preparation for conferences was an important goal for IARU.

It was the continued emphasis on that goal of conference preparation that led to the restructuring of IARU subsequent to 1979, a restructuring that has made IARU more truly international not only in scope but in administration and leadership. Now, the decisions made in the name of IARU are reached by a body — the IARU Administrative Council — which has on it two representatives from each of the three IARU regions.

There are some growing pains as we adapt to the new organizational structure, but there is every indication that we are better prepared to handle the next General WARC than we were for WARC-79. We have a more truly international leadership, and we continue to have the substantial support of ARRL, whose distinguished president, Hiram Percy Maxim, got the ball rolling in the first place 60 years ago.

In the history of mankind, 60 years is but the blink of an eyelid, hardly to be noticed. In the history of Amateur Radio, 60 years is a long time indeed. We like to think that in that time we (IARU) have grown to maturity, and that those representatives who gathered in Paris in 1925 to found the International Amateur Radio Union would be proud of what they wrought. — *Richard L. Baldwin, W1RU*

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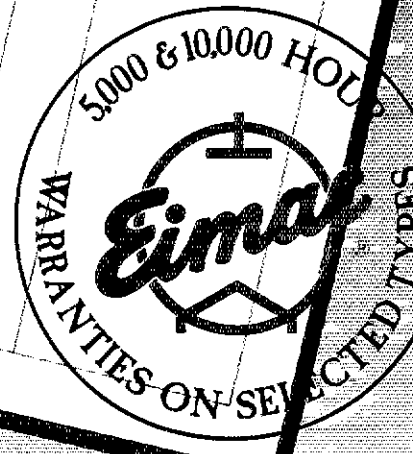
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	Serial	Hours	Serial	Hours		
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	A6N-435	68879				
	E6G-265	61829				
	E6G-270	59636				
	E6M-597	62456				
	G6R-896	59246				
	H6E-283	15892				
	H6J-368	64300				
	H6T-890	59472				
	H6T-890	64066				
	P6Q-624	62554				
	G4D-135	55907				
	H6J-367	59991				
	H6J-371	57809				
	J6A-2	42279				
	D6V-817	59386				
	P3Q-770	41416				
	D6V-815	47349				
	E6G-273	59067				
	J6A-7	57026				
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	H6C-161	31752				
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NASA Astronaut Tony England, WØRE (left), took some time out recently at the Johnson Space Center to get better acquainted with one of the planned Amateur Radio activities in his Space Shuttle mission. Here, NASA Engineer Louis McFadden, W5DID, explains the operation of the Robot 1200C/Panasonic Color Camera system, similar to one Tony will use during his flight aboard the Shuttle *Challenger* (STS 51-F). Tony is scheduled to become the second ham in space in early July. (photo courtesy KA5UKL)

Taoyun Wang, KA2WES, and his Elmer, QST author Jim Rautio, AJ3K, share the joy of Taoyun's first QSO as a radio amateur. The two became friends at Syracuse University when Jim brought a call sign map of the world to class. While pointing to his homeland, China, Taoyun told Jim of his interest in becoming licensed. With Jim's help, Taoyun studied for and passed the test for his Novice ticket. It was at Jim's home station that Taoyun made his first on-the-air contact. Taoyun may be the first citizen of the People's Republic of China to get a U.S. amateur license. (Syracuse Herald American photo)



Canadian Elmers: CRRL Wants You

Interested in guiding new hams into the ranks of Amateur Radio? The CRRL is starting an Elmer program, and they could use your help, particularly if you live in one of the less-populated areas of Canada. Drop a note to CRRL, Box 7009, Station E, London, ON N5Y 4J9.

Repeater Moratorium Lifted

In response to a petition from the ARRL, the FCC has issued an Order lifting the moratorium on new repeater operation imposed at the beginning of the year. The order states that the Commission will seek permanent solutions to the problems of repeater congestion and interference in this proceeding instead. See this month's Happenings for details.

VE Waiting Period a Question?

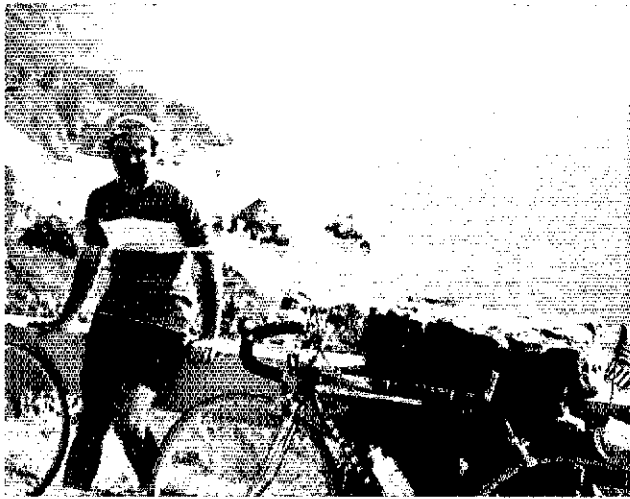
The FCC has proposed that the required 30-day waiting period for retesting be eliminated from the Rules (PR Docket 85-21). In effect, this would let VECs set their own waiting period for a candidate who fails a test element. See this month's Happenings for details.

Ham Industry Looks to Future

Amateur Radio manufacturers, dealers and publishers recently gathered in Miami, but it wasn't for the sunshine and warm waters. They met in a brainstorming session to come up with new ways to stimulate the kind of growth needed if the hobby is to remain strong in the years to come. Response from participants was vigorous, with many good ideas being proposed. More meetings are planned. See this month's Happenings for a full report.



News of formal Amateur Radio licensing has come from Turkey: In late January, Dr. Unal Akbal, TA1A, General Secretary of Turkiye Radyo Amatorleri Cemiyeti (TRAC), became the first officially licensed TA. Dr. Akbal, shown above, can be found on 160-10 meters, SSB and CW. In particular, he will be close to 21.025 and 21.250 MHz each Saturday and Sunday between 0500 and 1800Z, as well as around 14.195 MHz. If you're lucky enough to work TA1A, send your QSL to P.O. Box 787, Istanbul, Turkey. (tnx W1YL14)



Marc Helfman, KF6LN, recently lived his dream to combine two of his hobbies: He traveled bicycle-mobile along the California coast from San Francisco to his hometown of Los Angeles. On the trip, Marc operated using a hand-held radio mounted in the white basket attached to the handlebars. The antenna (with an American flag attached), a 1/4-wave telescoping vertical, was attached to the rear rack and was connected to the radio via a short length of coax. He reports making several contacts while pedaling along, using a built-in VOX and a mike-earphone headset under his helmet. Here, Marc pauses at a rest stop near Big Sur.

Amateur Life in the Yukon: No TVI, No Neighbors

Remember the article "No-Budget Hamming," the poor ham's guide to setting up a station? Since it appeared, in July 1984, the author, Michael Moon, KA7QZK, has some new adventures to report as a result of his Spartan lifestyle. His new QTH is the Yukon Territory, Canada, near Tagish Lake. The mailing address is Atlin, British Columbia, because that's where the dogsled that carries supplies comes from.

Mike is still active in building and using homebrew QRP equipment, but since operating VY1 is his only means of contact to the outside, he decided to "capitulate" and buy a 100-W solid-state transceiver before moving to his new QTH. Using simple dipoles, he has worked all U.S. states and continents. More importantly, Mike is able to check into Alaska traffic nets, keeping in touch with family and making a host of new friends. In fact, after their daughter was born (Mike had to deliver her because they were snowed in for the winter), he ran a phonepatch to the grandparents in Montana to give them the news. The radio equipment is battery powered; the charger is a 5-HP gasoline engine belt-driving an alternator from an old pickup truck.



Life in the Yukon is just the way Mike likes it — no TVI worries, no electrical noise, no antenna restrictions. For those needing VY1, Mike says he can be found on the YL International SSB Emergency System, 14.332 MHz, daily.

Satellite Users' Meeting This Month

Amateurs involved in SKYWARN and other weather-watch operations may want to attend a conference that's right up their alley. The second International Satellite Direct Broadcast Services Users' Conference will be held April 15-19 at the Holiday Inn near Baltimore-Washington International Airport. This is one of several events marking the 25th anniversary of the launching of the world's first weather satellite, on April 1, 1960. Of particular interest to amateurs are the Workshops on April 16 and the Satellite Applications Sessions on the 17th. For more information, contact Robert Popham at 301-783-7289.

Field Day Dates

Apparently, there's some confusion over the dates for Field Day '85. It will be held, as always, on the fourth weekend in June — the 22nd and 23rd this year. For the past 11 years, the fourth weekend was also the last weekend in June — but not this year — which no doubt led to some hams' confusion over this year's official Field Day dates.



Here's a novel way to raise an antenna. When it came time to erect a 2-meter vertical atop a 48-foot tower, Ken Pineo, VE1BAK, of Wolfville, Nova Scotia, persuaded local volunteer fire fighters to lend a hand — and their 100-foot aerial ladder. Ken, a former member of the fire department with 12 years of service to his credit, wisely stayed on the ground to supervise the installation. By the way, the tribander was installed in the same way about two years ago.

League Lines...

The FCC has acted on three issues of interest to amateurs. An Order, released February 21, rescinds the moratorium on new repeater operation imposed by the NPRM in PR Docket 85-22. The moratorium had been imposed to forestall a growing number of amateur repeater interference complaints while the FCC looked into ways of solving the interference issue. ARRL filed a Petition for Partial Reconsideration, and the FCC lifted the moratorium. The Commission is still looking for input from the amateur community concerning ways to solve the repeater-to-repeater interference issue. See Happenings, this issue, for more details.

On February 20, the FCC issued a Notice of Proposed Rulemaking concerning cable television. In MM Docket 85-38, the Commission asks for comments as to whether the home subscriber quality standards are still important, and comments as to whether signal leakage limits are still required. The Commission proposes to increase the cable TV leakage limit from 20 microvolts per meter at 3 meters to 50 microvolts per meter at 3 meters on frequencies between 54 MHz and 216 MHz. At press time, the comment deadline for this NPRM was March 29, with reply comments due by April 15. Formal comment requires the filing of an original and five copies to the Secretary, FCC, Washington, DC 20554. The most useful type of comments would be those incorporating test data and measurements of leakage that has caused interference to the amateur service.

Third-party participation in amateur communications is the subject of another NPRM, released February 28. The Commission proposes to amend Part 97 to prohibit participation by any amateur whose license has been revoked, suspended or cancelled. The FCC states in the proposal that persons whose amateur privileges have been terminated have taken advantage of the third-party rule by participating in communications from stations licensed to amateurs in good standing. The proposal also calls for sanctions for any amateur licensee who knowingly allows a disqualified person to participate in third-party communications. The NPRM is designated Docket 85-51. Comments are due by May 14, 1985, reply comments by June 17, 1985. Formal comment requires the filing of an original and five copies, but a single copy may be considered informally.

Publications news: 1985 Handbook sales are exceeding our most optimistic projections, so we're printing more. Minor revisions have been made to the Satellite Experimenter's Handbook, and the second edition of this popular title is now available. An apology is in order for the recent delays in shipping our other hot publications: The FCC Rule Book, the new Technician/General License Manual and 80th edition License Manual. We've been shipping as many as 4 tons of publications in a single day and we are now virtually current with the demand.

At the last ARRL Board meeting, the Membership Services Committee was directed to seek member input regarding recommendations for modifying the ARRL band plan for 160 meters. The decision was made in view of significant changes in 160-meter operation, in regard to frequency and mode allocations worldwide and operating preferences. If you have comments regarding the 160-meter band plan, direct them to the Membership Services Committee, c/o ARRL Hq.

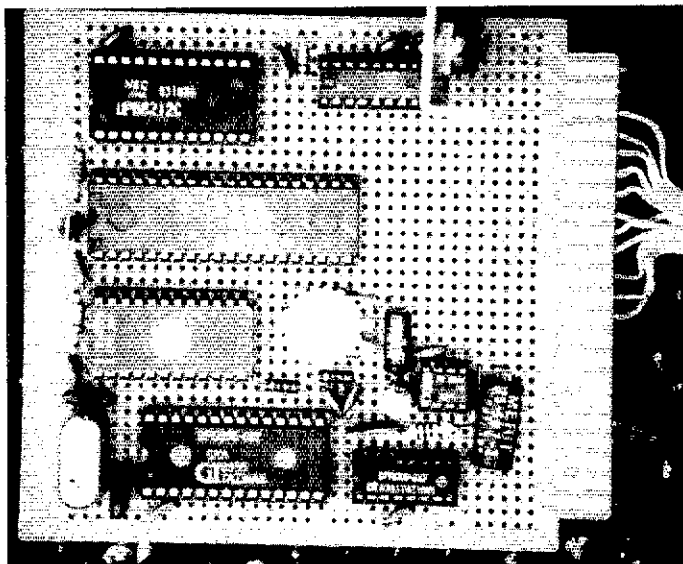
Photographers and club historians -- your help is needed in assembling a slide show to explain ham radio to police departments and other public service agencies. If you have recent color slides of hams in action, please send copies to Stephen Mendelsohn, WA2DHF, PRAC Board Liaison, P.O. Box 444, Little Ferry, NJ 07643. Slides cannot be returned. Please put the club name, or call sign, on each slide, and explain what each slide shows on a separate sheet of paper.

Attention Convention Committees: If you're planning to give FCC exams, and require pre-registration 30 days in advance, the exam information must be received at Hq. on the 15th of the third month before the Convention. For example, if the Convention will take place on August 15, the exam information must arrive at Hq. by May 15, so it can appear in July QST. Exam information consists of where to send the check, whom to make it out to, date and times exams will be given, and the exact deadline for receipt.

The first of a new nationwide series of instructors' forums will be held at the Atlantic Division/New York State Convention in Rochester, NY, on Saturday, May 18. See In Training and Coming Conventions in May QST for full details.

Did you remember to send your incoming QSL Bureau extra postage or mailing credits to cover the increase in U.S. postage rates? Effective February 17, the rate is 22¢ for the first ounce or fraction of an ounce, and 17¢ for each additional ounce or fraction of an ounce.

A Talking Frequency Display



This easy-to-build speech synthesizer is sure to find many uses around the shack. It makes an ideal frequency readout aid for the visually impaired radio amateur.

By John Langner,* WB2OSZ

Most of us can read the digits 14.095.0 on this page or on a transceiver frequency display. There are many radio amateurs, however, who have difficulty seeing them or cannot see them at all. Others of us may have longed for a device that will permit us to be doing other things instead of constantly watching a transceiver readout.

This article describes a simple circuit that will *speaks* the numbers present on the frequency display. Its uses are not limited to frequency readouts, however, and the experimentally inclined amateur is sure to find many other applications for this device.

A speech synthesizer must accomplish two fundamental tasks: extract the information from the frequency-display circuit, and convert it to speech. The speech part of this procedure is taken care of by an inexpensive IC set available at your local Radio Shack store.¹ Interfacing your radio to the speech synthesizer is quite easy once you understand how a multiplexed display works.

Multiplexed Displays

Most modern HF transceivers have a frequency display of six digits. Each of these

digits is formed by seven segments turned on in various combinations to form the digits 0-9. Six digits with seven segments each gives us a total of 42 individually controlled segments. You might expect that 42 wires are required for control, but there is a more clever technique that requires only 13 wires.

This great savings in the number of wires needed for control of the individual segments is achieved by connecting all like digit segments in parallel and applying the same 7-bit combination control code to each digit. Each digit has a separate line to enable it.

Refer to Fig. 1. Suppose the frequency 14.095.0 is being displayed. The 7-bit pattern to make a 0 is applied to all of the digits, but only the least-significant digit (D1) is enabled. Next, the pattern for a 5 is applied to all digits, but only the second (D2) is enabled. This process continues until all the digits have been selected. The selection process occurs on the order of 100 times per second, so the eye perceives no flicker.

Circuit Description

The circuit (Fig. 2) is trimmed to the bare essentials. U3 translates the signals from the transceiver display into commands for the speech synthesizer. U4 contains the program to control U3. U5, U6 and U7

generate the speech and drive a speaker. The type of IC used for U9 and U10, and the presence or absence of R9-R30, inclusive, depends upon whether your application requires signal inversion and/or level shifting. The values of R9-R19 and R20-30 are calculated to produce voltages of approximately zero and +5 V at the inputs of U9 and U10, respectively. If these voltage levels are available at the display, use jumper wires in place of R9-R19, and install nothing at the locations reserved for R20-R30.

To determine the resistor values, the following formula is used:

$$R9 = \frac{-V_L}{5} R20 \quad (\text{Eq. 1})$$

where

V_L = the lowest, or most negative, voltage produced by the display driver circuit

The value of R20-R30 is selected to produce as little loading as possible on the display driver output. Since the input current of a CMOS gate is in the microampere range, values of up to 100 k Ω or so may be used. For the ICOM IC-720 and IC-730, V_L is -13 V, and a value of 47 k Ω is chosen for R20-R30. Thus:

$$R9 = \frac{-(-13)}{5} 47 \text{ k}\Omega = 122 \text{ k}\Omega \quad (\text{Eq. 2})$$

*Notes appear on page 17.

¹115 Stedman St., Chelmsford, MA 01824

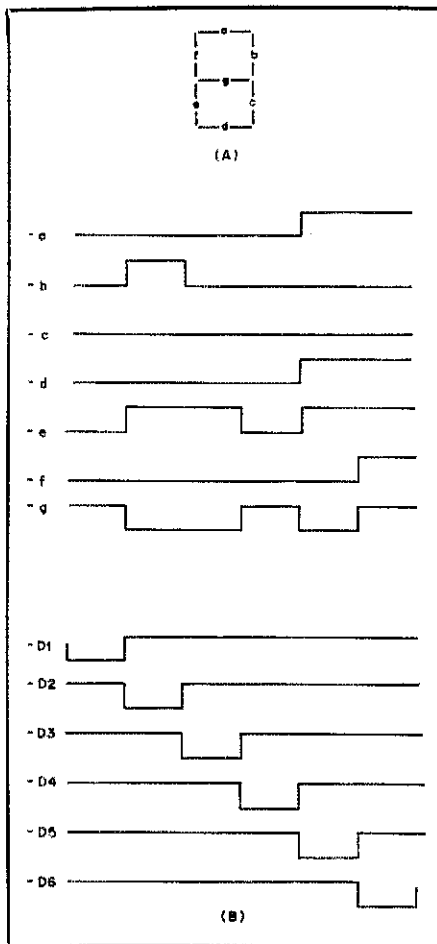


Fig. 1 — Digit-segment identification (A) and an example of multiplexed-display signal timing (B).

The nearest standard resistor value, 120 k Ω , is used. Note that this voltage divider circuit works properly only if V_L is negative. You must also ensure that the calculated values produce between +4 and +5 V when the display driver output is at its high (most positive) level.

To use the Talking Frequency Display circuit with the Kenwood TS-430S, no inversion is required. Therefore, R9-R30 may be omitted, jumpers are installed in place of R9-R19, and 4050 hex noninverting buffers are used for U9 and U10. For use with other transceivers, it is necessary to use some sort of voltage-level converter and/or inverter if signals are not compatible. For instance, the IC-720 and IC-730 use -13 V for off, and +3 V for on. So, signal inversion and level-shifting are required; R9-R30 are installed, and 4049 hex inverting buffers are used at U9 and U10.

Two steps were taken to condense the required number of 13 wires to the display unit into a single 8-bit input port (U2). First, segments c and d are ignored. It is possible to distinguish all the possible digits with only 5 bits of information. Second, the six digit strobes are converted to a 3-bit number by U1. This also simplifies the software requirements. U1 generates a unique

code when the speech synthesizer is busy, regardless of the digit-strobe signals.

Software

This speech synthesizer has a built-in vocabulary of numbers and a few words necessary for use in talking-clock circuits. To make the synthesizer produce a word from its vocabulary, you simply send it the numeric code for that word. (A speech synthesizer IC with an unlimited vocabulary would require you to build words from phonemes, the basic speech elements.)

The program waits for the desired digit strobe to come by, translates 5 bits of the seven-segment code to the corresponding number, and sends it to the speech synthesizer. The microprocessor's most complicated operation is to change the spoken megahertz value of displayed frequency values over 10 from two separate digits to a more natural combination. For instance, "14" is voiced as "fourteen" rather than "one four."

The assembly-language program listing and resulting machine-language code in Intel hexadecimal format for feeding to an EPROM programmer are available.² For those who cannot or do not wish to program their own EPROM, programmed EPROMs may be purchased.³

Construction

As shown in the photographs, the prototype is built on perf board using wirewrap techniques. This project is small enough to wire wrap in one evening, but a PC board makes the job even easier (see note 2). If you follow the wire-wrap method of construction, here are a few tips to make the job simpler:

- 1) Point pin 1 of all sockets in the same direction.
- 2) Use a marking pen or small labels on the pin side of the board to indicate the IC numbers.
- 3) Make a photocopy of the schematic diagram, and trace over each wire as it is installed.
- 4) Wire all ground and power leads first, then do the data and address bus wiring, and follow with the rest of the connections.
- 5) Be sure to leave room on the board for optional level conversion.

I used a trimmer potentiometer on the board for the VOLUME control. You may want to use a control that can be adjusted from outside the cabinet. Be sure to use a heat sink on U8 because it gets pretty hot. Bolting the heat sink to the cabinet provides for greater heat dissipation.

The speech-synthesizer specification sheet calls for use of a 3.12-MHz crystal. I did some experimentation using a signal generator in place of the crystal and found that the crystal frequency is not at all critical. So, I used a more readily available, less-expensive standard crystal frequency of 3 MHz. Don't waste money by purchasing a high-precision crystal; it won't make any

difference in the ultimate performance of the unit.

The value of R8 depends on the IC used at U5. Units bearing an A suffix require a 2.2-k Ω resistor; others need a 3.3-k Ω resistor.

Initial Testing

When the board is wired, the circuit should be tested before connecting it to a radio.

- 1) Do not install any ICs except U8.
- 2) Using an ohmmeter, ensure that all grounded IC pins are connected to ground.
- 3) Apply +10 to 12 V to the regulator input.
- 4) Using a voltmeter, check that +5 V is present at the proper IC socket pins.
- 5) Remove power from the circuit and install U5, U6 and U7.
- 6) At U5, temporarily connect pins 10, 11, 13, 15, 16, 17 and 18 to ground. Connect pin 14 to +5 V. Connect pin 8 of U5 to pin 26 of U3.
- 7) Adjust the VOLUME control (R6) to about midrange, and apply power to the circuit.
- 8) Press S1. Each time S1 is pressed, "sixteen" should be heard twice. If this works, the speech synthesizer and audio amplifier are operating properly.
- 9) Remove power from the circuit and disconnect all the wires temporarily added in step 6.
- 10) Install the remaining ICs.
- 11) Connect inputs a, e, f and g to +5 V, and input b to ground.
- 12) Apply power to the circuit.
- 13) Press and release S1. Touch a wire from ground to input D6 then D5. The circuit should say "eleven." As D4 through D1 are touched in order, "one" should be heard each time.

At this point, you can be fairly confident that everything is working properly. (You may wish to repeat this procedure with the other inputs and follow the program listing.)

Installation

The circuit and program have been tested with a Kenwood TS-430S and an ICOM IC-730. Warning: Connecting this circuit or any other foreign device inside your rig may void the warranty.

Attach the ground wire from the circuit board to the transceiver chassis. Connect the +12 V input to a point that has this voltage available when the transceiver is turned on. (If your transceiver doesn't supply +12 V, you will have to provide a source of about 10-12 V at 200 mA.) On the Kenwood TS-430S, an accessible 12-V source (actually, 13.8 V) is the lower front pin of the POWER ON/OFF switch.

In the TS-430S, the required TTL-level signals are found conveniently on two connectors on top of the display board. Fig. 3 shows these pin locations. If you want resolution only to the nearest

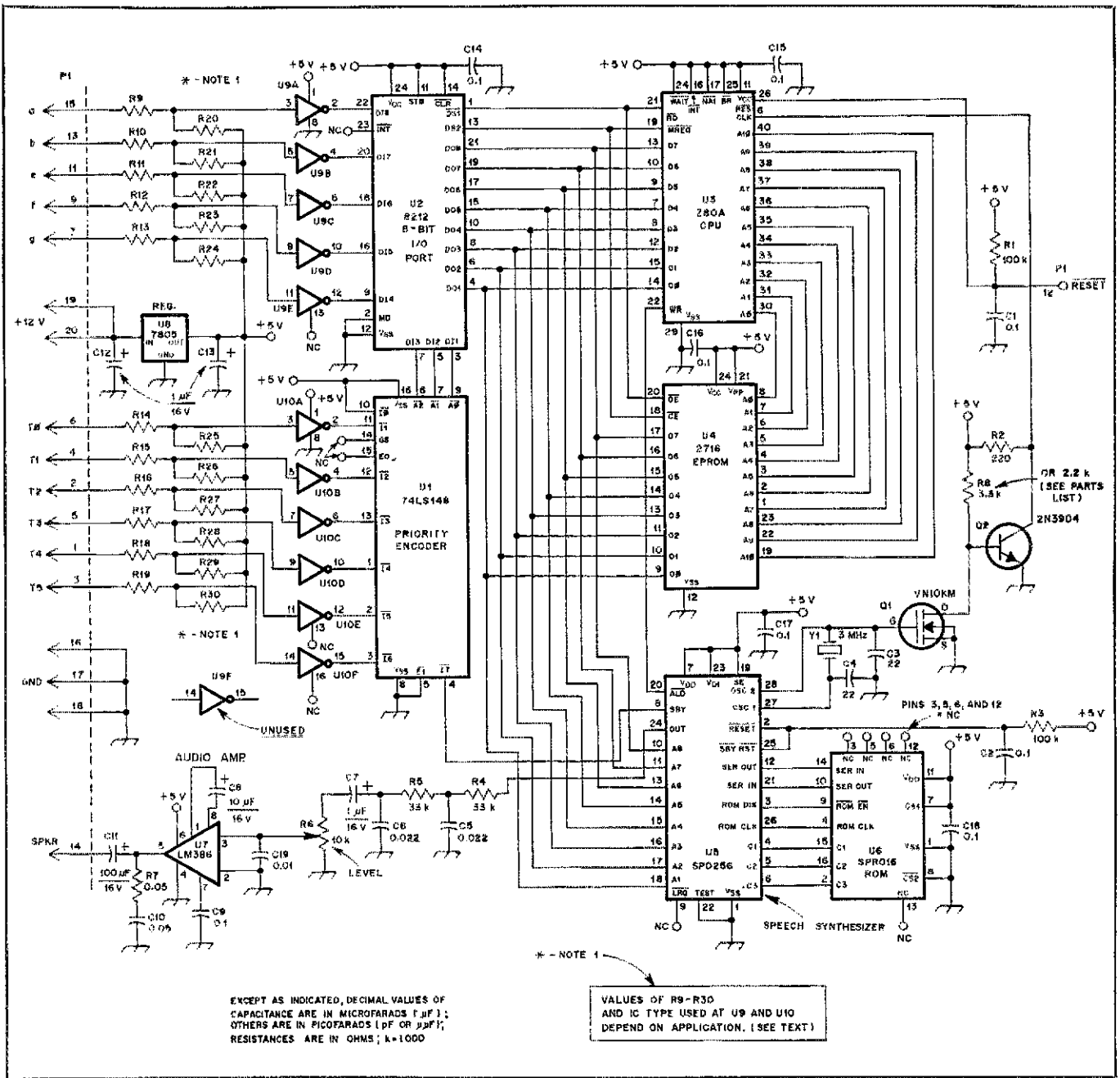


Fig. 2 — Schematic diagram of the Talking Frequency Display. Most parts are available from JAMECO Electronics, 1355 Shoreway Rd., Belmont, CA 94002, tel. 415-592-8097. Disc-ceramic capacitors are 50-V units.

C1, C2, C9, C14-C18, incl. — 0.1 μF , disc ceramic.

C3, C4 — 22-pF silver mica.

C5, C6 — 0.022 μF , disc ceramic.

C7 — 1- μF , 16-V, electrolytic.

C8 — 10- μF , 16-V, electrolytic.

C10 — 0.05 μF , disc ceramic.

C11 — 100- μF , 16-V, electrolytic.

C12, C13 — 1- μF , 16-V, tantalum

C19 — 0.01 μF , disc ceramic.

P1 — DIP 20-pin PC-mount connector

(JAMECO 923862R).

Q1 — VN10KM VMOS FET.

Q2 — 2N3904 or equiv.

R1, R3 — 100 k Ω

R2 — 220 Ω

R4, R5 — 33 k Ω

R6 — 10-k Ω , audio-taper potentiometer.

R7 — 10 Ω

R8 — 3.3 k Ω with Radio Shack/General

Instruments SP0256; 2.2 k Ω with General

Instruments SP0258A.

R9-R19, incl. — 120-k Ω (see text).

R20-R30, incl. — 47-k Ω (see text).

S1 — SPST push-button switch.

SP1 — 8-ohm speaker.

U1 — 74LS148 priority encoder.

U2 — 8212 8-bit I/O port.

U3 — Z80A CPU, 4-MHz.

U4 — 2716 EPROM (A TMS 2716 is not pin

compatible; see note 3).

U5 — SP0256 voice synthesizer (Radio

Shack 276-1783). See notes 1 and 3.

U6 — SP0256 speech ROM (packaged with

SP0256).

U7 — LM386 audio amplifier.

U8 — 7805 5-V regulator.

U9, U10 — 4049 or 4050 (see text).

Y1 — 3-MHz microprocessor crystal. JAN

Crystals, 2400 Crystal Dr., Fort Myers, FL

33906-6017, tel. 813-936-2397.

Wire-wrap sockets: one 8-pin, four 16-pin,

two 24-pin, one 28-pin and one 40-pin.

Perf board (Radio Shack 276-152A), heat

sink for U8, cabinet.

kilohertz, simply leave the D1 input disconnected.

A look at the schematic diagram of your transceiver should reveal how the signals

are routed from the control circuit to the display unit. Hopefully, the seven digit-segment leads will be labeled "a" through "g," and the digit-strobe leads labeled

"D1" through "D6," or something similar; this is how they are labeled for the TS-430S. The ICOM IC-720 schematic diagram identifies the digit-strobe leads as

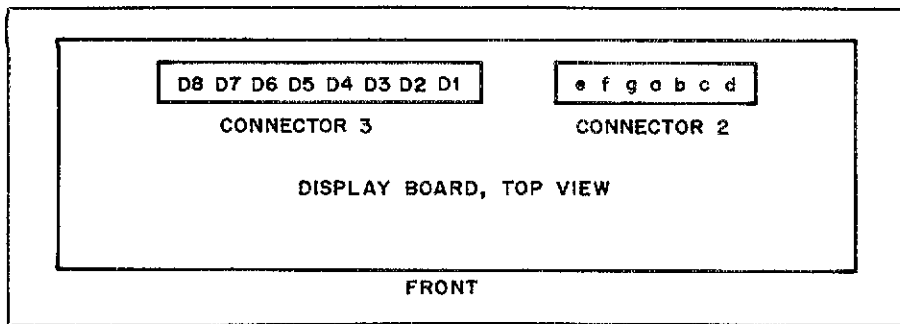


Fig. 3 — Connections to the TS-430S.

R0-R5, and the IC-730 schematic-diagram labels are T0-T5. R0 and T0 are the least-significant digits (100 Hz) in each case.

Try the example shown in Fig. 1, and look at the signals with a dual-trace oscilloscope. Connect one channel to the first digit strobe, and trigger on this signal. Adjust the sweep rate so that the pulse occupies one division. This will make observations easier to interpret. It doesn't

matter whether digits are scanned left to right or right to left. The program doesn't care about the order; it just waits for the right signal to come along.

Uses

You can find many uses for this device. Use it with a mobile rig that's hidden under the seat. Use it with a digital multimeter or frequency counter so you can look at

something else while making measurements. The only device you shouldn't connect this unit to is a clock — because *this* gadget costs more than a talking clock!

Acknowledgments

Thanks to Henry Oredson, WØRLI, for providing the required Intel literature and to John Biro, KIKSY, for the cross-assembler. Thanks also to Peter Quinn, KO1H, for letting me use his transceiver as a guinea pig; Robert Wallace, W1HH, for doing the IC-730 installation; and my XYL for tolerating my hobby.

Notes

¹This IC set is now a discontinued Radio Shack item and may no longer be available in some areas. A & A Engineering, however, can supply the ICs. See note 3.

²Please send a business-size s.a.s.e. and \$1 for these listings. Ask for the Talking Frequency Display listings.

³Preprogrammed EPROMs, PC boards and a partial kit of parts are available from A & A Engineering, 7970 Orchid Dr., Buena Park, CA 90620, tel. 714-521-4160. PC boards are \$12.50 each; programmed EPROMs are \$8.50 each.

New Products

LOGPAK+ LOGGING PROGRAM

LogPak+ is a disk-based logging program for the IBM® PC. System requirements are two 5¼-in disk drives and 64 kbytes of RAM. A printer is required for hard copy.

This is an elaborate logging system. It allows you to enter the call sign of the station worked, date, time, band, mode, signal reports, operator's name and notes. LogPak+ looks at the prefix of the station worked and fills in country data. If it is a U.S. contact, the program prompts the user for the state. Information stored in the log files may be edited at any time. The log data may be displayed on the screen or sent to a printer for hard copy.

A polished QSL management system takes some of the drudgery out of the QSLing process. The program not only keeps track of QSLs sent and received, but also prints labels containing QSO information from the log data; these labels are then affixed to QSL cards. The QSL routine also allows you to make up a label with the name and address of the station worked, as well as two return-address labels — one for the original envelope and one for an s.a.s.e.

Other LogPak+ features allow you to search the log for a specific call sign or to list contacts by country. Price class: \$49.

Manufacturer: Technical Software Corp., P.O. Box 722, Plainville, CT 06062, tel. 203-589-4045. — *Mark Wilson, AA2Z*

ALPHA DELTA COMMUNICATIONS AC TRANSI-TRAP™

The ACTT AC Transi-Trap is a plug-in-the-wall ac surge protector providing two 117-V ac sockets, a status light, circuit breaker and a three-stage automatic surge-protection circuit. This unit provides transverse- and common-mode protection; it has a hot-to-neutral, neutral-to-ground and hot-to-ground 6-kV, 2-kA surge-discharge, self-restoring, high-speed circuit. According to the manufacturer, competitive devices use only a single-stage 100-A protector.

The manufacturer states that the ACTT also protects equipment plugged into any other common branch ac wall outlet down line from the ACTT. Each unit is UL listed. Price class: \$30. Available from Alpha Delta dealers or directly from Alpha Delta Communications, P.O. Box 571, Center-

ville, OH 45459, tel. 513-435-4772. Please add \$2 for shipping and handling charges. — *Paul K. Pagel, N1FB*

Next Month in QST

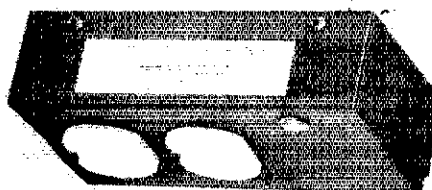
Variety is the word for the May QST menu. You can chew on a wide selection of feature-article entrees ranging from "Understanding FM Transmitters" to AC Design Using Complex Numbers. Those who'd like a taste of a new operating activity can feast on an article describing RTTY and AMTOR operating techniques.

If your thirst for excitement is quenched in a top-grade contest, you'll find the November Sweepstakes Results refreshing indeed, not to mention the Rules for Field Day and the IARU Radiosport Championship.

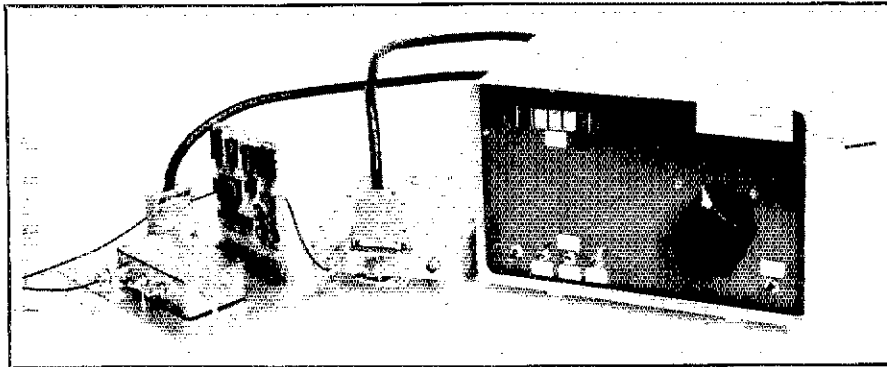
Side orders include columns that discuss, among other timely subjects, this year's rasher of meteor showers and alternatives to the overstuffed 2-meter band.

For dessert, you can choose from a tempting assortment of used equipment in the Ham Ads, and the always-tasty new gear in the display ads.

A veritable feast, coming to a mailbox near you, in May QST.



A Variable Reference Oscillator for Synthesized VFOs



Want to build a PLL frequency synthesizer for that homemade rig, but discouraged by the large frequency steps it would provide? Here is just the project for you!

Albert Haberstich,* WB5FXX

Many single-PLL (phase-locked loop) VFOs provide only 100-Hz frequency increments. Higher resolution is often desirable, particularly for an HF receiver or transmitter. Response time and tuning-range considerations are usually the limiting factors that determine the tuning-increment size. The resolution can be improved by the use of multiple PLLs. Although very accurate, this solution makes the design more difficult, and may introduce additional spurious frequencies into the system. Clearly, a better solution is needed for those who want to build their own equipment.

This article describes a project that I built to provide intermediate frequency steps by changing the PLL reference frequency. Wes Hayward discussed this type of approach in a *QST* article, and it is a generalization of the reference-pulling technique advocated by Helfrick in another *QST* article.¹ This design offers the advantage of nearly constant VFO steps over a wide frequency range.

The variable reference oscillator implemented in this article is intended for use with a single-PLL VFO with a tuning range of between 1 and 1.7999 MHz. It is a device that improves the original 100 Hz resolution of the VFO by a factor of 10, and the accuracy of the new frequency increments

is on the order of 1 Hz. The PLL design itself is not described, since ample documentation is already available on this subject.²

Using this technique, the construction of a high-resolution synthesized VFO can be carried out in two steps. You can start with the design and temporary use of a conventional 100-Hz-increment VFO. Later, you can add a variable reference oscillator to

upgrade the resolution by a factor of 10.

Principles of Operation

A block diagram of the unmodified VFO is shown in Fig. 1. The single PLL contains a voltage-controlled oscillator (VCO), a frequency divider of variable ratio, N , a phase comparator and a low-pass filter. The VCO frequency is divided by a fixed ratio, M , to produce the desired output frequency, f_{VFO} . The modulo- N divider is programmed by BCD signals originating from the digital readout. This display is controlled by a frequency programmer consisting of a shaft encoder and an up/down BCD counter. The reference oscillator (RO) is a crystal oscillator driving a fixed-frequency divider to produce the reference-

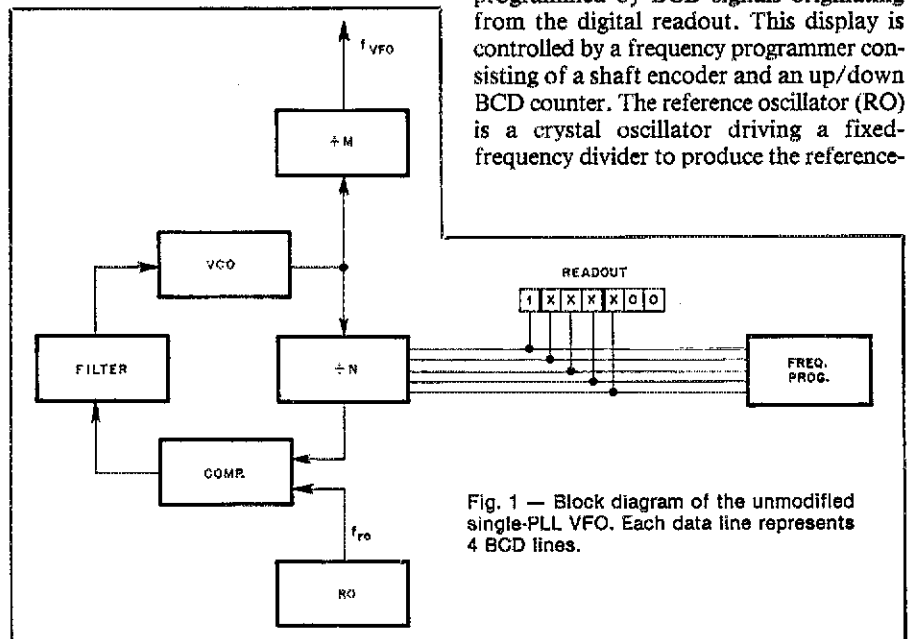


Fig. 1 — Block diagram of the unmodified single-PLL VFO. Each data line represents 4 BCD lines.

*Notes appear on page 22.

*159 Laguna St., Los Alamos, NM 87544

oscillator frequency, f_{ro} . The frequencies generated by this circuit are given by

$$f_{vfo} = \frac{f_{ro} N}{M} \quad (\text{Eq. 1})$$

In this situation, f_{ro} is 10 kHz and N varies between $N_{\min} = 10,000$ and a value of N_{\max} of up to 17,999. With $M = 100$, the readout displays the VFO frequency in hertz. This frequency ranges from 1 MHz to N_{\max}/N_{\min} times 1 MHz, in steps of 100 Hz.

Improving the VFO resolution requires dividing these 100-Hz steps into a number of substeps, n_s . Since the substeps are to be selected by signals from the existing readout, it is natural to make n_s equal to 10, to provide 10-Hz increments. The VFO frequencies made accessible by these new intervals are given by

$$f_{vfo} = \left(\frac{f_{ro}}{M}\right) \times \left(N + \frac{n}{n_s}\right) \quad (\text{Eq. 2})$$

where

N is programmed as before by the five most-significant digits of the display $n = 0$ to 9, as selected by the 10-Hz digit of the display.

The goal is to generate the new intervals by varying the reference frequency. To this end, the fixed reference source is replaced by a variable reference oscillator (VRO). After dividing the VFO frequency by N/M we find that the frequency of the VRO needs to satisfy the relation:

$$f_r = f_{ro} + \left(\frac{n}{n_s} \times \frac{1}{N} \times f_{ro}\right) \quad (\text{Eq. 3})$$

The VRO must, therefore, be programmed not only by n , but also by the setting of the loop divider, N .

Fig. 2 shows how the VRO is connected to the single-loop VFO. The most-significant digit of N is always 1. There is, therefore, no need to relay this information to the VRO. The least-significant digit of N can be ignored, also. The information carried by the remaining data lines corresponds to the integer part of $(N - N_{\min})/10$.

Circuit Design

The reference oscillator is designed for $N_{\min} = 10,000$ and an N_{\max} of up to 17,999. The nominal reference frequency, f_{ro} , is 10 kHz, and the number of substeps, n_s , is 10.

Fig. 3 shows a block diagram of the VRO. The reference frequency is produced by a voltage-controlled crystal oscillator (VCXO) with a nominal frequency, f_{xo} , of 6 MHz, followed by a $\times 600$ frequency divider. The VCXO frequency needs to obey an expression similar to Eq. 3:

$$f_x = f_{xo} + \left(\frac{n}{n_s} \times \frac{1}{N} \times f_{xo}\right) \quad (\text{Eq. 4})$$

The voltage, V_x , that controls f_x is prescribed to vary between 4 V at $n = 0$, and 8.5 V at $n = 9$, for $N = N_{\min}$. The variation of the VCXO frequency,

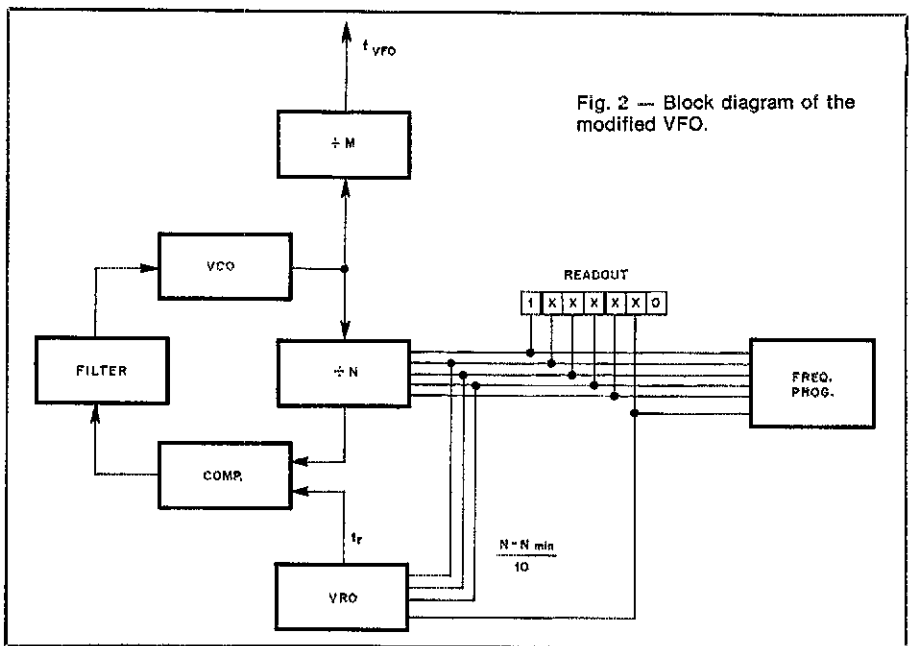


Fig. 2 — Block diagram of the modified VFO.

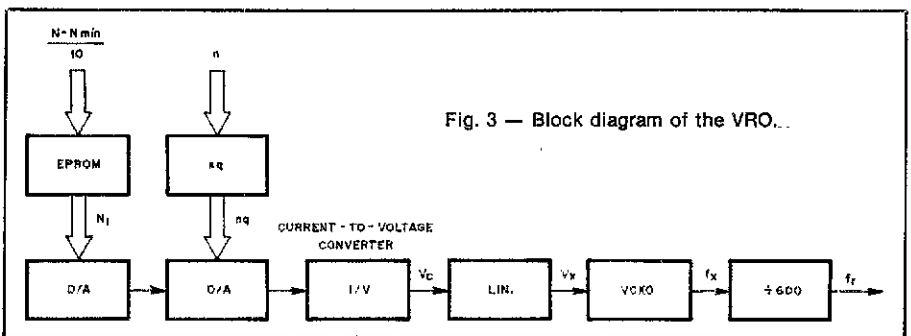


Fig. 3 — Block diagram of the VRO...

over this range, is 540 Hz.

The VCXO frequency does not vary linearly with V_x , the voltage controlling the oscillator. I compensated for this undesirable condition by using a circuit that is linear over small segments of the curve, as illustrated in Fig. 4A. The input voltage to this circuit is labeled V_c . Fig. 4B shows the correspondence between V_x and V_c necessary to linearize the VCXO transfer function. The circuit approximates this curve with four straight segments connecting points 1 to 5. A similar linearizer has been described in *Ham Radio* magazine by Craig Corsetto, WA6OAA.³

The control voltage, V_c , is specified to vary between 2.5 V at $n = 0$ and 8.5 V at $n = 9$, for $N = N_{\min}$. Because of the linear dependence of f_x on V_c , the control voltage has to follow the relation

$$V_c = 2.5 + \left(6 \times \frac{n}{n_s - 1} \times \frac{N_{\min}}{N}\right) \quad (\text{Eq. 5})$$

The digital-to-analog (D/A) circuit consists of two D/A converters, acting as programmable current sources, and a current-to-voltage converter. One D/A converter generates the basic frequency substeps according to the fraction $n / (n_s - 1)$, given

in Eq. 3. The other converter adjusts the size of the increments given by the value of $(N - N_{\min})/10$. The data, n , are multiplied by a conversion factor, q , of 16 before reaching the second D/A, to make better use of the 8-bit device range.

The data applied to the first D/A are encoded by means of an EPROM (erasable programmable read-only memory). This is an 8-bit device with N_1 ranging from 0 to 255. The data, $(N - N_{\min})/10$, are applied to the 11 address pins of the EPROM, without resorting to a BCD-to-binary converter. This choice is what limits the value of N_{\max} to 17,999.

A block diagram displaying the critical elements of the D/A circuit is shown in Fig. 5. Conditions for the output voltage of the circuit to match Eq. 5 are derived in the Appendix. Given $R_a = 5.6 \Omega$ and $R_c = 3.3 \text{ k}\Omega$, they specify R_b to be 2.498 k Ω , and R_d to be 5.154 k Ω . They also relate N_1 to N and thus prescribe the data to be stored in the EPROM.

Construction and Calibration

Fig. 6 is a photograph of the VRO. A schematic diagram of the control section, including the D/A converter and linearizer, is shown in Fig. 7. This circuit is assembled on a 4- \times -4.5-in commercial circuit board with

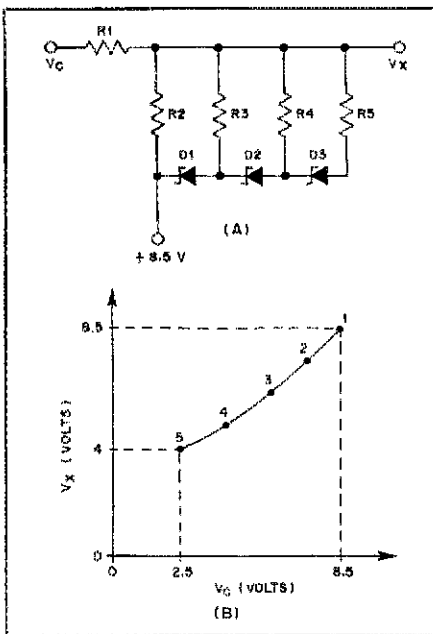


Fig. 4 — A shows the linearizer circuit, and B is a schematic representation of the linearizer response.

a 44-pin edge connector. A test point is provided to measure the control voltage, V_c .

A diagram of the VCXO and frequency divider is presented in Fig. 8. This section is mounted in a $4.3 \times 2.3 \times 1$ -in cast-aluminum enclosure to control temperature variations and to minimize spurious radiation. A BNC connector is provided for the reference-frequency output, and the supply and control voltages entering the enclosure are filtered by three feed-through capacitors. A test point is provided to measure the VCXO frequency.

The two sections are mounted on a temporary chassis. Connections to the VFO frequency readout and power supply are through a cable with a 25-pin D-type connector. Power requirements for the unit are a source of regulated +5 V (200 mA), -5 V (20 mA) and an unregulated +15 to +20 V (50 mA) for the 12-V regulator. The title photo shows the entire system that I built.

Parts Availability

Most of the solid-state devices or equivalent parts needed for this project are listed in the Jameco Electronics catalog (1355 Shoreway Rd., Belmont, CA 94002). Several items are available from Radio Shack. The varactor diodes can be obtained from a Motorola distributor, and the toroidal transformer core is sold by Amidon Associates (12033 Otsego St., N. Hollywood, CA 91607) or Palomar Engineers (Box 455, Escondido, CA 92025). The coil form for L1 and the capacitor C2 are surplus items. C2 is a 1.5- to 20-pF piston-trimmer capacitor, permitting very fine frequency adjustments.

L1 is a 35-turn, single-layer winding of no. 32 enameled copper wire on a 3/8-in-diameter ceramic form with a blue-coded

slug. Transformer T1 is wound on a T68-6 powdered-iron toroidal core. The tapped winding consists of 50 turns of no. 28 enameled wire, uniformly distributed over 80% of the core circumference. It is tapped 11 turns from one end. The crystal is a size HC-18/U element with a series-resonance frequency of 6 MHz (Jameco CY6.00), and C3 is a ceramic trimmer capacitor.

The VCXO is modeled after a circuit published in *The 1985 ARRL Handbook*.⁴ A Hartley oscillator is used, with the crystal connected in series with the transistor-emitter feedback circuit. The oscillator frequency is varied by changing the value of a series reactance consisting of the variable inductance, L1, capacitors C1 and C2, and 2 varactor diodes, D4 and D5. The parallel circuit of L1 and C1 is used in place of an ordinary inductance to include a temperature-compensating element in the oscillator circuit.

The VCXO output goes to an emitter-

follower circuit, driving a conventional three-stage digital frequency divider, U2 to U4, with an overall dividing ratio of 600. Except for keeping stray capacitances low on the emitter side of Q1, the wiring of the VCXO does not appear to be very critical.

When you turn the oscillator on for the first time, C3 needs to be adjusted for maximum output from the emitter-follower stage, Q2, at the test point, TP1. The value of R6 is then changed, if necessary, to adjust the magnitude of this signal to between 2- and 2.5-V peak-to-peak. If the voltage is too high, Q1 will saturate; if it is too low the divider may fail to function.

After you perform these preliminary adjustments, L1 and C2 are tuned to produce VCXO frequencies of 6 and 6.000540 MHz at control voltages, V_c of 4 and 8.5 V, respectively. The frequency measurements should be carried out, if possible, with a frequency counter having a resolution of 1 Hz.⁵ I recommend that you use a digital

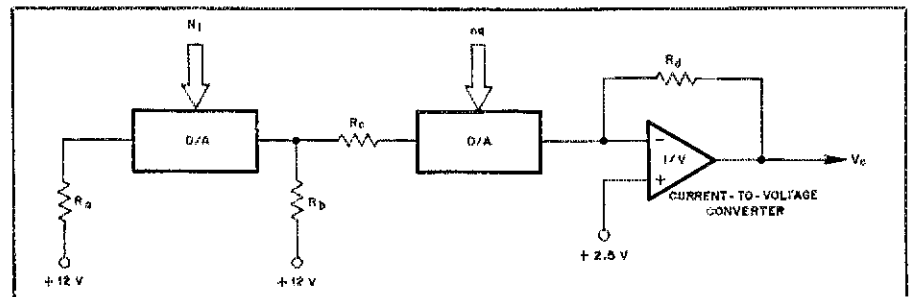


Fig. 5 — Main elements of the D/A circuit.

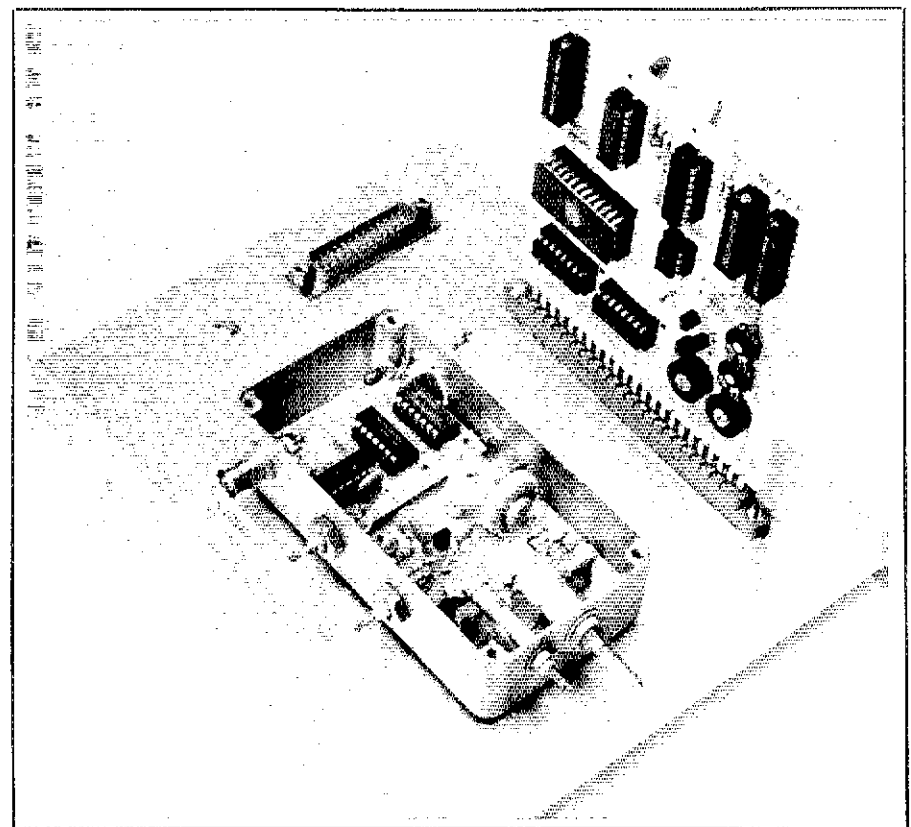


Fig. 6 — The VCXO and frequency-divider section mounted on a temporary chassis.

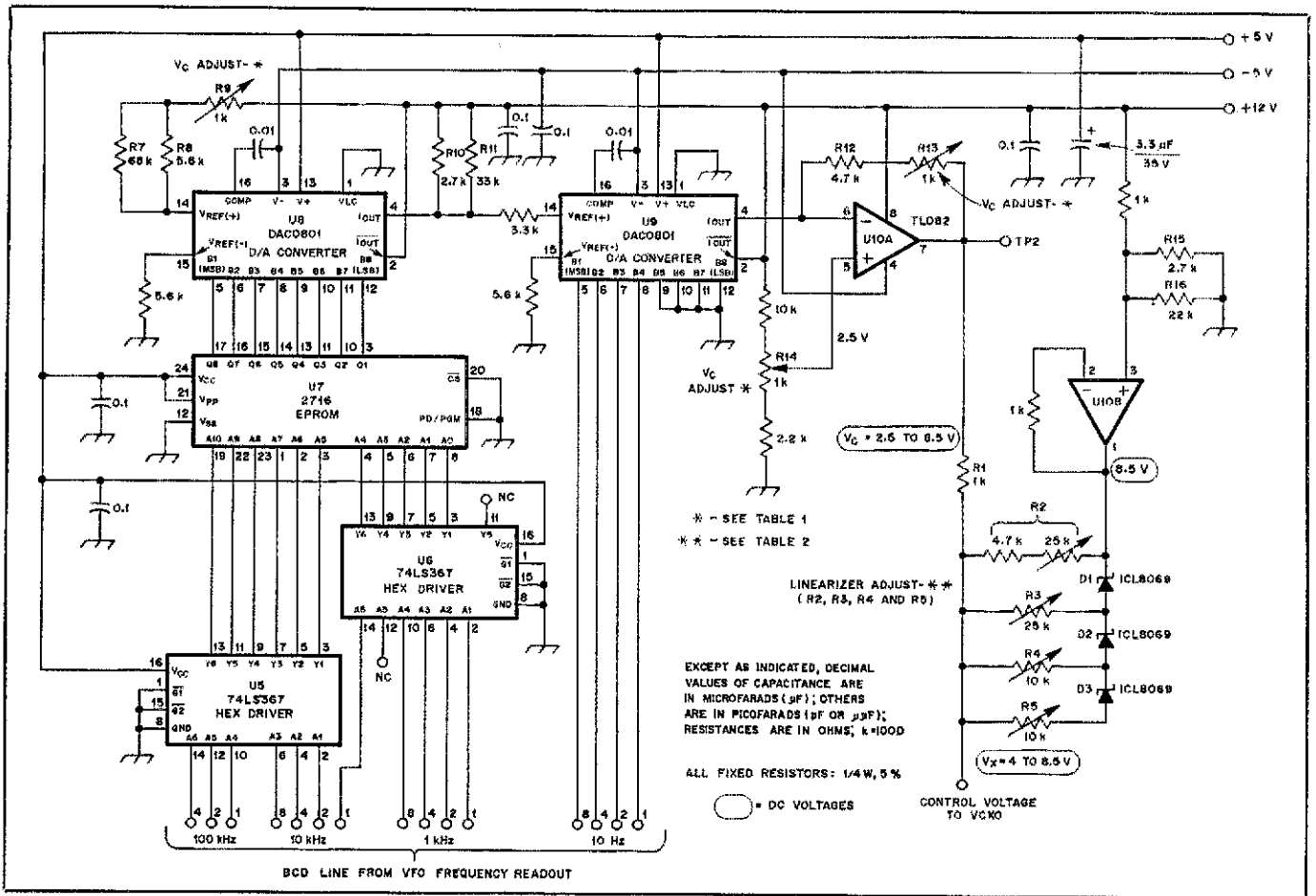


Fig. 7 — Circuit diagram of the D/A converter and linearizer section.

R2, R3 — 25-kΩ PC-mount potentiometers
 R4, R5 — 10-kΩ PC-mount potentiometers

R9, R13, R14 — 1-kΩ, 10-turn precision potentiometers

voltmeter for the voltage measurements.

The next section describes how to program the EPROM, U7 in Fig. 7. Although the 2716 is TTL compatible, the IC uses MOS technology and must be handled accordingly. Hex buffers U5 and U6 are used to isolate the EPROM from damaging voltage transients on the address lines.

The access time of the 2716 is 450 ns. For a fraction of a microsecond following a change in the VFO dial setting, the outputs of the EPROM and D/A converter are undetermined. The resulting control-voltage excursion is filtered out at the input to the VCXO. The conversion factor $q = 16$ is dealt with by applying the BCD data representing n to the four most significant input pins of U9.

D/A converter reference currents for U8 and U9 are obtained from a 12-V regulator, U1, mounted on the temporary chassis. The regulator is located close to the VRO to reduce ground-loop problems. U10A serves the dual purpose of inverter and current-to-voltage converter.

The fixed resistors used in the D/A section are all of the same type, to balance temperature effects. Resistors R7, R8 and R9 form the resistance R_a , mentioned earlier. R10 and R11 correspond to R_b , and

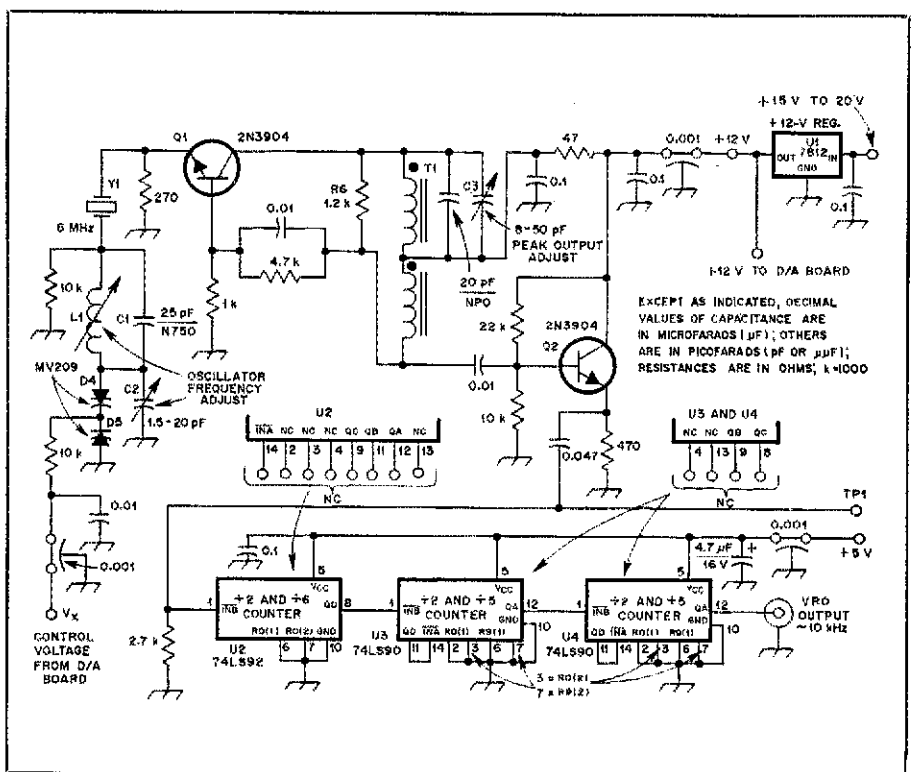


Fig. 8 — Circuit diagram of the VCXO and frequency divider.

Table 1

Adjustment of the Variable Resistors in the D/A Circuit

Adj.	N	n	V _c (V)
R14	10,000	0	2.50
R13	10,000	9	8.50
R9	15,000	9	6.50

R12 and R13 make up R_d. The multiturn potentiometers, R14, R13, and R9 are adjusted in the order given in Table 1.

The VRO can be programmed by the frequency readout of the VFO during these adjustments. If N = 15,000 is not accessible, then R9 can be adjusted at N_{max} for V_c = 2.5 + (60,000 / N_{max}) (V). V_c is measured at test point TP2.

UI0B generates the reference voltage used by the linearizer. Resistors R15 and R16 are selected to set this voltage at 8.5. The Zener-like devices, D1 to D3, are band-gap voltage references chosen for their excellent thermal stability and low bias-current characteristics. Their reverse breakdown voltage is typically 1.23 V at reverse currents as low as 50 μA.

The linearizer adjustment follows the sequence indicated in Table 2. N is set at 10,000 during this calibration.

After completing these adjustments, N can be varied between N_{min} and N_{max}, while keeping n fixed at 9, to verify the data stored in the EPROM. The VCXO frequency should then vary as 6 + 5.40 / N (MHz).

Programming the EPROM

The 2716 is a programmable read-only memory with a storage capacity of 2048 eight-bit data words. The device can be erased with a UV light source and reprogrammed a number of times.

The addresses, a_i, and the data, d_i, to be stored in the EPROM are prescribed by the expression relating N₁ to N given in the Appendix. Let a_i = 0,1,2...799 in sequence. Then, d_i is obtained from

$$d_i = 573.8 \frac{a_i}{a_i + 1000} \quad (\text{Eq. 6})$$

and rounding the result to the nearest integer. The first and last two entries of the fully programmed EPROM are listed in Table 3. You should realize that addresses are applied to the EPROM in BCD form, and that program data is recorded in binary form.

The PLL, in most applications, will use only a fraction of the range of N allowed by the VRO. A VFO with a tuning range of ±20%, for example, needs to access only the first 201 locations of the EPROM. In such cases, the EPROM needs to be programmed only up to the address a_i = (N_{max} - N_{min}) / 10, where N_{max} is the highest setting of the PLL divider.

The memory can be programmed with a simple homemade circuit.* It requires

Table 2

Adjustment of the Linearizer Resistors R2 to R5 at N = 10,000

Adj.	n	V _x (V)	f _x (MHz)
—	9	8.50	6.000540
R2	7	—	6.000420
R3	5	—	6.000300
R4	2	—	6.000120
R5	0	4.00	6.000000

Table 3

Partial Listing of EPROM Data

N	a _i	d _i
10,000	000	000
10,010	001	001
•	•	•
•	•	•
17,980	798	255
17,990	799	255

regulated +5- and +25-V supplies, a TTL-level 50-ms pulse source and a few switches. BCD switches are recommended to select the addresses, and hexadecimal switches to enter the data. Binary (on/off) switches are less expensive, but are more likely to induce programming errors. You can verify the stored data on the VRO.

Frequency Accuracy

The results discussed in this section refer to a VFO frequency of 1 MHz. During an absolute stability check, the VFO frequency decreased by 3 Hz when the ambient temperature of the VRO was lowered by 25 Celsius degrees.

Frequency-increment errors are caused by inadequate compensation of the VCXO nonlinearity, thermal effects in the D/A circuit and varactor diodes, and round-off errors in the digital controls. The frequency error caused by the first effect is less than 0.4 Hz. The other errors vanish at n = 0, and are most pronounced at n = n_s - 1. The frequency error observed at n_s - 1 has to be absorbed by the substep leading to the next higher value of N.

Increment errors caused by thermal effects are difficult to predict, since they depend on the particular components used in the assembly. I found the error originating in my VCXO to be -0.7 Hz at n = 9, during the ambient temperature test. The control voltage, V_x, increased by 10 mV at n = 0 and by 30 mV at n = 9, causing an error of +0.4 Hz. The overall frequency error at n = 9 was, therefore, -0.3 Hz. It might be possible to reduce this number by experimenting with the temperature coefficients of the resistive elements in the D/A section.

The uncertainty because of N₁ being rounded off to the nearest integer should be at most 0.16 Hz. Any error caused by the deletion of the least significant digit of

N in the VRO control signals should be less than 0.1 Hz.

Choosing Other Frequency Increments

This design can support values of n of up to 255. A change in the frequency step entails a change in q and R_d, and a new excursion of the VCXO (see Eq. 4). The ranges of V_x and V_c remain unchanged. One point to keep in mind, if you consider making n_s much greater than 10, is that the frequency-increment errors become more significant for smaller substeps.

Appendix

The output voltage of the D/A circuit drawn in Fig. 5 is given by

$$V_c = 2.5 + 12 \times \frac{R_d}{R_b + R_c} \times \frac{nq}{256} \times \left(1 - \frac{R_b}{R_a} \times \frac{N_1}{256} \right) \quad (\text{Eq. 7})$$

where N₁ and the product nq are the data applied to the two D/A converters. This voltage has to agree with the voltage described by Eq. 5.

Comparing the two relations while letting N₁ = 0 for N = N_{min} and N₁ = 255 for N = N_{max}, you get

$$\frac{R_b}{R_a} = \frac{256}{255} \times \left(1 - \frac{N_{min}}{N_{max}} \right) \quad (\text{Eq. 8})$$

$$\frac{R_d}{R_b + R_c} = \frac{128}{q(n_s - 1)} \quad (\text{Eq. 9})$$

and

$$N_1 = 255 \times \frac{N - N_{min}}{N} \times \frac{N_{max}}{N_{max} - N_{min}} \quad (\text{Eq. 10})$$

The first two results determine R_b and R_d, since R_a and R_c are assumed to be known. The third expression relates N₁ to N and leads to Eq. 6, used to calculate the data to program the EPROM. N_{max} should be 17,999 when making use of these expressions.

Notes

*W. Hayward, "Variations in a Single-Loop Frequency Synthesizer," and A. Helfrick, "The Universal Synthesizer," *QST*, Sept. 1981, pp. 24-26 and pp. 18-23.

¹See note 1, V. Manassewitsch, *Frequency Synthesizers: Theory and Design*, 2nd. ed. (New York: Wiley-Interscience, 1980) and C. Corsetto, "RF Synthesizers for High-Frequency Communications," *Ham Radio*, Aug. 1983, pp. 12-15, Sept. 1983, pp. 48-57, Oct. 1983, pp. 17-26.

²See note 2.

³C. Hutchinson, ed., *The 1985 ARRL Handbook*, (Newington: ARRL, 1984), pp. 30-9 to 30-11.

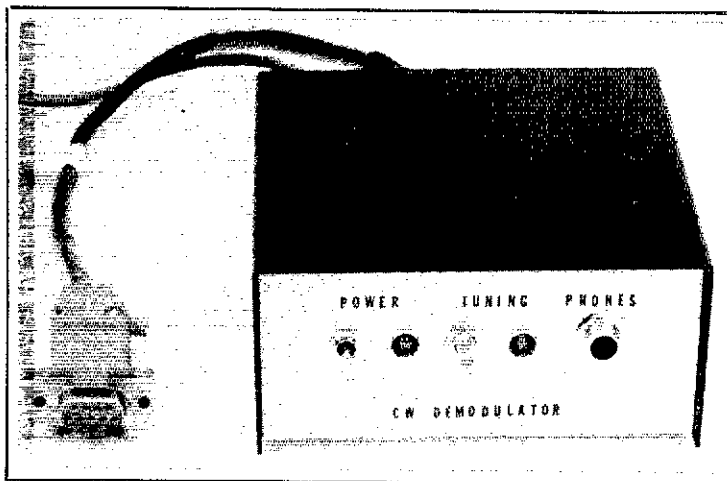
⁴See note 4, pp. 25-17 to 25-21.

⁵W. Barden, Jr., *280 Microcomputer Design Projects* (Indianapolis: Howard W. Sams, 1981), pp. 80-90.

A High-Performance CW Demodulator

Does QRM corrupt your CRT? Do weak signals leave your computer in the dark? Try this CW demodulator, and see what you've been missing!

By Joe Evans,* AA4AB



Many "all purpose" radio modems and computer interfaces are designed for RTTY reception. Unfortunately, they often display poor CW performance in our crowded (and noisy) amateur bands. This CW demodulator (CWD) uses circuits specifically tailored for automatic CW reception. Special aspects include a "no compromise" audio filter section and a novel headphone-switching arrangement. The result is a computer-compatible audio filter that can supply QRM-free CW signals to your headphones and appropriate binary voltage levels to your home computer.

Why Automatic CW?

Today, probably no automatic device can outperform a well-trained CW operator. So why bother with automatic reception? Perhaps the most useful feature, if you are interested in improving your CW proficiency, is the ability to conduct QSOs at speeds just beyond those with which you feel comfortable. This way, you can look at the computer display whenever you get confused or distracted, or just need to take a short break. Of course, CW can always be used as a substitute for radioteletype, especially if the band segment or your license class does not permit RTTY.

The computer and its software are not part of this article. I tested the CWD with the VIC 20™ HAMSOFT¹ combination. However, any computer and any CW software should work fine.

The CWD consists of two main sections. The audio-filter section eliminates QRM and improves the signal-to-noise ratio of the received audio. The detector section sends a low voltage to the computer when

a CW tone is present, and a higher voltage to indicate the absence of a CW tone. A complete parts list for the CWD is given in Table 1.

Filter Response

An "ultimate" filter response was desired for the audio filter — a flat pass-band with very steep skirts. After looking

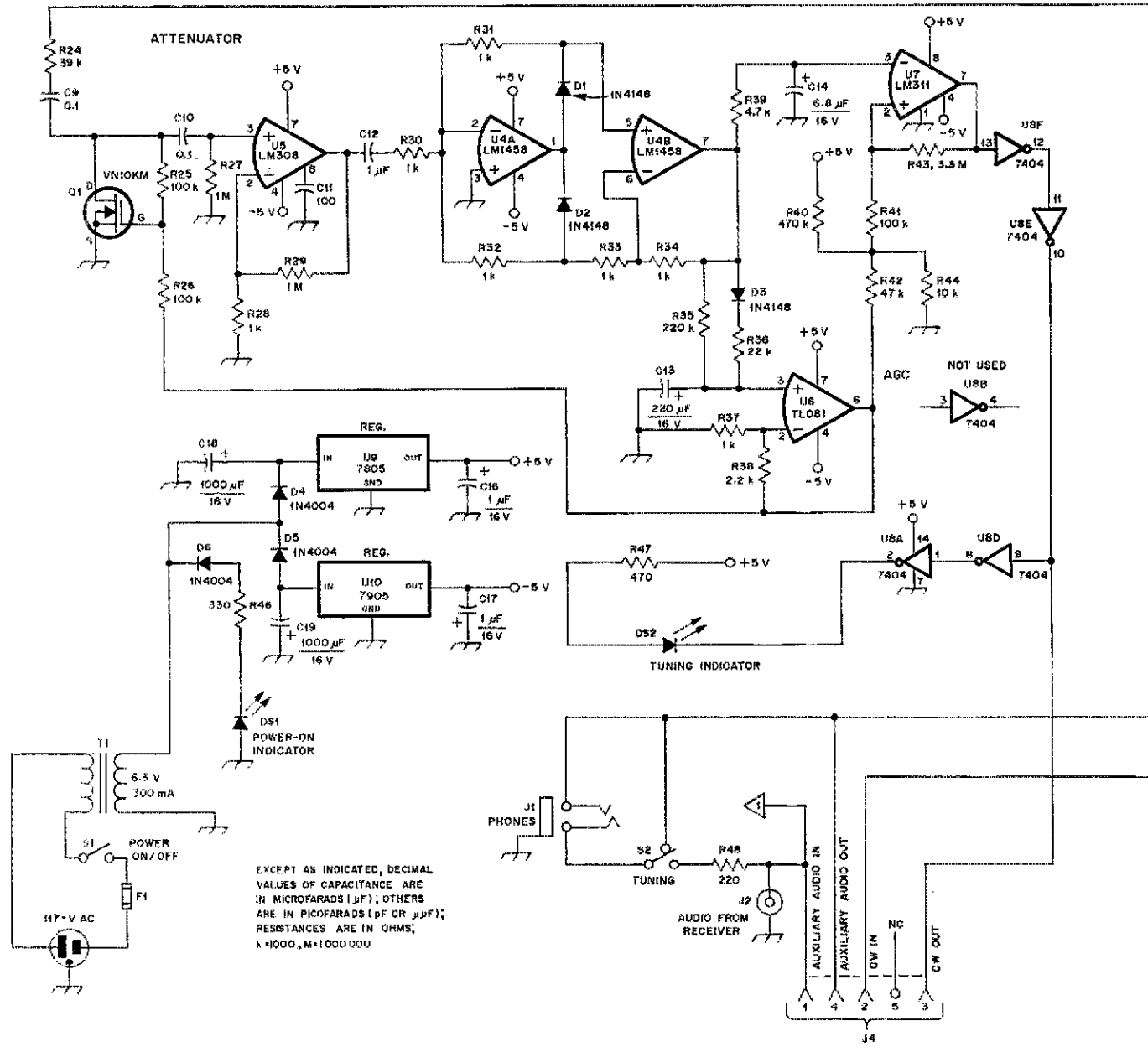
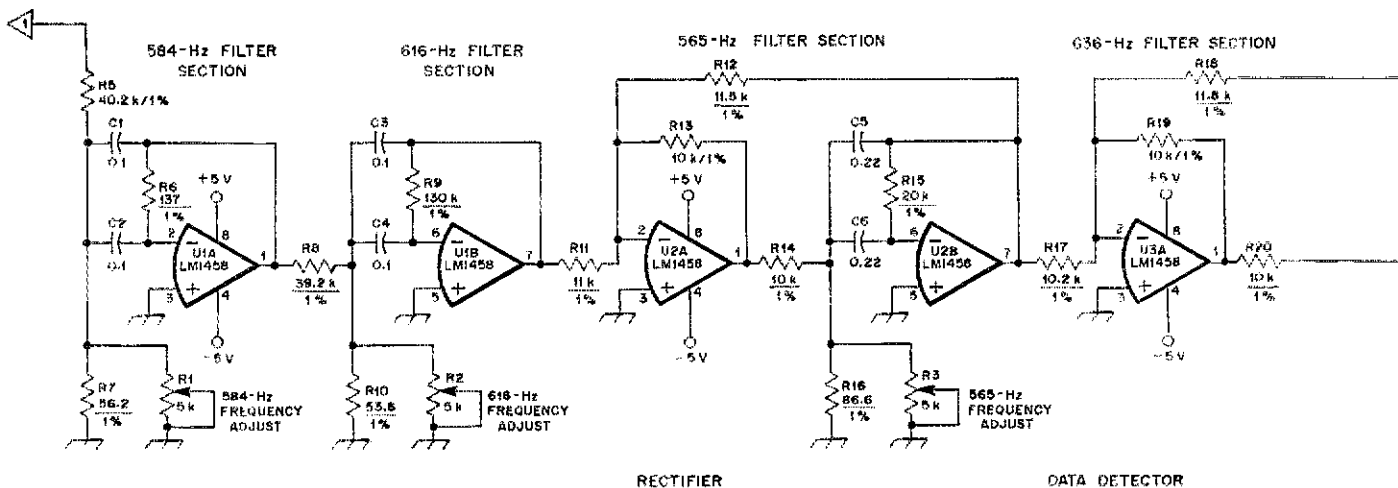
at theoretical filter curves, I decided on a four-stage Chebyshev design with 1-dB band-pass ripple. I chose a center frequency of 600 Hz (a fairly comfortable tone for listening to CW), and a 3-dB bandwidth of 75 Hz. The 75-Hz bandwidth is okay for all practical CW speeds, up to perhaps 60 WPM. Gain of the four-stage filter is unity. The characteristics of each filter stage re-

Table 1
Parts List for CWD

F1 — Fuse, 125 V, 1/16 A, 3AG slo-blo.	C1-C4, incl. — 0.1 μ F, 1% preferred, 5% okay.
J1 — Headphone jack.	C5-C8, incl. — 0.22 μ F, 1% preferred, 5% okay.
J2, J3 — Phono jack, RCA type.	C9, C10 — 0.1 μ F, 5%.
J4 — 5-pin DIN socket.	C11 — 100 pF.
R1-R4 — 5-k Ω trimmer potentiometer	C12 — 1.0 μ F, nonpolarized.
(Note: All fixed resistors are 1/4 W.)	C13 — 220 μ F, electrolytic, 16 V.
R5 — 40.2 k Ω , 1%.	C14 — 6.8 μ F, electrolytic, 16 V.
R6 — 137 k Ω , 1%.	C15 — 0.01 μ F.
R7 — 56.2 Ω , 1%.	C16, C17 — 1.0 μ F, electrolytic, 16 V.
R8 — 39.2 k Ω , 1%.	C18, C19 — 1000 μ F, electrolytic, 16 V.
R9 — 130 k Ω , 1%.	D1-D3, incl. — Signal diodes, 1N4148 or equiv.
R10 — 53.6 Ω , 1%.	D4-D6, incl. — Silicon rectifier diodes, 1N4004 or equiv.
R11 — 11.0 k Ω , 1%.	DS1-DS2 — LED. (RS 276-037 or equiv.)
R12 — 11.5 k Ω , 1%.	Q1 — N-channel TMOS FET, VN10KM or 2N6660.
R13, R14, R19, R20 — 10.0 k Ω , 1%.	Q2 — NPN transistor, 2N2222 or equiv.
R15, R21 — 20.0 k Ω , 1%.	U1-U4, incl. — General-purpose op amp, type LM1458.
R16 — 86.6 Ω , 1%.	U5 — High-gain op amp, type LM308.
R17 — 10.2 k Ω , 1%.	U6 — High-input-impedance op amp, type TL081.
R18 — 11.8 k Ω , 1%.	U7 — Voltage comparator, type LM311.
R22 — 88.1 Ω , 1%.	U8 — TTL hex inverter, type 74LS04.
R24 — 39 k Ω , 5%.	U9 — Positive 3-terminal voltage regulator (+5 V), type LM7805CT.
R25, R26, R41 — 100 k Ω , 5%.	U10 — Negative 3-terminal voltage regulator (-5 V), type LM7905CT.
R27, R29 — 1 M Ω , 5%.	S1 — SPST, 117 V, toggle.
R28, R30-R34, R37 — 1 k Ω , 5%.	S2 — SPDT, toggle.
R39 — 4.7 k Ω , 5%.	T1 — Transformer, 117-V primary, 6.3-V, 300-mA secondary.
R23 — 100 Ω , 5%.	
R35 — 220 k Ω , 5%.	
R36 — 22 k Ω , 5%.	
R38, R45, R49 — 2.2 k Ω , 5%.	
R40 — 470 k Ω , 5%.	
R42 — 47 k Ω , 5%.	
R43 — 3.3 M Ω , 5%.	
R44 — 10 k Ω , 5%.	
R46 — 330 Ω , 5%.	
R47 — 470 Ω , 5%.	
R48 — 220 Ω , 5%.	

¹Notes appear on page 27.

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EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μpF); RESISTANCES ARE IN OHMS; $k=1000, M=1000000$

636-Hz FILTER SECTION

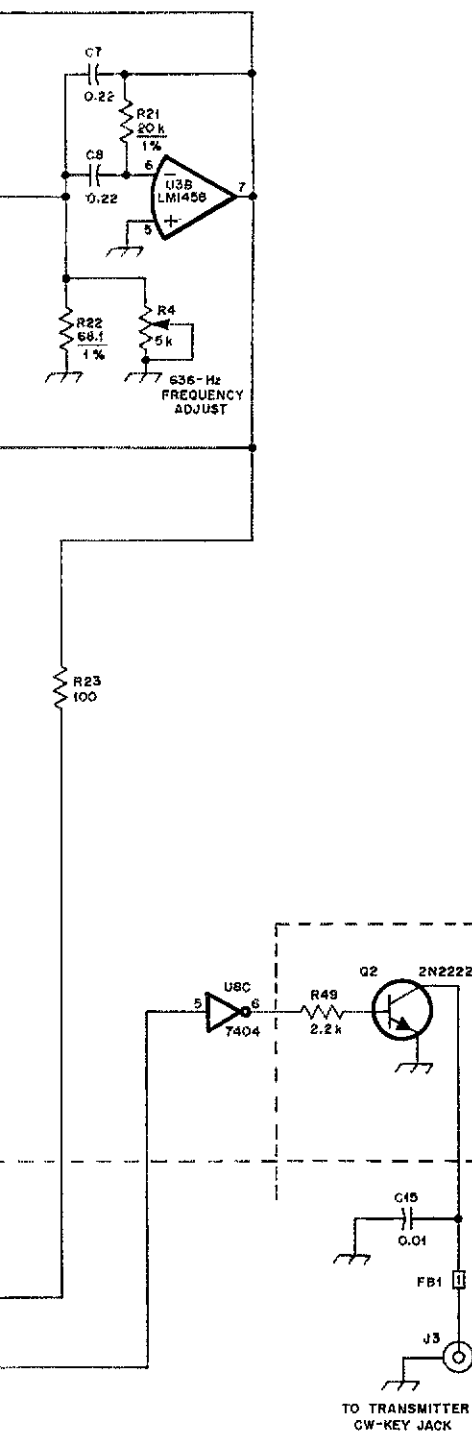


Fig. 1 — Schematic diagram of the CWD. A complete parts list is given in Table 1.

quired to meet these objectives are listed in Table 2.

Because the four band-pass filter stages are connected in cascade, they must be stagger-tuned. Otherwise, a needle-sharp passband response would be obtained. We want to approximate the ideal square-shaped response for several reasons, primarily ease of tuning the receiver. Incidentally, in order to use this filter, a 600-Hz CW signal must be available from the receiver output. Several popular transceivers have built-in IF CW crystal filters that give CW notes of 550, 800 or even 1000 Hz. With these rigs, there is no convenient way of changing the filter center frequency to 600 Hz, so the specifications for the four filter stages have to be recalculated. A systematic procedure is given at the end of this article.

Next, filter stages with the desired characteristics must be built. There are many ways to obtain the required pass-band response. Any configuration can be used, provided the filter specifications are met for each stage. With this in mind, we will use the simplest possible circuitry.

The first two stages (U1A and U1B in Fig. 1) can be designed from the active RC filter circuit in *The 1985 ARRL Handbook for the Radio Amateur*.² However, the high Q needed for the second two stages requires something extra. These sections are built using Q-multipliers (U2A and U3A) with low-Q unity gain filter sections (U2B and U3B). To design a Q-multiplier stage, we first select a value for R2, then compute: $R1 = R2 \times Q / (A_v \times Q_s)$ and $R3 = R2 / (1 - Q_s/Q)$. (See Fig. 2.) Here Q is the required Q, A_v is the required voltage gain and Q_s is the Q prior to the multiplication.

Component values for the filter are rather critical, and 1%-tolerance resistors are a must for R5 through R22. It is a good idea to use 1%-tolerance capacitors for C1 through C8, but they are hard to find. I used 5%-tolerance capacitors, which resulted in a little more pass-band ripple. Parts placement is not critical, but some effort should be made to keep the components of each filter stage together. Use sockets for the ICs to make troubleshooting easier.

Filter Alignment

The filter section should be aligned before proceeding with the detector section. As a first step, adjust the trimmers (R1-R4) for maximum resistance. Next, connect a sensitive ac voltmeter or an oscilloscope to the headphone output. Headphones should not be connected at this time. Apply ± 5 V and observe the filter output. If the filter is operating correctly, nothing will be seen. If there is any sort of ac waveform present, one or more stages are oscillating. This situation must be corrected before going further. Check the trimmers — a trimmer adjusted for zero resistance will usually cause oscillation.

Table 2

Filter Characteristics

Stage	Center Freq.	Q	Voltage Gain
1	584 Hz	25	1.68
2	616 Hz	25	1.65
3	565 Hz	60	6.86
4	636 Hz	60	6.69

Now, adjust an audio signal generator for approximately 0.5-V output and connect it to the filter input. Adjust the signal generator frequency to 584 Hz (± 0.5 Hz). This frequency is critical! Use a frequency counter if needed. Slowly decrease the resistance of R1, observing the ac output voltage as it rises and then begins to fall. Adjust R1 for maximum output at 584 Hz. Similarly, set the signal generator for 616 Hz, 565 Hz and 636 Hz, and repeat the alignment procedure for R2, R3 and R4, respectively. Now vary the signal generator between 550 Hz and 650 Hz, and verify that the output-voltage variation is similar to that given in Fig. 3. If it is, the audio filter section is complete. The filter input may be connected to the headphone jack of your transceiver, and headphone to the filter output, for a "live" test. Tune to a busy CW band segment and listen to the output. Key clicks may be heard from signals near, but outside of, the passband. You probably won't be able to improve the output by using any accessory audio CW filters that may be available on the transceiver.

The Detector

The components in the detector section are generally less critical than those in the filter. No substitute should be used for the LM308, however. Q1 is an N-channel VMOS FET, but substitutions for the VN10KM may work. The first section of the detector is a voltage-controlled attenuator, made up of R34, Q1 and associated components. The second stage is an amplifier (U5) with a voltage gain of 1000. These two stages comprise an AGC circuit that supplies a nearly constant signal level to the rest of the detector. The third stage is an active full-wave rectifier composed of U4A, U4B, D1 and D2. The output of the full-wave rectifier is fed to a data

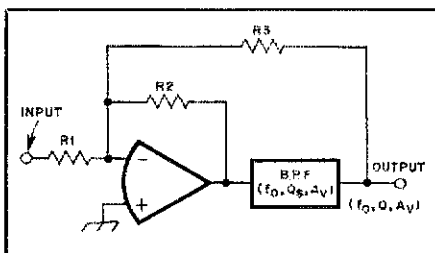


Fig. 2 — Q multiplier stage used in the CWD. See text for details.

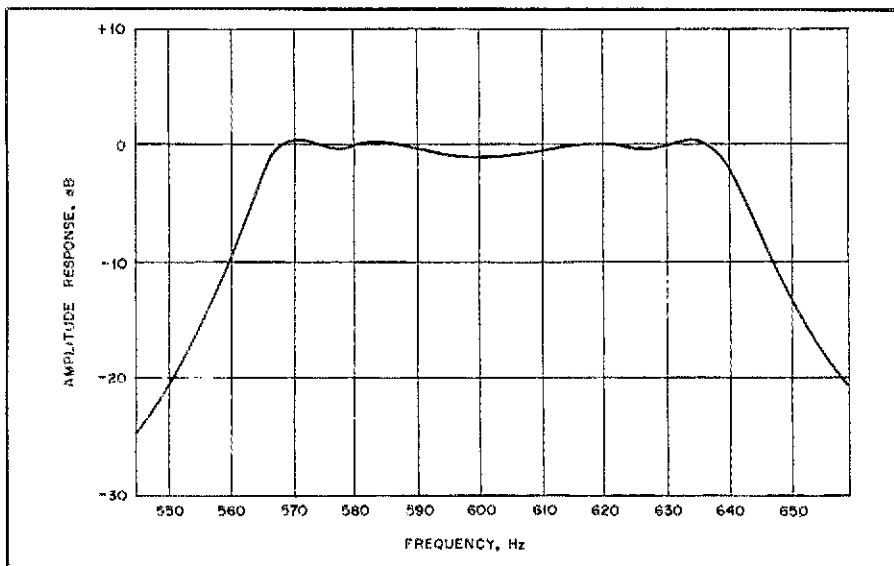


Fig. 3 — Frequency response of the four-pole Chebyshev filter.

filter consisting of R39 and C14, and an AGC filter consisting of R35, R36, D3 and C13. By using a 4.7-k Ω resistor at R39, the CWD will be optimized for speeds under 15 WPM, but will still work at 35 WPM. You may wish to change the data-filter timing, especially if you are interested in high-speed CW. By substituting a 1-k Ω resistor for R39, the CWD will even work with RTTY! (The smaller value for R39 may give some degradation in performance for slow CW when QRN levels are high.)

The AGC-filter time constant has no effect on CW speed capabilities, but does affect how long it takes the CWD to adapt itself to a change in the transceiver volume-control setting. The CWD requires about 5 seconds to adapt to an increase in signal level and about 40 seconds to adapt to a large decrease in signal level. If QSB causes a loud signal for 10 seconds, and then a faint one for 10 seconds, the CWD will not be able to adapt itself to the lower signal level quickly enough to maintain error-free copy.

The AGC filter is followed by an amplifier stage, composed of a high-input-impedance amplifier, U6, and some other components. Output from the AGC amplifier controls the resistance of Q1 in the attenuator stage, and also provides one of the inputs to the data comparator, U7. The data comparator uses this as a reference voltage to determine if a CW signal is present. CW signals arriving from the data filter are fed to U7 pin 3. When the signal voltage on this pin is greater than the reference voltage on U7 pin 2, the output of U7 (pin 7) is driven low to indicate the presence of a CW tone. When the CW tone disappears, pin 7 goes high. The output from U7 is buffered by TTL gates U8D and U8E, and the TTL output from U8E is connected to the computer input. (This is pin 6 of the

VIC-20 game-port connector.)

Detector Checkout

Detector section checkout is simple, especially if parts substitutions were avoided during construction. Adjust an audio signal generator for a 600-Hz, 0.5-V P-P signal. Connect this to the filter input through a straight key so the signal can be keyed on and off. Connect headphones to the filter output, and adjust the signal-generator output amplitude for a comfortable listening level. The dc voltage at U8 pin 8 should be between 0 and 0.5 V when the key is pressed, and between 3 and 5 V key up. Check the AGC by reducing the output voltage from the signal generator until the signal is very faint, but audible.

Within about 30 seconds, the CWD should adapt to the new signal level and the output on U8 pin 8 should be as described earlier.

If the detector section doesn't work, it may be easier to troubleshoot without AGC. AGC may be eliminated by removing U5 from its socket, and connecting a temporary jumper between U3 pin 7 and U5 pin 6. Output from the full-wave rectifier may be monitored by connecting an oscilloscope to pin 7 of U4. You should observe a full-wave rectified version of the 600-Hz key-down input signal. The dc voltage on pin 2 of U7 should be less than that on pin 3 of U7 with the key up, and vice versa with the key down. AGC amplifier output should show delayed change after the voltage from the signal generator is changed.

The CWD requires a ± 5 -V dc supply. Current drain is low enough so that series regulators (7805 and 7905) may be used without heat sinks. (See Fig. 4.)

Custom Filter Design

You may wish to modify the CWD audio filter for some other center frequency and bandwidth. The four stages of the audio filter are designed two at a time. For each pair, we need the corresponding 1-dB Chebyshev pole locations, A and B, given below. Running these pole locations plus your choice of center frequency, bandwidth and gain for the complete four-stage filter through the following calculations will give the required Q, center frequencies and gains of the first two stages. The calculations are then repeated with the other set of pole locations. The 1-dB Chebyshev pole locations are

$A = 0.3199$, $B = 0.3868$ for the first filter stage pair, and

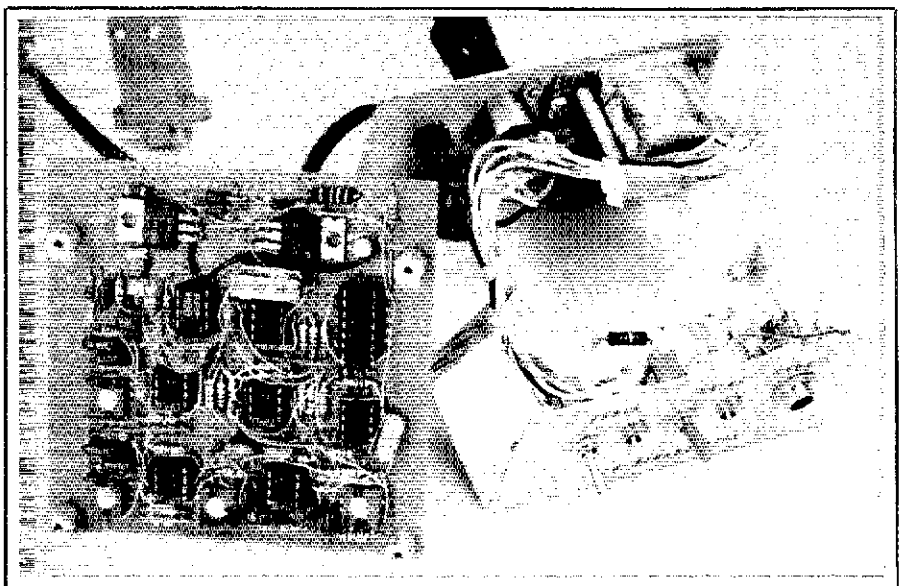


Fig. 4 — A glance inside the completed unit. The 3-terminal voltage regulators can be seen at the top of the circuit board.

$A = 0.1325$, $B = 0.9339$ for the second filter stage pair.

Now for the formulas. The examples that accompany the formulas use my choice of center frequency ($f_0 = 600$), bandwidth ($BW = 75$), and gain ($A_0 = 1$). Several formulas give intermediate results used in later equations.

$$Q_{bp} = f_0/BW \quad Q_{bp} = 600/75 = 8 \quad (\text{Eq. 1})$$

$$C = A^2 + B^2 \\ = (0.3199)^2 + (0.3868)^2 \\ = 0.2519 \quad (\text{Eq. 2})$$

$$D = 2A/Q_{bp} \quad D = 2(0.3199)/8 = 0.7997 \quad (\text{Eq. 3})$$

$$E = [C/(Q_{bp})^2] + 4 \\ = 0.2519/64 + 4 = 4.003936 \quad (\text{Eq. 4})$$

$$G = \sqrt{E^2 - 4D^2} \\ = \sqrt{(4.003936)^2 - 4(0.7997)^2} \\ = 4.0007402 \quad (\text{Eq. 5})$$

$$Q = \sqrt{(E+G)/(2D)^2} \\ = \sqrt{\frac{4.003936 + 4.0007402}{2(0.7997)^2}} = 25 \quad (\text{Eq. 6})$$

This Q value is the individual Q of the first two filter stages.

$$M = A \times Q/Q_{bp} \quad M = (0.3199) \times 25/8 \\ = 1.0003548 \quad (\text{Eq. 7})$$

$$W = M + \sqrt{M^2 - 1} \\ = 1.0003548 + \sqrt{(1.0003548)^2 - 1} \\ = 1.026994 \quad (\text{Eq. 8})$$

$$f_{ra} = f_0/W = 600/1.026994 = 584 \text{ Hz} \quad (\text{Eq. 9})$$

where

f_{ra} = resonant frequency of the first filter stage.

$$f_{rb} = f_0 \times W \quad f_{rb} = 600 \times 1.026994 \\ = 616 \text{ Hz} \quad (\text{Eq. 10})$$

where

f_{rb} = resonant frequency of the second filter stage.

The Q and resonant frequencies of the third and fourth stages are computed by repeating the above calculations with the second set of Chebychev pole locations. The gain of each filter stage is computed by multiplying the desired gain for the complete filter by

$$\sqrt{1 + Q^2 \times (f_0/f_r - f_r/f_0)^2} \\ = 1.68 \text{ for the first filter stage.}$$

This procedure is adapted from a technique described in *Electronic Filter Design*, an excellent reference on filter-design techniques.³

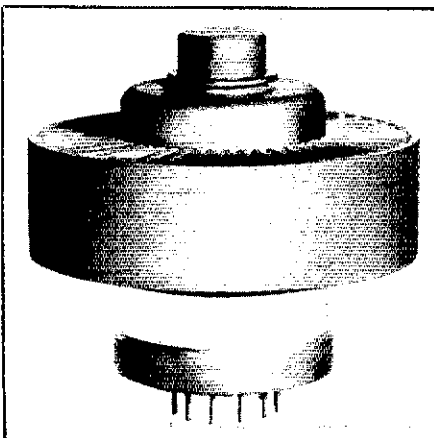
Notes

¹Available from AEA (Advanced Electronic Applications), P.O. Box C-2160, Lynnwood, WA 98036.

²The ARRL 1985 Handbook for the Radio Amateur, 62nd ed. (Newington: ARRL, 1984), p. 7-10.

³A. B. Williams, *Electronic Filter Design* (New York: McGraw Hill, 1981).

more information, contact Varian EIMAC, 301 Industrial Way, San Carlos, CA 94070, tel. 415-592-1221. — Paul K. Pagel, N1FB



New Products

VARIAN EIMAC POWER TRIODE

The EIMAC 3CX800A7 is a compact, high- μ power triode intended for use as a cathode-driven class-AB₂ or class-B amplifier in RF applications. A single 3CX800A7 will deliver 750-W PEP and 750-W key-down CW output power at frequencies up to 350 MHz. The 3CX800A7 is also useful up to 450 MHz. High power gain may be obtained without sacrificing low intermodulation distortion characteristics when the tube is operated as a linear amplifier. Low grid-interception and high amplification factors combine to make the 3CX800A7 drive-power requirements low for a tube of this power capacity. For

Strays

CALL FOR ARTICLES

Several articles have appeared in *QST* with regard to switched-capacitor filters and their adaptation for amateur use. What about switched-inductor-capacitor (SIC) filters? If you have any information about the cutting edge of this new technology, we would like to hear about it. Why not write a brief summary of what industry is doing with this type of filter, and suggest some possible amateur applications? We would welcome your manuscript. Please send it to Charles Hutchinson, K8CH, Technical Department Manager, ARRL, 225 Main St., Newington, CT 06111.

I would like to get in touch with...

anyone with assembly instructions for the Wilson System 2 multiband beam. Chod Harris, VP2ML, Box 4881, Santa Rosa, CA 95402.

anyone with a precision VTVM schematic diagram and manual for a series EV-10A. C. M. Pruett, K4BH, 4988 Flamingo Dr., NW, St. James City, FL 33956.

anyone with a manual or schematic diagram for a 2-meter AIRMARC, Model AVRTSM. John J. Moran, KA3JHB, 211 S. Third St., West Newton, PA 15089.

anyone who has successfully converted a Swan Mark II linear amplifier to 160 meters. Frank White, KBØTG, Box 2012, Olathe, KS 66061.

anyone who has an operator's manual and a schematic diagram for an Azden 2000 2-meter FM transceiver. Vernon Range, KA9NBH, 929 Ave. E, Rochelle, IL 61068.

anyone with operator or service notes or a schematic diagram for a Lafayette Model HA-63 multiband receiver. Isadore Gross, W3KLR, 105 Boulder Rd., Plymouth Meeting, PA 19462.

anyone with a manual for a UTICA 650 6-meter AM transceiver. H. L. Deitz, WB9VMY, 1000 Flamingo Ave., Oklahoma City, OK 73127.

anyone who heard echoes on 80-meter CW 0000-1000Z Dec. 28, 1984. Bill Ferguson, KAØLRW, Box 4915, Aspen, CO 81612, tel. 303-925-4553 (days).

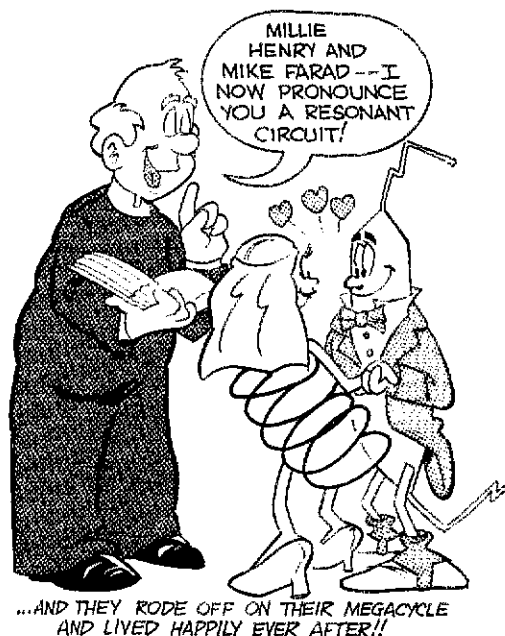
DX stations to operate CW beacons for a sunspot cycle propagation study. John Mahagan, WB4JHS, P.O. Box 3282, Thomasville, GA 31799.

anyone with power-transformer specs for a Memory scan MCP-1 Tennelec scanner. Paul Franson, W2HCA, Meadow Brook Rd., Flemington, NJ 08822.

Resonance and Tuning Methods

Part 16: Have you ever wondered how a piece of radio gear is able to tune in a particular frequency?

By Doug DeMaw,* W1FB



A recent letter, postmarked Pittsburgh, Pennsylvania, said, in part: "Your First Steps in Radio is super, and to some degree I understand the series. If only I could understand bias with respect to cathode ..."

This letter brings to mind an important point: The beginner series can't be explicit in all areas. No matter where we go to learn new subject matter, we should always consider additional reference material. All the installments in this series can be greatly enhanced if you are willing to dig deeper into the subjects covered. Don't be reluctant to do so!

This Month: Tuned Circuits

Radios contain many tuned circuits (made up of coils, also called inductors, and capacitors) that are set for a particular frequency. These take many forms. Furthermore, a given radio receiver or transmitter will have circuits that are tuned to many frequencies. Seldom are all of the tuned circuits adjusted for operation on the same frequency.

An understanding of tuned radio-frequency circuits is helpful in your quest for electronics knowledge. When you graduate to the level of home-equipment design and repair, it is essential that you know how these circuits operate. Another term you will encounter is "resonator." This is simply a coil and capacitor combination that forms a tuned circuit for a selected frequency. The inductors in these circuits are also known as "tank coils," especially in transmitters. You will hear amateurs men-

tion the "final amplifier tank," for example. This refers to the coil and capacitor used in the output tuned circuit of the amplifier.

Still another popular expression for a coil-capacitor combination is "network." For example, the matching network between a transmitter driver stage and the power amplifier may contain coils and capacitors that are used to change one impedance to another, such as a 50-ohm driver output to a 10-ohm power-amplifier input line. As we learned earlier in the series, maximum power transfer will take place only if unlike impedances are matched.

Like resistance, impedance is expressed in ohms. An impedance usually consists of resistance and reactance. The symbol for impedance is the letter Z. If an impedance happens to contain only resistance, it is defined as "resistive impedance."

Since we have mentioned reactance, it

would be wise to discuss it here. Reactance is also expressed in ohms. There are two kinds — capacitive and inductive. The impedance of a capacitor or an inductor changes as the frequency of operation changes. The part of the impedance that is frequency dependent is called "capacitive reactance" in capacitors and "inductive reactance" in inductors.

Capacitive reactance is expressed as X_C and inductive reactance is expressed as X_L . When a coil and capacitor are said to be tuned to resonance, the inductive and capacitive reactances are equal but opposite in action. When this condition is met, the reactances cancel one another. The tuned circuit then looks like a pure resistance at the frequency of resonance, a desirable condition. A more detailed explanation of reactance and impedance can be found in *Understanding Amateur Radio*

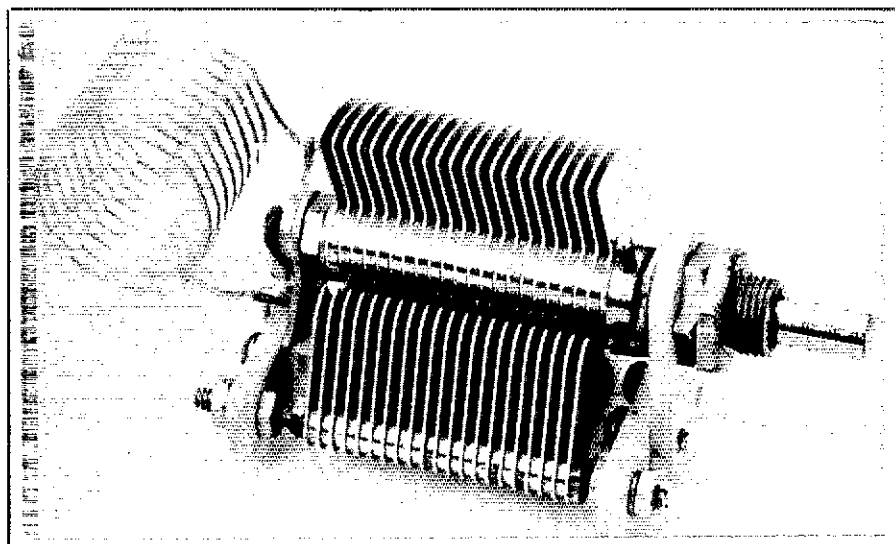


Fig. 1 — A tunable coil-capacitor combination. This is a parallel-resonant circuit. As the capacitor is adjusted through its range, various frequencies of resonance are established. The coil inductance and capacitance range are chosen to cover a specific range of frequencies.

*Several League publications are designed for this purpose. The first is *Tune In the World With Ham Radio* (\$8.50), which contains a clear, basic explanation of radio theory. If you'd like more detail, *Understanding Amateur Radio* (\$5) is a good source. The best all-around reference for Amateur Radio operators, of course, is the *ARRL Handbook* (\$15).

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

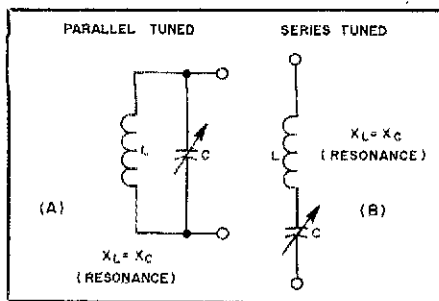


Fig. 2 — Illustration A is the electrical equivalent of the tunable coil capacitor in Fig. 1. It is a parallel-resonant circuit. A series-resonant circuit is shown at B.

or the *ARRL Handbook*.

Conventional Tuned Circuits

Let's look at some older types of tuned circuits to see how they are hooked up. Fig. 1 shows an air-wound coil and a mechanical tuning capacitor. The inductance value of the coil is not changed in this arrangement. Rather, the capacitor is adjusted to change the resonant frequency of the coil-capacitor combination. At each setting of the capacitor, we will have resonance (canceled reactance) at a different frequency within the adjustment range of the capacitor. Because of this ability to change the resonant frequency, the variable capacitor is called a "tuning capacitor" or a "resonating capacitor."

The electrical equivalent of the parts in Fig. 1 is offered in Fig. 2. The arrow through the capacitor indicates it is adjustable. The illustration at A represents what is known as a parallel-resonant circuit, since the coil and capacitor are in parallel. At B of Fig. 2, the same parts are arranged in a series-resonant circuit. In both instances, the reactances must cancel one another for the circuit to resonate.

Tuning capacitors take a host of forms. Some are adjusted by means of screwdrivers or tuning tools. These are generally called trimmers or padders. They are set for resonance just once, then left in that position. Trimmer capacitors may be made with metal plates; insulation between the plates can be made of ceramic, plastic, mica or glass. One type has a movable conductive plunger that is adjusted inside a glass cylinder that has a conductive outer coating at one end. These are called "piston trimmers."

Fig. 3 shows various trimmer and padder capacitors that might be used in a tuned circuit. Some are more desirable than others, since they are mechanically superior to the less-expensive types. This helps to ensure that they remain set to a specific capacitance in the presence of vibration or temperature changes. The insulation used between the movable plates of a trimmer capacitor also affects the performance. The better the dielectric quality of the material, the better the capacitor for RF tuned circuits. Some trimmer capacitors resemble the larger variable capacitors, except that they are

miniature versions of the larger units. Air is the insulating material between the plates.

Other Tuning Methods

A coil-capacitor combination can be used to cover a range of frequencies by using a fixed-value capacitor and a variable coil (Fig. 4). You will see many such circuits in pocket-size AM and FM broadcast receivers. These are little metal cans with tuning slugs that are accessible through holes in the cans. The resonant frequency is changed by adjusting the coil slug. The slugs are made from powdered iron or ferrite, which increases the coil inductance as it is moved farther into the coil. Brass slugs can be used in place of the powdered-iron ones, but the farther they are inserted into the coil the smaller the inductance becomes — the op-

posite effect from powdered iron or ferrite. Fig. 5 contains the electrical details of a number of adjustable inductors. You can see that various mechanical schemes make it possible to change the effective inductance of a coil.

Modern Tuned Circuits

Circuits used in modern radio gear are tuned electronically rather than mechanically. A semiconductor, such as a diode or transistor, serves as the tuning capacitor. Most modern TV receivers are tuned in this manner (varactor tuning).

An example of a typical electronically tuned circuit is given in Fig. 6. DI is a special diode manufactured for use in tuning an inductor to resonance or for changing the oscillation frequency of a quartz crystal. Il-

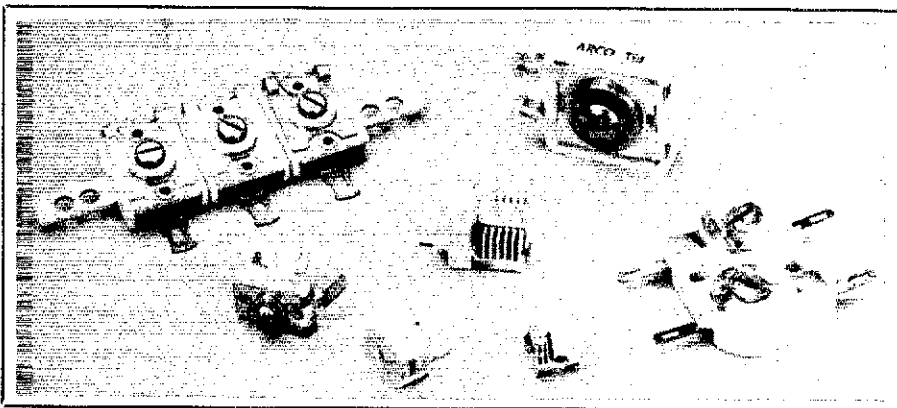


Fig. 3 — A collection of trimmer and padder capacitors. These units have variable capacitance, but are not suitable for use as a main-tuning control because they have no shafts on which to mount a knob or dial mechanism.

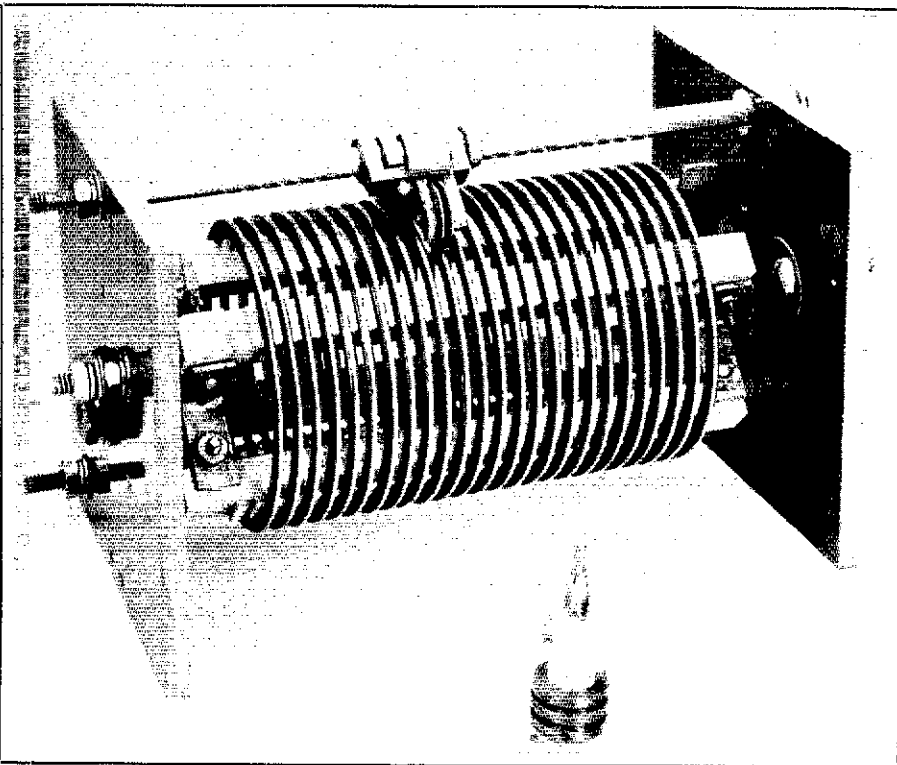


Fig. 4 — A slug-tuned coil (foreground) and a roller inductor coil. These inductors are variable, which permits the use of a fixed-value capacitor to form a tunable resonant circuit.

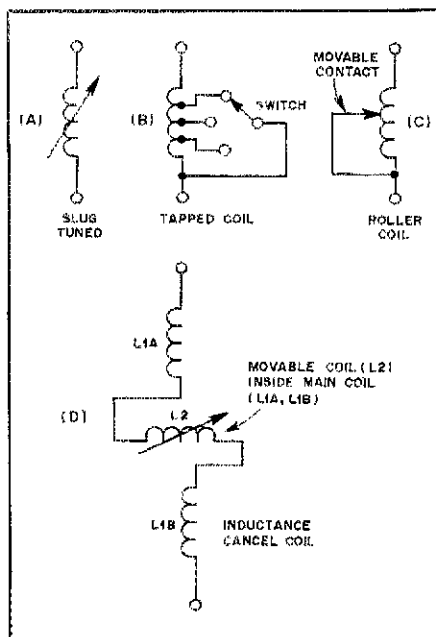


Fig. 5 — Electrical symbols for a slug-tuned coil (A), a tapped coil (B), a roller inductor (C) and a bucking or canceling coil (D). L2 of D rotates inside L1 to aid or oppose the total inductance, thereby changing the effective inductance. This old-style coil is seldom used.

Illustration A is for a VXO (variable-frequency crystal oscillator), while drawing B demonstrates schematically the arrangement for a resonant coil-capacitor circuit that uses a tuning diode. In both circuits, the internal junction capacitance of the diode is varied by changing the dc voltage applied to the diode. This is done at R1, which can be mounted on the equipment panel for accessibility. For the most part, the outward appearance of a tuning diode is no different from that of a rectifier diode or glass Zener diode.

Is there a shortcoming to the use of tuning diodes? Yes. They are not as frequency-stable as are mechanical variable capacitors: The diode junctions are affected by changes in temperature; therefore, they will change capacitance gradually after the operating voltage is applied. This causes frequency drift. Also, the ambient-temperature changes within a piece of equipment will cause the diode capacitance to vary slightly — a further cause of drift. Of course, mechanical capacitors are also affected to some extent by temperature changes, but not so dramatically as are tuning diodes. For many circuits, however, it is entirely practical to use tuning diodes.

Another important difference between mechanical and electronic tuning capacitors is the minimum-to-maximum capacitance range. Take, for example, a 100-pF (maximum capacitance) air-variable capacitor. When the plates are fully meshed it will provide 100 pF. With the plates completely unmeshed the capacitance might be only 10 pF. A tuning diode, on the other hand, may have a maximum capacitance of, say, 100 pF, but the minimum capacitance

may be 35 pF. This means that the tuning range with a given coil will be smaller than that with a mechanical tuning capacitor.

Once we recognize and accept the peculiarities of tuning diodes, we can proceed to use them in our amateur circuits. They are far less expensive to use than air-variable capacitors and they permit miniaturization that would otherwise be impossible. A tuning diode can cost as little as 35 cents, whereas a mechanical equivalent capacitor could cost \$20!

Tuned Circuits Versus Power

We have thus far overlooked the matter of RF and dc power that must be accommodated by a tuned circuit. In transistor or IC circuits, we need not be too concerned about the operating voltages of the variable capacitors we use. It is unusual to have more than 28-V dc in a semiconductor circuit, so small capacitors can be used without fear of arcing or overheating. This is not true in circuits that use vacuum tubes — particularly at high RF and dc voltage levels. The greater the voltage, the wider the plate spac-

Glossary

dielectric — an insulating material or medium that, ideally, has zero conductivity. A vacuum is a perfect dielectric. Solid materials, such as glass or ceramic, are suitable insulating materials, but not as good as air or a vacuum.

drift — a condition under which an electrical property changes as a function of temperature — internal or external to the components. Frequency drift is associated with oscillator circuits that change frequency as a function of time and heating.

network — a group of conductive components connected to form a specific circuit function. A group of coils and capacitors can, for instance, comprise a network.

resonator — a device intended to introduce resonance into a circuit. A coil-capacitor combination tuned to a specific frequency is a resonator. A quartz crystal is also a resonator.

tuning diode — a special type of semiconductor diode that exhibits a significant change in junction capacitance as the dc potential across the junction is varied. A varactor is a type of tuning diode.

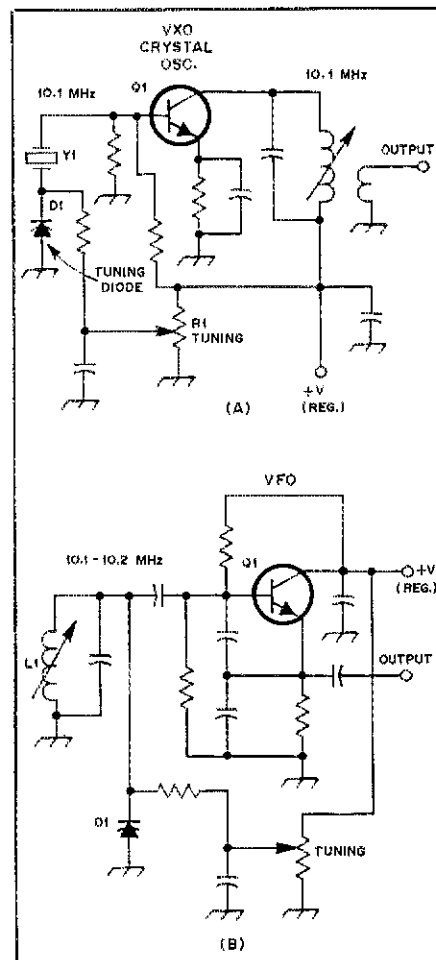


Fig. 6 — A crystal (Y1) can be shifted in frequency by using a tuning diode (D1) in series with it. As the dc voltage applied to D1 is varied by means of R1, the diode capacitance changes, and this changes the oscillation frequency of Y1 slightly, as indicated at A. A VFO can be tuned (B) by using a tuning diode in place of a mechanical tuning capacitor.

ing of the variable capacitor must be to prevent voltage from arcing across the capacitor plates. In circuits where high RF power is developed, it is wise not to allow dc voltage to be applied to the tuning capacitor, even though some amateurs have done this in homemade gear. Fig. 7 shows both methods, but the illustration at B is recommended for safety reasons as well as voltage-breakdown considerations.

The power-handling capability of a coil is dependent on the wire size. The greater the dc current or RF current that flows through a coil, the larger the conductor must be. The smaller wire has a higher dc resistance in ohms. The ac (or RF) resistance is higher also. Ohm's Law tells us that the greater the resistance and current in a conductor, the higher the loss, or voltage drop. Power is dissipated in the wire, and dissipation causes heat. A coil with too small a wire size can burn up easily. The coil resistance should always be as low as possible. The insulating material on which the coil is wound should also be able to sustain the developed or operating voltage without burning or arcing. If the wire in a coil becomes more than slightly warm after a few moments of circuit operation, chances are that the wire diameter is too small. Heating losses impair the efficiency of a circuit.

A Laboratory Experiment

Perhaps you have a desire to warm up a soldering iron and try your hand at building an electronically tuned circuit. This would be a fine way to observe what happens when the voltage on a tuning diode is varied. You will need a shortwave radio or ham receiver for this lab experiment. You will be building a 40-meter oscillator, and you will want to listen to the signal in a receiver.

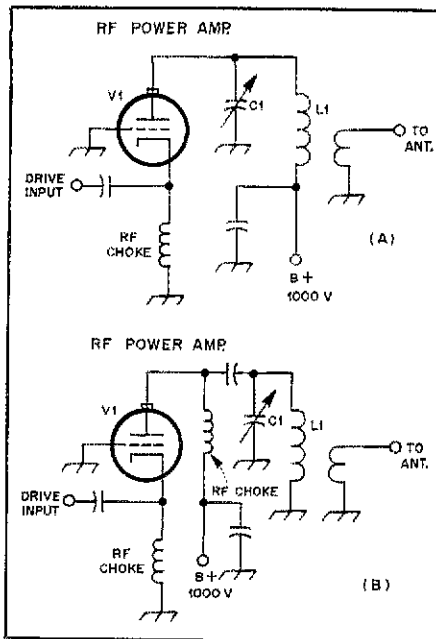


Fig. 7 — High voltage should be kept off the tuning capacitor (see text). Illustration A shows series feed of the B+ voltage (poor practice), whereas shunt or parallel feed is depicted at B (desirable).

Need a Copy of This Article or a Previous Installment?

Although each issue of *QST* is protected by copyright, we would like to make it as easy as possible for readers to obtain copies of each installment of *First Steps in Radio*. Provided that copies are made for the personal use of an individual, or of a Novice class, ARRL hereby grants permission for photocopies to be made of any article in this series. If your club plans to teach a Novice class, feel free to make a sufficient number of copies for students' personal use. If you are missing one or more installments, back issues are available for \$2.75 apiece from the Circulation Department, ARRL Hq., 225 Main St., Newington, CT 06111.

Fig. 8 is the schematic diagram of our voltage-controlled VFO (variable-frequency oscillator). An MPF102 or 2N4416 FET functions as the oscillator transistor. Any high-frequency N-channel junction FET can be used for Q1. The coil is wound on an Amidon T68-6 (yellow) toroid core. But, if you have access to other powdered-iron toroids that are 0.68-in OD, with a permeability factor of 8, you may use them (see the Amidon ads in *QST*). Any 3.8- μ H coil that can be tapped about $\frac{1}{4}$ the way from the ground end can be used, also.

The two 100-pF fixed-value capacitors can be silver-mica, polystyrene, or NPO disc-ceramic. If you don't care about frequency stability (drift), you may use ordinary disc-ceramic capacitors. The trimmer capacitor need not be elaborate for this test. One of the Radio Shack plastic 10-pF trimmers will suffice. The tuning control, R1, is not critical. I suggest that you use a 100-k Ω control with a shaft, but a PC-

board-mount potentiometer can be used. The value of the control can be anything from 20 k Ω to 100 k Ω for this circuit. The smaller the value of R2, the greater the tuning range. But don't make it less than 22 k Ω under any circumstances. My tuning range was 25 kHz when I used 100 k Ω at R2, but it increased to 55 kHz when R2 was changed to 33 k Ω .

Rather than buy tuning diodes, I chose to use four 2N3904 transistors. They are inexpensive (as little as 10 cents each). You may use only two transistors if you wish, which will compress the tuning range about 10 kHz. The transistors are hooked up so the emitter-base junctions act as tuning diodes. The collectors are not attached to the circuit. You may snip the collector leads or bend them out of the way.

The circuit of Fig. 8 can be tacked together on perforated board. If you want to make a circuit-board type of foundation, glue strips or squares of thin hobby copper to a scrap of Formica®. Or, use a block of wood on which you have mounted multigrid terminal strips. Use your imagination! This is the nature of experimentation!

Circuit Testing

Once you're certain all the parts have been wired correctly into your circuit (check two or three times), you are ready to connect the battery and see what happens. Tune your receiver to 40 meters (7.0-7.1 MHz) and connect a short length of wire to the antenna post. Allow this wire to lie near the oscillator (a few inches from L1 of Fig. 7). This will permit ample signal pickup for the receiver.

Set R1 at midrange, then adjust the trimmer (C1) until you hear the signal in your receiver. Next, tune the oscillator by adjusting R1 through its range. As you retune your receiver, you will note that the oscillator frequency has changed in accordance with the setting of R1.

When you first turn on the oscillator, the frequency will drift quickly. It should settle down in 2 or 3 minutes. This is caused by the heating of the Q2 and Q3 junctions when voltage is applied. Also, the junction inside Q1 will change capacitance slightly until it warms up. This condition is known as "short-term drift." If an oscillator continues to drift for long periods (an hour or more), the condition is referred to as "long-term drift."

Later you may want to replace Q2 and Q3 with a 25- or 50-pF air-variable capacitor and repeat the tests. You will find that the drift will practically disappear. With either type of tuning capacitor, you should remember that L1 and the tuning capacitor form a tuned circuit or resonator.

If you can't locate some 2N3904s, use any equivalent NPN transistor. Whatever you select, be sure it has a top-frequency rating (f_T) of at least 50 MHz. A 2N2222 type of transistor can be used at Q2 and Q3, also. The amount of capacitance change versus voltage will vary somewhat with the transistors used.

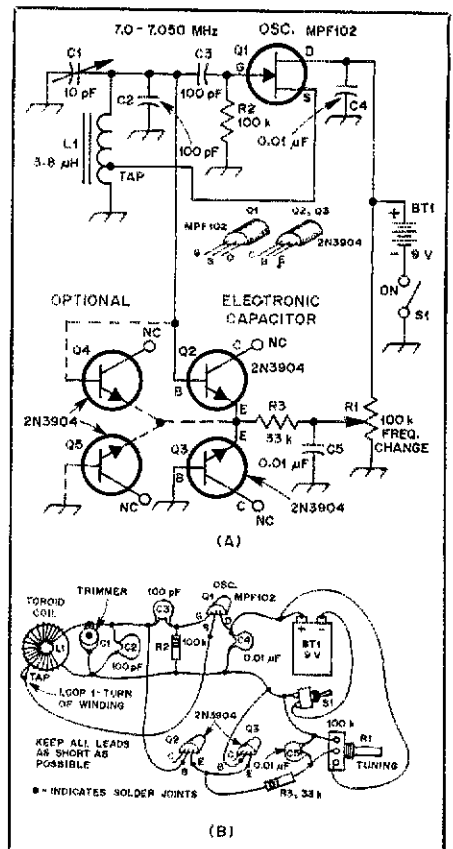


Fig. 8 — The diagram at A is for an oscillator that is tuned by means of diodes (Q2 and Q3), as detailed in the text. The frequency range via R1 is approximately 40 kHz at 40 meters when two transistors are used as diodes. Adding two more diodes (Q4 and Q5 in dashed lines) will increase the tuning range to roughly 50 kHz. Resistors are $\frac{1}{4}$ - or $\frac{1}{2}$ -W carbon composition. Fixed-value capacitors are disc-ceramic. A pictorial diagram of the hookup is provided at B.

BT1 — 9-V transistor-radio battery. Radio Shack 23-464 with snap-on connector (Radio Shack 270-325 or equiv.).

C1 — 10-pF maximum capacitance trimmer (Radio Shack 272-1338 or equiv.). Not a critical value for this experiment.

C2, C3 — 100-pF NPO capacitor (Radio Shack 272-152 or equiv.).

C4, C5 — 0.01- μ F capacitor (Radio Shack 272-131 or equiv.).

Circuit Foundation — Suggest Radio Shack general-purpose type, 276-148.

L1 — 28 turns of no. 24 or 26 enameled wire on an Amidon Assoc. T68-6 (yellow) powdered-iron toroidal core. Amidon Assoc., 12033 Otsego St., North Hollywood, CA 91607 (catalog available). Tap L1 at six turns above grounded end by forming a one-turn loop (twist), then scraping enamel from the loop wire.

Q1 — Junction FET, type MPF102 (Radio Shack 276-2062).

Q2, Q3 — 2N3904 NPN or MPS3904 (Radio Shack 276-2016).

R1 — 100-k Ω audio-taper control with shaft (Radio Shack 271-092). A PC-board-mount thumbwheel control may be used.

R2, R3 — Radio Shack 271-045 and 271-040, respectively.

S1 — SPST slide switch or similar (Radio Shack 275-406).

Good luck, and please do some additional reading on this important subject. □

A Quarter-Kilowatt 23-cm Amplifier

Part 2: Last month, we described the design and construction of a 23-cm cavity amplifier. This installment describes the rest of the components needed to put it on the air

By E. R. "Chip" Angle,* N6CA

After you complete construction of the cavity amplifier described in March *QST*, you are ready to assemble the rest of the components needed to put it on the air. This month, I will discuss the filament, bias and high-voltage supplies; a whisper-quiet, high-efficiency water-cooling system; testing and hookup; and, finally, tune-up and operation.

Power Supplies

The filament and bias supplies for the cavity amplifier are shown schematically in Fig. 1. The manufacturer's specification for the 7289/2C39 filament is 6.0-V ac at 1 A. I have found that the use of a standard

6.3-V ac, 1-A transformer only slightly increases the tube emission without much loss of tube life. The filament should be allowed to warm up before operating the amplifier, so the filament, bias and high-voltage supplies incorporate separate primary switches.

Biasing

Many biasing schemes have been published for grounded-grid amplifiers. Fig. 1 shows a bias network that satisfies all of the following operating requirements:

- 1) external bias supply referenced to ground
- 2) low-power components
- 3) variable bias to accommodate tube-to-tube variations
- 4) TR switchable with relay contact or transistor to ground
- 5) bias-supply protection in case of a

defective or shorted tube.

U2 provides a variable bias-voltage source, adjustable by R1. The output of U2 drives the base of Q1, which is used to increase the current-handling capability of the bias supply. Q1 must be mounted on a heat sink. J1 is connected to the station TR switching system so that R1 is grounded on transmit and disconnected on receive. The approximate range of the bias supply is 6 to 20 V. Z1 and Z2 provide protection for Q1 in case of a shorted tube. The amplifier can be run without Z1 and Z2 if you keep the anode voltage below 1100 V.

High-Voltage Power Supply

A safe, reliable high-voltage power supply is described here. Of course, you can use any readily available HV supply; keep in mind, however, that the 7289/2C39

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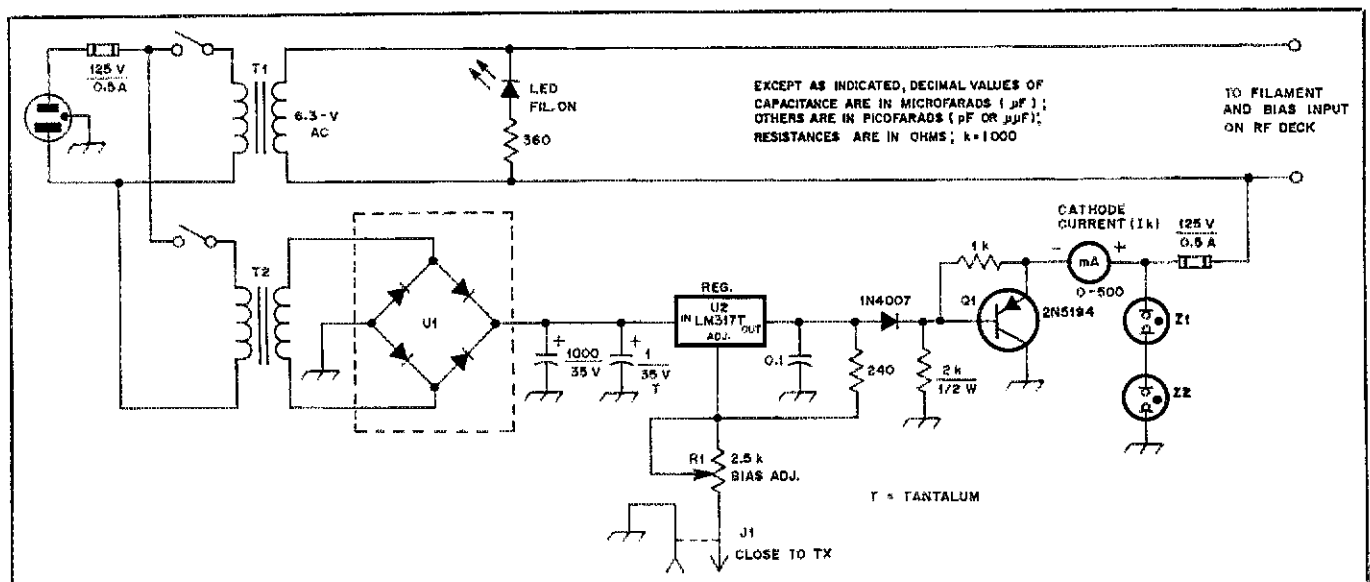


Fig. 1 — Schematic diagram of the cavity-amplifier filament and bias supplies. All resistors are 1/4-W carbon types unless otherwise noted.
 J1 — Female chassis-mount phono connector.
 T1 — Filament transformer. Primary, 117 V; secondary, 6.3 V at 1 A.
 T2 — Power transformer. Primary, 117 V; secondary, 24 to 28 V at 50 mA or greater.
 U1 — Bridge rectifier, 50 PIV, 1 A.
 U2 — Adjustable 3-terminal regulator (LM317T or equiv.).
 Z1, Z2 — 20-V unipolar metal-oxide varistor (General Semiconductor SA20 or equiv.) or two 20-V, 1-W Zener diodes.

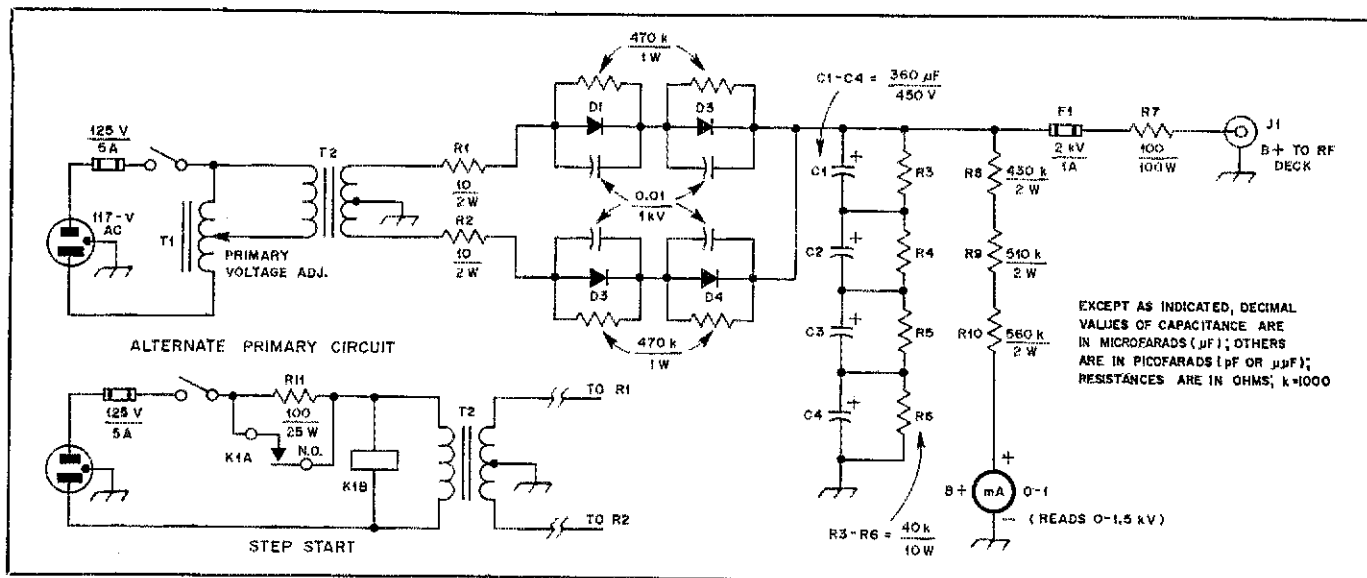


Fig. 2 — Schematic diagram of the amplifier high-voltage supply.

C1-C4 — Electrolytic capacitor, 360 μ F, 450 V.

D1-D4 — Silicon rectifier, 1000 PIV, 3 A.

F1 — High-voltage fuse, 2 kV, 1 A.

J1 — Chassis-mount female BNC or MHV connector.

R3-R6 — Wirewound resistor, 40 k Ω , 11 W.

T1 — Variable autotransformer, 500 VA.

T2 — High-voltage transformer. Primary, 117 V; secondary, 900 to 1050 V at 500 mA.

anode potential should never exceed 1400-V dc at full load and that the amplifier will withstand 1900-V dc at low cathode current and cut-off-bias conditions. For maximum power output, assuming adequate drive power is available, anode voltage under full load should be about 1200- to 1400-V dc.

Fig. 2 is a schematic diagram of the high-voltage supply. A power transformer (T2) that delivers 900- to 1050-V ac is ideal. The type of rectifier circuit used will depend on the type of transformer chosen. Each leg of the rectifier is made from two 1000-PIV, 3-A silicon diodes connected in series. Each diode is shunted with a 0.01- μ F capacitor to suppress transient voltage spikes, and a 470-k Ω equalizing resistor.

Filtering is accomplished with a string of four 360- μ F, 450-V electrolytic capacitors connected in series. R3-R6 equalize the voltage across each capacitor in the string and serve as bleeder resistors. Of course, a single oil-filled capacitor may be used here if available. Whatever type of filter you use, the total capacitance should be about 80 μ F at a voltage rating of at least 1500-V dc. This value allows adequate "droop" of the anode voltage under high-current loads to protect the amplifier in case of RF overdrive or a defective tube.

Protective Circuitry

Some type of start-up protection should be incorporated in the primary. Fully discharged filter capacitors look like a dead short at supply turn-on. Initial surge current (until the capacitors charge) may be high enough to destroy the rectifiers. R1 and R2 provide some surge-current limiting, but either of the two primary configurations shown in Fig. 2 should be used. T1, a variable autotransformer (Variac and

Powerstat are two common trade names), is ideal. In addition to allowing you to bring the primary up slowly (and charging the capacitors gradually), it also allows full control of amplifier output power by varying anode voltage.

The second method, a "step-start" system, uses a resistor in the T2 primary to limit the turn-on surge current. When the capacitors have charged, K1 is energized, shorting out R11 and applying full voltage to the T2 primary.

F1 and R7 protect against high-voltage arc-overs or short circuits. If sustained overcurrent is drawn, F1 will open and remove B+ from the RF deck. Use a high-voltage fuse here; standard fuses may arc when blown and not interrupt the B+. R7 provides current limiting to protect the amplifier and power supply in case of a high-voltage arc.

Safety

An HV meter should always be used to monitor the status of the power supply. The values for R8-R10 shown in Fig. 2 will give a 1500-V dc full-scale reading on a 0-1 mA meter. RG-58 or -59 coaxial cable should be used for the high-voltage interconnection between the power supply and the RF deck. Ground the shield at both ends for safety and a good dc return.

Safety must be observed when working with all power supplies. These voltages are lethal! Always disconnect ac power and then discharge the filter capacitors before working on the power supply. Never guess or make assumptions about the status of a power supply. Assume it is hot.

Metering

Cathode-current monitoring is all that's really necessary for observing amplifier dc

performance. Cathode current (I_K) is the sum of the plate (I_P) and grid (I_G) currents. Normally, when this amplifier is driven to 300- or 400-mA I_K , the grid current will be around 40 to 50 mA. The inclusion of a grid-current meter is not really necessary and only makes biasing and TR switching complicated.

Cooling

Desired output power and the level of drive power available will dictate what type of cooling to use. For intermittent duty (SSB, CW) at output levels less than 50 W, air cooling is satisfactory. Any small blower may be easily mounted to the aluminum box surrounding the tube anode. For high-duty-cycle modes and/or output levels greater than 50 W, water cooling is highly recommended. Greater than twice the normal air-cooled output power can be obtained from a water-cooled tube, and water cooling is quiet.

Tube Modification and Water Jacket

The first step is to remove the air radiator from the tube. The air radiator screws on, so it may simply be unscrewed without damage to the tube.

First, place a hose clamp around the tube anode. Secure the radiator fins in a vise and grip the hose clamp with a pair of large pliers. Gently unscrew the tube from the radiator. If the hose clamp slips slightly, tighten it.

Some 7289/2C39 tubes use an air radiator that is attached with setscrews. To remove the radiator, simply remove the setscrews and pull the radiator off.

The air radiator will be replaced with a water jacket that allows water to be circulated past the tube anode and through a radiator, where it is cooled and circulated

Microwave Radiation Safety

Intense RF radiation concentrated on body tissues can produce heat damage; the extent and penetration will depend on the radio frequency in use and on exposure duration. You should be aware of the approximate intensity of RF radiation of the transmitting equipment and antennas you come in contact with.

RF intensity is commonly expressed in milliwatts per square centimeter (mW/cm^2), which is the power flowing away from a source through a unit sampling or interception area at some specified distance. Although the United States as yet has no federal RF protection standard, a useful interim guide is the 1982 standard of the American National Standards Institute (ANSI '82). The most stringent level in this standard is $1 mW/cm^2$ for frequencies between 30 and 300 MHz. Above 300 MHz, the protection level rises until it reaches $5 mW/cm^2$ at 1500 MHz. Beyond 1500 MHz, the recommended level remains at $5 mW/cm^2$. These levels represent the average power density allowed over any six-minute period and are for the sum of all polarizations from a given source.

At 1296 MHz, where one wavelength (λ) equals 23 cm, a thick resonant dipole feeding a calibrated power meter with matched coaxial cable (itself free of pickup) may be used to obtain an indication of power density. A reasonably lossless resonant dipole has an effective aperture of $\lambda^2/8$; at 23 cm this is $66 cm^2$. The power meter reading in milliwatts, divided by 66, is the indicated power density. For this to be a reliable indication, the dipole must be positioned far enough from the RF source to be in its far field. For a small source, the distance should be at least $\lambda/2$, and here that would be about 12 cm (4.5 inches). The dipole should be oriented for alignment with the dominant polarization. Note that the power meter must be capable of readings well below 1 mW.

This arrangement would be useful for checking leaks along the coaxial route that the high power (here 250 W) takes to a load, be it dummy load or antenna. Cable connectors may not be tightly secured, or they may be faulty. For equipment operating in the SHF region, waveguide flanges may not be clamped properly.

Direct measurement of electric field strength near an antenna (with a calibrated instrument, preferably one with the indicating meter shielded and possibly positioned at the center of the sampling dipole) is another way to check for adequate protection. A field strength of 60 V per meter (V/m) corresponds to $1 mW/cm^2$; 134 V/m corresponds to $5 mW/cm^2$. At a distance 60 cm (2 feet) from an isolated dipole fed with 26 watts, the field strength would be about 60 V/m. This is a far-field field strength for all frequencies where the half wavelength is less than 60 cm, or for frequencies above 250 MHz. For full 250 watts applied to the dipole, the 60 V/m level occurs at a distance of 1.8 meters (6 feet), and at this distance this holds for all frequencies above 80 MHz.

With SSB or CW keying, the fields during Amateur Radio operation are highly intermittent, and usually include considerable pauses or intervals for listening. These factors reduce the average power density over the six-minute averaging period.

Further information on RF safety and protection estimates can be found in Chapter 7 of *The Satellite Experimenter's Handbook*, published by the ARRL. The following rules of good practice for RF protection are recommended:

- Never operate an RF amplifier with equipment shielding removed.
- Never handle antennas with RF power applied.
- Never guess that RF levels are safe. Take the time to consult a reliable reference for an estimate, or measure levels carefully. Allow a "cushion" of about 6 dB (factor of four in power density). If possible, borrow an RF radiation monitor (after learning how to use it), or consult with a ham who is well informed on RF protection.
- Never look into an open end of a power waveguide; never point a powered directive antenna (a beam or a paraboloid, for example) toward people. Keep all VHF and UHF transmitting antennas as high as possible, distant from humans.
- Use good-quality, well-constructed coaxial cable and connectors to avoid RF leaks.
- Think RF and electrical safety first; test later!
- Watch QST for news on RF measurement techniques and progression, protection standards and proposed federal and state RF regulations. — David Davidson, W1GKM

oriented so that air bubbles will rise into the impeller output port and can be blown out once the pump starts running.

Flow Indicator and Heat Exchanger

Water cooling is best described as "super quiet." There is no noisy fan to reassure you that the tube is receiving adequate cooling. If water flow is reduced or cut off during amplifier operation, tube damage is virtually assured.

Flow interlocks and switches to shut down the amplifier if water flow is reduced are hard to find and expensive. Flow indicators, however, are inexpensive and reliable. A flow indicator has a spoked rotor that turns as water passes through the unit. If the wheel is turning, there is water flow; if not, you have a problem. Changes in flow rate can be observed by watching

for speed changes in the rotor. A small lamp illuminates the flow indicator, making it easy to see rotation. The flow indicator should be mounted where it can be seen from the operating position and monitored during operation.

Heat exchangers, or radiators, remove the heat from water as it passes through. For this application, a small automobile transmission-oil cooler works great. Most auto-parts stores and speed shops have a good selection. Pick one that is similar in size and aspect ratio to a whisper fan (approximately $4 \times 4 \times 1$ inches). Some come with mounting brackets. Look for a cooler with the input and output ports on the top so air bubbles will rise to the top and move on without becoming trapped. Trapped air degrades cooler performance.

If you use the amplifier for high-duty-

cycle modes such as ATV or FM, or for long, slow-speed CW transmissions (EME, for example), you should use a small axial whisper fan to increase the effectiveness of the heat exchanger. A fan isn't necessary during normal operation, or even for sustained operation at moderate power levels, but I highly recommend one if you plan prolonged operation at maximum power. Locate the fan so the warm exhaust air won't heat up other equipment.

Hoses and Fittings

Most hardware stores carry a complete line of brass fittings and adapters that can be used for this project. Brass, however, will eventually corrode and pollute the water supply. Plastic fittings are cheaper and don't corrode, but they are harder to find. Recreational vehicle suppliers are my main source for these parts. They are used extensively in drinking water systems for mobile homes and travel trailers. Procure the fittings when you have the rest of the parts in hand, as there are many variables to consider.

You can use any relatively soft, thin-wall vinyl tubing for all water lines. The main runs are made from 3/8-inch-ID hose, while 1/4-inch-ID stock is used to connect to the 7289/2C39 water jacket. The 1/4-inch-ID tubing fits snugly over the 9/32-inch-OD inlet and outlet tubes on the water jacket, so no clamps are required. All other hose connections should be secured with stainless-steel clamps to prevent leaks. Any leaks mean air in the system and deterioration of cooling performance.

Safety

The tube anode, and hence the water jacket and water, are in direct contact with the high-voltage supply, so some safety precautions must be observed. Approximately 12 to 18 inches of tubing should run between the 7289/2C39 jacket and any other component in the cooling system. This will allow enough resistance in the water to provide adequate current limiting, should the water contact any components that are grounded.

It is best to ground the water supply at the pump. Do this by replacing a short section of the tubing that runs to the flow indicator with a piece of brass or copper tubing. Solder a wire to this metal tubing and connect the other end of the wire to your station ground. Use at least 24 inches of vinyl tubing between the anode cooling jacket and the ground point.

On the warm-water side of the 7289/2C39, run 12 inches of vinyl tubing to a small metal fitting or short section of metal tubing, and then another 12 inches of vinyl tubing to a grounded point (this can be at the heat exchanger). You can measure the water leakage current to ground by placing a microammeter between the metal fitting that connects the two vinyl hoses and ground. Leakage cur-

rent should be less than 10 μA with clean water and an anode potential of 1 kV. As the water ages, the leakage current will rise; when this happens, replace the water.

Grocery stores carry distilled water for use in steam irons. It may be deionized and not truly distilled, but it works fine for about four to six months in this application. Filters can be purchased from scientific supply houses, but they're not really worth buying because deionized water is so cheap.

Do not use tap water under any circumstances! When you turn on the water system for the first time, run a gallon of water through it for half an hour to wash out fabrication impurities. Replace with clean water before using the system to cool the amplifier.

Water was chosen because it's inexpensive, nontoxic, nonflammable and easy to clean up if you have a leak. Better liquid coolants are available, but they are toxic. Don't use them!

Cooling Performance

I have used water-cooling systems for several years with no problems whatsoever. Fig. 6 is a graph of several transmit/receive cycles on a water-cooled, 500-W output, 23-cm power amplifier. For this test, I used two of the amplifiers described in this article coupled with a pair of hybrid combiners. This particular cooling system used 1 gallon of water. Experiments indicate that, during extended operation, the water temperature rises only 30° to 35°F above ambient room temperature. Typically, the tube anode and water average 10° to 15°F above ambient during casual operating.

Flow rates in this system are typically 1/3 gallon per minute per tube, which is more than adequate. At this rate, more than 300 W of dissipation from a single inefficient 7289/2C39 were required to boil the water in the water jacket. The water should not be allowed to boil because this will heat the rubber gasket.

Tubes

It is not really necessary to buy a new 7289/2C39. Used tubes can be found surplus for around \$1 to \$5 and, in many cases, will perform as well as a new tube. Most used tubes have been sitting around for several years, so it's a good idea to run them through the dishwasher to clean them up and then run the filaments for about 24 hours. This will restore operation in many cases.

If you buy a new tube, you should be aware that the 7289/2C39 is being run far in excess of its ratings in this amplifier. The manufacturer's warranty will not cover tubes run in this application.

Contrary to popular opinion, glass tubes will work. Physically, they are not as rugged as the ceramic version, but the glass-to-metal seal seems to provide better shelf

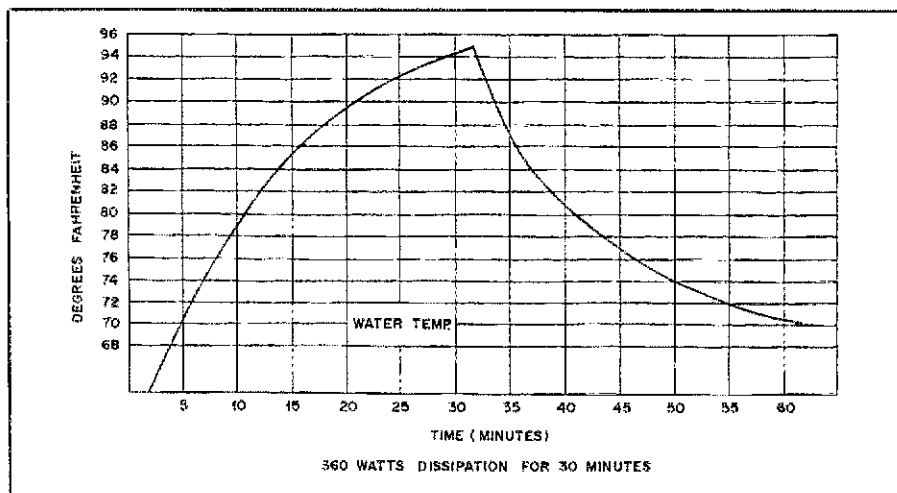


Fig. 6 — Performance graph of the water-cooling system.

life than the ceramic seal. The glass tubes make great driver tubes and will work fine for power levels up to 100-W output. Pulse tubes (7815, 7211) are not recommended because of their poor thermal stability at high power levels. Also, they generally are 30 to 40 MHz lower in resonant frequency in this amplifier compared to the 7289/2C39. Some 7289 tubes can be as much as 30 MHz lower in frequency. Minor length adjustment of the anode-tuning post may be required to accommodate amplifier and tube differences.

Tube Insertion

Extreme care must be exercised when inserting the 7289/2C39 tube. Never force the tube in place, as damage (bending) of the cathode finger stock may result. Observe the layout of the finger stock to get an idea of how the tube inserts. Carefully position the tube so it is straight as you gently push. It should slide in snugly without any solid resistance.

Testing

After you have completed all of the parts for the amplifier, it's time to test everything before hooking it all together. Test the water-cooling system by turning it on and watching for steady water flow as indicated on the flow meter. The tube and water jacket can be removed from the cavity amplifier for this test.

Check all of the power-supply voltages first without connecting them to the RF deck. Then, without the tube in place, hook the bias and filament supplies to the cavity and check the voltages again at the tube finger-stock connections. Connect the high-voltage supply to the RF deck and bring the voltage up slowly with a variable autotransformer. Monitor the high voltage on the anode-bypass-capacitor plate, and look and listen for any possible arcing between the anode-bypass-capacitor plate and ground. Use extreme care when measuring

and testing the high-voltage supply. If everything looks okay with the power supplies, shut them off and disconnect them.

You can make a safe, low-power test of the cavity resonance without applying any voltage. With the tube in place, insert a 2-inch-long coupling loop on the end of a piece of coaxial cable between the spring fingers of the anode down into the cavity. Connect the amplifier output probe/connector to a device capable of detecting low-level RF at 23 cm (for example, a spectrum analyzer or microwattmeter). Feed a signal from an L-band signal generator into cable attached to the wire coupling loop that you inserted into the cavity. Set the signal generator for various frequencies in the 23-cm band and tune the amplifier anode tuner. There will be sharp peak in output at cavity resonance.

This testing method can be used to determine cavity tuning range, anode-bypass-capacitor effectiveness and resonance of various tube types for use in this amplifier. Any cavity amplifier can be tested completely without ever applying high voltage. The better your test equipment, the easier the amplifier is to test. If all dimensions were followed strictly, the amplifier will tune as designed.

Amplifier Hookup

Installation and operation of this amplifier is relatively straightforward, but as with any amplifier, several precautions must be followed. If these are adhered to, the amplifier will provide years of reliable service.

The amplifier is designed to be operated in a 50-ohm system and should never be turned on without a good 50-ohm load connected to the output connector. *Never* operate it into an antenna that has not been tuned to 50 ohms!

Drive power to the amplifier should *never* exceed 15 W. *Never* apply drive power in excess of 1 W unless all operating

voltages are present and the tube is biased on. Otherwise, the tube grid-dissipation rating will be exceeded and you will probably ruin it.

As in all TR-switched systems, some type of interlock or sequencing of transmit and receive functions should be incorporated. In most systems, the sequence for going into transmit is something like this: First, switch the antenna changeover relay from the receiver to the power amplifier. Next, bias the power amplifier on. Last, key the exciter and apply drive to the amplifier. To go to receive, unkey the exciter, remove operating bias from the amplifier and switch the antenna relay back to the receiver.

If the antenna relays are switched while the power amplifier is operating and putting out power, damage to the relay contacts and/or the amplifier is likely. If there is a momentary removal of the antenna while the power amplifier is biased on, oscillation may occur. This can damage the TR relay, the tube or even the receive preamplifier.

Tune-up and Operation

This is it — the big moment when you will see your project come to life! Connect an accurate UHF power meter and a 50-ohm antenna or load to the amplifier output connector. A Bird Model 43 wattmeter with a 100- or 250-W, 400-1000 MHz slug will give reasonable accuracy, depending on the purity of the drive signal. Apply filament power and tube cooling, and allow 3 to 5 minutes for the filaments to warm up. Turn on bias supply (the amplifier will draw maximum current if the anode voltage is applied without bias). Apply 300 to 400 V to the anode. There should be no current flowing in the tube as indicated on the cathode-current meter. Ground J1 on the bias supply to apply transmit bias and observe cathode current. As R1, the bias control, is turned clockwise, quiescent idling current should increase. Set for about 25 mA.

Apply 1 W of RF drive power. Turn the anode tuner while observing the RF output power meter and tune for maximum output. The output should go through a pronounced peak at cavity resonance. Adjust C2 and C3 on the input tuning network for maximum amplifier output. If possible, use a directional wattmeter between the driver and the amplifier input to check that best input SWR and maximum amplifier output occur at roughly the same setting.

Depending on the amount of drive power available, you may want to tune the amplifier for maximum power output or maximum gain. Fig. 7 shows what you can expect from different drive levels.

Once the amplifier is tuned for best input SWR and maximum output with 1 W of drive, anode voltage and drive power can be increased. Increase both in steps; be sure to keep the anode tuner peaked for

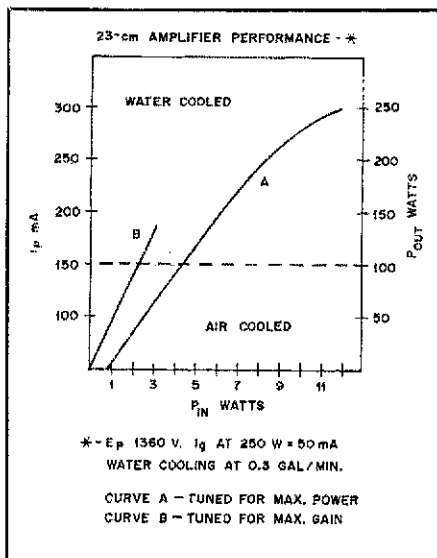


Fig. 7 — Performance of the cavity amplifier under different drive and plate-current conditions.

maximum output power. When you get to the 100-W output level, very carefully readjust the input circuit for maximum output. The input capacitor closest to the cathode is critical and should need to be rotated less than 90 degrees maximum. Maximum output power will be roughly coincident with best input SWR.

Increase the drive power and keep the anode tuner peaked for maximum output. Increase the drive until you reach the desired output level, but *do not exceed 400-mA I_K* ! At 1400-V dc and 350-mA I_K , output power with a good tube should be about 230 to 250 W. At lower anode voltages, I_K will be higher for the same output power. Higher anode voltages result in higher gain, lower drive levels, lower grid current and lower plate current for a given output power.

The anode tuner's tuning rate is approximately 5 MHz per turn. Clockwise rotation of the tuner lowers the resonant frequency of the cavity. This control will require re-adjustment as you make large frequency excursions within the 23-cm band (for example, if you go from 1296 weak-signal work to the 1269-MHz satellite segment). You should also check the input SWR if you move more than 15 MHz. Generally, amplifier tuning does not change much after initial setup. You should be able to turn it on and use it without retuning as it heats up. Slight adjustments may be necessary, however, depending on cooling, inherent thermal differences from tube to tube and duty cycle of the operating mode. Always keep the anode tuner peaked for maximum output, and check it from time to time, especially while you are first learning how the amplifier operates.

The output loading control is the output connector and probe assembly. Loading is

changed by minor rotational adjustment of the N connector. First loosen the jam-nut (or setscrew) slightly. While observing output power and keeping the anode tuner peaked, rotate the loading control ± 30 degrees maximum for greatest output power. This should be done only once and should not need repeating unless another tube is installed. Even then it may not be required.

Conclusion

This cavity amplifier for the 23-cm band is capable of safe, reliable operation at output powers in excess of 200 W. More than 50 of these amplifiers are in operation, and you can build one, too. I would like to thank Mike Stahl, K6MYC, Bill Troetschel, K6UQH, William Jungwirth, AA6S, Lem Moeschler, W6KGS and Joseph Cadwallader, K6ZMW, for their help and encouragement during the development of this project.

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Strays

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 March issue were:

- David Arbogast, NV4G, revealed how to eliminate duplicate contest contacts with his "TI 99/4A Contest Dupe Program"
- BITS article on "The Asymmetrical Folded Half-Dipole and Linear Extension Antenna Array" by Bill Conwell, K2PO
- A list of Product Review items, 1976 to 1984.

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.

A Power-Supply Performance Tester

Not all power supplies are what they seem to be. Whether you buy or build, this instrument will permit you to optimize power-supply performance.

By Bruce B. Lent,* WD8OYK



Unlike batteries, ac power supplies may not always provide the necessary voltage regulation. Noise in the form of ripple or hash may be present on the dc output line. Poor regulation or noise may lead to improper operation of the equipment to be powered.

We will discuss an adjustable electronic load that can be constructed with ease. Information is provided on how to conduct tests with this load in order to measure, detect and correct the problems mentioned above.

What Is an Electronic Load?

An electrical load is a device that allows us to closely simulate conditions the power supply will encounter in real life. It can also be used to "life test" a power supply. Why not just use the circuit or equipment for which the power supply is intended as the load? The electronic load allows for measurements and evaluation of a power supply, independent of the intended load circuit or equipment. If problems are encountered with the load equipment, a pretested power supply eliminates the power supply as the cause. This saves time and frustration.

The electronic load permits easy measurement of power-supply ripple (hum), regulation, noise and oscillations under actual load conditions. One may preset and check the current-limiting circuits, check for heating and learn about

power-supply dynamic characteristics.

Technical Details

Fig. 1 shows a basic load circuit. This circuit (Fig. 1) will work, but is very limited and inconvenient and produces excessive noise.

Fig. 2 illustrates a very simple electronic load. The battery supplies base current to the transistor. Base current can be changed by means of the potentiometer, from zero to some maximum value. As the base cur-

rent is increased, a greater amount of current flows through the collector circuit. This circuit is a basic electronic load. The circuit in Fig. 2 will indeed work. However, the transistor will heat up. Heating causes the transistor characteristics to drift, making it impossible to maintain constant current for more than a few moments.

Fig. 3 shows the circuit of the instrument I developed for this article. It could have been complex, but thanks to IC op amps the job was easy and inexpensive.

The circuit is divided into four sections. The power supply provides the +12 V. U3 is an operational amplifier that constitutes the control section. Q1 is a switch, or gate, for dynamic testing. Q2 is the driver, and Q3 is the high-power load stage.

The load current comes from the power supply under test. Current from the power supply under test will flow as the base current to Q3 is increased. This is accomplished by applying a positive voltage to pin 4 of U3. Q2 provides current gain — enough to provide base current to the final load transistor, Q3. As the base current to Q3 increases, the collector current (or power-supply load) increases by a larger amount.

That is how the basic circuit works. Now we add another twist. R7-R12 are used to develop an error voltage. Once the load current is set to the desired value, Q3 will warm up and try to cause the collector current to increase, all on its own. However, when Q3 tries to draw more current, a voltage is developed across the emitter resistor. This emitter-voltage change is

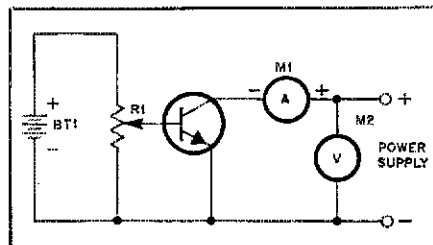


Fig. 1 — Diagram of a basic dc-load circuit.

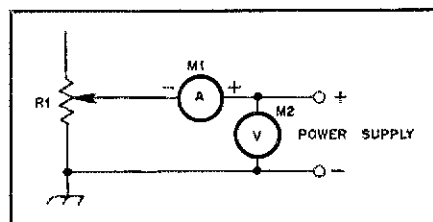


Fig. 2 — Arrangement for a simple electronic dc-load circuit.

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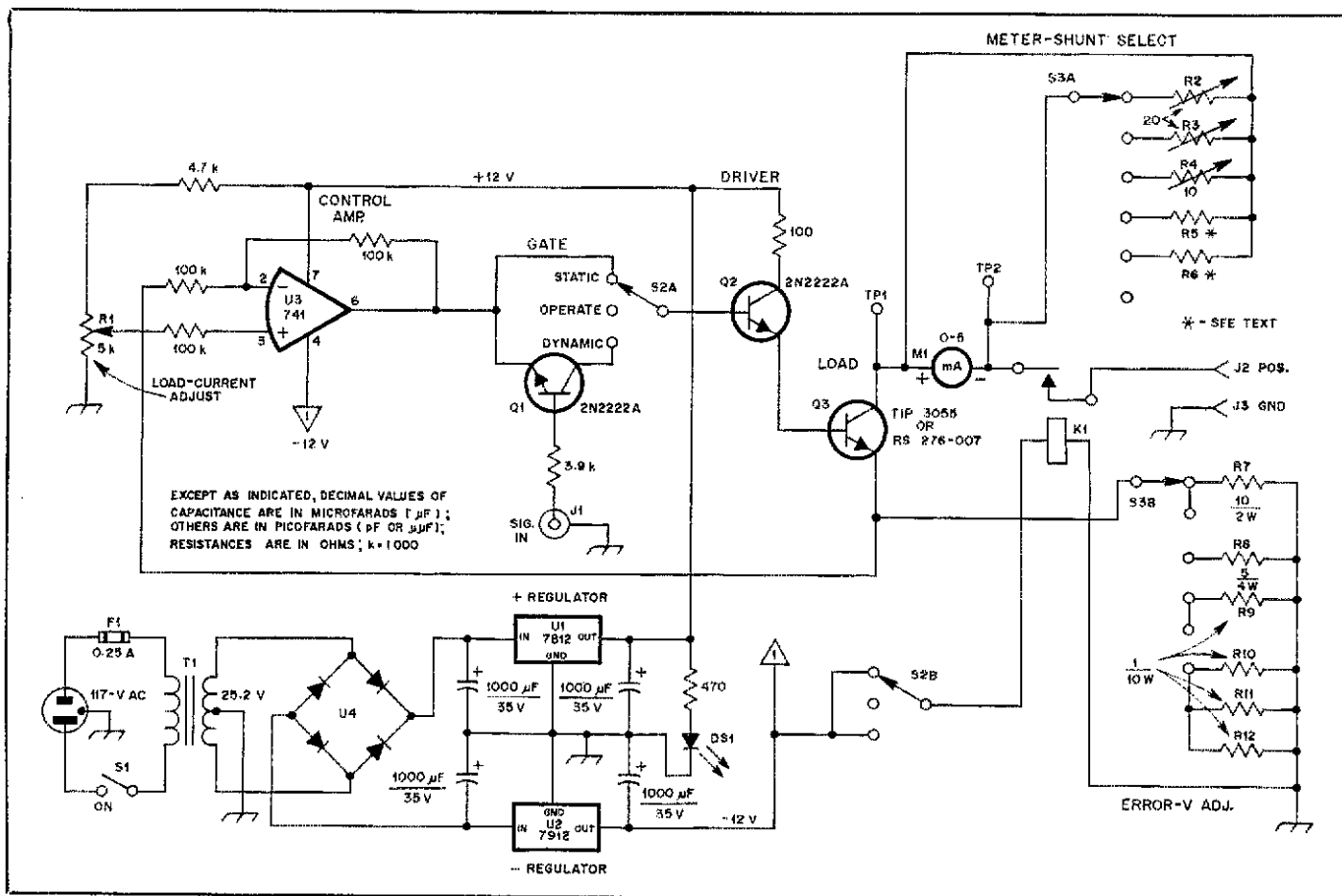


Fig. 3 — Schematic diagram of the power-supply test unit. Fixed-value resistors are 1/4-W carbon-composition types unless otherwise noted. Capacitors are electrolytic.

- DS1 — LED.
- F1 — 1/4-A fuse.
- J1 — BNC jack.
- J2, J3 — Dual jack or two 5-way binding posts.
- K1 — SPST 12-V dc relay (RS 275-003 or equiv.).
- M1 — See text.
- R1 — Ten-turn potentiometer (see text).

- R2-R4, incl. — PC-mount potentiometer.
- R5, R6 — See text.
- S1 — SPST toggle
- S2 — DPDT (center-off) toggle.
- S3 — Six-pos., two-pole nonshorting rotary switch (RS 275-1386).
- T1 — 25.2-V (CT), 450-mA transformer (RS 273-1366).

- TP1, TP2 — Feedthrough barrier strip (RS 274-653).
- U1 — +12-V, 1-A three-terminal regulator (RS 276-1771).
- U2 — -12-V, 1-A three-terminal regulator (RS 276-1774).
- U4 — 1-A, 50-PRV bridge rectifier (RS 276-1161).

detected at pin 2 of the operational amplifier, the inverting input. This error voltage is subtracted from the output voltage, making a correction and reducing the base current of Q3 accordingly. The result is a very stable loading instrument! The electronic load will even hold the load current constant during small changes in power-supply voltages.

Construction

The electronic-load instrument may be constructed in just about any metal cabinet (see Figs. 6 and 7). The instrument shown on the first page of this article is constructed in an LMB-type CO-4 cabinet. Metal is preferred, since Q3 gets very hot at high-current conditions (1 A and above).

This instrument can handle currents of up to 5 1/2 A. It is important that a proper heat sink be provided for Q3. If you never plan to exceed 1 A, the chassis will be a sufficient heat sink. To utilize the full current capability, an additional heat sink should be used. It should be mounted to the chassis

on the rear of the cabinet.

The power-supply regulators (U1 and U2) are contained in large TO220 packages. These devices were selected because of easy availability. They are an overkill in this circuit, and operate at a fraction of their rated power, so no heat sink is required. They may be mounted on a circuit board in any manner.

The builder has several choices for R1. I used a 10-turn potentiometer, and this approach is highly recommended. These devices are available in surplus stores at reasonable prices. Most are made by Beckman or Spectrol. Ten-turn potentiometers are expensive if purchased new. The counter dial is convenient, but optional. A single-turn linear potentiometer can be used, but is not recommended since adjustment of the load current can be difficult in many cases. If the 10-turn potentiometer cannot be located, use two single-turn potentiometers in a series configuration — 5 kΩ and a 1 kΩ in a coarse and fine arrangement.

R5 and R6 are low-resistance shunts. These are made from about 3 feet of no. 22 insulated hookup wire, coiled up. Prior to coiling, place a calibrated ammeter (e.g., a multimeter) in series with M1 of Fig. 3. Trim the no. 22 wire about 1-2 inches at a time until M1 reads the same current as does the external meter.

When working at the high-current range (5 A), place a piece of heavy wire (about no. 18) across TP1 and TP2. The reason is that I found the contact resistance of S3A too high to provide a proper shunt. Use a piece of wire (4-5 inches) and trim for a correct reading. TP1 and TP2 are terminals on a feedthrough barrier strip (RS # 274-653).

The meter used is 0-5 mA type. You may use a meter that best suits your testing needs. The use of potentiometers in the shunt circuit allows flexibility in meter selection. See page 25-2 in *The ARRL 1985 Handbook for the Radio Amateur* for more information on meter shunts, should you desire a different approach.

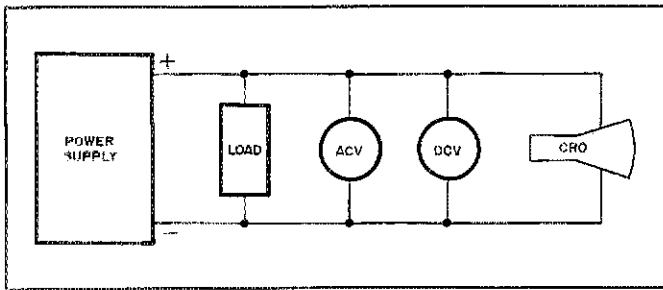


Fig. 4 — Example of an ideal setup for power-supply testing (see text).

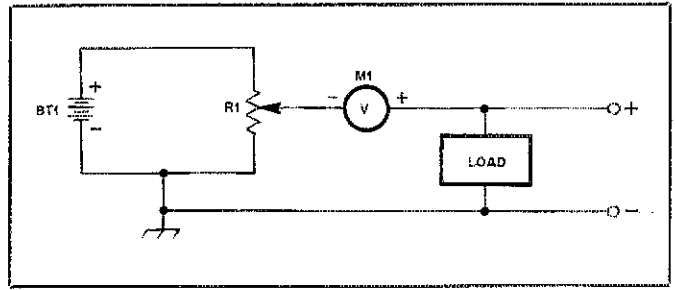


Fig. 5 — A simple bucking circuit for use with a low-level dc multimeter.

One may also construct a “blind load” — one with no meter. An external ammeter or multimeter may be used in place of M1 in Fig. 3.

Using the Electronic Load

Fig. 4 shows what might be the acme of a power-supply test setup. If all the equipment shown is not available, many of the tests described can still be conducted. As a minimum, the electronic load and a good ac/dc voltmeter are essential.

Ripple

One of the first measurements to be made is ripple (hum) level. The amount of ripple present is a measure of the effectiveness of the power-supply filter. An accurate ripple measurement can be made only with the power supply operating under full load. The maximum-allowable ripple must be determined by the user's or manufacturer's specifications, usually given as “percent ripple.”

The ac voltmeter (Fig. 4) is a millivolt meter. This meter can be a low-level digital multimeter or an audio VTVM. If such a meter is not available, use the lowest setting on your ac (output) scale of a multimeter, and make sure there is no excessive ac

voltage increase when going from no load to full load. A millivolt meter is a must for making accurate measurements. However, using a multimeter will give some idea whether the filter is working satisfactorily.

Since regulators may distort the sinusoidal waveshape, meters are not the ultimate in accuracy. In most cases the millivolt meter is suitable. A calibrated oscilloscope will give you an accurate reading, also. If an oscilloscope is available, it is always a good idea to include it in the test setup as shown in Fig. 4, even if it is not calibrated. The oscilloscope provides an additional picture of other bothersome sources of noise, such as hash or oscillations.

To calculate percent ripple use the following equation:

$$\% E_r (\text{RMS}) \approx \frac{100 E_1}{E_2} \quad (\text{Eq. 1})$$

where

E_1 = the RMS value of ripple voltage
 E_2 = the steady-state dc voltage at full load

Voltage Regulation

As the power-supply load (output cur-

rent) is increased, the output voltage tends to decrease. Voltage regulators are often used to reduce this effect. The amount of regulation required is determined by the equipment the supply will power (see page 6-3 in *The ARRL 1985 Handbook for the Radio Amateur*).

To measure regulation take a dc voltage reading at “no load.” Increase the load current to the full-load condition and read the dc voltage. Regulation is usually specified as “percent regulation.” Make this calculation as follows:

$$\% \text{ regulation} = \frac{100 (E_1 - E_2)}{E_2} \quad (\text{Eq. 2})$$

where

E_1 = the no-load voltage
 E_2 = the full-load voltage

Use of the dc-voltmeter arrangement shown in Fig. 4 is effective when testing unregulated power supplies, or for just getting an idea if a voltage regulator is working. Many regulated power supplies and the popular voltage regulator ICs used by amateurs have tight regulation specifications. Voltage variations, from no load to full load, of 12 mV or less are not un-

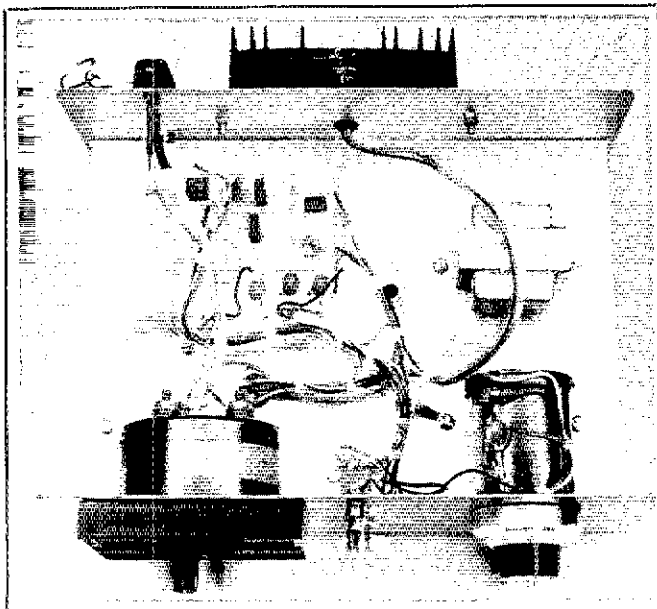


Fig. 6 — Top inside view of the tester.

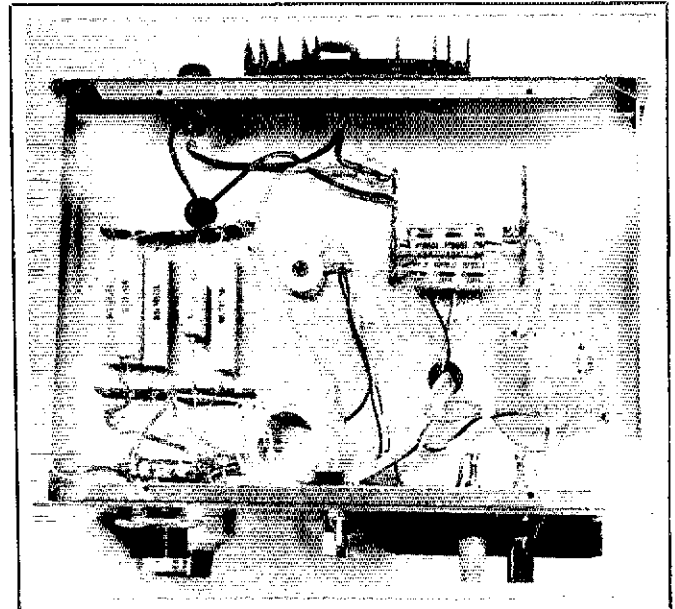


Fig. 7 — A bottom view of the unit.

common! Measuring these small variations in the presence of a higher dc voltage (e.g., 5, 12 V) can be accomplished without an expensive, high-resolution dc digital voltmeter. Fig. 5 shows a simple bucking circuit to use with any low-level dc multimeter. The bucking device is used to cancel the power-supply voltage, allowing the use of a dc voltmeter on the lowest range. Once the no-load supply voltage is cancelled, the meter will show only small changes in the dc voltage as the power-supply current changes from no load to full load. When building the circuit in Fig. 5, the voltage of the battery must be in excess of the voltage of the device under test. A battery makes the best power source for this device.

Line Regulation

A regulated power supply is used not only to correct for changes in the load, but also makes corrections in ac line-voltage variations. There are a couple of ways to make this measurement. The first method, and also the most accurate, is to provide a variable ac input voltage. This can be accomplished with a variable transformer connected to the ac input of the power supply. Run the ac voltage from a minimum to a maximum (95-V ac to 125-V ac). Measure the dc output voltage at no load and full load (static), and look for variations. Measurements are made in the same manner as making the load-regulation measurements described earlier.

Since variable transformers are not commonplace in the typical ham shack, here is an alternate method. Apply a heavy load to the ac line at the same outlet where the power supply under test is connected. An electric space heater is a suitable device. Make measurements, as described, with the heater on and off. This technique, while crude, will give an indication of the line-regulation characteristics.

Dynamic Testing

The regulation measurement described previously is usually called "static regulation." Static regulation is an important measurement and it should always be made. The electronic load purpose is to closely simulate the "real world," and a static load most often does not represent a real-world situation.

Devices such as keyers, transceivers, RF and audio amplifiers present a changing, or dynamic, load to the power supply. Should the load be a dc voltmeter circuit, there would be no dynamic loading, which would make this test unnecessary. Q1 in Fig. 3 is a switch for making dynamic measurements.

An additional piece of test equipment is required to make dynamic measurements. This is a square-wave generator. Feed the signal from the square-wave generator into J1. Set the generator frequency between 100 Hz and 200 Hz. Adjust the load con-

trol (R1) to a position that will allow only a small amount of current to flow when the load is activated (in the dynamic position). Activate the load. Increase the square-wave generator output voltage until there is an indication on M1. Once an indication is observed, increase the current to the full-load condition.

While using the dc voltmeter, measure the dc output voltage of the power supply. The voltage should be the same as that measured during the static test, if the power supply has good dynamic-regulation characteristics.

The dynamic measurement is a test of regulator, or power-supply recovery time. If a voltage regulator cannot recover fast enough, the output voltage will sag. The addition of a capacitor across the voltage-regulator output line will usually correct this problem. If there is an output capacitor present, the value will most likely have to be increased (maybe the capacitor is defective).

If an oscilloscope is a part of the test configuration (Fig. 4), some more important information is available from the dynamic test. A decaying sine wave, or ringing, may appear across the power-supply output; this is normal. If three to four cycles are observed, the power supply is working well. If this ringing continues, this is an indication that the power-supply regulator is going into oscillation, and this should be corrected. Oscillations are seldom encountered with unregulated power supplies. Try this test on a commercial VHF transceiver power supply. You might be surprised! For more information on this important test see page 6-4 of *The ARRL 1985 Handbook for the Radio Amateur*.

The Oscilloscope

In general, unregulated power-supply performance can be measured by means of ac and dc voltmeters. An oscilloscope is highly recommended when testing regulated power supplies. Many regulators have a tendency to oscillate. They also may add hash to the dc power line; this could show up later as a problem in the load. These oscilloscope tests should be made under no-load, full-load-static and dynamic conditions.

Other Uses

Using the electronic load for power-supply evaluation is a convenient and accurate way to test the power supply you have just built or purchased. Continued use of the electronic load will give you an indication that the power supply is still performing in accordance with the specifications.

When using junk-box parts in a power supply, or making parts substitutions, the electronic load is a good way to see if the right choice was made. Will that transformer you purchased at the surplus store or hamfest really do what it is sup-

posed to do? With the addition of a silicon rectifier, junk-box filter capacitor, electronic load and voltmeter, the answer is at hand. Leaving the load on the transformer for an hour or so will give an indication of the current-handling capabilities and real output voltage. We might call this the modified smoke test. Operating mobile? The electronic load is a helpful tool to test the automobile electrical system under load conditions.

Conclusion

The tests suggested in this article are but a few that are possible. Other useful tests are covered in books listed in the bibliography. The tests covered in this article are generally adequate for most amateur applications.

Building this electronic load will provide you with the capability to test power supplies in much the same way as is done in the electronic industry. Why not add this professional touch to your next construction project? Does that power supply just purchased for the 2-meter rig really conform to the advertised specifications? Why not test it and make sure while it is still under warranty?

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Strays

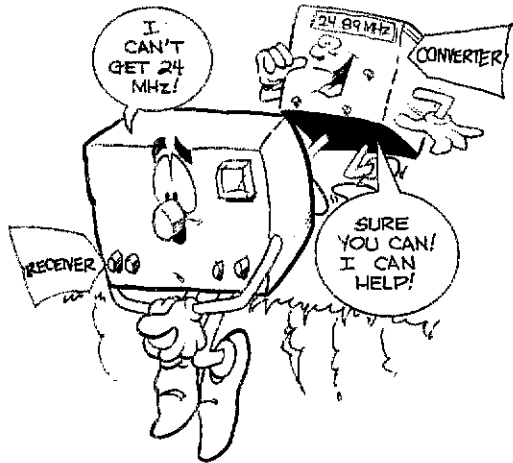
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- Edwin R. Roller, K4IA, of Punta Gorda, Florida



A Converter for the 24-MHz WARC Band

Here's your chance to listen to a new band and enjoy an interesting construction project.

By Doug DeMaw,* W1FB

Perhaps you've wondered what is happening on the 24-MHz band but you can't listen to the frequency because your rig doesn't include WARC-band coverage. This converter is easy to assemble and get operating, and it's inexpensive.

Few RF circuits are laid out casually. Knowing how to approach the general design and assembly will be helpful in the years ahead when you build other RF projects.

General Design Objectives

First, ask "What do I want this converter to do?" Obviously, it needs to cover the band of interest — a foregone conclusion. But what of the other, sometimes subtle, considerations? Let's draft the criteria. The converter should:

- 1) exhibit an overall gain of unity, or slightly better. It should not create signal loss.
- 2) provide sufficient front-end selectivity to reject unwanted out-of-band signals.
- 3) be free of spurious responses and parasitic oscillations.
- 4) have a low noise figure (NF), permitting weak-signal reception.
- 5) have a dynamic range (ability to cope with strong in-band and out-of-band signals) that is reasonable to ideal.

At this point, you may be asking, "What does all of this really mean?" Well, let's examine the list, item by item.

It is possible to design a converter that exhibits a signal loss. This can degrade the signal-to-noise ratio (S/N) of the overall receiving system. A poor S/N ratio places the weak signals in the internal noise of the receiving system. This is similar, in effect, to having a normal signal become buried in atmospheric or man-made noise (QRN). Therefore, the converter must have ample gain and a low-enough NF to override the

inherent noise of the receiver with which it is used. This does not mean that the converter must have an RF amplifier for all the amateur bands, but for 20 meters and higher it is wise to include one. Many converters for 40, 80 and 160 meters need only a mixer at the input stage, since atmospheric and man-made noise on those bands is usually greater than is the receiver noise.

Selectivity means that a tuned circuit or circuits with good Q (quality factor) should be used between the antenna and the first converter stage. This helps to discriminate against strong out-of-band signals. Some poor designs contain no tuned circuit ahead of the mixer, and that's an invitation to trouble!

To minimize spurious responses, you should ensure that no stage in a converter, other than the local oscillator (LO), is oscillating. The culprit in some home-constructed converters and receivers is the RF amplifier. Sometimes there is no outward indication of self-oscillation, and yet the unstable stage is generating a signal of its own. These random oscillations appear in the receiver output as unsteady or rough-sounding carriers, or "birdies." Under certain conditions, we may even find a mixer that is self-oscillating. Similarly, an oscillator may generate output on more than the desired frequency — especially if too much feedback is used. Other spurious responses can result from excessive harmonic output from the converter LO.

The transistor selected must be capable of providing an acceptable noise figure for our chosen operating frequency. This can be determined by looking at the manufacturer's data sheets for small-signal transistors that are earmarked for RF amplifier service. Let's be thankful that the NF requirements for 160 through 10 meters are not as stringent as they are at VHF and UHF! You can manage quite nicely with a maximum NF of, say, 5 dB in the HF spectrum. There are many transistors that meet this criterion. The f_T (upper-

frequency limit versus gain) of a transistor must be correct, also. If not, the stage will not provide ample gain. I like to use a device that has an f_T of at least 10 times the operating frequency. For example, if I wanted to build a converter for 14 MHz, the RF amplifier transistor f_T would be 140 MHz or greater. Also, the noise figure is determined by the input-matching circuit and the specific biasing of the amplifier. So, you must take many things into account when designing an RF amplifier.

The dynamic range figure indicates the ability of the RF amplifier and mixer to handle large signals without generating IMD (intermodulation distortion), or going into gain compression (lowered gain). The system immunity to this is determined by the type of device used in the RF amplifier and mixer stages. Operating conditions based on dc voltages also play an important role in dynamic range. The approach you must take is anything but casual in this general area. There is a wealth of information on all five items on the list in the League's book, *Solid State Design for the Radio Amateur*.

What about Mixers?

There are so many pros and cons about mixer choice and operation that you could soon be wading in a sea of confusion if we discussed this subject in depth. The bottom line is to use a *strong* mixer; one that won't collapse when strong signals enter it. Diode-ring mixers (four diodes in a quad arrangement) are among the better choices, but they require more LO output power than is needed for a transistor or an IC mixer. Also, diodes operate as passive devices (no operating voltage is required), which results in a signal loss in the mixer. This is known as *conversion loss*. With a diode-ring mixer, the loss can be as great as 8 dB. The RF amplifier ahead of this mixer needs to have a gain of at least 10 dB to ensure a low noise figure. ICs such as the MC1596G and CA3028A offer good performance as

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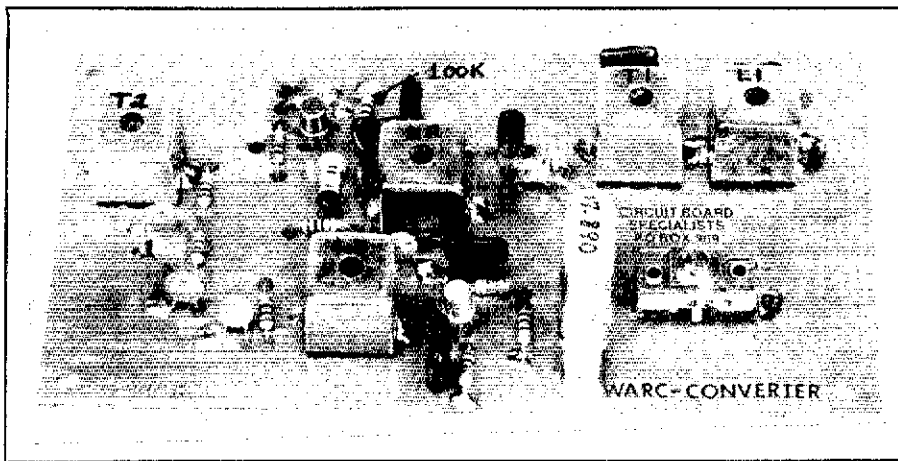


Fig. 1 — The assembled converter. Shielded Amidon Associates L43 and L57 transformer assemblies are used for the tuned circuits.

mixers. They do not require high LO power. Another mixer requirement is that ample LO injection power or voltage be applied. Too little LO power to a mixer results in reduced gain and degraded dynamic range. All of you won't grasp these fundamentals instantly. But you should have knowledge of the pertinent terms and a rough notion of what the terms relate to.

I suggest further study in the various ARRL textbooks.

A Practical Converter You Can Build

Fig. 1 shows an assembled version of the circuit in Fig. 2. As shown, it is set up for operation in the 24-MHz band. PC boards and complete parts kits for this converter are available.¹

In an effort to trade high performance for simplicity, I have chosen a design that uses only three transistors. Q1 is a grounded-gate (common gate) JFET RF amplifier. If the gate lead is kept very short when grounding it, the stage should be unconditionally stable. A good RF amplifier should not oscillate when the load is disconnected from J1. The stage gain is on the order of 10-12 dB. The same transistor, if used in a grounded-source hookup (input signal to the gate), can yield up to 20 dB of gain, but will be more difficult to tame.

A 40-meter trap (L1 and C1) help prevent 40-meter signals from riding through the converter: The 40-meter band is used as the tunable IF for this converter. T1 offers reasonable front-end selectivity. The source of Q1 is tapped near the ground end of the main transformer winding to provide an approximate 1:1 match between the 50-ohm antenna and 200-Ω source impedance of Q1. The source impedance of Q1 is determined by

$$Z = \frac{10^6}{\xi_{gm}} \quad (\text{Eq. 1})$$

¹Notes appear on page 44.

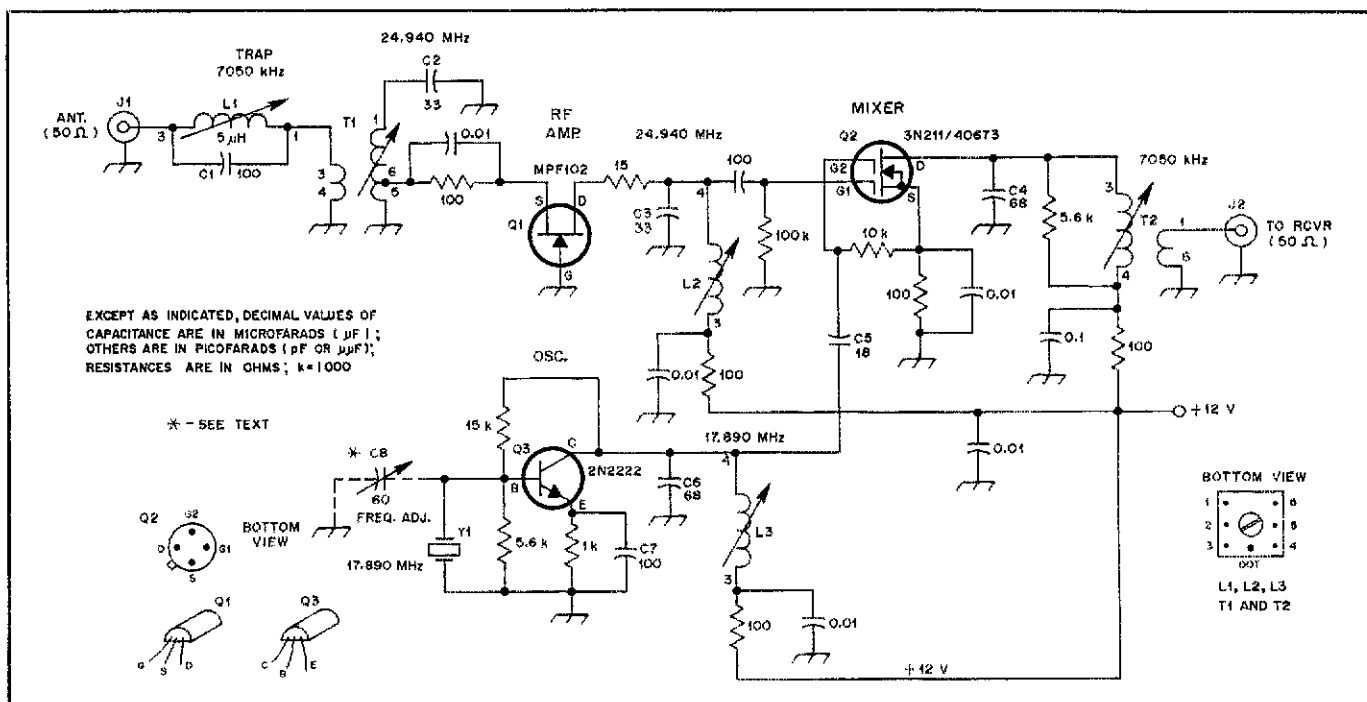


Fig. 2 — Schematic diagram of the 24-MHz receiving converter. Fixed-value capacitors are disc-ceramic, unless otherwise noted. Resistors are 1/4- or 1/2-W carbon-composition.

- C1-C7, incl. — Silver-mica, polystyrene or NP0 ceramic capacitors.
- C8 — Optional 60-pF trimmer (see text).
- J1, J2 — Phono jack, single-hole mount.
- L1 — 5-μH (nom.) coil. Use 26 turns of no. 30 enam. wire on an Amidon Assoc. L43-6 transformer bobbin.
- L2 — 0.75 μH (nom.) coil. Use 10 turns of no. 26 enam. wire on an L43-6 transformer bobbin.
- L3 — 1.1 μH (nom.) coil. Use 12 turns of no. 26 enam. wire on an L43-6 transformer bobbin.

- Q1 — Motorola MPP102 JFET or equiv. VHF type.
- Q2 — RCA 40673 dual-gate MOSFET or T1 3N211.
- Q3 — 2N2222 or 2N2222A NPN transistor or equiv.
- T1 — 0.75-μH (nom.) secondary winding. Use nine turns of no. 26 enam. wire on an Amidon Assoc. L57-6 transformer bobbin. Tap at two turns above the ground end. Primary is a one-turn winding over the secondary.
- T2 — 5-μH (nom.) primary. Use 22 turns of

- no. 26 enam. wire on an Amidon Assoc. L57-6 transformer bobbin. Secondary has three turns of no. 26 enam. wire. See inset drawing for pin locations for L1, L2, L3, T1 and T2.
 - Y1 — Fundamental crystal in HC-6/U holder, 20-pF load capacitance. International Crystal Mfg. Co. type GP or equiv.
- Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607, tel. 213-760-4429.
International Crystal Mfg. Co., Inc., 10 North Lee, Oklahoma City, OK 73102, tel. 405-236-3741.

where g_m is the transconductance in siemens (formerly called micromhos) of the transistor used.

Our mixer is a dual-gate MOSFET. This transistor is simple to use and offers average performance as a mixer in terms of dynamic range. A tuned transformer, T2, is used in the mixer output to provide an impedance match between the drain of Q2 and the 50-ohm receiver input. The 5.6-k Ω load resistor across T2 sets the impedance value of the drain circuit, and provides a relatively broad response across 100 kHz of the 40-meter IF. The resistor lowers the tuned-circuit Q.

Q3, a bipolar transistor, is the oscillator. Y1 is a fundamental crystal. The load capacitance for the crystal is approximately 20 pF. C8 is an optional trimmer capacitor that you may add to shift the crystal frequency in order to make the receiver dial match the received frequency. If the crystal is slightly off frequency, C8 may be needed. If the parallel arrangement for C8 is not satisfactory, move C8 so it is between the lower end of Y1 and ground, in series with Y1. The parallel arrangement will lower the Y1 frequency, while the series hookup will raise the Y1 frequency.

The RF injection voltage on the mixer (gate 2) should not exceed 6-V P-P (2.12-V RMS). A scope or an RF probe and voltmeter can be used to check the Q2 injection voltage. If it is too low, increase the value of C7. Similarly, decrease the value of C7 if the injection voltage is too high. A value of 4- to 6-V P-P is best for a dual-gate MOSFET mixer. Injection voltages greater than 6 can destroy the mixer transistor.

Construction Notes

A parts-placement layout, seen from the component side of the board, is given in Fig. 3. A scale etching template is shown in Fig. 4.

If you decide to make your own circuit

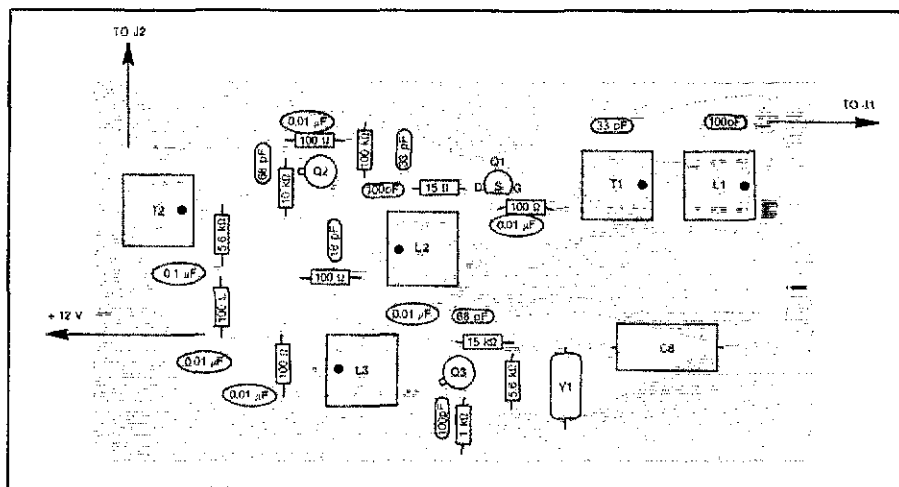


Fig. 3 — Parts-placement guide for the converter, as seen from the component side of the board. The shaded area represents an X-ray view of the copper pattern.

board, try to follow closely the pattern provided in this article. Double-sided board material is recommended for the circuit, but you may use single-sided material. Make certain that all solder joints are good ones. Component leads should be kept as short as possible.

Tune-up and Operation

The converter is capable of approximately 20 dB of gain when each tuned circuit is peaked for a single frequency on 40 meters. However, it is better to stagger-tune T1, L2 and T2 for 7.010, 7.050 and 7.075 MHz, respectively. Peak each circuit at the specified frequency. This will lower the effective converter gain somewhat while providing a more level gain response across the 100-kHz tuning range.² L3 is tuned for maximum output at 17.890 MHz. To ensure rapid starting of Q3, it may be necessary to tune L3 slightly off resonance to the high side of 17.890 MHz.

The 24-MHz amateur band extends from

24.890 to 24.990 MHz. Therefore, you will be listening to 24.890 MHz when your receiver is tuned to 7.0 MHz, and 24.990 MHz will be at 7.1 MHz on your receiver dial.

It is a good idea to enclose any converter in a shielded box. This prevents stray pickup of unwanted signals by the circuit board and various components. This is especially important in order to keep 40-meter signals out of the main station receiver during 24-MHz reception. Also, try to find a 40-meter signal that is leaking through the converter somewhere near 7050 kHz. Then adjust the trap, L1/C1, for minimum strength of the unwanted 40-meter signal.

Good luck, and see you sometime soon on 24.890 MHz!

Notes

¹Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002, tel. 303-542-5083.

²Excessive converter gain can degrade the dynamic range of the receiver used as the tunable IF.

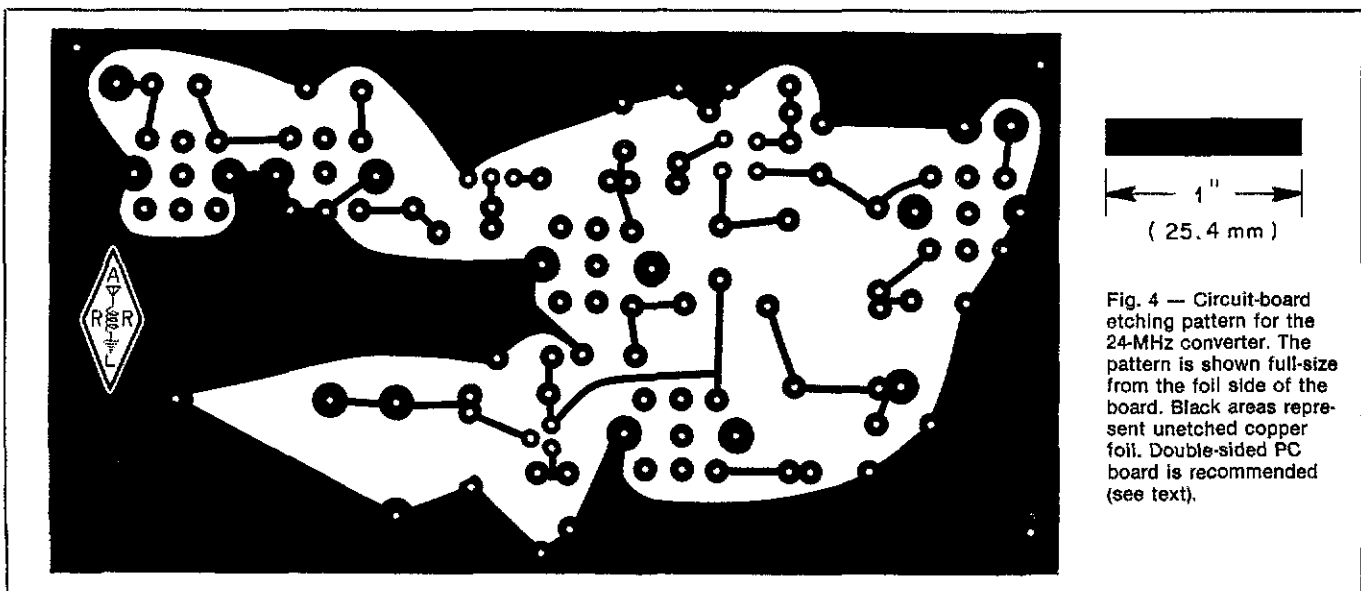


Fig. 4 — Circuit-board etching pattern for the 24-MHz converter. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Double-sided PC board is recommended (see text).

Heath SW-7800 General-Coverage Receiver

Radio Amateurs and SWLs may have been saddened to see that some of Heath's recent catalogs offered no shortwave receivers. Now, Heath returns to the low-end shortwave receiver market with the SW-7800. It features good sensitivity, a true frequency counter and digital display, envelope and product detectors (for AM and SSB/CW reception), and operation from 117-V ac and 12-V dc sources. These features, and its price, make the '7800 attractive to casual shortwave listeners and electronic enthusiasts.

The Kit

Heath's modular packaging and construction techniques continue in the '7800. Many parts come packaged on tape strips, arranged in the order of use. This saves a lot of time and effort during construction.

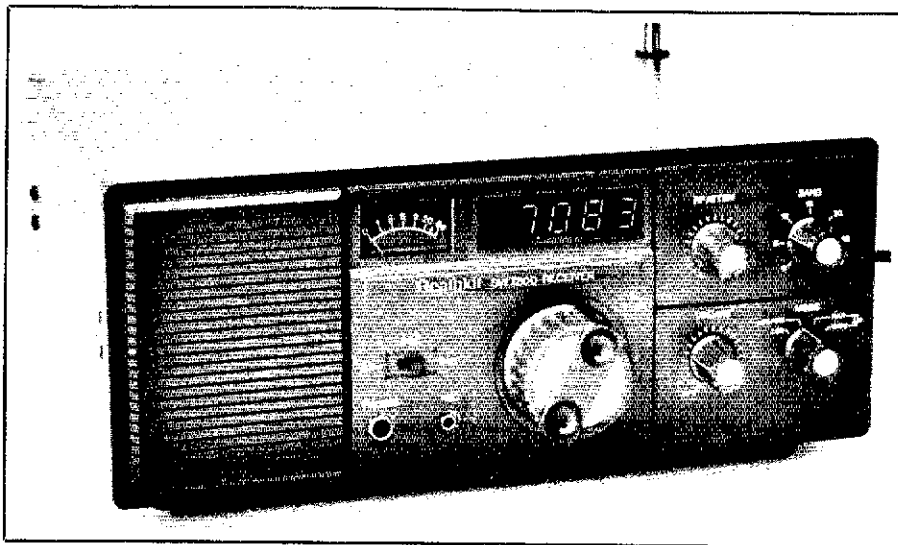
There are five major assemblies: the chassis and four circuit boards. The front-panel, controller and receiver circuit boards are single sided, while the synthesizer board has traces on both sides and plated-through holes. All boards are solder masked. The coating makes connections easy to spot and confines solder flow.

Along with clear construction and alignment instructions, the manual provides general and detailed descriptions of circuit operation. There are troubleshooting charts, installation instructions (including antenna construction) and a short section on basic radio theory. The theory section covers frequency/wavelength relationships and definitions of AF, RF, SSB and CW.

There were three problems with my '7800. The illustrations concerning the installation of D304, D323 and D414 did not match the components supplied. Each of these diodes has a package that resembles a plastic transistor ("D" shaped), while the circuit parts-placement diagram indicates a square package. Close inspection showed a very small mark on the diode case near one lead. This mark designates the cathode, which is indicated by a black band on the circuit board.

The '7800 knobs fit into front-panel recesses. Unfortunately, each nut that secures a control must be tightened without the knob on the shaft. Thus, it is impossible to accurately center the shaft in the hole. The problem is compounded by the fact that the knobs are not precisely concentric when mounted on the shafts. The knobs rub against the panel recesses, and this can be annoying. Smooth control operation can be achieved by carefully sanding the edge of each knob to fit the recess.

A major problem occurred with the frequency display. Once the radio was complete, I found that the display became erratic when the BAND switch was set beyond 26 MHz. As I advanced the BAND switch, the display indicated lower bands (21 and 23 MHz) and drifted 300 kHz, or more, with each count. Checks of components and solder connections revealed nothing that



Heath SW-7800, Serial No. 81-53018

Manufacturer's Claimed Specifications

Frequency coverage: 150 kHz to 30 MHz.
Modes of operation: AM, SSB, CW.
kHz/turn of knob: Not specified.
Backlash: Not specified.
S meter sensitivity (μV for S9 reading):
Not specified.

Receiver sensitivity: (0.15-30 MHz) less than $0.35 \mu\text{V}$ for 10 dB, (S+N)/N.

Measured in ARRL Lab

As specified.
As specified.
46.
Nil.

160 m, 19; 80 m, 19; 40 m, 23; 30 m, 24; 20 m, 25; 17 m, 34; 15 m, 34; 12 m, 39; 10 m, 46.

	80 m	20 m
Noise Floor (MDS) dBm:	-131	-130
Blocking DR (dB):	noise limited	noise limited
Two-tone third-order IMD DR (dB):	74	73
Third-order intercept (dBm):	-20	-20.5

Audio output (@ 10% THD): Not specified. 1.8 W.

Color: Khaki.

Size (HWD): 4-7/8 x 11-1/2 x 11 inches.

Weight: 7 lb.

generator showed that the receiver was, in fact, receiving the band indicated by the BAND switch, and the counter worked properly with an injected signal. The fault lay in the mixing chain that precedes the counter.

At this point, I contacted Heath for advice. They informed me that the problem has occurred on a few other '7800s, but it is not common. A permanent cure was in process, but they first suggested that I replace Q214, a buffer transistor, with one having a lower F_T . The replacement transistor Heath suggested I use was not on hand, but a comparison of specifications indicated that a 2N2222A might be a suitable replacement.

I removed the old transistor, installed a 2N2222A and tested the circuit before replacing the synthesizer board on the chassis. The display worked fine. When the board was fastened to

the chassis, however, the counter did not work above 28 MHz. I eventually shipped the radio to Heath for inspection. One of Heath's engineers called me after a few days and informed me that I had transposed the center and shield conductors of a coaxial-cable jumper on the underside of the synthesizer board. The cable leads are easily transposed because the conductors are inserted from the underside of the board, while the connection labels are on the top side. Now that the jumper is properly wired and the replacement transistors are installed, the counter and display work fine.

The Circuit

Simplified block diagrams of the receiver (A) and synthesizer (B) boards are shown in Fig. 1. Signals enter the receiver section of the '7800 through one of six diode-switched, one-octave,

*Senior Technical Editor

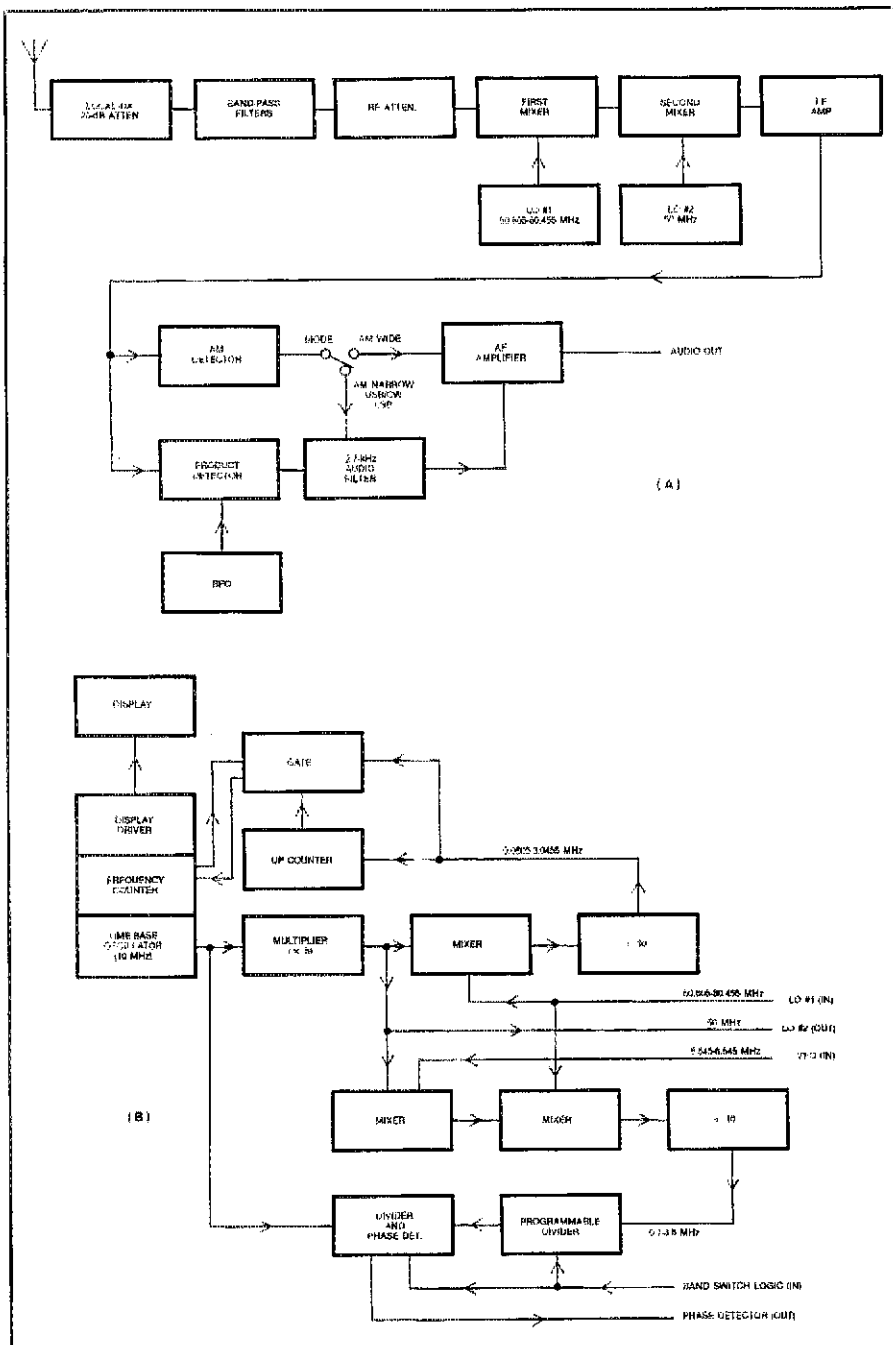


Fig. 1 — Simplified block diagrams of the SW-7800 receiver (A) and synthesizer (B) circuits.

band-pass filters. A PIN diode, with bias current established by the RF ATTEN control on the front panel, serves as a variable attenuator before the signal passes to the first mixer. There are no RF amplifier stages. AGC is sensed at the AM detector and applied at the IF amplifier. Slow and fast AGC constants can be selected from the front panel, but the AGC cannot be defeated completely. The normal AM bandwidth is 5.5 kHz (between -6 dB points). A three-stage active audio filter reduces the passband to 2.7 kHz for narrow AM, CW and SSB reception. When the rear-panel MUTE connection is grounded, the IF amplifier and active filter are disabled to mute the receiver.

The synthesizer board holds the frequency

counter and phase-detection circuits. An ICM7216D LSI IC performs as a 10-MHz time base, counter and display driver. A multiplier increases the time base to 30 MHz for use in the counter and phase-detect chains and as LO (local oscillator) 2. A mixer chain uses LO 1, LO 2 and the VFO signal to provide a counter input 455 kHz above the receive frequency. In order to produce a display of the true frequency, a programmable up-counter and gate prevent those pulses that correspond to the first 455 kHz from reaching the input of the frequency counter. Removal of one jumper and connection of another allows the counter to read external frequencies with amplitudes of 30 mV or more up to 40 MHz, but the count shown is 10 times the

actual frequency. The phase-detection process mixes VFO, LO 1 and LO 2 signals to produce a frequency between 7 and 36 MHz. Band-switch information, from the controller board, sets programmable dividers so that the 7- to 36-MHz signal is reduced to 100 kHz for comparison in the phase detector. The resulting error voltage is then routed to the controller board and LO 1, the VCO.

The controller board processes information from the band switch and uses it to select the appropriate input filter and VCO range. Two oscillators, a dc-to-dc converter and an RF detector (for use during receiver alignment) also reside on the controller board. A Hartley configured FET VCO tunes from 50.605 to 80.455 MHz in three ranges. The VFO uses an FET in a Colpitts circuit that tunes from 5.4 to 6.7 MHz. (The VFO is used only in the PLL scheme; it is not used in the actual reception process.) A dc-to-dc converter, running at 30 kHz, changes 13.8 V to 15 V for operation from dc supplies.

Controls

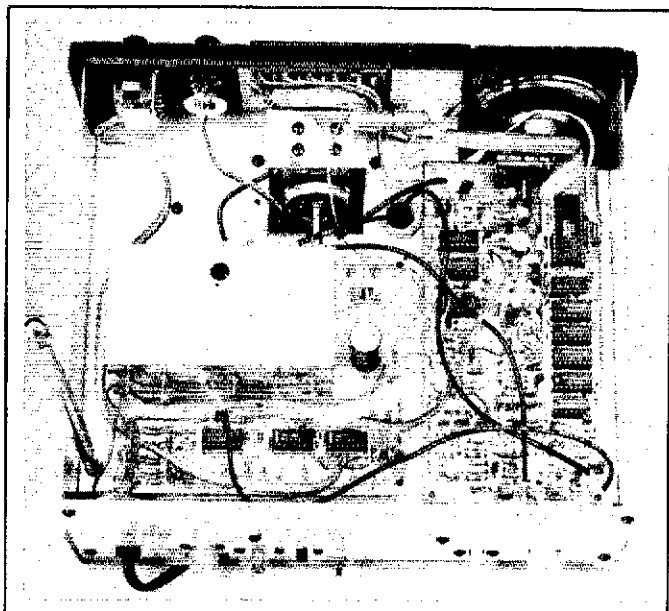
There are few controls on the SW-7800, and most are self-explanatory. The front panel holds the speaker, S meter, frequency display, AGC (SLOW, FAST) switch, PHONES jack (1/4 inch, 8 Ω), RECORD jack (1/8 inch, no specified impedance), tuning knob, RF ATTENUATOR control, BAND switch, MODE switch and VOLUME control. The frequency display has five 7/16-in.-high, red LED digits and provides 1-kHz resolution. A LOCAL/DX switch on the rear panel activates a 20-dB attenuator for strong-signal conditions (more on this later). Also on the back panel are terminal posts for HI-Z antenna and GROUND connections, an SO-239 connector for 50-Ω antenna, MUTE (phono jack) and EXT POWER (two-conductor, nylon, 13.8 V, 0.75 A). In addition, a 54-inch collapsible antenna screws onto the chassis through a hole in the top panel.

The true frequency counter in the '7800 eliminates some possible control problems: (1) Some microprocessor-controlled radios take display information directly from the control processor. Such displays have no connection to the oscillator or synthesizer chain and may not reflect a malfunction in those circuits. (2) Dial backlash can cause inaccurate readings in the mechanical frequency displays of some VFO-tuned receivers. The '7800 counter/display circuitry eliminates both of these problems because the operation of all frequency-determining circuits is reflected in the count.

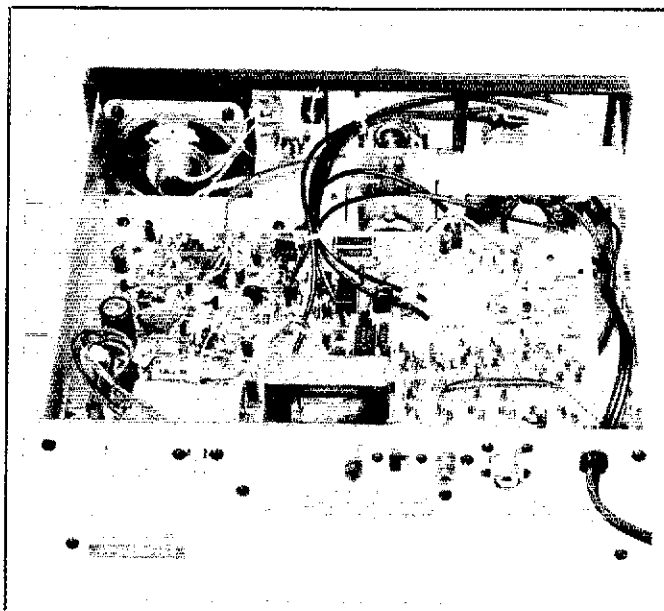
Performance

Heath personnel have told me that sensitivity was a major consideration in the design of the SW-7800. The minimum discernible signal is -130 dBm, which is quite good for a shortwave (non-ham) receiver. Unfortunately, the IMD dynamic range of this radio limits its sensitivity when strong signals are near the weak ones. A fairly strong, clear signal is necessary for good reception.

As an example, while I was using the radio on 4.993 MHz, I heard a group of loud CW signals. Some of the stations were calling CQ, and I was surprised to hear several W8 prefixes on the call signs. When the 20-dB attenuator was switched on, the extraneous signals disappeared. (Heath recommends use of this attenuator when receiving frequencies below 2 MHz.) Apparently, strong signals at my location demand its use on higher frequencies. (Of course, 20 dB of attenuation decreases the sensitivity to -110 dBm.) I had



A top view of the SW-7800, showing the controller board (lower left) and synthesizer board (right). The screw-on whip antenna is in place at the lower-left corner of the chassis.



This bottom view shows the back-panel connections and switch. Inside is the receiver board with ac-operated power supply (lower left) and diode-switched band-pass filters (lower right).

a similar experience with an AM broadcast station, which was "received" on 3.6 MHz.

The radio is relatively free from birdies. It has about 10 weak noises per 1-MHz band. Only three or four on each band are loud enough to be disturbing in the SSB mode. When subjected to strong signals, mixing products appear everywhere, but they indicate that the rear-panel switch should be in the LOCAL position.

My SW-7800 drifts about 3 kHz in the first hour after I turn it on. This is not bad, considering that the set has a 2.7-kHz minimum pass-band. The fellows at Heath, however, tell me that they are working on modifications to further reduce the drift.

The SW-7800 performance is consistent with its price range and market. I would not choose it for my only amateur receiver, however. Most transceivers offer much better performance. The radio is suitable for the casual SWL or as a ham shack add-on. There is extensive use of ICs and digital-control techniques. Much can be learned about control and basic PLL operations from a study of the schematic and circuit description. Thus, the kit should also appeal to the digital-electronics student or those interested in learning about the application of ICs in communications radios. The SW-7800 is available from the Heath Company, Benton Harbor, MI 49022, tel. 800-253-0570. Price class: \$350. — *Bob Schetgen, KU7G*

TRIO-KENWOOD TH-21AT 2-METER FM HAND-HELD TRANSCEIVER

□ Ho hum, another hand-held rig. You've seen one, you've seen them all, right? Wrong! Kenwood's latest offering for the 2-meter FM masses is so small that it fits comfortably in a shirt pocket. Take a quick look at the dimensions in the accompanying table and you'll see that this "baby" radio is only marginally larger than a pack of 100-mm cigarettes.

Features

What else does this tiny jewel offer? For starters, it packs a 2-W wallop and covers the entire band from 144 to 148 MHz, and then some. A DTMF pad is built in for the autopatch crowd; and, of course, it comes complete with a NiCd battery pack and wall charger. Receiver sensitivity is right up there with the best of the mobile and base-station rigs, and the 0.4-W audio amplifier and 2-inch speaker are enough for even the noisiest locations.

Like most of the truly well-engineered things in life, the TH-21AT is simple and straight-

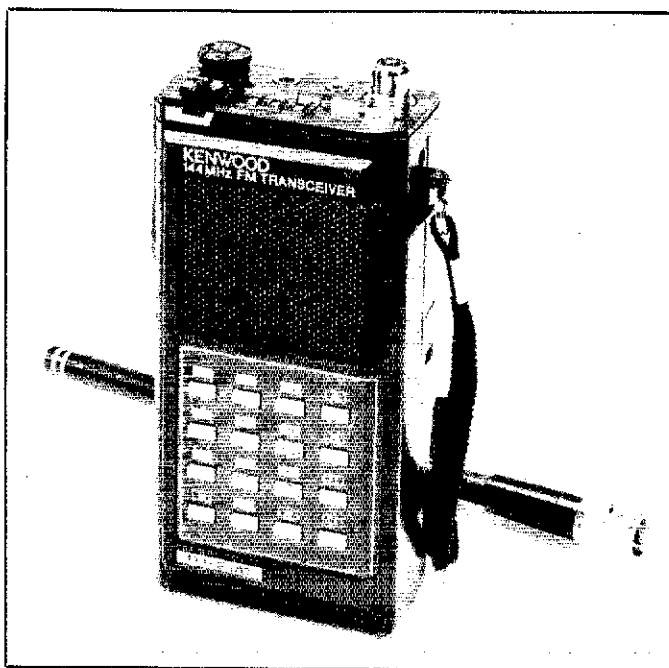
forward. The only controls are those essential to operation. Frequency display and selection are handled by thumbwheel switches. The first section sets the MHz range — 4 for 144, 5 for 145, and so forth. The second section sets the 100-kHz range, while the third sets the 10-kHz range. For example, 545 on the thumbwheel corresponds to a receive frequency of 145.450 MHz. Just press the +5kHz switch if you need to go in between the 10-kHz steps afforded by the thumbwheel. There's a switch on the back of the transceiver to choose the transmitter offset: -600 kHz, simplex or +600 kHz.

There are only a few other switches on the TH-21AT. The volume control doubles as the power switch, and it sits right above the squelch control. A TONE switch activates the optional

TU-6 tone-burst generator (the review unit was not so equipped), while the HI/LO switch on the rear panel selects full transmitter power or battery-saving flea power.

The review unit was equipped with several useful options. The SC-8T soft case protects the TH-21AT from damage. This vinyl case has cutouts for all the controls and features a clear plastic cover for the keypad area. I had some trouble getting the transceiver to fit inside the case at first, but it was easier after a few tries — sort of like learning to diaper a baby. The SC-8T also includes a belt hook.

If you're going to use the belt hook, check out the SMC-30 external speaker/microphone option. This accessory plugs into the top of the transceiver and functions as an external speaker on receive



Tri-Kenwood TH-21AT 2-Meter FM Hand-Held Transceiver, Serial no. 5042641

Manufacturer's Claimed Specifications

Frequency coverage: 144.0 to 148.0 MHz.
Mode of operation: FM.
Frequency display: Not specified.
Frequency resolution: 5 kHz.
Transmitter output power: High power, 1.0 W;
low power, 150 mW.
Harmonic suppression: Not specified.
Spurious suppression: Not specified.
Receiver sensitivity: S/N more than 28 dB at 0.5- μ V input
12-dB SINAD; less than 0.25 μ V.
Squeal sensitivity: Less than 0.25 μ V.
Receiver audio output at 10% THD: More than 250 mW.
Color: Black.
Weight: 9.9 oz incl. antenna and NiCd battery pack.
Size (HWD): 4.7 x 2.25 x 1.1 in.

Measured in ARRL Lab

140.000 to 149.995 MHz.
As specified.
Thumbwheel switch.
As specified.
High power, 2.25 W; low power,
1.0 W.
68 dB (see Fig. 2).
68 dB (see Fig. 2).
0.21 μ V for 20 dB quieting; 0.17 μ V for
12-dB SINAD.
Min. 0.8 μ V; max. 0.31 μ V.
380 mW.

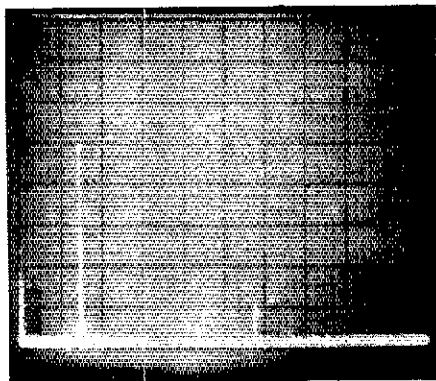


Fig. 2 — Spectral display of the TH-21AT. Power output is 2.2 W at 146 MHz. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The amplitude of the fundamental has been notched approximately 30 dB by means of notch filters to prevent analyzer overload. All spurious and harmonic emissions are at least 68 dB below peak fundamental output. The TH-21AT complies with current FCC specifications for spectral purity.

does not have an external power jack. Kenwood does offer, however, an optional dc-to-dc converter (DC-21) for operation from a 12- or 13.8-V dc power source.

Operation

The TH-21AT performed flawlessly during the review period. It took me only a few minutes to read the manual and become familiar with the controls. This rig is so small that you can take it virtually anywhere without worrying about nonhams pointing and talking in hushed tones about the radio on your belt. Remove the antenna and the TH-21AT becomes practically invisible in a shirt, suit or coat pocket. If you want to leave it in the car, it will lie concealed under the seat of even the smallest sport coupe. Perhaps the greatest worry is remembering where you left it.

A versatile piece of gear, the TH-21AT is just the rig to take for portable operation at a hamfest or mobile (with or without a roof antenna). It's also the heart of a functional base-station setup, especially with an external power supply, the SMC-30 speaker/mic and an outdoor antenna. I had no problem keeping in touch with friends from the car when I used the rubber duck antenna and several Hartford-area repeaters. From home, with an outdoor antenna, I could work into the WIAW repeater, 20 hilly miles away. The repeater was excellent copy, and I was practically full quieting with low power.

Like other hand-held rigs with thumbwheel switches, the TH-21AT is not so convenient when you want to change frequency. It's difficult to select the right frequency when driving (especially at night), but it is possible with some practice. Safe driving must always come first, so in that regard a transceiver with a lighted display and memories might be better.

That's it in a nutshell. This small wonder does the basics very well without all the bells and whistles. If you can live without the gadgets, the TH-21AT offers basic value and performance in an unmatched package. Manufacturer: Tri-Kenwood Communications, 1111 West Walnut St., Compton, CA 90220, tel. 213-639-9000. Price class: TH-21AT, \$230; SMC-30, \$35; SC-8T, \$10; AJ-3, \$6.50. — *Mark J. Wilson, AA2Z*

necter used with the standard "rubber duck" and converts it to a female BNC connector so you can use the hand-held radio with an external antenna.

Battery

The TH-21AT is equipped with a 180-mAh NiCd battery pack and wall charger. A full charge takes eight hours and can last all day or less than an hour, depending on how much transmitting you do. An optional BT-2 battery case that holds AAA alkaline cells is available. For extended portable operation, Kenwood recommends the optional BB-2 C-cell holder. Neither of these options was tried during the review.

Nominal supply voltage is 7.2, so the transceiver

and a microphone on transmit. The SMC-30 has a coiled umbilical cord long enough to allow freedom of movement with the TH-21AT attached to the belt, and it even has a nifty clip so you can attach it to your shirt pocket or jacket lapel.

The accessory that received the most use during the review period was the AJ-3 antenna adapter. This device takes the threaded phono antenna con-

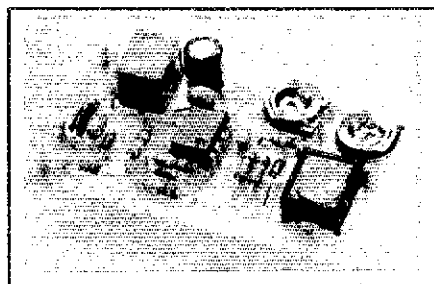
New Products

AMATEUR ASSOCIATES LTD. PEP MODULE

Amateur Associates Ltd. brings to the amateur market a module that can turn practically any in-line wattmeter into a PEP-reading wattmeter. The module consists of a PC board with one IC and a number of discrete components. Measuring only 1-1/4 by 2-1/8 inches, the board can be mounted inside most wattmeter housings; a single screw and stand-off (provided) or double-sided tape will hold it in place.

Wiring this module to a wattmeter is easy. First, remove the wire leading to the (+) terminal on the back of the analog meter (providing dc to the meter movement). Reconnect this wire to the input of the PEP module. Next, solder the

two wires leading from the output of the module to the (+) and (-) terminals of the meter. That's all there is to it! Sensitive RF portions of the wattmeter are left untouched. The instruction sheet gives additional information for wiring a



DPDT switch to allow either PEP or normal wattmeter readings to be taken.

Any voltage between 3- and 14-V dc will power the circuit. Three AA penlight cells are suggested, and will provide about nine months of continuous-duty operation.

To calibrate the PEP module, only a CW transmitter and dummy load are required. Simply record a power reading from the wattmeter before installing the module; after installation, adjust the coarse- and fine-tune potentiometers for this same power reading. In operation, the PEP module will cause the wattmeter needle to travel rapidly up scale but slowly down scale, allowing the peak power of an SSB signal to be monitored.

The PEP module is available from Amateur Accessories Ltd., Glan Conway, Colwyn Bay, Clwyd, Wales LL28 5LS, U.K. Price class: \$15. — *Greg Bonaguide, WA1VUG*

Hints and Kinks

[This month's column was compiled by Jeffrey W. Ward, K8KA]

FLEXIBLE WORK LIGHT

□ This inexpensive yet versatile work light can be assembled from readily available parts. It features a small light source that can be easily positioned to illuminate just about any corner of a chassis or other project where soldering, assembly or probing is needed. The lamp is completely insulated, so there is no danger of short circuits to the metal reflector or gooseneck of a conventional work light. For special situations, it is a simple matter to screw in a different length gooseneck.

The following discussion refers to the parts as labeled in Fig. 1. Part A is a 117-V lamp bulb with a small candelabra-style screw base. These lamps are available in 4- or 7-W versions.

The rotatable lamp shield is shown as part B. The shield portion is made from a 1-1/8 inch diameter plastic tube 2 inches long. A piece just the right size can be obtained by cutting the flanges off the plastic spool that Radio Shack solder comes on. Cement a 3/16-inch-thick by 7/8-inch-long piece of foam rubber into the end that slips over part C. The resulting snug fit permits rotating the shield to direct light where you want it. Line the inside of the plastic shield with black electrical tape to prevent glare.

Part C is a plastic, candelabra-type, screw-base socket. Such sockets are available in electrical supply stores and hardware stores. I used a socket made by Leviton that has two sharp pins to pierce the wire insulation when the end cap is screwed on. After assembly, apply epoxy to seal the cap onto the socket.

The gooseneck, part D, is the principal means of adjusting the lamp position. It consists of a

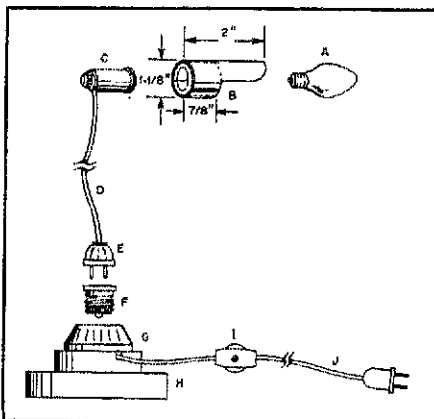


Fig. 1 — Construction details of the flexible work light.

12-inch length of plastic-jacketed, 14-gauge solid-copper, two-conductor cable. If your cable has a ground wire, pull the ground wire out and discard it. The cable is flexible yet stiff enough to retain its shape when bent to the desired configuration. Attach one end of the cable to the socket, part C, and wire a bakelite (not rubber) plug, part E, on the other end. File the round cable-entrance hole into an oval shape to make a tight fit for the gooseneck cable. Attach an adaptor socket, part F, to the plug, and apply epoxy to the joint, ensuring a wobble-free connection.

The base of the lamp is a keyless porcelain ceiling receptacle, part G, with a circular hardwood base, part H. The base should be large enough to be clamped to the bench using a C-clamp. It should also be heavy enough to keep the lamp from falling over.

To complete construction, wire an in-line switch (part I) onto a line cord (part J). You should now have a very handy bench accessory that will ease the frustration of working in dark, restricted locations. — *John T. Bailey, Short Hills, New Jersey*

TR-7400 ALTERNATOR WHINE

□ It was easy to tell when WB2MBW ("My Beautiful Wife") came on the air with her Kenwood TR-7400A in her 1973 Thunderbird — she was identified by alternator whine on her transmitted signal. The noise was clearly alternator whine, since it varied in pitch with engine speed.

Recently, we had occasion to use her rig in another car. Lo and behold, the whine moved with the rig! A quick check with my TR-7400A in her car and her TR-7400A in my car showed that the "alternator whine" went with the radio and not with the car.

A phone call to Trio-Kenwood solved the problem. Some of the circuit-board mounting screws were loose! We checked, and most of the screws could be tightened further, and several were barely finger-tight. After tightening all the circuit-board mounting screws, an on-the-air check verified that the whine was gone. [When tightening the screws, it is a good idea to place star lockwashers under the screw heads. The lockwashers make good electrical contact between the screw and the PC board — Ed.] — *Dick Duane, WB2VAT, Long Valley, New Jersey*

TS-520 WAVEFORM SHAPER

□ Here's a nifty idea for CW buffs who own Kenwood TS-520S or TS-520SE transceivers. A

conversation with a fellow ham on 80 meters one night netted me this easy, inexpensive modification to soften the '520 keying.

Fig. 2 shows a capacitor across the key jack, and an inductor in series with the key. The capacitor is a 100-V Mylar unit with between 0.4 and 0.6 μF of capacitance. Choose a value that results in a pleasant keying waveform. The inductor uses an iron-core toroid (about 1/2-inch-OD, T50-2 mix or equiv.). The inductor value is not critical, so try using a core from your junk box. The core is wound with 30 to 40 turns of no. 26 enameled wire.

After you have installed this circuit, you can get a fair idea of your keying waveshape by listening to the CW sidetone. The effect of the circuit is similar to a slightly heavy weighting, and the sound is almost bell-like — a joy to copy. The waveform shaper also makes your signal distinctive in a pile-up. Under QRM or weak-signal conditions, however, the standard "hard" keying will punch through better.

On-the-air reports are encouraging, with most operators preferring the soft keying for general-purpose ragchewing. High-speed operators may prefer to use a smaller capacitor to avoid "blurring" characters. I mounted the components on a perfboard and installed it inside my Heath keyer. A switch on the front panel allows me to put the shaper in or out of the circuit. My thanks to Dick Jaeger, W3DP, for this neat modification. — *Bruce Cope, KB3LF, Bethlehem, Pennsylvania*

[This item was adapted from an article in the Delaware-Lehigh Amateur Radio Club newsletter. — Ed.]

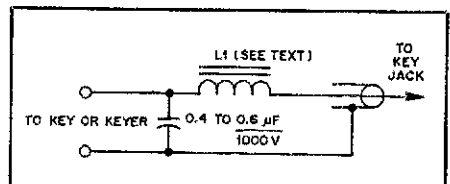


Fig. 2 — CW waveshaping circuit for the TS-520S. Component values are not critical.

12-V OPERATION FOR THE TR-2400

□ Several circuits have appeared on the market and in publications that enable the Kenwood TR-2400, which needs a 9.4-V supply, to be driven from a 12- or 14-V car supply. These circuits are encased in separate chassis boxes and

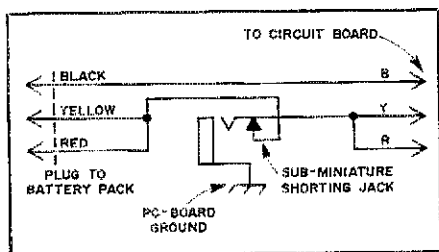


Fig. 3 — Circuit diagram showing insertion of subminiature jack in series with power-supply cable for the TR-2400.

plug into the charge jack on the TR-2400. To use one of these circuits, you must modify the battery wiring and the TONE switch, and you must be willing to tie up your charge jack. In the case of the TR-2400, this prevents the use of the external speaker/mic and, of course, the TONE switch.

Using the simple modification indicated in Fig. 3, the integrity of the external speaker/mic and TONE switch is maintained. A subminiature closed-circuit jack is placed in series with the yellow and red wires that run between the battery and the TR-2400 circuit board. When no plug is inserted in the jack, power is supplied to the board from the battery. When a plug is connected to the 12-V source is inserted in the jack, the rig is powered by that source.

One advantage of this modification is that there is no memory loss when switching from battery to external power; the 12 V (connected to the tip of the plug) is applied to the rig before the battery line is broken. Remember to insert the plug quickly, to avoid grounding the tip of the plug to the jack during this "hot switching."

Mount the subminiature jack on the same side of the case as the push-to-talk switch. A sharp drill is used to place a hole in the plastic case. Use care to prevent cracking the case. Place a small piece of electrical tape on the circuit-board ground strip to prevent the jack terminals from touching the ground strip if the jack is placed too close to the edge of the cover.

This modification allows you to run your TR-2400 from a 12-V supply without forcing you to sacrifice the TONE switch or the external speaker/microphone. With very little effort, you can make your TR-2400 a truly versatile rig. — Stan Zuk, K2SJO, Rye Brook, New York

MODIFIED BUTTERNUT VERTICAL FOR 80-METER OPERATION

Most amateurs know that shortened (inductively loaded) antennas exhibit a relatively narrow bandwidth. Most multiband vertical antennas have quite a bit of inductive loading, at least on the lowest one or two bands. They perform satisfactorily only over a narrow frequency range within these bands.

I became tired of readjusting my Butternut HF6V vertical antenna on 80 meters every time I switched from phone to CW operation, and vice versa. Although a Transmatch allowed me to feed the antenna over the entire 80-meter band with a low SWR at the transmitter end, I felt that the antenna was performing poorly when I was operating more than about 30 kHz from the resonant frequency. The HF6V antenna is only 26 feet long. If a shortened antenna shows a low SWR over a wide frequency range, it probably indicates that the ground system and/or feed line

is so lossy that the overall radiation efficiency of the antenna system has been greatly reduced.

Unlike most multiband verticals, the Butternut HF6V antenna uses an external air-wound inductor near the bottom of the mast as an 80-meter loading coil. The lower end of the coil is electrically and mechanically fastened to the mast with an aluminum clamp that is secured with a bolt and wing nut. The antenna is tuned to resonance by loosening the wing nut and stretching or compressing the coil.

To make it easier to set up the antenna for optimum performance in either of two preselected band segments, I installed a tap at about 2½ turns from the bottom of the coil. With this tap connected to the bottom end of the coil, I could operate on the phone segment (around 3795 kHz). If the tap was left open, I could operate on the CW segment (around 3505 kHz). Although I was able to shift between band segments quickly and accurately without loosening the wing nut, I was unhappy with the need to change the tap manually.

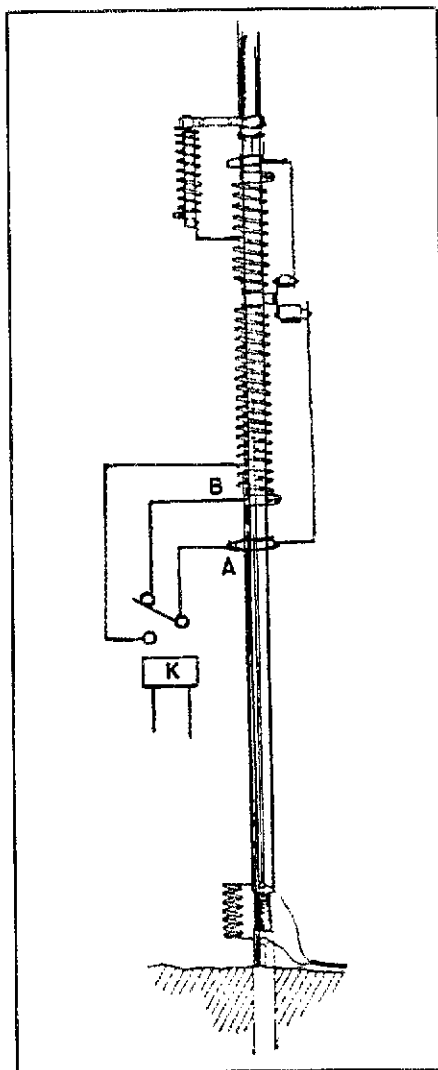


Fig. 4 — Diagram of the Butternut HF6V antenna, showing the addition of a relay and coil tap to enable operation on two segments of the 80-meter band. A is the attachment point for the movable relay contact, and B shows where the bottom coil clamp should be insulated from the mast.

To solve that problem, I installed a medium-power SPDT relay in a plastic refrigerator box and taped the box to the antenna mast just below the coil. The movable relay contact connects to the mast at the point where the shorting capacitor strap is clamped (see Fig. 4, point A). The normally open relay contact connects to the tap, and the normally closed contact goes to the bottom of the coil. When the relay is closed, the applied inductance is less than when the relay is released. I energize the relay to operate on the phone segment of the band.

To avoid circulating-current losses caused by shorted turns when the tap is connected, I wrapped the mast with polyethylene tape under the lower coil clamp (point B on Fig. 4). This effectively insulates the bottom end of the coil from the mast.

After installing and connecting the relay (keep all leads as short as possible), adjust the coil length to set the desired lower operating frequency. Because of the distributed inductance and capacitance of the relay leads, this setting will be different than it was without the relay connected. Once the lower operating frequency has been established, adjust the tap position for the desired upper operating frequency. These changes did not affect the operation of my antenna on any of the other bands.

You could run a separate control line for the relay, but I used the coaxial-cable feed line for that purpose. Fig. 5 illustrates the connection scheme. The purpose of the two capacitors labeled C1 is to keep the control voltage from traveling down the cable to the transmitter or antenna. The RF chokes prevent the radio signal from getting into the relay voltage source or relay coil, and the capacitors labeled C2 shunt any stray RF to ground. There is nothing critical about the component values, but they must exhibit appropriate reactances at RF and the relay-voltage frequency to route the signals to their proper places.

I now enjoy remote-controlled operation in either of two widely separated segments of the 80-meter band. The SWR at the center of each segment is nearly 1:1 after careful adjustment. — Robert Snyder, KE2S, New York, New York

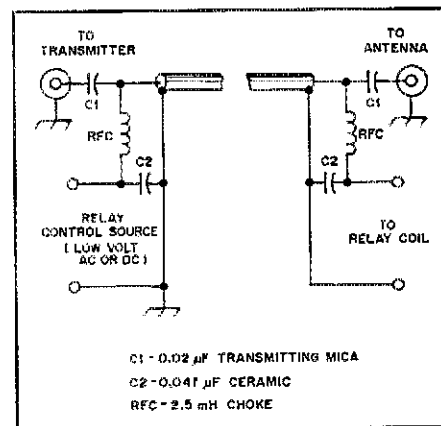


Fig. 5 — Schematic diagram showing the components required to use the coaxial-cable feed line to carry the relay-coil operating current. C1 must be a transmitting-type mica capacitor capable of withstanding the full transmitter power. C2 is a ceramic unit rated to handle the relay-coil voltage. The RF chokes must be made from wire heavy enough to carry the relay current without appreciable voltage drop.

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

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

BUILD A DUMMY DIPOLE!

□ The review of the Maxcom Antenna Matcher in Nov. 1984 *QST* fascinated me. In fact, I was so stimulated by the article that I promptly constructed a "Dummy Dipole" patterned along similar lines. First, I mounted a 50-Ω Globar® noninductive resistor (of unknown power rating) and an SO-239 connector on a piece of 3/16-inch-thick Lucite®, and then attached two 50-ft dipole legs. The antenna was installed as an inverted-V with the apex about 22 ft above ground (see Fig. 1).

I wondered how well the system would radiate a signal — replies to test calls were sometimes heard when using a light bulb as a dummy load in the "old days." The results certainly are surprising! The IC-730 protective circuitry did not reduce output power, the SWR was negligible on all ham bands, and within 15 minutes of completing the installation, I worked the three stations listed in Table 1.

My next effort was to try the dummy matcher across the feed point of my delta-loop antenna. The loop is oriented horizontally, 25 ft above the ground. One corner of the triangle is to the north, another is to the south, and the feed is at the third corner, in the west. The perimeter of the loop is 260 ft, and it was previously fed with 300-Ω line and a Transmatch.

Results with the delta loop do not seem as good as those with the dipole. The SWR is flat across all bands, however, and the rig loads perfectly. Initial tests yielded the contacts shown in Table 2. Helmut, HB0CBJ, could hear me when I used the "Delta Dummy," but did not have solid copy.

Since my original tests, additional work with

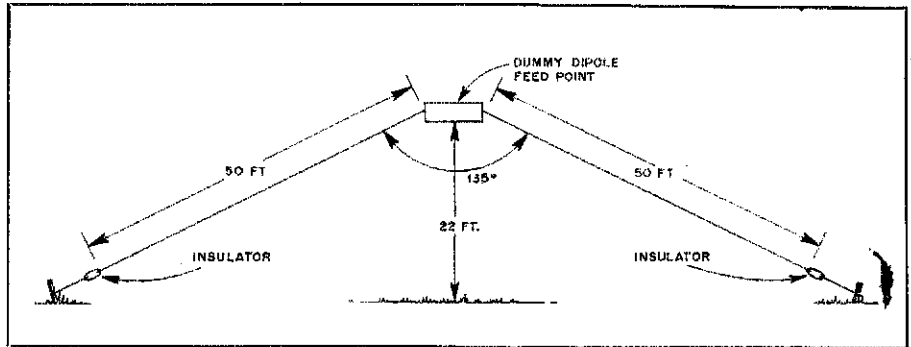


Fig. 1 — K3FGB's Dummy Dipole antenna. The ends are 3-4 ft above the earth. [Keep the ends of all transmitting antennas several feet from the reach of passersby. — Ed.]

the Dummy Dipole and the Delta Dummy has led me to the following conclusions:

1) Resistance-loaded antennas are not as efficient as a resonant dipole or delta loop on a given frequency, but they permit all-band operation from 1.8-144 MHz with SWR-protected transceivers. Incidentally, the Delta Dummy system works well enough for local repeater work on 2 meters.

2) A 1-kW model can be assembled with all new parts for \$20. (The noninductive resistors in the Heath and MFJ paint-can dummy loads can probably dissipate 1 kW in SSB or CW service. MFJ sells the resistor for \$15.)

Fig. 2 shows a second model. Twelve 150-Ω, 15-W resistors can dissipate 180 W continuously and should handle 1 kW for low-duty-cycle applications (SSB and CW). Lucite is used to reinforce the lid of a plastic food-storage container. Alternative packages could be fabricated from plastic pipe fittings.

3) If the builder is not satisfied with the resistance-loaded feed point, the feed system is not lost — a dummy load is gained!

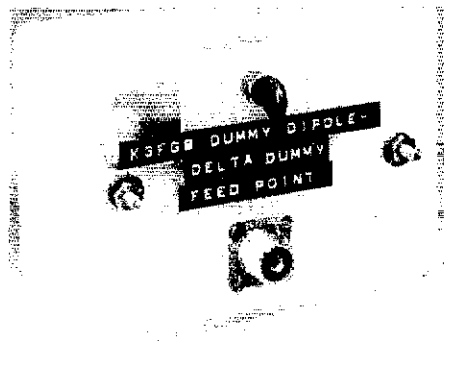
*Technical Editorial Assistant

Table 1
Initial contacts with the Dummy Dipole

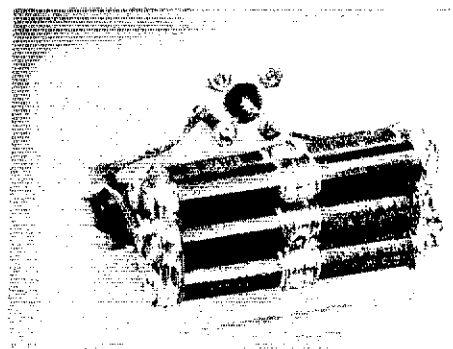
Date	Freq.	Mode	UTC	Call	Location
10/30/84	14.200	SSB	0455	W3IOW	Pittsburgh, PA
	3.900	SSB	0505	N4JST	West Palm Beach, FL
	14.200	SSB	0552	HH6MV	Cape Haitien, Haiti

Table 2
Initial contacts with the Delta Dummy

Date	Freq.	Mode	UTC	Call	Location
10/31/84	7.200	SSB	1237	W5RUT	Biloxi, MS
	14.200	SSB	1240	N1CJQ	Avon, CT
	14.200	SSB	1302	W2FMR	Levittown, NY
	14.200	SSB	1315	WB3DFQ	Greensboro, MD
	21.300	SSB	1338	HB0CBJ	Liechtenstein



(A)



(B)

Fig. 2 — Outside (A) and inside (B) views of the K3FGB Dummy Dipole feed point.

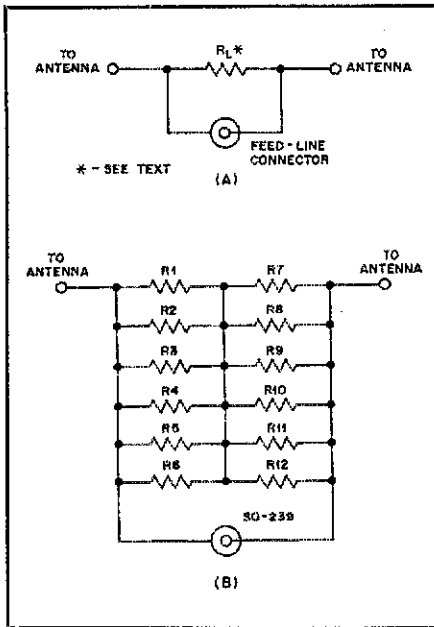


Fig. 3 — The Dummy Dipole feed-point circuit places a load resistance, R_L , across the antenna feed point at (A). The resistance can be assembled from any combination of non-inductive resistors that provide the desired resistance and power rating. A schematic of the unit in Fig. 2 appears at (B).

R1-R12 — 150- Ω , 15-W noninductive resistors.

The most difficult aspect of assembling the unit in Figs. 2 and 3 is connecting the block of resistors. I use a technique known as "whipping" in my Navy days. Wrap each end of each resistor with thin, bare, copper wire. Then, tie the individual resistors together with additional wire and solder the connections. This problem can be eliminated by using a single resistor of appropriate value and power rating.

My data is offered on a "seat-of-the-pants" basis. Perhaps someone could make measurements to determine what percentage of the power is dissipated in the load resistor. I feel that the loop antenna is about 24 dB down from my beam, but I have no reference dipole for comparison. I would also like to make some tests with R_L in the far side of the loop, opposite the feed point.

My greatest thrill from the project is duplication of an expensive commercial product for a few dollars. This is very satisfying to a ham who had to "do it yourself" in the 1930s. I have thoroughly enjoyed diddling with the Dummy Dipole and the Delta Dummy, but I hope you won't classify me as the "dauntless Dummy Designer." — *Mort Slavin, K3FGB, West Palm Beach, Florida*

□ There are two kinds of resistive loading in use to broaden the response of antenna systems. One method connects all open-circuit antenna ends to ground through a resistance. The other method places a resistance across the antenna feed point. Mr. Slavin's letter discusses the second method, and I will analyze that case.

For an accurate idea of the effect of a loading resistor, R_L , we must examine two aspects of the antenna system. First, we must consider the distribution of power between the antenna radiation resistance (R_R) and R_L . Second, we must

Table 3

Data for 3.5 to 4 MHz with 50- Ω Line and a 50- Ω Resistor Across the Antenna Feed Point

Freq. MHz	Z	SWR		Loss (dB)
		Ant.	With R_L	
3.50	70 -j130.152	6.782	1.366	8.598
3.60	70 -j 76.969	3.514	1.512	6.121
3.70	70 -j 25.303	1.710	1.880	4.122
3.80	70 +j 24.967	1.702	1.880	4.114
3.90	70 +j 73.948	3.376	1.522	5.980
4.00	70 +j121.736	6.168	1.383	8.218

Table 4

Data for 14 to 14.35 MHz with 50- Ω Line and a 50- Ω Resistor Across the Antenna Feed Point

Freq. MHz	Z	SWR		Loss (dB)
		Ant.	With R_L	
14.00	70 -j23.417	1.670	1.884	4.077
14.10	70 -j10.000	1.453	1.706	3.854
14.20	70 +j 3.321	1.403	1.710	3.808
14.30	70 +j16.549	1.544	1.699	3.942
14.35	70 +j23.129	1.666	1.684	4.071

Table 5

Data for 3.5 to 4 MHz with 50- Ω Line and a 125- Ω Resistor Across the Antenna Feed Point

Freq. MHz	Z	SWR		Loss (dB)
		Ant.	With R_L	
3.50	70 -j130.152	6.782	2.003	5.436
3.60	70 -j 76.969	3.514	1.688	3.497
3.70	70 -j 25.303	1.710	1.252	2.131
3.80	70 +j 24.967	1.702	1.249	2.126
3.90	70 +j 73.948	3.376	1.683	3.395
4.00	70 +j121.736	6.168	1.962	5.124

determine the SWR both with and without R_L in the circuit.

Wes Hayward described an unbalanced, lumped-constant model of a nearly resonant dipole antenna in Technical Correspondence, July 1984 *QST*. The model consisted of a series-resonant circuit comprised of a resistor, inductor and capacitor with the following values:

$$R = 70 \Omega \quad (\text{Eq. 1})$$

$$L = \frac{150}{f_o} \quad (\text{Eq. 2})$$

$$C = \frac{1}{2\pi(f_o)L} \quad (\text{Eq. 3})$$

where

- f_o = resonant frequency, in hertz
- L = inductance, in henrys
- C = capacitance, in farads

This formula is valid only for antennas operated near their resonant frequency. It cannot approximate impedance over a range of frequencies wide enough to allow the possibility of harmonic resonance. The model is sufficient, however, for study of a selected amateur band.

Given a band of frequencies, we can calculate the values for the model components at the center of the band. Next, we must determine the impedance of the model circuit for a specific frequency of interest. The reflection coefficient of the network is calculated from the complex circuit impedance and the transmission-line impedance.¹ From the reflection coefficient, we can determine the SWR.² This is all we need know about the circuit without resistive loading.

We can include the effects of R_L by placing it across the series-resonant circuit. The result is a ladder network. To obtain the reflection coefficient of this network, transform the model series circuit to its parallel-equivalent circuit, add R_L to the parallel network (this circuit determines the power distribution), and transform the result back to a series-equivalent network.^{3,4} The reflection coefficient and SWR for the circuit with R_L are calculated from this series circuit.

Power is radiated according to a relationship of R_R and R_L :

$$\frac{P_R}{P_T} = \frac{R_{RP}}{R_L + R_{RP}} \quad (\text{Eq. 4})$$

Then,

$$\text{loss} = 10 \log \frac{P_R}{P_T} \text{ dB} \quad (\text{Eq. 5})$$

where

- P_R = radiated power
- P_T = total power fed to the antenna system
- R_{RP} = parallel-circuit equivalent of R_R
- R_L = loading resistance

The calculation of SWR without R_L , SWR with R_L and P_R loss with R_L was repeated at the desired frequency intervals by a computer program. The results for a 50- Ω R_L across 80-meter and 20-meter antennas are shown in Tables 3 and 4, respectively. We can see that the 20-meter antenna easily covers the entire band without any resistive matching, while the 80-meter antenna covers only about 150 kHz without loading. The loaded 80-meter system, however, shows more bandwidth than is necessary.

Since loss varies inversely with the value of R_L , repeated calculations can yield an R_L value that provides any desired SWR range, over an entire band, with minimum loss. Results for an 80-meter antenna with a 125- Ω R_L are shown in Table 5. SWR is limited to about 2:1 across the 80-meter band, with 5.43-dB loss at the band edge. A transmitter that supplies 100 W to this system at 3.5 MHz applies 28 W to the antenna and 72 W to R_L . This situation is adequate for world communication with favorable propagation, but the radiation efficiency of the system is low.

I do not have facilities for practical prediction of feed-point impedance of nonresonant antennas. Thus, I cannot analyze a resistance-loaded, single-wire antenna over the entire HF spectrum. Whenever the antenna leg length approaches a multiple of $\lambda/2$, though, losses will be very great.

— *Bob Schetgen, KU7G, Technical Editorial Assistant*

¹C. L. Hutchinson, ed., *The ARRL 1985 Handbook for the Radio Amateur* (Newington: ARRL, 1984), p. 16-1, Eq. 1.

²Hutchinson, p. 16-2, Eq. 2.

³Hutchinson, pp. 2-21 and 2-22.

⁴Hutchinson, pp. 2-36 and 2-37.

Young People: This One's for You!

With the help of a brand-new feature for young people, *QST* will be doing its part in the League's broad-based effort to attract qualified newcomers.

By Joel P. Kleinman,* N1BKE

If you were asked to draw a picture of the "average ham," would you draw a 12-year-old girl, or even a young man of 19? Probably not. You'd think first of a middle-aged man, perhaps 50 years old. And you'd be right on target!

As the January editorial pointed out, the average age of a ham in the U.S. is 49, and rising rapidly. In response to this trend, we're redoubling our efforts to recruit newcomers. In fact, from now until the end of the decade, we're out to introduce 50,000 people a year to the special wonders of Amateur Radio communication. By 1990, there will be about 600,000 licensed hams in the U.S.

It's a challenge we're meeting on several fronts: through ARRL's new Office of Development, schools, youth groups, clubs and a new generation of license manuals. Add to that the League's hard-working volunteer examiners, who are offering many, many more exam sessions than the FCC has in recent years, and we have a broad-based effort that will help ensure that the Amateur Radio Service remains strong and innovative well into the next century.

How can we hope to compete with computer camps, rock concerts and athletics? It won't be an easy job, but it'll be made easier by the fact that several "household names" in computers, rock music and athletics happen to be active, longtime hams.

And in This Column . . .

To help show newcomers what can be accomplished in Amateur Radio, *QST* will introduce a new column aimed at young people. Beginning in June, Making Waves will convey just how much fun Amateur Radio can be: the excitement of making that first DX contact, of showing classmates what it's like to talk to someone in Sri Lanka, of making a mark on the Amateur Radio world by winning the Novice Roundup or of earning a DX

Welcome to Making Waves

Hello, and welcome to my first article for and about young people. My name is Scott Springate. I am a 15-year-old General class licensee and carry the call N7DDM. I'm going to be writing a regular column, Making Waves, for *QST*.

I hope you will submit material to me on how you got involved in Amateur Radio at an early age, or have gotten the Worked All Continents Award, or whatever else you think readers will enjoy reading. I'd appreciate it if you'd send me good-quality, glossy photos, too (if you want them back, enclose a self-addressed, stamped envelope).

Now I'd like to talk about a couple of ideas I have for the column. Every so often I'd like to have a "question and answer month" to try and answer some of your questions about Amateur Radio. I'll pick out the best ones, research them and then report the answers, along with your name and call. I'm also interested in ham families and in unusual ways you might have found out about or gotten involved in Amateur Radio.

If you have any ideas or suggestions on the column, write me about them. The column needs your input and feedback if it's to work.

A few words about myself. My shack is presently set up in Eugene, Oregon, where I attend Winston Churchill High School. I was first licensed at age 11 and carried the call KA7JPW until later that year, when I upgraded to my present status as N7DDM. Besides ham radio I also enjoy tennis, piano and writing. In addition, our family enjoys sun-filled days of sailing. The rig I have is a Kenwood TS-520S, which runs into a triband beam on a crankup tower. My father is also a ham, but doesn't find much time to operate these days. His call is KC7HI, and he is an Advanced class licensee.


I hope to be hearing from many of you soon! — Scott Springate, N7DDM, 2095 Broadview, Eugene, OR 97405



New *QST* contributing editor Scott Springate, N7DDM, looks pleased at the prospect of putting together his first column for young people.

Century Club certificate as a 12-year-old.

The column will be written by Scott Springate, N7DDM, from Eugene, Oregon. Scott, who introduces himself elsewhere in this article, is exactly the type of young person we're working toward getting into Amateur Radio. With his enthusiasm and commitment, he should have no difficulty gaining an equally enthusiastic and dedicated readership.

We feel strongly that this effort will help attract — and keep — a new generation of top-notch operators and innovators that will make a lasting contribution to the Amateur Radio Service. All League members can do their part by promoting the excitement of Amateur Radio to friends, neighbors and family members. Please let us know how you like the new column, and encourage the young people you know to send articles and photos about themselves to Scott Springate. 

*Assistant Managing Editor, *QST*

Visits with the HANDI-HAMS

By Katherine Hevener,* WB8TDA

Recently, invitations from radio camps located near Maple Lake, Minnesota and Los Angeles gave me the excuse I needed to temporarily put aside deadlines, meetings and other routine office matters. As a relative newcomer, I observed code and theory courses and participated in seminars involving the art of radio-control flying, operating an Amateur Radio station on board a vessel, installing a permanent station on land and using adaptive techniques to construct electronic equipment. I also taught code classes and conducted seminars on operating skills and the ARRL field-organization structure.

The Courage HANDI-HAM System is a program of the Courage Center, a large facility in suburban Minneapolis, Minnesota, for persons with physical disabilities. HANDI-HAM membership is composed of individuals who are studying for their licenses and those who already have them. It also includes disabled and nondisabled hams who volunteer their time, effort and services to help the students. Study materials, equipment and personal assistance are provided to students working toward new or upgraded ham tickets, on a "pay what you can" basis. But each must learn the

material and earn his/her own license. The most important element in becoming a HANDI-HAM member is an intense personal desire to pass the exams. Although preparing for exams involves hard work and study, there's no thrill quite like that of passing.

What is radio camp? In one camper's opinion, "it's a learning and inspiring week." Another commented that it's "a place wherein people are given the freedom to make mistakes without the fear of ridicule." These one-week extravaganzas provide a relaxed atmosphere that makes it possible for both able-bodied and physically handicapped people from all walks of life to come together for the purpose of earning a new ham ticket or participating in recreational activities that they had believed were impossible to do.

Staffers from the HANDI-HAM system's parent organization, the Courage Center of Golden Valley, Minnesota, are professionals who provide outstanding personal attention to the special needs of the campers. Likewise, faculty members divide the campers into small study groups for each class of license. In addition to the classes, instructors are often found coaching students on an individual basis.

During their spare time, the campers may be found in a swimming pool, on a boat, riding a horse, hiking through a nature trail, pursuing a hot trivia game or toasting marshmallows over a glowing camp fire. Of course, these diversions serve to reduce

exam anxiety.

Highlights of the session included legendary food, station construction, boat packing and backpacking expeditions, induction into the Royal Order of the Wouff Hong, and a one-time special tutorial by the world-renowned Professor Hertzenspitter for those who were mystified by the obscure principles of electricity.

Because of the campers' intense desire to better themselves, staff, faculty and students alike return home at the end of the session with a heightened sense of self-worth that enables them to face life's challenges more easily.

But enough said. Experience radio camp for yourself. In this instance, a picture is clearly worth more than a thousand words.

*Coordinator, ARRL Program for the Disabled



Dr. Tom Linde, KZ0T, made QSO practice simpler, if not easier, with a Morse code program for the camp's Apple computer.



Camper Jan Gilbert finds her way around a hand-held radio with help from instructor Sean Kedney, N9EJ.



You're never too young to learn — or too old to teach. Alex Waters, one of the youngest radio campers, gets help with code practice from veteran instructor Ralph Andrea, W0FCO.



Tackling tough theory with Vicki Gooch (center) and Laura Robbins, instructor Ralph Andrea, W0FCO, was an ideal example of Radio Camp spirit — he was always there to help those who wanted to learn.

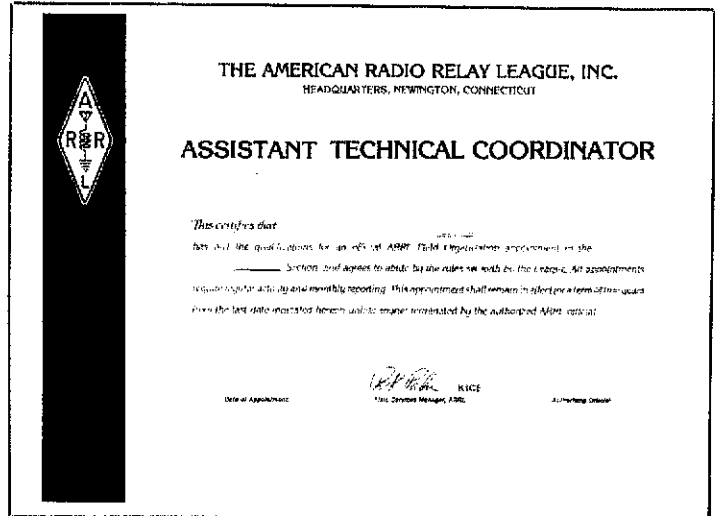


HANDI-HAM campers did not let their handicaps confine them to operating from land shacks. Here, Ron Peterson operates maritime mobile aboard a boat on Maple Lake. 55

ATC: New Kid on the ARRL Block

Wondering where to go for Technical or RFI assistance? To your friendly Assistant Technical Coordinator, of course!

By Rick Palm,* K1CE



In its continuing effort to fine-tune the League's important Field Organization, the ARRL Board of Directors recently approved the creation of a new appointment, the Assistant Technical Coordinator. This station-level post will be responsible for two critical areas in the local technical arena — RFI and technical information. With the Board's parallel action of transferring the OO/RFI Coordinator's "RFI" function to the Technical Coordinator, TCs will need much local support within a section to meet the demands of negotiating the ever-deepening RFI jungle. The Assistant Technical Coordinator will also help the TC respond to correspondence from section members on various technical topics.

Technical Information

The ATC will handle written correspondence from local members with technical questions about their antennas, rigs, and so forth. When appointed by the SM or TC, the ATC will be registered with Headquarters as official appointees; he or she will receive an attractive certificate and will be authorized to wear the distinctive blue League diamond lapel pin. ATCs will help newcomers and old-timers alike on questions ranging from "Is the red wire positive or negative or neutral?" to "Can I use insulated wire for my antenna?" and many, many more. The possibilities are almost limitless.

Gradually, during 1985 as the Headquarters Technical Information Service is phased out, general technical inquiries will be referred to the field ATCs. Some ATCs may have expertise in certain areas and may

*Field Services Manager

The Field Services Department — To Serve You Better

In a recent move to streamline the Headquarters operation to better serve our membership, all administrative support functions for Field Organization volunteers have been consolidated into one department, Field Services. Supporting the League's number one resource, the Field Organization, is our number one priority. With the Public Service and Field Organization branches, club and hamfest programs under one roof here at Hq., the Field Services Department will be your one-stop shopping center for all your field services needs. When thinking Field Organization, think Field Services Department! — Rick Palm, K1CE, Field Services Manager

offer to assist the Technical Coordinator with more involved or specialized requests or inquiries. Most of the ATCs' knowledge will likely be drawn from their own study and experience. An ATC Handbook, however, will help with lists of resources that have been used by Headquarters' own technical information staff.

Radio Frequency Interference

The ATC will also serve as an adviser to local hams and clubs having difficulties with neighbors and towns in RFI disputes. Every ham knows the trouble RFI can cause. It can drive an emotional wedge into neighbor relations, and cause frustration when an innocent ham must fight for his or her rights in front of a technically naive city council. RFI matters are best resolved at the local level by someone who knows the RFI game.

Enter the ATC. Not only will the effective ATC have a solid working knowledge of RFI, he or she will have a good diplomatic demeanor. Often, both sides of

an RFI dispute lose their objectivity as tempers flare. It will be the ATC with a cool head who will resolve the problem. The ATC will work with local TVI committees, CATV companies, power utilities, town and city boards, and, of course, hams, especially ARRL section leaders.

For the ATC function to be effective in ARRL's section structure, we'll need many, many ATCs. We're looking for you in local clubs, repeater groups, the electronics industry, everywhere.

The role of the ATC is a rewarding one. The local ham community will soon look toward the ATC as the local technical oracle — the price of fame. A respected ATC will soon find himself or herself with club and hamfest speaking dates and appointments to local industry and municipal advisory committees. The job's an important one, and one that will take experience, enthusiasm and expertise.

We Want You!

We want as many ATCs as we can possibly get to serve in one of the most important areas of Amateur Radio — the technical area. In fact, it says right at the beginning of Part 97 that we're responsible to the government for advancing the state of the technical art. With many ATCs per section, we'll be making great strides toward a renewed commitment to ourselves and our local communities, and national technical welfare.

To apply for an ATC post in your section, contact your ARRL Section Manager and/or Technical Coordinator. You may be appointed an ATC either directly by the SM or by the TC under delegated authority from the SM. The names and addresses of all Section Managers are listed on page 8 of your QST. Jump on the new ATC bandwagon!

- **No Waiting Period For VEC Exams?**
- **DOD Supports PRB-1**
- **ARRL Asks For Mode L Now**
- **Hq. Staff Meets With Cable TV Reps**

FCC Seeks Repeater-Coordination Comments; Imposes, Then Lifts, New-Repeater Moratorium

On January 30, the FCC released a Notice of Proposed Rule Making (NPRM) concerning repeater coordination (PR Docket 85-22). The FCC stated that the number of reported instances of amateur repeaters causing interference to one another in 1984 was more than three times the number recorded in 1983, and that most of the reported cases of amateur repeater-to-repeater interference appear to involve one or more non-coordinated repeaters. The NPRM proposes to add definitions of "coordinated repeater," "frequency coordinator" and "harmful interference" to Section 97.3, and to add a new paragraph (h) to Section 97.85 to read: "Where an amateur station in repeater operation causes harmful interference to the repeater operation of another amateur radio station, the two stations are each equally and fully responsible for resolving the interference unless one is coordinated [see 97.3 (k)] and the other is not. Where one repeater is coordinated and the other is not the station with the non-coordinated repeater has primary responsibility to resolve the interference."

The Commission requests comments from the amateur community on several issues concerning repeaters. The NPRM states, in part,

we seek comment on whether we should require an amateur operator to seek the recommendation of a local frequency coordinator for the input and output frequencies of any repeater located within a Consolidated Metropolitan Statistical Area (CMSA) or a Metropolitan Statistical Area (MSA) as set forth in government census documents . . .

We also request comments on whether we should consider alternative methods of frequency coordination. Additionally, we seek comment on whether the voluntary or required use of modern technological innovation (such as the use of narrow-band technologies, ACSB, or tone-operated squelch techniques) is a more appropriate or desirable solution . . . than the proposed solution. Comments are also sought with regard to whether the FCC should recognize a single national frequency coordinator for the Amateur Radio Service.

The NPRM imposed a moratorium on new repeater operation in certain large metropolitan areas, documented in the NPRM, during the pendency of the proceeding. "New" repeaters were to be defined as repeaters that would not be listed in the new edition of the ARRL *Repeater Directory* unless other proof of pre-operation was available. On February 7, the ARRL filed a Petition for Partial Reconsideration, asking the FCC to lift the moratorium. The Petition states, in part,

Section 97.85 of the Commission's Rules permits operation of amateur radio stations in repeater operation. No Order has been issued which would hold that rule in abeyance . . . A Notice of Proposed Rule Making cannot, in and of itself, modify an existing rule . . . Overall, the suggested moratorium is excessively vague, due to the very nature of repeater operation in the Amateur Service. The reference to "new" repeaters is inappropriate, inasmuch as repeater operation is not a separate amateur station but an operating mode of existing amateur stations. Further, even if the moratorium were to exist as a matter of law, its commencement is uncertain, as it is dependent

upon the issuance of the League's *Repeater Directory*, a date which is somewhat uncertain and unknown to the majority of the amateur community.

The Petition also states that the moratorium was "extremely detrimental to the Amateur Radio Service as a matter of policy." In conclusion, the Petition asks the Commission to modify the NPRM to remove any reference to a moratorium on new repeater operation.

Moratorium Lifted

On February 21, the FCC granted the ARRL's request that the moratorium be lifted. The Commission stated, in part,

Filings by the American Radio Relay League (ARRL) and by the Tri-State Amateur Repeater Council (TSARC) raise serious difficulties with the imposition of the moratorium, including financial hardship to those with repeater construction in progress. The problems persuade us to rescind the moratorium. Instead we will seek a permanent solution to repeater problems in this proceeding. We request substantive comment on all issues relevant to solving questions of interference and congestion by and to stations in repeater operation.

Copies of the NPRM, the ARRL Petition and the Order rescinding the moratorium are available from Hq. for a large s.a.s.e. with 73 cents postage. Comments in this NPRM are due by July 1, 1985, and reply comments are due by September 30, 1985. Formal comment requires the filing of an original and five copies, but a single copy may be considered informally.

FCC PROPOSES TO ELIMINATE WAITING PERIOD FOR RE-EXAMINATION

The FCC has released a Notice of Proposed Rule Making (NPRM) in response to a petition filed by Phil Miller requesting that the waiting period for retaking an amateur exam be reduced from 30 days to 7 days. The FCC proposes to allow individual VECs to determine their own waiting periods. The Commission received comments in this petition requesting that the waiting period be set at 15 days, comments requesting 26 days, and ARRL comments opposing the petition on the grounds that a 7-day waiting period would "result in compromise of the volunteer examination program due to prospective applicant abuse of the process by reliance on rote memorization through repeated test taking."

FCC comments in the NPRM state, in part, "We are not persuaded that VECs would have to change examinations weekly or that examinations would be compromised if we were to eliminate the Commission imposed thirty-day waiting period . . . VECs could set their own waiting periods for a candidate who fails an examination element based upon their own administrative requirements." The Commission concludes, "we are of the preliminary view that under the amateur volunteer examiner program no useful purpose may be served by retention of a retest waiting period. We therefore propose to remove paragraph (h) of Section 97.26."

The NPRM also proposes to require public notice of volunteer examination sessions only if the sessions are conducted for five or more candidates. Public notice is presently required for all examination sessions.

This NPRM is designated PR Docket 85-21. Comments are due by April 8, 1985, with reply comments due by May 10, 1985. Formal comment requires the filing of an original and five

copies, but single copies of comments may be considered informally. Copies of the NPRM are available from Hq. for a large s.a.s.e. with 39 cents postage.

The Commission has also issued three Orders that affect the Volunteer Examiner Program. Until now, VECs have been required to notify the FCC Field Operations Bureau of upcoming examination sessions. In the first Order, the Commission states that "there is no need to continue to require our Field District Offices to serve as repositories of these notifications, when the information could be more easily obtained directly from the regional VEC." Accordingly, the FCC has amended Section 97.513 to remove the requirement that VECs notify the Field Operations Bureau of examinations 30 days in advance of their registration deadlines.

Responding to a petition from the Dayton Amateur Radio Association (DARA), the FCC has amended Part 97 in the second Order so that Volunteer Examiners no longer need to list their address, license class and license expiration date

*Manager, Regulatory Information Branch

in Section II on the Form 610. DARA felt that obtaining data from the VEs which is already contained on their Amateur Radio licenses unnecessarily clutters the form, making it more difficult and time-consuming to complete.

Until the Commission revises the Form 610, Section II-B 1B, 1C, 1E, 2B, 2C, 2E, 3B, 3C and 3E may be left blank.

The third Order dismisses a petition filed by Gordon Girton on September 7, 1984. Girton requested several changes to the VEC program, including a three-Region limit for VECs and expanded responsibilities for Advanced Class VEs. In addressing the three-region limit, the Commission stated, "we know of no region which has an excessive number of volunteer examination opportunities." The petition asked that Advanced Class amateur operators be permitted to administer Elements 1(B) (the 13-WPM code test) and Element 4 (Advanced and Extra written).

The Commission reiterated its position that "The statute requires that examinations for each class of amateur radio operator license must be administered by a licensee of the next higher class . . . If a higher element does not exist, then the examiner must have passed the element being administered. Therefore, Elements 1(B), 1(C), 4(A) and 4(B) must be administered by a team of three Amateur Extra Class licensees." In conclusion, the FCC stated, "This petition is moot in part, repetitive in part, and requests several rule changes which are contrary to law. It does not warrant the initiation of a rule making proceeding."

DEPARTMENT OF DEFENSE SUPPORTS PRB-1

"The Department of Defense shares ARRL's concern over the proliferation of 'anti-ham' zoning ordinances which prohibit effective operation of amateur radio stations by limiting antenna heights or restricting accessory uses of residential real property. Continued success of the existing NSEP [national security, emergency preparedness] telecommunications plans involving amateur stations would be severely diminished if state and local ordinances are allowed to prohibit the construction of and usage of effective amateur transmission facilities." This paragraph opens the Department of Defense (DoD) reply comments in support of PRB-1, the ARRL request for preemptive relief from restrictive antenna ordinances.

The incident in Grenada, the 1983 New Orleans flood, the 1982 hurricane in Hawaii and the Coalinga earthquake are cited as examples of the responsiveness of amateurs in emergency situations. The comments conclude, "The Department of Defense respectfully supports the request of ARRL that the Commission issue a declaratory ruling delineating the limitations of local zoning and other local and state regulatory authority over federally-licensed amateur radio facilities."

AMATEUR RADIO INDUSTRY MEETING IN MIAMI

More than 40 representatives of the Amateur Radio industry — manufacturers, dealers and publishers — met for a daylong session in Miami just before the Miami Hamboree/ARRL Southeastern Division Convention. The subject of the meeting, which was moderated by Joe Schroeder, W9JUV, was how to bring about the kind of growth we need in Amateur Radio. Ex-

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 Col. Edison B. Snow, W2UN.

Mrs. Frederick H. Gildemeyer would like to acknowledge with sincere appreciation those contributions to the Goldwater Scholarship given in memory of her husband, Frederick H. Gildemeyer, W4CW.

ecutive Vice President David Sumner, K1ZZ, and Development Manager Bill Lazzaro, N2CF, attended for the League.

The following ideas were generally supported by the group:

- Novices need to have more-interesting privileges than just HF CW. RTTY, packet radio and UHF phone (220 MHz, perhaps) were specifically mentioned.

- Present CB operators are seen as a likely source of new recruits. ARRL was encouraged to build bridges to responsible CB groups, such as REACT.

- The concept of a comic book aimed at junior high school students was endorsed.

- A mailing to recent license expirées followed by regular mailings to amateurs just before their licenses expire was seen as a good idea. The mailing would include a Form 610 with simple instructions on how to fill it out as a license renewal.

- An industry-sponsored booth for display at the major conventions and hamfests will be investigated as a possible focal point for the "hosting" of nonham attendees.

- Dealers will be encouraged to provide whatever support they can to local classes, exam sessions and local efforts at personal contacts with prospective hams.

- A pamphlet for general industry use as a "stuffer" in their mailings to presently licensed amateurs will be explored — something with the theme, "Help Amateur Radio Grow — put back in what you've gotten out of it."

- A short "layman's guide to packet radio" is needed to explain the medium to computer-oriented prospective hams.

- Computer magazines should be a good way to get the word about Amateur Radio out to computer people.

To summarize, the meeting was positive and upbeat, resulting in many good suggestions for growth in the amateur service. Follow-up action on these items was agreed, with progress reports to be made at a meeting just before the Dayton Hamvention.

NEW MICROWAVE FREQUENCIES FOR AMATEURS?

The FCC has released a Notice of Proposed Rule Making proposing to add new microwave frequencies to the list of frequency allocations in Part 97. This would bring the Amateur Rules in line with the new microwave frequencies allocated to the Amateur Service and Amateur

Satellite Service at WARC '79. The NPRM, designated PR Docket 85-23 and nicknamed the "Microwave Access Docket," proposes, among other things, to authorize earth-to-space operation at 1260-1270 MHz (Mode L). AMSAT-OSCAR 10 presently operates Mode L periodically, and U.S. amateurs are unable to use the satellite at these times. In a related matter, the ARRL has filed a motion for interim operating authority asking the Commission to authorize Mode L operation in the U.S. while Docket 85-23 is being considered.

The NPRM is an attempt to deal with the "loose ends" from WARC '79 regarding amateur status on certain frequencies. Of particular interest is the inclusion of the 160-meter band in this proposal. The NPRM proposes to list the 1900-2000 kHz band separately from the 1800-1900 kHz band so that Part 97 will conform to Part 2, where the segments are already listed separately. FCC staff has informed ARRL that separating the bands does not prejudice any issues in Docket 84-874, the radiolocation matter.

Copies of the NPRM are available from Hq. for a large s.a.s.e. with 56 cents postage. Comments are due by April 8, 1985. Reply comments are due by May 10, 1985. Formal filing requires the submission of an original and five copies, but a single copy may be considered informally.

INDIANA HOSTS REPEATER MEETING

Repeater coordinators from Wisconsin, Michigan, Indiana and Ohio attended what was described as a "light, friendly, informal meeting" in Fort Wayne, Indiana on January 19. The meeting was called by ARRL Great Lakes Division Director Wilson, Central Division Director Metzger and CRRL President and ARRL Canadian Division Director Atkins, shortly after Michigan decided to adopt the Pacific Northwest 20-kHz 2-meter band plan.

The 20-kHz band plan was not the main topic of discussion, however. The main goal of the meeting was to promote active, direct dialog between coordinators, and this was accomplished, as Wilson described it, "without bloodshed." Wilson said that many specific accords were reached on communications standards among repeater coordinators — data bases from neighboring states were exchanged, and the process for dealing with coordination complaints was discussed in depth.

Michigan plans to proceed with implementa-

tion of the 20-kHz band plan, but stated that precedence would be given to adjacent states' repeaters in the changeover, helping defuse a potentially explosive situation. On January 12, a meeting on the 20-kHz band plan was held in Ohio, and Ohio repeater coordinators voted 54-0 to stay with 30 kHz and to proceed with de-inversion of the 15-kHz splits.

In a related development, at a meeting in Arlington, Texas on February 16, members of the Texas VHF FM Society voted 87-11 in favor of adopting the Pacific Northwest 20-kHz band plan.

ARRL STAFF MEETS CABLE TV REPRESENTATIVES

Kitty Hevener and Greg Bonaguide (ARRL Hq. staff) and Wendell Bailey and Bob Dickenson (National Cable Television Association representatives) met at ARRL Hq. on February 8 to review existing cable TV case files and discuss the status of the standardized method of measuring cable egress. In an apparent attempt to foster the spirit of cooperation, Bailey briefly discussed the benefits to the cable industry of the success of the joint ARRL/NCTA committee in resolving complaints of harmful interference filed by amateurs without regulatory intervention from the FCC.

Hevener reviewed 37 cases of harmful interference that have been filed since the inception of the joint ARRL/NCTA committee. She noted that 29 of them currently remain unresolved. Because of this, she emphasized the need for improved lines of communication between the NCTA, ARRL Hq. and amateurs filing complaints. She indicated that she had not received any verbal or written correspondence, until this date, from the NCTA regarding cases referred to them. The NCTA representatives agreed to develop and implement a standardized method of communicating with ARRL Hq. and amateurs who have complaints on file with the committee.

The committee members also discussed methods of resolving cases wherein a cable company felt that it was in compliance with all applicable FCC rules and the amateur continued to complain of harmful interference. However, no definite recommendations were made on this issue. Because of time constraints, progress on the standardized method of measuring cable egress was not discussed.

WD8LEU FINED FOR EXCESSIVE POWER

The Houston office of the FCC announced on February 8 that Jerry R. Dyke, WD8LEU, of Spring, Texas, has been fined \$2000 for operating with 25,000 W of transmitter power. Harris E. Maulden and Arthur A. Partain, both of Pearland, Texas, were each fined \$2000 for unlicensed operation on Amateur Radio frequencies.

FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a non-profit organization with headquarters in Washington, DC, plans to award 19 scholarships for the academic year 1985-86. The Foundation, composed of 50 local area Amateur Radio clubs, fully funds two of these scholarships from the proceeds of its annual Hamfest. It administers, without cost to the donors, seven scholarships for the Quarter Century Wireless Association,

two for the Dade (Florida) Radio Club and one each for the Radio Club of America, the Richard E. Chichester Memorial, the Young Ladies' Radio League, the Edmund G. Redington Memorial, the Amateur Radio News Service, The Columbia (MD) Amateur Radio Association, the Baltimore (MD) Amateur Radio Club and the Lewis W. Wilkinson Memorial.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college or technical school. Most of the scholarships require the applicant to hold at least an FCC General class license or equivalent. The scholarship awards range from \$350 to \$900, with preference given in some cases to residents of specific geographical areas or for the pursuit of certain study programs.

Additional information and an application form can be requested by sending a letter or QSL/postcard, postmarked before May 31, 1985, to: FAR Scholarships, 6903 Rhode Island Ave., College Park, MD 20740.

The Foundation is devoted exclusively to promoting the interests of Amateur Radio and to those scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

LILIAN M. SALTER, WIZJE

We regret to report the death of Lilian M. Salter, WIZJE. Originally hired at ARRL Headquarters as a stenographer in 1930, Lil soon branched out into other administrative chores — recording official station appointments, issuing supplies to the field organization, producing and distributing operating aids, handling affiliated club records and supervising SCM elections. She was responsible for editing the Section Activities reports for QST, and became assistant communications manager for administration on the Hq. staff, a position from which she retired in 1970.

For more than 20 years, Lil was of Amateur Radio but not *in* it. She finally joined W1YYM's lunchtime class, received her Novice license in 1953 and, before long, had earned her General class license. WIZJE was also a pianist, worked in ceramics, did needlework, taught Sunday School and collected dolls.

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 elections were conducted for a two-year term of office beginning April 1, 1985:

Balloting Results: In the Arizona Section, James E. Swafford, W7FF, received 577 votes and Erich J. Holzer, N7EH, received 320 votes. Mr. Swafford was declared elected. In the Arkansas Section, Joel M. Harrison, WB5IGF, received 282 votes and Nelson E. Bailey, K5TML, received 158 votes. Mr. Harrison was declared elected. In the Montana Section, L. C. "Les" Belyea, N7AIK, received 125 votes and George W. Smith, Jr., KC7OD, received 122 votes. Mr. Belyea was declared elected.

AIRS UPDATE

The ARRL Interference Reporting System submitted data gathered in January to the FCC on the following signals: 3600 kHz (A3E emission, no ID); 7100 kHz (A3E emission, Radio Moscow, with lower sideband extending downward into the exclusive amateur segment); 14,072-14,078 kHz (F1B emission, no ID); 14,080 kHz (A1A emission, no ID); 14,216 kHz (A1A emission, no ID); 14,216 kHz (A1A emission, no ID).

The latest AIRS Alerts are for 7014, 7018 and 7048 kHz.

ARRL Articles of Association

In last month's *QST*, page 55, we reported the action taken by the ARRL Board of Directors to restate, for the record, the entire Articles of Association of the American Radio Relay League. This is done periodically, especially after a series of amendments to the Articles of Association, to ensure that the corporate records on file with the Connecticut Secretary of State are accurate. Because of time and space constraints, however, we did not publish the entire Articles of Association. To meet our legal obligations, the entire text of Minute 77, including the Articles of Association, are printed below as a correction to the published minutes of the 1985 Annual Meeting of the Board of Directors of the American Radio Relay League, Inc.

77) On motion of Mr. Hurlbert, seconded by Mr. Metzger, the following resolution was unanimously ADOPTED:

WHEREAS, there have been numerous amendments made to the Articles of Association of The American Radio Relay League, Inc. during the past several years;

WHEREAS, the Board of Directors of The American Radio Relay League desires to make certain additional amendments to the Articles of Association; and

WHEREAS, it is desired by the Board of Directors of The American Radio Relay League, Inc. that the Articles of Association on file with the Secretary of State of Connecticut be in a form which facilitates reference; now therefore,

BE IT RESOLVED: that the Board of Directors, assembled on January 25, 1985 at Hartford, Connecticut hereby amends and restates the Articles of Association of The American Radio Relay League, Inc., in their entirety, to read as follows:

ARTICLES OF ASSOCIATION

Be it known that we, the subscribers, do hereby associate ourselves as a body politic and corporate pursuant to the statute laws of the State of Connecticut regulating the formation and organization of corporations without capital stock and the following are our Articles of Association:

Article 1:

The name of our corporation shall be **The American Radio Relay League, Incorporated**. Our corporation commenced its corporate existence as the American Radio Relay League, Incorporated, when its Articles of Association were approved by the Secretary of the State of Connecticut on January 29, 1915. The original Articles of Association were subscribed by Hiram Percy Maxim, Clarence D. Tuska and Lawrence A. Howard. The affairs of the corporation have since that time been continuously administered by a Board of Directors selected by the membership.

Article 2:

The purposes for which our corporation is formed are the following: the promotion of interest in amateur radio communication and experimentation; the establishment of amateur radio networks to provide electronic communications in the event of disasters or other emergencies; the furtherance of the public welfare; the advancement of the radio art; the fostering and promotion of noncommercial intercommunication by electronic means throughout the world; the fostering of education in the field of electronic communication; the promotion and conduct of research and development to further the development of electronic communication; the dissemination of technical, educational and scientific information relating to electronic communication; the printing and publishing of documents, books, magazines, newspapers and pamphlets necessary or incidental to any of the above purposes. No part of the assets or income of our corporation shall inure to the benefit of or be distributable to the members, the officers, or any of them, or to other private persons except that our corporation shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes set forth herein.

Article 3:

The principal office of the corporation shall be maintained at 225 Main Street, Newington, Connecticut.

Article 4:

The affairs of the Corporation shall be governed by a Board consisting of sixteen Directors, each representing a territorial Division comprising a geographical area as defined in the By-Laws. One Division shall be known

as the Canadian Division, or alternatively as the Canadian Radio Relay League, and shall comprise the provinces and territories of Canada. Except for the Director of the Canadian Division, the Director shall be elected for terms of two years by the members eligible to vote. Seven Directors shall be elected for terms beginning on even-numbered years and eight Directors shall be elected for terms beginning on odd-numbered years. The President of the Canadian Radio Relay League as duly elected by that body shall serve as the Director of the Canadian Division. Election of other Directors shall be by mail vote in accordance with the rules and regulations prescribed in the By-Laws. The Board shall meet twice each year at times and places as provided in the By-Laws. The first meeting shall be called the Annual Meeting and the second shall be called the Second Meeting. Special meetings of the Board shall be called by the President upon written request of at least one-half of the membership of the Board as then constituted.

Article 5:

At the time of the election of each Director there shall also be elected a Vice-Director who shall have power of succession to the office of Director as hereinafter prescribed. No person shall be eligible for the office of Vice-Director who does not possess the qualifications herein specified for the office of Director. The Vice President of the Canadian Radio Relay League, as duly elected by that body, shall serve as the Vice-Director of the Canadian Division.

Article 6:

During the intervals between meetings of the Board of Directors, the affairs of the Corporation shall be administered by an Executive Committee consisting of the President, four Directors selected by the Board of Directors, and, without vote, the First Vice President and Executive Vice President. The term of office of the Executive Committee members shall be for one year or until their successors are elected. The Executive Committee shall meet at the call of the President, but no less often than quarterly. The Executive Committee may in its discretion submit for determination or decision by members of the Board of Directors by mail vote any proposal pending before the Executive Committee. When such submission is made, it shall be in precise terms embodying the text of the proposed resolution. Such action shall be binding upon the Executive Committee.

Article 7:

Except in the Canadian Division, a vacancy in the Board of Directors shall be deemed to occur upon the death, resignation, recall, move of permanent residence outside the division from which elected, or refusal to act of any director. Upon the occurrence of such vacancy, the Secretary shall proclaim it and thereafter the duties of the Director shall be assumed by the Vice-Director, and the Vice-Director shall hold the office of Director for the remainder of the term for which he was elected Vice-Director. Should the office of Vice-Director be vacant, the vacancy shall be filled by appointment by the President. The Vice-Director shall also serve as Director at any meeting of the Board of Directors which the Director is unable to attend.

Article 8:

The officers of the Corporation shall be a President, a First Vice President, an Executive Vice President, an International Affairs Vice President, not more than two additional Vice-Presidents, a Secretary, and a Treasurer, who shall be elected by a majority of the Directors at the annual meeting on even-numbered years.

Article 9:

These articles may be amended by a three-fourths vote of all directors, or, provided due notice of the proposed amendment shall have been placed in the mail to each director at least thirty days in advance, by a two-thirds vote of all directors. The Board of Directors may from time to time adopt By-Laws not inconsistent with the Articles and applicable statutes. By-Laws may be amended by a three-fourths vote of the directors present, or, provided due notice of the proposed amendment shall have been placed in the mail to each director at least thirty days in advance, by a two-thirds vote of all directors. Notices shall be sent by First-Class Mail, and to all directors residing more than 250 miles from Newington, Connecticut, by Air Mail.

Article 10:

The membership of the League shall consist of (a) full members who shall be entitled to all rights and privileges of the League and (b) associate members who shall be entitled to all rights and privileges of the League except the right to vote for Directors and Vice-Directors and the right to hold office. The Board of Directors shall by appropriate By-Laws specify the requirements for membership and classes of membership provided, however, that the Board of Directors shall not ter-

minate or reduce the rights of any member except for the lapse or termination of a condition now required as precedent to the exercise of such rights. Nothing herein contained shall preclude the Board of Directors from expelling a member upon good cause shown and after notice and an opportunity to be heard.

Article 11:

No person shall be eligible for the office of Director, Vice-Director, President, Vice-President, or Treasurer who has not been a Full member of the League for at least four continuous years, and who has not held continuously during that period a valid authorization as a radio amateur in accordance with the applicable laws and regulations of the United States or Canada prevailing at the time of his election and throughout his term of office. No person shall be eligible for, or hold, the office of Director, Vice Director, President or Vice President whose business connections are of such nature that he could gain financially through the shaping of the affairs of the League by the Board, or by the improper exploitation of his office for the furtherance of his own aims or those of his employer. The primary test of eligibility under this Article shall be the freedom from commercial or governmental connections of such nature that his influence in the affairs of the League could be used for his private benefit.

Article 12:

The Board of Directors shall employ an Executive Vice President who shall hold office for a term and upon such compensation as the Board and he may agree upon. The Executive Vice President shall manage the affairs of the League under the direction of the Board of Directors. He shall be deemed a member of the Board, but without vote. He shall attend all meetings of the Board. He shall collect all monies due the League and turn them over to the Treasurer. He shall certify the accuracy of bills or vouchers on which money is to be paid and shall draw and countersign all checks. He shall have charge of the books and accounts of the League and shall furnish to the Board of Directors from time to time such statements as may be required. He shall conduct the general correspondence of the League and shall keep full records. He shall be in responsible charge, under the Board of Directors, of all property of the League. He shall, under the general direction of the Board of Directors, employ such personnel as may be necessary for the effective accomplishment of the purposes of the League. He shall be the general manager of League publications. He shall prepare and submit to each annual meeting of the Board of Directors a comprehensive report of the progress and status of the affairs of the League. He shall perform such other duties as may be assigned to him by the Board of Directors. His entire time shall be devoted to the affairs of the League. He shall furnish a bond satisfactory to the Board of Directors, the expense of the same to be borne by the League.

Article 13:

No substantial part of the activities of our corporation shall be the carrying on of propaganda, or otherwise attempting to influence legislation, and our corporation shall not participate in, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of any candidate for public office. Notwithstanding any other provision of these articles, our corporation shall not, except to an insubstantial degree, engage in any activities or exercise any powers that are not in furtherance of the purposes of our corporation.

Article 14:

Upon the dissolution of our corporation, the Board of Directors shall, after paying or making provision for the payment of all of the liabilities of our corporation, dispose of all of the assets of our corporation exclusively for the purposes of our corporation in such manner, or to such organization or organizations organized and operated exclusively for charitable, educational, religious, or scientific purposes as shall at the time qualify as an exempt organization or organizations under Section 501(c)(3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future United States Internal Revenue Law), as the Board of Directors shall determine. Any such assets not so disposed of shall be disposed of by a court of competent jurisdiction of the county in which the principal office of our corporation is then located, exclusively for such purposes or to such organization or organizations, as said court shall determine, which are organized and operated exclusively for such purposes.

BE IT FURTHER RESOLVED: that the officers of The American Radio Relay League, Inc. are directed to cause a certificate of such amendment and restatement to be filed with the Secretary of State of the State of Connecticut, and to pay all filing fees due thereon. □

Correspondence

Conducted By Bruce Kampe,* WA1POI

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

FORTY-METER FUTURE

□ First let me state that 80 percent of my contacts are on phone; only 20 percent are CW. However, I am opposed to any further expansion of the U.S. 40-meter phone band. I have two reasons for this.

We are to use the minimum amount of spectrum for our communications. This means using the lowest power necessary, but it could also mean the least spectral width. Phone allocations below 7.1 MHz would squeeze the CW/RTTY portion too much. Of course, the Extra-only bottom 25 kHz must be retained, to preserve the whole notion of incentive upgrading. Also, phone allocations below 7.1 MHz are completely unneeded for domestic use; the value there would be for DX chasing.

I like to work DX as much as anyone else. But (the second reason to oppose this expansion) I feel that we owe the DX stations some room of their own. — *Bob Cromwell, KC9RG, Paoli, Indiana*

□ The 7.0-7.3 MHz range is probably the overall "best" amateur assignment we have: (1) it is open to somewhere 24 hours a day; (2) worldwide DX is possible almost nightly; (3) complete stateside coverage exists almost nightly; (4) excellent "short skip" coverage occurs during the day, even usually during low solar activity; and (5) the band is strategically located for ease of RFI reduction. It's above the 4.2-MHz upper limit of the TV video passband, precluding direct pickup by TV video amps or color circuits, and is far below TV Channel 2 (54 to 60 MHz), which makes harmonic suppression relatively simple.

With all these pluses, we in ITU Region 2 also have three times as much of 7-MHz spectrum available to us as our less fortunate brothers in Regions 1 and 3. I have put myself in their shoes and say let's do something to help maintain minimum interference in their 100 kHz of the band. I think our good old-fashioned "American greed" is starting to show. I can think of no other logical explanation as to why this question would even come up.

DXing is alive and well on 7 MHz on CW, and to a lesser extent on SSB when split operation is used. — *Ronnie T. Miller, K5WLT, Sequin, Texas*

□ If the phone band on 40 meters is extended below 7.1 MHz, permit me to suggest that the League petition the FCC to permit us upstanding-but-downtrodden, dyed-in-the-wool CW types to use A2A (tone-modulated Morse) emission on that band. Even with A2A it would be a long, hard fight with a short stick for us. — *Harvey B. Savage, Jr., K4MD, Coconut Creek, Florida*

[Editor's Note: the letters we've received regarding the expansion of phone privileges on 40 meters generally have not been in favor. However, please do not draw any conclusions from this. The postcard that was included in January 1985 QST asked for your opinion on this issue, and it is the gauge that will tell how you folks feel. At press time, we do not have the results tabulated, as we are still receiving input.]

*Information Services Assistant

SEVEN THREE

□ Amateurs are in error when they use 73s at the end of a transmission. It is already plural and the "s" is redundant.

The old Western Union Telegraph Company, in order to shorten the transmission time of their messages, used the simple expedient of substituting figures for groups of words. Hence: 5, go ahead; 25, busy; 30, end of transmission; 88, love and kisses; and 73, best regards. (The last two examples have carried over to Amateur Radio.) Just say seventy three, or seven three, but not seventy threes. 73. — *Doug Player, VE3DJP, Markdale, Ontario, Canada*

SEVENTEEN

□ I am a junior in high school and have been a ham for about a year. I have found that, for the most part, hams are very friendly. However, because of my age, one cliché that I hear a lot really bothers me.

Too many times to count, I have been told, "Don't let Amateur Radio interfere with your schoolwork." I am wondering how often electrical engineers are told, "Don't let Amateur Radio interfere with your job." Or, how many times has Barry Goldwater, K7UGA, been told, "Don't let Amateur Radio interfere with the Senate"? And I wonder if anybody has ever said to King Hussein, JY1, or Rajiv Gandhi, VU2RG, "Make sure that you don't neglect your country because of ham radio."

The point I am trying to make is that teens generally have a lot of pressures as it is. We all get plenty of lectures from our parents and do not need to hear these things from a cattle rancher in Texas or an alligator farmer in Florida. Everybody, children and adults, has some distractions from their school or job. Young hams are often stereotyped as people who come home and get on the air from 3 P.M. until midnight. Just like adults, we are capable of knowing when to do our work. We do not need to be reminded during every QSO. It is this kind of comment that discourages "the younger generation" from becoming active in radio. P.S. Is it really true that in the 1930s, everyone had to walk 26 miles through seven feet of snow every day to get to school? — *Dave Fox, KA3LRQ, Bethesda, Maryland*

FIVE NINE

□ I have returned to the air after about 31 years absence and find many changes . . . some of them rather strange.

I spent a few hours listening around the bands over the weekend of January 19-20, mainly to see how the contests were run these days. It became obvious, early on, that even though it takes five or six very laborious exchanges to finally get a call sign correct, one must always give a five by nine signal report!

Since the exchange of signal reports on such QSOs takes an equally long time to get across and they are so obviously phony, why bother? — *Nate Benedict, KA7LVU, Friday Harbor, Washington*

7200 VOLTS

□ On the cover of February QST an antenna was pictured and centered in the foreground. Much to my surprise, in the background I saw high voltage wires. I hope this photo was intentionally taken at this angle to bring to the attention of hams the danger of "mixing" electrical lines with antennas.

Electrical wires appear harmless and innocent, but they can become instant killers. One experienced ham I know was going to throw a dipole over a 7200-V line to her neighbor's house across the street until I told her the possible consequences. Hams must exercise extreme caution when working on antennas that are near high voltage wires!

If you are in doubt about any wire, contact your electric company. It's better to be safe than sorry — or dead! — *William R. McCarthy, KA8RVU, Cincinnati, Ohio*

[Editor's Note: Death is permanent, so never place an antenna where it can come in contact with a power line. In the February cover photo, the camera distorted the perspective. The power lines are much farther away from the antenna than the photo might lead us to believe. It was not a dangerous situation.]

FIVE METERS

□ I read VE3CIE's article in January QST with great interest. I lived in Cedar Rapids, Iowa, from 1935 until 1951 and got to see the aurora quite a few times. It was beautiful and impressive. In 1938 through 1941 I was on 5 meters and bounced signals off the display a few times.

This evening I was looking back through my file of QSTs and just happened to pick out the December 1929 issue, which, to my surprise, contained an article on this same subject. I reread it with interest.

What wonderful "tools" we now have to prove some of the mysteries of nature. Thank you for publishing such interesting articles. — *Bill Stewart, K6HV, Los Angeles, California*

3-500Z PUNISHMENT

□ I'm sick and tired of people who constantly run a kilowatt and splatter 5 kHz. We're all familiar with the jerk who just has to be "30 over." Granted, amplifiers are great when conditions warrant their use. But c'mon; do you really need to use 1000 W to talk to someone five miles away, 50 miles away or 100 miles away? I don't think so. If you use your head and choose the band and operating time carefully, you'll get through 95 percent of the time (the other five percent is when some idiot running gabba-watts is up or down 5 kHz splattering the whole band).

If the FCC really wants to do something good for Amateur Radio, they should lower the maximum output to 600 W and enforce the "amateurs will use the minimum power necessary to carry out the desired communications" rule. Remember this one, gang? Those caught not abiding by the rules should be forced to wear a pair of 3-500Z tubes in a rather uncomfortable place. — *Jefferey Breitner, KA8NCR, Dundee, Michigan*



CE0AA — San Felix 1984

San Felix Island, a Chilean possession, is a small, active volcanic "bump" in the Pacific Ocean, about 600 miles off the west-central coast of Chile, close to San Ambrosio. Located at 80° W longitude, it is about a half mile wide by one and a half miles long. It is an unusually difficult landing and operating site.

With San Felix having been on the "ten most needed countries list" for about 12 years (1972, W9IGW/K9KNW), why was so little advance notice given last fall prior to this operation? CE3GN, expedition coordinator of the Radio Club of Chile, furnished a simple answer: The club had just 10 days to organize *everything* for the operation — from the word that they could go to the training of the operators!

Authorization from the Chilean Army arrived in late August, carrying with it several stringent requirements. The operators (two) had to be in the Chilean Army and had to be able to fly to the island within about a week. Fernando, CE2GXY, and Max, CE9DVN, filled this bill of particulars. Immediately, the Radio Club of Chile attempted to fill the information vacuum by transmitting news of the forthcoming event almost continuously.

In short order, equipment was centralized, supplied by CE3AJN and CE3BBW; CE3ESS came up with a TET antenna. The gear included TS-600, 830-S with external VFO (2), 130-S, AT-230, Honda E-500 generator, the TET and inverted-V antennas for 160, 80 and 40 meters.

On August 30, Fernando and Max got a royal sendoff — filled with good humor and the promise of a good performance on San Felix — at a very well-known restaurant in Santiago. The following day they left for San Felix, carrying with them the hopes and dreams of those they left behind.

On September 1, Max and Fernando had everything set up and ready to go. The first contact with Chile took place at 2207Z, when instructions were passed for the "official start of the expedition," to be scheduled for the next day. The sponsoring group felt that list operation, at least initially, would be the appropriate way to maintain order. List controllers were designated as CE3s BBW DPD ESS ELO NR and CE6s COR EZ — all of whom spent at least 6-8 hours

TURKEY

See Up Front in QST, this issue, for late-breaking news of legal licensing for TA.

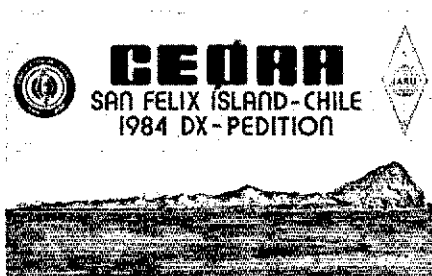
BRUNEI

AA4MI notes that Penigran Haji Idriss, V85PM, has been appointed Brunei's Ambassador to the U.S. Carl doesn't know if V85PM has brought his logs with him, but has found out that his mail QTH in this country is Brunei Embassy, 301 Third Floor, 2600 Virginia Ave., NW, Washington, DC 20037, tel. 202-838-1600.

CLIPPERTON

As of press time, W6SZN's news release *hoped* for fool-proof transportation leaving Mexico March 30, arriving on Clipperton April 3 and returning the group in time for their participation in the Fresno DX Convention (Center Plaza Holiday Inn), the second weekend in April. Confirmed operators included W6SZN,

*19620 SW 234 St., Homestead, FL 33031



Standing (l-r) are CE3GN, CE3ESS and CE9DVN; sitting are CE2GXY and CE3BBW — at the CE0AA San Felix "night-before-departure" party.

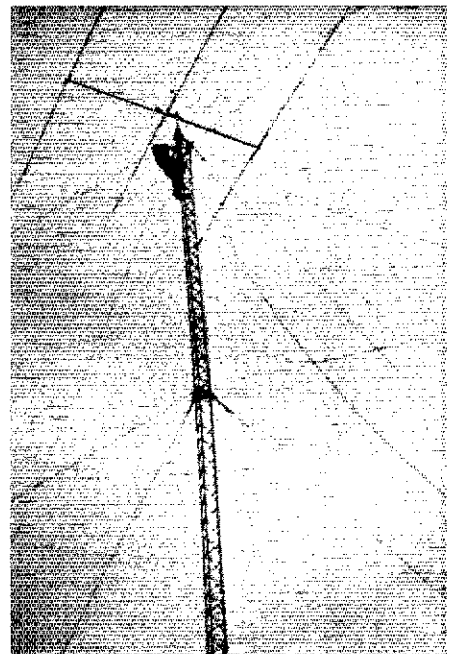
daily at their task. By the middle of the month, CE3BBW was so pleased with the burgeoning competency of the two operators that he felt they were more than able to continue the operation without lists. Their special thanks for helpful assistance goes to W6BF, KB7SO, WB4GCP, KF4IL, KB7QC, KC0YI, K6EDV, W6AHV,

W6OAT, W6RGG, N6GJ, KK6X, N7NG, K3NA, WA7NIN, F6GXB, F9LX, DJ9ZB, T12CF, XE1ZZA, JG3LZG, FO8HL and FO8GW — a truly international expedition. The group hopes to man three stations 24 hours a day, propagation permitting; 160-10 meters; sideband, CW and (hopefully) RTTY. If equipment and antennas become available, OSCAR and 6 meters are additional possibilities. Cards via the Yasmé Foundation, Box 2025, Castro Valley, CA 94546. GL, guys!

Troster's Tips for Easy Listening

What stations are your peers calling? Any pileups? Who is doing the calling? Locals? Or are all the callers JAs? Ask yourself, "Who might the JAs be calling at this time of day?" If you can hear the DX station, who is he going back to? If the locals in your district are working a particular area, you should be able to, also. If the band is "alive" and locals are working all sorts of DX, it would be good to listen closely for some of the "deep" DX that is not heard except under favorable conditions. So, don't begin working *everything*; be selective and see what you can find.

More next month from W6ISQ.



CE9DVN at the top of the tower on San Felix.

NB7R, HK0HEU, PY2PE and JA1ELY.

How do you evaluate the performance of an expedition like this? Certainly, the results were impressive: about 31,000 two-ways, on sideband, CW and RTTY (a first from San Felix), covering 160-6 meters. Even more than that, you must give high marks to the Radio Club of Chile for organizing and supporting the San Felix operation — with minimum time for advance planning. Nice going!

THE LOW-BAND DXER's PLEDGE OF ALLEGIANCE

As an aid to determine whether, in the midst of the sunspot doldrums this past winter, you qualified as a member of this specialty group, AB0X offers the following (from the Nov. 1984 issue of the *Kansas City DX Club Newsletter*):

"If you want to be a low-band DXer, place your left



6Y5NR was at the Jamaica booth at the Miami Hamboree with Coast Guard permission for the 6Y5 Navassa expedition "in hand." (W1YL photo)

life listening to static and QRM, and calling stations I can't hear!"

KX6DS

Dave presents an interesting recap of his first year of operation, which included some impressive statistics: 30,000 QSOs — 70% CW, 30% sideband. Percentage by band of operation: 80 meters, 5%; 40 meters, 29%; 20 meters, 25%; 15 meters, 35%; 10 meters, 6%. Breakdown by continent: Asia, 43%; N.A., 32%; Europe, 14%; S.A., 2%. The QSL address continues to be the North Alabama DX Club, P.O. Box 4563, Huntsville, AL 35815-4563. KX6DS (also K4TO) offers very special thanks to Jerry and Shari Cross, N4NO/N4CWL, for their superior assistance. His big news for 1985 is that KX6 amateurs have received permission to operate on 160. Your best bet to QSO KX6DS is on 1831, 3502 or 7005 kHz CW.

EGYPT

Thanks to SWL Patrick O'Connor, WDX1D, for the following rundown on members of the Egyptian Amateur Radio Society, received from SU1ER and dated January 1. With conditions right, they're ORV 3750, 7075, 14,275, 21,375, 28,575 (and locally 145.25 MHz), most Fridays and Saturdays around 1600/2100Z.



Sylvie, JP1LAB, and Mike, JH1KRC, at BVØYL/BVØJA, the DX Family Foundation's 5th Anniversary DXpedition, last June.

hand on your Alpha, raise your right hand and repeat after me:

"I, (insert your call), pledge allegiance solely to the low bands, forsaking all other frequencies, in my never-ending quest for DX, with full knowledge that I will forfeit all aspects of a normal life. Therefore, I will forsake any sort of family life, regular sleeping hours, etc. — all commitments that might interfere with low band DXing.

"I will also pledge to fill my backyard with as many wire, vertical and listening antennas as possible.

"I accept the burden of never having enough radials in the ground, and I am fully aware that I will be perpetually burying wire in my yard as long as I am physically able.

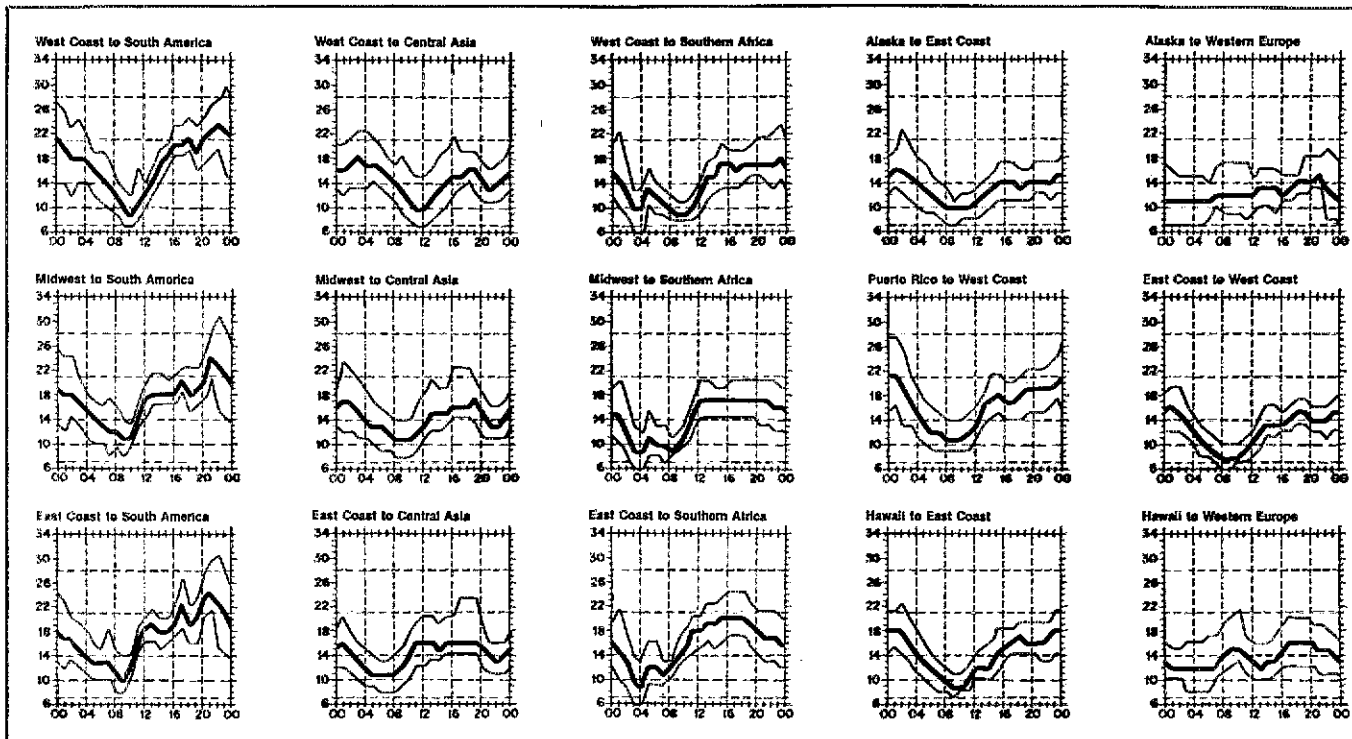
"I promise to disavow all guilt or wrongdoing when TVI complaints are received from irate neighbors.

"I further pledge to endanger my job on a regular basis as a result of countless hours of lost sleep spent tuning the low bands in the middle of the night.

"Lastly, I pledge to spend the rest of my amateur's

- SU1AA Iman Loutfy El-Mahdy (YL), QSL via SU1AL.
- SU1AB Ammal Loutfy El-Mahdy (YL), QSL via SU1AL.
- SU1AH Ahmed Hassan Ahmed, 40 El-Zahraa St., Ein-Shams, Cairo, tel. 872295.
- SU1AL Loutfy Moursy El-Mahdy, 13 El-Giza St., Giza, or Box 109, Giza, tel. 724123.
- SU1AW Ahmed Mohamed Wahbi, Heliopolis, Cairo, tel. 458494.
- SU1AZ Atif Badr Zaki, El-Zaitoun, Cairo, tel. 606874.
- SU1BA B. A. Bassiouni, Mokattam City, Cairo, tel. 922700.
- SU1CR Mohamed Shafie Reda, 50 Khedr El-Touny St., Nasr City, Cairo, tel. 602888.
- SU1ER Ezzat Sayed Ramadan, 18 El-Abnasi St., Manshiet El-Bakri, Cairo, or Box 33, Airport, Cairo, tel. 834370.

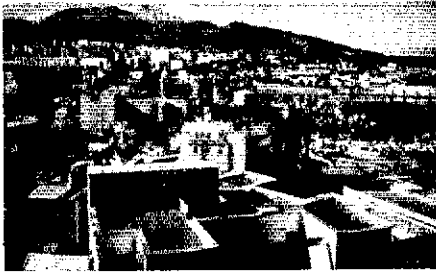
- SU1FR Fouad Said Reda, via SU1CR.
- SU1HK Hosni M. Khater, 20 Street No. 1, Mokattam City, Cairo, tel. 939397.
- SU1IA Ibrahim Mostafa, Giza, tel. 722089.
- SU1IM Ibrahim Ibr. Mohamed, 7 Roda St., El-Roda, Cairo, tel. 841701.
- SU1KG Mohamed Hassan Shaltout, 29 Omar Ebn El-Khattab St., Giza, Cairo, tel. 853195.
- SU1KH Mohamed Ahmed Rashed, 83 El-Mehata St., El-Zaitoun, Cairo.
- SU1MA Abdel-Moety Artia, 46 Omar Ebn El-Khattab St., Heliopolis, Cairo, tel. 661010.
- SU1MI Mouna Ibrahim Mohamed (YL), via SU1IM.
- SU1MK Magda Hosni Khater (YL), via SU1HK.
- SU1MR Magi Ezzat Sayed (YL), via SU1ER.
- SU1RR Rehab Ezzat Sayed (YL), via SU1ER.
- SU1SR Sali Ezzat Sayed (YL), via SU1ER.



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

THE CIRCUIT

□ **EA9:** N6TJ concluded a 10-day trip to Ceuta at the beginning of the year, where he signed N6TJ/EA9 and EA9KF. Jim notes that he had a great trip, and that the hospitality of the EA9 hams was super, making EA9 a top runner on the list of desirable DX venues. Cards via WA6OTU.



N6TJ operating EA9KF, and a shot by Jim of "downtown Ceuta" with the mountains of CN8 in the background (west). Looking north, both Spain and Gibraltar would be visible. Not many places in the world where you can see four DXCC countries at the same time! Look for Jim at the International DX Convention in Fresno.

- **DX Convention:** Last call; second weekend of April in Fresno, with hopes for participation by the returning Clipperton crew.
- **Dayton:** The Southeastern DX Club is sponsoring hospitality suite 325 at Stouffer's, shared with the 160-meter group that had it in 1984. A sizable and impressive group of well-known DXers and 160-meter addicts are expected this fourth weekend in April. Sample some Southern hospitality and find out if they are really planning to serve chitlin' hors d'oeuvres!
- **DXPO Atlanta '85:** Mark your calendars for the weekend of September 27-29, 1985, at the newly renovated Lanier Plaza in Atlanta, Georgia, sponsored by the Southeastern DX Club, WB4ZNH, president.
- **FOBJTP:** Jim (KA1GC) will be in the following DX countries in June and July, obviously hoping to operate VS6 VS5 CR9 BY DU 9M6 HS and 9V. At any rate, it should be an interesting trip. Any pasteboards via KA1GC.
- **Slide Shows:** The Northern California DX Foundation notes the availability of some interesting slide shows for your club meetings: W6KG/HK8, San Andres; W6KG/HK8, Galapagos; W6KG/CE8, Easter Island; W6QL/CE8, Juan Fernandez; the first Kingman Reef DXpedition and K5YY's first African DXpedition — all are 35-mm slides with cassette tape commentaries. Requests go to Jo Clarke, WB6ZUC, 207 Evergreen Dr., Kentfield, CA 94904. REC-1

- EL2FJ (JF2QHC)
- FB8WK Box 190, Mozamet, F81200, France
- FG5DL (F6ARI)
- FMSWD (W3HNK)
- FM7WD (W3HNK)
- J37XC (W2BJJ)
- J73LC (KF4IL)
- J88AQ (W2MIG)
- FO8JN Box 48, UTURUA, French Polynesia
- OD5LT 1030 Eden La., Evansville, IN 47715
- TA1AC (TA1AA)
- TG9NX (N4FKZ)
- T15FBP (KESKK)
- TG9XHQ (JA4FGD)
- TR8DR (W2PD)
- T38AT (G4GED)
- VP2MF (VE3GCO)
- VP5AB P.O. Box B, Grand Caicos Is.
- VU2FUN/KC3 (KC3AV)
- V3ZZ (KESKK)
- XT2BR Alain, Box 116, Ouagadougou, Burkina Faso (formerly Upper Volta)
- ZD8RC (ZD8AR)
- ZS1XR (N7RO)
- 3D6AN (WK4Y)
- 6Y5IC (KE3A)
- 4U1UP P.O. Box 199-1250, Costa Rica
- 8P6JQ (N8DCJ)

QSL Corner

Administered By Joan 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.

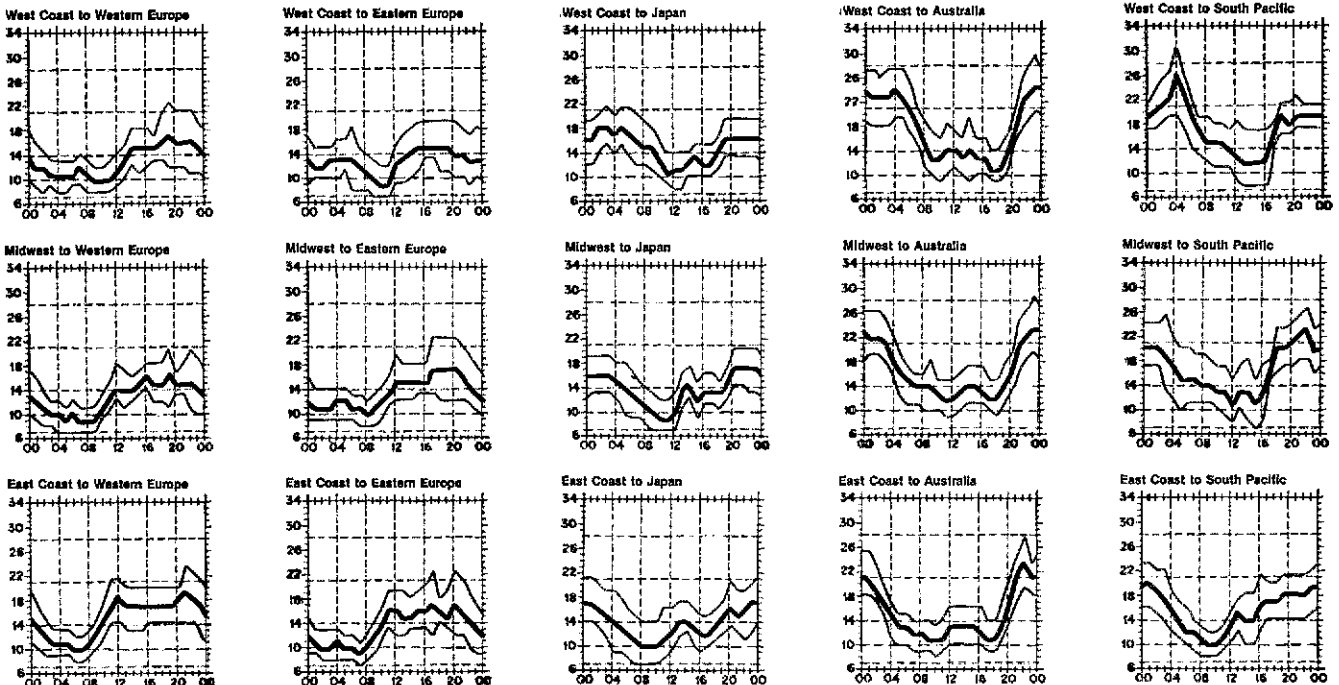
- CE6EAT (WB2PZX)
- CO2KK (KESKK)
- C53AL (KA2CDE)
- DX1N (JH3OII)
- C38LBM (EA5AGY)

QSL Manager Volunteers

- KA9LOE SK2AU
- N9EJL KC9XF
- KA2TFF KA3IFM
- VE6VW WD4GDZ

Special Notes

- KB6S is not the manager for OA4SS.
- W6AM is not the manager for TA1AA.
- K4BC is not the manager for anyone.
- W2ZO is not the manager for 5N3EC.
- December 1985 QSL corner, page 66, contains information and addresses for the Incoming Bureaus. March 1985 QSL Corner 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. REC-1



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 April 15 to May 15, 1985, assume a sunspot number of 31, which corresponds to a 2800-MHz solar flux of 87.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 28, 1984 through January 31, 1985. An s.a.s.e will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DF2IS/105	IK2BTI/126	JA2ITK/132	VE7DRI/124	KA1MX/102	KI2BI/100	WD4LOK/105	K6VRS/106	KB9L/104
DF3UB/104	I8WVV/105	JA9YBA/313	VE7YL/184	KT10/113	WB2GAI/100	WT4Z/100	KW6Q/107	N9AW/248
DL6ON/102	I8WYD/187	LA8XM/110	YU1EFG/166	N1BJY/104	W3TI/104	K5WJ/291	WA6F/101	KA8OMX/100
EA6EA/110	IK8BQE/180	OK1KBI/105	YU2REP/101	W1FMB/100	KI4BW/105	KA5HZD/107	K5TR/101	KC8DY/104
HA3HZ/136	JA1JYZ/161	PA3AFV/125	3D6AL/106	WA1WTP/287	K5AN/102	KC5YH/103	N8BIB/268	NE8V/161
HR1FC/107	JA1SY/309	PA0LEG/301	K1OVF/107	K2MUB/337	W4FON/103	NF5Y/110		

Radiotelephone

CP1PR/105	IK2AWT/110	JA2ITK/127	PY6KW/107	XE1JW/106	K1OVF/105	WB2EOB/137	WY4P/100	W8NE/152
CT1TM/154	IK2BTI/123	JA3BBG/107	PY6LE/104	YB6MP/101	KA1ION/104	WB2SRL/101	KA5QX/100	K9VTD/100
DJ7MD/113	IK8BQE/180	JA4IPU/129	SM0KN/109	YC8DP/103	K2KTT/PJ/7100	WB3HNN/100	W5BAV/140	KC9SF/104
DL4CQ/102	I8WYD/187	KL7EN/102	UW4NH/311	YV7QP/122	K2OVS/210	KC4SR/101	N6FNT/101	N9AW/212
G4HLC/102	JA1JYZ/111	OK1ORA/102	VE7YL/157	3D6AL/106	K2QXS/HH/110	WE4F/104	N7FFZ/100	NE8V/103
HA4ZZ/100	JA1SY/188							

CW

DF6ZK/210	EI3DP/101	I2QMU/132	OY7ML/211	VE7DRI/100	K2OVS/122	KA4BL/107	W6SIY/145	N9AW/168
DL1LD/194	F8HWM/105	PA3CNI/100	PA3CNI/100	YV7FF/112	KK2I/227	NF5Y/109	W7MNE/101	W9WAQ/254
DL3KAG/112	F08FW/114	JA1SY/112	VE3KYL/111	W1HJF/100	N3FT/209	KW6Q/101	K9BWWQ/251	NE8V/111

RTTY

EA2RE/106 W8WYK/102

160 Meters

DL9KR/105 HB9AMO/101 OH1XX/103 W1JR/100 W1WAI/100 W2BHM/110

5BDXCC

K0SLR	W7CNL	UT5MD	K2OVS	JA1LFR	JA6AD	WA8UQK	KK2I	JA1XAF
W0LYI	UD6DR	UR2RSA	DK7PE	K6HNZ	JA1OYY	W0VX	OY7ML	WA9EKA
KA0IGR	UW4NH							

Endorsement

Mixed

A22ME/134	IT9TGO/298	SM5FC/331	W1CYB/260	KW2P/305	K4SV/288	K5CSK/298	W6SIY/156	WB8TRW/296
CE3GN/305	JA1BMA/287	SM0BSB/158	W1HJF/258	N2BJ/294	K4YT/325	KC5NO/203	W6TXL/341	WB8VKL/279
DF4IE/125	JA1QXY/315	VE2DWH/176	W1LF/125	W2GA/325	KA4LRM/190	KD5UQ/147	W7EL/307	WB8VPA/295
DL1QT/298	JA1GV/332	VE5ADA/265	W1NHJ/329	W2GZ/336	KC4B/292	N5CFU/127	K7AA/331	WB8XE/270
DL1RB/316	JM1MGF/235	YU7BB/322	W1OHA/336	W2QL/314	KC4NH/208	N5DC/275	K7EG/307	K9L/319
DL2FAG/188	JA3CSZ/310	YU7BCD/342	W1QV/316	AJ3K/126	KF4YH/204	N5DSK/280	K7WF/270	KM9W/204
DL7MAT/186	JA3YS/235	ZP5CE/316	W1WAI/290	K3MD/195	N4JG/125	W5MQ/332	KC7GO/210	W8BZ/142
DL7WL/301	JA5CKD/251	4X4LJ/201	W1WWW/280	KA3IFX/150	N4PB/312	W5MUG/335	N7KA/310	W9NUF/300
DL9JU/252	JA6CM/280	4Z4DX/321	WB1EAZ/294	KE3A/305	W4FH/247	W5ZPA/312	W7AOL/171	W9UAC/274
EA8AG/154	JA6VA/322	AK1L/257	AC2F/229	KQ3W/203	W4HNNK/200	WB5DBT/213	W7CG/357	W9WSE/300
EA8HJ/150	JA7BJS/317	K1HKL/175	K2JF/279	N3US/314	W4OMQ/325	WB5YKD/281	K8RA/325	WB9IWN/181
F6CXJ/211	KH6BZF/295	K1SF/307	K2PZ/295	W3BZN/300	W4TL/280	WB5ZKR/281	K08J/300	WB9MSV/305
G3GWT/200	KP4AM/310	K1TH/184	KA2CYN/118	W3SD/328	W4XR/332	K6FM/300	N8AID/149	WB9UKK/250
G3JJG/260	OH3SG/271	K1TUQ/280	K1SF/307	W3XM/337	W4XS/238	K6LJS/302	W8CT/335	WD9ADB/300
HB9AFI/307	OY7ML/317	KA1HQ/277	KB2RA/254	W3XX/319	W4AGOX/127	KG6E/207	WB8KZ/273	WD9DZV/125
HB9AIB/259	PA0MAW/133	KA1YP/154	KM2V/326	W3YX/321	WB4QFH/255	KX6C/177	W8NE/300	W8FL/145
HB9HT/312	SP6AEG/300	KF1J/188	KN2N/291	WA3DVO/305	WD4RAF/200	N6V/290	W8QY/354	W8B/262
I3TZP/288	SP9AI/323	KM1E/254	KQ2L/365	K4BVU/224	W14K/251	W6JRY/318	W8ZET/344	W8LY/1316
I8WY/278	SM2EKM/328	N1BRT/228	KU2A/158	K4LRX/280	WM4Z/202	W6MND/300	WB8APN/181	WB9MWWJ/175
IT9JLA/310								

Radiotelephone

A22ME/128	JA3CSZ/293	ZP5CE/313	W1NM/291	W2QL/305	KC4BX/271	NK5Y/261	KC8KE/230	W9CZ/294
CE3GN/305	JA5CKD/132	4X4L/194	WA1OEZ/127	W2RS/265	KE4WY/209	W5MQ/332	KF8X/251	W9NUF/284
CP1FW/298	JA7BJS/313	4Z4DX/313	WB1EAZ/294	WA2BDP/268	KF4YH/203	W5MUG/309	N8BIB/267	WB9IWN/181
CT4UW/217	JA7CUK/191	8R1RBF/218	AC2F/276	KA3HXO/201	K4YT/323	WB5DBT/212	NF8W/250	WB9MSV/274
DL2FAG/174	JA8JUA/201	K1EF/299	K2PZ/276	K33PY/289	N4PB/312	WD5CGG/127	WB9UKK/242	WB9UKK/242
DK2VH/306	KH6BZF/292	K1RAW/320	KA2CYN/221	KE3A/302	W4HNNK/199	W8SUN/291	WB8AK/200	WD9ADB/300
F8BO/210	KH6JEB/294	K1SF/300	KA2PHQ/142	N3CWP/200	W4WHHJ/200	W6TXL/313	W8EJ/322	KB8S/277
I2JQL/299	KP4AM/300	KA1HBV/169	KB2RA/253	N3US/307	WB4YZ/251	W86FSR/154	W8ZET/344	KB8U/300
I2PQW/260	PA0LEG/298	KA1HJQ/277	KM2V/325	W3GG/328	W4K/251	K7EG/270	WB8TRW/250	WB8X/164
I2TZK/253	PY4AKL/316	KA1JLK/125	KN2N/291	W3IGU/252	K5UR/330	KB7HB/270	WB8VKL/276	W8LY/308
I3TZP/285	SM2EKM/324	KF1J/180	KQ2L/302	W3XM/336	KB5RA/226	K87UH/282	WB8VPA/295	W8VFB/338
IV3VER/305	SM5FC/331	KM1E/254	N2BT/291	W3YX/288	KC5NO/202	KC7GO/210	WB8XE/251	W8VFB/225
JA1JY/306	VE1JS/149	W1CYB/260	N2DNY/151	AD4E/151	KV5E/250	WB8SD/202	WB8SD/202	WB8CHS/150
JA1HEE/252	VE5ADA/281	W1HJF/251	NA2G/178	AG4M/199	N5DSK/280	K8WWA/125	KV9R/300	WB9MWWJ/175
JM1MGF/219	V86CT/282	W1WXX/339	W2GA/317	K4YAI/211				

CW

DL3RK/270	JA1QXY/283	JA6VA/278	VE1AXT/194	K2PZ/236	W2RS/256	K4BWU/224	W5ZPA/298	WB8TRW/252
DL7WL/271	JM1MGF/133	SM0BSB/158	4Z4DX/273	KB2FS/176	W2TQC/276	NN4B/175	WD5BV/252	WB8XE/182
HB9HT/290	JA3CSZ/291	SM0KN/183	K1EF/275	KN2N/210	WA2CNF/175	W4NZR/150	K7WF/179	W9NUF/261
I8WY/270	JA3FYC/308	TI4BGA/138	W1GL/301	W2QL/261	AB4H/288	WM4Z/163	W8NE/201	WB9UKK/161
JA1GV/274	JA5JGV/152							

RTTY

W0LHS/150

160 Meters

W2BXA/125 W2TQC/133

DXCC Notes: Pins Available

The Board of Directors has authorized that a nominal fee be charged for the DXCC pins. The fee will be \$2, effective June 1, 1985, including for those applying for DXCC for the first time. Distinctive pins are available for Mixed, Phone, CW, RTTY, 160 Meters, 5BDXCC and Honor Roll.


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Results, 1984 CRRL Survey

In the fall, we asked Canadian amateurs for their opinions on three important issues. Some 22,766 survey sheets were mailed out. Of these, 3126 were returned, for a return rate of 13.7%. About 1000 survey sheets went to holders of repeater or club licences. Inadvertently, these people received two or more surveys. With this calculated in, the return rate is about 14-15%. Apparently, in the survey business, any return rate of over 10% is considered good. For this reason, we were pleased with this response.

The first issue was possible expansion of the Canadian 75-metre phone band. Respondents were asked to classify themselves as being "very active," "somewhat active" or "not active" on 75-80 metres. They were then asked to choose a lower limit for the Canadian 75-metre phone band. Here are the results (percents, as in all Tables in this report, are out of the total in each "activity category").

The results in Table 1 indicate that most Canadian amateurs want some expansion of their 75-metre phone band. Desire for expansion down to 3675 kHz appears to increase with the amount of activity on 75-80 metres.

The second issue was possible "deregulation of mode subbands." This was a DOC proposal, not yet officially released, whereby Canadian amateurs would be able to operate any mode within their HF bands, relying on voluntary adherence to recommended band plans rather than on DOC regulations. After being given a brief outline of the concept and a summary of pros and cons, respondents were asked to classify themselves as being "very active," "somewhat active" or "not active" on HF bands. They were then asked if they thought this kind of "deregulation" was a good idea. See Table 2.

The results indicate that Canadian amateurs oppose "deregulation" about three to two. This opposition increases to about two to one among amateurs who are "very active" on HF bands.

The last issue was the possible introduction of a no-code VHF-UHF "communicator's licence" as part of DOC's "restructuring of the Amateur Service" proposal expected later this year. After

Table 1
75-Metre Phone-Band Expansion

Activity Category	3725 kHz			
	3675 kHz	3700 kHz	As at Present	Not Sure
Very active (615)	313 (50.9%)	150 (24.4%)	121 (19.7%)	31 (5.0%)
Somewhat active (1753)	635 (36.2%)	616 (35.1%)	361 (20.6%)	141 (8.0%)
Not active (758)	168 (22.2%)	143 (18.9%)	114 (15.0%)	333 (43.9%)
All respondents (3126)	1116 (35.7%)	909 (29.1%)	596 (19.1%)	505 (16.2%)

Table 2
Deregulation of Mode Subbands

Activity Category	Yes	No	Not Sure
Very active (1102)	339 (30.8%)	611 (55.4%)	152 (13.8%)
Somewhat active (1690)	549 (32.5%)	780 (46.2%)	361 (21.4%)
Not active (334)	100 (30.0%)	114 (34.1%)	120 (36.0%)
All respondents (3126)	988 (31.6%)	1515 (48.1%)	633 (36.0%)

Table 3
No-Code Licence

Activity Category	Yes	No	Not Sure
Very active (1108)	210 (19.0%)	834 (75.3%)	64 (5.8%)
Somewhat active (1511)	289 (19.1%)	1058 (70.0%)	164 (10.9%)
Not active (507)	107 (21.1%)	282 (55.6%)	118 (23.3%)
All respondents (3126)	606 (19.4%)	2174 (69.5%)	346 (11.1%)

being given a brief outline of the concept and a summary of the pros and cons, respondents were asked to classify themselves as being "very active," "somewhat active" or "not active" on VHF/UHF bands. They were then asked if they thought some form of a "communicator's licence" was a good idea. See Table 3.

This was the question on which respondents had the most definite views. Many included comments that GRS should be able to serve the needs of those who wanted a "communicator's licence."

At the end of the survey, respondents had an

opportunity to indicate if they were CRRL members; 1702 said they were. On the first and last issue, we found no meaningful differences between those who were CRRL members and those who were not. On the second issue, CRRL members were slightly more willing than others to accept "deregulation," although as a group they still rejected the concept by a good margin. A full report of the results of the survey is available from CRRL for \$2. This report will be going to DOC as part of a formal submission on the three issues. Hopefully, DOC will be open to what the amateurs of Canada have to say.

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

2304-MHz Operation

WA5DBY has sent details and comments on a recent series of 2304-MHz contacts between himself and WB5LUA. The impressive results may serve as encouragement to others to try the band.

WA5DBY's mobile equipment on 2304-MHz SSB consists of an IC-260A, SSB transverter, traveling-wave-tube amplifier and a 26-element loop Yagi fed with 20 feet of Belden 9913. The system has an output of 10 W.

All of WA5DBY's mobile contacts on 2304 MHz have been with Al Ward, WB5LUA, in McKinney, Texas. WB5LUA's station consists of an FT-290, a homebuilt interdigital transverter with a DXL1503 preamplifier (1.2-dB noise figure), Alfred 560A traveling-wave-tube intermediate amplifier and a Varian VA-802B klystron final amplifier (1-kW input). WB5LUA's antenna is a 5-ft dish with a 1-lb coffee-can feed at 65 feet fed with 7/8-in air heliax.

On the evening of November 25, 1984, WA5DBY made contact with WB5LUA from Midland, Texas, on 432 MHz and requested that WB5LUA turn on his 2304-MHz beacon. WA5DBY went to 2304 MHz and copied WB5LUA's beacon 2 S units out of the noise. WA5DBY went back to 432 MHz and was not able to make contact with WB5LUA, as the band had gone down. Efforts to make contact on 40 meters, which was being used as a back-up frequency, failed because the propagation was too long. WA5DBY continued listening to WB5LUA's Q5 beacon on 2304 MHz, unable to contact WB5LUA to have him remove his beacon and attempt a 2304-MHz contact.

Also that evening, WA5DBY made contact with WB5LUA on 2304-MHz SSB, over a distance of 210 miles, while operating mobile in Trent, Texas, in grid square DM92.

In addition, WA5DBY made contact that evening with WB5LUA on 2304-MHz SSB, over a distance of 110 miles, while operating mobile in Thurber, Texas, in grid square EM02.

On the evening of November 30, 1984, WA5DBY made contact with WB5LUA on 2304-MHz SSB, over a distance of 85 miles, while operating mobile eight miles southeast of Jacksboro, Texas, in grid square EM03.

During the afternoon of December 1, 1984, WA5DBY made contact with WB5LUA on 2304-MHz SSB, over a distance of 46 miles, while operating mobile in Cumby, Texas, in grid square EM 23.

Also that afternoon, WA5DBY made contact with WB5LUA on 2304-MHz SSB, over a distance of 51 miles, while operating mobile five miles southeast of Miller Grove, Texas, in grid square EM22.

On the evening of December 27, 1984, WA5DBY made contact with WB5LUA on 2304-MHz CW, over a distance of 300 miles, while operating mobile 20 miles south of Lake Charles, Louisiana, in grid square EL39. This is the first Louisiana-to-Texas contact ever made on 2304 MHz. It is interesting to note that WB5LUA was experiencing rain and fog during the contact. WA5DBY and WB5LUA had planned on coordinating via 2 meters; however, contact could not be established on 2 meters because of the distance separating the stations.

On the morning of December 29, 1984, WA5DBY and WB5LUA ran a schedule on 2304-MHz CW. WA5DBY was in grid square EM50 near Slidell, Louisiana, a distance of 450 miles from WB5LUA. WA5DBY was able to copy WB5LUA, but WB5LUA was not able to copy WA5DBY. WA5DBY experienced fading on

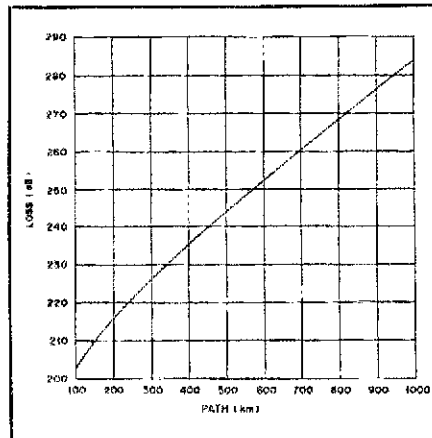


Fig. 1 — Troposcatter path loss vs. distance for 2304 MHz.

WB5LUA's signal for the first time. WB5LUA's signal slowly faded in and out of the noise. The signal came out of the noise at 10-minute intervals and stayed out for two minutes at a time, peaking 2 S units out of the noise. Both WA5DBY and WB5LUA were experiencing rain during the schedule.

During the afternoon of January 1, 1985, WA5DBY made contact with WB5LUA on 2304-MHz CW, over a distance of 203 miles, while six miles west of Jasper, Texas, in grid square EM20.

On the evening of January 1, 1985, WA5DBY made contact with WB5LUA on 2304-MHz CW, over a distance of 123 miles, while in Rusk, Texas, in grid square EM21. WA5DBY was looking into the side of a hill about 1/2 mile from him that was 300 feet higher than his elevation. This indicates that 2304-MHz signals will refract over the top of hills.

Also that evening, WA5DBY made contact with WB5LUA on 2304-MHz CW, over a distance of 85 miles, while seven miles west of Cayuga, Texas, in grid EM 11. WB5LUA was experiencing temperatures below freezing and heavy snow during the contact.

During the afternoon of January 12, 1985, WA5DBY made contact with WB5LUA on 2304-MHz SSB, over a distance of 115 miles, while two miles south of Hico, Texas, in grid

square EM01. Temperatures were well below freezing during the contact.

2304-MHz SSB mobile performance is very similar to 432-MHz SSB- and 144-MHz SSB mobile performance. 2304-MHz SSB is much more affected by hills and trees than 432-MHz SSB or 144-MHz SSB. When you have a clear path to the horizon, there is little difference in mobile operation on 2304 MHz and 432 and 144 MHz. In fact, the ability to run a high-gain loop Yagi antenna on 2304 MHz can make up for the path loss encountered on 2304 MHz and the lower power levels that are usually run on 2304 MHz.

2304-MHz SSB has consistently provided the best communications link between WA5DBY's mobile and WB5LUA when compared to other frequencies between 1.8 MHz and 2304 MHz. WA5DBY has copied WB5LUA in every location that a contact has been attempted. So far, contacts of up to 450 miles have been attempted. Contacts have been made in all types of weather, including rain, snow and freezing temperatures. All contacts between the two stations have been made during the months when conditions are the poorest on 2304 MHz. Contacts have been random enough to rule out their being the result of enhanced propagation conditions.

The mobile station used to make the contacts described above is shown in the accompanying photograph. A 2304-MHz 26-element loop Yagi is at the top of the mast; a 13-element loop Yagi for 1296 MHz and a "big wheel" for 144 and 432 MHz are at the bottom.

While the station in use at WB5LUA was running more power than most of us could achieve, a contact depends on the weakest link — in this case, the 10-W station of WA5DBY. Such power levels on 2304 MHz do not require the use of traveling wave tubes. The 2C39 tube and its better variants (3CX100A5, 7289) are quite capable of 30 W or more of power out at 2304 MHz and cost \$5 and up from surplus sources. Suitable amplifiers have been described elsewhere (e.g., WA9HUV, *Ham Radio*, Feb. 1975, p. 8) or may be found on the surplus market (the output stage of the military-surplus TRC-29 will tune 2304 MHz) from time to time. The 26-element loop Yagi used by WA5DBY is quite a small antenna, with a gain of perhaps 20 dBi — somewhat less than a 2-ft dish. A 3-ft dish or a couple of long-loop Yagis should show a gain of about 25 dBi.

Typical equipment range can be estimated with the aid of Fig. 1, which shows the troposcatter path loss versus frequency at 2304 MHz under average atmospheric conditions and assumes a clear horizon at each end of the path. An average station might consist of 10-W output power, a 3-ft dish and a 2-dB noise figure receive system. This translates to an effective receiver sensitivity of -174 dBm for SSB (2-kHz bandwidth), or -186 dBm for CW (100-Hz bandwidth). With a transmit power of $+10$ dBW (10 W) and a combined antenna gain of 50 dB (two 3-ft dishes) between two average stations, this gives a path-loss capability of 234 dB for SSB, or 246 dB for CW. From Fig. 1 these figures translate to communication ranges of 380 km on SSB, or 520 km on CW. Remember that these are ranges under average conditions; tropo enhancements will extend them considerably.

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A Memorable Decade

QST for April 1975 contained, as usual, the VHF column, then called *The World Above 50 Mc.* Except for a few years during WW II, it had been a regular feature since begun in 1939 by Ed Tilton, W1HDQ. Ed's years of stewardship were ones of tremendous growth in interest in our bands above 10 meters. The skillful manner in which W1HDQ chronicled the unfolding events on these "ultra high frequencies," as they were called in those days, provided a great stimulus to the growth in their occupancy. He also fostered a constant improvement in equipment that led to a wider realization that these short wavelengths were good for something besides crosstown ragchews.

After returning from several years of work in the war effort, Ed took on the job of VHF Editor for *QST* and the *Handbook*, in addition to his renewed stewardship of the column. In these dual roles, he was responsible for many of the designs that enabled many to get on the newly opened VHF bands, as they became known after WW II. When Ed relinquished the reins of the column in 1960 to devote full time to his position as *QST's* VHF editor, a veritable giant on the VHF scene was chosen to take over the column. Sam Harris, W1FZJ, brought with him a wealth of knowledge of up-to-the-minute techniques, which he effectively imparted to eager readers each month for the next seven years. Even to this day, Sam's columns are a valuable storehouse of information most of us have either forgotten or never knew. His columns were also interesting and informative in their presentation of a variety of news on what was transpiring on the bands, thanks in part to the able assistance of his wife Helen, W1HOY, well known especially to 6-meter operators of the day. One of W1FZJ's major contributions to the VHF/UHF scene was demonstrating that amateurs can communicate via the moon.

When Sam decided that he could no longer continue to conduct the column (because of work commitments and a move to Puerto Rico), a young, eager and knowledgeable VHF enthusiast, then on the Headquarters staff, was asked to assume the assignment. Thus, Bill Smith, best known as KØCER but holder of a number of calls as he moved about the country advancing his career in radio and TV journalism, became the conductor of the column, in April 1967. Bill continued the tradition begun by Ed Tilton, putting out interesting and informative columns until 1975.

It was into this lineage that I was asked to step 10 years ago this month. Understandably, it was with more than a little trepidation that I considered the proposition. But the challenge was just too intriguing to pass up, so accept I did. I had been writing a high-fidelity column in a local Baltimore-Washington magazine for some 12 years prior to that, so I had some idea of what I was getting into in terms of meeting deadlines and all of the other things involved in producing a monthly magazine column. Once a task such

as this is taken on, it must be done each month, and it must be done on time. At the same time, it cannot be allowed to get in the way of accomplishing those things one must do to earn a living. Despite the difficulty I sometimes face in forcing myself to sit down at the keyboard to put together another column, I must say that having been the conductor of *The World Above 50 MHz* for these past 10 years has been an extremely enjoyable and rewarding experience.

One of the things that has made it especially so has been the opportunity to hear from and meet so many VHFers from all across the country and throughout the world. In addition, being in a position to have a "birds-eye view" of events taking place on our VHF and UHF bands has been a unique and fascinating experience for me. I have had the pleasure of reporting on the advancement of moonbounce, from its use by a mere handful of advanced practitioners to where it is today — one of the customary DX modes used on 2 meters and 70 cm, and rapidly becoming so on 23 and 13 cm as well. It is also a favorite method of running up state totals on our much-threatened 1¼-meter band. Incidentally, the first column, which W3KRV had the pleasure of editing in April 1975, included a piece entitled "Our Bands at the Crossroads." It discussed, among other things, an FCC proposal to take part of the 220-MHz band from us and reallocate it to something called the "Class E Citizens Radio Service." That threat died, as I believe current and future ones will, if we remain active and regularly report our results. We also must be ready to mount letter-writing campaigns to appropriate officials when called upon to do so.

In addition to witnessing the advance of EME and seeing several challenges to our bands come and go, the other "happening," and I believe that is the proper term for it, was being around to report and participate in the outstanding F-layer conditions that turned 6 meters into an international DX band during the height of Solar Cycle Number 21. After having been shown by W1HDQ and a handful of others in 1947 that F2 propagation is possible on 50 MHz, a few of us experienced a taste of worldwide DX during the very high solar peak in 1957-58. However, we were disappointed by the distinctly subpar Cycle 20 in 1968-69.

So, in 1978, the stage was set for no one knew what. Most "experts" were predicting a lower than normal peak, perhaps lower than the previous one, but we hams hoped for the best anyway and prepared our stations in hopes that the "experts" would be proved wrong. We were not to be disappointed this time. Next to Cycle 19, the solar peak we have just been through ranked as one of the highest since records began being kept, over 200 years ago.

What turned out to be equally important, hams got on the band in numbers never before seen, and in lots of interesting places. In countries where they were not allowed to transmit on 50 MHz, many equipped themselves to listen and tell us via 10 meters that our signals were making it to the other side of the world. Another factor that contributed to the great success on 6 meters

during Cycle 21 was that equipment had improved over that available 20 years earlier. And most important, many learned what signs to look for to catch fleeting band openings. The existence of many continuously operating beacons in various parts of the world was no small factor in our ability to be in the right place at the right time. The result was that hundreds of operators in various parts of the world ran up country totals undreamed of when the cycle got underway.

What about Cycle 22? We can only wait and anticipate what might be in store for us four or five years hence, but a lot of dedicated 6-meter operators will be on deck searching for the return of those thrilling long-haul openings!

In addition to its effect on 6 meters, the high solar activity paid dividends for other bands above 50 MHz as well. It was during this cycle that it was proved that 2-meter propagation across the equator in early evening hours during certain seasons of the year was possible, leading to many regular QSOs between the Caribbean and southern South America, southern Europe and southern Africa, and Japan and Australia. This Transequatorial Propagation, or TE, mode even manifested itself on 1¼ meters and 70 cm. On 1¼, it resulted in a new world DX record, but the first 70-cm two-way TE QSO is still in the future. Also in the record department, the famous tropo ducting path from the coast of California to Hawaii resulted in new world records for both the 70-cm and 23-cm bands, and the Mediterranean provided the environment for extending the 10-GHz mark to over 1000 miles. Although not suitably situated to personally participate directly in these momentous events, I was certainly pleased to be able to report them.

It was also interesting to witness the improvement in activity on all of the VHF and UHF bands. This has shown a steady increase over the past 10 years, although it is still not all we would like it to be. Nevertheless, a ham who operates 2-meter SSB is no longer looked upon by the rest of the fraternity as some kind of unusual character.

We have all experienced the ups and downs of amateur satellites, but almost two years ago, AMSAT presented us with a new, highly capable and reliable satellite on which we can use our equipment when the bands are dead and with which we can exchange ideas with other VHFers throughout the world. Also on the space front, we were given our first opportunity to hear and to have a QSO with a fellow ham orbiting in the Shuttle high above us!

Many other events that will have a profound influence on the VHF/UHF scene took place. The FCC authorized the operation of unattended beacon stations and raised the amateur power limit, making legal EME a much more viable proposition.

This is by no means a complete summary of the many interesting and important events that have occurred on the VHF and UHF bands over the exciting 10 years I have been privileged to conduct the *World Above 50 MHz*. What can we expect over the next 10 years? Almost universal use of EME, with many DXCCs issued on

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

Coming Conventions

MISSOURI STATE CONVENTION

April 12-14, Kansas City

The PHD Amateur Radio Association will sponsor the 1985 ARRL Missouri State Convention on Friday, Saturday and Sunday at the Old Kansas City, Missouri, Airport. There will be a complete program of forums — ARRL, FCC, DX, AMSAT, computer, packet radio, amateur TV, QCWA luncheon, YL luncheon, homebrew contest, CW contest, PR, VE and others. Commercial booths and swap tables, all inside the 45,000-sq ft, one-level, air-conditioned building. Unlimited free parking adjoins the site. RVs welcome, no hookups. Missouri-Kansas CW and Amateur-of-the-Year awards. Doors open 9:30-5:30, Sat.-Sun. There will be a banquet Saturday night. Guest speakers will include ARRL Executive Associate W. Dale Cliff, WA3NLO; Bill Pasternak, WA6ITF, Westlink Radio; Bob Heil, K9EID, Heil Sound; Midwest ARRL Director Paul Grauer, W0FIR, and others. Registration \$4; banquet tickets \$10.50; swap tables \$10 for both days (includes one registration per table). Please order banquet tickets and swap tables in advance. Two-hundred swap tables available — all were sold in '84. All preregistration will be held at the door, s.a.s.e. for confirmation. Talk-in on 34/94. For information write to PHD, P.O. Box 11, Liberty, MO 64068-0011, tel. 816-781-7313 or 452-9321. For FCC Exam information, see Exam Box, p. 73 of March QST.

MICHIGAN STATE CONVENTION

April 13, Muskegon

The Muskegon Area Amateur Radio Council hosts the 1985 ARRL Michigan State Convention to be held at the L. C. Walker Sports Arena, 470 W. Western Ave., Muskegon. Registration at the door begins at 8 A.M. Food and beverages will be available. A Swap-n-Shop, manufacturers' displays, computer and packet-radio demonstrations to be held throughout the day. An ARRL meeting and net meetings are also scheduled. For nonhams, there will be shopping at Lumbertown and the Muskegon Mall, as well as guided tours through Muskegon's famous Hackley House and Emery House lunch and gift shop. A hospitality room will open Friday at 7 P.M. at the Ramada Inn, 2967 Henry St. Talk-in on 34/94 and 22/82, both Friday afternoon and Saturday. A banquet is scheduled for 7 P.M. Saturday evening at the London Steak House. Entertainment will be provided; reservations required. For further information, write State Convention, P.O. Box 691, Muskegon, MI 49443.

April 13 — Michigan State, Muskegon

April 13-14 — Arkansas State, North Little Rock

April 12-14 — Missouri State, Kansas City

April 20-21 — Mississippi State, Jackson

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

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.

ARKANSAS STATE CONVENTION

April 13-14, North Little Rock

The Central Arkansas Radio Emergency Net, Inc. (CAREN) proudly invites all hams to the ARRL Arkansas State Convention and Ninth Annual All-Arkansas Hamfest. Again this year, the Hamfest will be held at the North Little Rock Community Center on Pershing Blvd. Admission is free. The "World-Famous Boat Anchor Inn" operated by the CAREN Ladies Auxiliary will be open all day Saturday and Sunday. A repeat of last year's Social Hour and Bar-B-Que is scheduled at Burns Park Hospitality House Saturday evening. Covered flea-market area for all bargain hunters. Dealers include Moory Electronics, Hooper Electronics, Texas Towers, Generation Products (Badges and Caps), BCD Parts and a computer company, plus Icom Factory Display. Flea-market spaces \$5 each (bring your own table). Rental tables \$5 each as long as they last. CAREN will sell your equipment in the flea market for 10%. Reservations for the Saturday evening Social Hour and Bar-B-Que must be in by 11 A.M. Saturday to John Barnett, N5BPU.

MISSISSIPPI STATE CONVENTION

April 20-21, Jackson

The 1985 ARRL Mississippi State Convention/Capital City Hamfest will be hosted again by the Jackson ARC at the Communications Workers of America Building (1-220 at Country Club Dr.), 9 A.M. to 5 P.M. Saturday and 8 A.M. to 1:30 P.M. Sunday. Top attractions include commercial-dealer exhibits, a large indoor flea market, concessions and abundant free parking. Over-

night accommodations will be available for self-contained RVs. An ARRL forum is planned featuring League Counsel Christopher D. Imlay, N3AKD, Delta Division Director Clyde Hurlburt, W5CH and Mississippi Section Manager Paul Kemp, KW5T. Miss. Sideband Net, MARS and VHF/UHF forums are also scheduled. Admission is free. Flea-market tables will be available at \$5 each. Motel reservations may be made through the Holiday Inn Southwest; specify you are a hamfest participant for special rates. Talk-in on 16/76. For further information, contact Arden Fant, N5DSK, 375 Allstate Dr., Jackson, MS 39211, tel. 601-956-8591.

SOUTH CAROLINA STATE CONVENTION

May 4-5, Greenville

The ARRL South Carolina State Convention/46th Annual Greenville Hamfest and Electronic/Computer Flea Market will be held at the American Legion Fairgrounds, 1 mile n. of I-85 on U.S. 25 N Bypass on Saturday from 8 A.M. to 5 P.M. and Sunday from 8 A.M. to 3 P.M. Indoor/outdoor flea markets, tailgating, camping, dealer displays, forums on QSL Bureau/Morocco DXpedition/ARRL. There will be a banquet Saturday night at Rodeway Inn (I-85) with SC SSB Net, QCWA, ARES, MARS, all hams. Royal Order of the Wofff Hong ceremony will follow the banquet at midnight.

Advance registration \$3; banquet \$8.50. Preregistration deadline April 26. VEC walk-in exams will be given at Greenville Tech Saturday at 8:30 A.M. Send all inquiries to ND4N/N4ENX, John and Sue Chism, P.O. Box 6751, Greenville, SC 29606.

Hamfest Calendar

[Hamfest information is accurate as of our deadline; contact sponsor for possible late changes.]

Arizona (Sierra Vista) — May 4-5: The Cochise ARA (CARA) invites you to participate in the inauguration of the CARA Training Facility and Range. This 40-acre complex is located in Cochise County, 5 miles east of Sierra Vista, on Moson Rd., off Hwy. 90 East. The dedication and inaugural event will be our annual hamfest. A flea market is planned, and all tailgaters are welcome. For more information, please contact The Cochise ARA, Inc., P.O. Box 1855, Sierra Vista, AZ 85636, Attn: KB7HB.

California (Fresno) — May 3-5: The Fresno ARC Hamfest will be held at Tropicana Lodge from 5 P.M. Friday until noon Sunday. Full registration in advance, \$24; dinner \$13; at the door, \$26 and \$14. Technical talks, transmitter hunt, CW contest, ARRL forum, commercial exhibits, swap tables and flea market. Talk-in on 34/94. For reservations and information, write Fresno ARC Hamfest, P.O. Box 783, Fresno, CA 93712.

California (Sacramento) — May 5: The North Hills RC will host the 13th annual Sacramento Amateur Radio Hamswap at the Placer County Fairgrounds (Roseville) from 9 A.M. to 3 P.M. Talk-in on 144.59/145.19 and 223.18/224.78 MHz. Food and refreshments, free parking. For further information, advance table sales and flyer, send s.a.s.e. or call Carl Schultz, KA6KWB,

chairperson, tel. 916-366-9111, 2942 Gwendolyn Way, Rancho Cordova, CA 95670.

Colorado (Grand Junction) — April 20: The Grand Mesa Repeater Society will hold the Sixth Annual Western Slope Amateur Radio and Computer Swapfest from 10 A.M. to 4 P.M., at a location to be announced. Admission is free; swap tables \$5 each. Features include an indoor swapfest, Amateur Radio Exams, auction and refreshments. Talk-in on 22/82 and 444.200/449.200. To reserve a swap table and for further information, send an s.a.s.e. to Larry Brooks, WB0ECV, 3185 Bunting Ave., Grand Junction, CO 81504, or call 303-434-5603.

Connecticut (West Hartford) — April 14: The 8th annual Pioneer Valley Radio Assn. (PVRA) Flea Market will be held Sunday, from 10 A.M. to 4 P.M., at Conard High School, Berkshire Ave. This year's flea market will be bigger and better than ever! Volunteer exams, food service, plenty of parking space. Lectures on computers, auction at 3 P.M., and lots more. Tables are \$10 in advance, \$12 at the door. Talk-in on 19/79. For information and reservations contact Jon Patz, KA1FYL, 34 Whiting Ln., West Hartford, CT 06119, or call 203-232-8772, evenings.

Georgia (Marietta) — April 13: The Kennehoochee ARC hamfest will be held at the Cobb County Fairgrounds Park on Saturday. General admission \$3; flea market \$4 outside, \$5 inside. For further information, contact Ken Wilhoit, Jr., chairman, 153 Stonemill Ln., Marietta, GA 30064, tel. 404-428-4913.

Georgia (Athens) — April 21: The Athens ARC

Administered By Marjorie C. Tenney, WB1FSN

(formerly the Northeast Georgia ARC) will sponsor a hamfest at the Athens Vocational-Technical School, Hwy. 29, from 8:30 A.M. to 3:30 P.M. Registration is free. Talk-in on club repeater, output 147.825. For more information, write Norman Archibald, KB4ILA, P.O. Box 225, Athens, GA 30603.

Georgia (Albany) — May 4-5: The Albany ARC, Inc., hamfest will be held at the Hasan Temple, 1822 Palmyra Rd., on Saturday, from 8 A.M. to 5 P.M., and Sunday, from 9 A.M. to 2 P.M. Entertainment Saturday night. For motel reservations, call the Ramada Inn at 1-800-2RAMADA. Hospitality room Friday night at the Inn. ARRL-VEC exams for all license classes. (Walk-ins accepted, but early notification preferred.) Talk-in on 22/82, 29.58/68 and 52. For more information, contact AARC, P.O. Box 1205, Albany, GA 31702.

Illinois (Centralia) — May 5: The Centralia Wireless Assn., Inc., will hold its hamfest at the Kaskaskia College Gym, 3 miles NW of Centralia, on Sunday. Talk-in on 87/27 and 52. Doors open at 7 A.M. for flea-market setup and exhibit displays. Limited number of tables on first-come, first-served basis. Free admission. No charge for flea-market or exhibit space. Food, refreshments. Exams for all classes of license (except Novice) at 9 A.M. To register for exams, send a completed FCC Form 610, a copy of your current license and check for \$4 payable to ARRL/VEC to Lou Hodges, W9IL, Rte. 1, Box 62A, Centralia, IL 62801. Applications must be received by April 5. For further information, contact David Conder, KA9QPC, at 618-532-2772, Lou Hodges, W9IL, at 618-533-4724 or write to CWA, Inc.,

*ARRL Hamfest

Illinois (Kankakee) — May 5: The Kankakee Area Radio Society hamfest will be held at the Kankakee County Fairgrounds, 1/2 mile south of I-57 Exit 308 on Rte. 45 south, from 8 A.M. to 5 P.M. Advance admission \$2.50; at the door \$3. Flea market, ARRL booth, FCC booth, commercial exhibitors, food and beverages, shuttle service from airport. Talk-in on 34/94 carrier access. For further information, contact Don Kerouac, K9NR, 1377 Circle Dr. N.W., Kankakee, IL 60901, tel. 815-932-3111.

Illinois (Sandwich) — May 5: The Kishwaukee ARC will sponsor its 30th annual hamfest at the DeKalb County Fairgrounds, Suydam Rd., just north of Rte. 34, between Rtes. 23 and 47. Airport across Suydam Rd. Donation \$2 advance; \$3 at gate. For tickets write KARC, Box 334, Sycamore, IL 60178. Inside display tables \$5 each. Overnight camping, no hookups. All parking free — outside areas for tailgating. Hamfest markers at Airport on Rte. 34. Coffee, donuts available for early birds; food wagon thereafter. Talk-in on 94. 13/73.

Illinois (Sullivan) — May 5: The Moultrie AR Klub (MARK) hamfest will be held at the Moultrie County 4-H Center Fairgrounds, Cadwell Rd., 5 miles east of Sullivan, 8 A.M. to 3 P.M. Heated indoor and large covered outdoor flea market. No charge to vendors. Space on a first-come, first-served basis. Lunch available. Vendors can set-up on Saturday. No overnight hookups. Talk-in on 655/055 and 52. For more information, write MARK, P.O. Box 79, Sullivan, IL 61951, or call Vernon Jack, K9SWY, 217-728-7596.

Indiana (Greencastle) — April 6: The Putnam County ARC will hold its third auction and flea market at the Putnam County Fairgrounds, north of Greencastle, on U.S. 231. Doors open for setup at 6 A.M., flea market opens at 8 A.M. Flea-market tables \$2 each; admission \$3, children under 12 free. Auction begins at 1 P.M. Food and beverage available. All events inside, commercial exhibitors welcome. For more information, send s.a.s.e. to John S. Underwood, K9IB, RFD 1, Box 10, Fillmore, IN 46128 or call 317-246-6335.

Kentucky (Paducah) — May 3: The Paducah ARA's 6th annual Hamfest will be held at the Paducah Civic Center. Hours: 8 A.M. to 4:30 P.M. Admission \$1. ARRL Forum, swapfest, dealers, refreshments. Talk-in on 147,060/660 and 52. For more information, contact Ernest Evans, K4OEN, 220 Mimosa Ln., Paducah, KY 42001, tel. 502-443-5879.

Louisiana (Baton Rouge) — May 11-12: The BRARC will hold its annual hamfest on Saturday from 8:30 A.M. to 5 P.M., Sunday, 8:30 A.M. to 2 P.M., on the campus of Catholic High School. Admission is free. VE exams to Extra, 9-12 both days, by 30-day advance registration only. Send s.a.s.e., FCC Form 610 and check for \$4 payable to ARRL/VEC to George Perry, W5LVX, 17424 Lady Constance, Greenwell Springs, LA 70739. Talk-in 19/79. Features will include swap tables, forums and new-equipment dealers. For further information, s.a.s.e. to Rick Pourciau, N5HHF, 879 Castle Kirk Dr., Baton Rouge, LA 70808.

Massachusetts (Framingham) — April 14: The Framingham ARA, Inc., will hold its annual spring flea market at the Framingham Civic League Bldg., 214 Concord St. (Rte. 126), downtown Framingham. Doors open at 10 A.M. Sellers may set up at 8:30. Admission is \$2; tables are \$10 (includes one free admission); preregistration required. Talk-in on 75/15. Radio and computer gear, food on premises, bargains galore. Contact Jon Weiner, K1VVC, 52 Overlook Dr., Framingham, MA 01701, tel. 617-877-7166.

Massachusetts (Braintree) — April 21: Celebrating its 54th year in Amateur Radio, the South Shore ARC of Braintree will hold an indoor flea market on Sunday at the Viking Club, 410 Quincy Ave., from 11 A.M. to 4 P.M. Eight-foot tables available for \$10 each (includes one free admission per table), paid for in advance by sending appropriate amount to Ed Doherty, W1MPT, 236 Wildwood Ave., Braintree, MA 02184. Checks should be made payable to South Shore Amateur Radio Club. Receipt will be sent. No cancellation refund after April 17. Viking Club will open to vendors at 9:30 A.M. Doors open to public at 11 A.M., entrance fee of \$1. Plenty of parking. (First come, first served). Questions? Call 617-843-4431 (Ed, W1MPT), evenings.

Massachusetts (Fitchburg) — April 27: The Montachusett ARA will hold a flea market on Saturday at the Knights of Columbus Hall on Electric Ave. Doors open 9 A.M. to 3 P.M. Admission \$1; tables \$8 each. Free parking, refreshments available. Doors open at 8 A.M. for sellers. Talk-in on 144.85/5.45 and 52 simplex. For table reservations, send check payable to MARA, c/o Jim Beauregard, 7 Mountain Ave., Fitchburg, MA 01424.

Massachusetts (Webster) — April 28: The Eastern Connecticut ARA will hold their annual flea market at the Point Breeze Restaurant on Webster Lake, near Exit 1 off Rte. 395. For further information, contact Richard Spahl, K1SY1, Lake Parkway, Webster, MA 01570 or contact Dick at 617-943-4420 after 7 P.M. or

Don Amirault, K1APE, RR #1, Box 310, Thompson, CT 06277, tel. 203-923-2727. Talk-in on 825/225 or 52 simplex.

Massachusetts (West Springfield) — May 5: The Hampden County Radio Assn. Flea Market will be held, rain or shine, at the West Springfield Elks Lodge, Morgan Rd., from 9 A.M. to 3 P.M. Admission is \$1; tables are \$3 each. Dealers may display from vehicles at \$3 per vehicle. Food and refreshments available. Directions: Mass. Turnpike to West Springfield, Exit 4, travel about 1/2 mile south on Rte. 5. At Abdow's Restaurant, turn right onto Morgan Rd. Elks Lodge is 1/4 of a mile on the left. For more information, contact Paul Kress, WA1ZKT, at 413-568-8291.

Michigan (Chelsea) — June 2: The Chelsea Swap and Shop will be held on Sunday at the Chelsea Fairgrounds. Gates open for sellers at 5 A.M., for the public from 8 A.M. to 2 P.M. Donation is \$2.50 in advance; \$3 at the gate. Children under 12 and spouses admitted free. Talk-in on 52 simplex and 147.255 Chelsea repeater. For more information, write William Altenberndt, WB8HSN, 3132 Timberline, Jackson, MI 49201, tel. 517-764-5785.

Minnesota (Rochester) — April 20: The Rochester ARC will sponsor the 8th annual Rochester Area Hamfest at John Adams Junior High School, 1525 NW 31st St. Doors open at 8:30 A.M. Large indoor flea market for radio and electronics items, refreshments and plenty of free parking. Talk-in on 22/82. For further information, contact RARC, c/o W8BYE, 2253 Nordic Ct. N.W., Rochester, MN 55901.

Minnesota (Bemidji) — May 4: The Bemidji ARC will hold its annual Hamfest/Swapfest at the Middle School Cafeteria, from 9 A.M. to 4 P.M. Talk-in on 13/73. For more information, write Jerry Potrats, Bemidji ARC, P.O. Box 524, Bemidji, MN 56601, tel. 218-751-7502. Licensing exams will be given.

Missouri (Columbia) — May 5: Columbia Hamfest '85, sponsored by the Central Missouri Radio Assn., will be held at the Tigger Hotel. Flea market 7 A.M.; hamfest starts 9 A.M. Advance admission is \$3.50; at the door \$3. Covered flea-market area. Forums, FCC exams. For further information, contact Wayland McKenzie, Jr., K4CHS, P.O. Box 283, Columbia, MO 65205, tel. 314-442-7619, evenings.

New Hampshire (Somersworth) — April 20: Springfest '85, the 5th annual flea market/hamfest, sponsored by the Great Bay Radio Assn., will be held at the Somersworth Armory, Blackwater Rd., from 9 A.M. to 3 P.M. Admission \$1; tables \$8 (includes one admission). Plenty of free parking. Food and refreshments available. Talk-in on 146.40/147.00. For more information and advance table reservations, write Great Bay Radio Assn., P.O. Box 911, Dover, NH 03820.

New Jersey (Trenton) — April 20-21: The 10th Trenton Computer Festival will be held at Trenton State College on Saturday and Sunday, from 10 A.M. to 5 P.M. (TCF-85 is oriented toward computers and will be of interest to hams who are also interested in computing and digital electronics.) On Sunday, a packet-radio forum will again be held. There will also be the usual commercial exhibits, electronics flea market, technical sessions and user group meetings of interest to the ham, and free short courses. Admission to all activities is \$7 (students \$3). For further information, write TCF-85, Trenton State College, Hillwood Lakes CN550, Trenton, NJ 08625 or call 609-771-2487.

New Mexico (Albuquerque) — April 20: The UNM and Westside ARCs are co-sponsoring a tailgate swapfest, from 10 A.M. to 2 P.M. (MST), at the UNM North Campus parking lot at the intersection of Tucker Ave. and University Blvd. Talk-in on 75/15 and 449.30/4.3. No admission charge. Bring your own tables. For further information, send an s.a.s.e. to Robert A. Scupp, WBSYX, 648 Marquis Dr., N.E., Albuquerque, NM 87123-1429, tel. 505-296-6546.

New York (Owego) — May 4: The 26th annual Southern Tier ARCs Hamfest will be held at the Treadway Inn. Flea market opens at 8 A.M.; vendor displays and sales, tech and non-tech talks, refreshments. Dinner at 6:30 P.M. (advance tickets only). Take NY Rte. 17 to Exit 65. Talk-in on 22/82, 16/76 or 52 simplex. For further information, send s.a.s.e. to Craig P. England, KF2X, RD 1, Box 144, Vestal, NY 13850.

New York (Melville) — May 5: The Suffolk County Radio Club, Inc., Indoor/Outdoor Electronics Flea Market will be held at the Republic Lodge 1987, 585 Broad Hollow Rd. (Rte. 110), from 8 A.M. to 3 P.M. General admission \$2, spouses and children under 12 free. Indoor seller's tables \$7; outdoor space \$5 and includes one free admission. Free electric power inside. Large free parking area. Food and refreshments available. Talk-in on 144.61/5.21 and 52. For additional information, contact Richard Tyger, AC2P, 5 Chelmsford Dr., Wheatley Heights, NY 11798, tel. 516-643-5956, evenings.

North Carolina (Raleigh) — April 14: The Raleigh ARS, Inc. 13th Annual Hamfest will be held in the Jim Graham Bldg., N.C. State Fairgrounds, Hillsborough

St., from 8 A.M. to 4 P.M. Admission \$3.50 advance, \$5 at the door. Amateur exams, CW and homebrew contests, QCWA, MARS, NTS meetings, ARRL booth. Flea-market space, one table and two chairs (ours only), \$5 each. FCC amateur exams nearby. Preregistration by April 8; contact John Johnson, WM4P, direct. Dealer setup Saturday, 4-10 P.M.; Sunday, 6-8 A.M. Talk-in on 04/64 and 28/88. For preregistration, flyer and dealer information, contact Rollin Ransom, NF4P, tel. 919-779-5021, or Jim Bradley, WA4AOO, tel. 919-851-2437, or write RARS, P.O. Box 17124, Raleigh, NC 27619.

Ohio (Dayton) — April 26: The 16th annual B*A*S*H will be held on the Friday night prior to Dayton Hamvention, at the Convention Center, Main and Fifth Sts. Parking in adjacent City Garage. Admission free to all. Sandwiches, snacks and drinks available. Live entertainment. Two exciting top awards and many others. For further information, contact the Miami Valley F.M. Assn., P.O. Box 263, Dayton, OH 45401.

Ohio (Dayton) — April 26-28: Dayton Hamvention, Hara Arena and Exhibition Center. Giant 3-day flea market starting noon, Friday, all day Saturday and Sunday. Technical forums, ARRL and FCC Forums, new products and exhibits, special group meetings and much more. Admission \$8 advance; \$10 at door. Banquet \$14 advance; \$16 at door. Flea-market space \$17 in advance (valid for all 3 days). Checks for advance registration to Dayton Hamvention, Box 2205, Dayton, OH 45401.

Oklahoma (Mooreland) — April 14: The Great Plains ARC 4th annual Northwest Oklahoma Eyeball and Swapmeet will start at 9 A.M. Admission at the door, \$2. Covered-dish dinner at noon. Local airport. Dealer and swap tables available, no charge. VE tests will be given. Campsites available. Directions: North on Main or Elm St., across the tracks and west. Talk-in on 72/12 and 52 simplex. For further information, call 405-994-5394 or write Gordon Richmond, NR5L, Rte. 1, Box 12, Mooreland, OK 73852, or Gerald Bowman, N5CCV, Box 356, Mooreland, OK 73852, or call 405-994-5453.

Ontario (Pickering Village) — April 13: The 4th annual Durham Region Amateur Radio Flea Market, organized by the South Pickering ARC, Inc., VE3SPC, and North Shore ARC, Inc., VE3NSR, will be held at Pickering High School from 8 A.M. to 1 P.M. Admission \$3. Commercial displays, refreshments available. Vendors: doors open 6 A.M. to 8 A.M. Tables \$5 each plus admission. Information and table reservations payable to Phil Washburn, VE3HAA, 34 Albery Cres., Ajax, ON L1S 2Y3, tel. 416-683-3368. Talk-in on 147.975/375 (VE3SPA) and 52 simplex.

Pennsylvania (Bedford) — April 14: The 3rd annual Southern Alleghenies Hamfest will be held from 7 A.M. to 4 P.M. at the Bedford County Fairgrounds, 1 mile west of Bedford on Rte. 30, 1/2 mile west of the Rte. 220 bypass. This location is close to the Bedford Exit of the PA Turnpike. Sponsoring organizations are the Bedford, PA, Altoona, PA, Somerset, PA and Cumberland, MD ARCs and Blue Knob Repeater Assn. Talk-in on 144.89/5.49, 449.20/4.20 and 52 simplex. Admission is \$3; tables \$5 each; outside tailgate spaces \$2. Dealers can set up the day before. For more information, contact Joel Cunard, KB3TR, RD 6, Box 104, Bedford, PA 15522, tel. 814-623-9697.

Texas (Kerrville) — April 26-28: The annual 7290 Traffic Net Picnic will be held at the Kerrville State Recreation Area. Members of the Texas Traffic Net, Texas CW Net, Texas Slow Speed Net and the Fifth Region Daytime Net have been invited to join in the many activities. ARRL West Gulf Division Director Ray Wangler, W5EDZ, will be the guest speaker. Tickets for Saturday evening barbecue must be obtained in advance from Jo Ann Keith, KA5AZK, 1633 Dell Oak, Garland, TX 75040. Motels, hotels and RV camps are plentiful. Overnight camping, shelters and RV hookups available at park; reservations in writing to Kerrville State Recreation Area, 2385 Bandera Hwy., Kerrville, TX 78028, or tel. 512-257-5393. Talk-in on 7290, 37/97 and 52. For further information, contact W5TUK, Manager, 7290 Traffic Net.

West Virginia (Parkersburg) — April 14: The Second Annual NWWVRA Hamfest will be held at the Wood County 4-H Grounds, from 8 A.M. to 4 P.M. Dealers welcome. All-indoor flea market. Admission \$3; flea-market space \$3. Alternative activities. Talk-in on 36/96. Further information, tel. 304-422-7157 or send s.a.s.e. to Jim Whitlatch, 5007 Elmwood Ave., Parkersburg, WV 26101.

Wisconsin (Cedarburg) — May 4: The Ozaukee Radio Club, Inc. will sponsor its 7th Annual Swapfest, from 8 A.M. to 1 P.M., at the Circle B Recreation Center, Hwy. 68, located 20 miles north of Milwaukee. Admission is \$2 in advance; \$3 at the door. Four-foot tables \$2 each in advance only. Food and refreshments. Sellers will be admitted at 7 A.M. for setup. For tickets, tables, maps or more information, send a business-sized s.a.s.e. to 1985 ORC Swapfest, 101 E. Clay St., Saukville, WI 53080.

Silent Keys

Administered By Marvis Bogatz

It is with deep regret that we record the passing of these amateurs:


WIARV, Kenton E. Quint, North Anson, ME
WIBLQ, Donald K. Speed, Portal, AZ
KICGK, William T. Payne, Thompson, CT
WICTI, Frederick A. Ellis, Jr., Wilton, CT
KICUX, Harold I. Babcock, Bennington, VT
KAIHFU, Carleton J. Fisher, Presque Isle, ME
W1HS, Henry E. Martin, South Windsor, CT
W1LCK, John W. Ford, Sr., Scituate, MA
W1ZJE, Lillian M. Salter, East Hartford, CT
W2AIQ, Joseph A. Knedlhans, Long Island City, NY
W2BIZ, William J. Furman, Kings Park, NY
WA2BTD, E. E. Glover, Albany, NY
K2BWQ, Alfred A. Bein, Clifton, NJ
W2DUJ, Martin R. Karig, Glens Falls, NY
WA2FAN, C. David Murray, Fisher's Landing, NY
WA2FZR, Howard Q. Totten, Fayetteville, NY
W2HAE, Arthur C. Ford, Melbourne, FL
KB2PA, Frank E. Berg, Jr., Jamestown, NY
W2IPA, Frederick H. Scheuter, Staten Island, NY
KA2LIO, Richard "Mike" Van Kirk, Horseheads, NY
K2MUD, Alton M. Hotchkiss, Cortland, NY
W2OQV, Edward L. Holmes, Saddle Brook, NJ
W2PNW, F. Cecil Logan, Kennedy, NY
WB2RYE, Edward J. King, Brooklyn, NY
W2US, William H. Hannah, Riverhead, NY
W2UXB, John Heraphtha, Syracuse, NY
W3HPB, Edward L. Harris, Sr., Coral Hills, MD
K3KKG, Francis E. Brna, Washington, PA
W3KQN, Lewis Reiber, West Middlesex, PA
W3KYB, Verne L. Baker, Johnsonburg, PA
WA3TZS, John K. Simons, Blue Bell, PA
WA4CCY, Dewey Austin, Rome, GA
W4CZN, J. Allen Davis, East Point, GA
KA4DMB, Samuel R. Miller, Sunrise, FL
KA4DOL, Clifford W. Moore, Louisville, KY
W4EEQ, Robert E. Brown, Ocala, FL
AA4EI, William T. Blomquist, Hartwell, GA
WB4EXB, Theodore C. Pilcher, Norfolk, VA
WA4FGC, Henry F. Harris, Sr., Chester, VA
WA4FKV, Robert T. Spears, Jr., Miami, FL
KA4GJG, James W. Menefee, Sr., Prospect, KY
N4IHL, Gaye C. Buchanan, Concord, NC
N4JHL, Walter J. Johnson, Avondale Estates, GA

*K4JKE, James N. Horne, Columbus, GA
W4KI, John A. Stewart, Hartwell, GA
W4LQS, Dean C. Cole, Palm Bay, FL
W4OP, Scott H. Chase, Reed, KY
WA4RVM, James M. "Mac" Bazemore, Augusta, GA
K4TRQ, John A. Dominy, New Bern, NC
K4YGI, Benjamin T. Lewis, Dacula, GA
W5AH, Festus H. Harrison, Jr., Dallas, TX
W5DH, Glenn T. Raborn, Penitas, TX
W5EOC, Wilfred T. Martin, Carlsbad, NM
KA5MUE, William P. Campbell, Humble, TX
KA5ODR, Doris T. Andrews, Alexandria, LA
W5VUU, Robert B. Shupp, Weslaco, TX
W6BV, Richard E. Lake, Glenhaven, CA
W6CAG, August L. DeGrazia, Rosemead, CA
W6CWY, Amile J. Forni, Menlo Park, CA
WD6DRQ, Harry S. Conlin, Richmond, CA
KG6HR, Jack E. Waits, Capitola, CA
W6ING, Douglas M. Smith, Woodland Hills, CA
W6IRP, Morris Shishcoff, Pico Rivera, CA
K6JQ, Zachary Rosenman, Palo Alto, CA
WB6KAU, Peter W. Schmidt, Panorama City, CA
W6MLZ, Ray E. Meyers, San Gabriel, CA
W6NUC, Ben W. Armstrong, Stirling City, CA
WB6RWK, Gerald H. Barker, St. Helena, CA
K6UPY, James S. Allen, Saratoga, CA
W6VGA, George Koenig, Wofford Heights, CA
WA6WDZ, Albert A. Hook, Huntington Beach, CA
W6WH, James P. Simmons, Sr., San Diego, CA
WB7DGM, Charles W. Dryden, Flagstaff, AZ
W7DUJ, W. Dale Marshall, Bellingham, WA
W7HTG, Richard E. "Rex" Hald, Saint Helens, OR
W7QBK, Eugene P. Clark, Yakima, WA
W7RDO, Erwin P. Clark, Billings, MT
*W7RG, Richard G. Dundon, Kent, WA
K7IWX, Randall G. Parks, Coeur D'Alene, ID
W7UTM, Floyd L. Hinshaw, Bountiful, UT
KB7WT, Howard J. Luxan, Helena, MT
W8EGF, William F. Jackson, Phoenix, AZ
W8FNX, Ralph T. Cobb, Elyria, OH
W8HOH, James "Whitey" Larkins, Sr., Dayton, OH
W8HXR, Jerrold A. Swank, Washington Court House, OH

W8ODN, Milo Beal, Waynesville, OH
KA8SHB, Donald C. Foster, Port Clinton, OH
KV8W, Richard E. Lance, Sr., Cincinnati, OH
W9AHO, Earle A. Petersen, Barrington, IL
W9ASL, Francis M. Wood, Indianapolis, IN
W9BR, Arthur J. Schultz, Indianapolis, IN
W9EEN, Charles W. Hursh, Syracuse, IN
K9FUI, Gustave J. Bezy, New Albany, IN
WA9FXE, John E. Voyles, Petersburg, IN
WD9GFN, James C. Thompson, Clarks Hill, IN
W9QLK, Charles A. "Chuck" Dutton, Gays Mills, WI
W9RKB, Frank M. Ziegler, Port Byron, IL
W9RKP, Russell E. Burs, New Berlin, WI
WD0CBS, Linda J. Cude, Independence, KS
KA0DTP, Wallace James, Lakewood, CO
N0FPX, Joseph Teresi, Jr., Edina, MN
K0KMA, Harry J. Stolpestad, Fosston, MN
W0MMZ, Carroll W. "Chuck" Beasley, Des Moines, IA
W0NZP, Wilbert G. Stephens, Overland Park, KS
KA0QKI, Elden L. "Bud" Wolf, Lawrence, KS
K0RP, Gleason R. Pettitt, Conway, MO
*W0UHH, Lafe H. Rees, Lincoln, KS
*VE3DU, Cyril M. Lewis, Oakville, ON
VE3FQ, Rene Levesauer, London, ON
VE5KJ, John S. Houston, Regina, SK
VE6LQ, William W. Butchart, Edmonton, AB
FP8AP, Gustave Roblot, St. Pierre, Miquelon Is.
*VK3AVT, Peter Cheung, Glen Waverly, Victoria, Australia

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST. 

50 Years Ago

April 1935

- The versatile RK-20 is put to work by W1DF as a tri-tet oscillator for three bands, with 60-watt maximum output — pretty good for a single-tube transmitter. But use low-temperature coefficient crystals or you'll get too much drift.
- To get more power from a wind-driven generator, W5EQD carved his own impeller from a 7-foot length of 2 x 6 lumber, finished to careful specifications of his own design.
- The high-power fans should be impressed by W1TS's rig with that big 204-A in the output. Don says bandswitching is as important as plate efficiency — choosing the right band will get more DX QSOs than mere high power.
- W9WC liked the Type 58-58 high-stability 56-Mc. rig in last August QST so much he built an RK-23 power amplifier for it, with suppressor grid modulation.
- This seems to be a transmitter issue. A deluxe rig by W4UP is a monster by 1935 standards yet is versatile for the day, with phone capability and either Class B or grid-bias modulation.
- In 1929, W8BQ won a prize for his station design and construction. But six years of technical change required new gear, and he describes his "modern" version — once again in the customary bulky floor rack.
- W9QT says we're relying too much on capacity interstage coupling, and suggests link circuits as offering many advantages in matching and power transfer.
- QST has carried lots of info recently on antenna matching, but long wires have been ignored. W8GLY and W8BOG remedy this gap with a dissertation on

radiation resistance measurements and a comparison of power in lobes of maximum radiation versus the ordinary half-wave doubler.


- This issue carries a delightful yarn by W4VT (in your scribe's opinion, the all-time classic of its type) titled "Jim," a story of an "Elmer" helping a teenage recent ham licensee to achieve his first QSO.
- To help solve man-made static problems, L. E. Thompson claims his second detector circuit, which "combines" a (e.g.) 1000-cycle audio note with a (e.g.) 120-cycle power leak, produces more readable, desired signal than our present solutions of limiting or super selectivity.
- The Editor reminds members that the Board meeting is next month, so let your director know your views on matters of the day.

25 Years Ago

April 1960

- W1JEL caters to multiplying activity on v.h.f. with a design for a 6-meter v.f.o. transmitter of 75-watt power, complete with modulator and power supply.
- Mechanical instability has long been a bugaboo in quad-antenna construction. To solve this difficulty, SASTO put up a two-band quad in the form of vertical diamonds but with side points supported on a horizontal "X" spreader.
- Much of the circuitry for short-wave reception already exists in the common broadcast set, Novice editor W1ICP points out, and he describes an easy-to-build converter for 80 and 40 meters. You can tune the b.c. set to a nearby strong station to achieve a c.w. tone.

For the few yet to switch to sideband, W8NHH shows an intermediate step using a balanced modulator to eliminate the carrier, without the complication of getting rid of one of the sidebands.

- K8CFU reports good news from the Automobile Manufacturers Association — more restrictive standards for ignition-noise radiation.
- Poor voltage regulation on small gasoline generators can wreak havoc to delicate gear, especially in multiple transmitter club setups on Field Day. W4LEN uses current flow through a conducting VR tube to activate a relay for over-voltage protection.
- WIWF saved guy-wire problems and expense by mounting his beam on a pipe "tower" next to his house, with supporting brackets.
- Slow-scan TV on the ham bands is now more than a year old, and pioneer WA2BCW brings us up to date on progress in equipment and techniques.
- There's no discernible April Fool article in this issue, but an ad for "Larsen E. Rapp" Enterprises raises our eyebrows a bit!
- The 1959 Simulated Emergency Test was again an outstanding demonstration of amateur preparedness, reported in detail by WINJM.
- And this was no better exemplified than by the choice for General Electric's Edison Award: W8AEU and his efficient organization of Cleveland area amateurs to meet any kind of communications crisis in natural disasters.
- Responding to several rumors that there is cheating in some of the exams-by-mail procedures, the Editor suggests several principles of conduct for volunteer examiners who supervise the test. But the best approach, he says, would be for each affiliated club to elect an official examination team.
- Transistor power converters are the coming thing in mobile work. K2BQK relates not only the principles of good design, but also a basic circuit we can use without wearing a slide rule to the core. — W1RW 

Still Globe-Trotting

Among the passengers boarding the *Royal Viking Sky* in Southampton, England, on June 8, 1984 — enroute to Stockholm, Helsinki, Leningrad and Copenhagen — were Darleen and Joe Magen, WDSFQX and WD5HIL, from Hot Springs, Arkansas. Their daughter, Diane, 11, accompanied them.

Also listed among the passengers: Telly Savalas (*Kojak*), Jack Klugman (*Quincy*), Loretta Swit and Dennis Holahan (*M*A*S*H*), Christopher Norris (*Trapper John*), Ted McGinley (*Happy Days*), Suzannah York, Colleen Dewhurst, Lilli Palmer, John Davidson (*That's Incredible*), Janet Jackson (sister of Michael) and Priscilla Barnes (*Three's Company*). Patricia Klous, Cruise Director for the TV program *Love Boat*, was also on board, as were all the show's regulars, since one of *Love Boat's* special cruises was to be filmed during the journey. Darleen and Joe met and talked with several of the celebrities on board, which enhanced their journey, but this was not their prime reason for being on this particular ship. This happened to be the best way for them, at long last, to visit Vlad Kaplun, UA1CK, in Leningrad!

Darleen's first contact with Vlad was in 1971. At the time, she was wending her way around the world, DXpeditioning. She and Vlad had QSOs from many different locations, including 3B9DK, JY9DK, VR5DK and I0LLZ. The Leningrad Radio Club also extended an invitation to visit during this period, and not being able to accept was a great disappointment to Darleen. The thought that she would visit Leningrad one day was put in the back of her mind for many years.

Just when Darleen felt it was time to end her travels and settle down, her many ham friends all over the world jokingly planted the seed that, since she had operated from all continents except South America, she really ought to consider that possibility. It didn't take too many inquiries via Amateur Radio to learn that this was indeed a real possibility. In less than two months, Darleen was South and Central America bound. She planned visits to Mexico, Peru, Bogota, Panama, Honduras, Costa Rica, Nicaragua and Guatemala. During her visit to Guayaquil, Ecuador, Darleen was introduced to Joe Magen, HC2OM. Their instant friendship continued to grow via radio throughout the rest of her travels. Joe just always seemed to know exactly when and where Darleen could be found operating on the bands. They had met in February 1972 and were married in the United States in May.

Upon returning to Ecuador, Darleen received the call HC2YL, which perhaps makes them the only ham couple who have held YL and OM calls. Darleen had not contacted Vlad in Leningrad for a while, and was most pleased to receive a lovely card and note wishing her and Joe all the best.

When a travel-agent friend mentioned the *Love Boat* cruise 12 years later, Vlad was one



Vlad Kaplun, UA1CK, and Darleen Magen, WDSFQX, in Vlad's shack in Leningrad.

of the first to hear of Joe and Darleen's plans. They were thrilled to receive a reply to their news saying that he and his wife, Svetlana, would welcome their visit to Leningrad and would be happy to meet them at long last. Correspondence continued, and tentative radio schedules were arranged from the QTH of Roger Brown, G3LQP, where Joe and Darleen would be guests for a week prior to the cruise.

During their visit in England, several excellent radio contacts were made with Vlad, and plans were confirmed for the long-awaited meeting. On June 16, when the boat docked in Leningrad, Vlad was there to meet them. They hit it off immediately. Vlad's command of the English language is excellent, even to understanding some of our slang.

They went sightseeing by taxi through Leningrad, sometimes called the Venice of the North. They learned that there are more than 600 bridges and 66 canals in Leningrad, and saw its cathedrals and many monuments. When Vlad

took them to his apartment, Svetlana had prepared a beautiful Russian luncheon, which followed traditional vodka toasting. They visited the famous Hermitage Museum, containing unbelievable treasures by artists such as Leonardo da Vinci, Raphael, Michelangelo, Goya and Rembrandt. In total, it houses over 3 million exhibits. This was followed by a delightful evening at the circus.

At 11:30 P.M., it was still very light, and Darleen took many photographs without a flash. That time of the year in Leningrad is called "white nights" because the nights are very brief.

The following morning, Vlad met Joe, Darleen and Diane at the pier with plans to visit the famous Petrodvorts Palace on the Gulf of Finland. Later, they listened to Vlad's homebrewed radio while he made some transmissions. The QSL cards that Joe and Darleen had handcarried for him gave Vlad a total of 345 countries, which he believes is the highest total of anyone in the USSR. The Magens were deeply touched by Vlad and Svetlana's hospitality and genuine friendship.

There were many other highlights during this trip. During their week in England, while visiting G3LQP, Darleen and Joe were guests of the Chiltern DX Club, where they met many prominent DXers and were presented with a Certificate of Honorary Membership. Darleen had QSO'd many of these hams while on her around-the-world DXpedition of 1971-72. They spent three grand days in Stockholm sightseeing with SM0EWM and SM0FI; another great day in Helsinki with OH2BH and his family; and a grand finale in Copenhagen, where they visited with OZ5OI and OZIADX.

Globetrotting via Amateur Radio is the title of Darleen's book, written after many requests from fellow amateurs who hoped to share the many unusual experiences of her around-the-world DXpedition in the '70s. It's exciting reading, and one that radio amateurs from far and wide would enjoy. It's a pleasure to report that she's still globetrotting.

DX YL TO NORTH AMERICA YL CONTEST

April 10-11 and 17-18. Sponsored by YLRL for women licensees. CW, from 1800Z April 10 until 1800Z April 11 (phone is April 17-18). Net, repeater and OM contacts do not count. Exchange call sign, QSO no., RS(T) and state or country. Logs must include time, band, date and power. Phone and CW contests are scored as separate contests. DX YLs (including HI and AK) work the 48 contiguous states and Canada. North American YLs contact DX. Count 1 point for each contact per band. Multipliers are the states and provinces or DX countries worked. Count each multiplier once. Low-power stations (CW, 150 W or less; phone, 300 W or less) multiply total score by 1.25. Suggested frequencies are CW — 3.540-3.570, 7.040-7.070, 14.040-14.070, 21.080-21.110, 28.080-28.110; phone — 3.940-3.970, 7.240-7.270, 14.250-14.280, 21.350-21.380, 28.580-28.610. Awards and certificates. To qualify, all logs must be originals, must show state or country, must be signed by the operator and postmarked no later than May 6. Send to YLRL VP Marty Silver, NY4H, 3228 Eton Rd., Raleigh, NC 27608.



Those attending the 30th birthday party for The Texas YL Round-Up Net, held in Oklahoma City last October, are (l-r) Myra (no call), K5BNQ, W5FGM, W5FMP, W6QG/X5, K5JFJ, KJ5C, K5DLI, W5ELG, Lynn (no call), N5FFB, W5YKE, N5DXD, K5MPI. Officers elected for 1985 are President N5FFB, Vice President N5BOT, Secretary/Treasurer KJ5C, Publicity Chairman W5FMP.

*Country Club Dr., Monson, MA 01057

Straight Key Night — SKN XIVic + 1

*They float through the air
With a great host of E's
Those daring old men
On their rusty straight keys.
Through the wee morning hours
They each do their part
To pamper and cherish
The spark-gapper's art.
On the first of the year
The reversal is bold:
Out with the new,
And in with the old! — K0HT*

This year's Straight Key Night didn't host a great many E's. In fact, conditions weren't even that good, with the MUF approaching Top Band late in the evening. Nevertheless, for the 78 entrants who "stuck" with it and submitted their results, it was an experience well worth remembering.

While SKN isn't a contest, the perennial battle for "Best Fist" and "Most Interesting" honors is always a hotly contested one. When everyone's fist had stopped sending, WA7NXL was on top with a whopping six votes (twice the number needed for top spot last year, when K5MM and W9PCF tied for first). W5KL received second-place honors with five votes, while W6FU and W8WVU tied for number-three spot with three votes each. Six SKNers received two votes each (W2LYH, K4ASF, W4YE, K5PKA, W7CE and W0TQ). In all, 80 votes were cast for best fist (some participants couldn't vote for only one).



What call areas send the best CW? If SKN results can be considered conclusive, 5-land is tops with 16 votes, followed by 7-land with 13.

Who's the most interesting to talk to? K4KP, with three votes. Honorable mentions go to W2LYH, NQ5N, WDSBJT and W6FU, with two votes each. Thirteen entries thought that 5-land is the most interesting call area to work into (on New Year's Eve, anyway). Four-land

came in second with 10 votes. California must also be an interesting place to live, as nine nominations were cast for W6s.

It was an interesting and fun evening, especially for the 469 stations who slowed down, had interesting QSOs and took their code "straight." — W10D

KEY KLIX

Can't nominate a "Best Fist" or "Most Interesting" QSO. Everyone I worked was a veteran operator with perfect code and great nostalgic tales to swap — W2KTF. Put my vote for Best Fist to NC4H, but don't tell him that he's the best of two, because I only worked two stations — K2GBH. My most interesting QSO was with K4KP, who was using a transmitter made on a

breadboard with one 210 tube from a design in a 1929 QST — N9CKZ. We old CW operators appreciate the old straight key which, at least, gives you time to think of something to say. Why not have more CW events? CW is still the most dependable mode, as well as the most inexpensive — W4CDA. Who says it's safer to stay home for Straight Key Night on New Year's Eve rather than go out partying? I destroyed my 80-meter inverted V trying to change its pattern at night, during a blizzard, by pulling one of the wires loose from the feed point. For good measure, the microprocessor on my R-2000 greeted the new year with a puff of smoke — AA8M. I hooked up with Ken, W6FU, and we rattled on for nearly an hour. Ken must have kissed the Blarney Stone, or he was overdosed on RF (hi) — WB6RXE. VE3OLX has a good fist. He was also my first "foreign" contact — KB4LIP. It was great to hear those ole glass arms again — W10DY. Now I know what "glass arm" means! — KA7KLH. QST

W1AW Schedule

April 28 — October 27, 1985

MTWThFSSn = Days of Week Dy = Daily

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

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

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

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

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

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

Code practice texts are from QST, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1985 QST, pages 9 and 77" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 77.

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

On Wednesdays at 2230 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

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

CW bulletins are sent at 18 WPM.

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

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

W1AW will be closed on May 27, July 4 and September 2.

FCC Proposes Frequency-Coordination Rules

According to the FCC, the number of reported instances of amateur repeaters causing interference to one another in 1984 was more than three times the number reported in 1983. As a result, the FCC has taken a number of steps to alleviate this perceived problem. For starters, the FCC has issued a Notice of Proposed Rule Making (PR Docket 85-22) that would (1) add the definitions of "coordinated repeater," "frequency coordinator," and "harmful interference" to Part 97.3, and (2) add a new paragraph to Part 97.85 that states "Where an amateur radio station in repeater operation causes harmful interference to the repeater station of another amateur station, the two stations are each equally and fully responsible for resolving the interference unless one repeater is coordinated and the other is not. Where one repeater is coordinated and the other is not, the station with the non-coordinated repeater has primary responsibility to resolve the interference." What the FCC is doing is codifying its policy of the past few years to give preferential treatment to coordinated repeaters in disputes between coordinated and noncoordinated repeaters. When interference occurs, the uncoordinated repeater would have the burden of eliminating it.

The FCC is seeking comments on whether it "should require an amateur operator to seek the recommendation of a local frequency coordinator for the input and output frequencies of any repeater located within a Central Metropolitan Statistical Area (CMSA) or a Metropolitan Statistical Area (MSA) as set forth in government census documents." CMSAs and MSAs cover the ground that a lot of us live on, and the FCC is considering a requirement that would make frequency coordination mandatory for repeaters located on this ground.

National Coordinator or Advisor?

The FCC is also seeking comments on "alternative methods of frequency coordination . . . whether the FCC should recognize a single national frequency coordinator for the Amateur Radio Service. Such a coordinator could either be an individual national organization or an umbrella organization comprised of local coordination groups . . . to promulgate coordination (and de-coordination) standards, to facilitate the use of advanced technology, to consider alternative frequency assignments, to consider frequency spacing and repeater separation distances and, in the case of an umbrella organization, to advise local coordinators."

There seem to be three choices: a national coordinator, a national advisor for coordination, or status quo. A national coordinator would have a difficult task. Besides maintaining a data base of some 8000 repeaters, the national coordinator needs great familiarity with the geography of each part of the country and how that geography affects the propagation of radio

waves in the VHF and UHF spectrum. The FCC would like a national coordinator to have a lot of say, but no one will listen to what he says if that coordinator does not have some power. If the FCC chooses national coordination, it must give the national coordinator the power to make or break those he coordinates; otherwise, the national coordinator will be a "paper tiger."

A national advisor for coordination would have a different task than that of a national coordinator. Instead of coordinating repeaters, the national advisory group would coordinate the frequency coordinators, with the goal being continuity in how frequencies are coordinated throughout the country. How much power the national advisory group has depends, again, on how much power the FCC gives it. Besides coordination, the national advisory group could also maintain a national data base, to be used by local coordinators to determine what frequencies are available in a particular area.

More of the Same?

Status quo. Well, I don't have to tell you about that. In some areas, the present system of frequency coordination is working; in other areas, it is not working. If the proposed rules are instituted, however, coordinators will have a little more power (at least in the CMSAs/MSAs); unless a repeater is coordinated by them, that repeater has a chance of becoming a nonentity if it interferes with a repeater that is coordinated. Thus, more repeaters will seek out coordination, whether required or not.

I get letters concerning repeater life in status quo; some writers feel that some coordinators are not doing their job properly. Typically, I receive a letter from some group who studied the situation and found a frequency that was not populated by a repeater. The group contacts its area coordinator and informs him that it would like to put a repeater on the air and that it has found a frequency that sounds good for their new repeater. The coordinator writes back that all the frequencies in the group's area are coordinated and that they cannot put a repeater on the air. The group feels that the coordinator is wrong and puts a repeater on the air anyway. Thus, you have the birth of another uncoordinated repeater.

Who is right in this situation? Either the coordinator does not know what is going on in all areas of his jurisdiction or he is unable to make others believe that he has legitimate reasons for not coordinating a particular repeater. Or, the group seeking coordination listens to the coordinator only when he has good news. I do not believe that the proposed rules address this part of the problem head-on; if a local coordinator is out of touch with what is going on in his jurisdiction, giving coordinators more power is no solution.

[Editor's Note: Comments in the NPRM are due by July 1, 1985. See this month's Happenings for more information.]

REPEATER LOG

According to reports received during January, repeaters were involved in the following public-

service events: 13 weather emergencies, 1 criminal emergency, 0 medical emergencies, 32 vehicular emergencies, 11 fire emergencies, 1 search & rescue, 8 public-safety events, 28 drills/alerts, 2 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 20, W1PW 1, N3BFL 6, WA3PBD 1, WB3JOE 1, K3TR 1, K4GSO 1, NN4H 8, WB4QES 18, WB4UDS 3, WA5LVT 1, WD6FHK 1, KH6HHG 2, K6JE 1, WA6WVH 1, K8DDG 12, KB8GQ 1, WD8IEL 14, W0ILO 1, W0MXW 1, WA0VRS.

Strays

AMATEUR RADIO: REAL FRIENDS IN TIME OF NEED

□ The vacation trip my husband and I took to Alabama last November to visit K4NSB and his wife Dot took an unexpected turn when we were involved in an auto accident, but Amateur Radio saw us through the ordeal. At the time of the accident, I was working N0AJ in Florissant, Missouri, on CW. Our rig was still receiving after we were hit, and I could hear him calling me, wondering where I had gone.

As soon as the police arrived, we began to see firsthand just how helpful ham radio can be in an emergency. At my request, the police notified K4NSB of the accident, and he immediately got on the air and contacted W0NYV and N0AJ in the St. Louis area and WD0ALE, a friend in Kansas City. WD0ALE notified our family. (He had news of our accident before the ambulance arrived!) I will never forget the comfort I felt knowing he was on the air when we needed him.

We spent over a week in the hospital, but the seriousness of our injuries forced us to remain in a motel to recuperate before returning home. Calls, flowers and cards from friends, relatives, and fellow hams kept our spirits up. But it was especially helpful to be able to talk with other amateurs right from our room. WD0ALE kept local hams posted with information on our condition, and we never felt isolated.

When we finally returned home (after spending five days with K4NSB and Dot), word quickly spread via 2 meters, and many welcome-home wishes were sent our way.

I have always been proud to be a part of Amateur Radio, and I've had many hours of enjoyment and made many friends, but this experience made me appreciate it all so much more. — Ruby Henderson, WB0YQE, Independence, Missouri

QST congratulates . . .

□ The following radio amateurs on 60 years as ARRL members:

- Elmer H. Schubert, W8ALW, of Cincinnati, Ohio
- Carl B. Snyder, W8ARW, of North Fort Myers, Florida
- John S. Erickson, K4JNP, of Jensen Beach, Florida

*75 Kreger Dr., Wolcott, CT 06716
CompuServe ID no. 70645,247



President: Richard L. Baldwin, W1RU
Vice President: Carl L. Smith, W0BWJ
Secretary: David Sumner, K1ZZ
Assistant to the Secretary: Naoki Akiyama, JH1VRO/N1CIX

Regional Secretaries:
John Allaway, G3FKM
Secretary, IARU Region 1
10 Knightlow Rd.
Birmingham B17 8QB
England

Alberto Shaio, HK3DEU
Secretary, IARU Region 2
9 Sidney Lanier La.
Greenwich, CT 06830
USA

Masayoshi Fujioka, JM1UXU
Secretary, IARU Region 3 Association
P.O. Box 73, Toshima
Tokyo 170-91
Japan

The International Amateur Radio Union — since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

75th Anniversary of the Wireless Institute of Australia

On March 11, 1910, wireless experimenters came together in a bond of fraternal friendship and common purpose. They desired to unite for the protection and furtherance of their pursuit. The world's oldest radio society — the Wireless Institute of Australia — was thus founded. Currently, there are 8500 members.

During 1985, WIA will be celebrating their 75th anniversary in a number of ways:

1) *VK75A*. From March 10, this special call sign will be on the air, issued by the Australian administration to celebrate the 75th anniversary of the WIA. Special QSLs will be issued, and the first use of this call sign will be during the WIA CW contest.

2) *WIA CW contest*. This contest was to have been held on the 10th of March, with details via WIAW bulletin.

3) *WIA 75th Award*. Between March 1 and

December 1 contact 75 members of the WIA, log their membership number and send a log extract (with \$2 Australian) to WIA 75 Award Manager, WIA, 412 Brunswick St., Fitzroy, 3065 Victoria, Australia.

4) *Prestamped envelope*. On May 22, Australia Post will be releasing a prestamped envelope to celebrate the Institute's 75th Anniversary. Displays of Amateur Radio activities will take place in many Australian Post Offices to coincide with the launch of this envelope.

5) *World Amateur Radio Day — April 18*. This day will be promoted by WIA as an activity day for the 10, 18 and 24-MHz bands. All amateurs are requested to work on these bands (where permitted) on that day.

6) *Internal activities*. The first National Foxhunt Championship will be held during October. Any overseas visitors are welcome to par-

ticipate in this or any of the many other activities being planned throughout the States of Australia to celebrate the Anniversary.

7) *Formal dinners*. A number of formal dinners will be held during the year, culminating in the Federal 75th Anniversary Dinner, to be held in Melbourne at the Southern Cross Hotel on the 9th of November. Many dignitaries will be attending, including members of the IARU Administrative Council, who will be in Melbourne for a Council Meeting prior to their New Zealand meeting. A limited number of tickets are available. Overseas visitors will be welcome.

Anyone intending to visit Australia during the period of this 75th Anniversary celebration can obtain further details by contacting the Secretary, Wireless Institute of Australia, P.O. Box 300, South Caulfield, Victoria 3162, Australia.

AWARD OF THE GOLDEN ANTENNA BY STADT BAD BENTHEIM

For the fourth time, the Town of Bad Bentheim, Fed. Rep. of Germany, will award a "Golden Antenna" to some radio amateur who has made an outstanding humanitarian achievement in the field of Amateur Radio telecommunications. This year's winner will receive the award during the German-Dutch Radio Amateur Week (DNAT), to be held August 22-25. Amateur Radio organizations (such as clubs) are asked

to submit proposals for this award to Stadt Bad Bentheim, Schlosstrasse 2, D-4444 Bad Bentheim, Fed. Rep. of Germany, by May 15, 1985. It must be emphasized that only those applicants will be considered who have achieved an outstanding humanitarian feat in the field of Amateur Radio telecommunications.

The decision on this award will be made by a committee consisting of the presidents of the IARU, the Vereniging voor Experimenteel Radio Onderzoek in Netherlands, the Vereniging Radio Zond Amateurs/Netherlands and the Deutscher Amateur Radio Club. Decisions of the judging committee are final.

The Town of Bad Bentheim will defray all expenses incurred in connection with the journey and accommodation of the winner.



Pictured in the headquarters offices of ORARI, the IARU society in Djakarta, Indonesia, are (l-r) YB0WR, DL2JL, VS6CT, K4YT, YB0BZZ and YB0ARA.

*President, IARU

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

RS-9 TO BE LAUNCHED SOON

[Translated by W4KM from an article in the January 16, 1985 issue of *Sovetskiy Patriot*, "They're Checking Out Satellites On the Ground," by B. Lebedev. (tnx ASR 97)]

"In November of last year, in the 'satellite' segment of the radio amateur 10-meter band (29.402 kHz), the RS-9 beacon went on the air. It transmits telemetry information analogous to that sent in the airwaves from orbit by the Radio series of satellites. At year's end, the repeater, too, was switched on, translating the band of 145.869-145.900 MHz to 29,360-29,400 kHz. Many shortwavers and ultrashortwavers from Moscow and the Moscow area (UK3A, RS3A, RA3AHM, RA3AMM and others) have already made initial con-

tacts via this repeater. The principles for use of the terrestrial repeater are the same as those now operating from space orbits. The basic principle is choice by the operator of a transmitter power level such that the translated signal level does not exceed that of the beacon signal, in which case mutual interference will be minimized.

"The repeater is switched on around the clock but the robot is on the air irregularly. It transmits its own CQ on the frequency on which it should be called. Operation with the robot is conducted in accordance with the same program as with the robots of the Radio series of satellites."

Monthly Listings

ASR (Amateur Satellite Report) is available for \$22 (\$30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

AMSAT Membership is available for \$24 per year

(\$26 outside North America). Life Membership is \$600. Write to or call AMSAT Hq., P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

ARRL members only send a 4 × 9-in s.a.s.e. with your call sign to ARRL for a complete, monthly orbit schedule for all operating Amateur Radio satellites. Please mark the s.a.s.e. with the month needed, to help us ensure that the envelopes are filled properly. A year's supply of s.a.s.e.'s may be sent in at one time, but be sure to affix 2 units of postage to each s.a.s.e.

The OSCARLOCATOR package second revision is now available for \$8.50 U.S., \$9.50 elsewhere. This package and *The Satellite Experimenter's Handbook* contain all the information you need to get started using the Amateur Radio satellites.

A free package of information about AMSAT and the Amateur Satellite Program is available from ARRL Hq. This package is intended for those with no knowledge of the program.

*Satellite Program Manager, ARRL

SCHOOL TEACHERS, COLLEGE PROFESSORS AND AMATEUR RADIO

That teenagers' applications for ham licenses have declined drastically is hardly news. Nevertheless, that drop was highlighted recently by one who has taught ham radio in the Pacific Northwest regularly for 40 years. He wrote recently that, a couple of decades ago, most of his students were teenagers. Today, it's only one in 90.

That the average age of licensed hams in America is increasing is a demonstrable fact, not someone's wild guess. Now it's approaching 50 years. It's not that we don't want the "senior citizens." We *do* want them; they can offer mental maturity and plenty of good, solid advice, backed by years of experience in many fields, some directly related to Amateur Radio. They're joining us in ever-increasing numbers, and we're more than glad to welcome them.

But we need the youngsters, too. And they need us. Ham radio can provide a desperately needed sense of stability and purpose for thousands of our young people for whom that sense does not now exist.

Nobody, of course, supposes that ham radio is the panacea for all teenagers' ills. It will take more than that to solve this nationwide problem. But ham radio can help perhaps 10 percent of the teenagers who face the problem of instability, plus many thousands who don't.

Is helping them worthwhile? Definitely! Furthermore, 50,000 hams could be added to our ranks every year. In addition to the benefits conferred on the kids themselves, that kind of growth would make Congress, the FCC and even the next WARC sit up and take notice.

But if ham radio can provide all these benefits, why isn't there a waiting list of teenagers for every ham class? I'd suggest that one reason overshadows all others: Youngsters have no valid idea of what ham radio offers them. Most still believe that all hams do is chat with each other on the air about the same things CB enthusiasts talk about, except that hams sometimes use code instead of voice. We simply haven't gotten our message across, either to the teenagers or to those who always have exerted a powerful influence on them — their teachers and professors.

EME (moonbounce), packet radio, satellite communications, spread spectrum, amplitude companded single sideband, fast-scan color television, fox hunts: These are the ham activities most likely to interest today's teenagers. Simply talking with someone on the other side of the world is old hat.

Most teachers, of whatever academic level, understand their students' needs. They have an important stake in their pupils' success. Amateur Radio can help their pupils succeed. How?

Physics and mathematics are immediately identifiable with Amateur Radio, but what about the not-so-obvious subjects — for instance, foreign languages? Imagine the improvement in outlook and classroom ability for students who converse a couple of times each week with someone whose native language they are

studying. And, for geography students, place names on maps suddenly become real! A chat with someone actually living there makes both cultural and economic geography seem highly relevant.

Then consider political science. Ever wonder how a foreign government *really* functions? Ham radio is the ideal way to find out. Granted, some nations place severe restrictions (*de facto* if not *de jure*) on political discussions by their amateurs. Yet, even a discussion of the mechanics of government can be very informative and contribute to a better understanding of the world.

How about economics? Foreign trade — oil, for instance — can confuse the student until he hears how things are on the other end of the pipeline.

The point is clear: Ham radio can be absolutely invaluable to students in many different disciplines. But they and their teachers will never know it unless we tell them.

Try a demonstration of Amateur Radio at a school or college near you. Be sure to talk with teachers of all disciplines both before and after the demonstration. Get your fellow club members to help. Telephone the teachers individually. Have a politician who's also a ham talk with a political-science professor. Have an economist (or banker) talk with the economics teacher, an explorer (perhaps for an oil company) or a geographer talk with the geography instructor, etc.

And then offer to teach a class *at that school*. You might even find that while helping the youngsters learn, you will acquire some information you didn't have before about how this old world manages to keep functioning in spite of everything! □

*Training Manager, ARRL

Strays



W4JDU says he "got a kick" out of this sign on Rte. 10 near Huntington, West Virginia.

GOING ALL OUT

□ This was my year to go all out in the Pennsylvania QSO Party. Months before, I had started getting everything ready. My triband beam was atop a freshly painted 60-foot tower, accompanied by inverted Vs for 75 and 80 meters and 40-meter slopers going southwest and northeast. I installed a new set of SSB filters in the transceiver and cleaned all the dust out of the amplifier.

My XYL left town for the weekend, and I spent the evening before the contest numbering the logs, preparing the check sheets, working up a rate sheet and marking the controls on the amp so it could be tuned quickly for each band.

The contest started at 1600Z. My strategy was to open up on 20-meter SSB, with my beams toward Europe. I figured that by working a lot of DX early, I could pile up many more QSOs at the end of the contest. After working only 25 stations in the first half hour, I abandoned my plan to work Europe first and switched to 40 meters, chalking up 54 QSOs. For the next several hours, I switched bands every 20 minutes or so, working the stations that would only be around for a short while on the band.

With only nine hours to the finish, I spent some time on 15 meters to try to finish up the multipliers from the West Coast. I found that this didn't result in as many QSOs per hour as I could make on 40 meters, so I went back to switching modes and bands. As it turned out, I was able to rework a lot of mobiles as they changed counties. My score was looking good: 865 QSOs, including 66 of 74 ARRL Sections and 65 of 67 PA counties.

With five minutes left, I worked a station in Union County, one of the two PA counties I needed for a clean sweep. Could I find a station in Cameron County in the minutes remaining? The contest ended, and apparently there were no Cameron County stations operating during the contest. Thirty minutes after the

contest ended, my XYL came home — after a great visit with her sister in Cameron County! — *John Getz, AD8J/3, Allison Park, Pennsylvania*

I would like to get in touch with...

□ former members of the 574th and 565th S.A.W. Bns. interested in attending a reunion. Angel Zaragoza, W6ZPR, 1571 9th St., San Bernardino, CA 92411.

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. 86
Outgoing	Mar. 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

Traffic Handlers: A Vanishing Breed?

Since its inception, the National Traffic System has dealt with a wide variety of problems, to which the efforts of many dedicated traffic handlers have provided solutions. Today, we are faced with the beginnings of a problem which, left unchecked or ignored, could spell the end of traffic handling as we know it. Simply stated, this problem is one of numbers or, more accurately, declining numbers.

From its beginning, Amateur Radio has shown continual growth. This annual increase was relatively steady until the past few years. The League has become understandably concerned about this recent growth stagnation. The next five years will see the ARRL actively working to increase, not only its own membership, but the total size of the amateur community.

The problem faced by the NTS is a bit different. For more than the past several years, it has witnessed declining numbers of active, trained operators. From the area level to the Section level, the story is the same. Good operators are becoming as scarce as 10-meter propagation. The symptoms of this growing problem are multifaceted and easy to spot. TCC liaison slots go begging, with resultant traffic bottlenecks. It's becoming more difficult to find liaison operators to area nets. At the regional level, representation is becoming nonexistent for some Sections. Some Section-level CW nets now run with a mere handful of check-ins. Even Section phone nets, long the leaders in total check-ins, are becoming "old boy" nets, where a declining number of operators show up to let the remaining few know they lived through another day. Some phone nets have reached the point where operators checking in with traffic are ignored by net members. Occasionally, net control stations have been reduced to begging members to handle incoming traffic.

The total number of traffic handlers has never been great when compared to the total amateur population, but what they have lacked in numbers has been made up by time on the air. One of the great myths in ham radio is that thousands of people are out there passing messages back and forth, each and every day. This may have been true once, but no more. Oh, sure, you still have a lot of check-ins to your Section phone net, but how many of those people ever handle a message? A real eye-opener is going to your section CW net. You won't need the fingers on both hands to count total check-ins. Small wonder that much the traffic gets QTA'd (cancelled). At the present time, there are probably less than a thousand active traffic handlers, and some would place this figure as low as 500. Therein lies the problem. There are

simply not enough people to go around. Why are there so few traffic handlers left? How do we recruit additional people into our declining ranks?

A major factor in the loss of active traffic handlers is age. While the age of the average ham may be 49, surveys by this author have shown the average age of traffic operators to be 61, and increasing every year. Quite literally, we are dying at a faster rate than we are being replaced. It is interesting to note that traffic operators under the age of 40 are rare and those under 30 are an endangered species. The National Traffic System, more than any other speciality in ham radio, is in desperate need of younger operators.

One cannot help but wonder why this is so. Why hasn't traffic handling attracted younger, qualified operators? A number of factors may be responsible for this decline. Listed in no particular order, they are:

1) Traditional recruiting efforts have emphasized the glitter of new technology rather than the public service aspect of Amateur Radio. This is not to say that we shouldn't continue to recruit technically oriented people. However, it should be recognized that a great number of people may be more interested in what they can do with a radio without having to be an expert on the "cutting edge" of technology. For example, a significant percentage of the general public uses computers and has no more than a very rudimentary knowledge of the electronics behind the keyboard.

2) The trend away from CW as a communications mode. While this seems inevitable with the rise of new computer technology, it is unfortunate. The use of CW in handling traffic has some advantages not found in other modes. Additionally, CW training nets are, perhaps, the best place to learn correct procedure in handling message traffic.

3) Traffic handlers tend to be a clannish bunch of people. This is a result of declining numbers. You end up working and knowing the same operators, day after day. Area and regional nets, which have a higher visibility, operate on strict time schedules and quickly check-out newcomers if they have no traffic. A similar situation exists with traffic meetings and seminars at hamfests. To a stranger, it seems as if everyone in the room knows each other. This can be intimidating in the extreme. Seldom do these seminars teach the basics of message traffic, but, instead, concern themselves with problems that would be of interest only to advanced operators.

4) Little emphasis is placed on public service activities in amateur publications. Amateur Radio magazines introduce and encourage existing hams into new technologies and operating specialities within our hobby. Each periodical carries its own bias. Some are technically oriented, some are oriented toward contesting and DXing, but none toward public service.

5) There is little formal recognition of a traffic handler's operating activities. Hundreds,

probably thousands, of certificates are issued annually to contesters. There is seemingly no end to the awards for DXers. Each year, hundreds of special-event stations issue beautiful certificates for the multitude who collect them. But what do traffic handlers have? An ORS certificate. Some net certificates can be earned by showing up on a net four times a month. But don't hold your breath waiting for a net certificate — many nets are pretty casual about issuing them. PSHR certificates can be earned by never handling a message. Then there is BPL, which it almost seems is available only to those who have retired to take up a full-time job handling traffic. And that's it, folks. There are no other traffic certificates because there is no comprehensive program of awards. Seemingly, the rewards for handling traffic are intrinsic.

A coordinated program to combat this steady loss of trained, active operators needs to be launched by the NTS. The following concepts should be incorporated into such a program: a high level of visibility for the NTS at amateur functions, such as hamfests; perhaps a public service booth in addition to the regular ARRL booth at such hamfests; hamfest seminars that serve as an introduction to public service activities and handling traffic; recruiting new amateurs through expanded activities such as message booths at fairs and shopping malls; a videotape documentary introducing the public service angle of ham radio. This is a natural for use in message booths; expanded coverage and commitment by amateur publications to traffic handling and emergency communications; a revamped and expanded awards program for the NTS — provide lots of paper payoff for those who can't make BPL every month. Increase the overall volume of messages handled at the Section and local levels, thereby expanding member participation in these nets; encourage the use of CW to handle traffic — this traditional mode is open to all without the added cost of any peripheral equipment other than a key.

The many details of a recruiting program need to be hammered out by the NTS through the use of its three advisory groups: the Pacific, Central and Eastern Area Staffs. The time to begin is right now. If we wait much longer, message traffic will go the way of the spark gap. Advancing electronic technology will provide only a partial solution. The bottom line is that the system requires trained, active operators, no matter what the mode of communication, and they are now in short supply. — *Bradley Wells, KR7L, Manager THN, Assistant Manager RN7/c2.*

COMMUNICATIONS SERVICE OF THE MONTH

Benicia, California — January 19
On the morning of January 19, 1985, a double-tanker truck carrying a load of molten sulfur collided with a passenger car at the north end of the Benicia-Martinez bridge, one of the major traffic arteries in the San Francisco Bay area. The southbound truck rolled over the middle wall of the freeway and exploded throwing burning sulfur over a wide area. The bridge became impassable as a number of nearby vehicles

*Public Service Manager, ARRL

were engulfed in flames.

Captain Gary Ellis, Operations Officer of the Benicia Police Department, contacted KE6IA, ARRL Emergency Coordinator for Benicia, and requested assistance. Within 10 minutes, an emergency net was in operation and members were awaiting further instructions. KE6IA accompanied Capt. Ellis in the police command vehicle, while KA6BPR assumed net control duties. Mobile units consisting of two operators were dispatched to the four freeway on ramps, blocked the ramps, set flare patterns and tried to assist motorists by re-routing them north on Interstate 680. The ARES mobile units were on duty until 6 P.M., when they were relieved by police reservists.

At approximately 5 P.M., the Benicia Fire Department, which was participating in efforts to remove the wreckage from the bridge, requested autopatch support from the ARES members. KA6HZX and KG6LV were dispatched to the scene and remained on duty until midnight, handling a large quantity of autopatch traffic for the Benicia Police and Fire Departments.

The wreckage was removed about midnight, although extensive damage to the bridge delayed its opening to traffic until 4 P.M. the following day. Two persons died, and several were hospitalized as a result of the accident. Because of the severity of the accident, its effect on a main traffic artery, the explosion and release of hazardous material, and the threat of a recurrence, an investigative board of the National Transportation Safety Board of the Federal government was convened the following Monday.

The Benicia PD, FD, and California Highway Patrol were profuse in their praise of ARES readiness and efficiency. Mention of ARES was made to the NTSB as being a positive feature of the response.

From the Amateur Radio viewpoint, the ARES operations gained applause from amateurs throughout the bay area as being one of the most orderly, efficient net operations heard under such circumstances.

The following ARES members deserve special recognition for their efforts: KA6BPR, KA6HZX and KG6LV. [These amateurs, including KE6IA, received ARRL Emergency Communications Commendations — Ed.] — *David R. Autry, KE6IA, EC Benicia*

COMMUNICATIONS TEST OF THE MONTH

On Saturday, January 26, the Amateur Radio Emergency Service of Forsyth County members conducted a test of Amateur Radio communications capabilities at Forsyth Memorial Hospital in Winston-Salem, North Carolina. The planned exercise was an attempt to determine whether Amateur Radio could temporarily replace the telephone system and restore critical interdepartmental communications in the event of a telephone failure within the hospital.

Bill Bridges, Director of Safety and Security at Forsyth Memorial Hospital, was very cooperative in assisting with the test and was instrumental in working out its logistics. During the briefing prior to the test, Bill and the ARES volunteers arrived at a list of key patient care and administrative areas where interdepartmental communications would be of utmost importance during a telephone failure. The areas tested were the Emergency Department on the first floor, the Engineering Department in the basement, Nursing Administration Office in the basement, the Paramedical Building on the ground floor, the telephone switchboard on the first floor, the Radiology Department in the basement and on the second floor of the hospital tower. The Net Control Station, which directed the operation of the test, was stationed in the break room of the Paramedical Building and doubled as the test station in that area. Due to a manpower shortage, no station was dispatched to nearby North Carolina Baptist Hospital.

The ARES volunteers were dispatched to these seven areas, and the test began. During the communications test, each station was called sequentially by the net control station at a neutral location that could easily cover all areas of the hospital on a simplex frequency. When called, an individual station transmitted for 30 seconds on the simplex frequency, while the remainder of the stations listened and recorded a signal report of that transmission. The next station on the list was then called to transmit while all others listened. This procedure was repeated so that all stations had an opportunity to transmit for a suitable period of time, while the other stations could record a signal report from every hospital location covered. At each location, stations were asked to obtain and record a signal report of WA4GIC/R. Because of the balanced transmit and receive characteristics of the repeater, it was assumed that one's signal report into the repeater would be identical to the report of the repeater's output. Stations were asked to record signal reports on a standard, well-known scale from one to five, with one being unreadable and five being perfectly readable. Everyone had a report form on which notes were taken. After-

wards, a summary-chart page was used to compile the specifics of the test.

The results of the test supported what might be expected when trying to transmit from areas surrounded by structural barriers such as steel and concrete. Although most of the stations indicated signal reports of good communications quality from the majority of the other locations, there were a few areas that provided a formidable obstacle for efficient simplex radio operation.

During last year's North Carolina Baptist Hospital communications test, periodic interference was noted by the Amateur Radio operator stationed at Forsyth Memorial Hospital. This was due to intermodulation distortion products between the hospital VHF safety/security radios and the radio used by the amateur at Forsyth. At no time during this recent test was any type of interference experienced by any of the hams at the hospital despite use of the same Amateur Radio simplex frequency (146.52 MHz). Perhaps the previous interference problem was caused by the specific physical location of the amateur or by an electronic peculiarity of his radio.

It was disappointing that only seven volunteers turned out to participate in the test. A greater number would have allowed a more widespread test of Amateur Radio communications capabilities throughout the hospital. I am sure that if a real disaster situation ever develops a much larger number of amateurs would become involved.

In conclusion, this exercise demonstrated some of the capabilities of Amateur Radio in providing communications between various patient care and administrative areas of Forsyth Memorial Hospital in the unfortunate event of internal telephone failure. Despite a few problem areas, an excellent communications network can be established on simplex or repeater frequencies. This Amateur Radio network could eliminate a part of the hospital personnel "runner" system and improve the efficiency of interdepartmental communications. A large number of operational simplex (or repeater) frequencies could be used for many simultaneous conversations and information-flow pathways. This would be directed by a centrally located or geographically superior net-control station. Additionally, Amateur Radio liaison can also be established and maintained between Forsyth Memorial Hospital and other public service agencies (such as N.C. Baptist Hospital, the Red Cross, the Winston-Salem police/fire communications center, the National Weather Service and the Office of Emergency Management) during widespread disaster situations.

All in all, Amateur Radio operators were very pleased with the results of this exercise and are more than willing and able to volunteer their services when needed. — *James W. Lehnberg, WA4TCR, EC ARES of Forsyth County, North Carolina*

IN SERVICE . . .

□ Hampden County, Massachusetts — January 10. K1BE had left work and was on his way home. His Datsun hadn't even warmed up when he came upon a two-car, head-on crash. His call of "Mayday" on several repeaters was quickly answered on K1ZJH/RPT by WA1LES, who was asked to contact the Springfield, police and have them quickly send two ambulances. K1BE's prognosis of injuries were that both victims had cracked ribs and internal injuries and were going into shock. As emergency first aid was administered, WA1LES called and relayed the message and then kept the repeater open for further emergency use. When the injured began having more difficulty breathing, that information was relayed to the police via WA1LES. After the police and ambulance crews arrived, K1BE helped extricate one woman who was still in her car. After field prepping, they were rushed to Mercy Hospital. Quick action by K1BE and WA1LES resulted in rapid treatment and hospitalization of the two victims. (Ray Burke, WB1GLX, EC Hampden County)

□ Carrollton, Kentucky — January 24. Amateurs assisted local volunteers and the Kentucky State Police Special Education personnel in coordinating the Kentucky State Special Olympics Winter Games at the General Butler (State Park) Ski Resort. Amateurs were initially delegated to minor communications roles. By the end of the event, however, amateurs had relayed emergency first-aid request, coordinated ski-lift operations and race events, and provided reliable real-time communications between start and finish lines of the downhill and giant slalom courses. Race coordinators have decided Amateur Radio will be involved to a greater extent in the 1986 Special Olympic Winter Games. (John Hutcheson, K14QB, EC Carroll County)

□ Xenia, Ohio — January 25-26. Greene Memorial Hospital requested the assistance of X WARN in transporting key personnel to the hospital because snowdrifts had rendered local roads almost impassable. X WARN supplied two four-wheel-drive vehicles and five radio operators. Eight employees were transported

to the hospital from locations as much as 25 miles distant in time for their 11 P.M. shift. The following day, five employees were transported to their 7 A.M. shift at the hospital. (Norman Moranda, KA8BCD, EC Greene County)

□ Owensboro, Kentucky — February 11. A heavy snow with substantial drifting called the Owensboro ARES into action at 7:30 P.M. Through the night, hams coordinated search teams, rescue squads, several county fire departments, city and county police, city, county and state road departments, two area hospitals, several nursing homes, many wrecker services, and State National Guard and State Disaster and Emergency Services in providing transport to essential medical personnel while searching for several motorists who did not reach their destination. All worked well. K4HY/R and Owensboro ARC station K4HY were used. One hundred seventeen missions were completed, including 23 emergencies. Participating amateurs were W4EWL, W4EWM, W4OYI, W4TOY, K4EMX, N4AJG, N4IVQ, N4IWD, N4JCP, W4AFMY, W4AMXD, W4ASAC, W4BANL, W4AOH, W4NHO, W4NNTT, W44IMK, W4DIYH, W44IYI, W44LMN, K44BCM, K44BZM, K44GQB, K44NIP, K44LOM and K44VGG. (George S. Wilson, III, W4OYI, Director, Great Lakes Division)

YOUR CONDUCTOR'S CABOOSE

Most of you, we hope, have heard about our departmental reorganization here at Headquarters. The shifting of responsibilities and associated paperwork has caused us to decide, after much thought, on a few minor changes to this column.

Last month:

• You were informed how to increase the chances of your article being published in this column.

• You saw, for the first time, a section called "TCC Talk." Members of the Transcontinental Corps now have a way to communicate, albeit indirectly, with their counterparts throughout the nation on a monthly basis. National Traffic System Area and Region net managers have the same opportunity.

• You saw the Public Service Diaries and Emergency Communications Services headings combined under one heading, "In Service."

This month:

• We've begun the practice of stating when a Region or Area Net Manager has not submitted a monthly report. We felt this change was necessary to inform those of you involved with NTS at those levels that reports were not received. Those of you dedicating your time in the upper echelons of NTS deserve proper recognition every month.

• We've also begun listing SEC reports that have not been received. This month, 37 of 73 SECs submitted reports. Between 30 and 40 SEC reports a month has been the average for quite some time, so increased postal rates cannot be used as an excuse. Ladies and Gentlemen, we can do better!

• Deadline reminders are posted throughout this column for those who submit monthly reports to this Branch. These notices will be a permanent fixture in this column.

We hope you approve of these changes.

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For January, 37 SEC reports were received, denoting a total ARES membership of 16,830. Sections reporting were: AL, AR, AZ CO, EMA, ENY, EPA, IL, IN, ME, MI, MN, NE, NFL, NTX, NYC/LI, OH, OK, ONT, ORG, PAC, SV, SCV, SDG, SJV, SC, SD, SFL, SNJ, TN, UT, VA, WA, WMA, WNY, WV, WI.

Reports were not received by the following Section Emergency Coordinators: BC, MAN, MAR/NFD, QUE, SASK, DE, MDC, WPA, ND, LA, MS, KY, NNI, IA, KS, MO, CT, NH, RI, VT, AK, ID, MT, OR, EBAY, NV, SF, NC, NM, WY, GA, WIN, LAX, SBAR, STEX.

SEC monthly reports for April should be received at ARRL Hq. no later than May 12. Reports received after the 12th will be entered as time permits.

NATIONAL TRAFFIC SYSTEM

IRN certificates have been issued to WB1GXZ, KA1GWE, KA1XG, K1A0E, N1BOW, KWIU, KA1EPO, N1BGW, KA1EXJ, W1E0F, AK1W, N1BJW, W1JTH, KA1AVU, WB1GLH, W1PUO, WA1YYK, W1UKR, WA1DNB, WA1YYW (SK), KA1EKQ.

NTS reports for the month of April should be received at ARRL Hq. no later than May 12.

January Reports

	1	2	3	4	5	6	7
Cycle Two							
Area Nets							
EAN	31	804	25.9	.559	97.3		
CAN	No report received						
PAN	62	653	10.5	.422	98.9		
Region Nets							
1RN	62	668	10.7	.470	97.0	100.0	
2RN	58	319	5.5	.294	83.2	100.0	
3RN	31	248	8.0	.570	95.0	96.7	
4RN	No report received					100.0	
RN5	62	639	10.3	.398	98.4		
RN6	No report received					100.0	
RN7	62	510	8.2	.467	88.3	100.0	
8RN	62	295	4.8	.366	97.3	100.0	
9RN	61	300	4.9	.281	95.0		
TEN	62	435	7.0	.334	87.8		
ECN	No report received					54.8	
TWN	57	254	4.5	.279	85.6	96.8	

TCC	1	2	3	4	5	6	7
TCC Eastern	122	891					
TCC Central	93	648					
TCC Pacific	124	376					

Cycle Three	1	2	3	4	5	6	7
Area Net							
EAN	31	272	8.78	.576	80.1		

Cycle Four	1	2	3	4	5	6	7
Area Nets							
EAN	31	1142	36.8	1.07	90.9		
CAN	31	636	20.5	.840	89.5		
PAN	31	673	28.2	.873	99.5		

Region Nets	1	2	3	4	5	6	7
1RN	No report received						
2RN	87	402	4.6	.393	86.7		
3RN	62	213	3.4	.292	95.2		
4RN	No report received						
RN6	62	490	7.9	.541	89.1	100.0	
RN6	62	575	9.3	.687	97.0	100.0	
RN7	62	328	5.3	.465	87.6	100.0	
8RN	56	275	4.9	.342	76.0	93.5	
9RN	62	337	5.4	.310	91.0	98.4	
TEN	62	293	4.7	.289	76.0	100.0	
ECN	No report received					90.3	
TWN	60	299	5.0	.300	83.5	98.4	

TCC	1	2	3	4	5	6	7
TCC Eastern	No report received						
TCC Central	62	454					
TCC Pacific	No report received						

Sections	1	2	3	4	5	6	7
Summary	4447	12,856	2.9				
Record	5638	22,427	4.0				
	9039	59,630	16.4				

*PAN operates both cycles one and two.
 †TCC functions not counted as net sessions.
 ‡Section and local nets reporting (255): AEND CCEN AENR AENS ATNM AENK AENZ AENY WAEN AENX (AL), ATEA ACN SWN ATEA (AZ), OZK ARN APN MBIRD EC (AF), BCEN (BC), NCN NCTN (CA), CPN SGN/SB SCN/V RTTY/V GOV/TN GN LSTN NFPN QFN5 SVTN TPTN VEN QFN FMSN FMTN PPTN FAST FPON QFPN SEPTN PEN PRVAN SPARC PBTN ENMC (FL), GSBN GTN GGN GSN (GA), PTN (HI), ITN ILN ISN (IL), JIN ITN (IN), KSBN KPN KWN KMVN CSTN QKS QKS-SS (KS), MKPN KTN KYN KNTN KYPN CARN BARES NKARC TSTMN WTEA 3ARES TARES 11ARES (KY), AEN MSPN PTN OXRAOES SGN YEAR CMEN (ME), MERN (MD), EMRI EMRIPN EMRISN EM2MN HHTN CITN NEEPN WMN WMFN WMTN (MA), MSN/1 MSN/2 MSSN MSPN/N MSPN/E MSN/RTTY MNAMWXN/P (MN), MON MOSSB MEOW MTTN HBN LARN RRABN TCN PTN ZAEN IFN CMEN MOFON LOZFM LOZCW SARN ARES JCCC (MO), IMNS CCEN (MT), NNN NSN WNN CC2MN NCW NMPN (NE), NCEN NCMN CN CN CNCTN PCTN RARS THEN PETH CFARS M2MEN (NC), MCEN MSOVPN NHH GSPN GSFN (NH), NJPN NJM NJNE HCATEN NJSN SWARN SJVN SJVN220 NJN/L MSWWAR (NJ), BNR BSSN ONN OSSN OSSBN O6MN MASER MCTN NEON TATN VVEN WCTN RARA ALERT BRTN COARES COTN DAEN HCARES LCNWO (OH), NYS/M NYS/E NYS/L NYPON CNYTN WDN OCTEN QNET BSN MFN NYSPTN ESS (NY), NON STN MCARC OPEN OCWA-63 OLZ ONON OTWN OCWN (OK), OPN OSN OSND OSN2 OLN KTN TIN (ONT), OSN OHNN OARES THN WCN PDXARES PTTN BSN LBLARES SOFM (OR), EPA EPAEPTN PTTN ATN D3ARES D5ARES D6SEN PWA/ARES (PA), GSN (QNE), EMRI EMRIPN EMRISN (RI), SCSSBN CN CNNSCN LC2MN GPD2MN BR2MN (SC), TNCWNTS TNPNT6 TNVHFNTS (TN), TTN TEX (TX), BUN (UT), VTN VBSN VSN VNE VNL VLN STARES 6VEN SSN (VA), VTN (VT), EWTN NTM PSTS NWSBSSN WARTS WSN (WA), WINC WINS (WI).

1 - NET	4 - AVERAGE	7 - % REP.
2 - SESSIONS <td>5 - RATE</td> <td>TO AREA NET</td>	5 - RATE	TO AREA NET
3 - TRAFFIC <td>6 - % REP. <td></td> </td>	6 - % REP. <td></td>	

Transcontinental Corps

	1	2	3	4	5
Cycle Two					
TCC Eastern	122	90.9	891	437	
TCC Central	93	92.5	648	324	
TCC Pacific	102	83.1	—	102	
Summary	317	88.8	1539	863	

Cycle Four

TCC Eastern	No report received	62	85.5	454	207
TCC Central	No report received	62	85.5	454	207
TCC Pacific	No report received	62	85.5	454	207
Summary					
1 - AREA	4 - TRAFFIC				
2 - FUNCTIONS	5 - OUT-OF-NET TRAFFIC				
3 - % SUCCESSFUL					

TCC Roster

WA4JTE, WF4X, NW4X, N5AMK, N5BT, W5CTZ, N5DFO, N5DKM, W5KLV, KD5KQ, KD5RC, K5UPN, KW5J, W9UJ, W89NVN, KA0EY, ND5T, KT5A, VE5CHK, NV8T, K6UYK, K6YBV, K7FR, WB7WOW, KB7FE, K7OVK, KD7EY, WA0YI, ND0XJ, N5BB, WB5CIC, W5GHP, K5GM, K5OAF, N5TC, K5TL, K5VX, KW5J, W89NVN, W89UYU, KB9X, W9HI, K5QJ, W1AF, AA4AT, N1BHH, K1CB, KA8CPS, KA1EPO, KK3F, WA2FJJ, WD4FTK, NG4HI, WB3GZV, KB2HM, K8OZ, W8PMJ, W84PNY, KT1Q, W8QHB, W1QYY, KW1U, KB3UD, AF8V, W2VY, N2XJ, W1XX, WB8YOZ.

TCC Certificates Issued This Month

AA4AT, N1BHH, K1CB, KA8CPS, KK3F, WA2FJJ, WD4FTK, WB3GZV, KB2HM, WD8LRT, W8PMJ, KT1Q, W8QHB, W1QYY, KB3UD, AF8V, W2VY, N2XJ, W1XX, WB8YOZ.

TCC Talk

VE7ZK is under doctor's orders to give up his TCC schedule of over 10-years standing. W9CXY is in a nursing home following surgery. (K5GM, TCC Director CAN E)

Public Service Honor Roll January 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 an 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 are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSNR certificate from Hq. April reports submitted for this column should be received at ARRL Hq. no later than May 12.

254	KC4VK	KB4WT	WB8RFB
K7VW	115	KB3UD	94
189	N4GHI	K7GXZ	KA0BWM
W7LRB	114	102	AG9G
162	KS5V	K6UYK	KF8J
K4SCL	113	WD9FRI	KA2BHR
155	AL7W	N4KFU	93
KA3DLY	KB7FE	101	KB4OZ
152	112	KB4OZ	WB5SRX
K5CXP	WA2FJJ	VE3BDM	WB1HH
148	KA8GJ	W9FZW	WB4WI
W2YJR	111	111	W4ANK
147	KD7ME	KT5Y	VE2EDO
KA0EY	WB7WOW	99	KA2MYJ
WA4CCK	WA4PIM	99	WB0TED
134	KA4RSC	100	KB4GPN
133	WA4PFK	K2ZVI	W0KK
KA1EXJ	109	99	N4IYU
131	KB0MB	WB2MCO	90
129	KB0Z	N1BGW	KA1T
127	KW1U	WB6TIF	N6AWH
125	VE2CP	KJ3E	WD8LDY
124	WA6ZUD	KK3F	N3COE
122	VE7BN	WC4X	89
KC9CJ	W2MTA	97	WA2JBO
WD8MIO	105	97	WA1DXT
120	KA4BCM	97	WD8RHU
K4JST	WA4JDH	97	VE3DPO
KA1BBU	W8OYH	97	W7JMH
119	KD8YK	97	88
KD8VF	WA4QXT	96	KV5X
W6INH	104	96	W2BIW
WF4Y	AA4AT	96	AF3S
118	KW9J	96	WX4I
117	103	95	WB4HRR
WB2OWO	WA1TBY	95	W1RWG
		95	WB5GKH
		95	N0EVC
		87	87
		KA1EPO	3 - TRAFFIC
		N6CVF	4 - CHECK-INS
		WD80UO	

86	KA0ODQ	69	WA4EIC
K0GP	WA2KOJ	N2BFG	62
WD9IID	KCBOO	NB0D	WA2SMZ
84	W5CTZ	W9HLX	WD4PBF
WB2VUK	N1DBH	W5KLV	WB5YDD
WA1YNZ	K3NNI	W1JP	WA4MNR
WA4LXP	N2CER		KA1KTH
AE5I	KJ9J		WA7VTD
KC3Y	76	68	W0UO
	K4VWV	68	W5UAU
83	75	68	W5QFU
W7LG	WB4VMX	67	61
KA4MTX	WD0GUF	67	WB1GLH
KB5UL	N1BJV	67	KA5QVY
KY4U	WB2UVB	67	KA7KAJ
K5OAF	N0DZA	67	AA4GL
82	N8EFB	66	KA4OG
KD5FR	A100	66	WA3JUNX
WBFR	WB4ADL	66	W5TUM
WA0TFC	74	66	60
N8EYV	WB5IGF	66	WD5FCE
KA9FFO	KB4BZA	66	W5BPU
73	KR7L	66	KA5DFT
73	KA8OMM	66	NC0R
KP4DJ	W1KRV	66	WA8DHB
ND0N	KY1E	66	WD4BSC
KB4LB	WB5QBZ	66	WD8EIB
80	KG2D	66	K8JDI
WD0BOX	N10R	66	K0PCK
VE3WM	73	66	59
WD9DNQ	72	66	N1BYS/T
WB2IDS	W2PKY	66	57
K2YAI	KB1AF	66	WB1C8P
79	W9NXG	66	55
N1ARI	W4LXB	66	W1YOLT
WA7MEL	KL7JG	66	54
ND2S	N4JRE	66	KA6HJK/T
NT4S	KA4GUS	66	53
KA2UBX	KC3AV	66	KA2OPG/T
N7BGW	K7OVK	66	48
78	71	66	KA8GGZ/T
K4KDJ	WB4TZR	66	41
KR4V	70	66	KA7RFD/T
77	K2YQKU	66	N9EJOT
KD7EY	WB3QB	66	KA9RII/T
	WA4EYU	66	

Brass Pounders League January 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.

	1	2	3	4	5	6
W3CUL	879	889	1402	119	3289	
KA9CPA	48	1192	110	812	2162	
N1BTT	583	397	583	382	1955	
KW1U	12	993	885	26	1896	
W3VR	310	202	361	21	894	
W9UJ	1	371	373	0	745	
K6UYK	62	314	300	63	689	
WA1TBY	19	288	303	19	629	
WD410	230	76	272	20	598	
W7SE	0	290	298	8	596	
WF4X	9	319	251	13	592	
WA4STO	7	258	268	1	534	

BPL for 100 or more originations plus deliveries:

AA4FG	391
KA1BBU	372
KA4RSC	258
W9FZW	200
1 - CALL	4 - SENT
2 - ORIG.	5 - DLVD.
3 - RCVD.	6 - TOTAL

Independent Nets January 1985

April reports submitted for this column should be received at ARRL Hq. no later than May 12.

	1	2	3	4
Amateur Radio Telegraph Society	31	113	158	
Clearing House Net	31	117	326	
Early Bird Net	31	1156	—	
Empire Slow Speed	31	64	525	
Golden Bear Amateur Radio Net	31	113	2059	
International Mission Radio Association	27	894	1832	

Results, 15th Annual 160-Meter Contest

By Edith Holsopple,* N1CZC

It was the best of contests, it was the worst of contests (apologies to Charles Dickens). Attendance, propagation and scores were the best trio ever to play on the 160-meter band.

The worst of the contest was the amount of activity in the DX window. Rule 6 says, "Adherence to Band Plan: W/VE stations may transmit only in the segments 1800-1825 and 1830-1850 kHz, in conformance to the ARRL band plan." Just to make sure it wasn't missed, the rule was reiterated in the opening paragraph: "Remember that W/VE stations are prohibited from transmitting in the 1825-1830 kHz DX Window." The format of a contest usually involves seeing how many stations one can work within specified limitations, be they ARRL Sections, countries, band(s), or whatever. For the 160-Meter Contest, the DX window is one of the limitations. (The ARRL Board of Directors recently voted to seek member input regarding possible modification of the ARRL 160-meter band plan. Please send your comments on this to Hq.)

On the brighter side, the weekend of the 1984 contest, December 1-2, brought outstanding conditions. It was a real shot in the arm to the morale of those testing the waters on 160 who are normally dependent on the sunspot cycle for their Amateur Radio high. The contest branch watched in amazement as the logs kept piling up. The current tally shows 472 entries, as compared with 380 in '83.

Five of the single-op top tenners this year are repeats from last year. AA1K beat his last year's number one score by 81 kilopoints, but was outdone by K5NA, who topped AA1K's last year's score by 92,940 points. One indication of the work that these winners put into the 'test is that the top three single operators beat all the multiop stations. Well done! K5UR sneaked in to take the coveted third place. Of course, he also walked away with the Delta Division. Following him was a repeat from last year, K1ZM, who climbed up one rung. Newcomer N4AR came in fifth, and N7DF dropped to sixth place, even though he beat his last year's third-place score by a wide margin. N4ZZ and N5JJ took the seventh and eighth positions, respectively, while K4VX/Ø, operated by KM9P, skipped down to ninth. KØZZ, first place in the Dakota Division, stole tenth place with a score that would have won the 1983 contest. Congratulations!

Scores have risen similarly on the multiop front. Five of the Top Ten multiop stations this year are repeats from last. KS8S and N9NM traded places, with KS8S beating him by a narrow margin. It was a close race. KK5I was forced to improve his score considerably, but he managed to retain the sixth spot. WØAIH dropped from third to tenth, but his score this year would have taken second place in '83. W8LT moved up to third place with almost 50

Division Leaders

Single Op

Call	Score
AA1K	224,190
VE3ABG	125,642
K9UWA	138,446
KØZZ	149,400
K5UR	209,436
N4AR	189,450
KN9A	236,130
N7DF	182,424
K1MM	132,496
W7EJ	104,556
K160	57,477
KG4W	136,595
WØKEA	118,746
N4PN	141,185
K7CX	101,169
N5JJ	168,867
9Y4XX (N6AA)	115,270

Division

Atlantic
Canadian
Central
Dakota
Delta
Great Lakes
Hudson
Midwest
New England
Northwestern
Pacific
Roanoke
Rocky Mountain
Southeastern
Southwestern
West Gulf
DX

Multiop

Call	Score
K2XR	128,822
VE2OJ	15,738
N9MM	201,600
KØSR	76,072
KØSCX	31,320
KS8S	201,782
WA2JQK	18,354
WØCEM	140,857
WA1ABI	109,136
WB7FFF	93,715
WØEUZ	30,418
K4XU	146,856
WB5QYT	75,468
WS4Y	60,501
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W7FG	170,781
N4UM/C6A	146,880



One of Colorado's best, Karen Schultz, KAØCDN, operated the 160-meter Contest from her space-efficient capsule.



KØWN, WAØTKJ, WØCEM, and ABØS (l-r) shortly before the end of the contest. Not pictured is KØUR, who was perhaps manning the station. They slaved 34 hours for 140 kilopoints.

kilopoints more than last year. We were happy to add N4UM/C6A to the list. Their five-point QSOs were most welcome. Other newcomers to the Top Ten were W7FG, K9VV, K4XU and WØCEM.

As you can see from the score listings, it is all

Top Ten

Single Op

K5NA	236,130
AA1K	224,190
K5UR	209,436
K1ZM	192,660
N4AR	189,450
N7DF	182,424
N4ZZ	175,360
N5JJ	168,867
K4VX/Ø (KM9P)	167,705
KØZZ	149,400

Multiop

KS8S	201,782
N9MM	201,600
W8LT	180,900
W7FG	170,781
K9VV	168,152
KK5I	160,218
N4UM/C6A	146,880
K4XU	146,856
WØCEM	140,857
WØAIH/9	140,220

the participants who make a contest successful, not just the "big guns." Thanks for a job well done. To any top banders who weren't aware of the DX Window, put on your glasses and read the rules.

I hope to see you at the next ARRL 160-Meter Contest on December 7-8. Good luck, friends.

SOAPBOX

This was a super contest, as band conditions were excellent. The only gripe I have is an awful lot of people did not care about the DX window (WR4U). W/VE conditions were excellent, but mostly very poor to Europe. There were a few brief exceptions, and a fantastic EU sunrise peak the second night (N4IN). I was sure surprised at how I was getting out, according to the reports I received. Even when I got S9 reports, lots of them had trouble receiving my Section (N4KB). Nice contest, lots of activity (KG4W). Conditions were excellent from here (AA6DX/4). My highest hourly rate was 94. East Coast stations K5NA and AA1K, with their European runs, are unbeatable from the Midwest (K5UR). Again this year the 160 contest was a flop here. The early December noise levels are something to behold (AE5H). I can't copy too well anymore, but enjoy listening to everyone have fun (W5GWD). In my opinion, assembling an effective antenna for 160 with modest means is the greatest challenge in Amateur Radio (KT5X)! Too bad there wasn't more DX. I never heard Europe the whole weekend (KD5RO). Living on a city lot and working the 160 'test is a heck of a lot of fun, but it would be nice to copy the DX that we heard calling down in the noise (W7FG/5). I was just two states shy of WAS in the contest (AD6D). I had lots of fun, excellent conditions on Friday night. Next year, more than 10 W (WA6PZL). Pet peeve: stations with auto keyers that listen for 2-4 seconds to resume calling.

*Assistant Contest Manager, ARRL

KH8CP3 (+ Net)	
33,040-295-56-7	
Maryland-DC	
K3ZZ	109,725-709-75-30
K3ZO	90,188-551-78-24
K3CO	37,895-350-53
W3GN	11,438-133-43
K3ZNY	10,250-122-41-8
K43EAW	10,248-122-42-8
N3AOE	7527-90-39
W3TFA	7070-101-35

Weston Pennsylvania	
K3UA	131,690-802-80-24
W3QM	35,640-318-55-27
W3HDH	29,217-214-49-7
N3DLI	17,802-192-46-10
K43CRC	13,558-98-42
K3BIE	1450-29-25-2

Alabama	
WR4U	85,440-518-80
N4KG	63,145-419-73-18
N4JF	29,468-275-53-10
WZ4F	13,920-145-48-3
KZ4S	5624-78-37

Georgia	
N4PN	141,185-805-85-27
NQ4I	62,297-422-71-8
K4BAI	50,700-384-85-15
W1UA	43,248-636-88
K4UEE	35,341-292-58-7
N4UZ	14,112-144-49
W4IR	10,416-124-42-10
WA4BSN	7104-182-37-15
K4RE	162-9-9-1
N4RJ (+ Net)	15,808-116-52

Kentucky	
N4AR	189,450-1015-90-27
K4FU	92,700-603-75-23
KK4Q	52,886-425-82-12
NO4R	52,704-432-81-11
W4YOK	50,785-386-65-10
WA4EBN	7304-83-44-7
N4DBR (+ K14GO, NV4H, WNM4T)	129,782-783-81-33
N4XM (+ KD4U)	109,682-679-79-29

North Carolina	
AA4S	121,844-707-83-26
K4PB	30,470-274-55
NK4Q	20,650-172-59-16
KF4R	17,630-205-43-10
AA4NC	11,700-130-45-4
K4HF	4958-67-37-4
W4DQJ	4819-75-31
K4XU (+ W3ESU)	148,856-808-87-30

Northern Florida	
WA4JX (WA4SVO, opr.)	82,324-480-84-27
N4CC	78,584-406-88-14
K4KQ	29,988-204-68-15
WS4Y (+ WA6VVA, KB4s LRX, LTQ)	80,501-444-87

South Carolina	
K4CNW	50,020-401-81-8
KB4KDD	9792-78-32-12
K4AVU	5888-92-32-6

Southern Florida	
N4IN	76,580-398-87-28
W4OO	10,374-116-42-6
N4KB	2800-47-26-2
N4EJW (+ N4EJV)	16,856-163-49

Tennessee	
N4ZZ	175,360-1081-80-29
K4LTA	131,439-840-77-25
K4XO	29,891-200-71-7
NF4F	29,848-273-54-9
KV4B	18,338-170-53-14
WM4Z	12,900-150-43-5
W4FLW	7392-84-44
K4ON	5618-78-36
KB4FHE	3808-68-28-8

Virginia	
KG4W	138,595-772-85-28
AA8DX	90,321-587-77
AA4FF	63,492-414-74
W4DZH	51,128-414-72-33

W4XD	54,558-427-63-14
K4PQL	54,464-358-74-12
K4AV	32,775-284-57-9
K4OD	29,013-250-57-10
K4FFP	18,686-182-51
W4KMS	11,008-125-43
N4MM	8228-90-44
K4RDU	8290-85-37-10
N3RC	2790-45-31-2
W4JVN (+ W4JUU)	27,431-244-53-18
KA9X (+ KN4DPF)	2700-54-25

Arkansas	
K5UR	208,436-1081-93-34
N5DX	22,304-170-81
W5KL	280-13-10-1

Louisiana	
K5KLA	44,480-332-85
K5SXC (+ K5MS, KASRAD, KESBC, WBSNAA)	31,320-264-58-21

Mississippi	
KK5K	17,640-188-45-12
N5XA	9114-107-42-5
A5SH	6192-98-35-5
W5GWD	3472-55-31-12

New Mexico	
KTSX	64,021-434-73-18
K7UP6	25,056-216-58-10
N7AH	21,240-174-60-13
WBSQYT (+ AA5B)	75,468-489-78-16
W7LHO (+ N5EMR)	12,546-123-51-6

Northern Texas	
N5JB	118,880-704-80-27
KD5RO	94,180-589-80-29
KC5DX	71,820-510-70-18
K5RR (K5ZD, opr.)	37,520-332-56-4
N5UA	15,960-135-56-13
KB5UL	12,364-139-44-5
W5QF	12,012-111-52-8
NA5F	7252-98-37-7
AA5C	5088-78-32-4
W5HFN	1520-40-19

Oklahoma	
KM5H	87,984-543-78-17
N5AFV	11,094-129-43-11
W7FG (+ K5SM, K4BNHK, NA5B, W5VHP, W7BNK)	170,781-953-87
KK5I (+ K7CW, N5CG)	160,218-971-81-37

Southern Texas	
N5JJ	168,887-927-87-30
N5DU	132,430-779-85-24
W2IE	26,780-220-60-14
N5FSN	18,110-179-45-32
W5IRP	5550-75-37
KA5SBS (+ K5LZO)	38,810-259-70-10
W5NTJ (+ KCSZT, W5SEK)	38,332-300-61
WN5TEN (+ K5LD)	33,245-268-61-25

East Bay	
K6HIH	37,184-253-64
AD6E	29,882-214-87-16
W6FSJ	27,180-228-60-9
K6RK	20,852-188-54
K6TS	17,483-170-51-18
KN5S	7398-86-43-5
K2GMY	3538-68-26-7

Los Angeles	
K6SE	69,540-396-76-13
WA6PZL	10,332-128-41
W6SGJ	8086-109-37-11
W6PPE	6856-94-37-12
K6EID	5776-70-38-7

Orange	
N7AZ6	45,108-325-63-29
W6TMD	16,960-148-53-8
NN6W	8775-111-39-15
W6LEN	1120-28-20-2

Pacific	
N6HR/KH6	4805-70-31-8

Santa Barbara	
WA6FGV	14,706-192-38-20
Santa Clara Valley	
W8NA	26,226-201-62
N8RZ	24,318-193-83-6
N8QW	19,044-207-88-18
W6PRI	2006-58-17

San Diego	
N6ND	58,759-389-87
AA4M/6	14,014-140-49-13

San Francisco	
W6SDY	26,840-208-55-13
WB6EGE (KA6OPH, KB6HT, N6s MQ, OC, WB6WPO, WB7DEG, oprs.)	19,448-187-53-21

San Joaquin Valley	
K6MO	36,251-245-63-17
N8BJQ/6	14,000-140-50-10
W6BU (+ KA6VAF, K6SB, W6MUV, WB6YMK, W6DCNU)	35,328-276-64-17

Sacramento Valley	
K16O	57,477-415-69-17
KF6A	13,200-180-44-11
K6RN	8526-94-42
WA6BRV	1140-30-19-2
WA6EUV (+ W6ROVV)	80,418-454-78-34

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Alaska	
KL7AF	6808-94-28-11

Arizona	
K7OX	101,169-554-81
W9RY	10,384-118-44-11
KJ7I	2574-48-26

Idaho	
W7ZRC	84,750-428-70-13
K7RX	38,994-288-67
KA7T	27,218-212-82-20

Illinois	
W7IWU	5920-80-37
W7GCL	720-30-12

Montana	
K6PP7	68,639-467-73-22
W7LR	47,600-337-70
K5TJ	43,624-332-66
KE7X	28,438-241-59-17

Nevada	
KD7SP	3780-54-35-3
W7ABX	1050-25-21-4

Oregon	
W7EJ	104,566-614-77
A17B	64,532-435-68
W7MB	52,997-351-87-28
W7DOR	42,908-314-68-27
N7AKQ (KW7N, opr.)	20,480-183-55-13
N6TR7	15,898-167-47-14
W7HZL	12,013-144-41-18
AD7T	10,920-105-52
KA7FEF	1722-41-21-8

Utah	
KC7PA	35,258-289-61-17
K7OA	21,594-183-59-18
WA7ADK	13,865-146-47-10
Washington	
W7TJ	63,726-362-78-22
KG7D	60,192-408-72-18
N7CKD	47,424-300-78-20
W7KJI	45,195-320-88-20
K9JF	39,680-301-84-17
K7TG	31,437-230-63
W7KQU	25,296-204-82
W7IEU	13,800-139-50
K7WA	11,968-138-44-8
W7DRA	6880-86-40-14
W7ACP	5440-80-34-12
W7BYK	3190-55-29-4
N7ETC	2808-54-26-10
K7LXC	2148-37-29-2
WB7FFF (+ K7SS, K7XX, W7WA)	39,715-590-77-31

Wisconsin	
WA1UJU	68,185-523-85-20
NSAW	62,764-454-88-19
W9GIL	34,914-257-88-18
W9WQ	29,624-263-58-15
W9MQZ	23,688-210-56
W9MTZ	22,220-196-55
N9KS	21,632-208-52-8
W9BHO	14,194-151-47-8
K9DET	3034-103-39
W8AH/8 (+ K9SNM, K9FV, KM9O, N9BG, W9UC)	140,220-855-82-38

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Colorado	
W0KEA	118,746-679-81-35
KA8CDN	70,455-444-77-26

W7BOY	5600-70-40-6
KC7KC	1160-29-20-3
8	
Michigan	
N8EA	123,768-743-81-28
K8OOK	18,945-208-45-13
K8CV	11,408-124-46-8
K8OT	8580-110-39
AD8W	7751-98-39-7
WB8VU	6204-94-33-5
K8SIA	3180-53-30-3
WB8ML (+ K8JM)	105,968-701-74-42
KN8S (+ KA8PLH)	13,158-153-43-14
KD8QW (+ W8BAID)	12,604-134-46-13

Ohio	
W8FN	119,712-886-86-23
K8MN	112,714-858-83
W8DN	38,998-310-62-19
WB8MD (N9AG, opr.)	34,720-277-62-9
WA8MLV	33,040-292-56-17
K8IP	26,160-212-60
WA8RCN	23,128-205-56-9
KJ7T	12,690-141-45-11
WB8DM	12,645-139-45-6
WB8JUI	12,558-135-46
WB8PHI	11,962-135-41-10
N8EKS	9400-116-40-8
K8HF	8772-102-43-3
W8PCS	3224-52-31
WA2AZ3	3080-51-30-2
NC8V	2744-46-28-2
WA8GLF	2304-46-24-7
K8SS (+ AD8P)	201,782-980-98-35
W8LT (K1LT, K8ND, W8ERD, W8DXE, oprs.)	180,900-989-90-39
W8LNO (+ KA8HFO)	125,200-780-80-32

West Virginia	
K8OQL	66,240-448-72-24
N8II	55,704-410-66-8
K8BFJ	32,344-308-52-5
WB8JWX	18,000-188-48-8

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Illinois	
KF9D	95,249-802-77-25
W9YYG	67,521-468-71-17
NA9J	47,628-378-63-10
K9AB	43,896-315-68-12
W9BGYJ	29,522-250-58-20
K9MDO	24,587-214-57-18
W9AG	24,128-208-58
WA9EKA	22,320-188-60-8
W9LQJ	19,850-197-50
W9QWM	18,084-174-51-12
K9PPW	14,405-116-43-9
K9SNT	12,236-133-48
K9SD	9180-102-45
W9FSO	8000-100-40-16
K9SPY	7722-99-39-7
W9ABA	374-17-11-1
K9VV (+ K9s GL, HMB, WB9TT)	168,152-968-84
W9AZ (AK9F, K9NR, WB9HAD, oprs.)	37,898-296-84
K8BAC (+ N8AX, W9ZV, WB9YRX, W8LLR)	34,148-268-63

Indiana	
K9UWA	138,448-897-77-34
N8DE	108,498-879-78
KA9OKH	100,010-876-73-28
KE9I	85,410-573-73-21
K9CLO	57,188-418-68-22
W9RE	37,758-300-62-4
W9UOO	13,563-143-47
N9MM (KM9D, N9NC, W9ZRX, oprs.)	201,600-993-96-35

Wisconsin	
WA1UJU	68,185-523-85-20
NSAW	62,764-454-88-19
W9GIL	34,914-257-88-18
W9WQ	29,624-263-58-15
W9MQZ	23,688-210-56
W9MTZ	22,220-196-55
N9KS	21,632-208-52-8
W9BHO	14,194-151-47-8
K9DET	3034-103-39
W8AH/8 (+ K9SNM, K9FV, KM9O, N9BG, W9UC)	140,220-855-82-38

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California	
KBKJ	46,967-368-87

Contest Corral

A Roundup of Upcoming Operating Events



Conducted by
Edith Holsopple, *N1CZC

APRIL

2
West Coast Qualifying Run, 10-35 WPM, at 0500Z April 3 (9 P.M. PST April 2). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send it to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award or endorsement.

6-7
The SP-DX Contest, CW, March QST, page 84. Note: 1.8 MHz will be included in the SP-DX Contest this year.

World Wide SSTV Contest, Part 1, sponsored by the German AR Teleprinter Group, from 1200Z April 6 until 1200Z April 7. (Part 2 will be held Oct. 5-6.) All entrants must take a six-hour off-time anytime during the contest. 80-10 meters, SSTV only. Work stations once per band. Exchange call signs, signal report, serial number, starting with 001 and GARTG membership number if a member. Count 1 point for each 80, 40 or 20-meter QSO; 2 points per 15-meter QSO; and 5 points per 10-meter QSO. Multipliers: countries as defined by WAE and ARRL countries lists. KL7, KH6, W/K, JA, PY, VE/VO and VK call districts count as countries. Count multipliers once per band, and multiply by sum of QSO points. Multiply that total by the number of continents worked per band. Add 50 bonus points per GARTG member contacted. Mail logs to be received within two months after the contest to Wolfgang Puenjer, DL8VX, P.O. Box 90 11 30, D-2100 Hamburg 90, Fed. Rep. of Germany.

9
W1AW Qualifying Run, 10-35 WPM, at 0300Z April 10 (10 P.M. EST April 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See April 2 listing for more details.

9-10
NA-YL to DX-YL, CW. See YL News, this issue.

13-14
DIG QSO Party, CW, Feb. QST, page 80.

GARTG-RTTY Contest, Part 2 (of 5), sponsored by the German AR Teleprinter Group. HF portion is from 0700Z to 1100Z April 14. VHF portion is from 1200Z to 1600Z April 13. Score HF and VHF portions separately. Bands are 80 and 40 meters; 144, 432 and 1296 MHz for VHF. No repeater QSOs. Exchange RST, QSO number, name, QTH; VHF add grid locator. Work each station once per band. Count 1 point per QSO; VHF count 1 point on 144 MHz, 2 points on 432 MHz and 3 points on 1296 MHz per kilometer 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.

Connecticut QSO Party, sponsored by the Candlewood ARA, from 1100Z April 13 until 1100Z April 14, with a rest period from 0500Z to 1000Z. Phone and CW. Exchange signal report, serial number and ARRL Section (county for CT stations). CT stations work DX for QSO points (only one multiplier). Club station WIQI counts 5 points per band/mode. Novice QSOs count 2 points; OSCAR QSOs 3 points. CT stations multiply QSOs by ARRL Sections worked; others multiply by CT counties worked. Suggested frequencies: phone — 3.927 7.250 14.294 21.370 28.540 MHz; CW — 40 kHz from low end; Novice — 3.725 7.125 21.125 28.125 MHz. Mail by May 5 to CARA, c/o R. Dillon, N2EFA, Box 143, Bethel, CT 06801.

15
ARRL VHF/UHF Spring Sprint, 144 MHz, March QST, page 84.

16-17
NA-YL to DX-YL, phone. See YL News, this issue.

20-21
Spring QRP QSO Party, phone, sponsored by the QRP ARC International, from 1200Z April 20 until 2400Z April 21. Phone only, except Novices and Technicians. Operate a maximum of 24 hours. Power level must not exceed 10-W PEP. Exchange for members is RS, state/province/country and QRP ARCI membership no. Nonmembers exchange RS, state/province/country and power output. Work each station once per band for QSO points. Each member contact counts 5 points; each nonmember U.S. or Canadian contact counts 2 pts. Count 4 points for nonmember contacts on a different continent. QSO points (total all bands) times total no. of states/provinces/countries (an s/p/c may be worked on more than one band) times power-multiplier times bonus-multiplier equals claimed score. Multipliers are 8-10 W output $\times 2$, 6-8 W output $\times 4$, 4-6 W output $\times 6$, 2-4 W output $\times 8$, less than 2-W output $\times 10$. Bonus multipliers: If 100% natural power, $\times 2$; battery power, $\times 1.5$. Suggested frequencies are 1.810 3.985 7.285 14.285 21.385 28.885 50.385 MHz; Novices and Technicians: 10 kHz from the bottom of each band. (Novice/Tech use half of PEP powers shown to determine CW power multipliers and milliwatt scores.) Certificates. Logs must be received by May 21. Send to QRP ARCI Contest Chairman, Eugene C. Smith, Jr., KA5NLY, P.O. Box 55010, Little Rock, AR 72225.

World Fishing Contest — VIGO '85, sponsored by the Executive Committee of the Exposition Mundial de la Pesca, from 1000Z April 20 until 1500Z April 21. Phone only, 80 through 10 meters. Single op, all bands or multiop, single transmitter. Exchange signal report and CQ zone. Multipliers are the DXCC countries. Work each station once per band for QSO credit, but only once per contest for multiplier credit. Station EH1WFE counts as a bonus multiplier. Count 3 points for each contact with a different continent; count 1 point for contacts on the same continent, but different countries; count zero points for contacts with your own country, but they may be used for country multiplier credit. Multiply the sum of the QSO points by the sum of the multipliers. Certificates, awards and prizes. Use a separate log sheet for each band and submit complete logs (clearly mark dupes) and a summary sheet by May 31 to World Fishing Contest Committee, P.O. Box 833, Vigo, Spain.

23
ARRL Spring Sprint, 220 MHz, March QST, page 84.

27-28
Helvetia Contest, sponsored by the USKA (Switzerland), from 1300Z April 27 until 1300Z April 28. CW and phone, 160 through 10 meters (no WARC-band operation). Work stations once per band, regardless of mode. Exchange RS(T) and three-digit serial no. Swiss stations will also send one of the following abbreviations to indicate their canton: ZH BE LU UR SZ OW NW GL ZG FR SO BS BL SH AR AI SG GR AG TG TI VD VS NE GE JU. Count 3 points per QSO with Swiss (HB) stations. HB stations also work each other. Multiply by number of Swiss cantons worked (max. 26 per band). Awards. Separate QSOs by band on logs. Mail entry by May 28 to Walter Schmutz, HB9AGA, Traffic Manager, Gantrischweg 1, CH-3114 Oberwiltach, Switzerland.

28
W1AW Qualifying Run, 10-35 WPM, at 2300Z April 28, (7 P.M. EDT). See April 2 and 9 listings for more details.

MAY
1
West Coast Qualifying Run, 10-35 WPM, at 0500Z May 2 (9 P.M. PDT May 1). See April 2 listing for more details.
ARRL Spring Sprint, 432 MHz, March QST, page 84.

CW QRP Party, sponsored by the DL Activity Group CW, from 1300Z to 1900Z May 1. CW only, 80 and 40 meters. Categories: A — max. 5-W input/2.5-W

output; B — max. 25-W input/12.5-W output. Work stations once per band. Exchange signal report, serial number and category. Count 1 point for QSOs in your own country, 2 points for DX. QSOs with category A stations count double points. DXCC countries count as multipliers. Score each band separately, then add band totals for final score. Mail logs by May 31 (include s.a.s.e. and IRC for results) to Werner Henning, DF5DD, Mastholter Strasse 16, D-4780, Lippstadt, Fed. Rep. of Germany.

Indiana Mouth of May Contest, sponsored by the Southern Indiana QRP Group, from 0000Z May 1 until 2400Z May 31. Single operator only; all HF bands except 30 meters. No repeater or crossmode QSOs. Exchange signal report, state, province or country; Indiana stations exchange name and county. Aim for 500 Indiana contacts. Certificates to top 33 non-IN and top 33 IN stations. Certificate for working all IN counties. Send a copy of log, dupe sheet (if more than 200 contacts) and score sheet. Include an s.a.s.e. for results and/or certificate and mail to be received by June 30 to Russ Ryle, N9DHX, P.O. Box 2466, Bloomington, IN 47402.

4-5
Florida QSO Party, sponsored by Florida Skip magazine, from 1400Z to 1900Z May 4 and 0001Z-0500Z and 1500Z-2300Z May 5. 160-2 meters. Suggested frequencies: CW — 3.555 7.055 14.055 21.055 28.055 MHz; phone — 3.945 7.279 14.279 21.379 28.579 MHz. Phone and CW are separate contests. Use separate logs. Work each station once per band and mode. No crossband, crossmode or repeater contacts. FL classes are: A — those operating portable on emergency power and running 100-W or less output inside FL but outside their home counties; Class B — all other stations operating in FL. Indicate single op or multiop. For exchange, FL stations send signal report and county. Others send signal report and state, province or country. FL stations count 1 point per QSO. Multiplier is the total states (49 max.), provinces (12 max.) and DX countries (27 max.). All others count 2 points for each FL QSO. Multiply by total of FL counties worked (67 max.). FL class-A stations multiply final score by 1.5. Certificates and plaques. Include a summary sheet and a dupe sheet with logs. Mail by June 3 to Florida Skip Contest Committee, c/o North Florida ARS, P.O. Box 9673, Jacksonville, FL 32208.

County Hunters SSB Contest, sponsored by MARAC, from 0001Z May 4 until 2400Z May 5 (0800Z-1200Z each day is a mandatory rest period). Work mobile and portable stations each time they change band or county. Fixed stations may work other fixed stations only once regardless of band change. Exchange signal report and QTH (county for U.S., country for DX). Suggested frequencies: 3.920-3.940 7.220-7.240 14.270-14.300 21.365-21.385 28.570-28.600 MHz. There will be a mobile window at 3.925-3.935 7.220-7.230 14.275-14.285 where low-power mobiles will operate. Fixed stations are asked to work the mobiles and move out of the window. Point value of contacts: mobile — 15, mobile team — 30, portable — 5, DX (incl KH6/KL7) — 5, fixed U.S. station — 1. Final score equals the total of U.S. counties plus Canadian stations times the total number of QSO points. Awards and certificates. Send your logs by June 3 (or an s.a.s.e. for more information) to Barry Brewer, WA5DTK, P.O. Box 65, Randolph AFB, TX 78148.

8
W1AW Qualifying Run, 10-35 WPM, at 0200Z May 9 (10 P.M. EDT May 8). See above listings for more details.

9
ARRL Spring Sprint, 1296 MHz, March QST, page 84.

11
DIG VHF QSO Party, sponsored by DIG-Journal, from 1300-1600Z May 11. 144-146 MHz. Modes may be mixed. Exchange signal report, QTH-locator and membership number (if a member). Work each station once. Each bridged kilometer counts 1 point. Count each DIG member worked as a multiplier. Multiply kilometers by DIG members for the final score. Awards. Only the new VHF logs of the DARC (available for an s.a.s.e.) are recommended. Mail logs

*Assistant Contest Manager, ARRL

by May 31 to R. Knobloch, DJ3HJ, Freiburger Str. 13, D-7814 Breisach, Fed. Rep. of Germany.

11-12

CQ-M Contest (Peace to the World), sponsored by the Krenkel Central Radio Club of the USSR, from 2100Z May 11 until 2100Z May 12. CW and phone, 3.5 through 28 MHz. Amateur satellites count as a separate band if a 144-to-28 MHz mode is used. Work stations once per band, regardless of mode. No crossmode QSOs. Categories: single op, single band; single op, all band; multioperator, single transmitter (all bands); SWL. Non-USSR stations send signal report and serial number. USSR stations send signal report and oblast number. Avoid lower 5 kHz of 80/40 meters and lower 10 kHz of 20/15 meters. Count 1 point per QSO within your continent, 3 points for other continents. QSOs with your own country count for multiplier credit, but have no point value. Multiply total QSO points by the sum of different countries (R-150-S country list) worked per band. The R-150 list is basically the same as the ARRL countries list except for USSR countries.

Serious competitors should review the R-150 list. Awards. Mail logs by July 1 to CQ-M Contest Committee, P.O. Box 88, Moscow, USSR.

A. Volta RTTY DX Contest, sponsored by the SSB and RTTY Club of Como and the Associazione Radioamatori Italiani, from 1200Z May 11 until 1200Z May 12. (No rules received this year.) 80-10 meters. Entry classes: single op; multiop, single transmitter; SWL. Work stations once per band. Exchange signal report, serial number and zone number. QSOs within the same country do not count. Points for other QSOs are determined from exchange table available from sponsor. QSOs with different continents on 3.5 and 28 MHz are worth double. Multiply QSO points by sum of DXCC countries and W/VE/VK call areas worked per band. Count one additional multiplier for working the same "country" on at least four bands. Mail logs to be received by July 16 to Francesco Di Michele, I2DMI, P.O. Box 55, 22063 Cantu, Italy.

18

ARRL Spring Sprint, 50 MHz. See March

QST, page 84.

Armed Forces Day

18-19

World Telecommunications Day Contest (date not confirmed)

19

Abegweit Award Contest

19-20

Michigan QSO Party

20

WIAW Qualifying Run

25-26

CQ WW WPX Contest, CW

28-29

Clara AC/DC "Mystery" Contest

Special Events

Conducted By Edith Holsopple,* N1CZC

Tel Aviv, Israel: The Holon/Bat-Yam Club will make a DXpedition to the Dead Sea area, the deepest point on earth, from 0800Z April 6 until 0800Z April 13. 4X5DS will be used on 80, 40, 20, 15 and 10 meters. An award will be issued for working the station on three different days, three different bands and/or three different modes (phone, CW and RTTY). A special QSL card will be available for all other contacts.

Wilmington, North Carolina: The Azalea Coast ARC will operate K14IF during the Azalea Festival weekend, 1400-2200Z April 13-14, from aboard the battleship *USS North Carolina*. Frequencies will be (phone only) approximately 7.235 14.235 21.335 MHz. For QSL exchange, send an s.a.s.e. to P.O. Box 4044, Wilmington, NC 28406.

Philadelphia, Pennsylvania: Olympia ARC will operate from the *USS Becuna*, a historic submarine, and the *USS Olympia* from 1300Z April 13 until 2000Z April 14 to celebrate National Submarine Day. Approximate frequencies: CW — 3.390 7.050 14.050 21.090 28.150 MHz; phone — 3.890 7.240 14.285 21.360 28.600 MHz. Certificate for s.a.s.e. via Olympia RAC, P.O. Box 928, Philadelphia, PA 19105.

Plainfield, New Jersey: The Lockheed Electronics ARC will operate WA2KBI in conjunction with the Lockheed Electronics Co.'s 25th anniversary. Operation will be from 1800Z to 2200Z April 14 on 14.320 and 7.230 MHz. Certificate for s.a.s.e. and QSL card to LEC ARC, MS 147, 1501 U.S. Highway 22, Plainfield, NJ 07061.

Bellrose, New York: The Hall of Science ARC will operate from 1500-2100Z April 14 to celebrate their 12th anniversary. Stations using WB2JSM will operate CW in the first 25 kHz of the Novice bands of 40, 15 and 10 meters, and in the first 5 kHz of the 30-meter band; stations using WB2ZQO will operate phone in the first 25 kHz of the General portions of the 40, 20, 15 and 10-meter bands. Certificate available for large s.a.s.e. to HOSARC, P.O. Box 131, Jamaica, NY 11415, or to Arnold Schiffman, WB2YXB, 81-22 250th St., Bellrose, NY 11426.

Nebraska City, Nebraska: Members of the Nebraska City Radio Club will operate from the former home of Arbor Day's founder, J. Sterling Morton, during the annual celebration. Times will from 2400Z April 15 to 0600Z April 21 in the General portion of the phone and CW bands on 80-10 meters. Commemorative certificate for an s.a.s.e. and your QSL card to Nebraska City RC, P.O. Box 8, Nebraska City, NE 68410.

Fontana, California: The Fontana Jr. High School ARC will operate WA6ZEF in celebration of Fontana Days, April 19-21. Phone operation will be from 1700 to 0200Z daily in the General portions of 20, 15 and 10 meters; CW will be from 2000 to 0200Z daily on the Novice portions of 80, 40 and 15 meters. Special certificate for s.a.s.e. via WA6ZEF, Fontana Jr. HS, 8425 Mango Ave., Fontana, CA 92335.

Lolo Pass, Idaho: The Hellgate ARC of Missoula, Montana, will operate WB7SFL at Lolo Pass, com-

memorating the Lewis and Clark expedition crossing of the Bitterroot Mountains. Operation will be from 1700 to 0000Z daily April 20-21 in the lower 20 kHz of the General portion of 20, 15 and 10 meters. A commemorative certificate for large s.a.s.e. to HARC, Box 3811, Missoula, MT 59806.

Washington, DC: Amateurs from Rock Creek ARA and Capital City ARS will operate N3DYQ at Georgetown Day School to demonstrate Amateur Radio to students. Operation will be 1330Z-1715Z April 26. Frequencies: phone — 14.250 7.250 MHz; CW — 14.060 7.060 MHz; and on local 144 MHz repeaters. QSL to Eric Meyer, N3DYQ, 1303 Geranium St., NW, Washington, DC 20012.

Dayton, Ohio: The Dayton ARA will sponsor W8BI/M from the Dayton Hamvention 1700-2400Z April 26; 1300-2200Z April 27, and 1200-2200Z and some evening operation April 28. Operators will be Hamvention guests. QSL with a large s.a.s.e. to W8BI, P.O. Box 44, Dayton, OH 45401.

Westfield, New Jersey: Tri-County RA will sponsor W2LI from 0000Z April 26 until 0000Z April 27, in celebration of the 50th anniversary of TCRA. Phone operation will be in the lower 25 kHz of the General class bands on 80-10 meters. Special QSL via s.a.s.e. to Tri-County Radio Assn., P.O. Box 412, Scotch Plains, NJ 07076.

Canton Uri, Switzerland: Club station HB9MM/P will operate from the rare canton of Uri (UR) during the Swiss "H26" contest on April 27-28. Operation will

be mostly CW. QSL via HB9MM.

London, England, to Jamestown, Virginia: Crew members of the *Godspeed*, an English Renaissance sailing ship, will operate during the 6000-mile, 10-week trip from London to Jamestown, beginning April 30. Equipment was installed by the Williamsburg (VA) Area ARC. The trip is sponsored by the Jamestown/Yorktown Foundation. KA4FVB and possibly other call signs will be used. Special QSL cards will be available.

Louisville, Kentucky: The AR Transmitting Soc. will operate W4CN from 2200Z May 1 to 0400Z May 2, 2200Z May 2 to 0400Z May 3 and 2200Z May 3 to 0400Z May 4 to commemorate the Kentucky Derby Run for the Roses. Frequencies: phone — 3.880 7.280 14.280; CW — up from 3.700 7.100 14.025. QSL with a large s.a.s.e. for certificate.

Camdenton, Missouri: The Lake of the Ozarks ARC will operate KD8AW 1400-2300Z May 4 during the 35th Annual Dogwood Festival. Frequencies will be 14.255-14.285 (phone) and 7.125 (Novice).

Note: The deadline for receipt of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach Hq. by April 15 to make the June issue. For the convenience of those wishing to operate, please be sure to include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

ARRL International DX Contest Feedback

The following includes logs omitted from the 1984 DX Contest Results. We will take this opportunity to correct some other errors that we have discovered.

In the phone category: N6HK operated from Santa Barbara, not San Joaquin Valley. In Santa Clara Valley, KJ6V is actually KJ6Z. WA8LLY should have been listed in San Francisco. His score line reads 9108-92-33-B. In Idaho, W7DTL is actually W7OTL. In Ontario, the leading station was VE2WA/3 155,310-334-155-C. The station following him should have been VE3LDT instead of 'DLT. OX3KM should have been listed in the DX, North America, phone category, instead of CW.

In the CW category: Under Northern Florida, N4VQ is actually W4VQ. K4OD in Virginia operated C power, not B. KW7L in Wyoming operated B power, not C. W6YMH, listed in Santa Clara Valley, really operated from Sacramento Valley. N3BB (+N3ED) operated multi-single, not multi-two transmitter. This puts them in first place in 3-band, second place in W/VE Multioperator Single Transmitter, CW.

Following is a revised list of the stations who operated Multioperator, Two Transmitter in the

W/VE, CW portion of the contest:

K1RX (+ K1s RU YR, K22S; WA1ZDW)	3,088,781-2731-377-C	K5BS (+ ADHP, WM4T, N8ET, N6ALV, K0BE, KN8S, W8FN)	1,760,352-1687-352-C
W4RYVR (+ K8s GL GM LX, N4BY, WA8DGX)	2,802,483-2377-393-C	N16W (+ W6KUT, WA8EJL)	964,864-1114-252-C
N5AU (+ KM5X, K5ZD)	2,618,480-2238-390-C	KQ2O (+ K2BIQ)	840,078-993-282-C
W3GM (+ K3s, GM, ND, N3s ATQ, VV, W3FV)	2,582,712-2174-396-C	AA8T (+ KA8LAF, SM8ORDW@)	697,641-973-239-C
N2RM (+ N2MM, KB3TN, WA2HGM)	2,282,544-2096-383-C	K9ANP (+ K8LRFN)	394,632-648-203-C
		K83MM (+ N3ARK)	463,839-847-238-C
		NC7K (+ KP7E, WA7UTM)	224,502-527-142-C

In the next category, Multioperator, Unlimited, the score line KR3W (+ N3LR, N3NA) 1,096,680-1480-247-C was omitted. N4BP/C6A, listed under Multi-Single, North America, CW, operated B power, not C. N3BB won the CW, Multioperator, Single Transmitter plaque, and K1RX won the CW, Multioperator, Two Transmitter plaque.

*Assistant Contest Manager, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Steven Ewald, WAACMS

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — ASM: VE6AMM, SEC: VE6XC, STIM/NM/DEC: VE6ABC. Another cold month in our long winter has passed and hams have been busy with the minor hockey communication duties. Cross country ski races have relied on the hams as well for reporting the action. Your SM could stand some reporting from his ECs. But then it has been said that hams are the worst when it comes to communicating among themselves. Lets change it. Traffic: VE6CHK 211, VE6CPE 20, VE6ABC 19, VE6E0 4, VE6XC 4.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — B.C.E.N. CW Net 3650 — During these poor conditions at 0300Z the net opens at 2400Z and continue till old time for stragglers. B.C. Public Service Phone net 511, VE7QC, Net Manager, is in hospital and Ford, VE7DDF, has taken charge. Frank, VE7IK, in hospital with heart problems. Salt Spring Island group holds last Wednesday a Luncheon of each month. Let someone know they have pick ups at the parties. Real thrilled to see Victoria Short Wave Club's ZERO BEAT is back. Also nice to receive Burnaby's paper. Pacific North-West Gourmet Banquet Dance coming in March. Traffic: VE7BN1 337, VE7CDF 72, VE7FB 45, VE7EGM 28, VE7CCJ 28, VE7EIR 13, VE7EGM 12, VE7FSP 10, VE7BZ 6.

MANITOBA: SM, Jack Adams, VE4AJE — SEC: VE4FK, NMS: VE4LB, VE4VJ, VE4FAO, VE4TE, VE4ANR. Greetings, as your new Section Manager I will take this opportunity to thank Peter VE4PG for the many years of dedicated service. I have a challenge in filling Peter's shoes, but with the help of individuals who assisted Peter in the past years, hopefully they and all members will make this challenge a delight. There are many of us who like to leave the work for someone else and then criticize them for what they have done. Let one of the criticsizers. There are a number of official duties men here in Manitoba Section. Great challenge with no pay. I will be making these vacancies known and have great expectations that they will be filled. Net and traffic report MEPNQNI 1115 Sessions 30 QTC 14 MMNQNI 719 sessions 31 QTC 36 MTNQNI 237 Session 31 QTC 28 WRINQNI 321 Sessions 9 QTC NII M5SB (VHF) QNI 36 Sessions 4 QTC NII. Traffic: VE4AFO 47, VE4AJE 34, VE4TE 34, VE4RO 33, VE4BI 22, VE4ADD 17, VE4IX 13, VE4ID 8, VE4DT 6, VE4NE 5, VE4XN 5.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3LST, PGL: VE3AR, SEC: VE3GV, STIM: VE3BDM, TC: VE3EEO. Recent figures show that the Canadian amateur population having grown around 23,000 members in the 45 year station is at 412,000. There is a great need for us to recruit young members to amateur radio to establish a Canadian presence on the bands. I know a novice ticket became a dead issue a few years ago but perhaps, as an alternative, one with a 5 wpm code speed and HF only privileges instead of 2 metres might help. License fees have increased to \$20.00 and there have been a number of complaints. In my opinion, for the money and the amount of spectrum we have access to. It is still a bargain in view of the heavy demand on the radio frequency spectrum. Newly elected CRRL Ontario Region Director VE3FN presented the Ottawa ARC's 25th Anniversary with a certificate recognizing the Club's 50 years of League affiliation which began back in November of 1933 — congratulations. VE3KUC is busy organizing the VE3 side of the newly formed Chrysler Amateur Radio Society. All present and former Chrysler employees are invited to contact Jim in Windsor. The white caners net on 3.767 MHz have moved their starting time back to 1900 hours local from 1930. OSN Daytime has moved from 7.045 MHz to 3.667 MHz daily at 1600 hours daily. The Radio Society of Great Britain (RSGB) new President is G4CHH, the Society's first YL President. VE3DZK has moved to Quebec and is now VE3DB. Congratulations to the new President of CARF, VE3DWW. Regularly I am moved up to Ottawa from Halifax and was not back on the air yet except for 2 meters. VE3LAR was the recipient of the Ottawa ARC's certificate of merit. SORT Inc are reverting to a quarterly bulletin publishing schedule with the hope that expanded issues will cover a wider range of interesting topics. Traffic: VE3DPO 123, VE3KK 123, VE3GT 120, VE3BDM 91, VE3GNW 85, VE3KZC 54, VE3FGU 53, VE3JAN 43, VE3GOL 41, VE3GFN 29, VE3WV 21, VE3VM 19, VE3BAJ 14, VE3EUD 13, VE3OER 12, VE3DZH 9, VE3KX 5. (Dec.) VE3FGU 96, VE3KX 57.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2E0, BM: VE2AL, PLO: VE2RW, TC: VE2ED, NMS: VE2E0 and VE2FA. Congrats to all VE2 ops who handled holiday traffic very efficiently. VE2CP was very active in the Canada Day contest. DOC has announced a revised schedule of license fees. Effective April 1, Amateur radio station licences will increase from 13 to 20 dollars a year. VE2DZV, fait tres bien, comme remplaceant de VE2VL au reseau des Joyeux Copains. Traffic: VE2CP 149, VE2E0 57, VE2BP 53, VE2EC 46, VE2EKC 33. (Dec.) VE2CP 151, VE2E0 14, VE2NT 42, VE2EP 64, VE2PFK 51, VE2EC 40, VE2EKC 24.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — SEC: VE5CU, STIM: VE5HG, TC: VE5GF, BM: VE5WM, NMS: VE5EG, VE5HG, VE5VJ, VE5AEM, VE5AEU, VE5BAF. Net reports: MJARC-2 meter 30 sessions - 230 QNI; ARA-2 meter 30 sessions - 514 QNI - 1 QTC; Prairie Weather Net 31 sessions - 512 QNI; SK Home Net 31 sessions - 103 QNI - 28 QTC. The battle of QRM on 75 meters continues however, the move of the SPN frequency to 3753 kHz from 3785 kHz has shown an improvement in the first two weeks of operation. A tour of the Regina ARA new club station location at the Wascana Institute North Campus is scheduled for March 13th. Hamfest '86 - August 2, 3 and 4, 1985 - a date to remember.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX, SEC: W1PQ, PLO: N3DIP. Due to my vacation to Florida my report has some omissions. I apologize for this and hope to make corrections next month. Hal, WA3WYI,

was in the hospital. He is now home and well on his way to recovery. DEPN QNI 69, QTC 6 in 4 sessions. Traffic: WB3DJG 23, WA3WYI 23, W3FEG 16, K3ZXP 15, N3AXH 15, KC3FW 14, KA3ISM 10, KA3JXV 9, KC3JM 7.

EASTERN PENNSYLVANIA: SM, Jim Post, KA3JA — ASM: KC3LM, WA3PZO, K3FD, SEC: W3PZO, STIM: KB3UD, ACC: KB3NE, PLO: W3AMQ, TC: COJACC, W3FAF, DECA, K3QXC, A3AC, W3EEK, KB3UD, N3BFL, K3MWA, KB3LR, WA3JRL, N3AIA. Traffic:

	QNI	QTC	Sess.
EPA 3810 000/03002	454	157	59
EPA EPTN 3916 23002	575	164	31
PTTN 3810 2330	279	97	31
ATN 146.67	52	10	9
D2ARES 145.45			
D3ARES 145.37	95	7	4
D5ARES 148855	63	4	4
D6ARES 14700	106	11	4
PWARES	63		
PFN 3958	217	79	31

QRZ PENN WIRELESS: W3SK is celebrating its anniversary on May 18. The club is planning a special events station and reunion and would like to get in touch with all former members. Please contact Penn Wireless ASSN in care of Mike McLoughlin, WB3JHX. Our new and very efficient incoming QSL Bureau CARS is now offering an outgoing service cost - 10 cards - \$1.00. EPA FEED LINE EDITION #1 was a big success. Thanks to a very professional job by Kay, KC3LM. If you are an appointee or your club did not receive a copy, please contact KC3LM or KA3JA. Your SM KA3JA was at the business end of a wet noodle lashing for the erroneous report on Erie and the PA QSL party on the mispelling of Murgas. The Murgas club did not know about a volunteer for the frequency Co-ordination now in the capable hands of John Brochon, K3ZFD, and Dick Stewart of the newly formed MECCA (Middle East Coast Co-ordinating Assn.) They are working with SNJ Section and all repeater owners to re-establish the records of the old PJRC. If you or your club have correspondence that has not been answered from PJRC, it should be handled soon. All new inquiries should be directed to John Brochon, 615 Neshaminy Road, Croyden, PA 19020. Jeff Chapman, WA3RIZ is the new Dist. 1 SKYWARN co-ordinator. This is the finest flying emergency ham in EPA. Congrats to WA3PZO for the innovation in emergency service. Traffic: KA3DLY 245, N3COV 207, KB3UD 140, W3IPX 100, WB3KPE 99, KA3IME 88, W3KAG 77, N3AIV 76, AA3B 76, KC3LY 58, WA4Q 54, WA3EHD 46, N3CD 37, WA3CA 31, W3FAZ 31, N3AZW 30, KA3A 28, W3JXK 26, W3VA 23, W3FAP 23, WA3GLX 22, W3TWW 15, W3CL 15, KE3U 9, K3ZXC 4.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — SGC: KA3ERP, PLO: KA3DBN, OO/RFI: KC3EK, ACC: KA3DPO, STM: W3GXT, SEC: WA3TAI. We need a TA and BM. K3CHP, KA3R and WA3K are OOs helping the rest of us. If you are out of report forms, do like KC3SD send a radiogram! W3ZNV is getting help from his RTTY machine! N4DLA's antenna must be big enough — it came down in the wind storm, N3EBQ has North East on the map. W3ERT claims to be the best ham in the real winter. MDC is balm! K3JE gave net certificates to W3DQJ, WA3DUM, KK3F and KC3Y of the MEPN. Pax River Exams had 8 upgrades from 17 candidates. Good show! W3VYQ reports DC, VA, PA and MD have an informal RACES agreement. FBI K3NNI hustles a lot of traffic in his 10 hour days. W3LDD says that traffic number is it! W3DQJ is gonna keep the MEPN conforming. Delmarva ARC lists KA3NFZ and KA3NFQ Advanced at the latest VE session. KA3IHD's new inverted VEE takes the drudgery out of 75 meters. K3MR fills those liaison spots when needed. KA3EWW, K3JE, K3NNI, W3FA, KC3Y and XYL, N3EBN, XYL were hosted by W3LO and his XYL honoring KC3AV's years perfect attendance as MSN's NM. KC3J became new NM of MSN spelling K3VA. MSN meets 1930 daily local time on 3717 kHz. WB3BFK, W3OYY, KC3DWW and KA3JHT are all independent Net Managers. W3UT did not say one bad word about poor conditions. N3DE has won the battle with the flu bugs. KK3F finally has the new antenna working great. Too loud now! The ARRL QSO party and the 160 meter contest caught W3FZV's fancy. With the nets: Net/Manager Sessions/Traffic/QNI Average. MDD/W3PQ 62/231/9.3 Brass W3GQ and W3FA, MEPN/K3JE 31/228/31. Top Ten: K3JE, W3DKX, W3OYY, KA3CQD, KB3WL, N3EBQ, KB3NL, K3ORW, W3LDD and tied WA3DUM, W3HTE, MSN/K3AV 31/107/11.9. Honor Roll: KC3Y, KC3AV, K1BGT, KA2PCH and WA3Y10. WRN, PON, WA3BFFK 22/23/12. Wicomico ARES/KA3HT 3/4/12. W C 2 Mtr/KC3DQ 5/3/13.3. MDC PON/W3OYV 5/1/14.2. TNX for the Newsletters, LARC, SMARC and FAR. Traffic: K4JZ 177, KC3Y 157, K3NNI 146, KC3AV 133, KC3DWW 126, W3FA 121, KA3EWW 115, KK3F 59, W3VYQ 52, N3DE 47, N3EBQ 43, W3UT 39, W3ZNV 34, WA3ERTZ 28, WB3BFK 22, W3DQJ 20, K3MR 20, W3LDD 16, N4DLA/3 15, W3FZV 10, WB3FUE 8, KC3D 8.

SOUTHERN NEW JERSEY: SM, Richard Bard, WA2HEB — SEC: K2QJL, STM: W2ZUVB, ACC: K2IXE, TC: W2JX, SGL: W2XJ, PLO: W2BZE, BM: W2ZUVB, OO/RFI: WA2HEB. I would like to thank each and every one of you who took the time to comment on the recent section newsletter. I'll make it my business to put out another one or two during this year. If any of you in the section have something that you think might be of interest to the rest of us in the section, please feel free to send an article to me and I'll do my best to get it in the newsletter. Remember, it is YOUR newsletter! Our SEC informs me that we now have an EC in every county in our section. If you are interested in joining ARES, but don't know your EC, please contact SEC George Ford, K2QJL, P.O. Box 73, Burlington 08016. Please make a mental note to listen in on the SNJ Bulletin Net Thursday evenings at 2230Z and again at 0300Z. Our BM has the latest in Amateur Radio Info, both at national and section level. Traffic: W2ZUVB 172, WA2CJW 99, N2CER 37, W2ML 24, K2CPB 15, WA2MGV 12, KA2GSL 9, KA2CQX 8, WA2HEB 2.

WESTERN NEW YORK: SM, William W. Thompson,

W2FMA — SEC: W2BCH, ACC: N2EH, BM: W2GLH, PLO: WA2PUU, TC: K2QR, SGL: K2OX, OOC: WA2ET, STM: OPEN, RFI coordination duties move from WA2ET to K2QR with change from Official Observer/RFI Coordinator to Official Observer Coordinator. WA2ET as OOC addresses features of the Amateur Auxiliary Service related to Volunteer Monitoring Program. K2QR, as Technical Coordinator, will address appointment of Assistant TCs in WNY. RFI coordination is related to interference between radio amateur and consumer equipment, while VMP will address amateur-to-amateur problems. Watch QST for more info. Note that only certified Official Observers, those who have passed the certification exam, are OOs starting this year. FURTHER, note that all of the Field Organization is now under the Field Services Department at ARRL. Keep your boots on, "we're" getting there. Net info:

NYS/1*	10	381-174-31	BLUELINE	19	281-017-29
WDN/1*	11	337-083-31	NYS/4*	19	429-214-31
MFN	13	263-074-30	OARGN	20	080-000-05
NYPON*	17	730-326-31	BRVSN	21	400-006-31
NYSPTN	18	686-075-31	CNYTN*	21	363-054-31
ESS CW	18	525-064-31	OCTEN/L*	21	317-014-31
OCTEN/E*	18	842-093-31	STAR	21	317-014-31
NET	18	442-003-31	WDN/L*	21	583-106-31
WDN/E*	18	628-140-31	NYS/5*	22	308-128-31

*NTS Nets. 1984 MESSAGE HANDLING-NYS 6803, NYPON 5156, WDN 4532, NYS/M 2598, OCTEN 1646, CNYTN 934, NYSPTN 834, MIKE FARAD 764, EMPIRE SLOW SPEED 783, BLUELINE SERVICE 258, Q NET 83, BLACK RIVER SERVICE 75, for a total of 24,444 transactions; up ten per cent over 1983. NICE GOING! Public Service Honor Roll: KA2BHR, KG2D, KA2DQA, WA2FJJ, VE2FMO, WH2ID, WA2KQJ, W2MTA, W2BOWO, ND25, WA2SMZ, KX2T, KA2UBX, K2YAL. Appointment: N2GG-EC, Franklin County, OBS reports: W2DSR, WA2ZPE, WB2SCS OFFICERS: Binghamton ARA, N2CIC, N2BLX, CA2EJ, N2CFN; Ogdensburg ARC, KA2JL, KA2CE, K2JPM, WA2FJD, N2CQJ, WA2RXO; Oswegatchie, WA2NAN, N2EBG, WA2TSR, N2EJU, KA2ORM; Salt City DXA, K2ZJ, KA2K, KB2G, K2QK. Sorry to report former SCM, K2NY has become a Silent Key. Dick was an inspiration to many in ham radio. COMMS: 138 Boy Scouts at Cherry Valley SASQUATCH Camporee-WB2PEE/PEF, Lewis Co. Show emergency-WA2OEP, CONGRATS: WA2QYT honored by Auburn ARA for his Repeater Service; WA2ANU on publication of 200th technical article in QST; to all of WNY's 148 Volunteer Examiners! Traffic: W2BOWO 407, WA2FJJ 395, W2BDS 352, W2MTA 275, WA2HSB 170, KA2BHP 156, VE2FMO 144, KA2ED 98, N2PS 95, WA2KQJ 89, KG2D 83, KA2BHR 77, WA2SMZ 76, K2ZT 76, W2FR 64, K2YAL 60, KA2UBX 49, KA2DQA 45, W2UYE 45, AF2K 28, WA2OEP 16, W2PPS 16, W2ZOJ 15, N2EVM 12, WA2RXO 12, N2DZD 11, N2FBK 10, K2GZT 10, K2JUT 7, W2BNAO 5, K2CJ2 2, K2VR 1.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — STM: AC3N, ACC: N3EE, OO/RFI: Copr. KJ3Q, PLO: W3BZJ, SGL: K3HWL, BM: W3NVAW, TC: K3LR. Net QNI QTC Sess. kHz T/D
WPACW 335 136 31 3585 7:00 P/D
WPAPN 808 110 31 3983 6:00 P/D
WPA2MTN 497 55 31 148.28/88 8:00 P/D
WPA2MTN 437 3 30 145.13- 1400 UTC
PFN 317 79 31 3958 5:00 P/D
Silent Key W3WXS. New appointments: K3LR as Technical Coord. for the section. He is the technical head of "The Spring System" of the AF3P/R repeater in Sharon, PA on 145.350. I think he can be of great help to the section hams. The new OO/RFI Coordinator is KJ3Q of Lower Burrell, PA. He is the Pres. of the WPA DX ASS'N and is active in other amateur related activities. Please feel free to ask them for any help they can give. All OO reports for OO should be sent to KJ3Q. Please send any VE schedules for exams to W3NVAW the BM for dissemination to OBS stations in the section. This should help make times for exams better covered. Upgrades to Extra KA3SD, KJ3Q, K3SP and W3VYQ to Advanced KC3MR, to General KA3LNG, KA3MG, KJ3LB, N3E, W3KJ, and KA3MPT. Congrats to all Officers 1985: WPA2XSSN Pres. KJ3Q, V.P. WA3CGE, Sec. KB3KJ, Treas. KC3MP, DX info. KC3ET, SHP8MB Pres. W3JQD, V.P. K3MPJ, Treas. N3AEV, Sec. WA3KOD, Dir. W3MML, W3LDB & W3QNI, Trus. WA3PBD, WA3WNT & N3DXE, BVARA Pres. KA3MFG, V.P.'s KG3L & KA3MRD, Sec. KA3BNG, Treas. WB3HWP, E. BD KF3V & WB1BSU, Trus. WA3ZEW, The GPVHF Soc Pres. WB3HRN, V.P. KA3BLJ, Treas. K3JZD, Sec. WA3HGW, Trus. K3ADC, K3MC & K3WOD, Triple A ARA Pres. K3NFX, V.P.'s WA3ZJE & KA3GDO, Sec. KA3CQD, Treas. K3NVP, Trus. W3VZ & Ed. KB3YC, Traffic: W3EGE 313, W3NEM 132, KC3Q 132, W3QK 112, W3NGO 73, KA3ETC 63, WA3QNT 59, KS3MB 53, WA3JUNX 42, K3QM 42, W3BD3W 41, N3FPM 39, K3NPW 32, W3KJM 31, KC3JQ 31, N3WVS 25, W3KUN 23, KA3LJU 20, W3NVAW 20, W3RUL 15, W3MML 14, K3LTV 13, W3BGUK 10, K3BNV 7, KC3HR 4, KA3EGE 1.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH, STM: KB9X, OO/RFI: W9TT, BM: K9ZDN, PLO: W9BEE, SGL: W9KPT, ACC: W9B5FT, ASM: K9CQD. Net Freq Times (Z Wm) QNI QTC Sess.
ILN 3590 0030/0400 DY 678 145 61
ITN 3705 0100 DY 322 68 31
ILPN 3915 2230 DY (X Sn) 867 93 31
NCPN 3915 1300 DY (X Sn) 467 70 27
NCPN 7270 1815 DY (X Sn) 350 51 27
IEN 3940 1500 Sn 119 7 4
IARES 3915 2230 1 + 3 SN 119 7 4
ISN 3905 0000 DY 679 154 31

Illinois was represented 82% to 99N by stations K9AZS WA9BVF, K9BVE, N7DOW, Y9DR, KA9EWN, KA9FEZ, K9GMZ, K291, W9INZ, K9WJ, KD9K, K9JL, W9BNVN, W9NXX, KA9PKG, K9QEW, and N9TN. Illinois was represented 100% to D9RN by stations W9BNVN, KA9FEZ, W9HLX, W9NXX, K9AZS, W9BRFB, W9HOT, W9BQDN, and K9WJ. D9RN was represented 100% to CAND. Illinois stations



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IC-02AT 2-meter
IC-04AT 440MHz
IC-BC16U Wall Charger for BP7 and BP8 only
IC-ML1 12VDC 144MHz Booster 10W out/12 VDC (comes w/5 ft. coax, BNC to exb PL-259)
IC-DC1 DC Regulator 12 VDC in/ 9.6 VDC out (comes with DC cord — will not get power from BC30)
IC-CP1 Cigarette Lighter Cord w/ Fuse (charges BP3/ powers DC1)
IC-BP6 Battery Pack
IC-BP7** Battery Pack
IC-BP5 Battery Pack
IC-BP4 Battery Pack
IC-BP3 Battery Pack
IC-BP2 Battery Pack
IC-BC25U AC Wall Charger 117 VAC in (for charging BP3 only)

HS-10 Headset
HS-10SB PTT Switchbox
HS-10SA VOX Univ. (Not shown, works only with 02AT and 04AT)

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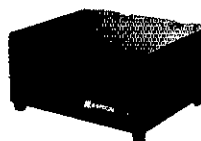
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B23S	2M	No	2W	30W	5A	\$79
B215	2M	Yes	2W	150W	22A	\$259
B108	2M	Yes	10W	80W	10A	\$159
B1016	2M	Yes	10W	160W	20A	\$249
B3016	2M	Yes	30W	160W	17A	\$199
C22A	220	Yes	2W	20W	5A	\$89
C106	220	Yes	10W	60W	10A	\$179
C1012	220	Yes	10W	120W	20A	\$259
D24	440	No	2W	40W	8A	\$179
D1010N	440	No	10W	100W	20A	\$289

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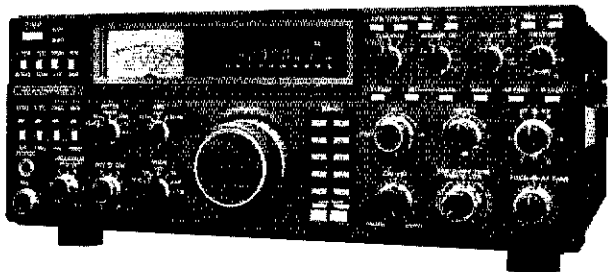
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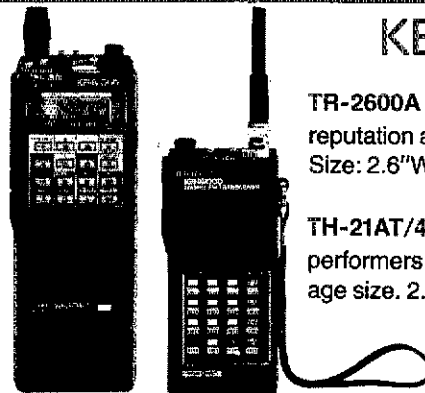
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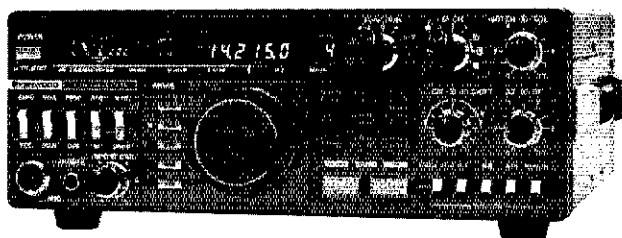
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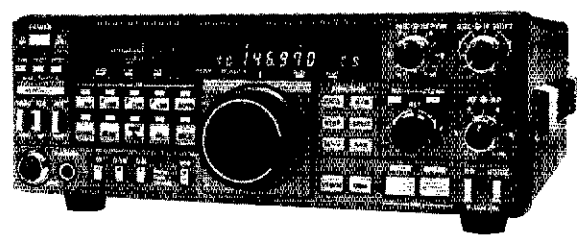
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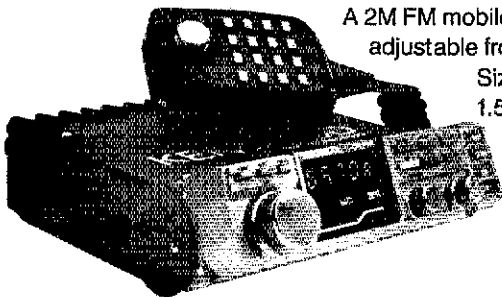
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were K9AZS W9NXG W9HOT KW9J WB9NVN KA9FEZ and WB9RFB. It is with great sadness that I report the passing of Jack, WA9SHL, into the realm of the Silent Keys. Jack was one of the most prolific and caring "Elmers" ever in the Illinois Section. He was one of those rare individuals who was loved by all whose lives he touched. Jack will be deeply missed by those of us who were his friends and students. AA9D presented a trial run of the Chicago SKYWARN Association's spotter and communications class at a recent meeting of the association. The class, which he developed, is intended to be available to provide training for persons interested in becoming spotters. The meeting was attended by Mr. Ray Waldman, Meteorologist in charge of the National Weather Service Forecast Office at Chicago. Mr. Waldman was very supportive of AA9D's presentation and indicated his support of and thanks for the volunteer SKYWARN program. WD9BBI reports that the Botingbrook Amateur Radio Society is holding its first annual hamfest on September 8, 1985 at Santa Fe Park in Willow Springs. This will be a third hamfest at Chicago's favorite location. For more information contact WD9AYR or KA9CAI via Callbook address. The Tri County Amateur Radio group's newsletter "The Dam Paper" was recently chosen as ARNS newsletter of the month. Congratulations to editor/publisher Neil, KA9DYV, and a special thanks for her article "Neil's Winter Driving Hints" which gave me a few chuckles on an otherwise disastrous day. Traffic: KW9J 232, K9DZ 177, W9HOT 117, W9HLX 107, W9NXG 96, WB9RFB 79, KB9X 60, WA9SHE 53, K9QEW 48, KD9K 32, N9DR 30, KA9BBV 26, KZ9I 26, KA9EWN 20, K9EUI 17, KA9PKG 17, W9UJ 17, WD9IBH 13, W9LNO 12, KB9QX 12, WA9SID 10, WD9BBI 8, WD9HCW 8, W9KR 7, W9IL 6, W9KPI 6, W9VEY 6, WD9CJB 5, WB9TVD 5, K9WMP 5, KA9BBD 3, W9RTD 3, WA9RUM 3.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE, STM: W9UJ, SACC: K9TUS, STC: K9PS, SGLC: WA9VQO, SOBC: KC9TA, SPIO: K9DY, SPC: N9WB, SHC: WA9FUD, SOOC: KJ9G, NM: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC, January Net Reports:

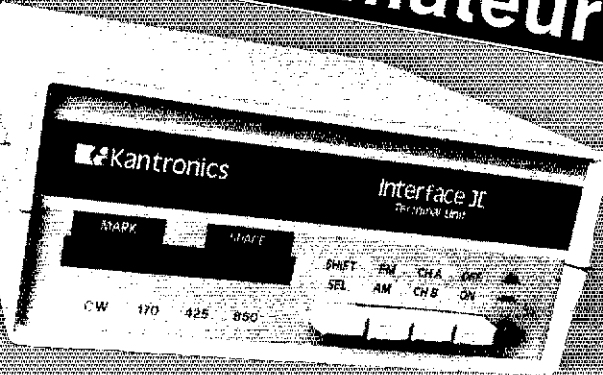
Net	Freq	Time Daily	UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300		3510	335	2427	93
QIN	3656	1430/0000/0300		695	284	1812	93
ICN	3708	2315		161	29	776	29
IRN	3629	0000		241	83	1158	31
IWN	3910	1310		1801	0	430	31
IWN VHF Bloomington				1132	0	310	31
IWN VHF Kokomo				1078	0	205	31

Hoosier VHF Nets for January, QNI 4984, QTC 134, Bulletins 57, QTR 4811 in 140 sessions for 19 nets. 9RN cycle three and four QNI 366, QTC 337, QTR 1080, IN 100% sins. N9AEI W9EI N9HZ KJ9J W9UJ WA9QCF WB9UJU K9WVJ, D9RN 300 messages in 1008 minutes. IN 92% sins. K9CGS W9UJ, N9DJ, KA9BD, CAND, 701 messages in 31 sessions. D9RN 100% sins. N9DUJ W9UJ AB9A. Appointments: Official Relay Station K9DKB K9FW WD9GET K9HH N9HZ KA9LAJ W9LBE and W9PMT, Silent Key W9EGV Logansport. There are now 31 OO/AA's: AB9A KM9A KC9AY W9QDDV KB9DE WB9DFD WB9EBI N9ECM KC9ED K9FAR KA9FFO K9FVN K9FW KJ9G WD9ZA WB9JUV K9KPC W9UJU KA9FMZ K9LSB W9MM WA9OQT WB9QWG KA9RBY WB9TOW W9UL W9URS WB9VPG WA9VQO WA9VRV and W9WVG. If you feel something needs to be done please let me or one of the AA's know. Let's not let a situation get out of hand. The 1984 winner of the Tri-state ARCS McCutchan Award is K9GG Evansville for his work in training over many years. Congratulations to K9GG for his certificate and trophy as Spencer County REACTOR of the month. A word of appreciation to the following core leaders and their groups providing testing in Indiana: N9AEI N9DKB KE9B KM9A WA9PPU W9UJ KA9ISM K9JR K9PS KB9V WB9FDC K9ET WD9GET KA9G and N9DJF. Traffic: W9UJ 745, KJ9J 224, KD9DU 207, W9CNE 150, KM9B 142, WB9UJU 86, KA9FFO 86, KB9HH 72, W9EI 63, N9AEI 49, W9UMH 45, KW9C 44, KW9D 42, K9KT 37, K9DFK 36, W9PRD 26, WD9JAA 25, W9JUV 24, WB9AWI 21, WD9HI 20, W9PMT 20, KA9EIV 19, WA9QCF 18, W9QYV 18, KD9EF 17, WA9OKK 16, K9PS 16, K9TKE 14, N9DHX 13, WD9JUV 12, WB9HR 12, W9RTH 12, N9DYC 11, AB9A 11, W9EIV 10, K9E 9, K9FVN 9, W9EAV 9, WB9OFG 8, K9OLP 8, KA9OZH 7, W9URS 7, K9BRF 6, WD9ART 5, WB9OZ 5, WD9CV 5, K9CCG 4, W9CMM 4, K9DIY 4, WB9MDS 4, W9BDP 3, K9FW 3, WB9VPG 3, WA9JNC 2, K9SBW 2, KB9DE 1, WB9AJY 1, W9UJI 1, W9XD 1.

WISCONSIN: SM, Richard R. Regent, K9GDF — ACC: KA9FOZ, BM: KA9CPA, OOC: NC9G, PIO: K9ZZ, SEC: W9OAK, SGL: AG9V, STM: K9UTQ, TC: K9GDF, Welcome Greg Miller, KA9FOZ, new Affiliated Club Coordinator. Greg, also an ARRL Public Information Assistant, works with ARCS and can be found on the La Crosse repeater. Concerned about your club? Then please ask KA9FOZ for the latest Affiliated and Special Service Club benefits. Thanks to A9K, previous ACC, who returned to college to become an electronics instructor. Pleased to report that the Green Bay Mike & Key Club, Inc. has been officially designated a Special Service Club. The West Allis RAC Midwinter Swapfest in Waukesha brought over 1,500 visitors and was enjoyed by all. Madison Area Repeater Assoc. Swapfest, Dane County Expo Center Forum Bldg., April 21st. Ozaukee RC Swapfest, Cedarburg Circle B Recreation Center, May 4th, free parking. W9CXY underwent surgery, is recovering from a successful operation and would appreciate a card from the gang. N9BR of Marshfield works NCLE in Tomahawk on 2-meter packet radio with 5 watts. Contestor W9OP works 140 stations in 40 minutes during the ARRL 10-meter contest. If you or your club would like to receive a terrific monthly newsletter about Amateur Radio in Wisconsin, contact K9EN or K9ZZ about the Badger State Smoke Signals. The Milwaukee RAC is now a FCC certified VEC, contact W9SNK for information. Wisconsin Rapids ARC VET on April 27th according to K9UTQ. Whitewater exams May 5th sponsored by Tri-County ARC, contact KW9W. Husband Mike KA9BHK and wife Diane KA9BHL both active in traffic. Milwaukee City of Festivals Parade June 22nd and Circus Parade July 14th need more volunteer communicators, please sign up with WB9SMM immediately. Loads of news on the Milwaukee area Computer Net, 148.91 MHz, Thursdays at 9 P.M., with questions about computers, interfacing, RTTY and packet radio all expertly answered by K9IZV. Wisconsin QSO Party logs must be postmarked by April 15th. PSRR to KC9CJ W9YGV WD9FRI AG9G N9BDL WD9HD WD9DNO KG9B and KA9RI. BPL to KA9CPA. As W9CBE said one evening when he signed off during a QRN storm, "A goodnight ... but not for radio."

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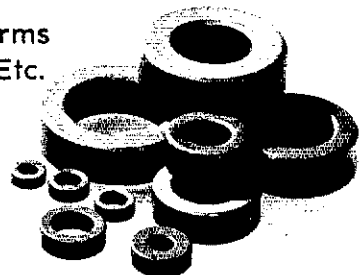
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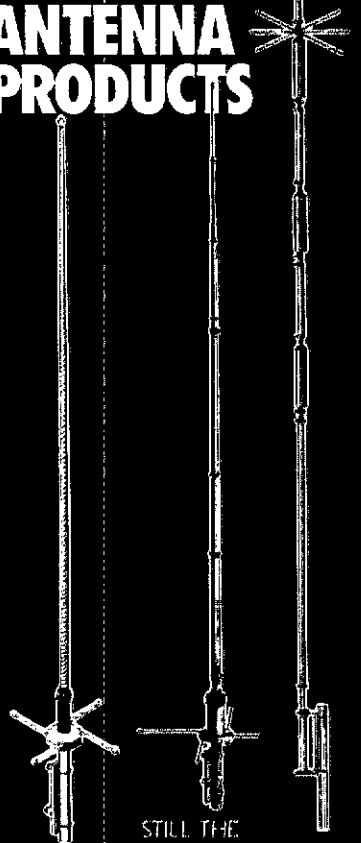
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25 watts	25A	25B	25C	25D	25E	25F
50 watts	50A	50B	50C	50D	50E	50F
100 watts	100A	100B	100C	100D	100E	100F
250 watts	250A	250B	250C	250D	250E	250F
500 watts	500A	500B	500C	500D	500E	500F
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WIN-E 3662 7 P.M. W991CH 300-113-31
WIN-L 3662 10 P.M. KC9CJ 181-66-31
WNN 3723 6 P.M. KA9OBP 171-28-29
XPO 3925 12:30 P.M. W99YVC 23-22
NWTN 3494 6:30 P.M. W9JJSF 447-65-31
WCWTVN 31/81 6:00 P.M. N9DHT 404-53-31
Traffic: KA9CPA 2182, W99WYS 198, K9GDF 197, KC9CJ 177, KA9BH 170, W991D 169, W99YFP 159, W99CBE 156, W991E 155, W991F 125, W991G 109, N9BBL 107, W991CH 97, KA9KG 95, N9BGE 91, W991D 70, W99ESM 68, K99B 65, W99JF 64, W99LD 64, W99HW 57, W99DF 52, KA9RI 52, K9UTQ 51, W99Y 50, A99G 49, N9DHT 45, N9AUG 41, W99ZTY 40, N9BCX 37, K99FH 37, KA9JY 34, W99OD 33, KA9AFB 32, W99JSW 30, K99PS 27, N9DCF 25, W99DNO 25, KA9RH 23, K99P 21, KA9BH 14, KV9J 9, W99UW 8, KA9NOT 5, W99RGE 3, W99NG 2.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KC8T — SEC: KA8AP, STM: KD8CI. With the beginning of a new year, our SM announced the "Ham of the Month" program. This program is designed to recognize amateurs who: A. Contribute to Amateur Radio and the section, B. Show willingness to assist in Amateur operations, C. Help in service to the local community, D. Conduct themselves on the air to the highest standards of Amateur Radio operations and E. Do not hold ARRL field appointments but contribute none the less to the day to day activities of our section. This award is open to any class license holder. If you know of someone who is deserving of some recognition for a job well done in any of the above categories, submit your candidate to any of us on the selection committee, KC8T, KA8AP, or myself, KD8CI. A special certificate will be issued to the "Ham of the Month" and at the end of the year, the 12 winners will be evaluated for "Ham of the Year" honors. Candidates for the awards will be evaluated on a 3 point system for each category. Our January "Ham of the Month" is KB8WV of Minneapolis. Activities in January included Amateur Radio communications support for sled dog races in Bemidji, Ely and Duluth. N9EXP expressed high praise for all those involved in the "John Beargrease Sled Dog Race" held Jan. 9-13. It was a totally dedicated effort and I hope to have more details on this later. NET NEWS: Band conditions continue to frustrate us but we carry on! Some changes of note: W0H2U has stepped down as mgr of PicoNet and WDBAG takes over. We continue to have W8TFC on as morning captain and also appointed KD8CL as the afternoon captain for PAW. KA8EY has asked N9OE to be his assistant mgr on MSN/2 while W8WVJ will be assisted by W8FMI on MSN/PN. I continue to be impressed with the rise in activity on MSN! FB Job Jeff. Stand by for some upcoming changes on MSN/RTTY; time and freq. You say there's no activity on 10 meters or 2 meter SSB? Well, on 10 meters the Sky Blue Waters 10/10 net is on 28.75 MHz at 9 PM every night. In the Brainerd area, the Paul Bunyan Wireless Net is on 28.633 MHz Sunday eve at 9 PM. Notices may QNI this net via 28.633 MHz on 2 meter SSB. The SWOT net meets Sunday evening at 9 PM on 144.250 MHz. If there are others, let me know! An experimental link is currently in operation between the 146.81 rpt in Isle and the 146.73 rpt in the Twin City Metro area. Finally, our deep regrets to the family and friends of W8MQT who is now a Silent Key.

Net	Freq.	Time	QNI/QTC/Sess.	Mgr
MSN/1	3685	6:30P	291/77/31	W8EHI
MSN/2	3685	10:00P	208/45/31	KA8EY
MSN/RTTY	3685	8:00P	1	K80TF
MSN/1	37	6:00P	245/29/31	KA8ODQ
MSN/N	3929	12:00P	694/99/31	W8WVJ
MSP/IE	3929	5:30P	1236/190/31	W8BGS
MNAM/WXNT	3929	6:15P	392/272/24	W8BAC
PICONET	3925	9:00A	4102/284/27	W0H2U

Traffic: KB8MB 412, W8TFC 325, KA8EY 238, W8EHI 164, W0H2U 144, KA8AP 139, KT9I 129, W8WVJ 123, KD8CI 111, W8WVJ 89, W8HDD 81, N9CL 72, W8A9E 57, KA8ODQ 53, KT9R 49, W8BHOX 43, KC8T 40, W8DM 37, W8BKI 35, W8BGS 31, W8KYG 29, KC8NL 27, KA8EY 24, N9BEI 22, W8GUF 18, N9FKU 15, W8FMI 12, KC8GI 11, W8FPU 10, W8JCE 10, KB8WV 10, KC8VD 9, N9EVA 7, KA8AF 6, N9BY 3, KB8WV 2, (Dec.) N9BY 24, K8IKU 21.

NORTH DAKOTA: SM, Joseph Gregg, KN8A — North Dakota is in the dead of winter, and so is the HF bands. 10 and 15 meters could just as well be VHF for all the propagation. The beautiful aurora is directly overhead so the VHFers are buzz-moding all over the country but not even a scratch can be heard in ND. Yes, winter can be dull, but don't give up. Try a new mode, like cw or RTTY; try a new freq. like 180 meters. Copy the code practice from W1AW. It is easy to get rusty on the code and you never know when some OM will say, "I need you for CW WAS". Don't forget Hobby High-Tech 85 in Fargo on March 30. Support your VE teams and do whatever you can to help out. DATA NET: 296 QNI, 14 QTC, North Fort: 38 QNI.

SOUTH DAKOTA: SM, Fredric J. Stephan, K8ROO — Net reports received this month from the SDEN, SHM, BCN, Waiworth Co. Emergency net, NUQ net and CAN/D. Individual station activities: notes were from KA8KPY W8YMB N8BD W8RWE W8VRE W8FZU W8WOMF W8H0J W8NRW N8T8 K8GRM N8FUG W8UJEN W8UJZ. Good comments still are bouncing in relating to traffic and nets. Also received the usual dose of crank responses. Some of the best info available still is in our NET DIRECTORY at the back; also in the OPERATING AN AMATEUR RADIO STATION and PUBLIC SERVICE COMMUNICATIONS MANUAL. Read all of that material for the latest. It is well worth the effort! For more details and questions on traffic nets contact W8SS or KB8MB. Let us know about any new DX news or club activities in your part of the country. We miss you, good old SOUTH DAKOTA. Anyone tried OSCAR lately?

DELTA DIVISION

ARKANSAS: SM: Joel M. Harrison, W8SIGF — SEC: N8BPU, STM: AE5L, TC: W8FD, ACC: AD5M, PIO: K5DW, SGL: W8LCL. REPEATER COORDINATOR: W8FDP. It's hamfest time in Arkansas again! April 13 & 14 are the dates for the ARRL Arkansas state convention and Hamfest. The ARRL meeting will be Saturday afternoon and I am looking forward to seeing you there. W8H reports a 79% pass rate at the last Hunter exams at Russellville. The computer group in Little Rock headed by TC W8FD are doing great things. Contact Elmor if you are interested. It is renewal time for most of the ARRL field appointments in Arkansas. I will be in contact to see if you remain interested in your appointment. Traffic: W8QFU 72, W8TUM 66, W8CK 45, W8UJU 40, W8DFCE 31, W85GWU 31, N8BPU 27, W8KL 18, W8RIT 16, W8MYZ 14, K5BIL 3.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR —

SEC: KA5PFB, ACC: K5DPG, SGL: KD5SL, TC: N5JM, OO/RFI: WB5TPG, Jefferson ARC election: Pres: Nick KSEF, V.P.: Doug KASMSD, Sec: Leo W5WZE, Treas: Bob K55GQ. Mark your calendar and save your shekels for the Baton Rouge Hamfest May 11 & 12 at the Catholic High School. The Baton Rouge ARC is continuing their lead in public service communications. During a recent emergency preparedness drill by the River Bend Nuclear Plant, they provided communications for the parish and state civil defense agencies and the Red Cross. Special thanks for the effort to N5ADF, KC5XC, KD5SL, N5GHX, N5GNS, KA5JPH & WD5CQG. The sad note from Baton Rouge is the death of Ted, K5TC, who was accidentally electrocuted while erecting a tower at his home. Kevin, KA5PFB, reports that ARES participation is back on the upswing. January reports are: Troop G 33 ARES members. Webster Parish 18. E. Baton Route 28, Iberia 24, Ouachita 57, Calcasieu 30. Greater New Orleans ARC election: Pres: Bob WA5WJZ, V.P.: Mike WB5LLI, Treas: Francis WD5IAA, Sec: Keith KE5GA, Traffic: K5TL 68, KE5PP 68, W5GHP 3B, N4ANH 32, WA4MUW 18, N5JM 6, K5WOD 4, (Dec.) W5GHP 181, KE5PP 174, K5TL 89.

MISSISSIPPI: SM, Paul Kemp, KW5T — STM: KB5W, SEC: N5DDV, VHF COORD.: NF5Q, ACC: KC5VD. We all extend our sympathy to the families of N5EZO, W5OTD, WA5AYC and W5VJC who became Silent Keys. Congrats to upgrades: Extra KD5DG, KA5OAU, KA5ENE: Adv N5GDO, N5GDV. Gen: WB8NOK. Tech: KA5TRK with new call N5HOA. If your Club has a newsletter, I would like to be put on your mailing list. Thanks to the following Clubs for sending them now: VARC, MCARA and JARC. Good response to Novice class sponsored by VARC tnx to WB5YKR. See you all at the Jackson Hamfest, Apr. 20 & 21 there will not be test only, however exams will be administered May 4. KA5JUD moved to Vicksburg. Welcome to Ms WD4NOG, CAND (W5KLV) sess. 31 QTC 701, DRN5 (WB5YDD) sess. 82 QTC 639, MTN (K5OAF) sess. 31 QNI 131, QTC 46, MSBN (KW5T) sess. 31 QNI 2462, QTC 52, MMN (WB5RMW) sess. 29, QNI 576, QTC 8, GCSBN (W5JHS) sess. 31, QNI 1471, QTC 19, MLEN (N5GDV) sess. 4, QNI 55, QTC 0, NEMFM (N5CAX) sess. 18, QNI 165, QTC 1, Traffic: N5AMK 450, K5OAF 182, KT5Z 12B, W5WZ 52, W5LSG 38, AJ0X 34, KW5T 19.

TENNESSEE: SM, John C. Brown, NO4O — ASM & ACC: WA4GLS, OO/RFI: W9FZW, PIO: WK4V, SEC: WA4GZQ, SGL: WA4GZZ, STM: NG4J, TC: W4HHK. Well we made it through the worst winter that Tennessee has seen in several years. I am sure that we all learned something about saving another operation and I am all the more sure that many weak points were found in our amateur equipment. Hope that it was a learning experience only and not a catastrophe. It did not seem so as the bands sounded as usual: busy and crowded. It seems that the DX activity was busy also, even though the bands did not open up as would be desired. I guess that never really happens to suit everyone. Your SM is getting several club bulletins now, and it can be seen that the operation of the volunteer examiner program is beginning to show signs of fine and active support. That is indicated by some of the old timers finally getting around to a try at upgrading. It is not that some were not capable, just did not seem to be able to have the time. Anyway again congratulations are in order for all those who have upgraded or finally decided to take up the hobby of amateur radio. Will be looking for you about the bands. Your section manager and staff will be looking for all to drop by the ARRL booth at the hamfest to chat or whatever your needs and thoughts. The hamfest dates for some locations have not been made available or at least passed along, so do so as soon as you can. It is appropriate to mention again about the total registration of all the repeaters in the section. New FCC attention is being focused in this area as overcrowding and overlapping is getting to be a real headache, especially when there is a repeater group that never has a publication of their capability. The ARRL Repeater Directory is being used as evidence of coordination as it is a publication. Section traffic is as follows: LF — Sessions-79, QNI-3274, QTC-483; VHF — Sessions-94, QNI-2037, QTC-683; CW — Sessions-49, QNI-238, QTC-163; RTTY: Sessions-26, QNI-156, QTC-3. CW net honor roll: W4DDK, K9IMI and NG4J. Traffic: KA4RSC 258 (BPL), W9FZW 200 (BPL) W4DDK 127, K4WWQ 39, K4WOP 26, N4AS 17, KE4LS 16, W4PFP 13, W4PSN 10, K4JGW 8, K4JUQ 7, W4TYV 7, W4ASIG 6, K4UMW 6, W3HET 6, W4EWR 5, N4KQX 3 and W4MRD 1.

GREAT LAKES DIVISION

KENTUCKY: SM, Rosie Parclift, KA4SAA — Western Kentucky Test Schedule - Please give the widest possible dissemination.

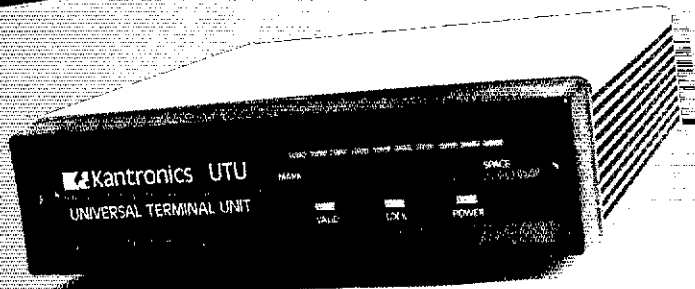
May 19 — Evansville, IN Aug. 17 — Evansville
 June 8 — Bowling Green Oct. 11-12 — Louisville
 July 13 — Owensboro Nov. 9 — Owensboro
 Mail 610, \$4 and photo to EVL - Blanche Elpers, KA9EIV, 840 Herndon Dr., 47711, BG - Vaughn Talbott, WA4SLG, 1610 Benson Ave., 42101, OWB - Mike Bruce, KA4BCM, 1611 Chapel Ln., 42301, JAN NET REPORTS: MKPN 1452 137, KTN 1743 58, KYN 140 44, KNIT 279 84, KYPCN 62 6, BARES 82 5, CARN 208 19, NKARC 50 2, TSTMN 703 53, WTEN 51 7, 3ARES 63 2, 7ARES 52 2, 11ARES 44 14. Traffic: WA4JTE 262, KB4OZ 77, WD4IYI 64, KA4BCM 58, WA4MXD 47, KA4SKV 40, K4MHL 39, WD4BSC 35, W4WQV 24, K4HOE 23, KA4MTX 21, WD4IXS 17, KB4JRL 16, W4PKX 15, KA4GBZ 13, WD4PBF 12, KA4IYI 12, W44SWF 11, W44AVV 9, WD4COF 9, WD4IYH 6, WA4SAC 6, WD4CJQ 5, WA4YPC 4.

MICHIGAN: SM, James R. Sealey, WB9MTD — ASM: WA8DH, SEC: WB8BGY, STM: WB8RHU, ACC: K8SB, PIO: K8BK, SGL: N8CNY, TC: W8YZ, BM: KZ8V.

Net	Freq.	Time	QNI	Tfc	Sess.
QMN*	3663	1800**	929	229	87
MITN*	3663	1900	636	187	30
MACS*	3953	1100**	565	127	31
UPN*	3922	1700	1225	84	35
160	1950	2000	411	51	31
WSSBN	3935	1900	1152	33	31
GLETN	3932	2030	264	9	17
MNN*	3722	1730**	21	0	11
VHF nets	16	rpts	1229	34	96

*NTS nets. Times local. **QMN late, 2200; MNN late, 2000; MACS Su, 1300. ARES Net, Su, 3932, 1730. ARRL Info Net/Traffic Workshop, Su, 3953, 1600, 3932 is MI HF emer. freq., with 1932 as suggested alternate. Silent Key, with deep regret: K8CDM, MI Certificates of Meritorious Service to: W8CUP, for his tireless efforts to promote and preserve our 160-meter band; to WA8EFK, for his eight years of excellence in the post of SEC; and to KA8NCR for his positive and effective performance during his term as manager as well as his own tireless efforts in ways in which the dedicated volunteers in Amateur Radio are rewarded. What I record here is my way of saying

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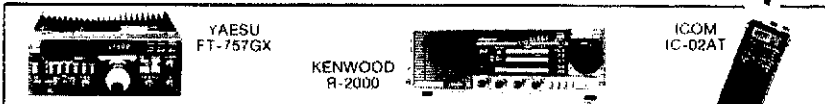


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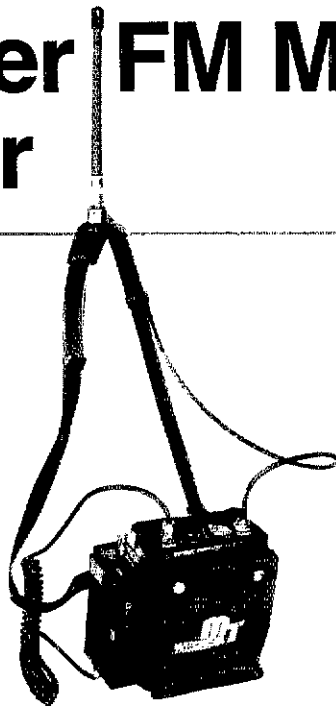
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Portable transceiver puts out 10 Watts... Ideal for amateur participation events such as emergencies... athletic events... marathons.

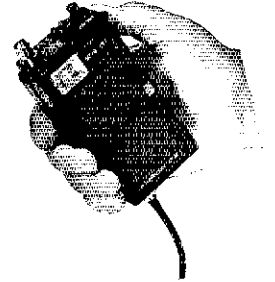
The new MT-20A transceiver can be used as a 10 W portable unit with carrying case, LA-20 Linear Amplifier and rechargeable Nicad Battery.

Easy to read thumbwheel digital switches provide complete coverage of the 2 meter band in 5 kHz steps.

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.

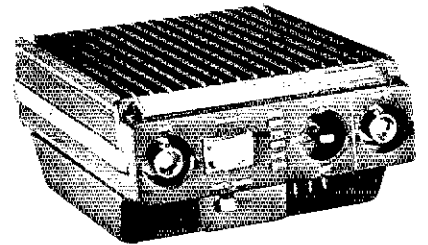


MULTIPURPOSE TRANSCEIVER



In mobile operation, the MT-20A transceiver provides 20 W output when used with the LA-20 Linear Amplifier and plugged into the vehicle cigarette lighter through an SD-1 adapter.

Use hand held transceiver for all functions... Thumbwheel Frequency Selector... Built-in S Meter... Microphone... Speaker.



The new LA-20 2 meter linear amplifier provides 20 W (at 13.8 VDC) of stable transmitting power using high performance transistors.

MT-20A SPECIFICATIONS

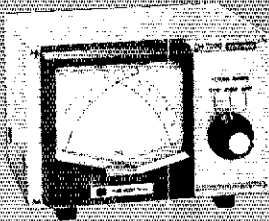
- General
- Frequency : 144-148 MHz in 5 kHz steps
- Emission type : (FM)
- RF output impedance: 50ohm unbalanced (BNC socket)
- Power source : 8.4V DC (5.5-11V DC)
- Current drain : 150mA Max. on reception
25mA on reception with no input signal
550mA Max. on transmission
- Dimensions/weight : Main unit (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 1 μ V for 30dB S/N
- Selectivity : Greater than \pm 7.5kHz/ - 6dB
Greater than \pm 15kHz/ - 60dB
Better than - 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)

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-5 (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)

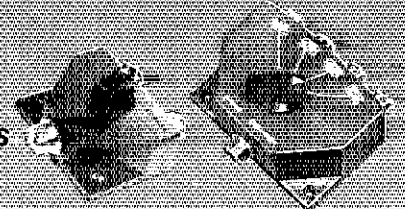
	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	6 W/25 W

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

PAT. No. 58-000803



	CS-201	CS-201G	CS-401	CS-401G	CS-4
Frequency:	2position	2position	4position	4position	4position
Connectors:	600 MHz	1.3 GHz	800 MHz	1.3GHz	1.3 GHz
SWR:	SD-239	N type	SD-239	N type	BNC type
Insertion Loss:	Below 1:1.2				

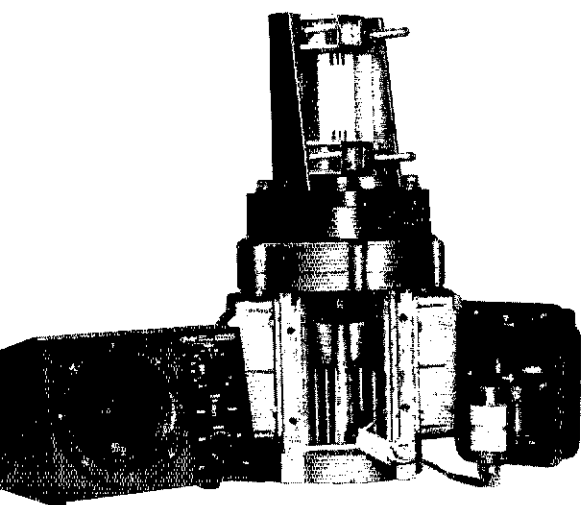
Less than 0.2 dB

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 outlets
10.8/10A 1 VDC-15 VDC

Advanced Multi Torque Antenna Rotator



The rotator frame can house up to 4 motors to increase torque and load capacity.

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

The main frame and reduction gear train have been designed to withstand maximum wind loading.

Maximum brake power is 18,300 lbs/in when 4 motors are installed.

Low voltage (24 VAC) motors... Low cost 6-wire control cable.

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



ANTENNA TUNERS

CNW-518
Frequency Range: 3.5-30 MHz (8 bands)
Power Rating: 1 kW CW (50% duty)
Output Impedance: 10-250/25-100 ohm
(On 3.5 MHz)

CNW-419
1.8-30 MHz (17 bands)
200 W CW (3.5-30 MHz)
100W CW (1.8-3.4 MHz)
10-250 ohm

CL-680 (no metering)
1.8-30 MHz (17 bands)
200W CW (3.5-30 MHz)
100W CW (1.8-3.4 MHz)
10-250 ohm



POWER AMPLIFIERS

LA-2035 144-148 MHz 0.5-3 W 30 W plus
LA-2035R 144-148 MHz 0.5-3 W 30 W plus
LA-2065R 144-148 MHz 0.5-5 W 60 W plus

Please call or write for technical literature.

Dealer inquiries invited.



AUDIO FILTERS

AF-606K & AF-406K

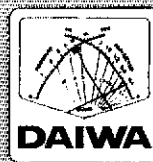
Four stages of filtering... variable bandwidth over broad range... razor sharp CW reception... built-in speaker.

The AF-606K adds PLL Tone Decoder circuitry. PLL locks onto the desired CW signal and reproduces it with utmost clarity.

ELECTRONIC KEYS

DK-210

Sharpen your "fist" with Daiwa precision!



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Surge protection from Alpha Delta... Before it's too late

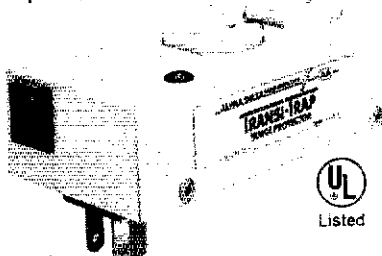
Take preventive measures now. Keep power supply and incoming coax lines "clean". Prevent infection of performance. Avoid part failure, critical equipment damage, loss of memory and premature aging. Alpha Delta

surge protection products are dependably designed to effectively block induced surges in power supplies and signal cables. Practice smart electronic hygiene... select Alpha Delta and keep your lines clean.

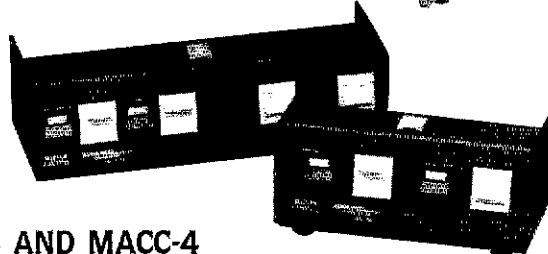
NEW! ACTT—POWERLINE TRANSI-TRAP™ 3-STAGE 2000-AMP LIGHTNING SURGE PROTECTION WITH STATUS LIGHT

Two socket wall outlet unit just \$29.95. Compare to others offering only single-stage, 100-amp circuitry. Alpha Delta gives you more protection — 3-stage, 2000-amp — for your money. Unit features automatically restorable circuitry and includes resettable circuit breaker for added assurance and convenience. Configuration also provides common AC branch downline protection.

Alpha Delta ACTT



Alpha Delta
MACC-8
(8 outlets)



Alpha Delta
MACC-4
(4 outlets)



MACC-8 AND MACC-4

TABLETOP POWERLINE SURGE PROTECTION AND MASTER CONTROL CONSOLE

Only \$79.95 and \$59.95. Rocker-switch-controlled outlets with indicator lights. One hot outlet for continuous power. Master on/off switch. Provides 3-stage 2000-amp

surge discharge protection where others have only single-stage 100-amp circuitry. Automatic restorable circuit with manually resettable breaker for added protection.

TRANSI-TRAP® COAXIAL CABLE SURGE PROTECTION

Alpha Delta R-T,
HV Mark II
Series



Alpha Delta LT,
HT "T-type"

With special Ceramic Arc-Plug™ cartridge which fires thousands of times and is also replaceable. Much better than standard air-gap devices. Arc-Plug provides precisely tailored firing speed.

First industry device with isolated ground to keep arc energy from chassis.

The 200-watt models are most sensitive and best for receivers and transceivers. The 2-kilowatt models are designed for amplifiers. UHF "T-type" with UHF connectors (through 148 MHz): Model LT, 200 W at 50 ohms, \$19.95 and Model HT, 2 kW at 50 ohms, \$24.95. VHF/UHF with UHF connectors (through 500 MHz): Model R-T, 200 W at 50 ohms, \$29.95 and Model HV, 2 kW at 50 ohms, \$32.95. Also available with N-type connectors.



See labels or data sheets for surge protection limitations. Powerline surge protection devices tested to IEEE pulse standards and rated at 15A, 125VAC, 60 Hz, 1875 watts continuous duty total.



At your Alpha Delta dealer. Or in U.S. order direct. All prices are in U.S. dollars. For postage and handling, please add \$4 for MACC-8 or MACC-4; \$2 for ACTT or Transi-Trap™ coax protectors. MasterCard and Visa accepted. Ohio residents add Sales Tax. Sorry, no C.O.D.'s.

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current solutions to current problems



"thanks" to these outstanding people on behalf of all who benefit from their diligent efforts. Please note above the suggested alternate "H" emergency frequency, 1932 kHz. This was included in the original draft of the state ARES/RACES emergency plan, approval and adoption of which is, at last, expected soon. The need for the 160 alternative has to be obvious to anyone who tries to work close-in on 75/80 any time after sunset these days. Are you following the ongoing saga of the record-setting attendance for the UPN? Another new record has been reported for January, this the 15th such in a row. Wow! The U.P. Hamfest will be in Manistiquie this year, July 27, 28. Preliminary indications point to its shaping up as one of the best ever. New officers for Chelsea Communication Club: Managing Dir., K4BFP Treas, K4JYV Sec, K4JVK; ARES/KC, K4BFC; K4BGS, 377; F8V 337; W8QHF 266, W8KQC 164, W8RHU 101, K4CQV 97, W8YMH 94, W8CUP 81, W8UOU 73, W8DHB 67, K8GXV 64, W8MJB 61, W8MTD 59, K8EQO 56, K8UPE 54, N8CNY 52, W8SCW 41, W8SIW 36, W8DEB 34, K8OCP 25, W8YQ 22, W8WVJ 21, K8VU 18, K8Q 16, W8YZ 14, W8URM 13, K8ZJU 12, W8CBH 11, W8VIZ 11, W8RNQ 9, K8BTD 7, N8JR 5, N8COA 4, W8BHSN 1. (Dec.) AF8V 1787, N8JM 156, W8ACW 74, W8BRX 30.

OHIO: SM, Jeffrey A. Maass, K8ND — ASM: KF8J. SEC: K8AN. STM: W8BZZ. ACC: K8US. BM: W8ZM. TC: K8MU. OOC: AD8L. PIO & SGL: N8VC.

Net	ONI	QTC	Seas.	Time (Local)	Freq.	Mgr.
BN	373	131	62	1845, 2200	3.577	W8KFN
BSSN	427	219	62	1815	3.585	N8AKS
QNN	192	44	31	1830	3.708	K8JVF
OSN	368	116	31	1810	3.577	N8AEH
OSSBN	2801	704	93	1030, 1615, 3 1845	3.9725	W8BMZZ

OSSN 193 87 31 0645 3.577 K8GJV
O6MN 300 19 30 2100 50.15 W8DCTX

At the risk of repeating myself, April is Dayton month in Ohio! I hope to see you there! There still may be time as you read this to catch the Madison Hamfest, scheduled for March 31. Congratulations and best wishes to Allan Severson, AB8P, on being appointed to serve as Vice Director of the Great Lakes Division for the remainder of the current term, an excellent choice that will benefit Amateur Radio. SEC K8AN reports that Ohio's ARES is looking for interested Amateurs to take on the Emergency Coordinatory (EC) appointment for any of the following counties: Ashland, Clinton, Coshocton, Deane, Geauga, Meigs, Morgan, Paulding, Vinton and Wood. If your county is named above, and you might consider undertaking the very important EC appointment, contact K8AN. Current ECs are reminded that your group should maintain regular (at least once per week) liaison with the National Traffic System (NTS) through one of the Section Nets listed above or through a local NTS net to tie your group into the total emergency system. I've just finished a review of Ohio's report on all of you with appointments (ORS, OBS, OES, OO, PIA) are reminded to report activity to me monthly to keep your appointment valid. Get your radiogram to me by the sixth of the following month. Welcome to new Net Manager of the Ohio Six Meter Net, W8DCTX. Thanks to outgoing NM W8BDYX, who felt it was time to pass on the reins. New Officers, Massillon ARC President N8ATZ, VP K8BAM, Secy/Treas K8MNU, Trustees W8LHY, K8EG, W8AU. New officers, Queen City Emergency Net President W8BSCJ, VP W8AEEB, Secy N8BZZ, Treas W8WAV, and CM K8HXK. I'm sorry to note the passing of two Dons, W8BQVH and W8BRCF. Both were well known throughout Ohio, and their loss will be felt. The Ohio Area Research Council meets on Saturday April 13 in Columbus; KC8DF for details. The last week in March is Tornado Awareness Week in Ohio, with a number of special classes and activities scheduled. Check with your EC for activities near you. What you don't know can hurt you: be alert and be prepared! New appointment: K8BJH, EC Gallia County, ORS: K8BCGF, K8BRID, K8CMR, W8BO. Congratulations!

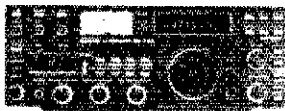
Local Nets QNI QTC Seas.

Local Nets	QNI	QTC	Seas.
ALERT	76	4	5
BRIN	253	63	4
COAHES	128	4	31
COTN	391	188	31
DAEN	69	6	16
Lucas County	257	70	28
MASER	25	0	4
Medina County	391	51	31
NCTW	45	10	20
NEON	103	19	16
RARA	58	2	5
TSRAC	1250	105	40
WCTN	319	31	31

Traffic: W8MIO 395, K8JDI 260, K8QZ 211, W8BO 200, W8BKN 182, K8ND 170, K8KJ 161, W8BZZ 161, W8SKP 139, K8GJV 133, W8BMEK 130, N8PCL 127, K8SS 118, K8J 117, N8X 107, N8AKS 106, N8AEH 105, K8RVF 104, W8QZK 96, K8KHS 94, W8KWD 93, W8DRB 92, W8BFAO 87, K8AN 85, K8BCGF 85, W8SSJ 62, W8KBW 61, N8EFB 54, W8AGMT 53, W8HGH 48, N8EVC 44, W8BHZ 41, K8CMR 40, W8DMF 40, K8BIC 40, N8CW 39, K8TVG 39, N8FPH 38, K8SAC 37, N8FNP 33, W8CXK 32, K8RC 31, N8NS 29, N8JP 28, W8RG 28, K8EF 27, K8Q 26, W8BHM 22, W8BRGS 22, W8BWW 21, W8AHD 21, K8BIC 21, W8BML 21, N8EJO 20, W8DCTX 19, W8BKJ 18, K8VOY 18, W8BHL 17, K8LGM 16, W8BRS 16, K8CKY 15, W8Q 13, W8BHY 12, K8BCSP 8, K8DL 8, N8CJ 7, W8OOL 7, W8JMD 6, AB8P 6, W8EJP 5, W8FUP 5, K8ATNA 5, K8MFG 4, W8BNT 4, N8CQ 4, W8NED 2, K8MFM 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydenary, W8VUJ — SEC: AK2E, STM: W8MCO, BM: W82EAG, ACC & SC: N2BFG, SGL: K8ZHQ, TC: K8ZZO, ASM: K2ZM, NET REPORTS: AESN-QNI-60 QTC-2; CDN-QNI-729 QTC-104; EPN-QNI-183 QTC-54; ESS-QNI-525 QTC-64; NYPON-QNI-790 QTC-326; NYSM-QNI-381 QTC-174; NYS/CQI-429 QTC-214; NYS/CQI-308 QTC-28; SIK-QNI-293 QTC-70; Ulster RACES-QNI-37 QTC-2. CLUB NEWS: Albany ARA had WA2AAU give presentation on VHF contesting, has new members KA2VAE, KA2VHE, new call for KA2FLB now KC2QP; FCC exams on 15 April; CCNR had meeting on RF amplifiers. Rip Van Winkle ARA is promoting "H" or Ham Day March 3rd and 24th. Also reports upgrades KA2VHD now N2FHM and N2EDN now KD2LB. Schenectady ARA had program on computers in the future in your shack. Westchester ARA had program by WA2ELE on effective low frequency antennas for limited space. WIECA had interesting program on upcoming Hamfest. All affiliated clubs should have received special packet of info from ARA for special push this year for new members. All clubs should push to bring new people into the hobby, particularly the young! W2PKY & N12B have been ap-



IC-751 PACKAGE DEAL

Order your IC-751 with: ICOM PS-35 internal power supply installed, ICOM FL-52A 500Hz CW filter installed and SM-8 desk mic.

All for \$1489
You Save \$236!



HANDHELD ACCESSORIES

- LC-14 Vinyl Case for IC-02AT \$17.95
- BC-35 Drop In-Charger1 69.00
- BP-2 425mA 7.2V NICAD Battery 39.50
- BP-3 250mA 8.4V NICAD Battery 29.50
- BP-4 Alkaline Battery Case 12.50
- BP-6 425mA 10.8V Battery 49.50
- BP-7 425mA 13.2V NICAD Battery 67.50
- BP-8 800mA 8.4V NICAD Battery 62.50
- HM-9 Speaker Mic 34.50
- CP-1 Cigarette Lighter Cord 9.50
- DC-1 DC OP Pack 17.50
- Leather Case for IC-2AT 34.95
- HS10 Headset for HTs 19.50
- HS10SA VOX Unit for IC-02AT 19.50
- HS10SB PTT Switch Box 19.50



IC-02AT IC-04AT



New full-featured 2M, and 440MHz hand-helds! Scanning, 10 memories and programmable sub-audible tones are just a few of the MANY features of these terrific new radios. AND THEY ARE COMPATIBLE WITH ALL ICOM HT ACCESSORIES!

IC-02AT Sug. Ret. \$349
IC-04AT Sug. Ret. \$379

Available at Reduced Price!

Now Offering *Free* U.P.S. Ground Service!

Applies to most transceivers with related accessories excluding antennas.



IC-745 PACKAGE DEAL

Order your IC-745 with: Astron RS20A 20A power supply, ICOM SM-6 desk mic and ICOM FL-52A, 500Hz CW filter installed.

A Super Buy at \$979
You Save \$245!

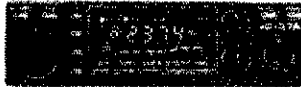


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IC-3AT SALE PRICED \$239.95
IC-4AT SALE PRICED \$239.95

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220MHz, FM, 25W.

At a Super Deal!
Just \$299.95!



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Perhaps the best receiver at any price! Sug. Retail \$799

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500 Watt Output. All solid state. Broadband. Automatic bandswitching with ICOM HF Transceivers.

A Super Buy at \$1349.95
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TS 430S

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TS 930S \$1799

With the following popular options:

- AT-930 Automatic Tuner Installed
- MC60A Desk Microphone
- YK88C-1 CW Filter
- SP-930 External Speaker

You Save \$229!



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- IC-27A (25W, 2M, FM) Sug. Ret. \$369
- IC-27H (45W, 2M, FM) Sug. Ret. \$409
- IC-47A (25W, 70cm, FM) Sug. Ret. \$469

Call for YOUR Low Price!

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KQ7D Bob



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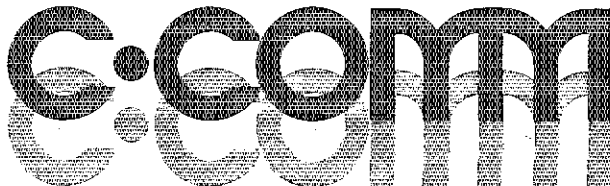
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Antenna + Rotors + Tower Package
Deal. Just In Time For DX Season

All Models Shipped Factory Direct—
Freight Paid*! (Continental U.S.A.)

- All towers shipped factory direct including free freight
- Complete with base and rotor plate
- Totally self-supporting - no guys needed
- Hot dipped galvanized steel construction

Model	Height	Wind Load	NET
HG37SS	37 ft.	9 sq. ft.	\$ 908
HG52SS	52 ft.	9 sq. ft.	\$1,328
HG54HD	54 ft.	16 sq. ft.	\$2,074
HG70HD	70 ft.	16 sq. ft.	\$3,355

WE HAVE MOSLEY IN STOCK!

HUSTLER

5BT	5 band trapped vert.	126.95
5BT	5 band trapped vert.	107.95
4BT	4 band trapped vert.	84.95
G7-144	2m Collinear	112.50
MO1-2	Mobile mast	19.95
RM 10, 15	10&15 mobile resonator (std)	10.00
	10&15 mobile resonator (sup)	15.80
RM 20	20m mobile resonator (std)	14.00
	20m mobile resonator (sup)	20.00
RM 30	30m mobile resonator (std)	15.25
	30m mobile resonator (sup)	22.15
RM 75, 80	75 & 80m mobile resonator (std)	16.70
	75 & 80m mobile resonator (sup)	33.95
BM-1	Bumper Mount	15.25
SSM-2	Stainless Ball mt.	16.70
QD-1	Quick disconnect	13.25
SF-2	2 meter mobile 5/8 wave	10.00
SGM-2	2 meter 5/8 mag mt.	25.60
HLM	Trunk mt w/swivel ball	15.80

K734A	4 element triband	337.95
K734XA	5 element triband	485.95
2M 14C	2M satellite ant.	87.95
435-18C	70 cm. satellite ant.	81.95

ROHN

25G	10 ft. stacking sect.	51.50
25AG(2,3,4)	top sections	62.10
S25SG	short base section	22.50
525SG	accessory shelf	11.25
45G	10 ft. stacking sect.	115.50
45AG(2,3,4)	top sections	126.00
545SG	short base section	49.50
A545SG	accessory shelf	37.50
20G	10 ft. stacking section	37.50
20AG	top section	36.45
BX-48	self supporting 6 sq. ft.	253.50
HX-48	self supporting 10 sq. ft.	300.00
HDX-48	self supporting 18 sq. ft.	375.00

SOUTH RIVER

MZ 165S	16 gauge 1 1/2" swaged	4.99
MZ-1625P	16 gauge, 1 1/2" x 2 1/2" rotor post	1.99

TRI-POD ROOF TOWERS

*HDT-3	3 ft. Galvanized Steel	13.80
*HDT-5	5 ft. Galvanized Steel	18.00
*HDT-10KD	10 ft. Tri-Pod Roof Tower	42.00
*HDT-15KD	15 ft. Tri-Pod Roof Tower	58.00

*Accommodates Masts up to 1 1/4" O.D.

It Has Ladder Steps on Side

STEEL VENT PIPE MOUNT

P-6	Steel for 2"-5" O.D.	5.20
P-1-ST	Stainless Steel	4.65

GUY WIRE

V-SW 6/20L	Vinyl Coated Galvanized Steel	4.00
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NO COD — we ship UPS daily

Allow two weeks for delivery

Shipping cost is NOT included except where noted

We reserve right to limit quantities

We gladly accept VISA & MASTERCARD

All price subject to change without notice

HY-GAIN

YH7DXS	7 element tribander	481.95
YH5MKZS	5 element tribander	416.95
EX-14	4 element tribander	328.95
YH3JRS	3 element 750W PEP	188.95
18AV7MWS	5 band trapped vert.	110.95
14 AVQWBS	4 band trapped vert.	87.95
V2S	2 meter omnidirectional	46.95
V4S	70 cm omnidirectional	54.95

HY-GAIN ROTORS

HDR-300	25 sq. ft.	553.95
T2X	20 sq. ft.	266.95
HAM IV	15 sq. ft.	238.95
CD4511	8.5 sq. ft.	149.95

TET

HB433SP	3 Ele 7/14/21/28	276.96
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HB33SP	3 Ele 14/21/28	247.95
HB43SP	4 Ele 14/21/28	274.95
SC-10	10MHz Swiss Quad	134.00
MLA-4	Loop 3.5/7/21/28	157.95
MV3AH	Vertical 7/21/28	95.00
MV3BH	Vertical 7/14/21	55.00

BUTERNUT

H6V6	80-10 vertical	119.00
H6V2	80-40 vertical	112.00
2MVC	2m. vertical	36.00
RMKV	cool mtg kit	41.95

CUSHCRAFT

A-4	4 element tribander	295.95
R-3	3 element tribander	210.00
10, 15, 20	remote tuned vert.	260.00
5-5	5 band trapped vert.	96.00
32-19	19 element 2 meter boomer	89.95
214B/FB	14 element 2 meter boomer	75.95
424B	24 element 70 cm boomer	77.00
416-1B	16 element OSCAR 435MHz	58.00
A14-10T	10 element OSCAR 145.9MHz	49.00
ARX-2B	2 meter vert.	35.00
ARX-2	2 meter vert. "ringo ranger"	28.00
AR-2	2 meter vert. "ringo"	23.00

KENPRO ROTORS

KR40S	Azimuth 12 sq. ft.	149.95
KR500	Elevation 12 sq. ft.	189.95

ALLIANCE ROTORS

HD73	10.7 sq. ft.	105.95
U110	3 sq. ft.	48.00

VAN GORDEN

PD8010	80-10 meter dipole kit	32.50
PD4010	40-10 meter dipole kit	28.75
PD8040	80-40 meter dipole kit	30.00
SD80	80 meter shortened dipole	26.25
SD40	40 meter shortened dipole	23.75

MINI PRODUCTS

HQ-1	mini quad 6/10/15/20	135.00
B-24	mini beam 10/15/20	101.00

WHILE THEY LAST

COAX

Belden 9913 New Super Low Loss only .49/ft.

Cable	100MHz	200MHz	400MHz	SALE
9913	1.0db	1.6db	2.5db	.49/ft.
RG213	2.1	3.1	5.0	32/ft.
RG8	2.1	3.1	5.0	29/ft.
RG8 Foam	1.8	2.6	3.8	29/ft.
RG8X (Mini)	4.0	5.3	9.0	14/ft.

PL259 N Type UG218/U in stock

EXCLUSIVE SWING LOCK MAST SOCKET

SOUTH RIVER HDT-15KD \$58.00

MAST SUPPORT BRACKET SWINGS MAST TO LOWER

TURNBUCKLES

TB-12	3/4" to 5/8"	.51
TB-14	5/8" to 7/8"	.62
TB-15	6/8" to 9/8"	1.06
TB-16	7/8" to 10/8"	1.72

GUY WIRE CABLE CLAMPS

GT-25	For Cable up to 1/4" Diameter	.44
GT-30	For Cable 1/4" to 3/16" Diameter	.51

U BOLT & SADDLE ASSEMBLY

UBS	Galvanized Steel U Bolt 1 1/2" wide	.59 each
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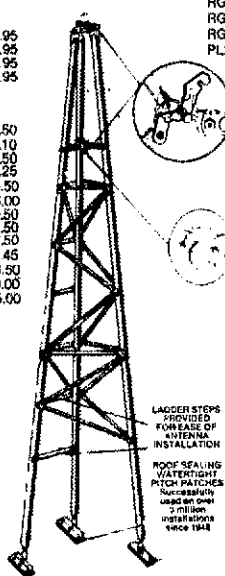
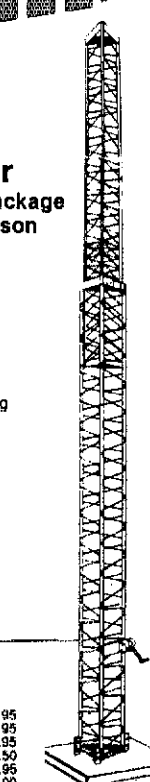
GROUND RODS

GND-4CP	4 x 1/4" Copper Plate/Steel Rod	3.00
GND-6CP	6 x 1/4" Copper Plate/Steel Rod	5.00
GND-8CP	8 x 1/4" Copper Plate/Steel Rod	6.00

GUY WIRE RING & COLLAR

GRA-140	Up to 1 1/2" O.D. Cast Aluminum	5.05
GR-1	Up to 2" O.D. Steel	3.96

*Mast can be rotated freely



pointed Bulletin Stations. If each one of us got one person interested enough in ham radio to get their license the growth of the hobby would be assured. JAN. PSHR: W2YJR K2ZTF K2ZVT WB2MCO KA2MYJ WA2JBO W2BIW K2BVK W2PKY N2BFG AK2E K2ZM KA2OPG. JAN BPL: K2ZTF. Traffic: K2ZTF, K2ZTF, W2YJR 280, K2ZM W2BIW 152, W2PKY 100, WB2B 82, WB2JUK 82, W2BIW 71, KA2MYJ 67, K2ZM 52, KA2JBO 40, KA2AOV 37, K2HNW 29, N2AWI 27, KA2OPG 24, WA2YBM 24, N2BFG 23, AK2E 18.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2JZ — ASM:ACQ. WB2IAP. SEC: KA2RJK. OQ/RFI: NB2T. TC: W2JUP. STM: WA2ARC. PIO: W2IYX. The following are traffic nets in and around the section:
NLI CW* 3630 kHz 1900/2000 N2AKZ mgr
NCVHF 6,145/745 1930 m-f K2MT mgr
BAVHF 6,077/67 2000 m-f WB2BNA mgr
SCVHF 4,775/37 2030 m-f W2GVD mgr
ESS 3590 kHz 1800 WB2WS mgr
NYS/M 3877 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 whether ever possible. IARU will sponsor exams on the second Sat. of each month starting in Mar. The exams will be held at the N.Y. Inst. of Technology, Route 25A, Old Westbury in Salten Hall, room 2. Persons interested in taking the exam should submit an FCC Form 610 along with the registration fee to Robert Reed WB2DIN no later than 30 days prior to taking the exam. Bob's address is 2970 Valentine Place, Wantagh, NY 11793. Walk in registrations will be conducted on a limited basis. Officers for Kings County ARC are: Iv Salen Pres., WA2PIV V.P., KA2KDD Sec. K2QVW Treas., Comms mgr Lou Perla, Trustee Murray Goldberg, Wantagh ARC has 13 Novice students pass their exams and they are awaiting call signs from the FCC. The following operators participated in RACES drill in Huntington: W2GLE K2LFH W2CIN WA2NFF WB2QCR K2MOC WA2TSN WA2DZD and WB2YWL. Under Curse of the month goes one for N2AKZ who dared to send me, freezing and snow shoveling, a nice post card from Hawaii, and the nerve to say he was enjoying himself. Congratulations to KA2VKD and N2EQN on upgrade to Tech and Extra respectively. Nassau County ARC will hold VE exams Mar. 11 at the Eisenhower park senior citizens bldg. at 8 P.M., contact Kate Saul, 3 Theodore Dr., Plainville, NY 11903. Officers for HARC are WA2MTT Pres. WB2D 1st VP. N2KZ 2nd VP. WA2NNG Sec. W2CIN Treas. K2SJO and WB2NVO Directors. If you need any info on when clubs meet, or any upcoming events, WB2IAP is keeping an accurate as possible list of dates, places times and names. Remember this list will only be as accurate as the info that is being supplied. Please let us know what is going on. Traffic: K2GCE 124, K2YQK 115, W2GKZ 18.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — ASM: K2BJG. SEC: WB2VUF. STM: W2XD. BM: W2FMN. RCC: W2CC. PIO: WB2NOV. TC: AD7I. ACC: KK2U K2YS. NMS: W2PC KB2HM WB2RMI WB2ANK WB2PKB WB2QMP W2RRX W2PSU.

Net	Freq.	Time	Sess.	QMI	QSP
NJ	3695	1000 Dy	31	227	93
NJPN	3950	1000 Dy	33	378	99
NJUN	3735	1830 Dy	31	353	103
NJNE	3695	1900 Dy	31	291	149
NJNL	3695	2200 Dy	31	139	34
NJVN	4949	2230 Dy	31	355	191
OBTTN	147.12	2000 Dy			
TCETN	147.255	1930 Dy			
NJRJTJ	147.51	Autostart	31	70	375

Uplink — Amateur Radio News call 201-735-8550. Two new appointments: ASM: Bob Anderson, K2B5G and BM: George, W2FMN — congratulatory QO report from KJ2D was negative for months of Nov-Jan 85. Cheryl will Uplink reports following upgrades: N2FFB to General and KA2WFO and WB9VBC to technician. From TCRA News - TCRA celebrated its 50th anniversary as a club on December 5th. Actual date was October 8, 1984. They had a big party at the King George Inn in Warren. They will operate a special events station April 26 to 27th from 7 A.M. to 7 P.M. Ask W2NKD for info. They will need ops. Their new 70 CM repeater will be on soon on 444.975 T and 449.975 R. Look for them! Ramapo Mountain Amateur Radio Club announces classes for all license grades. Classes meet every Wednesday 7:30 P.M. at Our Lady of Perpetual Help School, Room 107, Franklin Ave. near High Mountain Road, Oakland, NJ. For further info call 337-7915 or 337-2990 (during supper hours). Mountain Sparks newsletter of the New Providence ARC advises all amateurs of their 20th anniversary with a dinner on March 8th at the William Pitt in Chatham at 8 P.M. Amateur License exams will be held at the Union College in Cranford, N.J. Dates: March 16, April 13 and May 11 with later dates also. Contact Carl Felt, N2XJ, for further information. Jersey Shore Chaverm Newsletter reports WB2HHH talk on computer-related ham radio talk was excellent. Traffic: N2XJ 295, KB2HM 180, W2VY 167, K2VK 145, KA2SPH 114, KA2F 88, W2RRX 50, KB2WI 34, W2XD 30, KA2OIV 23, KD2BE 9, W2CC 7. (Aug. 84) K2VX 90.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, K4CY — SEC: WA4VWV. STM: KA8X. SGL: AK8C. ACC: WB8QAM. PIO: KB8ZP. TC: KD8AS. BM: K8IR. NOW is the time to prepare for SEVERE Weather, if you want to help contact the SEVERE. Remember the Iowa State Convention held in Des Moines July 19-21 in conjunction with the "Electronic Fair" - Kudos to New Novice KAB2TN, New Adv are WB8QF, K4G, K4TU, and New Generals KA8D, N8FX. New Off. at IARU are WB8HF, K8EVI, K8IWA, K8HWL. Start thinking about Field Day 1985, it is not that far away. The Coon Valley Amateur Radio Club has developed a new logo, bought new jackets and has about 35 members.

Net	Freq.	UTC	Day	QMI	QTC
TLCN	3560	0030-0400	Dy	330	136
75M Phone	3970	2330-1830	M-S	2534	123
ICN	3713	7 PM CST	M-F	102	35
ITEN	3970	2330	SUN	106	7

Note new time for ITEN: a new AF MARS sponsored Repeater in Snoopy, CIRAS Officers are AK8P, WB8ZKG, N8CFJ, W8EDF. Foreign Exchange student in Fairfield talk back home to Chili via K8MT5. The "Willie Otto Distinguished Service Award" K8EVI, K8IWA, K8HWL. Start thinking about Field Day 1985, it is not that far away. The Coon Valley Amateur Radio Club has developed a new logo, bought new jackets and has about 35 members. good going!! Traffic: WA8AU 255, W8SS 141, KA8AE8R 139, K8GP 93, K8XL 83, W8DFWB 83, KA8ADF 60, N8CWW 55, WB8VAW 41, N8CR 40, W4JL 38, K8CY 33, K8PT 26, W8HT 26, K8BRE 20, W8DND 20, K8C8C 18, W8YLS 14, N8EEF 14, W8WB 12, KD8BG 4, K8KUU 3.

KANSAS: SM, Robert M. Summers, K8BFX — Out best

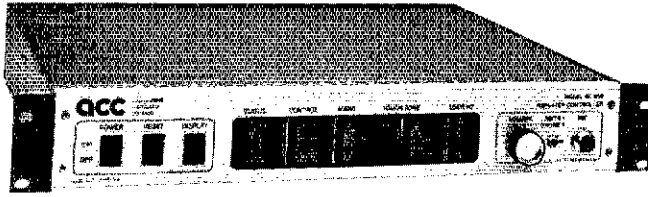


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- Fully remotely programmable with Touch-Tone commands or computer terminal
- Front panel LED display, or terminal based display
- Over 300 word customized male and female speech synthesis vocabulary
- Time/day of week Scheduler with 10 set-up states, 30 changeovers and events, over 100 scheduled items for hands off operation and automatic reminders.
- Full or half duplex autopatch, autodial (200 numbers), emergency autodial, reverse autopatch, autodialer, toll restrict including telephone exchange tables, supports remote and multiple phone lines
- Informative remotely programmable ID's (17), tail messages (13), bulletin boards (5)
- 16 channel voice response analog metering, automatic storage of min/max values on each channel, values may be read back on command or may be included in any programmable messages
- Supports synthesized remote base transceivers and full duplex links
- Individual user access codes to selectable features
- Mailbox for user-to-user, and system-to-user messages
- Paging - two-tone, 5/6 tone, DTMF, CTCSS, HSC display, GSC digital display, user commandable and may be included in programmable messages (i.e. alarms)
- Logical to physical I/O mapping and internal "toolbox" for easy customizing of the controller to meet your needs and minimize external wiring
- Easy hookup to any repeater

If your repeater budget can't afford the '850, we offer the **RC-85 Repeater Controller**, which we like to call the "second best repeater controller in the world". It's a scaled down, simplified version of our '850, but overall, it offers more capability and higher quality than anyone else's control equipment at any price.

- Remotely programmable with Touch-Tone commands
- Over 175 word customized male speech synthesis vocabulary
- Selectable "Macro sets" for easy control operator selection
- Autopatch, autodial (200) numbers, emergency autodial, reverse patch
- Remotely programmable informative ID's (7), tail messages (3), bulletin board (2)
- Supports synthesized remote base transceiver, control receiver, alarm
- Selectable, informative courtesy tones
- Talking S-meter, Two-tone paging
- Easy hookup to any repeater

For those who like to "roll their own", we can get you off to a rolling start with our **ITC-32 Intelligent Touch-Tone Control Board**. Much more than just a decoder, it's a mini-control system of its own, with the basic repeater and remote base functions built-in. And it can be tailored by you with its Personality Prom.

- 28 remotely controllable latched or pulsed logic outputs
- 4 alarm or remote sensed logic inputs
- Response messages to confirm command entry
- Repeater functions including COR, IDer, timers, courtesy tone, etc.
- Remote base functions including control of synthesized transceiver

Our new **Digital Voice Recorder** lets you remotely record ID's, tail messages, and various other response messages for automatic playback through your repeater. Audio is stored digitally with no-compromise reproduction quality in up to eight megabits of memory. The DVR can support up to three independent repeaters for a low per-channel cost. Its Touch-Tone activated voice mailbox lets your users easily record messages for other users when they aren't around.

- Remotely recordable, variable length audio tracks, accessed from controller messages
- Top quality, no compromise audio reproduction
- Supports up to three repeaters for cost effective installation
- Expandable to roughly 6 minutes of speech in 8 megabits of memory
- Easy interface to RC-850, RC-85 controllers, or to any stand-alone repeater

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If you own a shack, you should know about ShackMaster™

ShackMaster lets you carry your home station with you in the palm of your hand. It acts as your gateway to the world, linking your handheld transceiver to your high performance HF station. Now, instead of your valuable home equipment being available to you 1% of the time, it's available 99% of the time! Whether around the house, in the yard, or across town, ShackMaster lets you take it with you.

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- ShackPatch™ intercom into the shack
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Because of the remote control capabilities of ShackMaster, the ARRL would like us to remind you that "Use of this device with a transceiver operating in the two meter band, or on any frequency below 220.5 MHz is not permitted unless a separate control link is provided".

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gives it stability and keeps it short—nine to twelve inches. The flexible quarter-wave on top extends the range and allows it to bend 180°

Larsen offers ten different VHF HQ series antennas in the 136 to 174 MHz range, to work with most popular handheld radios. So whether you're calling for help, or just shooting the breeze, you can be sure that Larsen Kulduckie antennas will

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wishes for a speedy recovery goes to W0MI. Wayne has been in the hospital at Hayes. Many tnx to WB0CX5, W0FIR and W0QMT for keeping us represented on the DTRN. AC0E reports the KS RTTY net going good. Could use some more QNI for better coverage of the state though. The net has moved to 7073 kHz especially due to band condx. Same time 1 PM Sundays. Other net activity for January — K5BN QNI 1333 and QTC 92. KPN QNI 3935 QTC 14. KWIN QNI 1018 QTC 793. KMWN QNI 739 QTC 854. CSTN QNI 2213 QTC 108. QKS QNI 413 and QTC 125. QKS-SS QNI 52 QTC 25. The Pilot Knob Amateur Radio Club was organized in 1964, FEB. The Jayhawk Amateur Radio Society was organized in 1951. How about your club??? Drop me a line and let us all brag on the long tenure of our clubs. Glad to be back on the mailing list of the Douglas County ARC. We missed the news from Lawrence. Saturday morning coffee breaks have been a regular thing with several clubs. It looks like DCARC is starting another first — a regular monthly CLUB DINNER at a local STEAK house. First Sat. of each month it looks like and at 6 P.M. Bet they would let a stranger walk in every now and then. Contact Ken K6TLQ for more info. Traffic: W0ARC 22, W0FIR 210, W0BOK 165, K50U 135, W0OYH 98, W0H1 82, W0FDJ 78, K0BYE 34, W0MYM 25, N0BZ 16, K0AE 10, W0PB 6, W0QMT 6, W0RBO 2. (Dec.) AC0E 154.

MISSOURI: SM, Ben Smith, K0PCK — Congratulations to K0JAA, member of the Heart of America ARC and W0NUT, member of the Missouri-Valley ARC. They were named Amateurs of the Year by their respective clubs. A deserved honor for two devoted amateurs. K0RWL received the Kansas City DX Club DXer of the Year Award. W0BRHK has passed the certification exam for the Amateur Auxiliary FCC's Field Operations Bureau. Field appointments go to K0SI, OO, and K0UAA. PIA, MTTN, the Section slow speed net which meets 3,730 kHz has changed times from 7:30 P.M. to 8:30 P.M. Net manager, K0PGN, invites all novices and interested persons to check in. New club officers for the following clubs are: Missouri-Valley ARC: Pres. K0KCB, VP. W0BVA, Sec. K0KKS, Treas. W0HNO. Rolla Regional ARS: Pres. K0BBL, VP. K0RDL, Sec. W0NUR and Treas. K0RFS. Kansas City DX Club officers are: Pres. W0JLC, VP K0RWL, Sec. K0CS and K0TLM Treas. CMRA officers: Pres. ND0N, VP K0BDX, Rec-Sec. KTSY, Corr Sec. N0PPE and Treas. A100. OARS elected K0QZ as president for 1985. K0SI is the new president of Southwest Missouri ARC. K0BBL has been appointed VP of Heart of America, and K0RWL has been appointed secretary of that club. K0LLN is the new net manager of the Rolla Regional ARS Billboard Net. The Indian Foothills ARC provided communications for two major fires in their community last month.

Nets reporting:

Net	Sess.	QTC	QNI	Mgr.
MON	62	223	394	K0SI
MOSSB	31	91	739	KTSY
MEOW	31	39	442	K0DSQ
MTTN	29	31	141	K0PGN
PTN	14	20	52	W0LQO
HBN	23	19	288	K0DSQ
ZAEN	5	5	69	K9OCU
RPAAR	30	3	413	K0LLN
MOFON	3	3	43	A100
IFN	3	3	17	W0BZI
CMEN	5	0	86	K0PCK
LOZFM	4	0	82	W0RTL
TCN	5	0	77	K0ILO
ARES	5	0	67	N0EHU
SARN	5	0	48	W0ENW
JCCC	4	0	43	W0ORI
LARN	4	0	38	W0RHC
LOZCW	5	0	21	W0RTL

Traffic: W0BMA 252, K0SI 176, K0PCK 169, KTSY 146, K0BAS 134, ND0N 108, K2ONP 80, W0UDQ 73, N0EVC 60, N0B 54, A100 4, K0DSQ 39, K0BR 38, W0B0CB 18, N0BKE 16, K9OCU 14, K0J0B 8.

NEBRASKA: SM, Vern J. Wirka, W0BQGM — SEC James Sanford, N0AHT, STM Jerry Kohl, W0EGK, James DeBurb, W0B0MC, of Omaha and Myrtle Jones, K0B5WM, of Bushnell, are now members of the Amateur Auxiliary of the FCC Field Operations Bureau. Jim Parks, W0B0PM of Gering, is now the EC for Scotts Bluff County. The section traffic count remains high... the top four nets in January '85 were: NE, CW 110, NE, Storm 22, NE, Morning phone 14 and NE, 40 meter 8. Thanks to all of the Net Managers for your timely reports to the STM. Each report is important and each one is appreciated. The packet radio network system in Nebraska continues to expand. Mel Cunningham, K0VLA, Arnie Gribbs, K0BNCR, both of Fremont and Lyman Nelson, W0E1N, Jerry Morris, W0BRUS, both of Hooper, and the net with the digipeaters now in operation packet operators have scattered communications over eastern Nebraska and can reach out to North Platte in western Nebraska. Make your plans now to attend the 1985 Midwest Division Convention in Omaha at the 72nd and Grover Holiday Inn September 6-7-8. Pre-registration cutoff date is August 6, 1985. Traffic: W0KK 118, K0DKM 68, W0BTE 62, K0B0CB 37, W0EGK 29, K0IXY 26, W0B0X 18, K0B5WM 16, W0B0MQ 10, K0B0LI 6, W0B0GM 6, W0B0K 5, W0WZR 4, W0NIK 2, K0ODF 2, W0B0G 2, K0TUH 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO — STM: K1E1C, SEC: K1E1C, BM: K3ZJ, AGC: KGM1, OO:RFI: K1ML, TC: W1HAD, PIO: KX1B, SGL: K1AH.
Net Freq. Local/Time QTC QNI MN
CN 3640 1900/2200 197 315 K1E1R
CPN 3965 1800M-S/1000Sn 130 425 K1BHT
NVTN 23/88 2130 32 274 WA1EM1
WCN 78/18 2030 184 549 WB1GXZ
RTN 13/73 2100 54 328 KA1JAN

Happy Easter to all in the Connecticut Section. Congrats once again to Mary, WB1GXZ, for 100% representation to IRLM. Field Day will be held on June 22 and 23. Now is the time to make your plans for the big weekend. Thanks to the following Newsletter for contributing to this month's column: KEY KLIX, TIME OUT, THE SINE POST, FARA NEWS, and SARC TRANSMITTER. This is YOUR column for the Connecticut Section. Use it. Send your information and news to me and I will do my best to include as much of it as possible in the column each month. The annual meeting of the ARRL Board of Directors was held Jan. 24 & 25 in Newington. Many topics were discussed, from increasing membership to League and FCC proposals. See Q57 for details. The ARRL has reorganized. All administrative services for volunteer services will be under the office of Volunteer Resources. Within this office are the ARRL/VEC dept and the Field Services dept which incorporates Public Service Nets, ARS affiliated Club Program and Convention Support. This latest change



the HAM STATION

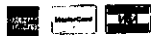
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should streamline HQ operations and be a definite asset in the field organization. As of Jan. 1, 1985 the ARRL membership in the New England Division totals 3782 members. Also at the end of 1984 FCC records showed 412,156 individual Amateur Radio operators across the country. Volunteer exams will be given on a monthly rotating basis throughout the year by FARA, SARA and the BEARS. Register via HAMTEST, P.O. Box 99, Southport, CT 06490. ECARA is in need of a photographer for SINEPOST. If interested contact KB1H. OBS reports: W1ULF 3, K1VQ 4, W1N1, K1EFT Traffic: WB1GKZ 400, W1EFW 237, KA1GWE 110, KA1JAN 82, KA1JTB 91, KA1BHT 83, KA1XG 72, W1YOL 63, K1AGE 52, N1DBH 49, W1BDN 40, N1BOW 37, KA1KPS 33, W1DPR 24, KA1EGE 16, WA1EMI 12, K3ZJJ 11, W1CUH 8, W1QV 5.

EASTERN MASSACHUSETTS: SM, Luck Hurder, WA4STO — ASM: K9HI, STM: KW1U, SEC: W1AY, OD AUX: KA1KF, BM: W1HH, ACC: K1AZE, TECH: KA1IU, PIO: WA1DA, SGL: K1BCN.

Net Mgr Freq. Time (Loc)/Dy QNI QTC
EMRI N1AJJ 2658 1900/2200/Dy 402 372
EMRIPN N1BGW 3880 1730/Dy 311 430
EM2MN KA1AMR 63123 2000/Dy 531 411
NEEPN K1BZD 3945 0830/Sn 71 13
H1EIN WB1CMQ 0464 2230/Dy 491 364
KAMRIS KA1EMJ 3715 1800/2030/Dy 215 133
CI2MN N1BYS 645/045 1900/Dy 300 50

With this being my first EMASST QST column, I'd like to make a plea for input from everyone who can contribute to the column. Do you have a "newsy" item that the members of this section would find interesting? Send it along! Tks to Cape Ann ARA, Wellesley ARS, Greater Lawrence ARF, and Cape & Islands ARA for fine newsletters. Congrats to KA1LKY & W1OMN for upgrading! KW1U K2LP and others holding up under the strain of the N1BBT/MM effort. Use of packet for traffic increasing dramatically lately as more stations linking into Eastnet. KA1E working hard on FCC Amateur Auxiliary. More members of the Aux are needed as are amateurs interested in forming local interference committees to assist their neighboring hams in resolving RFI difficulties. Contact KA1KF or WA4STO for further details. K1OJH & WA1UQA planning on operating from China at BY4AA - and perhaps on packet as well! Any of you who belong to a club that hasn't heard K1OJH, KA1MI or NEPRA give their fantastic talk on packet is missing out! The section is in need of Public Information Assistants - do any of you have contacts with your local media? If so, consider becoming a PIA. The more we can expose amateur radio to the public the better. Contact WA1DA for details. KA1E reports that 38 notices were sent out by EMASST OOs in Jan. KA1EXJ enjoying thrill of being Net Manager and moving right along toward an effective training program. WA1TB still cranking out his networks newsletter in fine style. Contact him if you're not receiving it. Have you expressed your opinions to your SM or Division Director today? Traffic: N1BBT 1965, KW1U 1896, WA1TBY 629, WA4STO 534, N1BGW 496, KA1EXJ 453, KA1BBU 372, KN1K 327, KA1AMR 241, N1AJJ 193, W1ZHC 192, K1GRP 179, WA1DXT 159, WA1FCD 151, KA1EPO 149, N1BHH 132, KB1AF 97, N1DDC 88, W1CE 81, KA1EID 75, WA1FPM 73, N1BYS 70, KA1KA 60, K1ABO 47, WA1FNM 44, WA1STH 43, W1QLL 24, WA1LBG 18, WB2PD 17, K1LCC 11, KY1B9, N1CKR 8, WA1XA5. (Doc) K1ZYW 178.

MAINE: SM, Cliff Lavery, W1RWG — SEC: K1LJG, STM: KA1W, AGC: KY1C, OD/RF: WA1KX, PIO: KY1E, SGL: K1N1T, TC: K1PV. New calls KB1JF now KY1C and KA1TJ now KY1E. The section regrets losing KQ1L as TC; he resigned due to health. Eric Edler, K1PV, has been appointed TC. He is young and energetic and knowledgeable. Comms provided by KA1BSF KA1DDA KA1CLF KA1C KA1EMK N1BLZ for 2-day Maine state champ race at Skowhegan, w/cold clear windy with a fast track. PSRR: W1RWG WA1YNZ N1BJW KY1E K1LJG WB1GLH WB1CBP 57 (Novices).

Net	Sess.	Checks	Tic.	Mgr.
Seagull	27	1093	200	K1GUP
PineTree	31	215	84	W1OTC
LatePTN	23	107	23	WA1YNZ
MePubSvc	4	73	1	K1JWG
Aroostook	5	82	2	WA1YNZ
RACES	4	60	5	W1RWG

Traffic: KA1JOD 125, W1RWG 104, WB1CBP 88, W1ISO 87, AK1W 80, KA1JPR 76, N1BLZ 69, W1BXM 59, WA1YNZ 37, W1CTP 36, K1LJG 38, N1BJW 33, WB1GLH 30, W1KX 32, KY1E 26, W1VEH 19, N1BME 12, W1OTQ 9, W1GCB 8, W1AHM 4, KA1ENL 4, KA1FTL 2.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: Open. Plan ahead: New England ARRL Convention Oct. 4-5, 1986. Mark your calendar now so there will be no excuses. Please note GSPN now on 3870 kHz E30 P.M. local. WB1DSV now in Maryland. W1AGO now K1IT. Only GSPN rep for W1YR, w/c max 5PL. New officers Concord Brasspounders: Pres K1L, VP KA1CCK, Sec KA1KYU, Treas WB1BXJ. Nice to hear club stations in recent NH QSO Party. W1CUE retiring from traffic work — Thanks, Steve, for 20+ years. K6UXO new manager of GSPN Net. W1UBG is back on the air. WB1BRE and KA9GHT operated from VT in NH QSO Party. Lots of GB expressions and use of G signals heard on repeaters. Another enjoyable dinner and ladies night by Fort City ARC. Don't forget ABARA Springfest 85 on April 20 to signal the arrival of spring. See you there. Traffic: N1CVR 170, AK1E 157, W1GLX 151, W1TN 140, K6UXO 138, N1NH 105, KA1K 102, K1VW 101, K1HM 58, W1ALE 56, K1POV 37, K1TOV 28, WB1GXM 28, KA1HPO 26, K1UWB 25, W1MHX 22, N1ALM 6, KA1GQZ 2, KA1QF 2. (Dec) W1GUX 151, N1AKS 91, KV1S 70, W1FYR 24, W1MHX 10, N4KMW 4, KS1S 2.

VERMONT: SM, Ralph Stetson, KD1R — Congratulations to CVARC for being first ARRL-VEC in VT. Their next exams are set for APRIL 20; contact WB1AJG before MARCH 20. No walk-ins this session, thanks to K1HKI for info. Also apologies to K1HKI for typo last month on his upgrade to Extra. Hope everybody has sent their log sheets to K1IU for the VT QSO Party. Heard all that participated had a real good time. Have you considered PACKET radio you can be on for the cost of a hand held. That is for the TNC, want more info contact N1CBT, WA1OZE, WB1AJG, N1CBT or one of them who give you hand getting up on PACKET, hopefully by the time you are reading this KD1R will be on PACKET as well. If Packet is not your thing how about television ATV is alive and well in Northern VT with ATV Repeater in Westford, VT KA1BJPR input 439.25 MHz, output 426.25 MHz with color id. TFC, KT1Q, 22x; AE1T, 137; W1KRV, 95; N1ARI, 65; N1COB, 48; W1OAK, 13. NETS, VTN 31/153/77; VSSN 12/29/7 CVFM 4/77/4; GMN 27/455/30; VPHN 4/77/10; CAR 27/848/42; VSB 31/474/135; VRFD 4/39/5. Traffic: KT1Q 226, AE1T 137, W1KRV 95, N1ARI 65, N1COB 48, W1OAK 13. **WESTERN MASSACHUSETTS:** SM, Don Haney, KA1T —

Introducing The New LK-500Z "B"

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Thinking of buying a linear amplifier? You owe it to yourself to check out the new LK-500ZB.

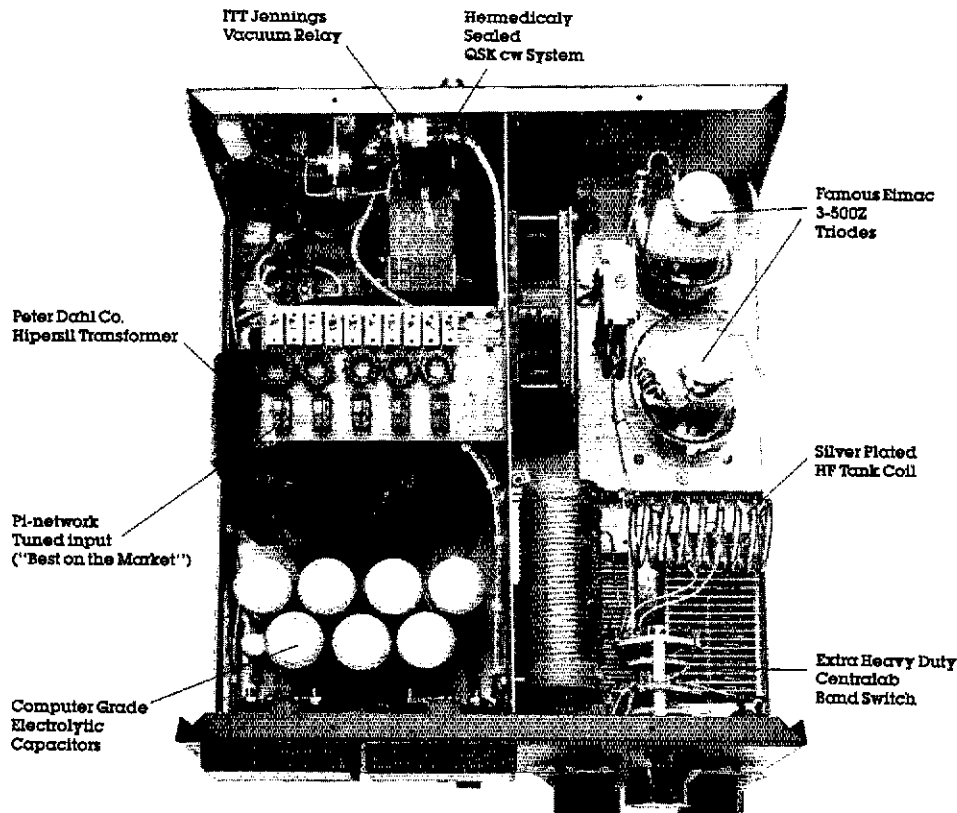
The LK-500Z series of amplifiers were created to offer the best value you can buy in HF linears covering 160-15 meters. Last year, it was demonstratively the best value. It was the lowest priced, full feature pair of 3-500Z's on the market. It had the longest warranty and the only amplifier with a money-back guarantee. It's not surprising that the LK-500ZA, both the standard and "hipersil" version, became one of the most popular amplifiers on the ham bands.

Now, for 1985, Amp Supply engineers have taken this durable, dependable "rock crusher," fantastically improved it, and call it the LK-500Z "B" version.

Improvements include an ITT Jennings vacuum antenna changeover relay with a companion sealed relay QSK system which eliminates any signal attenuation between CW characters. The silver-plated HF tank coil and the extra heavy duty silver-plated Centralab bandswitch are the finest available.

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The LK-500Z "B" version is clearly a progressive, new amplifier, a leader in its field; but what else would you expect from a company called Amp Supply?

Thank you for purchasing an Amp Supply Co. product.

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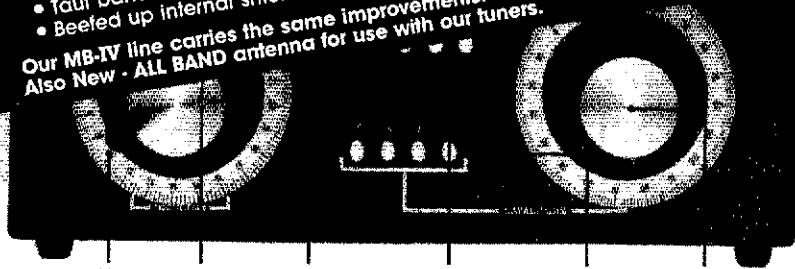
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SEC: WB1HH, STM: W1UD, TC: KA1JIM, OO/RF: N1CM. Welcome to new licensees and recent upgrades. Total of 36 new and upgrade exams given by HCRA in January. And MARA Novice class produced 3 new hams in WM. HCRA schedules next exam on May 18; register with K1BXE by April 18. Preparing for the exams, HCRA giving Novice thru Extra classes. Receiving regular OO/Amateur Auxiliary reports from WA1MJE, N1AZG and N1DAY. Report to learn of WB1GV's becoming Silent Key. Hope you can attend the Massachusetts Flea Market on April 27. If you are in the coverage area, Thursday night packet radio info net at 8 on 147.12 Bilerica. PSNR: WB1HH, W1KK, KA1T W1JP. Traffic: KA1T 242, KA1EKO 174, W1UD 172, W1SJV 151, W1KK 126, W1JP 56, WA1OPN 44, WB1HH 42, K1JHC 32, W1ZPB 30, K1UJV 17, WB1FSV 9, (Dec.) WA1MJE 4.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS. PIO: NL7CG. OO/RF: AL7FL. Daniel Stevens, ARRC President, informs me that the ARRC's radio interference committee is formed. NL7D Frank Bolin did an excellent job coordinating the communications for the Iditarod Dog Race. Once again, communications is the key to information, safety, and a smooth race. Did you hear Iditarod dog traffic on 160 meters. Thanks goes to KL7HFQ, KL7WM and KL7EB for installing HF antennas, setting and testing the HF station at the Anchorage Boys Club. Traffic: (Dec.) AL7FJ 163, KL7VL 95.

IDAHO: SM, Lem Allen, W7JMH. SEC: KD7HZ. STM: W7GHT. PIO: WB7PPQ. OO/RF: KU7Y. CLUB NEWS: Eagle Rock Radio Club in Idaho Falls is holding regular VE Exam sessions now — congrats to the VE Team KARJ KC7C W7RH A17Q W7COM. Meridian DX Club is sponsoring an ARC on April 6 at Borah High School in Boise at 9 A.M. with VE Team W7ZRC, K7TM, KA7T, KU7Y and others — Walk-Ins Welcome. Notify K7TM which exam you will try for. Newly elected officers for the Boise Club are N7EZO Pres, N7DYU Sec, W7KZH Treas, W7ALZ, W7IQG, N7AL, W7JE, Directors, K7PKT, W7JMH ISRA Board members. W7MAL is teaching the Spring Novice class and W7JMH is teaching a class in Ham Workshop and Construction. New officers for the Pocatello Club are WB7PBB Pres, KA7THF VP, KC7XP Sec, KB7MU Treas, K7RX Director at large. They will affiliate with ARRL become a Special Service Club, field a VE Team and hold regular exams in the Pocatello area — GREAT WORK, fellows! The Magic Valley Club in Twin Falls is giving Novice classes again, thanks to WB7CVO. Coconino Club is sponsoring a hamfest June 8 at Coeur d'Alene — Magic Valley club Swapfest is June 15 at Twin Falls — MARK YOUR CALENDAR! PEOPLE AND THINGS: KY7I has new IBM computer, old Commodore 64 relegated to Ham Shack. W7KXA and XYL W7KWZ back from trip to New Zealand, report that getting ZL license was no problem. They were issued ZL6AE and ZL6AE for their stay. They worked 15 of the 31 2-meter repeaters while there, advise us that you will need to take along a transformer, since the electrical distribution there is 230 VAC. WA7RUT visited Boise for 2 weeks, Doctor says his new knee is just fine.

NET REPORTS:

Farm Net	3935 Lsb	7 PM DT 31	1841 64
Idaho CD	3990 Lsb	8:10 AM 23	822 7
IMN	3635 Cw	8 PMDT 21	164 43

2M NW TFC 146.98 Fm Da 30 1713 42

GENERAL: The Ham Community offers condolences to Ray Skidmore, W7NXX on the death of his XYL Florence on Jan. 27 at Nampa. She will be sorely missed by all who knew her. Traffic: KA7KA 104, W7JMH 64, K7JD 4.

OREGON: SM, William R. Shrader, W7QMU STM: W7EPA. SEC: K7YZ. PIO: K7YJ. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SO. STG: N7EJ. Upgrades: KA7UCE (Novice), KA7RPL, KA7OQG, KA7BZY (Tech), WA6ZJA, N7GMT, KA7AZK (General), WB7GOV, KA7TDL, N7FGW, N7EYS (Advanced), KA7NPN, KA7JOA, N7H (Extra). A big list this month, Congratulations all. Lots of new Club officers for 1985. Salem ARC: Pres. KD7YB, V. Pres. KB7KM, Sec. KC7LE, Treas. KA7GVZ. Rogue Valley ARC: Pres. WB7ROG, V. Pres. WB7JHP, Sec/Treas. KA7OFM, Sunset Empire ARC: Pres. N7EYS, V. Pres. W6LLC, Klamath Basin ARC: Pres. KD7AD, 1st V. Pres. W6HSW, 2nd V. Pres. KA7NEP, Sec. ND7V, Treas. W7IEO, Sgt. at Arms, KD7WB, Editor, K7TDX. Big news from Klamath Basin: KD7DI got a new bride on 6 Feb. Congratulations!!! Crater Lake Chapter #153 of QWA, now a reality, NB7J is charter president. Oregon Section badly needs Emergency Coordinators for the following counties: Linn, Wasco, Dechutes, Crook, Malheur, Baker, Wheeler and Harney. If you are interested in doing something to help Amateur Radio this might be a good spot. If you are interested, contact N7CPA, Oregon SEC, 801 Pinehurst, Newberg, OR 97132 for info. Traffic: W7VSE 596, W7ZB 151, W7LBB 137, N7FLC 136, AL7W 117, K7WVC 111, WB7OEX 72, KX7T 70, KX7W 50, N7BGW 49, WA7VTD 42, KATAID 37, W7LNE 12.

WASHINGTON: SM, Joe Winter, WA7RWK — STM: W7GXZ, SEC: WB1HH, BM: KD7G, TC: K7UU, PIO/SGL: W7OKZ. OO/RF: COORD: KC7FA

Net	Freq	Time(Z)	QNI	QTC	Mar.
EWTN	146.04	0030/0430	135	43	WA7CBN
NTN	3970	2000	1298	101	W7UU
NWSSB	3948	0130	392	32	W7HFN
PSTS	145.33	0030/0630	170	112	W7IEU
WARTS	3970	0100	2771	178	W7SET
WSN	3590	0130/0545	357	156	W7GB

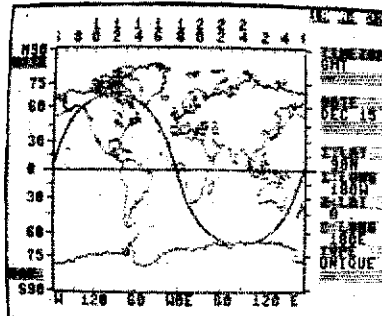
Are you ready for Field Day? It is not too late to get in on the fun. Remember it is an Emergency test. Right? The dates are June 22-23, 1985 the fourth not the last weekend in June. The Mike & Key Electronics Flea Market March 30th Wetrn. Wash. Fairgrounds Expo Hall, Puyallup 9 A.M. to 7 P.M. Call 206-835-3012 for Resv's. CVARS is conducting upgrade classes and KA7NJC is in charge. Clark Co. ARC holding license exams. May 18, 1985 at CC PUJ Big Vancouver. Register by 4-18-85. Call 206-574-7480 for info. WB8QHS noticed a Mother and two children stranded in a car on I-5 called for help. WB7NAU answered and notified the mother's friends of her trouble. WB8QHS started the car and followed them to their destination. Bravo guys! Lower Col. ARA 1985 officers are Pres. NC7P, VP KA7JVV, Treas. WB7PEI, Sec. N7DWF. WVVDXC 1985 officers are Pres. N7TT, VP K7TH, Sec. W7VY, Treas. W7NG, W. Sea. ARC VP N7AHX is recruiting mbrs. to work the ADA Bike-O-Thon on April 14th in Seattle. This should remind us all to again volunteer and support this worthy cause in our areas. The Northwestern Road Rally being held April 12-13 stretches from Shelton to North Bend.

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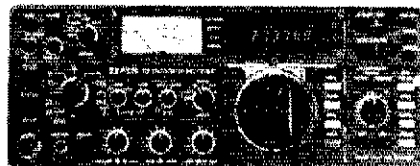
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- *EX-242 FM unit..... 39.00
- *EX-243 Electronic keyer unit..... 50.00
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- *FL-54 270 Hz CW filter (1st IF).... 47.50
- *FL-52A 500 Hz CW filter (2nd IF) 96.50 89⁹⁵
- *FL-53A 250 Hz CW filter (2nd IF) 96.50 89⁹⁵
- *FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
- 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 569⁹⁵
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 - FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
 - 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 869⁹⁵
- 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 789⁹⁵
- PS-35 Internal power supply..... 160.00 144⁹⁵
- 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 144⁹⁵
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- FL-63 250 Hz CW filter (1st IF).... 48.50
- FL-52A 500 Hz CW filter (2nd IF).... 96.50 89⁹⁵
- FL-53A 250 Hz CW filter (2nd IF).... 96.50 89⁹⁵
- 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 134⁹⁵
 - EX-144 Adaptor for CF-1/PS-15..... 6.50



Options - continued

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- 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 129⁹⁵
- 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 314⁹⁵
- AT-500 500w 9-band automatic ant tuner 449.00 399⁹⁵
- AH-1 5-band mobile antenna w/tuner 289.00 259⁹⁵
- PS-30 Systems p/s w/cord, 6-pin plug 259.95 233⁹⁵
- OPC Optional cord, specify 2 or 4-pin 5.50
- GC-4 World clock..... 99.95 94⁹⁵

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- IC-2KL w/ps 160-15m solid state amp 1795.00 1299
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- EX-106 FM option..... 125.00 112⁹⁵
- BC-10A Memory back-up..... 8.50
- SM-2 Electret desk microphone..... 39.00
- IC-271A 25w 2m FM/SSB/CW xcvr..... 699.00 619⁹⁵
- AG-20 Internal preamplifier*..... 56.95
- IC-271H 100w 2m FM/SSB/CW xcvr 899.00 759⁹⁵
- AG-25 Mast mounted preamplifier* 84.95
- IC-471A 25w 430-450 SSB/CW/FM xcvr 799.00 699⁹⁵
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- IC-471H 75w 430-450 SSB/CW/FM xcvr 1099.00 989⁹⁵
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- PS-35 Internal power supply for (H) 160.00 144⁹⁵
- PS-15 External power supply..... 149.00 134⁹⁵
- 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 synthesizer..... 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 489⁹⁵
- IC-490A 10w 430-440 SSB/FM/CW xcvr 649.00 579⁹⁵
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- IC-27H Compact 45w 2m FM w/TTP mic 409.00 369⁹⁵
- IC-37A Compact 25w 220 FM, TTP mic 449.00 299⁹⁵
- IC-47A Compact 25w 440 FM, TTP mic 469.00 419⁹⁵
- UT-16/EX-388 Voice synthesizer... 29.95
- IC-120 1w 1.2 GHz FM transceiver.... 499.00 449⁹⁵
- ML-12 10w amplifier..... 339.00 299⁹⁵

6m portable Regular SALE

- IC-505 3/10w 6m port. SSB/CW xcvr \$449.00 399⁹⁵
- 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 299⁹⁵
- IC-04AT for 440 MHz 379.00 329⁹⁵
- Standard models Regular SALE**
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- IC-2AT with TTP..... 269.50 199⁹⁵
- IC-3AT 220 MHz, TTP 299.95 239⁹⁵
- IC-4AT 440 MHz, TTP 299.95 239⁹⁵

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
- IC-11 Vinyl case..... 17.95
- LC-14 Vinyl case for Dlx using BP-7/8..... 17.95
- IC-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 PIT unit for HS-10..... 19.50
- ML-1 2m 2.3w in/10w out amplifier..... SALE 79.95
- ML-25 2m 2.3w in 20w out amplifier..... SALE 179.95
- SS-32M Commspec 32-tone encoder..... 29.95

Shortwave receivers Regular SALE

- R-71A 100 Khz-30 Mhz digital receiver \$799.00 689⁹⁵
- 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 569⁹⁵
- EX-257 FM unit..... 38.00
- IC-7072 Transceive interface, 720A 112.50
- FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
- FL-63 250 Hz CW filter (1st IF).... 48.50
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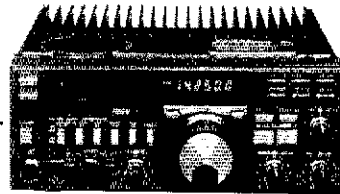
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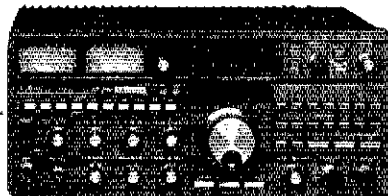
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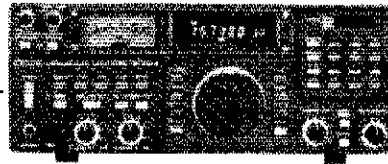
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Your help in this fun event is needed. Contact K6DOW, 271-6314. Boeing Emp, ARS 1985 officers are Pres, KF7S, VP W7JZD, Treas, KA7COD, Sec, KA7LDU. The BEARS are celebrating their 25th anniversary as a club. Special QSL cards among other things are planned for the occasion. Radio Club of Tacoma grants its first Scholarship to a Bates Voc. Tech. civil engineering student. He plans to attend the U of W in the fall of '85. 1985 officers are Pres, WA7OII, VP, W7BUN, Sec, WB7QAH, Treas, N7DPT, Tacoma Hamfair is set for Aug. 17-18. The Skagit ARC announced that they will not have the Skagit Hamfest this year. Let us all hope this popular event will be back next year. The many years of hard work is appreciated. Why we have Ham license plates. RCW 46.16.340 provides for Hams to display their call on their auto lic. To identify them as trained radio operators with mobile equipment to assist in emergencies when requested by the DEM, state patrol, sheriff, police, etc. This law attaches a responsibility for us to be involved in emergency communication work, a principle reason for Amateur Radio. Traffic: WB7WOW 423, KD7ME 388, K7GXZ 154, W7LG 143, W7GB 119, KR7L 174, N7CSP 106, K7RF 74, W7IEU 44, KD7G 44, K7AJT 24, WA7BDD 19, K7DMV 16, K7TJ 9, N7FXM 4, K7OXL 3, (Dec.) K7TJ 83, WA7BDD 39.

PACIFIC DIVISION

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: K7HRW. Boulder City Radio Amateurs to take part in the HOOVER DAM FIFTIETH Anniversary Celebration on 28 September. NNARA has set up a CW net for their Novice members code training. A remote base on Peavine Mtn. is talking to several repeaters in NV and CA. 449.1 in and 444.1 out sub-audible tone 114.8 Hz (CTCSS#18) and 222.95 in and 224.46 out linked to repeater on MGM Hotel. Thanks to N7FP, N7FK, K7YN, WA7HVJ and others. New repeater on Red Peak 147.68/08 sub-audible access 127.3 Hz (CTCSS#19) RTTY, SSTV and 110 baud ASCII signing N77PIR. KB7WV VP Sparks Nugget Hotel has offered a site for a repeater. Any takers? Tahoe ARA repeaters; East Peak 147.240, AF7I/R, Angel's Roost 148.850, W6CSP/R and East Peak 442.475, AF7I/R, WA6VKL elected Worshipable Master of F. & A. M. Lodge #707. Traffic: W7PBV 1.

PACIFIC: SM, James Wakefield, AH6CO — Traffic low due to condx. Results of VEC this month: Novice-8; Tech-8; up to Tech-WH's BBJ, BBK, ASO and AVW; to General-NH6BO, WH6BBT and WH6BBH; to Advance-NH6BF; to Extra-AH6DM and AH6FJ. Congrats! EARC had 22 participate in support of the Honolulu Marathon. BIARC donated set of ARRL books to Hilo Library and sponsor Ham class at Waialeale HS. KH6AT and KH6AFS have completed WA5 on 160. KH6CC worked Europe on 160. KH6B is QSY to new QTH near Hilo. Add KA7NCL up to Tech. Hawaii West ARS supported the Keauhou-Kona Half Triathlon with DB coordination. Pappy Field, KH6IU was Silent Key on January 24. HARC had 133 attend Annual Dinner with W6ZM, Pacific Division Director attending. Need Guam news to print! Traffic: KH6HIJ 25, KH6S 20, KH6H 9, KH6RQ 2.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — It is with a deep sense of sadness and loss that I report the passing of Wayne Heck, N6EPG. Throughout Wayne's long battle with cancer he continued to keep the needs of Amateur Radio, NTS, and ARS in the forefront of his thoughts. While in considerable pain he did not despair and through faith kept his spirits high until the end. Our Section will miss Wayne's spirit and contributions. Thanks to all of you who kept Wayne in your prayers. Tom Dollard, SGL, WB6WFG, has resigned his position due to pressing personal needs. Our sincere thanks to Tom for all of his assistance in the State Capitol. UPGRADES: KB6FVS became N6LGG, W6MHG became KG6MS, KA6FCE to N6LHL. New Calls include: KB8HKO, KB6HGC and N6LHB. Congratulations to each of you. It's the time of year to again look at Public Service calendars. Make sure you let me know what your group is doing. Traffic: N6CVF 02, WA6WIZ 74, WB6FZ 64, WB6RF 24, W6RFF 23, WA6ZUD 21, KA6PDG 14, WB6SRQ 6, (Dec.) W6BZQ 31.

SAN FRANCISCO: SM, Bob Smith, NA6T — SFRC Radio Club had a very successful "Computer Fast" with 18 different computers demonstrating all types of uses including amateur radio. This would be a good meeting program for any club. Sorry to hear that Vern, WB6RTE, is a Silent Key. A scholarship has been set up at Vern's wish for a deserving electronics student at "College of the Redwoods" in Eureka. Early word has it that JS Ladd Chapter of Telephone Pioneers has won the contest again — good work. Don't forget the SCRA "Flea market" in September. Both buying and selling, good times, and UPGRADE TESTING. Get used to CW again and join the slow speed CW nets. Check with SFRC and MARC for information. Traffic: W6RNL 254, W6IPL 220, K6TWJ 154, KK1A 55, N6FWG 53.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA8YAB, STM, N6AWH, TC: WA8EXV, ACC: N6ECH, Asst. SMs W6TRP and K6YK. Appointments renewed: EC WA6QYF and WA6UOR; CO WB6ITM. KA6FCH is the new EC for San Joaquin County. WA8ZCL is a SILENT KEY. New officers of the Stanislaus ARA (SARA) are Pres NV6S, VP N6JRC, Sec KG6LY, Treas KB6DXX. The club meets the 3rd Tuesday in Modesto and operates WD6EJ/R on 145.39 and 223.88 MHz. If your Club prints a newsletter, be sure to include the SM, Director and Vice Director on the mailing list. KB6HGW is a Novice, KB6DKT and KA6YZU are General. N6AWD and WB6RR has IC 751s. AF6Y has an IC 02A1. KB6BSF has an Azder. K6CS 4000. K6ECS has HF amplifiers galore. The Fresno Hamfest is May 3-6, 1985 at the Tropicana Inn in Fresno. Plan to attend and keep this event going in the future. Traffic: N6AWH 91, W6DPD 16, WA8YAB 8, W6SX 8.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — BM: WB6CY, PIC: N6BIS, TC: K8HLE, SEC: K6ITL, ACC: W6MKM, ASM: NS6N, STM: W6PHT. Welcome to new Section Appointees, WB6CY and NS6N. WB6CY is the Section Bulletin Manager. He is responsible for disseminating ARRL Bulletins from W1AW on the Section Manager Net on Tuesday evenings on WB6OQS (146.76). NS6N has been appointed Assistant Section Manager. He is responsible for collecting information about the VEC program so that information can be made available to the SCV Section Amateurs. If your club or group is having a test session be sure to let NS6N know about it. By the time you read this, the section will have a telephone number that you can call and obtain information about test sessions in the area. Tune in to the Section Net for further info. In addition to the WD6YH/R system (224.46 & 443.125) the Section Net is now carried by WB6ADZ/R (146.715). W6PRI reports that the Stanford Park Emergency Preparedness Net meets every month on the Thursday closest to the 15th of each month at 12:15 local time on 147.48 simplex. The purpose of the net is to test communications

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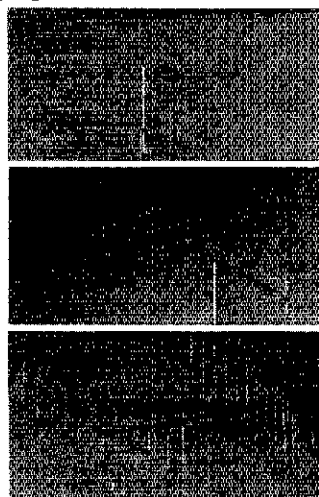
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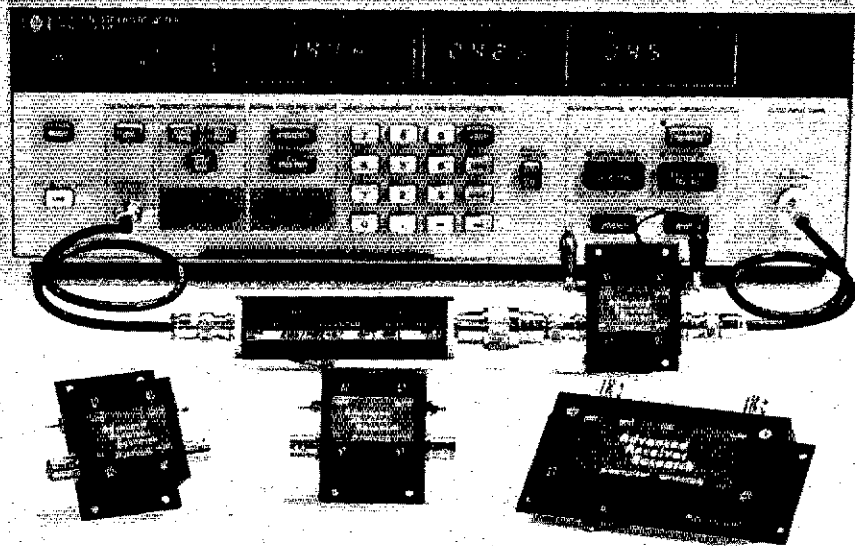
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SP220VD	220-225	<1.9	15	0	DGFET	\$59.95
SP220VDG	220-225	<1.3	15	0	DGFET	\$67.95
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capabilities between the various industrial facilities in the Stanford Park area although the net is open to anyone from any company in the bay area and all are encouraged to check in. Immediately after the simplex net, a second session of the net meets on the Varian ARC repeater on 147.315. The session has been quite well received by the various companies involved as well. K6JTL now has his homebrew antenna system performing very well. 12 elements on 20 meters, 16 elements on 15 meters and a 32 element monoband on 10 meters helped him garner first place in the San Mateo City DX contest recently. Because of space limitations he is limited to rotatable Rhombics on 80 & 160. Official Relay Stations should report their monthly traffic totals to STM W6PHT so that they can be included in her monthly report. I hope everyone has written to Senators Wilson and Cranston in support of Senate Bill 66 and Senate Resolution 36. Silicon Valley Radio Communications System (SVECS) has new leadership for 1985. N6KJ is Chairman and Technical Vice-Chairman. N6JQJ is Net Manager and the Technical Committee is composed of WA5ZBX and WB6ADZ. SVECS recently had a quarterly breakfast meeting that drew over 80 people interested in emergency communications. If you're interested in becoming involved in the group and live in the central Santa Clara County area, tune into the SVECS net on Tuesdays at 8:00 P.M. on WB6ADZ/R (148.715). If you live in the Northern part of Santa Clara County, tune into the Southern Peninsula Emergency Communications System (SPECS) on Monday evenings at 8:00 P.M. on 145.27. Both systems now carry the Westing radio reports 145.715 on Sundays at 7:45 and 145.27 on Mondays at 7:45 P.M. N6JGA, the EC for San Jose, is coordinating the amateur participation in the 1985 World Police and Fire Games that will be centered in the Santa Clara area with events taking place in several of the Bay Area Counties. WA6PWW is the Technical Coordinator for the event. He will be coordinating the operating frequencies and the equipment needed to cover the event. Over 11,000 policemen and firemen from around the world will be participating. It presents a good opportunity to showcase amateur radio. Electronics Museum Amateur Radio Club officers for 1985 are: Pres-N6GXX, VP-VA6TKV & Sec-WA6JON. The Flea Markets are once again in full swing at Foothill College the second Saturday of each month through September. K6GZK is building quite a repeater system. His 224.82 repeater is now linked into Lake Tahoe and his 224.64 repeater is linked to repeaters all the way to the San Diego area. K6GZK's 224.60 will soon be linked to a repeater near Lake Isabella and then into the Los Angeles area. N6FW reports recent grads of the Sylvania GTE ARC Novice class are: KB8s GLW, GLX, GNB, GWN & GWO. IBM SJ ARC officers for 1985 are: Pres-A462, VP-N6AKK, Sec-K6GKD & Treas-KJ6K. The IBM ARC members are providing communications for the Terra Bella Century bicycle tour through southern Santa Clara County. For those in the Section interested in Packet Radio, there is now a packet link to San Diego through W6AMT digipeater (145.01) located on Loma Prieta. Traffic: W6YBV 104, W6PRI 7.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN — SEC: AB4W, STM: K4NLK, BM: K4JWW, ACC: WC4T, PIO: WA4QBR, SGL: AB4W, DANGER!! BE ALERT AND READY! Tornado season is here. Remember March 28, 1954! Get involved in Emergency Communications — ARES and traffic handling. NTS and be prepared to help if and when needed. That's what we're here for! — PUBLIC SERVICE. Congratulations to W4JAW, who won the division first place award for best newsletter in its category. Award presented by Dir. WAJUG at Division Convention; To W4DW for qualifying for BPL. Nice to see swell group of amateurs in section at the Convention. Reports received indicate that section has made significant improvements in most aspects of the League Field Programs within the last year. Keep up the good work. I compliment all who have made this possible. Raleigh Hamfest April 14. New location is NC State Fairgrounds. Everything enclosed. FCC Exams — Contact W4JW for more info. Other Exams: Winston-Salem April 20, cutoff April 14. FCC Exam at CC Norfolk Office, and his start meet with RARS club. If you have any good information on amateur radio. Thanks Jax. Over 600 HAM WATCH plates made. Have you ordered yours? If not contact AB4W. Packet Radio is picking up steam in section. W4RXG is working on his repeater on 145.01. This Section needs to start frequency coordination. I need your ideas and suggestions. Is your Packet Radio repeater coordinated? FCC is proposing major changes in Part 97 to curb growing problem of interference. Watch for NPRM, League Planning Meeting May 11-12 in Raleigh. Special guest from League Hq. K9CH, will talk with VECVE's about exam program. This section will be the host for LPM. Let's get a representative from each club to attend along with all league members. This is where you can express your views to Division and League staff. Write W4TJU for details. Amateur Radio has fared well thus far with new administration in Raleigh. Wish everyone a Happy Easter. Traffic: K4NLK 217, K4EYF 210, WB4HRR 152, WB4WII 135, WA4OBR 98, WB4N 90, N4JRE 89, KB4FLW 78, WD4LR 78, WB4DAR 89, WA4S RD 50, KB4JVV 44, K4SWN 43, WA4MNR 35, N4CJ 33, K4AYMY 33, WD4CEB 32, NE4J 32, NT4K 31, N4JEO 27, K4YJB 27, N4LFX 23, K4GI 22, WB4CYN 19, WD4HE 19, KU4V 19, N4JLE 16, K4QXA 12, W2JDB 10, WR4E 7, N4KYD 7. (Dec.) W4W 210, NE4J 35.

SOUTH CAROLINA: SM: Jimmy Walker, WD4HLZ — ASM: WB4JLJ, ACC: WA3WJP, BM: WB1KT, OOC: W4NTO, PIO: WD4NMF, SEC: K4JUG, STM: W4ANK, TC: NE4G, AIRS: W4DRF (1) ARRL State Convention, Greenville Hamfest, May 4-5. A combined meeting of the SC and NC Net members and interested amateurs is scheduled for 2:00 P.M. Saturday. Presentation of the SINGLE SIDEBANDER OF THE YEAR Award will be the highlight of the meeting. (2) League Planning Meeting, Raleigh, May 11-12. This is the annual meeting in which league members and officials meet and discuss future courses for the ARRL. The meeting will start at 1 P.M. Saturday and all clubs are urged to send a representative. Write W4TJU for info — LPM 195. Nets Oct-Jan: SCSSB 4709/527, SCNT 875/261, BRARS 636/262, GP22NN 368/2461, York 867/98, Lancaster 549/35, Traffic: K4ZJN 127, K4WJR 119, W4ANK 118, KB4ZTA 70, W4NTE 61, K4ALR 61, K4ZB 50, WD4FJP 38, WB4UQ 35, W4FNMZ 34, K4AYEA 20, W4JF 15, W4V4B 11, WA4JWS 10. VIRGINIA: SM, Claudia Falgley, W3ATQ — STM: WD4ALY, SEC: WB4UHC, ACC: WD4KQJ, OO: W4HU, BM: AB4U, SGL: W4THV.

VN	1 PM	3907	AA4AT
VSN	6 PM	3947	WB2OMZ
VSN	6:30 PM	3680	KB4WT
VN (EARLY)	7 PM	3680	K4JST
VN (LATE)	10 PM	3680	KR4V
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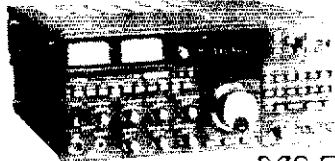
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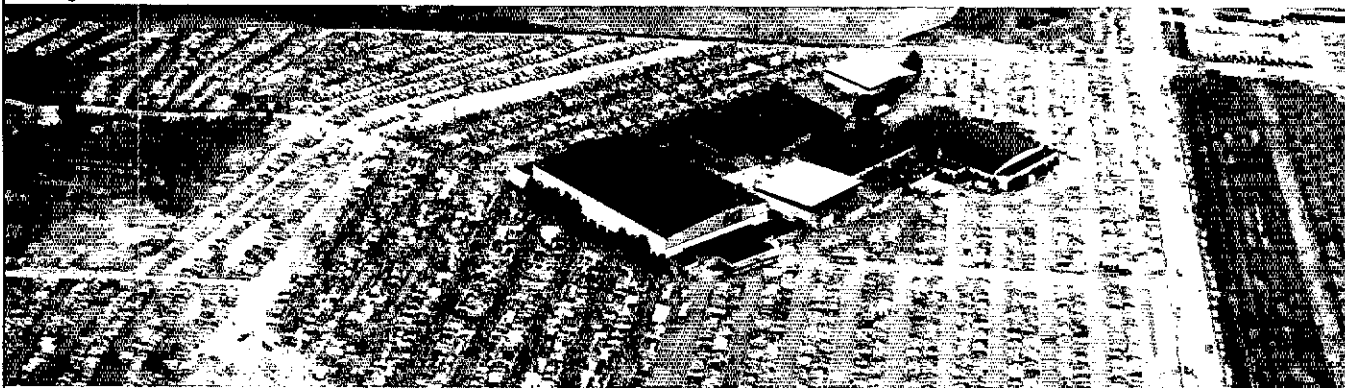
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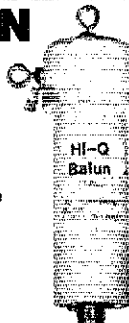
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D-40	40/15	68'	28.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
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SD-80	80/75	90'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80,40,20,10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
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PD-4020	40,20/15	66'	33.95
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containing job of providing communications to the Va. Winter Special Olympics. LARC stns were WA4RTS N4BTM KB4JL W8KMX W4WVQ N4KSS W4KNC N4JLC KA4MVO W4OKM KA4YNO W4KBJ K4YCR. Others were WB4FNW WB4JHC and WA1VRL. The Prince George/Hopewell ARES were alerted by the Red Cross for communications at a Hopewell chemical train derailment. Stns who responded were WA4HJH, WA4HJL, WA4HJ, WB4KZI KA4YZ K4OJE WAHTR N4KDE KB4LIF N4EXQ (DEC) and KA4HBU ARES Coordinator for the area. Sorry to report as Silent Keys K4AB, K4FX and WB4PFM. KB4PW reports 16 SW Va Wireless Assoc. stns active helping the Star City Marathon. WB4FDT's XYL now KB4MBF. As a result of action taken at the ARRL Annual Board meeting it is imperative that I fill the job of section Technical Coordinator (TC). Anyone who would like this appointment contact the SM for details. Assistant Technical Coordinators (ATC) are needed. Also the job of Public Information Officer (PIO) is open; contact the SM if interested. The Division League Planning meeting is set for May 11-12 at Apex, NC, which is just south of Raleigh. This is an excellent chance to take part in planning future activities of ARRL. Each club should try to have a representative; contact the SM for details. It's time for Field Day planning. Field Day will be June 22-23. KB4EQO has gone to Florida, AF4V to Calif. Welcome to K0BET in Alexandria. W4HU reports KE4EQ, WB8RT, K4JDJ and WA4PGM active as OOs. Would like to have more stns willing to assist in this program as well as assisting in the bulletin dissemination by becoming an OBS stn. If interested contact AB4J. As of Feb. 1985 our section has 178 VEs who have qualified with ARRL. 153 of the stns of the section are now holding exams. Traffic 3478 with 10 stns reporting: Traffic: AA4A 483, N4GHI 472, N4EXQ 312, WA4CCK 238, WD4ALY 181, W3ATQ 179, WD4OCW 167, WB4PNY 162, K4KDJ 153, AA4GL 144, K4VJ 98, KB4WT 98, K4AXF 94, K4JST 94, KA4IUM 62, K4JM 49, WB4EDB 45, NT4S 44, WB4FDT 36, KB4OG 36, KB4PW 33, NW4O 30, K4GR 28, WB4VMX 26, N6ANQ 22, K4ECD 21, N4FNT 20, N4KSO 20, K4MTX 18, WB4KIT 16, K4VVK 15, W4LXB 14, W4YE 10, K4MLC 9, WB4DQZ 8, W4PVA 8, WA4TV5 7, K3RZR 6, W4TZC 6, K4J4O 4, KA4ZTB 3, N4LE 2, N3RC 2, KC4HN 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: KB6EW, STM: KD9G, ACC: WA8CTO, TC: K8CG, SGL: K8BS, Net Coord: WD4KHL. VEC net meets daily on 3638 at 8:30. Participating so far has been good. KD8RD welcomes all chngs. regret to report that KB9GX and W8RGE are now Silent Keys. Plan now to attend Jackson's Mill on July 6 & 7.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3860	8:00	1139	103	31	N8AJC
WVMD	7230	11:45	1128	72	31	WB7ZP
WVN	3687	7:00	254	99	31	WBLYV
WVRN	3639	8:30	250	35	18	KD8RD
Hillbilly	14290	Noon Su	148	30	4	WB7YV
KFC WTR	4718	3:30	29	0	73	N8FPF

Traffic: K2Z 179, WD8DJ 197, WB7P 73, K8SOMM 66, KB7PF, WA3JUI, KB9EW, K8KT 42, KA8OGM 34, W8CKY 25, W8HZA 22, NC8G 18, W8CAL 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, K0BJ — SEC: WB9FQB, STM: WD8AIT, OO/RFI: N09F, ACC: WB0DUV, PIO: KA0PYH, SGL: WD0GQL, TC: KO0P, BM: WB0MDT. The 6th annual Western Slope Amateur Radio & Computer Swapfest is April 20th in Grand Junction. VE Test is scheduled. Contact: KD7EY. Info. on Swap activities contact WB9EVC. Always a good one . . . and April is a good month to travel to the Western Slope. Since Walk-ins have been approved for 1/2 Tests . . . Remember that it is up to the individual VE Teams as to their policies on Walk-ins. Walk-ins. Check with the Contact person of scheduled VE Tests . . . as many will still require that you apply 30 days in advance. The schedule of May VE tests are May 9th Aurora (K0BJ), May 18th, Littleton (WD8AIT), SEC, WB9FQB & DEC, WB0TUB have recently had meetings with the Eastern ECs & Southeastern ECs, they plan a future one for the Northeast ECs. Also in the planning of WB9FQB & DEC, K0BWR, will be a meeting of Western Slope ECs. These meetings have been very successful with useful information obtained. With planning underway, as soon as the snow melts, we will begin our trek into the Western Slope. This time the name droppers: N8FC, WB8ZID, N8DRE, 73, K0BJ, NETS: Col; QNI 845, QTC 26-Inf 133, Time 852, 26 sess. CWN: QNI 122, QTC 38, Time 419, 28 sess. CWN: QNI 2660, QTC 3110, 2090 time, 31 sess. HNN: QNI 1957, QTC 90-Inf 406, Time 2578, 31 sess. NCTN: QNI 248, QTC 57, Time 336, 24 sess. SCTN: QNI 81 QTC 7, Time 89, 12 sess. Traffic: N0BQP 2487, WA0HJ 1999, W8ACH 535, K8FXK 435, KB2Z 138, WA0YJ 119, N0DZA 112, K40G 102, WD8BS 92, WB0MDT 75, WD8AIT 68, KD7EY 33, KL7IP 17, W0NFW 17, A10W 17.

NEW MEXICO: SM, Joe T. Knight, W5P5D — ASM: W5HD, DEC: KB5XD, STM: ND5T, NMs: WASUNO K8LL W5VFO, TC: W8GY, ACC: W5HD, Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 140 msgs with 215 stations in New Mexico. New Mexico Net meets daily on 3939 at 0100 UTC and handled 62 msgs with 110 stns in New Mexico. Breakfast Club meets daily on 3939 at 0630 local and handled 79 msgs with 1032 stations in. Yucca 2-Mtr Net 78/18 & 93/33 handled 18 msgs with 385 checkins. Caravan Club 2-Mtr Net 66/06 handled 11 msgs with 148 checkins. SCAT 2-Mtr Net 66/06 handled 30 msgs with 633 checkins. The first ARRL VE exams in ABQ were a huge success with a 85% passing rate. Our congrats to all. Sorry to report the passing of W5MYM, BEAN FEED, Las Cruces, April 27-28 with ARRL VE EXAMS. Traffic: W5DAD 116, N5EXC 4.

UTAH: SM, Ron Todd, K3FR — STM: W7OCQ, SEC: NA7G, BM: WA7ML, OO/RFI: KD7FL, ACC: KB7XO, PIO: N7BHC, TC: K7EX, EXAMS: N7IE, Cedar Mountain ARC having a big Do May 17-19 at Little Salt Lake Area; exams, camping, swap-fest, etc. Contact: K7LJK. K7LJK, WB7UJO, re tests. K7MQ planning vacation to VE7 this summer, will take rig and be operating 3935. UPRA coordinating 2 mtr packet frequencies. Keep me aware of summer events. I'll see what I can do to come visit. Now that nice wx on hand, safety first with your antenna projects. Traffic: K7HLR 242, WA7KHE 93, WA7MEL 19, KO7H 15, W7OCQ 9, K3FR 8, N7BQE 1.

WYOMING: SM, Dick Wunder, WA7WFC — Asst. Section Mgr — KA7WAS, Steve Cochran Sect. Emergency Coordinator — W7TVK, Jim Anderson. Wyoming Hamfest is July 13 & 14 at the Wyoming State Fairgrounds in Douglas, Wyoming. Hope to see everyone there. Cheyenne Club has a Novice class in progress with 30 students. The ARRL/PACES Net is holding a CW and RT check-in session following the SSB portion. Listen in at about 8:30 A.M. Sunday morning on 3923 kHz for the specifics on what mode and where for that particular day. Wyo. Cowboy Net held 23 sessions with 847 QNI & 14 QTC. Wyo. Jackalope Net held 27 sessions with 489 QNI & 2 QTC. Tnx to the

Volunteer Examiner in Wv. Additional KO traffic: W7LYA 814, Traffic: WB7NHR 180, W7HLA 22.

SOUTHEASTERN DIVISION

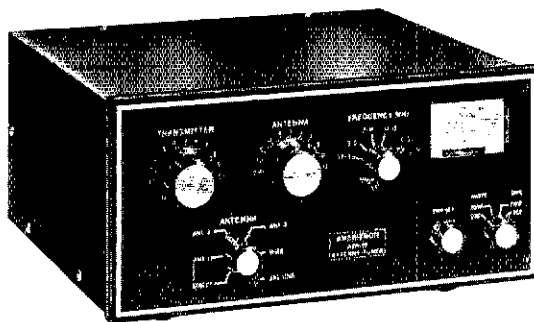
ALABAMA: SM, Joseph Smith, Jr., WA4RNP — SEC: N4DMA, STM: NAJAW, SGL: KA4WVU, BM: KF4VV, OO/RFI: K4ELV. Here are the new Cadaver Amateur Radio Club officers for 1985: President: Greg KA4ZV, V Pres: Dwayne KE4E, 1st Vice: Bill W4GH and Secretary: Ed WA4GJ. As of 1/10m historical records are the Haylark to four ladies: President KA4SHI Teresa, V Pres N4HIX Melanie, Secretary WD4DDJ Shirley, and Treas WA4DJY Elizabeth. Some recent upgrades include KB7PY to Gen, KB4E4F and KA4W/LK to Tech, with KD4JD and KA4WZD to Extra Class. Congratulations to all of you. We have a new ARRL affiliated club in the section, it's called the 67 Repeater Group and is from the Gadsden area. Here are six Silent Keys: W4NCK Groce W. Johnson of Selma, K4HNO Jack Wrenn Sr. of Hueytown, W4DUW Jack Patterson of Huntsville, K4QP J. P. Sweeney of Mobile, W4UHA Jack C. Short of Oxford and K4CQC "Woody" Mitchell of Montgomery. They will be missed. Traffic: BPL WA4JDH; PSIR: WA4JDH; WACKS: KB4GXP WA4LXP WX4I and WA4RNP. CAND reports 701 messages in 31 sessions with DRNS rep 100% by NW4X W4CKS and WX4I. DRNS reports 639 messages in 82 sessions with Alabama rep 93.5% by WA4JDH KC4GS W4CKS NW4X WB4IXA W4WJF and WX4I. Very Seventy Three Joe, Totals: WA4JDH 667, W4CKS 90, WX4I 70, NW4X 62, KB4GPN 51, WD4NYL 42, WB4IXA 33, WA4RNP 32, KA4OZ 30, WA4LXP 21, WD4DGH 14, W4ZIJ 12, KC4GS 6, W4WJF 4, and WB4TV 2. Traffic: WA4JDH 667, W4CKS 90, WX4I 70, NW4X 62, KB4GPN 51, WD4NYL 42, WB4IXA 33, WA4RNP 32, KA4OZ 30, WA4LXP 21, WD4DGH 14, W4ZIJ 12, KC4GS 6, W4WJF 4, WB4TV 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB84Y, STM: K4VHC, ACC: WA4ABY, BM: WA8IA, OO/RFI: WA4RZL, PIO: WA4PNY, SGL: W4B7Z, TC: K4UDR, NWS: WA4PZD. The past year has been one of many frustrations. With my change of employment, the loss of my father-in-law, odd working hours & having to help care for my mother-in-law made a big change in my normal routine. For over six years as ur SCM & now SM I endeavored to perform my duties to the fullest. Since I don't foresee any future changes in the previously mentioned obligations I will not be a nominee for the forthcoming two years. Petitions for the nomination of a new Georgia Section Manager can be found in this issue and K4SMD over your choice and elect what you feel is the best cooperation in the transition so that we can keep the Ga section moving forward. My term of office expires on Sept. 30th. Conyers ARC Net on Mondays at 8 PM on 147.21/147.21. Their new officers are Pres: KE4SG, Vp: WB4CXP, Sec: WB4YBH & Treas: WB4YBG. Chehaw elected WB4TFW as Pres. K4IBW 1st VP, WD4NAE 2nd VP, K4HAV Sec, KB4AJ Treas. Lanierland ARC new officers are Pres: N4FCL VP: KA4JGR N4BYX as Treas, Sec: WA4YWK, Act mgr: KA4JGR. Remember the annual Kennesawhamfest Hamfest Sat. April 13th at the North Georgia Fairgrounds. Tnx to the gang at Metro A1 Tel Pioneer APF for the FB newsletter. ARRL officers sent a letter to the ARRL Sec. WA4QO, Treas: E4Q, Trustees: WA4PM & WA4BT, Mgr: K4LDR. 1985 Middle Ga Computer Expo will be held at the Recreation Center in Warner Robins on April 12-13. Proceeds will be donated to the Ga Special Olympics & the Meals-on-Wheels. The Georgia section Hamfest season is underway. Most clubs keep their repeaters on the air from the proceeds of these activities. Won't u get out & help support some in the section? Traffic: W4PIM 168, N9ECB 54, W4JWO 42, K4EV 41, K4FME 40, N4DQM 28, W8NXC 28, K4VHC 21, WB4NTW 18, WD4NGI 16, WA4ON 16, WA8IA 12, KF4FG 12, K4NM 8, K4BAI 6, KA4AIM 4.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X — STM: WA4QJ, SEC: WA4FPU, PIO: WA4FQ, BM: KB4LE, SGL: K4CAN, OO/RFI: K4JJE. This month we are glad to welcome Jim, WF4Y, and Walt, KE3D, as the latest additions to our ranks of the FCC Amateur Auxillary, and urge those who may have failed the test to keep trying. Our Volunteer Examiners are continuing to do a great job, but some of the areas with several clubs are finding that they need a council type governing body to coordinate and manage this valuable resource. Our Section Emergency Coordinator, Rudy, WA4PUP, is seeking inputs from Clubs and individuals on candidates for ECs for those counties in our section not having an active EC! We are badly in need of help in the northern tier of counties; so talk to your friends and us. We are also looking for help in solving trouble with the League getting our list of Traffic Handlers into the Section News and the BPL Column in the same issue of QST; know they're busy so going to start sending them two copies appropriately marked to see if we can help them help us! Traffic: WD4IO 598, WF4X 592, WX4H 450, N4PL 354, WF4Y 323, WA4QXT 293, WB4ADL 254, KC4VK 219, KB8LT 200, WA4EYU 158, KD4KC 138, WD4HBP 115, N4GMU 104, K4VND 98, WD4MLQ 87, WB4TZR 79, W4MGW 77, WB4GHU 75, W4KIX 65, N4JAC 63, WD4UI 60, N4EDH 55, KF4J 55, KC4FL 53, N4YI 54, WB4YQP 50, NY4E 48, W4GJU 47, AA4FG 43, N4ADJ 38, K4CC 28, N4QF 22, WD4JDU 18, W4P4Y 18, W4DY 17, N4S4 17, WA4ST 14, KF4GY 13, W4AWWG 12, W4M 11, WD4EQB 10, WX4J 9, KB4LHP 9, WA4PLJ 8, N4EN 6, N4UF 6, N4JH 6, WD4BTQ 4, N4AF 2, (Dac.) AA4FG 391, WD4BTQ 174, W4GJU 106, WD4JDU 42, WA4STZ 19, N4UF 6.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFF — SEC: W4SS, STM: K4ZIK, TC: K4IAT, BM: WA4EIC, PIO: W4WYR, SGL: KC4N, OO/RFI: W4SS, WA4EIC reports total bulletin activity of 68 bulletins received and transmitted this month. Bulletin statistics reporting were WA4EIC 22, WD4KBW 8, WT4F 8, K4IEK 12 and AA4MI 16. K4IAT has been appointed as the chairman for the Emergency Communications Advisory Committee. W4SS reports that the governor sent a letter to the Palm Beach Radio Council thanking them for their efforts during the storm last November. WB4NYG sent a radio message to the manager of WIN4IV, Bob in Tallahassee, as the new assistant manager for the Florida Phone Traffic Net. N4KB says that high speed code practice was held on 3636 and 7085 kHz at 0130 UTC on January 3, 7, 10, 14, 17, 24 and 31. W4JM says he has been helping to teach radio classes which will lead to exams scheduled for March 27. Others involved in the teaching are W2HGV, WT4F, W9H0H, K8RIF and K4GKY. Anyone interested should contact WT4F at 813-858-9723. W4DL writes that he and KF4PR married recently and are house hunting in the Lake Placid area. He says that he will get set up somewhere and be back on the air. Since his next test he has to take the test with a pre-arranged time — WB4WYV was also off the air with pneumonia recently. W4IRA also back on the air following a hospital stay. W4DVO not heard recently and understand he may be sick also. Sure hope that when you read this everyone is back in good health! W4LLA reports 28 phone patches this

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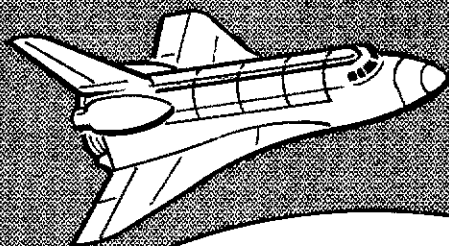


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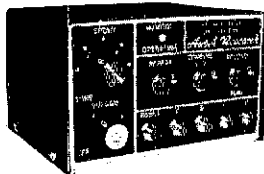
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month. The Miami Hamboree was in early February and excellent as usual. Congrats to WA4YR, Tropical Hamboree Chairman and also to KI4T who chaired an outstanding program on packet radio. KI4T has also been working with a committee of Coral Gables amateurs. This group has worked in cooperation with the City Planning Department to enact an Amateur Antenna Ordinance. Anyone wishing a copy contact KI4T for a copy with an S.A.S.E. 73 de WA4PFK. Traffic: W3CUL 3289, W3VR 894, K4ZK 323, WA4PFK 292, K4SCL 271, N4KFU 218, KJ3T 204, KF4JA 158, WA4HW 116, KA4YHS 108, K4IA 108, WA4EIC 94, KA4GUS 93, W4PKP 85, KY4U 85, WB4WYG 85, AF3S 84, N4KB 80, KF4RL 74, K4EUK 69, WA4HXU 69, K4YCL 64, WB4AID 61, KA4NXF 60, WJNJJ 54, WD4KBW 53, W4LE 47, W4MIA 47, W2ZNL 44, WD9AEP 42, KA4FZI 41, KM4Y 38, K5IHH 36, K5EHP 34, K4JI 34, WB4GCK 31, W3TLV 27, K8BXT 20, K2GQU 20, W4SS 19, AA4MI 18, KA4SIH 15, WD4MCC 14, W3JLR 13, N4JOA 13, WD4NXX 13, K4IRT 11, KA4RWW 11, N4HAS 10, WT4F 9, W4UIO 9, WA4YNO 9, KA4KDD 8, KA8AKY 7, KB4ELQ 6, WK4F 6, N4ILN 6, KD4GR 6, W4MPV 5, NX4 5, AA4WJ 5, KA4GDU 4, W4MFD 3, K4OVC 3, KB4AXD 2, N4IXQ 2, WA4ATF 1, KA4EBO 1.

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 8:30 P.M. (2250 UTC). Desecheo Island will be revisited early March by a new group now headed by K5LZO and backed by the Texas DX Society. The group, a total of 12, including the cook and maintenance man will depart from Cabo Rojo, Puerto Rico the 7th of March and will be operating 15, 20, 40 & 80 meters and 160. Emphasis will be given to 40 and 160 meters. The group consists of K5LZO, KZ5M, KA5SBS, KD5SP, N5JJ, NP4KA, WP4C and WP4ATF. The Puerto Rico Amateur Radio Club will hold its first examination session the 23rd of February with the first group of accredited ARRL volunteer examiners. The next session will be on March 30 and thereon the last Saturday of each month. Those interested in applying to take the test at any of these sessions send Form 610 together with check or money order for \$4.00 to GPO Box 693, San Juan, P.R. 00936 or just write to the Club for information. KP4DJ reports the following totals for WINS: QND 424, QTC 51, QNI 94, 31 sessions. KP4BK reports the following totals for WINC: QND 462, QTC 18, QNI 448, 31 sessions. Traffic: KP4DJ 59.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzar, N7EH — STN: W7EP. NMs: K6LL WB7CAG KA7HEV. Well it seems that everyone has settled back and is taking a rest to get ready for the spring public service events. None of the club newsletters indicated any public service event participation. The TRA reports the following new officers for 85: Pres. K7KYW; Vice Pres. N7ECJ; Sec'y. K7FTZ; Treas. W7EYB; Bd. Mbrs: KB7HU and N7EH. QPC reports its new officers for 85: Pres. KB7YK; VPres. WB8KSW; Sec'y. KB7NE; Treas. N7BXX; Bd. Mbrs. KD7KW AF7M WA8NNG KA7RHD W8YOY. The following have completed the necessary training and have been accepted into the FCC. Amateur Auxiliary and have been appointed OOs: NJ7E, KB7VY. PSHR for January again KB7FE. W7AMM reports he will spend the next 4 1/2 months in South America. If your club does not presently have the Section Manager on its mailing list please be sure to add him. SWN: QNI 215, QTC 140, ATEK: QNI 128, QTC 138, Cactus Net: QNI 682, QTC 90. Traffic: KB7Z 348, W7UM 136, KF6T 126, W7EP 102, KB7 85, KA7TCI 48, W7OC 43, KA7HEV 38, W7LVB 27, K7JKM 27, WB7CAG 28, W7KXE 21, KP7OP 19, KA7KHU 16, WA7KOE 10, WA7NXL 9, W7DQS 7, K7NMQ 1. (Dec.) N7GQM 39.

LOS ANGELES: SM, John Walsh, N8UK — ASM: N6ZH. STM: W6INH. SEC: N6ZH. ACC: KX7C. W6LS has undertaken a major volunteer examiner effort. Novice through extra on the first Saturday of every month. Applicants must submit a Form 610, a four-dollar check (payable to ARRL/VCEC), and a SASE at least thirty days prior to the test. The check is not required for the Novice test. Thanks to W6LS for a grand effort. Other VE groups are active and will be noted as the dates firm. KX7C is welcomed as the new ACC. We appreciate his willingness to undertake the task. Royce is the City of Arcadia. The Arcadia antenna ordinance issue is now history as a result of an outstanding effort by a great group. Kudos to W6VIF KE6IM W6OCV WA6ACS W6RBB W6VHU N6AJK N6EID KA6KDU K6YNW W68CJW W68WCY N6NO N6NB W6UOJ K6KIL and W6VZA. Their efforts won the support of the Arcadia City Council which voted to throw out the entire ordinance. K6UYK really set a traffic handling record what with the regular messages plus the Olympic ones. Congrats to K6UYK the newly appointed DPAN Manager, also to K6DD, the new ORS, for doing a big job on SCN. We lost an old faithful trafficer recently as W6HJJ is now a Silent Key. The cheers are in order for the hundreds of SoCal amateurs, particularly in the Los Angeles Section. At its meeting held January 8, 1985, on motion of Supervisor Michael D. Antonovich, the Los Angeles County Board of Supervisors recognized and supported the efforts of ARES and the volunteer radio amateurs in their role of supporting the Los Angeles County Fire Department during times of extreme emergency, especially in developing and preparing a back-up emergency disaster communications system. The first challenge will be the State "85" earthquake drill to be conducted April 18, 1985. ARES will work in conjunction with other organizations, i.e., RACES. By this date, the organization which will support the ongoing efforts of the Los Angeles County Fire Department will be in place. That is, N6ZH and his staff of the groundwork. If you are not already involved, ARES solicits your cooperation, assistance and support for the public service activity. Congratulations also to K6ASK on joining the FCC Amateur Auxiliary. On the traffic net, AIB6 had to resign due to work and the new section net manager is K6UYK. Note that K6UYK had a big traffic total for Nov. Chapter seven of the QCWA had gala dinner at Pikes Verdego with over 90 in attendance. Don't forget that early this year the SOWP dinner will show up. The VHF and RTTY nets are now bringing traffic into the NTS. This will increase the traffic flow. Many thanks to them for the help with heavy holiday traffic. There were a tremendous amount of messages going thru the system this year and without the help of some dedicated people it would have been very difficult. Special note to KA6HJK, N6GOT, K6UYK and many more. We made it in good shape. A special kudo to K6UYK for making A-1 Operators Club. Still need more check-ins on SCN so you who are interested in handling traffic please join in. It is a rewarding public service. Traffic: K6UYK 689, K6YBV 410, W6NH 307, W6ROF 16, W6NKE 12, W6DFWV 10. (Dec.) K6UYK 1523, W6INH 836, K6YBV 381, WA6OCM 124, K6AD 108, W6ORF 66, WA6BHF 14, N6DZQ 11, W6FPWZ 8.

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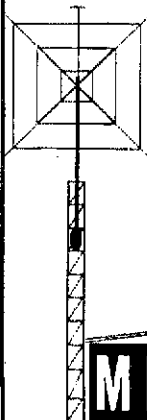
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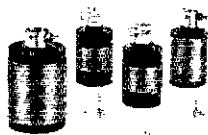


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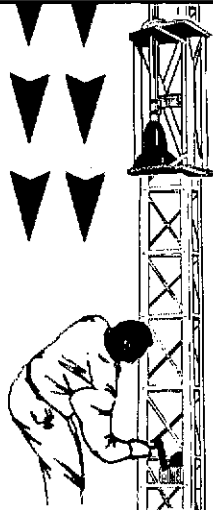
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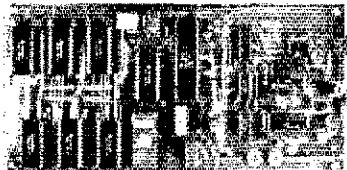
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K6CL 4. (Nov.) K6UYK 953, W6INH 329, K6YBV 229, W6OCOM 57, K6DD 37, W6NKE 18, W6ORF 17, N6DZQ 15, W6DFWZ 8, K6CL 2.

ORANGE: SM, Sandra Heyn, WA6WZN — ASM/SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLI. BM: W6DXL. OO Coord: W6RE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. Note the OO/RFI Coordinator is now simply the OO Coordinator. The RFI function is assigned to the Technical Coordinator. In addition the TC can make appointments of Assistant Technical Coordinator (ATC) in order to help resolve RFI problems as well as being a technical resource. ARRL Hq. has been reorganized so that the field organization will be headed by Field Services Department Manager K1CE. The entire field organization will be receiving the new newsletter "Field Forum" edited by WA4CMS. Starting April 1st W6UBQ will be your new Section Manager. Clubs are requested to send information including newsletters to the new SM. Affiliated clubs will receive \$5.00 commission for each new ARRL member they sign up in 1985. Yucaipa Valley ARC club net meets 8:05 P.M. Wed. on 146.655 (-) K6BNE/R. Congrats to new qualified OO/IFCC Aux member WA6RNA. New club officers: MI Wilson Repeater Association (MWRA): KA6WH pres. W6BHD v.p. KA6QZV rec. secy., W6BRSB corr. secy., K1UJCT treas. YL Radio Club of Los Angeles: WA6UBU pres. N6JDE v.p., WA6QKC treas., W65VAU rec. secy., KF6GW corr. secy. Ladies Amateur Radio Association of Orange County (LARA): KA6WAH pres., KA6NLP v.p. KA6TYO treas. N6F8T rec. secy., WA6JMT corr. secy. Irvine Disaster Emergency Comm (IDEC): WA6JIM pres., KF6LG 1st v.p., W65DIH 2nd v.p. N6KXK secy. Citrus Belt ARC (C-Bar-C): W6BQM pres., W6OGL v.p., WA6TRI secy., W6BQM treas. So Counties Amateur Teleprinter Society (SCATS): W6DFWZ pres., N6QZP v.p., N6OPP secy., W66INV treas. Western ARRA: N6ME pres., K6RUB 1st v.p., N6GC 2nd v.p., K6BT secy., K66AY treas. Hughes Fullerton EA A.C.: K66A pres., N66U v.p., W66Y secy., KA6PMT treas. For info on So Calif 6 meter radio group contact K6JZK, Orange County ARC Club nets are Wed. 9 P.M. 146.55 MHz and Sun. 8 P.M. (CW) 21.175 MHz. W6TIF is new manager of So Calif Net (SCN1 and SCN2). AIG6 will continue as editor for SCN Bulletin "Zero Beat." K6UYK is the new manager of the Daylight Region 6 net (RN6D) which meets at 9:45 A.M. and 3:30 P.M. daily on 7275 kHz. N6GA (N6GN) reports NTS Packet radio mailbox on 14.080 MHz. Outstanding ham and close friend W6POU became a Silent Key; his service included Santa Barbara Section Manager and ARRL Emergency Communications Advisory Committee, 5th Division Director WA6WZO has appointed K6YCI as the ECAC. PSRR: W66TIF, W66QBZ, WA6QCA, KA6HJK. Traffic: W66TIF 156, WA6QCA 146, KA6HJK 118, N6GOT 94, W66QBZ 76, K6ZCE 68, AD6A 66, W6CPB 34, K6CYD 25, N6FRW 16, W6TKV 9, KA6BNW 6, WA6WZO 4.

SAN DIEGO: SM, Arthur R. Smith, W6INI — PIO: K6GLF. ACC: WA6COE. TC: N6NR. BM: WA6HJJ. STM: N6GW. SEC: W6INI. The ARRL National Convention will be held in San Diego Sept. 5-7, 1986. Now is the time to plan your San Diego vacation. Due to difficulties encountered, SANDARC-VEC will no longer accept walk-ins. Form 810 must be in their hands ten days before the test date. For details phone 619-465-3926. Extra class volunteer examiners are needed. Palomar ARC a repeater problems were solved recently by the Palomar Club. A new club consisting of K6BDNR, K66DIH, W6FQN, N6GZI, W66IQS and WA6QJQ. New voices heard on 220 with IC-37As: W6GVK W6INI KD6OJ. Club officers for 1985: ARC of El Cajon Pres KF8YB, VP KX6O, Sec WA6BJQ, Treas N26J, Poway ARS Pres KF6HU, VP W66BOD, Sec W65TAA, Treas K7YCI. No. County Tlc Net met 30 times, handled 101 msgs. Hone your DF skills each Sunday evening at 2000 hours on 146.04/64 during WESTLINK transmission. Tune to 146.04, take bearing and phone to 565-7515. Prize for closest bearing. Traffic: K66AI 95, K6MI 18, N6GW 17.

WEST GULF DIVISION
NORTHERN TEXAS: SM, Phil Clements, K6PC — ASM/ACC: N15V. STM: A6SI. OO/RFI: W65JBP. SGL: W5UXP. BM: W5QXK. PIO: N5FDL. New EC for Grayson Co. is KA5SLL. Mike takes over the helm of the fine group headed for many years by W658BO. The Texas Tlc. Net has moved to 3873 kHz and the new NM is WA5UIH. Congrats, George! New officers for the SVARA out Greenville way are: Pres/K2SCU, VP/WA5TMY, Sec/W5TXV, Treas/W65EV. Our STM, A6SI, has come out of retirement and is back at the TV set with diddle stick in hand! The 7290 Tlc Net is again hosting the annual picnic at Kerrville State Park on April 26, 27 and 28. Talk-in on 7290, 146.37/97 and 62 simplex. R5C for overnight camping in the park can be made by calling 512-267-5392. Other Net invited to the shindig are: Texas Tlc. Net, Texas CW Net, Texas Slow Speed Net, and D-RN5. The main program will be on Sat. morning, and the barbeque Sat. nite. Reg. starts at 1300L Fri. For more details, contact NM-W5TUK on 7290. PSRR for Jan. KA5AZK N5BT A6SI K6BUL KD5FR and KA5QYV. Traffic: N5BT 247, K65UL 221, KD5RC 158, KA5AZK 95, A6SI 83, W9OYL 60, KD5FR 56, WB4HML 43, W65VIH 39, W5QU 39, N15V 33, KA5SPT 24, W65EEH 16, KA5RYE 15, KA5QYV 14, W5CUE 9, K5PC 9, W65NFS 8, K2SCU 2.

OKLAHOMA: SM, Dave Cox, N65N — SEC: W5ZTN. STM: K5XK. ACC: N5JY. BM: W6AS. PIO: W65FB. OO/RFI: K5WQ. SGL: N5ZS. TC: W5GCM. Spring is here at last, and along with it come some weather forecasts that prepared this year by attending one of the many Weather Seminars near you. Check with your emergency coordinator, (EC, DEC or SEC) for details. We still need many local emergency coordinators throughout the state, so please contact W5ZTN to volunteer. All clubs need to contact N5JY for details on the "Club Challenge of the 80s." Also any club needing info on ARRL affiliation or Special Service Club certification contact N5JY. Mark your calendars: Great Plains ARC Eyeball, Mooreland, April 14; Green Country Hamfest, Wagoner, May 25-26; Ham Holiday, OKC, July 27-28. Congrats to Wheat Straw ARC on 25th anniversary. K5CY was presented Certificate of Merit at Section Leaders Meeting for outstanding work as Affiliated Club Coordinator. Traffic: W65SRX 243, K5CXP 212, W5VXU 183, K65EK 165, KD5QO 109, W6RE 83, WA5OUV 68, K6SOU 64, K55X 62, W65FB 50, N65N 47, N65L 45, KA5FUJ 43, N65V 39, K5CAJ 36, K6ENA 35, W65LSW 35, W65RB 35, W65JCE 30, W65VOR 30, WA5ZCO 27, W5VLW 27, K65BN 27, WA5OGC 27, N5PT 15, W5UYH 14, K6X6 10, N65S 5, W5JJ 2.

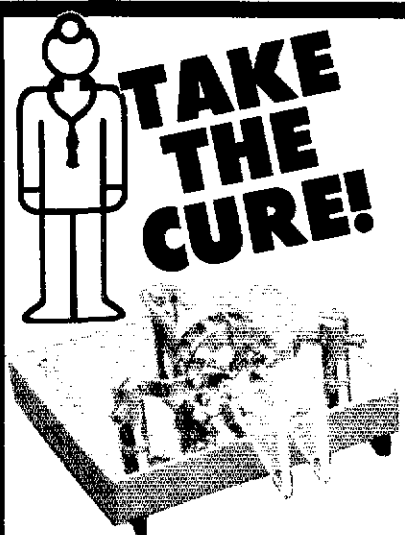
SOUTHERN TEXAS: SM, Art Ross, W5KR — SEC: KA5KRI. ASM: N5TC. TM: K5QEW. ACC: K65V. OO's reporting: W6BKK, K5IE. WA2VJL appointed OO/RFI coordinator Jan. 20. Texas Traffic Net (TTN) moved to 3873 kHz. WA5JMZ and KE5O gave excellent program on the OSCAR 10 to Beaumont ARC; BARC bulletin, BARN, is five years old this month. Brazos Valley ARC runs a SLOW SPEED

NET Wednesdays at 7:45 P.M. on 3740 kHz. Hill Country ARC, Kerrville, has Novice classes going regularly. Valley Amateur Radio Interaction Committee (VARIAC), made up from all clubs in the Rio Grande Valley, has been active in assisting in public events: Mercedes Livestock Show, several walkathons and triathlons, and will be active at the Brownsville/South Padre Island International Airport Fiesta in March; EC W6GUP coordinates with all concerned. Texas Southmost ARC, Harlingen, has classes going for all classes on a continuing basis; VE team members doing the instructing using classroom facilities donated by Texas Southmost Training Institute; TSTI will issue certificate of completion. Communications Hobby ARO received a nice write-up in Brownsville paper in its pitch for students and members. RN5 Manager K65W reports Texas represented 100% in January with A6SI K55V N5BT N5TC K5SOR K6BUL N5DKM W5CTZ WB4HML K5GM N5BB W5TFB and W65FQU helping do the job; K65V gets special mention for being most active. Traffic: W65DD 242, W5KLV 221, N5SJ 190, K55V 135, K5GM 135, N5DFQ 117, N5GKM 93, W5CZT 83, W65EPA 74, W65FQU 68, K6OJK 55, W65GKM 44, K5QEW 25, W6BGE 24, WA2VJL 18. (Cont.) K5GM 312, WA2VJL 12. (Nov.) K5GM 168. (Oct.) K5GM 161.

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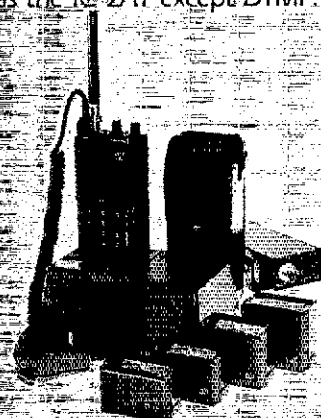
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tion. The IC-2A is also available and has the same features as the IC-2AT except DTMF.



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The high quality of AEA products is appreciated long after the price paid is forgotten.



**No Antenna
No Radio
No TV!**

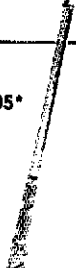
THE FANTASTIC DOCTOR DX™
CW Band Simulation That Is So Real
You Won't Believe It!


- Will improve the operating skills of ANY CW operator
- More fun than ANY Morse Code trainer yet devised.
- Use with a C-64, TV set, and key (or keyer).
- Experience the thrill of a "DXpedition" to anywhere in the world.
- Operate anytime you want, ideal for travelers.
- Impressive award certificates available for verified performance.
- On-going contests: 8-hour sprint and 24-hour marathon.

NOW \$99.95

HOT ROD™
½ Wave Telescope Antenna **\$24.95***

- Fewer telescopic sections than any ½ wave whips.
- Shorter and lighter than all ½ wave whips.
- Special matching network designed by Professor D.K. Reynolds (co-inventor of Iso-pole™ antenna) makes Hot Rod competitively priced.






- Most gain attainable for length of antenna
- Best decoupling of any commercial VHF base station antenna available.
- More gain than many antennas claiming up to 7 dB gain—don't be fooled by misleading claims!
- Zero degree angle of radiation.
- Factory-tuned matching net work.
- Greater bandwidth than any competitive product.
- DC grounded for static discharge protection.
- Documented cases of wind survival in 140+ mph hurricanes.
- Easier than any competitive antenna to assemble.

**Mast
Not
Included**

ISO = 144 or 220—\$59.95*
ISO = 144 JR or 220 JR—\$49.95*
ISO = 440—\$84.95*

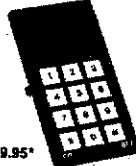
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ANTENNA™**



PKT-1 Packet Controller \$589.95*


- First commercially available packet controller for Amateur Radio.
- Uses TAPR circuitry and firmware.
- Digital radio communications for computer to computer.
- Easy to use—five usual commands.
- Multiple conversations on simplex channel.
- EVERY PKT-1 is a digipeater.
- Send computer files error free.
- Operates from 9–15 VDC for portable or fixed operation.

ELECTRONIC KEYS




\$109.95*
BT-1 Basic Morse Trainer

- Teaches code at 20 wpm.
- Random practice mode.
- Variable monitor tone.




\$149.95*
KT-2 Keyer/Trainer

- Proficiency Trainer.
- 01–99 WPM.
- Full-feature keyer (no memory).



\$199.95*
CK-2 Contest Keyer

- 10 soft-partitioned™ memories.
- Automatic serial number.
- Stepped variable speed.
- Two speed memories.




\$229.95*
MM-2 MorseMatic™

- Memory keyer.
- Auto serial number.
- Proficiency trainer.


All AEA Keyers operate from 9–15 VDC (power supply not included) and offer many more advanced features than can be listed here. It is no accident that AEA keyers are regarded as the best in the world.

**TI-1
RTTY/AMTOR
Tuning Aid \$119.95**



- Spectral display of RTTY tones.
- Instant indication of shift (THREE RANGES).
- Built-in speaker with switch for quiet monitoring.

**MAP-64/2
\$239.95***



- Plug-in hardware and firmware for C-64 computer.
- Dual channel filters.
- Ext. 12 VDC reduces load on computer (power supply not included).
- Morse-Baudot-ASCII-AMTOR.
- Most advanced software available.

**Unmatched Software For C-64
And VIC-20 Computers**

MBA-TORT™—The most advanced software written for Morse-Baudot-ASCII-AMTOR including mail drop.

MARSTEXT™—A special Morse-Baudot-ASCII package written especially for MARS and other traffic operators.

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**CP-1 \$239.95*
Computer Patch™ Interface**

- Better performance than any competitive product
- Dual channel filtering with auto threshold correction
- Variable shift
- 117 VAC power supply included

AEA also offers Morse, Baudot, and ASCII software for the following computers: Apple II, II+, IIe; IBM-PC.

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Call or visit our new store
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KENWOOD

...pacesetter in Amateur radio

NOW
220 MHz!

The Smallest HT!

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

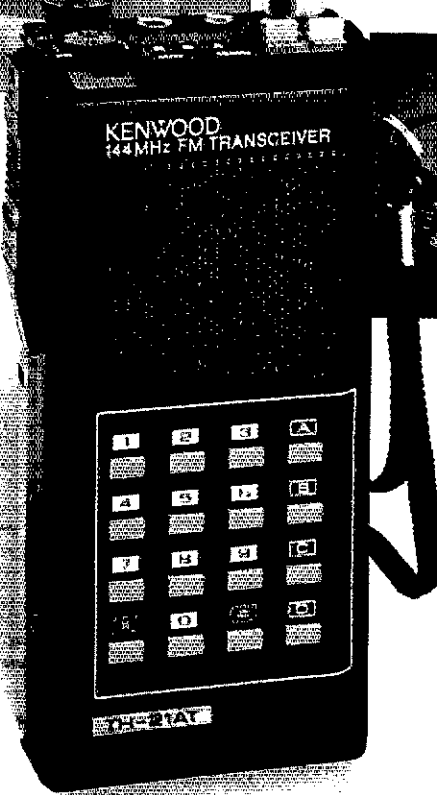
- **High or low power.**
Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
- **Pocket portability!**
Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with batteries!**
- **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!



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

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

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.



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.

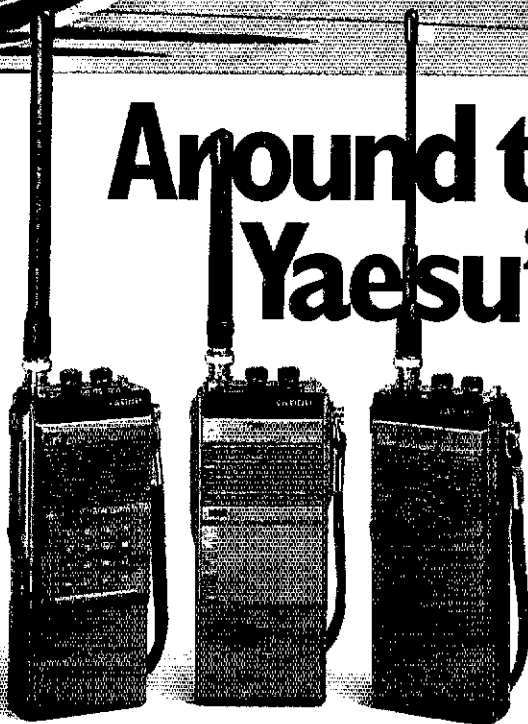
In fact, you'll discover that our VHF/UHF line is as diverse as your operating needs.

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.

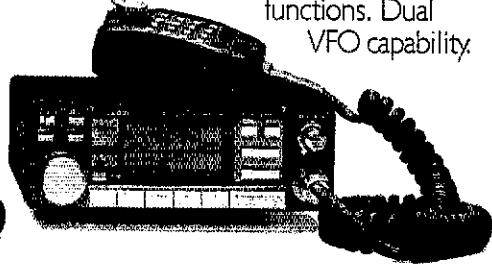
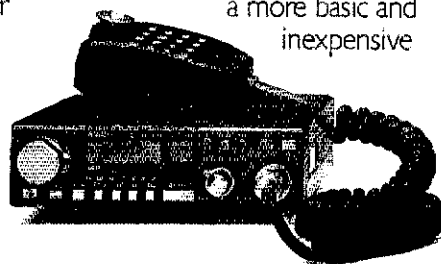
Each of these lightweight rigs features 2.5 watts of power and an optional DTMF keyboard.

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. Yaesu 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.

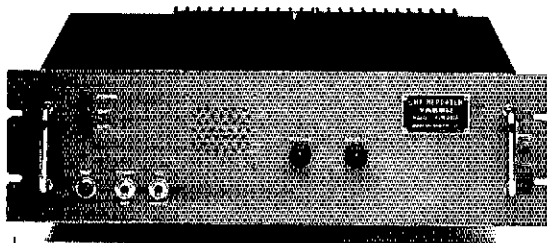
Also, an optional plug-in tone encode/decode board is available.



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. 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.

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

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

YAESU

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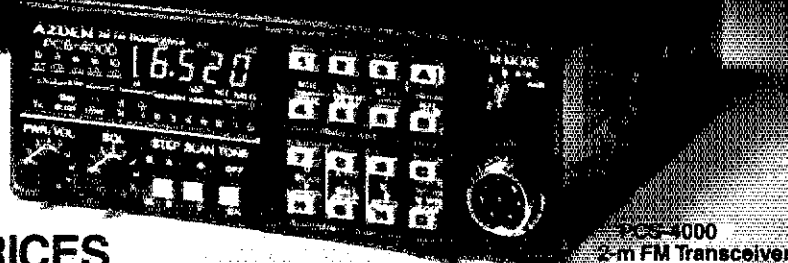
JPC/AZDEN[®]

4000 SERIES

FM TRANSCEIVERS

10 METERS & DOWN

**PLEASE CALL FOR
SPECIAL PRICE**



**COMMERCIAL-GRADE
QUALITY AT AMATEUR PRICES**

EXCLUSIVE 1 YEAR LIMITED WARRANTY! COMPARE!

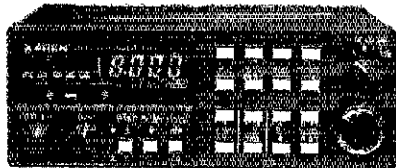
THE 4000 SERIES



PCS-4300 70-cm FM Transceiver



PCS-4500 6-m FM Transceiver



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 x 5.5"W x 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; auto-resume 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/R/F 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.
- **ONE YEAR LIMITED WARRANTY!**

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JPC/AZDEN

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Food for thought.

Our new Universal Tone Encoder lends its versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency—just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers' repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
- Separate level adjust pots and output connections for each tone Group.
- Immune to RF
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak
- Instant start-up.
- Off position for no tone output.
- Reverse polarity protection built-in.

Group A

67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 2A	123.0 3Z	162.2 5B
74.4 WA	97.4 2B	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, $\pm .1$ Hz maximum - 40°C to + 85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B

TEST-TONES:	TOUCH-TONES:	BURST-TONES:
600	697 1209	1600 1850 2150 2400
1000	770 1336	1650 1900 2200 2450
1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy, ± 1 Hz maximum - 40°C to + 85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Model TE-64 \$79.95

 **COMMUNICATIONS SPECIALISTS**

426 West Taft Avenue, Orange, California 92667
(800) 854-0547/ California: (714) 998-3021

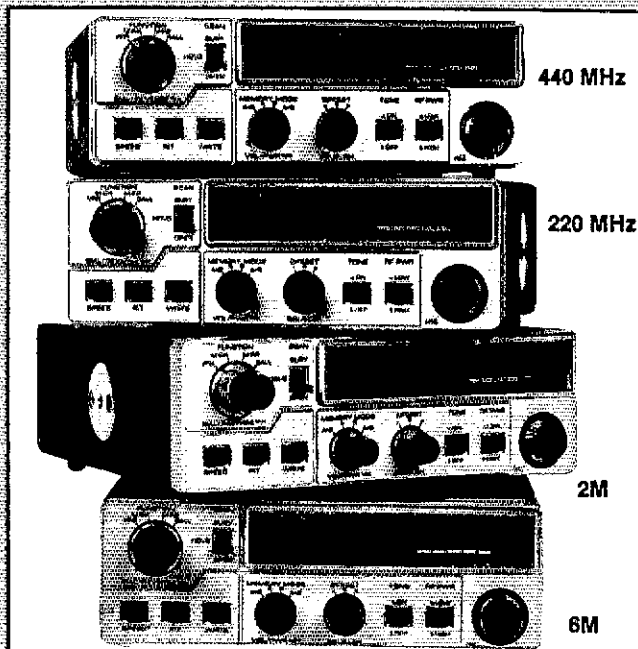




DO YOU HAVE AN HEIRLOOM RADIO?

Well... they might not last forever. However, there are certainly many older model KDKs out there in 'Ham Radio-land' just chuggin' away. Every day calls come from all over asking for information and advice on care and feeding of an FM-144sx or a '2015 and there are even a few older than that but some of them seem to be in disguise. That's a tribute to the folks who design and make the KDK. They care about building a radio to last longer because their name and their pride are on the front of each one. BUT... What we are really getting to is we would really like for all you folks who have known and loved your KDK's all these years to go and update yourselves by purchasing a newer KDK, one like, say, the FM-2033 or maybe an FM-7033 UHF. That way you can start your own collection of heirloom KDK radios. Right there in your own hometown. Take a look at the chart of available models and visit your nearest KDK dealer and check them out. We think you will drive home with one.

MAXPAC STACK



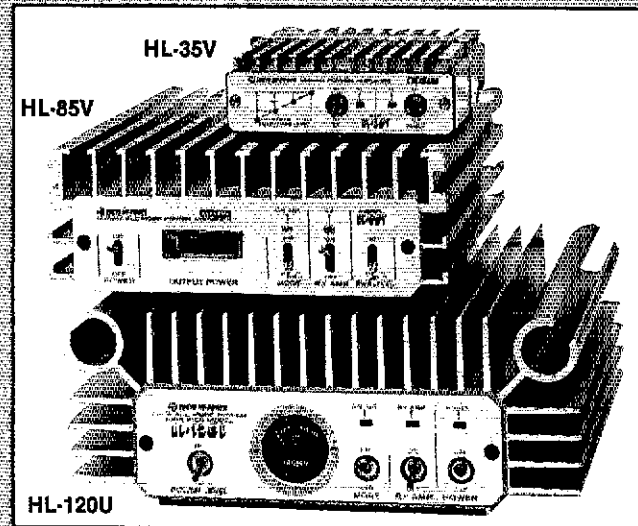
SPECIFICATION	FM-2033 144 MHZ	FM-4033 220 MHZ	FM-7033 440 MHZ	FM-6033 50 MHZ
NUMBER OF MEMORIES	10 Memories + CALL CHANNEL organized as two banks of 5 channels each. (CH 1-5, CH 6-10, CALL.)			
MEMORY SCANNING	Memories may be scanned A(1-5), B(6-10), A+B(1-10) or A x B(1-5)			
BAND SCANNING	Programmable band scan between values loaded into memories 5 and 10, step size set in INIT module.			
FREQUENCY RANGE	142.000-149.995 MHZ	220-224.995 MHZ	440-449.975 MHZ	50.00-53.995 MHZ
OUTPUT POWER HI/LO	25/2.5 Watts	25/2.5 Watts	10/2 Watts	10/2 Watts
REPEATER OFFSET	600 kHz UP or Down	1.6 MHz UP or Down	5 MHz UP or Down	600 kHz UP or Down
SUB AUDIBLE TONE	103.5 @ 500 Hz Dev	103.5 @ 500 Hz Dev	Dipswitch Select	103.5 @ 500 Hz
SENSITIVITY	0.2 uV @ 12dB SINAD	0.35 uV @ 12 dB SINAD	0.4 dB @ 12 dB SINAD	0.2 uV @ 12 dB SINAD
BANDWIDTH	±5 kHz @ -6 dB	±5 kHz @ -6 dB	±5 kHz @ -6 dB	±5 kHz @ -6 dB
SELECTIVITY	±12.5 kHz @ -60 dB	±12.5 kHz @ -60 dB	±12.5 kHz @ -60 dB	±12.5 kHz @ -60 dB

THL CORP.

AMPLIFIERS • PREAMPS • COUPLERS

TEAM THL LINE-UP FOR THE SEASON

TEAM THL brings competition class performance to everyday operation. Whether you're looking for a little more performance or a "super charger" boost, TEAM THL products can get you out of the pits and back in the race better and faster almost every time. Three different power performance classes in either VHF or UHF band capability give the TEAM THL a broad spectrum of performance options. So remember the next time you get beat in the race, soup-up yourself with a product from TEAM THL.



Specifications	HL-30V	HL-35V	HL-35VL	HL-85V	HL-110V	HL-160V	HL-160V25	HL-20U	HL-30U	HL-60U	HL-120U
Pre-Amp Type	N/A	Gaas-FET	Gaas-FET	Gaas-FET	Gaas-FET	MOS-FET	MOS-FET	N/A	Gaas-FET	Gaas-FET	Gaas-FET
Power Metering	N/A	LED	LED	Meter	Meter	Meter	Meter	N/A	LED	Meter	Meter
Input (Watts)	.25-5	.25-5	.25-5	10-14	3-14	3-14	20-30	1-4	1-4	8-14	8-14
Output (Watts)	2.5-30	2.5-30	2.5-30	70-90	90-110	140-160	140-160	18-22	25-30	45-60	90-110
SSB Mode	NO	NO	YES	YES	YES	YES	YES	YES	NO	YES	YES
Sugg. Retail	\$69.95	\$79.95	\$89.95	\$169.95	\$239.95	\$349.95	\$299.95	\$114.95	\$129.95	\$229.95	\$379.95



2M 200E
400E 400E

Priced at a level to make your budget smile, the ST-200ET and the ST-400ET are direct hardware replacements for the famous ICOM® series of thumbwheel switched hand held radios. Present accessories for the 2AT and the 4AT should work on the ST-200ET (VHF) and ST-400ET (UHF) with no modifications. ** Same slip off battery pack style and the same mic and speaker jack arrangements provide as much compatibility as possible.

These units are made in Japan and sold by SANTEC and backed by the famous Encomm **TWO YEAR EXTENDED SERVICE PLAN** and Encomm service facilities located in Plano, Texas. Priced at \$199.95 for the ST-200ET (VHF) and \$249.95 for the ST-400ET (UHF). No it's not a misprint. Those are the suggested retail prices. Now smile. Please see your favorite SANTEC dealer for his best price.



2M — \$199.95
70CM — \$249.95

SPECIFICATION	ST-200ET	ST-400ET
GENERAL		
Frequency Range	144-147.995	440-449.995
Battery Pack (V/mAhr)	8.4/250	8.4/250
Receive Squelched Norm	18 mA	22 mA
RX At Full Volume	130 mA	130 mA
Transmit (Low Power)	220 mA	300 mA
Transmit (High Power)	550 mA	700 mA
Dimensions mm	60 x 170 x 40	60 x 170 x 40
Weight (with Battery)	490 gms	490 gms
TRANSMITTER		
Output Pwr. (Hi, Lo)	1.5W, 0.15W	1.5W, 0.15W
Spurious Transmitted	< -60dBc	< -60dBc
Deviation Limit	5 kHz	5 kHz
Pickup Device	Condenser Mic	Condenser Mic
RECEIVER		
Receiving System	Dbl. Superhet.	Dbl. Superhet.
I.F. Frequencies	10.695 1st 455 kHz 2nd	21.6 1st 455 kHz 2nd
Receive Sensitivity	< 0.25 uV @ 12dB	< 0.35 uV @ 12 dB
I.F. Bandwidth	30 kHz @ -60dB	30 kHz @ -60 dB
Operating Temp	-10-+60 C	-10-+60 C
ACCESSORIES		
SKT-BA Battery Case	HSA-1/HBM-1 Headset/Mic	
SKT-PA DC/DC Conv.	STK-BP Battery Pack	
ST-MC Mobile Charger	STR-BC Battery Charger	
SKT-LC Leatherette Case		

NOTICE: These specifications are typical unless stated otherwise. They may be changed in the future without notice or obligation. Conditions of measurement may be obtained from Encomm, Inc.

* ICOM is a registered trademark of ICOM, INC of JAPAN.
** ST-200ET/400ET Batteries are not fully compatible with BC-30/35 drop in chargers.

WELZ CORP.

SUPERIOR ACCESSORIES

WELZ POWER VSWR
COMPACT METER

SP-122 HF PEP HOLD
SP-220 HF PEP MONITOR
SP-420 VHF/UHF PEP MONITOR

These new compact HF/VHF/UHF meters from WELZ provide multi-mode operation in auto or home station. Utilizing the WELZ toroidal core based wide-band sensor technology, these VSWR/POWER meters are the next generation of accuracy and reliability. Pictured here is the model SP-420 covering the VHF/UHF band from 140-525 MHz. In addition there is the SP-220 covering 1.8 to 200 MHz and the SP-122 covering 1.8-60 MHz with PEP peak hold mode. All three of these new models are ready for PEP output measurement with either the "PEP Monitor" function or the "Instantaneous PEP HOLD" function, back-lighted easy-to-read meters, high sensitivity and very attractive styling. Check your favorite dealer and check out the new WELZ COMPACT VSWR/POWER meters.



MODEL	SP-122	SP-220	SP-420	SP-230	SP-430
Freq. Range	1.6-60MHZ	1.8~200MHZ	140~525MHZ	6-1400MHZ	1.8~150MHZ
Sensor Mnt.	FIXED	FIXED	FIXED	DETACHABLE	DETACHABLE
Pwr Ranges	20/200/2KW	2/20/200	2/20/200	15W/150W	5W/60W
No. Meters	1	1	1	1	1
Peak Mode?	YES+HOLD	YES	YES	NO	NO
Impedance	50 OHMS	50 OHMS	50 OHMS	50 OHMS	50 OHMS
Functions	PWR/VSWR PEP+HOLD	PWR/VSWR PEP	PWR/VSWR PEP	PWR/VSWR CAR VOLTS	PWR/VSWR CAR VOLTS
Accuracy	10% READING	10% READING	5% READING	5% F.S.	5% F.S.

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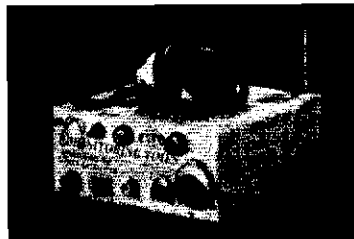
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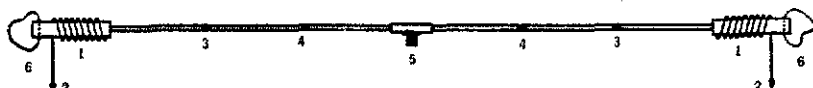
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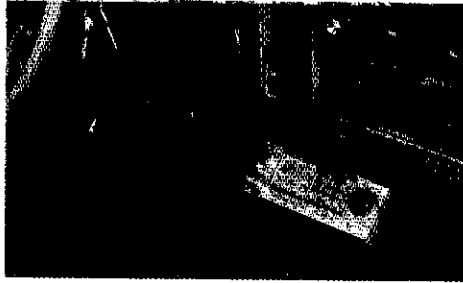
The exceptional front-end selectivity and sensitivity, coupled with Kenwood's excellent audio section, gives you lots to hear! Compact design makes this transceiver at home in the shack or on the go!

• **Large, easy-to-read backlit 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.**

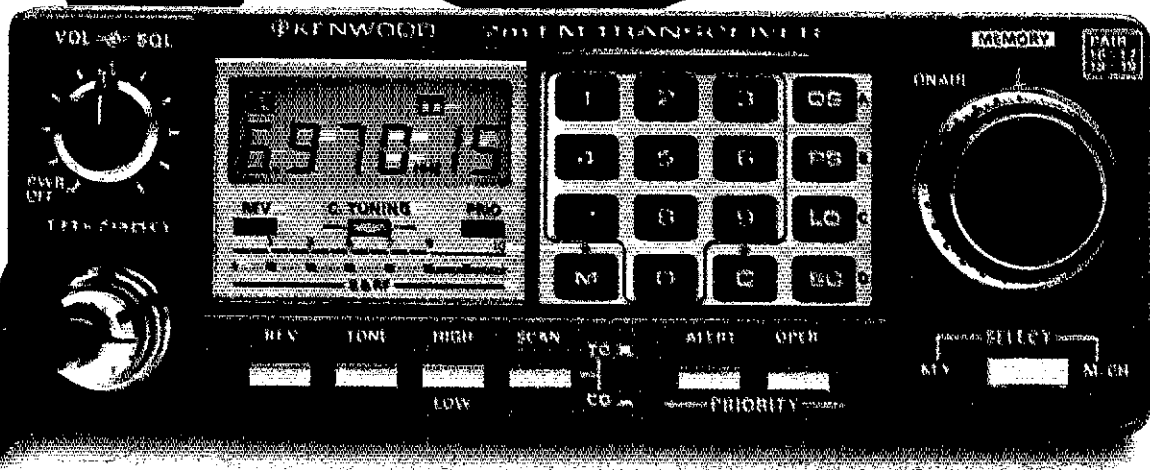
The TR-7950/7930 "remembers" frequency offset, and optional subtone channels. Memories 1-15 are for simplex and "normal" repeater operation. Memory pairs 16/17 and 18/19 are for "odd-ball" splits. Memories "A" and "B" store upper and lower band scan limits. The radio "beeps" when memory channel 1 is 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, sub-tone selection, memory address and scan programming. The keyboard is illuminated for night time use.



TR-7950 optional accessories:

- PS-430 power supply
- TU-79 three frequency tone unit
- KPS-12 fixed-station power supply (7950)
- KPS-7A fixed-station power supply (7930)
- SP-40 mobile speaker
- SP-50 mobile speaker
- MC-55 mobile microphone with time-out timer
- MC-46 16-key autopatch UP/DOWN mic
- SW-100A/B power meters
- PG-3A noise filter.

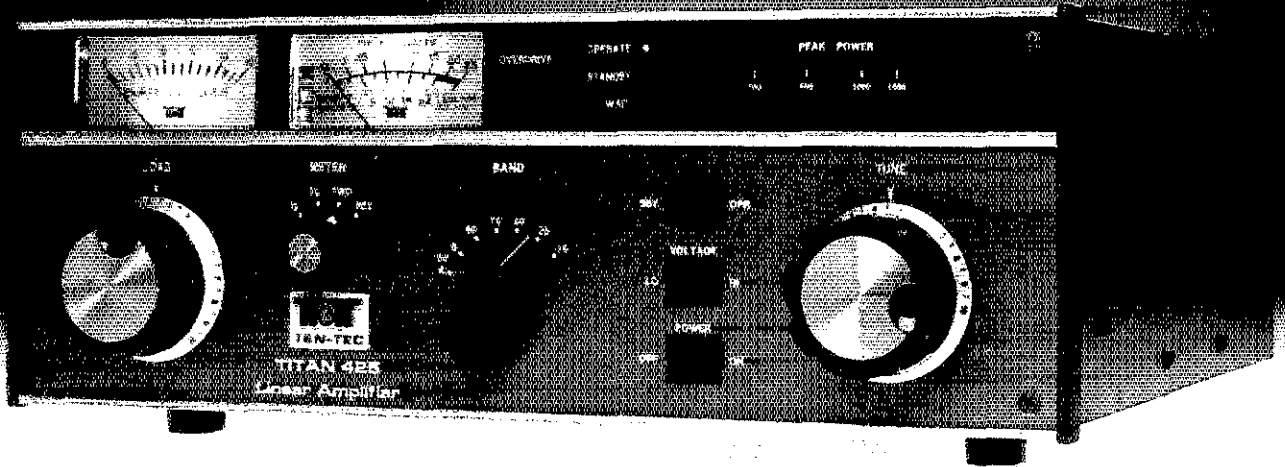
More TR-7950/7930 information is available from authorized Kenwood dealers.

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Model TR-7950 (45 watts) shown. TR-7930 is identical, but with 25 watts output.
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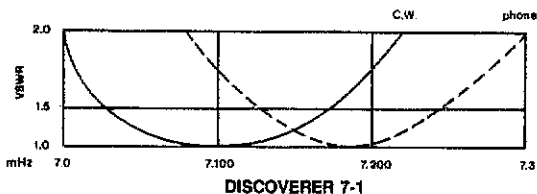
Rediscover 40 meters with the **DISCOVERER SERIES** Rotatable Dipole or Monoband Beams

This 40 meter antenna series gives you three choices. The Discoverer 7-1 which is a rotatable dipole. Or the Discoverer 7-2, a two-element beam you can upgrade to three elements with a kit.

Whichever you choose, you'll get Hy-Gain's superior mechanical design. Such as tapered tubing to reduce weight and wind surface area. Maintenance-free stainless steel hardware and preformed clamps for an easy, rugged assembly.

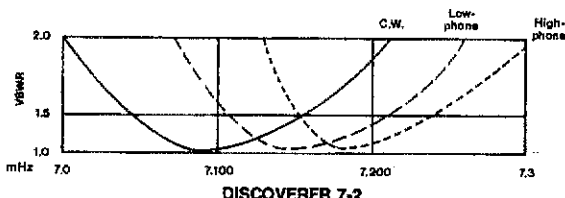
You also get superior performance. Wide bandwidth with SWR of 1.5:1 or less at resonance. High-Q efficiency because there are no high-loss coils. A low voltage feed point that eliminates insulator failure and assures that the antenna can handle twice the new legal power limit.

The Discoverer 7-1 dipole can be added to most existing rotatable beam installations. This model can be tuned to either 30 or 40 meters.

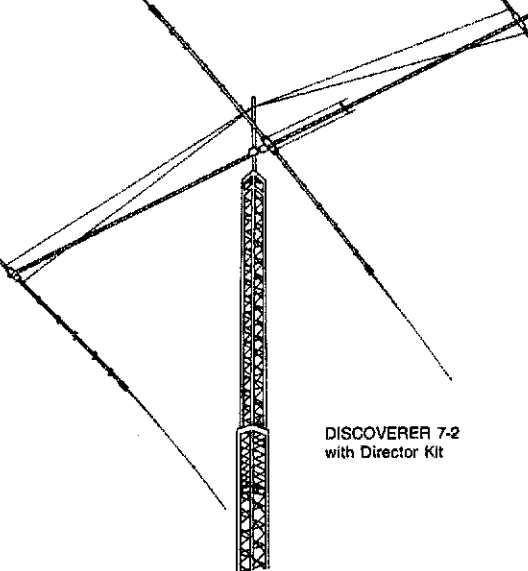


DISCOVERER 7-1

The Discoverer 7-2 requires only a 25 ft. (7.6 m) turning radius and opens communication doors you previously thought possible only on 20 meters. Combining the advantages of high forward gain and a high front-to-back ratio lets you hear and work stations you couldn't read on a dipole or vertical antenna. Best of all, you can upgrade this antenna anytime with the 373S Director Kit.

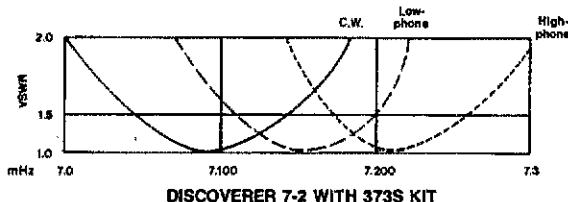


DISCOVERER 7-2



DISCOVERER 7-2
with Director Kit

By adding the Director Kit to the Discoverer 7-2 you create a three-element beam on a boom of only 35 ft. (10.7 m), that outperforms many of the heavy-weight giants with much longer booms. In fact, the kit doubles the effective radiated power of the Discoverer 7-2, and nearly doubles the front-to-back ratio. And, because the antenna is still more compact than a "giant", you only need a medium-duty tower such as the HG52SS. All of which saves you money and space without compromising safety or performance.



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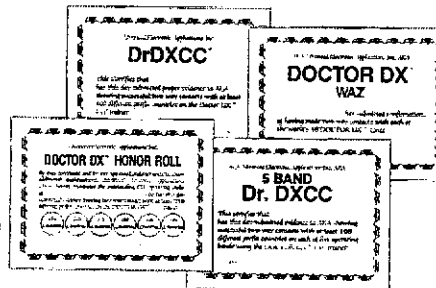


There is not enough that I can say about your Doctor DX. . . . I find a half an hour or so, every evening, just as rewarding as all get out. . . . As I said at the outset, I don't think there are words to describe just what Doctor DX will do for any amateur. 73's, **Barry Goldwater, K7UGA.**

" . . . Any operator capable of copying code will come out of a few sessions with the good Doctor a better operator, or a much better operator. . . . This is a serious Trainer for anyone interested in contests of DX. I guarantee it will make you a better operator." . . . **Bob Locher, W9KNI, CQ Review, October 1984.**

"I haven't had so much fun since I was a teenager. Doctor DX is the closest thing to the fountain of youth I have found." . . . **Jack Gutzelt, W2LZX, CQ Magazine.**

"This is the sort of simulator we've all looked for—a trainer to permit new DX'contesters to sharpen skills off the air, a simulator to permit possible DXpeditioners to get the feel of operating 'on the other end,' a fun club program and a brief peek into the awesome technology of tomorrow, up and running 'today.' Congratulations indeed to Advanced Electronic Applications, Inc." . . . **Ellen White, W1YL4, How's DX column, QST Magazine, October 1984.**



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Super program for the DX'er. Great fun! . . . **F.S., Milwaukee, WI**

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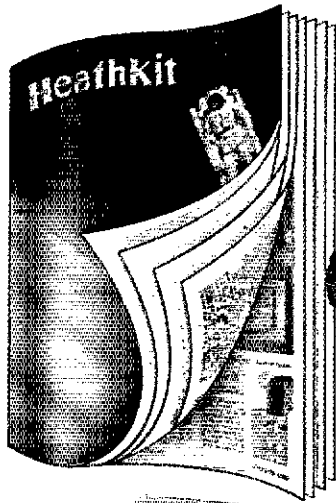
AEA Congratulates Dale Appleton NB7Y on being the first to receive all DR DX Awards.

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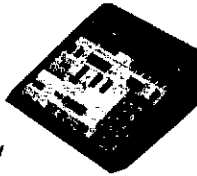
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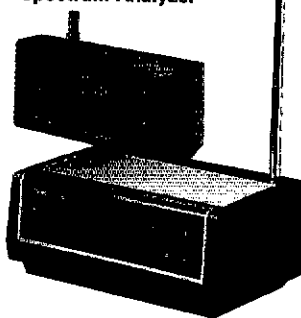
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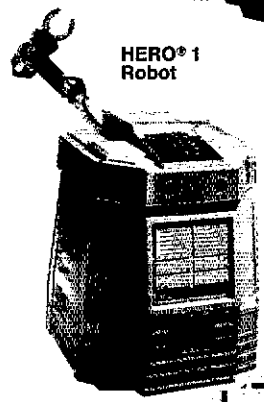
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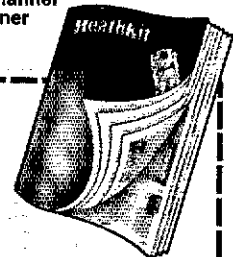
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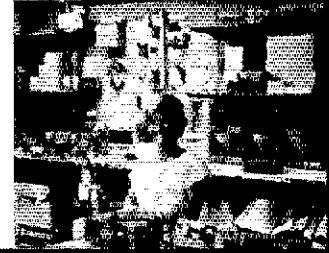
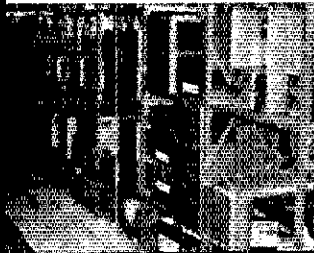
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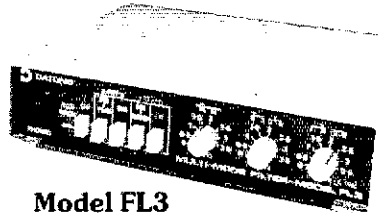
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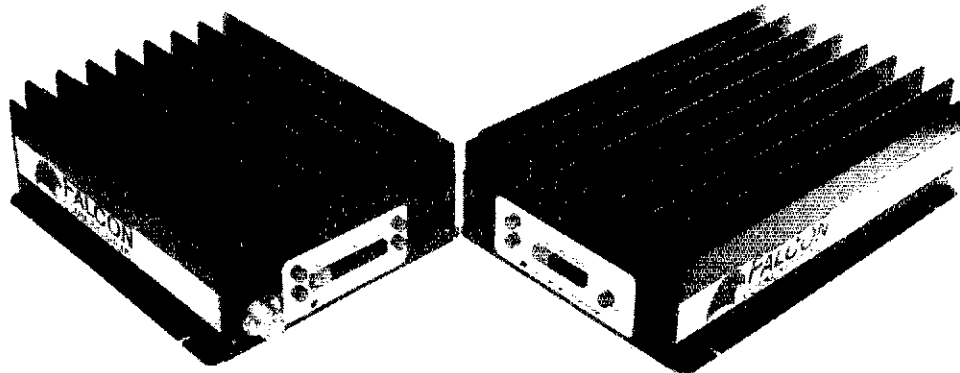
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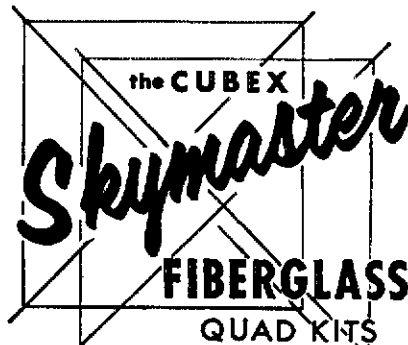
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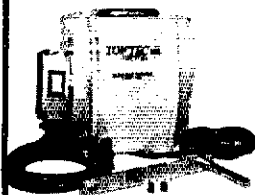
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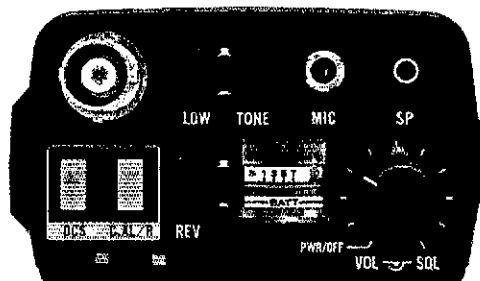
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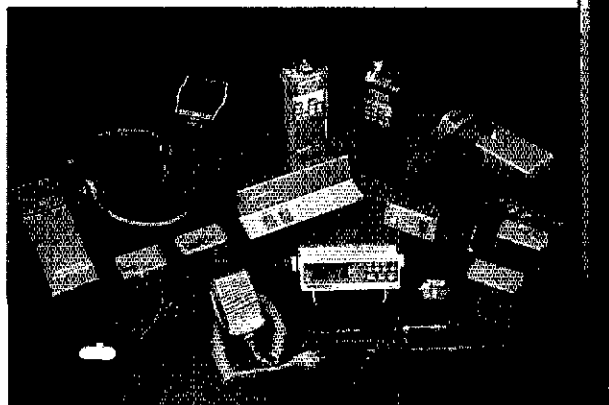
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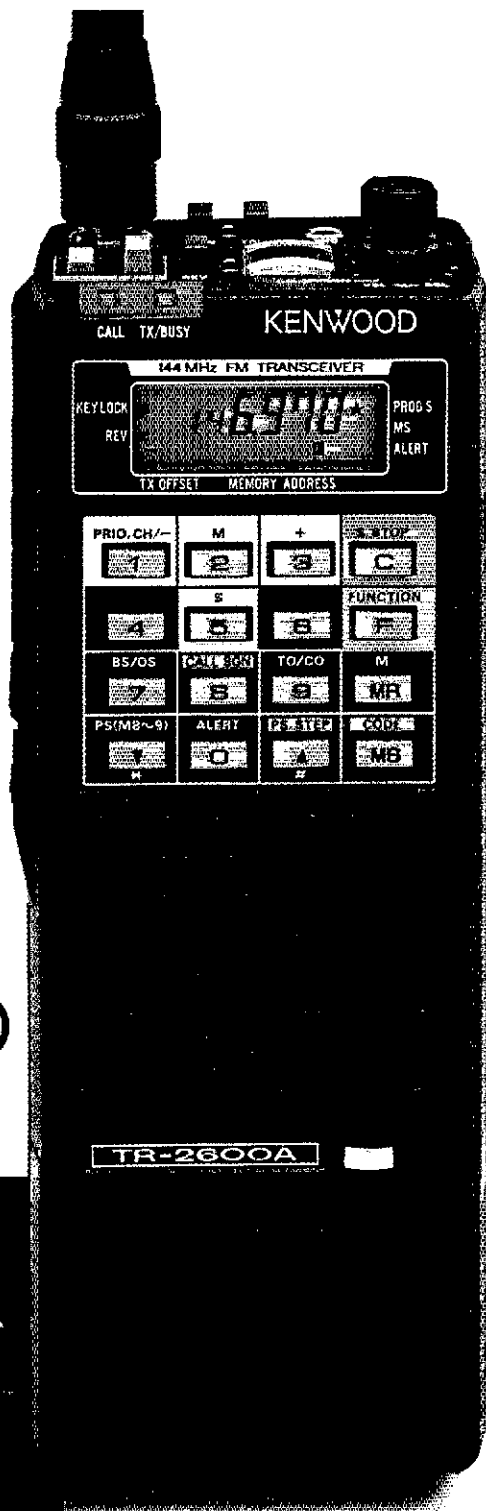
Channel scan or band scan. search for open or busy channels.

• 10 Channels

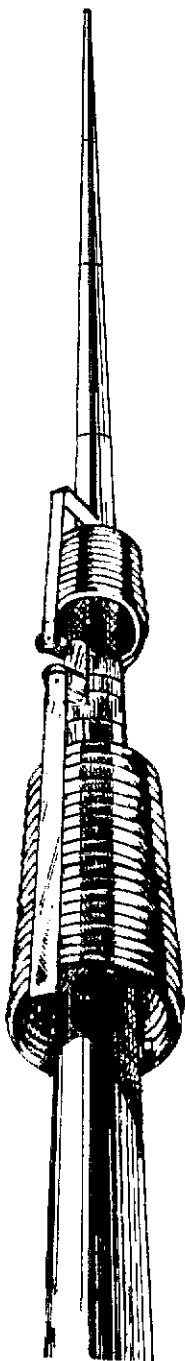
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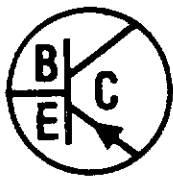
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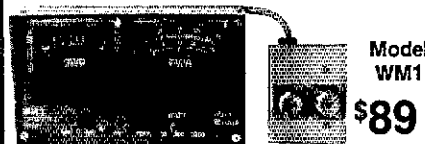
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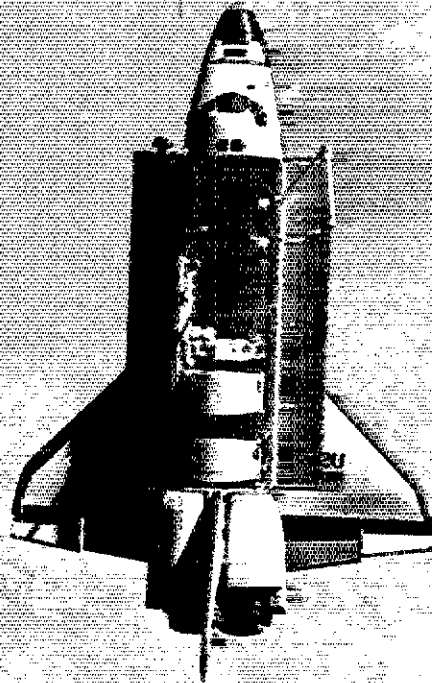
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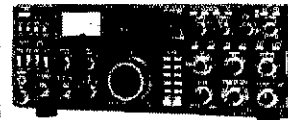
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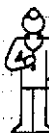
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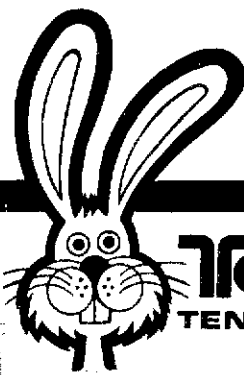
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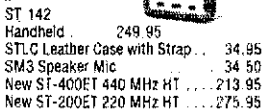
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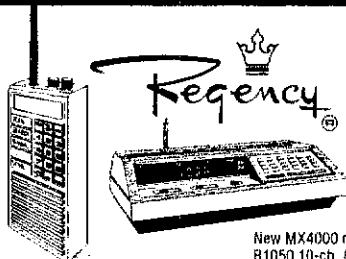
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3

80TH EDITION LICENSE MANUAL

This publication will gradually be phased out as new question pools are released, and new versions of the License Manual Series are published. (See February *QST* page 51.) The material covered is still valid for some General Class exam sessions — most VEC's will have changed to the new pools by April. Material covering the Advanced Class should still be good until June and until September for the Extra Class.

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THANK YOU for attending Warren, Ohio Hamfest. See you August 18, 1985.

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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.

ANNUAL FLEMINGTON, NJ Hamfest by Cherryville Repeater Association will be held Saturday April 20 at Hunterdon Central High School Field House on Route 31. Doors open at 8 AM, but breakfast will be served on site from 6:30 AM. Talk-in: 148.52, 147.975/.375, 147.815/.015, 222.52/224.12, 449.850/444.850. For table reservations, call 201-788-4089 or write Bill Inkrote, K2NJ, RD 10 Box 284 Quakertown-Croton Rd. Flemington, NJ 08822. FCC Exams will be given; send FCC 810 Form, copy of current license and \$4 (checks to ARRL/VEC) to Cherryville Repeater Association, Inc., Box 308 Quakertown, N.J. 08868.

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.

SACRAMENTO VALLEY Hamswap '85: Sunday, May 5th 9 AM to 3 PM at Placer County Fairgrounds, Roseville, California. Talk-in on 145.190 and 224.78 repeaters. Food, refreshments, free parking, lots of fun! For information and advanced table sales, SASE to Carl Schultz, K8KWB, 2942 Gwendolyn Way, Rancho Cordova, CA 95670 or call 916-366-9111.

JUNE 2 -- SRRRC Hamfest, Princeton, Illinois. Plans include FCC/VEC exams, Registrations \$2.50 before May 20, \$3 June 2. For advance registrations and/or complete information, furnish a long SASE to Starved Rock Radio Club, W9MKs, RFD #1, Box 171, Oglesby, IL 61348. Phone 815-667-4614.

FCC/VEC EXAMS - June 2 during SRRRC Hamfest in Princeton, Illinois. NO pre-registration required. Bring original license, plus photocopy of same. A \$4 fee is required. For details, furnish long SASE to Denny R. Chestney, KM9L, 1212 Dogwood, Bloomington, Illinois 61701.

DO YOU HAVE your vacation plans made yet? The Black Hills Amateur Radio Club is hosting the 1985 Dakota Division Conference, July 5-6-7 in Rapid City. New equipment exhibits, flea market, YL activities, seminars, awards. Amateur exams. This will also be the Club's 50th Anniversary. Would all former members please QSL with brief history. KX0U, Gene F. Bauer, 713 Blaine Ave., Rapid City, SD 57701.

THE KANSAS CITY DX Club invites all DX and Contest enthusiasts to its 5th floor Stouffers Hotel Hospitality Suite during this year's Daytona Hamvention. Continuous CW pile up contest, DX trivia contest, DX video room, and refreshments, Friday and Saturday starting at 7:00 PM.

FLEA MARKET & FCC EXAMINATIONS. April 13, 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.

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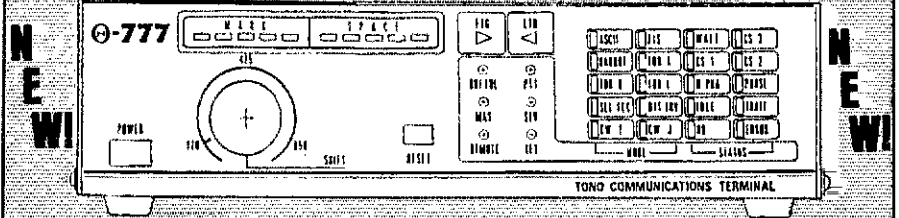
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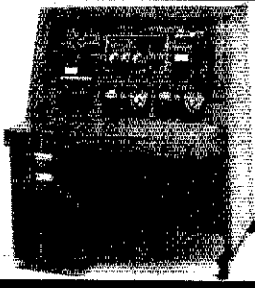
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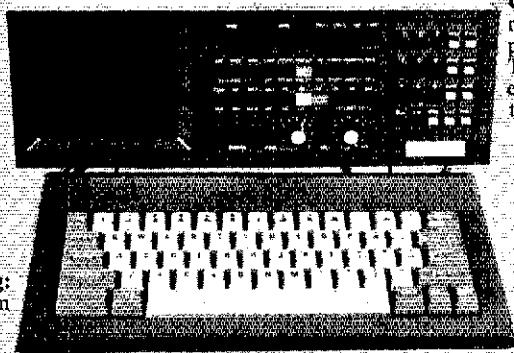
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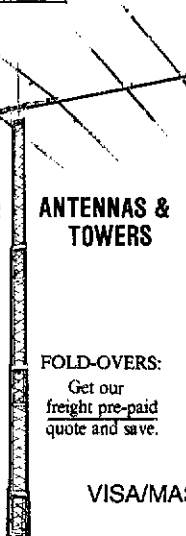
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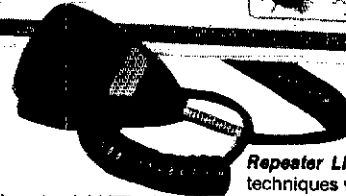
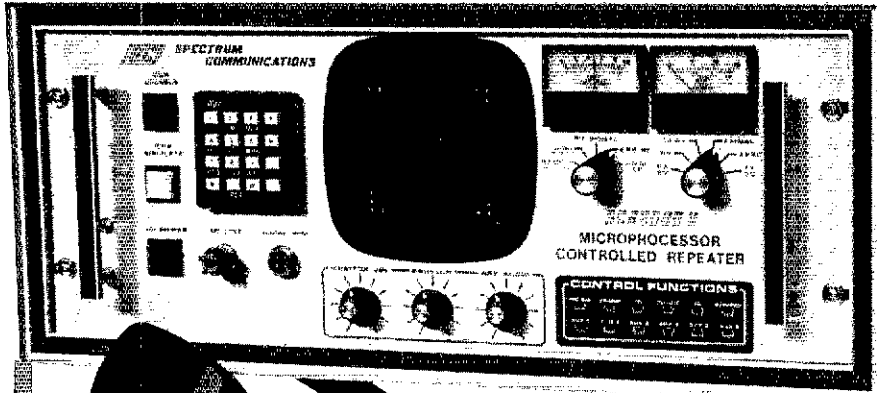
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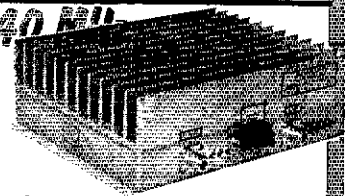
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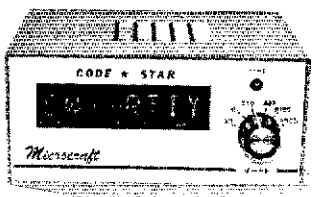
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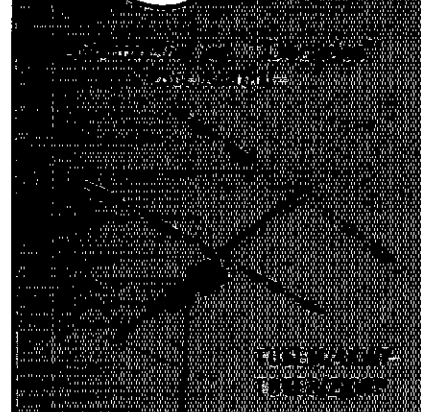
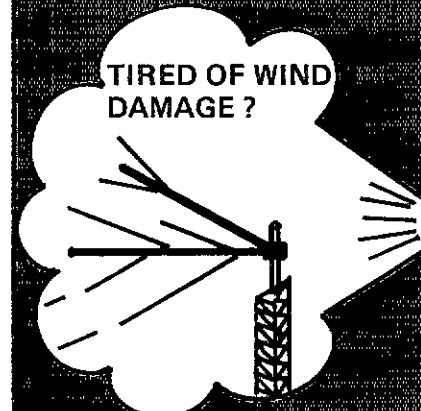
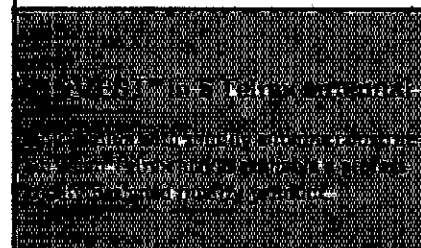
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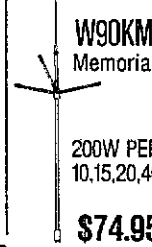
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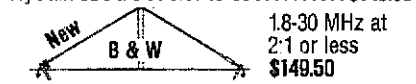


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A4	4 element triband beam	\$269.00
AV4	40-10 mtr. vertical	\$88.00
AV5	80-10 mtr. vertical	\$95.00
ARX2B	2 mtr. 'Ringo Ranger'	\$34.00
ARX450B	450 mhz. 'Ringo Ranger'	\$34.00
A144-11	144 mhz. 11 ele. VHF/UHF	\$44.00
A147-11	11 element 146-148 mhz. beam	\$44.00
A147-22	22 element 'Power Packer'	\$122.00
A144-10T	10 element 2 mtr. 'Oscar'	\$47.00
A144-20T	20 element 2 mtr. 'Oscar'	\$68.00
214B	14 element 2 mtr. 'Boomer'	\$74.00
214FB	14 element 2 mtr. FM 'Boomer'	\$74.00
220B	17 element FM 'Boomer'	\$88.00
228FB	28 element 2 mtr. 'Boomer'	\$204.00
424B	24 element 'Boomer'	\$75.00
R3	20-15-10 mtr. vertical	\$257.00
10-4C	4 element 10 mtr. 'Skywalker'	\$101.00
15-4C	4 element 15 mtr. 'Skywalker'	\$115.00
20-4C	4 element 14 mhz 'Skywalker'	\$257.00

HYGAIN ANTENNAS

V2S	2 meter vertical	\$45.00
18AVT/WBS	80-10 mtr. trap vertical	\$104.00
TH5MK2S	5 element 'Thunderbird'	\$385.00
TH7XD	7 element triband beam	\$439.00
TH3JRS	3 element triband beam	\$185.00
396S	Explorer 14 triband beam	\$304.00
103BAS	3 element 10 meter	\$49.00
105BAS	5 element 10 mtr. 'Long John'	\$129.00
153BAS	3 element 15 meter	\$69.00
155BAS	5 element 15 mtr. 'Long John'	\$199.00
2BDQ	40 & 80 mtr. trap doublet	\$59.00
204BAS	4 element 20 meter	\$254.00
205BAS	5 element 20 mtr. 'Long John'	\$345.00
214S	14 element 2 meter	\$45.00
7-1S	Discoverer rotary dipole 30/40	\$140.00
7-2S	Discoverer 2 ele. 40 meter	\$315.00
7-3S	Converts 7-2 to 3 element beam	\$199.00
BN	ferrite balun	\$21.50

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48TV	40-10 mtr. vertical	\$79.00
58TV	80-10 mtr. vertical	\$99.00
68TV	6 band trap vertical	\$139.00

ROTORS

Alliance HD73	[10.7 sq.ft.]	\$99.90
Alliance U110		\$44.00
CDE-CD45-2	[8.5 sq.ft.]	\$139.00
CDE HAM 4	[15 sq. ft.]	\$219.00
CDE TAILTWISTER	[20 sq. ft.]	\$265.00
HYGAIN HDR300	[25 sq. ft.]	\$515.00

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[2-18 & 6-22]	4080 per foot	\$0.18
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49 mhz. FM 2-WAY RADIO
hands free operation, voice activated
transmit up to 1/2 mile. Batteries optional
model 49S



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BEL 860-dash mount super het	\$119.00
BEL 834-dash munt super het	\$149.00
BEL 837-remote mount super het	\$159.00

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\$519.00

Multi band, programmable, synthesized scanner/radio, 20 channels with 12 block chan. space switches, 26-520 mhz. frequency range, AM/FM change mode, momentary memory recall, birdie-free seek, DC or optional AC power, priority, muting circuit, dual squelch control, auto noise limiter/FM IF filter.

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RS5080- 500 mhz-800 mhz	\$199.00



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SX200-scanner/radio

Covers aircraft, military, FBI, satellites, police, fire, defense, aero navigation, amateur radio plus AM/FM radio on 16 channels, seek and scan, digital readout, AC/DC



\$154.00

PROGRAMMABLE SCANNER-no crystals, 10 channels to store frequencies you choose, 60 pre-programmed 'hot' frequencies, touch keyboard with audio response, skip, pause and action. Base-mobile or portable capabilities.



\$136.00

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preprogrammed frequencies, search/scan, clock/alarm, priority	
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HX2000-800 mhz. prog. hand held	\$359.00
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MX4000-multi band, 20 ch, AC/DC	\$394.00
MX-7000-10 band, 20 ch, AC/DC	\$449.00



\$354.00

MX5000-20 chan. continuous 25-550 mhz., including aircraft, search/scan, clock, chan. i priority, scan or search delay

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For a Limited time!

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and get a PREAMP for only
"One Buck" extra.



ICOM IC-271A 2-Meter FM/CW/SSB Base. Covers 143.8-148.1999 MHz. 25/1 Watts, 32 subaudible tones, 32 memory channels. Memory, band, and priority scan, RTI, internal speaker, hand microphone. 13.8V DC @ 6A or 117V AC with optional internal power supply. 4 1/4" h x 1 1/4" w x 10 1/2" d, wt. 13.2 lbs.

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AG-20 Internal Preamp... ONE BUCK!*

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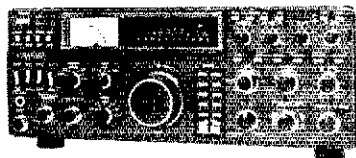
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KENWOOD SALE!



TS-930S

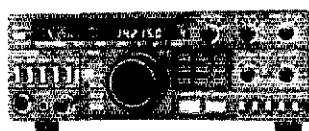
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- Superior Dynamic Range
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- Dual VFO w/8 Memories
- Dual Mode Noise Blanker
- RF Speech Processor
- Built-In AC Power Supply
- MUCH, MUCH MORE



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Most Advanced, Compact HF Transceiver \$899.95

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- 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



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
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TS-830-S List \$949.95

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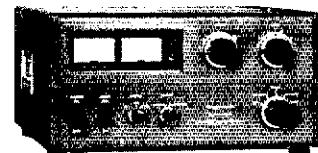


TS-130SE Compact 80-10 Meter Transceiver

- All Solid State
- 100W Output
- IF Shift
- Speech Processor
- Noise Blanker
- Narrow SSB/CW Filter Option

TS-130SE List \$629.95

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TL-922A Linear Amplifier

- 160-15 Meters
- 2KW PEP Input Power
- Pair of Rugged 3-500Z Tubes Included
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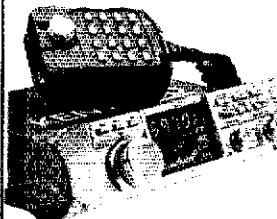
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- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- 45 Watts (TR-7950)
- 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

TR-7950 List \$399.95

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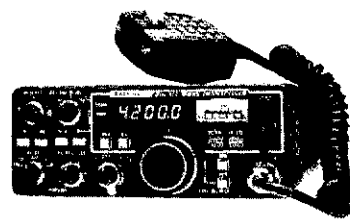
**TM-211A/TM-411A
2m/70cm FM
Transceiver**

- 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

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TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
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- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List \$529.95

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**TR-2600A
New High Tech
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- Built-in 16 Key Tone Pad
- Extended 140,000-148,995 Frequency Coverage

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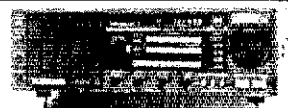
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**TW-4000A Dual Band
2m and 70cm FM in One Compact Package!**

- Big LCD Readout
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- 10 Memories w/Scan and Back-up
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- 16 Key Up/Down Mic

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New Pocket Size
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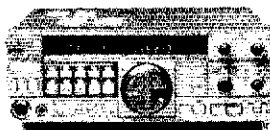
**All-Mode,
Multi-Function
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- Dual VFO
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- Memory & Band Scan
- 25W Output
- Built-in 120 VAC Power Supply
- Noise Blanker

TS-711A List \$699.95

TS-811A List \$899.95

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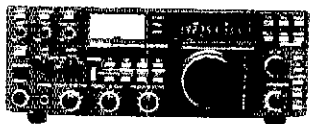
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ICOM SPECIALS

YAESU SPECIALS



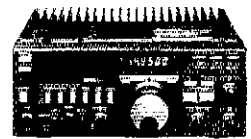
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Plus 2 Bonus Items
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AC Power Supply, Full Break-in CW,
SSB/AM/FM/FSK, RF Speech Processor
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includes CW keyer, AM/FM, CW filter
List Price \$859
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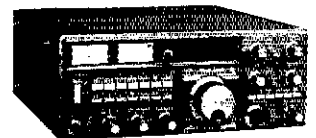
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(Optional modules for 6m, 430, 440 MHz)
Great for Satellite Work
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Perfect Oscar Equipment
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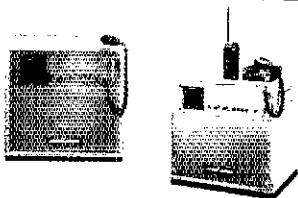
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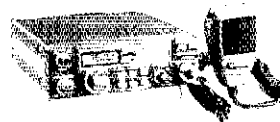
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B215	2M	Yes	2W	150W	20A	\$249
B108	2M	Yes	10W	80W	10A	\$149
B1016	2M	Yes	10W	160W	20A	\$249
B3016	2M	Yes	30W	160W	17A	\$199
C22	220	No	2W	20W	5A	\$79
C106	220	Yes	10W	50W	10A	\$119
C107	220	Yes	10W	100W	10A	\$204
D24	440	No	25W	40W	8A	\$179
D1010N	440	No	10W	100W	20A	\$289

RC 1 Remote Control for Mirage Amplifiers \$24
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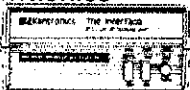


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Full Featured!
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● Current Limiting & Crowbar Protection Circuits
● M-Series With Meter - A-Series Without Meter

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RS4A	3	4	\$34
RS7A	7	8	\$59
RS12A	9	12	\$69
RS20A	16	20	\$99
RS20M	16	20	109
RS35A	25	25	136
RS35M	25	25	144
RS50A	37	50	199
RS50M	37	50	229



MODEL RS-50A

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IC271H 2m Base 100W \$789
IC490A 70cm All Mode 10W \$579
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TEN-TEC
2510 Satellite Station \$439

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Ken Pro KR500 Elev Rotor \$189
Ken Pro KR400 Azim Rotor \$149
Alliance HD73 Azim Rotor \$99
Hy-Gain Ham 4 Azim Rotor \$219

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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

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416TB 70cm cir pol. \$59
P54 70cm Circularity Switch. \$69
AOP1 2m/70cm Oscar Pack \$149

KLM
2m-14c 14el 2m w/cir switch \$89
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THL HRA-2 2m Mast Mount PreampList \$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 2m Mast Mount PreampList \$210
THL HRA-2 2m Mast Mount PreampList \$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
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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 PreampList \$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

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PACKAGE PRICE—ONLY \$1999 DELIVERED!
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PACKAGE #4

Yaesu FT726R VHF/UHF Duplex Xcvr List \$899
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SU/726 Sat Duplex Unit List \$109
Mirage D1010N 70cm 100W Amplifier List \$347
THL HRA-2 2m Mast Mount PreampList \$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

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Versa
(+4)

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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-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. **\$49⁹⁵** (+\$4)

5x2x6 in. Use any transceiver, solid state or tube. Operate all bands with one antenna.

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MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 **\$229⁹⁵**
KW PEP (+\$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

\$329⁹⁵ 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. (+\$10)

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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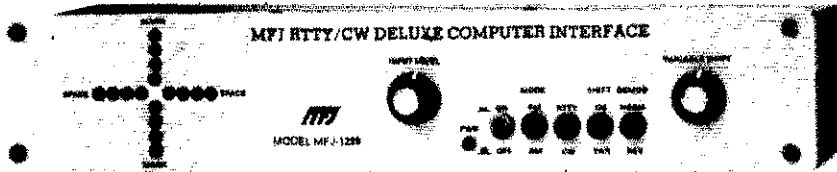
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MFJ RTTY/ASCII/CW software on tape, cables for C-64/VIC-20.

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. 12 1/2 x 2 1/2 x 6 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.

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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.



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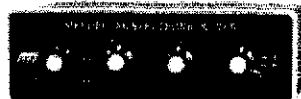
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MFJ-407
\$69.95

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



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-1621 \$79.95

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 5 1/2 x 6 1/4 x 2 1/4 inch Phenolic case. Built-in antenna tuner. Weld strength 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

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 separate 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, 4 1/2 x 1 x 2 inches; MFJ-107, 2 1/4 x 1 x 2 inches. Battery included.

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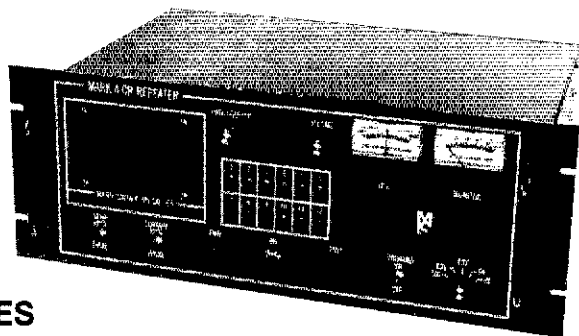
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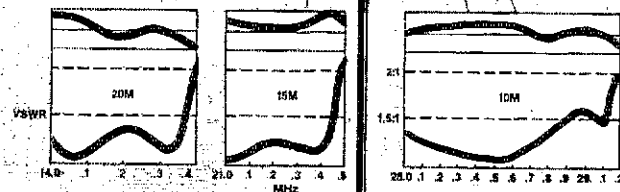
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KT-34XA GAIN / VSWR
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WANTED - 2-Meter Duplexer, with or without repeater, in good condition. Prefer Sinclair, Wacom or comparable manufacturer. Turner Johnson, WB4TVY, 205-222-5112, Covington Amateur Radio Club, 106 South Ridge Road, Andalusia, AL 36420.

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FOR SALE: Yaesu Antenna Tuners, FC-102 and FC-707. Twelve-volt power supply, Yaesu FP-707 and Thompson 108RM. Heathkit power meter HM2140A. Tubes, Meters, Microphones, Books by Everett, Hoag, Ghirardi, etc. Send for list. Bill, N0ZX, 11608 Davenport Plz #23, Omaha, NE 68154.

HW-101 w/HP23B, CW filter, mike \$315. Argonaut 505 w/210 power supply. Both sets excellent with manuals. Each brought up to specs by factory and unused since. Jim, KA3JMD, 717-842-2584.

SELL: ICOM 701, power supply and mike, excellent condition \$450. C. Unger, WA2DGP, 6400 N.W. 2nd Avenue, Boca Raton, FL 33431 305-994-8838.

J. W. Miller AT-2500 Auto Track Ant Tuner. \$550. Lee, KA7FEH, 1-503-657-8048.

WANTED - 50 Hz, 500 Watt output, 60 Hz input frequency changer power supply, also HF/VHF Signal Generator with calibrated attenuator suitable for use at Two-Meters. Info to K4IHP, 6950 Hunter's Knoll, Atlanta 30328.

FOR SALE: Datong FL-2 Audio Filter \$100. KB8LH, 216-875-8703.

GALAXY3/P.S. Just retubed, Works Great! \$199. Clegg FM27B. Needs new finals - \$65. You ship. KC9TD, 3645 North 37th Street, Phoenix, AZ 85018.

FOR SALE: R-392 receiver \$200; Tektronics R-529 Waveform Monitor \$100; Midland 13-921 VHF-UHF Pocket Scanner \$65; Standard Signal Model 80 RF Generator \$200; VHF 5-watt HT-220 \$210; Kenwood R-599D hamband receiver \$200; Teletype ASR-33 \$90; KSR-33 \$70; Midland 13-509 220 MHz transceiver \$175. Buyer pays shipping. WB4MYA, Charles Wall, 533 Stratford Way, Clarksville, TN 37043, 615-552-2199.

FOR SALE: ICOM 502A six-meter transceiver \$110. 3 watts. Built-in whip, SSB and CW, noise blanker, RT. Instruction booklet. Absolutely mint. Brit Hill, KASBES, 436 Goodlett, Apt. 3, Tupelo, MS 38801, 601-841-2280.

FOR SALE: SB-104A with power supply, speaker, CW filter, all manuals and cables. Excellent condition. Asking \$400. Let's talk. Jeff Ronner, WB2AEO, 518-735-7400 evenings.

FREE TO Young Ham: HW-100 Transceiver. Hundreds of copies of QST and Ham Radio. You must take everything! Dick Hammelt, W2FRC, Summit, NJ 201-273-2824.

TS-180S with SSB filter, MC-50 mic, PC-1 phone patch (\$475) Dentrion Clipperton L amp (2000 Watts PEP) \$425. Total pkg for \$825. U Ship. Jay Johnson, NC7D, 14208 Fisk Rd., Yakima, WA 98903, 509-966-8661.

YAESU FT901DM hf transceiver, C.W. filter, D.C. power cable, owner & service manuals. Excellent condition. \$575. W7BER, Tempe, AZ 602-820-9111.

ATLAS 210X with AC console, NB, mike \$280. Kenwood R2000 with VHF Converter, like new in original packing \$495. M. Fein, 132 Locust Lane, Irvington, NY 10533.

FOR SALE: Parks 432 conv. - Tapetone 220 conv. - Tecraft 220 xmt - Dentrion MT-2000A - Dentrion GLA-1000 - Amplidyne 6N2 xmt - Gonset Sidewinder 144 Mc - Swan 250 with preamp - MMT-144-28 - HT-37 - Gonset 10-80 kW - Vanguard 220 conv. - ARR 50 Mc conv - K2LNS, 201-526-0781 days.

TELETYPE MODEL 43 with RS-232C Interface, \$350. No shipping. Tom Beckwith, A1SA, 5830 Meridian, Apt. 104C, Gibsonia, PA 15044. 412-443-4383.

VIBROPLEX PRODUCTS: all at big discount (SASE). LML, Box 6435, Alexandria, VA 22306.

WANTED: E-Z-Way RBS50 tower with ground post. WA3FII, 412-264-3576.

YAESU FT-101ZD transceiver, with service manual blower, cascade filter, will ship UPS. Call Jim Hadder, 404-977-7460 or leave message with name & telephone number, excellent condition, \$450, KE4ZX.

FOR SALE: Kenwood TS-930S with CW filter, manual, original cartons. FB condition. I ship. \$900. Dr. Martin, 98-427 Kiliha Way, Aiea, HI 96701.

TS-830S/SP-230/AT-230/MC-50/H2-5: Brand new. \$1000. I ship UPS/Alfred Fredrickson, N2EUL, 215 33rd, Brooklyn, NY 11232.

WANTED: INFORMATION, source for part RT 4 (Bolometer) UTE SM-B-194708 150-250 Ohms for MARS Sig. Gen. AN/JRM-70, TM-1259-30. K4VFA, 915 Madison St., Manchester, TN 37355.

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power supply \$700. You pick up while rig in svs. Paul Wise, W5LI, Rogers, ARK.

ICOM IC502A 6M SSB/CW \$150; Yaesu FT221R 2M multimode xcvr \$250; Cushcraft DX120 2M \$25; Tom, WB2CHE, 914-473-7228.

FOR SALE: SB-104A with all mods. Spare set of output transistors - excellent condition, SB-604 power supply, SB644 VFO never used. Asking \$400. S. Pavone, W2DDN, 201-335-5732.

8158 AND 8072 tubes. Make offer. K4BHV.

FOR SALE: Drake TR-4, AG-4, MS-4, DC-3, manual, mint condition. \$375. I ship. K1HDO, 603-889-2703 evenings.

TRANSFORMERS FOR SALE: 7.5 KVA, 480/240 Volt primary; 240/120 Volt secondary. Also some smaller transformers such as 1.28 KVA filament transformer; Isolation transformers; also 208 to 240/120 Volt transformer, also Stabiline A.C. Voltage Regulator 120 Volt 52 Amp. Klieschmitt Teletype keyboard and printer, make offer. Also 120 Volt 20 Amp. Variac \$50. 30 Amp & 60 Amp. Square "D". Westinghouse and Trumbull fused switch boxes. \$15 each. Merle J. Newton, K2KVV, 311 Main Street, Whitesboro, NY 13492, 315-768-7981.

HEWLETT-PACKARD HP-110A Portable Computer. IBM compatible, includes Lotus-123, Word Processing, Term Emulator, Modem, Brand new, costs \$2995. Selling for \$2450. Fred Bay, K8II, 3291 Cutter Lane, Maineville, OH 45039.

SIMPLEX AUTOPATCH for sale. Connect Systems II includes free programming, ringback and warranty and shipping. \$385. KR8S, 25881 Pembroke, Huntington Woods, MI 48070. PH: 313-399-4646.

PANEL METERS for sale: Voltmeters, Ammeters, Milliammeters, Microammeters, expanded scale meters. Five dollars each. Also circuit breakers made by Heineman, Airpax, Klixon, Wood, Westinghouse, G.E. One to five dollars each depending on type & size. Also link coupled kW antenna tuner, and Palomar Engineers, 2 kW antenna tuner. Make offer. Merle J. Newton, K2KVV, 311 Main Street, Whitesboro, NY 13492, 315-768-7981.

ICOM IC-02AT 2M handi-talkie, spkr/mike, Tokyo HL - 82V like new condition. Must sell \$395. Fred Bay, K8II, 3291 Cutter Lane, Maineville, OH 45039.

MADISON TUBES: GE8146B \$9.95; 12BY7A \$5; 572B \$62; Eimac 3-500Z \$99.95; 4-125A \$35; 807 \$7.50; 6CL6 \$1.95; 3E29/829B \$15; 632A \$5; 4D32 \$60; 6L6M \$12.50; 616B \$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.

DOW KEY coaxial relay Model 60-262842. \$60. WA2LYZ, 609-627-5883.

APRIL SHOWERS bring May Flowers but your unwanted gear will bring sunshine to the Crew learning English Thru Amateur Radio at Junior High School 22 on Manhattan's Lower East Side. Contact WB2JKJ for information.

ATARI CW keyboard program send/receive 40 WPM diskette or cassette for 800 XL, 800 XL \$15. R. Simpson, WA2PYX, 62 Wesleyan Dr., Hamilton Square, NJ 08690.

WANTED: 4- or 5-element Triband Beam. Above average condition only. Richard Schweizer, WB2PCF, 20 Highridge Rd., Monroe, NY 10950 914-782-0673.

WANTED: WORKING Motorola P31 Handle Talkie, low band, high split for 6-meter operation; need not have battery. Ben Kittredge, WA1PBR, Ocean View Hwy, Watch Hill, RI 02891, 401-696-3230.

ICOM IC-701 with SM-2 mic, and 2 DC cables, \$410; PS-20, \$120; RM-2 Remote Controller, \$60. Antenna tuners: J. W. Miller AT-2500 (automatic), \$375; Drake MN-2700, \$225; MFJ-941B, \$50. All equipment in original cartons and in mint condition. You pay shipping. Money orders only. Ted Ayres, KA0FXH, 303-779-8553.

SELL: HEATHKIT SB-104 transceiver, SB-604 speaker, HP-1144 power supply, CW filter & noise blanker installed, manuals, good condition. \$375. N8LS, Stuber, Amherst, OH 44001.

COMPLETE HAL Communications Station. For Sale: KB2100-CT2200-ARQ1000-RS2100 with cables, mint condition. Used less than 20 hours, complete. \$1,295, KC8MY, 616-883-5963.

TELETYPE, KSR-28. Scope tuned T.U. Included. \$200. You ship. WA8YFK, 513-324-3065.

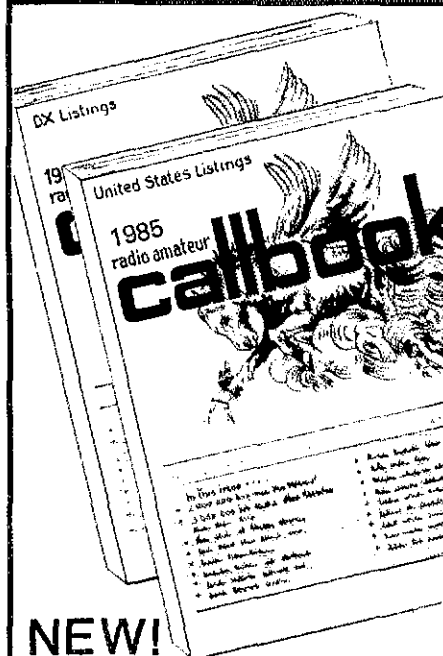
DRAKE: PURCHASED 1973, TR4 with N.B. mike, RV4 remote VFO speaker and power supply. Console with phone patch, wattmeter, antenna relay box never used. Recent factory overhaul. Mint condition. All for \$500. Raul Bottenhorn, 203-575-0426.

ATTENTION OSCAR BUFFS have complete OSCAR station for sale used less than two hours total. FT-726R Yaesu (432-435 MHz & 2 meter transceiver w/satellite module 145.00-1 KLM 160 watt amplifier 2 meter, \$100, 100 watt Tokyo Hy Power 432-435 amplifier, \$160. Phone 806-273-5540 or Ron Gandy, 821 Jackson, Borger, TX 79007.

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
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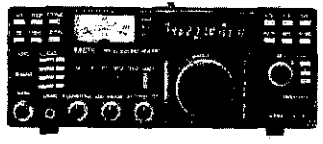
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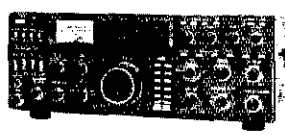


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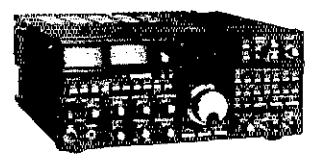


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SALE YAESU FT-221, \$220. ICOM IC-490A, \$400. Kenwood R599A with two and six meter converters, \$230. Rohm tower 40' tilt with rotor, \$160. WA2EUS, 516-842-3037.

FOR SALE: Collins 75S-1, very good, clean, manual, \$150. Will ship UPS free. WB6ZJM, 213-653-6993.

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SB-303, SB-401, SB-600, like new, \$275. W1FF, 354 20th Ave., Brick, NJ 08724, 201-458-1538.

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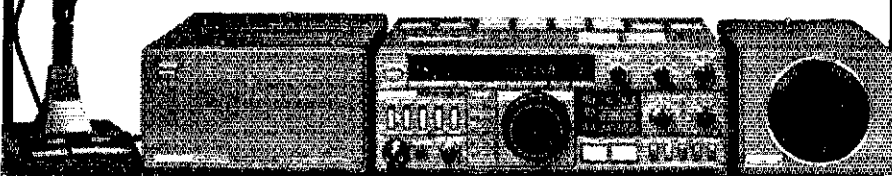
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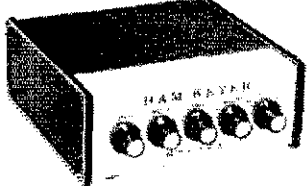


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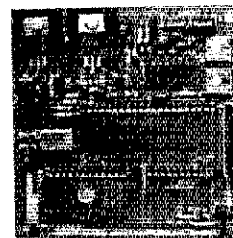
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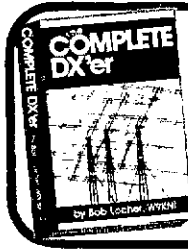
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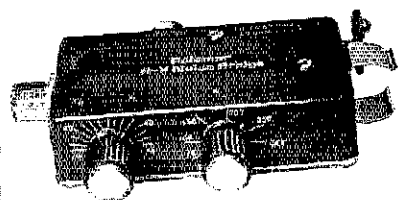
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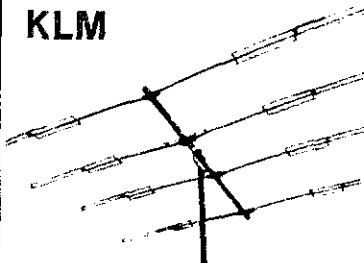
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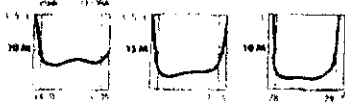
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TS-430S Most Advanced, Compact HF Transceiver

- General Coverage Receiver
- USB/LSB/CW/M Optional FM • 10Hz Dual Step Digital VFO • Eight Memories w/Lithium Back-up • Memory and Band Scan

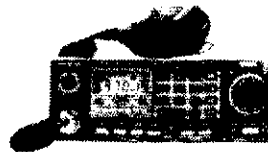
KENWOOD



TS-930S Top of the Line HF Transceiver

- General Coverage Receiver • Superior Dynamic Range • All Solid State—28 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

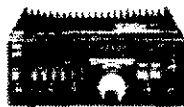
KENWOOD



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/M/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—Computer Aided Transceiver
- Wide Dynamic Range • General Coverage • Low Noise Front End • 10 Hz Digital Readout • All Mode Transceiver—CW/SSB/AM/FM/FSK!

ICOM



IC-745 HF Base

- All ham band HF transceiver. 16 memories. 100KHz to 30 MHz general coverage receiver and adjustable noise blanker and AGC

ICOM



IC-27A Compact Mobile

- A breakthrough in 2-meter mobile communications! Most compact on the market (5 1/2" x 1 1/2" H x 7" D). Contains internal speaker for easy mounting. 25 watts. 32 PL frequencies. 9 memories. scanning and touchtone mic.

ICOM



IC-02AT

- The IC-02AT 2-meter LCD readout handheld features 10 memories, 32 PL tones, scanning, keyboard frequency entry, dial lock, 3W std., 5W opt. DTMF

ICOM



IC-R71A General Coverage Receiver

- The IC-R71A 100KHz - 30 MHz super-ior-grade general coverage receiver features keyboard frequency entry, 32 memories SSB/AM/RTTY/CW, selectable AGC and noise blanker, and wireless remote controller (optional)

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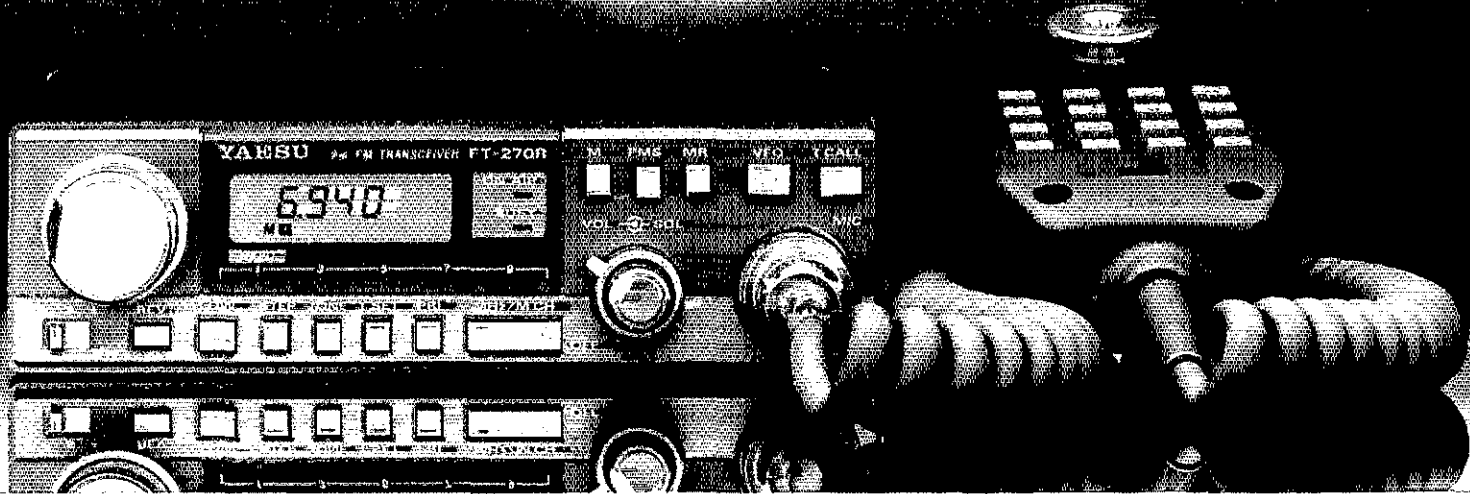
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Presenting two small cases for a lot of mobile power.

You won't find a 45-watt, 2-meter FM mobile rig that's built smaller than the Yaesu FT-270RH.

Nor will you find a dual-band FM mobile that offers the crossband full-duplex capability found in the 25-watt Yaesu FT-2700RH.

It shouldn't be surprising. We've been coming up with a lot of innovative concepts lately.

The FT-270RH measures just 2 x 6 x 7 inches. Conveniently fitting its high-power punch into many small spaces of your car. Places where other 45-watt mobiles just won't fit.

The FT-2700RH is small too. Smaller than other dual-banders. But with one big difference: a "DUP" button. Push it, and you're operating full duplex, 2 meters on one VFO, 440 MHz on the other. Each at 25 watts. So you can simultaneously

transmit and receive in true telephone style.

Once installed, you'll find the FT-270RH and the FT-2700RH equally simple to operate. Just turn the rig on, dial up a frequency, select offset or duplex split, and you're on the air.

Each rig gives you 10 memories for storing your favorite frequencies. Dual VFO capability. A clean, uncluttered LCD display for easy readout. Push-button jumps through the band in 1 MHz steps. Band scanning with programmable upper and lower limits. And priority channel operation.

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. The FT-2700RH announces both your

2-meter and 440 MHz operating frequencies.

Also, tone encode and encode/decode capability is programmable from the front panel, using an optional plug-in board.

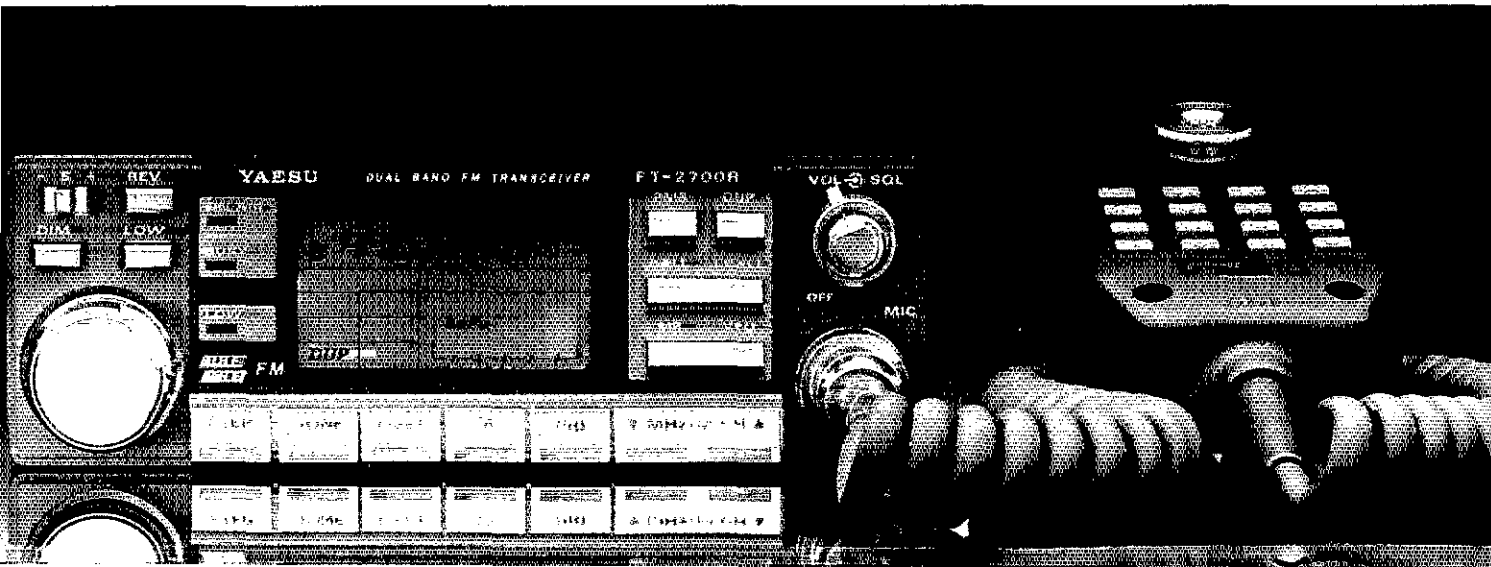
So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

YAESU

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(213) 633-4007

Yaesu Cincinnati Service Center
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(513) 874-3100

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...pacesetter in Amateur radio

NEW!

“DX-cellence!”

TS-940S

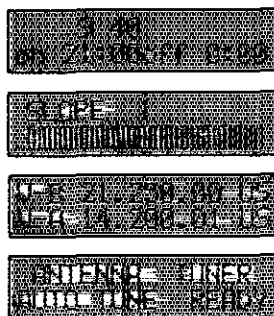
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display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

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting work with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**

- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows 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.



- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel!"
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.



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

KENWOOD

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

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