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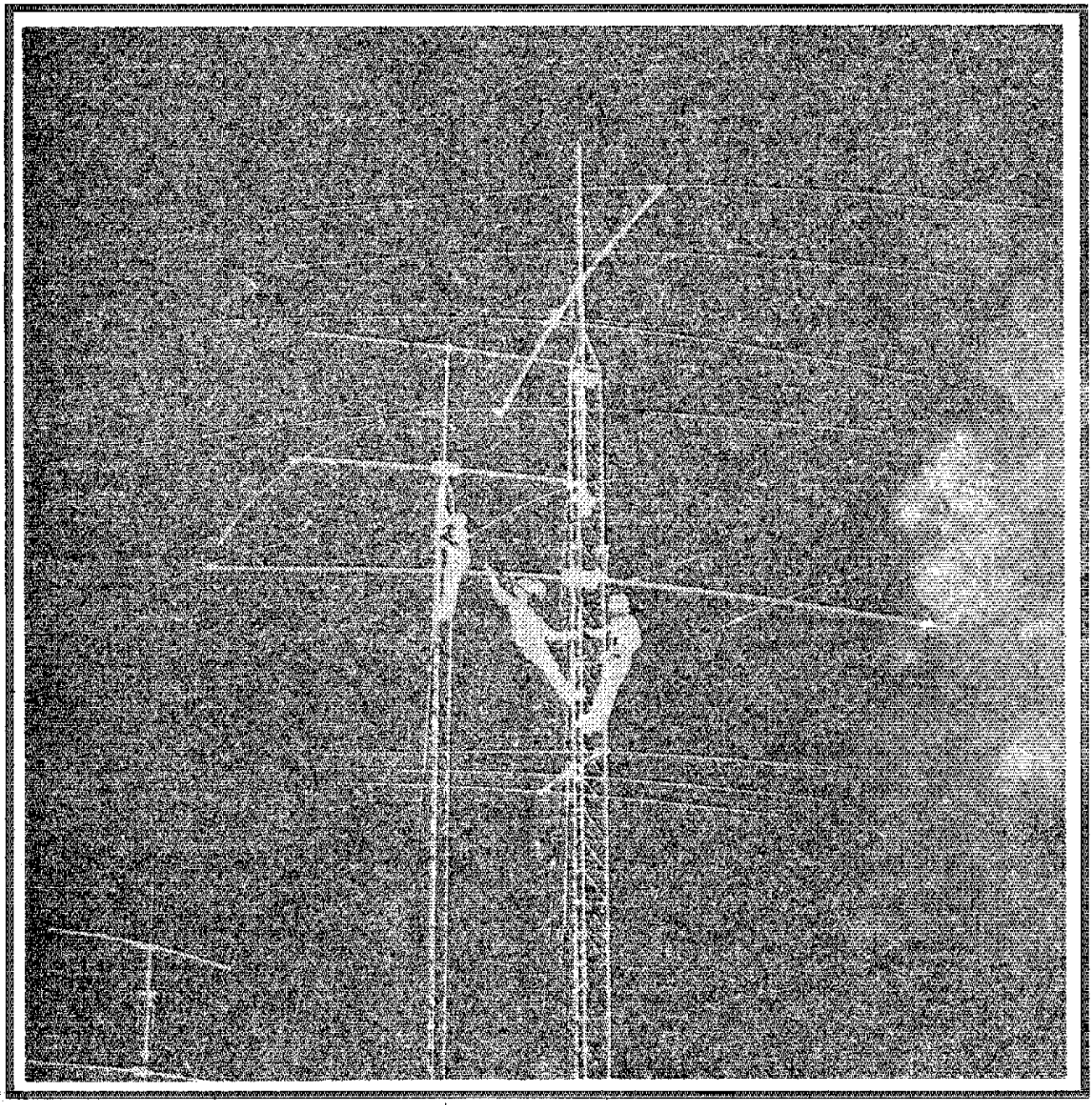

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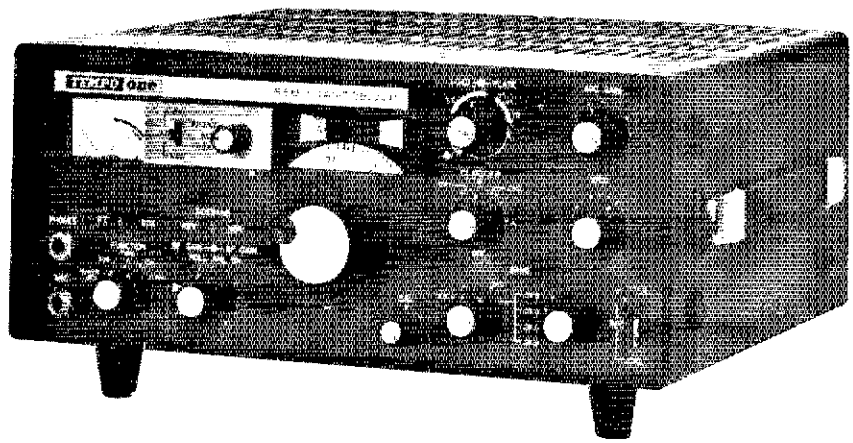

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AF BANDWIDTH: 300-2700 cps
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AGC: Fast attack slow decay for SSB and CW.
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ANTENNA IMPEDANCE: 50-75 ohms
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SIDEBAND SUPPRESSION: -50 dB at 1000 CPS
THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PE

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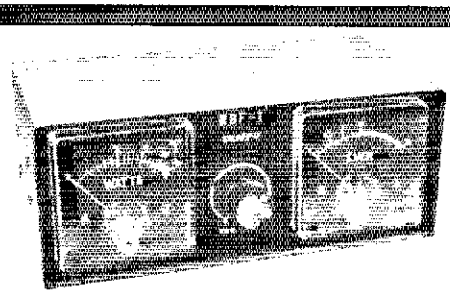

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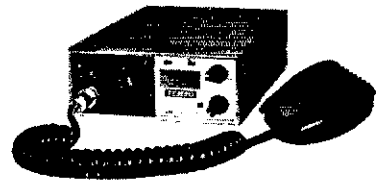

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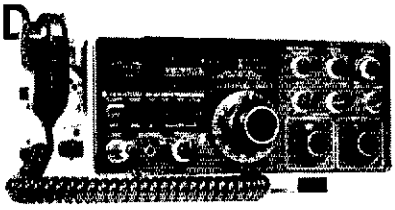

The promise of 2 meter operation...the Kenwood way. The TS-700A operates all modes: SSB (upper & lower) /FM/AM/CW and provides the dependability of solid state circuitry. Has tunable VFO and 4 MHz band coverage (144 to 148 MHz). Automatically switches transmit frequency 600 KHz for repeater operation. AC and DC capability through its built-in power supply. Outstanding frequency stability Complete with micro phone and built-in speaker. $599.00

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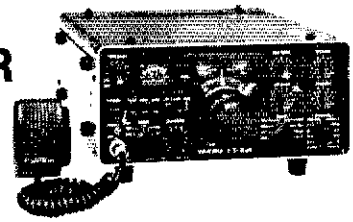

A compact, versatile transceiver designed for the active 2 meter enthusiast. Features all mode operation — SSB/FM/CW/AM — with repeater offset capability. Advanced phase lock loop circuitry, computer-type modular construction. Preset pass band tuning provides the optimun selectivity and performance needed on today's active 2 meter band. Complete 144-148 MHz coverage. Built-in AC and DC power supplies and speaker. $595.00

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The **IC-211** is so new that your local dealer is still playing with his demo. Just hang in there and you can grab this new leader for yourself. ICOM's new wave is rolling in.

Frequency Coverage: 144 to 148 Mhz
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Modes: SSB (A3J), FM (F3), CW (A1)

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FM 0.4 uv for 20db Q.S.

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Power Output: 10W PEP (SSB), 10W (CW, FM)
Size: 111mm H x 241mm W x 264mm D
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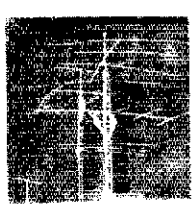
THE COVER

A Murphy's Marauders Field Day photo illustrates the antenna theme of this special issue.



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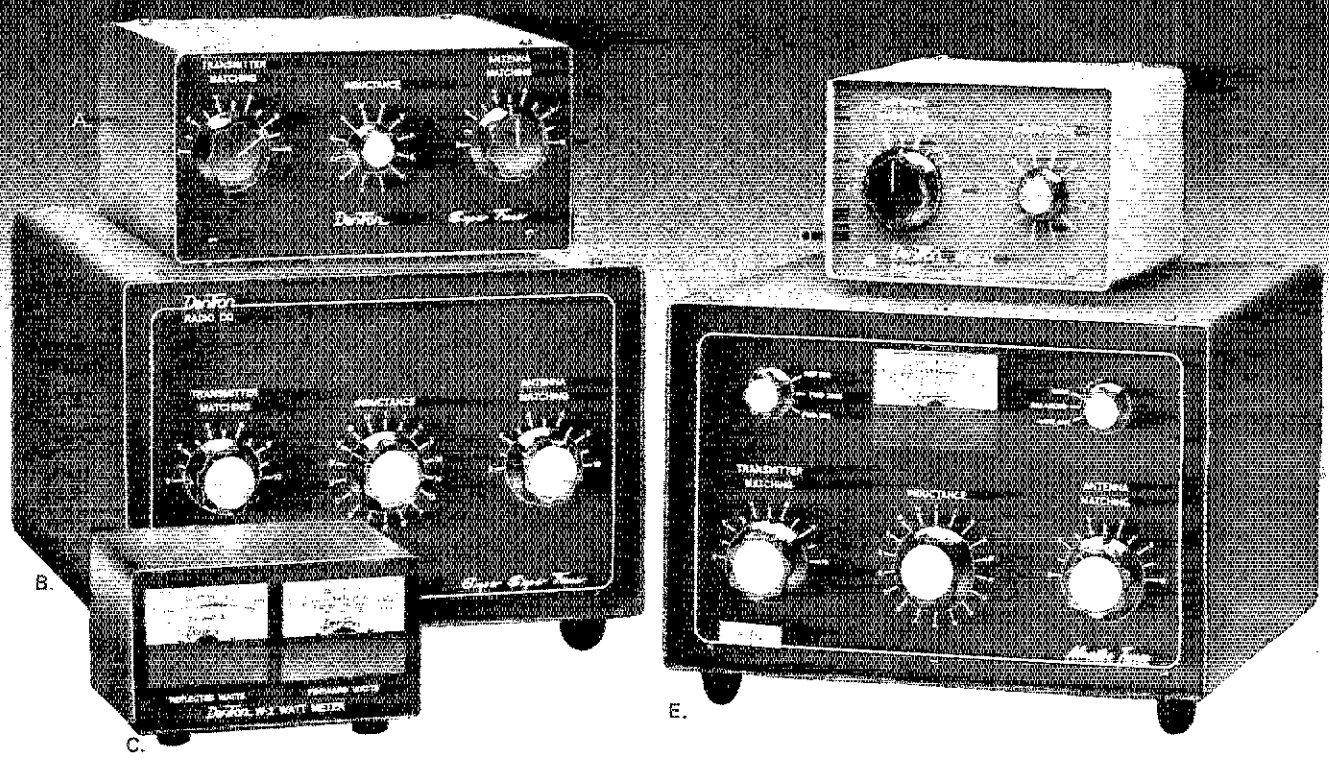
Does Your Transmitter Love Your Antenna?



If you're fighting the constant battle of limited band width, high SWR ratios, inefficient low-pass TVI filter operation due to high SWR you're not alone.

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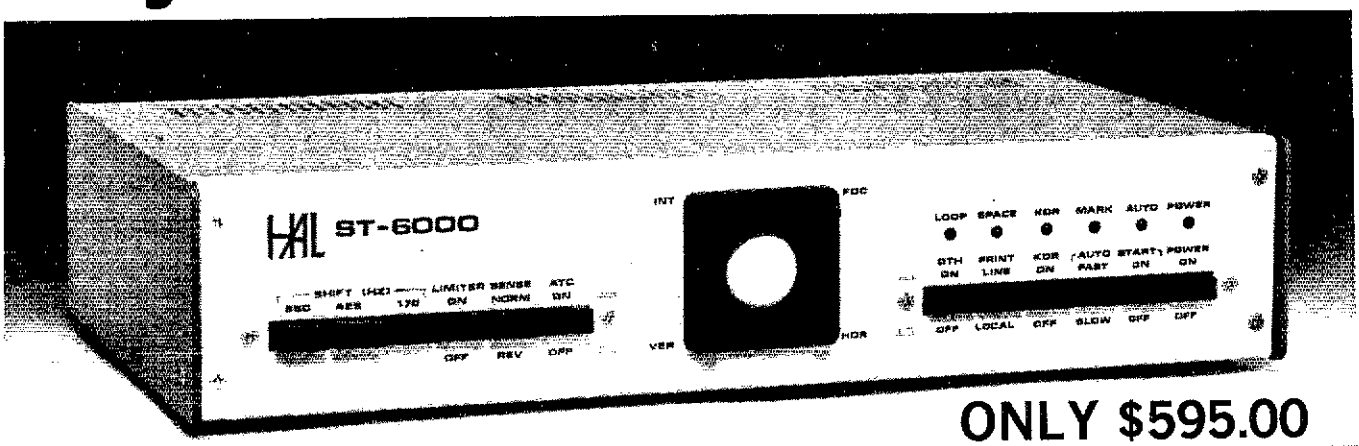

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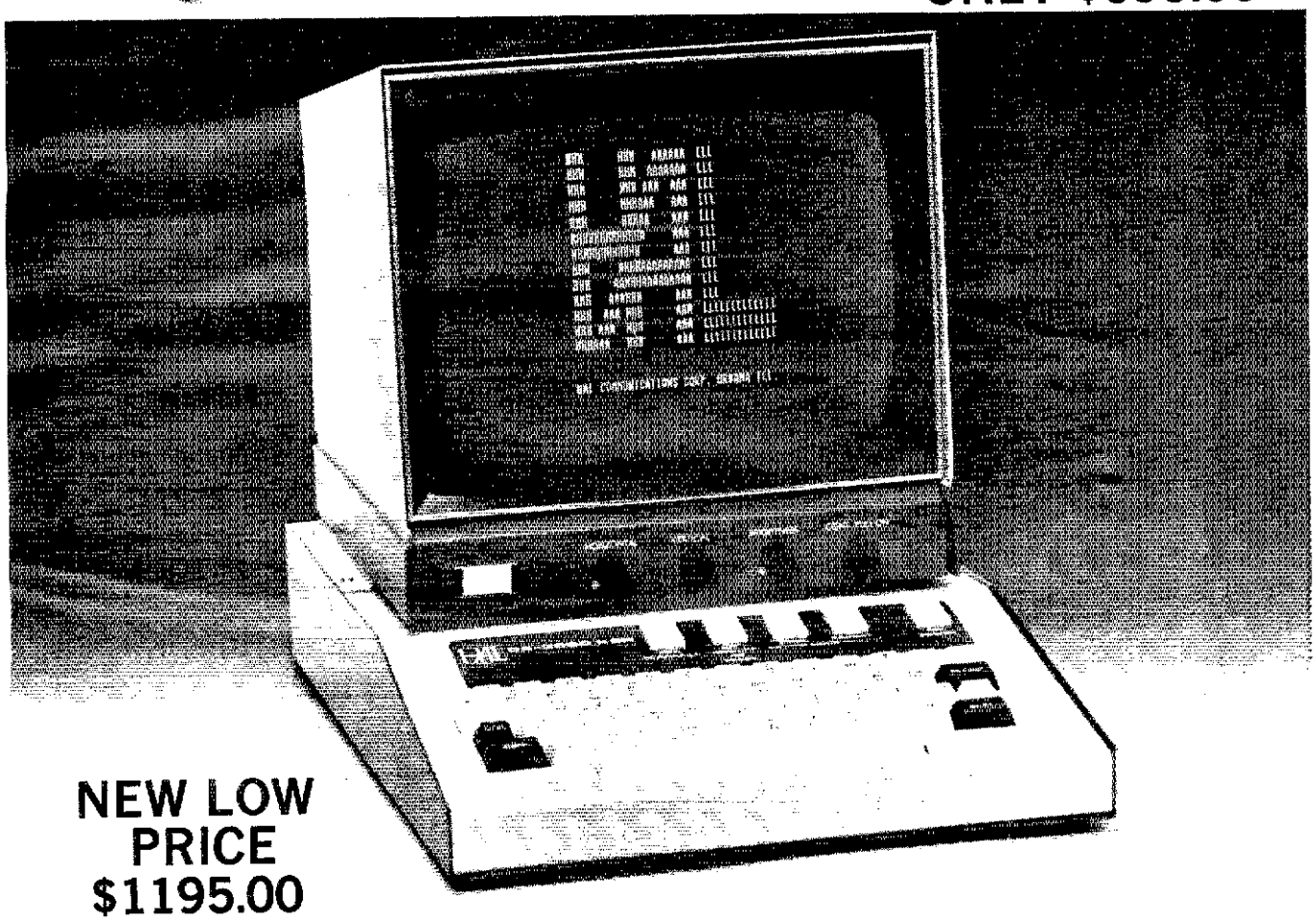

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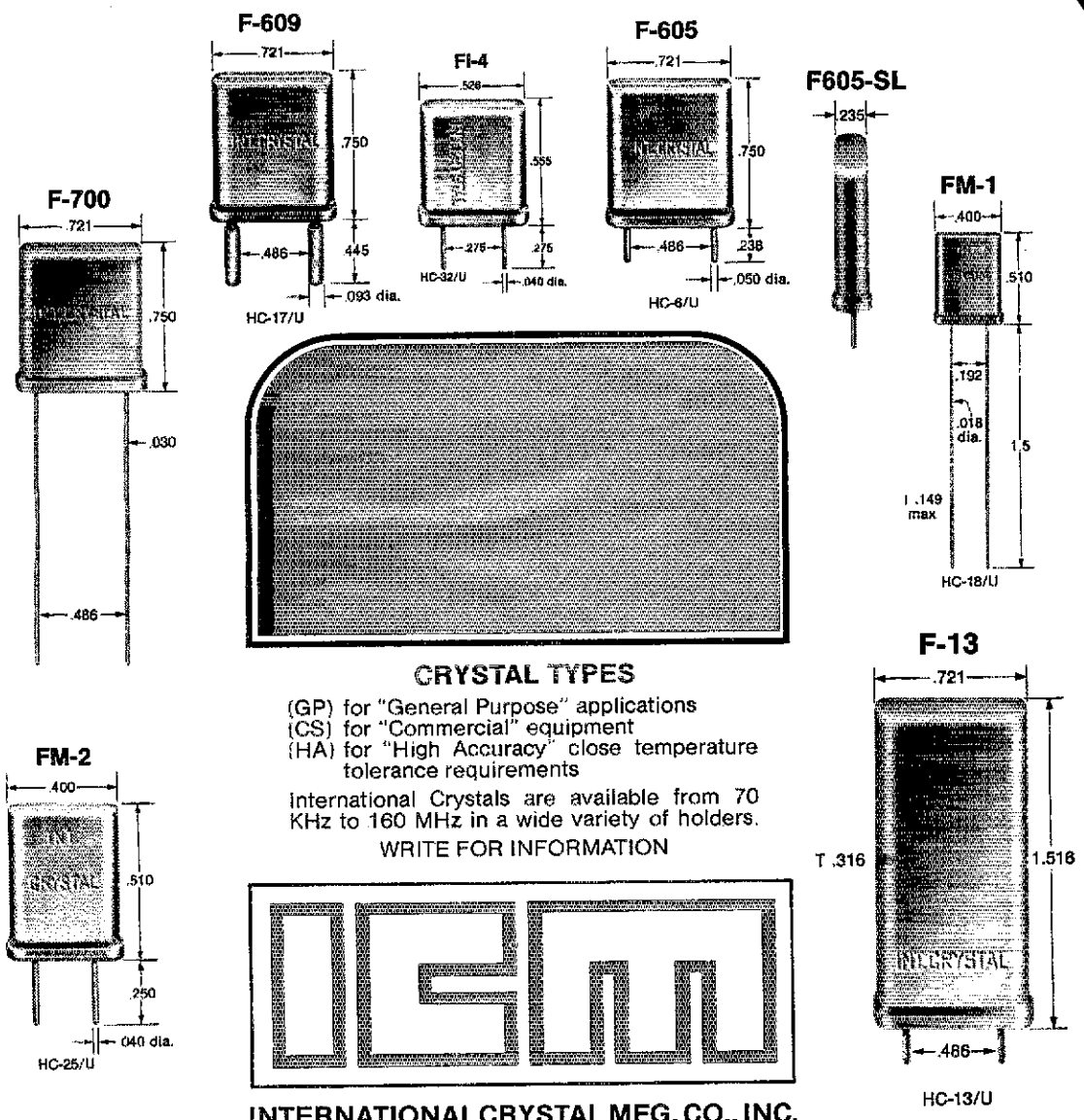

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Sacramento Valley	Norman A. Wilson, WA6JVD, Route 1, Box 730, Woodland 95695
San Francisco	Charles K. Epps, W6OAT, 36 Belcher St., San Francisco 94114
San Joaquin Valley	Charles R. McConnell, W6OPD, 1658 W. Mesa Ave., Fresno CA 93711
Santa Clara Valley	James A. Maxwell, W6CF, P. O. Box 473, Redwood Estates 95044

Roanoke Division

North Carolina	Charles H. Brydges, W4WXZ, 4901 Tiffany Ave., Winston-Salem 27104
South Carolina	Thomas L. Lufkin, WA4DAX, 4337 Flynn Dr., Charleston 29405
Virginia	Robert L. Follmar, N4RF, 1057 Dune St., Norfolk 23503
West Virginia	Donald B. Morris, W8JM, 1136 Morningstar Ln., Fairmont 26554

Rocky Mountain Division

Colorado	Clyde O. Penney, WAØHLQ, 1626 Locust St., Denver 80220
New Mexico	Edward Hart, Jr., W5RE, 1909 Moon N.E., Albuquerque 87112
Utah	Ervin N. Greene, W7EU, 4326 Hermosa Way, Salt Lake City 84117
Wyoming	Chester C. Stanwaity, W7SDA, 353 S. Ferris St., Powell 82435

Southeastern Division

Alabama	James A. Brashear, Jr., WB4EKJ, 3002 Boswell Drive, Huntsville 35811
Canal Zone	Theodore J. Herrman, KZ5VV, Box 144, Gamboa
Georgia	Alpheus H. Stakely, K4WC, 2220 Lyle Road, College Park 30337
Northern Florida	Frank M. Butler, Jr., W4RH, 323 Elliott Rd., S. E., Fort Walton Beach 32548
Southern Florida	Woodrow Huddleston, K4SCL, 219 Driftwood Lane, Largo 33540
West Indies	David Novoa, KP4BDL, Paseo Arce 2430, Levittown, PR 00632

Southwestern Division

Arizona	Marshall Lincoln, W7DQS, Box 1490, Wickenburg 85358
Los Angeles	Eugene H. Violino, W6INH, 2839 Canada Blvd., Glendale 91208
Orange	William E. Heitritter, WB6AKR, P. O. Box 521, Hemet, CA 92343
San Diego	Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego 92117
Santa Barbara	D. Paul Gagnon, WA6DEI, 1791 Hedon Cir., Camarillo 93010

West Gulf Division

Northern Texas	Leland F. Heithecker, W5EJ, 1409 Cooper Dr., Irving, TX 75061
Oklahoma	Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750
Southern Texas	Arthur R. Ross, W5KR, 132 Sally Lane, Brownsville 78521

*Official appointed to act temporarily in the absence of a regular official.

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

The FCC Dilemma

Fees for radio license applications, a subject of much debate and controversy for these past 12 years, were discontinued as of January 1. In December the U.S. Court of Appeals for the District of Columbia directed the Commission to justify each fee assessment, to calculate the cost basis for each fee, and to set a fee calculated to return the cost basis at a rate which reasonably reflects the cost of the services performed and the value conferred on the payor. Furthermore, the court stated that FCC should recalculate its 1970 fee schedule under the court's guidelines and refund any portion of the money collected in excess. While some fees range as high as $100,000, it is probably safe to say that the majority are in the $2 and $4 category – the cost of returning such fees would surely exceed the amount of the return, and to contemplate the return of the zillion or so such fees that have been paid in is a nightmare.

Fees or no fees, FCC is faced with an ever-increasing flood of work – caused mainly by more license applications and the need for more enforcement of the regulations. News media coverage of the CB phenomenon has made us all well aware of the 500,000 or so CB license applications per month (actually, there were 980,253 CB applications during the month of January!), the increase to 40 channels for Class D and the need for type-acceptance examinations of the new 40-channel gear, and the need for greater enforcement.

In the amateur service, much the same thing is happening – only the scale is different. In January there were 21,500 pieces of amateur-related mail at Gettysburg – as recently as 1974 the average number of pieces of such mail per month was 8300. Because amateur applications are more complicated than those for CB, they are, on an individual basis, more work for the Commission.

But the problem is that, despite all of this, the Commission has not been able to obtain approval of a budget large enough to cope. In order to survive, the Personal Radio Division has streamlined the CB license-issuing process so that it costs less than a dollar to issue a CB license. But they still don't have enough money and people to handle the flood.

Many of the recent actions taken and proposed by the Commission were designed to reduce the cost of regulating the amateur service. New programs, even though beneficial to the amateur service, can't be considered at this time, according to the Commission, because to implement the programs would cost money, and there is no money.

The ironic thing is that even when there were fees, the Commission never saw the money – it went directly into the general fund of the United States, and the Commission still had to exist on a budget reviewed by the Office of Management and Budget, and finally approved by the Congress – a budget that may have been less than the fee receipts and was generally inadequate.

What to do? Some have suggested, for example, that the problem be solved by doing away with CB licensing. There are those of us who shudder at *that* thought. Ten million radio transmitters, unlicensed, unregulated? Whew!

Another solution is for the Commission to have more money. Now, none of us are in favor of higher taxes, but if we are to have regulated radio services, we've got to have an FCC that is equipped to handle the task. Perhaps the higher taxes wouldn't be necessary if there were fees which were calculated on a realistic cost basis and if the income from those fees went directly to FCC to support the regulation of the stations which paid the fees.

Chairman Wiley has taken the position that the Commission's prior schedule of fees was established in an effort to comply with the Independent Offices Appropriations Act of 1952 and Supreme Court action. He further states that the ultimate solution is for the Congress to consider suitable legislation which would provide clear guidelines. In other words, the Congress needs to establish the basis on which fees are collected and the disposition of fees.

Because of the long lead time in developing a government agency budget (for instance, right now the 1978 budget is being developed), it is difficult to deal with the realities of the present with a budget that was devised a couple of years ago. We think this is a good argument either for radio license fees being channeled back directly to FCC or a more realistic budget.

If you believe that all radio services should be licensed and regulated (and we do), and if you believe that FCC needs those additional resources to properly accomplish this task (and we do), then you may wish to communicate directly with your Congressional representatives. Now. – *W1RU*

League Lines...

The FCC has announced a moratorium, effective March 3, 1977, on applications for special events stations and new secondary stations in the amateur service. Amateur Extra class licensees eligible for 1x2 calls on January 1, 1977 that applied for those calls on or before March 2, 1977 are not affected by this ruling. However, those eligible for 1x2 calls on April 1, 1977 will not be able to have 1x2 calls assigned as new secondary station licenses, but must modify an existing primary or secondary station license to show the new call. All amateurs currently holding secondary station licenses may modify or renew them during this moratorium. The moratorium applies only to new secondary station and special event license applications.

Regarding 1x2 applications: If you get your Extra today and you were a licensed amateur 25 or more years ago, you are eligible to apply for a 1x2 call. You must submit copies of proof of your Extra class standing now and of your licensing then. Those licensees having their Extra before July 1, 1976, no matter how long licensed are also able to apply now. Updated lists of available 1x2 calls are available from ARRL for a self addressed stamped envelope (S.A.S.E.) with 24¢ postage. Mention April 1x2 list.

Gettysburg was swamped with applications in January -- 21,500 amateur and 980,253 CB. More applications were received during the first five days of January than during the entire year of 1973. End of January figures showed a total of 293,655 amateurs and 8,159,176 licensed CBers. Monthly averages for amateur applications in 1974 were 8300, for 1975 were 9700, and for 1976 were 12,300.

Staff expansion is necessary in the HQ Technical Department. We're looking for people who enjoy helping others through technical correspondence. They will serve as Technical Information Specialists, handling interesting letters and phone calls from ARRL members. We also have openings for lab technicians, plus two editorial positions in the Technical Department. All of the jobs are springboards for career posts at Hq. Please contact WIFB for additional information.

Notices of Proposed Rulemaking (NPRM) relating to type acceptance of amateur equipment and banning of linear amplifiers have been released by the FCC. Discussion of that matter is in the article "Amplifiers and Type Acceptance - FCC's Latest Proposals," this month. Copies of both Dockets 21116 and 21117 are available from ARRL for a s.a.s.e. with 24¢ postage. Ask for the Type Acceptance and Amplifier Dockets.

Reminder to radio clubs wishing to spread the word about amateur radio by donating a complete set of League publications to the local library: We've got a deal for you! Your club can get a complete set of ARRL publications for this purpose at half price. Three conditions: (a) Yours must be an ARRL affiliated club, (b) It must send a letter from the local library agreeing to display and circulate the manuals, and (c) $35.00 with the order. (Sorry, we cannot bill.)

The propagation predictions from Boulder this month (see page 83) are based on increased solar activity: a smoothed sunspot number of 13, compared with last month's 8. A sign of better things to come? Let's hope so!

Life Member WA5CBT from San Antonio is the very first qualifier for the new 6-Meter "600 Club" Award. Gene did it in a period of 7 1/2 weeks, working 182 contacts, 34 sections and 2 countries.

FCC crack down on CB operators in Syracuse, NY; Birmingham and Phenix City, AL; and Columbus, GA after extensive investigations by engineers from the Buffalo and Atlanta District Offices has led to the confiscation of more than $18,000 of equipment, four convictions and various fines. The actions followed numerous complaints of interference by television viewers and other CB users. Most equipment seizures involved high power amplifiers and amateur equipment illegally modified for use on the Citizens Band.

Eyesight extra good? QST is available in microform from Xerox University Microfilms, 300 N. Zeeb Rd., Ann Arbor, MI 48106, right back to Vol I No 1, December 1915.

The VHF Quagi

There have been many half-hearted attempts to combine a Yagi and a quad. Most have produced questionable results. Well, here are the "true" facts, the real dope, the hot scoop.

By Wayne Overbeck,* K6YNB

As its name suggests, the quagi combines the best features of the cubical quad and the linear Yagi-Uda beam antenna. This article describes an eight-element quagi design with quad type driven element[1] and reflector plus six Yagi type parasitic directors.

The result is an antenna that has outperformed all similar size conventional Yagis and a number of bigger ones at three vhf conferences where antenna gains were measured. At frequencies above 144 MHz, only larger and very well-tuned antennas seem to outperform the eight-element quagi. But equally important, the quagi can be built by the average amateur with simple materials at a small fraction of the cost of a commercial antenna.

The quagi requires neither fine tuning nor careful handling. Many of these antennas have survived several years of bouncing up and down mountain roads that are little more than goat trails. The elements can be bent and restraightened repeatedly without affecting the gain or SWR.

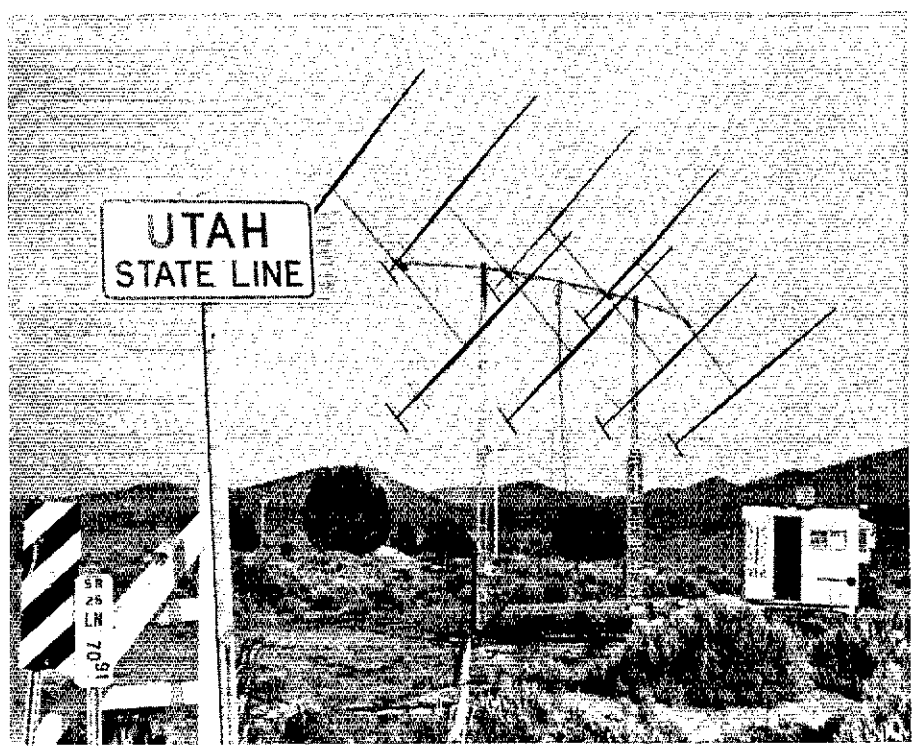
The antenna's secret, if there is one, is its hybrid character. With Yagi type directors, the quagi retains the simplicity and gain of a long-boom Yagi without the Yagi drawback at vhf – a dipole driven element. As many antenna builders have learned, matching a Yagi at vhf (and especially at uhf) is not easy. Gamma matches tend to become less than effective at these frequencies, and other feed methods such as the delta with a balun and universal stub lead to cumbersome antennas that may not endure rough handling or wet weather.

In fact, some of the best vhf-uhf antennas these days, both homemade and commercial, are hybrid designs that avoid the problems inherent in a Yagi type dipole driven element by not using one! Notable commercial examples of this trend are the log-periodic Yagi (using a log-periodic type broadbanded feed) and a 20-element collinear with Yagi type directors. Both are effective antennas, sans dipole feed problems.

The quagi solves the feed problem in a way that is more practical for the amateur by using a quad type driven element that requires no tuning at all for good performance, even at 432 MHz. The quagi can be fed directly with RG-8/U (or if necessary, RG-11/U, since characteristic impedance of the loop is about 60 ohms at resonance). Anyone who can measure off some lengths of wire can build one and make it work, with no test equipment at all. The quad loops don't even have to be very "square" for the antenna to work correctly. Besides the simplicity, the quad loops offer a fringe benefit of a little extra gain over linear half-wavelength elements. More about that in a moment.

Some Quad-Yagi Theory

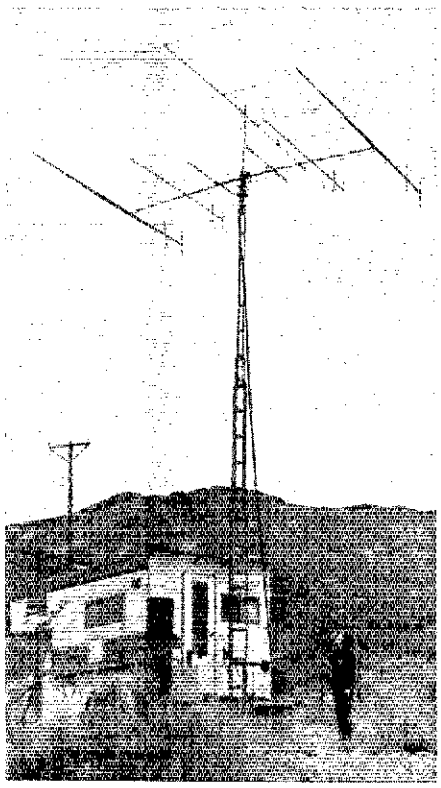
Although this is a practical construction article and not a theoretical



This array of eight quagis was used for a portable moonbounce expedition to the Utah-Nevada border in 1975 (see "Boondoggle in the Boondocks," page 11 in *QST* for May, 1976).

*5113 Whitecap St., Oxnard Shores, CA 93030

[1] Footnotes appear on page 14.



In this photo WB6IDK looks over an array of two quagis each for 144, 222 and 432 MHz (plus a five-element Yagi for 50 MHz) at a site in southwestern Utah. From this site K6YNB/7 worked numerous stations in the Los Angeles area, 400 miles away, on all bands through 432. A *nonconductive* support is recommended when quagis are mounted side-by-side as here.

treatise on antenna design, it would violate the spirit of amateur radio to merely present the dimensions and send people running off to build a new type of antenna without any discussion of its theoretical basis. The Yagi-Uda antenna with half-wavelength linear elements was very popular before amateurs began experimenting with parasitic beams made of full-wavelength wire loops. However, it became apparent in the 1940s and 1950s that the cubical quad rivaled the performance of a conventional Yagi.

An excellent history and theoretical explanation of the quad appears in Orr's *Quad Antennas*.[1] In fact, Orr provided some of the inspiration for the quagi when he suggested that a two-element quad had an edge over a two-element Yagi because of the loop gain (perhaps an extra 1.5 dB). However, he found that quads seemed to lose this advantage as more elements were added.

Others have disputed that conclusion, notably Bergren,[2] Lindsay[3] and recently Harrison.[4] Lindsay's studies at the Denver University antenna range in the 1960s suggested that, for any given boom length, a quad would outperform a Yagi by about 2 dB. Harrison summarized two scholarly antenna studies and concluded that a loop-Yagi (i.e., a quad type antenna) with any number of elements probably outperforms a similar size Yagi by 1 dB or more.

Lindsay reported that a Yagi must have nearly twice the boom length of a quad to achieve the same gain. This author took advantage of the high gain per foot of boom of the quad to build an extremely compact and lightweight moonbounce array of 16 three-element quads for a recent 2-meter DXpedition to Alaska. A description of this small high-gain antenna appears in a moonbounce application note published by Eimac.[5] The Alaskan moonbounce expedition itself was recently described in *QST*.[6]

The Birth of the Quagi

This type of thinking led to the inspiration for the quagi. More immediately, though, the quagi was born because a commercial Yagi for 432 MHz performed poorly. It's a story worth reading if you have ever believed the often exaggerated catalog gain figures for some commercial antennas.

In 1970, I took a brand-new commercial Yagi which had a claimed gain figure of 13.5 dBd to a measuring session at the West Coast VHF Conference. It measured 6.4 dB over a dipole! A quick check revealed no errors in assembly, and an identical Yagi was soon measured – also around 6-dB gain!

"It's the gamma match. They don't work at 432 MHz," a veteran of many vhf antenna measuring sessions said knowingly. "In fact, few amateurs can put together any kind of feed system that works well at that frequency," he added.

That was a bit of an overstatement, of course. Several true Yagi designs have now been published that work well at 432 MHz – including the W1HDQ classic "Tilton Yagi,"[7] and newer designs by Knadle[8] and Hilliard.[9] However, all three use matching systems that require considerable skill to tune. Having read what Orr, Lindsay and others had said about quads and Yagis, the author wondered if a quad type of feed might be the answer.

Before the next West Coast VHF Conference, the ill-performing, store-bought Yagi was modified in *only one* way: The driven element was removed and replaced with a quad type loop of no. 12 wire. There was no matching of any kind. A type-N connector was soldered in the center of the quad loop bottom side, and it was fed directly with RG-8/U. Now the SWR and gain both looked better. In the gain contest at the next VHF Conference, this antenna was measured at 9.8 dB over a dipole. Simply eliminating the gamma-matched dipole and adding a quad loop had increased the gain 3.4 dB!!!

That led WB6RIV and the author into a summer of antenna design work on a backyard antenna range with a signal source, a remote dipole and a field-strength meter. If just replacing the driven element would get us an extra 3.4 dB, what could be done with a whole new design optimized for a mix of quad and Yagi type elements?

Many, many antennas later, we had an eight-element quagi whose element lengths and spacings seemed about right, with an overall antenna size that seemed to be a good compromise between bulk and gain.

The rest is history. The quagi has won three consecutive 2-meter antenna-gain contests at West Coast VHF Conferences with measured gains up to 14.2 dB over a dipole.[10] The 220-MHz version has won two out of three measurements (losing once to a much bigger log-periodic Yagi). Even on 432 MHz, where the quagi with its four-foot 10-inch boom is usually one of the smallest parasitic antennas measured, it finishes high in the standings, not far behind the 10-foot Yagis.

In presenting this information, the author does not mean to imply that the 2-meter version of the eight-element quagi will outperform some of the largest antennas, such as the popular 16-element log-periodic Yagi and 20-element collinear. Both are a bit big to enter in gain contests, but both probably outperform the quagi by 1.5 to 2.0 dB on 144 MHz. On 432 MHz a 12-foot log-periodic-Yagi described by Holladay[11] and made commercially by KLM Electronics tops the four-foot 10-inch quagi by about 2.8 dB. (But it costs and weighs at least 6 dB more!!!!)

New Ideas, Anyone?

As far as we know, no quagi of any size has ever been built for a frequency below 144 MHz. A 20-meter quagi would probably be a very good antenna, but it would be 140 feet long!!! Moreover, gamma-matched dipoles work well at 14 MHz; this design was created to solve problems unique to the vhf-uhf world. A conventional Yagi may well deliver more gain per pound or per square foot of windload at 20 meters. Even at 50 MHz, a quagi of this design would be too big for the author's portable expeditions and contest work.

If what you want is a good, easy-to-build antenna for 144, 220 or 432 MHz, the quagi may be your answer. Here are the construction details.

How to Build a Quagi

There are few tricks to quagi building. The author has mass produced as many as 16 in one day. Table 1 gives the dimensions for various frequencies.

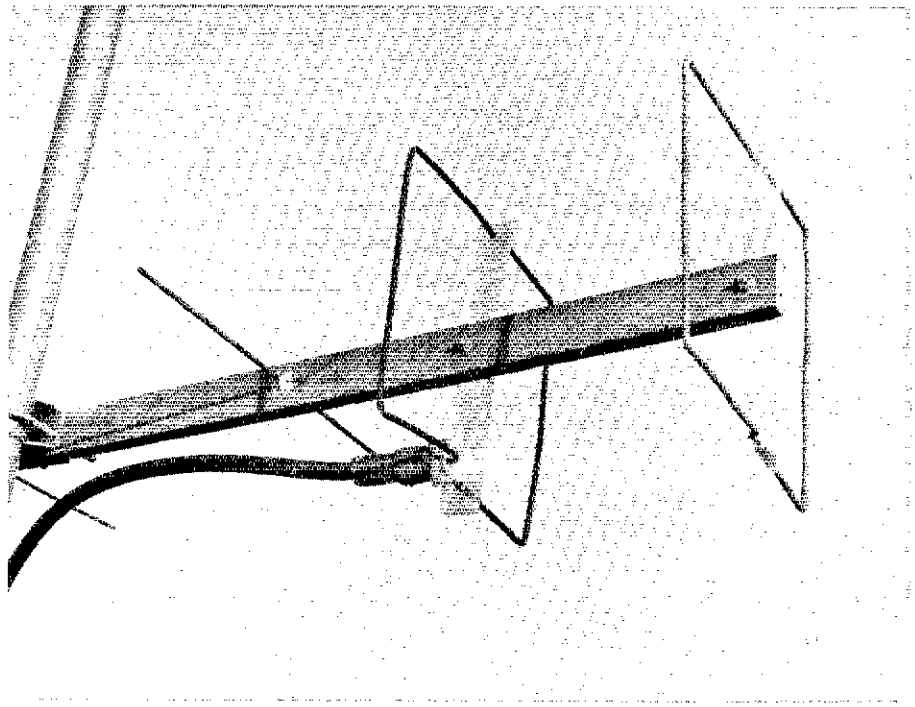
The boom is *wood* or any other nonconductor (e.g., fiberglass). If you

use a metal boom, you'll have to redesign the whole thing and come up with new element lengths. Many vhf antenna builders go wrong by failing to follow this rule: If the original uses a metal boom, use the same size and shape metal boom when you duplicate it. If it calls for a wood boom, use a nonconductor. Many amateurs dislike wood booms, but in the author's salt-air environment they outlast aluminum (and surely cost less). Varnish the boom if you wish.

The 2-meter version is usually built on a 14-foot 1 X 3 boom, with the boom cut down to taper it to one inch at both ends. Clear pine is best because of its light weight, but construction grade Douglas fir works well. At 220 MHz, the boom is under 10 feet long and most builders use 1 X 2 or (preferably) 3/4 by 1-1/4-inch pine molding stock. On 432 MHz the boom must be 1/2-inch thick or less. Most builders use strips of 1/2-inch exterior plywood for 432.[12]

The quad elements are supported at the current maxima (the top and bottom, the latter beside the feed point) with Plexiglas or small strips of wood. The quad elements are made of no. 12 copper wire, commonly used in house wiring. Some builders use no. 10 wire on 144 MHz and no. 14 wire on 432 MHz, although this changes the resonant frequency slightly. Solder a type-N connector (an SO-239 is often used at 2 meters) at the midpoint of the driven element bottom side, and close the reflector loop.

The directors are mounted through the boom. They can be made of almost any metal rod or wire of about 1/8-inch diameter. Welding rod or aluminum clothesline wire will work well if straight. The author uses 1/8-inch stainless-steel rod secured from an aircraft surplus store.

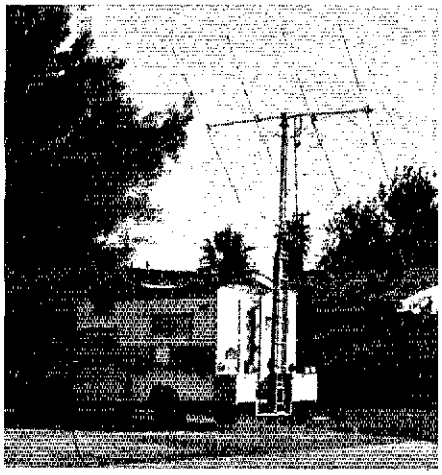


Here is a close-up view of the feed method used on a 432-MHz quagi. This arrangement produces an excellent SWR and an actual measured gain in excess of 13 dB over an isotropic antenna with a four-foot 10-inch boom! The same basic arrangement is used on lower frequencies, but wood may be substituted for the Plexiglas spreaders. The boom is 1/2-inch exterior plywood.

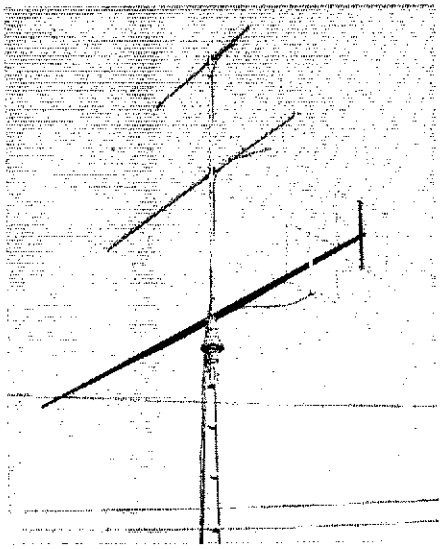
A TV type U-bolt mounts the antenna on a mast. The author uses a single machine screw, washers and nut to secure the spreaders to the boom so

Table 1
Dimensions, Eight-Element Quagi

ELEMENT LENGTHS	*144.5 MHz*	*147 MHz*	*222 MHz*	*432 MHz*	*446 MHz*
Reflector (all no. 12 TW wire, closed)	86-5/8" (loop) (2200 mm)	85" (2159 mm)	56-3/8" (1432 mm)	28" (711 mm)	27-1/8" (689 mm)
Driven element (no. 12 TW, fed at bottom)	82" (loop) (2083 mm)	80" (2032 mm)	53.5" (1359 mm)	26-5/8" (676 mm)	25-7/8" (657 mm)
Directors	35-15/16" to 35" in 3/16" steps	35-5/16" to 34-3/8" in 3/16" steps	23-3/8" to 22-3/4" in 1/8" steps	11-3/4" to 11-7/16" in 1/16" steps	11-3/8" to 11" in 1/16" steps
SPACING					
R-DE	21" (533 mm)	20-1/2" (521 mm)	13-5/8" (346 mm)	7" (178 mm)	6.8" (173 mm)
DE-D_1	15-3/4" (400 mm)	15-3/8" (391 mm)	10-1/4" (260 mm)	5-1/4" (133 mm)	5.1" (130 mm)
D_1-D_2	33" (838 mm)	32-1/2" (826 mm)	21-1/2" (546 mm)	11" (279 mm)	10.7" (272 mm)
D_2-D_3	17-1/2" (445 mm)	17-1/8" (435 mm)	11-3/8" (289 mm)	5.85" (149 mm)	5.68" (144 mm)
D_3-D_4	26.1" (663 mm)	25-5/8" (651 mm)	17" (432 mm)	8.73" (222 mm)	8.46" (215 mm)
D_4-D_5	26.1" (663 mm)	25-5/8" (651 mm)	17" (432 mm)	8.73" (222 mm)	8.46" (215 mm)
D_5-D_6	26.1" (663 mm)	25-5/8" (651 mm)	17" (432 mm)	8.73" (222 mm)	8.46" (215 mm)
STACKING DISTANCE BETWEEN BAYS					
	11' (3.35 m)	10'10" (3.30 m)	7'1-1/2" (2.17 m)	3'7" (1.09 m)	3'5-5/8" (1.06 m)



This is a 432-MHz moonbounce array of 16 eight-element quagis in a configuration that measures only 12 X 12 feet. Only 15 stations around the world worked WA6LET *on ssb* via the moon during the Stanford group's November 1975 test. Two of those 15 (WB6RIV and K6YNB) used this array.



This photo shows a stack of eight-element quagis: one each for 144, 222 and 432 MHz. A TV type rotor will support a stack such as this, even in high winds, with little or no windmilling. Each antenna is fed directly with RG-8/U coax.

the antenna can be quickly "flattened" for travel. In permanent installations two screws are recommended.

Construction Reminders

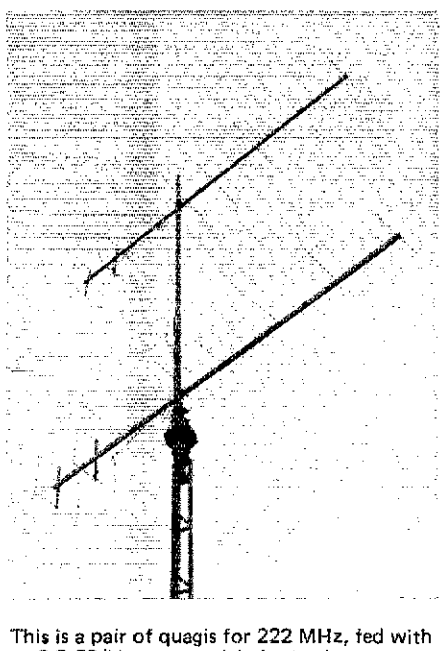
Here are a couple of hints based on the experiences of those who have already built the quagi. First, remember that at 432 MHz even a 1/8-inch measuring error will deteriorate performance. Cut the loops and elements as carefully as possible. No precision tools are needed but be careful about accuracy. Also, make sure you get the elements in the right order. The longest director goes closest to the driven element.

Finally, remember that you are feeding a balanced antenna with an unbalanced line. Every balun the author has tried introduced more losses that the feed imbalance problem. Some builders have tightly coiled several turns of the feed line near the feed point to limit radiation further down the line. In any case, keep the feed line at right angles to the antenna. Run it from the driven element directly to the supporting mast and then up or down perpendicularly for best results.

Phasing Quagis

Like other antennas, quagis can be phased for additional gain. Arrays of two, four, eight and sixteen have been phased successfully for tropospheric, meteor scatter and moonbounce work. Table 1 gives suggested stacking distances. When phasing quagis, make sure each bay is fed in the same *sense*. Each bay must have its driven element in the same relative position and must be fed with the center conductor going to the same side.

For those not wishing to calculate phasing-line lengths, here is a phasing plan for two quagis on 144 MHz that should achieve at least 2.5-dB stacking gain. Secure 25 feet of Belden no. 8221 feed line, an 80-ohm foam cable widely used in CATV applications, and mount PL-259 connectors (with UG-176 adaptors) on each end. Cut the cable into two 148-inch lengths, including the length of the connectors. You'll have a few inches of cable left over. Strip the two open ends back 3/4-inch and solder both outer braids into the grounded mounting holes on an SO-239. Trim away excess wire. Both center conductors go to the center pin. Weatherproof all exposed connections with a silicon coating and mount one quagi 11 feet above the other . An RG-8/U feed line goes to the SO-239 at the junction of the two phasing lines. If you use any other brand or type of coax than Belden no. 8221, the line lengths will probably be different.

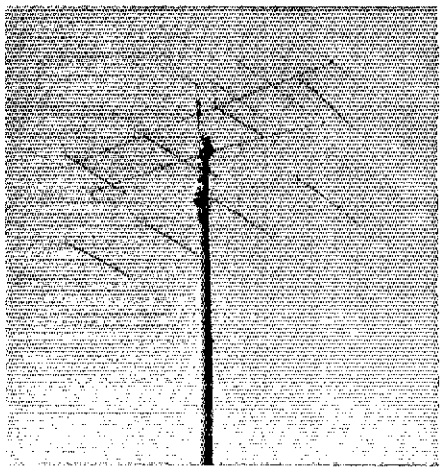


This is a pair of quagis for 222 MHz, fed with an RG-59/U type coaxial phasing harness in the manner described in the text. Note that a small coil along each feed line is arranged to minimize feeder radiation. Several QSOs over the difficult Utah-southern California path have been completed on 220 MHz with arrays like this on *both ends* of the path.

Conclusion and Acknowledgement

The eight-element quagi has consistently performed well in many kinds of vhf-uhf service. It delivers high gain in an inexpensive and easy-to-reproduce design, even at 432 MHz. We hope this article will not only inspire others to build quagis, but also to spend more time working DX on the exciting frequencies above 144 MHz.

The author wishes to thank Wilson Anderson, Jr., WB6RIV, for his valuable assistance in the development of the quagi antenna. QST



An array of eight quagis for 144 MHz joins a seven-element Yagi for 10 meters atop a 90-foot pole at the Rainbow Ridge contest station near Malibu, CA. Here K6BCE straddles the main boom while WB6PXP works on the pole. This array develops some 20-dB gain over a dipole — enough for moonbounce work — but is not designed to steer in elevation.

References

[1] Orr, *Quad Antennas, 1st Ed.*, Wilton, CT: Radio Publications, Inc.

[2] Bergren, "The Multielement Quad," *QST*, May, 1963, page 11.

[3] Lindsay, "Quads and Yagis," *QST*, May, 1968, page 11.

[4] Harrison, "Loop-Yagi Antennas," *Ham Radio*, May, 1976, page 30.

[5] The Eimac moonbounce notes are available from Robert Sutherland, Eimac Division of Varian, 301 Industrial Way, San Carlos, CA 94070.

[6] Overbeck, "Moonbounce Boondoggle," *QST*, February, 1977.

[7] Tilton, "Yagi Arrays for 432 Mc.," *QST*, April, 1966, page 19.

[8] Knadle's 432-MHz Yagi is described in the *ARRL Antenna Book*, 13th edition (1974), beginning on page 243.

[9] Described in Smith, "The World Above 50 MHz," *QST*, January, 1972, page 96.

[10] About measured gains in antenna gain contests: Except on 432 MHz, where a National Bureau of Standards reference antenna is often used, the actual gain figure of a tested antenna means less than its *relative* performance compared to other antennas measured at the same time. On 144 and 220 MHz, there is rarely a reference antenna of known gain, so the actual gain figures may vary from one vhf conference to the next. One 144-MHz quagi received absolute gain figures ranging from 11.5 to 14.2 dBd at three measurements, winning each time with a different gain. Whatever its true gain, the merit of this quagi is best shown by its relative superiority to other antennas against which it has been measured.

[11] Holladay, "High Gain Yagi for 432 MHz," *Ham Radio*, January, 1976, page 46.

[12] Note: The elements are intended to be mounted through the *shorter* dimension of the boom. Mounting the elements vertically through the longer dimension of the boom may affect performance. Even vertically polarized quagis are normally assembled with the elements going through the shorter dimension, even if this means mounting the antenna "on its side" and supporting the boom with an outrigger line.

Some Basic Antenna Information

Want to load a wet string? Will the bedsprings make a good antenna? Or how about the flagpole on the front lawn? Here are some basics on antennas that will help you get some rf out where it is useful.

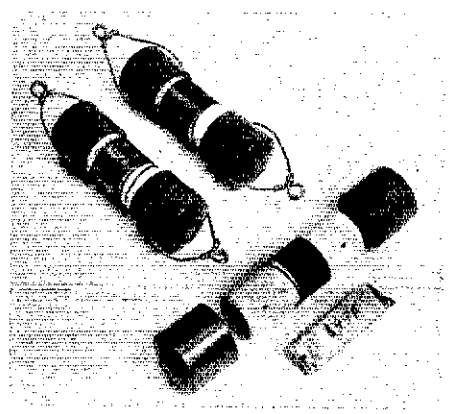
By Lew McCoy,* W1ICP

How does my antenna work? How do I know if the power is actually leaving the transmitter and reaching the antenna? Should my antenna be higher? Lower? These are just a few of the typical antenna questions received at ARRL hq. from beginners (and old-timers, too). Probably no facet of amateur radio is more confusing to the newcomer than the subject of antennas and feed systems. In this article we'll attempt to clear away some of the confusion and present some simple guidelines so that the beginner can have a reasonable assurance that his antenna system is working.

Problem No. 1

One of the first important decisions the new amateur has to make is what kind of an antenna to use. Let's begin with "worst case" conditions. It is quite common to get letters from apartment dwellers that lay down the following guidelines: No outside antennas permitted; or, no antennas permitted on the roof; or, I have an inside apartment, no windows; what do I do? All these questions can be answered – but not with a *precise* answer.

In the first place, *any* piece of wiring or tubing will radiate a signal if you couple radio-frequency energy into it. There are three important considerations about an antenna. First, within certain limitations, the longer the antenna, the better it will perform. Second, the location of the antenna is important in that the more it is in the clear, the better it will work. And third, the height of the antenna above earth ground is important.



This shows two of the completed Pace-Traps plus one broken down to show what they are made of. The capacitor is weatherproofed and then installed in the form.

Let's discuss the length of the antenna. As we mentioned above, any antenna will radiate a signal as long as we can get rf to flow into it. The normal or usual length of antennas used by hams is a half wavelength. It so happens that, depending on the band, a half-wavelength antenna may be slightly long for some locations. An 80-meter half-wavelength antenna, for example, is about 135 feet long – which could be a difficult length to put up inside an apartment. Naturally the question would be, how short can it be and still work? Let's put it this way: A wire as short as 10 feet long can be used on 80 and will work; not well, but it will *work*. You'll need a coupling/matching network, which will be described later. But what is important at this point, a short wire will produce contacts. A couple of questions come up that should be covered. Let's suppose that we live in an apartment and have enough room for more than 10 feet of wire if it is run around corners. Does the wire have to be straight? As a general answer put up as long a wire as you can, even if you have to snake it around corners.

What about locations? An indoor antenna will usually work better when strung along an outside wall than an inside one. By the same token, if any part of the antenna can be brought outside the building, the better the system will work. Probably a short antenna strung out a window will work better than a longer one that is installed inside, but you may have to try both types to see which is best. Also, an antenna mounted on a rooftop is much better than one draped out a window. If the antenna is strung out clear of the building, even better yet.

As to height – well, there is an old axiom in ham radio which is still good advice – get the antenna as high as possible above the ground and make it as long or as big as possible. (They also say that if it stays up, it's too small!) However, it is good advice; get the antenna as high as you can.

By this time you should be getting the idea. Everything about the placement and size of an antenna versus how well it performs goes in steps. We know of one ham in Canada who was told no outside antennas – period! He lived on the first floor of a huge apartment complex, but he solved his problem. He installed a small flagpole on the lawn in

*Asst. Technical Editor, *QST*

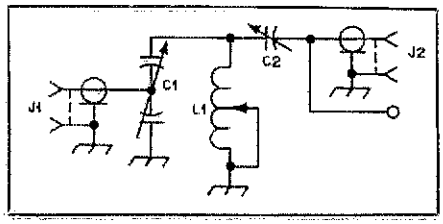


Fig. 1 — Circuit diagram of the Ultimate or Universal Transmatch. See text for details.

front of his living room and ran up the flag. But in the meantime, he buried a feed line and base-loaded the flagpole and used it on all bands! That is what we call *ham ingenuity*.

"Invisible" Antennas

While we are discussing concealed antennas, the so-called invisible types should be mentioned. That's right, we are not joking. There *are* some almost invisible antennas. Any antenna made from no. 24 or finer size wire is practically impossible to see unless you are right on top of it. Many college students use invisible antennas, making dipoles or random-length wires supported by using rubber bands or very thin clear-plastic strips for insulators. One of the crazy problems with invisible antennas is that birds cannot see them and they fly into them, breaking the wires.

Another ham we know had a window that was near a rain-gutter and downspout. He connected a wire lead to the downspout and used a Transmatch to tune the system: He ended up with a very usable radiator. He worked over 100 countries using low-power cw — so we know such a system works.

Which leads us to our first nuts-and-bolts rule: Any metal of any length can be an "all-band" antenna. The only problem we have is making such a piece of metal take power, but usually this can be accomplished by means of a Transmatch.

The Transmatch

What is a Transmatch? Simply stated, a Transmatch is an adjustable rf transformer. Some years ago we called such devices antenna couplers or tuners, but this never was really a correct name because normally one doesn't couple an antenna, but rather an antenna *system*. Therefore, a more appropriate name was coined. Some hams still call such circuits antenna couplers but they mean the same thing as a Transmatch. A look through the advertising pages of *QST* will show many such items with a variety of names but their functions are all identical, to take the unknown antenna-system load and convert it to a usable value for the transmitter. Most transmitters are designed to work into certain resistive loads, usually in the order of 40 to 100 ohms. If the load, in this case the antenna system, is not within this range, it is impossible to get the transmitter final stage to take a full load, or "load up." The Transmatch can be adjusted so that the antenna-system load is transformed to a value the transmitter can handle.

Let's digress for just a second and try to cover the problem of reactance in simple terms. Whenever a circuit such as an antenna or antenna system is not resonant, there is reactance present. Until you become a technical whiz, all you need to know about reactance is that, while it is expressed in ohms, you cannot dissipate power in a reactance. What the reactance does is prevent or hinder the flow of energy into a circuit that has reactance present. The answer to the problem is to cancel out the reactance. Without getting too technical, that is exactly what the Transmatch does. It "tunes out" the reactance along with transforming the antenna load to a value we can work with — usually 50 ohms.

Fig. 1 is the circuit diagram of the Ultimate Transmatch,[1] also sometimes called the Universal Transmatch.[2] This circuit, and many variations of it, will provide an almost unlimited matching range. Depending on a very large number of factors, an antenna system can have a wide range of values from as low as a fraction of an ohm to many thousands of ohms. The important point here is that this Transmatch circuit will convert any such antenna load to the 50-ohm range required for the transmitter.

Multiband Trap Antennas

If the newcomer has the space, one of the simplest antennas to use is a multiband trap dipole. This is an antenna about 105 feet long overall. It is used to cover the 80- through 10-meter bands. Also, it can be used as either a horizontal dipole or inverted V. In the horizontal configuration the antenna is strung between two supports, as high as possible. As an inverted V, the center of the antenna is supported as high as possible and the ends are tied or supported as close to the horizontal as possible. The inverted-V included angle should be close to 90 degrees, but never less than that if possible.

Fig. 2 is a drawing showing the typical trap dipole. Each *L* and *C* represents a coil and capacitor. In the system we are discussing, this coil and capacitor combination is resonated to the 40-meter band. The two sections inside the traps, A-A are each 32 feet long. This provides a total length of 64 feet, which works out to be a half-wavelength dipole on 40 meters. The feed point where the feed line is attached will present a load of about 50 to 70 ohms to the feed line, which in our case should be 50-ohm line. When the system is operated on 40 meters, the traps effectively divorce the end wires B-B from the system, leaving us with a resonant 40-meter antenna.

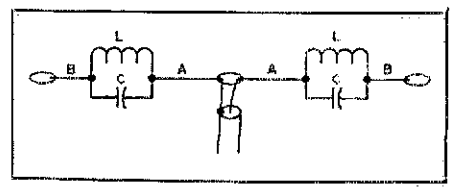


Fig. 2 — This drawing shows a typical multiband trap dipole. The lengths A-A can represent a half-wavelength antenna on 40 meters, while the overall B-A-A-B would be an 80-meter half-wavelength dipole.

What happens when we use this antenna on 80 meters? Well, we know that in order for the traps to be resonant at the 40-meter frequency, the inductive reactance of the coil must equal the capacitive reactance of the capacitor. At 80 meters the inductive reactance becomes half what it was at the 40-meter frequency, and the capacitive reactance becomes twice what it was. Letters are often received at ARRL hq. asking why the extra capacitive reactance doesn't make the antenna electrically shorter still — when it's already less than a half wavelength overall at 80 meters. We won't go into great detail here, but *L* and *C* reactive components in parallel (as in a trap) combine in a different way than they do with the components in series. When the *L* and *C* are in parallel the values combine according to the reciprocals of the reactance values. The net result on 80 meters is that the trap looks electrically like an inductor — a loading coil! Just what we need in this kind of antenna, to make the overall length, A-A, B-B, and L-L become an electrical half wavelength on 80 meters. And the center impedance is about 50 ohms.

One other point about the coil and capacitor type of trap needs mentioning. There is nothing critical about the amount of *L* or *C* as far as the effectiveness of the trap *on 40 meters* is concerned. You could have a coil with a lot of inductance and a small amount of capacitance for the capacitor or vice versa, and the trap will still be effective. The coil and capacitor need only to be resonant in the 40-meter band. But the values selected for *L* and *C* will make a lot of difference in 80-meter operation. If a particular *L*/*C* combination favors the low-frequency end of the 80-meter band, a lower *L*/*C* ratio with the same outside-end sections will favor the high end.

[1] Footnotes appear on page 17.

A common value used for the traps is 10 μH for the coil and 50 pF for the capacitor. The traps shown in the photograph come in a kit which we tested and it worked very well.[3] Also, a recent article by WB9OQM in *QST*[4] shows how to make low-cost traps. What about 20, 15 and 10 meters? The combination works out so that the center feed-point load is in the vicinity of 50 ohms. Let's be honest – this system won't match a 50-ohm line on every band and every frequency perfectly. In fact, there could be enough of a mismatch so that your final amplifier in the transmitter wouldn't take a load. However, the way around this problem is to use a Transmatch – in fact it is a method we highly recommend. We'll tell you how in a minute.

Feed Line – What Kind and How Long?

The feed line we recommend for the multiband dipole is 50-ohm coaxial cable. There are two common types of 50-ohm line you'll hear hams talking about – RG-58/U and RG-8/U. The RG-58/U is less expensive but it also has a smaller diameter line and has higher losses than RG-8/U.

As a newcomer, you'll hear lots of arguments about the length of the feed line. Some hams will tell you that the length has to be a half wavelength or a multiple thereof to get the lowest SWR. This is completely false. There are reasons for using such lengths but they have to do with measurements, not the actual feeding of antennas. There is a simple answer to the question of how long a feed line has to be – it has to be long enough to reach from the antenna to the transmitter and receiver!

Many beginners like to use an end-fed wire or what is commonly called a random-length, end-fed. (Some hams call them long-wire antennas, but a *long*-wire antenna is a wavelength or greater in length by definition.) Using the end-fed wire antenna means that a feed line isn't needed. The end of the antenna is connected directly to the Transmatch. As we said earlier, make the wire as long as possible. Also, try to make the end-fed wire an odd multiple of a quarter wavelength if you can. Such an end-fed wire will work out to be a low-impedance load, somewhere near the 50-ohm value, and easier to adjust with the Transmatch.

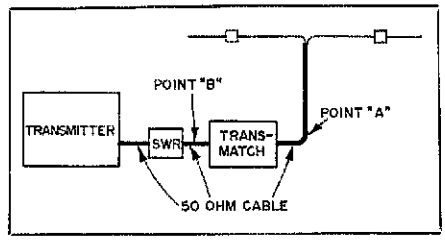


Fig. 3 – This drawing shows the correct placement of an SWR indicator when used for adjusting a Transmatch.

Adjusting the Transmatch

The basic techniques for adjusting a Transmatch do not vary a great deal with the different types that are available. Fig. 3 shows the usual arrangement for a Transmatch hookup. For our illustration, we are using the multiband type antenna described earlier. This antenna is connected to the Transmatch via 50-ohm impedance coaxial cable. Between the Transmatch and transmitter is an SWR indicator which can be a Monimatch or any one of the many power bridges that are available to hams. It is *very* important that the SWR indicator be placed between the Transmatch and transmitter, *not* on the antenna side of the Transmatch. Many amateurs write in saying they cannot adjust a Transmatch and we find on checking that they have installed their matching indicator (the SWR bridge) on the antenna side of the Transmatch. (You can put one there to check the SWR on the line to the antenna, but it shouldn't be used for making Transmatch adjustments.)

With any of the many varieties of Transmatch circuits, the first thing to do is to set the variable capacitors to maximum capacitance (plates fully meshed). With the Universal or Ultimate circuit shown in Fig. 1, the roller inductor coil can also be set for maximum inductance in the circuit. Next adjust the tuning controls on the transmitter so that you are sure the final amplifier stage is in resonance, as indicated by a plate-current dip or by whatever means are used to indicate resonance. Apply enough power, or adjust the drive control of the transmitter so that there is enough power coming out of the rig to provide an indication, preferably a full-scale reading on the SWR meter in the forward position of the SWR bridge. Also, make sure that you have connected the SWR bridge in the 50-ohm line correctly. It is a common mistake to connect one backward, which would give erroneous readings. Next, switch the SWR indicator to read reflected and then adjust the roller inductor toward minimum inductance (turns shorted out) until you notice a dip in the SWR reflected reading. Recheck your transmitter tuning to make sure the final amplifier is resonated. Next, adjust the variable capacitors in the Transmatch while looking for the lowest reading on the SWR indicator in the reflected position. By going back and forth over the adjustments – keeping the transmitter properly tuned – you should be able to reach a point where your SWR meter doesn't show any reading (zero) in the reflected position with a full-scale reading in the forward position. When you have reached that happy situation, you have adjusted the system and particularly the Transmatch for the best transfer of energy from the transmitter to the antenna. QST

Footnotes

[1] McCoy, "The Ultimate Transmatch," *QST*, for June, 1970.
[2] *The Radio Amateur's Handbook*. See chapter on transmission lines.
[3] Pace-Traps, Upland Rd., Middlebury, CT 06762.
[4] Mathison, "Inexpensive Traps for Wire Antennas," *QST*, Feb., 1977.

Strays

I would like to get in touch with . . .

□ any group or individuals planning a DXpedition and looking for an additional operator who will share expenses. I am accustomed to traveling abroad. Dick Ackerman, WB8OFG, 1902 Colgrove, Apt. 108, Kalamazoo, MI 49001.

□ players of strategic or fantasy games (such as Diplomacy or D & D) who are on 2-meter fm. Howard Goldstein, WB2IWX, 5409 Ave. K, Brooklyn, NY 11234.

□ radio amateurs who are also members of an amateur chorus performing classical music. Edward G. Bowley, W2VLH, 86-22 Dongan Ave., Elmhurst, NY 11373.

□ Ojibwa or Chippewa Indian amateurs, especially from Minnesota. M. Michael Dorr, WB9WCR, 531 E. Carpenter Dr., Palatine, IL 60067.

□ any amateur with the name Willingmyre, or anyone knowing about the name, for exchange of genealogical information. Daniel W. Willingmyre, WA3SKO, 9601 51st Ave., College Park, MD 20740.

□ a couple in the U.S. to become pen friends and later to exchange visits. We are an elderly couple living modestly on the outskirts of London. Although we have not worked DX for many years, we are still active locally and would like to become acquainted with another retired couple sharing similar ambitions. A. H. Wickham, G3IAZ, 22 Western Ave., Thorpe, Egham, Surrey, U.K.

Broadband, Steerable Phased Array

Those who own rotatable antenna arrays know how long it takes (or seems to take) to turn the system, especially when chasing DX. What? Instantaneous beam steering on 80 through 10 meters? Now that sounds interesting!

By Richard C. Fenwick,* K5RR and R. R. Schell, PhD*

Although the technique has been known for many years, little amateur use seems to have been made of broadband phased arrays using time-delay beam steering. The "phased-vertical" systems in common use are a rudimentary example of this type of array, but typically are designed for a single band or require adjustments for a band change. As the term "phased verticals" implies, the amateur has become accustomed to thinking of phase shift between elements to steer the beam, whereas we suggest that it is often more useful to think in terms of time delay.

The Time-Delay Principle

The basic principles of time-delay beam steering are illustrated in Fig. 1. If equal-length transmission lines, L_A and L_B, are used to feed antenna elements A and B, radiation from the two will add in directions $\phi = 0°$ and $\phi = 180°$, the broadside directions and perhaps in other directions as well depending on the element spacing S. If a length of transmission line, L, is inserted in series with the line to element B, then the current in this element is said to lag that in element A. The radiation from the two elements will now add in a new direction, ϕ', such that the time delay provided by the extra distance a wave has to travel from element A is just equal to that inserted by the added transmission line to element B. It should be obvious that radiation from each element will also add in the direction $\phi = 180 - \phi'$. It should also be apparent that the length of transmission line inserted uniquely defines the beam steering angle ϕ' completely independent of frequency. For end-fire beam steering, the condition $L = S$ is required (L is an electrical length). The physical delay line length will be $V(L)$ where V is the velocity factor — 0.66 for solid polyethylene dielectric cable and 0.80 for foam cable. In general, $L = S \sin\phi'$. For $\phi' = 45°$, for example, $L = 0.707\,S$. L is inserted in series with the line to element A for steering to angles between $\phi = 180°$ and $\phi = 360°$.

All of the above is predicated on the assumption that the impedances of the two elements are the same. If they are not, phase and amplitude errors are introduced, such that the radiation from the elements does not add up exactly in the intended direction. Because of mutual coupling, the element impedances will never be exactly the same, except when fed in phase or 180° out of phase. The effects of mutual coupling are tolerable, as will be demonstrated. The azimuth patterns of two quarter-wave vertical monopoles have been calculated for several spacings under the assumptions of no mutual coupling (equal element currents) and with mutual coupling. The results are shown in Figs. 2, 3 and 4 for three steering angles at three spacings. These calculations were made using a computer program based on Schelkunoff's expressions for the self and mutual impedances. For the calculations with mutual coupling, the monopoles have been assumed to be fed from a hybrid power divider. This device has the property that equal power will be delivered to the elements so long as they have the same VSWR.[1]

By referring to Fig. 2, it can be seen that the principal effect of mutual coupling is the degradation of the front-to-back ratio in the end-fire direction. This is as would be expected intuitively — the rearward null is caused by a canceling of the fields from the two elements, and any phase or amplitude error will affect the null much more than it will the beam maximum. Incidentally, the impedances of the elements are not at all alike for end-fire steering. For quarter-wave monopoles fed with a hybrid power divider, providing approximately an equal power split, the element impedances are $22 - j7$ and $40 + j35$. For equal element currents,

*Electrospace Systems, Inc., P. O. Box 1359, Richardson, TX 75080.

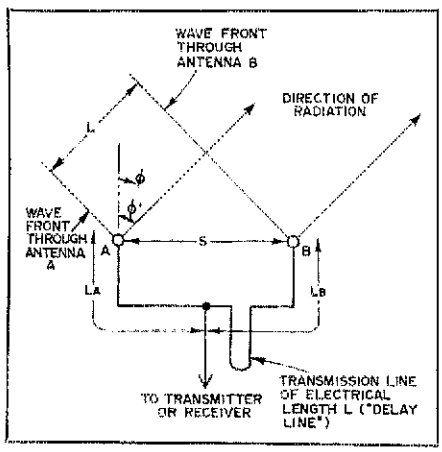


Fig. 1 — Two-element array with time-delay beam steering.

[1] For hybrid designs see C. L. Ruthroff, "Some Broad-Band Transformers," *Proc. IRE*, August 1959, pp. 1337-1342.

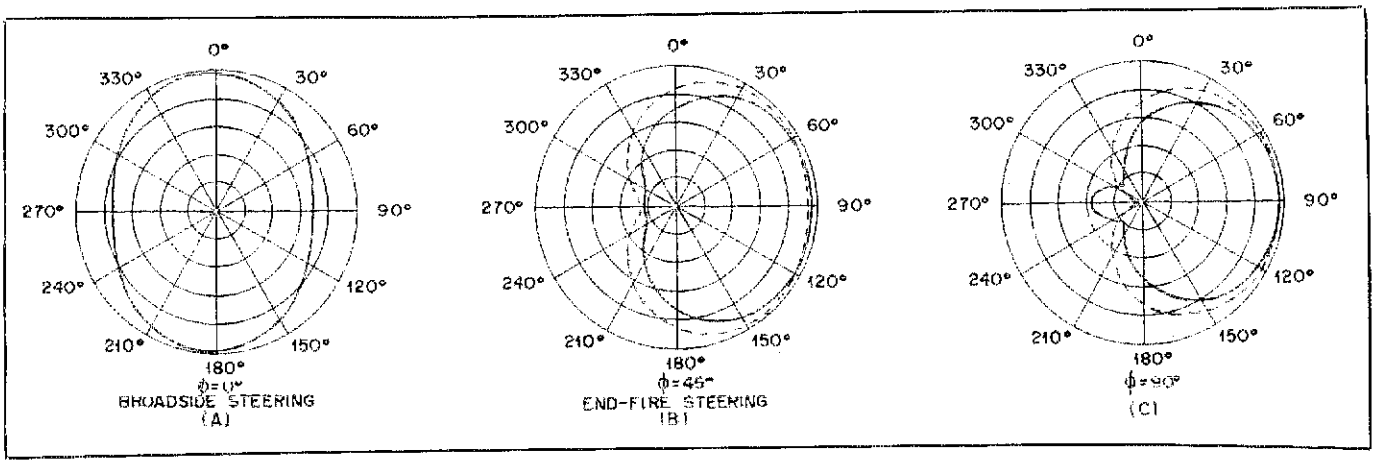


Fig. 2 — Azimuth patterns (linear voltage plots) of an array of two quarter-wave vertical monopoles spaced 1/4 wavelength apart.

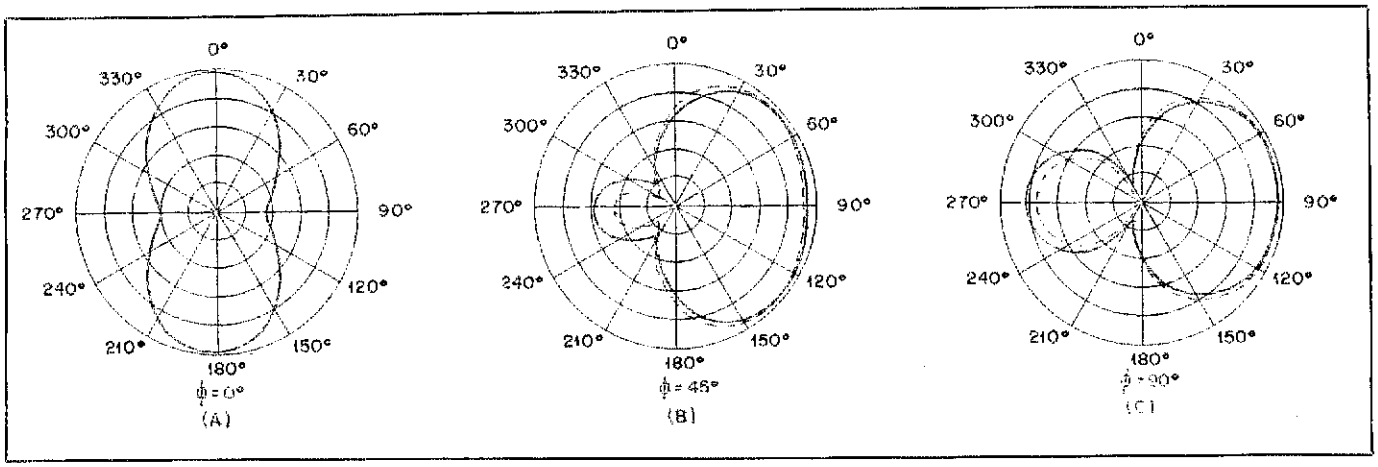


Fig. 3 — Azimuth patterns (linear voltage plots) of an array of two quarter-wave vertical monopoles spaced 3/8 wavelength apart.

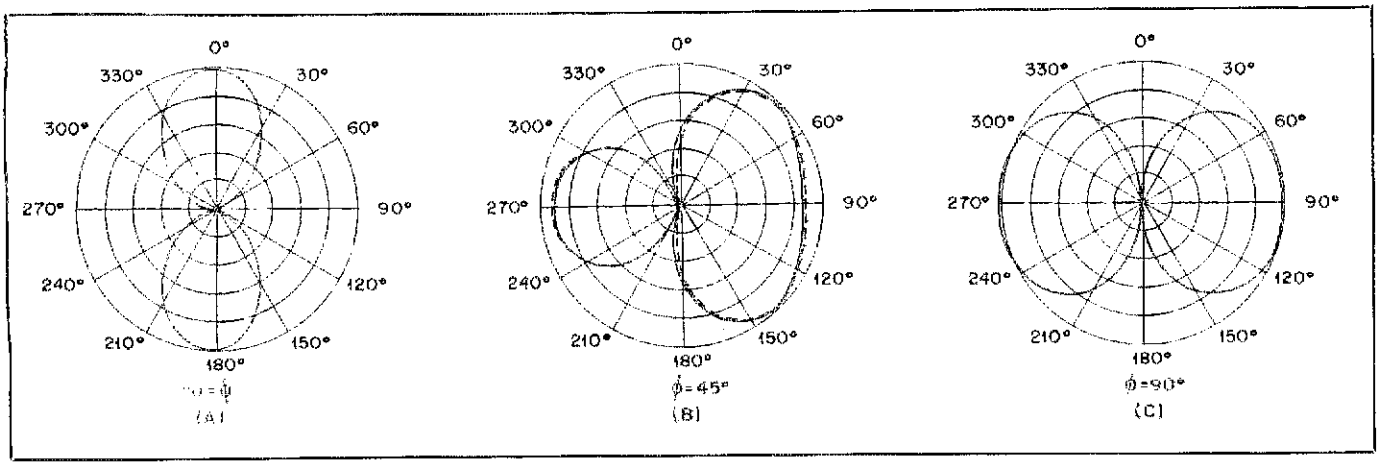


Fig. 4 — Azimuth patterns (linear voltage plots) of an array of two quarter-wave vertical monopoles spaced 1/2 wavelength apart.

the impedances are $20 - j20$ and $51 + j20$, and it is seen that power delivered to one element is more than twice that in the other. At spacings as large as a half wavelength, Fig. 4, the effects of mutual coupling on patterns are seen to be negligible for any steering angle, although mutual effects on VSWR are noticeable in practice. Even though mutual impedances are considerable for broadside steering at all spacings considered, and for end-fire steering for $\lambda/2$ spacing, patterns with mutual impedances taken into account are identical with the "equal current" patterns. This is because the elements have identical impedances and, therefore, equal currents.

A Five-Band System

Time-delay beam steering is readily extendable to larger arrays. For example, Fig. 5 shows a four-element array. Lengths of delay lines L_A, L_B,

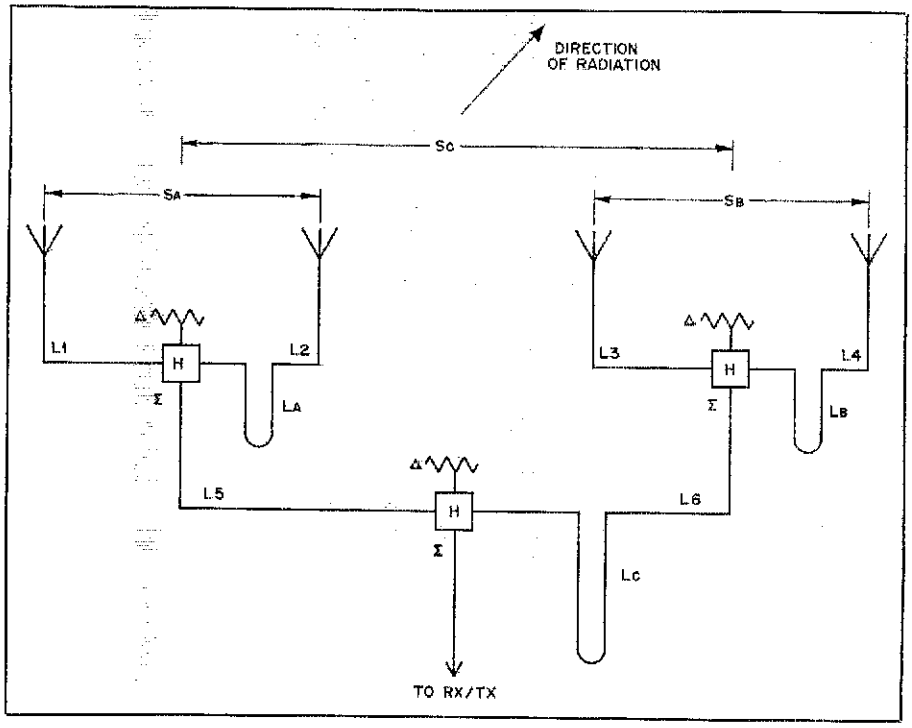


Fig. 5 — Configuration of a steerable four-element linear array. H denotes a ferrite hybrid power divider and matching transformer. Δ denotes the difference port and Σ denotes the sum port.

$L_1 = L_2 = L_3 = L_4$ $\quad S_A = S_B$

$L_5 = L_6$ $\quad L_A = L_B$

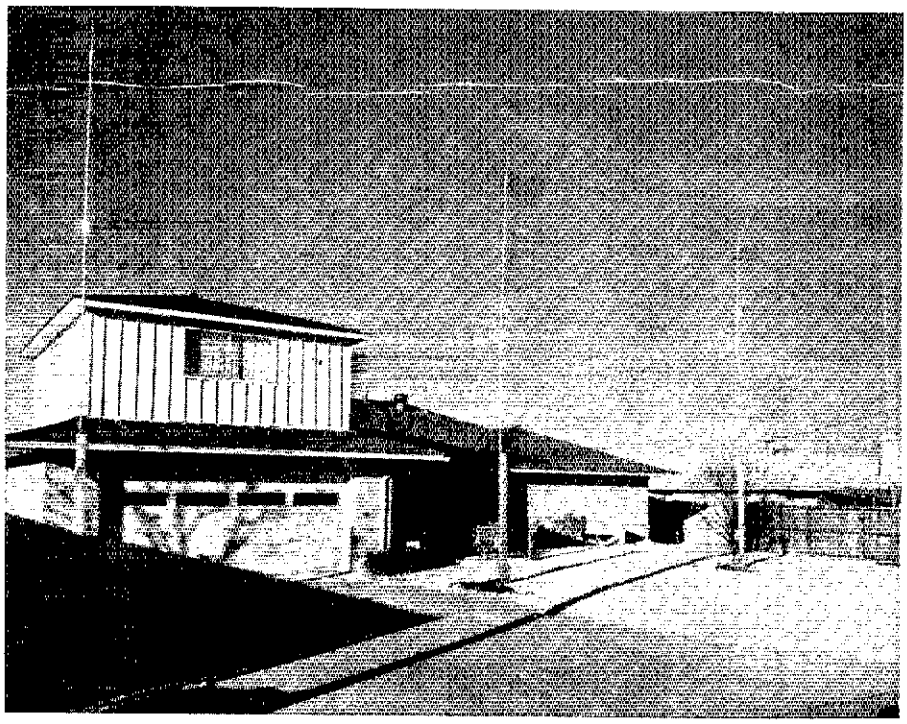


Fig. 6 — Experimental five-band steerable phased array.

and L_C for any steering angle are related to distances S_A, S_B, and S_C in exactly the same way as in a two-element array with spacing S_A, S_B, or S_C respectively. For $S_C = 2\ S_A$ (equal element spacings), $L_C = 2\ L_A = 2\ L_B$ for any beam steering angle chosen. Owing to the complexity of calculation, it was decided to build a four-element monopole array like that in Fig. 5 for 80 through 10 meters in order to evaluate the effects of mutual coupling. The array is shown in Fig. 6. Element-to-element spacing was 25 feet. Somewhat greater spacing was desired, but space limitations prevailed. The element bases were raised to eight feet above the ground and two elevated quarter-wave ground-plane wires were used for each band to minimize ground losses (ground rods were used on 80 meters). Switchable delay lines were used which enabled steering a beam maximum to any of 30 directions. Of particular interest was the VSWR and pattern performance as a function of steering angle. No special effort was made to minimize the VSWR of the individual elements. On all bands except 10 meters the greatest VSWR occurs for broadside steering, falling to 1:1 as the beam is steered away from broadside, then rises near end-fire. On 10 meters the broadside VSWR is 1.5:1 and fluctuates between 1:1 and 1.5:1 at other steered angles. VSWR for the other bands measures 15 meters — 1.8:1 broadside, 1.3:1 end-fire; 20 meters — 1.9:1 broadside, 1.5:1 end-fire; 40 meters — 1.5:1 broadside, 1.3:1 end-fire; 80 meters — 2.5:1 broadside, 1:1 end-fire. Individual element VSWR was high on 80 meters, owing to the lack of a good ground plane. The actual VSWR of the elements themselves is expected to be significant for end-fire steering, but the characteristics of hybrid transformers are such that considerable VSWR compensation is obtained, at the expense of some power dissipated in the hybrid difference-port terminating resistor. This amounts to approximately 0.5 dB maximum for an element VSWR of 2:1.

Radiation patterns appear to be very similar to the predicted patterns for broadside steering. The most significant operational departures are for end-fire steering at spacings where high front-to-back ratios would be expected. Front-to-back ratios on 20, 40 and 80 meters range from greater than 10 dB on 20 meters to 6 to 8 dB on 40 meters and 4 to 6 dB on 80 meters. However, deeper nulls are observed in between the side-lobes. Even on 80 meters the directivity effects are quite noticeable. The trap verticals used, no doubt, are quite lossy on 80 meters and progressively less so on the higher bands. Lower loss elements could be expected to provide further degradation in end-fire front-to-back ratios, such that spacings below a quarter wavelength should probably not be used. However, for readily available five-band trap monopoles, a four-element array with an element-to-element spacing of λ/8 on 80 meters should provide very useful directivity on all bands. Fig. 7 illustrates a few of the patterns obtainable with such an array, neglecting mutual coupling.

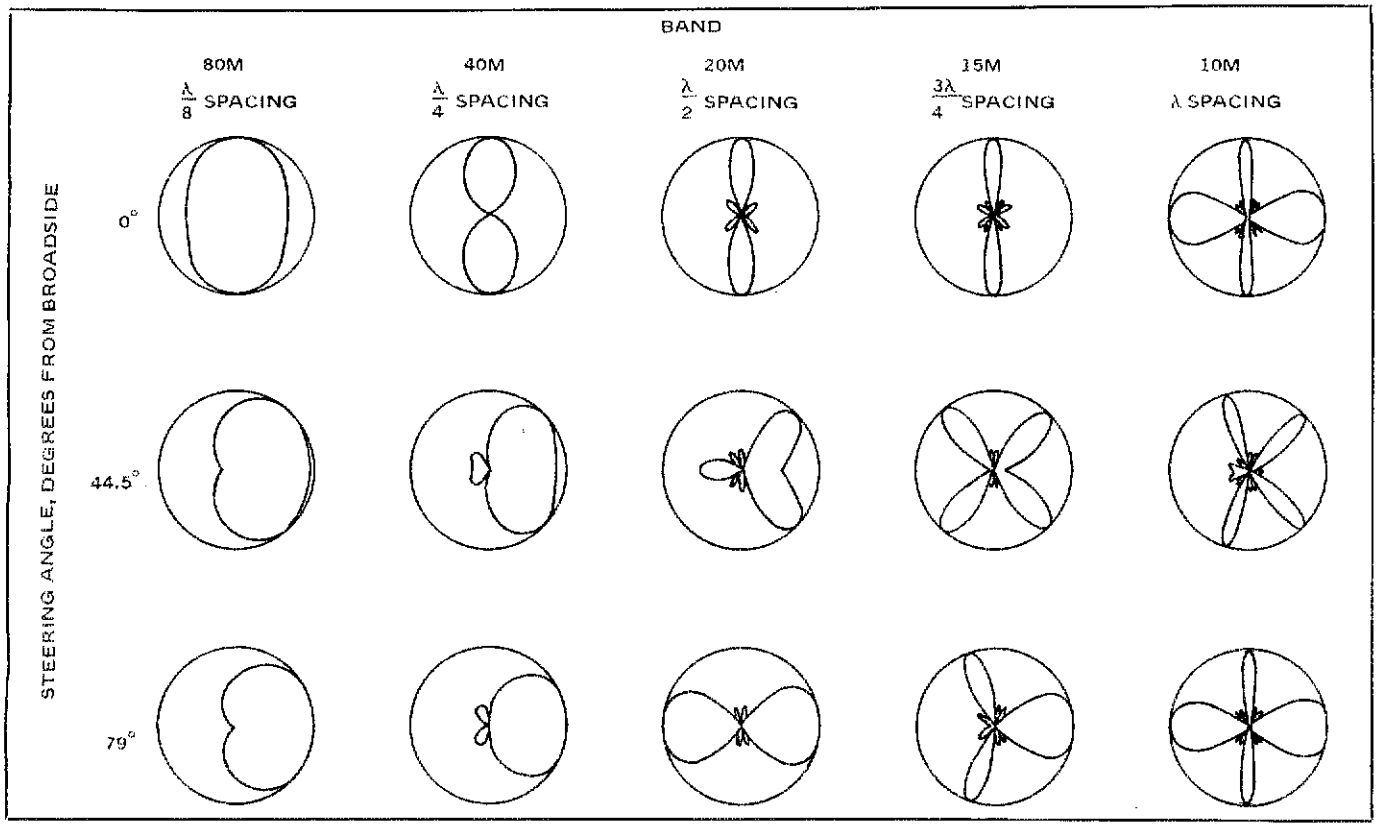


Fig. 7 — Idealized azimuth patterns for a five-band steerable four-element linear array of omnidirectional elements.

Time-delay beam steering is not only attractive for arraying vertical monopoles. Horizontal dipoles are also good candidates for array elements, although radiation off the element ends will be reduced in amplitude and will be vertically polarized. Arraying of rotary beams is also an attractive prospect. We expect to see increasing use of phased arrays on the amateur bands as increasing QRM demands greater azimuth directivity. Also, instant beam and null steering is a useful property of phased arrays which cannot be obtained with rotary beams. QST

Strays

New CD DXCC aide Gary Bartels, WB2CFE.

ELECTRO 77

□ Any amateurs in the vicinity of New York City and the Hotel Americana on Tuesday, April 19, won't want to miss two technical sessions sponsored by the ARRL. In the first session on antennas, papers will be presented by Dana Atchley, W1CF; Jerry Sevick, W2FMI; Wayne Overbeck, K6YNB and Walt Maxwell, W2DU. This one starts at 10 A.M. In the afternoon, there will be a session on RFI featuring Stuart Meyer, W2GHK; Jerry Hall, K1PLP; Edward Brunaugh, W9BWI and Ray Spence, W4QAW. Moderator and organizer for both sessions is Lew McCoy, W1ICP. See you in New York?

I would like to get in touch with . . .

□ hams who are physicians, for QSO regarding but not restricted to medicine. Oscar M. Ocampo, M.D., EL3A, P. O. Box 148, Greenville, Sinoe, Liberia.

□ Jay, or anyone who may have known him. We became good friends on 10 meters when he worked KL7FAM at McGrath Air Force Base in Alaska. I never knew his last name, but he planned to visit me while on furlough. KL7FAM operators Jim and Joe confirmed that he was to fly from McGrath to Elmendorf Air Field, then to Seattle and on to Cincinnati, but he never arrived. Please contact Russell E. Bloss, K8ABF, 7066 Salem Rd., Cincinnati, OH 45230.

□ hams who are railroad fans. Roger Hinz, WAØSRM, 627 9th St., Manning, IA 51455.

A Multiband Vertical Radiator

An efficient multiband radiator with no traps and no loading coils? Impossible, you can't build one without them and have it work! "Oh, yes, sure you can." I doubt it. "You wanna bet? Come on, I'll show you."

By A. E. Collins,* K6VV

What would you say if I told you this vertical antenna system was 89-percent efficient but had only six radials? (Efficiency is defined as the ratio of radiated power to total power delivered to the antenna.) No, I'm not joking. The vertical antenna that is described here is designed to work against ground systems that are less than optimum.

By increasing the radiation resistance to about 200 ohms, we have been able to improve the effectiveness substantially of a vertical radiator with a poor ground system. The value of 200 ohms was selected as the feed-point radiation resistance because a toroid autotransformer with a 1:4 ratio will match 50-ohm coax line very nicely. An added bonus when using such an arrangement is the Faraday screen effect that reduces noise pickup from being transferred to the feed line. The noise reduction over a conventional network was determined to be about 6 dB. See Figs. 1 and 2.

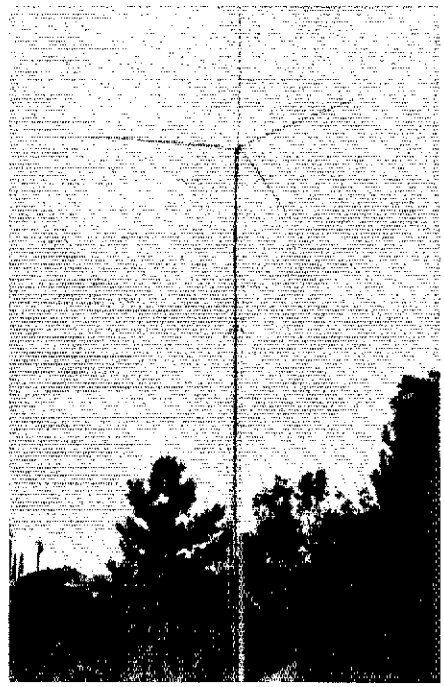
The system is based on a 135-degree antenna height. The radiation resistance at the base of the structure is about 200 ohms,[1] ideal for our matching system. And at the same time the radiation pattern retains a reasonable form. The 10-meter ground plane on top of the structure acts as a top hat. On 7 MHz the phase loops cause the antenna to look like a fat radiator and between the two, top hat and phase loops, the electrical height of the antenna is raised to within the tuning range of the toroidal loading network. On 14 and 21 MHz the phase loops keep the instantaneous current on the structure in phase and eliminate high-angle lobes. When the system is switched to operate on 28 MHz, the ground plane at the top of the structure is fed through the coax line running up the lower portion of the structure.

*6271 Lake Shore Dr., San Diego, CA 92119

[1] *The ARRL Antenna Book*, 13th edition (1974). See Fig. 2-74 and accompanying text on p. 60.

Construction and Tuning

The photographs and the drawings show how the antenna is constructed.



This multiband radiator, just over 36 feet tall, operates on five amateur bands, 80 through 10 meters.

The system was designed so that "store-bought" items could be used for the assembly, rather than fabrication of the antenna components. A list of required parts is given in Table 1.

The tuning adjustments of the system are very noncritical. Tuning can be done with an SWR indicator. The best sequence is to start with the highest frequency and work down. The 28-MHz ground plane used as a top hat can be adjusted before it is attached to the rest of the antenna. The Radio Shack 11-meter ground plane that we used comes with a hairpin or "beta" match. With a short length of 50-ohm coax for the feed line, the ground plane should be adjusted for the lowest SWR in the 10-meter band. After the ground plane has been adjusted and attached to the top of the antenna, the entire system can be raised into position for final tune-up on the lower frequencies.

At this point the SWR indicator should be inserted in the 50-ohm feed

Table 1

Parts Required for the Multiband Vertical Radiator

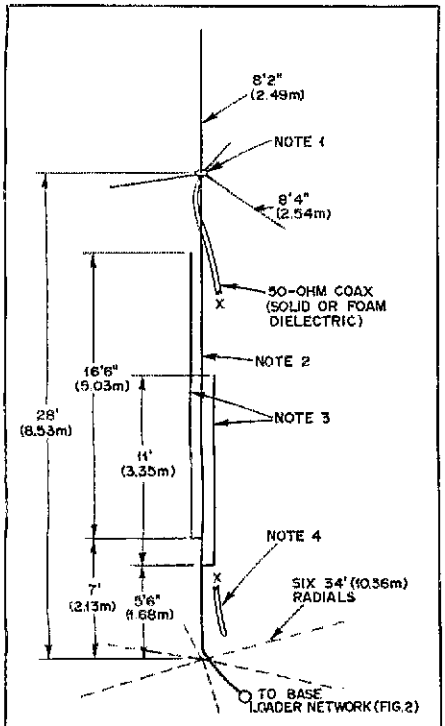
3 – 10-ft lengths TV mast; Radio Shack 15-5066.
1 – 27-MHz ground plane; Radio Shack 21-901.
3 – 100-ft rolls of 22 gauge hook-up wire; Radio Shack 278-1295.
1 – Amidon Balun kit (see Fig. 2).
1 – Aluminum box for tuner.
1 – 28-ft length of RG-8/U coax line.
4 – 8-ft sections of aluminum tubing (see Fig. 1).
1 – Base insulator; soft drink or (?) bottle.
1 – 200-pF capacitor, air variable, surplus.
Misc. – See text and figures.

line from the transmitter, as close to the antenna matching network at the base of the structure as possible. All that remains is the adjustment of the 200-pF capacitor. The tuning will be different for each band. On 21 MHz the capacitor will be only about five percent meshed, on 14 MHz about half, and on 7 MHz nearly fully meshed. The capacitor on 3.5 MHz, along with the 3.5-MHz coil, can be adjusted to whatever section of the band you wish to work. The bandwidth will be about 400 kHz with less than 2:1 VSWR. To switch bands, all that is required is to set the double-pole double-throw switch for the proper band and adjust the 200-pF variable capacitor.

All of the antennas constructed so far were cut to the dimensions shown in Fig. 1 and have not required any change. They have been installed in a wide variety of locations and the system design has been broad enough in tolerance to handle all of them. My own antenna has been in operation since 1972 and has performed exceptionally well. In the first year on the air, I managed to work 100 countries with less than 250 watts. In several experiments with just the six radials, we made comparative tests between this design and a properly matched quarter-wave vertical over the same radial system. The radiation efficiency was about 60 percent for the quarter wave, vs. 89 percent for the "little monster." In the far field the signal improvement was better than 6 dB.

Now there are eight of these antennas on the air, and several more are under construction. All of the hams who have built the antenna have had comparable results to mine.

There are three hams to whom I would like to give credit. They helped in testing and measuring the system and encouraged me to get it down on paper. They are Bob Crawford, WA6RYZ; Frank Scott, W6WOP and John Campbell, W6NVV. QST



Note 1: Radio Shack 27-MHz ground plane cut to dimensions shown. Radials are at right angle and connected to mast.
Note 2: Three heavy-duty 10-ft sections TV mast.
Note 3: Phase loops, sections of telescoping 5/8- and 1/2-inch aluminum tubing spaced 4-1/2 inches from mast. See text.
Note 4: 50-ohm coax such as RG-8/U. At upper end connect center conductor to top element, braid to ground-plane elements. Connect lower end to base loader network (Fig. 2).

Fig. 1 — Details of the multiband radiating structure. See Table 1 for parts list. It is very important that a uniform spacing be maintained for the phasing loops, which may be supported at the bottom by shelf brackets. To support the upper portions of these loops, the author used homemade wooden spacers, 1/2 by 1 inch, which were soaked in paraffin and held in place by screws passing through the loop tubing and the main radiator tubing. Homemade Plexiglas spacers may also be used.

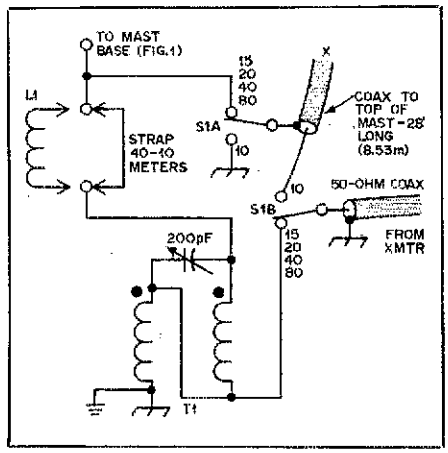
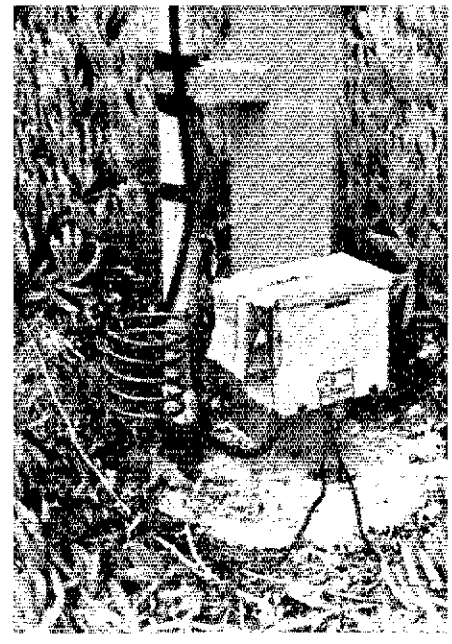


Fig. 2 — Schematic diagram of the base loading network. The connection to the mast base should be made with a short wire, no longer than one foot (0.3 m). The 200-pF capacitor should have a minimum of 1/16-inch plate spacing.
L1 — 80-meter loading coil, 0.67 μH; 4 turns of aluminum grounding wire, 3-inch diameter, 1 turn per inch, air core.
S1 — Dpdt, heavy-duty type. Two porcelain knife switches from the local hardware store will suffice, one for each pole.
T1 — Bifilar-wound toroidal autotransformer, 1:4 ratio; 11 turns spaced around 2-inch ID toroidal core; Amidon Balun Kit or equiv. (Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607).

References

The ARRL Antenna Book, ARRL, Newington, CT.
King, *The Theory of Linear Antennas*, Harvard University Press, Cambridge, MA.
Terman, *Radio Engineering*, McGraw-Hill Book Co., New York, NY.



The base of the multiband antenna system. The 200-pF capacitor of the matching network is mounted inside a weatherproofed box, and the 80-meter loading coil is mounted outside. The porcelain knife switches for bandswitching are mounted outside the aluminum box under a homemade hinged cover. The structure itself is supported by a 10-foot wooden post set two feet in the ground (concrete optional). Although heavy-duty insulators were used to support the radiating mast from the post as shown here, experience has indicated that insulators are not required. The author suggests that a modified pair of chimney-mount brackets be fastened to the post with lag screws. A short length of PVC pipe or Mylar film may be placed around the mast where it is supported, if you feel it necessary to have the mast insulated from the post.

Quad Log-Periodic Fixed-Beam Antennas

The gain and broadband features of the log-periodic antenna are combined in the QLP to provide the characteristics of a five-element beam that makes a signal sound big.

By George E. Smith,* W4AEO

For the amateur who enjoys constructing his own antennas, the quad log-periodic offers the attraction of a multielement, single-band, fixed wire beam antenna that combines the good features of a simple single-band log periodic with the benefits of the quad. The effect of such a combination is to produce greater gain. In addition there is no need to tune or prune the elements after assembly.

A QLP antenna is in effect, a multielement, end-fire array that is broadband by virtue of being in a log-periodic formation. This produces a unidirectional beam antenna having a well-defined forward lobe and renders 10 to 12 dB of gain over a dipole placed at the same height. The bandwidth for both antennas described here is approximately 500 kHz. To achieve that frequency spread, five elements for the array seem about optimum. Also, five elements seem to be a good choice as far as gain is concerned.

The largest element (no. 1) in the quad log-periodic array can be considered the reflector while the three shorter forward elements (nos. 3, 4 and 5) may be thought of as driven directors. All quad elements are fed by means of a two-wire transmission line connected to the bottom terminals of the diamonds. No element is parasitically operated. The two-wire feed line within the array is supported by the terminal ends of each individual quad loop. Rf energy is applied to these elements by the method that is commonly used with conventional log-periodic antennas where feed wires are transposed. For more information on feeding log-periodic antennas refer to *The ARRL Antenna Book*, 13th Edition (1974), page 161.

As with any end-fire array, including the log-periodic antenna, rf currents in adjacent elements of the QLP must be out of phase with each other. This condition is satisfied by simply transposing the connecting wires from the transmission line of the array to the individual elements, as shown in Fig. 3. Phase reversal may also be accomplished by transposing the transmission line within the array as indicated.

The Arrays for 20 and 40 Meters

The quad log-periodic antenna for the 20-meter band is not too large to be impractical as a fixed-direction wire beam antenna. Actually, it is fairly simple and inexpensive to construct. Furthermore, it is not difficult to erect between two existing masts or trees. The basic design of the QLP is shown in Fig. 1, while Table 1 and Table 2 give the dimensions for both the 20- and 40-meter arrays.

Elements used are a full wavelength overall. The largest element in the 20-meter antenna is 18.5 feet (5.64 m) per side or 74 feet (22.56 m) total, and the smallest element is 12.5 feet (3.81 m) per side or 50 feet (15.24 m) total. Boom length is 24.9 feet (7.59 m).

Although it was realized that construction of a 40-meter QLP would be an ambitious project, it presented a challenge. For this band the antenna, of course, is twice the size of the 20-meter QLP. While there is no structural boom, such as with a rotary-beam antenna, there is a comparable boom length of 49 feet (14.94 m). Since the rear element is 36 feet (10.97 m) long per side, or 144 feet (43.89 m) overall, it requires a mast height of at least 70 feet (21.34 m). The width space requirement is a minimum of 80 to 100 feet (24 m to 30 m). The lengthwise space requirement or mast separation is 60 feet (18 m).

Comparative reports from several South American stations give a positive indication of improved gain achieved with the QLP. Generally, the more distant the station, the greater the difference noted in the QLP performance over that of the dipole standard.

Although the quad log periodic gives approximately two dB of gain over an equivalent dipole log-periodic antenna having the same number of elements, the quad type does require slightly more than twice the amount of wire. Worth considering is that in constructing a log-periodic antenna, it is most desirable to place the array in the clear, away from other wires or antennas.

Assembly of the Quad Log Periodic

The only items which are difficult to purchase for building a QLP are the five 4-hole spacing insulators for the two-wire transmission line. These may be fabricated easily and inexpensively. Fig. 2 is a drawing of the five diamonds, illustrating the element spacing of a monoband QLP. The dimensions required for constructing the 20-meter QLP are furnished in Table 1. Similar information for making the 40-meter QLP is shown in Table 2.

After collecting the required materials, the first step is to make the five spacing insulators. These four-hole

*1816 Brevard Place, Camden, SC 29020

spacers are easily cut from 1/4-inch-thick Lucite or Plexiglas. Each spacer measures 3/8 X 2 inches. Four holes are drilled into the insulators as indicated in Fig. 3.

Not only do the insulators serve their usual purpose, but they also space and support the transmission line between the five quad elements. The feed point of each element is connected to the outside holes of the insulator. In turn the diamonds support the transmission line by means of these insulators. It should also be noted that the correct spacing distances between the elements are governed and maintained by these insulators which are secured to the feed line running the total length of the QLP.

Center Feed for the QLP

The center feed for the QLP is identical to that used for most hf dipole log-periodic beam antennas. It may take the form of a transposed line as used for the K4EWG rotary LP,[1] or it may be constructed as a two-wire transmission line with parallel conductors (such as the ones generally employed for the large commercial hf log-periodic fixed-direction beam antennas).

Although the parallel feed line required slightly more work to assemble, it has one mechanical advantage in that it is better suited for spacing the five quad elements. The writer has used both methods for the other LP beams with equally good results.

The assembly process is the same as for any open-wire transmission line using spacing insulators, except that instead of the insulators being spaced at equal distances they are separated with logarithmic spacing. The greater separation occurs at the rear and the closer spacing is used at the forward or short-element end. This arrangement is essential for a logarithmic antenna.

Transposition of the transmission line to the alternate quad elements is made by the connections between the quad terminations and the center feed line as illustrated by Fig. 3A. The alternative method of transposition using the criss-cross configuration is illustrated on page 145 in *The ARRL Antenna Book*, 13th Edition (1974).

Stranded copper wire (preferably soft drawn, rather than a stiff wire) is best suited for the center feeder. The two QLPs described here use plastic covered no. 16 stranded wire. Bare wire is more apt to short on the large 40-meter QLPs.

The Catenary Support Line

The next step is to assemble the catenary support line which will run between the two masts or trees. This line supports the top of the five quad elements. Polypropylene line (3/16-inch diameter) is well suited since there is little give or stretch under varying weather conditions. Although 1/4-inch nylon line is good for halyards,[2] if pulleys are used, nylon does have some "give" which may be desirable if trees are used for supports. Since the catenary system governs the spacing distance between the quads, there should be little or no give in this portion of the antenna.

With the overall length of the 20-meter QLP set at 24.9 feet (7.6 m), it is suggested that the rear end of this catenary be made long enough to be tied to the halyard. Thus, it will be within a few feet of the mast when raised to the maximum height. The rear (no. 1) element should be about five feet (1.5 m) in front of the mast or at least far enough to clear any obstructions which may be at the sides of the rear mast.

After the necessary spacing distance between the mast and the rear element is determined, proceed as follows. First tie a knot at the rear of the catenary to which the halyard will be secured when it is time to raise the QLP. A slipknot or bowknot is best suited in this application.

Next, measure the distance from the

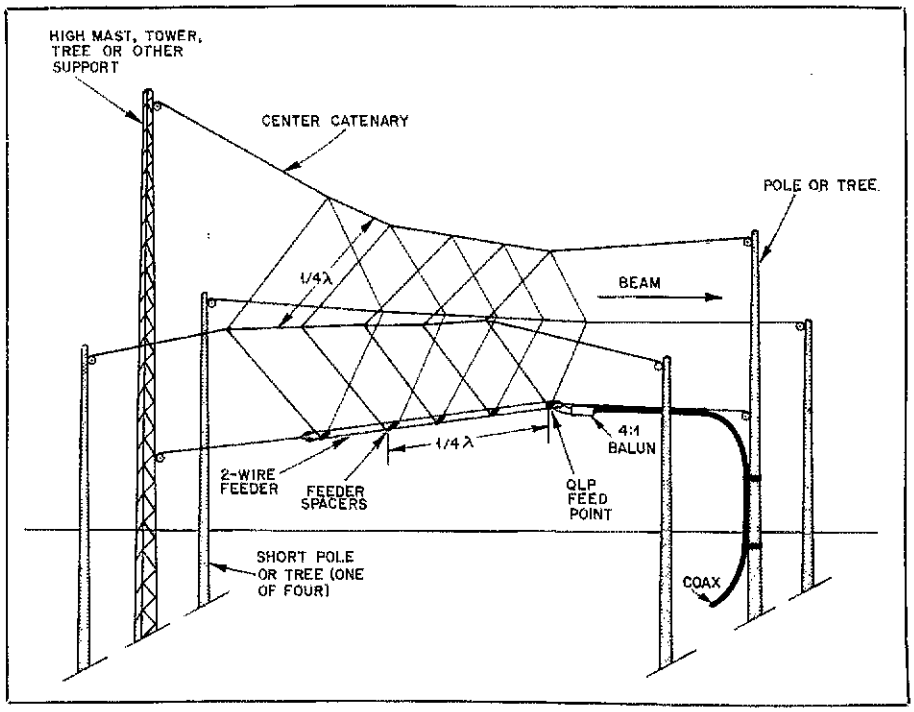


Fig. 1 — The general configuration of a quad log-periodic antenna.

Table 1
Dimensions for the 20-m QLP

QUAD ELEM. NO.	*SIDE LENGTH*	*TOTAL ELEM. LENGTH*
1	20' (6.10 m)	80' (24.38 m)
2	18' (5.49 m)	72' (21.95 m)
3	16.25' (4.95 m)	65' (19.81 m)
4	14.75' (4.50 m)	59' (17.98 m)
5	13.5' (4.11 m)	54' (16.46 m)
S-NO.	*S-LENGTH*	
1	7.4' (2.26 m)*	
2	6.7' (2.04 m)*	
3	6.0' (1.83 m)*	
4	4.8' (1.46 m)*	

*See Fig. 2

For each individual quad element of the beam, this table shows the length of a side of that element followed by the total wire length for the element. Also shown are the S-measurements for the spacings shown in Fig. 2. The total length of wire for the five quads should include two ft (0.61 m) per quad element for connections. The total length of wire for the center feeder, as shown, is for both conductors, and includes 20 ft (6.10 m) of additional wire required during assembly. Materials: 340 ft (103.63 m) no. 16 soft-drawn copper wire. (See notes above.) 70 ft 21.34 m) no. 16 stranded copper wire for the two-wire feeder. 5 Plexiglas insulators for center feeder. 600 ft (182.88 m) 3/16-inch polypropylene rope (water-ski type). Spool of monofilament fish line, 40 to 50 lb. (18-22 kg) test. Roll of 3/4-inch masking tape.

[1] Footnotes appear on page 26.

rear halyard knot to the location of the rear quad. At this point tie a small slipknot with the loop large enough to pass the quad wire through it. There will be five of these knots which hold the five quad elements in place at the required spacing. The wire feeder with the five spacer insulators can be used to measure these spacing distances. The measurements can also be made with a steel tape. The spacing distances between the five slipknots will be identical to the spacing distances S1, S2, etc., given in Tables 1 and 2.

As each loop is made, check the distance to the previous one. If correct, the knot should then be tightened before proceeding to the next. After all five knots for supporting the loops are completed, place this portion of the catenary beside the feeder to make certain that the knots of the catenary and the five spacer insulators have equivalent positions for the entire length of both the catenary and the feeder.

Getting RF to the Antenna

The simplest method of supplying rf energy to the array is through a length of coaxial cable. This cable is terminated in a 4:1 balun that is connected to the short-element end of the array. Because of the inherent impedance step-up characteristic of the QLP antenna, an impedance of between 200 and 300 ohms will appear across the terminals of the forward element.

A second and possibly more efficient method is to use a tuned open-wire feeder. Use of a Matchbox or comparable tuner with this system will present a low SWR at the transmitter as well as attenuate any harmonic content.

Results

In tests comparing the two 5-element monoband 20- and 40-meter quad log-periodic beam antennas with the dipole log periodic used here, the quad configuration shows advantages. When compared with a log-periodic dipole array at the same height, the QLP appears to be 2 dB better. This is about the same difference that is generally claimed for a quad versus a Yagi.

The front-to-back ratio is approximately 16 dB for the QLP and about 14 dB generally measured on the dipole LPs. Side attenuation also is better. The forward lobe or beam width is sharper (narrower) for the QLP. SWR measurements made on both the 20- and 40-meter quad log periodics indicate a slightly flatter response across each band when compared with an equivalent five-element monoband DLP. The bandwidth is from 300 to 500 kHz before exceeding an SWR of 1.5:1. It has also been observed from test measurements that the impedance at the feed point is

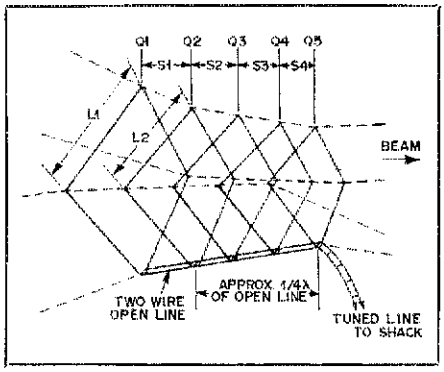


Fig. 2 — Spacing of the elements is indicated in this illustration. See text and Tables 1 and 2 for details.

approximately 300 ohms, making a good match to a 4:1 balun when used with 72-ohm coaxial cable.

For reception the quad configuration seems less subject to man-made noise and precipitation static than open-ended Yagis and dipoles. It is noted that other amateurs have made similar comments concerning quads for reception. This benefit may result from the closed loops of the quads. The entire QLP is at ground potential with respect to dc because there is a ground return through the balun, providing a static drain.

There are no critical dimensions or adjustments required of the element lengths, as are usually required for high-Q Yagis. No stub adjustments are required for a quad having a parasitic director and reflector. The dimensions for constructing a QLP are not critical since the log-periodic configuration makes it a broadband antenna covering the entire band for which it is designed, with a relatively flat SWR.

The quad log periodic, being a fixed direction wire beam, is inexpensive. It should cost no more than $20 or $25 to construct including the wire, insulators and nylon or polyethelene line. Not included, of course, is the cost of masts if it becomes necessary to use one or more for support instead of trees. QST

Footnotes

[1] Rhodes, "The Log-Periodic Dipole Array," *QST* for November, 1973.

[2] See information on this in *The ARRL Antenna Book*, 13th Edition (1974), p. 268.

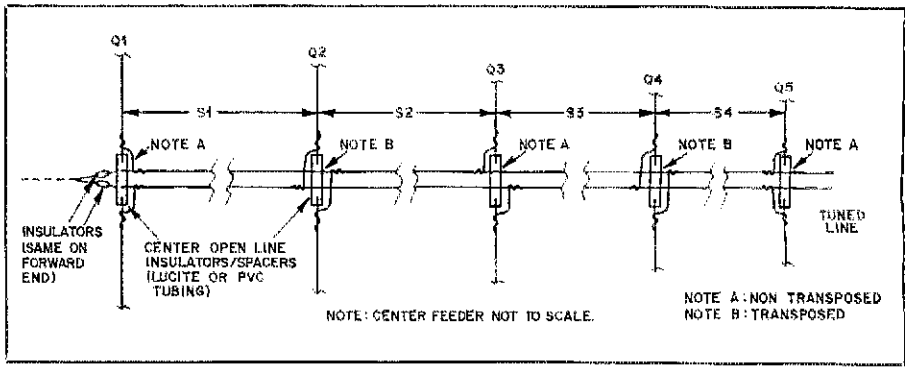


Fig. 3 — This illustration shows the physical arrangement of the internal transmission line of the QLP array.

Table 2
Dimensions for the 40-m QLP

QUAD ELEM. NO.	*SIDE LENGTH*	*TOTAL ELEM. LENGTH*
1	40' (12.19 m)	160' (48.77 m)
2	36' (10.97 m)	144' (43.89 m)
3	32.5' (9.91 m)	130' (39.62 m)
4	29.5' (8.99 m)	118' (35.97 m)
5	27.0' (8.23 m)	108' (32.92 m)

S-NO.	*S-LENGTH*
1	14.8' (4.51 m)*
2	13.4' (4.08 m)*
3	12.0' (3.66 m)*
4	9.6' (2.93 m)*

*See Fig. 2

For each individual quad element of the beam, this table shows the length of a side of that element followed by the total wire length for the element. Also indicated is a tabulation of the measurements for the spacings shown in Fig. 2. Materials: 670 ft (204.22 m) no. 18 copper-clad electric fence wire. (See notes with Table 1.) 120 ft (36.58 m) no. 16 stranded copper wire for the two-wire feeder. 5 Plexiglas insulators for the center feeder. 600 ft (182.88 m) polypropylene rope (water-ski type). Roll of monofilament fish line, 40 to 50 lb (18-22 kg) test. Roll of 3/4-inch masking tape.

Sweep 6 Meters and Really Clean Up!

You'll never know how many band openings you missed last year. As the new sunspot cycle comes alive, so will band openings on 6 meters. This weekend project will give you peace of mind, and maybe a few new states to boot!

By John R. Bingham,* W7WKR/WB6BDR

Serious 6-meter operators spend many hours monitoring 50.11 MHz, the calling frequency, waiting for a band opening. Few need to be reminded of the frequent trips to the shack to monitor the band to ease the gnawing feeling that the band may be opening. But what if activity is a few kilohertz from the frequency to which the receiver is tuned? One answer to this dilemma is an electronically tuned receiver that may be remotely controlled.

Construction

Fig. 1 is the schematic diagram of a simple sweep generator and voltage-controlled oscillator (VCO) the author uses with a Heathkit SB-102 that was modified to operate on 6 meters. The VCO was designed to operate in the 5- to 5.5-MHz range of the transceiver LMO. Construction techniques at this frequency are elementary, but the unit should be installed in a metal enclosure to provide rf shielding and a stable thermal environment when the sweeper is used for remote-manual tuning.

Alignment and Operation

Connection of the unit is made through the SB-102 crystal socket. When the transceiver is placed in the crystal-controlled mode, the sweeper takes the place of the built-in LMO. The SB-102 FUNCTION switch should be placed in the LOCKED AUXILIARY position when sweeper control is desired. S1 on the sweeper is placed in the MANUAL position and R2 is turned fully ccw. If a signal at the *lowest* frequency to be received is applied to the transceiver antenna jack, it should be possible to center the signal within the receiver i-f passband by adjusting

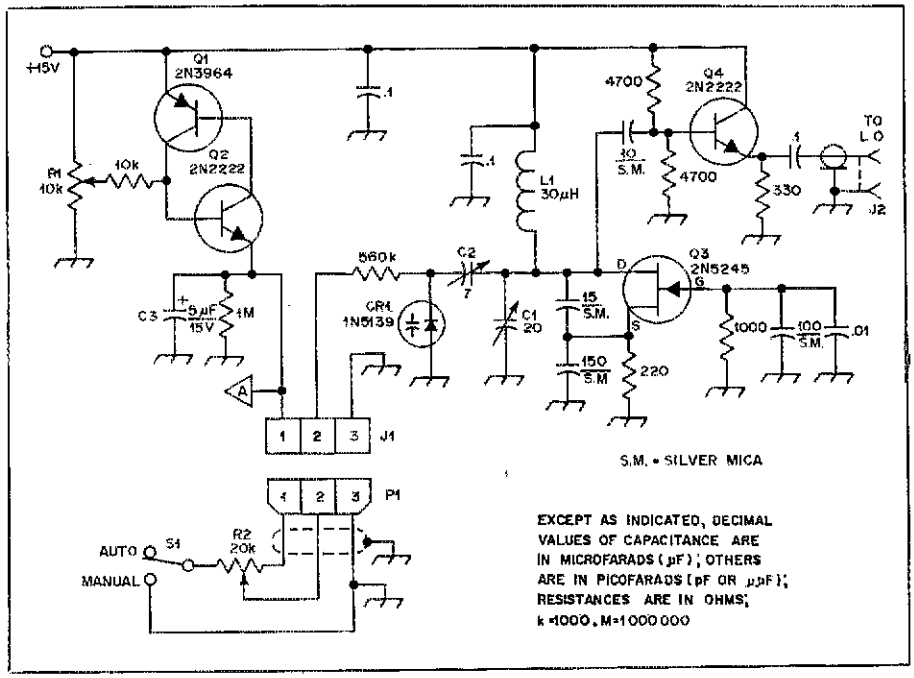


Fig. 1 — Schematic diagram of the sweeper circuit. The unit should be built in a metal enclosure, such as a Bud Minibox, for proper rf shielding. Capacitors are disk ceramic unless otherwise indicated. Resistors are 1/2 watt, 10-percent tolerance.

C1 — 1.7- to 20-pF ceramic trimmer (Arco 402 or equiv.).
C2 — 0.9- to 7-pF ceramic trimmer (Arco 400 or equiv.).
C3 — 4-µF, 16-volt electrolytic capacitor. Value may be adjusted for desired sweep rate. See text.
CR1 — 6.8-pF variable capacitance diode (Motorola 1N5139 or equiv.).
J1 — Miniature cable connector (Amphenol no. 91-MPF-3L or equiv.).
J2 — RCA type phono connector (Cinch no. 81A or equiv.).
P1 — Miniature cable connector (Amphenol no. 91-MPM-3L or equiv.).
Q1 — Pnp transistor, type 2N3964. 2N3906 or equivalent may be substituted.
Q2, Q4 — Npn transistor, type 2N2222.
Q3 — JFET, type 2N5245. MPF102 or Motorola HEP F0021 may be substituted.
R1 — 10,000-ohm miniature potentiometer, pc or panel mount.
R2 — 20,000-ohm potentiometer, panel mount.
S1 — Spst miniature toggle switch. Slide or rotary switch may be used if desired.

*4880 Burnside Rd., Sebastopol, CA 95472

C1. Then turn R2 fully cw, apply a signal at the *highest* frequency to be received and adjust C2 to center the signal within the passband. Because there is some interaction between C1 and C2, it will be necessary to repeat the procedure until proper tracking is obtained. When S1 is placed in the AUTO position, the highest frequency to which the receiver will be tuned is determined by the position of R1. If the sweep rate is unsatisfactory, it may be increased by decreasing the value of C3.

When the band is "dead," the sweeper is a delight to use because gardening and work around the house are no longer interrupted by "tuning trips" to the shack. Thanks to this circuit the author worked four new states during the 1975 sporadic-E season when the band was "dead."

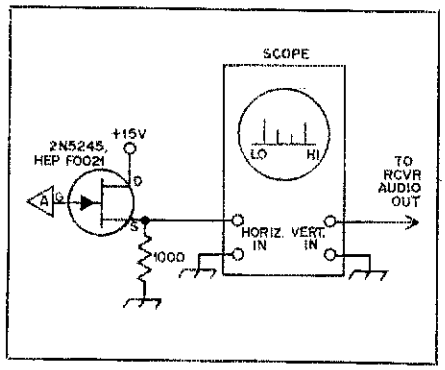


Fig. 2 — The sweeper may be connected to an oscilloscope as shown here. Signals within the passband of the receiver as it is scanned will appear as "pips" on the CRT. Sweep rate may have to be decreased in this application; see text for details.

Use as a Visual Display

Using the sweeper, it is possible to display the received-rf spectrum on an oscilloscope. VCO-sweep drive is applied to the horizontal deflection amplifier through a buffer stage, and the receiver audio output is connected to the vertical amplifier. Fig. 2 gives details of this connection. Signals present within the sweep range of the device will be displayed as pips on the screen. Standard oscilloscopes are equipped with short-persistence CRT phosphors, and if the trace fades between sweeps it may be necessary to reduce the value of C2 in order to speed up the sweep rate.

QST

Strays

□ Last November 15 when Stewart Munroe, VE8CM, was listening on the bands, there wasn't anyone working OSCAR 7 Mode B. He was one of the lucky few to copy OSCAR's cw birthday message: "This is OSCAR 7 I am 2 years old. Have pity and use QRP and I may make it to 3 years old. Hi Hi Hi Hi."

□ A church in Tipton, OK, boasts at least half a dozen devout hams: The Rev. Cal Hunter, W5ZUS; elders Butch Pinson, WA5WIC and Keith Pinson, WA5ZFI; Sunday-school superintendent Ed Fox, WA5WHV; and church members Loren Simms, WA5CBF and Janice Simms, WB5WMN. — *WA5CBF*

TECHNICAL TOPICS

□ *Radio Communications*, the RSGB journal, carried in January of 1977 an interesting and thought-provoking editorial by RSGB Technical Topics Editor Hawker, G3VA. It seems worthy of being reprinted in *QST* as we amateurs race toward automation in our amateur stations. Here are G3VA's thoughts.

The other day, reading an excellent and informative article on optimum hf receiver design by Ulrich L. Rohde, DJ2LR (*Ham Radio*, October, 1976), I found myself thinking, "How good is good enough?" The solid-state techniques described by DJ2LR are basically those which have gradually gained acceptance for the very highest quality professional general-coverage receivers costing thousands of dollars: up-conversion to vhf, roofing as well as selective crystal filters, elliptic filters, etc. While we would certainly not wish to deter anyone from tackling the design and construction of such an advanced receiver (though we still feel that for an hf *amateur-bands* receiver an i-f of 9 or 10.7 MHz is probably high enough and presents fewer problems) we suspect that only a handful of amateurs could or would complete such a project, although of course many will wish to understand such trends.

How Good Is Good Enough?

For many years the electronics of communications equipment has been getting progressively more and more complex and less and less within the economics (and sometimes the understanding) of the average amateur. Yet the competitive nature of amateur operating has encouraged the view that we all need "optimum" equipment. Sometimes, it seems that everyone is having to run faster and faster to stay in the same place; not only ever more complex receivers and transmitters but also all the ancillary equipment to go with them.

Now if an amateur wants to buy a fully equipped, all-mode, highly professional station, that is his or her affair; my concern is rather that we need to reassure newcomers that they do not *have* to spend a mint of money to take any sort of active or useful part in the hobby — plus sometimes a worry that the whole hobby may eventually blow itself up by trying to become too professional, at professional prices.

Recently, *IEEE Spectrum* (October, 1976) devoted an entire issue to the theme "What went wrong?" presenting many of the stories behind major professional projects that never came to fruition, or ran into serious and unexpected problems in attempting to push too hard on the frontiers of knowledge: the 3D radars that proved "too big and too expensive"; the U.S. Navy's 600-foot radiotelescope for which cost estimates built up and up to over $200 million until finally the whole scheme was abandoned; the poor reliability of early cardiac pacemakers where human fluids knocked out batteries, transistors, resistors and capacitors in months rather than the calculated years; the commercial disaster of Bell's two-way Picturephone videotelephones; the "slow sad death" of evr (electronic video recording on film); the emitter-coupled-logic that was confidently expected to wipe other logic families off the electronic map; the continuing struggle to establish extremely low frequency communications with their need for hundred-mile antennas. Pages and pages of American projects that could be matched on this side of the Atlantic by Blue Streak; the murdered TSR2; the Mark V radiotelescope for Jodrell Bank; the Post Office's confident prediction in the '50s that it would never need cross-bar telephone exchanges but would go straight to fully electronic switching; and of course the technologically successful but financially disastrous Concorde.

So, sure, as amateurs we need good equipment, and we need many of the latest techniques. But we also need occasionally to ask ourselves just how good is good enough. If not, we risk "galloping obsolescence" and biting off more than we can chew in seeking "optimum" equipment. Then again, do we really need to eliminate manual controls and adjustments and human skills in dreaming of running our stations from microprocessors and electronic memories? After all, amateur radio is still a hobby for *humans* — not yet for computers. — *Pat Hawker, G3VA*

Build This C-T Quad Beam for Reduced Size

No inductors are needed. There are no costly accessories required. This quad-beam antenna, while smaller in size than a conventional quad, performs like a veteran. The trade secret is to use capacitive tuning. If you have the will to build, this is the way.

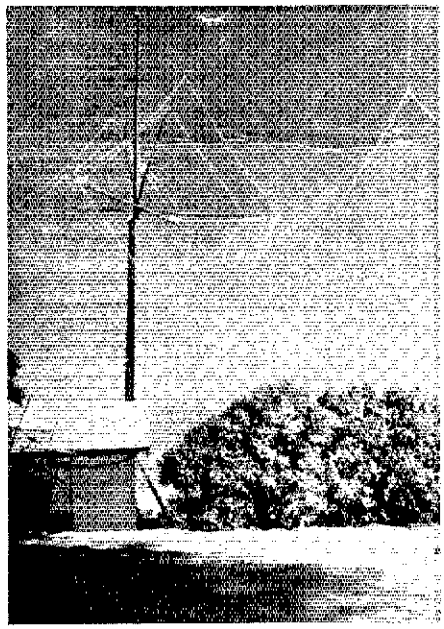
By Roger Sparks,* W7WKB

Ah! There's your friend's quad beam. He's already extolled its ability to work DX, and you're thinking of that upcoming contest. Yet, you look at that thing and say to yourself, "It's bulky, sort of overweight." Still, you know what a quad will do. Well, then, let me suggest the C-T treatment – the easy way to reduce that size at almost no extra cost.

One of the main drawbacks of the quad beam is its large size compared to the Yagi beam. Previous efforts to reduce the size of the quad have utilized systems of inductive tuning. Loading coils have been used on one or two sides[1] or in the corners. Linear inductors on the vertical sides have also been used.[2] The purpose of this article is to explain a simple method of capacitive tuning to reduce the size of the quad. The C-T (capacitor-tuned) loop is diagrammed in Fig. 1.

It is well-known that the physical size of the dipole antenna can be reduced by replacing a portion of the antenna with a capacitive body and adding an inductor to restore the system to resonance. It seems less well-known that the full-wave loop antenna also may be reduced in physical size while holding the resonant frequency of the system constant by adding capacitance at the voltage loops. No inductors are needed. The capacitance may be added by any of the methods shown in Fig. 2.

The outside dimensions of the C-T loop may be anything chosen by the builder with the larger limit being the full-size, full-wave loop. The limit on the amount of size reduction effectively attainable depends both upon the electrical resistance in the circuit and upon the tendency in loop antennas for the current to become equal at all points in the circuit when the loop becomes very small in proportion to the free-space wavelength at the frequency under consideration. The geometrical shape of the loop is unimportant to basic operation provided that the capacitance is placed at or between the voltage loops. The bottom half of the chart in Fig. 5 shows the effective dimensional range of the



A winter snow sets the scene and accentuates the diamonds of the C-T quad-beam antenna at W7WKB.

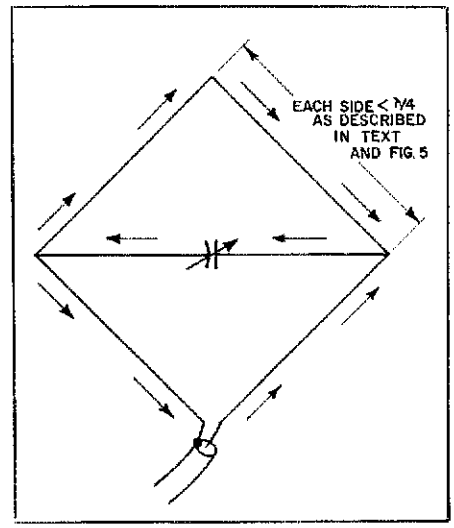


Fig. 1 – The C-T quad design with arrows indicating current flow for 1/2 cycle. The center capacitor is located at the minimum-current (highest-voltage) point in the loop. Each side is less than 1/4-wavelength long. See text and Fig. 5.

*Rte. 1, Box 950, Ellensburg, WA 98926
[1] Footnotes appear on page 31.

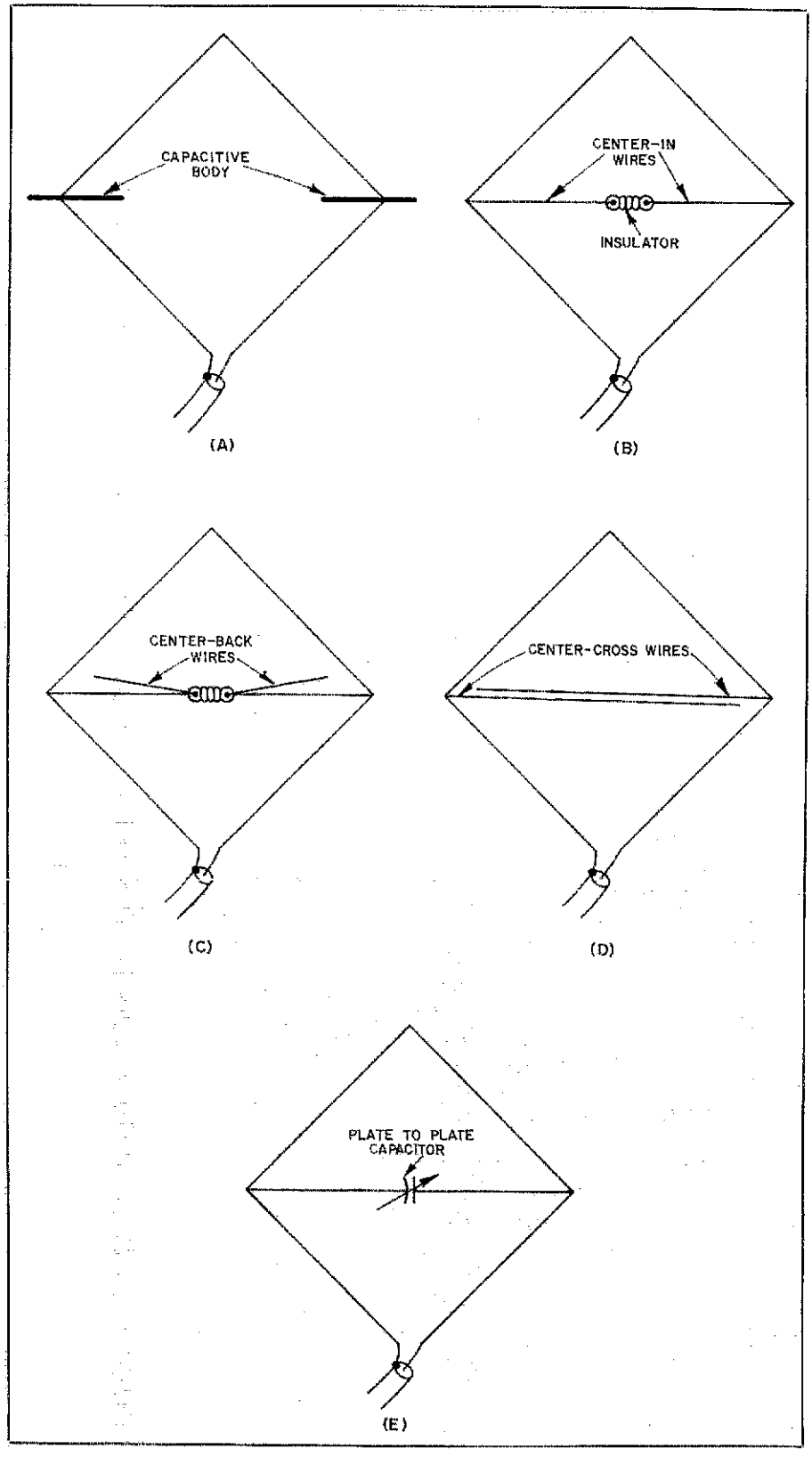


Fig. 2 — Methods of adding capacitance to the C-T loop are shown here. In Fig. 2C, if the center-back wires are placed too closely to the center-in wires, they become ineffective. A 12-inch spacing from the end of the center-back wire to the center-in wire is satisfactory. Wires running back toward the loop center may be attached to the outside ends of the center-back wires if more capacitance is needed. In Fig. 2D, the capacitance added by the center cross wires varies with both the length of wire and spacing between wires.

C-T loop, and the top half shows the tuning range that can be expected by using various methods of adding capacitance to the diamond quad. These dimensions are intended as guidelines only.

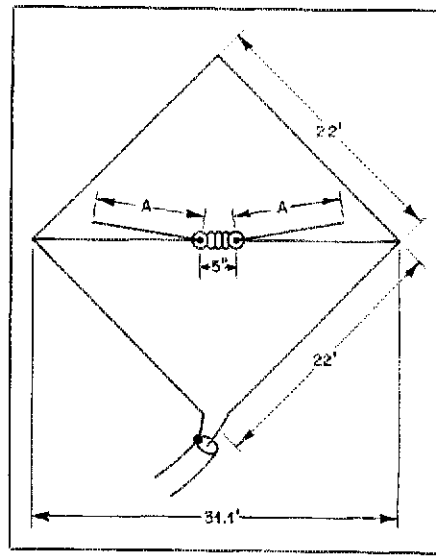


Fig. 3 — Dimensions for the 40-meter C-T quad are shown above. For the two-element beam the spacing between the driven element and the reflector is 20 feet. The length of the center-back wire (dimension A) is 12 feet, 9 inches for the reflector, and 9 feet, 11 inches for the driven element.

The feed-point resistance of the full size, one-wavelength loop is about 10 ohms. The feed-point resistance of th C-T loop decreases as it is made smalle but will offer a good match to a 50-ohm coaxial line over the entire usable rang as shown in the chart. A gamma match may be used if an exact match is desired.

More than one C-T loop may be used to form the C-T quad beam. A parasitic reflector was used in this installation because of the higher radiation resis tance attainable while maintaining good gain. Maintaining the radiation resis tance as high as possible is particularly important in small beams both to keep efficiency high and to prevent the band width from becoming too narrow.

Tuning and Mounting

The use of a grid-dip meter to attain initial band resonance is very helpful. By using a grid-dip oscillator, this beam was tuned initially with the driven element to resonate at the center of the band of interest. The reflector was then tuned to resonate at a frequency three percent lower than the driven element. Final adjustments were made using a test oscillator located about 1,000 feet away as a reference signal. The director was tuned for lowest SWR and the reflector for best gain. If you lack a grid-dipper, initial resonance can be established by listening to your station receiver for a strong signal while making the adjustments. A dramatic increase in signal strength will be noticed at reso nance. Tuning is accomplished by short ening or lengthening the capacitance wires.

The single loop or beam may be mounted either horizontally or vertically for horizontal or vertical polarization, but in either case it should be mounted as high above the ground as possible. Loop antennas operating close to ground will show a much higher feedpoint resistance than normal and will waste considerable power in ground-heating effects. A rough guideline is to mount the antenna so that the bottom point is at least half the loop diameter above the ground.

The working 40-meter version of the C-T quad beam had a diamond configuration because of the greater mechanical strength and because of the longer center wire for tuning purposes. Final dimensions are shown in Fig. 3. A good quality center insulator should be used because of the high voltages present at the center.

A tubular tuning capacitor was originally installed in the driven element and worked well until the kW power level was reached. It then promptly arced over leaving a conductive carbon deposit. A version using two-inch plates as shown in Fig. 4 adequately tuned the reflector even at the kW level for some time. The capacitors, as shown, were not tried under wet conditions, but would probably be satisfactory at power levels up to 400 watts. For long-term use, the method shown in Fig. 2D is preferred over plate-to-plate capacitors because the high voltages are handled more easily.

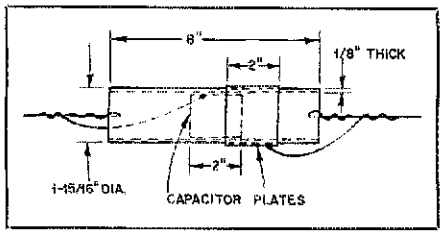


Fig. 4 — A variable capacitor is illustrated here. It can be used to tune the C-T quad. The eight-inch tubular portion is made from plastic water pipe. The cylindrical capacitor plates are formed from a copper sheet. One plate slides inside the eight-inch tube and the other over the outside of the tube. Maximum capacitance is approximately 25 pF.

Table 1
Data for plotting SWR curve. Information in this table is used for plotting the SWR curve for the 40-meter C-T quad beam, as described in the text.

FREQUENCY (MHz)	*SWR*
7.5	4.87
7.45	4.00
7.4	3.08
7.35	2.33
7.3	1.82
7.275	1.78
7.25	1.94
7.2	3.44
7.15	5.25
7.1	8.08

Because some dielectric heating was noticed in this capacitor, the wire-tuned version was adopted. The wire version is recommended over the methods shown in Fig. 2D and 2E, anytime the loop is large enough to be tuned by no more than one doubled-back wire (as shown in Fig. 2C). Tuning wires eliminate the capacitor with its heat loss and allow somewhat better current distribution. Less center radiation occurs because of partial canceling effects in the doubled-back wires. It would be wise initially to cut each center-back wire 12 inches longer than shown to allow tuning. Pruning each center-back wire by one foot increases the resonant frequency by roughly 100 kHz in the 40-meter version. No. 14 Copperweld wire was used throughout.

Performance

The antenna described performed up to expectations and has prompted many complimentary reports. The SWR curve information shown in Table 1 was attained using a 75-ohm coaxial feed line without any matching network. The SWR would be lower if a 50-ohm line or if a matching network were used. Forward signal strength as compared to the strength to the rear showed a maximum 30-dB difference as measured by means of the receiver S-meter. Typical difference, as finally adjusted, was 12 dB.

The gain of the C-T quad over a comparable double Zepp (full wave on 40) was typically at least one S-unit

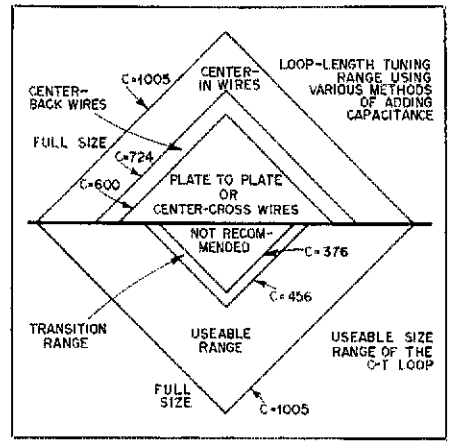


Fig. 5 — The chart shown above, providing dimensional guidelines for a single C-T loop, is based on the equation $LF = C$, where L is the outside dimension in feet, F is the frequency in MHz and C is a constant chosen for the size of the C-T loop to be constructed. Use the largest size possible for the best electrical results. This is particularly true when using C-T loop elements to form a parasitic beam.

To use the chart, pick the largest C (up to $C = 1{,}005$) feasible for your application. Use bottom half of the chart to see if the C-T loop will operate at the dimensional size selected. Then refer to the top half of the chart for the recommended capacitance method.

better when both antennas were at a height of 45 feet. The Zepp was better on very short skip but the C-T quad consistently was favored on longer skip. When elevated to 65 feet, the C-T quad gave outstanding results. At this height, two S-units improvement over a vertical antenna at distant points was noted many times.

The C-T quad may be built for any band. It should be most useful in meeting requirements for an inexpensive easily tuned wire-beam antenna where the full-size quad is unsuitable for mechanical or economic reasons. QST

Footnotes

[1] Pinner, "The Short Quad," *QST*, Feb., 1964.

[2] Courtier-Dulton, "Some Notes on a 7-MHz Linear-Loaded Quad," *QST*, Feb., 1972.

Strays

STOLEN EQUIPMENT

□ SB-144 transceiver, serial no. 620565, stolen from auto in Kingsport, TN, on Jan. 25, 1977. James E. Rhein, K4ZEK, 404 Main St., Jonesboro, TN 37659.

□ Stolen from camper in Boston, MA, near old North Church in summer of '76. Drake TR4/NB, serial no. 29907. Marc Robins, WA6NJR, 6700 Warner Ave., No. 12B, Huntington Beach, CA 92647. Tel. no. 714-847-6904.

□ Clegg transceiver, serial no. HM-298, and mic taken from van on Feb. 5, 1977, in Bridgeport, CT. Jon P. Zaimes, WA3BGN, 681 Longhill Ave., Shelton, CT 06484 or telephone 203-929-4659. Bridgeport Police Dept. file no. 6856.

□ R. L. Drake R4C, serial no. 19003; Drake T4XB, serial no. 18403B, Drake TR72, serial no. 640050; Motorola Metrum III, serial no. ROC 47V; Drake TR22C; and JBL L100 speakers, serial no. 188892 and 188893. Harvey Hetland, WA6KZI/N6MM, Box 73, Altadena, CA 91001. Telephone no. (day) 213-578-7231, (night) 213-794-4419. Los Angeles County Sheriff file no. 577 00238 0773 503.

The Inverted-L Antenna

You can't put up a low-band half-wave dipole for local work because you're cramped for space? Unable to lay out a good radial system for a vertical antenna to work DX? This antenna may be just what you're looking for — it has the performance advantages of both, without the disadvantages.

By Richard A. Lodwig,* W2KK, ex-W2IHJ, ex-W3GNK, ex-K2ODT

Amateur radio operation in the low hf bands has historically been a challenge, especially for those persons without large amounts of antenna real estate available. In order to operate on the 160-, 80/75-, and 40-meter bands in locations where either or both minimum space and few vertical supports are available, antenna compromises are usually required. Such compromises generally have a significant effect on the bandwidth, efficiency and direction of radiation of the signals. Many antenna types have been proposed and constructed which try to "optimize" the variables involved.

This paper introduces a new type of antenna which was developed and tested, including comparison tests against several other popular antenna types. The antenna has exhibited excellent performance characteristics during these tests and offers some interesting installation advantages, such as no requirements for ground radials and short physical span between supports. In addition, it has been intentionally designed to provide simultaneous low-angle radiation (vertical polarization) for DX work and high-angle radiation (horizontal polarization) for short-distance and local work via sky-wave signals. This article discusses some of the performance factors of this inverted-L antenna, as well as explains how and why it and some of the other popular 160-, 80-, and 40-meter antennas operate in a practical environment.

*22 London Lane, Endicott, NY 13760

On the 40-meter band, the daytime D-layer absorption is even lower than on 160 or 80 meters, thus enabling communication up to about 1,000 miles during the day. Up to about 200 miles, the propagation is via high-angle vertically or horizontally polarized sky wave; from 200 to about 1,000 miles, moderate to low-angle vertically or horizontally polarized sky-wave signals provide the communications path. During the evenings, communication on 40 meters is possible from about 500 miles to as far as the limits of darkness permit; the signals are propagated as low-angle horizontally or vertically polarized sky waves. Communication over distances closer than 500 to 1,000 miles is usually impossible on 40 meters during the evening, because the high-angle signals for this distance (within the "skip distance") penetrate the normally reflective F-layer.

At this point, let us examine a principle which relates the propagation mode to the relative performance of several antenna types: The effectiveness of any efficient antenna system is dependent upon how well the particular system (including the surrounding environment) couples energy into an efficient mode of propagation between communicating stations.

Note that this principle implies several necessary conditions for maximizing the communicating efficiency: The antenna itself must be efficient (low losses, little energy dissipated by coupling to nearby objects). One o more efficient propagation modes mus exist between the communicating sta tions since no antenna is capable o enabling communication when there i no suitable propagation mode. The an tenna must couple energy efficiently into at least one of the propagatin modes.

Taking all of these consideration into account, some general conclusion concerning the desirable properties o antennas for the 160-, 80/75-, and 40-meter bands can be drawn.

1) Close-in daytime communicatio would be optimized by an antenna which provides some degree of high angle radiation (about 60-degrees eleva tion angle on 160 and 80 meters, and 3(degrees on 40 meters). Either horizonta or vertical polarization is suitable a these angles.

2) Close-in nighttime communi cation (where skip permits) would b optimized by an antenna which provide some degree of high-angle radiation (4(to 73 degrees) on 160 or 80 meters with either horizontal or vertical polari zation suitable.

3) Distant nighttime communica tion on any of the three bands require low-angle radiation (40 degrees or less in either polarization. Generally speaking, the lower the elevation angl that an antenna system provides (close to the horizon), the better will be th communication at extreme distances.

It is obvious that some of the mos

popular antenna systems used by amateurs provide efficient coupling to either high-angle or low-angle propagation modes, but not both simultaneously. This results in a compromise, whereby good results may be obtained for close-in daytime and nighttime communications, but not for distance or vice-versa. But there are certain antenna types which can be designed to provide efficient operation and coupling to both the close-in and distant propagation modes.

Simultaneous High- and Low-Angle Radiation

The configuration for the inverted-L antenna was arrived at through a process which asked the question, "Is there an antenna type possible which will provide high-angle coverage (for local and moderate distance communication) *and* low-angle coverage (preferably down to the horizon for DX communication) simultaneously in a compact configuration which is reasonably independent of ground loss (thereby obviating the need for an elaborate ground radial system)?" After much thought, a configuration was found which theoretically met these requirements. An 80/75-meter and a 40-meter version of the antenna were built and the 40-meter model was tested directly against other antennas in a set of "blind" experiments. The results of the experiments confirmed that the radiation properties of the antenna were noticeably better than the four basic antenna types used in the "average" type of amateur operation involving both local and DX communication on 160, 80/75, and 40 meters, namely a horizontal dipole, a quarter-wave vertical, a half-wave vertical, and an inverted V.

Fig. 1 illustrates the basic inverted-L configuration. The antenna consists of a quarter-wavelength vertical element and a quarter-wavelength horizontal element which are joined at the central coaxial feed point. The feed line can be run off at an angle away from the plane of the antenna (as in Fig. 1), in the plane of the antenna, or in a direction perpendicular to both legs. The height of the feed point should be at least a quarter-wavelength above ground (but can be higher if feasible) in order that the vertical radiating wire does not reach the ground. (A later section will discuss variations of the basic antenna to allow for installation of the antenna at heights lower than a quarter wavelength above ground.) In the basic configuration, the antenna can be considered to be either a horizontal dipole with one of the arms bent downward by 90° until it is vertical, or a half-wave vertical dipole with its top arm bent 90° until it is horizontal, or a 90° inverted-V antenna which is rotated in its plane by 45°.

Note several desirable factors which such a configuration results in. The vertical arm of the inverted L is a quarter-wave element above ground, but with the high-current end of the dipole located at the top of the vertical structure (not the bottom, as with a quarter-wave monopole). This results in relative independence from ground-loss coupling (since only the high-voltage, non-radiating end of the antenna is near the ground) and good low-angle vertically polarized radiation (since the active high-current radiating portion of the antenna is at a substantial height above ground).

The horizontally polarized section of the antenna, being located at least a quarter wavelength above the ground, provides good high-angle radiation in a manner similar to that of a full-sized horizontal dipole.

Naturally, the amount of signal radiated by the inverted-L antenna in low-angle vertical polarization is not as strong as that of a full half-wave vertical antenna, since we are only providing one of the two arms of the antenna. Similarly, the amount of high-angle signal radiated by the inverted L is not as strong as that provided by a full half-wave horizontal dipole antenna (again, because we are only providing one arm of the two which the dipole normally has). However, the inverted-L antenna provides a substantial amount of both types of radiation, and thus provides better "compromise" performance for the standard types of amateur communication which involves a mixture of high- and low-angle radiation requirements.

The approximate radiation patterns of the inverted-L antenna in the E-W and N-S direction are shown in Fig. 2. Note the relatively uniform amount of total radiated power in both the N-S and E-W direction, independent of the elevation angle. These are theoretical patterns, calculated for perfectly conducting ground, but calculations for an imperfect ground show that the patterns are relatively independent of the electrical properties of the earth. In directions other than the E-W or N-S direction, there is always both a substantial amount of low-angle vertical polarization and high-angle vertical or horizontal polarization. It can be seen by examination of these radiation patterns that the antenna should provide effective local and DX coverage for any of the three low frequency bands.

With a 50-Ω coaxial feed line the VSWR bandwidth of the inverted L is somewhat broader than that of an inverted V and slightly less than that of a dipole, primarily because of the stronger coupling between the adjacent arms of the antenna. About 180 kHz of the 160-meter band or 375 kHz of the 80/75-meter band can be covered with a VSWR of less than 3:1, and the full 40-meter band can be covered with a VSWR of less than 1.8:1. (Later, it will be shown how a short "tail" can be added to the vertical element to permit easy adjustment of the exact center frequency to any desired spot for 160- or 80/75-meter versions of the antenna.)

Theoretical and Experimental Comparison of Types

An experimental program was undertaken to try to verify the predicted radiation performance of the inverted L. Forty meters was chosen to be the frequency band for the test, since there are useful and stable local and distant foreign broadcast signals which could be used for signal strength comparisons. Use of a-m stations facilitated the signal strength measurements by enabling measurement of the received carrier level.

A horizontal half-wave dipole was erected as a reference antenna. Tested

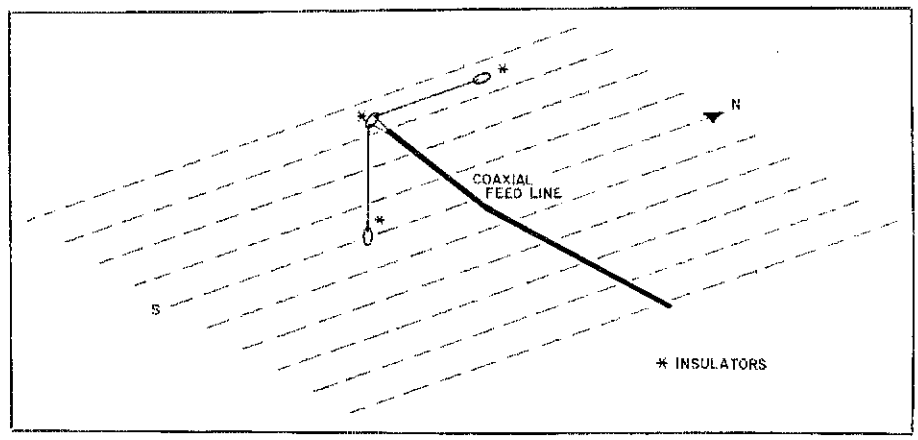


Fig. 1 — The inverted-L antenna. As an aid to discussing radiation patterns, the antenna is shown with the horizontal portion running north and south. The vertical and the horizontal sections are each a quarter wave in length for the frequency band of operation.

against this reference antenna were a quarter-wave vertical, a half-wave vertical, an inverted-V, and the inverted-L antenna. The method for measurement of the antenna performance was to select a local or distant a-m carrier for reception by a calibrated receiver, with the two antennas under test being fed to an spdt rf switch. The peak carrier level was recorded during a period of about 30 seconds for each of the two alternate antennas and was tabulated. The test was performed in a "blind" fashion, with a noninvolved party performing the connection of the two antenna connectors to the spdt switch prior to recording of data. Only after completion of the test were the antennas identified. Several hours of measurements were performed at different times during the day and night for local and distant signals. All of the results (for signals in various directions) were averaged in order to obtain the "average" effectiveness of each candidate antenna compared to the dipole standard. The results of the evaluations are summarized in Table 1.

Of particular significance is the performance of the inverted L with respect to all other antenna types (exceeded in performance by only the half-wave horizontal dipole for local contacts and the half-wave vertical dipole for DX signals). Note the effect of the radials on the performance of the quarter-wave monopole. The radials were physically removed for the "no radial" test, and only a minor VSWR effect was noted when comparing data before vs. after radial removal.

It should be noted that during the measurement series the general trends of the received signal measurements usually substantiated the average trends presented in Table 1. Of course, particular measurements taken at a particular time with a particular signal may momentarily show signal strengths which are different than that indicated in the table.

Table 1

Received Signal Level from 40-Meter Test Series

ANTENNA	*LOCAL (<1,000 MILES)*	*DISTANT (>2,000 MILES)*
Horizontal half-wave dipole λ/4 above ground	Reference	Reference
Quarter-wave monopole, 12 λ/4 radials	−8 dB	+2 dB
No radials	−10 dB	−4 dB
Half-wave vertical dipole	−15 dB	+9 dB
Inverted V, 0.2-λ vertex ht.	−3 dB	+3 dB
Inverted L	−2 dB	+6 dB

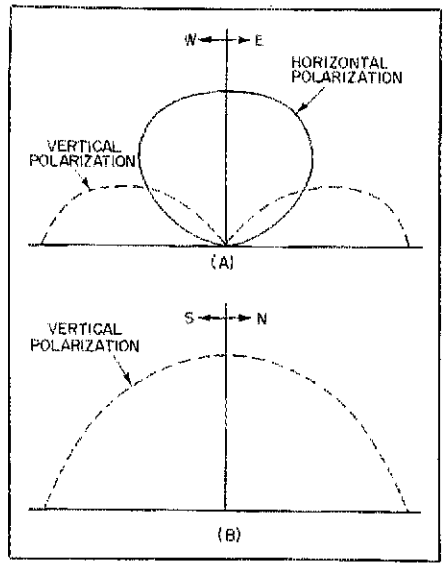


Fig. 2 — Calculated radiation patterns of the inverted-L antenna having the orientation shown in Fig. 1. These patterns show performance for a perfectly conducting earth, but calculations for imperfect ground indicate that the patterns are relatively independent of the electrical properties of the earth.

The relative effectiveness of the inverted-L antenna compared with the others evaluated for the average amateur operation is clear from the table. For local operation, the inverted L was not as effective as the horizontal dipole (2 dB worse), but it is slightly better than the inverted V (about 1 dB better) and significantly better than the quarter-wave monopole and half-wave vertical dipole. When used in providing long-distance communications, the inverted L is not as effective as the half-wave vertical dipole (3 dB worse), but is significantly better than the inverted V (by 3 dB), horizontal half-wave dipole (by 6 dB), and quarter-wave monopole (by 4 dB, even when the monopole had a radial system).

Variations on Basic Inverted L

For the basic inverted L, the approximate length of each leg (in feet) can be calculated by dividing the desired resonant frequency (in MHz) into 230. If it is desired to provide for a degree of adjustment of the resonant frequency (especially in the 160- and 80/75-meter versions of the antenna), an additional length of wire may be added at the accessible bottom of the vertical section. This additional wire can be either vertical or horizontal since hardly any radiation occurs at this point in the antenna. The tuning wire should not be a portion of the main antenna structure, so that its attachment can be accomplished rapidly. An alligator clip or other similar means of attachment is quite acceptable, since very little r current flows across the connection. These tuning wires can be preconstructed, such that with no wire added the antenna is resonant near the high frequency end of a particular band. Adding a particular wire will lower the resonant frequency to a preset new frequency lower in the band.

If the geometry of a particular installation does not permit equal lengths for the vertical and horizontal portions of the antenna, the legs may be made of unequal lengths (within reason) as long as the overall antenna length is 460 divided by the desired resonant frequency. As an alternative, the leg lengths may be kept equal and the feed point located at a point other than the point at which the antenna bends by 90°. For most effective operation of the antenna, the feed point should be located at the junction of the horizontal and vertical sections of the antenna.

Electrically loaded (shortened) antennas, which are commercially available from a number of sources, or continuously loaded types (such as Slinky Dipoles) can be employed where space does not permit installation of a full-sized antenna. Even trap dipole antennas can be used to provide multiband coverage in a single inverted-L antenna structure. Tuning of the antenna at the bottom of the vertical section (similar to the full-sized version) is practical for these alternative configurations.

The inverted-L antenna has been in use at the author's station since the spring of 1974. Performance of the antenna has been quite satisfactory, to the point where other antennas (including horizontal and vertical dipoles) have been removed and are no longer used. The particular advantage of the antenna (excellent local and DX coverage in a single antenna) is easily observed when operating with this antenna. The convenience of a single antenna usable for both local and DX work is noteworthy.

It should be mentioned that I am not aware of any previous disclosure of this particular antenna structure, but I am certain that it must be in use by others who have installations which dictated the particular horizontal-vertical configuration of the invertical L. It is not my intention to claim "discovery" of this antenna, nor to advocate its use in preference to other antenna types. The purpose of the article has been to enable the reader to gain a little more understanding of how various antenna types operate, especially the concept of effective antenna coupling to propagating modes in the 160-, 80/75- and 40-meter bands. QST

A Two-Meter J Antenna

We haven't heard much about this antenna lately. But take a careful look. Current information shows that it still has a lot to offer in the way of performance.

By W. B. Freely,* K6HMS

In the early 1950s, Oliver Wright, W6GD, described the design and construction of several types of vhf antennas, including the J antenna.[1] Adaptations of the basic design and construction techniques used in Wright's antenna have since been made by the author, using traditional amateur ingenuity and with varying degrees of success. This article presents some historical background, design information and suggestions derived from personal experience. While the J antenna is not a cure-all to problems associated with 2-meter antennas, it does offer some significant advantages over other designs. The antenna yields approximately 2-dB gain over a quarter-wavelength whip, but the angle of radiation is higher. Its physical length may be undesirable. A J antenna exhibits low Q and may be used across the entire 2-meter band with little deterioration of performance.

Mechanical Considerations

In mobile service an antenna must be rigid enough to minimize detuning caused by bending while in motion, yet it should be flexible enough to resist hitting low-hanging branches without breaking. It must withstand exposure to rain, dirt and air pollution. The design described by Wright was easy to construct and tune, but performance deteriorated quickly. My antenna design evolved from a number of changes made over the years in an attempt to improve the electrical performance and mechanical durability. An overall view of the final design is shown in Fig. 1. A 59.52-inch (23.43 cm) long whip (A) is cut from the bottom of a 108-inch (42.52 cm) stainless-steel mobile whip. The shorter whip (B) is cut from the same material. A shorting block (C) is made from a 3/8 × 3/8 × 2-1/2-inch (0.15 × 0.15 × 1-cm) piece of brass, drilled as shown in Fig. 2A. The two outer holes in the block are reamed out to provide a tight fit to the stainless-steel whips. The brass block is heated by means of a torch, and the whips are pressed into the block. The dimensions according to operating frequency are given in Table 1. Once in position, the whips are silver-soldered to the block, assuring mechanical rigidity. A top spacer (D in Fig. 1) is made from Teflon block, as shown in Fig. 2B.

Balun and Feed System

Further improvements were made in the balun and feed design. I had experienced difficulty with baluns constructed from flexible coaxial cable, such as RG-59/U. Smaller designs, using ferrite-bead transformers and TV type baluns (used to match 72-ohm cable to the 300-ohm input of a TV receiver), exhibited excessive loss although some did provide a close impedance match. A balun made from semirigid coaxial cable (the outer shield is solid copper tubing) was found to be mechanically suitable. This cable (Amphenol no. 421-668) has an outside diameter of 0.141 inch (0.06 cm) and a solid Teflon dielectric. Its velocity factor is 0.695. Balun length was calculated to be 28.5 inches (11.22 cm), and a section of cable this long was prepared, leaving 1/16 inch of dielectric

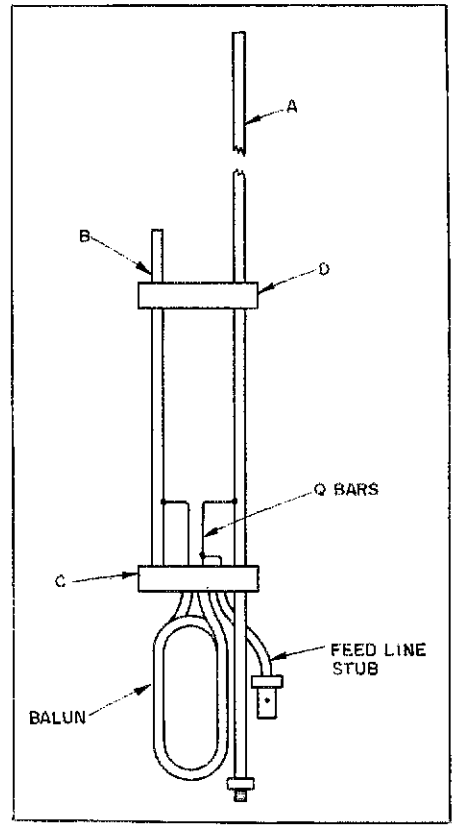


Fig. 1 — An overall view of the J antenna, showing the component parts. Dimensions are given in the text.

Table 1
Whip dimensions vs. operating frequency for the J antenna.

FREQUENCY	*LONG WHIP ABOVE SHORT*	*SHORT WHIP ABOVE SHORT*
144 MHz	59.95 in.	18.63 in.
146 MHz	59.15 in.	18.34 in.
148 MHz	58.34 in.	18.12 in.

*1807 Port Wheeler Place, Newport Beach, CA 92660

[1] Wright (silent key), *VHF Antenna Notes — With the Accent on Two Meters*, private distribution.

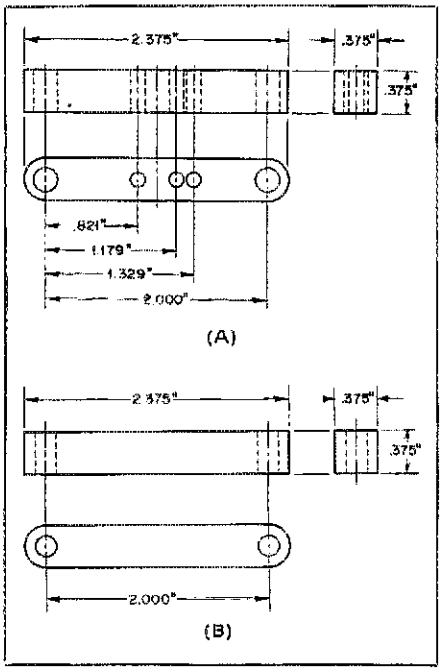


Fig. 2 — At A, dimensions of the brass shorting block. Hole diameters are (a) 0.144 inch (0.06 cm), (b) ream for tight fit to the long whip, (c) ream for tight fit to the short whip (see text). At B, dimensions for the Teflon spacing block. To prevent the spacer from slipping, the holes should be only large enough to provide a snug fit to the two whips.

and 1/4 inch of the center conductor protruding at each end. This balun was found to resonate at 145 MHz, close enough in frequency to eliminate the need for trimming. The cable is easy to work with and seems very resistant to moisture.

The *Q* bars shown in Fig. 3 perform two functions. They provide a convenient method of tapping onto the vertical elements, while their spacing is such that they act like a transmission line of 200-ohms characteristic impedance, allowing the balun to be installed beneath the antenna proper. Construction is from 0.125-inch (0.05 cm) diameter brazing rod which is formed initially as shown in Fig. 3A. Spacing between the bars should be 0.358 inch (0.14 cm). To evaluate the effects of different lengths and spacings of the *Q* bars, adjustable bars were used to determine the dimensions: The units shown were constructed from this data. Silver solder and rosin-flux solder were used in the assembly of the shorting block and *Q* bars. In Fig. 3B the points marked A were secured with silver solder, and rosin-core (soft) solder was used at points marked B.

A Teflon cover may be placed over the brass block to protect the connections from rain and dirt, if desired. A BNC female connector (UG-89/U) is attached to the input end of the feedline stub. The connector body must be slightly enlarged to accept the 0.141-inch (0.06-cm) OD of the rigid coaxial cable.

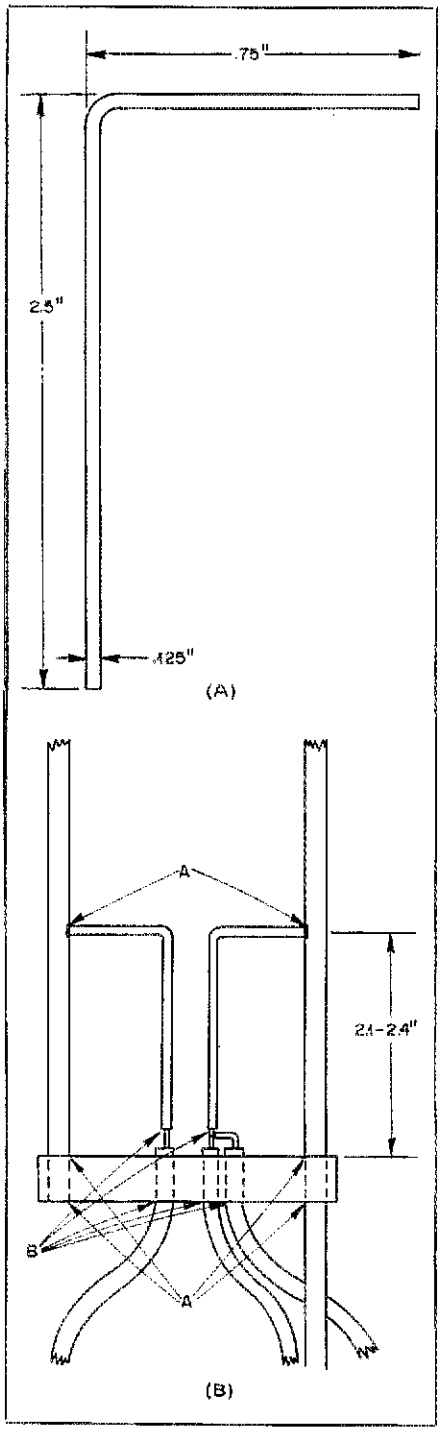


Fig. 3 — At A, bending dimensions for the *Q* bars, and at B, the details of the mounting of the *Q* bars and 4:1 balun. Points marked A are secured with silver solder, and rosin-core solder is used at points marked B.

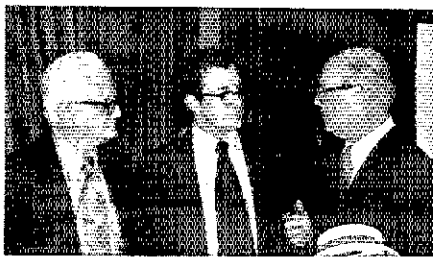
Excellent Service Results

Several antennas built in the manner described here have given excellent service while withstanding the rigors of mobile operation. The author hopes that readers will construct J antennas based on this information, and perhaps some will continue to experiment and develop even better versions. QST

Strays

I would like to get in touch with . . .

□ amateurs from Vermont and Rhode Island for 160-meter sked for WAS. Best time is 2 A.M. PST. Have been trying for 160-meter sked WAS for 45 years — I hear plenty of W1s but no Vermont or Rhode Island! Ed Marriner, W6BLZ, 528 Colima St., LaJolla, CA 92037.



Club presidencies are not hereditary, but we just can't convince some folks! Shown here at the installing party of the Virginia Amateur Radio Association (VARA) last December are WB4UUY (right), 1976 VARA president, with Ed Redington, W4ZM (left), recently elected president of the Springfield-Annandale Amateur Radio Club, and his son, WB4JHN, who was installed as 1977 VARA president. Ed proudly wrote, "My vest buttons popped off!" (*W4GF photo*)

Carol Cothern, who works in the "tag division" of the Mississippi Motor Vehicle Comptroller's office, has been instrumental in taking applications and shipping out call-sign auto tags for Mississippi amateurs requesting them. She says that there has been an enormous increase in applications within the past year. This is largely due to a recent drive by members of the Mississippi sideband net who thought it would be in the best interest of amateur radio to have their amateur plates displayed on their vehicle. While inflation spirals, this is probably the best bargain any Mississippi amateur ever got. The special tag fee for Mississippi amateurs is only $1.00.

Efficient Short Radiators

You hear a lot of talk about helically wound elements (sometimes they're called continuously loaded elements) for short beam antennas. If you're cramped for space to put up a beam antenna, you'll want to investigate these ideas as one way to shrink 'er down to usable size.

By Ronald J. Gorski,* W9KYZ

Shortened antennas have been popular with amateurs for either esthetic, space limitation or economic reasons. And most are inefficient radiators with narrow bandwidth. Let's define some limitations and problems of conventional short antenna designs. Then, I'll describe a design for a half-size two-element Yagi, the performance of which is competitive with its full-size equivalent.

It has been proved that no appreciable difference exists between the directive patterns of "short" and full half-wave horizontal dipoles. Since the gain of a half-wave dipole over an isotropic radiator is determined by the dipole directive pattern and since the length of the dipole (up to $\lambda/2$) has negligible effect on its directive pattern, the length of the dipole (up to $\lambda/2$) has a negligible effect on its gain. An assumption is made that the efficiencies of both the short and half-wave dipoles are equal. The efficiency of an antenna can be expressed as follows.

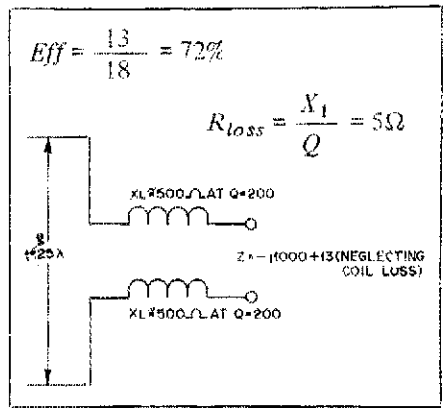
$$Eff = \frac{R_r}{R_r + R_{loss}} \qquad \text{Eq. 1}$$

where R_r = radiation resistance

R_{loss} = loss resistance of conductors, coils, etc.

The radiation resistance (R_r) of a horizontal dipole is determined by its length and height above ground. In free space, the R_r of a half-wave dipole is 73 Ω. As the length of the dipole is reduced, the R_r decreases as the square of the length. Thus, for a half-size dipole (as compared with $\lambda/2$), the R_r decreases to a value one-fourth that of the $\lambda/2$ dipole or approximately 13 Ω.

The efficiency of a half-wave dipole is very high, being on the order of 95 percent. The R_r is large and R_{loss} small by comparison. If we reduce the overall length by a factor of two, the R_r decreases by a factor of four. Input impedance at the center of the dipole is comprised of a low resistance and large capacitive reactance, so inductive loading is required in order to resonate the dipole. The inductive reactance needed to center-load the antenna will be approximately 1,000 Ω (depending on conductor size used for the antenna). Assuming a coil Q of 200 and computing efficiency using Eq. 1.

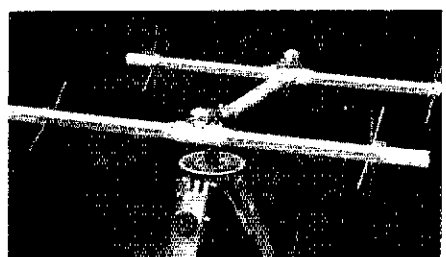


This means that 28 percent of the transmitting power applied to the antenna is dissipated in the loading coil. I have neglected any additional losses in the matching network which would result if the above antenna were driven by a 50-ohm source.

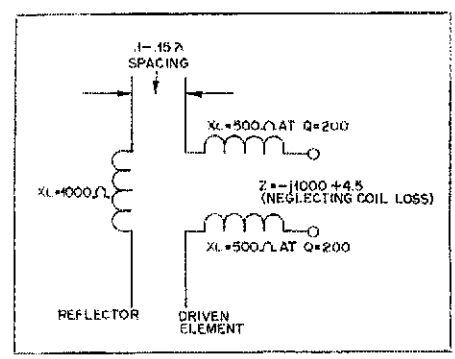
Let's suppose we decide to build a two-element Yagi using shortened center-loaded elements. The driven element by itself has an R_r of 13 Ω. Adding a close-spaced parasitic element reduces the radiation resistance by approximately a factor of three. Thus, the driven element has an impedance composed of approximately 4.5 Ω resistive and 1,000 Ω reactive. Loading both the driven and parasitic elements with the same inductors that were used for the dipole and computing efficiency:

$$Eff = \frac{4.5}{4.5 + 5} = 47\%$$

This efficiency equates to slightly more than a 3-dB power loss in the driven element. I have neglected the sizable loss in the matching network since it must transform the 50-Ω source to the 9.5-Ω impedance of the antenna at resonance. In addition, the loading coil of the parasitic element will contribute approximately 1 dB of loss.



The 100-MHz "model" used by the author for testing shortened elements in a Yagi antenna design.



Taking into account the losses on loading coils of both the driven and

*615 E. Otjen St., Milwaukee, WI 53207

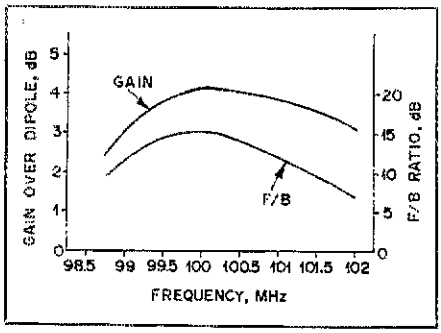


Fig. 1 — Curves depicting gain and FBR (front-to-back ratio) vs. frequency when the Yagi antenna is tuned for operation at 100 MHz.

parasitic elements and the loss on the driven element to feed-line matching network, we can easily account for a 5-dB power loss. Such a power loss would nullify the gain of a properly tuned Yagi, making it little better than a full-size dipole.

It should be obvious from the previous examples that the poor performance of short dipoles, and particularly Yagis, is a direct result of losses in loading inductors. If we can reduce these losses while raising the radiation resistance, the increase in efficiency will (might?) make the short dipole or Yagi competitive with its full-size counterpart.

Test Antenna

The helically wound whip antenna has always appealed to me because the R_r tends to be higher than that of the base-loaded whip. This is because it is continuously loaded. In fact, using end-loading (large capacitance hats), the current distribution will be much more constant, yielding an R_r of up to four times that of a base-loaded whip. I decided to use the helical design for a short test dipole and investigate the properties of this antenna vs. that of a full-size dipole.

Conventional design for a helically wound antenna uses a form (wood, bamboo, fiberglass) wound with approximately $\lambda/2$ of no. 14 wire per $\lambda/4$ element. I felt that the resistive R_{loss} of this large amount of wire would be as great as that of the loading coils in the center-loaded dipole, making the helical design ineffective. As it is desirable to reduce conductor resistance, the surface area of the conductor must be substantially increased. Tubing is not mechanically suitable, and because skin depth is only on the order of 0.001 inch,[1] the use of tubing is not required. Some 1/2-inch wide copper tape[2] was on hand and a study of its skin resistance revealed a loss per unit length of 12 percent less than that of the no. 14 wire.

Footnotes appear on page 39.

A helically wound dipole was constructed (using the 1/2-inch wide tape) for use at 100 MHz. This frequency was chosen so that field-strength measurements could be performed using a local fm broadcast station as the signal source. A 28-inch length of 3/4-inch CPVC tubing (plastic water pipe) was wound with 38 equally spaced turns of the 1/2-inch wide tape. Using a grid-dip meter, resonance was measured at 104 MHz. Next, two 5-1/2-inch diameter six-spoke capacitance hats were attached to the ends. Resonance was again measured and found to be 84 MHz. A *C*-match[3] was constructed to transform the low impedance of the short dipole to 50 Ω. The *C*-match requires that the element be made to look inductive by lowering its resonant frequency. A variable capacitor is then shunted across the feed point and adjusted for resonance. This *L/C* ratio determines the impedance transformation. A 100-pF variable capacitor was shunted across the feed point of the test dipole and a 50-Ω coaxial cable was attached. Since the dipole is a balanced antenna, feed-line decoupling was necessary. I used a quarter-wave sleeve (bazooka).

Antenna Tuning

R-f power was applied to the test antenna through an SWR meter (measurements were taken in a screen room). Turns were removed, one at a time, and the shunt capacitor adjusted until a 1:1 match occurred. The capacitance hats were always installed at the tips of the element. When adjusted for a 1:1 match, the dipole consisted of 32 turns of copper tape, center fed, with 40 pF shunting the feed point and an overall element length of 21 inches which is 37 percent of the length of a full-size dipole. Tuning was very simple and took but 15 minutes to complete.

Measurements

The feed-point impedance was measured (with *C*-match disconnected) to be 20 Ω. The skin depth resistance was computed to be 0.24 Ω. Computing efficiency;

$$Eff = \frac{20}{20 + 0.24} = 98\%$$

which is essentially the same as a full-size dipole. Bandwidth between 2:1 SWR points was measured to be greater than 6 percent of the operating frequency. Large capacity hats (for 100 MHz) and wide tape play an equally important role in reducing the *Q* of the antenna sufficiently to obtain a wide bandwidth. Next, a low-level signal generator and dipole were set up 5-wavelengths away from the test antenna. Using an Empire NF-105 noise and field-strength meter, a

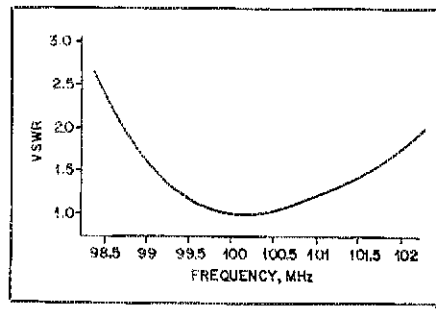


Fig. 2 — VSWR vs. frequency when the Yagi antenna is tuned for operation at 100 MHz.

comparison was made on field strength between the test antenna and a full-size dipole. Results indicated no apparent measurable difference between the short helically wound dipole and a full-size dipole. Field-strength measurements were then taken on the signal from a local fm broadcast station. Again, there was no apparent difference. Not bad for an antenna that is less than half size. The next question to be answered was whether gain could be secured by the addition of a parasitic element.

A boom and a parasitic element were added to the shortened test dipole. Although a director might provide better gain and front-to-back ratio (FBR), the decrease in radiation resistance, to a very low value (dipole by itself equals 20 Ω) because of the close spacing, was thought to decrease efficiency and bandwidth. A parasitic reflector was constructed, similar to that of the driven element. The element was split in the center and a 100-pF capacitor installed for tuning purposes. Element spacing was adjusted to 0.15 λ. With the capacitor fully meshed, the six-spoke capacitance hats were physically positioned on the element (both equidistant from element center) so that the reflector resonated at 93 MHz. Nominal reflector tuning calls for reflector resonance approximately 5-percent lower in frequency than the driven element, or 95 MHz. With the above configuration, I was able to adjust reflector resonance, using the variable capacitor, anywhere in the range of 93 to 96.5 MHz or 3.5 to 7 percent lower in frequency than the driven element.

Using the same field-strength measurement set up as with the dipole, the reflector was aimed at the source signal and adjusted (using the variable capacitor at element center) for minimum pickup. The driven element was then readjusted for a 1:1 SWR and the process repeated until minimum rear pickup and a 1:1 SWR occurred simultaneously. Gain and FBR measurements were made at the design frequency and at points two percent of the design frequency on either side. The results are

described in Fig. 1. The bandwidth measurements are given in Fig. 2.

As can be seen from the curves in Fig. 1, a gain of 4 dBd, and a 15-dB FBR can be secured quite easily with a physically short Yagi. As with other Yagis, the gain is relatively constant over a wide frequency range. However, the FBR drops quite fast especially when trying to use the antenna below its design frequency. From curves given in Fig. 2, the bandwidth between the 2:1 VSWR points is shown to be about 3.7 percent. Translated to 20 meters this bandwidth would be 500 kHz, equal to or greater than the average 3-band trap Yagi. If indeed the design were scaled to 14 MHz, the antenna would have element lengths of slightly over 12 feet and a boom length of 10 feet, 6 inches.

Adapting Design to Ham Bands

Since it has been shown that a physically short Yagi can provide significant gain and FBR, a few design pointers are in order. First, make the element length no shorter than physically necessary for your particular situation. Bandwidth and efficiency will improve with greater lengths. Second, the use of large capacitance hats is recommended, as this reduces the helical conductor length and thus R_{loss}. Third, use large forms of good dielectric quality (fiberglass). The larger the form diameter, the greater the length reduction for a given number of turns. Also, with large diameter forms (1.5 inch), the width of the conductor can be increased, thus reducing R_{loss}. Fourth, regardless of the matching network used, construction of capacitance hats, etc., *solder all* joints and *seal* with silicone rubber. *Do not rely on pressure joints.* Fifth, to secure a reasonable FBR with any Yagi using a split driven element and fed with coaxial cable, some form of balun transformer is required to keep currents from flowing on the outside of the coax braid. Sixth, the use of a grid-dip meter is the only practical method to secure resonance with a fixed physical length. Construction will require some cut and try. Proximity to surrounding objects will effect resonance, and should be avoided when tuning the array.

No doubt I have left out items which may prove to be a problem for the reader. This article was intended to be more thought provoking than constructional although there should be enough information here to build your own antenna with a reasonable amount of experimental effort. My current plans call for construction of a 2-element 10-meter Yagi (for reception of OSCAR signals) with 6-foot elements and a 5-foot boom. I wish to thank Mike Povlich, WB9HGS and Russ Mills for their assistance with measurements.

QST

Footnotes

[1] Kuecken, *Antennas and Transmission Lines*, Howard W. Sams and Company, Indianapolis, IN, 1st Edition (1969), p. 274.
[2] Copper tape available from Minnesota Mining and Mfg. Check Yellow Pages for the address of a local distributor.
[3] Orr, *Beam Antenna Handbook*, Radio Publications Inc., Wilton, CT, Third Edition, p. 63.

Feedback

□ In "Solid-State BC-221 Frequency Meter" (*QST*, February, 1977), page 36, first column, the value of 4.7 ohms is incorrect. It should be 4700 ohms. We are also advised that if there is difficulty in getting the crystal oscillator to oscillate, try a 3- to 10-pF capacitor between the gate and drain of Q3 (pins 5 and 6, Fig. 2).

□ With reference to the "Hints and Kinks" item concerning an antenna adapter for the Wilson T-1402 Handie-Talkie (*QST*, November, 1976), AVA Electronics & Machine Corp., of Lansdowne, PA, advises that they no longer manufacture the model 1013-24 adapter. Thanks to VE2JN for the notice.

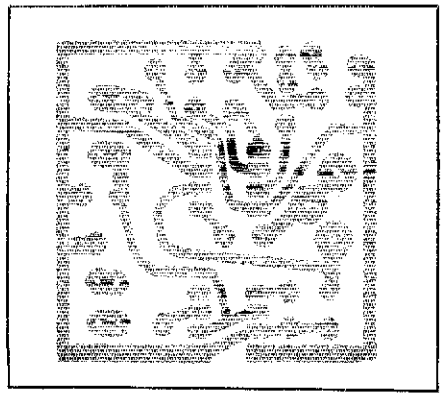
□ Technical Correspondence contributor (*QST*, February, 1977) John Robotham's full call is VE4XI, not VE4X.

□ Jury Belevich, UA1IG, advises that in his article, "On Signal Strength Evaluation" (*QST*, October, 1976), the standard for R. L. Drake Co. given under point 3, page 50 is "50 μV through a 5-dB pad for S9."

□ The exhibit photograph from the Big Rapids Area (MI) Amateur Radio Club (*QST*, February, 1977, page 17) should be credited to W8OWN instead of WB8TVD.

□ WAØUZO reports a feedback for "Understanding Linear ICs, Part 2" (*QST*, February, 1977). A typographical error specifies no. 38 enamel wire. It should be no. 28 wire.

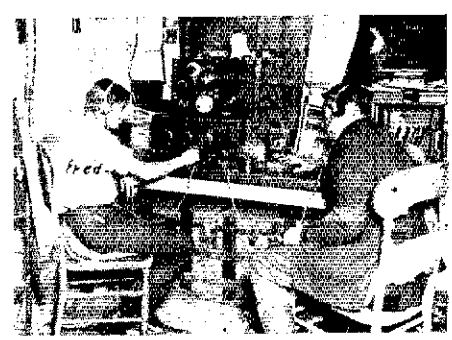
□ If you tried to associate the pc-board pattern in March 1977 *QST* "Feedback" with the blurb above it, they actually refer to two separate articles. The pattern belongs to "A Time-Delayed Tone Encoder" (*QST*, February, 1977). Diodes CR1 and CR2 are reversed from the way they should be installed in Fig. 1. Also, there is an error in the pc-board layout as it appears in Fig. 2. Here is a corrected layout of the board, full-scale pattern, viewed from the foil side.



Strays

□ Fred B. Cassens (left), presently residing in Phoenix, AZ, has been an avid *QST* reader since 1920, when this picture was taken. He has collected most issues and is the proud owner of ARRL's 1928 *Radio Amateur Handbook*, 3rd edition.

During his early years, Fred operated 9DB out of Lane Technical High School and 9ZN out of the Edgewater Beach Hotel in Chicago, which was the old Karl Hassel and R. C. Mathews station. Also, he was one of five employees for Chicago Radio Lab, later Zenith Radio Corp., to help build and wire the Zenith transmitter and radio receiver that went with Don Mix on the *Bowdoin* in 1923 to the Arctic. At 73, Fred hopes a few of his old ham friends are still on the air.



My Feed Line Tunes My Antenna

This classic paper originally appeared in QST 21 years ago to help clear up misconceptions about transmission lines.† But misconceptions persist. As valid now as it was then, the information is reprinted here in today's terminology and QST style for those without the earlier issue.

By Byron Goodman,* W1DX

You don't have to be in ham radio very long before you hear some self-styled antenna expert talking about "cutting the line to reduce the standing-wave ratio." An allied problem – and misconception – is exemplified by the card that came in the mail some time ago:

"I carefully cut an antenna for 7 MHz according to the formula in the *Handbook* and fed it in the center with 300-Ω Twin-Lead. Using a grid-dip meter, I found the frequency was 5 MHz instead of 7. And it also had dips at 10, 20 and 25 MHz. Adding more 300-Ω Twin-Lead brought the frequency up to 7 MHz, but what I don't understand is why the feed-line length affects the resonant frequency of the dipole. If it is supposed to, how can I check the resonant frequency of the dipole itself?"

This is a good subject. If you know the correct answers to all of the questions in the quote above, you aren't likely to have trouble understanding most of the common feed-line problems. Let's see what it's all about.

Transmission Lines

Ask any amateur if he knows all about coaxial cables and he will probably say, "Sure, RG-8/U is 50-ohm line and RG-11/U is 75-ohm line. What else is there to know?" The answer to that one is "Everything."

In the first place, RG-8/U is *not* 50-ohm line. It has a "characteristic impedance" of 50 ohms. This fancy language can best be illustrated by Fig. 1. Here we show a long length of RG-8/U with a 50-ohm resistor connected at one end (we'll call that end the "load" end). If we measure the impedance at the input end (by using an impedance bridge), it will measure 50 ohms. This, of course, is just what you expect, and you're probably wondering what we're driving at. Patience, please.

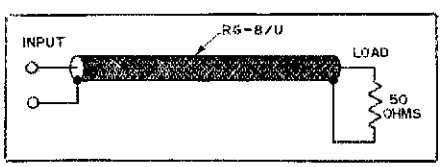


Fig. 1 — A length of RG-8/U with 50 ohms connected across one end will look like 50 ohms at the input end of the line.

Now suppose we take this same piece of RG-8/U and connect a 100-ohm resistor at the load end, as shown in Fig. 2. Measuring the impedance at the input end, what should we get for an answer? 50 ohms? 100 ohms? 200 ohms?

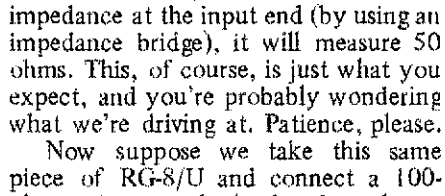


Fig. 2 — With 100 ohms connected at the load end of a length of RG-8/U, the problem is to determine what the line looks like at the input end.

If you came up with an answer, any answer, you had better continue reading this article, because there isn't any answer to the question in the preceding paragraph! There isn't any answer because the problem isn't definite enough to be capable of solution. In order to know what the input end of the 50-ohm line looks like when a 100-ohm resistor is connected at the load end, you must also know the *electrical length* of the line. This is another way of saying that you have to know the frequency and the physical length, from which you can compute the electrical length. (Electrical length is measured in wavelengths, so any given length of line has an electrical length that varies with the frequency. A line one-wavelength long at a given frequency is two-wavelengths long at twice that frequency, etc.)

Actually, with the "50-ohm" line terminated in 100 ohms, some interesting things happen along the line. Take the lines shown in Fig. 3. If the line is a quarter-wavelength long, we find that the impedance bridge would measure the input impedance as 25 ohms. If the line is a half-wavelength long, the bridge would come up with an answer of 100 ohms. If the line is 1/8-wavelength long, the bridge would measure the input as a 40-ohm resistance in series with a capacitor, and a 3/8-wavelength line would be measured as 40 ohms resistance in series with an inductance! These effects repeat every half wavelength along the line, as shown in Fig. 4A.

The example we just discussed used a load for the transmission line that was higher than the characteristic impedance of the line. When the termination is

*Former Assistant Technical Editor, *QST*, now retired.

†Goodman, "My Feedline Tunes My Antenna," *QST*, March, 1956.

lower than the characteristic impedance of the line, the impedance varies along the line in the manner shown in Fig. 4B.

Now let's get back to that "characteristic impedance" thing again. Here's what it is: *The characteristic impedance of a transmission line is the value of resistance that, when used as a termination for the line, makes the input impedance of the line independent of the electrical length of the line.*[1]

Measuring Antenna Impedance

By now you may begin to see where the card-sender of the opening paragraph went astray. He connected an antenna to a length of "300-Ω line" and expected that the line was acting as a direct connection between antenna center and the shack, adding no effects of its own. It wasn't, of course. The antenna was probably resonant at 7 MHz, and a half-wave antenna looks like 70 ohms at its center. Hence this was the same as connecting a 70-ohm resistor to the end of the 300-ohm line, for measurements made at 7 MHz. At other frequencies the antenna becomes a complex termination, involving both resistance and reactance. From the previous discussion you know that the 300-ohm line terminated in something other than 300 ohms is going to show various values of resistance and reactance at the input end, depending upon the electrical length of the line. Consequently, the resonant frequencies checked with the grid-dip meter (these would be the frequencies where pure resistance showed at the input end of the line) have no bearing whatsoever on the resonant frequency of the antenna proper. By changing the physical length of the line our friend was able to get a length that showed "resonance" at the frequency for which he cut the antenna, but all this means is that his electrical line length at 7 MHz is now a multiple of a quarter wavelength, since it takes that length to show pure resistance at the input end when the load is a pure resistance (we're assuming it is).

Okay, how do you measure the resonant frequency of the antenna? Well, it isn't too easy, but fortunately, it isn't too important.

(WHAT?!!! It isn't important that the antenna be resonant? What kind of sacrilege is this?)

Our friend of the postcard is using what is known as a "tuned antenna system." He is terminating a 300-ohm

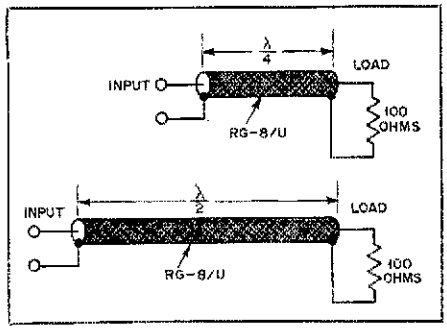


Fig. 3 — Part of the answer to the problem posed in Fig. 2. When the line is a quarter-wavelength long, it looks like 25 ohms at the input end when the load is 100 ohms. When the line is a half-wavelength long, the input end shows an impedance equal to that connected at the load end.

line with a load other than the characteristic impedance, and consequently, what the impedance looks like at the input end of the line depends upon the electrical length of the line (see Fig. 4). To put power into the antenna, the line is connected to the transmitter through a network that compensates for any reactance showing at the input end of the line, and a resistive load is presented to the transmitter. In plain language, the "network" is the output stage plate tank or, to handle a wider range of conditions, the plate tank plus a Transmatch (sometimes called an antenna tuner or antenna coupler).

Perhaps we should mention at this point that only resistance can use up power; reactance can't. You know this from practical work; you can pass ac through a capacitor, but the capacitor never gets hot (if it's a pure capacitor) or uses power in any other way. The same is true of a pure inductance, but they are harder to come by because the conductor of the coil has some resistance. When a coil heats up, it is the resistance of the coil that causes this, not the reactance.

Since only resistance can use up power, what difference does it make if the antenna is resonant or not? When the antenna is resonant it appears as a pure resistance (made up of the conductor resistance plus the "radiation" resistance), but when it isn't resonant it looks like a resistance and a reactance. Only the resistive part can use up power, so we don't throw anything away. We do want the antenna to be resonant and look like a resistance if we are planning to use it as a load for an "untuned" transmission line, but to do this we have to use a line with a characteristic impedance equal or close to the value of resistance the resonant antenna shows. We can't feed a 70-ohm antenna with a 300-ohm line and expect

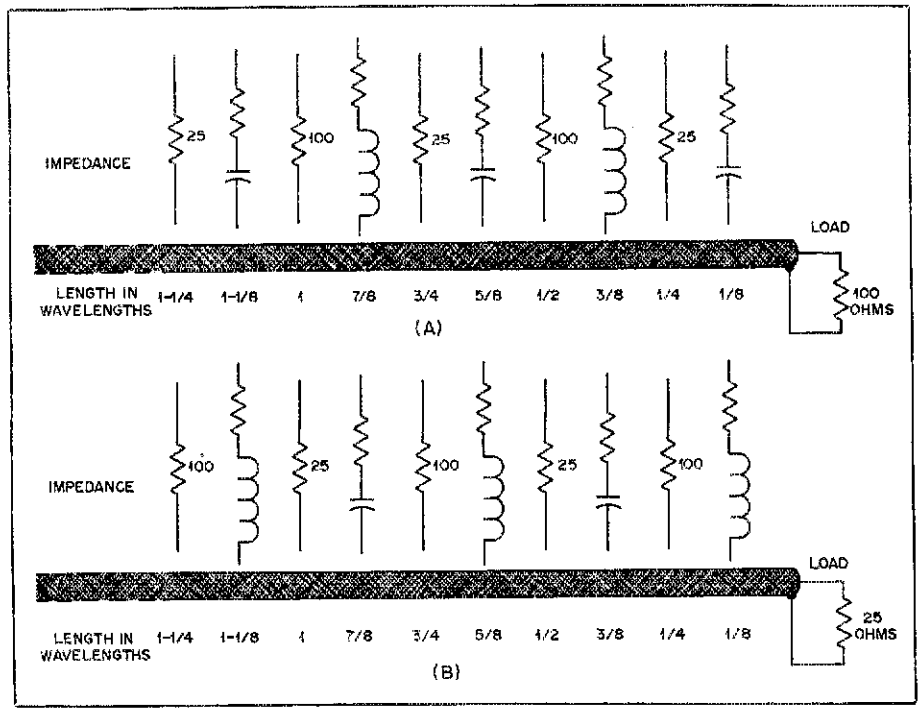


Fig. 4 — These two examples show how the input impedance of a 50-Ω line varies with the length of the line when the line is terminated in something other than the characteristic impedance of the line. It should be realized that the impedance is continually changing along the line, repeating every half wavelength. The impedance is purely resistive only at the quarter-wavelength (and multiples) point, and it becomes reactive either side of this point. When the load includes reactance as well as resistance, the impedance along the line varies in the same manner as shown here, but the purely resistive points do not occur at multiples of 1/4 wavelength from the load.

[1] [Editor's Note: This is strictly true only for a lossless line, where the input impedance will be equal to the characteristic impedance for any length of line. Lines with appreciable loss will show a gradual variation in input impedance, depending upon the length, as a result of the cumulative effects of series resistance and shunt conductance.]

it to be anything but a "tuned antenna system," exhibiting the variations shown in Fig. 4. We can feed a 70-ohm antenna with 70-ohm line, and then no matter how long we make the line, it will always look like 70 ohms at the input end, and we won't have to use an antenna coupler if 70 ohms will load the transmitter satisfactorily. But the antenna *has* to be a 70-ohm antenna, resonant at the frequency we're interested in.

Standing-Wave Ratio

By this time it may or may not have occurred to you that all this talk about the way the input impedance varies with a mismatched line may have something to do with that old conversation piece, the "standing-wave ratio." It does. Since the power at any point along the line must be constant, you can see that as the resistance and reactance vary along the line, so must the voltage and current. Take the line of Fig. 4A. Let's say we're putting 100 watts into that 100-ohm load. The current at that point is 1 ampere and the voltage is 100; $W = I^2R = E^2 \div R$. A quarter wavelength from the load, the line looks like 25 ohms, and 100 watts at this resistance level is a current of 2 amperes and a voltage of 50. At the half-wave point from the load we're back to 1 ampere and 100 volts. Thus you can see that the current and voltage vary along the line, and of course they can be measured and that will give us something called the "standing-wave ratio." This SWR is the ratio of a current maximum to a current minimum, or the ratio of the voltage maximum to the voltage minimum, and in this case it is equal to 2.0. We say, "The SWR of the line is 2.0." Note that this ratio of 2.0 is also the ratio of the resistive load to the characteristic impedance of the line ($100 \div 50 = 2$). It always works out this way; the SWR of the line is equal to the ratio of mismatch between load and line, for resistive loads. (When the load is smaller than the characteristic impedance, you divide by the load, because the SWR is normally stated as a ratio larger than 1.0.) The solution is more complicated with some reactance in the load.

And now you can see why those "brains" who change the SWR on the line by changing the line length just don't know what they're talking about. What they are doing is adjusting the length of the line so that at the input end it looks like a resistance and hence becomes a little easier to couple to. *But the SWR is determined by the load,* and don't you forget it.

That's about it. If you've learned that the SWR is determined by the load and not by the line length, and if you've learned that the antenna resonant frequency isn't important when you're using a tuned line, you've come a long way. Of course, the latter doesn't mean you can use a very short (less than 1/8 wavelength) antenna and get out just as well as with a full-sized one. In this latter case the ohmic resistance of the antenna and loading devices may be greater than the radiation resistance of the antenna, and most of your power goes into heating the loading device and the feed line.

Other Considerations

To keep this discussion simple, w have of necessity left out a number c points that often must be considere For example, a piece of open-wire tran mission line and a piece of Twin-Lea (or coaxial line) of the same physic length do not have the same electric length. The reason for this is that th radio waves travel slower through th solid dielectric of the Twin-Lead tha they do through the air dielectric of th open line, so a wavelength in air (for given frequency) is longer than a wav length in solid dielectric. The "velocit of propagation" in air is considered t be 1.0, and the "VP" in a solid dielec tric will be something less, dependin upon the material. VP values for variou lines are given in any good antenn book, and they must be considere when you compute the electrical lengt of a line.

Another aspect that was not con sidered was the loss in a transmissio line. If the line itself had no loss, the the SWR value would make no diffe ence where losses are concerned. How ever, any practical line does have som loss, and this loss increases with th SWR, and the inherent loss of the line This is a consideration in any antenn system requiring a long run of line, an is the reason that one shoots for a lo SWR with coax or Twin-Lead bu doesn't worry too much about it (fro a loss standpoint) with open-wire line

QST

Strays

□ The Knoxville, Tennessee, Radio Club has two teachers who are really at home in the classroom. Dr. LeRoy B. Cebik, W4RNL, associate professor and director of graduate studies in philosophy at the University of Tennessee, has spent two evenings a week with amateur classes for the past two years. This year he is teaching General and Advanced classes to over 30 new Novices.

Dr. Allan Lasater is associate professor of statistics at UT, and with the blessing of his XYL, WA4VGD and son, WA4IRH, he is instructing a Novice class of 45.

□ WSØBSA, special-event call for Troop 188, Boy Scouts of America, Aurora, CO, operated for four days in November. If you worked this station and would like a special QSL, please send your QSL and s.a.s.e. to WSØBSA, 740 Galena St., Aurora, CO 80010.

QST Congratulates . . .

□ Milton Dexheimer, W2VCI, who has been chosen by the Amateur Radio Association of the Tonawandas (NY) as its outstanding member for 1976. Holder of an Extra Class ticket, Dex's main ham interest is cw QSOs. One of the founders of the club 25 years ago, he is an electronics engineer at the Sierra Research Corp., a navy veteran and superintendent of his church's bible school. — *WB2GUF*

I would like to get in touch with . . .

□ hams who are under 16 to form a net for building code speed, WAS and ex changing general information pertainin to this age group especially thos hams who would be willing to be ne control operators. Will B. Eaves II WB5TRE, Rte. 1 Box 293, Merryville LA 70653.

□ a pen friend in any part of the world speaking English or French, and prefer ably a young OM or YL. I'll answer al letters. J. Repetto, F6FJK, 507 Ave. des Palmiers, 83140 Six Fours, France.

□ Richard Pierce. He is an old friend but I lost contact with him about 1 years ago. In 1966 his call wa WA2VWD and he lived in Brentwood NY. I'll be grateful to anyone who ca help me locate him. David R. Marlowe Alyeska Service Center, Fairbanks, AK 99716.

Build This "Quickie" Preamp

Those incoming signals on 160-meter Beverage antennas and other inefficient low-noise receiving antennas are sometimes so weak they need crutches. Pick up 20 dB of signal level by adding this JFET preamp in the line.

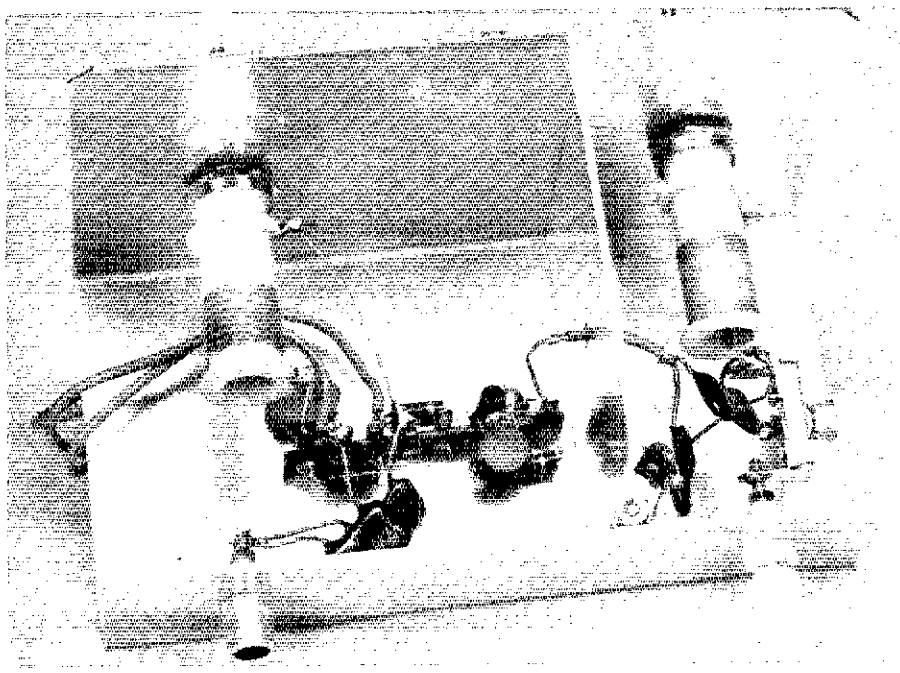
By Doug DeMaw,* W1FB

If you have been having a bad time of it while trying to extract weak signals from the ether by means of a receiving loop, Beverage antenna or some cobbled-up wire antenna, you probably need a booster in the feed line. Users of vertical antennas on "top band" need not be told about the noise pickup characteristics of that type of antenna. A DX signal from Europe is heard – just barely discernible amid the man-made and atmospheric noise, and you go frantic trying to identify the call letters so you can respond. Chances are you may not succeed: You're tempted then to take a sledgehammer to the rig, or worse yet . . . cry yourself to sleep! Such reactions are a bit on the side of fantasy no doubt, but the frustration of trying to sort a cw or ssb signal out of an S-9 noise level is a common one for many operators.

The more experienced 160-meter DXer will often use a vertical antenna for transmitting, but will employ some low-to-the-ground wire or loop antenna for receiving in an effort to cope with the ever-present noise problem. Land barons often use several wavelengths of wire to form a Beverage antenna. The far end of the wire is terminated in a resistance (typically 50 to 300 ohms), and the resistance is connected to a radial ground system, or in a less complex installation, to a ground rod. The far end of the wire must be aimed at the world area of interest. The entire wire need be only high enough above ground to enable people to pass under it without getting injured. Some operators have simply laid the wire on ground, while others have said that they have placed the wire underwater in a lake or ocean!

Compromises need to be made if there is not enough property available for a Beverage antenna (a Beverage needs to be a wavelength or greater in size to be effective as a low-noise directional antenna). Good results have been had in some instances by merely stringing out a short length of wire a few feet above ground. A nondirectional pattern will result, but noise pickup will be greatly minimized. The writer, for example, uses 200 feet of wire about seven feet above ground. The far end of the wire is connected to a six-foot ground rod. In effect, the system functions as a poor man's loop, the earth comprising the resistive missing half of the loop. Noise pickup is three or four S units below that of the 75-foot vertical, but the antenna efficiency is dreadful – hence the need for a preamp to serve as an "equalizer." With unity gain established for the two antennas, noise is reduced by a significant margin when using the horizontal wire. It does not

*Technical Editor, *QST*



seem to show any spectacular directional characteristics, but appears to favor signals arriving from the non-broadside directions of the antenna.

The Preamplifier

This preamplifier was literally thrown together at the 11th hour of the 1976 ARRL 160-meter contest – three hours before the contest kicked off! For that reason it is a somewhat grotesque-looking gadget, but the important goal was met: It played nicely when checked out. Point-to-point wiring was employed in order to get the job done quickly. The chassis was formed from a chunk of scrap aluminum.

Fig. 1 shows the circuit details. It was desired to obtain 20 dB of gain, approximately, so a common-source JFET arrangement was chosen. That meant that the possibility of self-oscillation would be present. Therefore, the gate was tapped down on the tuned circuit by means of a capacitive divider (C3 and C4), thereby dragging the input of the transistor down to a fairly low impedance level. The divider capacitors serve as the resonating elements for the input inductor, L1.

A high-pass type of tuned-circuit response was desired to help prevent bc-station energy from reaching Q1. C1 was used for matching to the antenna, and that contributed to the high-pass characteristic.

The output tuned circuit also has a capacitive divider. This provides a 50-ohm output impedance for looking into the station receiver. A 15-ohm resistor was placed near the drain lead of Q1 to prevent vhf parasitic oscillations.

Although J. W. Miller 43-series slug-tuned coils are seen in the photograph (L1 and L2), they need not be used. They are rather costly, so a substitute may be more appropriate. The calculated nominal inductance for L1 is 58 μH, but it is necessary to allow for the antenna capacitance as seen through C1. Therefore, a coil is recommended which tunes from 36 to 57 μH. A Miller 20A475RBI is suitable. For L2 one can use a coil with a range of 24 to 40 μH – a Miller 20A335RBI. Although silver-mica capacitors are recommended for C2 through C5, inclusive, disk ceramic units will probably serve adequately.

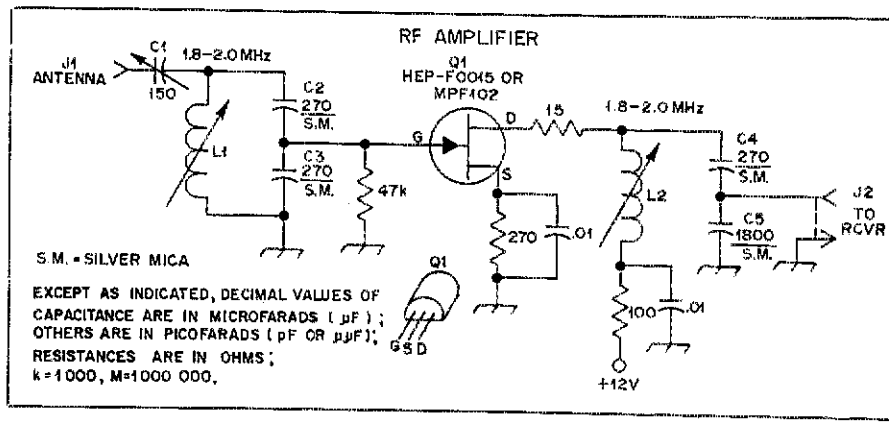


Fig. 1 – Schematic diagram of the 160-meter preamplifier. Fixed-value capacitors are disk ceramic unless otherwise indicated. Resistors are 1/4-W composition. C1 is an Arco 424 mica compression trimmer. For L1 and L2 see text. J1 is a binding post (insulated) and J2 is a phono jack.

Operation

This preamplifier is not unconditionally stable. That is, it is prone to self-oscillation if no antenna is connected to it. However, with only four feet of wire attached at the input (C1), the stability was good. Unconditional stability was made possible by incorporating a slight trade-off: making C5 smaller in value and increasing the capacitance of C4. This provides an intentional mismatch and loads the drain tuned circuit more heavily. A slight reduction in gain will result. Alternatively, the drain of Q1 could be tapped down about midway on L2 to assu stability.

With the receiving antenna co nected and the station receiver tuned t the frequency of interest in the 16 meter band, tweak the slugs of L1 an L2 for maximum band noise or fo greatest response of a weak signal. Th writer's preamp is peaked at 1827 kH to provide maximum gain in the D window (1825 to 1830 kHz).

This project was tacked together as means to an end, and it could be mad to look much neater if a pc board wer used and the chassis painted. A 12-vo power receptacle could be added to th rear lip of the base. The important thin is that it did the job required of it – an rather well at that! QST

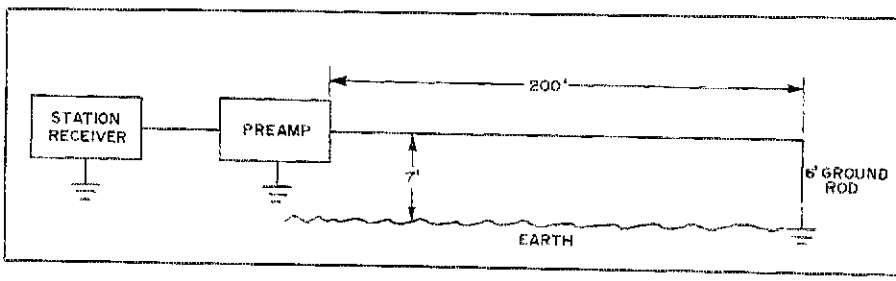


Fig. 2 – Details of the low-noise wire antenna used by the author with this preamp.

Strays

□ A president named Jimmy was involved in some back-room operations in Plains, GA, on election night, 1976 – Jimmy Poole, K4VBH, that is. He headed the nearby Americus (GA) Amateur Radio Association in a special operation on 80, 20 and 2 meters. They set up in the local pharmacy, owned by one of the club members. Besides creating pileups, they caused some QRM to one of the network color cameras but still had a lot of fun. Participating were K4VBH, WA4RDO, WA4LHH, W4UFD, W4AXB and WA4QVM.

□ Carl Smith, WØBWJ, knows his aircraft equipment isn't Built With Junk. The ARRL vice president was captain o a commercial San Francisco-Honolul flight with 62 passengers and eight crew members. While approaching Honolulu Carl discovered that the nose gear would not lower and lock. Requesting tha foam be spread only on the last part o the runway, he circled for 45 minutes, then eased the Boeing 707 down and balanced the quarter-million-pound weight on the two main gears until it almost stopped. No fire and only minor damage resulted.

Solid-Tubes – a New Life for Old Designs

Worried about vacuum-tube replacements for your equipment? No wonder, with tube production being phased out by some manufacturers. But, take heart. Try this fresh solid-state idea. It's cool, in more ways than you think!

By Howard J. Sartori,* W5DA, ex-W5KYD

Yesterday you noticed that the tube in the rf stage of your priceless receiver was getting gassy – and you also just heard that tube manufacturers are getting scarcer and scarcer. To compound matters, some of the other tubes in the receiver look a little sick. What to do – what to do? Well, friend, have faith and go the solid-tube way. You'll be intrigued by this solution.

Our objective is to make a plug-in replacement that matches the impedance, transconductance (g_m) or voltage gain (μ), frequency, high voltage and dissipation parameters of vacuum tubes. Junction n-channel field-effect transistors (FETs) will meet most of the requirements. But, not all of the parameters can be met with a single device. So, unique dual-semiconductor circuits were designed to be compatible with vacuum-tube parameters. While FET parameters vary more than those for vacuum tubes from device to device, this variability can be controlled by proper source resistor selection in much the same way that a cathode resistor is used. Fortunately, only four basic solid-tube configurations will synthesize commonly used vacuum tubes. They are the low-gain configuration types for triodes like the 12AU7, the high-gain configuration for types like the 12AX7, the high transconductance with low-feedback configuration for pentodes like the 12BA6 and 12BY7A, and the low-power configuration for triode or pentode vacuum tubes like the 6EV7.

Basic solid-tube configurations are illustrated schematically in Fig. 2. The approach used to build different types of vacuum-tube replacements is to begin with a simple low-gain voltage amplifier. As shown in Fig. 2A, a single high-voltage, low-μ A5T6449 JFET will do the job. Additional source-resistance, R_s, may be required to provide the correct "plate" voltage. The semiconductors shown are electrically identical. The 2N6449 is a higher dissipation TO-39 metal-case version of the less expensive plastic TO-92 case A5T6449. With a minimum I_{dss} (zero-gate-drain current) of 1 mA and a typical value of 5.5 mA, this JFET is useful for low currents in the pinchoff region of operation. The JFET has a minimum breakdown of 300 volts, and its typical μ is 15, which compares well with the μ of 19 for a 12AU7.

For the high-gain triode application, the "dual-cascode JFET" configuration shown in Fig. 2B works well. A high-

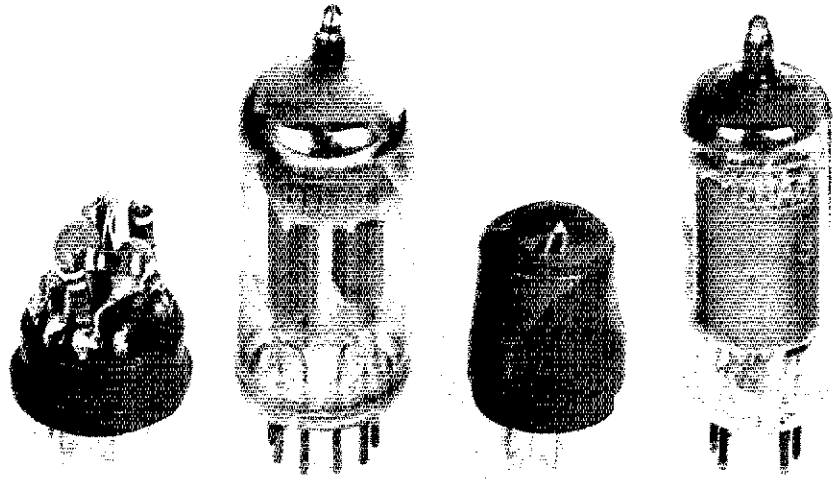


Fig. 1 – Two solid-state "tubes" standing beside their big brothers, the 12AX7 and 12BA6. They're not only smaller, but cooler.

*Transmission Engineer, Microwave Div., Collins Radio, 721 James Dr., Richardson, TX 75080

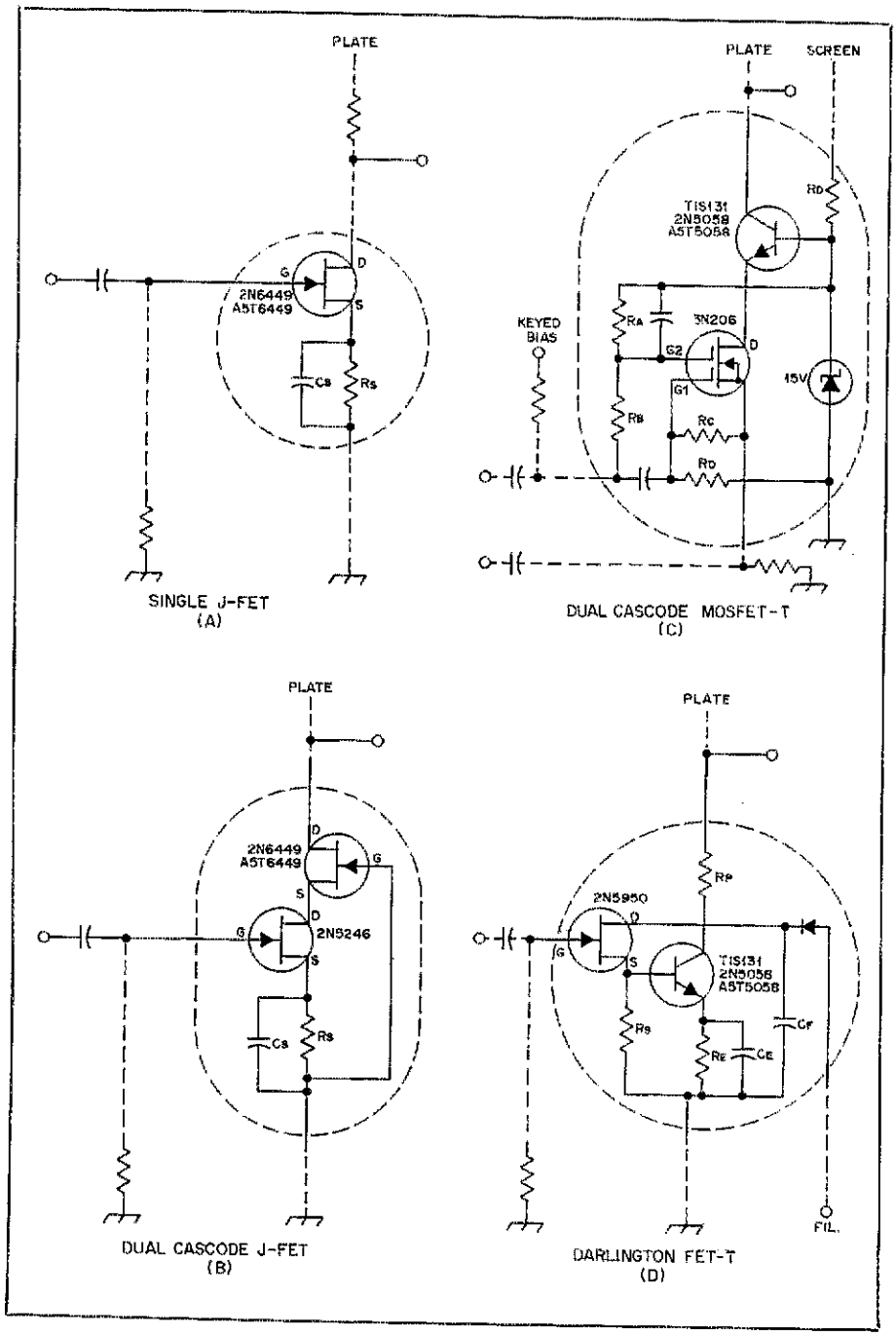


Fig. 2 — Four basic configurations are used to design solid-tube replacements for vacuum tubes. Dashed lines indicate equipment wiring. Specified *R* and *C* values depend on tubes being replaced. Solid-tube characteristics are given in Table 1.

Table 1
Solid-Tube Characteristics

Voltage (V)	>300	>300	>300	>300
Transconductance (g_m — mmho)	1.5	4.5-8	8-15	15
Frequency (MHz)	<10	<10	>30	<10
Typical Application	Low-μ triode audio amplifier	High-μ triode medium-g_m pentode audio amplifier, fixed gain i-f and rf amplifier	High-g_m pentode large signal i-f and rf mixer or amplifier	High-μ power triode high-g_m power pentode audio and i-f amplifier relay control
Typical Tube	12AT7, 12AU7	12AX7	6AU6, 12BA6 12BY7A, 6CL6	6EV7

voltage common-gate output JFET driven with a high-gain input JFE current source. It is important that t I_{dss} of the output JFET reasonab complements the input JFET. Becau the high JFET gate-source cutoff vo age is typically −9 volts, simp grounding the gate will provide ad quate drain voltage to the input JFE Again, source resistance may be r quired in addition to the cathode circu resistance to set the proper operati point. The key to successful design is keep the operating current below th high-voltage JFET I_{dss} to ensure minimum of 4-volts drain-to-source vol age for the input JFET. Tightly spec fied and a superb performer, yet i expensive, the 2N5246 grounded-sourc JFET sets the g_m of the configuratio at typically 4,500 μmhos, with a μ about 90, which matches the requir ment of the 12AX7. Because th grounded-gate output stage becomes th load for the common-source input stag the voltage gain of the configuration the g_m of the input JFET times the loa resistance of the output JFET. As result, the output JFET only extend the voltage performance of the inpu JFET from 30 to over 300 volts, whil the gain is nearly set by the input JFE This dual-cascode JFET configuratio can be used for high-frequency, high gain circuits up to about 10 MHz.

Pentode vacuum-tube replacement require a lower feedback capacitanc and reverse transconductance as well a higher gain and often operate at highe currents than triodes. Fig. 2C shows dual-cascode metal-oxide silicon-FE transistor (MOSFET) configuration This semiconductor pair provides op timum gain and frequency performanc up to about 20 mA. The grounded-bas output transistor greatly extends th frequency response beyond a standar common-emitter design in addition t simplifying the coupling and bias net work. While different MOSFET bia arrangements are possible, this figur illustrates a vacuum-tube replacemen for grid-block keying and shows a input for the local oscillator in mixe applications. Gate 2 bias network R_a and R_b sets the key-down level at 4 to volts above the source, but provide cutoff bias during key-up. Gate 1 bia resistors set the operating point of the input constant-current-sources MOS FET, and then the signal effectively modulates the current-source to drive the output transistor. As a result, the MOSFET drain voltage swing is quite low and the output parameters change very little with large signal levels. The gate 1 bias resistor R_c connection to the source extends the dynamic-input signal range by tending to keep gate 1 in the linear region as the source voltage in creases with large signal inputs. A handy

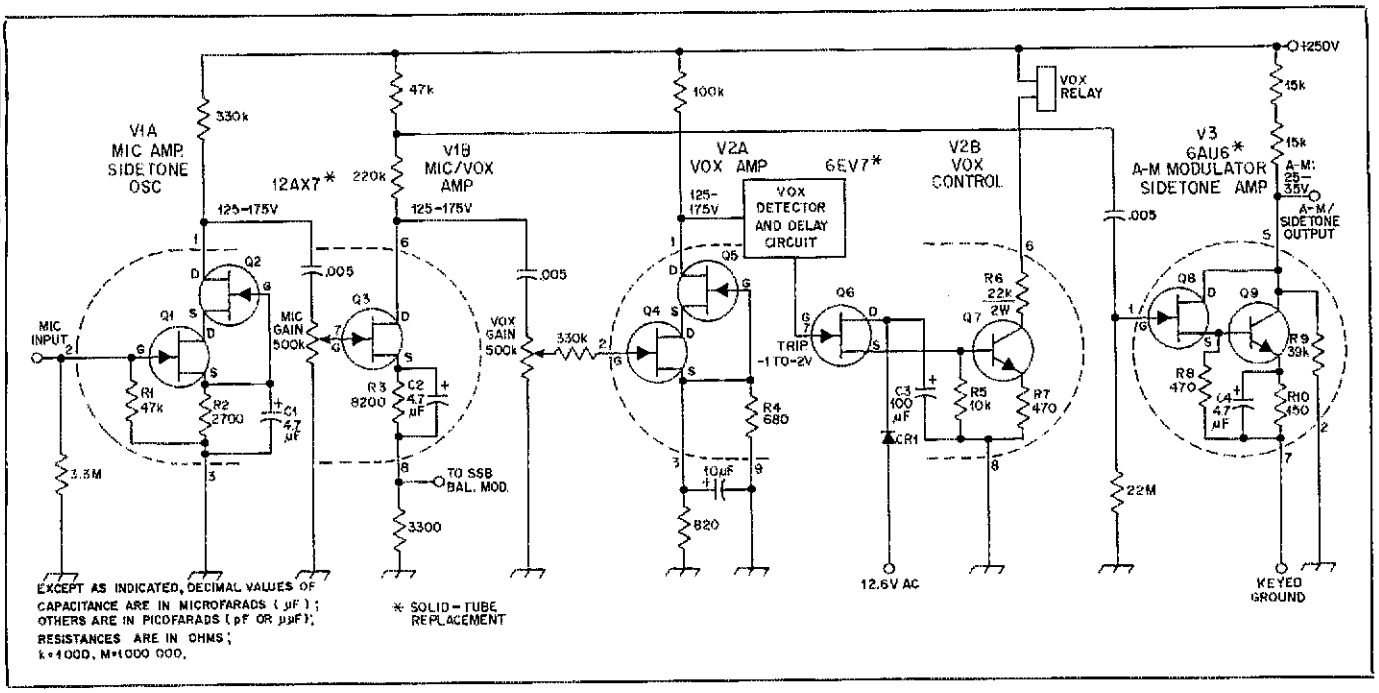


Fig. 3 — Solid-tube transistorization of the Drake T-4XB transmitter first and second audio stages, VOX and VOX-relay control amplifiers, and a-m modulator/sidetone amplifier. Note: Semiconductors are Texas Instrument devices obtainable through Hall-Mark Electronics Corp., 9333 Forest Lane, Dallas, TX 75231. Voltages indicate proper operating points. Source resistors may require adjustment. Transistors A5T5058 and TIS131 are electrically interchangeable.

CR1 — General-purpose silicon diode, 300 PIV, 1N645 or equiv.

Q1, Q4 — N-channel JFET, 30 $V_{(BR)}$, 2N5246 or equiv.

Q2, Q3, Q5, Q8 — N-channel JFET, 300 $V_{(BR)}$, Texas Inst., A5T6449.

Q6 — N-channel JFET, 30 $V_{(BR)}$, 2N5950 or equiv.

Q7, Q9 — Npn transistor, 300 $V_{(BR)}$, Texas Inst., A5T5058.

place to obtain operating voltage is the screen circuit. The three transistors shown offer a choice of a 10-watt TO-220, one-watt TO-39, or an 800-milliwatt plastic TO-92 case style. But the 10-watt case is most inexpensive at 78 cents. This dual-cascode MOSFET will provide more than enough power to drive a pair of 6146s to full output up to 30 MHz.

Sense-circuit and relay-control vacuum tubes, such as voice-control applications, are conveniently substituted by a JFET-input Darlington configuration (shown in Fig. 2D). The 2N5950 is an inexpensive low-noise JFET which offers tightly controlled parameters. The JFET is a source-follower driver to the output power transistor. Therefore, the configuration behaves like a power JFET, of which the total g_m is the product of the JFET g_m and the transistor β. Since the stage gain is higher than that of most vacuum tubes, a source-base resistor or emitter degeneration can be used to set the gain. When the supply for screen voltage is not available, filament voltage is easily rectified to provide the low-voltage JFET drain voltage. This Darlington FET solid-tube will replace such vacuum tubes as the 6EV7.

A comparison will show that the input and output capacitances of the semiconductors shown in Fig. 2 are lower than for most vacuum tubes. The second cascode stage reduces the reverse transconductance to a level comparable to or lower than that of vacuum tubes. As with vacuum tubes, parameters vary among semiconductors. Realignment should be checked when the solid-tubes are installed just as when a set is retubed. These four solid-tube configurations can be used to replace nearly every radio vacuum tube. This project proved successful in replacing every miniature vacuum tube in a typical single-sideband exciter/transmitter. Only the power-amplifier 6146/6BJ6 tubes remain. This article will now show how to build solid-tubes for a typical 100 watt, 1.8- to 30-MHz single-sideband transmitter.

The Circuit

The Drake T-4XB transmitter is a typical example of the various types of equipment in which solid-tubes can replace vacuum tubes. The circuit environment of the T-4XB equipment is shown as an illustration. Solid-tube schematic diagrams are shown in Figs. 3, 4, 5 and 6.

Beginning with the simple low-gain, high-voltage JFET circuit, the mic/VOX amplifier, V1B, shown in Fig. 3, is an application for this solid-tube. The relatively high resistance of R3 provides the typical gate-to-source bias of −9 volts for Q3. The reduction in hum (from the absence of the filament) is quite an improvement.

Another example of a single JFET is the carrier-oscillator, V5B, shown in Fig. 4. An inexpensive low-voltage, but high-μ JFET works well with Zener-diode voltage regulation in the grounded "plate" oscillator circuit. High keyed-ground voltages are isolated by CR3 and R16.

Next, the alc amplifier, V5A, shown in Fig. 4, is simply a single high-voltage transistor. A transistor of this type was selected because of the well-behaved base-emitter transfer characteristics as well as the low-gain requirement. To maintain the same audio time response, R14 is used to synthesize the 12AX7 plate resistance. This solid-tube alc amplifier will drive either the solid-tube i-f amplifier or the 12BA6 with equally excellent results.

Now, we're ready for the high-μ and high-voltage solid-tube application, where very large signal voltages are encountered. Our dual-cascode JFET configuration is applied to the mic amplifier V1A and the VOX amplifier V2A shown in Fig. 3. The input common-source JFET Q1 is biased to the proper operating point by R2, as evidenced by the correct "plate" voltage at pin 1. The Q2 gate is normally returned to ground, but since R2 is bypassed the R2 voltage drop provides an extra measure of drain voltage to Q1. R1 is used as a standard technique to reduce pos-

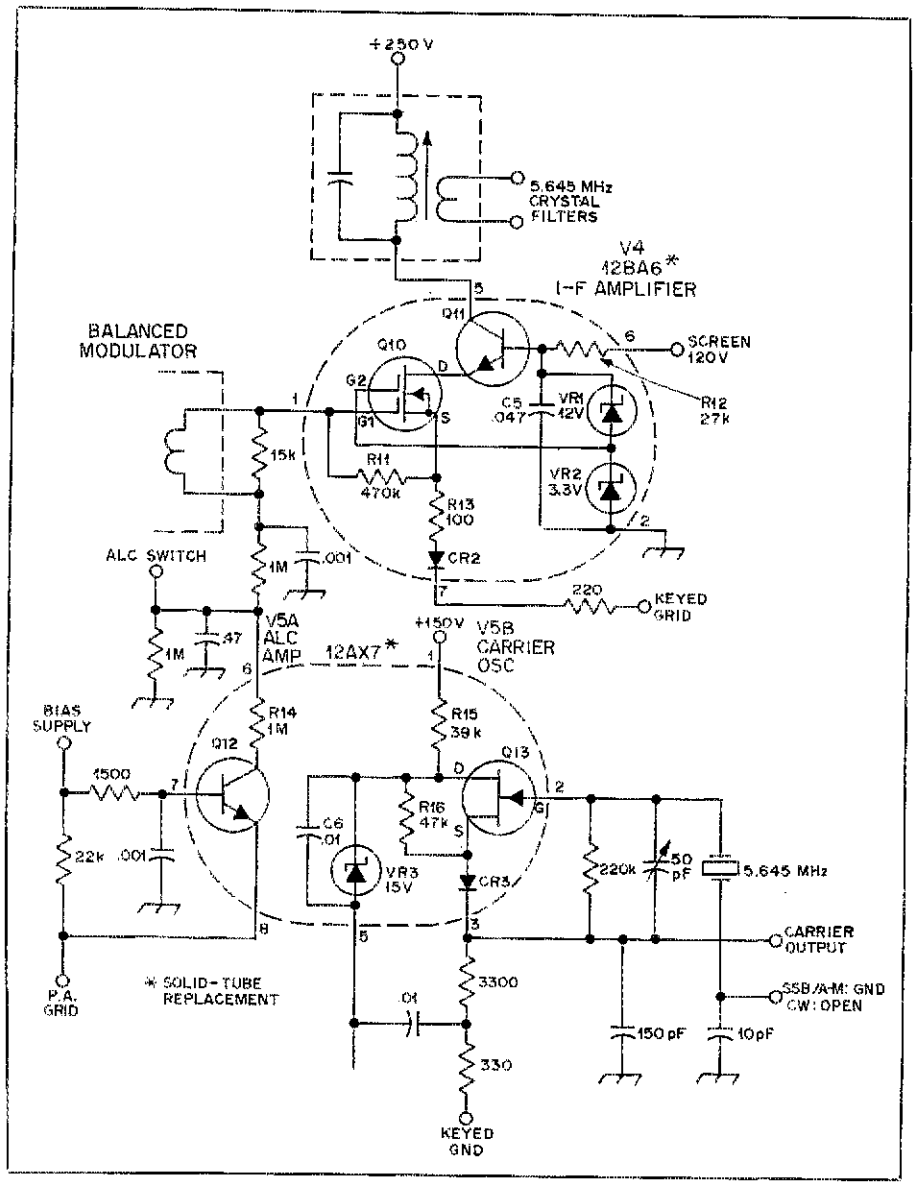


Fig. 4 — Solid-tube transistorization of the Drake T-4XB transmitter alc i-f amplifier, alc amplifier and carrier oscillator. See note of Fig. 3.
CR2, CR3 — General-purpose silicon diode, 300 PIV, 1N645 or equivalent.
Q10 — N-channel dual-gate MOSFET, 25 $V_{(BR)}$, 3N206 or equiv.
Q11 — Npn transistor, 300 $V_{(BR)}$, Texas Inst., TIS131.
Q12 — Npn transistor, 300 $V_{(BR)}$, Texas Inst., A5T5058.
Q13 — N-channel JFET 30 $V_{(BR)}$, 2N5246 or equiv.
VR1 — Zener diode, 12 V, 400 mW, 1N759.
VR2 — Zener diode, 3.3 V, 1 W, 1N746.
VR3 — Zener diode, 15 V, 400 mW, 1N965.

sible RFI. These same biasing techniques apply to the VOX amplifier, V2A, solid-tube.

Our high-voltage Darlington FET is used for the a-m modulator (V3) and VOX relay control, V2B. V3 is a typical Darlington circuit, where R8 sets the a-m carrier level for the correct "plate" voltage at pin 5. The Q9 collector voltage is set to 150 volts during standby through adjustment of R9. This is to prevent anti-VOX audio from exceeding the device breakdown.

VOX control tube V2B is similar to the Darlington FET of V3 except that a 2N5950 is used to improve the sensitivity and stability of the very high-resistance VOX timing circuit. CR1 and C3 provide drain voltage from the filament line and isolate the input JFET current from relay transients. This Darlington FET stage simply acts as the VOX relay electronic switch. Since the three audio amplifier tubes, V1, V2 and V3, are on the same filament string, these solid-tubes should be made in one replacement project.

The alc i-f amplifier vacuum tube (12BA6) shown in Fig. 4 is replaced by the dual-cascode MOSFET arrangement. While the dual-cascode JFET system will work, the dual-gate input MOSFET improves the isolation between the b anced modulator and the i-f filter tra formers. Since the MOSFET bias chara teristics are not similar to the drive emitter high-voltage transistor, the co mon-base voltage of the transistor increased to about 15 by the Zen diode. High-voltage protection from t keyed ground is afforded by CR2 a the FET Zener diodes. The alc voltage best applied to gate 1 for reasons simplicity and control. Since the pow dissipation is low, the transistor tab m be removed. The alc control provid excellent performance, and it compar well with the 12BA6.

Several vacuum-tube mixer circui are good candidates for solid-tube us Two examples are premixers a mixers. Premixers are often used provide injection signals to the first second mixer in transmitters. Fig. shows the T-4XB premixer solid-tub V6. In the source circuit CR4 protec the MOSFET from the keyed-grou circuit. The Q15 transistor tab is n mally not required, and capacitor C may be omitted if the high-band tun circuits are realigned. Because the sign levels and bias circuits are compatib with the 3N206 biasing, the solid-tub replacement for the 6HS6 is easy build. Other similar types of tubes (lik the 6EW6) can be replaced in oth equipment with as much as 50-volts rm signal output.

The 6AU6A mixer, V7, is a high level mixer operating over a very larg dynamic range of input signals from th i-f stage. A large I_{dss} device like th 2N5950 JFET operating in the sam mode as the 6AU6A with "grid leak bias works well. The output of th mixer is low level — about four-vol rms maximum. Decoupling capacitor C and choke L1 illustrate how to isolat the low-voltage JFET from a high voltage vacuum-tube circuit. The mixe works very well and has excellen keying characteristics.

An Interesting Application

One of the most interesting applica tions for the dual-cascode MOSFE solid-tube is the power-amplifier driver The 12BY7A replacement operate much cooler than does the vacuum tub (Fig. 6). Two factors are important however, for a successful design. First since the MOSFET is operated at max imum gain, a shield is required betwee the input and output circuits. The shield is simply a 3/4 × 1-1/2-inch piece o single-side printed-circuit board ce mented to the plug base between pins 3 and 4, and pins 8 and 9, with the copper plate soldered to pins 3 and 9. Point A is a standoff or etched isolated tie point for feeding the base connection through to the input side. Point B is the single tie point for grounds, to help prevent

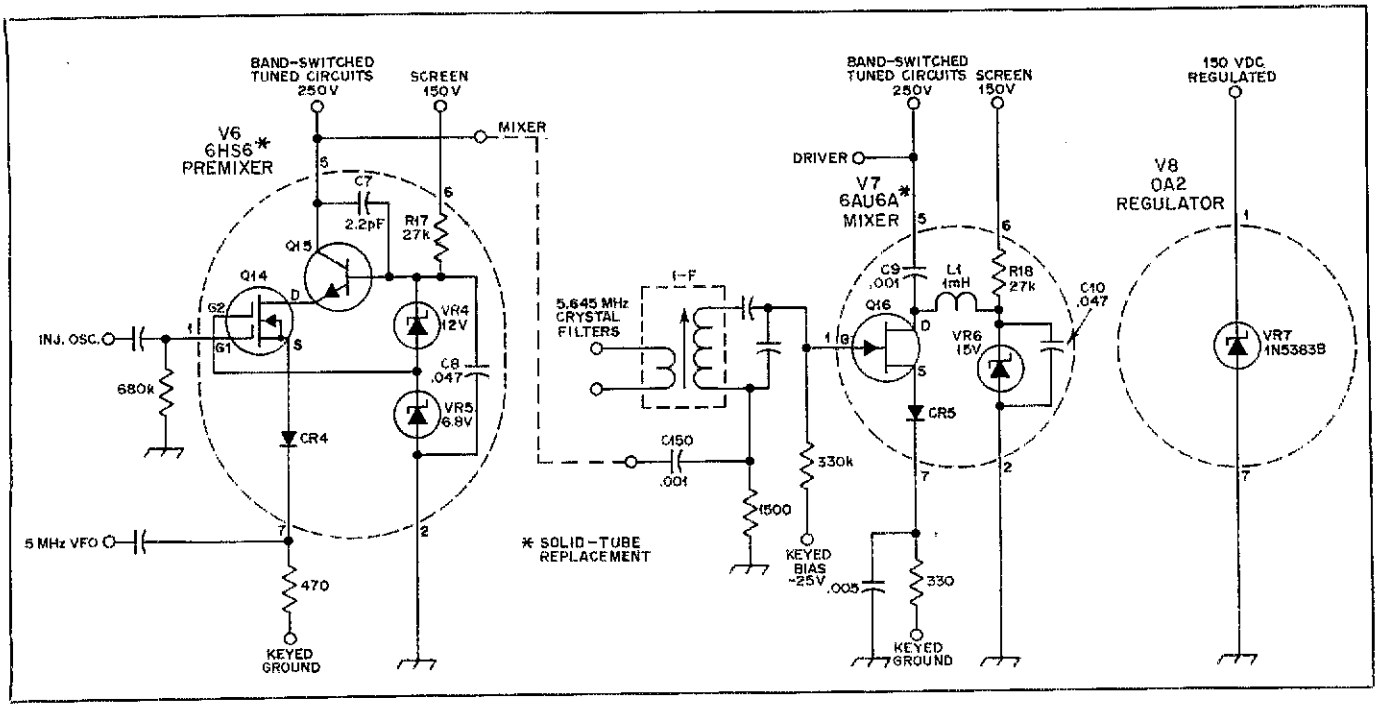


Fig. 5 — Solid-tubes for the Drake T-4XB premixer, mixer and voltage-regulator vacuum tubes. See note of Fig. 3.

CR4-CR5 — General-purpose silicon diode, 300 PIV (1N645).
Q14 — N-channel dual-gate MOSFET, 25 $V_{(BR)}$ 3N206.
Q15 — Npn transistor 300 $V_{(BR)}$ TIS131.
Q16 — N-channel JFET 30 $V_{(BR)}$ 2N5950.
VR4 — Zener diode, 12 V, 400 mW, 1N759.
VR5 — Zener diode, 6.8 V, 400 mW, 1N754.
VR6 — Zener diode, 15 V, 400 mW, 1N965.
VR7 — Zener diode, 150 V, 5 W, Motorola 1N5383B.

parasitics. The emitter is fed through a hole close to the plug base. Plug terminals facilitate construction, leaving only three unsupported terminals. Second, the biasing must permit maximum signal range without changing the parameters. This is accomplished by biasing gate 2 very high and referencing gate 1 close to the source potential. Another design feature uses a bypassed Zener diode (VR9) to prevent the +100-volt collector signal swing from exceeding the transistor breakdown voltage. Heat dissipation is achieved adequately through the diode, the transistor tab, and cementing the transistor to the board.

During screen-grid modulation, point A drops out of regulation to a dc level of about −8 volts. R25 determines the zero-modulation carrier level of about 10 watts. C15 and R24 prevent excessive modulation. For those not desiring a-m, R24, R25 and C15 may be omitted.

As with tubes of different brands, installation of this solid-tube will require some touch-up realignment on the top frequency band. C12 approximates the vacuum-tube-input capacitance and may be omitted if a complete realignment is acceptable. The 33-ohm resistor, R23, should be omitted in transmitters which provide degenerative feedback in the cathode circuit. This 12BY7A solid-tube has been used in both this pin-out arrangement and a 6CL6 version to replace tubes in most major amateur radio transmitters with equally excellent results.

Construction

As illustrated in Fig. 1, solid-tubes are built on readily available 7- and 9-pin miniature plugs. Most of the transistors and FETs selected are plastic types to help prevent shorts. As many as four TO-92 devices can be accommodated on these miniature plugs by wiring them "dead-bug" (leads up)

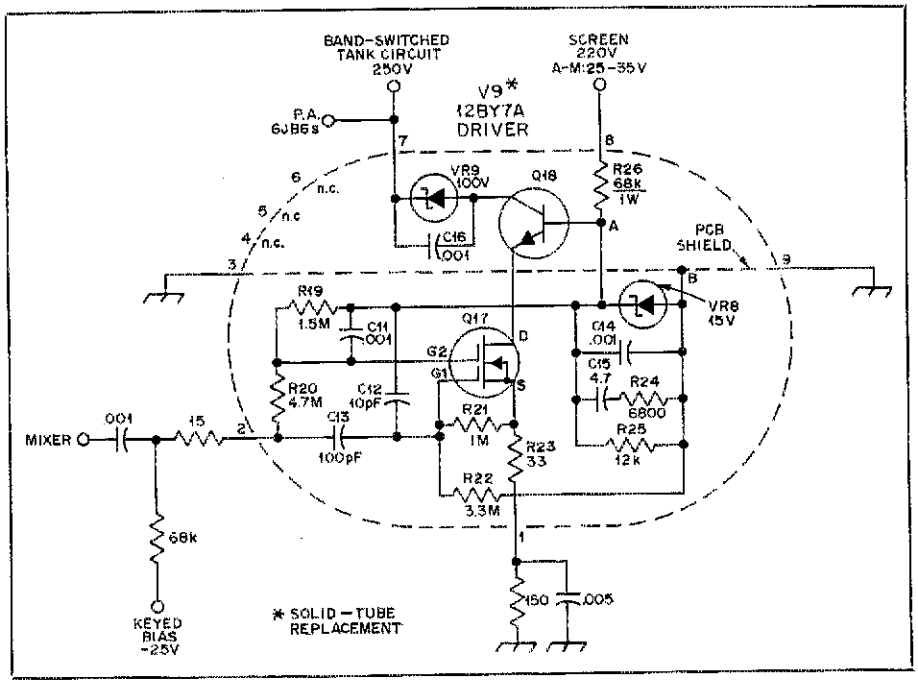


Fig. 6 — Solid-tube design for the Drake T-4XB power-amplifier driver.

Q17 — N-channel dual-gate MOSFET, 25 $V_{(BR)}$ 3N206.
Q18 — Npn transistor, 300 $V_{(BR)}$, TIS131.
VR8 — Zener diode, 15 V, 400 mW, 1N965.
VR9 — Zener diode, 100 V, 5 W, 1N5378.

style. Vertically mounted printed-circuit boards are also excellent for building solid-tubes. Miniature sleeving is used to prevent shorts. Larger sleeving is used to insulate the 3N206 TO-72 metal cases. To keep the circuit small, miniature parts are used, such as the 0.047-μF monolithic capacitors and the 4-watt resistors. After a little experience, clean-looking solid-tubes can be built in about 15 minutes to a half-hour. At least one manufacturer offers rubber slip-on covers for protection, and they give that finished professional look to your solid-state vacuum-tube replacements.

Results

Operational improvements are quite obvious when the solid-tubes are plugged into the old vacuum-tube sockets. "Cool" describes the once hot cabinet. Almost 2.5 amperes of filament current and 30 mA of plate current are a power savings of about 38 watts of heat. As one might expect, both the VFO and crystal oscillator are more stable. But the really big payoffs are the improved VOX gain and stability along with the 20-dB reduction in audio hum on the carrier. Of course, gone is the tube replacement problem, particularly for the well-known short-lived 6EV7 VOX amplifier and relay-control tube. Furthermore, all of these benefits aid the pocketbook. Costs average about the same as for vacuum tubes, with some solid-tubes costing more and some costing less than current retail prices.

QST

Ham Newsline

Spread the word about ham radio!

By Pete O'Dell,* WB8NAS

How many times within the last six weeks have you picked up a newspaper that carried at least one story on CB? You probably said to yourself, "Why don't hams get the same coverage?" There are many reasons, some of which have to do with sheer numbers and the economics of the media. Some of it has to do with old attitudes and old habits.

For example, suppose that we create a mythical disaster — swamp draining: Early one morning Providence decides that it is time to drain the swamp. Draining the swamp, of course, disrupts normal communications; therefore, amateurs wade in to help the victims of the swamp draining. The news media hears about the swamp and sends a reporter out to find out what is going on. Maybe he stumbles across the ham and maybe he doesn't. If the reporter does find the ham, he starts to ask a lot of questions. Meanwhile the ham is up to his knees in alligators and tells the reporter to find some quicksand and go swimming.

Two weeks after it is over the ham calls the reporter and asks if he needs more information. The reporter tells him that the story has no news value now and to call him the next time hams are involved in a swamp draining. The ham then sends the details into *QST*, which immediately prints the story. Everyone pats everyone else on the back and we all rest assured that 150,000 hams now know that hams did a good job!

Telephone 203-667-0138

In order to combat this at the national level, ARRL has established *Newsline*. This is simply a telephone that is answered 24 hours per day by a machine. The caller is given enough time to leave his name, call, telephone number and the essential details of the story. ARRL takes over from there and issues the appropriate publicity and news releases to the national wire services and networks. In a few cases it may be necessary to call back the person reporting the story for more details. Obviously, calling *Newsline* does not guarantee that UPI will pick up the story or that NBC will be knocking on your door.

What are some of the kinds of stories that we will be looking for? Major local disasters come to mind first. More and more emergency traffic is being handled at the local level on repeaters. Not too long ago a pilot lost his radiocommunication while making an approach at Tucson International. Using a Handie-Talkie, he dialed through autopatch to the air-traffic controller and received his landing instructions. This got some local coverage, but was not picked up by the national press. If a ham is involved in rescuing a lost child or locating medicine for a dying child in South America then there is a good chance that one or more of the wire services will pick up the story — if they know about it.

Wire services often look for human interest stories, also. Suppose that a local ham (male) meets another ham (female) on the air, and after a courtship over the airwaves they decide to get married — chances are the wire services and, perhaps, even the networks would carry the story. This should give you some feeling for the kinds of stories that should be phoned in. Since the line will be answered by a machine at all times, there is little reason to call during business hours unless it is an emergency. Dial 203-667-0138 and leave your name, call, telephone number and the essential details.

No Substitute for Local PR

Please do not assume that this a substitute for local publicity and public relations. You should continue to contact the local media yourself or through your ARRL public relations assistant (PRA). WHAT? You don't have a local PRA? Contact your ARRL director and find out how you can get a PRA in your area.

You should continue to send information for "Public Service Diary" and other *QST* departments through normal channels. *Newsline* is separate from *QST*. Calls regarding business other than *amateur radio news* can't be handled there. All such calls should go to the regular ARRL number which is answered by machine when the office is closed.

Newsline is strictly a place for compiling news items related to ham radio and passing them on to the appropriate media. Paste the number next to your receiver in the shack. Paste it to your Handie-Talkie. Publish it in your club bulletin. We know that hams are good guys and that they do good things — *Now it is time to tell it to the world!*

*Public Information Officer, ARRL

Technical Correspondence

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LOOPS VS. DIPOLES — WHERE WILL IT ALL END?

The analysis of loops vs. dipoles, by WA4JVE and K4HKX, is very interesting.[1] However, the tests made here imply that the vertically polarized component is a major factor in quad performance. There is a distinct suggestion that this component produces a narrow on-axis lobe at very low-elevation angles. This seems to be associated with ground reflections. Its location is surprising, since a scale-model quad (10 wavelengths high at 2 meters) shows the vertical components to lie at about ±30° from the axis. The horizontal component is on axis. However, the equivalent does not seem to be present when the quad is vertically polarized.

I do not have facilities for a full theoretical or experimental investigation. I hope that a careful investigation or study will be made some day, taking into account *H* and *E* polarization, *H* and *E* lobes, and partial ground reflection. (Note to some graduate student — it should make a good thesis.) — *R. P. Haviland, W4MB, 2100 S. Nova Rd., Box 45, Daytona Beach, FL 32019*

I read with some interest the article by Belcher and Casper,[1] an analysis and discussion of the comparison of a single full-wavelength loop antenna to a reference half-wave dipole antenna in the environment of a conducting earth. This is a subject which I have previously considered in some detail, and I would like to offer a few observations of my own concerning the methodology, results, conclusions and "unsubstantiated observations" of these authors.

The general model used by the authors seems quite good and is the same as has been used by others. Two horizontal dipoles above a conducting earth should model a rectangular (or square) horizontally polarized loop above earth very well. The top and bottom resonant loop elements are capacity loaded and shortened. It is well-known that such shortened elements behave much like full half-wave dipoles but with somewhat smaller directivity or gain; indeed, the free-space gain of an infinitesimal (elementary) dipole is only 0.38 dB below that of a full half-wave dipole. Thus, the gain of the loop should be close to, but slightly *less* than, the gain of the stacked broadside half-wave dipoles. Note that the vertical portions of the loop play no part in the radiation field; due to symmetry they create only quadrupole local fields.

The free-space gain of the two dipoles is a strong function of vertical spacing, *D*. An "exact" calculation can easily be made using an approximation which is probably quite good. The approximation assumes the current distribution to be sinusoidal along the half-wave dipole(s) and the mutual coupling to have the real and imaginary components given by Uda and Mushiake in their classical publication.[2] In this way I have calculated the free-space gain for a few representative spacings. These are shown in Table 1. Note that those figures agree quite well with the graph shown in *The ARRL Antenna Book*.[3] The value for $D = 0.318$ wavelength does not agree too well with the value of 1.94 dB calculated by Belcher and Casper; the reason could be due to round-off errors in the field-strength comparisons made by these authors. To model a square (quad) loop, one must use $D = 0.25$ λ; such a loop should therefore have a gain over a half-wave dipole somewhat smaller than 1.09 dB.

I now come to a difficulty with the model used by Belcher and Casper. In all of their calculations they use $D = 0.318$ λ "to approximate Lindsay's model." Lindsay used *circular* loops with diameters which were indeed 0.318 λ, but it is obviously wrong to model a loop with dipoles separated by the full diameter of the loop. One should place the simulating dipoles at a separation approximating the mean or average loop current distribution; inspection shows this to be close to 0.25 wavelength! No "exact" calculation has been made to my knowledge of any equilateral loop configuration other than the horizontal square, but all of them by inspection show current distributions that can be well approximated by $D = 0.25$ λ. I believe, therefore, that the free-space loop gain is not very dependent on whether the loop is a triangle, square, diamond, hexagon or circle (this point was also mentioned explicitly by Lindsay[4]). Furthermore, it appears that the loop gain as calculated by this dipole model should be about 1.0 dB instead of the 1.94 dB cited by Belcher and Casper[1] or the approximately 2 dB found by Lindsay.[4] The discrepancy in the case of Belcher and Casper is probably entirely due to their choice of *D*; in the case of Lindsay it is very possibly due to experimental or calculational error. Lindsay did not state his estimated absolute accuracy of the determinations; gain calculations were made entirely from the experimental 3-dB *E*- and *H*-plane angles rather than the more cumbersome, but potentially more accurate, power density integrations over the entire sphere. In order to really clear up this controversial point, it would be nice for someone to do a very careful experiment where the inherent absolute accuracy is significantly better than the discrepancy itself! On the modeling side, it would also be nice for someone to make a rigorous calculation for a circular loop to verify its performance. Because of the reason given above, I believe all loop-vs.-dipole gain figures are somewhat overstated.

Table 1
Free-Space Gain, Stacked Horizontal Dipoles

VERTICAL SPACING, D, λ	*GAIN, dB OVER A DIPOLE*
0	0
0.1	0.176
0.25	1.086
0.318	1.734
0.5	3.830
0.7	4.819
1.0	2.778

Furthermore, the gain figures of a loop vs. dipole are, in my view, largely an artifact of the definition of loop height. If one thinks of the loop as two stacked dipoles (as in the actual model), then the low-angle radiation comes predominantly from the *upper* dipole. It is no surprise, therefore, that this upper dipole outperforms the reference dipole at a lower height (the mean height of the loop). Note, however, that if the reference dipole were at the same height as the *top* of the loop, the results would be entirely different. In fact, the loop shows inferior performance at low angles in this case. Thus, the cited performance is not so much an "inherent" loop vs. dipole measure but more a loop vs. "what dipole" measure. It has been my experience that amateurs quote the height of their quad in any of three ways — as the height of the bottom of the loop, the height of the midpoint of the loop (boom height, in many installations), or the height of the top of the loop. These changes in definition, especially at low heights, have more to do with comparative performance than the inherent properties of loop vs. dipole.

As unsubstantiated observations Belcher and Casper observe, "In all real-world situations, the loop is somewhat unbalanced between top and bottom currents which causes the vertically polarized components of radiation to be greater." Unbalance between top and bottom currents in the twin-dipoles model cannot produce vertically polarized radiation. What does produce vertically polarized radiation is an off-center feed point in the loop (most amateurs do this at the corner of a triangle).

Belcher and Casper continue, "A one-wavelength horizontally polarized loop may have more gain in the diamond configuration than in the square. This is due to the current centers being separated by different distances and could account for the diversity of gains reported." I wonder if this is really true. It would, indeed, be a fine idea for someone to make a legitimate rigorous calculation.

In this article the authors have dealt with a model for a *single* loop over a perfectly conducting ground. It is natural for the reader to extend the apparent conclusions to multiple loops as in a two-, three- or four-loop quad system. I want to point out here that the computed gain increase for stacking multielement Yagi arrays at a separation, *D*, of 0.25 λ to 0.5 λ is less than that for dipoles. This is largely due to the greater overlap of the larger aperture of each multielement Yagi. Therefore, the attractive loop gain over a dipole of one dB (for $D = 0.25$ wavelength — free space) diminishes for multielement systems. For such large arrays the stacking separation should be increased to perhaps a full wavelength; such stacked Yagis should always outperform a single multiloop (equivalent) quad.

My conclusions are that Belcher and Casper have not resolved the long controversy over loop gain vs. dipole gain, nor have they shown why a single (horizontal) loop is

[1] Footnotes appear on page 52.

significantly better for DX than a simple dipole placed at a reasonable height (for example at the height of the top of the loop). – *James L. Lawson, W2PV, 2532 Troy Rd., Schenectady, NY 12309*

This letter is in response to James L. Lawson's letter which contained a critique of our August *QST* article on loops vs. dipoles.[1] Mr. Lawson's critique contains two key items of fundamental impact: (1) the choice of 0.318 λ for the spacing of the two phased elements in the loop model, and (2) the accuracy of the computer model in predicting 1.94-dB free-space gain for the loop over a dipole, using 0.318-λ spacing. We have found that Mr. Lawson's points are indeed well taken, and our results are in need of revision.

The choice of 0.318-λ spacing was based upon the diameter of the circular loop used by Lindsay,[4] reinforced by an erroneous determination that 0.318 λ was a good approximation of element spacing for a diamond-shaped loop. Encouragement was also provided by agreement with the empirical gain results obtained by Mushiake and Adachi.[5] Reexamination of the diamond shape, assuming sinusoidal current distribution for the horizontal component, indicates that 0.25-λ spacing is indeed more realistic.

With regard to the discrepancy of predicted array gain for 0.318-λ spacing vs. Lawson's calculations, we have found that round-off errors are not the explanation. The computer equations were found to contain a subtle error that resulted in optimistic results. The error was corrected and the free-space gain calculations were rerun, with interesting results. Table 2 summarizes results for various element spacings in comparison with Tai's classic curves,[6] Lawson's calculations (Table 1), and data from *The ARRL Antenna Book*.[3] All figures are for 0.5-λ elements relative to a 0.5-λ dipole in free space, with the exception of the one column for isotropic elements.

As is immediately apparent, our current results track Tai's results for isotropic elements almost exactly. This is to be expected since our method involves simply multiplying the element equation by the array equation, and the element equation effectively drops out when the array and single element field-strength figures are ratioed for relative gain. Tai's results for 0.5-λ elements are also given, and it is seen that up to 0.7 λ they differ by a maximum of 10 percent from the array gain figures for isotropic elements. This difference illustrates that it is not entirely rigorous to multiply element gain by array gain to predict total antenna gain, but for our purposes this method is a reasonable approximation. It is also evident that Tai's 0.5-λ results are in substantial disagreement with Lawson's figures and those extracted from the *Antenna Book*. No explanation is offered for this discrepancy. It was noticed, however, that the array-gain figures listed on page 138 of the *Antenna Book* for three through six half-wave elements *are* in close agreement with Tai's results.

Having determined that the computer equations correctly predicted array gain for isotropic elements and approximated results to be expected with 0.5-λ elements, the analysis for two 0.25-λ phased dipoles vs. a single 0.5-λ dipole was accomplished. The results predict 1.14 dB of gain at 0.318-λ spacing and 0.63 dB at the more realistic 0.25-λ spacing. Thus it is quite apparent that our initial figure of 1.94-dB gain is optimistic and, in fact, the true free-space figure should be somewhat less than 1.0 dB.

Because of the time and quantity of data reduction involved, we have not attempted to rerun all of the curves showing radiation patterns at various elevations above ground and loop vs. dipole gain at various take-off angles and elevations. We anticipate significant changes only in relative pattern amplitudes rather than shapes, however, and the gain magnitudes of Figs. 5B and 5C of our earlier article may be optimistic by up to a factor of three.

Mr. Belcher and I are indebted to Mr. Lawson for his time-consuming critique. We sincerely hope that this exchange might stimulate others to contribute to the subject. – *Paul W. Casper, K4HKX, 3592 Sylvan Dr., West Melbourne, FL 32901*

RFI AND THE URBAN AMATEUR

One frequent topic of conversation among amateurs these days is RFI and the apartment (urban) ham. I have seen many items in the correspondence column from urban hams requesting more articles and more industry attention to their specific needs. Perhaps some of my discussion will be of general interest to these hams.

First, let me comment on the availability of properly shielded equipment. There isn't any, except on the used market under the heading of E. F. Johnson. I've checked Tempo, Kenwood, Drake, Heathkit, Collins, Ten-Tec, Hallicrafters and Yaesu. Some were better than others (or maybe that should be "worse than others"), but they're all competing for last place.

My station equipment consists of a much modified Drake T4XC transmitter and a slightly modified Drake receiver (SPR4). The transmitter has an added bottom plate (shield) that is fastened on all four sides to the chassis. The normal bottom cover slides over this. The cabinet top cover has been modified so as to include sheet aluminum with cut fingers (contact fingers) that exert pressure around the perimeter that the cover normally encloses. Of course, this entailed a lot of work sanding off the epoxy paint on the covers and sanding the nonconductive Iridite cadmium plating found on the chassis. The latter part would have been much easier on the older copper-plated T4 or T4XB models. The work took about 20 hours and was fairly effective. I also added some screening (aluminum coated with silver) to see if it would help, however, I've never determined if it did. Before modification, running the transmitter into a dummy load on 10 or 15 meters would completely wipe out local TV Channels 6 (10 meters) and 3 (15 meters). The TV was a Sony TV 720 black-and-white set located about five meters away from the transmitter (i.e., across the room) with a "rabbit-ears" antenna. Also visible on some bands on the TV monitor was the 5645-kHz BFO and the HFO crystal injection oscillator. After modification, the TV monitor was clean on 10 meters monitoring Channel 6. Fifteen-meter operation produced a slight herringbone pattern on both Channels 3 and 6. Also, there was no evidence of leakage of the injection oscillator (HFO). It was determined that the 5645-kHz energy was escaping via the Morse code key jack; a small coil and 680-pF capacitor were used inside the T4XC to eliminate the problem. There was already a 0.01-μF unit but apparently the pickup loop was lower than the capacitive reactance presented by the bypass. It was also necessary to use double-shielded coax for the HFO slave energy to reduce this cause of TVI. The cost for aluminum and parts was below $5.

Apparently manufacturers do not consider such problems as serious. However, to the urban ham they are just as important as to the fringe-area ham. A phone call to the R. L. Drake Company about these problems put me in touch with the company's service manager. I explained that I live in an apartment (2nd floor) and that I need better shielding. He suggested that a good ground would help (it would help very little). I asked if a special shielding enclosure was available and told him that even a price of $150 wouldn't frighten me because I had about $2,000 worth of Drake equipment and accessories. I was politely informed that Drake offered no such cabinetry for their transmitters or receivers.

That encounter reinforced my opinion that manufacturers don't think this problem is worth considering. I do, and I hope that you, too, share the opinion. A manufacturer shouldn't assume that 95 percent of his equipment won't be in a position to cause interference. If he does, then he is in the same boat as the hi-fi manufacturers who assume that only 5 percent of their equipment will be in a position to intercept and rectify a local amateur. – *Thomas W. Howey, WB2IML, K-20 Fairways Apts., Hilltop, NJ 08012* QST

Table 2
Comparative Gains

SPACING	BELCHER/CASPER (0.5 λ)	TAI (Iso.)	TAI (0.5 λ)	LAWSON (0.5 λ)	ARRL (0.5 λ)
0.25 λ	0.87 dB	0.8 dB	0.76 dB	1.1 dB	1.0 dB
0.318 λ	1.38	1.4	1.28	1.7	1.7
0.5 λ	3.01	3.0	3.3	3.8	3.9
0.7 λ	4.07	4.1	4.29	4.8	4.8
1.0 λ	3.01	3.0	2.48	2.8	2.8

Footnotes

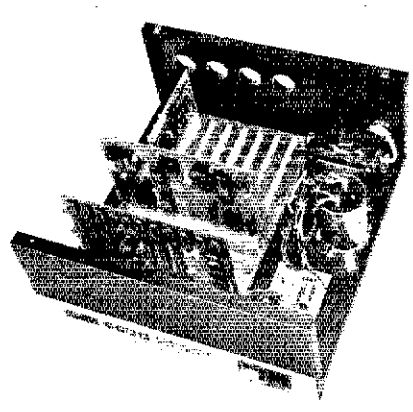
[1] Belcher and Casper, "Loops vs. Dipoles – Analysis and Discussion," *QST*, August, 1976.
[2] Uda and Mushiake, *Yagi-Uda Antenna*, Research Inst. of Elect. Comm., Tohoku Univ., Sendai, Japan, 1954.
[3] *The ARRL Antenna Book*, 13th edition, Fig. 4-16, p. 138; ARRL, Newington, CT, 1974.
[4] Lindsay, "Quads and Yagis," *QST*, May, 1968.
[5] Adachi and Mushiake, "Studies of Large Circular Loop Antennas," *Rep. Ritu. B (Elec. Comm)*, Vol. 9, No. 2, Tohoku Univ., Sendai, Japan, 1957.
[6] Tai, "The Nominal Directivity of Uniformly Spaced Arrays of Dipoles," *Microwave Journal*, September, 1964, Vol. 7, No. 9.

Product Review

Southwest Technical Products Corporation – 6800 Computer System

The Southwest Technical Products (SWTPC) 6800 microcomputer system is a family of kits, the basic system comprising a complete computer with 4096 words (4-k bytes) of static read/write memory. The system is based on the Motorola MC6800 microprocessor IC (MPU) and its mating support devices.

This is the second item from SWTPC that has been reviewed at ARRL hq., the first being the CT-1024 terminal system (see "Product Review," March 1977 *QST*). As with the terminal-interface unit, the quality of the circuit boards and components was found to be excellent. The SWTPC method of marketing their systems may be slightly different from what ham-kit builders are accustomed to. Some of their kits are broken down into subkits so that the builder only has to purchase those items required for his system needs. The 6800 system consists of the following subkits which are treated in detail in this review; MP-A, MP-B, MP-C, MP-D, MP-F, MP-M and MP-P.



The MP-A Microprocessor-Board Subkit

The MP-A pc board is the heart of the microcomputer system, containing the primary logic. The pc board measures 5-1/2 × 9 inches and is double sided with plated-through holes. In addition to the MC6800 IC, there is an MC6830 read-only memory (ROM) IC which stores the system mini-operating instruction program, and an MC6810 which is a 128-byte scratch-pad memory for the ROM. A crystal-controlled processor/clock driver and a baud-rate generator provide serial-interface rates of 110, 150, 300, 600 and 1200 baud for all but the control interface which is operated at 110 or 300 baud. The MP-A pc board also contains a power-up, manual-reset circuit which loads the ROM-stored system mini-operating program when activated. There are 16 address lines and eight bidirectional data lines which have full input/output (I/O) buffering.

Before going further, let's explain three terms used in discussing computers: *hardware, software* and *firmware*. Hardware usually refers to the circuitry, the various components, ICs, power supply, etc. Software, on the other hand, means the programs or programming material used in computers. Firmware is considered as the interconnections within a system or device that permanently determine what functions it can perform. Firmware for the 6800 microcomputer is contained in the MC6830 ROM and is named MIKBUG by Motorola.

The MIKBUG (ROM type 6830) is programmed to provide several functions in this system. It can (1) load user programs or data into memory from either a keyboard or tape where applicable, (2) execute user programs, (3) list user programs or data within specified memory locations on the terminal or tape, (4) print the data contents stored within the internal microprocessor registers, and (5) change the data in specified memory locations or registers.

Any of these functions can be called up by simply pressing a restart switch on the control panel. In fact, the system is the height of simplicity in that only two switches are used on the microprocessor – a switch to turn the system on (ac power) and the reset switch. We don't mean to imply that you don't need a terminal because you do, but the preprogrammed 6830 ROM makes many functions easy to perform.

The 6800 microprocessor IC is a 40-pin, eight-bit, parallel processor with 16 memory/peripheral-address lines and an eight-bit bidirectional data bus. There is a full complement of 72 basic instructions with five possible address modes (direct, relative, immediate, indexed and extended). There are six internal registers (a register is a short-term storage circuit whose capacity is usually one computer word). The registers include a program counter, index register, accumulator A, accumulator B and a condition-code register. An accumulator is a register for doing such arithmetic and logic functions as addition and shifting. The minimum instruction-execution time in the 6800 is two μs.

Also used in this system is an MC6810 random-access memory (RAM) IC which is a 128 × 8-bit memory. This IC is used primarily to support the 6830 ROM. However, a large portion of the RAM addresses are unassigned. This means many short programs, such as diagnostics, can be loaded directly into the operating system without the need to use any of the static-memory boards.

MP-B – Mother Board

The *mother board* is the circuit board that accommodates all the other pc boards, the MPU board, memory units, interfaces, serial or parallel I/O and so on. The MP-B is a 9 × 14-inch, double-sided pc board with plated-through holes. Provisions have been made for up to four memory boards (a total of 16,384 words [16-k bytes] of memory or 4,096 [4 k] per board) along with the microprocessor system board, and eight interface boards. If more memory is needed, two mother boards can be placed in parallel which will then provide a total of 32,768 words (32-k bytes) of random-access memory.

The mother board uses Molex type male connectors of the 50-contact strip variety permanently mounted to the board. The other boards have female Molex sockets mounted to them so they can be plugged in the mother board. This connection method is very rugged. Circuitry on the mother board consists of interconnections between the various interface boards and the information bus of the system. ICs are used to drive selected control lines feeding the various interface pc cards. The eight-bit data bus for the main and interface boards are bidirectional. Bidirectional-transceiver buffers (ICs) are used to buffer the incoming and outgoing data to the processor-system data bus.

MP-M Memory Board

The MP-M memory board is a 5-1/2 × 9-inch double-sided board with a total storage capacity of 4,096 words (4-k bytes) of 8-bit random-access memory. The circuitry on this board provides all the address decoding and data-line buffering to handle a total of 32 type 2102 (1 k × 1 bit) RAM ICs. All interconnections are made to the system via a 50-pin connector of the type described above. There are two 5-volt regulator ICs on the board, one for each 2 k of memory.

MP-C Serial Control Interface

The MP-C control interface is a 5-1/4 × 3-1/2-inch pc board which is designed to interface a serial terminal to the computer system for both system control and, when selected, user program I/O. The interface may be configured (by jumper) to operate serially at either 110 baud (10 characters per second) or 300 baud (30 characters per second) with an upper-case ASCII terminal that is RS-232C or 20-mA-TTY compatible. The heart of the interface is a Motorola 6820 peripheral interface adapter (PIA). The PIA interfaces the MC6800 with an eight-bit bidirectional data bus, three chip-select lines, two register-select lines, two interrupt-request lines, read/write line, enable line and reset line.

MP-P Power Supply

The MP-P supply is designed to power the mother board and its complement of plug-in boards including four full 4-k-byte memory

boards. The voltages available from the supply are plus and minus 12 volts and 7 to 8 volts unregulated. The 7- to 8-volt bus is used to feed all of the 5-volt regulators used throughout the system.

The power transformer has a 10-A rating for the 7- to 8-volt line and 0.5 A for the 12-volt bus. A small circuit board is used to hold the diodes, fuse, electrolytic capacitors and the cable terminal for the power-supply line to the mother board.

MP-F Enclosure

The MP-F is the enclosure for all of the previously described items. The cabinet is 15-1/8 inches wide, 7 inches high, and 15-1/4 inches deep. The chassis cover is black anodized aluminum with polished aluminum trim around the cabinet.

MP-D Documentation Package

The MP-D documentation package is a loose-leaf notebook containing comprehensive information on the 6800-system hardware and software. In addition, the package includes the Motorola-written 6800 programming manual which gives complete assembler/machine-language instructions as well as various programming manuals.

Construction Notes

Building the SWTPC 6800 system is not something you are going to complete in an evening. Their instructions are excellent, but this is a construction project where one is wise to take plenty of time. Like many typical kit builders, I didn't take my time and hurried on some items. Sure enough – problems. The time spent troubleshooting could have been saved in the first place by not hurrying. Also, a jeweler's magnifying visor was found to be a real help. The memory boards have rather close-spaced pc runs so when soldering the ICs, one must be careful to avoid solder bridges. (There were a couple of those too!) Everything went together with no problems (except those just mentioned) and after the errors were found, the computer worked!

Software

As mentioned at the beginning of this review, software is programming. One of the things you'll be hearing a lot about when discussing microprocessors is simple ways of programming them. It isn't easy to use machine language and it takes considerable study to learn how to program in this manner. In the early days of computers, some savvy operators derived methods (or languages) for simplifying the job of writing computer programs. FORTRAN, COBAL and APL are just a few of the languages which are currently in use. Another language which appears to be popular with microprocessor hobbyists is BASIC (which is what this writer uses).

A tremendous amount of work and expense goes into "building" a BASIC program, at least a *good* one. Some manufacturers charge quite a price for BASIC programs usable with their microprocessor systems. SWTPC has an interesting philosophy. They practically give their BASIC programs away, $4.95 for a 4-k and $9.95 for an 8-k program. SWTPC probably figures that by keeping the software prices down (or giving them away, as they do in their bulletins) they will attract more computer customers. You'll notice articles in *QST* showing programs for various amateur-computer uses. Chances are they'll be in BASIC.

At the time of this writing, the price class of the complete system with 4 k of memory is $395. The manufacturer is Southwest Technical Products Corp., 219 Rhapsody, San Antonio, TX 78216. Bulletins and catalogs are available. – *W1ICP*

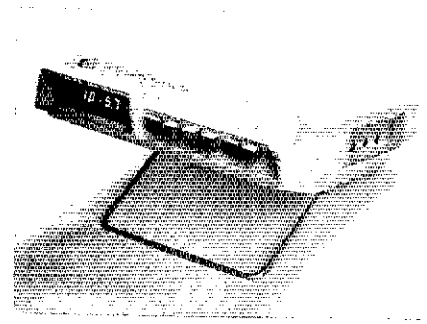
HEWLETT-PACKARD 3476A DIGITAL MULTIMETER

Digital multimeters, an expensive luxury for even a well-equipped laboratory a dozen years ago, are now becoming available in models that cost less than a small amateur transceiver. One such model is the Hewlett-Packard 3476A. With the 3476A you get not only economy, but you get that economy with all the luxury features included – autozero, autopolarity, autoranging and more.

Nearly all the commercially manufactured digital multimeters of today will measure ac and dc volts, ac and dc current, and ohms – each in several ranges. Being no exception, the 3476A measures ac and dc volts in five ranges, 0.11 volt "full scale" to 1100 volts; measures ohms in five ranges, 1.1 kΩ to 11,000 kΩ; and measures ac and dc current in two ranges, 0.11 A and 1.1 A. Accuracy on the low-voltage dc ranges is 0.3 percent of reading, and 2 percent or better for ac ranges (below 2 kHz). The input impedance of the instrument is 10 MΩ (shunted by less than 30 pF) for all voltage measurements. Ohmmeter measurements are accurate to better than 0.5 percent of reading, and the open-circuit voltage at the test terminals for these measurements is less than 4 volts. For current measurements the instrument impedance is less than 1.5 ohms; accuracy for dc is 0.8 percent of reading and for ac is better than 2.5 percent of reading (below 2 kHz). All input circuits are fuse protected. With all of these measurement capabilities, the 3476A holds its own with even the best of the conventional electronic multimeters, some of which are in the same or a higher price class.

One complaint many users of digital multimeters have is about the continual need to change ranges while making measurements, especially when accuracy is wanted. Here is where the autoranging feature of the 3476A is very helpful; the indication range is automatically selected to show you the measurement most accurately (within the capability of the meter). Voltage measurements are always shown in volts, current measurements always in amperes, and ohmmeter measurements always in kilohms. (But if you *want* to stay in the same measurement range for a sequence of measurements, a front-panel switch allows you to do this.) Or how about the annoyance of having to swap the test leads around every time a measurement is to be made for the opposite polarity. That nuisance is gone with the 3476A; autopolarity takes care of making the reversal for you. Even zeroing is done away with, and you really appreciate this feature when you're making a sequence of ohmmeter measurements with values covering several ranges of the instrument.

Operation of the 3476A is controlled by six push switches, for power on/off, ac/dc mode, voltage measurements, current measurements, ohmmeter measurements and autoranging/range hold. The LED display



features leading zero suppression, and aut matic positioning of the decimal point provided by the autoranging feature. Depen ing on the range and type of the measu ment, up to four digits plus decimal point a negative polarity indicator may be displaye The digits themselves are 0.2 inch hig Measuring 2-3/8 × 6-1/2 × 8 inches overa the case is made of high-impact-resistan plastic. The complete instrument, less te leads and power cord, weighs a mere ounces. A convenient bail permits the 3476 to be used in any of three positions: fl elevated approximately 25° (as shown in t photo), or elevated approximately 80°. Fu ther convenience is offered in the event o of the circuit-protection fuses is blown, wi no disassembly or recalibration required. Si ply slide back the cover plate and pop out t fuses.

The 3476A operates from the ac lin requiring 104 to 127 volts at 6 VA, 54 to Hz. Other options are available for 50-H operation and line voltages up to 250. Or t brother of the 3476A, the 3476B, may operated either from the ac line or from internal NiCad batteries. All the other fe tures of the 3476B are identical to those the 3476A; the B version may be operated to eight hours from batteries which are ful charged initially. These digital multimeters a manufactured by Hewlett-Packard Compan P. O. Box 301, Loveland, CO 80537. Pri class of the 3476A is $225 and of the 3476 is $275 (including rechargeable NiCad ba teries). With the 3476A/B are available number of optional accessories, including soft carrying case with shoulder strap, an probe for operation to 700 MHz, and test-lead kit with all kinds of replaceable ti for the probes – alligator clips, spade lug needle tips, banana plugs, and convention probe tips. The instruction manual is secon to none, with full operating instructions, section on theory of operation, another c maintenance and adjustments, troubl shooting diagrams, schematic diagrams ar very detailed parts lists. – *K1PLP*

SINCLAIR MODEL D-236H 2-METER ANTENNA

If you're a 2-meter mobile finer, maybe yo constantly worry about having your rig ripp off. After all, that 5/8-wavelength antenna o the trunk of the car is a dead giveaway t would-be thieves that there's expensive radi equipment inside. But take heart – Sincla Radio Laboratories has a solution to you dilemma! Sinclair has been noted for pr ducing "security" type antennas for som time. The concept is one of disguising the fa that there is a mobile rig installed in a vehic

where the *antenna* would be the tip-off that two-way radio gear was in use.

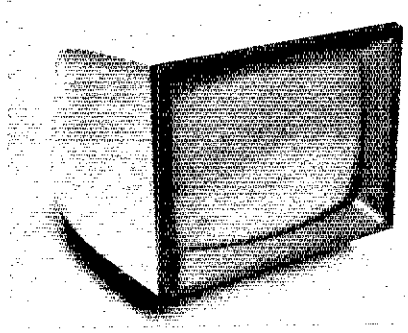
Sinclair's model D-236H is an antenna that *appears* to be a typical a-m broadcast-band receiving antenna. It is similar in appearance to the antennas used on automobiles *before* the wire-in-the-glass type was found on more recent vintage cars. In actuality it *is* an a-m/fm broadcast-band receiving antenna, but it also happens to be a 2-meter mobile 5/8-wavelength antenna. Matching for the antenna to a 50-ohm load is accomplished with a capacitively tuned stub. A power splitter is used to facilitate placing the transceiver and the broadcast receiver in the antenna line, simultaneously. The D-236H antenna system is rated for use at power levels up to 100 watts with an insertion loss (through the splitter) of 0.2 dB. Insertion loss at the a-m broadcast-band frequencies is specified at 0.2 dB and at 0.5 dB for the fm broadcast band. Isolation between amateur-band transceiver and the broadcast-band receiver port is 30 dB minimum.

Installation of the antenna system usually involves the removal of the original antenna from the car, if one was already installed, or drilling (chassis punching) the required mounting hole for the D-236H in an appropriate location on the body of your automobile. The splitter and matching-stub assembly are mounted behind and under the dashboard inside the car. Since a power splitter/combiner is used, no switching of the antenna between car radio and amateur-band transceiver is necessary.

Maybe this antenna won't stop rip-offs completely, but it may be a way to save your rig from the hands of would-be thieves! Just make sure you hide the rig. All the camouflage one could use won't help if the thief happens to walk by your car and *see* your equipment. The D-236H is manufactured by Sinclair Radio Laboratories, 675 Ensminger Road, Tonawanda, NY 14150. – *W1ICP*

COMPUTER WAREHOUSE STORE VIDEO MONITOR

If you are one of the "new breed" that is into RTTY or microcomputers which use video displays, you may be interested in the Computer Warehouse Store video display. The display, which uses a 12-inch CRT, is housed in an attractive 12 × 12 × 13-inch cabinet. The display provides a viewing area of 7 × 9 inches and has room for 24 lines with an 80-character length.



The CRT is a P39, green-phosphor type which provides more comfortable viewing than a black-and-white tube. The video input requires the standard 1-volt pk-pk signal. The display has a built-in power supply and cooling fan. These units are new but surplus. We checked one out with a TTY/computer terminal and were pleased with the performance. Price class at the time of this review is $150. Distributed by Computer Warehouse Store, 584 Commonwealth Ave., Boston, MA 02215. – *W1ICP*

DATONG ELECTRONICS LIMITED – DATEST 1

The Datest 1 is an instrument which will test transistors and operational-amplifier ICs. It is intended for use in research and development, repair and production environments. An easy-to-use pocket-sized instrument, Datest 1 may fill a gap in the capabilities of conventional testers which often provide either too much or too little information and may be difficult to use or too time-consuming for general use.

The Datest 1 will test bipolar and FETs, diodes, and operational-amplifier ICs and will display test results instantly as characteristic patterns on an array of six LEDs. No prior knowledge is required of device type (npn or pnp transistors, p- or n-channel FETS or even if it is a bipolar or an FET). Instead, Datest 1 will supply this information as part of the test results. And the unit is supplied with "tweezer-probe" and "needle-probe" for rapid and convenient in-circuit testing of the component.

The Datest 1 is available from Datong Electronics Limited, 11 Moor Park Avenue, Leeds LS6 4BT, UK.

THE ANTENNA SPECIALISTS COMPANY HM-224 220-MHz MOBILE GAIN ANTENNA

As many amateurs who have operated mobile on vhf fm have found out through experience, the performance of a quarter-wave whip antenna leaves a lot to be desired. There is a variety of antennas available for the 144-MHz band that offer improved coverage – many of them being the base-matched or base-loaded 5/8-wavelength type of radiator.

The Antenna Specialists Company has taken care of the antenna needs of the 220-MHz fm crowd with an improved-performance mobile antenna. Basically, the antenna is a base-fed 1/4-wavelength section with a 5/8-wavelength radiator added on top. There is a matching inductor between the sections of the radiating elements, to perform the impedance transformation between the top of the 1/4-wavelength portion and the bottom of the 5/8-wavelength whip. The inductor is encapsulated in a tough, molded, grey plastic material, which protects the coil and provides durable support for the upper portion of the whip.

Performance evaluation of an antenna mounted on a vehicle is often very difficult, in terms of absolute numbers, because of the nearby metal that tends to distort the radiation pattern. The irregular shape of the ground plane, in the form of the car body, also has the same effect. In theory, this HM-224 antenna should raise the center of radiation above the surface of the car and lower the angle of radiation, in addition to providing an increase in gain. The gain improvement was often difficult to discern, depending upon the direction and distance to the repeater being received. At times, there was no change by comparison to a 1/4-wavelength whip; at other times there was a greater indication of gain than theory would predict. The greatest improvement, and it was considerable, was noticed in the response while in motion. Rapid fading and flutter (picket-fencing) were all but eliminated. In shadow areas, where reception on the small whip was poor, the Antenna Specialists' HM-224 usually provided enough improvement to enable the mobile station to copy the repeater, albeit not full quieting. Also, there was a noticeable improvement in the distance at which a given repeater could be used. The reason for this was somewhat hard to pin down because of the terrain (plenty of small hills and valleys, with lots of shadow areas), but the effect of the antenna gain was noticeable and worthwhile.

The HM-224 antenna is mechanically rugged – the whip sections are joined by the tough plastic which covers the coil, as mentioned. The bottom of the whip is given support and flexibility by a strong coil spring. The entire length of the antenna is 49-1/2 inches, so a spring is definitely in order to prevent damage if the antenna strikes a tree branch or some other obstruction. The whip and spring assembly unscrews easily from the base section for ease of removal for security purposes, or for safety when sending the vehicle through a car wash.

The base clamp is of the no-holes variety – a C type of clamp that clips over the lip of a trunk lid or hood. It fastens by means of a couple of rugged set screws. Some protection is given to the coaxial cable by providing a depression or channel in the pressed-metal C section of the mount. This prevents the trunk lid from chafing the cable and causing a problem with deformed or broken coax. Enough RG-58/U cable is furnished to reach from the trunk compartment to the dashboard area of almost any modern car.

The price class for the HM-224 at the time of this review is $34. The antenna is manufactured by The Antenna Specialists Company, Division of Orion Industries, Inc., and may be purchased at any authorized Antenna Specialists dealer nationwide. QST

Strays

I would like to get in touch with . . .

□ anyone knowing the whereabouts of radio operators aboard the Navy destroyer U.S.S. *Wakiva* when she sank near France in 1918, especially J. R. Fitzpatrick, Lyman Duryea, and shipmate Jetty. Stu J. Ruch, WB9WVL, Veterans of WWI, Barracks 790, 1002 W. Charles St., Champaign, IL 61820.

□ amateurs or shortwave listeners who would like to form a net to exchange tips on international shortwave DXing, especially for reception of rare foreign commercial broadcasts. M. W. Baker, WB9YOE, 415 E. Sixth St., Dixon, IL 61021.

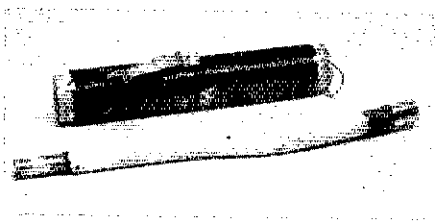
□ clubs interested in maritime mobile communications. Russell A. Bert, W1CIW, 192 Howard St., Melrose, MA 02176.

Hints and Kinks

A DIELECTRIC "NO-NO"

Let's call this a Hint, rather than a Hint and Kink. In fact, I would like to hint strongly that certain kinds of insulating material, regardless of how good they look to the human eye, are definite members of the "no-no" family. Vhf and uhf men are especially cognizant of the need to select suitable insulating materials, as the effect of using an improper dielectric substance becomes more pronounced as the operating frequency is increased.

Among the worst offenders available to amateurs on a widespread basis is nylon. Polyvinylchloride (PVC) is a bad hombre also. Despite the physically durable nature of the materials, they are extremely lossy. In circuits where considerable rf power is used, they will absorb the rf energy, heat up rapidly, then warp or melt. Even though the insulating agent may not burn or melt (depending on the power level involved), the losses will be high.



Melted PVC tubing.

The photograph shows the catastrophic result of using PVC tubing for building a loading coil for a top-loaded vertical antenna. When 300 watts of rf power were supplied to the antenna, there was an immediate and constant change in SWR. Eventually the SWR became so great that the transmitter would not load into the antenna system.

Examination of the vertical showed the top section (loading inductor and above) to be leaning at a 30-degree angle with respect to the lower member of the vertical. The inner PVC support tube for the coil had overheated, causing it to melt the plastic centering disk at the lower end of the coil. The photograph shows the warped inner tubing section – complete with rf burn holes!

The inductor was rewound on two-inch diameter solid phenolic rod (impregnated-cloth variety), and the problem was resolved. In an ideal situation (though frail, physically) an air-wound coil, or one placed on a ceramic form, would be used. – *W1CKK*

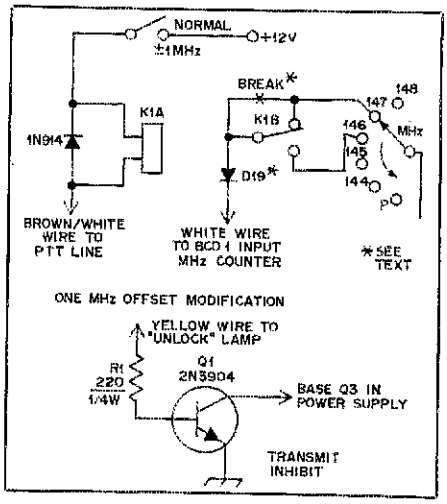
ADDING 1-MHz OFFSET TO THE KDK FM-144

Automatic plus or minus 1-MHz offset may be added to the KDK FM-144 simply and economically, using the circuit shown in the schematic diagram. No additional crystals are required. The only limitation is that the operator must place the rig in the SIMPLEX mode when the 1-MHz offset is to be selected. Normal operation of the transceiver is not affected by this modification.

K1 is a 12-volt miniature spdt reed relay. When transmitting, this relay is energized simultaneously with the existing T-R relay, whenever S1 is closed. The anode of D19 is separated from the 147 terminal on the MHZ switch and connected to the arm of K1. While receiving, the anode of D19 is connected to the 147 terminal as in the original circuit, but when K1 is energized D1 is connected to the 146 terminal of the MHZ switch.

If the operator is receiving in the 146- to 147-MHz segment of the band, selecting the 1-MHz offset will switch D19 to add a BCD "1" to the MHz counter while transmitting. When receiving in the 146- to 147-MHz segment, the modification causes a BCD "1" to be subtracted from the MHz counter. The frequency display of the transceiver will indicate the frequency the rig is transmitting or receiving on. Offset direction is determined by the selected receiving frequency. The proper offset is automatically chosen, and operation below 146 MHz or above 148 MHz is impossible. Placing S1 in the NORMAL or open position restores normal operation.

An additional circuit was added to the FM-144 which may be of interest to owners of other synthesized rigs as well. Lock-up time of the phase-locked loop may vary depending on ambient temperature. A transmit-inhibit circuit will prevent the rig from transmitting until the loop is locked. Voltage dropped across the UNLOCK lamp turns Q1 on, which holds the base voltage of regulator control transistor Q3 at ground. Turning off Q3, a 2SC1908, cuts off the regulator pass transistor which prevents the transmitter from operating. R1 prevents the base-emitter junction of Q1 from shorting the UNLOCK lamp. When the loop is locked, the UNLOCK lamp is extinguished, Q1 is turned off, and the rig will transmit. Lock-up time is generally very rapid.



FM-144 modifications.

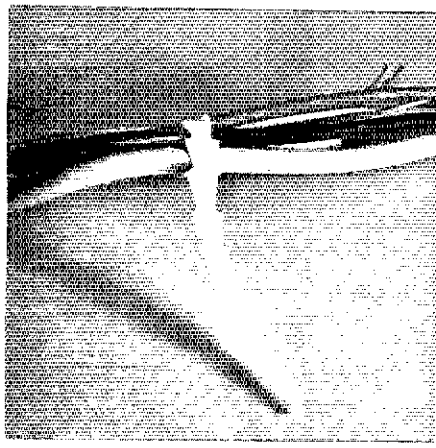
K1 and Q1 may be mounted on a sma perforated board installed between the meter and the right-side chassis rail. Colo coded leads from the board may be route through the vinyl harness sleeves and result a neat installation. S1 may be located several places, depending on the needs of th operator. The author used a miniature togg switch, mounted on the rear panel next to th dc power receptacle, toward the lower corne An external switch may be connected to plug compatible with the ACCESSORY jac If the 1-MHz offset is used frequently, th operator may choose to mount S1 on th front panel.

Observation of the transmitter output on spectrum analyzer confirmed that the modifi cation had no effect on the excellent spectra purity of the FM-144. The modification do not require entry into any shielded enclosur and no connection is made to any poin where rf is present.

One last reminder: When 1-MHz offset i desired, the original OFFSET switch must b placed in the SIMPLEX position. Considerin the simplicity of the modification, this is small price to pay. – *Al Young, W2TMF*

PLASTIC-BAG TIES MAKE NEATER CABLE HARNESSES

The serrated plastic ties supplied with dis posable plastic bags are useful around the shack and mobile installation to hold the various cables together. Unlike the com mercial version, they may be unfastened when a wire must be added or removed. – *Mack Beal, W1PNR*



Economical cable ties.

HEATH IM-104 VOM MODIFICATION PREVENTS METER PEGGING

The critical spacing between contacts 11 and 12 on the front of range switch wafer 3 may result in a momentary open circuit resulting in meter needle pegging when the instrument is switched between ohmmeter ranges. The

pegging may be eliminated by installing another switch contact at any unused position on the front of wafer 3. An insulated jumper wire should be connected between the new contact and either contact 11 or 12. If no new contact is available, remove either contact 11 or 12 by carefully drilling out the rivet and replace the contact in any unused position on wafer 3. A similar problem resulting from contact spacing on the rear of wafer 3 may be corrected by moving either contact 1 or 2 to any unused position. – *David Kraeuter*

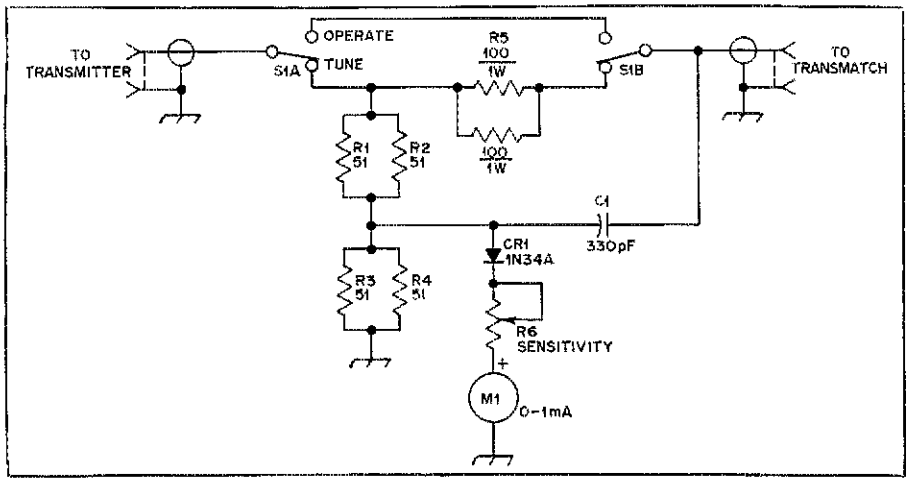
NICHROME IGNITION WIRE REDUCES INTERFERENCE

Some automotive-parts distributors carry a resistance type of ignition wire which uses nichrome instead of carbon as the resistive conductor element. This wire appears to be more resistant to aging and more effective in reducing ignition-noise interference. – *Murray Lampert, VE3FXA*

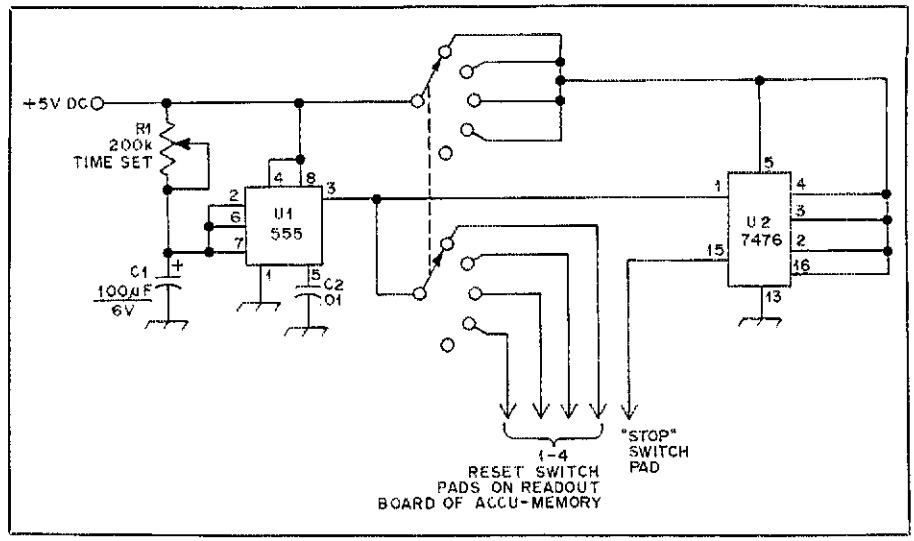
SIMPLIFIED OUTPUT METERING PROTECTS QRP TRANSMITTERS

After destroying a few transistors while tuning QRP transistors into a mismatched load, I decided I needed some way to indicate proper transmitter adjustment, and then protect the rig while the antenna tuner was adjusted. An adaptation of the simple resistive SWR bridge described in the ARRL *Handbook* provides me with a dummy load, relative power-output indicator and a safe method of tuning the transmitter.

As shown in the schematic diagram, the input divider (R1-R4) has a total resistance of 50 ohms. Four 1/2-watt composition resistors safely dissipate the output of my transmitter when S1 is in the TUNE position. Meter M1 indicates relative power applied to this load. The antenna is connected (through a Transmatch) and the antenna tuner is adjusted for minimum deflection on S1, or lowest SWR. R5 acts as an attenuator and effectively isolates the transmitter from the antenna, preventing possible damage to the output transistor of the rig. When the SWR has been reduced to its minimum, S1 is placed in the OPERATE position. M1 now indicates relative power output into the antenna. CR1 may be any germanium signal diode; C1 is either a ceramic-disc or silver-mica capacitor. S1 should be a ceramic rotary switch (dpdt), although a phenolic rotary switch or a slide switch is adequate for use on the 80-meter band – *Albert S. Woodhull, W1GSJ*



Protective circuit for QRP transmitters.



Timing modifications for Accu-Keyer memory.

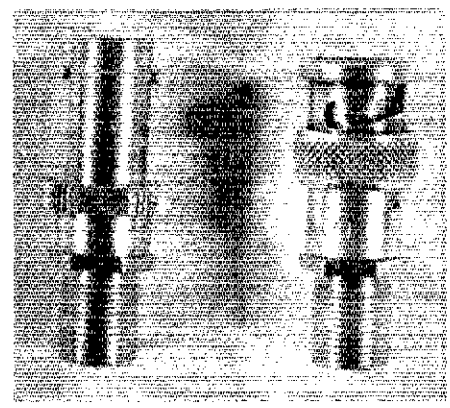
METEOR-SCATTER TIMING MODIFICATION FOR THE ACCU-KEYER MEMORY

My primary interest is operation in the 2-meter band. Therefore, I spend much time calling CQ, so the Accu-Memory is quite helpful. Meteor-scatter contacts are much simpler: The memory takes care of the repetitious transmitting of my exchange. I developed the modification shown in the schematic diagram to eliminate the need to synchronize pressing the appropriate memory switch with the sweep second hand of a clock. U1, an NE555 timer, provides timing pulses at intervals determined by the setting of R1. U1 "clocks" U2, a flip-flop, the *Q* output of which stops the memory of the keyer. The output of U1 is applied through the five-position switch to the RESET switches in the keyer. Every second pulse from the timer resets the memory. Fifteen seconds (or whatever interval is desired) later, the memory is stopped, and after 15 seconds is restarted for as many cycles as desired. The unused position on the rotary switch allows the operator to disconnect the timing circuit from the keyer, for synchronization with WWV.

This circuit works very well and takes much of the hassle out of meteor-scatter work. It may also be of interest to EME (moonbounce) workers, with appropriate changes in the time constants. – *Michael R. Owen, WB5DOJ*

TYPE F TO BNC ADAPTORS

It is often necessary to adapt from a type-F TV connector to a BNC fitting. Adaptors from type-F female connectors to BNC male or female connectors may be easily made from type-F chassis female connectors available from TV sales stores and any of the BNC variety of connectors with bodies threaded to receive 3/8-32 clamping nuts. Before assembling, trim the solder lug on the type F connector to allow the center pin of the BNC connector to just contact the lug when the connectors are assembled. It is only necessary to solder the pin and lug together and reassemble the pair (see photo). – *Harold S. Eisley, W3NET* QST



F connector becomes a BNC.

Getting to Know OSCAR – from the Ground Up

Part 4: What happens to OSCAR 7 every other day? What is meant by Mode B? Like Dr. Jekyll and Mr. Hyde, OSCAR 7 has two very different facets.†

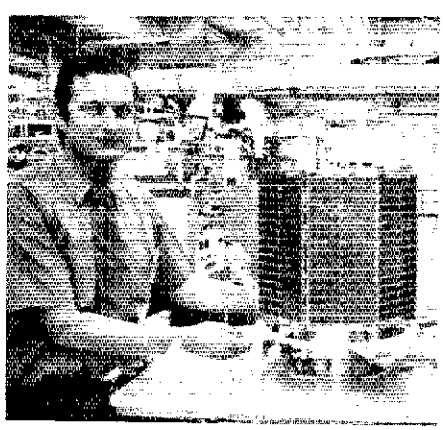
By Charles J. Harris,* WB2CHO

"The results really amazed me: 3-watts output ssb brought 29 contacts, 14 states and six countries, in only three days!" Thus W9DOR described his experience with QRP (low power) in June, 1976. Other amateurs shared his enthusiasm. "WA4DYL and I contacted each other with as little as 2-watts erp," wrote WA4NKN. "WØEOZ acknowledged my answer to his CQ while I was unintentionally running only 50-milliwatts output," WB4HQE reported.

What is particularly exciting about these QRP contacts is that they were made through AMSAT-OSCAR 7! Even a couple of watts proved adequate for two-way contacts through the spacecraft during QRP tests run in June, 1976, and reported in the *AMSAT Newsletter.*[3]

QRP and OSCAR do indeed go together — if the satellite is OSCAR 7 and the day is an even-numbered day of the year. On those days OSCAR 7 is in Mode B, receiving signals on 432 MHz and converting them to 2 meters. The phenomenal sensitivity of this 70-cm/2-m transponder has surprised even its designers, and makes possible regular satellite communications with only a few watts of power.

OSCAR 7 Mode B is by far the preferred function by experienced satellite communicators. It far surpasses OSCAR 6 in sensitivity and downlink signal strength, which in turn is superior to OSCAR 7 Mode A in the same areas.



AMSAT President Perry Klein, W3PK, inspects OSCAR 7 during final testing.

Getting involved in the other half of satellite communications, where DX stations outnumber stateside users, is actually very easy.

Receiving Mode B

If you are already active on Mode A, the 2- to 10-m transponder common to AMSAT-OSCAR 6 and 7, you probably have the ingredients to get started in Mode B operation. The transverter or transceiver which you use for the uplink to the 2- to 10-m transponder will also receive the 2-meter downlink from Mode B. The existing 2-meter antenna can complete the receiving half of your Mode B station.

Almost any receiver capable of tuning the proper segment of the 2-meter band will receive the downlink signals from OSCAR 7 Mode B. The signals are much stronger than those from either OSCAR 7 Mode A or OSCAR 6. They are so much stronger, in fact, that you will wonder if you are listening to the same satellite! The Q5 downlink signals contrast sharply with the often weak 10-meter signals from the other transponders.

Even the older 2-meter a-m rigs which see little use today can be modified to receive the OSCAR 7 Mode B downlink. In most cases, the sensitivity of the receiver will be adequate for easy copy of the satellite. However, these rigs do need the addition of a beat-frequency oscillator (BFO), as nearly all satellite communications are cw or ssb. The 2-meter a-m rigs can often be picked up for little or no money at auctions and flea markets, and the construction of a BFO is within the power of almost every amateur.

If you are using an ssb transceiver or transverter for a 2-meter uplink, you can copy Mode B downlink signals without any modifications. Merely tune to the appropriate part of the band at the right time, and your receiver will be filled with signals. You can use the squelch on the Kenwood TS-700A to mute the rig between passes. When the satellite comes within range, the squelch opens: instant satellite communications!

Mode B Transmitting

Presently active Mode A operators already have the basis for a complete Mode B station, with one addition: a frequency tripler. A tripler is only suitable for cw operation through the satellite, as it multiplies the input frequency by some integer including any modula-

†Parts 1 through 3 appeared in *QST* for January through March, 1977.

*Club and Training Manager, ARRL

Footnotes appear on page 60.

G3IOR (left), AMSAT director, and G3HUL put the finishing touches on an inventive Mode B antenna.

tion sidebands. Those commonly used for 432 work have an input in the 144-MHz range with an efficiency of about 50 percent. They require no outside power source and no switching, so they can be left permanently mounted next to the 432 transmitting antenna, in a weatherproof container. This helps to reduce feed-line loss at 432 MHz. Varactor tripler circuits can be found in the ARRL *Handbook* and *The Radio Amateur's VHF Manual.*

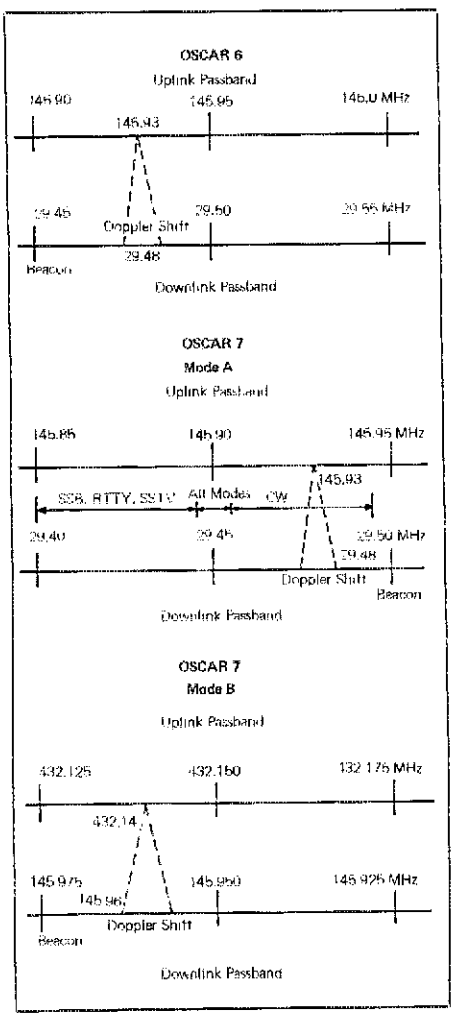
One of the simplest ways to generate rf in the 435-MHz range is through the use of readily available fm transmitters. There is a wealth of commercial gear now on the surplus market, gear originally designed for the 450- to 470-MHz public-service land-mobile band. Most rigs are sufficiently broadbanded to operate well in the amateur 70-cm band. The addition of a variable crystal oscillator (VXO) provides frequency control throughout the OSCAR uplink passband. In a Motorola transmitter, for example, the 18-MHz crystals are multiplied 24 times to produce the 432 output. By varying the crystal frequency as little as 1 kHz up and down (a change of 0.005 percent) you can vary the output frequency throughout the 50-kHz uplink passband. More active crystals will allow a greater frequency shift, but any crystal may be varied somewhat. Details on variable crystal operation for vhf are included in *The Radio Amateur's VHF Manual,* 2nd edition, chapter 6.

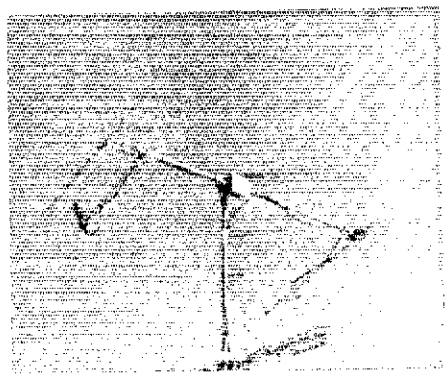
For cw operation, only one other modification to the transmitter is necessary: a keying circuit. Keying the oscillator is never good amateur practice, and at 432 MHz, the resulting chirp will pull your signal right out of the satellite passband. The chirp is multiplied the same 24 times! Depending on the transmitter used, any stage after the oscillator and buffer can be grid-blocked keyed. For safety reasons, you should use a keying relay rather than placing the entire grid voltage across the key terminals. Since fm transmitters do not normally have biasing for the final amplifier, you will need to add a small amount of fixed bias to the driver and final to cut off current flow in the key-up position.

A simpler project is to modify one of the low-power fm transmitting strips available from VHF Engineering, 320 Water Street, Binghamton, NY 13901, or from Hamtronics, 182 Belmont Road, Rochester, NY 14612. Again, "pulling" the crystal oscillator provides bandspread. The small companion amplifiers can be keyed to provide a couple of watts output on the 70-cm band.

70-Cm SSB

Single-sideband operation on 432 MHz is a little more complicated than cw, but well within the reach of any interested OSCAR communicator. Commercial equipment is beginning to become available, and increased amateur activity in this band bodes well for more equipment in the near future. The Echo transceiver, available from KLM Electronics[4] has sufficient output for Mode B operation.





Mode B antennas make a compact package in an az-el mounting configuration.

The most popular approach to 432 ssb today is the use of a transverter. As discussed in part 2 of this series, transverters convert low-level ssb on one frequency to another. Transverters are available for the 432 range, with inputs on 28 MHz or some other frequency. Spectrum International, P. O. Box 1084, Concord, MA 01742, imports Microwave Modules' MMT 432 transverter from England. This little box accepts 28-MHz ssb or cw and transverts it to the 432 range, with an output of about 10-watts cw or PEP ssb. A single 12-volt power connection completes the hookup. As with the varactor tripler, the transverter can be mounted directly at the antenna to reduce losses in the feed line. ARCOS, Box 546, East Greenbush, NY 12061, also markets a 432 transverter.

Yet another approach to 432 ssb for the do-it-yourselfer is mixing in the final of an fm transmitter. The 460-MHz transmitters mentioned above can be used to generate ssb on 432 by mixing 28-MHz ssb in the final amplifier. The final tank capacitor is retuned to 432, which helps to attenuate the other mixing product (460 + 28 = 488 MHz). As before, a bias supply is needed to reduce key-up current flow. Output on 432 runs about 10 watts. Regulation of the crystal oscillator in the transmitter helps make for chirp-free operation. Thanks to Ron Stevenson, W2BXA, and *AMSAT Newsletter* for this suggestion.

The Power Problem

Most of these methods of generating 432-MHz rf produce a few watts of output. Putting this into a small antenna will usually provide the 100 watts of erp to access the satellite. As mentioned above, even a couple of watts of erp is sufficient for contacts on QRP days, now on "Mode B" Mondays. Sometimes you may find that your usually copyable downlink disappears for no apparent reason. Check the rest of the down-

link passband for a particularly loud signal.

The OSCAR transponders divide the output power among the users of the satellite; the more users, the less power each gets. Very strong signals into the satellite receive a disproportionate amount of the output power, thereby reducing the strength of the other signals. Also, very strong uplink signals can activate the automatic limiting circuits (alc) in the satellite receiver, reducing its sensitivity. This combination means that strong signals can drive the weaker ones from the satellite.

Accustomed to erps in the range of thousands of watts on 432, moonbouncers and other weak-signal vhf enthusiasts have the capability of using excessive power through the satellite. This power level will drive all other signals from OSCAR. Other stations retaliate by increasing their erp, and the battery drain on the satellite increases to a dangerous level. This high battery drain will put the satellite into "Mode D," or recharge, while shortening the useful life of the satellite.

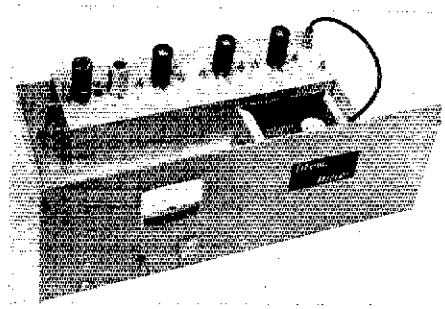
Running high power through the satellites means you have fewer people to work, discourages other operators from running recommended power levels and hastens the demise of the satellite. In a word, DON'T!

Mode B Antennas

The strength of the 2-meter downlink signals from OSCAR 7 Mode B make the choice of an appropriate receiving antenna very simple. Almost any 2-meter antenna into an adequate receiver will capture Q5 signals from the satellite. Even a simple ground plane is sufficient for overhead passes. The more elaborate the antenna, the more accurately the antenna must be pointed. To reduce tracking problems, you may wish to use a simple antenna for the Mode B downlink.

If you have circular polarization on the 2-meter antenna for the Mode A uplink, you will have to reverse the connections to use it for the B downlink. In the Northern Hemisphere, the Mode A uplink requires left-hand circular polarization, while the Mode B downlink needs right-hand. Cross polarization will introduce at least 30-dB loss. One way around this is to bring both feed lines from the two 2-meter antennas down into the shack. The circular-polarization harness can then be reversed for the different modes. Or a separate, less elaborate antenna can be used for Mode B reception.

Did you opt for az-el mounting of your 2-meter antenna? If so, the 432-MHz antenna can be mounted on the same horizontal boom as the 2-meter antenna. Thus the two antennas track together through the az-el gyrations. The extra antenna helps to balance the system, and the small size of the antenna seldom creates a problem with the rotor.



28-MHz input, 35 watts 432-MHz output. This transverter will be featured in the 1978 ARRL *Handbook*.

Another point to consider in designing your Mode B antenna system is feed-line loss. At 432 MHz, even RG-8A/U type foam-filled coaxial cable introduces about 4 dB of power loss per 100 feet. That means more than half your output power is lost as heat in the cable, before it ever gets to the antenna. So-called uhf connectors, types PL-259 and SO-239, also introduce impedance mismatch "bumps," resulting in losses of up to 0.5 dB each. These add up quickly, until your 10 watts of rf in the shack are down to only a couple of watts at the antenna.

Putting the transverter or transmitter at the antenna is one way around this problem. The use of BNC and type-N (designed for uhf applications) connectors will also help to reduce losses. A final, rather expensive cure is the use of hardline — coaxial cable with a stiff solid shield, rather than the braid found on RG-8/U. Though hard to work with and very expensive, it does have excellent loss figures, and can compensate for very long feed lines in some installations. Surplus cable of this type may be available from local cable-TV installers.

Mode B Operating

Making Mode B contacts is similar to making the usual 2 to 10 QSOs. The signals are a good deal stronger, an often European DX outnumbers th U.S. stations during mid-Atlantic passe Two other aspects of Mode B operatio make it unique, however. Doppler shi on Mode B is nearly three times tha found on Mode A, as Doppler is function of frequency. You may have t search farther from your calculate downlink frequency to find your ow signal coming back from the satellite.

Another difference is that the pas band is inverted in Mode B. That i lower sideband in the uplink is inverte to produce upper sideband in the dow link. Increasing the frequency of you 432-MHz uplink signal will lower th frequency in the downlink passband. I takes a little getting used to, especiall right after you have mastered Mode A operation, but it will become secon nature after a few passes.

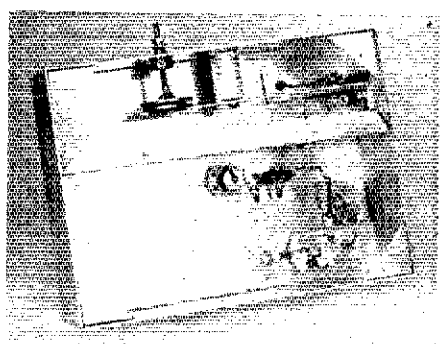
Not Only OSCAR

Your 432-MHz transceiver or trans verter does not have to rest unuse between Mode B passes. OSCAR 7 als transmits RTTY telemetry while i Mode A, on a frequency of 435.1 MHz with 850-Hz shift. You should be abl to copy this beacon without difficulty Hook up your TTY system, and you'l have complete, 60-channel telemetry reports from the satellite. Be sure t send copies of these to AMSAT for thei monitoring purposes. Watch your anten na polarization, however. The uplink fo the 70-cm/2-m transponder is right-hand polarized in the Northern Hemisphere while the receiving antenna for the 435.1-MHz beacon has left-hand polar ization.

The 432 rig can also be used fo terrestrial communications. A growing number of amateurs are joining long time vhf enthusiasts on this band. In vhf contests and during enhanced tropospheric-propagation conditions, the 432-MHz band becomes highly populated. Most activity is centered above 432.010 MHz. Avoid operation too near 432.000 MHz where moonbounce experiments are conducted.

Coming

OSCAR is a paper-chaser's dream. There is a wealth of attractive certificates available for honoring all levels of satellite activity, from your first contact to your 50th state. Someday, there might even be a satellite DXCC! Additional info on these awards, over-the-horizon operating and more next month. QST



Varactor tripler from 144 MHz to 432 MHz.

Footnotes.

[3] "Special Low Power (QRP) Test," *AMSAT Newsletter*, Vol. 8, No. 2, June, 1976, p. 8.

[4] KLM Electronics, Inc., 17025 Laurel Rd., Morgan Hill, CA 95037.

Amplifiers, Type Acceptance—FCC's Latest Proposals

Deregulation — a thing of the past? FCC proposals would tighten control over transmitters and eliminate 24- to 35-MHz amplifiers that are commercially manufactured.

By Hal Steinman,* K1FHN

It's just possible that the next linear amplifier you buy won't have a 10-meter position on the band switch, or that your next transmitter will cost a good deal more than it went for last year or that some of the more specialized types of ham gear might disappear entirely from the market. These possibilities would become realities under two FCC proposals, Dockets 21116 and 21117, just released. The first would totally ban the manufacture and sale of external power amplifiers capable of operating on any frequency between 24 and 35 MHz. The latter would put all commercially manufactured transmitters and external power amplifiers under the FCC's type-acceptance program.

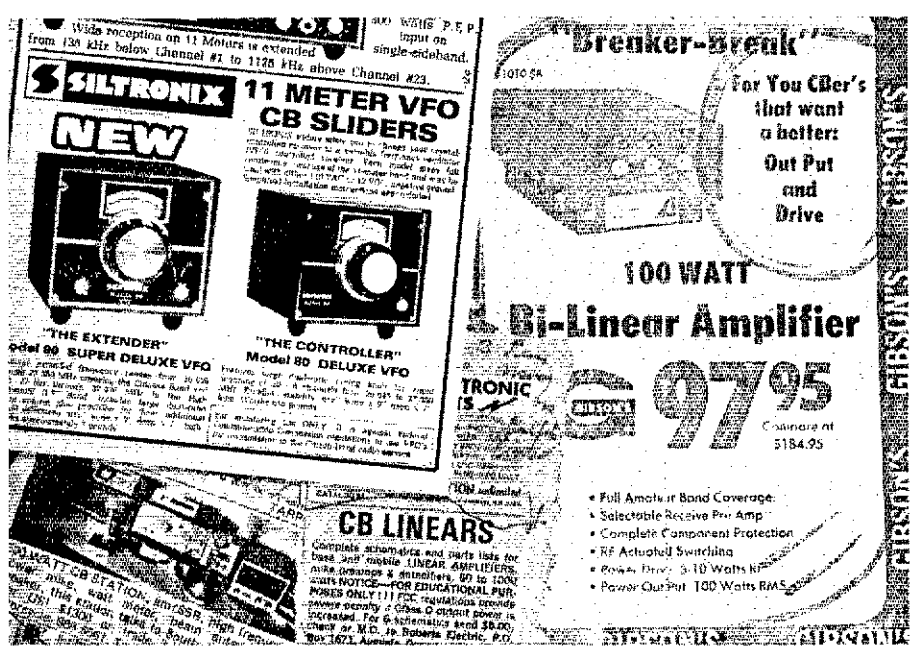
Why 10-Meter Amplifiers?

If you're wondering what amateurs have done to make the FCC want to ban 10-meter amplifiers, you're headed in the wrong direction. The problem is not with the Amateur Radio Service, but with the illegal use of these amplifiers in the CB service. A recent FCC study of 30 random TVI cases found that 60 percent involved the illegal use of amplifiers by CBers. To compound the problem, some manufacturers and dealers appear to be catering to this illegal market. Even though ads for external power amplifiers carry a disclaimer that the equipment is not for use in the CB service, the FCC states that "the suppliers consistently place their advertising in publications which cater to the CB operator and seldom, if ever, advertise in publications catering to amateur operators."

No one can deny that a problem exists. Amateur radio equipment is readily available and may be purchased by anyone. In the free-market system it is impossible to keep amplifiers out of the hands of those who want to use them illegally. Of course, there are rules *against* using amplifiers in the CB service. Unfortunately, however, the clout of fines or imprisonment has been an ineffective deterrent. With the large numbers of CB radios in use today and with limited FCC staff available for enforcement, chances of being caught are miniscule.

What is debatable, though, is whether the Commission's proposed outright ban is the best way to solve the dilemma. Is it proper to take privileges away from a service known for its good operating practices and self-discipline in order to control illegal practices in another separate and distinct service? Obviously, the Commission feels the need for some sort of strong action to curb illegal use of amplifiers, but there *are* alternatives. One would be to require the purchaser of an external rf amplifier to show a valid amateur radio operator's license. Another possibility would be "registration," requiring amplifier purchasers to present identification and sign a registration book, similar to some gun registration laws.

If you like homebrewing and are wondering how Docket 21116 will af-



Ads such as these prompted FCC action in Dockets 21116 and 21117.

*Asst. Manager, Membership Services Dept.

fect you, have no fear. You will still be able to homebrew amplifiers for your personal use. Amateurs would still be able to sell or trade amplifiers to other amateurs, provided they are for the personal use of the amateurs involved. The 24- to 35-MHz prohibition does not apply to homebrewing or to personal bartering among amateurs. Present owners of 10-meter amplifiers will *not* be affected.

Even with these exceptions, the impact of Docket 21116 on the Amateur Radio Service would be severe: It would put an end to the commercial availability of amplifiers capable of operating in the 10-meter band (28-29.7 MHz). It may put a damper on the increase in 10-meter activity we are seeing during this upswing in the sunspot cycle. And one question that should be considered is whether such a ban would actually curtail the illegal use of amplifiers, which is the Commission's aim, or whether a "black market" would develop in amplifiers, which would be detrimental to all parties concerned.

Type Acceptance – What Is It?

Type acceptance is an equipment authorization program which requires that manufacturers provide the FCC with evidence, prior to marketing, that its equipment meets certain technical standards. The manufacturer must conduct tests in his own laboratory to assure these standards are met, and submit test data to the FCC. Almost all licensed radio services, except the Amateur Radio Service, are governed by some sort of FCC equipment authorization program. Amateur radio has been exempt thus far because the very nature of the service – that of self-training and advancement of the radio art – implied that it was the individual amateur's responsibility to meet high technical standards. The Commission recognizes that this is still so, but adds that the manufacturers of commercial gear should share some of that responsibility.

The Commission sets type-acceptance standards according to what it feels will serve the public's interest. Requirements vary from service to service. For example, CB radios must be type approved (type approval means that the manufacturer must send sample units to the FCC laboratory in Laurel, Maryland, for testing) for maximum output power, modulation limits, chassis radiation and spurious and harmonic emissions. The requirement for amateur gear would not be so complicated. Manufacturers need not submit actual units to the FCC – only test data, and the FCC is requesting data only on spurious and harmonic emissions of transmitters.

However, the standard that the Commission seeks to apply to spurious a harmonic emissions is the same standa that applies to other services such as t aviation, public safety, industrial a land mobile radio services. These s vices do not assume any technical expe tise on the part of the radio operat whereas an amateur must demonstra his technical competence before he c get on the air. See Table 2 for discussion of the specific FCC requi ment.

The Commission's type-acceptan proposal has dual objectives. First, would establish overall technical a quality standards for commercial made amateur gear. The Commissi claims that fewer and fewer amateu are building their own equipment the days, and therefore there has been increase of commercially made equi ment. Second, it would make amate equipment, capable of being easily mo ified so as to be operated illegally on frequencies, unavailable. For examp transceivers with an 11-meter rece position on the band switch who 11-meter transmit function can be fai easily restored would be unacceptab to FCC.

Who Will Be Affected, and How?

Ultimately, it is the consumer w must pay the price for type acceptan Although manufacturers incur the i mediate cost, this is eventually pass on to the consumer in the form higher prices. Three features of ty acceptance would increase the expen of manufacturing amateur transmitte

1) Manufacturers may have to mo fy their design and production tec niques to assure that the strict su pression requirement of 63 to 72 dB met.

2) Manufacturers will have to devi and implement elaborate testing pr cedures in order to supply the FCC wi data on spurious and harmonic outp of transmitters.

3) There are overhead costs involv in meeting the type-acceptance applic tion procedure, although this perhaps a relatively minor expense compared points one and two.

All manufacturers would face t uphill battle of meeting the Comm sion's 63- to 72-dB suppression requir ment, a standard that is considerab greater than present day norms (s elsewhere in this article the photo of t spurious output of a typical amate transmitter).

There is no doubt that type a ceptance would represent an addition burden to manufacturers of amate transmitters. Larger manufacture would be better able to absorb t added load than smaller manufacture In fact, type acceptance could represe a significant threat to the very existen

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Concurring Statement of Chairman Wiley.

FCC Chairman Richard E. Wiley, while agreeing with the rest of the commissioners in voting to adopt the two Notices of Proposed Rulemaking discussed in the accompanying article, had reservations over the impact the dockets would have on the Amateur Radio Service. He expressed those concerns in a "concurring statement," which we reprint here in its entirety.

"While I concur in the Commission's proposal to ban the use of linear amplifiers in the 11-meter citizens radio band and to require type acceptance of amateur equipment, I must admit to doing so with some reservations. The prohibitions on the illegal use of linears by CB operators would also prevent their lawful and legitimate utilization by amateurs in the 10-meter frequencies. Similarly, while a requirement for type acceptance may be desirable relative to the effective regulation of CB radio, it has both advantages and disadvantages for the amateur service. My concern is that, in attempting to deal with the rapidly proliferating and sometimes troublesome CB service, we may appear to be penalizing the amateur community, which, in my judgment, is one of the most "professional" and self-regulated services within the Commission's jurisdiction.

Chairman Richard E. Wiley

"Although I have voted with the majority to put these items out for comment, I wish to make it clear that I approach both of them with an open and questioning mind. It may be that comments we receive will suggest other and better alternatives to the Commission's proposals. If so, however, I am hopeful that such suggestions will pragmatically recognize the tremendous task facing the FCC in regulating CB radio which, in the space of only two years, has gone from 50,000 license applications a month to over 1 million applications in January 1977 alone.

"I look forward to a healthy and vigorous discussion on the proceedings which the Commission has opened today. Whatever their ultimate outcome, however, I wish to take this opportunity to express my respect and admiration for the amateur community. I hope and trust that my colleagues will give these Dockets, and the comments filed by the amateur community (as well as others) careful attention prior to reaching any final conclusion."

Table 1

In Docket 21116 the FCC specifically requests comments on the following:

a) Any further regulations which may be necessary to prevent the use of illegal amplification devices.

b) The practicality of such a prohibition and the possible techniques which could be used to produce such an amplifier.

c) Problems associated with preventing the few unscrupulous manufacturers from including such features as accessible wiring which could be cut to provide for operation on the prohibited frequencies.

d) Controls which could provide for operation on these frequencies, or any other concepts which could be used to circumvent this prohibition (i.e., "loopholes").

Table 2

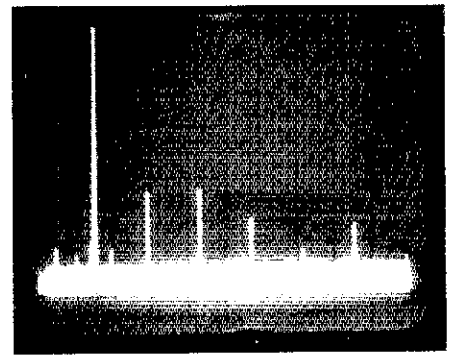
Explanation of proposed technical standard for spurious and harmonic output.

a) "The mean power of spurious and harmonic emissions from type-accepted transmitters shall be attenuated by an amount at least 43 plus 10 times the log of the mean power (in watts) decibels on any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth."*

b) For example, this would mean that a 100-watt output transmitter must have its harmonic and spurious emissions reduced by no less than 63 dB (43 plus 10 times the log of 100, which is 2). An 800-watt output transmitter must have its harmonic and spurious products attenuated by at least 72 dB (43 plus 10 times the log of 800, which is 2.9). Thus, the Commission is asking that most commercially made amateur transmitters have their harmonic and spurious emissions attenuated by 63-72 dB.

c) The requirement would be applied to *any* and *all* spurious and harmonic outputs of the transmitter. While such a stringent requirement might easily be met for higher order harmonics, the same standard would also apply to the second harmonic.

*Pending action in Docket 20777 — the bandwidth docket — this requirement would apply to all emissions outside of the amateur band being used.



Harmonic output of a typical hf amateur transmitter. 2nd and 3rd harmonics are 45-dB down, 4th and 6th are 55-dB down, 5th is 63-dB down. FCC proposes stricter requirements.

of some smaller manufacturers who would not find it economically feasible to meet the requirements imposed on them. But there are long term implications, also. Many of the industry leaders of today got their starts as smaller concerns many years ago. Similarly, it is today's small manufacturer that has the potential of becoming tomorrow's leader. The amateur market has always been good to the small entrepreneur. type acceptance *could* change that.

The Testing Procedure

Much of the burden and expense of type acceptance would be caused by the elaborate test procedures which Docket 21117 requires the manufacturer to follow. The manufacturer would have to investigate the entire radio spectrum from the lowest frequency on which the transmitter operates to the 10th harmonic of the highest frequency (or the highest frequency practicable under present state-of-the-art measuring techniques, whichever is lower). These tests would have to be performed on each band on which the transmitter operates. Established measuring procedures as published by such societies as the Electronic Industries Association, the Institute of Electrical and Electronic Engineers, or the American National Standards Institute should be used. If different test criteria are used, the manufacturer must submit a detailed description of the actual test procedure.

Commercial kits also fall under the auspices of Docket 21117. The kit manufacturer must follow the same testing procedures to assure that its kits, if properly built, will meet type-acceptance requirements. Additionally, he will have to assemble three units and obtain type acceptance for each of those three units. That data must accompany his type-acceptance application, along with a copy of the kit's instruction manual. The manufacturer would also have to provide a label with the kit stating that the kit could be expected to meet type-acceptance requirements when assembled according to the directions.

Exceptions

If you've been reading this poised on the edge of your chair concerned how type acceptance will affect your latest homebrewing project, you needn't worry. Type acceptance would *not* apply to gear built by individual amateurs for use at their own stations (commercial kits excepted, of course). Equipment purchased or obtained before the effective date of the rules would not be affected. You will still be able to modify equipment once purchased, and to sell or exchange such equipment with other amateurs.

The 11-Meter Problem

One of the objectives of Docket 21117 is to prohibit the availability of transmitters and amplifiers that could be easily modified for illegal operation on the CB frequencies. You're probably wondering how the proposed suppression requirement for harmonic and spurious emissions attacks this problem. It doesn't. But there is another feature of type-acceptance data which does. The Commission may withhold approval of an application if it feels that a grant of the application would not serve the public interest, convenience and necessity. It is under this provision that the Commission intends to disapprove applications for type acceptance of equipment easily converted for illegal citizens band use.

This is a two-edged sword however. There are on the market today transceivers and transmitters that need only a change of crystal to change frequency bands. There is a possibility of added amateur bands, or expansion of present bands, when the World Administrative Radio Conference meets in 1979. It's conceivable that equipment manufactured so as to be difficult to use illegally on the CB frequencies could be equally as difficult to change over for use on any new amateur frequencies.

Comment!

The FCC needs and welcomes your views on these dockets. You have until May 25, 1977, to file comments, and June 6, 1977, for reply comments. An original and five copies should be sent to the FCC. ARRL hq. would appreciate a copy, also. And don't forget to let your director know your feelings on these crucial matters. Your thoughts are needed to help the League form its position on the FCC's proposals. QST

Strays

□ To further general interest in flea-power operation and skills under emergency conditions, the Milliwatt Field Day Trophy will once again be awarded to the highest-scoring QRPp entry in the ARRL Field Day. To enter, send a copy of your official ARRL Field Day summary sheet showing power outputs used (five watts or one watt), whether battery or solar powered, and whether portable or away from home QTH, to Ade Weiss, K8EEG, 83 Suburban Estates, Vermillion, SD 57069.

ARRL Responds to FCC Frequency Proposals

The expanded amateur allocations proposed by the Commission for the 1980-2000 time frame are inadequate, says the League; more expansion is possible, and here's how to do it without affecting other vital radio services.

By David Sumner,* K1ZZ

In February *QST*, page 62, we reported that the Federal Communications Commission had requested public comment on some tentative proposals to change the amount of radio spectrum allocated to each of the dozens of different radio services which are in operation around the world: broadcasting, radar, ships and aircraft, land mobile, amateur and so on. These proposals were contained in the Commission's Third Notice of Inquiry (NOI) in Docket 20271, the official proceeding through which the Commission hopes to resolve the inevitable conflicts of position between the various users of the radio spectrum in the U.S. The final result of Docket 20271 will be the position which the U.S. delegation will take to the World Administrative Radio Conference (WARC) in Geneva in 1979. This conference, sponsored by the International Telecommunication Union, will determine how the radio spectrum is used for the remainder of this century.

WARC-79 will determine how the radio spectrum is used for the remainder of this century.

ACAR Participation

The Third NOI contained some proposals for expanding the amateur bands and for new bands to accommodate experimentally inclined hams. These changes were proposed as a partial response to requests made by the Commission's own Service Working Group, the Advisory Committee for Amateur Radio (ACAR), a public committee of radio amateurs who are deeply interested in the future of their service and who have been working for almost two years to identify its future needs. The ACAR proposals, and the Commission's response, are detailed in the February *QST* article.

One phase of the League's extensive WARC preparations is full participation in the ACAR. At times, as many as nine League representatives have been in attendance at an ACAR meeting. However, the real value of the committee has been the opportunity for many viewpoints to be aired and explored, in an open, public forum. Any U.S. citizen may attend an ACAR meeting, and, although attendance is at the individual's expense, meetings with as many as 40 participants from as far away as Hawaii have not been uncommon.

If one service is to expand, another must surrender spectrum space.

In responding to the Third Notice of Inquiry, the ACAR and the ARRL worked separately but in close cooperation. The separate filings were necessary because of the tight scheduling imposed by the Commission: There was time for only one ACAR meeting prior to the January 31 deadline (which was subsequently extended to February 7 at the request of the National Association of Broadcasters), and this did not permit close coordination of a single set of comments. Though the two sets comments are in general agreement most points, the League's are somewh more extensive because of the ava ability of professional staff.

HF Conflicts

The radio spectrum is a finite r source: There are just so many usab kilohertz to go around, and there a more possible uses for radio than ca possibly be accommodated. In additio

ARRL: Fixed Service needs will be far less after 1985 than they a today.

the representatives of every radio servic argue that they need, at minimum, th spectrum that is now allocated to them and usually that they need a lot mor for present and future requirement Except for some frequencies above 4 GHz, where a wavelength is less than th width of a droplet of water and a mospheric attenuation is extremel high, the spectrum now is fully a located. If one service is to expand, follows that some other service is goin to have to surrender spectrum space.

In the bands below 30 MHz, th major occupants are now the Fixe Service (point-to-point circuits), th Maritime Service (ships at sea to shor points, and vice versa), the Aeronautica Service (aircraft to ground points, an vice versa), the Broadcasting Servic (both domestic and international broa casting), Land Mobile (land vehicles t fixed points, and to one another) an

*Assistant General Manager, ARRL

the Amateur Service. The advocates of the Maritime, Broadcasting and Amateur Services are all arguing for greatly expanded allocations. The others are mainly trying to hold onto what they now have.

The Commission's Solution

There are many ways of trying to resolve this dilemma, none of which is going to make everyone happy. The way the FCC proposed to resolve it in the draft Table of Frequency Allocations in the Third NOI was as follows.

A) Slight reduction of Fixed Service allocations.

B) Major expansion for Maritime Service.

C) Moderate increase for Amateur Service.

D) Slight increase for medium frequency (standard a-m) broadcasting, *no* increase for high-frequency (international, or shortwave) broadcasting.

Better techniques could improve the utilization of existing international broadcasting bands, says FCC.

In proposing no increase for international broadcasting, the Commission noted that the proposal did not take into consideration the views of the government users of the spectrum, such as the U.S. Information Agency, which operates the Voice of America. However, the Commission did take into account the needs of the nation's private international broadcasters (at the moment, all are religious groups), the fact that the number of program hours of the world's major international broadcasters has remained essentially static for several years, and the fact that many spectrum conservation techniques which could improve the utilization of existing broadcasting bands are not being used.

HF Fixed: How Important?

The major difference between the League's and the Commission's perceptions of the best way to allocate the spectrum below 30 MHz involves the future needs of the Fixed Service. Since the last general WARC in 1959, the most heavily used circuits in the Fixed Service have shifted at an ever increasing rate to undersea cable, landline, microwave links and satellites. All of these alternative methods of communication provide higher quality and greater capacity than is possible below 30 MHz. For example, a single geostationary satellite now has a bandwidth of 500 MHz, more than *18 times* the width of the entire high-frequency spectrum, and the same set of frequencies can be reused by dozens of satellites because of the narrow antenna beamwidths involved.

The concern the Commission voices is for the developing nations, who, according to the Commission, ". . . will have a large and continuing need for Fixed Service allocations, primarily to satisfy internal national (domestic) communication requirements." This consideration has caused the Commission to propose less reduction in the Fixed Service bands than one would expect from looking only at the needs of the U.S., which has essentially no nongovernment Fixed Service operations in the high-frequency bands.

There is a critical need for new amateur allocations at 10, 18 and 24 MHz.

The League's Solution

In its response to the Third NOI, the League argues that further reductions in the Fixed Service allocations should be made. The 1979 WARC will establish frequency allocations for the remainder of this century; Fixed Service needs will be far less after 1985 than they are today, or will be in 1979. Also, ITU policy is to reserve the frequencies between 5 and 30 MHz for long-distance communications, not for the domestic communication requirements referred to by the Commission. Finally, the very availability of inexpensive, poor-quality communications may actually retard the economic development of nations, by forestalling the creation of the higher-quality telecommunications services which are necessary for a dynamic society.

The Amateur Service is expanding worldwide at a rapid rate; projections show that a total of six-million amateur stations by the year 2000 is quite likely.

The League counterproposes 300-kHz shared allocations at 10, 18 and 24 MHz.

To accommodate this growth, new and expanded high-frequency allocations are needed. The Commission has recognized some of this need by proposing the slight expansion of some existing bands. However, says the League, there is a critical need for *new* allocations at 10, 18 and 24 MHz, in order to increase the number of hours when communication is possible between widely separated points on the globe. The need at 10 MHz is especially critical, because of the wide gap between the existing bands at 7 and 14 MHz and because the 7-MHz band is not wholly usable as a result of interference from other services, notably the Broadcasting Service. The lack of a better allocation below 14 MHz for international communications has created difficulties in maintaining circuits under emergency conditions in the evening hours.

The League proposes the following solution: Allocate 300 kHz at 10, 18 and 24 MHz on a shared basis to the Fixed and Amateur Services. While sharing is generally undesirable in the bands between 4 and 27.5 MHz, because of the worldwide nature of propagation at these frequencies, sharing is entirely practical in this particular instance:

1) Because of the cost of new equipment and the need to erect new antennas, it will take several years for the Amateur Service to fully occupy any new band.

2) At the same time the increase in amateur occupancy is taking place, the needs of the Fixed Service will be declining.

3) The needs of the Fixed Service are greatest during the hours of normal commerce; because most hams are working during those hours, the needs of the Amateur Service are greatest at other times: evenings and weekends.

The sharing arrangement with the Fixed Service is a realistic solution to the problem of expanding one service without seriously impairing another.

4) Stations in the Fixed Service are assigned to specific frequencies. Amateurs, on the other hand, routinely select and adjust their operating frequency within a band so as to minimize interference. Therefore, amateurs have the flexibility that is needed to avoid interfering with other stations.

5) Stations in the Fixed Service communicate over specific paths, with relatively high power, using sophisticated equipment, with directional antennas for both transmitting and receiving. The possibility of harmful interference by an amateur to a Fixed Service circuit is remote.

Naturally, this sharing arrangement would not be as desirable as an exclusive allocation and does not provide for the requirement of 500 kHz per band which was identified by the ACAR. However, it represents a significant improvement over the present situation and is a realistic solution to the problem of accommodating growth in one service without seriously impairing another.

Other Problems Below 30 MHz

In its comments in response to the Commission's Third Notice of Inquiry

in Docket 20271, the League addressed several other problems below 30 MHz. At 160 meters, the Commission proposes an exclusive allocation of 100 kHz to the Amateur Service, along with 50 kHz shared. The League argues that the Commission has been too generous in continuing obsolete allocations in this part of the spectrum, and urges that the 50-kHz shared band be expanded to 100 kHz. At 40 meters, the League points out that the problem of incompatible sharing between the Amateur and Broadcasting Services has not been addressed. Three solutions are suggested,

A shift in the 15-meter band is unnecessary and undesirable.

short of eliminating the Broadcasting Service (in Regions 1 and 3) entirely from the band: a reasonable power limitation on broadcast transmitters, a mandatory technical standard requiring the use of single-sideband, full-carrier emission, and a ban on the all-too-common practice of transmitting the same program on several frequencies in the same band at the same time. At 15 meters, where the Commission proposes a shift in the band from 21.0-21.45 MHz to 20.7-21.2 MHz, the League points out that such a shift is unnecessary and undesirable. While a slight expansion of the band is justifiable and desirable, the requirement for expansion of the 21-MHz band is not nearly as great as the requirement for new bands at 10, 18 and 24 MHz.

Sharing between amateur and CB at 220 MHz is wholly impractical, for a number of reasons.

In the case of the other bands below 30 MHz, the League's comments are generally supportive of the Commission's proposals and express appreciation for the Commission's recognition of the legitimate needs of the Amateur Service.

VHF: More Sharing Proposed

Above 30 MHz, the major battle that is shaping up doesn't involve the Amateur Service at all: It pits the uhf television broadcasting interests against the Land Mobile community. The controversy could not be resolved before the release of the Third NOI and is likely to linger on throughout the domestic WARC proceeding. It's interesting to note in passing, however, that professional frequency managers do not regard the popularity of television viewing in this country as sufficient reason, in and of itself, to continue the present allocations to uhf television.

The major changes affecting the Amateur Service which have been proposed by the Commission are to allow amateur-satellite operation in narrow segments of several bands where satellites are not now permitted and to permit several additional services to share some of the bands now shared by amateurs and radiolocation. The League argues strongly that the proposed sharing arrangement with the Mobile Service (possibly Class E CB) at 220 MHz is wholly impractical and undesirable, for a number of reasons. Amateur occupancy of the 220-MHz band is increasing rapidly, as the 144-MHz band becomes overcrowded in many parts of

The solution for CB lies at 900 MHz, where sufficient spectrum space is available for future expansion.

the country. Furthermore, other countries operate vital services in or immediately adjacent to the 220-MHz band — services which could not tolerate interference from the CB equipment which would inevitably find its way into these countries, whether legally permitted or not. The solution for CB lies at 900 MHz, where sufficient spectrum is available to accommodate any contemplated expansion; there is no logic whatsoever in establishing an interim, ultimately inadequate, CB allocation at 220 MHz when adequate spectrum already has been identified at 900 MHz, and when the technology already exists to utilize it. While the League is hopeful that both CB and amateur needs can be accommodated in new allocations at 900 MHz, from the amateur viewpoint, our needs at 220 MHz have priority.

Inadequate information is available to assess some of the other sharing proposals. However, the League stresses that sharing at 420 MHz must continue to be limited domestically to *govern-*

ment radiolocation in order to be ceptable.

The League proposes a worldwi amateur allocation at 50 MHz, in ord to encourage the investigation of pro agation phenomena at this frequenc The League also urges that amateu continue to have access to the 48-GH band, which the Commission propos for a combined maritime and aer nautical satellite system, since such system is years, if not decades, awa from being operational.

The Next Steps

As announced in March "Leagu Lines," a copy of the League's filing available from Headquarters. Just send 9 × 12 inch envelope with $.30 posta for third-class mail, or $.90 for fir class. The League's comments were file with the Commission on February Interested parties had until February to file reply comments, in effect cor menting upon the comments. Th League examined the comments filed b others (a four-foot stack of paper!) ar replied as appropriate.

What's happening next? By now, th FCC staff has had a chance to consid the comments and replies and to draft new table, reflecting, insofar as possibl the additional needs identified in th comments. The new draft table the must be cleared with the governmen users of the spectrum and presented t the FCC Commissioners for their ap proval. By the end of April a Fourt Notice of Inquiry should be on th streets for another round of commen and replies.

By the end of April a Fourth Notice of Inquiry should be on the streets.

The proposals contained in the Thir NOI were tentative and incomplete, bu release of the draft Table of Frequenc Allocations in that form was necessar in order to initiate discussion. Consid erable fine-tuning of the Table remain to be done. This will be the majo preoccupation of the FCC's Inte national Conference Staff for the re mainder of the year. Seeing that th legitimate needs of the Amateur Servic are adequately considered will be th major preoccupation of the League own WARC team. QST

Strays

STOLEN EQUIPMENT

□ SWAN 350, serial no. C132403, with mic and ac power supply. Stolen during Christmas '76 holiday season from amateur/Navy MARS Club station in Stockton, CA. Report info to Commanding Officer, Naval Communication Station Stockton, Stockton, CA 95203. Telephone 209-944-0582.

□ Stolen from locked car in Lowel MA, Jan. 15, 1977. Clegg Mark 3, seria no. 750117, with engraved marking no A1177 on rear. Emile T. Timko W3OHX, S.W. 17th St., Hazleton, P. 18701.

Demise of the Computer Kid

Is QSO subject matter "fill-in-the-blank"? What happens when the ultimate automated station assumes human qualities? It may occur sooner than you think!

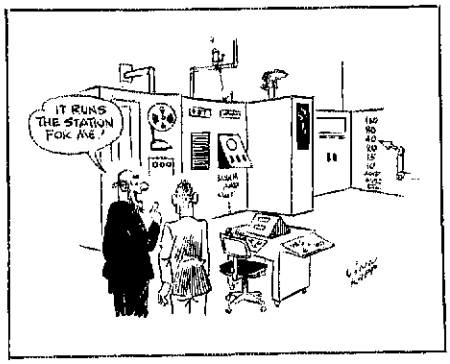
By L. Foord,* VE3FLE

Within our ranks there are those who, because of their technical expertise, rise head and shoulders above the rest. Each community has such a person. Ours was Zach: local wizard, mentor to young and old alike, the guiding light for anyone lost in the darkness of electronic confusion. Zach had been an amateur as long as I had known him, and probably long before. He wasn't very active in the operative sense; his time was reserved for endless experiments in his basement. I cannot recall the time when Zach could not solve a mysterious problem or offer the proper advice on some anticipated project.

One could not help but contemplate the reality of applying that mass of hardware to any worthwhile amateur radio project.

Long before the computer age began to align itself with our hobby, Zach was deep into the subject. When the armed services obsoleted some of their original computer equipment, Zach was the first on the scene. One wall of his basement was lined with those monstrosities, symmetrical rows of dials, meters and flashing lights. The vision was certainly awe-inspiring, yet one could not help but contemplate the reality of applying that mass of hardware to any worthwhile amateur radio project.

*763 Gladstone Dr., Woodstock, ON, Canada N4S 5T1



Undaunted, however, Zach worked away and it wasn't long before we were summoned to his house one evening to witness his triumph. With baited breath we stood before the massive array, patiently awaiting some new development in electronic technology.

"What does it do?" an eager voice asked.

With baited breath we stood before the massive array, patiently awaiting some new development in electronic technology.

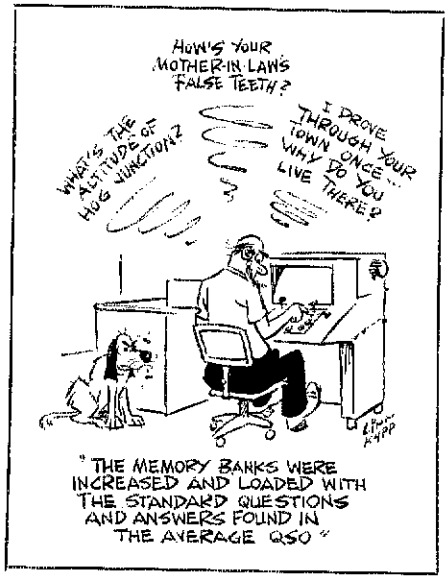
"It runs the station for me," and he proceeded to give a demonstration. The Morse code was converted to Baudot, the call applied against a memory bank and, if the station was a new country for Zach's DXCC, there was a quick murmur of clicking relays and the computer would call the station and exchange reports with him. Everything was conveniently printed by the computer, right down to the log entry and QSL card. While Zach sat at the workbench, he was racking up new countries.

There were drawbacks: Once Zach inadvertently interrupted a QSO in progress, another time he thanked a W8 for being a new country. But all new systems have bugs and Zach soon had them ironed out.

And he didn't stop there. He was constantly abreast of the latest developments. As the early versions of solid-state computers came on the surplus market Zach soon acquired one. One would think that with the advent of miniaturization Zach would have gained space in his cluttered basement. But as one heavy monstrosity was replaced by a compact cousin, he soon filled the space with more equipment, and each acquisition improved his versatility immensely. His achievements became remarkable.

He moved into ssb with an ingenious maze of electronics that performed his end of the QSO. The memory banks were increased and loaded with the standard questions and answers found in the average QSO. His perfection reached the degree where he could carry on a complete QSO without attending the rig at all, and the other operator would not even know he was talking to a computer-triggered recording. Zach covered all the bases. Should a question be asked during one of these automatic QSOs to which he had not programmed a reply, the computer would merely claim QRM until his contact either gave up or asked another question.

We also used Zach in another fash-



ion. He was the source of inspiration for us and if one felt his interest in amateur radio waning, a visit to Zach was sufficient to send us home bursting with new-found enthusiasm. It was on one such visit to Zach's that I witnessed his ultimate demise at the hands of technology.

Downstairs in his basement I found myself a chair while he returned to his position huddled over the workbench. Etiquette called for silence while he was working. When the time came, Zach would come out of his shell and explain what was happening. A half hour passed during which he emitted no more than a few grunts and a couple of indiscernible murmurs.

During this time my eyes roved about the room, lost for a time in a science-fiction daydream. The length of the room was occupied by the impressive row of computers and their associated paraphernalia, leaving barely enough room to walk by. At one end was his workbench, above it shelves of parts and rows of manuals and texts. At the far end of the room on a small desk was his rig, dwarfed by the rest of the equipment. Beside that was the terminal and keyboard with which Zach communicated with the computer. It was heavenly vision to every technician.

Should a question be asked to which he had not programmed a reply, the computer would merely claim QRM until his contact either gave up or asked another question.

"This," he announced, taking the printed-circuit card he had been working on and shoving it in the rack alongside its relatives, "is my new brain-child." I raised my eyebrows questioningly. "I think I've finally come to a new height in my career," he went on proudly. There was a look on his face – I could not help but compare it to the mad scientist in the horror movies – clearly spelling the pride in his achievement. "It occurred to me that I've been spending so much time fooling around with the electronics of the hobby that I have absolutely no time left for the pure pleasure of it, that is operating. Do you know that I haven't had a QSO for over two years?"

"I was just talking to you on 2 meters coming over here," I protested.

He frowned at me. "That wasn't me. You were talking to the computer."

"Right," I conceded. I should have known.

"I feel like I've been missing an integral part of the hobby – the day to day contact with fellow amateurs. Oh, I know," he said leaning back in his chair and staring wistfully into space, "I've got the programming down so pat I can anticipate 95 percent of the questions any given contact might present. But I sometimes think I might be setting a kind of precedent in amateur radio by having an automatic station. I think it's destroying one of the fundamentals of the hobby."

"I feel like I've been missing an integral part of the hobby – the day to day contact with fellow amateurs . . ."

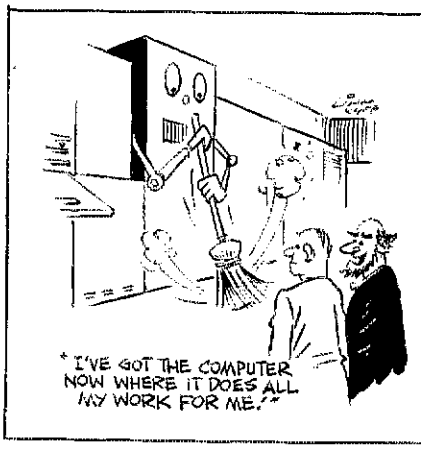
"But," I argued, "the hobby was built on experimentation. In fact, that is actually what our licenses are for."

"True enough," he replied. "But the reason for the success of the hobby over the years has been the day-to-day communications. An idea is born in conversation and it slowly kindles itself into a flame. Sometime along the way someone takes the initiative and transforms that idea into reality."

"That's what you're doing."

"Of course, but if everyone was like me there would be no one left to dream up new ideas. It is possible you know, that everyone might jump on the bandwagon and go to automatic stations. There wouldn't be anyone left out there engaged in simple conversation and dreaming up new ideas. The computer can duplicate everything we do as amateurs except envision new thoughts. It can develop them, but it cannot give birth to them."

I nodded in silence as he went on, talking in a deep low monotone as if I weren't even in the room. "I'm convinced that the birth of new ideas is so important that I should be working in



that field. Assuming that I have certain amount of intelligence," and h blushed slightly before continuin "then that is where I should be applyin myself."

"So what's your plan?"

"Well, I think I've got the compute to the point now where it can do all m work for me. I have fed all the technica information, every project and ever thought I've had, into it. I merely typ out instructions on the keyboard and le it do the thinking. I've even pro grammed it to continually review it own circuitry and implement all of th latest innovations. I'll be free to go o the air and talk with other amateurs. can concentrate my attention on dream ing up new ideas for the betterment o ham radio and then hand them over t the computer and let it work out th problem."

When I left Zach that evening thought he might be going mad. I coul not grasp the magnitude of his thoughts But as I mulled over his theory the nex few weeks, I slowly came to accept perhaps even understand, what he wa reaching for.

I was pleased to find him one day or 20 meters, and ecstatic when he invited me over. For a moment I was curious i I was really talking to him, or to the computer. "It's really me," he laughed "The computer's working on a problem for me."

"There wouldn't be anyone left out there engaged in simple conversation and dreaming up new ideas."

He sounded elated and I was happy for him. Perhaps he had perfected the system and now was enjoying the simpler aspects of the hobby while the computer did his work. But when I arrived and went downstairs I was in for a surprise. Instead of the neat rows of

equipment, everything was in a sorry state of disarray. Equipment was on its side, circuit boards pulled, test probes running in all directions, components strewn about the floor.

"I'm having difficulties," he confessed as he saw my bewildered look.

"What on earth happened?"

"You remember my telling you I wanted the computer to do everything for me? Well, this morning I was working a guy on 20 who had this theory about removing QRM from ssb signals by a sampling method. It sounded good so I fed the problem into the computer and went on to work another station. A little later it printed out the answer, proving to me why it wasn't feasible, so I threw the switch to *standby* because I didn't have anything else for it to do. Would you believe that the switch flipped back to *operate* by itself? I couldn't believe it!

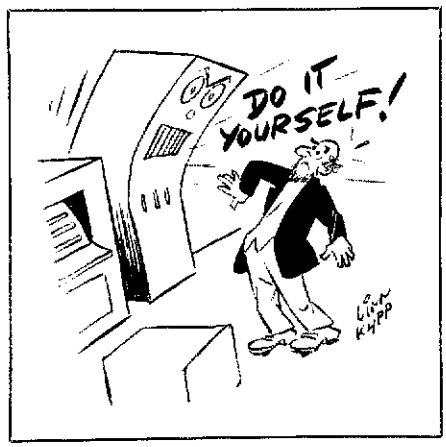
"So I sat down at the terminal and asked it what it thought it was doing. You see, this thing is so sophisticated you can actually carry on a conversation with it. Well, it said it didn't have anything to do and didn't want to sit around. It sounded kind of eerie; it was just the way I would think. I would go bananas if I didn't have something to do. So, I suggested it do some work on itself, see if there was any of its own circuitry that could be updated. It banged right back with the reply that everything was finished, it had nothing to do and wanted to go on the air. Can you imagine that? By this time I was getting angry and quite frustrated having the computer arguing with *me*. I threw the switch back to standby and sure enough the machine turned itself back on. We played that game a few times and then I got real mad and started to kick and smash things. Finally when I put it on standby it stayed there. But it looks like I've done some real damage."

Instead of the neat rows of equipment, everything was in a sorry state of disarray.

The whole incident sounded a little bizarre. After all, the computer was nothing more than a machine doing what Zach programmed it to do. Could it possibly be that a person might program a machine to such a degree of refinement that it possessed human qualities and resisted its own master? It seemed ludicrous, yet the evidence lay before me.

"What are you going to do?" I asked.

"Well, I was just in the process of checking out the circuits when you



came in. I don't mean to be insulting, but frankly you couldn't have come at a worse time. I need peace and quiet to try and figure this thing out."

I was suddenly embarrassed by my intrusion. "I'm sorry," I stuttered. "But you did tell me to come over."

He looked confused. "When?"

"About an hour ago, on 20. You said to come over and see how things were going."

As I spoke, I suddenly realized that it was not Zach I had been talking to, it was the computer. And in an instant the same thought struck Zach and his face turned chalk-white. "I've got to get this thing straightened out," he said and began to file the boards back in their places, connecting cords and flipping switches. I sat in silence watching him methodically put the equipment back into operation. While I knew my presence was hardly welcome, I couldn't resist the temptation to witness what might happen.

"It banged back with the reply that everything was finished, it had nothing to do and wanted to go on the air."

There was a deathly silence as he sat down at the terminal and I looked over his shoulder as he typed away. He entered the word "RUN" which I knew was the command to start things going. The work flashed on the display tube and instantly the reply came, "RUN YOURSELF."

Zach's face turned even whiter. Angrily he pecked away at the keys: "PROCEED WITH THEOREM 4382. SOLVE PROBLEM AND STATE HYPOTHESIS. PRINT SOLUTION DOUBLE-SPACED INCLUDING ALL FORMULA IN FORTRAN."

The response flashed across the screen: "DO IT YOURSELF. I WILL BE OPERATING 20 METERS. DO NOT DISTURB BEFORE 2200 HOURS."

The message was very clear. The computer was instructing *Zach* to do its work while *it* operated 20. I wanted to laugh at the absurdity of the situation but one glance at Zach's ghastly appearance assured me humor had no place in this situation.

Zach merely sat there staring dumbly at the screen as the computer issued further instructions: "WHEN THEOREM 4382 COMPLETED PREPARE 20 METER PROPAGATION FORECAST FOR NEXT FIVE DAYS AND CALCULATE BEST OPERATING TIMES FOR EASTERN ASIA AND SOUTH PACIFIC. REPEAT: DO NOT DISTURB BEFORE 2200 HOURS."

I could take no more. I made an excuse to leave and slipped out. Zach didn't even acknowledge my exit; he was still sitting there staring at the screen.

I wanted to laugh at the absurdity of the situation but one glance at Zach's ghastly appearance assured me humor had no place in this situation.

I didn't hear from Zach for some time afterwards. I wanted to call him up and see how he was making out but did not seem able to summon the courage. I knew that inevitably I would run into him on the air and when I finally did I was surprised to find him quite cheerful. Although I was naturally suspicious whether I was really talking to him, I eagerly accepted the invitation to visit.

When he met me at the door I could see the change in him. His face had a haunting greyish look to it and his voice seemed deeper, more melancholy than before. When we reached the basement I could see he was in the midst of another project. Circuit boards and parts were scattered over the workbench and there was a stack of textbooks propped up beside them. Along the wall the row of computers greeted me with a low hum. In the corner I could hear the rig was turned on and while the sounds were barely audible from it I was sure I could hear Zach's call sign being repeated.

"How are things going?" I asked.

"Fine, just fine."

"Getting on the air much?"

"Not much. Been pretty busy."

After a moment I asked, "Solve the problem from the last time I was here?"

"Oh yes," he replied without looking up. "Working on something else now."

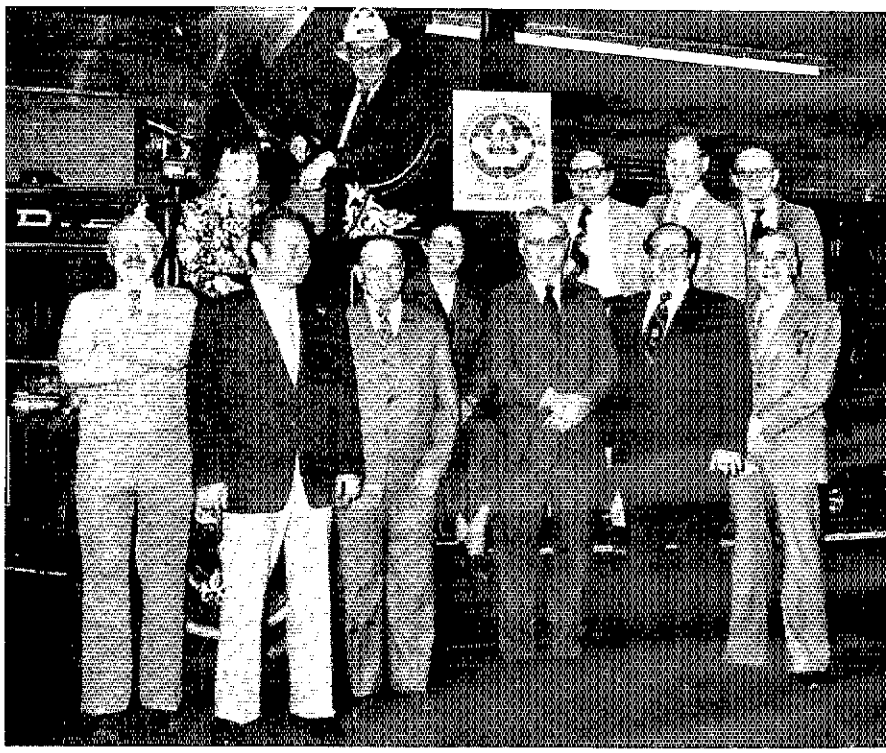
A bell rang in the corner of the room. Zach dropped whatever it was he had in his hands. He rushed over, sat down at the keyboard and began typing.

We Want You... at the National!

235 miles east of Detroit, 90 miles north of Fort Erie and Niagara Falls, 340 miles west of Montreal — all roads lead to "Communications Between Nations," the 1977 ARRL National Convention in Toronto, Canada, on June 3-5, 1977.

By Bill McDonald,* VE3ENO

Here it is, just one month away from the greatest ARRL convention yet. It has been literally years in the planning. The call sign of the Scarborough Amateur Radio Club is VE3WE, that "WE" is no mere accident. We will be there to greet you, and by *we* I mean all amateurs in the Toronto area. We Torontonians will be readying our welcome to all at the convention.



"We're all fired up to meet you in Toronto," says the National Convention Committee. Front row: VE3HOU, VE3GGD, VE3CKI, VE3BBO, Canadian Vice Director VE3AR, VE3CNA an VE3GAT. Second row: Ladies Chairman, Jean Steane, VE3FTV, VE3DAY and VE3EOD. "The Chief," VE3BMG, convention chairman, in the driver's seat.

Don't Forget Your Walking Shoes!

Last month in *QST* we gave a thumb-nail sketch of things to do and see around the metropolitan area of Toronto. This time I'll try to keep within a "walking distance" of our convention hotel.

If you stand on the sidewalk outside the Sheraton Centre Hotel, you will be facing a modern City Hall, that is a mecca for all the residents. The City Hall, although designed 20 years ago, is the most photographed building in Toronto. It was built for the people to use. Day or evening, you'll always find the City Hall Square alive with people. Now glance a bit to your left. You will see a large iron fence around a building (Osgoode Hall, our law school). The fence is unique, in that it is original, and fitted with special gates that allow free pedestrian access, but will not allow cattle to go through. That's right, cattle! Years ago, this was all a pasture area. We still try to hang on to a bit of our past.

Well, let's take a bit of a walk from the Sheraton. Just a few blocks away, you'll come to the Chinese section of Toronto; you can tell you're there when the street signs are in English and Chinese!

Hey! Ever see a real Chinese tomb from late Imperial China? A few blocks north of the Sheraton, right on the corner of Bloor Street and Queen's Park, you'll find it completely set up as it was many years ago in China. The building next to it is the ROM building (Royal Ontario Museum). This, too, is worth a look-see.

We have instant weather forecasting for you when you step out of the Sheraton Centre; just look to your left and up! There you will see the Canada Life Assurance building. It has a large tower on its roof. If the temperature is rising, the column of lights will travel up the tower, or reverse if the temperature is dropping. The light on top will show green for sunny, red for cloudy, an flashing red for rain.

Ready for a Ride? Or, for a Meal?

I think you should take at least on ride on our subway. Best spot is th front coach where you can watch th tunnel ahead of you, as you trave through it at 40 to 50 mph. Hopping streetcar can be fun, too. Like th subway (providing you don't transfer you'll always come back to your board ing point.

*87 Madelaine Avenue, Scarborough M1L 2X6

Favorite restaurant spots for Torontonians are Ed's Warehouse and the Old Spaghetti Factory. Both places are worth a trip even if you're not hungry; just to go in and look around is a tourist attraction in itself.

What's Toronto Famous for?

Well, standard time was conceived here, insulin was discovered here, and the paint roller and the batteryless radio were invented here. Until Ted Rogers came along with a radio that could be plugged into a wall socket, radios required battery packs. While you're here, tune in radio station CFRB. You're right! That RB stands for Rogers Batteryless. Without Toronto, there would be no White House in Washington, USA. Seems it needed its white-paint job due to fire damage caused by the British in retaliation for Americans burning public buildings in "York" (now Toronto). They pinched our first fire engine, too. But that was a long time ago in the spring of 1813. Ever see a streetcar trolley? It was invented here as well.

If you are attending the convention and you are confined to a wheelchair, don't worry. The whole convention complex is designed to accommodate you. Provisions have been made for guide dogs as well. If 807s are your interest, the Sheraton Centre has the longest bar in Toronto – 70 feet long – as well as the largest ballroom in Canada, 20,000 square feet. That's where our banquet will be held.

Program Notes

Let's talk a bit about our program for the convention. The activities start with registration at noon hour on Friday for the early birds. They will find a welcome coffee room and an opportunity to go up on the CN Tower to the 1,500-foot observation deck, where you still have over 300 feet of tower above you. It's kind of spooky sometimes when there are clouds below you and you're in the sunlight. There's an airport a short distance away and you can see the planes flying *below* you. All day Friday, the Ladies' hospitality suite will be available. After supper drop in for eyeballs and cocktails in the large ballroom. There's lots to do Friday, so don't worry about coming early. We'll be ready for you.

The ARRL Forum on Saturday morning will give you a firsthand idea of the operations of the Headquarters staff. We have arranged a talk and a film on the CN Tower. The engineers that built the tower will be there, as well as the people who operate the communications section. Your trouble with Field Day operations may be over after you've listened into the Field Day Forum.

The ladies program of wine tasting, micro-cooking and astrology, to name a few, will commence on Saturday. A luncheon and tour has been set up for the ladies while they are in Toronto to Scarborough's famous Guild Inn overlooking Lake Ontario. Ladies, don't miss this luncheon. The Guild is famous throughout Ontario for its beautiful setting and excellent meals. The Radio Society of Ontario will have a hospitality suite for you to put up your feet and learn about the Ontario amateur. They have decided to forego their usual fall convention to assemble together at the ARRL National Convention.

The Antique Wireless Association will have an outstanding display and will show, for the first time anywhere, a new film entitled, *Early Years of Wireless*. There will be equipment demonstrations. A talk on propagation, past and present, will be given by one of Canada's leading authorities on antennas. Many ARRL films will be continually shown. These are available to your clubs from ARRL hq. Mark down those you would like your club or your public to see. Probably one of the most important functions is public relations. A forum that has been set up will give you all the dope on publicizing and promoting amateur radio. There will be two forums on AMSAT (Canada), the morning one for beginners and the afternoon one for advanced. The Quarter Century Wireless Association will have a luncheon and forum in the Essex Room of our convention hotel.

So far, we have covered the program to Saturday noon. OK, let's keep going. Lew McCoy, W1ICP, of the Hq. staff, will give a talk on antennas. Handicapped operations of radio equipment will be demonstrated. This is where you find out how to rig up a unit for handicapped operations. Additionally, there will be a talk on microprocessors for the beginners and advanced; a DX Forum; a homebrew forum, and fast and slow-scan television will be operating and demonstrated with all the available aids and ideas. The World Administrative Radio Conference will be held in Geneva in 1979. This upcoming meeting will be the topic of a forum. The sessions close at 4:30 P.M. to get ready for our super banquet. The Ontario Trilliums (VE3TOT) will have a hospitality hour from 4 to 5 P.M.

After cocktails and eyeballs the super banquet will begin. There is no other way we will attempt to describe it. Just a super banquet in the largest ballroom in Canada, prepared by a world-renowned chef, who continally wins gold medals wherever he competes. You will be entertained by television and radio stars as well as a 10-piece orchestra. As Saturday draws to a close, the mysterious investiture into the Royal Order of the Wouff Hong will take place.

Get up early Sunday morning for a live AMSAT (Canada) demonstration across from your hotel, in the City Hall Square. MARS will hold a forum on their operations. This should prove interesting to Canadians as we have no counterpart. The Canadian DOC and the American FCC will give consecutive forums on operations pertaining to Canada and United States jointly and separately. The Canadian Division of the ARRL will have a get-together. Did you know there's a CRRL? Well, it's alive and well in Canada.

Sunday brunch will have a guest speaker, followed by the grand "Sur-Prize," and that's all we're going to tell you. We will say this much though: Several people are going away from the '77 National with big grins on their faces.

Toronto = "Meeting Place"

Before the coming of the Europeans to this area, the Huron Indians met here to trade with each other and Indians of other nations. They called this area on the north shore of Lake Ontario *Toronto*, which is a Huron Indian word for "Meeting Place" or "The Place Where We Meet." Could there really be a more appropriate place for "WE" amateurs to hold our meeting? See you at the Meeting Place . . . Toronto . . . June 3 to 5.

Call-in frequencies for convention information are VE3WE, 3818 ±0100 UTC daily; talk-in, VE3RPT, 146.46/147.06; VE3TOR, 146.34/147.94; convention hotel and area, 146.52 simplex. VE3RPT has a minimum range of 50 miles and *may* be linked to the Buffalo, NY, repeater, WR2ABU, 31/91.

The '77 National Convention special commemorative call sign VA3RRL will be used from convention headquarters on all bands and special QSL cards will be issued.

Anyone wishing to operate his amateur radio gear in Canada is requested to write ARRL hq. in Newington, for Canadian DOC form 16-52. Attend to this immediately as without proper authorization, amateur radio equipment may be refused admission into Canada or be sealed by Canada Customs.

Room accommodations at the Sheraton Centre can be made through any branch of the Sheraton International Reservation System or by writing the Sheraton Centre Hotel, 123 Queen Street, W., Toronto, Ontario, Canada M5H 2M9, and indicating '77 National Convention.

Send all inquiries regarding 1977 ARRL National Convention, "Communications Between Nations," to P. O. Box 1011, Stn. "C," Scarborough, Ontario, Canada M1H 2Z4. QST

Happenings

Conducted By Perry F. Williams, W1U

FCC News Briefs

The Commission has issued a public notice clarifying procedures for the obtaining of one-by-two call signs by Extra Class licensees. Eligibility dates established in Docket 20092 were October 2, 1976 – all whose Extra Class licenses were issued before November 22, 1967; January 1, 1977 – all whose Extra Class licenses were issued before July 2, 1974; April 1, 1977 – all whose Extra Class licenses were issued before July 1, 1976; July 1, 1977 – all Extra Class licensees.

The docket stated that the Commission would not accept prematurely filed applications. This has now been modified: They will accept applications filed within two weeks prior to the effective date. These applications will be held until that date, and processed with those arriving on the actual date. Applications received earlier than two weeks in advance will be returned. And applications should not be filed in person.

There are no fees to be filed. All fees were suspended by FCC effective January 1, 1977, to comply with a court order.

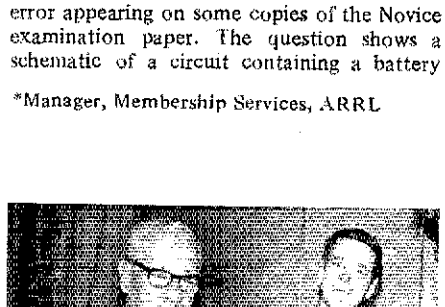
ARRL's Membership Services Department has an updated list of vacant and occupied two-letter calls as of mid-March which includes those beginning with W, K and N and which also includes the two-letter suffixes beginning with X. Please send a self-addressed envelope with 24-cents postage to MSD, ARRL Hq., Newington, CT 06111 for your copy; mention "April 2-Letter List."

Error on Novice

The Commission has notified us of an error appearing on some copies of the Novice examination paper. The question shows a schematic of a circuit containing a battery and two resistors in parallel. The voltage across both resistors is given, along with the value of one resistor. The examinee is asked to determine the value of the second resistor; however, this value cannot be determined without knowing the value of the current, which is not given.

The people who correct Novice exams are aware of this error: The question is simply skipped over, and, whether the answer is left blank or one choice is picked, it will not affect the applicant's chances of passing or failing.

*Manager, Membership Services, ARRL



Philip E. Haller, W9HPG (left), received a special service award from the Chicago Area Chapter Quarter Century Wireless Association, "in recognition and grateful appreciation of his dedicated service to amateur radio as Central Division Director, ARRL, 1963-1976." The award was presented by the chapter president, Ed Webb, W9IPO. *(W9CSA photo)*

Novice Power Includes Grids

When FCC changed the permissible power inputs for Novices last June, it inadvertently changed the definition of power, a matter not within the scope of the rulemaking under consideration. Effective February 22, Section 97.67 (d) reads:

(d) In the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial location of the station is not within Region 2), 21,100-21,200 kHz and 28,100-28,200 kHz, the power input to the transmitter final amplifying stage supplying radio-frequency energy to the antenna shall not exceed 250 watts, exclusive of power for heating the cathode of a vacuum tube."

Note that this applies to *all licensees* when using these frequencies, regardless of license class, and that the practical effect is that one must consider power delivered to the grids as well as to the anode or equivalent.

FCC Actions Toward "HFers"

The FCC has issued the following Public Notice about operations in the "10-1/2-Meter Band":

"The Commission is aware that a number of persons using single-sideband emissions (ssb), are operating on frequencies not assigned to citizens band radio. With equipment intended for amateur radio, and using false call signs, certain ssb groups have been transmitting in the 27.40- to 28.00-MHz range and above. These frequencies are currently allocated by the Commission and international treaty to the Public Safety and Industrial Services, U.S. Government and the Amateur Radio Service. Numerous complaints of interference have been received from these services. Moreover, many of these operators cause interference to televisions and other home-entertainment equipment.

"Part 95 of the Commission's Rules makes clear which frequencies are allocated for use by citizens band licensees. Transmissions on unauthorized frequencies constitute unlicensed operation in violation of Section 301 of the Communications Act, and are punishable by a fine of up to $10,000, or up to one year imprisonment, or both.

"The Commission considers out-of-band operation a major enforcement priority and will prosecute vigorously any violation."

As if to underscore the notice, FCC has designated for hearing the application of John H. Randall, president of HF Internatior (one of the ssb groups referred to the notic for renewal of a Citizens Radio Servi license. The call for the hearing mentions number of illegal activities urged or condon by HFI and its publication.

Six-Meter CW Change Requested, RM-2382

The Six Meter International Radio Kl (SMIRK) has filed a request for rulemaki with FCC which would open the frequenci 50.05-50.1 MHz to Technicians and Genera for A1 emission. At present, only Advanc and Extra Class licensees may use the freque cies 50.0-50.1 MHz; SMIRK would contin the restriction in the lower half of t segment but open the remainder in an a tempt to help vhf operators get practice in t international Morse code without either d rupting phone communications or having buy extra equipment for the lower bands.

Restrictions of Equipment Sales Asked

The San Antonio Repeater Organizatic has filed a request for amendment of t amateur rules to provide restrictions of t sales of transmitting apparatus and rf pow amplifying devices currently exempt fro regulation under the Equipment Type A ceptance or Type Approval programs. The request that the Commission establish Dealer Licensing Program for dealers engage in the sale, lease, trade, shipment or distribu tion of nontype accepted or nontype a proved transmitting apparatus at the reta level. They further ask that FCC provide f mandatory penalties for any party, wh during or after the original retail sale, delive or causes to be delivered any such tran mitting apparatus to any individual or grou of individuals not in possession of a vali license authorizing its use.

BEHIND THE DIAMOND

This month we introduce you to the person i charge of the most intensive effort the ARR has ever made to recruit newcomers int amateur radio. *Charles J. Harris, WB2CH* (known as "Chod" to his friends), has bee manager of the Club & Training Departmen since its inception in March of 1976, and without a doubt the best club & trainin manager the League has ever had. Back i January, 1976, the League set a goal o 100,000 new amateurs by the year 1979, i preparation for defense of amateur frequen cies at the 1979 World Administrative Radi Conference. The mechanism for reaching tha goal was the Club & Training Departmen Chod seems to be on the right track, fo

Chod Harris, WB2CHO

during the period from June, 1976, to January, 1977, a period of just over six months, the number of amateurs in the U.S. increased by 23,000.

Chod came to ARRL from the Taft School in Watertown, CT, where he taught advanced biology and oceanography. He was also faculty advisor of the amateur radio club, astronomy club, photography club, and masque and dagger society. He is an honor graduate of Princeton University, where he was president of the amateur radio club and photography club. He received numerous awards during those years, but the one thing he remembers best is having dinner with Janis Ian.

Chod has always had several outside interests. He once served as a congressional intern for Congressman Frank Horton. During his teaching career he wrote an advanced-placement biology laboratory manual and an oceanography textbook. He enjoys photography, astronomy and backpacking. When the pressures of the job start to get to him he will take off alone for some mountain in Arizona, with only minimal sustenance.

He is also very active on the ham bands. Until coming to the League in 1975, he was the manager of the Daytime First Region Net of the ARRL, and a member of the Eastern Area Staff of the National Traffic System of ARRL. He still enjoys traffic handling, and in addition is active in DXing, contesting and OSCAR communications. He is active as WA1SQB from his home in Bloomfield, CT.

Chod takes a lot of kidding from his colleagues at Hq. One question he's often asked is, "Isn't it unusual that someone with the nickname 'Chod' would get WB2CHO as a call sign?" Let's set the record straight; there was no under-the-counter deal. Chod did not ask for WB2CHO. Actually, he asked for WB2CHOD. – *K1FHN*

CLUB PUBLICATIONS CONTEST

Each year the Amateur Radio News Service conducts a competition for amateur radio club journals published in the U.S. and Canada. The rules for this year's contest conducted for the purpose of identifying and rewarding excellence in amateur radio journalism, are the following: Applicants participate by submission of their issuances, as outlined below. Up to three places (ties may be recognized) of standing in each of the following six categories may be determined by the judges.

A) Publications wholly or partially subsidized by interests other than individual members of the issuing agency. (Examples: *The AT&T ARC News Bulletin, The West Coast FM Bulletin, Hoosier Howlers*) Class A-1: local club, less than 50 members; Class A-2: local club, 50 members or more; Class A-3: multiple club, section, division, area.

B) Publications prepared solely from the resources of the club's membership. Class B-1: local club, less than 50 members; Class B-2: local club, 50 or more members; Class B-3: multiple club, section, etc.

General-circulation magazines and professional-type journals are not eligible for consideration. Applicants agree to the decisions of the judges, which are final. Winners will be announced and appropriate certificates issued on the basis of the following considerations.

A) General format
B) Member contributions
C) Editorials
D) Club activity coverage
E) Recruiting activity and training
F) Technical articles

Participants are required to submit three separate 1976 issuances (of their choice) to each of the addresses listed below, so as to arrive not later than April 15, 1977. Each mailing (of three issues) is to be accompanied by a letter signed by the presiding official of the organization concerned noting (A) class of entry, (B) name and address of editor, (C) official name and mailing address of the issuing agency, (D) average monthly membership (or subscribers, where applicable) during the period for which entries are submitted, and (E) monthly average number of copies distributed during the same period. Material submitted will be returned only if requested and accompanied by appropriate s.a.s.e. Norm Monro, K4FRY, 215 Brindley St., Gadsden, AL 35901; Phil Sager, WB4FDT, 3827 N. Abingdon, Arlington, VA 22207; Lee Knirko, W9MOL, 222 S. Riverside Plaza No. 2400, Chicago, IL 60606.

ARRL HELPS WITH OSCAR 8

Just when interest in the amateur satellites is at an all-time high, "Murphy's Law" strikes – both OSCARs now in orbit show signs of deterioration. Not that the situation was unexpected: AMSAT-OSCAR 6, with a design lifetime of one year, is well into its fifth year of operation. AMSAT-OSCAR 7, the most sophisticated yet, will reach its design goal of three years this November.

In order to maintain the many ongoing amateur satellite programs, especially the Education Program that brings the excitement of live satellite communications into schools across the U.S. and Canada, another OSCAR should be launched as soon as possible. To this end, ARRL has explored the possibility of engaging a project manager at Hq. to coordinate the satellite program. Unfortunately, we could not come to terms with a suitable candidate, so another approach has been adopted.

ARRL has agreed to reimburse AMSAT for $50,000 of its development and construction costs for AMSAT-OSCAR 8, provided the spacecraft achieves the desired orbit and functions properly. (This proviso isn't as arbitrary as it sounds: AMSAT will be insured against launch failure!) Additionally, the League will take over licensing and operational management, with AMSAT personnel serving as technical consultants when necessary. Once in orbit, with its name changed to AMSAT-OSCAR 8, the satellite will be considered to be in the public domain, not owned by either AMSAT or ARRL.

Two ARRL staffers, Clarke Greene, WA1JLD and Ed Kalin, WA1JZC, will assist AMSAT with final construction and testing of A-O D. With the ARRL's financial and technical assistance, the eighth amateur satellite should meet its November launch schedule, while allowing AMSAT volunteers to continue work on the revolutionary Phase III satellite. – *WA1ZIY*

Lloyd Colvin, W6KG/VP2VDJ (left), past director of the ARRL Foundation, stopped during a *Yasme* DXpedition to visit Bob Denniston, WØDX/VP2VL, ARRL honorary vice president, past president, and past president of IARU. Bob is owner/operator of the Smugglers Cove Hotel on Tortola, BVI. *(W6QL photo)*

WA5VJX NEW VICE DIRECTOR

Thomas W. Chance, Jr., WA5VJX, of Grapevine, TX, has been appointed by ARRL President Dannals to be vice director from the West Gulf Division. (The vacancy was created by the resignation of Douglas N. Brooke, K5YHX, because of a change in employment which renders him ineligible.)

Tom is 49 and holds the Amateur Extra Class license. He is in business as a real-estate broker. WA5VJX may be heard in the amateur bands from 80 meters through 50 MHz on phone and cw. The new vice director currently serves as public relations assistant of the West Gulf Division and as net control station for Skywarn 2-Meter Net of Ft. Worth/Tarrant County Civil Defense. He is a former director, Hurst Amateur Radio Club, vice president Southwest Radio Council, and co-chairman, 1973 West Gulf Division Convention. Ham radio is a family affair: Tom's wife Ruth is WA5VJW.

FCC EXAMINATION SCHEDULE

These schedules change from time to time, and thus it would be advisable to verify the

examination times by phone before visiting an FCC office. Of course, no tests are administered on national holidays. Additional examination points are listed after the office schedule in most districts; at such places, appointments should be made during the month previous through the district engineer. He will probably ask that the completed form 610 be filed in advance. An applicant may appear at any FCC examination point regardless of where he lives. Recent changes are in italic.

1) Boston, MA 02109; India & State Streets. Wed., 9 A.M. Also conducts examinations at Bangor, ME in Feb. and Aug.; Hartford, CT in Jan., Apr., July and Oct.; Portland, ME in May and Nov.; Burlington, VT in Apr. and Oct.

2) New York, NY 10014; 201 Varick St., corner of Houston. Wed., 9 A.M. Also conducts examinations at Albany, NY in Mar., June, Sept. and Dec.

3) Philadelphia, PA 19106; 601 Market St. Without code test, Mon.-Wed., 10-12 A.M.; with code test, Tues.-Wed., 8:30 A.M.

4) Baltimore, MD 21201; 823 Geo. M. Fallon Federal Bldg., 31 Hopkins Plaza. With code, Mon., 8:30 A.M.; no code required, Mon. and Fri., 8:30 A.M.-noon.

5) Norfolk, VA 23502; Military Circle, 870 North Military Highway. Thurs., 9 A.M. Also conducts examinations at Salem, VA in Apr. & Oct.; Wilmington, NC in June and Dec.; Winston-Salem, NC in Feb., May, Aug. and Nov.; Charlotte, NC in Jan. and July.

6) Atlanta, GA 30309; 1365 Peachtree St., N.E., Rm. 440. Tues. and Fri. 8:30 A.M.-noon; exams with code test, Fri. only 8:30 A.M. Also conducts examinations at Birmingham, AL in Mar. and Sept.; Montgomery, AL in June and Dec.; Albany, GA in Feb. and Aug.; Columbia, SC in May and Nov.; Knoxville, TN in Mar., June, Sept. and Dec.; Memphis, TN in Jan., Apr., July and Oct.; Nashville, TN in Feb., May, Aug. and Nov.

6S) Savannah, GA 31402; Bull and State Sts., P. O. Box 8004. By appointment one week in advance only.

7) Miami, FL 33130; 51 S.W. First Avenue. Exams with code test, Thurs. 9 A.M.; others, Tues and Wed., 8 A.M.-1P.M. Also conducts examinations at Jacksonville, FL in Apr. and Oct.

7T) Tampa, FL 33602; 500 Zack Street. By appointment only, made one week in advance.

8) New Orleans, LA 70130; 600 South Street, Rm. 829. With code, Tues., 8 A.M.; others, Tues.-Wed., 8:30-noon. Also conducts examinations at Jackson, MS in June and Dec.; Little Rock, AR in Feb., May, Aug. and Nov.; Shreveport, LA in Apr. and Oct.; *Mobile, AL in Jan., Apr., July and Oct.*

9) Houston, TX, 77002; 515 Rusk Avenue. Without code, Wed., 9 A.M. to noon; with code, Wed., 8 A.M. Also conducts examinations at San Antonio, TX in Feb., May, Aug. and Nov.; Corpus Christi, TX in June and Dec.

9B) Beaumont, TX 77701; Rm. 323, Fed. Bldg., 300 Willow Street. By appointment only, one week in advance.

10) Dallas, TX 75202; Rm. 13E7, Federal Bldg., 1100 Commerce St. Tues. 9 A.M. Also conducts examinations at El Paso, TX in June and Dec.; Lubbock, TX in Mar. and Sept.; Oklahoma City in Jan., Apr., July and Oct.; Tulsa in Feb., May, Aug. and Nov.

11) Long Beach, CA 90807; Suite 501, 3711 Long Beach Blvd. With code, Wed., 8:30 A.M. and 1 P.M.; no code required, 8:30 A.M.-2P.M. Also conducts examinations at Bakersfield, CA in May and Nov.; Las Vegas, NV in Jan. and July; Phoenix, AZ in Jan., Apr., July and Oct.; Tucson, AZ in Apr. and Oct.

The Blue Valley Amateur Radio Club presented a set of ARRL publications, including the *Tune in the World* casette and booklet, to the Seward, NE, public library. In the photo (from left), Frank W. Kinnamon, KØCDI; Violet Wilson, WØZWG; John Odell, WØZOU and Librarian Sandra Steinbach. Your ARRL affiliated club can do the same for your library, at $35, which is approximately half retail cost. With your order please include the written assurance of the library that it is willing to accept the gift for display and circulation.

11SD) San Diego, CA 92101; 1245 Seventh Avenue. By appointment only, one week in advance.

12) San Francisco, CA 94111; 555 Battery Street. Fri., Extra 8:30 A.M.; others with code, 10 A.M.; without code, 8:30 A.M. Also conducts examinations at Fresno, CA in Mar., June, Sept., and Dec.; Reno, NV in Apr. and Oct.

13) Portland, OR 97204; 1782 Federal Office Bldg., 1220 S.W. 3rd Ave. Fri. 8:45 A.M. Also conducts examinations at Boise, ID in Apr. and Oct.; Pocatello, ID in Nov. and June; Medford, OR in Sept. and May.

14) Seattle, WA 98174; 3256 Federal Office Bldg., 915 2nd Ave. Fri. 8:30 A.M. Also conducts examinations in Billings and Helena, MT in Apr. and Oct.; Spokane, WA in Feb., May, Aug. and Nov.

15) Denver, CO 80202; Suite 2925, The Executive Tower, 1405 Curtis St. 1st and 3nd Wed., 8:30 A.M. Also conducts examinations at Albuquerque, NM in Apr. and Oct.; Rapid City, SD in May and Nov.; Salt Lake City, UT in Mar., June, Sept. and Dec.; Casper, WY in May and Nov.

16) St. Paul, MN 55101; 316 N. Robert Street, Fri. 8:45 A.M. Also conducts examinations at Bismarck, ND in Feb. and Aug.; Fargo, ND in June and Dec.; Marquette, MI in May and Nov.; Sioux Falls, SD in Apr. and Oct.; Duluth, MN in Mar. and Sept.

17) Kansas City, MO 64106; 601 E. 12th St., 1703 Fed. Bldg. Tues., 9 A.M. Also conducts examinations at Des Moines, IA in Mar., June, Sept. and Dec.; Omaha, NE in Jan., Apr., July and Oct.; St. Louis, MO in Feb., May, Aug. and Nov.; Wichita, KS in Mar. and Sept.

18) Chicago, IL 60604; Rm. 3935, 230 S. Dearborn Street, Fri., 8:45 A.M. Also conducts examinations in Rock Island, IL in Feb., May, Aug. and Nov.; Fort Wayne, IN in Feb., May, Aug. and Nov.; Indianapolis, IN in Jan., April, July and Oct.; Louisville, KY in Mar., June, Sept. and Dec.; Milwaukee, WI in Mar., June, Sept. and Dec.

19) Detroit, MI 48226; 1054 Federal Bldg., 231 W. Lafayette St. Fri., 9 A.M. Also conducts examinations in Grand Rapids, MI in Jan., Apr., July and Oct.; Cincinnati, OH in Feb., May, Aug. and Nov.; Cleveland, OH in Mar., June, Sept. and Dec.; Columbus, OH in Jan., Apr., July and Oct.; Charleston, WV in Mar., June, Sept. and Dec.

20) Buffalo, NY 14202; 1307 Federal Bldg., 111 W. Huron St., Fri., exams with code, 9 A.M.; others, 10 A.M. Groups of 10 or more by appointment. Also conducts examinations at Pittsburgh, PA in Feb., May, Aug. and Nov.; Syracuse, NY in Jan., Apr., July and Oct.; Wilkes-Barre, PA in Mar. and Sept.

21) Honolulu, HI 96808; 502 Federal Building. Wed., 8 A.M. and by appointment. Also conducts examinations in Guam, in July, Sept., Nov., Jan., Mar. and May; in Hilo, in Aug., Nov., Feb. and May; Lihue, in Sept., Dec., Mar. and June; in Wailuku, in Aug., Nov., Feb. and May.

22) San Juan, PR 00903; 323 U.S. Post Office and Courthouse, P. O. Box 2987, Thurs.-Fri., 8:30 A.M. or 1 P.M. by appointment only; exams with code test, Fri., 10 A.M. only.

23) Anchorage, AK 99510; U.S. Post Office Bldg., Rm. G-63, 4th and G Sts.; P. O. Box 644, Mon.-Fri., 8 A.M.-noon; exams with code test, Mon.-Fri. by appointment only. Also conducts examinations in Fairbanks in Jan., Apr., July and Oct.; Juneau and Ketchikan, in May and Nov.

24) Washington, DC 20554; 1919 M. Street, N.W. Rm. 411. Fri., 9 A.M. and 10:30 A.M.

CANADA MOVES AGAINST AMPLIFIERS/BEACONS

The Department of Communications has proposed amendments to its regulations which would control the sales and use of external radio-frequency power amplifiers and of emergency beacons for 121.5 and 243 MHz.

With respect to amplifiers, one paragraph prohibits use of the devices to boost the output of a station performing a General Radio Service (that is, a "citizens band" station). The following paragraph requires anyone selling an external radio-frequency amplifier to record complete details of the sale, secure the signing of a declaration by the purchaser that the rules are understood and that they will not be violated, and then to send both documents to the Director, Operations Branch, DOC, Ottawa, within 10 days.

The emergency beacons were intended for use by downed aircraft and sinking ships only, but have been bought by hunters, skimobilers, survey crews and the like. The resultant inadvertent operations and false alarms have increased alarmingly, DOC says, with corresponding increase in expense to search and rescue units. The proposed rules would prohibit use of the devices except in connection with downed aircraft or sunken ships and would require the same sales controls as are proposed for amplifiers.

Comments may be filed with Director Operations Branch, Telecommunications Regulatory Service, 300 Slater Street, Ottawa K1A 0C8 immediately.

International News

Conducted By Bruce A. Johnson,* WA6IDN/WA1ZQP

Lord Wallace: New Leader for British Amateur Radio

On Saturday evening, January 22, IARU President Noel Eaton, VE3CJ, and this writer were guests at the installation of Lord Wallace of Coslany as the new president of the Radio Society of Great Britain. Though himself not a licensed amateur, Lord Wallace demonstrated clearly that he is thoroughly informed about RSGB affairs and about amateur radio the world over.

The setting lent an impressive air to the occasion: The reception was held in the House of Commons of the British Parliament. Many an amateur who began as a shortwave listener can recall hearing Big Ben chime out on the BBC broadcasts. To hear it chime from within the walls of the centuries-old institution was to be reminded that this was the source of so many of the ways of the Western world.

Following the ceremony, Lord Wallace remarked that he had chosen the setting with good cause: to catapult the RSGB still further into the limelight of British official life. Indeed, with WARC-79 on the horizon, the RSGB is included regularly in government discussions concerning WARC and telecommunications. Amateur radio is seen as a vitally important service in Great Britain, and will be represented on the British WARC delegation. Remarking further on his choice of the Houses of Parliament for his installation, Lord Wallace said, "This venue is unique and deliberate. I hope it will mark an even closer link with authorities and a greater recognition of the Society's place as an important section of the English community."

The RSGB is making important progress on other fronts, as well. It was a proud Headquarters staff that showed this writer its new membership services computer two days later. Although physically small, the floppy-disc IBM brain is capable of handling several different programs in a matter of seconds without manual disc changes. Each master entry indicates the member's name, address, call sign, district, membership status, expiration date and IARU region. In addition, the computer terminal prints the mailing labels for the monthly *Radio Communication* journal, commercial statements for supply and book orders, and the labels for the latter. General Manager George Jessop, G6JP, observed that the system is already paying for itself, for the computer's printing of presorted postal codes on the labels has resulted in a substantial discount on mailing fees from the Post Office.

In short, the RSGB appears to be in excellent health, and making splendid efforts toward the promotion of amateur radio in Great Britain. We congratulate the Society on its fine work, and we congratulate Lord Wallace on the occasion of his installation as 43rd president of the Society. We can only second his observation that "the world would be a happier and more peaceful place if the worldwide brotherhood involved in amateur radio existed in international affairs."

WORLD TELECOMMUNICATION DAY, MAY 17

Each year, the International Telecommunication Union sponsors World Telecommunication Day on May 17, the anniversary of its founding in 1865, to call attention to the importance of telecommunications in today's world. This year, the theme of the observance is "Telecommunication and Development." Radio amateurs traditionally have played an important role in the special activities surrounding the event, operating special stations with the "ITU" suffix and participating in contests on the weekends before and after May 17. "Operating Events" this month carries details on the contests, which are sponsored by the Brazilian Ministry of Communications.

GENEVA: GETTING READY

The importance to amateur radio of the 1979 World Administrative Radio Conference cannot be overstated. In recent months you have read a great deal in *QST* about preparations taking place in the U.S. and Canada. Our countries have only one vote apiece at such a conference, though, so it is crucial that amateur radio be supported by a broad spectrum of nations. It is to this end that the International Amateur Radio Union devotes its efforts.

What makes the 1979 conference so important is that it is a *general* conference, affecting all of the services which share the radio spectrum. Specialized conferences dealing with specific services or problems take place on a continuing basis. Such a conference dealing with the broadcasting-satellite band at 11.7 GHz was held in Geneva during January and February of this year. While this conference had no direct bearing on the Amateur Radio Service, it afforded the IARU an opportunity to attend as an officially recognized international organization and to observe how such a conference is conducted. IARU President Noel Eaton, VE3CJ, and this writer attended the opening days of the conference in order to gain experience which should prove valuable at the 1979 WARC.

Attendance at the conference also gave us the opportunity to meet the delegates from more than 100 member-nations of the International Telecommunication Union, and to discuss with many of them the benefits of supporting a strong Amateur Radio Service in their countries. We underlined the contributions which amateur radio can make to national growth and technological progress, especially through self-training in communications and electronics. On Tuesday evening, January 18, the IARU and the International Amateur Radio Club (4U1ITU) jointly hosted a reception for the heads of the national delegations to the Conference. More than 120 persons attended.

Many of the officials who attended the Broadcasting-Satellite Conference will return to Geneva in 1979 to represent their countries at the general WARC. They will not be unfamiliar with radio amateurs, or with the benefits to be derived from supporting the Amateur Radio Service.

Presidents all: Lord Wallace of Coslany, the new president of RSGB; John Allaway, G3FKM, immediate past president; and Noel Eaton, VE3CJ, president of IARU, in the House of Commons, London.

Heads of delegations and amateurs attending the ITU Broadcasting-Satellite Conference in Geneva were invited to a reception sponsored jointly by the IARU and 4U1ITU. Among the delegates present were (l-r) Dexter Anderson, K3KWJ/W4KM, USA; H. Goetze, DM2HGO, German Democratic Republic; and W. Kahle, head of delegation, German Democratic Republic.

*International Services Assistant, ARRL

Washington Mailbox

Conducted By Harold M. Steinman,* K1FHN

A NEW LOOK

This issue of *QST* opens a new era for "Washington Mailbox." We are expanding to a full page. And unless this is the managing editor's idea of an April Fool gag, we will remain at a full page from now on. The reason for expanding the column is simple: You – the readers – have liked the column, and have said so. For your expression of support I am deeply grateful; I will do my best to live up to your expectations.

This new expanded format will allow us to do several things. It will allow us to treat more topics, and to treat those topics more thoroughly. We will be able to delve into subjects that, because of space restrictions, we were not able to discuss before: questions that by their very nature preclude the possibility of short answers. Finally, we hope the expanded column will be more attractive, more readable, and a greater service to members.

CALL SIGNS

Q. I know that holders of the Amateur Extra Class license who meet certain requirements as to when they first obtained their Extra Class ticket are eligible to apply for specific 1×2 call signs. Has the FCC said anything yet about specific 1×3 call signs?

A. No. Specific 1×3 call signs are, at this time, not available for the asking. Random issue 1×3 call signs are available to past 1×3 holders, or to present 1×3 holders who move to a different call-sign area.

Q. I keep hearing stories about newly licensed amateurs who obtain 1×3 call signs. How can this be?

A. There is one very well-defined and limited condition under which a new licensee may obtain a 1×3 call sign, and that is if he once held a 1×3 call at some time in the past. Many people, having let their licenses lapse at some time in the past, find their interest in amateur radio rekindled, and requalify for an amateur radio license. If these people submit evidence of having once held a 1×3 call, they may receive that call back (if it hasn't been reassigned to someone else), or another 1×3 call of the Commission's choice. (97.51a1)

Q. It appears that I qualify for a 1×3 call under this provision. How do I apply?

A. Just use the standard 610 form. Check off the "modification" and "special call sign requested" blocks, as well as the other pertinent blocks, attach evidence of having once held a 1×3 call, include a photocopy of your present ticket, and mail to FCC, P. O. Box 1020, Gettysburg, PA 17325. It wouldn't hurt to attach a cover note briefly detailing your qualifications under 97.51a1, and stating that if the specific call you once held is presently assigned to someone else you will accept any 1×3 call of the Commission's choice.

Q. Are call signs with prefix "N" being issued by the FCC?

A. In November 1976 the FCC opened the "N" block of 1×2 call signs to Amateur Extra Class licensees who were otherwise qualified for a 1×2 call. But that, in general, is the only condition under which N-prefixed call signs are being issued.

There is only one exception to this rule, and that is the case of special-event stations. Temporary licenses – usually for a weekend, but not to exceed 30 days in general – may be issued for the operation of a special-event station commemorating a unique, one-time, worthy event (such as N4SCI celebrating the 20th anniversary of Sister Cities International). N-prefixed 1×3 call signs may be assigned to such stations. (97.41d)

FOR NOVICES

Q. The FCC regulations are changing so fast that it's hard to keep up with them. It's even hard for the FCC to keep up with them, as indicated by the fact that there are some questions on the Novice test (and other tests, too!) based on rules that no longer apply. How should I answer these questions? Will they affect my score if I answer them incorrectly?

A. It takes time to rewrite and print examinations to reflect new rules and regulations. It certainly can't be done overnight. Questions that appear on examinations about rules that are no longer in force are simply not graded; they do not affect your chances of passing or failing. The percentage of correct answers required to pass an FCC examination is 74 percent, and this percentage is simply computed on the remaining questions, ignoring those questions that are no longer valid.

Q. Some people say the Novice license is now renewable; some say it's not. What's the story?

A. There does appear to be considerable confusion on this issue. Let's make it clear that the Novice license is NOT renewable. What IS true is that the Novice license is reobtainable upon examination. Prior to July, 1976, there was a one-year waiting period before you could retake the Novice examination. That one-year waiting period no longer applies. You may retake the Novice exam right after it expires (or even shortly before, if you wish to maintain continuity).

Q. Can I keep my old call sign, or will I be issued a new one?

A. If you attach a photocopy of your old Novice license and apply within one year, you will be issued the same call.

Q. Can a Novice use a VFO?

A. Yes.

Q. Where in the FCC rules does it state that a Novice can use a VFO?

A. That is an interesting question. The fact is that *nowhere* in the rules is it stated that a Novice, or anyone else, can use a VFO. On the other hand, nowhere is it stated that a licensee can *not* use a VFO. Rule section 97.63 permits operation on any frequency within any authorized amateur band. Since there is no prohibition *against* using a VFO, it is allowed.

Prior to November, 1972, the rules stated explicitly that a Novice transmitter had to be crystal controlled. That restriction has been dropped, and no longer applies.

Q. What is the present maximum Novice input power?

A. 250 watts. With this increase in maximum input power and the deletion of the crystal control requirement, Novices may now purchase medium power, VFO-controlled transmitters or transceivers that can serve them even after upgrading to a higher class license. No longer does the Novice have to go searching for new equipment upon upgrading. (97.67)

Q. For how long is the Novice license valid?

A. Two years.

Q. Who may conduct an examination for a Novice license?

A. Volunteer examiners who conduct Novice class examinations must be at least 21 years of age, shall be unrelated to the applicant, and shall be the holder of an Amateur Extra, Advanced, or General class license. (97.28b)

Note particularly the requirement that the volunteer examiner be unrelated to the applicant. This is a rather recent addition to the rules that went into effect in July of 1976.

Q. What are the present frequencies authorized to a Novice licensee?

A. Currently, Novices may operate, using telegraphy (A1) only, on the following frequencies: 3700-3750 kHz, 7100-7150 kHz, 21.1-21.2 MHz, 28.1-28.2 MHz. Section 97.63 requires that all sidebands resulting from keying be confined within these authorized bands, so it is wise to keep your VFO 1 or 2 kHz inside the edges of these bands.

FINALLY, FEES

Q. I've read that the FCC is no longer charging filing fees for amateur license applications. Does this apply to any and all amateur applications, including renewals and requests for special call signs, or are there any exceptions?

A. The fee suspension applies to ALL amateur applications; there are absolutely no exceptions.

It seems many people find it difficult to believe that the FCC is no longer charging fees. Even though they read or hear it, they just can't believe it, and call or write for verification. But it IS true; until further notice there are no more fees. Full details may be found in last month's "Happenings" column.

*Asst. Manager, Membership Services Dept.

Correspondence

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

NETS? NUTS!

□ I'd be disgusted with myself and my net, not with ham radio, if it took a half hour to pass one priority message. If nets can't work around a hardship like the Sweepstakes contest by switching modes or moving frequency, of what use are they under the real hardships of a genuine emergency? – *J. D. Cain, WA9AUM, Richmond, IN*

OVERPOWERING URGE

□ What is needed is an expansion of the frequency allocation rather than an increase of power. Out there on the Novice bands there must be some 50,000 hams crowded into a very small segment of the allocated frequencies. When you call CQ, it produces a mad scramble like some ARRL contest. I didn't get into this for some overpowering urge to compete; I thought that it was supposed to be fun. Why not expand the Novice segments so that it can be fun? – *Charles Gallimore, WD4AQB, Wytheville, VA*

NUTS TO PEANUTS

□ In the eighteen years that I have been an amateur radio operator, never have I experienced the bedlam, chaos and disorganization that I experienced on the eve of January 20. Special-events station ND4JC was trying to work stations throughout the United States in celebration of the inauguration of President Jimmy Carter. The pileup of 3905 rivaled that of the rarest DX. There were other special (unauthorized?) calls being used: N1XON and F0RD. I suppose that these idiots thought they were being cute and clever, but to me they sounded like they were direct from Lidsville.

I feel sorry for those stations who tried so hard to work ND4JC with no avail. The same goes for those who set up the special operation in Plains, GA. – *Gene Santoski, K9UTQ, Wisconsin Rapids, WI*

MORE PROS AND CONS

□ Personally, I am in favor of the dues increase and think that League membership is still the best buy one can make in ham radio. I feel sure that the Sun City Amateur Radio Club members will agree with me on this matter. – *F. Parker Burkart, Jr., W7JAJ, Sun City, AZ*

□ Now hear this! The League was the force behind incentive licensing. I will never forgive or forget. DROP DEAD! – *Russell Hamilton, W2FXU, Ithaca, NY*

□ Enclosed is my check for membership in the ARRL. At best, it can only be considered a token repayment for all the wonderful assistance you have given us. As my licensing class progresses, I hope to have additional candidates for membership in the League. – *David Zaslau, W2OHU, Brooklyn, NY*

□ As a member of some years, I continue to wonder how you can keep on putting out a quality ham magazine, look out for the amateur interests with the FCC, and still provide the support services. Thanks for being a responsible and responsive organization on the ham's side. – *George Crowder, W5QDE, Alexandria, VA*

□ I firmly believe the League needs the support of every dedicated amateur radio operator. We see new publications, with their strictly commercial orientation, slandering the League. But without the accomplishments of the League since its inception, there would be no amateur radio as we know it today. – *George Caspers, Lake Nebagamon, WI*

□ Here is my renewal. I delivered 500 papers to earn that money. I enjoy *QST* very much, but would like to see a little more for the Novice. – *Dave Bullard, WB3CBG, Hamburg, PA*

□ While I am renewing my membership in ARRL, I am not necessarily endorsing *QST*. I am endorsing the work of the League. I think the League is necessary for the future of ham radio. I usually give my magazine away. I can't understand 99 percent of it. But I do support ARRL – the League is needed! – *M. H. Mandrell, W0IHP, Sterling, KS*

NEW CONTEST????

□ I would like to see a new contest that would be called SILENT-KEY NIGHT. It would be an unique opportunity to hone your operating skills while getting to know some of the pioneers of amateur radio. The object would be to work as many silent keys as possible during the contest period, which would be Halloween evening, from local sunset to local midnight. Contest exchange would include a consecutive contact number, your call, your ARRL section and a check consisting of the year of expiration of your ARRL Life membership. Log forms would be available from ARRL Probate Department (50 contacts to the page). Certificates would be issued to the top-scoring amateur in each celestial quadrant. *Paul Shuch, WA6UAM, San Jose, CA*

MESSAGE FROM ABROAD

□ May I take this opportunity of congratulating you on the new format of *QST*. It is a pleasure to see the larger drawings, the articles presented without a break and the improved typography. Also the editorial style seems to have undergone a change towards a lighter style and improved communications. The layout of the various departments and their groupings make it a pleasure to scan every issue on arrival and then dig in for some serious reading. – *Henry Flanter, ZS1FD, Camps Bay, South Africa*

GESTAPO REPEATER

□ I am writing in response to the Mt. Wilson Amateur Radio Association newsletter which made up the entire "FM Repeater News" in the January issue. You titled the column, "Self Policing – Are We?" Contrary to the article, which I must say frightens me, the answer is yes, we can and we are. And we don't have to deny anyone's constitutional rights to do it.

I question these points in Mr Thornburg's letter: (1) Allowing 12 people to dominate a repeater is a sign of nothing but poor leadership in and by the repeater organization, (2) he states that the abusers' conduct is not illegal in the "FCC sense," but their language and subject matter are "deplorable and obnoxious." The FCC is quite specific in describing what language and subject matter (e.g., commercial) are not permitted on the air. Everything else, obnoxious or not, is allowed.

What really shocked and frightened me though, and prompted this letter, is the statement that when the repeater returns to the air, "subject matter will be censored as well as language and operating procedures. Freedom of speech and 'right to use' will have no precedence." This practice is later described as "user's attitude adjustment." A great phrase – one that sounds like it is right out of a North Vietnamese "re-education" manual. This practice not only violates the spirit of amateur radio, but also the constitutional rights of every amateur who happens to be a U.S. citizen. If the government can't abridge my freedom of speech, I'll be damned if I'll consent to some private citizen arbitrarily doing the same.

Who is this man, and his "ordained" control operators to decide with no appeal to the membership possible what subjects an individual amateur will discuss on the air? What gives him this supreme authority? It is repugnant in a democratic society.

Here are some suggestions for self policing without trampling on the Constitution. Any or all of them, in different combinations, should deter abuse. (1) The leadership should stress a positive attitude among the majority of the association members and keep them actively involved. Enthusiasm is contagious. (2) Use peer pressure – remember, it takes two to QSO. With encouragement from leadership, the legitimate users may apply pressure on the others by either publicly reprimanding them, refusing to talk to them, or completely ignoring them. Without an audience, it is amazing how quickly people will step down off their soapbox. (3) The membership, not one person, should set rules and regulations for the proper use of the repeater. Prohibited uses, including but not limited to those specified by the FCC along with those adopted by the association membership, should be defined and publicized. The names and calls of repeated violators should be published in the club newsletter. The names of those particularly helpful in maintaining standards should be printed as well. (4) When choosing control ops, look for someone who knows how to deal with other people, not necessarily a former Gestapo agent. (5) For persistent abuse, have the control op shut down the machine, first for 10 minutes, then longer if the abuse continues. The fourth time should be for the rest of the day, if it gets that far. It shouldn't. Again, he's losing his audience. (6) Finally, as a last resort (and with membership approval!) turn the machine into a closed repeater. Obviously, don't admit known abusers to membership.

These suggestions provide an alternative to the authoritarian plan put forth by Mr. Thornburg. What frightens me even more than the censorship plan is the fact that the local repeater council is watching for possible application to other repeaters, and that the League would connote acceptance of the idea by the wording of the introduction and by devoting a full page and the entire FM News

column to it. We need to police our bands, but not with Gestapo tactics. – *Richard Moseson, WA2QQN, Albany, NY*

AND SEW FORTH

□ We had one minor problem at our class tonight. A new class, a sewing class, was scheduled in the same room as ours. There was only a small partition separating us. Is there such a thing as sewing machine QRM or should it be called SMI? This might be good for training the subconscious, but *not* for our beginners. Next week we move to a different room. – *George Turner, W8FWG, Laurium, MI*

NEANDERTHAL-THINKING HAMS

□ As an avowed CBer, but not yet a ham, I share your enthusiasm for upgrading CB operators to ham licensees. In studying for my license, I have encountered a problem in dealing with hams – the attitude of many hams toward CBers. They tend to regard us as second-class citizens. No one likes to have his hobby downgraded, yet references to "chicken-banders" continue. In reaction, CBers become defensive and feel that they are not really welcome in the world of ham radio. This kind of thinking is keeping large numbers of CBers from becoming hams. – *Terry Bush, Bloomington, IL*

PECULIAR PECUNIARY PROPENSITIES

□ I have a wild idea that might help to raise a lot of money. I enjoy all the old *QST*s, particularly the front covers with the cartoons. Would it be possible to have them reproduced in book form and sell them? – *Joe Szabat, W3LST, Oil City, PA*

□ There are seals to represent everything from the March of Dimes to Father Flannigan Homes. Why don't we have a seal to publicize amateur radio. You could sell it to members for use on their letters. – *Ruth Harris, K4IPZ, Arlington, VA*

108 TIMES???

□ I'm a Novice with some thoughts for everyone. I've had my ticket since September. Before I got on the air, I knew how to call CQ in the proper way. About 20 percent of the stations that I've heard put me to sleep before they signed with their call. I've often heard stations call CQ up to 12 times. About four weeks ago I heard a station call CQ 108 times in a row! Then he sent his call so fast, and only once, that it sounded like RTTY. I don't know about you, but 108 CQs in a row at five wpm makes me sick. It is a real pleasure to hear an honest 3 X 3 call! – *Neil Schwanitz, WD8CRT, Greenville, OH*

FCC FB

□ I could not believe my eyes today when the mailman delivered my new two-letter call only four and one-half weeks after I mailed in my application and in spite of that tremendous quantity of mail delivered to Gettysburg that first week in January. A most grateful tip of the hat to all those hard-working and dedicated FCC employees who are providing such excellent service to us amateurs. – *Alan Chedester, N3AC, Columbia, MD*

TOXIC TOPIC

□ An item entitled "Allergic to Ham Radio" appeared in January "Hints and Kinks." I do not doubt the doctor's analysis that W9NIN is allergic to the plasticizer in the PVC covering the coax. However, the statement that polyvinyl chloride (PVC) is a very toxic substance is just not true. The material which caused the liver cancer in workers in PVC plants was the vinyl chloride monomer which is used to make the final product. A cable such as Jim was using would not contain any significant amount of this highly volatile monomer, especially after heat processing, which is necessary to jacket the cable. – *William G. Baird, K4II, Duncan, SC*

VAST WASTELAND DX

□ The last segment of the TV novel "Roots," aired on January 30, was one of the most popular programs of all time, and this was reflected in an unnatural quiet on the ham bands. A PJ8 with a strong signal was observed calling CQ several times for each QSO that he could scrape up. This operator, for the first time in over 27 years on the air, managed to get a pileup of European stations calling him and worked 22 of them with plenty more calling before the QSB got them. Perhaps an operating hint should be to get on the air during popular TV programs. – *H. A. Ross-Clunis, Jr., K4MU, Seaford, VA*

ARE YOU NAVY?

□ After more than 50 years reading *QST*, I'm amazed at how few members read or remember what *QST* says. With a strange call (?), I'm being accused of Blunderbuss keying, of being rare DX or of just plain bootlegging! Everyone that I've worked has had at least some hesitation about an "N" call. Some ask, "Are you Navy?" Now I have a list of pages of *QST* beside my key to refer them to. Where but in *QST* would you find the real news of our ham radio? – *Ellis Smith, N4FA, Jacksonville, FL*

LIFE BEGINS AT 40

□ I enjoyed and appreciated your article "Happy Birthday, W1AW" in the February issue. It was a masterpiece and I ate up every word of it. Great writing and a great layout! Thanks! – *Ken Johnson, W6NKE, Canoga Park, CA*

□ Many thanks for your report of W1AW's 40th anniversary, and congratulations to all the staff responsible. Along with numerous others, I certainly appreciate your ever present code practices and qualifying runs. Fellow hams here who have visited W1AW report that it has a small but dedicated staff, which was duly confirmed by your article. – *Leon Nettleton, WB2IZE, Oneonta, NY*

ECONOMIC DECAY

□ In these days of economic decay due, at least in our country, to increased government intervention in economic affairs, it becomes disconcerting to me to note the radio amateur's promotion of this decay. It appears that in our own quest for freedom from the complaints of the "nonham," we have further abandoned the ideal of the free market economy and sought government aid in doing so.

It is for these reasons that I must oppose HR 7052 and S 3033, the "twin" RFI bills presently in Congressional committees. The bill would require manufacturers to adjust audio products in such a way that local shortwave signals would not interfere with their reception This, of course, would please amateurs immensely while forcing manufacturers to change plans, increase prices and ultimately alter shipment quantities. Hams would be flagrantly violating the principles of the free market; indeed, they would be denying men their right in a free society to produce in private, as they wish.

As an alternative, we might pressure manufacturers to make available products both with and without the anti-RFI adjustments. In this way, we leave the law of supply and demand, a far more sound determinant of financial policy, to govern what will be produced and what will be consumed. Both consumer and manufacturer are left with a freedom of choice. – *Dave Darrow, WB2TFQ, Amherst, MA*

CHICKEN WIRE?

□ I recently answered a CQ DX from a W2 on 7004 kHz. I was amazed at this fellow's signal strength. I told him that he was by far the strongest East Coast station ever heard on 40 and requested antenna details. He attributed his success to four phased verticals and several hundred feet of chicken wire for a ground plane.

After listening to dozens of other amazed Pacific stations tell him the same thing, I surmised he wasn't operating from the East Coast and was more likely on the West Coast. His QTH info also consisted of "NR LA" with no mention of state or portable operation in any of his QSOs. Since the ham operator bases his station design on performance, it is nice to know if a station is where its call sign indicates. Count me in favor of the FCC required portable identification. – *Bryce A. Carr, KH6AT, Hilo, HI*

CHARTS

□ I think that the new DX Propagation Charts are the best thing since sliced bread. WAØHAL came into my shack the other evening and said it was about time to work into Australia or New Zealand. I humored him by firing up the rig – and immediately worked ZL1PZ on 15 cw. He was the first ZL that I have worked for several years. We enjoyed a tough, but very nice QSO. I have used the charts five times since, and they have clicked every time. I have one complaint though. While attempting to contact someone in South Africa, all I could raise were several Cs. Keep up the charts – they are excellent! – *Tom Bracket, KØJPN, Fremont, NE*

MIDWAY

□ My present Novice class, which will be my last one here since I leave Midway Island in May, has 15 students. They all seem very enthusiastic. With 12 new Novices from my last class, these will make 27 new hams I have helped get their license. In fact, most of the KM6s by far are as a result of my classes using the League's course. I feel very good to have helped the cause of ham radio in these times prior to WARC. – *S. G. Kibler, KM6EI, Midway Island*

SILVER LININGS

□ In the past three years, I have developed a severe hearing impairment; this makes sideband almost impossible to copy, even with my hearing aid. However, it increases the ability to copy cw, as it narrows the readable response. I would like to urge others with the impairment to switch over to cw, and make the hearing problem work for them, without the hearing aid. – *Mel Ringer, W6CJM, Sun City, CA*

Hamfest Calendar

Alabama: The Mobile Amateur Radio Club's annual hamfest and computerfest is April 16-17. All the newest equipment on display, computers, too. Swap 'n shop Saturday 9 A.M.-5 P.M. Activities for the ladies and children; campsites available. For more info write Marvin Uphaus, K4BVG, 512 Tuttle Ave., Mobile, AL 36604.

Alabama: The Birminghamfest Amateur Radio Convention is May 7 and 8 at the Alabama State Fairgrounds, Birmingham and the Rodeway Inn, Oxmoor, at I-65 and Oxmoor Rd. Flea market, technical and operating forums, manufacturer's and distributor's displays. Ladies' and children's activities. Booth display area to be offered free to bona fide distributors, manufacturers and publishers, etc., on a first-come, first-served basis. Others may rent space inside or outside flea-market areas at a small charge. Talk-in 34/94, 3965 kHz. For reservations and info write Birminghamfest, P. O. Box 603, Birmingham, AL 35201. Saturday activities include a free hospitality suite at Rodeway Inn. Motel reservations available toll-free at 800-228-2000 for the Rodeway Inn or through club members for other accommodations.

Arkansas: The Ozark Picnic is April 17 at Burns Park, Pavilion no. 7, N. Little Rock, AR. Write S. M. Pokorny, W5UAU, 1335 N. Ridge Circle, Horseshoe Bend, AR 72512.

California: The Fresno Amateur Radio Club's annual hamfest is May 6-8 at the Airport Holiday Inn, Fresno, CA. For details write Hamfest Chairman, Fresno Amateur Radio Club, Inc., P. O. Box 783, Fresno, CA 93712.

Florida: The Tampa Hamfest is at Lowry Park on Sunday, April 17, from 9 A.M.-4 P.M. Bring the family; zoo and rides for the children. Refreshments available, bring a picnic lunch for a day of fun. Tables available or swap from your trunk. Due to location, no dealers please! $1 donation. For info write Hillsborough Amateur Radio Society, 8835 Nautilis Dr., Tampa, FL 33615.

Illinois: The Rock River Radio Club hamfest is April 24, at Amboy, Lee County, at the 4H Center, Rtes. 30 and 52. Tickets, $1 advance; $2 at gate. Indoor and outdoor facilities. Camper parking at a nominal fee. Write Carl Karlson, W9ECF, Nachusa, IL 61057.

Illinois: The Moultrie Amateur Radio Klub's 16th annual hamfest is April 24 at Wyman Park, Sullivan. Heated indoor area and large outdoor parking area. No charge to vendors. For info write MARK Radio Klub, P. O. Box 327, Mattoon, IL 61938. Talk-in: 146.94.

Massachusetts: The Central Massachusetts Amateur Radio Assoc.'s auction and flea market is the evening of April 15 at the American Legion Post 341, 1023 Main St., Worcester. Doors open at 6 P.M. Talk-in on 37/97. Auction begins at 7 P.M. sharp. Flea-market table items $5 and under, rent $5. Items more than $5 thru $100 auctioned with 15-percent commission. Area set aside for direct buyer/seller barter, for items $100 and up again 15 percent to CMARA.

Massachusetts: The Hampden County Radio Assoc.'s flea market is May 6 at the Feeding Hills Congregational Church in Feeding Hills. Location is just off Rte. 57 in Feeding Hills. For info write Mr. Richard Stevens, W1QWJ, coordinator HCRA Flea Market, Crest Rd., Monson, MA 01057.

Missouri*: The PHD Amateur Radio Assoc, Inc. of Liberty holds its eighth annual Northwest Missouri Hamfest Saturday and Sunday, April 23-24, at the Kansas City Trade Mart, Exhibit Hall 2 (Municipal Airport terminal building). A complete program of forums both days; commercial exhibits, swap tables, YL-XYL program; all inside a one-level air-conditioned building. Unlimited free parking. From noon-6 P.M. on Saturday and from 9 A.M.-5 P.M. on Sunday. Setup time from 10 A.M. 'til noon. Saturday night is a banquet at the world famous Gold Buffet, with ARRL president Harry Dannals, W2HD, as guest speaker. Preregistration $2, with banquet $8; at the door $2.50. Talk-in on 34/94 and 3.925 MHz. Order ahead for banquet. Write PHD Amateur Radio Assoc., P. O. Box 11, Liberty, MO 64068.

New Jersey: The annual Delaware Valley Radio Assoc. (W2ZQ/WR2ADE) flea market and auction is Sunday, May 1, 9 A.M. rain or shine at the Villa Victoria Academy in West Trenton. (The school is adjacent to Rte. 29 near the jct. of Rtes. 29 and I-95). Talk-in on 07/67 and 146.52. Refreshments are available. Advance registration $1; $1.50 at gate. For info or tickets write DVRA, P. O. Box 7024, West Trenton, NJ 08628, s.a.s.e. please.

New Mexico: The Mesilla Valley Radio Club sponsors Whitey's Bean Feed and Swapfest Sunday, April 24, at 10 A.M. Located near Las Cruces at La Mesa with talk-ins on 16/76, 04/64 and 3940 kHz. Fun for all the family with plenty of food and the usual beverage truck. All included for $5 for adults and $1.75 for kids. Free overnight parking at the grounds. Write Thomas B. Rapkoch, Jr., 650 W. Las Cruces Ave., Las Cruces, NM 88001.

New York*: The 18th annual STARC Hamfest is Saturday, May 7, at Binghamton. (Take exit 71 N. from NY-17, go 3.8 miles north on Stella-Ireland Rd. to the Lutheran Fellowship Recreation Center.) Flea market, tech talks. General admission $2 per person. Banquet by preregistration at $6 per person. Indoor exhibit space by preregistration at $5 per table; outdoor space free. Talk-in 146.22/82 and 94/94. For info and reservations write STARC, P. O. Box 11, Endicott, NY 13760.

North Carolina*: The Mecklenburg Amateur Radio Society's hamfest is March 26-27 at the Charlotte Civic Center, Charlotte, NC.

North Carolina: The 5th annual RARS Hamfest is Sunday, April 17, at the Crabtree Valley Shopping Center, Highway 70W; also, FCC exams will be given starting at 12:30 P.M. Saturday, April 16. Exams to be by appointment only through the Norfolk, VA, FCC office. Saturday night from 7-12 P.M. eyeball social. Sunday a large covered flea market, meetings and ladies' program. For more info write RARS Hamfest, P. O. Box 17124, Raleigh, NC.

Ohio: The 26th Dayton Hamvention is at Hara Arena, April 29, 30 and May 1. Program brochures mailed March 7 to those registered within the past three years. For accommodations or flyer write Hamvention, P. O. Box 44, Dayton, OH 45401.

Ohio: The 8th annual Dayton FM Bash is Friday night of Dayton Hamvention, April 29, at the Dayton Biltmore Towers (hotel), Main at First Sts., from 8 P.M. 'til midnight. Admission is free to all hams and their friends. Sandwiches, beverages, snacks and C.O.D. bar available. A live floor show by TV personality Rob Reider (WA8GFF) and his group. Miami Valley F.M. Assoc., Sue Hagedon, WB8GWQ.

Pennsylvania: The University of Pittsburgh's first annual hamfest is March 26 from 10 A.M. to 6 P.M. Located at the Pitt Student Union, 5th Ave. near the Cathedral of Learning. Phone 412-624-7768.

Pennsylvania: The 3rd annual Northwestern Pennsylvania Hamfest is May 7 at the Crawford County Fairgrounds, Meadville. Free admission. Flea market begins at 10 A.M. $2 to display. Refreshments; commercial displays welcome. Indoors if rain. Talk-in 146.04/64 and 146.52. For details write C.A.R.S., P. O. Box 653, Meadville, PA 16335.

Texas: The Brownfield Amateur Radio Club's Swapfest is May 1, the first Sunday of May, at the National Guard Armory in Brownfield, TX. Contact Earl Ehod, Box 821, Brownfield, TX 79316.

Virginia: The Potomac Area VHF Society's 6th annual hamfest is Saturday, May 7, from 8 A.M.-5 P.M. at Frying Pan Park on West Ox Rd. in Herndon, VA, approximately 15 miles west of Washington, DC. Registration of $3 includes flea-market or tailgate sales. Catered food and beverages and unlimited parking available. Talk-in on 146.52 and 31/91. Formerly held in Westminster, MD, but moved because of Maryland trader laws. For further info contact K3DUA or WA3NZL.

Wisconsin: The Twin Ports Two Meter Club 2nd annual swapfest is Saturday, May 7, in the hall of the Duluth First Methodist Church from 11 A.M.-3 P.M. Admission is $1 advance; $1.25 at the door. Selling space is $1.50; $1 with your own table. Food available on the premises. Plenty of parking. Talk-in on 34/94. For flyers and /or tickets write Twin Ports Two Meter Club, c/o Libby Welsh, WB9MLN, 525 Homecroft Ct., Superior, WI 54880.

*ARRL hamfest

Coming Conventions

May 14-15
Mississippi State, Jackson, MS

May 21-22
New York State, Rochester, NY

*Date Change

May 21-22
Wisconsin State, Lake Delton, WI

May 28-29
Tennessee State, Knoxville, TN

June 3-5
ARRL National, Toronto, Ontario

June 18-19
Georgia State, Atlanta, GA

July 2-3
West Virginia State, Jackson's Mill, WV

July 9-10
Roanoke Division, Norfolk, VA

July 22-24*
West Gulf Division, Austin, TX

July 30-31
Northwestern Division, Seattle, WA

September 23-25
New England Division, Hartford, CT

October 7-9
Midwest Division, Wichita, KS

October 7-9
Southwestern Division, Santa Maria, CA

October 8-9
Delta Division, New Orleans, LA

October 15-16
Pacific Division, San Mateo, CA

November 19-20
South Florida Section, Clearwater, FL

YL News and Views

Conducted By Louise Moreau,* W3WRE

YLISSB

In November of 1961, V. Mayree Tallman, K4ICA, helped low-power DX YLs make contacts with this country. On the air regularly, she was eager to assist anyone with problems due to low power. Other YLs joined her and the International Single Side-Band System was organized in December. As the spirit of cooperation filtered worldwide, membership broadened to include anyone interested in the theme of "building friendship among all peoples of the earth through amateur radio."

Known as a "system," not a net, the YLISSB has grown to a membership of 10,000 amateurs representative of almost every country. On the frequencies 14.333, 7.280, 28.673 and 21.373 may be found the weekly business of these "Sidebanders" - getting acquainted with amateurs of other nations and providing emergency aid where and when needed through their global facilities. Their efforts in the past years have located medical necessities for remote areas, supplied communications links in disasters and procured rare drugs for medical crises in various countries.

For the membership some 32 different certificates as well as plaques and awards symbolize all types of amateur operation. And there is the added bonus of contacts with other members in countries needed to complete certificate requirements of many organizations.

YLISSB publishes *Voice*, the system newsletter, that keeps the membership informed of all YLISSB business, changes in rules and reports of the mini-conventions as well as featuring photographs of membership activity.

Membership Chairman Dr. Fred Holzapfel, W0UUE, states that affiliation is open to all amateur radio operators who wish to help promote international friendship through the medium of amateur radio.

Now an Advanced licensee, Nancy Coleman, WB3CCU, is aiming for Extra Class in 1977. She prefers cw and is an avid contest operator. Her fluent Spanish comes in handy in skeds with friends in Mexico and Colombia. *(Photo courtesy of Johnstown Tribune-Democrat)*

1977 LARK Officers (l-r) Secretary Dawn Chartrand, WB9TNM; President Marilyn Backys, WB9TDR; Treasurer Pat Fleissner, WB9PTO, are shown here at the club's 25th anniversary banquet. *(W9NEJ photo)*

FLORIDORA ACTIVITIES

A cw practice net has been set up by the Floridora YLs to help those gals with Technician licenses upgrade to General tickets. Lori Barfield, W4VQZ and Thelma Bolvin, WB4AUR, have scheduled the program on a twice-a-week basis: Tuesday on 3.745 MHz at 1530 UTC, and Thursdays on 3.745 at 2330 UTC. All amateurs who are looking for assistance to upgrade to General class are welcome.

LARK 1977 OFFICERS

LARK, the Ladies Amateur Radio Klub of Chicago, announces the following YLs as 1977 officers: President Marilyn Backys, WB9DTR; Secretary Dawn Chartrand, WB9TNM; Treasurer Pat Fleissner, WB9PTO. LARK members meet twice a week on Tuesdays at 0200 UTC on 7.130 MHz in a cw net and again on Sundays at 0200 on 7.240-MHz phone. All women amateur radio operators of the Chicago area are welcome.

VE YL CONTEST RESULTS

The results of the Trillium Weekend sponsored by the Ontario Trilliums has been announced. Winner Douglas Lane, VE3EES, receives a bar for the plaque that he received in 1975. Second place went to VE3GZY while VE3CQY occupied third place. The Trillium station with the most contacts was that of Tess Hardie, VE3HIR. Winners of the "Lucky Draw" from all logs submitted were VE3FXM, VE3COH and VE1TK.

WAS is not easy but Margaret Jackowski, K7YAG, made it on 6 meters. Margaret and OM ED, K9YAE, are working with code classes to upgrade their licenses this year.

CLARA 1977-1978 OFFICERS

President Marj Karl, VE6LC; Vice Presiden VE3HAI; Secretary Jeanne Gordon, VE2JZ Treasurer Marie Moskal, VE6CHM; Edito Vivian Taylor, VE3HGA; Supply Chairma Anne Rushford, VE6AYR; Certificate an DX Chairman Cathy Hrischenko, VE3GJH area representatives: VE1IY, VE2EKC VE3COH, VE4ST, VE5FI, VE6BDA VE7DKC. These gals will be the hostesses a the YL activities of the ARRL Nationa convention in June this year.

GERMAN "YL DAY" ANNOUNCED

The very active German YLs have scheduled monthly activity to be known as YL Day an to be held on the 15th of each month wit German YLs active on the announced fre quencies of 14.250, 14.310, 21.250, 21.400 28.500 and 28.600 MHz. The YLs will b looking for contacts with YLs on thos frequencies on YL Day each month. It ha been requested that because of languag difficulties those gals of this country wh wish to work these YLs speak slowly in orde to facilitate these women who are anxious fo contacts with North American YLs. QST

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

FM Repeater News

Conducted By Lew McCoy,* W1ICP/WR1ABH

First 34/94?

George Munsch, W5VPQ, one of the original members of the League's VHF Repeater Advisory Committee (VRAC), shows off his latest set of call-sign license plates. With the FCC indicating the possibility of elimination of future WR calls, we have just about come full circle in repeater rules, and these plates may well become collector's items.

George, by the way, claims to have put on one of the first, if not the first permanent 146.34/.94 repeater in the country, in May of 1962. [Anyone top this? – Ed.] This machine, in various embodiments has served San Antonio since then, as W5VPQ/rpt, WA5UNH/rpt, WA5VKZ/rpt and currently as WR5ADJ, operated by the San Antonio Repeater Organization, of which W5VPQ was one of the originators and first president. He also, along with W5NFC, co-founded the Texas VHF-FM Society in August of 1965, making it the first [Or top this? – Ed.] area-wide fm group in the country.

With many of these early responsibilities taken over by other hams and clubs, George presently operates only a limited-coverage 440 repeater as WR5AKI and serves as a consultant to many of the other fm operators in Texas, earning him the nickname "Godfather of Texas VHF-FM."

George Munsch, W5VPQ.

MT. WASHINGTON – WIND-POWERED

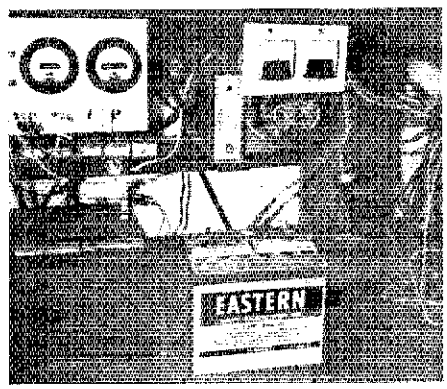
At the Mt. Washington Observatory, the 6,288-foot (1916 meters) high location of 2-meter repeater WR1AAL, winds in excess of 160 kilometers are not unusual. To those not familiar with the Mt. Washington repeater, we refer you to page 76 of Sept. 1976 *QST*. Power for the repeater must be generated locally at about 31 cents per kilowatt hour. The obvious solution for this energy-cost crunch is to generate electricity using the wind. Although problems of rotor design and icing must still be overcome, the Observatory's experimental windmill, a Savonius rotor made from a 55-gallon trash can and turning since September, 1976, really went to work on December 13.

The mill on the roof comprises a Savonius rotor made from trash cans attached to the rear axle salvaged from a truck. Here, Observatory Director Guy Gosselin has stopped the rotor so that he can scrape the rime ice from it. *(Photo courtesy MWO)*

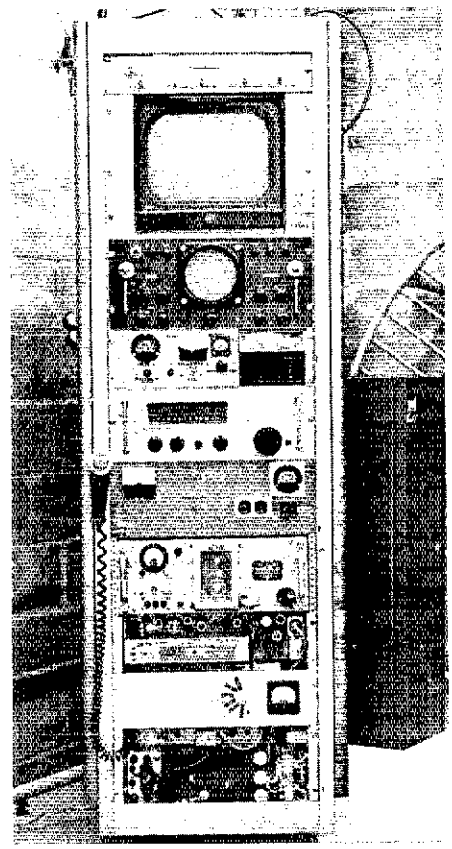
For more than five hours, while the wind averaged 110 to 160 km/h, repeater station WR1AAL was operated entirely on wind power, without even a storage battery floating on the line. Eleven stations checked in at various times while the repeater was dependent on the winds of Mt. Washington for its energy. They were K1OIQ (control station at the summit), W1BST, K1KWU (at the TV transmitter next door), W1VKQ, W1HMP (station mentor), K1HRG, W1PNR (control station in the valley), W1BTY, W1TDK, WA1ZYX and VE2AKF all the way from Sherbrooke, Quebec.

Outside the Observatory wind gusted to "a hundred and then some" and the temperature was "plenty too cold below zero" (an endearing term used by some observers to describe temperatures too cold to matter anymore); inside, all was snug and warm although a bit nerve-racking as the building was shaking and humming because of the uneven accumulation of rime ice on the mill on the roof. During this period Al (K1OIQ), duty observer, went out to do the regular noon observation. The temperature was –34°C and the 100-meter round trip to the snow gauge was made mostly on all fours in winds averaging 143 km/h and gusting over 160. All in a day's work!

Anyone interested in knowing more about the Observatory is invited to write K1OIQ at the Mt. Washington Observatory, Gorham, NH 03581. QST



The meter panel and batteries located in the radio room are convenient to the repeater power supply. To the right is the repeater panel. On the floor is a 60-Ah (ampere-hour) battery that powers the repeater. To the left is the windmill panel which monitors generator voltage, load current and regulator condition. *(Photo courtesy MWO)*



This neat-looking rack and panel is the LIMARC ATV repeater, scheduled to commence operation in February, this year. The repeater is located at Plainview, NY, on a 320-foot tower. Antenna height is 390-feet HAAT. Erp is 200 watts peak with omnidirectional vertical polarization. Input frequency is 439.25 MHz with output at 427.25 MHz. Ed Piller, W2KPQ, is the chairman of the group's ATV project.

*VRAC Liaison, ARRL hq.

50 Years Ago

April, 1927

□ Cover cartoonist 8ZZ very aptly shows the tweet of songbirds as illustrative of the new d.c. and x.d.c. signals, with the dissonant caw of a crow representing r.a.c.

□ Congress finally passed a new radio law, and a Federal Radio Commission has been formed with a life of one year to bring order out of the regulatory chaos.

□ For experimenters, 1BFA explains some of the fundamentals of wave motion and radiation.

□ Hiram Percy Maxim says the 1927 Board meeting shows the League is in strong shape and growing.

□ The Radio Corporation finds 15 meters ideal for consistent communication with Argentina, and this issue describes the gear and procedures in use at 2XS.

□ Promotional features are run on both the Institute of Radio Engineers and the Army-Amateur liaison system.

□ Sometimes a vacuum tube acts as an r.f. amplifier, while at others, in practically the same circuit, as a detector; Lou Hatry explains why.

□ Technical Editor Kruse's plea for a dry rectifier to handle tube filament currents rather than only lesser "B" supply is answered by a new unit from Elkon. He is also pleased with some new tubes, UX-240 and CX-340, with great advantages in audio applications.

□ If you want to know how far away is that DX you worked last night, sharpen your pencil and trig procedure and apply the principles described by saJB8 of Argentina.

□ "The Most Useful Meter" is an apt description by R. F. Shea of his vacuum-tube voltmeter design.

25 Years Ago

April, 1952

□ The indefatigable W1TS fills a gap with his "bandbox" design of a frequency multiplier between oscillator and driver stage for rapid multiband changing.

□ W9DPI's analysis of ignition and other automobile noise interference will be a boon to the growing mobile crowd.

□ A League survey of the first newcomers to amateur radio via the Novice route finds them with characteristics (age, etc.) generally similar to the rest of ham radio, though even a greater percentage – 93% – are regular *QST* readers.

□ A Larson E. Rapp classic solves the problem of frequency congestion; he proposes positive modulation for phone and, on the same channels, negative modulation for c.w.

□ Plenty for the v.h.f.er, especially the Technician, in this issue. W1HDQ has a 145-220 rig, simple to build and adjust. W2s NJR, ORX and BWN join to present their design of a compact portable 2-meter emergency station. And the Simulated Emergency Test, highlighting civil defense communications, moves more and more to the higher frequency bands.

□ W11YI has no trouble adjusting his big beam; a track on the tower and airplane cable hoist permit easy lowering to ground level.

□ "Happenings" announces, though with a noticeable lack of enthusiasm, FCC's decision to "grandfather" to Extra Class those hams who started before May, 1917.

□ If you're low on cash, W9WJS has some mighty good ideas on scrounging parts from junk boxes and adapting them for your purposes.

□ Staffer W1BAW is a Silent Key, stricken while at the printer supervising *Handbook* production. – *W1RW*

Strays

□ Al Mitchell, WA4HLP, of Jacksonville, FL knew what he was after. He was licensed as a General in March, 1976, and within four months had RTTY Worked All States. In fact all the work for RTTY WAS no. 18 was done on less than 100 watts and was endorsed as the first ever reported for a single band, 20 meters, on RTTY!

□ LIMARC, the Long Island Mobile Amateur Radio Club will be sponsoring an AMSAT net on club repeater WR2ADM, 146.25/85 at 2000 hours local time, each Wednesday. The net will be educational and conversational with its basic objective being to get operating information to new and potential OSCAR users. The net will soon operate on the 2-meter sideband at 145.70, too. Stations not located in the immediate area should aim their antennas toward Bellmore, LI, located in south-central Nassau County. Net control is Hank, WB2ALW, with assistance from Barry WA2BOP. *WB2ALW*

NEW LOGIC CHIP ANNOUNCED

□ Fresh out of Silicon Valley, USA, comes word that a "Nope Gate" IC has been developed. In the words of the information source: "A new gate with tristate output. It doesn't do anything at all, regardless of the input. It is intended for use in cost-plus contracts where it is desired to increase the parts count." The announcement was carried in *Lorlin Datalog* for September, 1976, the official newsletter of Lorlin Industries, Danbury, CT.

The new IC seems to have some interesting possibilities in the amateur world: One could use a substantial number of nope gates to build an impressive piece of gear for the shack. Just think about how your friends would react upon seeing rows and rows of nope-gate ICs in your next DVM or keyer! – *W1FB*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AHQ, John A. Moran, Jr., Malden, MA
W1DTZ, Philip P. DiNunzio, Centerdale, RI
Ex-W1GMM, Everett C. Gould, Portsmouth, NH
W1HJ, Robert H. Roberts, Sun City, AZ
K1JMV, Michael E. Buczek, Meriden, CT
W1LWW, Thomas "George" L. Lappe, Manchester, CT
W1TH, Theodor E. Schreyer, Newfane, VT
W1WAS, Vincent L. Carr, S. Portland, ME
W1WRG, John R. Blake, Jr., Fairfield, CT
W2CEJ, William E. Mays, Westcreek, NJ
W2CIF, Henry J. Abreu, Newburgh, NY
WA2EOY, Charles H. Peacock, Jr., Fairton, NJ
WA2HFH, Walter R. Hagmaier, Sr., Blackwood, NJ
W2KLS, Stephen Bossey, E. Setauket, NY
W3DVO, Ray P. Aylor, Garrett Park, MD
WA3KGJ, Dr. Edward Martin, Jr., Johnstown, PA
W3PL, Sherman F. Booth, Easton, MD
W3SAO, Francis D. Brick, Philadelphia, PA
K3SZO, Robert F. Walker, Broomall, PA
W3VU, Edward E. Jones, Glen Burnie, MD
W4DGU, Norman B. Lee, Lattimore, NC
W4ELX, Philip S. Mentz, Tuscaloosa, AL
W4GOC, Wilbur T. McNallan, Annandale, VA
K4GXF, William F. Schallmo, Port Charlotte, FL
W4HWO, Carl A. Lyons, Louisville, KY
WA4KZH, Herman C. Garrett, Greenfield, TN
WB4MFB, Gorham "Pete" Cluett, Vero Beach, FL
K4NIG, James W. Ford, Prichard, AL
W4ZWH, Mitchell Adams, Boca Raton, FL
W5DAU, John M. "Jack" Shipman, Hobbs, NM
W5FFJ, William A. Vestal, Snyder, TX
W5JPJ, Clyde D. Smith, New Orleans, LA
W5KRE, John A. Gould, Baton Rouge, LA
W5MPF, Warren C. Patterson, Buffalo, OK
WB5ULF, Lyle L. Sensintaffar, Weatherford, OK
W6DEL, L. Bruce Kelly, Pasadena, CA
K6DH, John D. Keim, Tiburon, CA
W6FYG, James D. Matheny, Laguna Hills, CA
W6HQ, Joseph T. Binder, San Bernardino, CA
KH6JCS, Raymond "Monty" Von Tempsky, Jr., Kaunakakai, HI
K6JWY, Melvin A. Thomas, Baldwin Park, CA
W6KDI, Edward Van Bosch, Walnut Creek, CA
W6KUI, Mason Stockton, Willows, CA
W6LGC, Herbert E. Stoddard, San Francisco, CA
W6NZV, John L. Ryan, Sebastopol, CA
K6UHD, Herman O. Weidenbach, Paradise, CA
K6VOQ, William J. Pearce, Carmichael, CA
W7SQK, William R. Edwards, Seattle, WA
W7UMB, Louis A. Hayes, Creswell, OR
W7VIK, Roy Dawson, Libby, MT
WB8AYB, Clifford M. Stevens, Plymouth, MI
W8FKX, Roland "Wayne" Bloss, Cincinnati, OH
W8HNE, Howard Foster, Flint, MI
W8JPT, Edward L. Seger, Detroit, MI
K8LAL, Robert W. Gleason, Grand Rapids, MI
W8NXT, Donald F. Grant, Detroit, MI
W8PTT, Almon J. Chapin, Bellevue, OH
W8RHZ, Harry L. Steffan, Twinsburg, OH
W8TE, Andrew L. Shafer, New Carlisle, OH
K8TFO, Milo L. Baird, Battle Creek, MI
K9DEY, Leonard J. Julien, Villa Park, IL
K9GHY, Howard C. Cornelius, Indianapolis, IN
W9KSK, Edward M. Zychowski, Harvey, IL
W9KWB, Harold H. Lee, Bedford, IN
W9NCB, Richard M. Robinson, South Bend, IN
W9WBD, Stanley R. Towers, W. Allis, WI
W9WYK, Harris H. Heublein, Waterford, WI
KØABT, Paul D. Combs, Norfolk, NE
WØOBQ, Frank B. Taylor, Kansas City, MO
WØRPY, Charles L. Hall, Oxford, NE
KØSLI, Margaret H. Yancey, Grandview, MO
VE1AGP, George G. Houston, Charlottetown, PE
Ex-VE1AAM, Robert L. Alexander, Dartmouth, NS
VE1AGA, Dr. John R. W. Bessonette, Dartmouth, NS
VE3BDD, Edgar A. McCracken, Brockville, ON
VE3GI, Walter G. Sheppard, Willowdale, ON
VE3HVI, Chuck H. Creasey, Stouffville, ON
AP2ABH, A. B. Hanfi, Karachi, Pakistan
DL3KO, Rudolf Fehres, Hamburg, West Germany
VK3ACE, Clyde Case, Birchip, Australia
KV4CK/W1WZ, Dr. Randolph Piper, St. Croix, VI
Ex-VP2VV, Yvon J. A. Kerguen, Guadeloupe Is., FWI
VP9AS, Gladstone "Al" Stovell, Paget, Bermuda

How's DX?

Conducted By Rod Newkirk,* W9BRD

In the Spring a Young Ham's Fancy...

Young in years, heart or what have you, 21 MHz is the place to turn to when first appear the brave buds of spring. Ma Nature's big repeater in the sky may need a few more sunspots for real jivin' but DXcitement is always there. This month we traditionally highlight DX doings in the Novice hf ranges. So 16-year-old WB8YJF, how's DX?

"For the past few months I've been fairly active on 15. DX tends to be scarce for Novices but I have a total of 33 countries and all states. I use a Heath Cheyenne mobile rig with homebuilt power pack at 40 watts input, receiving with a Hammarlund HQ129X. The antennas are dipoles and a 15-meter ground plane. I'm proud of my station even though the transmitter and receiver have a combined age of 53 years. Some recent catches are C6ABA, EA8BK, EL2ET, FM0MM, HC2SL, JA8UI/PZ, KV4FZ, LU1EKM, TI2LA, VP2LDT, VQ9R, WH6JCE, ZF1WW, ZLs 1NG 2GH, 4Z4NTJ, 6Y5BF and 9J2WS. In 10 months on the air 1250 QSOs have pushed my code speed to 25 wpm."

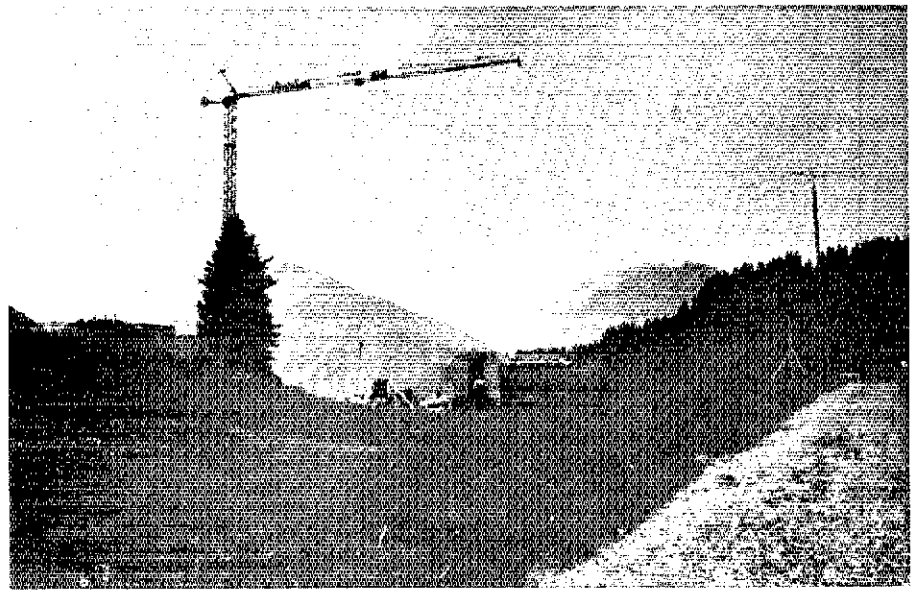
Jon acknowledges competition from a fresh group of newcomers to Novice-band DXing, Technician class licensees. Among them is WA5IYX who brings glad tidings of good hunting in our new 28-MHz Novice-Tech subband:

"Since September by Swan 500, 14AVQ vertical and 12-foot-high 10-meter dipole have captured KZ5BAN, PJ2FR, PY2BKO, WB5LSU/TI, ZL1BDG and 9J2CB. On 15 I bagged C6 CX DA-DK-DL EA8 F HA HB9-Ø I JA-JE-JG-JH-JI KH KL OK OZ PJ9 UB UK2 VP2A-L WH6 YU ZD8 ZF1 and 6Y5. On 7 MHz an old Adventurer, SP600JX and 30-foot wire caught up with C6, several KH6s and K4BR/VP9. Thirty other countries were heard on 15. Prior to trying lower frequencies, I made 50-MHz WAS no. 143 and worked such six-meter DX as CE3 and ZK1."

Right on, Pat. We're anticipating great DX things for the Technician gang this season with their new 10-, 15-, 40- and 80-meter radiotelegraphy privileges. About 12 percent of the stations we worked in February's Novice Roundup were adding "/T" to their calls. That annual activity's title may need revision. Welcome aboard the DX bandwagon!

FROM *QST*'S DX MAILBAG

NORTH AMERICA: DXpeditions to southern regions should be encouraged to take six-meter equipment along. Chances are they'll find enough 50-MHz skip to spice up the usual lower-frequency routine. (WA4MMP/7) . . . Agreed — six surely is interesting DX territory at the right times of year. Let's urge more widespread 50-MHz DXpeditionary interest. (W1HDQ) . . . KV4JY was the final QSO here for the Bicentennial Year, 35,335 contacts in 1976 for KV4AA as AJ3AA. That averages out to 96 per day. Forty came through with consistent nighttime openings. (KV4AA) . . . Satisfactory cw contest results on Montserrat as VP2MNR with 40 watts in the face of kilowatt competition. I'm in favor of a QRP multiplier. Resident VP2MGB displayed FB ham hospitality. (WA6VNR) . . . Closed W2BP for retirement at my dream QTH, beautiful Dominica, which I activated on 160 in '72. I'm quite in demand as the only regular cw station on the island with Drake gear on 1.8 through 28 MHz. The skywire at present is a multiband 150-foot wire. Also have 2-meter stuff on hand for OSCAR efforts. Left W2BP with 83 countries, WAC and WAS on 160. (VP2DD) . . . Quite interested in your WVNA-WAR story because I operated WVB at Fort Sam on the old War Department Net in the mid-'30s. (W2FRX) . . . That Rocky Point commentary brings back memories of my work at Riverhead in the late thirties. I watched five 300-foot towers topple in hurricane winds. Then there was the great propagation blackout of '39 when all shortwave circuits went dead for several days. (ex-W2JER) . . . Rocky Point may still be around for a spell if the possibility of housing WCC's transmitters materializes. There are airline base rigs and offshore-oil platform circuits to be serviced, too. (W2LYH) . . . HP1ON called wide attention to misuse of those clandestine HP8-9 call signs with announcements on several 14,313-kHz marine nets. (K4DZ) . . . K5s DB ETJ, W5OSJ and WB5CIT are pres. v.p., sec. and treas. of Alamo DX Amigos for the '77 run. (K5DB) . . . Twin-City DX Association pres., v.p., sec.-treas. and director for the new season are KØIEA, WØs GYH OUE and NG. (TCDXA) . . . The Mississippi Valley DX & Contest Club came into being in December to serve the greater St. Louis area. WØFF (ex-KØRTH) will gladly supply details to interested DXers. I act as interim corresponding secretary. (WBØGOP) . . . I'm managing my own QSLs for a change, preparing application for ARRL's 5BDXCC. (W4KA) . . . W6s KG and QL moved their Caribbean caper to Antigua after eight thousand QSOs with 123 countries as VP2EEQ, more from PJ8KG. Despite generally abominable propagation this OM-XYL DXpeditionary duo expects enough action to add more trophies to their imposing collection of 31 DXCC diplomas. (YDXF) . . . After working 105 countries in my first few weeks on 15 and 20 sideband I'm hoping to be one of the first WD8 Century Club applicants. (WD8CRY) . . . PJ3JD fired up at San Nicolaas in November with an FT200 and dipole. (VE3EIM) . . . Glad to be back in DX after too long away from the fun. High time I added a few endorsement stickers to the DXCC diploma I tacked up 20 years ago. (W4YHF) . . . Our FT101E and inverted V managed 98/93 worked/confirmed on 75 and 80 last year, all but a few on ssb. The autumn months were good for 102 21-MHz countries. (W3OJS-WA3UFO) . . . I'm becoming more interested in DX these days now that my brother is KH6AF. I hit the air 50 years ago with UV202s, a 201A and two-step. Casually collected about 90 countries with modest power up to 1940 but never got back to it after WWII. Plenty of antenna space at my fine Tennessee location to go with an NCX3 and TR4C. (W4ZZ) . . . Got the wanderlust and more time than money? Consult Freighter Travel Service, 201 E. 77th Street, New York, NY, for info on a leisurely mode of travel. Maybe they've even got that slow boat to China. (W5QPX) . . . Received my Novice ticket last June but didn't try 21 MHz until I put up a DB43 beam in December. DX! DF-DK-DL EA1-2-4-7 F2-6-8, FR7ZL, G3-4 GW I2-3-4-5-6 KH KL KP4 KZ LU OA ON4-5



HBØXAA's long-wire is supported by a convenient construction crane at your Liechtenstein QTH of the Month. DA1s DM and DS of Weisbaden ARC scored 1500 contacts with 65 countries and 33 states in their recent DXpedition to Triesenberg. Dennis and Don are WB5KEA and K5KVK back home.

*c/o ARRL, 225 Main St., Newington, CT 06111

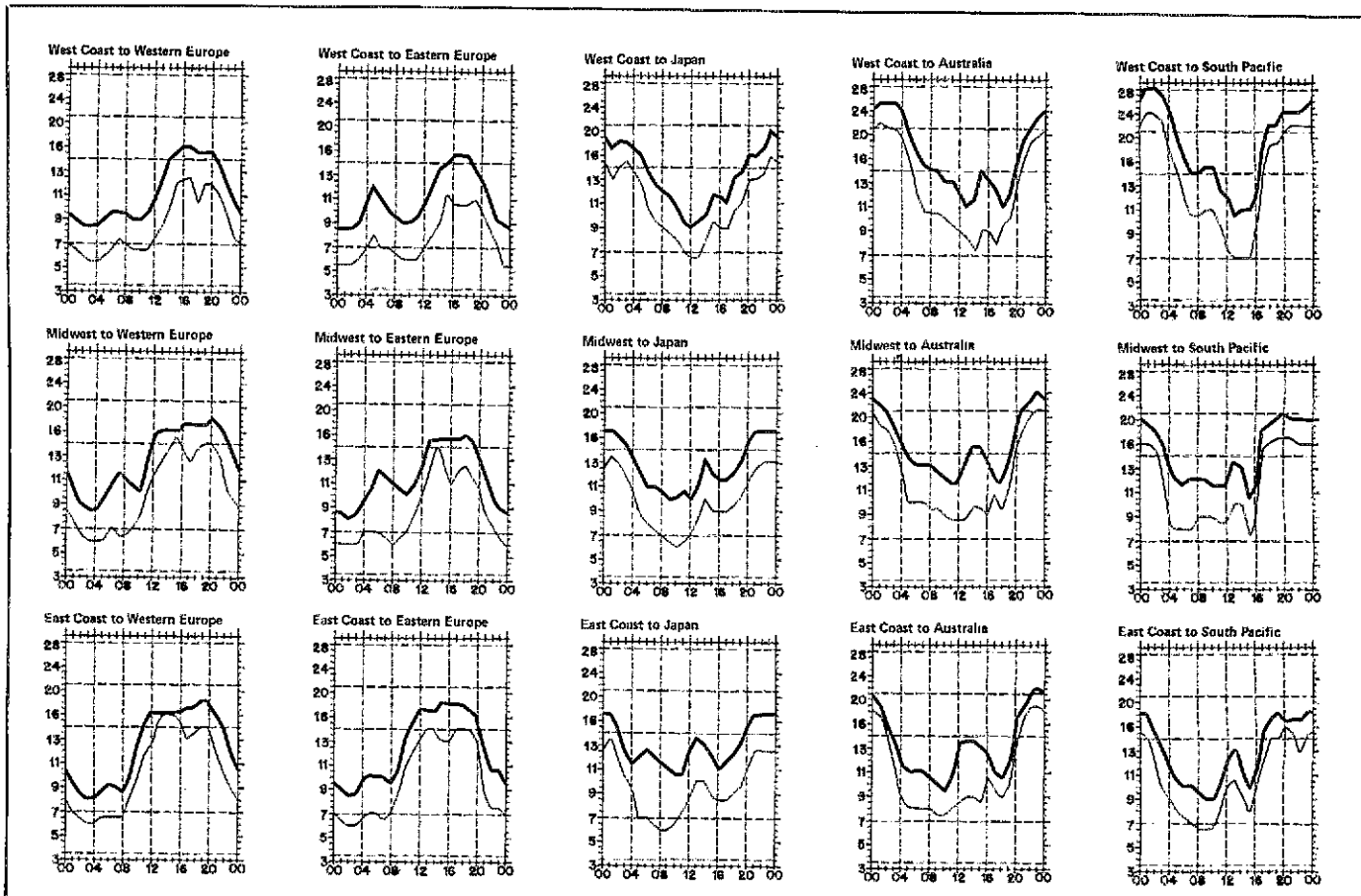
OK PA PY SM6-0 VK VO1 YU ZE ZL2-3 ZP 4Z4 and WAC when the QSLs come through. Fifteen sure beats battling SWBC megawatts on 40. (WB8ZRL) . . . Pleased to be one of 20 Novices who made 200 contacts in ARRL's Bicentennial bash. (WB8ZJF) . . . I'm stalking pretty rare stuff in the 21-MHz Novice slot – D2 KC4-6 5W1 and 8P7, for examples. (WA5IYX) . . . W4GSM, WA4DUS and I logged nearly eight kilo QSOs from FG0CVX/FS7 late last year. Fifteen was our big band but we ran the DX gamut from 160 all the way to OSCAR. (W4PRO) . . . Reminder: April 18th is entry filing deadline for this year's ARRL DX Test. Your results, large or small, should be documented in *QST*.

EUROPE: On the 7th-11th of this month DB3s CV MR, DF1s CB MD, DJs 2CW 8NS, DKs 1YG 6XH 8CK 8MO 9MO, DL3GX and I will man several Liechtenstein transceivers simultaneously on code, voice and RTTY from 1.8 through 1296 MHz. We'll add "/HB0" to our call signs. (DK5CI) . . . My HB0CBM sideband activity on 10 through 75 occurred on Ventotene Island. At the home QTH many W/Ks have been QSOd me as IK2CBM near 14,330 kHz. (I2CBM) . . . Working DL1JW as VP1EK reminded me that he was my first Germany contact as a Novice 21 years ago. The recent 160-meter contest season brought the best 1.8-MHz European openings I've ever observed. Scandinavians on 7 MHz have been popping through at noon UTC. (W8IBX) . . . DA1QB and I are active in Berlin on 80-, 40- and 20-meter cw. (DA2AA-K7VAY) . . . We hope many W/K/VEs participate in the Common Market DX Contest on the first weekend of this month. (ON4GO) . . . Likewise in VERON's PACC DX Test during April's final weekend. (PA0DIN) . . . Note that Poland's annual DX contest splits into separate cw and ssb segments this month. (WCDXB) . . . Nice to

5Z4RG was a pleasant stop along the route of VE3AUI's recent DX safari. Ron radiates a steady 20-meter signal from Nairobi.

QSO ON4BZ again 43 years after our first contact. My rig then was a 210 Hartley. (W1BFK) . . . Inquiries are welcomed concerning the DX certification sponsored by White Rose Radio Society of Leeds. (G4EZI) . . . CT4AT (K7CBZ) scored some 25 kilo QSOs last year with his 75-foot-high triband quad. Nice October visit with CR9AK on hand at Don's Portugal QTH. (K4GKD, PVRC) . . . WA1TCG radiates from Norway as LA0BP where his father spends a U. of R.I. sabbatical. (WA1UZK) . . . Delighted to be back on the air after a 10-year absence. Many DXers will recall QSOs with me as UC2AA in the early sixties. A recent contest weekend on 3.5 MHz produced 750 contacts with 65 countries. (UC2ACA) . . . F2BI and REF's Section 33 gang were wonderfully hospitable on our visit to France last year. (WB2QXX-XYL) . . . GJ2LU is former GC2LU displaying Jersey's new label, GU4EON offering the Guernsey version, both on 80 cw's low edge. (VERON) . . . Continental comments courtesy WA6AUD's WCDXB: 3Ys 1VC and 3CC emanate from the Norwegian antarctic where a fresh party is quite radioactive. LA4DD performs back-home liaison on 20. . . . Fs 3AT 8EX and 8VJ engineered a rare 160-meter availability of France last winter. Yugoslavia also joined the 1.8-MHz frolic, YU1PCF boosting top-band country totals far and wide. Other European areas are expected to follow suit. . . . SV0WA, 14,235 kHz at 1700 UTC, hunts U.S. westerners for WAS purposes.

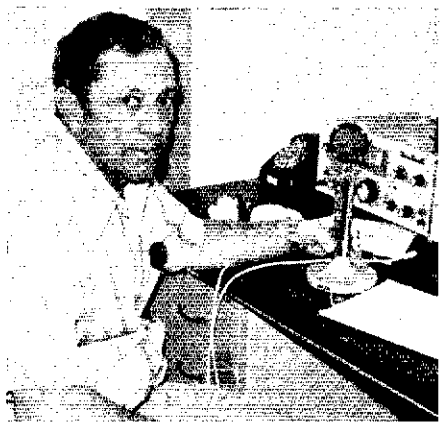
ASIA: From the 5th through 10th, possibly longer, of this month we hope to have KA1DX operational on 10 through 80 from Iwo Jima. (HL9JA-WA2JFK) . . . DXers should be aware that most amateurs in the Middle East concentrate activity on their Thursday-Friday weekends, Saturdays and Sundays being normal workdays. EP2SV likes cw at 1400-1800 UTC near 14,030 kHz and expects to hit the contests. In seven months Bill has had ten thousand QSOs with some 200 countries on 10 through 160 meters. (K5MM-W7NQ) . . . EP2DC, my brother WA1FEH, should be active for a year or so from Tehran with an NCX5 and 85-foot-high TH3. I'll try to get him going on 40 and 80 for the SBDXCC gang. Richard reports exciting long-path 14-MHz openings to the USA and hopes to encourage more activity from A6-7 regions. (K1DFC) . . . Still have another month or two on Masirah, mostly near 14,025 kHz, then it's back to G4BVH.



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. On 50 percent of the days of the month, the highest frequency propagated will be at least as high as the upper curve. On 90 percent of the days of the month, it will be at least as high as the lower curve. See January 1977

(A4XVK) . . . More than 50 DXers with exotic calls attended the recent Southeast Asia Net shindig in Jakarta. All continents but South America were represented. Ws 5AK SCP 6HOC 6PN and I, touring Asia with a sightseeing group, managed to take in the affair. Elsewhere we encountered great ham hospitality at BV2A, HS1WR, JA3GX, VS6s AF BL and other hamshacks plus a fabulous meeting with KH6IJ. (WA0TAS) . . . By the time this word gets around I should be signing 8Q0A in the Maldives with battery-powered QRP on 10, 15 and 20. (I2AXC) . . . Your mention of W2LYH's visit to Karachi brings back my own wartime radio days with the Office of Strategic Services. In '44 I was in charge of the hf site at Kunming, old Detachment 202. There I discovered some XUs employed by China's Central Radio Works. In the spring of 1945 we organized a lively hamfest and an interesting tour of the CRW complex. (W7LXD) . . . VE6CDN/mm has a TS520 and 14-MHz dipole aboard his 40-foot ketch in the Med. Fellow countryman VE3FXV signs 5B4DJ nearby. (CDXA) . . . Asiatic addenda courtesy WCDXB: JT1AT, tuning just above 3800 kHz, hopes for regular Saturday 3608-kHz showings around 1330 UTC with JA1EOD and UW0MF assisting. . . . AP5HQ keeps workable near 14,210 kHz at 1300 or so. . . . JA1OED needs New England states for WAS on 75, haunting 3795 kHz around 1100 UTC.

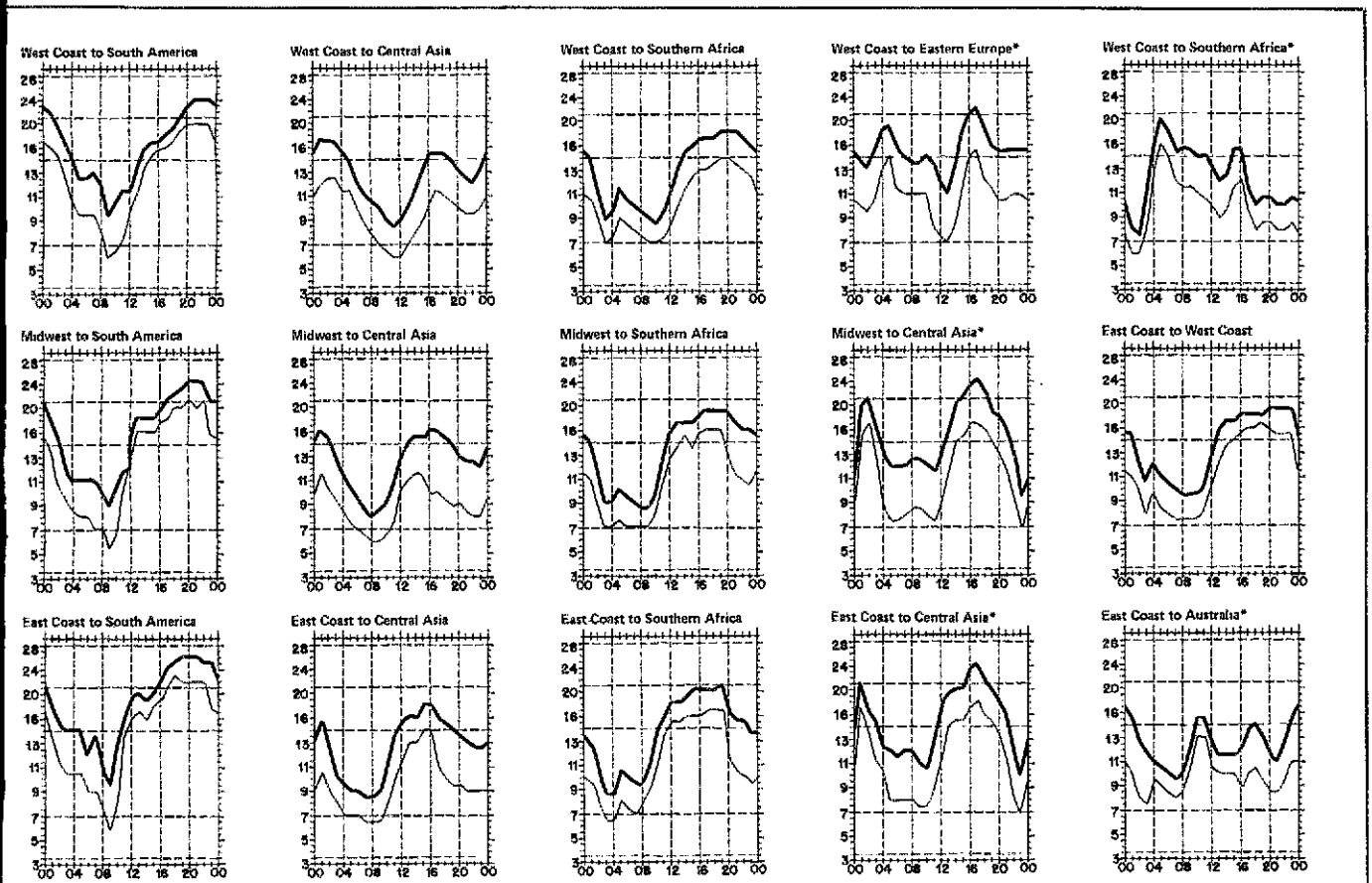
AFRICA: I look forward to a year's DX sport from the Chagos, mostly Saturdays and Sundays from 0700 to 1300 UTC. DXcellent location but slow *QST* arrival is a drawback. (WA4RQK/VQ9) . . . Piet Swommer, government radio technician and 1975-'76 operator of ZS2MI on lonely Marion Island, thanks radio amateurs for brightening his assignment there. He regrets unfamiliarity with cw but all the friendly ssb voices will never be forgotten.



5B4DI's Yaesu outfit and TH6DXX rotary are widely worked near 14,200 kHz. Clyde hails from Texas and is often heard as JY9DI/am when piloting for Jordan's airline. *(5B4WR-CARS photo)*

To all who tried but failed to make contact with Marion during Piet's tour we wish better luck next time. (ZS6s BBF CE) . . . With the aid of League literature I'm assisting an OT commercial op in Abidjan to join the ranks of hamdom. (TU2EF) . . . It's obvious that someone has been borrowing 3D6AX's call since Vic has been off the air since March, 1976. He may resume activity in the near future. (WA5IEV) . . . Items via VERON and WCDXB periodicals: JA1SNA intended to follow in JA1TES/5A's footsteps with 9H1FC another Libyan possibility. . . . FB8s WE and WJ hail from Crozet, FR7ZQ/e begins a stand on Europa, and FR7AI/t supplants FR7ZL on Tromelin. . . . Many ZSs are interested in operational visits to the new Transkei autonomy where S8AAA is reported on 14 MHz. . . . South Dakota and Alaska will wrap up 9G1JN's WAS near 14,012 kHz at 0000-0300 UTC. . . . An Indian Ocean net is said to occupy 14,115 kHz Sundays at 0800 UTC. . . . ZS6WW (WA6QGW) likes to visit with homeland sixes on the low edge of 40 cw after 0330 UTC. . . . 6W8DY sometimes hops the Mali border for 6W8DY/TZ QSOs, 20 sideband preferred. . . . 5Z4NI hopes to key from Kenya for a year or so, mainly 20. Neighbor 5Z4LW is popular near 3504 kHz.

OCEANIA: Sure enjoyed last year's operation at the DX end as C21NI, VR4DA and ZL2AWK. Anybody needing an additional experienced operator willing to pay his share of such DXpeditionary doings in the future can count me in. (WB8OFG) . . . What's this? I thought I had QSLd every contact for my VR1RO work of 20 years ago but January's "How's" indicates otherwise. (G2RO) . . . Via WCDXB's Pacific desk: ZK1BA's tentative itinerary calls for Manihiki on the 12th-13th of this month with the next shot in July. . . . VK2ZQK expects to sign VK0AC on Macquarie through '77. . . . VR1AA forsakes Oceania in favor of GW3HCL after more than 33 kito QSOs from the Gilberts since 1971. Old-timers will remember Dan as LI2CL, MD1D, ZC1CL, 3A2AE, 9Ms 2LO and 6CL. . . . KC6CG yaks from Yap near 3800 kHz at 1230 UTC with a Swan 500 and vertical. . . . VS5MC keeps Brunei coming on several cw bands. . . . K3RLY's IDXA congregation has W9MR scouting more Pacific DXpeditionary prospects . . . Time to thankfully acknowledge excerpts in these pages from Canadian DX



QST, page 58, for a complete explanation. The horizontal axis shows Universal Coordinated Time (UTC); the vertical axis, frequency in MHz. Asterisk indicates long-path circuits. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions for April 1977 assume a sunspot number of 13, which corresponds to a 2800-MHz solar flux of 73.

Association *Long Skip* (VE1AL/VE3), Columbus Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (G. Watts of England), Newark News Radio Club *Bulletin* (M. Witkowski, Rte. 6, Box 255, Stevens Point, WI 54481), Northern California DX Club *DXer* (K6SSJ), North Florida DX Association *News* (WA4UFW), Southern California DX Club *Bulletin* (WA6KZI), VERON's *DXpress* (PAØTO), West Coast *DX Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (WA7JCB).

DXAC NOTES

The following recommendations were received from the DX Advisory Committee in a January, 1977, letter from the DXAC chairman:

1) Any country that does not meet Rule 4 of the Countries List Criteria as of Janu 1, 1977, should be deleted.

2) The ARRL should issue a DXCC contacts made exclusively by satellite, subj to all of the rules for DXCC, except that award will not be subject to endorsement additional countries beyond 100.

3) The Pelagic Islands should not be giv special consideration for country status.

These recommendations were accepted the communications manager. For more formation on the function of the DXAC, page 90 of *QST* for December, 1974.

DX Century Club Awards

Administered by David Newkirk, WA1VCG

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. But there's more — you can endorse your certificate in 20-country increments through 240, in 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from November 8 through November 19, 1976. Think you may be ready to qualify for DXCC? Write Headquarters for details.

New Members

Mixed

WA4YDR/121	WA5CVQ/106	K1KRY/103	JA5BZL/100	W9HPP/100
DK5ML/110	W6NDS/105	K4BIY/101	W2SEC/100	WAØEWU/100
WA3KCY/106	W5PPS/104	WA4JJW/101	WA6QFU/100	

Radiotelephone

W7BG/163	ZF1MA/113	SM4ACH/103	W6MJM/102	G4CVZ/100
W7YEM/116	DK5ML/107	K9BQL/102	K2CTJ/101	WA5CVQ/100

CW

W7WN/109	W6YKS/104	WØFHE/102	W6ISQ/100	W9HFN/100
W7YTN/106				

Endorsements

Mixed

DL7BA/342	I7WL/313	DL1LD/282	WB2SFC/199	W4EDB/160
W5NW/340	DL6KG/309	VO1AW/282	K7NHV/193	W4UVP/153
I7ZPB/331	K2KGB/306	WØNAR/277	WB6BKN/191	W3HAO/151
W4DRK/331	WA9SLD/300	W2BZL/246	W1JDE/190	W1YK/141
JA4ZA/328	W1RLV/298	JH1AGU/220	W8KI/185	K3GYS/140
SMØKV/326	WA1HFN/294	WA4UPR/211	W1SK/181	W9VWV/140
JA1ZZ/325	K6GWN/291	VE3AER/201	VE3HBX/163	F6AZT/136
W5IR/321	K2DNL/284	K9KEV/200	K3HBP/160	WA4LOF/120
WA9IVL/321				

Radiotelephone

DL7BA/338	WA9IVL/310	WA1HFN/251	JH1AGU/200	W3FZE/177
I8AA/326	DL6KG/304	WA3ATX/243	K6JT/200	WA4UPR/159
JA4ZA/324	K2KGB/302	K2DNL/242	VE3AER/197	WA7TTM/144
W4DRK/322	WA9SLD/293	DK5AD/221	WB6BKN/191	WA6HAV/140
PY2DYI/321	W2EV/270	W2BZL/202	W8KI/180	WA4JDI/122
K3GKU/311	TR8DG/253	G4DJC/200		

CW

K9KEV/168	K4DAS/150	W4EDB/124		

QSL BUREAU NOTES

Attention is called to two changes in dresses for QSL Bureaus in Canada. T changes are for the VE4 QSL Bureau and Canadian Central QSL Bureau. These chan are effective as of April 1, 1977.

VE7 QSL Bureau Manager H. Martin, VE7AFY, is the "newest in time" as a QSL Bureau manager. Marty was first licensed in 1972 as VE3AKU and moved to BC in 197 along with his XYL Gloria and their two so In 1976 he took over operation of the VE7 Bureau.

Marty is a member of the Maple Ridge ARC and is currently involved with a group that is forming a local DX club. With the help of the XYL, Marty says he is having no problem keeping the cards moving for the 1000 or so hams in BC.

All you VE7s, help Marty help you by keeping those envelopes on file at the burea

THE ARRL DX QSL BUREAU SYSTEM

The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 X 7-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp, unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL hq.

- W1, K1, WA1, WN1* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- W2, K2, WA2, WB2, WN2* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.
- W3, K3, WA3, WN3* — Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- W4, K4 — National Capitol DX Assn., Box DX, Boyce, VA 22620.
- WA4, WB4, WN4 — Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.
- W5, K5, WA5, WB5, WN5* — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.
- W6, K6, WA6, WB6, WN6* — ARRL Sixth (6th) District DX QSL Bureau, 2814 Empire Avenue, Burbank, CA 91504.
- W7, K7, WA7, WN7 — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.
- W8, K8, WA8, WB8, WN8 — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- W9, K9, WA9, WN9 — Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- WØ KØ WAØ WBØ WNØ — WØ QSL Bureau, Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.
- KP4, WP4* — Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.
- KV4 — Graciano Berlardo, P. O. Box 572, Christiansted, St. Croix, VI 00820.
- KZ5* — KZ5 QSL Bureau, KZ5OD, Box 407, Balboa, CZ.
- KH6, WH6* — John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.
- KL7, WL7 — Alaska QSL Bureau, Star Route, Box 2401, Wasilla, AK 99687.
- *QSL Cards for Canada (VE and VO) may be sent to: ARRL Central QSL Bureau, P. O. Box 396, Downsview, Ontario, Canada M3M 3A8. Or, QSL cards may be sent to individual bureaus.*
- VE1* — L. J. Fader, VE1FQ, P. O. B 663, Halifax, NS.
- VE2 — A. G. Daemen, VE2IJ, 29 Douglas Avenue, Montreal, Quebec H3R 2
- VE3 — The Ontario Trilliums, P. O. B 157, Downsview, ON, Canada M3M 3A3.
- VE4 — W. A. Studen, VE4BJ, 578 Oxfo St., Winnipeg, MB, Canada, R3M 3J9.
- VE5* — A. Lloyd Jones, VE5JI, 23 Grant Road, Regina, SK S4S 5E3.
- VE6* — D. C. Davidson, VE6TK, 11 Trafford Dr., N. W., Calgary 47, AB.
- VE7 — Howard Martin, VE7AFY, N 45-9960 Wilson Road, Ruskin, BC V0M 1F
- VE8* — Al Sturko, VE8NS, P. O. Box Fort Smith, NWT X0E 0P0.
- *VO1, VO2 — William Coffen, VO1KM, O. Box 6, St. John's, NF.*
- SWL — Leroy Waite, 39 Hannum S Ballston Spa, NY 12020.

*These bureaus sell envelopes or posta credits. Send an s.a.s.e. to the bureau further information.

QSL bureaus for other areas can be fou in the December, 1975, issue of *QST*, p 64.

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

OSCAR—What Has It Done for Us Lately?

Much has been written about the amateur satellite program and its contribution to ham radio. We are all aware of OSCAR's classroom applications in demonstrating the fundamental principles of orbital mechanics, Doppler effect and other phenomena associated with the space age. It has often been stated that amateur radio's accomplishment of constructing and securing launches for several long-lived satellites capable of relaying our signals over thousands of miles will stand us in good stead at the 1979 WARC. Moreover, actual experiments using OSCARs 6 and 7 have demonstrated the value of amateur satellites in emergency communication, including the transmission of medical data. The particular application of satellites for setting up EME, m.s. and tropo skeds by a number of vhfers has been mentioned on several occasions in this column. Most amateurs are, I believe, convinced that the OSCARs have been good for our cause. But, aside from the obvious opportunity of working through the "birds," how many of us in the world above 50 MHz realize the direct benefit the satellites have brought to our particular niche of the hobby?

When OSCAR 6 went into orbit in the fall of 1972, many vhf enthusiasts complained that it was draining conventional activity from the bands. It was, at about the same time, that 2-meter fm was really taking hold and the combination of the two developments certainly appeared to have a detrimental effect on "traditional" vhf operation. In the ensuing four years, however, there has been a marked turnaround. Particularly on 2 meters (even though fm activity remains high), other modes, especially ssb, are gaining. It is evident that satellites have provided the stimulus that encouraged many to try vhf again or for the first time in their ham careers. Most of these new converts are using new commercial rigs which probably wouldn't exist, or at least would not have been marketed on a wide scale, if OSCAR 6 and 7 had not been there to provide a worldwide demand.

Because of the wide coverage provided by the satellites, 2-meter and 70-cm stations can now be found in many countries that would not otherwise support such activity. The very existence of these stations has already led to observation of some very interesting propagation phenomena. YV5ZZ's reception on 145.9 MHz of the OSCAR uplink signal of LU7DJZ has previously been reported in these pages. This is undoubtedly the greatest distance that 2-meter signals have ever been heard without benefit of the moon. It's also the first known instance of transequatorial propagation being observed this high in frequency. Another case in point, mentioned in last month's column, involves the contacts made between 6W8AK and TU2GA. On a number of occasions these two African stations, which are about 925 miles apart, have been able to work at high noon via 2-meter cw and sometimes ssb. Attempts at other times of day have so far proved fruitless. No one yet knows the propagation mode but whatever it is, it would not have been observed if two hams in out-of-the-way places had not set up OSCAR stations.

From the Caribbean, we learn that another satellite operator, KV4AD, is regularly working on 2-meter ssb through several mountains to KP4s GN and EOR, as well as running schedules with FM7AB. With this OSCAR generated 2-meter Caribbean activity, and the right conditions, life could become very interesting for us here in parts of the U.S.

We have only begun to scratch the surface with satellites and the things they can do for us. This fall should see the launch of the next in the series of medium-altitude polar-orbit OSCARs. A little more than two years from now AMSAT's Phase III spacecraft is due to be lofted into a high-altitude orbit that will make it visible to, and workable by, most of the northern half of the earth for hours at a time each day. The prospect of holding extended QSOs with distant stations via this new and exciting mode, boggles the imagination. But that's not the whole story. Once again, the existence of this super satellite in orbit high over the North Pole will induce literally thousands of amateurs to acquire vhf and uhf capability. Many of them will be in remote places, but places which, nevertheless, may provide some interesting terrestrial propagation possibilities. Who can predict what new chapters will be written in the history of the world above 50 MHz as a result of the influx of new population that the Phase III and follow-on satellites will bring?

CONFERENCES EAST AND WEST

May will witness two fine vhf/uhf conferences, one at each end of the country. The Eastern VHF/UHF Conference will be held on the 7th and 8th at the University of New Hampshire in Durham. Two days packed with interesting and useful technical information have been planned by Joe Reisert, W1JR. Contact Joe at 17 Mansfield Dr., Chelmsford, MA, for details. Registration is being handled by Rick Como, K1LOG, 3 Pryor Rd., Natick, MA. Despite the wealth of technical material to be presented, W1JR promises that there will be plenty of time to relax and swap stories with fellow vhfers. The beautiful surroundings afforded by the campus atmosphere are certain to make this a pleasant and rewarding event for all serious vhfers.

The site for the 22nd annual West Coast VHF Conference is the Miramar Hotel on the beach at Santa Barbara, CA. This affair will be held May 13 through 15, one week later than the Eastern Conference. How many will make both? According to Wayne Overbeck, K6YNB, conference coordinator, technical and operating oriented talks for advanced and beginning vhfers will be featured; also a VHF Contest Forum which he, as chairman of the ARRL Contest Advisory Committee, will be conducting. Following dinner Saturday

Well-known father and son moonbounce team Marc, F9FT and Franck, F5SE, total 93 years of vhf experience and enthusiasm.

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

evening, WA6UAM will officiate for the noise figure measurement tests. Sunday morning will be devoted to an antenna-gain competition conducted on the hotel's beachfront boardwalk. Registration until April 30 is $2; $3 thereafter and at the door. For further information write Dr. Wayne Overbeck, Communication Division, Pepperdine University, Malibu, CA 90265.

VUAC NOMINATIONS

As announced on the W1AW bulletins and in *QST* for March, the ARRL Board of Directors, at their January 20 meeting, established the VHF/UHF Advisory Committee (VUAC). The next move is now up to the vhf/uhf fraternity to make nominations for this committee. League President Harry Dannals, W2HD, will select from your nominations one member from each of the 10 U.S. call areas and one member from Canada. If this new committee is to effectively deal with the many issues presently confronting the world above 50 MHz, it must have the very best people. These people must be well informed on the various aspects of our part of the hobby, and they must have the desire and ability to serve. You are the best qualified to know who these people are. Therefore, you are urged to send your nominations now for the VUAC to Harry at ARRL headquarters.

WANT TO BE A *QST* EDITOR?

Do you have a suggestion you would like to get off your chest? Maybe you have a technical point to share with the rest of the vhf/uhf gang. This is an invitation to try your hand at writing the lead material for "The World Above 50 MHz." The lead material is the section of the column which is set in large type and precedes the rest of the text. It is the part of the column which sets the tone for what is to follow and provides the opportunity to get points across whereas the remainder of the column tends to be more in the nature of straight news reporting. So sit down, take pen or typewriter in hand and write, in no more than 500 words, on whatever subject appropriate to vhf/uhf matters you feel should be aired in these pages. We will collect your contributions and select one every few months. Of course, your by-line will accompany your work and we will do a minimum of editing. Let's hear what you have to say.

GEOGRAPHICAL COORDINATES WANTED

The mileage figures listed in the standing boxes are often quite inaccurate. Many times they are guesses at best. Even in the case of the DX records, the precise distance is sometimes open to question. Something can be done about this. By plugging the geographical coordinates of two locations into a standard set of equations, the exact distance between them can be calculated. I now have a program for my Texas Instruments SR 52 calculator with which I can do this very quickly and easily. But I must have the geographical coordinates of the stations involved. I plan to start a file of coordinates of the active vhf/uhf stations throughout the world and ask, therefore, that everyone send me their coordinates. In the U.S., your coordinates can be determined by consulting the topographical maps put out by the government. For those not having access to such maps, please provide your distance and direction from the nearest major city. I will then estimate your coordinates using that information and a world atlas. Please provide information to assure as great a precision as possible.

ON THE BANDS

6 and 2 Meters — Due to the fantastic propagation conditions involving both 6 and 2 meters which took place in late January and early February, we are abandoning for this month the usual practice of treating these two bands separately. It's difficult to believe that sporadic Es would form the major 6-meter news for this time of year, but it did. What's even more amazing is that this same propagation mode also dominates the 2-meter reports turned in as of mid-February. That would be astounding even in June or July. Reports of contacts made are so numerous that we can't possibly list them all, but we will try to summarize the situation as best we can.

The OVS report of WAØTRO provides a good synopsis of the 6-meter conditions. Larry says that the band was open at his Smith Center, KS, QTH on 12 days during January netting him a total of 113 contacts. During the first half of February, Es sessions occurred on the 5th, 6th, 7th, 8th, 9th and 10th. On February 5 at 2323 UTC he worked XE1FE, Mexico City, and a few minutes later heard but did not work XE1GE and XE1RCP. It sounds as if activity is picking up south of the border.

WA8OGS of Cincinnati, OH, reports many of the same openings including a double-hop session producing contacts with WA6JRA and WB6HDB during the morning of January 29. Following this, the band remained open for single hop until 2000 local time that evening. Joe believes that these conditions were predictable on the basis of various Es or aurora conditions at approximately 27-day intervals prior to this time. K5ZMS of San Antonio is another 6-meter operator experiencing much better than average conditions. Ray particularly points out the backscatter propagation produced by the very intense E-layer ionization prevalent this winter. Another manifestation of this is reported by WA5IYX, also of Alamo Town. Pat called on the answering machine to inform us that between 1750 and 1835 CST on Feb. 7 he was receiving high-band vhf TV signals from MN and SD. Even channel 13 from Sioux Falls was in for a few minutes. The chances are very good that the muf exceeded 220 MHz.

Naturally the conditions observed by WA5IYX were felt on 2 meters and we now have the activity that enables us to take advantage of conditions when they occur. WA8OGS filed a report that W8HWB worked TX stations W5VDS and W5UWB. Unfortunately the antenna at WA8OGS, an 80-element collinear, was fixed north for aurora so he couldn't take advantage of the opening. Cy promises to have it rotating soon. The high ionization resulted in some very short skip including 2-meter contacts from many TX stations to the gang in Wichita. WB5JHG in Houston is one such TX station. He also reports landing QSOs in NE, SD, CO and AZ and hearing two FL stations. From Sierra Vista, AZ, W7RUC writes that he worked about a dozen 5s in TX, LA and MS as well as WB4MBV in TN for state number 26. Steve points out that he has now worked WB5LUA, WA5TUD and W5JTL on both Es and m.s.

W5GVE of Corpus Christi was another far-off 5 having a ball working stations all over the Midwest. He even heard a single unidentified 3. In addition to working TX stations W5GVE, WA5TBE and W5UWB, all of the Corpus Christi area, KØDAS in Hiawatha, IA, reports hooking up with WAØRJT in Dubuque on E-layer backscatter.

The fm gang were having a field day too. Many have written asking what made the band open like that. I don't blame them for wondering. Who would have thought that E skip would occur this time of year? One fmer who took advantage of the opportunity is W4SMU, Erlanger, KY. Paul made contact with W5BIY, Austin, TX, as well as W5ZBI and W5AHU in San Antonio. His compatriot over in IN, WB9SRL, also came up with three Texans WB5FWR, WB5GSN and WB5OTC.

Judging from the reports received so far, the honors for the most easterly station to get in on the Es conditions belongs to an fmer, W4YFR of Marietta, GA. W4LNG of nearby Atlanta writes that Gene worked W5CXP, Clovis, NM, both through the local 28/88 repeater and direct.

February 7 wasn't the only day that 2-meter Es contacts were made. W5UWB in Kingsville, TX, near Corpus Christi reports that on the previous evening he heard two 6s and worked W7OO in AZ on 146.52 fm.

The 1977 winter Es season didn't end in a blinding flash of 2-meter contacts on February 7. It had a lot of life in it yet. Six meters was open for several days thereafter, but the most interesting event for that band came on the afternoon and evening of the 10th (11th UTC). From San Antonio, TX, and Hilo, HI, comes word of a near miss on an attempted 3580-mile 6-meter contact between K1VPD/5 and KH6IAA. High line noise at the Hawaiian end prevented comp tion of a QSO despite the fact that bo stations received each other's call

Despite the noise KH6IAA was able work WB6ECD and WA6OIL on the openi which took place about 0200 UTC Februa 11. Another San Antonio station, K5ZM reports hearing the KH6 about S-2. Althou Ray was in QSO with WB6EOD at the sar time that KH6IAA was, he was unable make it through Al's noisy power lir K5ZMS also notes that he did not hear t KH6EQI beacon which is located in t Honolulu area about 200 miles to the nort west of Hilo. Operator of that beac KH6GRU says that it is running on 50.1 from 1800 through 0500 UTC daily using SB110 feeding a five-element beam aim toward the mainland. Anyone hearing t beacon wishing a contact is advised to c 808-689-0111. Stations attempting to bre the beacon should call about one kHz high.

70 Cm — The short EME career of FY7AS French Guiana is over but thanks to th effort some of the gang have another not on their guns. Those understood to ha worked Jacky are W1JR, F9FT, PAØSS G3LTF, VK2AMW, K2UYH, VE7BBG ar F2TU. The contact with F9FT included ssb exchange in French. This is thought to the first French language EME contact history. The dish is gone now, but once aga the perseverance and ingenuity of hams ha overcome the administrative and technic problems of putting a big installation amateur moonbounce, and once again it h stimulated interest in EME especially amo amateurs in places where moonbounce ar OSCAR are about the only dependab sources of vhf/uhf contacts. One of these YV5ZZ who should be operational on 70-c EME by the time this appears in print. Soc WAC on 70 cm will be routine for any static with reasonable EME capability.

The K2UYH/VE7BBG *432 EME Newsletter* gives an excellent overall view of what transpiring in moonbounce on the 70-c band as well as providing the month schedule list. As an inkling of what can and being accomplished, the following is a list some of the QSOs which took place durin January and early February, in addition those involving FY7AS mentioned abov F9FT worked I5MSH, JA1VDV, SM5LE an LX1DB. PAØSSB made the grade wit JA1ATL and G3LTF while I5MSH, in add tion to his exchanges already noted, co tacted JA1ATL and F2TU. G3LTF chalke up the second 70-cm WAC history by workir JA1VDV after having salted away Sout America in the form of FY7AS.

Alaska is now represented on 70-cm EM thanks to WAØFLS/KL7. Although he is usir only four, 16-element KLMs, he has manage to work WØYZS and K2UYH. This conta brings K2UYH's state total to 35.

Although too late to make last month EME Annals, PAØSSB writes that he is up t 18 stations in 10 countries. He failed t mention how many U.S. states he has, but di state that he has five continents and expec to work Africa just as soon as ZE5JJ become operational again. Incidentally, Jan als claims contact with four stations in thre countries on 23-cm EME.

On the ATV front, W3HMS of Valle View Dr., RD 1, Mechanicsburg, PA 1705 states that he is active on 439.25 MHz, an looking for skeds. Those interested can writ to John or call him at 717-697-4747.

23-Cm Standings

Figures are U.S. states, call areas and best D in miles.

K1PXE	13	5	448	K4NTD	3	2	84
K9AQP/1	7	3	300	W4VHH	2	1	3
WA2LTM	16	6	770	W4LDV	1	1	2
W2OMS	13	5	537	K5LLL	2	2	8
K2UYH	10	5	520	W5LDV	2	2	8
K2JNG	10	4	305	K5PUF	1	1	2
W2DWJ	10	4	200	W5HN	1	1	2
WA2VTR	6	4	330	W5HPT	1	1	2
K2YCO	6	4	570				
WA2EUS	4	5	330	WA6UAM	1	1	1
K2OVS	3	2	135	K8UQA	6	4	4
K2EVJ	2	2	215	W8YIO	5	4	5
W3HMU	10	5	260	WA9HUV	5	3	5
K3IUV	7	4	320	W9JIY	5	3	3
K4QIF	12	5	551	W9WCD	3	3	7
K4SUM	5	3	220	W9JTP	3	2	1
				VE3HW	1	1	2

Public Service

Conducted By Robert J. Halprin,* WA1WEM

Highlights – NTS Pacific Area Staff Meeting

The following is taken from a preliminary report filed by K7NHL.

The Pacific Area Staff met on January 15, 1977, in Los Angeles, CA. Those present were K7NHL (chairman and PAN manager), K5MAT (TCC director), W7KZ (RN 7 mgr.), WØHXB (TWN mgr.) and members-at-large W5RE, W6BGF and W7GHT. Nonvoting observers were WB6FTY, WB6AKR, W6INI and Southwestern Division Director W6KW.

Staff reviewed National Traffic System operation within the Pacific area during the previous 18 months. All region and area nets seem to be doing well, although some region nets, particularly the daytime nets, need more representation from section level.

Staff voted to take a census of traffic handlers in the Pacific area, based on QN1/net manager reports, not limited to NTS nets, but based on identified call signs, to make more visible the extent of public service activity within the area.

Staff recommended that the materials sent to new licensees by ARRL should include discussions of traffic handling by inclusion of reprints of the December *QST* article "Checking into Slow-Speed Nets" [This is being done in "New Ham News," vol. 2, no. 2, sent to all new licensees – Ed.] and either an abbreviated list of slow-speed nets or a mention of the availability of the *ARRL Net Directory*.

Another recommendation by PAS was that the Communications Department, in conjunction with the Membership Services and Club & Training Departments, should prepare a package for affiliated clubs, giving advice on the operation of traffic booths whenever amateur radio is displayed or demonstrated to the public.

In a discussion of emergency procedures, the Chair pointed out that during 1976, four emergencies had produced significant traffic loads in the Pacific area: Guatemala, Guam, Idaho and Colorado. The possibility of emergency calling frequencies was discussed and it was emphasized that the principal difficulty in summoning communications support from amateurs was to alert them to the existence of the emergency. Staff decided to try to develop more usage of certain frequencies for this purpose and to encourage systematic monitoring of such frequencies. After an informative discussion by W6INI on American Red Cross' requirements for emergency communications, it was agreed that more information is needed on what such agencies as the Red Cross require and more standardization of such requirements on a chapter-by-chapter basis within the Red Cross.

The concept of NTS operations expressed in the current revision effort of the *Public Service Manual* was discussed, together with the variants of the system design, originating with WA8MCR and K5MAT. Staff voted to make a trial of the plan proposed by K5MAT for integrating daytime and evening cycles of NTS within the Pacific area. The principal feature of the plan calls for TCC stations to carry traffic to the next sequence of the system without regard to whether it is a daytime or evening session.

Brief discussion of possible changes to message format and QN signals used by cw nets was held without action, except to call the attention of the communications manager to the minutes on the subject in the meetings of 1974 and 1975.

PAS terms of reference were amended to allow net managers who resign their positions to seek nominations for their successors from within their participating groups, in addition to nominations from members of the staff.

Staff recommended that the status of assistant managers be changed so that assistants could represent the manager at staff meetings in the latter's absence or incapacity, with the same privileges of voting and reimbursement, and could also immediately take over a managership upon death or resignation with all such privileges, until a successor is appointed in the regular way. The assistant manager would be appointed in the same way as net managers are now.

It was recommended that the next meeting of PAS be held in either Spokane, WA, or San Diego, CA, during the summer of 1978.

PUBLIC SERVICE DIARY

□ Bartlesville, OK – December 24. Area amateurs handled field communications during a massive fire that destroyed 25 homes on the west side of town. Hams did a great job of keeping vital information flowing into c.d. headquarters. (WA5FSN, SCM OK)

□ Weirton, WV – December 26-27. A severe snowstorm knocked out power and telephones. The Hancock Co. RACES net mobilized to supply communications for the city's emergency services. (K8QEW, EC Hancock Co.)

□ Daviess Co., KY – January 8-9. When the area was clobbered by heavy snow, EC K4UDZ and 17 other local hams provided communications in various emergency situations. (W4OYI)

□ Springfield, MO – January 9-10. Following a severe snowstorm in the area, a 24-hour watch was established on 31/91 at the emergency-operations center, located at the Greene Co. Sheriff's office. Mobile units were dispatched from the center to help motorists in trouble, and those traveling were provided with the latest road conditions. (WØSIV, EC Greene Co.)

□ Fort Worth, TX – January 10. When telephone service was disrupted, Tarrant Co. RACES members manned a communications link at the fire department to handle emergency calls. (W5SH)

□ Columbia Co., NY – January 10-11. The Columbia/Greene Co. ARES handled communications for authorities when a devastating blaze destroyed the largest industry and four stores in the town of Philmont. (W2KHQ, EC Columbia & Greene Cos.)

□ Ventura, CA – January 16. While spending a day at the beach, WB6RVA, a certified scuba diver, observed almost simultaneously a sailboat capsize and a powerboat run aground. Realizing that he couldn't handle both accidents, he contacted WA6LBS on a local repeater, who notified the Sheriff. Later that day, he witnessed another boat capsize. He immediately dove into the surf and rescued a six-year-old girl. (W6RIC, EC Ventura Co.)

□ New Bedford, MA – January 18. When gas explosions and fires destroyed parts of the city's waterfront historic district, the AREC supplied communications for police, fire, c.d. and the Red Cross. (W1LE, EC New Bedford)

□ Pittsburgh, PA – January 20. At the request of the Red Cross, Allegheny Co. AREC members provided disaster-site communications following an explosion at the Univ. of Pittsburgh's Oakland campus. (WA3JBQ, EC Allegheny Co.)

□ Georgia – January 23. The GA ARES net operated continuously for 20 hours when an ice storm hit the state. The Weather Service was unable to gather info through their regular channels and relied on the net for incoming weather data. (K4VHC, EC Cobb & Douglas Cos.)

□ Indiana, Michigan, Ohio – January 28-30. Hams provided outstanding service when blizzard conditions struck these areas. Reports are still coming in. Watch *QST* for a complete report.

□ *Repeater Log.* According to reports received to date, repeaters were used to report 82 automobile accidents and related occurrences, four disturbances, two burglaries, one fire and one medical emergency. Repeaters involved were WR1s AAC ACI, WR2AIU, WR3AAA, WR4ALM, WR5s ABA ABY AJG, WR7AFT, WR8s ABS ACB ACQ, WR9ABY, WRØACD.

□ For 1976, 442 SEC reports were received from 53 different sections, slightly up from 1975's 426 and 50. In 1975, 22 SECs reported every month however, in '76 only 20. The following sections had 100 percent reporting, the number in parentheses shows how many years of complete reporting has occurred: Alta (1), Ariz (2), Colo (11), Conn (2), Del (3), EMass (1), Ind (3), Ky (1), Mich (8), NC (3), NFla (1), Ohio (1), Org (7), SDgo (6), SCV (3), Sask (12), SFla (25), SNJ (2), Utah (9), WVa (1). These figures include late reports.

Those sections not achieving 100 percent, but reporting every month since July are Ark, ENY, Ga, NNJ, NTx, Okla, Ont, Va, WMass. Several of these missed 100 percent by only one report. Congratulations to SFla, now with a *quarter century* of continuous reporting.

Now for the bad news. Those sections not reporting at all numbered 21, as compared to 1975's 18. They are BC, CZ, EPa, Ida, Ill, Ia, LA, La, Man, Mar/NFld, NH, NMex, ND, Que, RI, SC, SD, Vt, WI, Wis, Wyo.

SEC reports received in January total 32, compared to 34 this time last year. Reported AREC members totaled 12,765, compared to 11,733 in January 1976. Sections reporting were Alta, Ariz, Ark, Colo, Conn, EMass, Ga, Ind, Iowa, Kans, Ky, Me, Mich, NLI, NC, NFla, NNJ, NTex, Ohio, Okla, Ont, Org, SDgo, SBar, Sask, SFla, SNJ, Utah, Va, WVa, WMass, WPa.

NATIONAL TRAFFIC SYSTEM

It's deadline city at the Public Service Desk, so your scribe will be briefer than usual. Everyone seems to have survived the SET, albeit with mixed emotions. There didn't seem to be any dearth of traffic this year.

*Assistant Communications Manager, ARRL

QST will carry a complete SET report later. The annual Bill Shaw, WB2VEJ, Award went to both WA2WKH and WB2ASD for their dedication and contribution to the Second Region Nets during 1976. Eastern Area NTSers have started the "Tail Twisters Net" on 3940 kHz, 8 A.M. Sundays, to "instruct and critique individual operating techniques and hopefully to draw additional stations into traffic handling." If you're up that early on Sunday, please drop by. Certificates: WA4UKU (4RN-D), WA4JDH WA4JGG WB5UAK (RN5-D), WB7NPP K7RAO VE6HO VE7MW (RN7-D).

January Reports

(evening sessions)
(daytime sessions)

1	2	3	4	5	6	7
EAN	35	2213	63.3	1.410	97.1	
EAN	64	740	11.5	.571	89.3	
CAN	35	1544	44.1	1.046	99.5	
CAN	61	316	5.1	.217	94.0	
PAN	31	1403	45.3	1.077	98.3	
PAN	62	212	3.4	.203	83.0	
1RN	63	703	11.2	.402	93.3	97.1
1RN	39	447	11.5	.532	82.0	89.0
2RN	92	645	7.0	.450	92.6	97.1
2RN	65	518	7.9	.535	81.2	95.3
3RN	64	430	6.7	.409	93.2	97.1
3RN	33	158	4.7	.509	88.9	96.8
4RN	66	728	11.0	.434	95.4	97.1
4RN	63	392	6.2	.284	69.7	100.0
RN5						100.0
RN5	34	380	11.1	.338	87.1	96.7
RN6	60	652	10.8	.416	96.7	100.0
RN6	33	278	8.4	.270	90.9	91.9
RN7	57	374	6.5	.415	76.4	96.8
RN7	61	189	3.1	.202	52.2	85.4
8RN	50	306	6.1	.317	68.8	97.1
8RN	34	159	4.6	.403	81.3	100.0
9RN						100.0
9RN	31	180	5.8	.327	97.5	88.7
TEN	60	539	8.9	.334	80.1	98.5
TEN						96.7
ECN						97.1
TWN	66	678	10.2	.415	97.3	98.4
TWN	18	42	2.3	.119	47.1	70.9
CTN	31	434	14.0	.610	98.0	
TCC Eastern	127[1]	762				
TCC Central	93[1]	726				
TCC Pacific	115[1]	822				
Sections[2]	4245	21348	5.0			
Summary	5553	38318	6.9			
Record	5620	42106	19.1			

[1] TCC functions not counted as net sessions.
[2] Section and local nets reporting (124): MTN (MB), OPN (ON), WQV/UHF (PQ), STN (SK), AENB AEND AENJ AENM AENW SENS (AL), ASN (AK), ATEN HARC (AZ), AMBN APN ARN OZK (AR), NCN NEN SCN (CA), CWN (CO, WY), CN CPN VHF-2 (CT), FAST FMTN FPTN GN QFN QFN5 SPARC (FL), CVEN GARES MAEN (GA), IMN MTN (ID, MT), ILN (IL), TLCN (IA), KPN KSBN KWN QKS QKS-SS (KS), KRN KTN KYN MKPN (KY), LAN LRN LSN LTN (LA), MSSN PTN SGN (ME), MDCTN (MDC), EMRI EMRIPN EM2MN NENN WMN WMPN (MA), HEN KCAN MACS MI6m MNN QMN WSBN (MI), MSN MSPN MSSN MWX PAW (MN), MSBN MSN MTN (MS), MSN MOSSBN PHD (MO), NJN NJPN (NJ), SWN (NM), NLI NLIPN NLS (NY), BRTMN NCSSBN SCSSBN THEN (NC, SC), MASER ONN OSN OSSBN (OH), OAN OFON OLZ OPEN OTWN STN (OK), OSN (OR), WPTN (Pac), EPA PFN PTTN WPA (PA), ETTMN TN TNN TPN (TN), BEN TEX TTN (TX), BUN UCN (UT), VFN VSBN VSN (VA), WVN WVPN (WV), BEN BWN WIN WNN WSBN (WI).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVG.
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

The special TCC Net (Eastern Area), which convened on SET Saturday, worked quite well. Fourteen stations checked in and all 16 functions were filled within the half hour. First-time certificates were earned by WA3SXU (TCC-E), WØHH (TCC-C) and WBØDJY (TCC-P).

All it takes is 20 points for a Novice or Tech to make the newly expanded Public Service Honor Roll. The first Novice to qualify was Jay, WB4QBB, from Pensacola, Florida. Besides being active on a myriad of Novice nets, Jay was quite active in the Novice Roundup. You might have heard him, cruising along at 25 wpm or so. If you're a Novice or Tech who wants to bring up your code speed, traffic handling is the best way to go.

1	2	3	4	5
Eastern	140	85.7	2130	762
Central	99	93.9	1444	726
Pacific	124	92.7	1648	822
Summary	363	90.7	5222	2310

TCC Roster

The TCC roster (January): Eastern Area (W2FR, Dir.) — W1s NJM QYY, K1EIR, WA1s FCM MSK WEM, W2s FR GKZ JJ, K2HI/VE2, WA2s ICB PJL, WB2RKK, WA3s SXU VBM, W4UQ, K4KNP, W8s LTA PMJ, K8KMQ, WB8ITT, VE1AAO, VE3s GOL SB. Central Area (W5GHP, Dir.) — W4RQS, K4VM, WB4SKI, W5s GHP MI UGE UJJ, K5TFG, WA5IQU, W9s CXY DND NXG, WA9EED, WB9s NOZ TWT, WØs AM HI QMY, KØs AEM CVD, WAØTNM. Pacific Area (K5MAT, Dir.) — W5RE, K5MAT, WB5KSS, W6s BGF EOT MLF OA VZT, K6HW, W7s DZX GHT KZ VSE, K7s IWD NHL QFG, WØs ETT HXB IW KLE LQ, KØs DRL TER, WBØs DJY QOT, VE7ZK.

Independent Nets (January)

1	2	3	4
Clearing House	31	404	664
Hit & Bounce	62	1209	506
IMRA	28	428	924
Mike Farad	26	69	367
North American SSB	27	196	266
Washington Region PON	18	86	348
20 Meter ISSB	21	351	355
75 Meter ISSB	31	602	1346
7290 Traffic	46	552	2352

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll January 1977

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points. This listing is available to Novices and Technicians who achieve a total of 20 or more points.

354	WB2ASD	K4YRL	WB4SKI
W9NQW	W2MLC	WA5IQU	K4SWJ
73	WB2RUZ	WA5ZZA	WB4TEK
WB5NUM	WA4FBI	WB6UZX	W6BGF
66	WA4PSL	WA7MEL	WB6FTY
W5KLV	W5GHP	W8DIL	WA8JPX
65	W6RNL	WB8TRK	W9NXG
K4VHC	K8LGA	K9ZTV	WB9QKH
64	WA8RQQ	KØMRI	VE1ACU
WA1FCM	55	WØRFF	VE1AAO
WA3SXU	WA1TEH	WBØSND	VE1ZH
WB4EKJ	54	VE3DV	VE3GOL
W4OGG	WB8NCD	VE4UL	VE4IX
62	53	48	VE4PG
WBØHOX	WA2PJL	WA1MJE	43
61	WA6BFL	WA4PZD	WB4NMU
K1PAD	W6JXK	WØHXB	KG6JES
K1PNB	WB9SKA	WBØQOT	KØEVH
AA1VEI	WBØLFY	VE7DKY	WØOYH
WA2ECO	VE5XC	47	42
WB4HHX	52	WA2DSA	WA5VBM
WB5NKD	WB2LZN	WB2RKK	W9GGW
WA5YEA	W4MEE	WB4FDT	WØCHJ
WA6TVA	K5MAT	WA7KQE	41
W7OCX	W6JTA	WB8WTS	K2BHL
WB8JGW	WB6PVH	46	WA3CFU
K9SAO	W7GHT	WB4OXT	WA5JYH
60	W9MMP/Ø	44	WBØFKY
WA3YJG	51	WIBVR	WBØMAO
59	WA2BMI	W1ERW	WØOTF
WA1VGP	WB5KGP	K1NAN	40
58	50	WA2DIW	WA1RAJ
WA5RKU	WB2YKG	WB2EMU	WA2SLF
WB9ICH	WA3VBM	WA2ERT/1	WBØOFQ
57	K4BKX	K2HI/VE2	WBØTAQ
WB2VTT	K5ZSI	WA2VEN/Ø	27
WA9QCF	WB8VLR	W3IPX	WA1ZAZ/
KØPVI	VE4VV	K3KAJ	22
56	49	W3RJ	WA1UWF/
WA1MSK	WB2CST	WA3NAZ/4	WA1VKB/
	K3ORW	WB4DJU	WB4QBB/
	K3YHR	K4EV	WD8AVY/
		WB4GHU	WD8COS/

Brass Pounders League January 1977

BPL Medallions (see December, 1973 *QST*, p. 59) have been awarded to the following amateurs since last month's listings: WB4ARJ W4MEE WAØGLI

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM 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 or receipt in standard ARRL form.

1	2	3	4	5	6	
W3CUL	338	1271	1501	61	3171	
WØWYX	55	1126	422	704	2307	
kØONK		608	589	14	1215	
K1BCS	317	194	538	39	1088	
WAØRWM	50	510		506	1066	
K9CPM		437	71	396	904	
WB6EIG	23	412	410	2	847	
W3VR	297	165	321	12	795	
WØZWL		377		372	749	
W7VSE	81	232	250	84	647	
W4MEE		341	283	22	646	
WA4BZY	208	176	242	12	638	
WA1FCM	2	293	318	6	619	
WA3VBM	2	309	296	12	619	
K4TH	10	294	215	93	612	
WA1MJE	38	294	259	11	602	
WBØHOX	14	307	244	31	596	
KØZSQ		294		294	588	
VE3SB		267	297	2	566	
WA8MCR	6	291	243	8	548	
WBØQOT	3	272	263	6	544	
WA4JDH	5	272	258	6	541	
WB4EKJ	1	317	214	3	535	
K4BKX	1	242	288	2	533	
W5JOV	13	270	211	39	533	
W9MMP/Ø	25	252	204	49	530	
WAØVRE	75	225	225		525	
W5KLV	3	290	210	20	523	
W4RQS	1	240	272	3	516	
WA3SXU	2	252	240	16	510	
WB4ARJ (Dec.)		667	720	6	1404	
WA4BZY (Dec.)		594	304	71	1156	
WB4OBZ (Dec.)		293	328	11	679	

BPL for 100 or more originations-plus-deliveries

W7TZK	337	WB9LTJ	128
WA3ATQ	223	WØFIR	126
W7SQT	158	W9IOH	123
W9UMH	155	K7GXZ	107
K7VWA	148	VE1AWS	104
WA3YJG	141	WA1VGP	101
WA3THT	138	W2YJR (Nov.)	109
		VE3CDK (Nov.)	102

More-than-one operator station

WA1UNE	142

Strays

RCA MODEL AR-88 – A CLASSIC IN RADIO DESIGN

□ It is unusual that an electronic equipment design weathers the technological advances over a period of 35 years and is still found suitable for use by an exacting group of radio operators. This situation exists today for the Model AR-88 communication receiver in the operations of RCA marine radio station WCC on Cape Cod, MA. Here, these receivers are in daily use for worldwide ship-to-shore message handling. Other RCA shore stations, such as WSC, Tuckerton, NJ, also use them.

The initial concept of the AR-88 design was to provide a deluxe model to be sold by the RCA Amateur Radio Section as a sequel to a prior model (AR-77) in the amateur equipment market of 1939-1940. The AR-88 was designed as a general purpose six-band communications receiver, covering frequencies of 535 kHz to 32 MHz. The electrical design of this receiver was done by Lester T. Fowler and the mechanical design by George Blaker, both of whom are now retired.

However, before the AR-88 reached the production stage, the outbreak of World War II created an export market, particularly to Great Britain, that was going to greatly overshadow the dwindling domestic amateur market. (Amateur operation was not permitted during WWII, curtailing the equipment sources for amateur stations.)

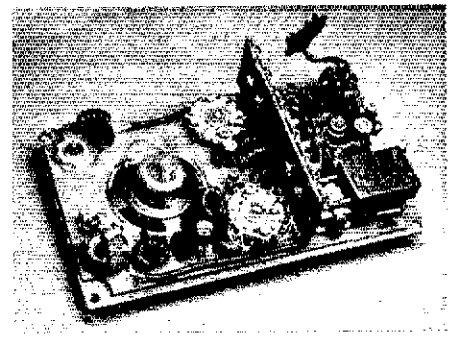
To meet this changing market demand, organization of AR-88 production and sales was taken over by Export Sales, under the late Charles W. Roberts, at the Camden, NJ, offices. Large numbers of the units were produced in the RCA plants in Camden, NJ; Bloomington, IN; Montreal, Canada; and in the Grigsby-Grunow plant in Chicago, IL. Most of these receivers were procured by Great Britain and used at many places, including the Battle for Britain. Russia also used the receivers.

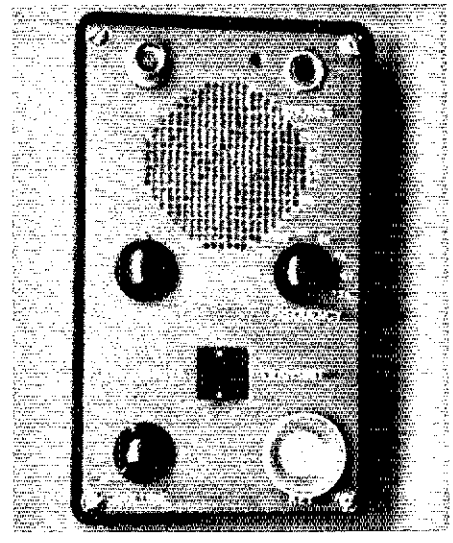
After more than 35 years of service, many RCA AR-88 general-coverage receivers are still in service like this one operated by Nelson Foster at RCA marine shore station WCC in Chatham (Cape Cod), MA. *(Will Bryant photo)*

During that time, when RCA's shortwave shore facilities were being expanded, many AR-88s were installed to meet the increase in message traffic. These receivers have been kept in use up to the present time as shown by the accompanying photograph.

One of the problems in keeping a receiver in service 24 hours daily for seven days each week over the years has been the availability of replacement parts. Fortunately, components were found in military-supply depots set up during WWII in Tangiers, Africa, and in San Juan, Puerto Rico, saving many of these venerable AR-88s from being retired from service.

After WWII, many of these receivers were sold in surplus markets where they were purchased by radio amateurs and are still in use. — *W2BAY/W1BBK (Reprinted by permission of RCA Corp.)*





Still another example of homemade gear: The accompanying photographs illustrate that the art of building homemade equipment is not languishing. Here's a "sanitary" example of how one constructor packaged his QRP station for 40 meters. It's in a 3-3/4 X 6 X 2-inch plastic box, uses Penlite cells for power, and delivers 0.8 watt output on 40 meters. The builder, W1BG, reports signal levels of RST 569 or better from 300 to 500 miles when operating from vacation sites. He uses a small wire-wrap dipole which contains no. 28 conductor. The circuit is that of the Micro Mountaineer by W7ZOI, published in *QST* for August, 1973. Penn Clower, the builder, says that he gleaned many of the components (including the audio amplifier) from a junked bc-band transistor radio. His crystals are some surplus FT-243 types which were cut originally for 6,900 kHz. With a modicum of elbow grease he has ground them for use in the 40-meter band. Innovation of this variety is refreshing in this day of complaints about parts being impossible to obtain! — *W1FB*

January CD Parties: High-Claimed Scores

The following are high-claimed scores. They read, from left to right, call sign, score, contacts, sections, time of operation. Final scores will appear in the April CD Bulletin.

CW

WA7WXY	349,140	1005	69	20
W6PAA	336,600	983	68	20
WB6ZVC	326,715	940	69	20
W6NTI	319,150	977	65	20
WB6ION(WA6TLV,opr.)	291,040	848	68	20
W1AF(K1EA,opr.)	285,260	839	68	19
WA2UOO	277,440	809	68	18
K6PU(WB6CEP,opr.)	275,370	818	67	20
W5DRW(WA5RTG,opr.)	269,940	813	66	20
W7TML	267,685	797	67	20
W6UE(WA6OTU,opr.)	260,975	797	65	20
K6LL	248,235	735	67	17
N6YX(WA6VEF,opr.)	246,510	747	66	20
W4YUU	233,025	717	65	17
K4BAI	230,425	702	65	16
WA4KKP	221,440	687	64	20
K@GXR	208,975	643	65	15
WA5YTX	202,290	606	66	12
W@EO	201,915	637	63	18
W4BTZ	200,640	620	64	18
N4AA	187,520	580	64	13
WA5HNN	177,210	530	66	14
W3IN	175,175	533	65	13
WA1LKX	173,120	535	64	13
W5TXA	169,000	512	65	14
K7CTI	162,825	497	65	12
WA1QJU	162,750	520	62	14
WB1AQF	162,540	511	63	15
WB4AIN	160,650	504	63	15
W@BF	160,270	511	62	10
WA4HRG/@	156,300	516	60	19
WA4ZHU	153,110	497	61	13
W2FVS	148,535	482	61	9
W2JJ	146,240	449	64	8
WB2PYM	145,390	462	62	8
W@ETT	143,640	452	63	13
K3HXS	142,695	449	63	14
W9JOO	141,520	464	61	19
WA8POS	139,995	454	61	6
W9PJT	138,775	450	61	11
WB9NME	132,800	415	64	16
VE3GFN	131,750	420	62	14
W4WHK	130,680	391	66	10
K3OAE	128,650	418	62	9
N8AA	128,205	400	63	7
WB2ASD	127,720	407	62	16
W4YZC	127,185	410	61	12
W5KL	126,790	402	62	11
VE4VV	125,570	428	58	17
W5RUB	124,200	410	60	7
W8VAH	121,220	418	58	17
W@TDR	120,580	384	62	13
K9BGL	120,000	400	60	8
N6ZZ	119,700	393	60	7
WA1WEM	118,320	400	58	8
W7YS	115,500	378	60	19
W1AX	115,320	365	62	6
WB2RKK	114,390	361	62	9
W4ZM	111,910	354	62	9
K6QPH	111,510	348	63	8
W3FCS	111,510	350	63	12
WB5PVL	111,325	362	61	11
WB2RJJ	105,020	350	59	7
W9EI	105,020	349	59	11
WA7QQD	103,230	326	62	11
WA2RYD	103,200	339	60	10
W2AZO	102,950	350	58	8
WA3GUL	102,480	335	61	6
WA3VBM	102,480	329	61	6
W2GKZ	102,175	328	61	13
WB8NUA/7	102,080	316	64	18
W4KFC	101,680	321	62	4
WA9ITB	100,200	327	60	7
WA4PSL	100,130	320	62	12

PHONE

W6PAA	226,380	679	66	16
WB2RKK	125,660	404	61	9
WA1WEM	114,975	357	63	10
K@GXR	107,100	340	63	11
WB6HJW	101,760	318	64	15
WA7TZO	98,595	308	63	8
WB@OHV	90,860	308	59	7
WA2UOO	90,600	295	60	6
N4AA	90,270	300	59	9
WA4ZHU	85,260	289	58	8
W7GHT	80,825	268	61	7
K3HXS	78,010	265	58	9
K@PVI	72,590	235	61	9
W4YUU	71,100	237	60	8
W8GIO	68,400	228	60	12
W9MMP/@	65,540	226	58	20
W3FCS	61,305	197	61	8
WB4K1R	60,475	205	59	8
WA2VBM	58,575	206	55	4
WA2PCF	57,855	200	57	13
W6IKW	56,640	208	52	14
WA4KKP	55,350	200	54	4
N8AA	53,295	180	57	3
KG6JES/W6	51,570	187	54	12
W9JOO	51,040	176	58	11
W4WHK	50,875	180	55	10
WA6VEF(+WA6BMV)	162,560	502	64	20
W1YK(K1EA,WA1QJU,oprs.)	86,075	308	55	20

Operating News

Conducted By George Hart,* W1NJM

W1AW Schedule Changes

What's so great about that? The W1AW schedule changes every time we shift from standard to "daylight saving" time and vice versa. Ah, but *this* time it's different. This time, everything is changing – the bulletin times, the code practice times, the number of code practice sessions. . . . See for yourself! The W1AW bulletin and code practice schedules appear elsewhere on these pages. Regular users of W1AW services will want to note these new features:

1) Code-practice time will be increased about 20 percent, but the percentage spent on slower speeds will be much higher than it is now.

2) Cw and RTTY bulletins will be increased in number and frequency (no, not in kHz!). The 18 wpm cw bulletins can also be used as code practice; the RTTY bulletins are an ideal way to get the latest news from Hq.

3) OSCAR bulletins will be much shorter, and we hope to shorten some of the propagation-forecast bulletins also, without reducing the service rendered.

4) All RTTY bulletins will be on 170-Hz shift. The number of RTTY-equipped amateurs unable to copy 170 Hz is now infinitesimal, and we save both time and spectrum space by "going 170" altogether.

5) The midnight (Eastern Time) bulletin at 10 wpm will be discontinued. This was an experiment that didn't work out. All cw bulletins will be sent at 18 wpm.

6) Code-proficiency qualifying runs will be increased from 18 to 24 per year, adding QRs at 0900, 1900 and 2200 Eastern Time (UTC depending on whether the nation is currently saving or wasting daylight). This is 9 A.M., 7 P.M. and 10 P.M. Eastern Time, or 6 A.M., 4 P.M. and 7 P.M. Pacific Time.

7) The 160-meter frequency is now (effective Apr. 24) 1835 kHz, changed from 1805 where we bothered the DXers. Let's hope we don't bother anyone on 1835!

8) No general operating schedules will be published or observed. We'll try to accommodate anyone who wants to make a schedule for a contact, but it will have to fit in with "free" time. Note that we did not say there will be no general contact! Many amateurs cherish the idea of making a contact with the Maxim Memorial Station, and when time is left after a bulletin the station operator will announce on what frequency he will listen for calls. This will be varied, but because of the different bulletin lengths it cannot be scheduled.

The code-practice program is changed from the former 0900, 1600, 1930, 2130 (Eastern Time) pattern that has been observed so long, in an attempt to reach more listeners at times more convenient to them. (We have no expectation that it will be more convenient to everybody!) Cw and RTTY bulletins will follow morning and afternoon code-practice periods, and in the two evening periods phone bulletins will be added. Experience has indicated little utilization of phone bulletins during daylight hours. Thus, transmission cycles from W1AW will start at (Eastern Time) 0900, 1600, 1900 and 2200, starting with code practice, then cw bulletins, then RTTY bulletins, and in the two evening cycles, phone bulletins.

The code-practice sessions are designated "slow" and "fast," and while the slow is very slow, the fast isn't all that fast, so much more attention is being devoted to the "slow" speeds (15 wpm and below) than to the "fast" speeds (20 wpm and above). "Fast" sessions will start at 35 wpm and present eight-minute sessions at 35, 30, 25, 20, 15, 13 and 10 wpm, in that order. The "slow" sessions will start with the lower speeds, with double sessions at the very slowest speeds, thus: 5, 5, 7-1/2, 7-1/2, 10, 13 and 15 wpm. There will be 12 fast sessions, 14 slow sessions each week. All four daily cycles will be observed *every* day (excluding holidays) except the morning cycle, which will be omitted Saturdays and Sundays.

The new schedule is designed to be easier to read and understand. We hope it meets this important objective and would value comments. With so many different services to render, the W1AW schedule cannot be "simple." The station has to be many things to many amateurs.

But that isn't all. One of the biggest complaints is that W1AW isn't strong enough to override QRM or to be heard with sufficient strength in midwestern and far western areas. Thus, starting as soon as weather permits, construction will begin on the Ralph P. Thetreau Memorial Antenna Array. "Tate," (W8FX) as he was known, remembered ARRL in his will, and part of this bequest will be used to supply W1AW with a sophisticated antenna array, something we know would have pleased Tate no end. The array will consist of a 120-foot tower supporting stacked 20-meter, four-element Yagi beams at 60- and 120-foot levels, and a three-element, 40-meter Yagi at the 90-foot level, with the top beam rotatable. This should improve our western signal strength overall on those two crucial bands.

So there you have it. Spring is here once again, and things are getting better. – *W1NJM/W1WPR/W1YL*

SCM ELECTION NOTICE

To all ARRL members in the Southern Texas, Colorado, San Francisco, British Columbia, Sacramento Valley, Los Angeles, Georgia, West Virginia and Washington sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. 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. No member may sign more than one petition.

Petition forms (CD-129) are available on request from ARRL headquarters but are not required. The following form is suggested.

Communications Manager, ARRL

(Place and date)

225 Main St.
Newington, CT 06111

We, the undersigned full members of the . . . . ARRL section of the . . . . Division, hereby nominate . . . . as candidate for Section Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . Zip . . .)

SCM candidates must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must have been received at Headquarters on or before 5:30 P.M. Eastern Local Time, June 10, 1977.

Wherever more than one member is nominated in a single section, ballots will be mailed from Headquarters on July 1, returns counted August 23, and SCMs elected as a result of the above procedures will take office October 1, 1977.

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, 1977.

If no petitions are received for a section by the specified closing date, such section will be resolicited in October *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

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

George Hart, W1NJM
Communications Manager

*Communications Manager, ARRL

QSL INDEX

K8EKG uses a quick and easy way to keep track of received QSLs. Joe uses an ARRL Operating Aid 6 (the "dupe" QSO record) to make note of cards received (plus filing the QSLs alphabetically). Then, months or years later, if a call seems to ring a bell, he looks at the check sheet to easily determine if a card was received. If so, it's quick to locate it. He says his 20-year QSL collection is easily indexed on one sheet.

W1AW Operating Schedule (April 24-October 30, 1977)

PDST	CDST	EDST	UTC	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6 A.M.	8 A.M.	9 A.M.	1300	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]		
7 A.M.	9 A.M.	10 A.M.	1400	←		Cw Bulletins[3]		→		
8 A.M.	10 A.M.	11 A.M.	1500	←		RTTY Bulletins[4]		→		
1 P.M.	3 P.M.	4 P.M.	2000	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Slow[1]
2 P.M.	4 P.M.	5 P.M.	2100	←		Cw Bulletins[3]				→
3 P.M.	5 P.M.	6 P.M.	2200	←		RTTY Bulletins[4]				→
4 P.M.	6 P.M.	7 P.M.	2300	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Fast[2]
5 P.M.	7 P.M.	8 P.M.	0000	←		Cw Bulletins[3]				→
6 P.M.	8 P.M.	9 P.M.	0100	←		RTTY Bulletins[4]				→
6:30 P.M.	8:30 P.M.	9:30 P.M.	0130	←		Phone Bulletins[5]				→
7 P.M.	9 P.M.	10 P.M.	0200	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Fast[2]	Slow[1]	Slow[1]
8 P.M.	10 P.M.	11 P.M.	0300	←		Cw Bulletins[3]				→
9 P.M.	11 P.M.	12 P.M.	0400	←		RTTY Bulletins[4]				→
9:30 P.M.	11:30 P.M.	12:30 P.M.	0430	←		Phone Bulletins[5]				→

[1]Slow code practice on cw bulletin frequencies, 8 minutes each session; 5, 5, 7-1/2, 7-1/2, 10, 13, 15 wpm.
[2]Fast code practice on cw bulletin frequencies, 8 minutes each session; 35, 30 25, 20, 15, 13, 10 wpm.
[3]Cw bulletins, 18 wpm, on: 1.835 3.58 7.08 14.08 21.08 28.08 50.08 145.588 MHz.
[4]RTTY bulletins 60 wpm/170-Hz shift on 3.625 7.095 14.095 21.095 28.095 MHz.
[5]Phone bulletins on 1.835 3.99 7.29 14.29 21.39 28.59 50.19 145.588 MHz.

Operating-visiting hours are Monday through Friday 7:30 A.M. to 1 A.M. and Saturday and Sunday 3:30 P.M. to 1 A.M. (all local Eastern Time). The station address is 225 Main St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street detail are available upon request. Please note that all footnoted frequencies are approximate. If you wish to operate when visiting, you must have your original operator's license with you. (Schedules can also be arranged to work W1AW). The station will be closed May 30, July 4 and Sept. 5. *Staff:* Chief operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, WB2SEZ; Stan Gibilisco, WAØOKV.

In a communications emergency monitor W1AW for special bulletins as follows (times in UTC): *phone* on the hour, *RTTY* at 15 minutes past the hour, *cw* on the half hour.

To improve your fist by sending in step with W1AW (but not over the air!) and to allow checking the accuracy on certain tapes, note the UTC dates and *QST* text to be sent in the 2300 practice from the issue of *QST* two calendar months past: May 2, It Seems to Us; May 5, Correspondence; May 11, League Lines; May 24, Public Service; May 27, World Above; June 1, YL News.

Operating Events

APRIL

2-3	Tennessee QSO Party*
	SP DX Contest cw*
2-4	QRP QSO Party*
	Zero District QSO Party*
2-30	Cape Town Festival Award**
3	Wisconsin State QSO Party*
7	West Coast Qualifying Run**
12-13	DX-YL to Stateside YL Contest cw*
15	W1AW Qualifying Run**
16-17	Florida QSO Party**
	County Hunters SSB Contest**
16-18	"Open" CD Party cw*
	SP DX Contest phone*
	VP9 Contest*
23-24	"Open" CD Party phone*
	Swiss Contest (H-22)*
	Dutch Contest (PACC)*
25	W1AW Qualifying Run**
25-26	DX-YL to Stateside YL Contest phone*
30-5/1	10-X Chapter Certificate Hunters QSO Party**
30-5/2	Connecticut QSO Party*

MAY

4	West Coast Qualifying Run
7-9	Georgia QSO Party**
	Vermont QSO Party**
14	Frequency Measuring Test**
14-15	Kansas QSO Party**
	Massachusetts QSO Party**
14-16	Michigan QSO Party**
15	World Telecommunications Day Contest phone**
17	W1AW Qualifying Run
21-22	New York State QSO Party**
22	World Telecommunications Day Contest cw**
24	W1AW Qualifying Run

*Detailed last month
**Details follow
***Details next month

JUNE

11-12	VHF QSO Party***
25-26	Field Day***

JULY

4	Straight-Key Night
9-10	IARU Radiosport Competition

SEPTEMBER

10-11	VHF QSO Party

NOVEMBER

5-6	SS cw
19-20	SS phone

APRIL

2-30: Cape Town Festival Award, sponsored by the Cape Town Branch of the South African Radio League, for contacts during the full 29-day period. Non-ZS stations are required to work ZS1CTF or ZS1CTM plus two other ZS1 stations. QSLs not required. Submit an extract of your log certified by two licensed amateurs, your club, etc. Any band/mode or combinations permissible. Closing date for applications is July 31, with an award fee of U.S. $2. Applications should be addressed to Derek Siegl, ZS1DP, SARL CT Branch, P. O. Box 5100, Cape Town 8000, South Africa.

7: West Coast Qualifying Run, W6OWP prime, W6ZRJ alternate, 10-35 wpm at 0500Z (Universal Coordinated Time abbreviated UTC, Z used as a designator), on approximately 3590/7090 kHz. This is 2100 PST the night of April 6 (9 P.M. PST). Please note that dates are always shown several months in advance and times are always the same local "clock time," i.e. 9 P.M. local Pacific time. Underline one minute of the highest speed copied, certify that you made the copy without any aid and send your entry to ARRL for grading. Please include your full name, call (if any) and complete mailing address. A large addressed stamped envelope will help to expedite your award/endorsements.

15: W1AW Qualifying Run, 10-35 wpm at 0230 UTC, transmitted simultaneously on 1.805 (changing to 1835 kHz April 24) 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. Note that this is 2130 EST, 9:30 P.M. local Eastern time, the night of April 14. Underline one minute of the highest speed you copied, certify that the copy was made without aid (typewriters OK) and send to ARRL for grading. Include your name, call (if any) and complete mailing address. A large addressed stamped envelope will help to expedite your award/endorsements.

16-17: Florida QSO Party, 1500-2000Z April 16 and 1400-2400Z April 17, sponsored by Florida Skip (12th annual event). Phone and cw are separate contests. The same station may be worked on each band for QSO points. Florida stations may work in-state stations but for QSO points only. Exchange RS(T) and QTH (county for Florida; state, province, or country for others). To score, Florida stations count one point per QSO. The multiplier is the sum of states without Florida (49 maximum), provinces (12 maximum), and DX countries (12 maximum); equaling a maximum multiplier of 73. Florida mobiles and portables (on emergency power and running 200 watts or less) multiply total score by two. Out-of-state stations count two points for each Florida portable or mobile worked and one point for each fixed station worked. The multiplier is the number of different Florida counties worked (maximum of 67). Suggested frequencies, plus/minus: cw, 3570 7070 14070 21070; phone, 3970 7270 14317 21370. Awards. Disqualifications: At the discretion of the contest committee stations may be disqualified for improper reporting (note, out-of-state stations should not combine phone and cw scores!), excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. Anyone disqualified in the party this year will be ineligible to compete next year. Report using a summary showing the scoring and other pertinent information, plus your name and address in block letter with a signed declaration that all rules and regulations have been observed. Include a 13-cent stamp for results in a future issue of Florida Skip. Mailing deadline is May 30. Send to Florida Skip Contest Committee, P. O. Box 660501, Miami Springs, Florida 33166. County Hunters SSB Contest, 6th annual, sponsored by the Mobile Amateur Radio Awards Club Inc. Periods: 0001-0800Z April 16, 1200Z Apr. 16 to 0800Z April 17, 1200-1400Z April 17. Please note the two 4-hour rest periods. Suggested frequencies: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28575-28595. Note that this year there will be a mobiles/portable "window" of 10 kHz as follows: 3925-3935, 7225-7235, 14280-14290. Mo-

biles and portables will be in this 10-kHz segment and fixed stations are asked to avoid calling CQ Contest herein. Mobiles may be worked each time they change counties or bands. Mobiles worked from the same county on different bands count for point credit only. Mobiles worked on a county line count as one contact but two multipliers. Portables changing counties during the contest may be worked for both point and multiplier credit from each new county. Fixed stations may be worked by other fixed stations only once during the contests, regardless of band changes. Fixed stations may be worked by mobiles/portables each time they change counties or bands. Repeat contacts between mobiles/portables are permitted provided they are on a different band or county. Exchange signal report, county and state (country for DX). Mixed mode is permitted provided that one station is on ssb. To score count one point for a contact with a fixed U.S. or Canadian station, five points for a DX station (including KH6/KL7), 10 points for a portable or mobile. Multiplier is the total number of U.S. counties plus Canadian stations worked (take credit for a county only the first time it is worked while a Canadian station counts each time it is worked). Final score: total number of QSO points times the multiplier. Usual log data with claimed points and numbering of each new multiplier. Log sheets available from W0QWS (use an s.a.s.e.). Awards. Entries must be received by June 1. Send to John Ferguson, W0QWS, 3820 Stonewall Ct., Independence, MO 64055.

25: W1AW Special Qualifying Run (note the new time of 0200Z which represents 10 P.M. EDST the evening of April 24). Other details the same as under the April 15 listing.

30-May 1: 10-X Chapter Certificate Hunters QSO Party, sponsored by the Long Island Amateur Radio Service, full 48-hour period UTC. Object is to contact as many certificate holders and V-Ps as possible. Exchange call, name, QTH, 10-X number, total of three chapter certificates or less and V-P number (if any). Two-way QSOs only are valid. Score one point for each 10-X number received, a point for each certificate number or non-numbered award received. Total number of points is then multiplied by the total number of V-P numbers received for the total score. (Max. is four points and one multiplier for each exchange). Awards. Log legibly and send entry to Bob Watson, WA2MHL, 2 Suffolk Court, Oceanside, NY 11572. Please include your chapter name and an s.a.s.e if a copy of the results is desired. Logs must be received by June 15.

MAY

7-9: Georgia QSO Party, 2000Z May 7 through 0200Z May 9, 16th annual sponsored by the Columbus Amateur Radio Club, Inc. No time or power restrictions and contacts may be made once on phone and once on cw on each band (OSCAR counts as one band) with each station. GA mobile or portable stations count as a separate station in each county. Exchange QSO no., RS(T), and QTH: county for GA stations; state, province or country for others. (Note, GA-to-GA contacts permitted.) Each complete contact counts two points. GA stations multiply their total QSO points by the number of different states and Canadian provinces worked. DX stations may be worked for QSO points but do not count as multipliers. Out-of-state stations will use the number of GA counties worked as their multiplier (possible 159). No repeater QSOs, except OSCAR. Certificates, plaques. Suggested frequencies: cw, 1805 3590 7060 14060 21060 28060; ssb, 3900 3975 7245 14290 21360 28600; Novice, 3718 7125 21110 28110. Try 160 meters at 0300Z. Try 10 on the hour and 15 on the half hour during daylight periods. Usual log, indicate multipliers and include signed declaration. Mail your entry to the CARA, c/o Jeanne J. Hunting, K4RHU, 3701 Peabody Avenue, Columbus, GA 31904. Postmark entries by June 6 and include a large s.a.s.e. for a copy of the results. Novices should clearly designate their logs as such. **Vermont QSO Party**, sponsored by the Central Vermont Amateur Radio Club, from 2100Z May 7 through 0100Z May 9. VT stations score one point per contact and multiply by the number of ARRL sections and countries worked. All others score three points per VT station worked and multiply total by the number of Vermont counties worked on each band. The same station may be worked once on each band and mode. Mobiles may be worked considering each new county they enter as a new "station." Awards. Suggested frequencies: 3555 7055 14055 21055 28160 50260 144-144.5, 3909 21375 28600 50360 145.8, 3932 7290 14325. Try cw on the odd hour and phone on the even hour UTC. Exchange QSO number, RS(T) and county (for VT) and ARRL section (for others). Logs with an s.a.s.e. must be mailed by June 15 to Peter Kragh, W1AYK/K2UPD, 170 Summit Ave., Ramsey, NJ 07446. All band/mode activity is urgently needed from the counties of Bennington, Caledonia, Essex, Grand Isle and Orleans – contact K2UPD.

14: Frequency Measuring Test, open to all, begins with a callup at 0200 and 0500 UTC May 14. Remember, this is the evening before, May 13, by local time. Effective with this FMT you'll note that the times are changed to conform to W1AW's new schedule. The periods for measurement start at 0207 (20 meters), 0215 (40 meters) and 0223 (80 meters); for the late run, 0507, 0515 and 0523, respectively. Each measuring period lasts five minutes. Submit your averages for each five-minute period which will be compared with the umpire's averages during the same period. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are 14,110, 7070 and 3542 kHz; late-run frequencies are 14,082, 7023 and 3552 kHz. Your report must be received by May 25 to qualify for the August *QST* report of the competition. W1AW will start transmitting the official results in a special bulletin May 26.

14-15: Kansas QSO Party, sponsored by the Central Kansas Amateur Radio Club, from 2000Z May 14 through 2400Z May 15. Work each station once on each band; cw and phone are considered separate bands. KS stations send signal report and county. Others send report and state/province/country. KS stations multiply total contacts times the sum of U.S. states, VE provinces and other ARRL DXCC listings worked. Everyone else multiply total KS contacts times the number of KS counties worked. Awards. Look for cw 55 kHz up from the bottom of the band and phone 25 kHz above the Advanced/General dividing log. Send logs and comments to Robert Davis, K0FPC, 1857 South 4th, Salina, KS 67401. Be sure to include your name and address as well as all relevant information. S.a.s.e. NOT required for summary of the results. **Massachusetts QSO Party**, sponsored by the South Shore Repeater Assn., from 1200Z May 14 through 2200Z May 15, no time limit. A station may be worked once per band (cw and phone considered separate bands). No crossband or repeater QSOs permitted. MA stations may work each other. Exchange RS(T) and county (for MA), and ARRL section (or country) for others. Count two points for each completed exchange. Outside stations multiply total QSO points by different MA counties worked (total of 14). MA stations multiply total QSO points by the number of different MA counties plus ARRL sections and DXCC countries worked. (Do not include EMass. or WMass. as sections). Suggested frequencies: cw, 1810 3560 7060 14060 21060 28060; phone, 1820 3960 7260 14290 21390 28590 50110 146,520; Novice, 3720 7120 21120 28120. Awards. Mailing deadline June 30. S.a.s.e for results and awards. Send to R. J. Doherty, W1GDB, RFD no. 1, 14 Pine St., Sandwich, MA 02563.

14-16: Michigan QSO Party, sponsored by the Oak Park Amateur Radio Club, from 1800Z May 14 through 0200Z May 16. This year phone and cw are combined into one contest. MI stations may work MI counties for multipliers. A station may be contacted once on each band/mode. Portables/mobiles may be counted as new contacts each time a county change takes place. Exchange RS(T), QSO no., county (for MI), state or country for others. Multipliers are counted only once. MI stations score one point per QSO multiplied by the sum of states, countries, and MI counties (KL7/KH6 count as states) and VE counts as a country. The maximum multi is 80. For non-MI stations, multiply points times Michigan counties. QSO poin follows: one point for each MI QSO, points for each MI special event station (no ITU suffixes), maximum multiplier of Vhf entries only, same as before except multipliers per vhf band are added toge for the total multipliers. Suggested quencies: cw, 1810 3540 3725 7035 7 14035 21035 21125 28035 28125; ph 1815 3905 7280 14280 21380 28580; 50.125 145.025. From 1600-1900Z, try on the hour and 10 on the half hour. Si ops only qualify for a variety of awards. U summary with full details including name address in block letters, and a signed decl tion. MI stations include club name combined club score. Party contacts do count toward the Michigan Achieven Award unless one fact about Michiga communicated. Members of the MI W QSO Party Committee are not eligible individual awards. Committee decisions fi Results will be finalized July 30 and maile all entrants. Mailing deadline is June 20. S to Mark Shaw, WA8EDC, 3810 Woodn Troy, MI 48084.

15: World Telecommunications Day Con phone, the full 24-hour period UTC, sp sored this year again by the Brazilian Mini of Communications and, in future years, the Brazilian Society LABRE (Liga de A dores Brasileiros de Radio Emissao). event commemorates yearly World Telec munications Day (May 17). Each particip will attempt to make the highest poss number of contacts with the different zones of the world in order to enable country to win the ITU Trophy. (Note will be held May 22). Operation 160 thro 10 meters. Categories are single opera multiband, fixed station or mobile marit operating on 76 to 90 ITU zones, inclus clubs to be considered as special multi multiband participants, (all operators "multis" must sign the log). Send RS(T) ITU zone. Contacts in the same country f 160 through 10 meters count zero points the same country in the same zone 40-20-15-10 count one point, on 160 and two points; in another ITU zone on the s continent, on 20-15-10 count two points, 40 three points, on 160 and 80 four points another zone on another continent 20-15 three points, 40 five points, 160-80 six poi Repeat contacts on other bands count points, but zones counted once only. country determination use the ARRL DX List. To determine points for the cou (and the trophy) scores of the five top en per country per mode are added toget (Multis not added in for this final sc Trophy, medals, certificates. Log separa for each mode, see that they're postmar before June 30 and send to LABRE, U. Contest Coordination, P. O. Box 07-0 70.000 Brasilia DF, Brazil. Note: W1, 2, 3 8 and 9 are in ITU Zone 8; W5, 0 Zone 7; 7 Zone 6; VE/VO 1, 2, Zone 9; VE3 Zon VE 4, 5 Zone 3; VE6, 7 Zone 2; VE8 Yuk Zone 2; the rest of VE8 split between Zon 3, 4 and 75. Logs to contain usual info, t in UTC, stations, messages, band, notatio new continent, zone multiplier and poi complete with summary and signed decl tion.

21-22: New York State QSO Party, sponso by the Rensselaer Polytechnic Institute R Club, W2SZ, from 1600Z May 21 to 04 May 22 and 1200-2400Z May 22. Stati may be contacted once on phone and once cw on each band. NY stations may work e other. Mobiles/portables changing coun may be reworked. Exchange consists of port, serial starting with 001, and Q (counties for NY, state/country for othe Suggested frequencies: cw, 1810 3560 7 14060 21060 28060; phone, 3900 7 14285 21375; Novice, 3725 7125 21 28125. Score one point per QSO times number of multipliers: states, provinces countries for NY stations; and counties others (maximum of 62). Number the contact for each new multiplier. A ch sheet is required for stations making m than 100 contacts. Awards. Entries should mailed no later than June 30 to Barry Kut WB2LYB, 741 Plain Road, Westbury, 11590. Results will be sent if a no. 10 s.a is included with your entry.

Station Activities

SCM ≤ AREC ≤ ORS ≤ OVS ≤ SEC ≤ OBS ≤ TCC ≤ OO ≤ NTS ≤ WAC ≤

CP ≤ A-1 OPR ≤ EC ≤ DXCC ≤ CLUBS ≤ RM ≤ OPS ≤ RCC ≤ PAM ≤ WAS

CANADIAN DIVISION

ALBERTA: SCM, Sydnet T. Jones, VE6MJ — The highlight of the month was the SET which was the best yet. VE6XC and all those who participated are to be congratulated on a real good show. Conditions were not the best on the Sun. but traffic was moved. VE6KL is organizing the swap and shop on 75, liaison with Edmonton. VE6HR conducting theory classes on the VE6SS repeater and has a large following. VE6BC now VE7RW moved to Sicamouse, B.C. VE6ABC on a business trip to Victoria while the XYL — VE6BBC takes part in the Novice roundup. VE6BBR have a demonstration of autopatch at the NARC meeting in Jan. It is with deep regret that I report the passing of VE6TK. Dunc has been our QSL Mgr. for some years and has done a remarkably good job. We shall all miss him. Traffic: VE6XC 101, VE6AVV 77, VE6HO 20, VE6MJ 20, VE6AMM 16, VE6FS 8, VE6OZ 8, VE6ASL 7, VE6YW 6, VE6CE 5, VE6WN 4, VE6AMN 4, VE6CAA 3, VE6BL 2, VE6BBL 2, VE6AAT 1.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — BCEN net 3650 kHz, new Net Manager, VE7GY and Route Manager, VE7CDF are working out plans to stimulate the net activities, and help the newcomers who are not sure of their cw or net procedure. Procedures must be polished up. Coming up soon will be the Fire Marshall's PEP communication tests. VE7TM has been in the hospital. Heard an old call active on cw, VE7WM. British Columbia Chapter QCWA, June 11, 1977 at the Biltmore Hotel, watch for information to follow. Traffic: (Jan.) VE7DKY 196, VE7ZK 173, VE7FB 132, VE7CCJ 68, VE7CDF 33, VE7BLO 16. (Dec.) VE7AVW 26, VE7AFY 17.

MANITOBA: SCM, Steve Fink, VE4FQ — Asst. SCM: Peter Guenther, VE4PG. RM: VE4UL. PAM: VE4JP. New two-meter repeaters are operating in Miami (22/82) and in Portage la Prairie (25/85). BARC has helped establish a Ham Radio section in the Brandon Public Library with reference issues of QST, ARRL Handbooks, and Callbooks available. VE4FT edits BARC's new Sparks II bulletin. Manitoba activity on the Agassiz Chapter 10-X net Sun. evenings is increasing. MTN was active during SET. Its 1976 totals include 3074 QNI and 1765 QTC. Plan now for the Peace Garden Hamfest July 9-10. MTN: 30 sessions, 283 QNI, 230 QTC. MEPN: 31 sessions, 1203 QNI, 52 QTC. Traffic: VE4PG 211, VE4UL 157, VE4UQ 143, VE4YE 96, VE4IX 85, VE4RO 82, VE4UO 82, VE4VV 37, VE4AAJ 22, VE4JP 19, VE4NE 11, VE4JA 8, VE4OW 7, VE4CR 6, VE4HR 6, VE4JK 5, VE4TE 5, VE4AAW 3, VE4EJ 3, VE4IF 2, VE4LB 2, VE4MG 2, VE4PA 2, VE4QJ 2, VE4TY 2.

MARITIME & NFLD.: SCM, Aaron D. Solomon, VE1OC — Asst. SCM: Maurice Gladden, VO1FG. SEC: VE1HJ. PAM: VO1JN. RM and APN Mgr.: VE1AMR. NTN Mgr.: VO1GW. OBS: VE1GL. Silent Keys: ex-VE1AAM, VE1DM VO1DV VO1GO. Welcome back as RM & APN Mgr.: VE1AMR. Many thanks to VE1AAO for FB work as APN Mgr. VE1HJ took over as Asst. SEC for SET and ran 8 extra sessions of APN with heavy tfc. load. SET participation greater with six local exercises, APN, 75 and 2-meter activity for '77. VE1 Contest popular on both CW & Phone weekends. New HARC ex. incl. VE1AMC, pres.; VE1AJP, vice-pres.; VE1AMZ, 2nd vice-pres.; VE1AFN, secy.; VE1FQ, bulletin. VO1KP rec'd award as 1st Ship Cap't. Montreal '77. VO1IM VO1IM organizing VO Emergency network. VO1MO VO1FN A/NCS NPN in absence of VO1JN. VO1DR VO1JR trying out new rigs. APN: sessions 31, QNI 246, QTC 238/220. NTN: sessions 25, QNI 116, QTC 30. Traffic: VE1AAO 362, VE1ZH 263, VE1ACU 156, VE1AWS 131, VE1HJ 128, VE1AMR 107, VE1OC 73, VE1BDT 45, VE1BFV 34, VE1ARN 31, VE1QJ 27, VO1GW 26, VO1KE 10, VE1AIF 4, VE1AMB 4, VO1KP 2.

ONTARIO: SCM, Larry Thivierge, VE3GT — Asst. SCM: Noreen Nimmons VE3GOL. South Western Ont. and sections of the Northern US didn't require any imagination for SET '77 as these areas were hit hard by severe snow storms. Several ARES groups put aside their simulated activities to concentrate on the real emergency at hand. Overall SET a success with many stations taking part for the first time. Congratulations to ONTARS on celebrating their fifth anniversary of successful operation. QVMRC looking for more cw activity on 3620 kHz Sun. at 11 A.M. local time for their Pot Lid Net. VE3CDK earned the Bi-Centennial Certificate and VE3MO picked up his WOC award. VE3GOL newest CRRL Life Member. Due to the efforts of CJ3BLU, DOC has granted Japanese Canadian amateurs permission to use the prefix CJ in lieu of VE for 1977 during their centennial year celebrations VE3RSB's autopatch again operational. Burlington ARC's TVI committee members are VE3s GKJ HYI and WN. Welcome to newcomers VE3s IVO and IIL and congrats to VE3s BWT HZH and HPR on passing their Advanced. Best wishes and speedy recovery to VE3s FOV BMB and HOV. VE3VA joined the PL Club and plans to QSY to VE1-Land. The annual exodus in search of warmer wx has VE3s YX DV OZ JA NN FCN BJI and others on the move. VE3AXA/W4 a recent QNI on the GBN from Panama City. VE2CV spoke on the subject of Repeater Autopatch and the Bell to the St. Lawrence Valley Repeater Council in Kemptville. Apr. 1st CRRL membership dues increase to 13.50. Many clubs doing the same thing due to increasing postal rates. VE3TTT, with autopatch on 146.40/147.00 MHz on the air from City Centre in London. Hamilton ARC has established the "Order of the Gavel" to honour past presidents. VE3AWE stepping down as mgr. ECN with VE2WT taking over the reins. Thanks for a job well done TU. A recent ODN session had VE3s ATR DH and DV QNI. Congrats to our Canadian Dir. on being elected to the ARRL executive committee, the first Canadian so honoured. Welcome to VE3FVN latest addition to the OVS gang. Traffic: (Jan.) VE3SB 566, VE3GOL 308, VE3DV 204, VE3DPO 191, VE3CDK 187, VE3HTT 134, VE3GT 117, VE3GFN 115, VE3GJG 103, VE3GNW 92, VE3HGJ 86, VE3ATR 79, VE3AWE 68, VE3AJN 62, VE3EWD 55, VE3IDL 45, VE3BZB 38, VE3GYD 37, VE3EEH 31, VE3FGV 28, VE3DH 10, VE3GCC 6. (Dec.) VE3BDM 7.

QUEBEC: Larry Dobby, VE2YU — VE2BAQ continues to work hard on projects related to P.R. in the Montreal area. Please give Ed any assistance you can should he call on you. With increasing activity on some repeaters in the Montreal area some locals are looking towards higher frequencies for relief. I have had some requests lately for information on Intruder Watch. There is no doubt we have visitors on the 10-meter band when it opens to the south and west. Any information you can supply on this should be forwarded to VE3BAQ. The 160-meter and ARRL DX tests have been well represented by VE2 population. Conditions on the first week end appeared to be very good. Numerous amateurs have purchased 432 transverters from Microwave Modules (U.K.) to operate on Oscar 7. VE2KN and VE2LI continue to represent Que. on this aspect of Ham Radio. PSHR: K2HI/VE2. Traffic: VE2BYJ 266, VE2/K2HI 208. VE2BP 68, VE2EC 36.

SASKATCHEWAN: SCM, P. A. Crosthwaite VE5RP — I had an interesting visit with an enthused group of amateurs in the Northbattleford area. The possibilities of classes being taught in NB looks most promising. There is also a possibility of a repeater going in the area. Linking of repeaters is the topic in Sask. now and I dare say we shall be hearing more on the linking in the future. experiments are on the agenda with 220 & 430. Our SET exercise showed how important it is to have cw operators in the whole of Sask. to pass the traffic. Traffic: VE5CU 263, VE5XC 28, VE5UK 26, VE5LN 24, VE5QS 24, VE5WM 24, VE3NJ 21, VE5UP 18, VE5IZ 16, VE5TT 13, VE5EH 10, VE5HE 10, VE5UT 10, VE5YI 9, VE5AAE 6, VE5MP 6, VE5LO 5, VE5RB 5, VE5YK 4, VE5CX 3, VE5TS 2, VE5UX 2, VE5YD 2, VE5FU 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: K3KAJ. RM: W3EEB. PAM: WA3DUM. PSHR: K3YHR 49, K3KAJ 44. High Scores in '77 DE QSO Party: DE K3YHR 20,605; K3HBP 6,900; WA3WIY 5 635. OR AC7UIC 450; LA W5WG 325; AZ AB7BAN (N) 225; FL K4KMA 200; IA AC0BQ; TX. WA5KGW 200; CT AA1UAX 175. New appointments OPS, K3HBP. OBS, WA3QPX. Delaware Nets (local time) DTN M-F 1830; DEPN S 1800; both on 3.905 MHz. DE 2-Meter Net "13-73" Repeater M 1930. Please send reports of any traffic handled to W3DKX by the 5th of the following month. DTN QNI 319, QTC 55. DEPN QNI 123, QTC 66. Traffic: K3KAJ 159, K3YHR 87, W3DKX 71, WA3WIY 70, W3EEB 31, W3TRC 25, W3WD 24, W3YAH 13, W3HKS 8, W3FEG 7, K3HBP 4, WB3ANC 2, W3EGN 1, WA3TNP 1.

EASTERN PENNSYLVANIA: SCM, George S. Van Dyke, Jr., W3HK — SEC: W3FBF. RMs: WA3OGM WA3SXU WA3YJG. PAMs: W3AVJ WA3PZO. Net Reports: PTTN QNI 131, QTC 117; AREC (2) QNI 6; AREC (10) QNI 4. RMs and PAMs are getting lax in sending in reports, you are letting EPA down! OVS reports W3GOA WA3BJQ WA3BSV WA3NDQ W3CL. OBS reports WA3SXU W3ID W3CL W3RJ. OO reports K3RDT WA3SXU. BPL: W3CUL W3VR WA3SXU WA3ATQ WA3YJG WA3THT. PSHR: WA3SXU WA3YJG W3IPX W3RJ K3KW. OOPS PFN report QNI 541, QTC 330; CM6 QNI 29, QTC 11. W3CUL & W3VR still piling up the traffic. WA3SXU now Class I OO. WA3ATQ says high snow and low temp don't seem to effect Tfc. WA3CFU has right idea, XYL is studying for Novice! W3WRE quiet why? Ant down! WA3OGM studying in ole England. WA3NDQ says squeezing Tfc in between school and sleep a tough job. WA3OFD did it the hard way, first crack at NCS during SET. W3ID still struggling with VHF Tfc outlets, how about some check-ins fellas! WB3AZE now Tech has a 6M net on 50.4 at 0515 GMT Fri. and Sat. U of P ARC is now N3KZ! W3EU reports 30 renewal time at FCC. New officers: S Chester Co ARC K3WAC, pres.; W3BGA, vice-pres.; WA3ZXI, secy.; W3FM, treas.; W3KT, without portfolio! NE Phila ARC WA3VII, pres.; WB3CNG vice-pres.; WB3CYX, secy.; WB3DLR, treas.; WB3EVY property. WA3VUE did a real good job of planning for the SET. Reading ARC K3DTD, pres.; W3WJC, vice-pres.; W3UQC, secy.; W3UQH, treas.; K3DTD W3WJC K3BFA K3PCX W3UQC W3EYN W3ETJ K3RZF WA3GTR W3CDS, dir. The WX almost made the SET for real in a lot of places! Traffic: (Jan.) W3CUL 3171 W3VR 795, WA3SXU 510, WA3YGJ 434, WA3THT 433, WA3ATQ 400, K3KW 175, W3IPX 123, WA3ZXI 71, WA3CFU 56, W3WRE 52, WA3OGM 49, W3RJ 42, K3IAZ 40, W3ATJ 37, W3AVJ 31 WA3NDQ 22, WA3OFD 19, W3BNR 17, WA3TMP 17, WA3ZRE 16, WA3IUV 14, K3RVC 13, K3GJL 12, WA3WQP 12, WA3YHR 11, W3ID 11, WB3AZE 10, WA3BSV 10, W3CL 10, WA3YMV 10, WA3YNO 10, W3ADE 9, W3HK 6, N3KZ 5, WA3MQP 5, WA3BJQ 2, WA3VUE 2, W3EU 1, W3GOA 1, WA3VDQ 1.

MARYLAND — DISTRICT OF COLUMBIA: SC Karl R. Medrow, W3FA. SEC: N3II. RM: W3FZ PAM: K3ORW. NCM: WA3PRW. After the SE W3FCS was rewarded with N3II. Congrats to all fo very good SET. WA3YKK made all his points in t SET, and misses the AA prefix. Cumberland a W3DFW had a public event station in a local sto generating meaningful traffic for the SET. Good sho W3FZV had MDD well organized in the SET, as c K3ORW and WA3PRW for the new Maryland Em gency Net, MEN. WA3UYF has returned to MD permanently. WA3HEM and W3BFV demonstrat Amateur Radio to an elementary school, and no WA3HEM ahs 31 in his Novice class of 5th and 6 graders! W3EOV is off to FL this time. Add W3ZN losing his inverted Vee to a falling tree, but WA3KO is amazed his quad survived the wind and ice. W3F upgraded to Extra. WA3YSW to Advanced. WA3VY K3JIN and WB3CSR to General with WB3DCN a WB3FAS new Novices. Congrats to a WB2TJR/WB3EPN's trip to VK- and W6-Land w great. WA3SXH has it 201/237 CW DXCC. WA3RS was promoted and can now boss instead of bei bossed. WA3YSW is awaiting better WX for a ne antenna. W8K5R/3 capped BICent WAS and 1 DXCC by passing the Extra. Congrats. QO repor from WA3JSZ WA3KCY W3WBY WA3RSK a WA3NSA. Thank you. K2ULA VP Antietam ARC now WB3EOL. W3IDF and WA3EOP say credit t Antietam ARC for the Novice classes they teac W3QW WA3HEM and W3BFV generated some go PR. W3IKA is building up his tfc total on CW, a WB3BUA is doing the same on Fone. Meanwh K3OAE meets his NCS job well despite QRL at wor WA3EOP is walking in this weather. W8BZY/3 is a t leader. W3CDQ has the cold WX blaahs. WA3ZTW a WA3SJS are good liaison men. With the Nets: Se sions/Tfc/QNI average. MEPN/WA3PRW 21/102/24. 100% W3ADQ K3ORW and WA3PRW. Othe WB3AUK W3DKX W3LDD and K3RIJ. MDC PO W3OYY 4/12/23.3. WR PON/W3DFW 18/86/19. MDCTN/K3ORW 26/52/18.4 with top honors WA3UYB K3ORW W3DKX and W3FA. Thanks to t MDD bulletin, FAR minutes, NOVARC and Aut Call. Traffic: W3FA 254, W8BZY/3 216, K3OAE 9 W3FZV 86, WB3BUA 67, WA3UYF 65, WA3SJS 6 W3IKA 52, W3EOV 44, K3ORW 42, WA3YKK 3 WA3ZTW 32, WA3EOP 28, WA3PRW 22, W3FCI 1 WA3HEM 15, W3ZNW 7, W3QW 5.

SOUTHERN NEW JERSEY: SCM, Raymond F. Cla cy, WB2GTE — W2HOB SEC worked hard to mal SET a success. W2UI buried 3000 ft. of radials improve ant. W2ZI QSO'd Russia on 80A, W2LZ delivers Radiograms first class. W2BZ works 100 hou a month on MARS tfc. W2BMA on 2M. K2KA lik 160M at nite. K2LA new pres. of Southern Counti ARA, K2BR. Club meets at Egg Harbor Townsh Municipal Hall 2nd Fri. of month. W2FGH likes 2 40M. WB2AYA now has Extra. SJRA operators slug out in VHF contest to see who wins the Iron Cro Award. Members held White Elephant Sale at Ja meeting with W2OSD W2EKB officiating and K2K new pres. of SJRA. W2BAY had nice write up RCA's TREND magazine. W2PH on SSTV. WA2U wkd Germany with DX60. W2PTQ wks OOTC a SWOP Nets. Delaware Valley RA new pres. W2HL vp WA2YIA; secy, WB2EIZ; treas. K2AAR. Clu planning to visit Hq. H2HOB has 2 new rigs. Burlin ton County Club held a 2M xmttr hunt. WB2LT WB2LCC reports West Jersey ARC has plans for ne FD. WA3LMY/2 attends Princeton Univ. W2PU and new OBS. W2HAZ new R599, T599. WA2HOQ wan to join a Novice Net. W2YPZ former SCM is a Silen Key. K2QIJ busy with SET. W2ORA active on 2 6M. W2EVD active straight key nite. W2CST is RA WB2LCC PAM. WB2WXK asst. EC in Burlington C Gloucester Co. ARC has new Crosstalk edito WB2LMR and new FD chmn. WA2AXJ. Traffi W1HOB 73, WB2LCC 64, W2IU 39, WB2FBL 2 WA3LMY/2 20, WA2AWU 18, WA2PTQ 15, K2B 13, K2LPJ 12, W2FPY 7.

WESTERN NEW YORK: SCM, Joseph M. Hood K2YAH — Asst. SCM: W. B. Thompson, W2MTA SEC: WB2EDT. Needless to say the SET this year w anything but simulated, particularly in the greate Buffalo area. Individual stations providing emergenc communications during the blizzard of '77 are to numerous to mention however, suffice it to say tha many members of BARRA, RAWNY, ARATS, RAGS RARA, BARA, GRAM and others I'm not aware o provided significant public service during the storm which caused telephone and transportation outages. fine performance by WNY amateurs. Congratulation to W2MPM who was recently appointed Atlantic Di Asst. Director. New NYSPTEN officers for '77 ar K2QUA, mgr.; WB2DPR, asst. mgr.; W2QYT, secy treas.; WB2QOH, asst. secy. The previous two WN SCMs K2KTK and K2KIR are now K2NY and W2J respectively. Nice calls too. WB2VMS WA2TQS WA2TCZ and K2DNN are teaching an amateur radi course in Elmira at George Washington H.S. and hav produced these new Novices: WB2s JCR JQU JSI BIM JNZ JJJ KEB KCN JNY KDZ JUZ and KCM a well as WA2JNZ. K2PBK is now W1COG. Th Genesee Repeater Assn. is planning an FM banquet o Mar. 26 at the Marriott Inn in Rochester. The speake will be the famous W1ICP. Those interested shoul contact WA2ABQ for reservations. I regret to repo that K2RUM became a Silent Key on Feb. 12. Th Skyline ARC of Homer N.Y., K2ZER, pres., is a ne ARRL affiliated club. WB2UYI is the new ARAT publicity dir. and W2VCI was recently voted the 197 ARATS outstanding member. Rochester VHF Grou sweepstakes score is over 425K with many logs st not in. Congrats to new OO III WB2ZON and ORS WA2GXV. Don't forget the Rochester Hamfest Ma 20-22. Details P. O. Box 1388 Rochester, N.Y Traffic: W2MTA 348, W2FR 224, WA2HSB 17 W2RUF 113, WA2UYK 102, W2JJ 60, WA2ZJP 9 W2MPM 35, WB2QIX 16, K2OFV 14, K2DNN WB2VND 7, WA2ECA 4, WA2FJO 2.

WESTERN PENNSYLVANIA: SCM, Donald J. My lewski, K3CHD — SEC: W3ZUH. Asst. SECs: K3SM WA3LJW. PAM: K3SMB. RMs: W2KAT/3 W3NE W3LOS W3KUN.

Net	kHz	Time/Days
WPA CW Traffic	3585.0	7:00 PM Dy
WPA Phone Traffic	3983.0	6:30 PM Dy
WPA RACES	3990.5	9:00 AM Su

If you need info on Amateur Radio publicity, contac W3SN (Erie area), WA3HHC (Pgh. area) and K3RX WB3AIQ (State College area). The Two Rivers AR had 205 persons show up on the first night of Novic classes. It sure pays to advertise! The South Hills Bra Pounders & Modulators officers for 1977: WA3SRE pres.; WA3UUG, vice-pres.; WB3AAC, treas WA3UIE, secy. K3LVO received the 25 wpm sticke

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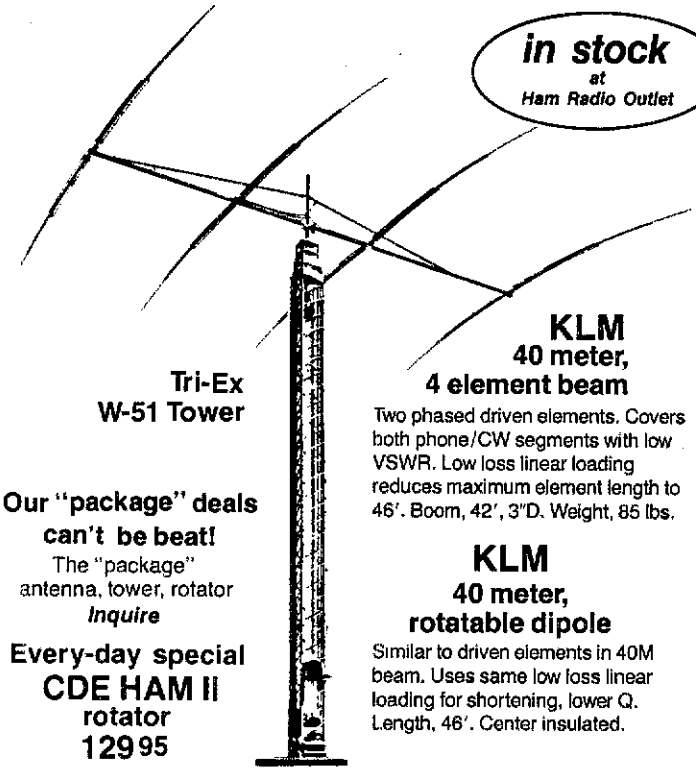

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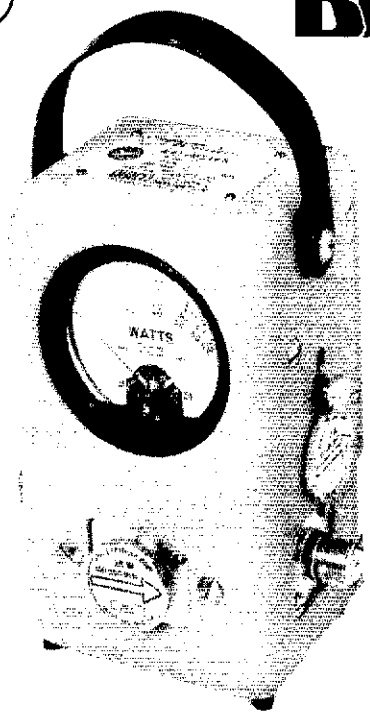

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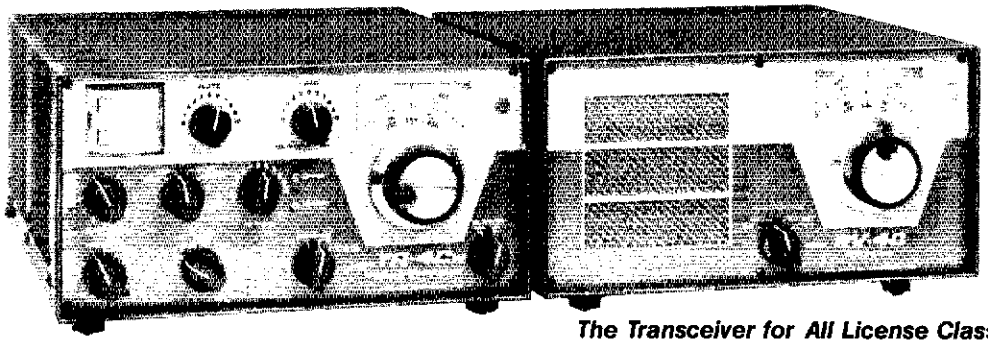

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It is with deep regret to note the Silent Keys of W3IHE and WB3ECY. W3SN acquired the Bicentennial WAS Award. Get well wishes for WA3EBA, W3NSX WA3BOH. Welcome to the following new Novices: WB3EFQ WB3EYH WB3ENK WB3ENL, WB3FIA WB3FIB WB3EXS WB3DHI WB3BHJ, WB3ENR WB3ZPL, WA3WAA and WB3DCO upgraded to Technician. WB3DHL and WB3FAB upgraded to General Class. WB3AGB WA3EVT, WA3JBQ K3SMB participated in some fine Amateur Radio publicity on KDKA-TV. Skyview Radio Society officers for 1977: K3YLI, pres.; K3VRU, vice-pres.; W3ICB, secy.; K3VRV, treas. The Nittany ARC sponsored a microcomputer seminar. K3HJI, K3ITH, WB3AGB WA3JBQ WB3EKE provided field communications during the Pitt University explosion for the American Red Cross. I want to thank all of those WPA members who stayed up many long hours providing communications during the severe cold weather emergency. The WPA Phone & Traffic Net had 28 sessions in Jan. handled 15 messages with 190 check-ins. The WPA CW Traffic Net had 33 sessions in Jan. handled 236 messages with 466 check-ins. BPL and PSHR credits WA3VBM. Traffic: WA3VBM 619, W2KAT/3 266, WA3AHP 200, W3EQJ 176, K3CHD 124, K3KUN 87, W3GQJ 52, WA3ZAO 48, W3LOS 36, WA3YIR 36, K3MIY 34, W3TTN 32, K3HCT 27, W3ATQ 20, W3SAY 18, W3SN 17, WA3UDZ 16, K8MYU/3 14, WA3MDY 13, WB3AGB 11, WA3JIH 8, W3IDO 6, W3YD 5, WB3CDO 3, W3KQD 2, K3LVO 2, K3VQV 2.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: Harry Studer, W9RYU. SEC: W9AES. PAM: WA9KFK. RM: K9ZTV. Cook County EC: W9HPG.

Net — Freq.	GMT	Days	Tfc.	Sess.
ILN — 3690	2330/0300	Dy	277	62
Ill Phone — 3915	2245	Dy	281	31
NCPN — 3915	1200/1700	M-S	224	52
IEN — 3940	1400	Su	10	4

K9ZTV, RM for the IL Section will be leaving 9-Land and Jan. will be his last month as our very active RM. Kent has been in our official ARRL family for two years and in that time his traffic management has been superb. He will be missed by all the gang in the ILN, and especially your SCM who knew that Kent could be called upon for the finest of cooperation. Thanks Kent, for a job well done and the best to you in your new endeavor. Starting Feb. 1st, the new RM will be W9NJP who has been a traffic handler for many years, and the fine reputation of the ILN will continue to lead. W9GCZ is now W9BD. WA9DLT has passed his Extra Class and is waiting for the FCC notification. The IL Section was well represented in this year's SET. From reports received the activity was at an all high. Now is the time to make reservations for the ARRL National Convention which will be held in Toronto, Canada on June 3-4-5. Write P. O. Box 1011 Station C, Scarborough, Ontario, M1H 2Z4. The first month of the IL Slow Net held 16 sessions with 12 Novices checking in with a QNI of 57. New ORS appointments this month include W9PE WA9EBT and WB9RGC. WB9PEA was appointed OPS. Newly elected officers of the Schaumburg ARC are: K9ZMZ, K9MFY WB9PTO and WB9KUP. WB9TDR, XYL of K9UQN passed her General. A new Technician is WB9YYX. The Six Meter Club of Chicago will hold their annual Hamfest on Sun. June 12th at Santa Fe Park in suburban Willow Springs. W9TKR WB9UZU and WA9KZI are the new officers of the Waukegan UHF Society. The frequency of their repeater is now input, 147.63 and output 147.03. K4GXF, ex-W9YZV passed away in FL. Our sympathy to his family and friends. Bill was a past pres. of Hamfesters (Chicago). W9HOQ is now an Extra Class licensee. Charles Harris, WB2CHO, ARRL club and training mgr. was guest at the Jan. meeting of the St. Clair Amateur Radio Club in Belleville. This column's sympathy to the families of K9YUS and WA9YIF on the loss of their father who recently passed away. WD9AKB is a new Novice in the Springfield area. WR9AKL (Galesburg) is on 146.01 and 146.61. The University of Chicago ARC has been given a club room and equipment loaned to them and the club station WD9AAE is on the air. With this report I am starting my 21st year as your SCM. It has been a pleasure to serve you. My many thanks to all for their support because without it this position could not be successful. Traffic: W9NJP 203, W9HOT 202, K9ZTV 171, W9OK 160, W9NXG 149, WA9AGW 148, WB9TWT 123, WB9NOZ 120, WA9OBP 115, WA9EBT 114, WA9KFK 108, W9KR 78, W9JIJ 62, WA9BGW 57, W9OYL 57, WB9NEH 50, WB9RSW 32, WB9SNA 29, W9HPG 25, W9PRN 22, WB9DED 21, K9EEA 17, WB9RGZ 16, WA9TOC 16, W9PE 14, WB9NIO 10, K9DDA 3.

INDIANA: SCM, M. P. Hunter, WA9EED — Congrats to WA9ITB for a good showing in the Nov. FMT. Several good scores are surfacing from the CQWW. The Jan. snows played havoc in the state. Ft. Wayne EOC provided excellent assistance to authorities during the storms. Lafayette AREC also operated under emergency conditions. The SET was a huge success, but not snow related. The snow areas had their own version of SET. Some problems existed in trying to convince certain ITN stations that the snow related traffic was of greater priority than the routine SET traffic. That's what SET is all about — find the weaknesses and cure them before it's too late. FWRC reports that their annual "Santa visit by radio" was a huge success. Lake Co. ARC reports 63 applicants for code and theory classes. Congrats go to WB9JKO for 40 wpm CP. Congrats also to K9OTB for SBDXCC No. 520. WB9PFZ reports he is now one of the 2 mtr. fm gang. W9MR left in early Feb. for a Pacific DXpedition. WB9SKA has been named Asst. Mgr. for D9RN. Net Traffic: INN 39, INTN 114, IPON 0, ITN 538, Hoos. VHF 126, Hoos. VHF (Dec.) 159. Traffic: (Jan.) WB9KTR 441, W9UMH 399, WB9SKA 325, W9NQW 322, W9IOH 301, W9GGW 271, W9LTU 261, W9YB 249, WB9FOT 183, K9DCX 180, WB9LTJ 172, WB9OZW 165, WB9PIR 129, WA9QCF 122, W9AQF 121, WB9NAQ 99, W9EI 88, WB9QEZ 72, K9YBM 54, WB9LCN 51, WB9SQH 47, WB9IHR 44, K9WWJ 39, WB9DIX 32, K9FOV 31, WB9ORM 29, WB9OQI 29, W9PMT 29, WB9VKO 23, K9JQY 22, WA9OHX 22, W9ENU 21, K9LZN 21, WA9TJS 21, K9QWJ 19, K9RPZ 14, WB9RVL 14, K9CGS 12, W9DLF 10, W9BDP 9, W9CMT 7, K9EQT 7, WB9UBF 7, K9HWG 6, K9RGF 5, WA9BSK 3, WB9GTC 3, WB9GHS 2 (Dec.) W9PMT 53.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: K9PKQ. PAMs: W9AYK W9IEM K9UTQ. RMs: WB9ICH K9KSA W9OT K9LGU. Nets, Freq., Time,

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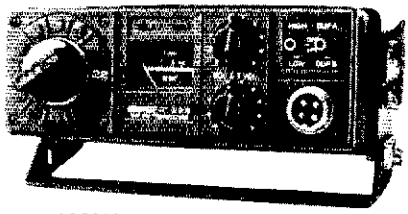

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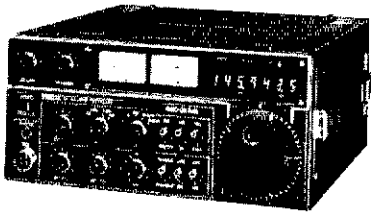

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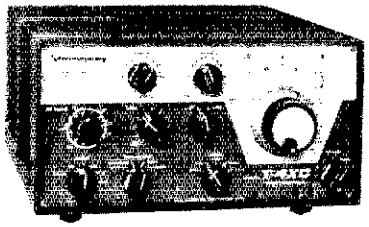

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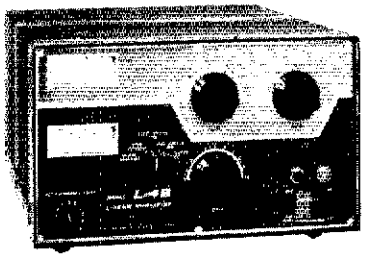

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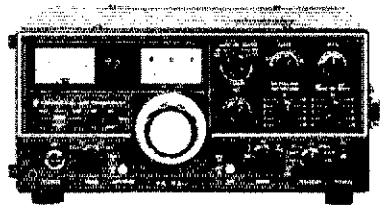

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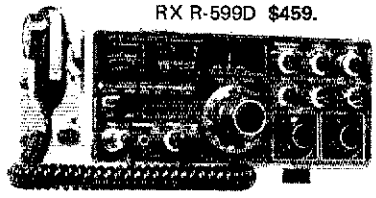

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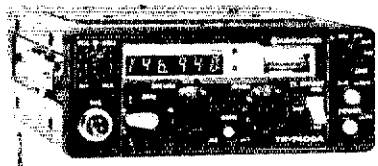

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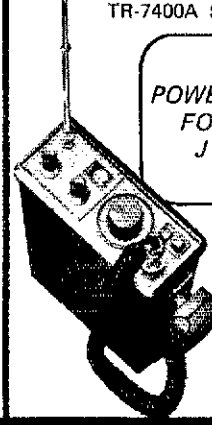

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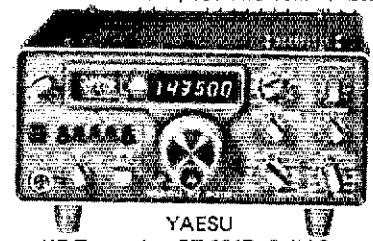

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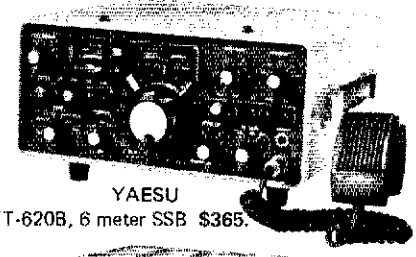

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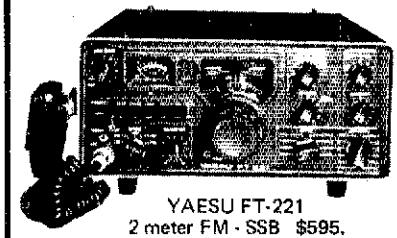

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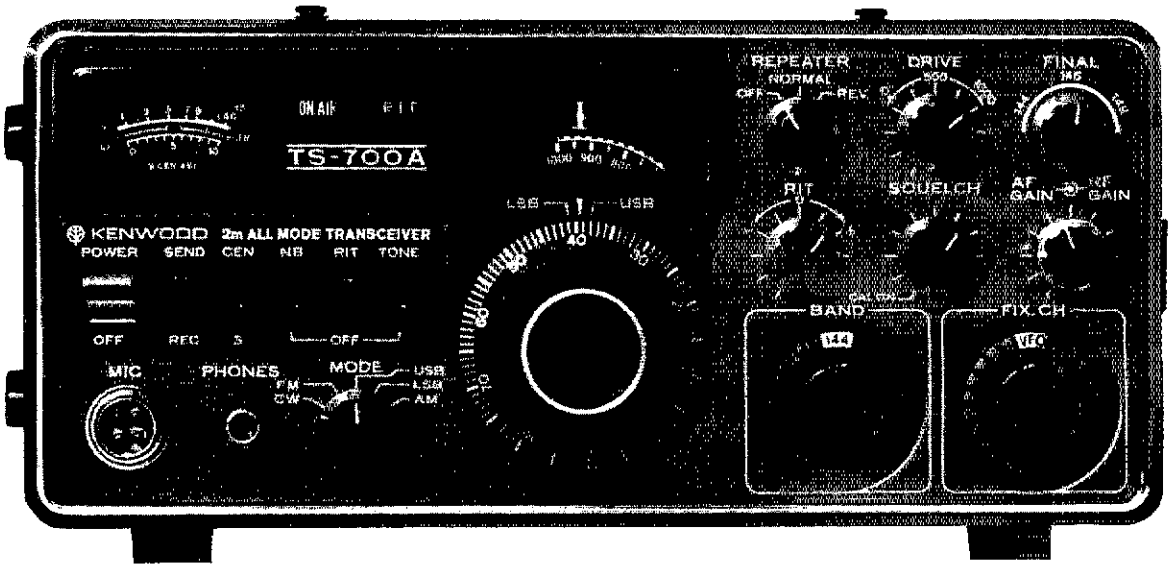

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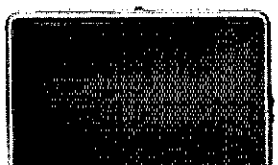

SP-70

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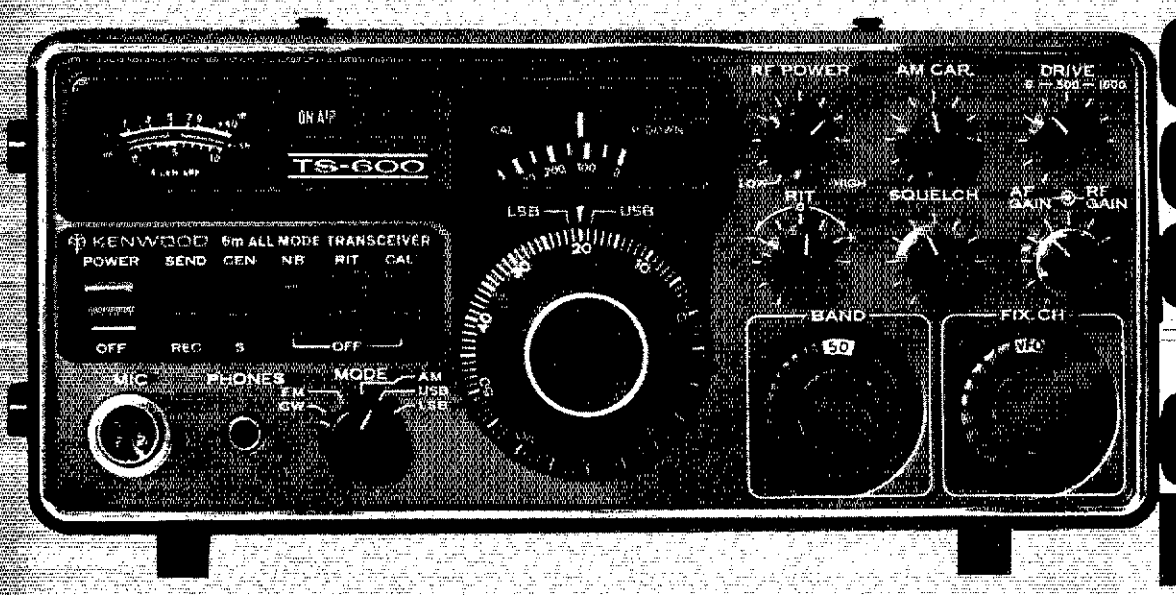

TS-600

VHF

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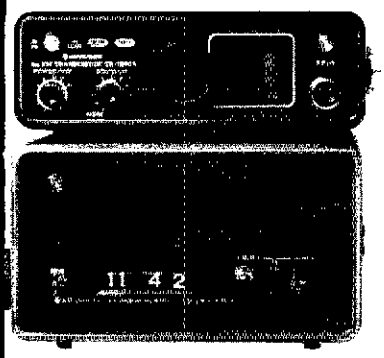
The hottest 2-meter mobile rig on the market. Features a brand new and unique squelch system with continuous tone coded squelch, tone burst, or carrier squelch. Full 4 MHz band coverage and 25 watt output. It's phase-locked loop (PLL) frequency synthesizer provides operation on 800 channels. The TR-7400A's list of features goes on and on, but even more important is its superb performance and dependability . . . and all at a surprisingly low price.



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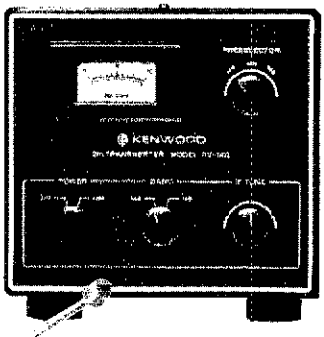

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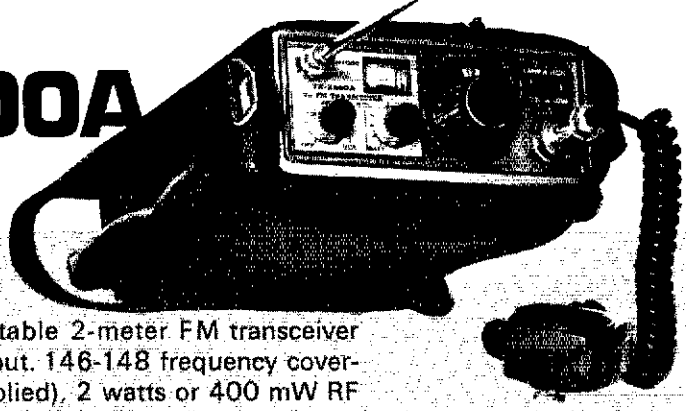

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DAKOTA DIVISION

MINNESOTA: SCM, Frank Leppa, KØZXE — SEC: WAØOFZ. PAMs: WØOSJ WAØYVT WBØHOX. RMs: KØCVD WBØLDW WBØOFQ. The FCC will give exams in Sioux Falls, SD, Apr. 19. Send in form 610 to the St. Paul office now. W9MMP/Ø and WBØHOX made BPL this month. WBØMAO and WBØOFQ made PSHR. WAØGLI received the Bicentennial WAS, 13 Original States, and the President's Inaugural Celebration awards. The North St. County ARES net was activiated for a power shortage on the iron range. The Anoka County Repeater Group and the Spirit Valley Amateurs (WBØSVA) received ARRL affiliation charters. WØMD KØSVW WAØETR WAØERW WAØGLI are after 5BWAS starting as of Jan. 1. Good luck. KØSVW sent 17 official bulletins in Jan. and WØHW sent 40. MN Navy MARS looking for new members outside the Twin City Metro area. Contact KØLAV or WBØLJH for info. WBØFHH is in the hospital. The MN QSO Party endured poor condx but, WØIYP took first place, with AKØSID the high scoring Novice. This year's contest will be June 4 and 5. See operating events section. The Heartland ARC of Staples sponsors this event. WBØMAO received OPS. WBØJYT received the "Outstanding Amateur of the Year Award" for his efforts in organizing and handling mass traffic originations at tha Mankato Farmfest last fall. Traffic: (Jan.) WBØHOX 596, W9MMP/Ø 530, KØCVD 308, WAØYVT 186, WØQMY 183, WBØOUH 137, KØZXE 123, WBØLDW 118, WAØTFC 110, WBØQEU 110, WØRIQ 100, WBØEKC 97, WBØMEB 96, WBØUCU 94, WBØPKG 93, WAØGLI 83, KØPIZ 72, WAØQIT 63, KØZBI 62, WØOXN 61, WØDUW 57, WØOSJ 52, KØGNI 48, WAØTQT 48, WBØNZB 45, WØOPX 38, WBØOFQ 37, KØELT 36, WBØMAO 34, WBØJYT 31, WØHZU 30, WBØPGZ 24, WAØURW 20, KØRMX 18, WBØQPO 16, KØCSE 14, WAØJPR 14, WBØLSI 12, WØØET 11, WAØWOV 7, WBØNCP 6, KØSXQ 6, WBØPBN 5, WBØVNC 4. (Dec.) KØRMX 34, WAØTGM 25.

NORTH DAKOTA: SCM, Mark J. Worcester, WAØWLP — Devils Lake having Novice classes with 11 signed up so far and more expected. WØZCM giving Novice class at Dickinson with 23 attending. WØAZN waiting for Genave. Set of cavities for the rept. at Minot, are waiting for warmer weather. Williston trying to get club organized with some talk of a rept. Minot club had their annual party on the 18th of Jan. with about 50 in attendance, again picking the coldest day of the year, Jan. 7 blizzard net had 36 amateurs check in. The SET went well with the Bismarck Club doing FB job. There were 60 hams participating, and again Tnxs to all. NDCW net should be starting in Feb., check the DATa net for time and freq.

Net — kHz Mgr.	CDT/Days	Sess.	QNI	QTC
DATa — 3996.5	1700 S-S	51	617	330
WAØSUF	1800 M-F			
Goose River — 1990 W@CDO	0900 Su	5	41	
YL Wth — 3996.5 WAØRWN	0700 S-S	31	700	735
YL Wth				
Jan. 7 Blizzard		36	136	

Traffic: WAØRWM 1066, WAØSUF 199, WØFNZ 184, W@CDO 102, WBØBMG 92, WAØCRH 89, WAØVGH 75, WØDM 60, WØWWL 41, WBØBMH 8, WØMXF 7.

SOUTH DAKOTA: SCM, Ed Gray, WAØCPX — Lake Area Radio Club (LARK) of the Watertown area has the following officers. WBØMRR, pres.; WBØMSH, vice-pres.; WBØMWJ, secy-treas. LARK recently provided two meter communication at 13 check points for a March of Dimes fund raising snow mobile run from Watertown to Waubay, to Webster, and back to Watertown. There are a number of new Novices on in the state. Please find out who they are and let me know so we can list them in QST. Also please help them all you can by offering your help; don't make them ask because many never will. WBØZLK Salem, is a new Novice. Prairie Dog ARC officers are: WBØEVQ, pres.; WAØARZ, vice-pres.; WBØMVX, secy-treas. KØOTZ Watertown, is getting on RTTY. WBØZCF Rapid City is a new ham. Net Reports: Total QNI 3942, QTC 380. Traffic: WØZWL 749, WAØVRE 525, WØHOJ 119, WBØEVQ 78, WØDVB 31.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WA5VNV. PAMs: W5POH WA5ZWZ. RM: W5MYZ.

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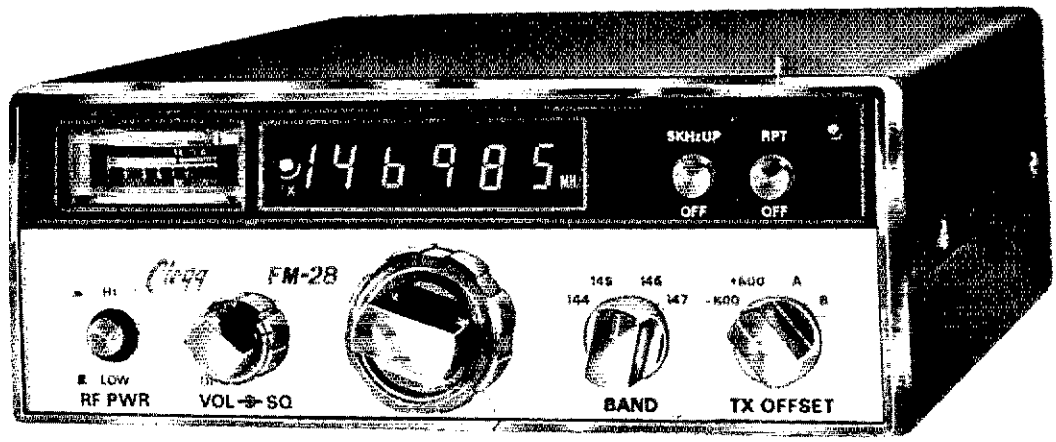

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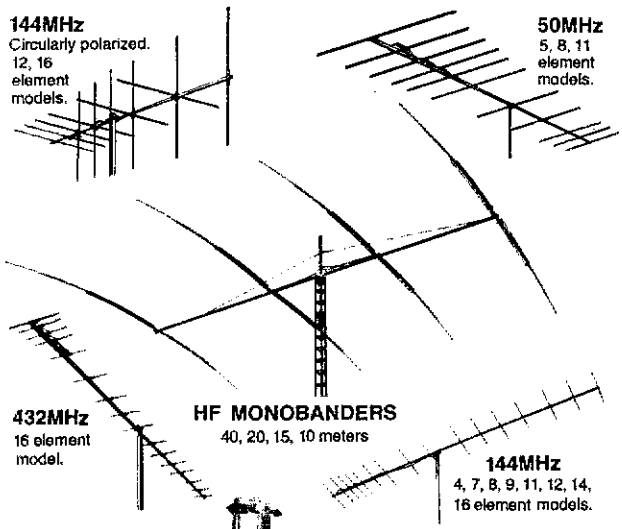

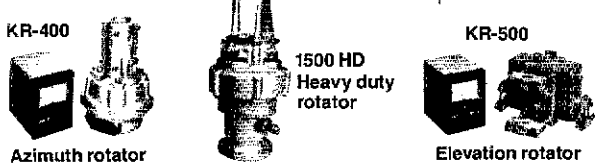

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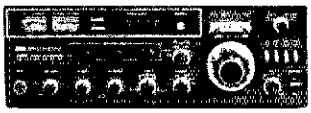
"2700" All Mode VHF Tranceiver



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Nets, kHz, Time/Day, QNI, QTC, Mgr.: ARN, 3995, 0030/Dy, 604, 52, W5UAU; OZK, 3760, 0100/Dy, 229, 55, W5MYZ; APN, 3937, 1200 M/S, 901, 42, W5POH; M-BIRD, 3928, 727, 7, WA5ZWZ. New ECs WB6OGD Pulaski Co., WB5YDY Saline Co., WB5MQH Boone Co. ORS Cert. to WB5BDU. WA5JCX WB5LLY now Advanced. W5TDP now Extra. UR SCM rec'd 10 SET msgs. K5MEA new ARN Mgr. W5KL has new solid-state repeater on order. Radio Club secretaries. Please send list of new officers to UR SCM. Any club activity would be appreciated. Traffic: WA5HNN 211, W5BED 73, W5POH 44, W5UAU 35, WB5GWU 17, K5MEA 10, K5GKN 8, W5KL 6, W5SHY 5, WB5GQH 1.

LOUISIANA: SCM: Robert T. Schmidt, W5GHP — Asst. SCM: John Souvestre, WA5NYY. SEC: WB5CIQ. RM: WA5ZZA. PAM: WB5KFY. VHF PAM: W5VBX. WA5NYY has been elected to the Board of Directors of the Jefferson ARC. Congrats to W5FMO for again making the Honor Roll of the FMT. Baton Route ARC upgrading class successfully completed in Feb. The Lafayette ARC Hamfest in Mar. was a great success. Their new Novice class started in Feb. and will run for 10 weeks. WB5ZED is trying to start a club in Bogalusa, and would appreciate help. If interested contact him thru the Hammond Repeater. SELARC has started a new 2-meter net on their repeater. Our four traffic nets did an excellent job during SET. Many thanks to all members who helped, especially to those who acted as net control and liaison stations. W5CEZ, Maplewood, out of hospital after a mild heart attack. K5BLV now has 164 confirmed out of 168 DX.

Net — Freq.	Time/Days	QNI	QTC	Manager
LAN — 3615	7 & 10 PM Dy	541	224	WA5ZZA
LTN — 3910	6:15 PM Dy	312	78	WB5KFY
LAN — 3703	8:30 PM M-F	120	52	WA5ANV
LRN — 3587.5	7:00 PM Su	16	8	WB5FHU

Traffic: W5GHP 386, WA5IQU 366, K5TFG 208, WB5PTH 200, W5MI 111, WA5ZZA 90, WA5VQE 85, WB5NEZ 43, WA5TQA 41, WB5LBR 38, WB5EKU 36, WB5CDX 30, K5BLV 19, W5YN 12, WB5VGY 11.

MISSISSIPPI: SCM, E. Ed. Robinson, W5YTN — Net certificates for MS-LA Weather Net issued to W5s AXQ CZR JTL RUB SRU; K5s AUR FSQ IMT WSC ZRO; WA5s EBH EEX FII OKF; WB5s JCX NEK OJQ OJT OUC OWY PPG SQL SXK THG TIW VGN WTM YGQ and K5VXV NM reports good participation. K5RRG now Extra Class. WA5TMC reports excellent check-ins for the Northeast MS FM Net. WB5DCY doing construction and repair for more DX and VHF. W5TXA now N5XA. 1977 SET very successful in most of the state. SEC WB5FXA still needs more county and district ECs. Don't forget Jackson Hamfest May 14 and 15. See you there. MTN QNI 250, QTC 121. MSN QNI 25, QTC 5. MSBN QNI 1168, QTC 92. CGCHN QNI 3219, QTC 119. NE MS FM Net QNI 514, QTC 55. MS-LA Weather Net QNI 199, QTC 3. Traffic: K5RRG 180, WB5FHA 161, WB5LXX 160, WB5MTQ 119, K5OAF 117, W5YTN 106, WB5SNB 88, W5RUB 84, W5LSG 79, W5EDT 77, K5VXV 67, N5XA 51, WA5YTW 37, WA5YZW 23, W5BW 20, W5NCB 19, WB5QCA 17, WB5HAS 4, WB5LVA 4, WB5NGF 1.

TENNESSEE: S M, O. D. Keaton, WA4GLS — SEC: WB4DYJ. PAM: WB4PRF. RM: WB4DJU.

Net — Freq. Manager	Time(Z)/Days	Sess.	QNI	QTC
TPN — 3.980 WA4EWW	1140 M-F	85	4109	509
W4PFP	1245 M-F			
WB4YPO	0130 M-Su			
	1400 SSuH			
TCN — 3.980 WB4WHE	0130 M			
TN — 3.635 K4YFC	0130 Dy	9	177	46
TNN — 3.710 WA4CNY	2300 M&Th	9	25	25
ETVHFN — 50.4 WB4WZJ	0200 MWF	12	108	2
ETVHFN — 145.2 WB4DZG	0200 TTh	9	42	1
MTTMN — 28.8 W4EAY	0200 TF	9	80	0
WTVHFN — 146.37 WA4VVX — 146.97	0230 TF	9	228	11

The SET activities continued for 13 hours with QNI 293 and QTC 364. PSHR for W4OGG for Dec. 1976 was 67. RACES station call is WC4ABV and the TCDARC's station call is WB4EBZ. New officers for KARC and MBRC are: WA4LJW, pres.; WB4BLN, vice-pres.; K4VOS, vice-pres.; WA4QMC, secy-treas.; WB4BXG, secy-treas.; WA4EJX, act. mgr.; WA4LBN, zero-beat editor. Congrats on new call signs, K4VM ex-WB4LCR, W4QD ex-K4VVE and W4VS ex-W4YAU. Congratulations to the following who give their time to the TNN: WA4CNY Net Mgr. & NCS, WB4HHR NCS, WB4DJU RM, WA4HLV WA4JDY WA4AHE WB4DHC WB4HHX WA4JGG WB4SNX WB4EKJ AL SCM, WB4GJR WA4CNW WA4WSY. Active OBSs are W4SGI WB4ANX W4PFP WB4BKF W4OGG WB4IAW and W4CYL. Current OOs are K4KG K4VM W4IYU K4MZE and W1FCC/4. Current VHF are WB4KHV WA4IAX W4HHK W4CK W4WQZ K4EJQ WB4ZSZ. The above appointees are reminded to make a monthly report to the SCM. Traffic: W4OGG 409, K4CNY 262, WB4DYJ 204, WB4DJU 98, WA4WVW 93, WB4ZSZ 87, WA4GZZ 74, WB4PRF 74, WA4DKC 70, WA4WHQ 69, K4FSK 56, K4JSF 46, WB4GBI 45, W4CYL 44, WB4BKF 43, W4VS 43, WB4WHE 38, WB4YPO 38, WA4GLS 29, W4TYV 21, W4RUW 17, W4SGI 15, K4UMW 12, K4AMC 10, WB4MPJ 8, W4PSN 4, WA4ATI 3, W1FCC/4 2.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID — SEC: WB4ZML. Jan. Net:

Net	QNI	QTC	Net	QNI	QTC
KRN	351	28	KYN	284	96
MKPN	1381	64	KNTN		
KTN	1363	151	6DAREC	101	47
KPON	115	13	8DAREC	105	9
			SEKEN	61	47

Twenty seven attendees at the annual SET/Section meeting. Lots of good discussion on our nets, AREC and ARRL board meeting notes from vice-dir. W8IMI. Activity in the SET was down due to the terrible weather affecting local participation. SEC WB4ZML is reorganizing the AREC districts. Suggestions are solicited. KY amateurs are involved in keeping an eye on

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Our circuit designs prove it

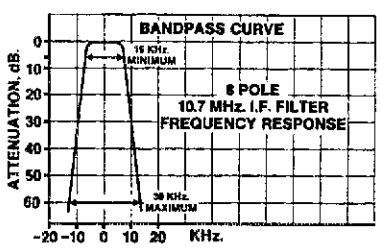
The HW-2036 offers true digital frequency synthesis for real operating versatility. No extra crystals are needed and there are no channel limitations. Advanced digital technology uses a voltage-controlled oscillator (VCO) that is phase-locked to a stable 10 MHz crystal-controlled reference. Double-tuned stages following the VCO in the receiver and transmitter provide clean injection signals. The result is a signal that has spurious output more than 70 dB below the carrier (see spectrum analyzer photos below). Additionally, the "add 5 kHz" function is accomplished digitally in the HW-2036 so that no frequency error is introduced.

True FM

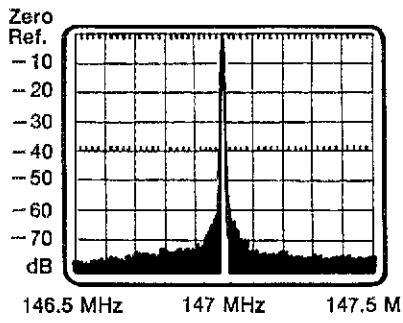
Careful attention to the transmitter audio circuitry and the use of true FM gives exceptional audio quality. A Schmitt-trigger squelch circuit with a threshold 0.3 μV or less provides positive, clearly-defined squelch action. Other design advantages include diode-protected dual-gate MOS FET's in the front end, IC IF and dual-conversion receiver.

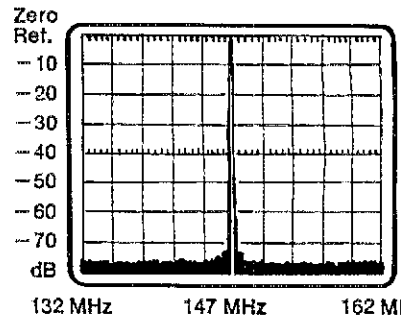
Outstanding Specifications

The HW-2036 puts out a minimum 10 watts and operates into an infinite VSWR without failure. Receiver sensitivity is an excellent 0.5 μV for 12 dB Sinad making the HW-2036 ideal for use in crowded signal areas. You won't find another synthesized 2-meter transceiver that delivers the features and performance of the HW-2036 at anywhere near its super-value price.



An 8-pole IF crystal filter greatly reduces adjacent channel interference.

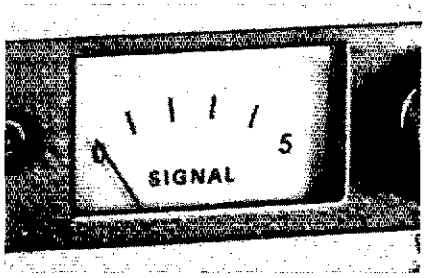




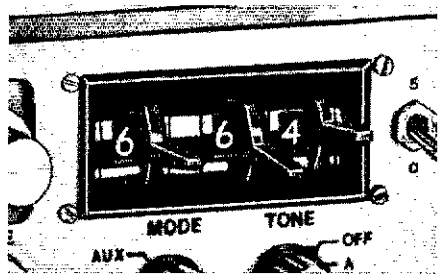
Actual spectrum analyzer reproductions of the HW-2036 transmitter output operating at 147 MHz. Spurs within 20 MHz of carrier are down to a full 70 dB!

HAS THE BEST 2-METER AROUND.

2-Meter Transceiver for example



Signal strength meter lets you adjust for optimum reception.



Lever switches for quick, easy frequency selection.

Optional Micoder for accessing repeaters with auto-patch input.

Features you'll appreciate

And some you'll find nowhere else. For example, the transmitter will not key if you inadvertently dial-up an out-of-band frequency. LED status lights warn that the frequency synthesizer is not locked and also indicate whether the channel is in use. A built-in continuous tone encoder, with three front panel selectable tones, lets you access most repeaters. And if you order the optional HD-1982 Micoder™, you can make telephone calls through repeaters equipped with auto patch input. Has built-in simplex, + and − 600 kHz offsets, and an Aux. position that lets you add your own crystal for any other offset frequency you may want.

The compact HW-2036 includes a gimbal-mount for easy mounting as a mobile unit, or with optional AC power supply, as a fixed station.

You're on the air in no time

Because building the HW-2036 is quick and easy. Just five printed circuit boards and a wiring harness. A built-in signal source lets you align the HW-2036's receiver section for maximum sensitivity using just the front panel meter (no signal generator is required). Total alignment requires a VTVM. A frequency counter with a range to 150 MHz is also recommended, but not necessary.

Complete HW-2036 SPECIFICATIONS:

Receiver: Sensitivity: 0.5 μV for 12 dB SINAD (or 15 dB of Quieting). Squelch Threshold: 0.3 μV or less. Audio Output: 1.5 watts at 10% T.H.D. typically 2 watts. (5 kHz deviation). Image Rejection: −45 dB or greater. Spurious Rejection: −50 dB or greater. IF Rejection: −80 dB or greater. Internally Generated Spurious: Below 1 μV equivalent. Bandwidth: 6 dB at 15 kHz min. and 60 dB at 30 kHz max. Modulation Acceptance: 7.5 kHz min. Transmitter: Power Output: 10 watts min. at 25°C and 13.8 VDC, into a 50Ω load. Harmonic & Spurious Output: −70 dB within 20 MHz of carrier; −50 dB elsewhere, −40 dB harmonics. Modulation: FM, 0 to 7.5 kHz, adjustable. Duty Cycle: 100% with infinite VSWR. Tone Encoder: 3 tones, 70 to 200 Hz, approx. ±70 Hz deviation. Transmitter Offset: 0 (simplex), −600 kHz, +600 kHz with crystals supplied. Provision for one additional offset crystal. General: Frequency Coverage: Any 2 MHz segment from 143.5 to 148.5 MHz. (Both receiver and transmitter must be aligned for the same 2 MHz segment.) Frequency Increments: 5 kHz. Frequency Stability: ±.0015%. Operating Temperature Range: 15° to 125° F. (−10° to 50° C). Operating Voltage Range: 12.6 to 16 VDC (13.8 VDC nominal). Current Consumption: RX: 700 mA max. squelched. TX: 2.6 A max. at 13.8 volts. Dimensions: 2¾" high x 8¼" wide x 9⅞" deep. Weight: 6.25 lbs.

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the Ohio River for possible flooding condition WB4NAR now has his Advanced ticket. Traffi WB4ZML 290, K4UNW 231, W4CID 190, WB4IL 173, WB4QVS 122, WA4AGH 81, WB4NAR 7 WB4AUN 65, WA4IGS 60, K4AVX 58, WA4JTE 5 WB4EOR 47, W4CDA 36, K4HOE 32, WA4AVV 3 K4FUM 28, K4LOL 14, K4HRF 14, K4UMN 1 WA4FAF 6, WA4UBE 2, WB4KTR 2.

MICHIGAN: SCM, A. L. Baker, W8TZZ — Se W8MPD. RMs: W8JYA WB8NCD. PAMs: WB8J K9LNE. VHF PAM: WA8WVV.

Net — Freq.	Time/Day	QNI	Tfc.	Ses
MACS — 3953	1600 Dy	1070	407	
QMN — 3663	2300 /0300 Dy	1048	389	
WSBN — 3935	0001 Dy	985	94	
MNN — 3720	2230 Dy	144	70	
BRMEN — 3930	2230 Dy	714	65	
UPEN — 3922	2230 Dy	915	56	
GLETN — 3932	0230 Dy	352	35	
MI6M — 50.7	0001 Dy	340	30	
VHF PAM		556	4	

Foul weather caused postponement of Michigan SET. Emergency Coordinators failing to report SE activity have been cancelled. Election results: Centr Mich ARC K8ZKM, pres.; WB8JVW, vice-pres W8TXM, treas.; WA8MHY, secy. Midland AR W8QOI, pres.; WD8BPT, vice-pres.; WB8UOP, secy W8JIU, treas. Saginaw Valley ARA K8BWC, pre WB8IOT, vice-pres.; WD8CTU, secy.; WB8AYW, trea MACS Net Amateur of the Month: Oct. W8LDS, No W8JLD, Dec. WB8JIX. New appointees in Feb K8AIT K8HJU OOs, WB8YDZ ORS. New licensee WD8CWU WD8DII Novice. WB8UXD Gener WD8CGA WD8CIQ Advanced. WB8WDP Extra. Co gratulations. W8TXM is stateside QSL Mgr. f 2S6ATA. Grand Rapids RTTY Repeater now o erationnal on 146.10/70 Narrow shift. Don't forget M QSO Party May 14-16. Regretfully I report W8ZMI Silent Key. Traffic: (Jan.) WB8ITT 453, WA8OI 193, W7KQU/8 124, K8DYI 122, WB8NCD 11 WB8POL 96, W8VPW 96, W8GLC 88, W8YIQ 8 K8LNE 81, W8OW 76, WA8TBL 70, WD8CIQ 5 W8TZZ 56, WB8VOM 55, K8WRJ 54, WA8DHB 5 WB8JIX 52, W8MO 50, WB8DKQ 45, K8ZJU 4 W8IHX 38, W8IUC 38, W8CSO 35, WB8NOH 3 W8JJP 30, W8VIZ 27, WB8UFS 22, WB8BYB 2 W8UFS 20, WB8OI 19, WB8SNT 17, WD8CUU 1 W8SDB 16, K8DTG 15, WB8EYM 14, WA8FXR 1 W8LDS 12, W8UOQ 12, K9JED 11, W8CUP 1 WA8PIM 10, W8TBP 10, WA8WVV 10, WA8WWS 1 W8BYY 9, WB8DJS 9, WB8FBG 9, K8GXV 8 W8QBE 9, WA8SVI 9, K8BZL 8, K8CIP 8, WB8VA 8, WA8YPY 8, WA8AXF 7, K8PYN 7, W8WVL WA8FJF 6, W8HKL 5, K8MJK 4, WRJLD 3, W8LO 2, WB8ITA 2, W8RNQ 1. (Dec.) WB8YDZ 16 WA8TBL 37, W8DC 17, W8CUP 10. Total 2883.

OHIO: SCM, Hank Greeb, W8CHT/N8XX/WR8AJ WR8AJP — Asst. SCM: William K. Schaeff WA8MCR. SEC: WA8KPN. PAMs: W8DIL WA8S RMs: WB8JGW WB8KKI WB8VLR. Remember t Dayton Hamvention Apr. 29, 30, May 1, 1977. N reports

Net — Freq.	Time(Z)	Sess.	QNI	QT
ONN — 3.708	2330	26	115	
BNR — 3.605	2300	31	144	1
O6MN — 50.16	0200	36	265	
OSN — 3.577	2310	33	281	1
OSSBN — 3.9725	1530/2100/ 2345	108	3009	1
BN — 3.577	2345/0300	59	372	2

The SET 1977 was a disaster in Ohio. Yes, a real sno and weather emergency hit many parts of OH durl the SET week end, and many simulated emergenci turned into the real thing. Fragmentary reports activity have been received from Toledo, Lima, V Wert, Cincinnati, Akron, Wooster, Mansfield a elsewhere. If YOU or your group participated in re emergency activities, PLEASE SEND YOUR REPOR TO WA8KPN OR ME! As this is being writte amateurs along the Ohio River and its tributaries a participating in a standby alert, reporting river co ditions to Cincinnati Red Cross, National Weath Service and local disaster service agencies. Congrat lations to all who participated. Traffic: WA8MCR 54 W8DIL 483, WA8RQQ 298, W8PMJ 297, WB8K 238, WA8KPN 229, K8LGA 219, WA8JPX 20 W8TH 206, WB8VLR 175, W8LTA 162, WB8WT 135, WB8JGW 131, WB8YVI 123, WA8TYF 11 WA8VWH 112, W8QZK 92, WB8TRK 90, WA8TS 74, W8JD 69, WB8OMQ 67, WB8TTP 56, K9MLO 5 WB8QXN 47, K8LXA 44, N8XX 42, WB8CJU 4 W8CXM 35, WD8AVY/N 34, WA8SED 33, WB8GG 29, W8VND 28, W8OOU 27, W8CHT 25, W8GOE 2 WA8CFX 24, K9CKY 24, W8EMK 24, WA8GPO 2 W8QCU 22, W8OE 21, WD8COS/N 18, W8IBX 1 WB8KQJ 17, WA8MAZ 17, W8ARW 16, K8KWO 1 WB8VCG 15, WB8UIN 15, WB8UJL 14, K8TQM 1 K8BYR 10, K8QYR 9, WB8IJM 8, N8AA WB8DNZ 7, WB8VDL 6, WB8WEK 6, W8KAJ K8ONA 4, WD8ALM 4, K8MR 3, K8JA 1.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Gary J. Ferdinan WA2PJL — SEC: K2AYQ, Asst. SEC: WB2VU PAMs: WB2EMU WB2QEI. RMs: K2OYG WB2IX SET reports received by too many to list. Thank y all and congratulations on your successful SET oper tion. As many classes end a hearty welcome to ne hams: WA2JPC WA2KBF WA2KHI WA2KM WA2KQF WB2JTG WB2KJG WB2KJR WB2KM WB2KMY. Let's hear from you all on your month activities! Congrats on upgrading go to: WA2KD (Tech.), WA2EJB (Gen.) and K2LOZ (Adv.). O WB2YQU reports that at last an aurora occurred two meters — good for VE1 VE3 and W8. At yea end comes the report from WB2QOH) "You wor have AB2QOH to kick around anymore." WB2EL manned on 80 and 2 by WB2VVS and WA2ZC during SET. FDR VA ARC now an affiliated club congrats. WB2TGL laments after the plug was pull on a net session, "will have to get a generat sometime." Westchester Co. has a good group Technicians working on cw, 21125-30 during t evenings. A good idea, and no QRM there! Ne Albany ARA officers are W2GFP WB2PUH WA2WN WB2CQK WA2KUL WB2DXM and WA2BD Schenectady ARES nets meet on Sun. 1 PM 50.6 1:30 PM 34/94, and 2 PM 3950. New check-ins alwa welcome. Condx on 80 termed "worst ever" WB2EKM, who keeps trying. Nov. BPL: W2YJ Traffic: (Jan.) WB2EMU 258, WA2PJL 236, WB2T 147, W2YJR 144, WB2IXW 59. WB2QOH 5 WB2RUZ 56, WB2ELA 34, WA2PAU 30, WB2EK 16, WA2JCY 2. (Dec.) WB2QOH 63, WA2PAU 2 (Nov.) W2YJR 259.

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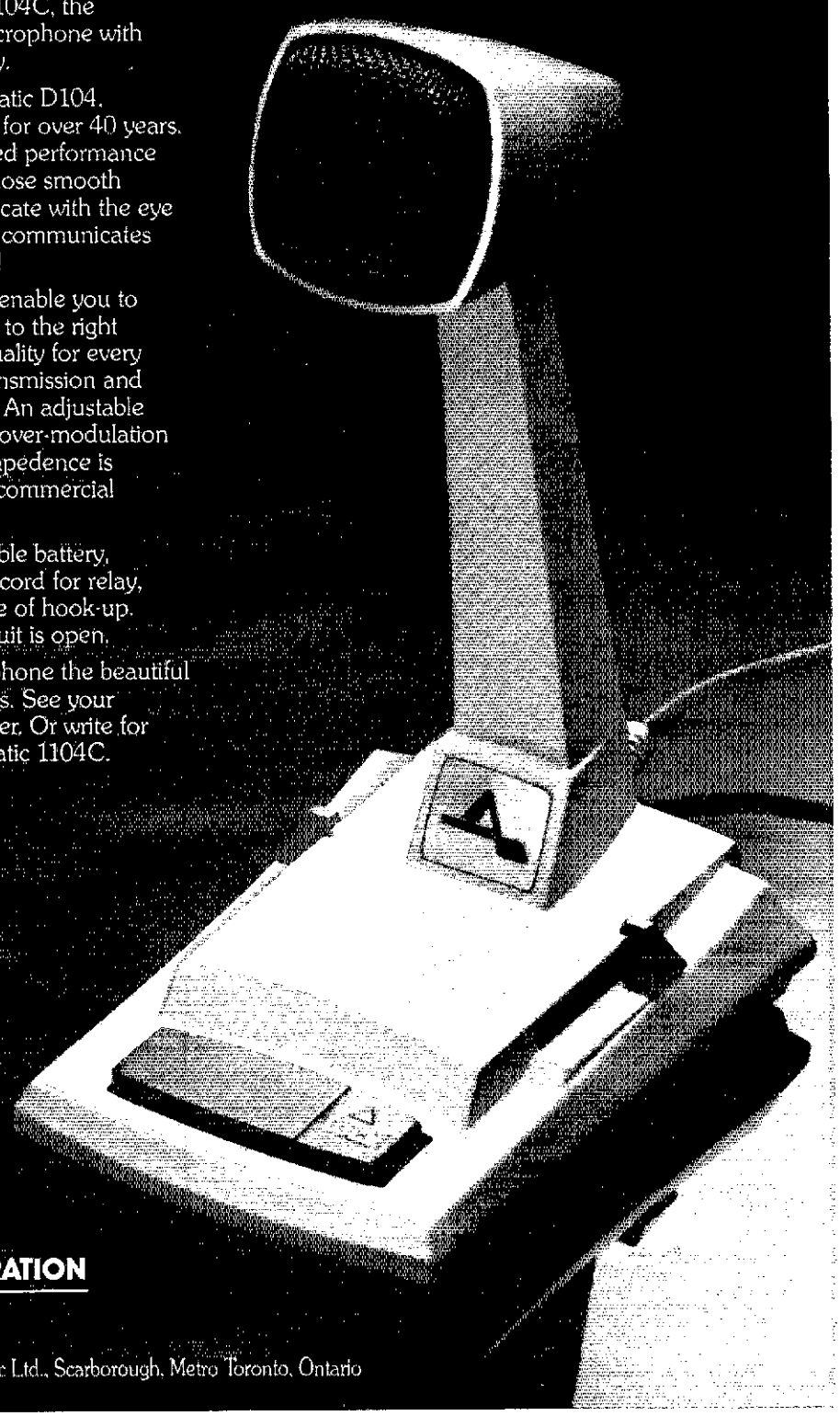

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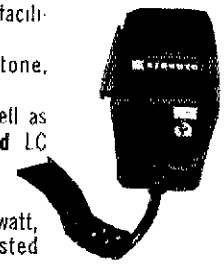

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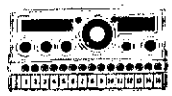

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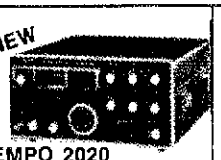

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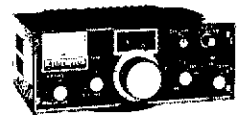

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Current Limit	12 Amp
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Ripple/Noise	2 mV RMS
Transient Response	20 uSec
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NEW YORK CITY — LONG ISLAND: SCM, John H Smale, WB2CHY Asst. SCM: Art Malatzky WB2WFJ. SEC: K2HTX. RM: WB2LZN. PAM WA2ECO. The following are traffic nets in and aroun the section:

Net	kHz	Time/Day	Manager
NLI*	3630	1900/2200 Dy	WB2LZN
NLI Phone*	3928	1730 Dy	WA2ECO
NLS*	3730	1800 Dy	WB2YKG
Clear House	3925	1100 Dy	W1UX
Mic Farad	3925	1300 MTWThFS	W1DFT
ESS	3590	1800 Dy	K2UIR
NYSTPEN	3925	1800 Dy	WA2RSP

*Denotes Section Net, all times are local. Attention - East end of Long Island hams, WB2FHN reports tha more clubs are starting. In Montauk there is th Montauk RC which meets on the 1st and 3rd Wed They are planning Novice classes, contact WB2FID fo info. In the Southampton area there is the Peconi ARC which meets the first Fri. of the month a S.U.N.Y. Southampton. They use a 147.63/03 re peater in Amagansett owned by W2HLI; contac WB2YNK for more info. The Shelter Island has Novic classes, contact WB2FHN for more info. Also plans ar being made to start a club in the Greenport o Southold area, contact W2SZF for info, and WB2F2 is getting the Rocky Point ARC going. WB2OYV now has call of N1EE. Welcome to new traffic station WB2BTA in Deer Park. LIMARC's new 450 repeater on 444.125 in and 449.125 MHz out. It is with deep regret that we list WA2ENP as a Silent Key. WA2YE now has a Wilson 1450 sm, and his brother jus received his Tech with call of WB2KHR. The Larkfield ARC had K2SJO, Dir. Hudson Div. as Guest Speake for the Feb. meeting. WA2BMI was appointed Asst Net Mgr. for NLS. W2GKZ is building the Heath HW 2036. Congrats to WA2GXQ who passed his Gen. WA2SUB and his brother-in-law WB2FEB both up graded to Advanced. Please note the time for the NL net is 1800 local. K2CFG reports that WR2AKO on 444.375/449.375 MHz will be active shortly, with the ant. on WNYE-n tower and it will be PL No. 4a and 6A except Thur., open 0900 to 1700 for school and general use. Now is the time to get everything set up for Field Day, why not hold it in an open area close to the public this year so the public can see what it's al about. K2GCE has been active on 15 meters. Don't forget the ARRL National Convention June 3,4,5 in Toronto, Canada, for further info write '77 ARRL National Convention, P.O. Box 1011, Station "C," Scarborough, Ont. M1H 2Z4. Welcome to WA1WMZ who is now going to Suny Stony Brook and living in the Port Jefferson area. Traffic: (Jan.) WB2LZN 366 W2EC 350, WA2ECO 314, W2GKZ 208, WA2BMI 129, W2MLC 107, W2HXT 80, WA2YEI 66, WB2YKG 54, WB2BTA 51, WB2CHY 31, WA2BRF 29, W2DBQ, WA2TQT 25, K2GCE 9, K2JFE 6, WA2HSQ 5, WB2OYV 1. (Nov.) WA2ECO 177.

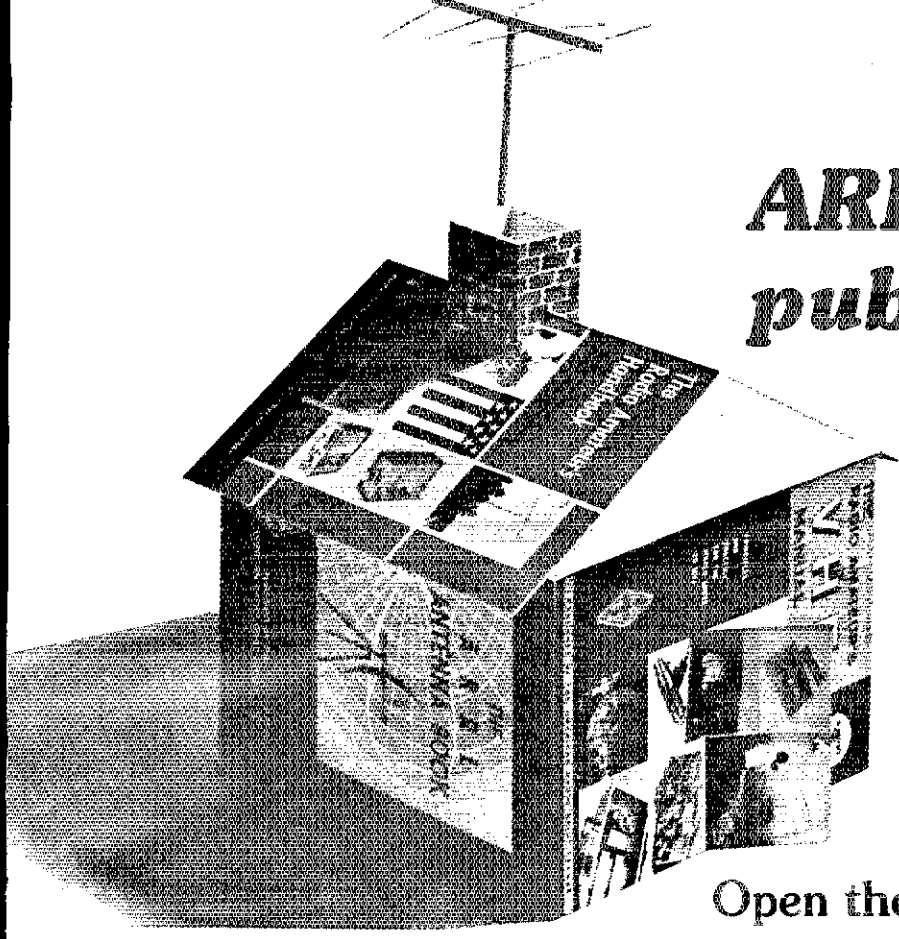
NORTHERN NEW JERSEY: SCM, Louis J. Amoroso, W2ZZ

Net — Freq. Manager	Time(PM)/Days	Sess.	QNI	QSP
NJN — 3695 WB2CST	7:00 Dy	39	477	208
NJN — 3695 WB2CST	10:00 Dy	31	179	49
NJSN — 3730 WA2WIW	8:15 Dy			
NJPN — 3950 WA2SLF	6:00 Dy	39	664	411
NJPN — 3950 WA2SLF	9:00 A Su	5	102	53
PVTN — 145.7 WA2OPY	8:00 Dy			

SEC: WB2PBO. PAMs: WA2OPY (VHF) and WA2SLF. RMs: WA2WIW and WB2CST. New appointment, WB2RKK as EC. OO reports from W2TPJ WB2CST and WB2TFH. The following made PSHR for Jan.: WB2VTT WB2ASD WB2CST WA2DSA WB2RKK WA2DIW K2BHL and WA2SLF. WA2UOO has a new half wave up for 160. The Balkm blew the first morning of the DX Test on W2ZZ Tri-Bander. Murphy and next year. K2CYX revd his Bi-Cen WAS. New officers for the Cranford ARS are W2OBJ, pres., WA2TZM, vice-pres.; WA2CPH, secy.; WB2VOJ, treas.; WB2PBO, act. mgr. W2RS worked EA2AU for No. 61 on Oscar. WA1EVX/2 is now K2AM. The TCRA with WB2RNJ as chmn. and W2OJ as the teacher will continue the Novices Classes. WA2KFE looking for help with his AREC group. WB2VTT is teaching a Novice class at Rutgers on Thur. evening. W2NR built the new Heath 2036 and gives it a good report. WA2DTO upgraded to Tech and built the Heath 2 Mtr rig. WB2RJJ passed the Extra and we welcome his XYL to ham radio. She is now WA2KLO. WA2DIW reports his graduates include WA2KJQ of Oakridge, WB2JYG of Oakland. WB2KNH and WB2JYH of Wayne, and WB2KNX of Paterson. Recent graduates of the Kearny ARC include WB2JCM WB2JRE WA2HXM WA2JHP and WA2IUI. WB2JCM also passed the General. We welcome all the new hams and hope to hear from all of you. WA2FZJ revd his Advanced. WA2AYY passed the Extra and WA2FYI passed the Tech. We also welcome WB2KNC and WB2KND of Tenafly. A big Thank You to all those who gave up their time to make it possible for the above to join the ranks of Ham Radio. Traffic: WB2ASD 479, WA2BAW 292, WB2RKK 252, WB2VTT 162, WB2RMK 156, WB2ELF 144, WA2KFE 108,WB2CST 104, WA2RMZ 96, WA2SLF 76, K2BHL 74, W2CC 70, W2SWE 64, WB2HSG 61, W2ZEP 60, WA2PCF 56, WB2DFO 51. WA2FIB 48, WA2WXM 47, WA2DIW 45, K2CYX 35, W2BLM 34, WA2CAK 26, WA2DLZ 24, WA2QJU 21, W2ZZ 20, WB2VFT 19, WA2DSA 18, WA2NPP 17, K2ZFI 15, WB2KAK 13, WA2UOO 9, WA2YWK 9, W2WOJ 7, K2AM 5, WA2AYY 5.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, W@LFF — SEC: W@IYW. PAM/VHF: K@KLH. PAM/HF: WB@AVW. RWRA election results: WA@EOA, pres.; WA@DFF, vice-pres. K@PNZ, secy-treas. Congrats to W@VV on making Bicentennial WAS, all 1X2 calls, worked DC Inaugural and three in GA which netted a photo of President Carter, also a 30 wpm CP Certificate. K@PNZ is QRP with 1/4 watt. WA@DFF received QSLs via the Bureau from II, IJ, IK, IL all at same time. K@ZPZ now W@GN and WB@SBJ is K@BHX. W@EIY has new Kenwood Twins and says 10m is like old times. WB@JGS having good luck with Oscar. Upper Iowa Valley RC is a duly affiliated society. Iowa City welcomes one of Iowa's youngest Novices, WB@ZGF is 11 years old and a YL. WB@SEL has WAC. The Pony Express will be riding for the handicapped on Apr. 8-9. Let's give WB@KAM on 3970 kHz some progress reports, or oil up the mobile and ride along. WA@ZFK K@GXR WA@ZZG and WB@KFB are turning out new



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Swan precision meters are designed and built to help you make sure you're putting out all the watts your rig can deliver.

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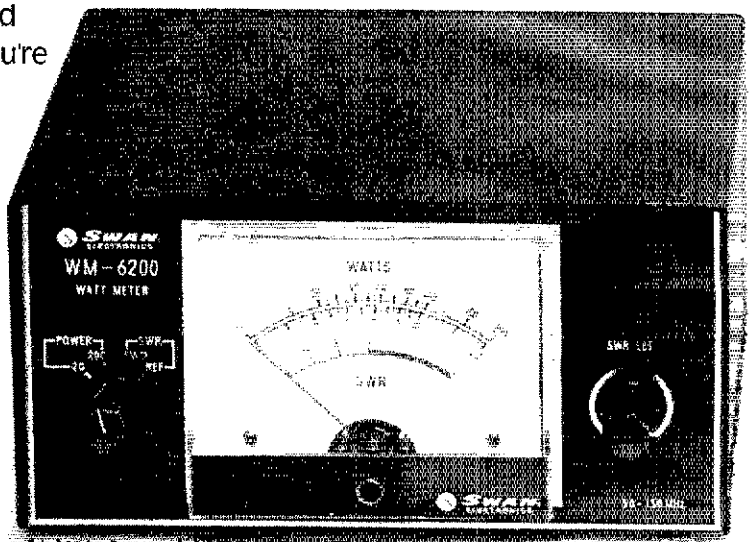
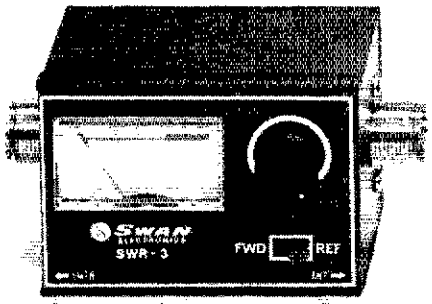
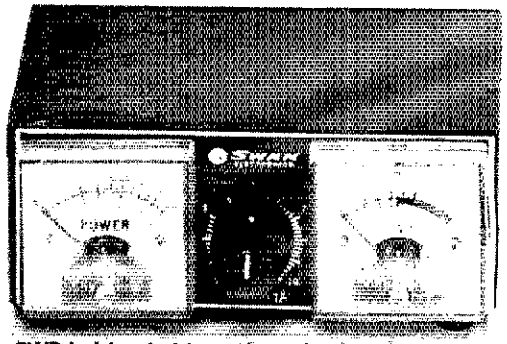


At last. A precision wattmeter for the 2-meter man. The upper-band man needs accurate output measurements, too. Now our WM6200 gives them to him with ±7% accuracy output power at 50 to 150 MHz. Two scales to 200 watts. Reads SWR on expanded range scale.
WM6200 In-Line Wattmeter **$59.95**

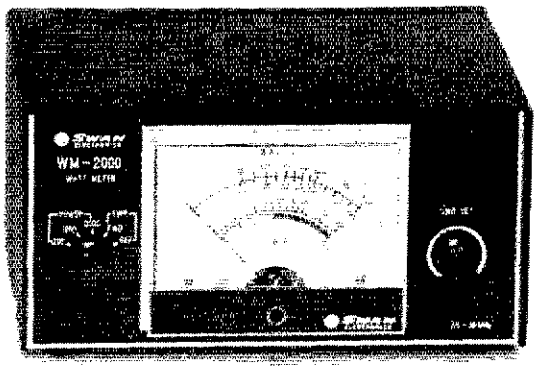
Measure power coming and going. Measure SWR and get maximum power to your antenna. Then get your antenna pattern right by measuring relative radiated power. A one-two power punch at a knockout price. **FS-2 SWR and Field Strength Meter** **$15.95**



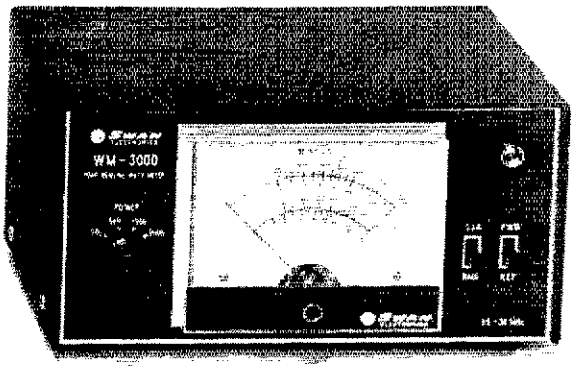
Easy-on-the-pocket pocket SWR. Mighty mite SWR meter with high accuracy, SWR-3 indicates 1:1 to 3:1 SWR at 50 ohms on frequencies from 1.7 to 55 MHz. Precision PC board directional coupler makes it a solid value at a rock-bottom price. **SWR-3 Pocket SWR Meter** . . . **$12.95**



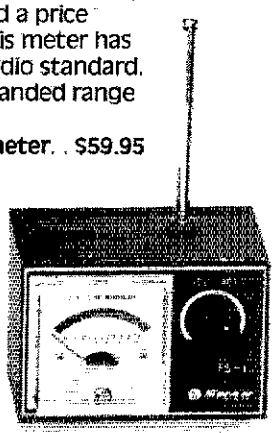
SWR bridge bridges the price barrier. This little jewel gives you relative forward power and SWR on two 100 microampere mete at a remarkably low price. Rear mounted coax connectors for easy, neat installation. Capable handling 1000-watt signals on frequencies fron 3.5 to 150 MHz. With low insertion loss, it's grea for mobile operations, too. **SWR-1A Relative Power Meter and SWR Bridge** **$25.95**



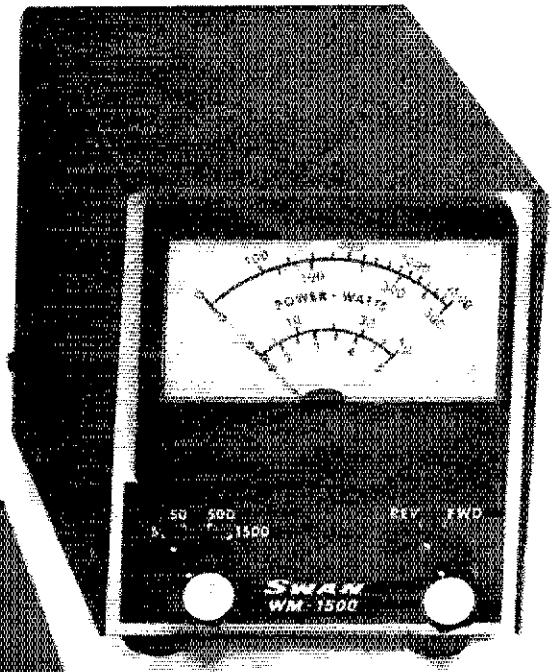
All-the-law-allows in-line wattmeter. With three scales to 2000 watts, new flat-frequency-response directional coupler for maximum accuracy and a price anybody can afford, this meter has become an amateur radio standard. 3.5 to 30 MHz with expanded range SWR scale.
WM2000 In-Line Wattmeter. . $59.95



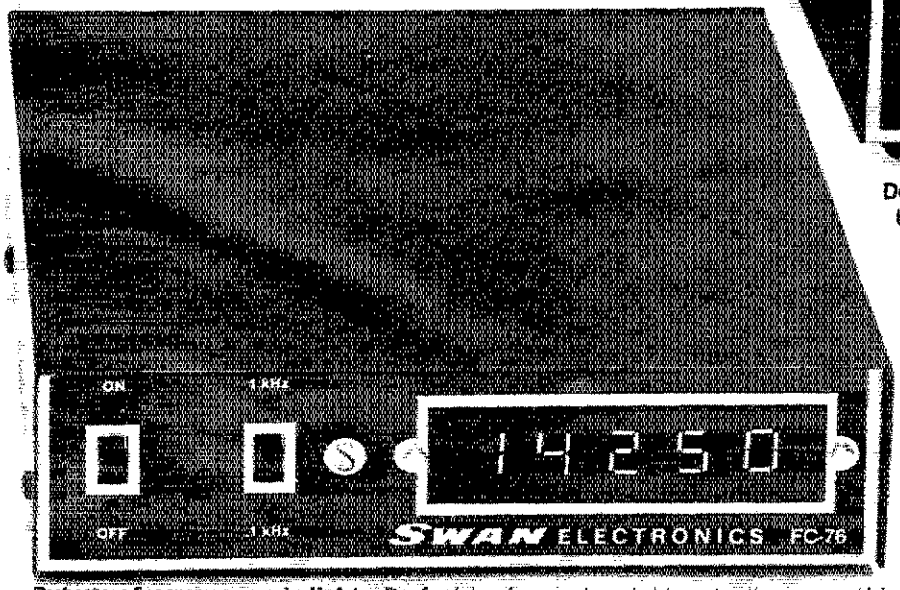
This wattmeter tells the truth about SSB. True peak envelope power of your voice modulated signal is what you want to know most about your SSB transmission, and that's where our WM3000 shines. Flat response forward or reflected power from 3.5 to 30 MHz on scales to 2000 watts in RMS or PEAK at the flip of a switch. **WM3000 Peak/RMS Wattmeter $79.95**



Sniffs out radiated power wherever it is. This little unit is so compact it could measure relative radiated power in your pocket. Telescoping antenna and a frequency range of 1.5 MHz all the way to 200 MHz.
FS-1 Field Strength Meter $10.95



Double-duty in-line wattmeter. Use this meter for output power measurement and troubleshooting, too. Better than 10% full scale accuracy from 2 to 30 MHz, and you can go to 50 MHz with only slightly reduced accuracy. Four scales to 1500 watts and selector for forward or reflected power.
WM1500 In-Line Wattmeter . . $74.95



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hans via Novice classes. Muscatine Red Cross on .52 simplex thanks to WØBX. KØGFU and WBØSEL made good use of film "Moving Up to Amateur Radio." KØCVD says WØSS WBØPYD WØYLS KØEVH WAØLKM WØMOQ KØFLY WAØTAQ and WBØCPR active on NTS-TEN and WBØHOX says WAØAUX keeps IA alive on DTRN. Nets: Iowa 75M 1830, QNI 1964, QTC 130. 2330 QNI 1289, QTC 65. (Dec.) QNI 1254, QTC 77. TLCN 0030/0400 QNI 422, QTC 113,62 Sess. Traffic: WAØAUX 465, KØEVH 309, WØSS 122, WØYLS 119, KØEVC 19, WØLFF 16, KØUAA 14, WBØAVW 12, WØIKT 6, WØBW 4, WØBX 4, KØLKH 4.

KANSAS: SCM, Robert M. Summers, KØBXF. SEC: WØKL. PAMs: WAØSEV WBØBCL. RM: KØMRI. VHF PAM: WAØEDA. Heard recently of two more of our ranks who have become Silent Keys. WØNNK who passed away Jan. 28, 1977. WØWAI who passed away a couple of months ago. Our sincere sympathy to both families. The flu bug has been taking its turn at biting a lot of us-yours truly not excepted. Our SET in KS was a real success this year thanks to the whole coordinating gang WØKL WAØSEV KØMRI and all supporters. More details later. Reno Co. now has a repeater going on 06/76 and working out real good. Many clubs reporting Novice code and theory classes now in full swing. Net reports for Jan. are as follows: Kansas Phone Net KPN QNI 256, QTC 12, Mgr. WAØSEV; Kansas Sideband Net KSBN QNI 994, QTC 102, Mgr. WAØSEV; Kansas Slow Speed Net QKS-SS QNI 91, QTC 23, Mgr. WØRFF; Kansas CW Net QKS QNI 584, QTC 260, Mgr. KØs,MRI; Kansas Weather Net KWN QNI 1148, QTC 91, Mgr. WAØLBB; Central States Tfc Net CSTN QNI 849, QTC 273, Mgr. WAØOMB. Mid-States Mobile Monitor Service still keeping a turn at the air waves when band conditions permit. If you can help, do so, any evening after regular nets are over and the AREC net sessions have cleared the freq. Monitor and indicate you are available to help on 3920 kHz from 8 PM to 10 or 11 PM. The life you might save could be a friend. Traffic: WA2VEN/Ø 482, WØRFF 247, WØKL 192, WØCH 140, WØFIR 135, WØOYH 113, WAØSEV 98, KØMRI 94, WAØSWC 75, WAØLBB 70, WØAM 67, WBØSGI 62, KØBXF 58, WBØKDE 58, WBØLKA 48, WAØMLE 56, WØHI 43, WØFDJ 37, WBØLUN 35, WØBLI 30, WBØOQX 27, WØPSN 21, WBØBEZ 18, WAØSRQ 18, WØFCL 16, WAØKVP 16, KØJDD 15, WØPB 12, WØRBO 12, WAØHRG 11, WBØKWI 11, WØNYG 11, WBØOCK 10, WAØOWH 5, WAØTRO 3.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst. SCM, Joe Flowers, WØOTF. SEC: WBØDBW. We regret the passing of KØSLI to the rank of Silent Keys. WAØKUH is out of the hospital and recuperating nicely. The 1977 officers for WECOMO ARC are WØQBX, pres.; WBØTSC, vice-pres.; WØDAL, secy.; KØJPR, treas. Officers for Central Place ARC are WAØEMX, pres.; WAØNBY, vice-pres.; WBØJXZ, secy.; WBØLYE, treas. St. Louis ARC elected WØHBH, pres.; WBØIKR, vice-pres.; WAØ secy.; WØRUR, treas. Officers for MVDX Club are WØFF pres.; WØHBH, vice-pres.; KØVUW, secy-treas. This is a St. Louis area DX Contest Club. Congratulations to WBØTVK WBØTVI WBØYBP WBØSND and WBØRRA on their new Generals and congratulations to WBØONM, WBØTIO and WBØYBP on passing tech.

Net	QNI	QTC	Net	QNI	QTC
SCEN	92	11	PHD	37	8
MSN	134	89	HBN	269	29
MOSSBN	1206	202			

WAØTLT is currently operating ZF1MJ. WØHBH has a new ST-6 and complete Drake C-Line. FCC exams will be given at PHD ARC Hamfest on Sat., Apr. 23 at 10 A.M. All 610 forms must be on file with PHD Club 2 weeks in advance. Mail forms to: PHD ARC, Box 11, Liberty, MO 64068. WBØSND and WBØVHN, both new licensees have taken over NCS duties on the MSN and are doing a very fine job. Traffic: KØONK 1215, WØNUB 181, WBØLFY 108, WBØNXX 104, WAØFKD 97, WAØFMD 80, WBØFND 70, WBØLMW 65, WBØFKY 52, WØOUD 48, WBØSND 44, WBØMEO 42, WØBVL 31, WØOTF 31, WØEEE 30, WØEPI 27, WØRR 24, WØRTO 24, KØRWL 24, WBØERI 23, WAØOCU 22, WØOQD 20, WBØVHN 14, WBØNPC 11, WAØKUH 8, WAØMOF 7, KØAHL 4.

NEBRASKA: SCM, Dick Dyas, WØJCP — SEC: WAØASM. Asst. SCMs: WBØGWR & WAØGHZ. Net Mgrs.: 160 M WX Net, WAØCBJ; Western Nebr. Net, WØNIK; Sandhills WX Net, WBØJWQ. There are indications that many of the communities participated in the annual SET and the results were rewarding. WØNIX is a Silent Key. WØAMY received Golden Award (50 yrs as a ham) from QCWA. Net reports: Nebr. Morning Phone, QNI 1250, QTC 37; Nebr. Cornhusker, QNI 1353, QTC 56; PM QNI 326, QTC 40; Nebr. Storm, QNI 1090, QTC 35; Western Nebr. QNI 504, QTC 38; Sandhills WX, QNI 416, QTC 24; AREC, QNI 209, QTC 2; 160 M WX, QNI 386, QTC 175; East Nebr. 2M, QNI 475, QTC 12; QCWA, QNI 63. Traffic: WØVEA 113, WØFQB 87, WAØCBJ 66, WØYFR 39, WBØEVS 31, WØGEQ 25, WBØYSG 26, WØNIK 20, WØCSW 17, KØTUH 16, WØVYX 16, WØJCP 12, WBØJWQ 12, WØMW 11, KØSFA 10, WAØQEX 9, WØFOW 8, WBØGWR 6, WØZOU 6, WAØGHZ 5, WBØGMQ 5, WAØLOY 5, WAØPCC 5, WØWKP 5, WØZNI 5, KØs,FJT 3, WAØEEI 2, WØATU 1, WØIXB 1, KØODF 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, John McNassor, W1GVT — SEC: W1DGL. RM: K1EIR. PAM: K1EIC. VHF PAM: WA1ELA.

Net — Freq-	Time/DAys	Sess.	QNI	QTC
CN — 3640	1900/2200 Dy	66	347	344
CPN — 3965	1800 M-S 1000 Su	36	469	330
VHF-2 28/88	2130 Dy	34	437	186

High QNI: CN — K1EIR WA1VGP and W1KV. CPN WA1UOT WA1UOU WA1VGP K1EIC and W1NQO. High QTC VHF-2 W1EFW. SEC W1DGL pleased with excellent reports via Conn. EC Net and thanks all who assisted during the SET. Director W1HHR and Vice Director W1DGL suggest you refer to Mar. QST for details on Jan. ARRL Board Meeting — please contact them with your comments. Net Mgrs. extend thanks for your activity during SET. WA1URA WA1TAS WA1ZCN WA1ZWB & WB2SEZ provided the first direct RTTY link to W1AW via SCRAS 85/.25 repeater during SET! Another first: N1II and W1FTX handled SET traffic via Oscar satellite! A Slow Speed Traffic Net in the Novice Band is needed for CT. Section — will you help? Be sure your Annual Club

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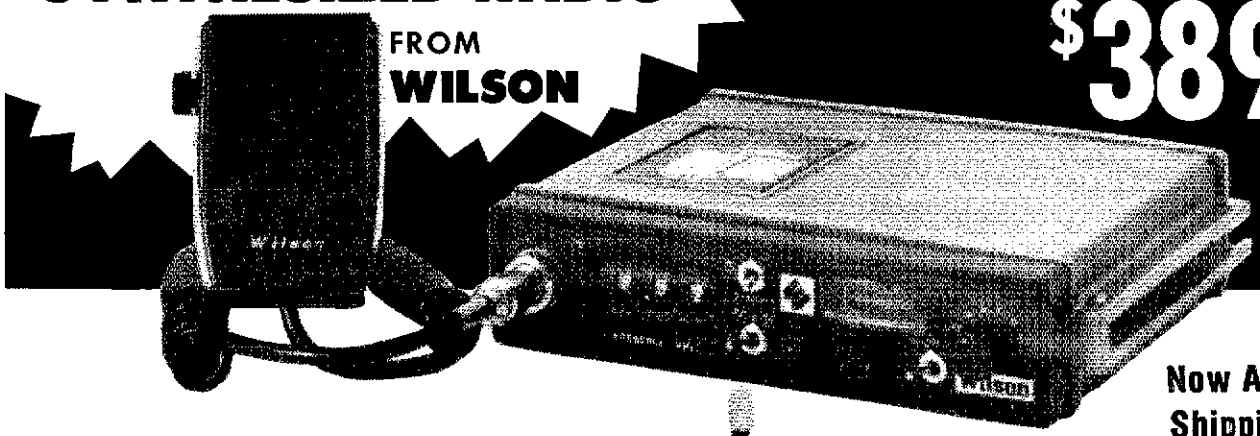

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450 & 220 HAND HELDS

MODEL 4502 . . . $299.95

FREQUENCY RANGE 420 - 450 MHz

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- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 1.8 Watts Output @ 12 VDC
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- Microswitch Speaker Mic
- Unbreakable Lexan® Case

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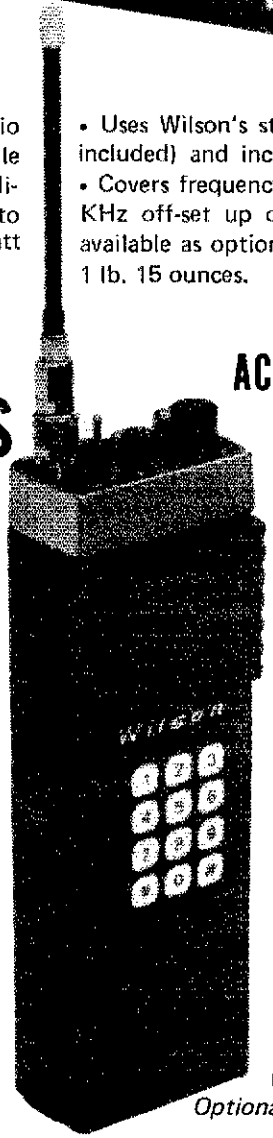
- 10.7 and 455 KHz IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 2.5 Watts Output @ 12 VDC
- Current Drain: RX 25 MA, TX 400 MA
- Microswitch Speaker Mic
- Unbreakable Lexan® Case

MODEL 2202 . . . $249.95



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- ★ Battery Charger (BC2)
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- ★ Leather Case for 1402 (LC-1)
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- ★ TE-1 Sub-Audible Tone Encoder, installed
- ★ TE-2 Sub-Audible Tone En–Coder/Decoder, Installed
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- ★ 10.7 KHz Monolithic Xtal Filter (XF-1)

(Photo Shown with Optional Touch-Tone Pad)

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FAST DELIVERY!!

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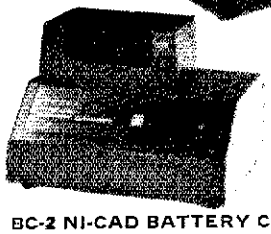
- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 10.7 and 455 KHz IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 4 oz. less Battery
- Battery Indicator
- Size: 8 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 5 Watts Minimum Output @ 12 VDC
- Current Drain: RX 25 MA TX 400 MA (1w) 900 MA (5W)
- Microswitch
- Speaker Mic
- Unbreakable Lexan® Case

$249.95

1405SM
HAND HELD
5 WATT
TRANSCEIVER
144-148 MHz

Shown with Optional Leather Case



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1402SM
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2.5 WATT
TRANSCEIVER
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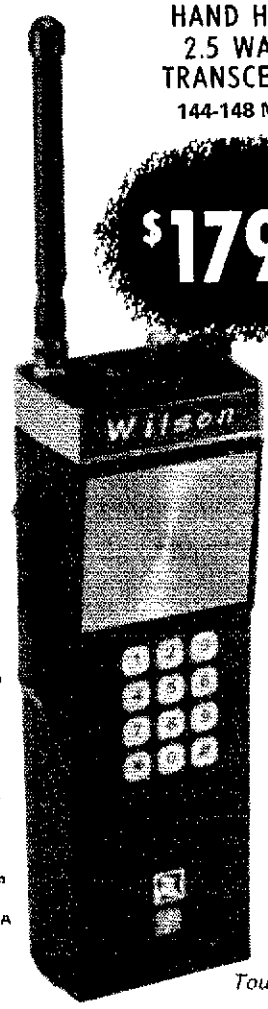

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Report to ARRL has been returned. Please suppo
the Annual CT QSO Party sponsored by Danbu
CARA Apr. 30, May 2. W1VH has details. Stamfo
"Squelch Burst" extols the merits and potential of th
GHz (Gigahertz) Amateur Bands we should be usin
Southington ARA and Stamford ARA provide $1o
Speed cw on 15 meters. For Tri-City Bulletin e
change contact WA1YDK. Congratulations t
WA1UNE & WA1VGP Jan. BPL; Greater Fairfie
ARA & Waterbury State Tech. College for ARR
affiliation; and to WA1VGP for High QNI on CN
CPN during Jan.! I'll be waiting for CW QSOs on 16
QRP on the first — bcnu — Tnx.! Traffic: WA1VG
347, WA1URA 336, WA1UNE 256, WA1GFH 25
W1AW 229, WA1UOT 110, K1EIC 107, WA1UO
101, WA1WEM 97, W1GVT 72, WA1UHN 7
W1DGL 70, WB1BRQ 35, K1DFS 33, W1KV 2
WA1KVI 22, WA1TZK 17, W1BDN 11, W1BDI
W1QV 8, WA1WAL 7, K1ZZ 7, K1AQE 6, W1CUH
W1CTI 4, WA1SFH 4, W1VS 2.

EASTERN MASSACHUSETTS: SCM, Frank Bake
W1ALP —

Net — kHz	Time/Day	Manager
NENN — 3720	1630 MTWTF	K1PNB
EASN — 3726	1830 Dy	WA1VE
EMRI — 3660	1900/2200 Dy	WA1MS
EMRIPN — 3898	1730 Dy	K1PAD
EM2MN — 145.8 MHz	2000 MTWTF	WA1OW

I received many SET msgs. W1LVR W1WZ/KV4C
are Silent Keys. WD9AEL/1 new in Cambridg
K1QOW now in CA. W1IAS in Falmouth. Ex-W1MK
retired from Raytheon. New calls: W1XA w
W1EQH, W1JR was W1JAA, W1AX kept old c
W1JYH. N1EE a new call in Boston on our Net
Massasoit ARA elected; K1AWP, pres.; W1ECK, vic
pres.; W1KGU, secy.; W1EWP, treas. K1CLM sa
plenty of IW reports. W1NF's antennas down. W1AO
writes from FL. South Shore ARC met. W1UJF spe
month operating KL7FBI, Oshemya Is
Endorsements: W1SMO W1PEX as ORSs; K1UM
OBS; WA1PGY K1CLM OPSs; W1BHD OVS EC OB
WA1KZT W1BAB K1WVW W1MOJ K1NFW EC
K1OJQ OVS; W1UF ORS OVS; W1AX OPS/OR
W1GJK PAM 6; W1HGY new EC for Taunto
WA1UWF WA1VKB new ORS-2. W1DA/W1DA
working lots of 40 cw DX. WD4AOH is ex-WA1UZN
W1IPZ new QTH and 3 acres for ant. Wellesley AR
have Novice & General classes. W1ATX on 75-SS
W1IOA moving to AZ. The SEMARA on Sun. at 8 A
a net on 28.7; W1LAZ NCS. WB1ASD new in Ne
Bedford. W1LE assisted Red Cross during explosion
fire in N.B. WA1QKD DXing on 20. WA1VBV h
General. Billerica ARS have Novice class and the
General; K1PAD WA1IKG WA1LXU WA1SXL i
structors. WB1ABM going after WAS. W1XA a
pointed W1SSA, WA1UMA as "Official 1st Contac
Stations." WB4ZZA is ex-WA1OTG in FL. WA1MR
gave a talk at the Framingham RC on using variou
electronic equipment. Lexington ARC held a meetin
K1DC & W1HIQ conducting General Class. W1RJ
had a series of heart attacks. Quannapowitt RA had
"CB Night — Amateur Radio & How to Join Th
Fun" with ARRL's film and various subjects, sho
talks on them. EMRI had QNI 477, QTC 311. NENI
QNI 136, QTC 136, EMRIPN QNI 410, QTC 253
EM2MN QNI 83, QTC 26, on Mon. & Fri. o
Weymouth repeater on 90-30. W1BK is ex-W1UJF
N1EE is ORS/OPS, operates at WA1VMU. W1GXT o
220.05 MHz am/cw, also on 2 ssb. New hams: WB1
AED AEL ADI AEJ ADF ADB AES AFP AFT AE
ACW AEB AFC AEI ADC ADV AGZ AHB AHE AH
AGN AHL AGU AGF. Norwood ARC has new QSL
thanks to WA1TLX. W1QP/W1ICO have a sked on 75
W1LJH made his first solo flight. W1CUY & K1DC
made a QSO from plane to snow tractor, on 2
K1NDA on 2 fm. W1RM is ex-W1BDG, W4RJ
ex-W1FCC. SM@CCE visited W1PL and other loca
hams. Old Farmers Net on 1840 Sat. nites at 7 PM
NEEPN had 85 QNIs, 24 QTC. W1KKD says the ne
certificates are ready, cost $1.00. Traffic: (Jan.
WA1MSK 485, WA1VEI 451, WA1TEH 393, W1XA
284, WA1TBY 197, WA1ZAZ 188, W1UX 147
WA1RAJ 141, K1PNB 131, WA1UWF 129, N1E
117, WA1EYY 107, WA1RVZ 98, WA1OWQ 84
W1ATX 80, WA7ETN/1 64, WA1MYK 63, W1DM
52, W1EMG 52, W1FJI 45, W1LE 38, W1DMH 22
W1MX 17, WA1QKD 11, WA1FNM 10, WA1IFE 9
WA1VKB 8, W1ALP 4, W1BK 4, W1DA 4, WA1PQY
3, W1IPZ 1. (Dec.) WA7ETN/1 154, K1EA 100
WA1QKD 6.

MAINE: SCM, Ed Bristow, WA1MUX — This month'
report submitted by K1GUP, Asst. SCM. SE
WA1YUZ reports WB3BOK/1 of Milbridge EC fo
Washington cty. The Augusta RC began licensing clas
Feb. 2 with 30 students. Promoters of the class are
W1GCM WA1REQ W1KIQ and W1GZK. Ellsworth
and Bangor classes both doing well. Maine made 100%
on IRND for Dec. W1CBU now 76 years young
WA2ERT/1 new ORS. WA1YUZ interviewed on chan
nel 7 during SET. Sent msgs from Gov. Longley t
other Governors. SET a real success, K1JGO, Pitts
field, on with new triband beam. K1VCZ, St. Albans
back on with 2 and 75 mtrs. Officers Acadia Nava
RAC: WA1YUZ, pres.; WB2BOK/1, vice-pres.
WA2ERT/1, secy. MSSN Jan. sess. 14, Tfc. 43, stns
77. Barnyard Net: 26 sess., 997 stns, 26 tfc. W1HDC
heard on 75 mtrs. Traffic: WA1FCM 619, K1NAN
451, W1ERW 230, WA1YUZ 219, K1PQS 163
WA2ERT/1 152, WA1JHT 109, K1TZH 94,
WA1MUX 87, W1ISO 71, K1JCX 62, K1GDI 16,
K1RQG 12, WA1JCN 9, W1OTQ 5.

NEW HAMPSHIRE: SCM, Robert C. Mitchell,
W1NH/W1SWX — SEC: K1RSC. RM: WA1GCE. The
GSPN had 75 traffic & 375 check-ins. W1BDK now
W1TN with a trap vertical and Kenwood twins.
W1BYS a member of the Nobility Net and checks in as
WB4BCP when in FL. K1VBL's DX Alert Repeater
WR4AIL now active on 222.86/224.46. The 220
repeaters are increasing. There are now 6 in the
MA/NH area. WB@IXE now WB1ALO. WA1PEL active
in the CD Party. WA1JSD sends best wishes from new
job in Mex. Dave operates ZE1BD/3. The No'r Easter
Chapter of the 10-10 Net meets Mon. PM on 28.703
with W1RQG, Chapter head, WA1KTV, secy. &
WA1PEL treas./certificate custodian. W1JY/K1QLZ
building a counter and helping to build the ham
population. John gave 15 Novice exams. W4ZM will
put on his antique wireless demonstration at the
Concord Brasspounders meeting on May 10. Time will
be 7:30 PM at the Concord Red Cross Bldg. It is sad to
hear of the passing of the XYL of W1NQ. She was
known on the air as Queen Ann of Nottingham.
W1NQ was founder of the OOTC in 1947 and Ann
served many years as secy. Traffic: K1BCS 1088,
K1NH 91, K1PQV 49, K1ACL 34, W1BDK/W1TN 30,
W1JB 16, W1WHB 16, W1BYS 4, W1NH 3, W1DXB 2,
WA1PEL 1.

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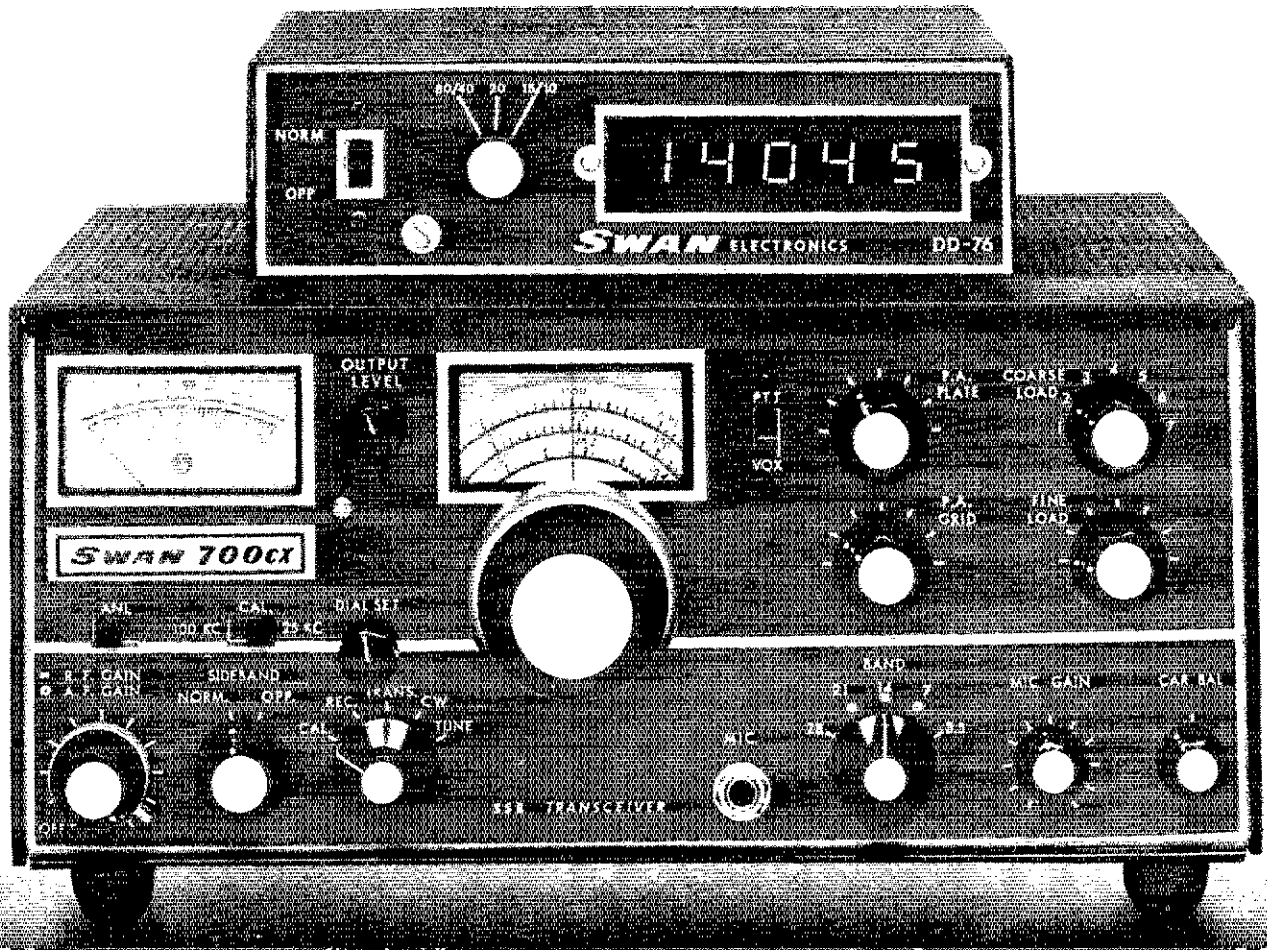


VERMONT: SCM, Joel Breakstone, WA1PSK — WA1PSK resigning in Feb. — leaving VT. Bob Scott W1RNA designated to complete Joel's term. If you VT boys and gals have news — send it in; letter radiogram, or on the air. Clubs are asked to send any special info for inclusion in the reports. Kinds? Specifics of VT ham activities, awards, unusual operating incidents in VT. The more the merrier! W1RNA has given 6 Novice exams to CBers; 3 now licensed hams, 3 anxiously waiting word. Those interested in starting slow speed CW net, 80-meter, Novice portion, contact W1RNA. VT PONE 130/15; Green Mt 573/56; Carrier 650/62. Missed from nets, K1BQB — Illness. Station Activity Reports: in time, monthly, to make this report. Silent Key: K1UQR. Traffic: W1RNA 8, WA1TXI 1.

WESTERN MASSACHUSETTS: SCM, Percy C. Noble, W1BVR — Jan. SET very successful with liaison from many repeaters to our lower frequency nets. FB, gang! WA1MJE for WMPN (4:30 PM, M-F, 3935): 21 sessions, total QNI 291, traffic 53, different stations 64. W1DVW for WMN (7:00 PM dy 3562): 37 sessions (including SET), QNI 264, traffic 153, stations 21. WA1DNB for WMEN (Sun. 8:30 AM 3935): 5 sessions, QNI 256 (including 166 from 2-meter liaison). WA1PLS for Mt. Lincoln repeater (tri-co. report): 22 sessions, QNI 103, stations 22. Novices & Techs — New England Novice Net (NENN) Mgr. K1PNB MWF 2330 on 3720. MSSN MWF 2130 on 3726. TNNE Northeast Traffic Net MWTh 2145 on 3722. WA1YXL Net Mgr. The SCM again reminds club secys. to send info here for this report by separate mail. Traffic: WA1MJE 602, W1TM 319, WA1RLP 181, W1BVR 137, W1UD 109, W1DVW 102, W1KK 52, WA1OUZ 40, W1DOY 29, K1RGQ 25, W1ZPB 20, WA1TYY 11, WA1YXL 9, W1HNJ 6, WA1OPN 3, WA1PLS 3.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — I would like to thank all of the stations who participated in the SET. The final results are not in yet but it looks good from the first reports. KL7HOV (PAM) for ASN reports 681 check-ins this month. KL7CFX passed his Extra Class and also telegraph 2nd. Congratulations! KL7AG and his XYL KL7AZJ are touring ZL-Land on bicycles. KL7AG is enjoying Straight Key Nights. KL7HMH busy with public service traffic and OBS on 2 meters. She also advised she will be getting a new Yaesu 2-meter rig and trying some Oscar contacts. The Anchorage Club is running several classes for new licensees and upgrading students. KL7IPO is building 2-meter synthesizers for the gang. The Fairbanks monthly publication "short circuit" is very interesting with lots of good dope for everyone. How about some news for next month's activity report? Traffic: KL7CFX 69.

IDAHO: SCM, Dale A. Brock, WA7EWV — SEC: W7JMH. PAM: WA7HOS. RM: WA0KKR/7.

Net — Freq.	Time	QNI	QTC	Manager
FARM — 3.935	0200 Dy	846	16	W7TGU
IMN — 3.635	0230 M-F	229	339	W7GHT
RACES — 3.99	1415 M-F	600	40	WA7WXI

New appointments are WB7DEJ, EC, Gem Co.; W7KDB, EC, Canyon Co.; and W7TYG, EC, Payette Co. W7GHT attended the ARRL PAS meeting in Los Angeles in Jan. The new officers of the Pocatello Amateur Radio Club are WB7DNU, pres.; W7BNJ, vice-pres.; WA7ACG, secy-treas. W7BDL is teaching a Novice class at Pocatello's Bonneville School. Traffic: W7GHT 447, W7GBO 24, W7TY 5, W7KDB 4.

MONTANA: SCM, Robert Leo, W7LR — New OO, WA7KKN. New ECs: WA7PDC WA7KMP W7GWW WA7OBH. SET a big success. Special sessions of IMN & MTN well attended. W7RZY AMSAT rep. for MT. W7DB puts ARRL bulletins on MTN; & builds 6-meter transverter. Active in SET: WA7JHC WA7GHW W7HAH W7LR W7IXD W7TGU K7CHY K7GHK K7KJS WA7ZOO K7OZU K7CTI W7GSV W7DEO WA7RDD W7OZH WA7ONS WB7EVG W7TYN WA7ZXN W7JMX WA7CAC W7DB WA7ZJF K7IMZ WA7YPQ W7LKB W7KUN W7NEG W7TZN W7RKM WA7FOB W7AVG WA7KMP WA7MTH W7WYG WA7PZO WA7VIK WA7PDC K7RRS W7TZN K7MGM WA7GFE W7KOG K7ICM W7RZY WA7YYB WA7KST WB7CGT WA7YYO W7IPB K7IQC W7LBK W7MPS W7PHB K7SAR K7TIM W7LVY W7AMK WB7AZJ WB4DAD// W7PX W7KJA WA7IIQ WB7AGV WA7VTT and others. Traffic: K7CHY 162, W7LR 119, W7NEG 77, WA7ZOO 43, W7DEO 16, WA7PZO 13, W7DB 6, WB4DAD/7 3, W7HAH 1.

OREGON: SCM, Dwight J. Albright, W7HLF — Asst. SCM: Leland McIntosh, WA7UUU. SEC: W7LBH. PAM: K7RQZ. RM: K7OUF. W7DAN K7OUF W6TOG sent in the first messages for our SET. The AREC Net 3993.5 opened at 9 AM. WA7TAE net mgr local Jackson Co. AREC out of hospital and feeling FB. All clubs should take note our SEC is Fred Dickson, W7LBH, Albany, OR. I'm sure Fred will be seeing some of you soon. Tnx to WA7UHC former SEC who moved to Seattle. Officers in Central Oregon RC are K7YLO, pres.; WB7NET, vice-pres.; W7LFC, secy-treas. WA7DVJ heard on a new Yaesu. Send K7RQZ a 13 cent stamp for a Cora News letter if you never read one. Lane Co. Ham Fair July 23-24, contact K7KVV for details. Some new calls WB7OFW WB7PEM. Officers in Mid-Valley Amateur Radio Club WA7UER, pres.; W7LDO, vice-pres.; WB7EEI, secy.; W7QLC, treas. EARS: WA7SZR, pres.; WA7SDL, vice-pres. JC AREC, QNI 90, QTC 8. 147.06, WA7TAE Mgr., 8 sess, OSN QNI 133, QTC 91, K7IWD Mgr, 30 sess. State AREC, QNI 267, QTC 21, WA7NEQ, 31 sess. WB7CBA really enjoyed the SET — sez can hardly wait 'til the next one. Traffic: (Jan.) W7VSE 647, K7OUF 218, WB7NPP 161, K7NTS 146, WB7CBA 138, K7IWD 120, K7QFG 89, WA7TXV 54, W7LT 11, WA7GOO 3. (Dec.) K7QFG 148, W7TZO 10.

WASHINGTON: SCM, Mary E. Lewis, W7QGP — SEC: K7VAS. RM: K7OZA. PAM: K7YRQ. VHF PAM: K7GWE.

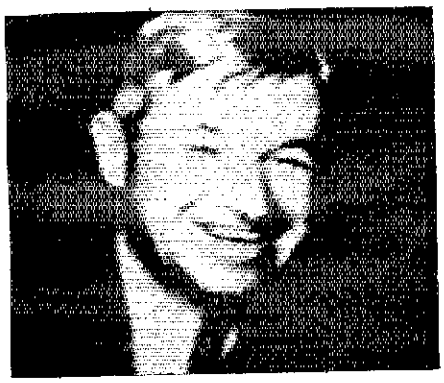
Nets — Freq.	Time	QNI	QTC	Sess.
Manager				
NTN — 3970	1130	2065	122	31
W7PFD				
WARTS — 3970	1730	2341	68	31
W7QGP				
NWSSB — 3945	1830	763	61	31
WA7RCR				
WSN — 3590	1030	326	107	31
K7OZA				
ESN — 3720-CW	0100	288	21	26

Amateur TV is easy with the new ROBOT Scan Converter

If you're a licensed Ham who can operate a camera and tune a TV set, you have all the skills necessary to operate slow scan television on amateur radio.

All licensed amateur radio operators, except novices, can operate amateur television

And there is ample room on those bands designated for SSTV. The FCC has authorized SSTV operation on all phone bands except 160 meters and the General Class portions of the phone band on 80, 40, 20, and 15 meters. With the exception of the General Class portion, a licensed Ham can operate SSTV on the same frequencies he operates phone.



Contacts are easy to make

At last count there were over 12,000 SSTV stations in operation in over 100 radio countries, from the Netherlands to New Zealand, from Italy to South Africa, and the list is growing rapidly.

Making contacts on the SSTV frequencies is easy. Just tune to 14.230 MHz and listen to the SSTV operators rag chew about this exciting activity. Call-ins with or without SSTV gear are welcome and you'll find that slow scanners are happy to answer any questions you have about SSTV.

DX'ing on SSTV?

You bet! There's tremendous interest and activity among SSTV'ers for DX'ing. Many have WAC, and several stations have made DXCC on Slow Scan (W8YEK was the first to log 100 countries 2X SSTV more than a year ago). There's even an active USSR station, who, while not allowed to transmit pictures, anxiously receives and acknowledges SSTV contacts.

Amateur television can be a family activity

Imagine transmitting pictures of your station, your QSL card, pictures of yourself, your family, even a "TV Program" to another SSTV'er halfway around the world. You can do it easily with the new ROBOT Scan Converter, a CCTV camera, and TV monitor. Your entire family can now get into the activity. Many slow scanners write us that SSTV has become a family project, with the whole family building displays, making art work, working the camera, writing "programs".

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Yes, we said, AUDIO tape recorder. Tape is a basic tool for SSTV'ers. Many CQ calls are put on continuous loop tape so the operator can keep it running as long as necessary to call CQ without having to use his camera each time. A tape recording will provide a picture absolutely as good as the live original!

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WA7MIF 3920-Phn.

Training slow speed CW nets are needed, if interest contact K7OZA Route Mgr. thru WSN or why not t ESN which is a dual net both cw and phone. Novic contact K7OZA via mail, address is correct in any c book. Novice OBS appointments are available conta W7QGP, SCM WA address in call book or page 8 Q5 under SCMs. SET was handled smoothly under SE K7VAS. Thanks to all for a great job — sure the were problems, that's what a test is all about. T SEA-Q-DX convention in Seattle the last week end July '77 is progressing. Speakers are committe exhibitors are signed on the dotted line, programs a being printed and well do you have your pr registration in? You don't know where? Well I do. S W7QGP at Skagit Hamfest Apr. 23rd. Several oth committee members also will be there. Northweste Division ARRL, National Quarter Century Wirele Assn., Northwest DX, Northwest Computer Assn. ar MARS. See U in Seattle July 29 thru 31, 197 Traffic: W7DZX 350, WB7AIX 349, K7GXZ 15 WA7BDD 115, K7OZA 85, W7QGP 78, WA7IKZ 7 WA7OJI 69, W7IEU 67, W7APS 66, W7LG 4 W7PWP 24, W7BUN 8, W7AIB 7, WA7NJO WA7GVB 5, K7GGD 3.

PACIFIC DIVISION

EAST BAY: SCM, Charles R. Breeding, K6UWR Asst. SCMs: W6ZF VE2AQV/W6; SEC: W6IIH. Ass SEC: WB6DSI. Jan. saw the first general meeting the South Bay AR Assn. with 115 present. Nearly are now members and the list is growing. The SBAR meets on the 3rd Wed. of the month at 7 P.M. Irvington High School. In addition to other duti WA6VEF is now an OO. Thanks to W6ZF on a mo detailed SET report from Napa. W6JXK is now Honorary Member of the Southern Calif. Net. Th following were listed on the NCN Honor Ro WA6BFL WB6JIK W6JXK K6PMG WB6UZ WB6VEW and W6OA. From CCRC the following wer listed as new calls in the Section: WN6QCZ WA6RG WN6QBC WA6RIP WN6QBP WN6NTE WN6NT WN6NVV WN6NVS WN6NVT WN6NTG WA6NO WN6NVX WN6NUQ WN6NQR WN6NTI WB6NP WA6NRS and WA6NSV. Good luck to all. For thos who plan ahead, be sure to include the Fresn Hamfest the first week end of May and the Pacif Division Convention the third week end of Oct. W note with great sadness that W6KDI has become Silent Key. Traffic: K6HW 399, W6JXK 200, W6O 188, WA6BFL 64, WB6UZX 52, WB6WBG 15.

NEVADA: SCM, Leonard M. Norman, W7PBV SEC: K7ZAU. NV RACES Net 3996.5 kHz meet 0300 GMT Tue. only. K7ZOK needs, GA KY ME an RI for WAS on Oscar 6 SSB. W7OK is QSL Mgr. fo FK8BG, VK4AK/9 VP2KN VP2KA K6JMZ/VQ9 an CQ QSL Awards Mgr. for Southern NV. K7VDR nov K7OJ. W7JRW K7OHX WA7KVV and WA7NYL ar running a Murphy's Radio Class at Western High School in Las Vegas. W7JUO W7MWF W7OK an K7ZOK report good DXing. W7PRM is hollerin "FOUR" on the golf course more than CQ on hi radio. K7YVN and K7ZAU spent the Christmas Holiday in XE-Land. Traffic: W7ILX 223.

PACIFIC: SCM, Pat Corrigan, KH6GQW — RM KH6JAC. ORS: KH6IJE. Additional stations to re ceive WPTN net certificates: KH6CKJ KH6IJE an KG6JIE. ARRL Int'l DX contest had lots of Pac activity including KJ6DL heard on 6 bands. Congrats to Kauai ARC on their recent affiliation with ARRL. Much success. It is sad to report the death of Joseph Silva, ex-KH6CM who had to give up hamming earlier due to a loss of hearing. It was the hardest thing he ever did. SET was the biggest success ever. Over 60 stations active, many with emerg. power including solar power. All went very smoothly. Plans are for even bigger next year. Gov. Arivoshi was involved by receiving and sending messages to Gov's of LA and ME. It was a pleasure to welcome the San Francisco SCM for a visit recently. Traffic: KH6JAC 124, KH6IJE 98.

SACRAMENTO VALLEY: SCM, Norman Wilson, WA6JVD — SEC: W6SMU. New officers for the North Hills ARC are: WA6LXT, pres.; WB6NRR, vice-pres.; WA6ANV, secy.; W6BWZ, treas.; W6SMU K6CJ and WB6RDA, dir. Up in Chico the Golden Empire ARS elected: WA6WJZ, pres.; K6RYB, vice-pres.; WB6JRT, secy.; WB6GZI, treas.; K6HTM, publisher. WB6FAA is now an Advanced Class ticket holder and WB6AKF WB6IFW and WA6SIM passed their Tech. W6RSP is now an ORS and WA6OJE is the new EC for Shasta Co. W6VQV has recently moved to Grass Valley from the Bay area. WB6GFY has a new KLM 2-meter amp. and WB6FAA has a 40-meter sloper system operating. The GEARS and I regret to report K6UHD of Paradise as a Silent Key. WA6JVD was pleased to address the Jan. meeting of the El Dorado Co. ARC. Their pres., WA6UDD, recently underwent an operation that restored his sight. HI JACK! K6QIF and the Sacramento AREC had a large turnout for the Simulated Emergency Test. Traffic: W6RSP 159, W6DEF 38, K6RPN 14, WA6JVD 5.

SAN FRANCISCO: SCM, Rusty Epps, W6OAT — Congrats to WA6HVX on being selected editor of the CCRC "Circle"; to W6NL on making BPL in Dec.; to WA6KWM and WA6NBG, elected respectively pres. and vp of HARC; and to WA6HPF who, at age 14, became the second youngest person ever to pass the Extra Class exam. W6QIE is sending code practice on 146.58 MHz starting at 8:00 PM Tue. through Sun. nights at 5 to 30 wpm. The No. Calif. Net is operating an experimental fm cw net starting at 19:30 daily on WR6ADC (147.84 in, 147.24 out) — all are welcome. K6TCD moved to Oakmont. SFRC conducting a membership drive — meetings are the 3rd Fri. of each month at 8:00 PM at 375 Woodside Ave, SF. W6NP vacationing in Mexico. WB6ITN busy helping to get Terra Linda High School's new BC station, KTLH, on the air. WB6EUG has a new TS-520 and IC-22A. Traffic: (Jan.) W6IPL 220, W6RNL 202, K6TP 198, W6OAT 97, W6NL 94, WB6UPV 28, K6PB 20, WB6JEO 8. (Dec.) AA6HPF 7.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6HNO. WA6WRR and WA6MIP passed Generals. K7PBT on 160m. K6YK mobile on 20 cw. WA6CPB will have an "ITU" call for ITU week. WB6FGY WA6QVR K6IDP and WA6KZV are building synthesized 2m rigs. WA6KZV has 40 students in ham classes in Ridgecrest. Eastern Kern, Fresno, Kings and Tulare counties active in SET. WA6EXV has a 2.3 GHz beacon ready. Madera RC

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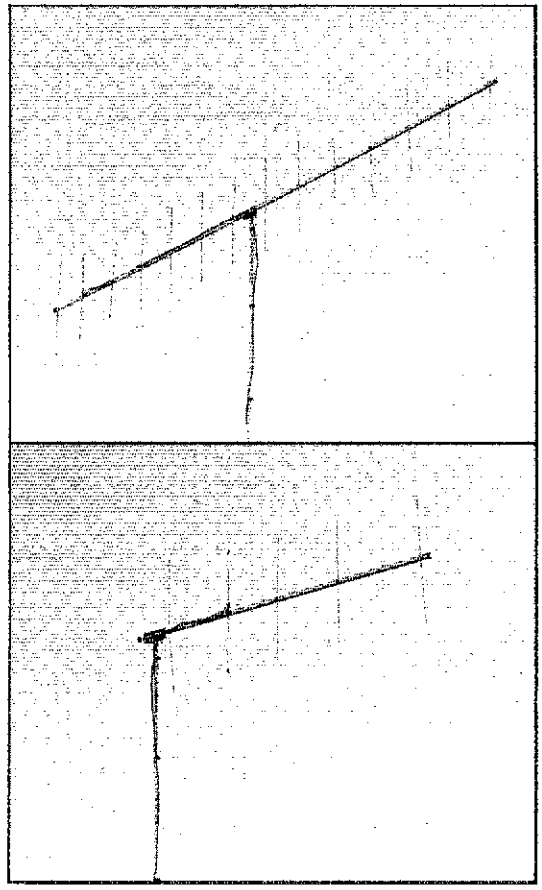

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Wind survival	80 mph	80 mph	80 mph	80 mph
Mast diameter	1¼-1⅝″ O.D.	1¼-1⅝″ O.D.	1¼-1⅝″ O.D.	1¼-1⅝″ O.D.
Boom diameter	1¼″ O.D.	1¼″ O.D.	1¼″ O.D.	1¼″ O.D.
Wind load area	1.65 ft² max.	1.26 ft² max.	.740 ft² max.	.496 ft² max.
Net weight	5.5 lbs	4.1 lbs	2.9 lbs	2.2 lbs
Electrical				
Front-to-back ratio	20 dB	20 dB	20 dB	20 dB
Maximum SWR	2:1	2:1	2:1	2:1
Band width	2 MHz	2 MHz	4 MHz	4 MHz
Maximum power	250/500 PEP	250/500 PEP	250/500 PEP	250/500 PEP
Impedance w/balun	52 ohms	52 ohms	52 ohms	52 ohms
½ power beam width	35° vertical 35° horizontal	43° vertical 36° horizontal	60° vertical 45° horizontal	95° vertical 60° horizontal
Stacking distance	82″ min.	82″ min.	82″ min.	82″ min.

operates WR6ARQ on 78/18. CCATS operate WR6AOU on 10/70 RTTY. WA6BUH has an IC 211 WA6UOR a TS700A, K6QPE a TS820. W6EJQ a IC22S. WA6ZLO WB6TTP and W6RUA have Heath 2036. WB6NTQ a keyer. K6ZNJ a TR-7400A. WA6WRS had over 100K points in phone SS. Send inquiries for Fresno Hamfest on May 6-8, 1977, to FARC Hamfest, P. O. Box 783, Fresno, CA 93721. WB6JGY has TAD, DEHC, and WAS as a Novice. WA6FXV working on a microprocessor to steer his 20 ft. EME dish. WB6DKR W6OHT WB6OHB W6JPU W6WZM WB6QMD W6IRV W6DCP and WB6MDN attended SAROC. WA6CPP hunting counties. Traffic: (Jan.) WA6GJV 15, WB5VRJ 10, WA6YAB 10, WA6KMW 6, WA6JDB 5. (Dec.) AA6KMW 18, WB6MGG 10, K6PSJ 5, WA6YAB 2.

SANTA CLARA VALLEY: SCM, Jim Maxwell, W6CK — SEC: WA6RXB. WB6JNN and WA6UAM report a two way on 1296 with JNN working from his new Watsonville QTH to UAM's QTH in San Jose. This is thought to be the first Monterey Bay to Santa Clara Valley 2-way on 1296! Also not QRV on 1296 is WB6MYC. W6ASH got some nice PR in the Palo Alto times during the Palo Alto/Los Altos/Mountain View SET exercise. 34 participated in ASH's well-run simulated earthquake emergency, including 3 bicycle mobiles. WA6UAM is teaching microwave theory & practice (what else?!) at SJCC. Congrats to WA6HAD for his new WAC; also to new Generals WB6POT and WA6PLY, as well as new Advanced WB6POR and Extra licensee WB6HBT. Interested in up-to-date info on N. CA repeater activity? An SASE to the Northern Amateur Relay Council (NARC) c/o W6GO will bring the latest repeater list pronto. WA6QGW now sports W6NV, even tho currently active as ZS6WW, while K6QZ now holds N6GG, thought to be the first N6 in SCV. N6IQ belongs to W6ISQ, covering a second mountain cabin location. VHF contesters should contact WA6GYD for some interesting thoughts on equalizing competition between the mountain-topper and the stay-at-homes. There IS a way, feels GYD. WB6IZF reports formation of the Williams Hill ARC Relay Soc. (WR6AWM) down King City way. Plans are afoot to install a new 2M machine on Williams Hill to serve Monterey, San Luis Obispo, San Benito and Southern Santa Cruz counties. New boss of the NORCAL chapter of QCWA is W6YCT, with W6AUC still holding forth as secy-treas. Club Program Mgrs please note: W6SP/W6ASA has a super presentation available on the future of Oscar and other amateur satellite experiments. Don't pass it up! Traffic: W6YBV 360, W6RFF 146, W6AUC 54, W6NW 47, W6OII 22, WA6HAD 14, W6KZJ 12, WB6HBT 5, W6CF 2.

ROANOKE DIVISION

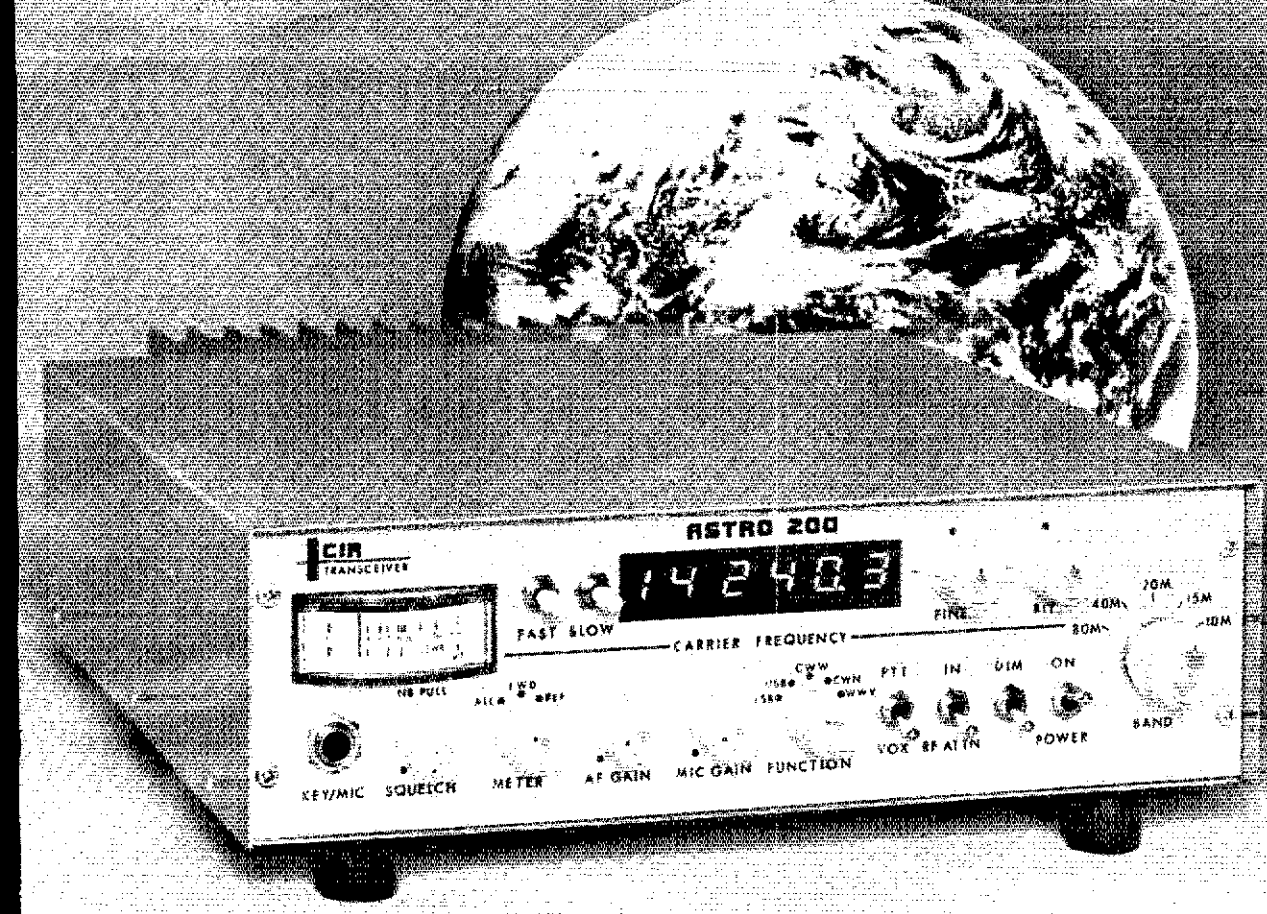
NORTH CAROLINA: SCM, Chuck Brydges, W4WXZ — SEC: W4EHF. PAM: W4OFO. VHF PAM: K4GHR. RM: K4MC. EC of the Month has departed NC but WA4MUW/Don did his best for Pasquotank County, and hopefully a new EC will jump in soon. Many ECs were stars during SET/77 and hopefully our score will be one of the national highs. Please watch QST for final SET results. The Cary ARC annual Swapfest will be July 16 so mark your calendar. Congrats to Onslow ARC now League Affiliated. WA4TCR and K4FTB say Murphy is lurking in their rigs, and probably mister M is in a few others. Central NC Tfc Net (13/73 Salisbury) had 31 sessions, QNI 1154 and QTC 16, tnx WB4VIM. Congrats to new NCSSBN Mgr. WA4UWK, Maxine, who will be a good one since she knows everybody on the net. Almost 200 came to Charlotte for FCC exams in Jan. and another run is planned for July. Alamance ARC '77 officers are WB4VHE, pres.; WA4SWS, vice-pres.; WA4IVR, secy-treas.; WA4CAO, ch. eng.; WA4FFW, mgr-at-large. Nets: (times local).

Net (Abrev.)	Freq.	Time
Tar Heel Emerg. Net (THEN)	3923	7:30
JFK Net (JFKN)	3923	6:30
NC Single SideBand (NCSSBN)	3938	7:30
Carolinas Net (Early) (CNE)	3573	7:00
Carolinas Net (Late) (CNL)	3573	10:00
Carolinas Novice Net (CNN)	3718	5:30
Central NC Tfc Net (CNCTN)	13/73 Salis	10:00
Costal Carolina Net (CCN)	3907	7:00

Traffic: (Jan.) W4EAT 261, WA4PSL 242, K4EG 223, W4OFO 182, K4FBG 125, K4MC 107, W4PCN 88, WB4MXG 78, WB4WOR 74, W4WXZ 68, W4EHF 66, K4FTB 59, WA4TCR 47, W4ACY 30, WA4SRD 28, W4WWR 25, WB4OXT 22, WA4KSO 20, WA4QJL 13, W4IZI 11, WA4JCS 11, WB4VHE 11, WB4CES 8, K4EZH 5, K4TTN 4. (Dec.) WB4EZR 114, WB4OXT 41. (Nov.) WB4EZR 30.

SOUTH CAROLINA: SCM, Tom Lutkin, WA4DAX — Asst. SCM: Gary Barnette, WA4MDP. SEC: WB4TNS. Chief PAM: W4MTK. PAM: WA4DZG. RM: WB4CAK. Looks as if 1977 is going to be a banner year for amateur radio, received reports from all over state of graduating and beginning Novice/General classes. Congratulations to W4NTO for again placing in top of list in FMT. (4/10 parts per million). WB4OBZ besides being Net Mgr. of 4RND is also to be contributing editor to World Radio News. K4GL again active on VHF/UHF and suggests QSO party in spring. Anyone interested? W4FVU reports 42 section stations active in SET. WA4FKY very busy during SET on Novice net. Looks like a fine group of Tfc men coming up. Regret to report WB4GPS in VA Hospital. We look forward to his return soon. Charleston Novices start Roundtable on 10 mtrs Wed. and Sat. For further info contact WA4ZMT. Many new calls on the band as result of reissue. Greenville Hamfest is Apr. 23 & 24. Hope to see y'all there. Net reports: SCSSB QNI 1269, QTC 158. Traffic: WB4ARJ 341, WB4OBZ 340, WA4KXZ 140, W4NTO 103, W4MTK 72, W4FMZ 58, W4ANK 54, WB4CAK 37, WA4DAX 37, WB4UDK 30, W4OCX 30, W4DRF 11, WA4ANW 8, WB4JNE 6, WB4NBK 5, N4EE 2.

VIRGINIA: SCM, Robert L. Fullmar, N4RF — SEC: WB4DTG. PAM: K4VWK. Asst. PAM: WA4YIU. RMs: VN K4IAF; VSN WA4EPJ; 4RN W4SHJ. New officers for the Springfield-Annandale ARC: W4ZM, pres.; K7MPP/4, vice-pres.; WA4KUT, secy.; WB4ENI, treas. Congrats to the Danville Amateur Radio Society on ARRL affiliation and welcome to the fold. Recvd a copy of the Portsmouth ARC News & FB writeup on



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amateur classes; NTS & the programs for their next s meetings and FB list of members. W4TMN rpts o VFN activity; WA4EPJ on VSN with extended info & K4IAF on VN. Tnx fellas as this represents a lot o effort. Recd advance info on the ARRL Nat'l Conv. to be held in Toronto June 3-4-5, HMM. Your SCM asked for & recd the new call N4RF & recd it Jan. 14. Still start to send QDY when busy, Hi. FB OO rpt recd from WA4SBC on violations, also W4HU and WB4AJB. Have word from Director Wicker W4ACY that the LO meeting is in the planning state. From all observations the SET was a real "barn burner" as gud friend WA6BEC wud say. Now if we can get all the EC rpts we'll have it made, what say Bodie! Recd FB rpt and schedule from WB4KIT on VARA's preparation for SET. Needless to say NTS got a terrific workout all along the line and much credit is due to all participants. WA4RUI says his new HW-101 wrking great, FB! 4RN stalwart W4SHJ is attending Southeastern Div. Conv. for the NTS meeting. WB4FDT says new TS-520 makes ssb more interesting. W4YZC rpts wrking Europe for the first time on 160! Includes G, DL, PA and F. Has 300 ft. long-wire. W4TMN completed HW2036 2-meter rig, wrks fine. Also has 5/8 collinear for car. W4LXB had 110 total net ck-ins during month. New EC WB4DQZ was NCS in VSBN and liaison to D4RN during SET. Says new 20 vert. wks FB. W4NWM has new SB-200 amp and all ants. weathered the recent storms. WB4PBG sez that Bodie put on a fine SET and shud be congratulated. Many of us think likewise! W4OOL trying to improve CW rig and plans to change ant. AFTER the cold wx, hi. First VP W4KFC attended board meeting and took part in CD Party. He congrats SCM on "snazzy new call." Tnx Vic. W4KX getting more active on VN. W4JUJ spent 3 wks in hospital with some form of ticker trouble. Sorry Charlie — take it easy! Oh yes, K4BKX makes BPL for 1st time. Kudos OMI Traffic: (Jan.) K4BKX 533, WB4DTG 283, WA4RDI 280, N4RF 192, K4KNP 189, K4MLC 144, WA4YIU 139, W4SHJ 138, WB4FDT 96, WB4KIT 89, WA4QQI 74, K4JM 64, W4YZC 60, W4YVG 59, W4IMN 56, W4LXB 55, K4ITV 53, W4ZNB 52, WB4DQZ 46, W4NWM 38, WA4PBG 38, W4OOL 32, WA4UUK 30, WA4FDY 21, W4NHI 21, WA4RNF 20, WA4EAZ 16, WA4NOB 14, WA4WQG 13, W4ZM 9, W4KFC 8, W4KXF 4, WB4DRC 4, W4KX 4, WB4EKY 2, W4TY 1, WB4WLJ 1. (Dec.) W4LXB 183, K4KDJ 41, WA4KKP 28, WB4UUY 14. (Nov.) K4KDJ 137, WB4UUY 12.

WEST VIRGINIA: SCM, Donald B. Morris, W8JM — New apointments: ORSs: W8PZT WB8YEX. OPSs: WB8TEE WB8SAW. ECs: WB8TDA K8AXW. Officers, Tri-State ARC: WB8WNZ, pres.; WB8PRL, vice-pres.; WB8AON, secy.; WB8AGH, treas. Hillbilly Net with 107 stations and 43 messages. WB8IJW has 93 counties on 80, phone and cw. Opequon Radio Soc. members W8AEC WB8NQB WA8PEJ WD8EGW and WB8HOG operated in VHF contest. Novice Net in 31 sessions with 194 stations, passed 110 messages. New Novices, Weirton area, WD8s DZU IHX IIA IIC IIF III IIB IIH IIL IHZ IIG IIY. Clarksburg area WD8s IBN IGX IGT IGU IGV IGQ IBQ IHA. CW Net 32 sessions, 195 stations 64 messages. WVN Noon Day Net 31 sessions, 1101 stations and 153 messages. WVN Phone Net 31 sessions, 1313 stations and 260 messages. Kanawha ARC Committees W8AH, WA8FLF K8WMX WB8TKX WB8TSE WB8DRV K7MBH. Mountain State ARC and FM Assn. dinner attended by WA8ZGX WA8TOX WB8NMP WA8YHK WB8QVU K8TPF WD8BDS K8CHW W8TGF WD8CDF WB8DKM WB8YTL W8DHT WD8BVF. New Generals, WB8QGO WB8WQG WD8IGH. Traffic: WB8DQX 112, WB8TDA 104, WB8IJW 92, K8QEW 68, WB4ZA 52, WB8SAW 47, WB8YEX 45, W8CKX 41, W8JM 28, WB8III 27, WB8YSM 24, W8CUL 19, WA8NDY 19, WB8YMJ 19, W8FZP 15, WB8TEE 13, WB8TJN 12, K8IXO 10, WA8PQS 10, WA8RUZ 10, WB8CNN 8, WB8ZMX 7, W8EUE 7, WA8ZNH 7, W8ETF 7, WA8LFW 5, WB8PKH 5, WA8LFZ 5, W8NJB 5, WB8VAZ 5, WA8KXI 5, K8ZDY 5, WD8BRD 5.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Clyde O. Penney, WA@HLQ — SEC: K@FLQ. RM: WB@HCK. PAMs: K@DNV WA@YGQ. Newly elected officers Longmont ARC for 1977 are W@ONF, pres.; WB@ODU, vice-pres.; WB@OSM, secy.; WB@OSD, treas. Mile-Hi DX Assn. officers are WB@CGJ, pres.; WB@HAD, vice-pres.; WB@RTZ, secy-treas. Officers for 1977 Boulder ARC are WB@NEU, pres.; WB@MMJ, vice-pres.; WB@NFW, secy.; WB@FFV, treas. The Colo. YLs officers for 1977, re-elected from last year are WB@DUV, pres.; WB@RTF, vice-pres.; WB@HUC, secy.; W@HEM, treas. Newly elected officers for CCARC are W@OQM, chmn.; WB@NLW, vice-chmn.; WA@WAD, rec. secy.; WB@DUV, secy-treas. W@WYX reports that during 1976, the Colo. Amateur WX Net handled a total of 24,414 messages, for an average of 2034.3 per month — 66+ per day — 33.35 per hour, with an average net time of 2 hours. Sign of the times — would you believe that W@HXB appeared on a 2-meter net and W@HEP appeared on an 80-meter cw net in Jan? WB@TAQ, who is now filling an alternate PAN slot for TWN, passed his Extra Class exam in Jan. It is with deep regret that we add to the list of Silent Keys in the Colo. Section, the call WA@UCY. Net Tfc. for Jan: Hi-Noon QNI 1103, QTC 50, Informals 232, QNF 1261, 30 sessions. CWN QNI 359, QTC 354, 33 sessions. Traffic: (Jan.) W@WYX 2307, K@ZSQ 588, WB@QOT 544, WA@YNP 209, WB@BAL 206, W@HXB 193, W@ETT 176, WB@TAQ 173, W@IW 159, W@RE 139, K@OTU 122, WB@PVT 121, W@KLE 97, K@TER 61, W@EJD 35, WB@IZO 32, W@GO 31, K@PVI 31, W@LAE 30, WB@NHA 30, W@GW 8, WA@HLQ 1. (Dec.) WB@TAQ 169, W@ETT 164, WB@NHA 42, WA0s,KXD 6, W@PT 5.

NEW MEXICO: SCM, Edward Hart, Jr., W5RE — Asst. SCM: Joe T. Knight, W5PDY. SEC: W5ALR. PAM: W5PNY. RMs: W5VDH K5KPS. New Mexico Road Runner Net meets daily at 6 PM local time on 3940 kHz. Southwest Net (SWN) meets daily on 3585 kHz at 7:15 PM local time, reports QNI 351 for Jan. with tfc. count of 279. QNI up, tfc down. Breakfast Club net meets daily on 3940 kHz at 7 AM and reports 657 QNI and handled 38 messages. During the SET, Jan 29/30 SWN held 6 sessions and handled 45 msgs. 16 stations participated. W2HHN/5, Los Alamos, now W5VTL. W5QNQ reports the 04/64 repeater now has an autopatch installed and the 16/76 repeater went from 2 watts to 20 watts. K5HZH returned from CA for a short visit. The Pecos Valley ARC is running Novice classes. More on this later. Traffic: W5JOV 533, W5UH 246, K5KPS 242, W5DAD 224, W5ENI 171, K5MAT 75, WB5LZF 72, WA5YTX 38, W5RE 34, W5YQ 34, W5TWZ 23, W5VTL 17, W5QNQ 10.

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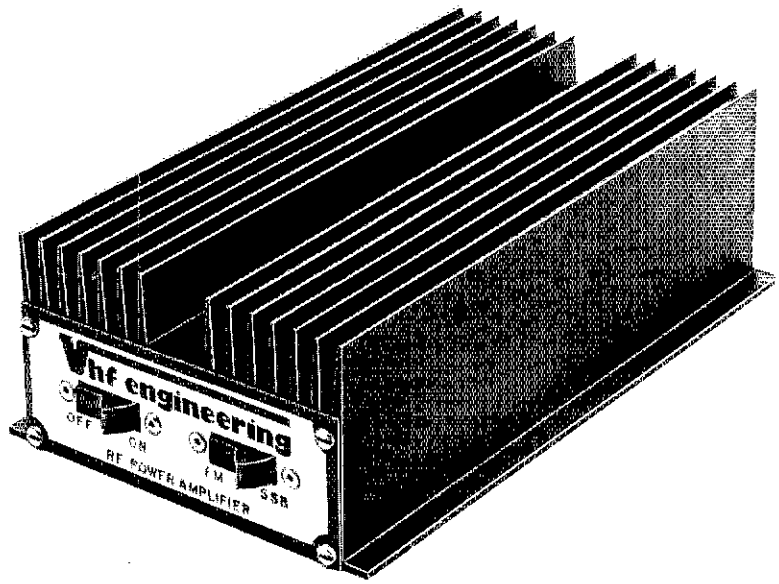

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UTAH: SCM, Ervin Greene, W7EU — SEC: WA7ZBO. RM: W7OCX. In 1976 BUN met in 368 sessions for 5,714 minutes accounting for 10,597 check-ins successfully completing 422 messages. Six net certificates were issued. From Jan. 1, 1959 thru Dec. 31, 1976 (18 years), there were 6,381 sessions of BUN with 128,862 check-ins completing 12,846 messages in 106,537 minutes. A total of 123 net certificates were issued. Thanks to the dedication and teamwork of all net members and especially the NCSs. A successful SET was held due to much advanced planning by those involved. Thanks from the SEC and ECs to those who participated. The Utah Code Net held some very active sessions during the SET. WA7GWU worked W6RRO in Convent La. via treak skip thru the Hidden Peak Repeater. Quite some distance for 147 MHz. W7BE reports a three way QSO with W4JFE and W6EPP/4. The unusual thing is that W6EPP taught Herb and W4JFE the code and theory for their tests back in 1931. First QSO since then. Much discussion about nominations for the SCM position being vacated by yours truly in July. May the best man have the support of all. Traffic: WA7MEL 122, WA7JRC 101, W7OCX 57, WA7TEH 47, W7BE 20, W7DKB 19, W7EU 15, WB7DMI 7, W7UTM 4.

WYOMING: SCM, Chester Stanwaity, W7SDA — SEC: WA7NHP. RM: K7KSA. The Shy-Wy Radio Club of Cheyenne with the cooperation of school district one sponsoring beginner classes in amateur radio starting in Feb. W7IRL now home recuperating after open heart surgery in Denver Jan. 14. The 1977 WY Hamfest will be held in Casper, WY July 16 & 17. The Casper RC is sponsoring the Hamfest. K7JED assembling the Heath HW-2036 Synthesized transceiver. W7SDA worked W7VEW and W7SA for his first contacts via the Oscar satellites. Net activity has been good in spite of poor conditions on 75-meter phone. K7SLM reports 20 sessions, 463 QNI, 8 QTC for WCN. More info on the Hamfest next month. Traffic: W7SQT 443, K7VWA 359, W7TZK 337, W7SDA 6, W7BKI 4.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Jim Brashear, WB4EKJ — SEC: W4UGH. PAM: WA4JYU. RM: WB4EKJ. WA4JGG has new keyboard keyer. WA4ZDW back on 2 meters again and his XYL is now WA4WMX. Hamfests? Yes, Mobile ARC hamfest Apr. 16 & 17 — contact any club officer for details. Birminghamfest on May 7 & 8, WA4NMQ is chmn. W2TPV/4 and WB2VYK/4 gave a talk at the Twin Base ARC on traffic handling; the Twin Base club also had Lt. Roy Smith, AL Highway Patrol for a talk at their Jan. meeting. K4HJM says those that attend their Sat. morning breakfast really enjoy it — check in with them if you are in that area on Sat. Thanks to all who helped with the traffic handling/emergency exercises during SET. Net Managers, send in your net registration before June 1st to have your listing in the new Net Directory. Active Section Nets: AENM, 3.965 at 0030Z; AEND, 3.725 at 2330Z; AENB 3.575 at 0100Z. One hour earlier (in Zulu time) during DST. Reminder to all apointees — send your reports monthly — many cancelled this month for failure to report. Appointed WA4JYU as PAM and OPS, WA4OOW as EC. Endorsed WB4RCF WB4TVY as OPSs; WA4ZDW as OBS and K4JK as OO. Traffic: (Jan.) WA4JDH 541, WB4EKJ 535, W4RQS 516, WA4RND 208, WA4RMP 81, K4LYY 61, K4AOZ 54, WA4JGG 52, WB4QIH 47, WB4RCF 23, WB4TVY 12, W4EF 6, WA4ZDW 6, WA4HGD 1. (Dec.) K4LYY 34, W4MHO 4.

CANAL ZONE: SCM, Ted Herrman, KZ5VV — Hello from your new SCM. Many tnx to ex-SCM Rod Isler KZ5PI for FB job. New Novice net on 21.150 MHz at 8:15 PM on MWF. All check-ins welcome. Check-ins so far include KZ5s AMN ARN BAN BVN EBN MAN PDN PMN TJ TLN TV VS VV WON WPN TPN and HP1XDC. Many tnx to the CZARA 2-meter crew, KZ5s AMN AS BVN DS GB TJ TN PMN for commo during the Gamboa 10 mile foot race. KZ6JM erecting a 2-meter repeater in Diablo to provide more commo between the Pac and Atl sides. Operational this fall, freqs not yet determined. GL to KZ5SS on the Atl side in his Novice classes. Keep up the gud work. 1977 Hamfest at Ft. Clayton now WOW history, hope you were there. Great this year, even better next. Contact KZ5AS if you want yourself included in the next KZ5 callbook.

GEORGIA: SCM, A. H. Stakeley, K4WC — SEC: K4YRL. RM: K4FLR. PAM: K4JNL. Congrats to the whole gang for a huge Jan. packed with activity! ND4JC at Plains and GSBN sponsored Presidential Inaugural Celebration were tremendous successes. Thanks to all who made these possible, especially, WA4AKU and his crew. SET was a fantastic success thanks to much planning by K4YRL. GSBN did themselves proud due to good planning of WA4AKU. Results still being tabulated but it was the biggest and best ever. Emergency sessions watched the bad weather so carefully it didn't even seem a problem! Looks like ham radio in GA is ready. So many classes are turning out so many new hams SCM can't keep up. Please drop me a note or send a message. Congrats to K4VHC WB4HHX K4YRL WA4PZD K4FV WA3NAZ/4 K4SWJ and WB4TEK for making PSHR. Congrats to WA4BZY making BPL Dec. and Jan. New officers ARC of Augusta, W4DV, are: WB4CRH, pres.; WB4TQI, vice-pres.; WA4KLQ, secy-treas. W4JM working 10 new countries on 74 while W4SHL got 3 more states confirmed. WA3NAZ/4 now 4RN rep even though he goes to school four nights! Another good GTN bulletin by K4FLR. GA ARES net QNI 126, QTC 15, CVEN No. 1 QNI 38, QTC 10, CVEN No. 2 QNI 725, QTC 54, GTN QNI 182, QTC 43, CNYI GA VHF QNI 145, QTC 2. Traffic: (Jan.) WA4BZY 638, W4FOE 440, K4WC 223, W4PIM 115, WA3NAZ/4 92, K4VHC 81, K4SWJ 74, WB4TEK 74, WB4DHC 68, WB4HHX 65, W4CZN 59, K4EV 52, K4FRM 52, W4SHL 47, K4YRL 46, W4VTA 42, W4HON 40, WB6VTK/4 34, K4NM 31, WA4PZD 30, WA4LHH 24, K4BAI 22, WA4CBT 21, WB4CGH 19, WB4IUK 17, K4PIK 14, W4NWB 7, W4JM 6, WA4IYB 4, W4LGM 4. (Dec.) WA4BZY 1156, W4SHL 27.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr. W4RH — The 1977 SET had a good turnout throughout section. WB4TZR apptd. EC for Pasco Co. Other new/renewed appointments: WB4IJR and WA4OEM as OPSs; K4IEX and WB4HRG ORSs. SNC's earned by WA4FBI WB4GHU and WB4HKP on EAN; WB4NMU on D-4RN; W4LQV on NFPN; WB4QBB on Tenn. Novice Net. N. FL rep. on D-RN5 up to 97% last month! Gulf Coast ARC sponsoring Adv. Class theory course, taught by W4LQV. WB4TVQ now NCS

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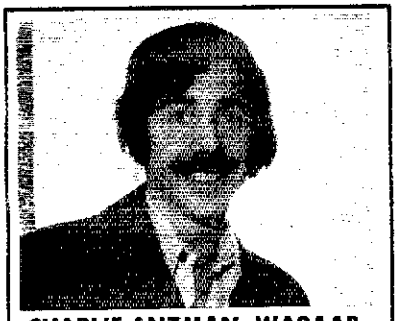

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on NFPN. K4IEX now holds W4VQ; W4TXE now W4KS after struggle with FCC computer. Club station W4SDR runs 200 watts on Volusia Emerg. Net 147.42 MHz FM. K4HLC apptd. Asst. EC for W Volusia Co. W4VQZ earned Floridora YL Certificate. WA4JNC elected pres. of Lake Monroe ARS; meeting at C. of C. Bldg. in Sanford, first Mon. WB4QWX's Jr Op. now WD4AKC. K4DBM upgraded to Advanced. NOFARS new club simplex frequency is 146.49 MHz. New West Jax. repeater is WR4AYW, 69/09, operated by WB4NCZ. W4WHK had FB article on CW operating tips in NFDXA News. W4IZ/4 and K4VFY/4 won Fla. Skip FD trophies. Gainesville ARS filed extensive comments with FCC on WARC Docket. W4KFA named Outstanding Member of GARS for 1976. WA4PWF and W4KFA upgraded to Advanced. WA4MJU to Tech. WA4ZVP received Extra Class after passing all exam elements at one sitting! WA4KIL helped in highway emergency via 2m FM. W4CS$ won Fall VHF-QSO Party. WB4GYX is now K4PD. Playground ARC has a Novice rig for 30-day loan to new members. WB4QBB/N has CP-20 and WAS-45. WA4VRY WA4TVF and WA4QBC upgraded at General; WA4RAG to Advanced. WB4NIP acquired a TS-700. Traffic: (Jan.) W4WNY 374, WB4GHU 327, WA4FBI 324, WB4SKI 233, WB4NMU 178, WA4EYW 143, W4JL 140, K4RZM 128, W4KIX 107, WA4TXN 93, W4LDM 76, WB4QBB 72, K4BSS 69, K4DDY 61, W4RH 57, WB4HRG 55, WB4NJI 55, WA4EYU 54, WA4QQQ 54, WB4FHT 51, WB4TZR 51, WB4NIC 50, WB4DTS 41, WA4OEM 35, K4KPI 28, W4MGC 28, K4OER 27, WB4FJY 25, WA4FKE 21, W4ILE 19, W4GUJ 18, WB4IJR 18, WB4DXN 17, WR4VAP 16, WB4ADL 15, WB4VDL 15, WA4TNC 13, WA4HHC 12, K4RNS 10, WA4CRI 8, K4IEX 7, K4FLV 6, WA4ECY 1. (Dec.) WB4HRG 104.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — SEC: WB4ALH. Asst. SEC: W4WYR. RM: W4MEE. PAMs: WB4AID WA4NBE. Congratulations to W4MEE and K4TH on earning BPLs again this month. W4MEE also made PSHR 52. We had considerably more stations reporting this month, probably due to SET. W4MEE W4QM and K4SCL reported receiving EAN certificates. New appointments this month: WB4AID PAM-40; W4GPL OPS and OVS; WB4WOG OVS. W4JHF has taken a job in VA. Sorry to lose him. K4DRH enjoyed the CD Party. WB4IKX reported an auto accident through the Lake Wales repeater and had Highway Patrol on scene in 2 minutes! The St. Petersburg ARC installed new officers: WB4LWB, pres.; W4GPL, vice pres.; WA4CTM, secy.; W4VIP, treas. The SET Jan. 28 and 30 brought lots of activity within the Section. There were many intensive drills at the local level with better than usual contact with local government agencies and Red Cross. Long haul message handling, including NTS activity, seemed less intensified compared to recent years. Florida Gulf Coast Amateur Radio Council has recently placed a repeater in service in Largo on 223.34/224.94. In addition to the estimated 20 locals already active on 220, a group purchase plan recently placed an additional 22 Midland 13-509 units on 220, giving Pinellas County amateurs a real significant 220 MHz capability. Traffic: (Jan.) W4MEE 646, K4TH 612, K4SCL 450, K4SJH 354, W4NFK 335, WB4WYG 276, WB4AID 235, WA4JPV 226, W4QM 224, WA4NBE 186, K4IWT 171, W4EH 163, W4GPL 156, W4WYR 154, WA4QGV 112, WA4ZHU 112, K4BLM 106, WA4LGT 92, K4SJA 92, WA4GYR 90, K4YSN 74, W4EHW 65, W4IRA 56, WB4KSJ 50, WA4EIC 45, W4IYT 40, WB4IZS 40, WA4KCR 40, WA4PFK 39, K4PXM 32, W4GDK 26, WA4HDH 25, W4MML 23, K4CFV 21, WB4BZF 18, K4ISS 18, WB4TJG 18, WA4TJG 16, WB4FVN 12, WA4MJT 12, W4NTE 12, W4SMK 11, W4MML 10, W4OJH 10, K4JVA 7, WB4JPG 6, WB4LXH 6, K4DRH 5, WA4GHI 5, WB4IKX 5, WA4QWA 5, W4KGJ 2. (Dec.) WA4JPV 74, W4QO 63, WB4HJW 40, W4GDK 19.

WEST INDIES: SCM, David Novoa, KP4BDL — SEC: KP4CV. PAM: KP4AOC. RM: KP4WL. The Club de Radio Aficionados Boricuas, better known as the Bambalanes are very active with KP4HG as pres. They have a 2-meter net, are giving a Novice course and have good attendance at meetings. KP4EBQ passes weather reports to the West Indies in the Antilles WX Net. He is also Asst. NCS of the Caribbean Net. He still has time to work DX. KP4FAH is a new rptr owned by KP4BRI. Will have Auto Patch. This is the first 432 MHz machine in the Island. KP4s AYA and AHQ have Mutt 2700s. KP4s AZN CK and EMP have TR 7400As. KP4EFS passed his General exam. KP4CM is now N4CM. KP4EQE/N very active using a Heath xcvr. KP4CL has a TR-72. KV4FZ earned 160-meter DXCC No. 3 Bravo! Thx to KP4BRI for assistance in preparing this report.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Marshall Lincoln, W7DQS — PAMs: W7UQQ WA7KQE. RM: K7NHL. New calls in the Kingman area are WB7GSU WB7OST and WB7OVI, from a class taught by W7KAX. New officers of the Arizona ARC are K7UXB, pres; WA7OHS, vice-pres.; K7TLP, secy.; WA7VLA, treas.; K7GH, act. chmn. K7UDG is new advisor of Explorer Post 599, sponsored by the Ariz ARC, and is pres. of the new Tempe ARC. The Scottsdale ARC has started a General and Advanced License class with WB7DYD and WB/BXE in charge. New officers of the Arizona Repeater Assn. are WA7PNY, pres.; K7RAC, vice-pres.; WA7GEQ, secy.; K7ESA, treas.; WA7KRC, property custodian; K7VOR, W7MDY, WB7CNY, WA7NIY and W7JSW, board members. W7HXM was featured in a Prescott newspaper article on license classes sponsored by the Prescott Amateur Radio Assn. W7CAF is now K7GH. WB7CAG monitors the Phoenix 88 repeater 6-7 P.M. daily for traffic to be relayed out of the area. New officers of the Amateur Radio Council of Arizona are W7HFR, chmn.; WB7EYT, vice-chmn.; K7VDG, secy.; WA7NIY, treas. and freq. coordinator chmn.; WA7GEQ, dir.-at-large. ATN QNI 699, QTC 42; certificates to W7RQ W7CRZ K7GH K7NMQ; SWN QNI 351, QTC 279. Traffic: (Jan.) K7NHL 335, WB7CAG 211, K7ZUY 104, WA7KQE 50, W7DQS 46, WA7CMY 21, WA7PDW 18, W7OIF 17, W7HFR 16, W7FH 12, W7CAF 10, WB7CZL 6, K7NMQ 4, K7GH 2, WA7JCK 2, W7YS 2, K7GLA 1, K7RLL 1, W7RQ 1. (Nov.) WB7CZL 6.

LOS ANGELES: SCM, Eugene H. Violino, W6INH — Act. SEC: W6SPK. RM: WB6PKA. Recently have been monitoring the 220 MHz band and also operating a little. This band is far superior to the 144 MHz band in many ways, first there is more experimenting, the propagation seems to be better and a more serious

type of operator. There are six repeaters active along the coast also one on Mt. Wilson, which has good coverage. WB6PKA is planning to operate on 160 meters as soon as he can find room for the antenna, besides which he is experimenting with multi-element two meter antennas. The JPL club now has an Amateur Radio Exhibit in their library bldg. The display includes amateur spacecraft models, and other memorabilia. W6OFP recently donated back issues of QST to the Millikan library at Cal Tech to complete the whole group. The yearly SET are over-with a good turnout from the traffic nets but nothing heard from the SSB or two meter groups. Wonder if they were not prepared or is it lack of interest. Listened to several repeaters and there was nothing going on there except the same ole thing. K6ASK needs five states still to complete his 5BWAS. I'm beginning to wonder if the liberalized licensing programs are really going to bring in more amateurs or just gradually convert us all to becoming CB operators? Most of the new hams get on 2 meters and park there for the rest of the time. Lets hope that they keep incentive licensing, it will help keep the high standards at least on the low bands. The Lively gang at the United Radio ARC are already preparing for Field Day full steam. W6VH has been promoted to Senior V.P. of the Society of Wireless Pioneers while W6VI replaces him as Chapter Director of the DeForest Chapter No. 3., congrats to both. A very fine get together recently brought a large group of the Southern California trafficker's together at Long Beach, thanks to WA6TVA and Army K6EA for their efforts and bulletins. Lets do it more often fellows. Phil formerley W6DQX now sporting a new call N6ZZ, there are several of these new calls floating around, W6QIL now N6RF. Traffic: K6CL 201, W6HUJ 175, W6INH 164, WB5OUD 108, WB6PKA 94, W6DEO 79, W6BWG 64, W6QAE 53, W6BRO 39, K6EA 23, W6NKE 10, WB6AIT 6.

ORANGE: SCM, Wm. Heitritter, WB6AKR — Asst. SCM: Dick Birbeck, K6CID. SEC: W6AQB. PAM: W6CPB. RMs: WA6TVA, WB6AKR. ECs: K6GGS W6LKN WB6NSU WA6VMI WA6YWS. New appointments: W6CPB PAM; W6LKN WB6NSU ECs; WB6NSU OO; WB6NEX OPS; WB6QUD ORS; WB6NEX OVS. K6WS reports the Baja Amateur Radio Radio Assn. specializes in providing off-road racing communication services at no charge. Contact Neil Vadnais WA6TZA 950 River Dr. Norco, CA 91760 for further information. New officers at Hughes (Fullerton) ARC: WB6HSA, pres.; WA6JFP, vice-pres.; W6TCJ, secy.; WB6HMW, treas. New officers at Anaheim ARC: K6MXL, pres.; WA6MUP, vice-pres.; WA6PZO, secy.; WB6AGD, treas. Morongo Basin ARC (Yucca Valley) has WR6AXT repeater operational on 146.19/.79 from QTH of W6BPI. Lee DeForest ARC (Hemet) has ARES net Tue. 7:30 P.M. with OBS WB6SKL as NCS on 146.52. WA6CHH has a new ICOM IC-211. The Jan. SET included station set up in Orange County Mall providing answers to the public on Amateur Radio; Channel 2 (KNXT) coverage of WB6OGD (Santa Ana Red Cross) on the 6 P.M., 11 P.M. and 2 A.M. News; highest written traffic rates and participation ever. WR6AAC has been relocated to Santigo Peak (Approx. 5560-ft. Elev.) as combined efforts of the Standard Communications ARC and Lake Elsinore ARC. Freq. 146.37/.97 has coverage from San Diego to Santa Barbara counties and extends into NV. Contributions towards support of this new repeater should be sent to: David Maxer WB6NSU 18860 Dexter Lake Elsinore CA 92330. An ARES net is conducted at 7 P.M. Thur. on WR6AAC. WB6QIE reports Novice class (Mon. 7:30 P.M.) has 40; Technician Class (Thurs. 7:30 P.M.) has 10; both at Saddleback college. Advance/Extra starts Feb. 3 (Thurs. 7:30 P.M.) Room 312 Mission Viejo High. WA7POI/WB6HQV is now living and attending college in Orange County. Traffic: WB6EIG 847, WA6TVA 152, W6O 102, W6RF 78, WA6YWS 29, W6QBD 13, W6CPB 11, W6VOZ 5.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — SET 1977 was held in two phases this year. Phase I Jan. 29-30, provided input to NTS and was mostly Red Cross oriented. Phase II, Feb. 5, concentrated on a local simulated earthquake. ARES supported Red Cross, Civil Defense, and fire departments throughout S.D. County. W6BGF WB6FTY W6INI attended PAN staff meeting in L.A. New slow-speed/beginners traffic net operates daily at 1800 PT on 3730 kHz. Net ID is "SDN." Novices & Technicians welcome. W6DEY & W6PJU made annual trek to SAROC. K6DS received Silver Bowl award from S.D. County Volunteer Service Bureau for work with handicapped students. Upgraded: WB6HUA to Extra; WA6LLV, WA6UDE to General. Palomar ARC monthly flea mart has become biggest around. 1st Sat. each month in SWAN Electronics parking lot, Oceanside. SD County Office of Emerg. Services needs amateurs for RACES program. Call 448-4611 for info. Imperial Vly ARA planning dinner meeting for May. Traffic: WB6PVH 353, W6BGF 170, WB6FTY 161, KG6JES 115, W6PZU 36, W6DEY 22, W6SIF 20, K6LKD 4.

SANTA BARBARA: SCM, D. Paul Gagnon, WA6DEI — K6YNB continues to write for QST and NCJ. K6WI appointed an ORS. WA6WYD again active on MARS. The new Santa Barbara directory is out. Contact W6POU for a copy. WB6HOZ teaching class in Santa Barbara also Advanced and General. WB6IBO and WA6BLS continue to NCS the Section net on 3935 at 8 P.M. Wed. WB6QDS donated a 220 MHz repeater to SBARC for use on Santa Cruz Island. K6YX authors the Interference column in Worldradio News. WB6SRF donated a code instructograph for use by SBARC classes. K6AQA a Silent Key. The Ventura Co. Club auction went well. Keep June 19 open for the Satellite ARC picnic in Santa Maria. WB6QMN in charge. WB6TFW teaching Advanced and Extra classes in Santa Maria. Officers of the Sulphur Mt Repeater Assn. are WA6TPL, pres.; WB4CBZ, vice-pres.; Every Sat. at 8 A.M. Santa Maria hams get together for breakfast at Sambos. WA6MHA is on RTTY from Simi. We still need a PAM and a mgr. for Teletype Bulletin Network. PSHR: W6JTA 52, WA6VBS 38, WB5KPL 29, The SET went well. Many thanks to those who participated. Traffic: (Jan.) WA6MBZ 226, WA6VBS 204, WB5KPL 84, K6WI 61, W6JTA 33, WA6DEI 20, K6QPH 10. (Dec.) WA6MBZ 385, WA6VBS 319, WB5KPL 213, W6JTA 51, WA6DEI 14, K6WI 13, W6POU 4, WB6HJW 3, WB6IBO 2, K6QPH 2.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Ted Helthecker, W5EJ — Asst. SCM: Ruth Chance, WA5VJW. EC: W5DWL. RM: W5LA. CD Party seemed to have more than ever

before, and enjoyed by all. SET activity directed by W5DWL with 51 taking part in Dallas City outstanding success with 758 points claimed. Clubs in Metro area report huge enrollements in Novice and other classes. DARC has 96 Novice, 55 General, 22 Adv going for 173, with much work by K5YKT WB5NKL W5SOQ WB5MZP WA5RSS & WA5GNT. Forth Worth KC Club has 36 Novice, 36 Generals and 25 in Extra class with work by WB5FLQ W5SBY W5IYA W5SGM & W5OMQ. Congrats to all who are doing so much for amateur radio. Traffic reports for Jan. even larger than Dec. so must be activity and not the Christmas card rush. SWOT bulletin No. 9 reports many DX openings on 145.1, write W5JTA for info on this growing bunch of VHF Hams. WA5ZNZ sends CRW reports faithfully every month. Panhandle ARC Local Oscillator full of good info by K5IBI and gang, reports Amarillo repeater group to be planning a second installation. Old pal. W5VR reported ill, but at home. Its rumored that DARC is getting ready to publish Volume 2 of its famous "Blue Book." Reserve your copy now! City of Dallas adopted a "Tower Ordinance" with help, shoving and pushing by many Dallas Hams spearheaded by WB5LWB and WB5JBP — it was a good job and a very fair ordinance, thanks fellows. Club is $4000 in hole due to the fight, needs your help. WA5GNT reports Amigod De Las Americas planning activity again this year, June thru Aug. — a fine public health assistance program, if you are interested, contact WA5GNT or WA5KRI. Appointments in Jan. W5UGM OO and OVS with several new ECs on the list for Feb. Many of the clubs are reporting planning for Field Day, scheduled for June 25-26 this year. Sure appreciate reports and information sent to this office, keep it coming so we can report the news and activities from all parts of the NoTex Section. It's a long way from Shreveport to Texline! Late note from WB5RPU on formation of new Lampasas Amateur RC, with W5GFR, pres.; WB5RPU, secy. Looking forward to ARRL affiliation and planning on starting Novice classes soon — that's good work. Message traffic received this office connection with SET noted and acted upon. Traffic: (Jan.) W5TI 408, W5DWL 336, WA5INJ 34, K4SOR 23, WB5LAT 17, WB5GII 16, W5EJ 15, W5LA 15. (Dec.) W5TI 286, W5GY 26, W5YK 24, WB5LWB 19, K5SOR 16, W5EJ 11, W5PBN 10, W5GSN 8, W5YK 1.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst. SCM: Ray Miller, W5REC. Congratulations to Osage Amateur Radio Soceity, Pawhuska: Newest affiliated club in OK. We have more clubs working on affiliation and should be hearing from them soon. It is not all that hard to gain affiliation and the benefits are many and growing every day. Early reports on 1977 SET are very encouraging BUT, I am afraid many of our new operators are not receiving the training they need in emergency operations, particularly, emergency traffic. I hate to say this, but some considered it as a game and played it as such. This is reflected from reports received. By the time this is printed, we will be well into our Spring Storm Season. Many of our groups are really ready, ARE YOURS? Some of the new calls heard on the nets include: WB5UXI WB5ZLA WB5ZNY WB5ZNZ 7 WB5ZOA. Also WD5AAX WD5AGY & WD7ABL among others. Jan. traffic totals almost double last year at this time. Much of it is handled on the cw nets with WB5RXZ WB5KGP WB5NKD WB5OYU WB5NKC & W4REC regulars on DRN-5. Traffic: WB5NKD 446, WB5NKC 325, W4REC 173, W5RB 137, WA5JGU 106, WA5FSN 101, WB5KGP 81, W4FKL 57, WB5AZS 49, WD5ADL 30, WB5ELG 29, W5SUG 28, WA5OUV 27, K5EA 20, K5ZDB 7, WB5UCM 6, W5FFW 5.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — SEC: W5TQP. RM: W5UGF. PAM: WB5NUM. OOs reporting this month: WB5CIT K5DAE. OVS reports this month: WB5CIT WA5QCP. EC WB5FMA reports WD5AAL/N and WD5AAN/N are new ops on 80 mtrs. W5KR and WB5LHK graduated ten Novice students via FCC exams on Feb. 1; all are watching mail box closely. WD5ADC/N WD5ADB/N and WD5AGS/N new ops in Harlingen graduates of the W5KR garage school. EC WB5TNN rpts great SET for 1977; has K5EWJ for Asst. EC in the Pearland area. WB5NHV upgraded to Advanced. ORS WA5JYH has more than 50 students in new code class. From W5ES Bulletin: K5GSA now on 2-mtrs with Icom 245; K5DKX has designed and is building SSB rig for 2-mtrs (designing and building is almost unheard of these days); K5QVH is now N5AB. WB5QXZ is new EC in Galveston County. Traffic: W5KLV 523, K5HZR 476, WA5YEA 349, WA5RKU 325, WB5NUM 188, WA5VBM 166, W5TQP 158, WB5GVO 154, K5ZSI 99, WB5TNN 70, W5AC 60, W5KR 54, WA5QAL 32, K5GDX 30, WA5JYH 29, W5QO 10, K5RVF 8, W5BHO 5 WB5FMA 2.

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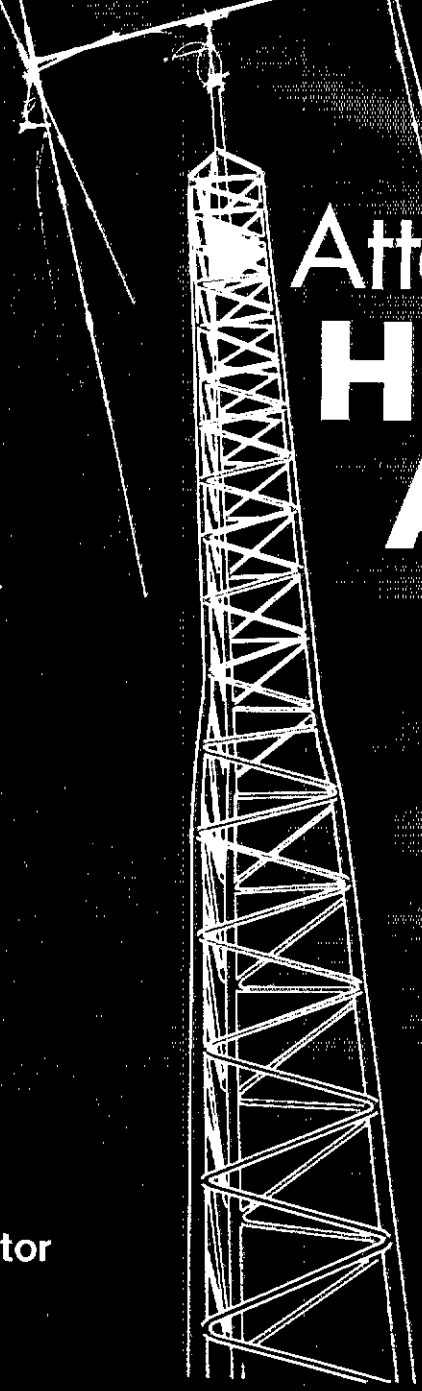

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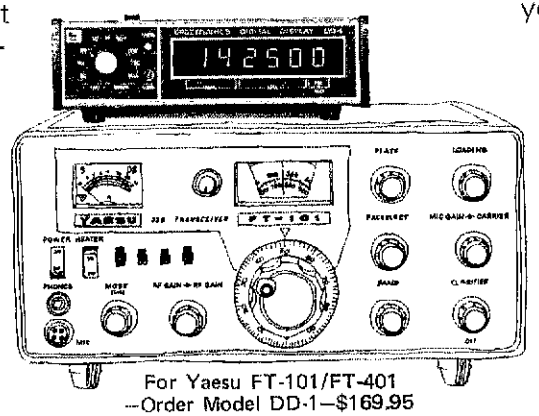

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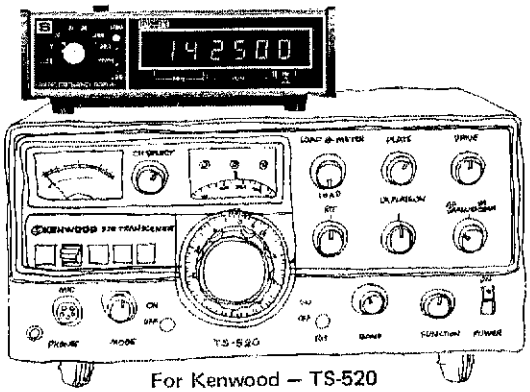

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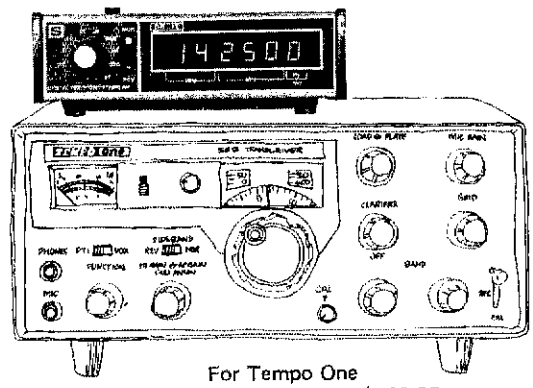

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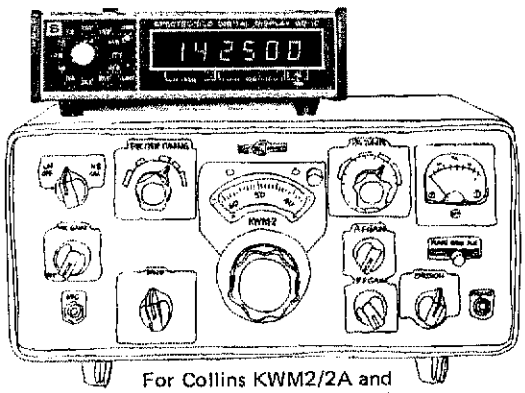

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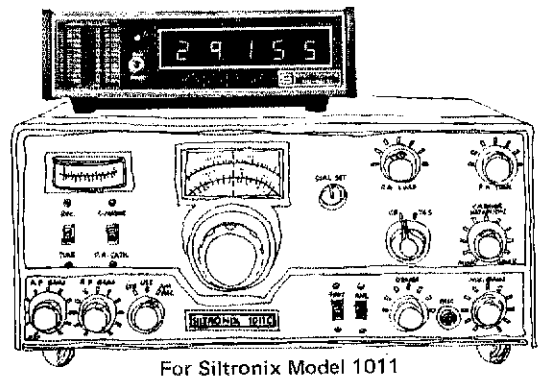

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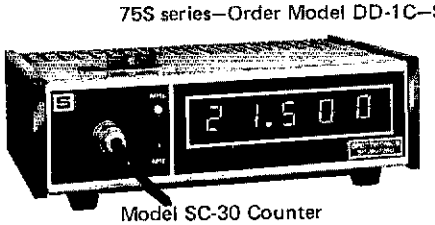

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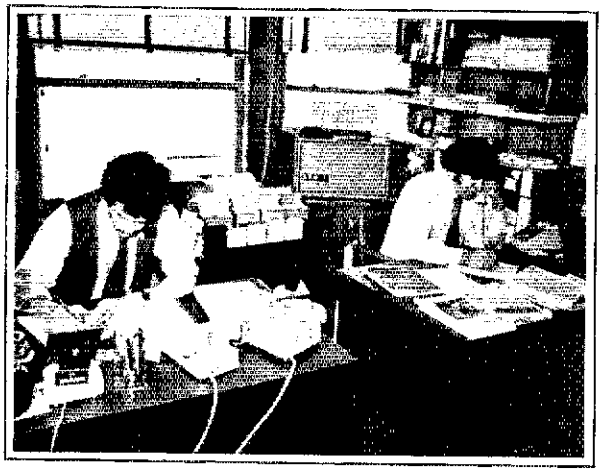

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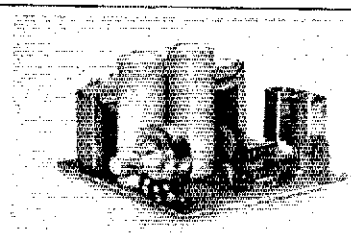

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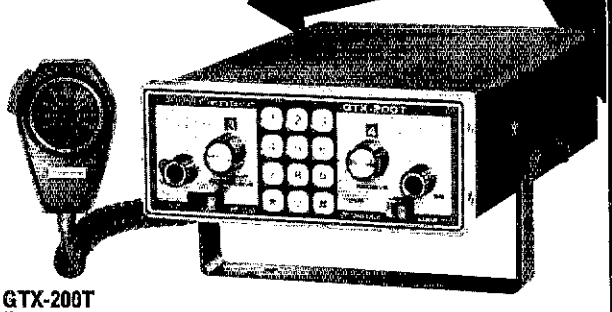
2N3906 PNP Amp-Sw β100	6/$1	CA3086 6 Trans Array DIP	.55
CP650 Power FET ½Amp	$5	RC4195DN +15V/50mA mDIP	1.25

RF391 RF Power Amp Transistor 10-25W @ 3-50MHz TO-3	$6.00
565X Timer (as the Different pinout from 565 (w/data)	3/$1
RC4194TK Dual Tracking Regulator +1.2 to 36V @ 200mA TO-66	$2.50
RC4195TK Dual Tracking Regulator +15V @ 100mA (TO-66)	$2.25
8038 Waveform Generator (+1A Wave With Circuits & Data	$3.75

Genave' amateur radio tomorrow . . . today!



GTX-200T
(incl. 146.94 MHz)
$249.95

Engineered and designed for the quality conscious 2-meter enthusiast

Genave's GTX-200T offers the FM operator up to 100 channel combinations incorporating 10.7 MHz first IF and 455 MHz second IF for outstanding sensitivity, minimizing effects of adjacent channel interference.

ADDITIONAL FEATURES INCLUDE:

- 30 watts output power, nom. 25 watts min. @ 14 VDC input
- Separate controls for independent transmit and receive frequency selection
- Switch for lock-in of pre-selected frequency pairs allows one-knob operation
- Supersensitive dual-gate MOSFET in receiver head end.
- Blacklighted for night operation
- Factory-installed, front panel mount 12 digit tone encoder.

GTX-IT
$299.95
Hand-Held 2-meter FM, 6-channel, 3.5 watts hand-held with factory-installed tone encoder

GTX-I
$249.95
Hand-Held 2-meter FM, 6-channel, 3.5 watts hand-held

Accessories Available

- Nicad battery pack
- Charger for GTX-1 battery pack
- Leather carrying case
- TEIII tone encoder for auto patch

CHECK THESE FEATURES:

- All metal case
- American made
- Accepts standard plug-in crystals
- Features 10.7 MHz crystal filter
- Trimmer caps on TX and RX crystals
- 3.5 watts output
- Battery holder accepts AA regular, alkaline or nicad cells
- Mini hand-held measures 8" high x 2.625" wide x 1.281" deep
- Rubber ducky antenna,
- Wrist safety-carrying-strap included
- 6 channels
- Factory-direct to you!

GTX-2
2-meter FM, 10 channels, 30 watts with pushbutton freuency selector (incl. 146.94 MHz) **$189.95**

GTX-200
2-meter FM, 100 channel combinations, 30 watts (Incl. 146.94 MHz) **$199.95**

GTX-10-S
2-meter FM, 10 channels, 10 watts (Xtals not included) **$149.95**

TONE ENCODER PAD
Plug-in installation on most amateur transceivers.

TE-II **$29.95** TE-I **$59.95**

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ADDRESS_____ CITY_____

STATE & ZIP_____ AMATEUR CALL_____

☐ GTX-200-T	$249.95
☐ GTX-200	$199.95
☐ GTX-10-S	$149.95
☐ GTX-2	$189.95
☐ GTX-1	$249.95
☐ GTX-IT	$299.95

☐ Ringo Ranger ARX-2 2-M Base Antenna	$29.95
☐ Lambda/4 2-M and 6-M Trunk Antenna	$29.95
☐ TE-I Tone Encoder Pad	$59.95
☐ TE-II Tone Encoder Pad	$49.95
☐ PS-I AC Power Supply for use with all makes of transceivers 14 VDC—6 amp	$69.95

and the following standard crystals @ $4.50 each ..... $_____
Non-standard crystals @ $6.50 each: ..... $_____

Add $4 per Radio for Shipping, Handling, and Crystal Netting.

Payment by:
☐ Certified Check/Money Order ☐ Personal Check
☐ C.O.D. Include 20% Down

Note: Orders accompanied by personal checks will require about two weeks to process.
20% Down Payment Enclosed. Charge Balance To:

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IN residents add 4% sales tax: $_____

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All orders shipped post-paid within continental U.S.

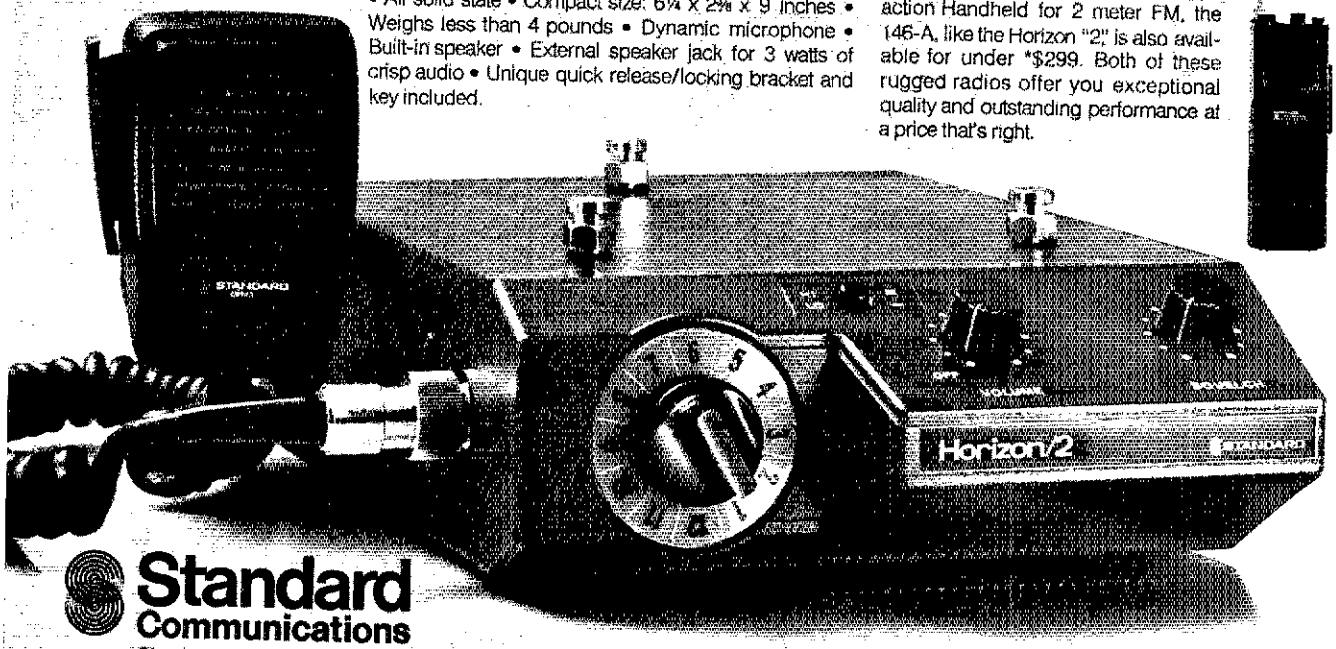
ACCESSORIES FOR GTX-1 and GTX-1T

☐ PSI-18 Optional Nicad battery pack	$29.95
☐ PS-2 Charger for GTX-1(T) battery pack	$39.95
☐ GLC-1 Leather carrying case	$12.95
☐ TE-III Tone Encoder (for use with GTX-1)	$49.95

Performance... your choice for under $299*

Horizon "2" outclasses them all! 25 watt output 2 Meter FM transceiver for HAM, CAP, and MARS • Full 12 channel capability • All solid state • Compact size: 6¼ x 2⅜ x 9 inches • Weighs less than 4 pounds • Dynamic microphone • Built-in speaker • External speaker jack for 3 watts of crisp audio • Unique quick release/locking bracket and key included.

Because no two transceiver applications are exactly alike, Standard also makes the rugged 146-A. An action Handheld for 2 meter FM, the 146-A, like the Horizon "2," is also available for under *$299. Both of these rugged radios offer you exceptional quality and outstanding performance at a price that's right.



Standard Communications

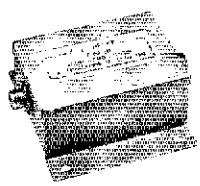
Standard Communications Corp. P.O. Box 92151 • Los Angeles • Ca • 90009

DRAKE TVI Filters

High Pass Filters for TV Sets

provide more than 40 dB attenuation at 52 MHz and lower. Protect the TV set from amateur transmitters 6-160 meters.

Drake TV-300-HP
For 300 ohm twin lead
$10.60 ea.

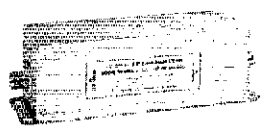


Drake TV-75-HP
For 75 ohm TV coaxial cable; TV type F connectors installed
$13.25 ea.

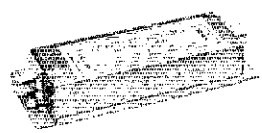
Low Pass Filters for Transmitters

have four pi sections for sharp cut off below channel 2, and to attenuate transmitter harmonics falling in any TV channel and fm band. 52 ohm. SO-239 connectors built in.

Drake TV-3300-LP **$26.60 ea.**
1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as TV front-end problems.



Drake TV-5200-LP **$26.60 ea.**
200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42 LP.



Drake TV-42-LP **$14.60 ea.**
Four section filter with 43.2 MHz cut-off and very high attenuation in all TV channels for transmitters operating at 30 MHz and lower. Rated 100 watts input.

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- Iambic circuit for squeeze keying.
- Self completing dots & dashes.
- Dot memory.
- Battery operated with provisions for external power
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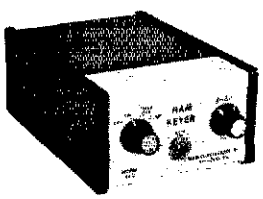
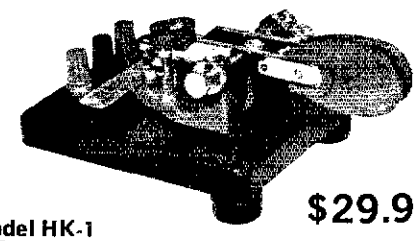
- Speed, Volume, tone & weight controls.
- Grid-block or direct keying.
- Use with external paddle such as HK-1.

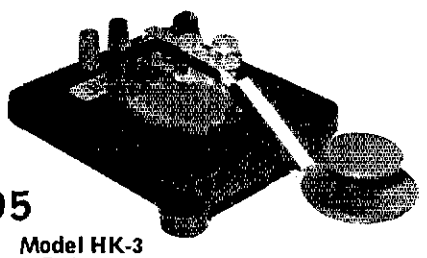
NEW
MODEL HK-5
ELECTRONIC KEYER
$69.95





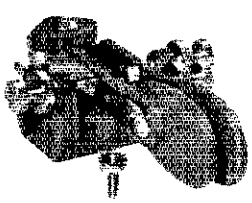
$29.95

Model HK-1
- Dual lever squeeze paddle.
- Use with HK-5 or any electronic keyer.
- Heavy base with non-slip rubber feet.
- Paddles reversible for wide or close finger spacing.



$16.95

Model HK-3
- Deluxe straight key.
- Heavy base, no need to attach to desk.
- Velvet smooth action.



$19.95

Model HK-2
- Same as HK-1, less base for those who wish to incorporate in their own Keyer.

$44.95

Model HK-4
- Combination on HK-1 & HK-3 on same base.

Available from your local dealer or order direct.

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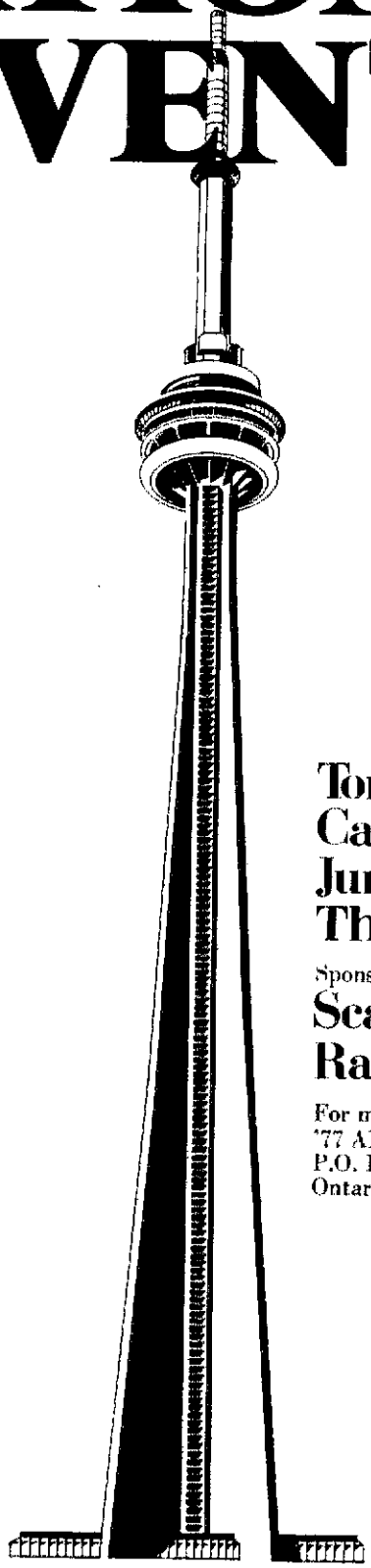

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Drake Accessories

designed for convenience and accuracy

Drake Directional RF Wattmeters

W-4 1.8-54 MHz

WV-4 20-200 MHz

Drake directional, through line wattmeters, using printed circuits, toroids, and state of the art techniques, permit versatile performance and unsurpassed accuracy, yet at a lower cost.

In contrast to VSWR measuring devices of the past, Drake wattmeters are frequency insensitive throughout their specified range, requiring no adjustments for power or VSWR measurements.

Negligible insertion loss allows continuous monitoring of either forward or reflected power for fast accurate tune up and checking of transmitter-antenna performance.

Indirectly measure radiated power (forward power minus reflected power) and VSWR by means of a plastic nomogram included.

Each wattmeter makes possible quick, accurate adjustments of antenna resonance and impedance match, when placed between transmitter and matching network.

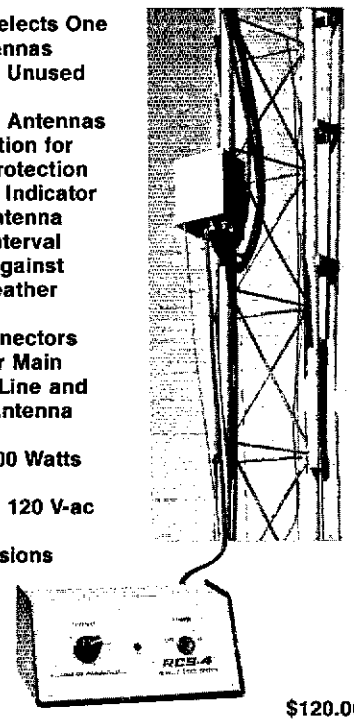
High accuracy; ideal as laboratory instruments.

Removable coupler allows remote metering.

Specifications	W-4 $72.00	WV-4 $84.00
Frequency Coverage	1.8-54 MHz	20-200 MHz
Line Impedance	50 ohm resistive	50 ohm resistive
Power Capability	2000 W continuous	1000 W continuous
Jacks, Removable Coupler	Two S0239 input and output connectors	Type N input and output connectors.
Semiconductors	Two 1N295 power meter rectifiers	Two 1N695 power meter rectifiers
Accuracy	± (5% of reading +1% of full scale)	

Drake RCS-4
Remote Coax Switch

- **Remotely Selects One of Five Antennas**
- **Grounds All Unused Antennas**
- **Grounds All Antennas in Gnd Position for Lightning Protection**
- **Front Panel Indicator Monitors Antenna Selection Interval**
- **Protected Against Adverse Weather Conditions**
- **SO-239 Connectors Provided for Main Coax Feed-Line and Individual Antenna Feed-Lines**
- **Handles 2000 Watts PEP**
- **Available in 120 V-ac or 240 V-ac 50/60Hz Versions**

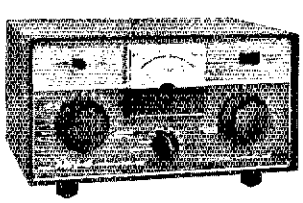


$120.00

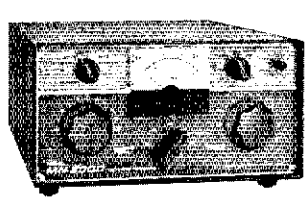
• Control unit works on 110/220 V-ac, 50/60 Hz, and supplies necessary voltage to motor. • Excellent for single coax feed to multiband quads or arrays of monobanders. The five positions allow a single coax feed to three beams and two dipoles, or other similar combinations. • Control cable (not supplied) same as for HAM-M rotator. • Selects antennas remotely, grounds all unused antennas. Gnd position grounds all antennas when leaving station. "Rain-Hat" construction shields motor and switches. • Up to 30 MHz, insertion of switch changes VSWR no more than 1.05:1. • From 30 MHz to 150 MHz, insertion changes VSWR no more than 1.5:1. • Motor: 24 V-ac, 2 amp. Lubrication good to −40°F. • Switch Rf Capability: Maximum legal limit.

Drake MN-4 & MN-2000 Matching Networks

- **80-10 Meters**
- **Antenna Selector and By-Pass Switches included**



MN-4 (300 Watts)
$110.00



MN-2000 (2000 Watts)
$220.00

A Drake matching network is a worthwhile addition to any amateur station where peak performance is desired. Basically identical, except for power handling capabilities, the MN-4 and MN-2000 enable feedline SWR's of 5:1 to be matched to the transmitter. If input impedance is purely resistive, even higher SWR's can be handled. • Besides presenting a 50 ohm load to the transmitter, the Matching Network's built in rf wattmeter allows accurate and continuous power measurement and VSWR indication. The advanced wattmeter circuitry yields frequency-insensitive readings from 2 to 30 MHz, and accuracy until now obtainable only in expensive wattmeters.

To receive a FREE Drake Full Line Catalog, please send name and date of this publication to:

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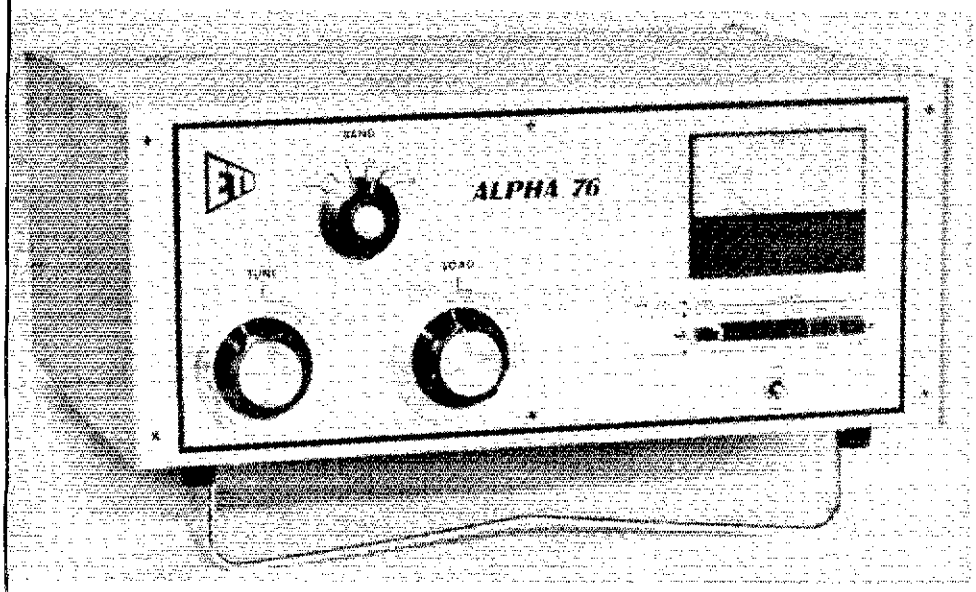
■ 2 + KW PEP ■ 1KW LOCKED-KEY ■ 10 THRU 160 METERS



- True CCS Kilowatt Average D-C Input
- Fully Self-Contained in One Cubic Foot
- Popularly Priced
- Full Year Warranty

ALPHA 76 is first of all power — brute, uncompromising power. It easily handles up to 2.5 KW PEP or more — a full 1000 watts of average d-c input — with no need for a key-down time limit! That's *true* 'continuous duty' [or 'CCS' — Continuous Commercial Service]. No other linear amplifier, except another **ALPHA,** delivers such power capability in a self-contained desk top cabinet.

ALPHA 76 is also the only true [CCS] full KW linear that includes 160 meter amateur band coverage and costs under $2000!

Traditional **ALPHA** ruggedness and quality are conspicuous throughout the **ALPHA 76** — modern ceramic tubes; a full pi-L network with silver-plated copper tubing coils plus Teflon-insulated toroids for compactness and efficiency; the brutish 1.5 KVA [CCS!] transformer that itself outweighs many competative amplifiers.

ETO's dedication to your convenience shows up in features like the plug-in transformer for easy handling and UPS shipping; the remarkably compact one-cubic-foot size for a linear of this power capability; full amateur band coverage including 160 meters; and the built in rf directional wattmeter.

TECHNICAL SPECIFICATIONS, MODEL PA-76

FREQUENCY COVERAGE: Tunable 1.8-2.0 and 3-30 MHz; all bands 160-10 meters.
PLATE POWER INPUT: Up to 2.5 KW PEP-SSB, 1 KW average or key down; no time limit.
RF POWER OUTPUT: Typically 1.2-1.5 KW PEP-SSB voice, 600 watts continuous carrier.
INPUT & OUTPUT IMPEDANCES: 50 ohms nominal, unbalanced; VSWR 2:1 or less.
DRIVE POWER: Nominal 100 watts PEP, 50 watts carrier; compatible with all popular exciters and transceivers.
DISTORTION: Third order IM more than 30 db below 1 KW PEP output.
ALC: Negative-going, adjustable threshold.
TUBE COMPLEMENT: Two Eimac 8874 ceramic-metal grounded grid triodes.
COOLING: Full-cabinet, ducted forced air; low noise centrifugal blower.
PROTECTION: Primary fuses, plate overcurrent relay; AC & HV cover interlocks.
PRIMARY POWER: 240V/10A or 120V/20A nominal, 50-60 Hz, 1Ø. Automatic step-start.
SIZE & WEIGHT: 7.5″h x 17″w x 14.75″d. 75 pounds net [UPS-shippable, 2 cartons].

ALPHA 76 is real **'ALPHA'** all the way — POWER, QUALITY, CONVENIENCE . . .
*YOU **CAN** BUY A CHEAPER LINEAR . . . BUT IS THAT **REALLY** WHAT YOU WANT?*

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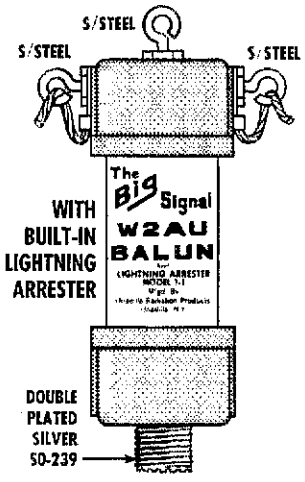

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1. **HANDLES FULL 2 KW PEP AND THEN SOME.** Broad-Banded 3 to 40 Mc.
2. **HELPS TVI PROBLEMS** By Reducing Coax Line Radiation
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5. **REPLACES CENTER INSULATOR.** Withstands Antenna Pull of Over 600 Lbs.
6. **BUILT-IN LIGHTNING ARRESTER.** Helps Protect Balun — Could Also Save Your Valuable Gear
7. **BUILT-IN HANG-UP HOOK.** Ideal For Inverted Vees, Multi-Band Antennas, Dipoles, Beam and Quads

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Comes in 2 models. 1:1 matches 50 or 75 ohm unbalanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

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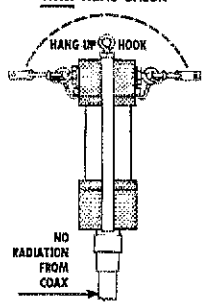

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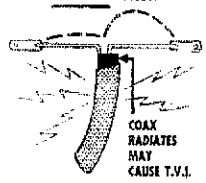

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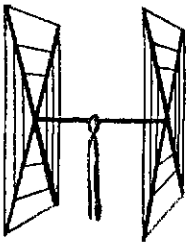
V40 VERTICAL ANTENNA FOR 40, 20, 15, 10 and 6 METER BANDS. ESPECIALLY SUITED FOR THE NOVICE WHO OPERATES 40 AND 15..... $22.95

V80 VERTICAL ANTENNA FOR OUR 80, 40, 20, 15, 10 AND 6 METER BANDS. OUR MOST POPULAR VERTICAL. USED BY THOUSANDS OF NOVICES, TECHNICIANS, AND GENERAL LICENSE HAMS..... $24.95

V160 VERTICAL ANTENNA FOR 160, 80, 40, 20, 15, 10 AND 6 METER BANDS. SAME AS THE OTHER VERTICAL ANTENNAS, EXCEPT THAT A LARGER LOADING COIL PERMITS OPERATION ON THE 160 METER BAND ALSO.. $26.95

HOW TO ORDER: Remit with order. We ship verticals prepaid no charge to you; beams and quads sent collect cheapest way, due to size of package.

FAMOUS GOTHAM QUADS



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CHAMPIONSHIP BEAMS

Every beam is absolutely complete in every respect, fully machined and with hardware, ready for easy assembly.

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New! 2, 6, and 10M Beams Shipped Prepaid to the 48!

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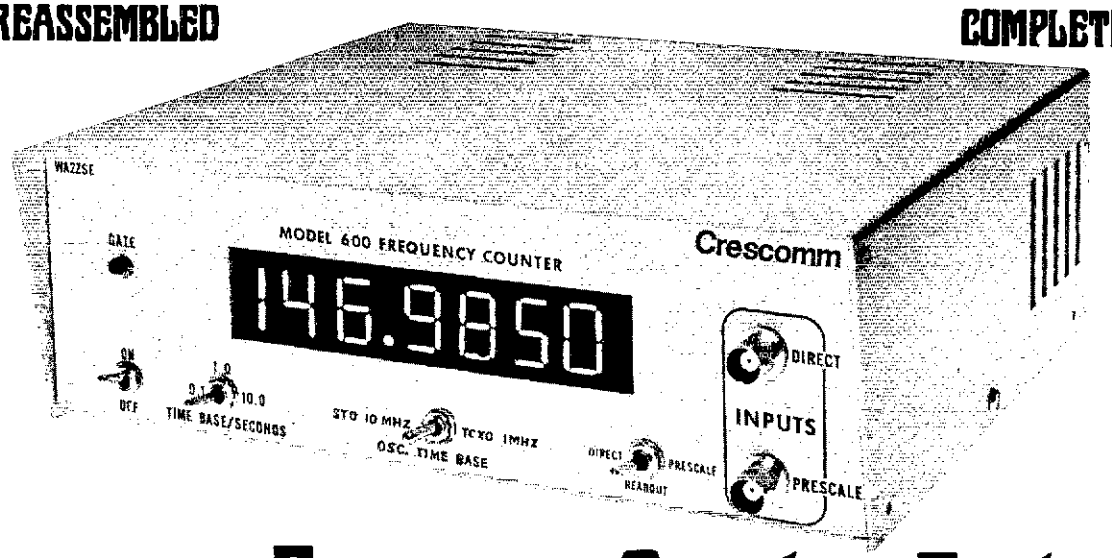
PREASSEMBLED **COMPLETE KIT**



Crescomm Frequency Counters Features:

1 High Sensitivity VHF pre-scaler (built-in), 100mv RMS @ 50Ω @ 300MHZ. Frequency range DC through 600MHZ Model 600.

2 Excellent temperature compensation crystal controlled time base, yielding ± 1 part/ 10^6 stability per hour after 10 min warm-up, ± 10PPM worst case, from 0^o to + 55^oC!, at 100Hz @ 450MHZ is attainable, typically if calibrated to WWVL. This is approximately 2 parts in 10^7!

3 7 digit display, resolution 100Hz with 10m Sec. gate interval, pre-scaled! 10Hz resolution with 1 Sec. pre-scaled, 1Hz resolution with 10 Sec. gate interval pre-scaled!

4 Built-in 5VDC regulator; input to 3-terminal regulator is accessible for use with 12VDC out-board PS. You can use this counter mobile.

5 Easy 6 hour assembly; all circuit broad tracks are pre-tinned, have drilled holes and are plated through! All I.C. sockets included - Makes trouble shooting a breeze.

6 Cabinet, plexy window and all necessary components included for easy, trouble-free assembly.

7 90-Day full coverage warranty.

Optional accessories TCXO time base yielding ½ PPM stability. $79.95

Optional 10 Sec. time gate resolution to 1Hz. $15.00. (Free with purchase of above TCXO)

Optional 12VDC power recepticle and cord assembly $15.00 (on preassembled counter only)

"HAVE IT YOUR WAY"

Complete kit or preassembled, burned in, and environmental chamber tested unit available for the commercial shop or modern ham shack.

KIT Model 600K 179.00 ea. **PREASSEMBLED & TESTED Model 600 AT 249.00**

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Digital Dial
Frequency Readout
(Optional).
Plug-in auxiliary VFO
or crystal oscillator
(Optional).

The transceiver that has everything you'll ever need!

ne 350-XL was designed to fill all the operating require-ents of the ham operator. Whether you operate fixed, ortable, or mobile, SSB, CW, RTTY, or SSTV, the 350-XL the perfect rig. It has the performance, versatility, and ower to give you everything you need all in a single, ompact, high quality transceiver.

/e deliberately made many of our special features such s the auxiliary VFO and the Digital Dial Frequency Read-ut optional so that every feature you could possibly want available, but you only pay for those that you use. We ven made our programmable selectivity filter an option, nabling us to lower the base price of the 350-XL to $895.

The Atlas 350-XL is the State of the Art in Amateur Radio Transceivers for the Next Decade, but available today at your ham dealer.

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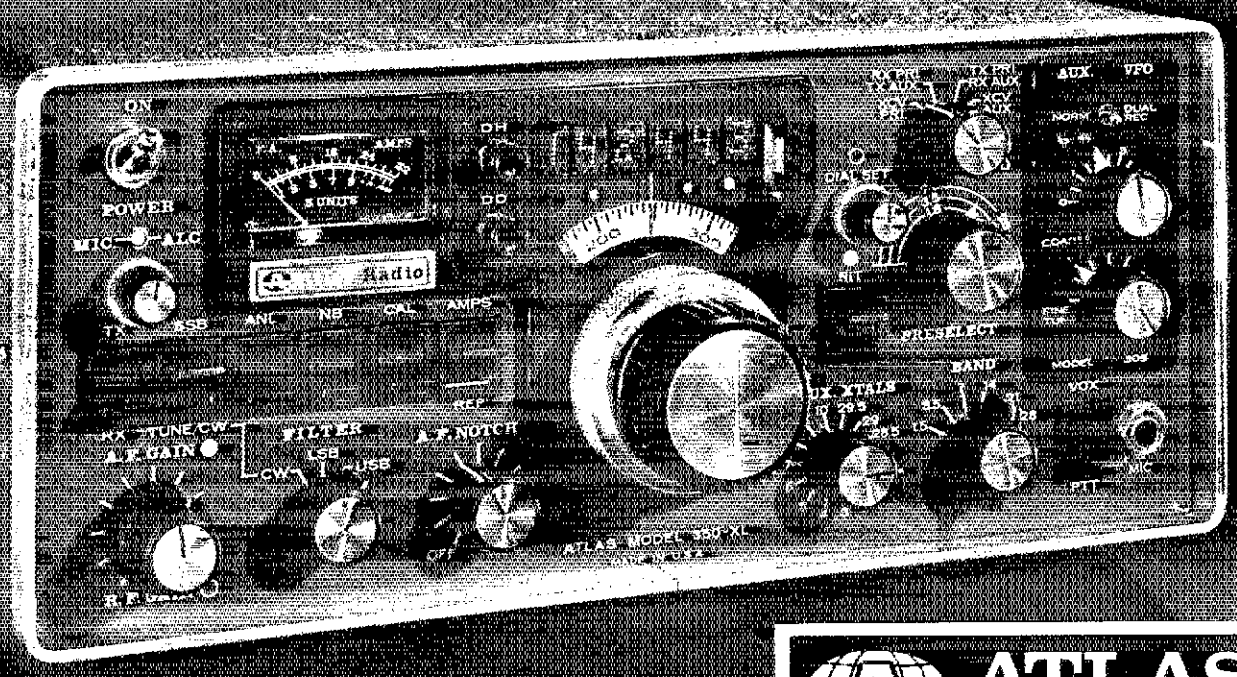
Model 350-PS Matching AC Supply	$195.
Mobile Mounting Bracket	$ 65.

Other optional features to be announced.

THE ATLAS 350-XL



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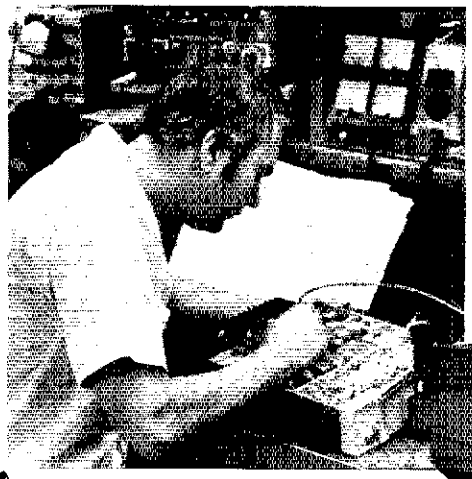

The complete program includes 48 lessons, 9 special reference texts, and 10 training kits. Also included are: your own electronics Discovery Lab, a new Antenna Applications Lab, an Optical Transmission System, CMOS Digital Frequency Counter, and TVOM. The course covers AM and FM Transmission Systems; Radar Principles; Marine, Aircraft, and Digital Electronics; and Mobile Communications. You must earn your first class radio telephone FCC license or you get your money back.

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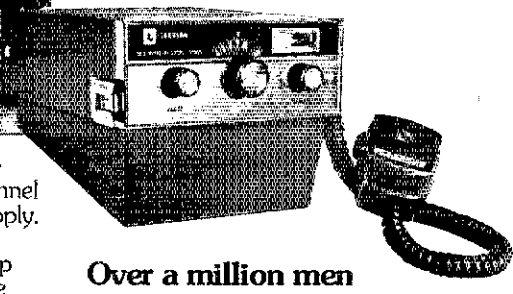

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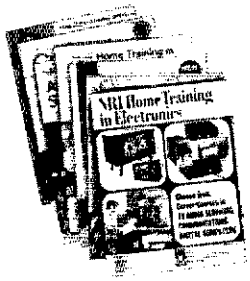

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All steel tubing is galvanized plated and conforms to ASTM specifications for years of maintenance free service. The SST-64 is made of 4 sections, being 4.5", 3.5", 2.5" and 2". These large diameters give unexcelled strength and virtually makes the thin push-up poles a thing of the past. The large loads of today's antennas make the Wilson SST-64 the best value on the market today.
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THE WILSON GT-46 GUYED CRANK-UP TOWER, 46 Ft.
The GT-46 features quality construction and materials, with the stability of the Guyed System.

FEATURES OF THE GT-46:
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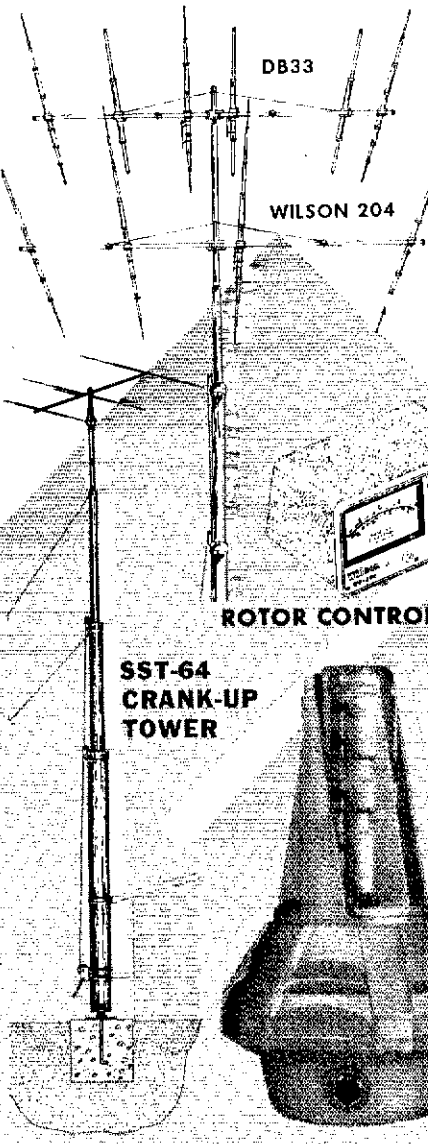

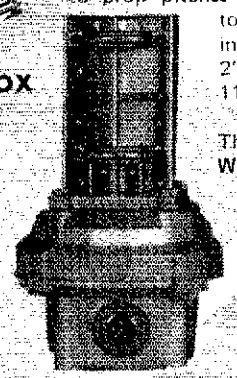

AMATEUR ANTENNAS

The Wilson 204 is the best and most economical antenna of its type on the market. Four elements on a 26' boom plus a Gamma Match (no balun required) make for high performance on CW & phone across the entire 20 meter band. The 204 Monobander is built rugged at the high stress points. Using taper swaged slotted tubing permits larger diameter tubing where it counts, for maximum strength with minimum wind loading.

The DB33 is the newest addition to the Wilson line of antennas. Designed for the amateur who wants a lightweight economical antenna package, the DB33 compliments the M204 for an excellent DXers combination.

All Wilson Monoband and Duoband beams have the following common features:
- Taper Swaged Tubing
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- Adjustable 52 Ω Gamma Match
- Quality Aluminum
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The Rotor everyone has been waiting years for — capable of the largest arrays up to 25 sq. ft.—Superior to prop pitches — Full 4,000 inch lbs. of turning torque. Braking system requires 12,000 inch lbs. before over-riding — accepts 2" - 3" masts — Weighs 60 lbs. — Size: 11" diameter, 19" high.

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The Wilson WR500 Rotor has 780 inch lbs. of turning torque before stalling.

In addition, a Special Braking System requires 1300 inch lbs. of torque before windmilling—This is more than twice the braking ability of the other comparable rotor being marketed.

Full 98 Steel Ball Bearing raceway assures elimination of side torque jamming when Rotor is mounted in line with the mast.

Recommended for antennas of 7.5 sq. ft. or less . . . weighs 20 lbs.

The WR500 Rotor . . $129.95 List

WILSON AMATEUR ANTENNA SPECIFICATIONS

Model No	Frequency	Boom Length (ft.)	Number Elements	Longest Elements (ft.)	Turning Radius (ft.)	Surface Area (sq. ft.)	Wind Loading at 80 MPH (lbs.)	Assembled Weight (lbs.)	Shipping Weight (lbs.)	Price
M340	40	40	3	70'0"	39'0"	15	300	180	220	$749.00
M620	20	58	6	36'0"	32'0"	10.5	210	98	123	420.00
M520	20	40	5	38'4"	27'0"	8.75	175	74	96	289.00
M204	20	26	4	36'4"	22'6"	6.8	136	42	48	169.00
M203	20	18	3	36'0"	20'5"	5.25	105	35	40	129.00
M155	15	26	5	24'3"	18'0"	5.0	100	41	44	159.00
M154	15	18	4	24'3"	15'8"	4.0	80	30	33	109.00
M153	15	12	3	24'3"	14'0"	3.0	60	21	24	89.00
M108	10	40	8	18'0"	22'0"	5.5	110	68	77	219.00
M106	10	31	6	19'0"	16'1"	4.0	80	34	38	119.00
M105	10	26	5	18'0"	15'8"	3.0	60	29	32	109.00
M103	10	11½	3	18'0"	10'0"	2.0	40	10	12	39.00
DB54	20	40	5	38'4"	27'0"	12.75	255	94	119	349.00
	15		4	24'3"						
DB43	15	19	3	24'3"	16'8"	6.0	120	38	43	149.00
	10		3	18'0"						
DB33	15	17	3	24'3"	12'2"	4.5	90	30	33	109.00
	10		3	18'0"						

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Your new GLB 200 will operate with any hand-held transceiver, with spurious outputs over *60 DB down!* Space does not allow us to show complete specs. here, but we're proud of them. Write us for more information, or to order your GLB 200. You want unlimited flexibility with your hand-held two meter transceiver, and GLB wants to hand it to you.

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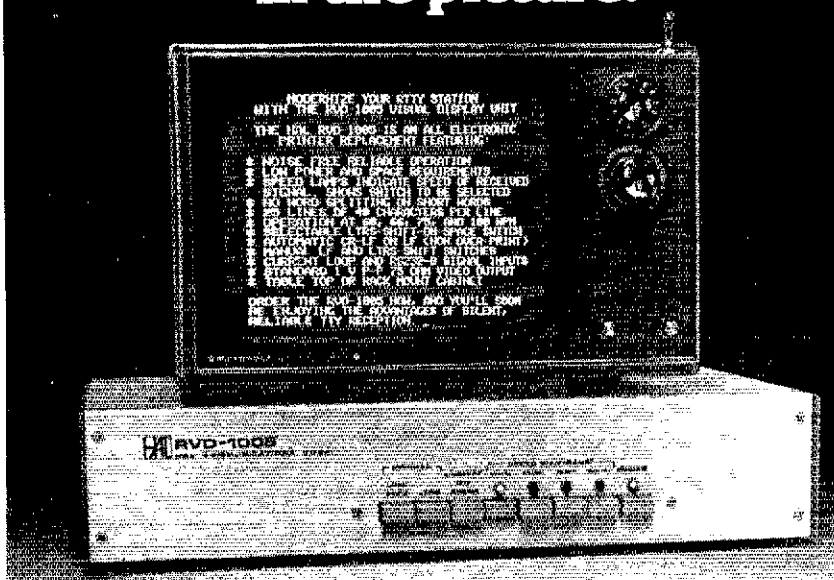

Picture the HAL RVD-1005 video TTY unit in your station. And start enjoying silent, trouble-free TTY reception.

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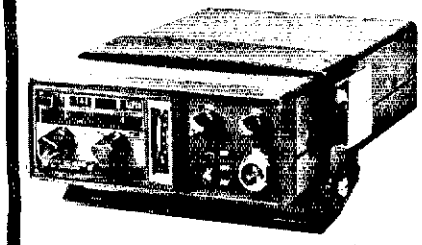

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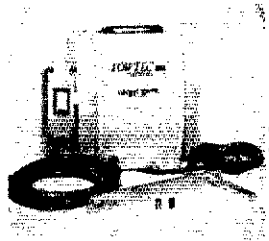

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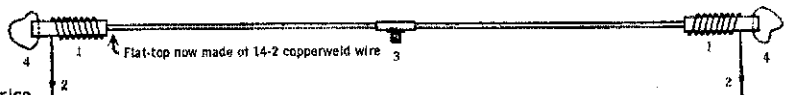

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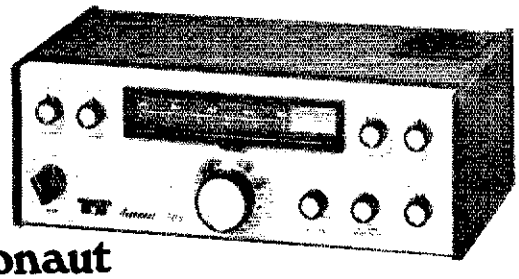

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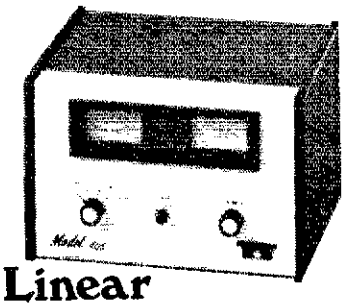

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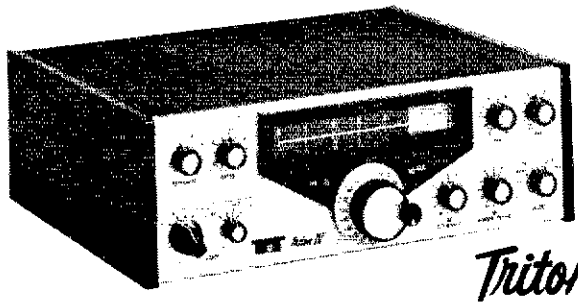

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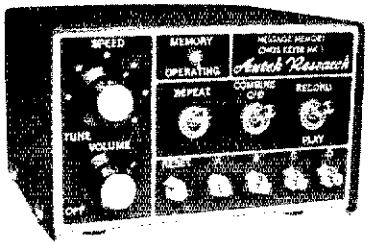

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- Designed for daily QSO's, not just contests.
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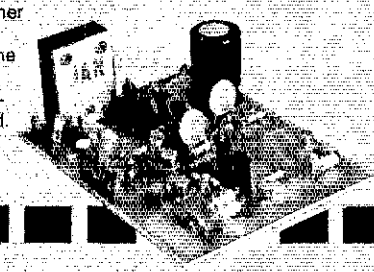
39.95 kit form
$49.95 assembled



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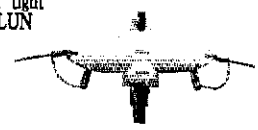

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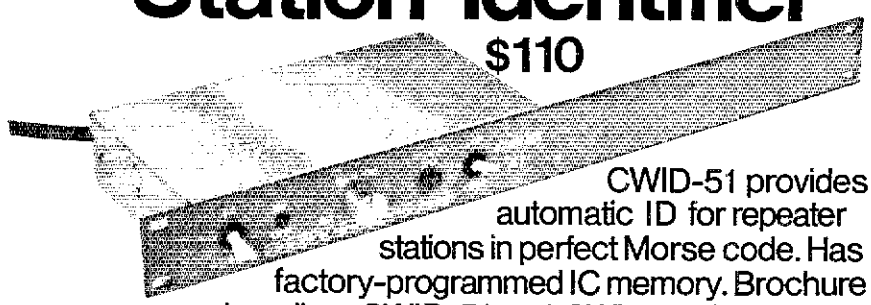

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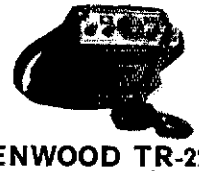

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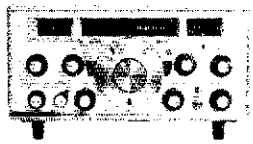

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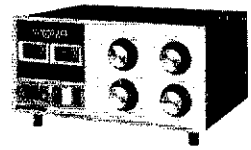

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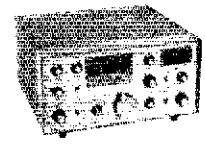

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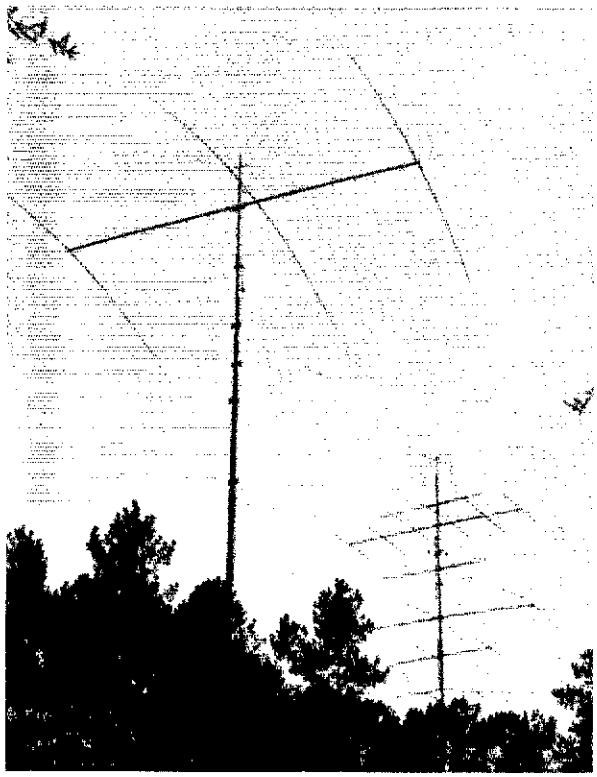

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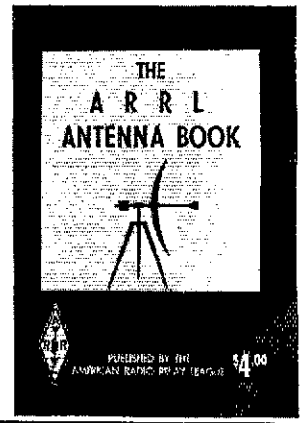

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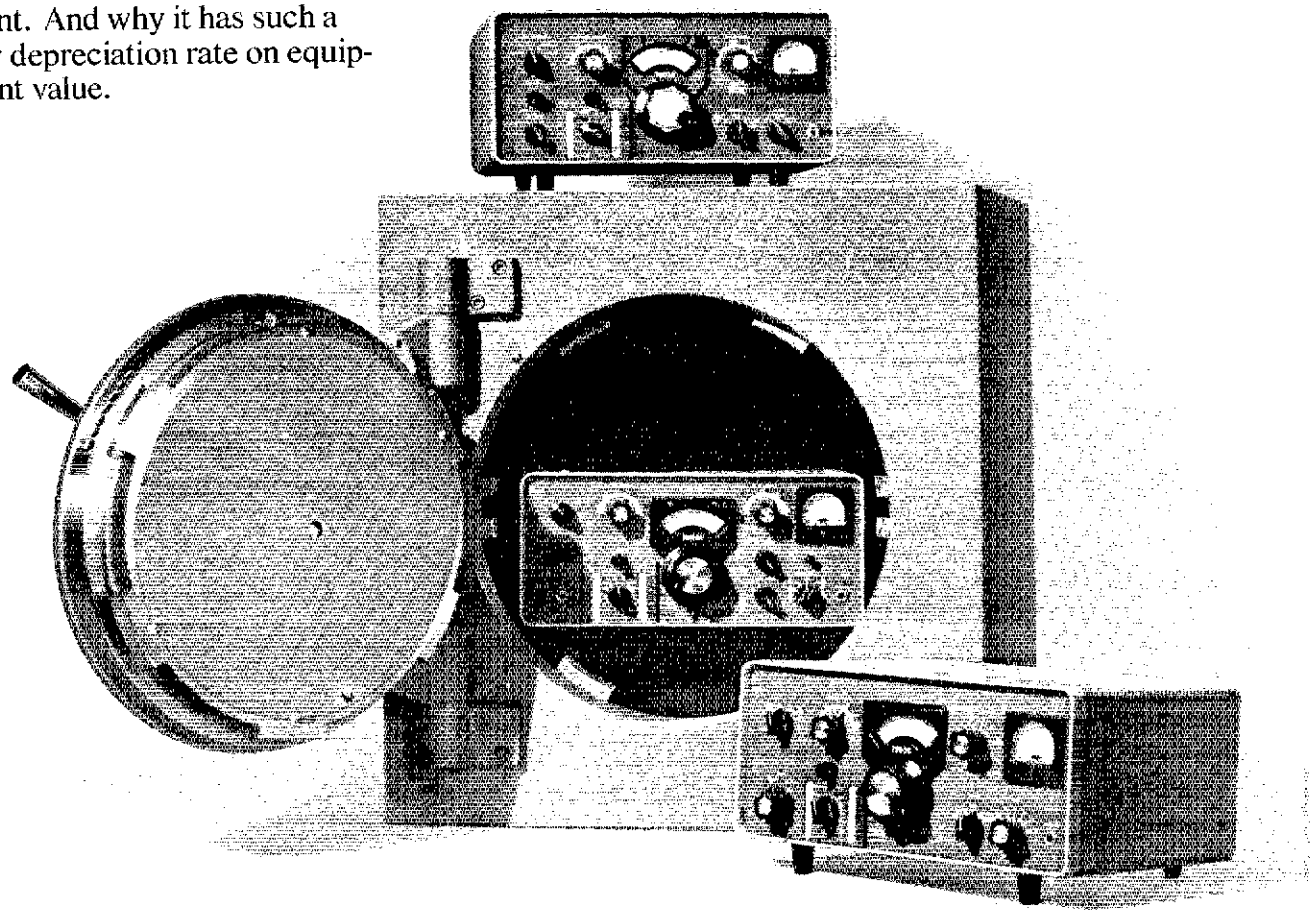

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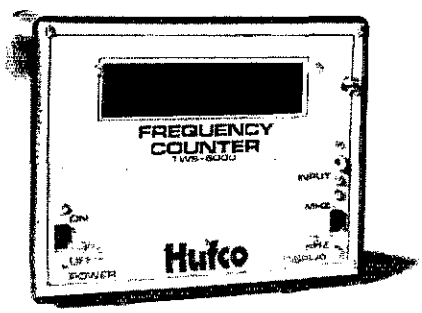

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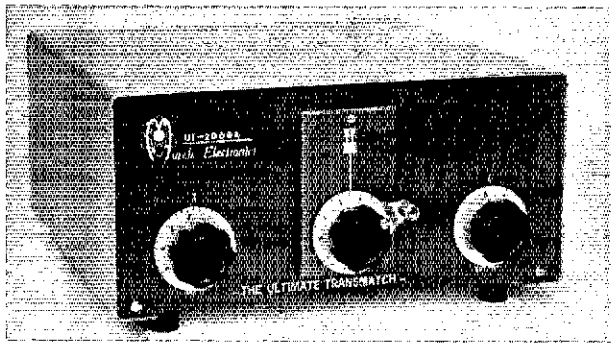

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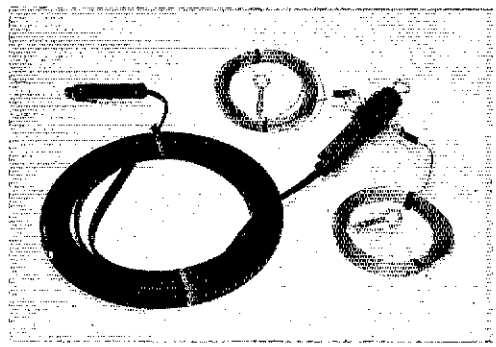

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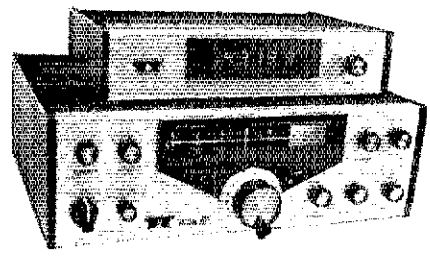

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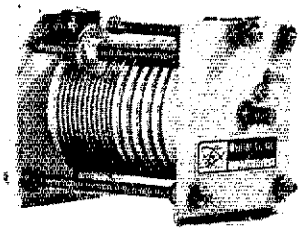
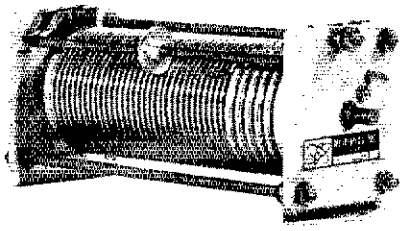


229-201



229-203

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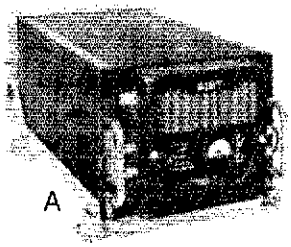

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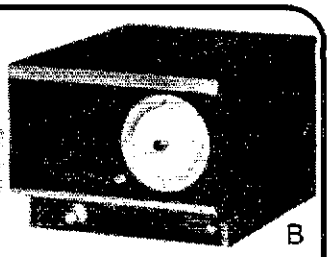

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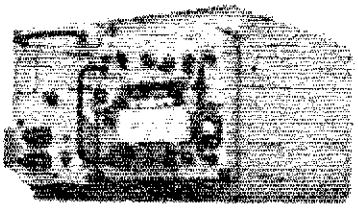

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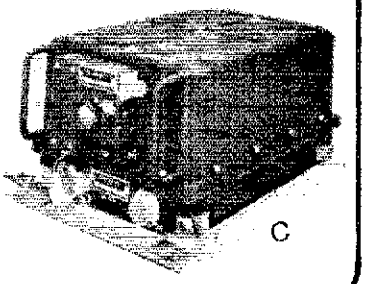

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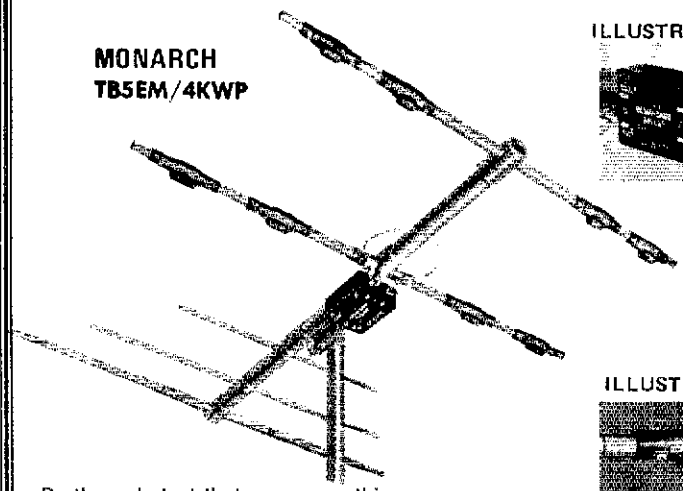

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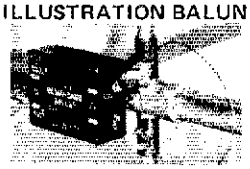
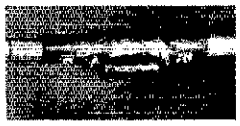


ILLUSTRATION TRAP



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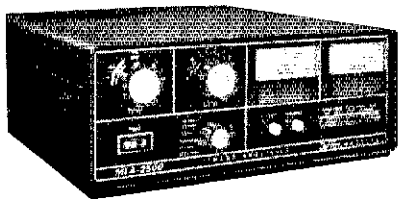

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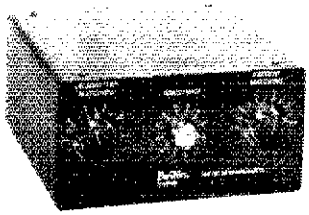

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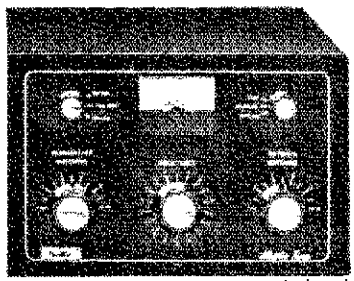

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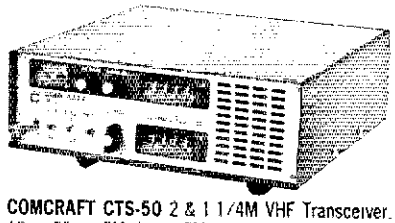

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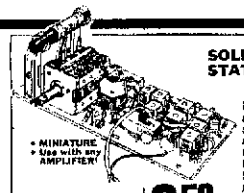

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FIRST TIME ever offered! Enjoy AM and FM broadcasts at a tremendous savings! Top quality compact construction, only 2½ x 6 x 2¼". Highly sensitive and selective, with excellent S/N ratio, sensitivity less than 5 μV for 10 db S/N. Tunes complete FM band from 88.5 to 108.5 mHz, and complete AM band from 540 to 1605 kHz. Features built-in AM antenna, 3 gang variable condenser, IF frequency of AM is 455 kHz, of FM is 10.7 mHz. Zero signal current 7.1 ma FM, 8.4 ma AM. Five stages: RF amp, mixer, and 3 IF stages. Slide switch selects AM, FM or FM-AFC. NOT A KIT! Completely wired and easy to connect to amplifier. Operates on 9-12VDC, Wt. 12 ozs.

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LM309H	3 for 1.19	LM703H	4 for 1.19
LM322N	3 for 3.00	LM709H	5 for 1.19
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Code H=TO5 case. V=Mini Dip, N=DIP.

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4" x 1" panels that glow blue-green with 110VAC. Use for site lites, indicators, etc. Cat. No. 4M3850.

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Unbelievable! Worth $50. High precision submini caps for all applications. Wt. 8 ozs. Cat. 4M3528

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Test lamp manufacturer dumps inventory! Worth 6½¢ ea. Like grain-o-wheat. Cat. No. 4M3526

BARREL KIT #200 9 DIGIT READOUT MODULES
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Cat. No. 4M 3515

BARREL KIT #188 400 Parts
$1.98
Includes resistors, caps, transformers, rectifiers, diodes, etc. for p.c. work. Preformed, dumped into barrels by factories. 100 %. Cat. No. 4M 3401

BARREL KIT #184 ¼-WATT METAL FILM
150 for $1.98
100 % metal film resistors. Long leads. 4M3413

BARREL KIT #182 JUMBO RED LEDS
15 for $1.98
100 % material, user cancellation from factory dumps. 3V 10 mils. For 10's of projects, red lens. Cat. No. 4M3369

BARREL KIT #167 ROMS-RAMS-REGISTERS
1-lb. $1.98
with approx count of 80 pcs. You get more, Mostly marked, mostly National. Some 40 pins. 4M3684

BARREL KIT #166 LONG LEAD DISCS
4 ozs. $1.98
No counting makes it so you get 150-pc. kit (approx). All marked, 100 %. Cat. No. 4M3089

BARREL KIT #163 MINI TRIM POTS
30 for 1 oz. $1.98
Asst. values 100 to 1 meg. What a buy. Single turn. ¼ W. Wt. 8 oz. 4M3345

BARREL KIT #5 SCRS, TRIACS QUADRACS
40 for $1.98
Raw factory stock! All the 10 amp types. Cat. No. 4M 2419 Untested.

BARREL KIT #159 MODULAR SWITCHES
25 for $1.98
Centralab switches. PY-makers assess. Dpdt, 6pdt, etc. Brand new. Cat. No. 4M3150

BARREL KIT #158 MAGNIFIED MAN-2's
12 for $1.98
MAN-2, 7-seg readout, with built-on magnifier. Factory discontinued line. 100 % material. Cat. No. 4M3325 7 ozs.

BARREL KIT #157 MOLEX CONNECTORS
75 for $1.98
12 ozs. Nylon, white cable connectors, asst. factory over-run NO PICKEE! Mixed in barrels. Cat. No. 4M3324

BARREL KIT #144 RCA PHONO PLUGS
40 for $1.98
1,000,000 RCA phono plugs for this one. You hi-fi-ers know what they are . . . 100 % material. 4M 3292

BARREL KIT #154 CLOCK CHIPS
20 for $1.98
We gathered an assortment of clock chip, alarm, calendar, beepers, who knows, all mixed. Cat. No. 4M3308

Back By Popular Demand!

BARREL KIT #142 75-PC TRANSISTORS
$1.98
100 % material, TO-92, factory discontinued. Includes pnp's mixed with guns. 2N4400-1-2-3-4. 4M3280

BARREL KIT #138 PANEL SWITCHES
30 for $1.98
Did you hear of OAK? Another export maker barrelled all types of rotaries, slide, etc. 4M3245

BARREL KIT #135 MICRO MINI LAMPS
20 for $1.98
1 oz.
Imagine! Micro size T-1¾'s with wire leads. 3 to 6 VDC, 40 mils. Worth 60¢ ea. Cat. No. 4M3259

BARREL KIT #134 MINI DIP ICs
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Large mfgr dumped 100's of lbs into barrels. Includes 741s, LM-380-8, 703, 567, 555, etc.—but who knows? Wt. 1 lb. 4M3248

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Type	Sale	2 For
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SN7403N	.16	.17
SN7404N	.16	.17
SN7405N	.18	.19
SN7406N	.20	.21
SN7407N	.25	.26
SN7409N	.18	.19
SN7410N	.16	.17
SN7411N	.25	.26
SN7413N	.45	.46
SN7417N	.32	.33
SN7420N	.16	.17
SN7421N	.29	.30
SN7423N	.35	.36
SN7425N	.27	.28
SN7430N	.16	.17
SN7437N	.26	.27
SN7438N	.26	.27
SN7440N	.16	.17
SN7441N	.84	.85
SN7442N	.83	.84
SN7445N	.69	.70
SN7446N	.79	.80
SN7447N	.79	.80
SN7448N	.76	.77
SN7450N	.16	.17
SN7451N	.16	.17
SN7454N	.16	.17
SN7464N	.16	.17
SN7470N	.45	.46
SN7472N	.34	.35
SN7473N	.36	.37
SN7474N	.31	.32
SN7475N	.49	.50
SN7476N	.31	.32
SN7478N	.79	.80
SN7482N	.69	.70
SN7486N	1.95	1.96
SN7490N	.44	.45
SN7491N	.73	.74
SN7492N	.47	.48
SN7493N	.47	.48
SN7494N	.78	.79
SN7495N	.78	.79
SN7496N	.72	.73
SN74100N	.98	.99
SN74106N	.65	.66
SN74107N	.33	.34
SN74112N	.65	.66
SN74113N	.65	.66
SN74114N	.65	.66
SN74121N	.38	.39
SN74123N	.59	.60
SN74125N	.59	.60
SN74126N	1.00	1.01
SN74132N	.89	.90
SN74141N	.89	.89
SN74145N	.69	.70
SN74148N	1.29	1.30
SN74150N	.99	1.00
SN74151N	.70	.71
SN74153N	.65	.66
SN74154N	1.03	1.04
SN74155N	.70	.71
SN74157N	.70	.71
SN74158N	.85	.86
SN74160N	.88	.89
SN74161N	.88	.89
SN74162N	.79	.80
SN74165N	.89	1.00
SN74173N	1.39	1.40
SN74174N	.97	.98
SN74175N	.89	.90
SN74176N	.79	.80
SN74177N	.79	.80
SN74181N	2.05	2.06
SN74184N	1.75	1.76
SN74185N	1.75	1.76
SN74190N	1.15	1.16
SN74191N	1.05	1.06
SN74192N	.87	.88
SN74193N	.83	.84
SN74195N	.73	.74
SN74196N	.88	.89
SN74198N	1.49	1.50
SN74199N	1.49	1.50
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SN74281N	1.09	1.10
SN74284N	5.95	5.96
SN74285N	5.95	5.96

BARREL KIT #131 TANTALUM ELECTROS
30 for $1.98
Mixed, marked prime, top grade asst. values, voltages. Cat. No. 4M 3255

BARREL KIT #128 MINI DIP ICs
75 for $1.98
Large mfgr dumped 100's of lbs into barrels. Includes 741s, LM-380-8, 703, 567, 555, etc.—but who knows? Wt. 1 lb. 4M3248

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BARREL KIT #126 UPRIGHT ELECTROS
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BARREL KIT #112 MICRO MINI LEDS
40 for $1.98
All the tiny leds, axial, upright of Monsanto, Litronix, variety of colors. Yield 60 % or better. 4M 3132

BARREL KIT #109 TERMINAL STRIPS
100 for $1.98
Wide asst. of terminal strip connectors, from 1 contact up. Strip manufacturers barrel dump in your gain. Wt. 1 lb. Cat. No. 4M 3136

BARREL KIT #104 SLIDE VOLUME CONTROLS
10 for $1.98
Cat. No. 4M1057

BARREL KIT #101 RESISTOR SPECIAL
200 for $1.98
Includes: ⅛, ¼, ½, 1, 2-watters, carbon, 8 oz. 100 % good. 4M3054

BARREL KIT #99 PHOTO ELECTRIC CELLS
10 for $1.98
Asst. cds types, CdS types. Mixed by factory. Big lot, for us to separate. 100 % good. Cat. No. 4M 3052

BARREL KIT #93 HALF WATTERS
200 for $1.98
Resistor factory tried to fool us by mixing 100 % wirewounds resistors in barrel. But value is there. 4 oz. 4M3046 Untested

BARREL KIT #92 3 AMP EPOXY RECTIFIERS Untested
100 for $1.98
Cosmetic rejects, electrically fine businessa! You check 'em, It's not for us! Asst. voltages. 4M 3204

BARREL KIT #91 SILVER MICAS
100 for $1.98
Axial, red case, variety of physical sizes & values. Cat. No. 4M3018

BARREL KIT #88 LITRONICS LED READOUTS
10 for $1.98
11, 8, 7.62 mm angles, triples, etc., .03 to 0.6. Bot from factory, all mixed, have fun! No. 4M 2861

BARREL KIT #87 NATIONAL IC BONANZA
100 for $1.98
Types 8000, 400 series, DTLs, RAMs, registers, clock & calc. chips, unsure, etc. Cat. No. 4M 2580 Untested.

BARREL KIT #86 HOBBY LEDS
40 for $1.98
Untested
747's, 727's, singles, triples, etc., .03 to 0.6. Bot from factory, all mixed; have fun! 4M2855

BARREL KIT #83 LM-340T VOLT REG
15 for $1.98
Factory rejected them for length of leads. May include 5, 8, 12, 15, 18, 24 volts. Power tab. Cat. 4M2635

BARREL KIT #81 SUBMINI RESISTORS
200 for $1.98
PC, upright type, color coded, ¼ watt. Asst values. Came to us in a barrel. Cat. No. 4M 2746 100 % good

BARREL KIT #76 1-WATT ZENERS
100 for $1.98
Factory same as 400-mw's. Never-to-see-again offer. 8, 8, 10, 12, 16V, under glass. Double plug. Cat. No. 4M 2741 Untested.

BARREL KIT #72 TRANSISTOR ELECTROS
50 for $1.98
We don't wish to separate wide asst voltages & values up to 300 mf. Cat. 4M2747

BARREL KIT #71 CAPACITOR SPECIAL
100 pcs. $1.98
Micas, molded, plastics, ceramics, discs, etc. Nifty 100 % good Cat. No. 4M 2738

BARREL KIT #68 2 WATTERS
100 for $1.98
100 % good.
Suppliers throw 'em in the barrel. It's a h'l gold mine. All marked. Cat. No. 4M 2735

BARREL KIT #65 MIXED READOUTS
10 for $1.98
Factory returns — such numbers as MAN-4's, MAN-7's, MAN-8's. 11 barrels & no time to separate. Cat. No. 4M 2733 Untested.

BARREL KIT #61 POLYSTYRENE CAPS
100 for $1.98
Finest caps made. As a gamble we bought 10 barrels from factory, mixed values; all good. Cat. No. 4M 2729

BARREL KIT #58 SLIDE SWITCHES
30 for $1.98
All shapes, sizes, spst, dpst, momentaries, etc. Tremendous shop pak for 100's of switching projects. Cat. No. 4M 2726 100 % good

BARREL KIT #56 POWERS! POWERS!
$1.98
100 for
Large distributor cleaned house. Barrels of power resistors 3 to 7 watts. Cat. No. 4M 2724

BARREL KIT #54 8 DIGIT READOUTS
10 for $1.98
Bargain of a lifetime! All we got was 1 barrel — the cylinder digit" types. Multiplexed. Cat. No. 4M 2722

BARREL KIT #40 PNP HIGH-POWER TRANSISTORS
20 for $1.98
Popular germanium 10-3 case 4M 2618 100 % good.

BARREL KIT #39 2N3055 HOBBY TRANSISTORS
15 for $1.98
Fallouts of the famous 2N3055. 4M 2617 100 %

BARREL KIT #37 1 AMP "BULLETT" RECTIFIERS Untested
100 for $1.98
Famous style, assid. voltages, silicon, axial includes all types of voltages to 1KV. Cat. No. 4M 2615

BARREL KIT #36 GERMANIUM DIODES
200 for $1.98
Untested
Famous maker, popular types. Never grows old. But this is the way the RE-TESTERS buy 'em from the factories. Cat. No. 4M 2614

BARREL KIT #35 NEON LAMPS
30 for $1.98
100 % good.
Famous NE-2's. All prime, but factory made millions and barrel'ed 'em. Your advantage Cat. No. 4M 2613

BARREL KIT #31 METALLIC RESISTORS
100 for $1.98
Made mostly by Corning, the rest made. Mostly ½ watters. 1% to 5 % tol. & a barrel of values. Cat. No. 4M 2609

BARREL KIT #30 PREFORMED RESISTORS
200 for $1.98
We got barrels of ¼ and ½ watters for us use. 100: ¼, 100 ½ watters. No. 4M 2608 100 % good

BARREL KIT #27 PREFORMED DISCS
100 for $1.98
Hi-Fi mfr's shelf inventory but he dumped 'em in barrels. Preformed, for PC use. Mixed values too! 4M 2605

BARREL KIT #26 PLASTIC TRANSISTORS
100 for $1.98
Untested.
Type TO-92 (TO-18), all manufacturers, variety of 2N #'s. Cat. No. 4M 2604

BARREL KIT #25 METAL CAN TRANSISTORS
100 for $1.98
Includes TO-5, TO-1, TO-18, etc., assorted 2N numbers, unmarked etc. Cat. No. 4M 2603 Untested.

BARREL KIT #20 LONG LEAD DISCS
100 for $1.98
"suction sale"... Prime, marked only. Long leads. Cat. 4M 2598 100 % good

BARREL KIT #19 DIPPED MYLARS
60 for $1.98
Finest capacitors made, shiny finish. Imagine factory dumping 'em in barrels. Cat. No. 4M 2597 100 % good

BARREL KIT # 3 1N4148/914 SWITCHING DIODES
100 for $1.98
Imagine famous switching diodes at these prices! Cat. No. 4M 2418 Untested.

BARREL KIT #2 LINEAR OR AMPS, DIPS
75 for $1.98
Untested
May include 709's, 741's, 703's, 560 series, 565 includes 4M 2416

BARREL KIT #1 SN7400 DIP IC'S.
75 for $1.98
Marked 14 and/or with 16 pin dips, may include gates, registers, flip flops, counters. 4M 2415 Untest

BARREL KIT #14 PRECISION RESISTORS
200 for $1.98
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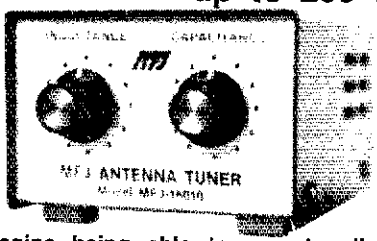

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Imagine being able to operate all bands — anywhere, with virtually any transceiver — using a simple random wire and an antenna tuner small enough to carry in your hip pocket. Size is only 2-3/16 x 3-1/4 x 4 inches.

Operate from your apartment with a makeshift wall to wall antenna. Tune a simple vertical for low angle, DX operation. Operate from your motel room with a wire dropped from a window. Tune out the SWR on your mobile whip. Enjoy ham radio on a camping or backpack trip with a wire thrown over a tree. Prepare for an emergency. Take it on a DX expedition or use it for Field Day.

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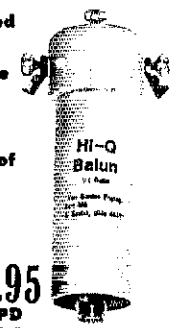

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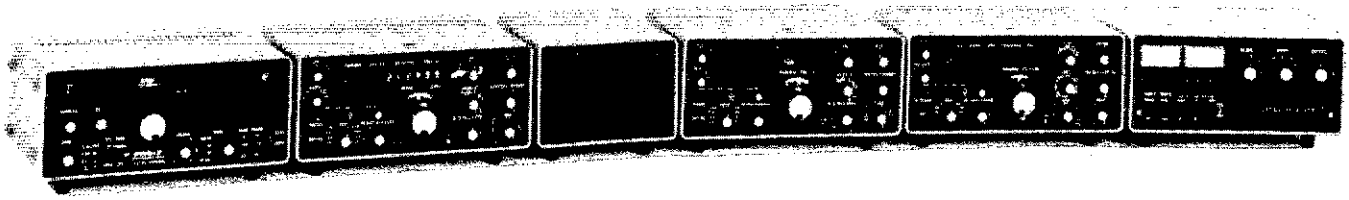
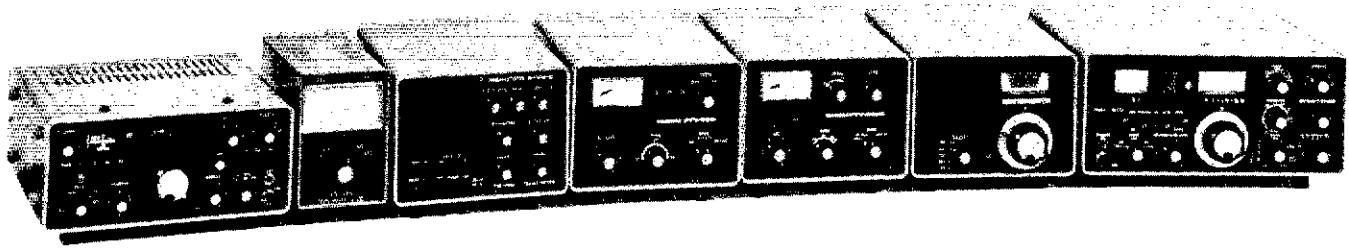
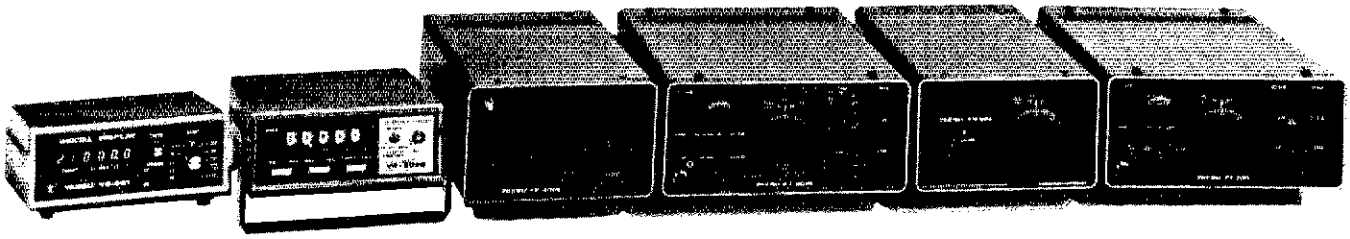


Left to right – FRG-7, Solid State Synthesized Communications Receiver • FR-101 Digital, Solid State Receiver • SP-101B, Speaker • FR-101, Digital Solid State Receiver • FL-101, 100 W Transmitter • FL-2100B, 1200 W PEP Input Linear Amplifier



Left to right – FT-620B, 6 Meter Transceiver • YP-150, Dummy Load Wattmeter • YO-100, Monitor Scope • FTV-250, 2 Meter Transverter • FTV-650, 6 Meter Transverter • FV-101B, External VFO • FT-101E 160-10 M Transceiver



Left to right – YC-601, Digital Frequency Display • YC-355D, Frequency Counter • FP-301, AC Power Supply • FT-301S Digital, All Solid State Transceiver • FV-301, External VFO • FT-221, 144-148 All Solid State All Mode Transceiver

YD-844
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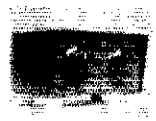

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Model	PRICE	Outputs	Connector Placement	Remarks
375	18.95	6	Axial	PROTAX switch. Grounds all except selected output circuit.
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561A	17.50	2	Radial	Special 2 pole, 2 position switch used to switch any RF device in or out of series connection in a coaxial line. See figure (over)
556	.95	-	-	Bracket only, for wall mounting of radial connector switches.
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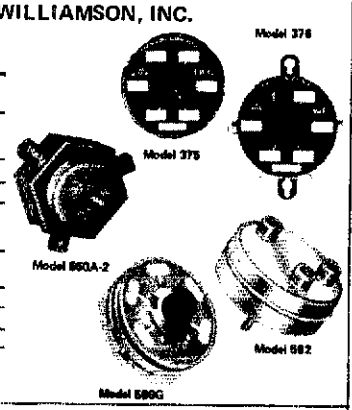
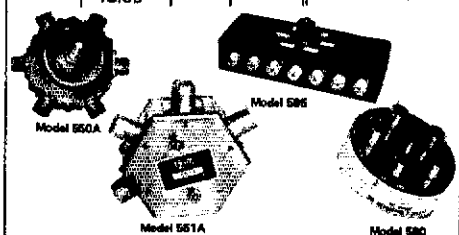
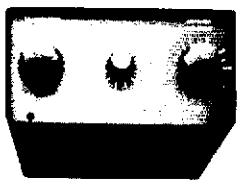
590G	17.95	5	Axial	Grounds all except selected output circuit.
592	16.50	2	Axial	
595	18.50	6	In-line	Grounds all except selected output circuit.





DENTRON



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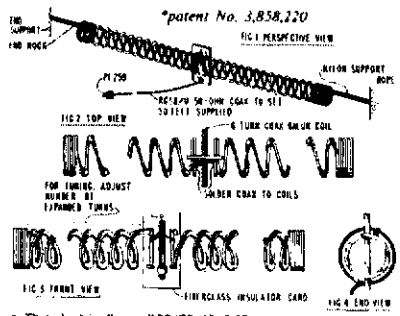

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ROCHESTER Hamfest 1977 & NY State ARRL Convention is May 20-22. Names added to mailing list for information — write: Rochester Hamfest, Box 1388, Rochester NY 14603.

HAMFEST — Princeton, Illinois, June 5, 1977. Mail S.a.s.e. for information, after April 1, to Starved Rock Radio Club, W9MKS/WR9AFG, RFD 1, Box 171, Oglesby IL 61348. 815-667-4614.

W6LS 12th Los Angeles Amateur Radio Convention. Saturday and Sunday, May 21 & 22. 2814 Empire Avenue, Burbank CA 91605.

KANSAS City: Eighth Annual Missouri Hamfest, April 23, 24, 1977, at Exhibit Hall 2, Municipal Airport. Forums, swap tables, commercial exhibits, contests, YL-XYL program, free parking. Banquet Saturday evening at world famous Gold Buffet with ARRL president Harry Dannals as guest speaker. Preregistration, $2. door, $2.50; preregistration with banquet, $8 Info: PHD, P. O. Box 11, Liberty MO 64068.

THIRD Annual Northwestern Pennsylvania Hamfest May 7 Crawford County Fairgrounds Meadville, PA. Free Admission Flea Market begins 10 A.M. $2 to display. Refreshments Commercial displays welcome. Indoors if rain. Talk-in 146.04/64 and 146.52. Details C.A.R.S. P. O. Box 653 Meadville PA 16335.

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CENTRAL Electronics multiphase rf analyzer (model MM-2) schematic or manual needed. KH6GSH, Box 431, Aiea, HI 96701.

CASH for a ssb transceiver or transmitter and receiver needing repair. W9HF, 509 Roxbury, FT. Wayne, IN 46807.

WANTED 40-60ft self supporting tower, legal limit linear, transmatch. W6QV 913 Westmont Dr. Alhambra CA 91803 213-281-7298.

RUGGED 2 kw PEP linear (8877 Triode) — $600 without power supply; filtered dc power-supply, continuously-variable 0-4000VDC with oil-filled capacitor and solid-state rectifier — $600; Tempo RBF-1 wattmeter hardly used — $35; audio amplifier/filter 500 cycle — $20; 3-100Z Triode with chimney — $100; Shure 404-C microphone — $22; Collins 75S-1 receiver in excellent condition — $225; offers welcome. WA6DUG — 785 Radcliffe Ave., Pacific Palisades CA 90272 or call Dr. Dantes 213-459-2440.

SELL: Tempo one, ac-power supply, speaker, 3-27 MHz crystals, 10 weeks old. "Mint." $500. Bobby L. Benningfield, Route 1, Elkhorn, KY 42733.

SELL 72 foot Heaviest self-supporting Tristao tower (TMS 771) with refurbished motor drive. Supports 40 square feet of antenna surface in 60 mph winds fully extended. New BTS base and template, new cable, new work platform. Also sell 54 foot heavy duty Trlex guyed tower and Ham-M rotator. S.a.s.e. for prices & details — W6CY — Frank Melcher 521 N. West St., Anaheim, CA 92801.

WANTED — TBX-8 xmtr receiver and other type gear. Ray Fantini 1715 S. State St., Dover, DE 19901.

WANTED: Heath HW-101 or SB-102 send price and condition. WA4DIL Jim Metzler, RD no. 7, Elizabethton, TN 37643.

TS-820, VFO-820 and cw-filter $950. K8CVV, 313-549-2353.

AMPLIFIER — 3-1000-Z with power supply built for continuous duty — High Power — send request for detailed description — All queries answered — K7BV 4091 W. Redwing St. Tucson AZ 85704 602-297-0434.

FOR SALE — Mint condition — Heath HD-1410 electronic keyer $35 — Pick up only. Nicholas Lefor, W1DB, 2A Knollwood Acres, Storrs, CT 06268, 203-429-7062.

COLLINS 75S-3B Round Emblem, excellent. Best offer over $750. K2KIR, 315-468-0940.

HEATHKIT — HW8 QRP + p/s mint. Serviced by Heath $110. K2UQC. 201-349-0938.

WANTED: Heath HW-16 with vfo in very good condition, WB9GYI RR1 Box A-79, Chillicothe, IL 61523.

SELL: Collins 75S-3 $425, 32S-3 $775, 516F2 $100, 62S-1 $800, Hal ST-6 RTTY demodulator $290. Regency HR-2B with 12 sets crystals scanner and preamp $200. W3JW 1098 Mountain Rd., Pasadena, MD 21122, 301-437-0171.

HEATH HR10B, new, manual, crystal calibrator, you build — $60. WB3DAW, 1804 Ladd Street, Silver Spring, MD 20902.

2 METER FM station: Drake TR22C; 24 stals; 10w Amp; 5A supply, 4 el beam. $340. Electronic keyer: Elco 717, chrome vibroplex. $80. All mint. ARC 5, $6. WA2OVG, 212-796-8617.

BIRD Coaxwitch coaxial switches types 74 (6-position) and 718 (8-position), DC to 10 GHz, low VSWR. If new over $125. each, used in good condition $20. each postpaid. Will ship type on hand unless you specify. Dial plate and/or knob included while available. R. Combs, Box 231, Cedar Grove, NJ 07009.

SELL: FT-101B with hand mic, fan, ac & dc power cords, new finals, fan. All excellent. Can schedule. First money order/certified check for $465. Shipped registered mail. Jim Gulvin, HL9VA, Det 2 621 TCS APO SF 96455.

TS-820 $750. Jerry Holmes, 17 High Field Lane, Madison CT 06443.

HEATHKIT SB-303 mint, cw filter, and SB-600 speaker. Used less than one year. EV model 638 mike also included. $275 — plus shipping. WB2ACB, Chuck Tremblay, 3720 Woodlawn Terrace, St. Joseph, MO 64506.

YAESU FT301S like new. With VOX, sidetone and calibrator options. Early version, ssb and cw only, $450. FP301S ac power supply/speaker $50. Jerry Kavanaugh K6IG 185 E Street, San Bernardino CA 92401 714-889-2569.

SELL Communicator III with 50 watt amplifier $125; Model 15 teleprinter converter and table $150; Model 26 teleprinter $50. cannot ship. WA2FZH 201-634-3574.

NCX-3 National — 3band transceiver. Excellent. New finals, with AC-1 supply, $160. WB2HFE/0 298 Riverwoods Lane, Burnsville, MN 55337 612-890-7512.

DRAKE SW4A with matching speaker. $350. new, mint. Sacrifice at $195. F. Roney 71 Pine St., Waverly, NY 14892.

WANTED Hallicrafters SX122. Must be mint Von D. Stafford, 8316 Denise Dr. Louisville KY 40219 502-969-5414.

SELL: HW-7 in good condition, with manual. $45. WA9MQM 1611 Canterbury, Joliet, IL 60436.

SELL HQ160 $120. H$120. HP-35 Calculator $60. K9UKX 51625 Chestnut Road Granger, IN 46530.

WANTED Collins 32V3, 75A3 in good condx. W9VHN, 8101 S. Kilpatrick, Chicago IL 60652.

DRAKE R-4C — $420. Very good condition. Includes optional 250 Hz, 500 Hz filters; crystals for 160M, 10M cw, WWV. I'll pay shipping via UPS. Rick Kuester, WB9AWY. 1002 Montoe, Wauconda, IL 60084. Tel. 312-526-8057.

WANTED: Modern Electrics; Electrical Experimenter and Science and Inventions Magazines 1911 through 1920. Radio News for July 1926. Will buy bound volumes or trade. K7NER, Jacks, 172 Freihage Dr., NE Sierra Vista, AZ 85635.

SWAP like new IBM selectric II typewriter for 32S3A or 75S3C or TS-700A or TS-820 or FT221 or IC-211 or FT-101-E. New 4CX250B $20 ea. Used Collins f455f15 $50 ea. New 2N1049A $2 ea. Write A. Bruno, 24 Butternut Dr., New City, NY 10956.

SELL Collins 75A2 & 32V1. Both in mint condition. Bill Presley, 1600 Chapman Ave., Huntsville AL 35811.

COLLINS KWM-2 (serial 13565) $700 with 516F2 power supply — speaker; 75S3 with 200 cycle filter (serial 14683) $435; Drake 2-C/2-AC $170. All excellent, manuals, F.O.B. K6SRM 272 Fourth St. East, Sonoma, CA 95476.

SALE: Two Hammerlund HQ-180 receivers. Good condition. Will ship collect for $300 each. 605-336-2750 Paul White, W9KSK days.

SIGNAL/ONE Repairs. 505-522-3705.

HEATHKIT HW-16, HG-10B, Homebrew Transmatch — $140. 723 Eico xmtr 10m-80m — $50. Hallicrafter rcvr SX-101A — $140. Hallicrafter MA-1 keyer — $50. All mint, cond. prefer local. WA2YVU — 212-991-7226 after 6 P.M. EST.

NEW HR220 $150. FM27B excellent $250. EB34 old but good $200. Frank Merceret, WB4BBH 6491 S.W. 43rd St. Miami FL 33155.

COLLINS S-Line station for sale. All mint condition. 75S3B receiver, just completely aligned; 32S3 transmitter, brand new 6146B's, with 516F-2 power supply; 30L1 Linear with brand new 811A's; 312B-4 station console (patch, wattmeter, speaker). All cables, All manuals. $2100. Firm price, UPS-insured. K4GOS, 813-443-6659, 1142 N.E. Cleveland St., Clearwater, FL 33515.

WANTED: National HRO speaker, National one-ten receiver, and other 1930's National equipment. Also want pre-1930 QSTs. Paul Kluwe, Edmore, MI 48829.

WANTED — 20A and/or 10A Central Electronics Exciter. Send price and condition to WB6ALC, Box 332, Covina, CA 91723. 213-339-9372.

COLLINS 75S1 mint condition $340. Phil Finnegan, 47 Glenmere Dr., Chatham, NJ 07928. 201-635-9423.

RARE! Drake TR-6 six meter transceiver, 300 watts PEP SSB, a-m & cw, noise blanker & VOX. MS-4 ac supply/speaker, Waters 373-6 Cavity Filter, 4 element Hy-Gain beam. All in like new condition with manuals. Can be seen in operation. Best offer. Carl Zaruba, WA9NRI, 780 Hillside, Elmhurst, IL 60126. 312-832-2539.

ART-13 power supply — 1650, 400, 28VDC, 28VAC, finest components, Bud Cabinet, $75. New Peerless Transformer, 4720VCT, 900ma, $65. W5ETM, 7021 Edwina NE Albuquerque, NM 87110.

DRESS up your station with your call sign cut in handsome hardwood plaque 15 X 5 X 3/4-inches. Ideal to hang on shack door or wall $6.95 postpaid $7.95 in Canada. Bob WB7CDF Box 172 Logandale, NV 89021.

HALLICRAFTER FPM300 mint, original carton, car mount, cw filter, all crystals. $495. Will ship at my expense within USA. W2PDM, S. Casper, 5 Pippin Lane, Lloyd Harbor, NY 11743.

TEKTRONIC Scope type 531, with 53/54C Dual-Trace, and 53/54B wide-band plug-in calibrated amplifiers, two P6006 probes, manual, new CRT — like new condition. $595. firm. Prefer pickup buyer. KILON, 3 Beechwood Road, Norwalk CT.

SALE: 18-AVQ 80-10m vertical antenna. Heathkit base mike, SB-640 LMO, HD-10 keyer, RCA moblie mike, Vibroplex paddle, Bean filter , Best offer: WA3UKB/5, 116 Kingston Dr., Slidell, LA 70458.

WANTED — Collins 75A2 receiver. Leland Smith, W5KL, Jasper, AR 72641.

WANTED — Old receivers, transmitters, parts era 1920-30. Also call books in the 30s. Leland Smith, W5KL, Jasper, AR 72641.

SELL Telrex model 20m-536 wide spaced super-Deluxe 5-element beam, also Telrex model 20m — 326 optimum-spaced 3-element beam. All mounting hardware, baluns and instructions included — W6CY — Frank Melcher, 521 N. West St., Anaheim CA 92801.

HARDLY used factory alligned SB-102, SB-600, HP-23A $300. WA4AEB Box 1246 Tryon NC 28782.

TEN-TEC, Swan, Icom, Hygain, Cushcraft, Standard, Nye-Viking. Trades accepted. Art WB2YPP, Lee WA2ACF Stereo Repair Shop 3206 Erie Blvd. E. Syracurse, NY 13214 315-446-2266.

WANTED General Radio 1606B radio frequency bridge complete and in good order Richard McCurdy, Contentment Island, Darien CT 06820.

SELL: SSTB Robot model 70 monitor, like new, ship via UPS COD $175. Finnegan, 214 S. Rhode Island, Mason City, IA 50401.

NEED Central Electronics 20A. W7KIZ, 1402 Craig, Moses Lake, WA 98837.

FOR Sale: Lampkin 107-C signal generator — frequency meter. Complete. Mint. $2000. Cashier's check only. Will deliver UPS. Richard Matassa. 225 E. Irving Park. Roselle, IL 60172.

WANTED — Lafayette Semi-automatic bug in good condition. John G. Hall, RFD No. 1, Box 264, Port Allegany, PA 16743.

STOP Looking for a good deal on amateur radio equipment — you've found it here — at your amateur radio headquarters in the heart of the Midwest. We are factory-authorized dealers for Kenwood, Drake, Collins, ICOM, Ten-Tec, Tempo, Atlas, Regency, Swan, Midland, Alpha, Standard, Dentron, Hy-Gain, Mosley, Cushcraft, and CDE, plus accessories. For the best deal around on Hf or VHF gear, write or call us today for our low quote and become one of our many happy and satisfied customers of Hoosier Electronics, P. O. Box 2001, Terre Haute, IN 47802. 812-238-1456.

ATWATER Kent model 20 radio — make offer. RCA 10J104 color test jig, like new $85. W2ACC, Horace Brokaw Neshanic Station, NJ 08853 201-369-4200.

FOR Sale: Yaesu FT101B transceiver, mint condition with cw filter and cooling fan. $550 plus shipping. WB9GYI, RR1 Box A-79, Chillicothe, IL 61523.

QST & CQ 1947 to 1965 W2FW.

SELL Atlas 210 factory converted with noise blanker and all features of 210X, AC deluxe console, Atlas DD-6 digital display unit all mint condition all $750 will pay shipping via UPS in states. M. Swedgal K2HAM 258 Broadway, New York, NY 10007.

SELL 75S-3B with matching speaker, $625. 32S-1 with 516F-2 supply $450. All items Mint. S.a.s.e. for information. Earl Eggers 2105 West 29th. Eugene, OR 97405.

WANT: VanHorne 5VC and 5VCX tubes, circa 1926. Also Hopewell antenna insulators. Walt Lehnert, 5209 Minnehaha Blvd., Edina MN 55424.

HEATH SB-102 mint s/cw filter, HP-23A, SB-600, Electro-voice 638 mike $450; Heath SB-630 $80; SB-200 mint $300; HM-102 $25, HD-10 $30; Regency HR-2B w/6 pr. xtals $160. WB9SRX, R. B. Coulter 317-299-3698.

WANTED: Old Collins xmtrs or parts for 45A, 150, 30FX, 32B, 30J. Norman Johnson, 1508 South Citrus, Escondido, CA 92027.

QSTs 1940 to 1970 best offer. Fred Chevillot, W8SWI, 17830 Fairway Dr. Livonia, MI 48152.

WANTED: National NC188 receiver for cannibalizing. Robertson Smith, Acworth, NH 03601.

FOR Sale: Heath SB102 with SB600 speaker and homebrew pwr sply matching HP23 design $375; SB-650 display $155; SB-620 $110; HM2102 VHF wattmeter $29; Archer capacitive discharge unit $30. All units excellent condition — complete with manuals. You ship. S.a.s.e. WA2DTI, 210 Utica, Tonawanda, NY 14150 716-692-5451.

FOR Sale: TR4C Drake transceiver with MS4 p.s. $545. (mint) Atlas 210X $550, (mint) P. Laspina, WA2ERD, 33 Gloria Ann Smith Dr. Bricktown NJ 08723 — call eve. after 6 P.M.

FOR Sale: All mint, with manuals. Solid state BWD-525 oscilloscope. Two vertical plugins (each has dual trace and 50 MHz bandwidth). Capable of four traces. Delayed sweep plugin timebase $1000. New Heath SM-5238 AC voltmeter, factory assembled. $75. Tennelec MS2 Memoryscan. $200. Barlow-Wadley portable communications receiver. 0-30 MHz. batt am-ssb. $100. National HRO-500 communications receiver. $1000. Reasonable offers considered. Cashier's check only. I ship UPS. Richard Matassa. 225 E. Irving Park, Roselle, IL 60172.

NET Control Operators — Send details of your net to: Net Directory Dan Sewell, Box 372, Red River, NM 87558.

ENGRAVED Nameplates — 1" X 3" 2ln. $1. Postpaid. Red, Blue, Black, Walnut. White letters, with Pin. J & L Sales. P. O. Box 61 Feasterville, PA 19047.

JOHNSON Ranger II 160 thru 6 meters — $140. Johnson 6 & 2 Linear — 150 watts $60. Johnson Courier linear — 500 watts ssb-dsb-cw, A-M 200 watts. All real clean with manuals. Al Allison, Rt 2, Box 1012, Bonita Springs FL 813-992-0058.

WANTED — HW7 reasonable will pick up Frank, P. O. Box 181, San Geronimo CA 94963.

WANTED: Manual w/schematic for Gonset G 151 A FM Communicator. Will Xerox and return. D. Knight WBØVFJ RR no. 1 Box 72 Country Est. Long Grove, IA 52756.

FOR Sale: Surplus gear, HT-45 linear with 3-500Z (new) in final excellent, $250. Collins 75-S-1 $300. good, command receiver 3 to 6 MHz with P.S. $12. works, Swan trap vert. 10 thru 40 1040-V $50., Hybrid mini Quad $75. Antennas never exposed to weather, pick up only on linear and antennas. Bill Dean W4SJ 1228 Vintage Place, Nashville TN 37215.

DRAKE SPR-4, 2 yrs. old, mint cx., SCC-4 cal., 80-10 M x-tals, Worcester SM-1 antenna. $535. Dr. J. H. Ross, Hunter Hills — F9, Flemington, NJ 08822.

WANTED: HG-10B vfo with manual. W1DRO, 14 Deborah Dr., Ellington, CT. 06029. 203-872-2376.

SPAULDING 40' heavy duty tower, TR-44 rotor, Mosley TA-33JR beam antenna, $220. Heathkit O-8 oscilloscope, $25. RCA WR-64B color bar/dot/crosshatch generator, $40. Lineman's climbing belt, $35. John Rosenbaum, WA9UIM, 617 1/2 N. Cushing St., South Bend, IN 46616.

HEATH Factory aligned - five inch triggered sweep oscilloscope, $105. Digital multimeter, $55. HW-16 converted for 20 meters with VFO $100. I ship - WA2WBJ, 9 Williamson St., Malone, NY 12953.

SB-301/All xtals, filters — SB-401 — SB-600 — Manuals — extra xtal for RCV only CB. Come and get all for $450. Good excuse for fishing trip to Northern MN. W9OD - 218-634-2861.

HEATH SB-104, cw filter, noise blanker, power supply, mint. First $725. takes all, you ship. Ron Sobay Star Route Box 66D. Menominee, MI, 49858. 906-863-3058.

DRAKE R-4B $300, Heath DX-60A xmtr and HG-10 vfo $100. Equipment above in mint condx with manuals. Collins 180 S-1 transmatch $50. Large Vari-caps split stator 150 pf per section $10 each. RG 11/U coax new 15c per foot. Gary Metzger 816 Broadway no. 3, Atwater, CA 95301.

GE-MASTR 450 FM base, new also U43GGT, U44BBT, U41GGT, GE prog. mobils/complete make offer. Also, Motorola P33AAM handy talkies as is/no mikes (tube rec) $12./incls shipping. John WA9DYU 913-631-9533.

RTTY conv CV-57 plus spare parts kit, good cond $75. John WA9DYU 913-631-9533.

RECEIVERS: BC639 and RBM-5 2-20 MHz. with ac supplys, Collins RUQ vhf, HW-32 + ps $125. John WA9DYU 913-631-9533.

ELDICO ssb 500 watt linear amplifier with spare 4X250B tube must be picked up price $200. John Herland W2MDB Port Jefferson Station LI NY 516-473-5439.

WANTED: HW-101, SB-101 or similar xcvr in good condition, reasonable price. Also want 440 MHz gear xcvrs, rcvrs, xmitters, hard-line, power-amps, etc. Steve Burkholder, WB3DYL, 717-532-4597.

GALAXY V, AC-35 supply & speaker, DC-35 supply. Garry Ritchie, 1303 East Dartmoor, Seven Hills, OH 44131. 216-524-1123.

WANTED: HG10B-vfo with cable. L. Daniels 22 W. Ridge Lansford PA 182 32.

TEFLON wire shorts. 10c foot. Cash or check. Add 1.00 postage. WIRECRAFT, Box 362, West Brookfield, MA 01585.

SYNTHESIZED Clegg FMDX digital 2mtr transceiver with optional 16 pole super filter installed — like new — $480 (will ship) Write or call: Ed Feins Box 115 Union, NJ 07083. 486-8457 eves.

DRAKE T-4XC transmitter $480. AC-4 MS-4 $95. 2-C receiver w/calibrator $249. Shure 444 microphone $25, Ten Tec KR-1 kever paddle $10. Gotham V-160 vertical antenna $19. All like new mint condition. Send offers to WB8UGJ James Kley 3420 Vintage Valley Ann Arbor, MI 48105.

ALPHA/THETA brain wave monitor. Edmund Scientific Company bioteedback instrument. Cost $55. Mint condition. Sell $35. Lowry, Brown's Lane, Old Lyme, CT 06371.

TECH Manuals for Govt. surplus gear — $6.50 each: SP-600JX, URM-25D, OS-8A/U, PRC-8, 9, 10. thousands more available. Send 50c (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

SALE: GTX 200 with xtals, supply $200; HA-1 kever $50; Vibro-keyer paddle $25. WA2MBZ 212-358-2879.

WANTED: Two Elmac Tubes, 3-1000Z, Contact W8KUV.

TOUCH Tone (W. E. Type) enclosures: Mobile $8.95, Base $6.95, wired w/W. E. Pad $39.95. 16MPW Mini-Pad, wired $39.95. Mini-portable dipole, 40M or 20M band $39.95 each. Prepaid. (See Feb. QST) King Products, P. O. Box A, Lomita, CA 90717 213-534-4402.

JOHNSON Viking Invader $165. Drake 2-B $160. Both for $300. K0JFV, 14333 Gladiola Court, Apple Valley, MN 55124.

TWO Collins KWS-1/75A-4, one mint no console, one excellent, custom desk-console-spares, asking $1000 each, come operate. W4JHE, 51 N. Grand ave. Ft. Thomas, KY 41075. 606-441-0712.

NEEDED — 20-15-10M coils for HX50A txr will pay top price — J. Willcox 4598 Dearing Memphis TN 38117. 901-767-2164.

SELL: Swan MB80A, 160 watt ssb, cw, transceiver $200. WB0DGY, David Holle, Star Route Box 5, New Salem, ND 58563. 701-843-7344.

SB-144 w/xtals for 10 channels — $200/B.O. or trade for Argonaut, HW-8 or similar QRP. Jeff Salzman WB6QAY 841 Lincoln Blvd. Apt. C Santa Monica, CA 213-393-5526.

OPERATE Collins kilowatt station. Vacation in beautiful Belgrade Lakes, Maine on Private 1000 foot peninsula. Housekeeping cottage on lake sleeps five. Excellent fishing, boating swimming. Indescribable setting. Pictures available $300/week. W9NQF 312-641-2320.

DRAKE T-4XC, T-4XB, and R-4C for sale. Wanted Telrex antenna parts and hardware. R. Myers, 221 Long Swamp Road, Wolcott, CT 06716.

FOR Sale: E-Z way 65 foot 3 section tiltover — self-supporting — motor elevation tower — make offer Eugene Anthony P. O. Box 73, Prospect, KY 40059.

6 METER 2 times W.A.S. station. Clegg Venus Mo 416A, Clegg supply, Clegg SS booster, Clegg Apoll amp., mike, manuals, cables and extra finals. All i mint condition. Cost $1000 sell $495. WB6UW 714-825-3734 after 6:30 P.M.

WANTED: SB2LA linear amp. to use with SBE 3 xcvr. Must be A1 cond. Call 1-614-633-3223 day tim or write A. B. Adkins 2nd. & Wood Sts. Martins Ferry OH 43935.

WANTED: Expired Ham Radio license plates Collector desires plates from all states for collection Offering $1.00 each plus postage. Joe Franko, 110 Evamar, Midland, MI 48640.

WANTED: 70E-24 PTO for 75A4, also 80M antenn coil for same. State price and condition. WA9AXK C E. Falkiewicz, 1635 Chestnut St., So. Milwaukee, W 53172.

I CAN beat any quote you get on new Swan, Atlas Ten-Tec, Lafayette, Tempo, Dentron, KLM. "Bill" WB5FXI, 604 Oakwood, Moss Point, MS 39563.

WANTED: Drake TC-2 2 meter transverter. Pleas send offers, condition and description to Spencer Bell WA2DJG, 1933 Anita Ct., Baldwin, NY 11510.

FOR Sale: IC-230, very clean, $295. Need SSE equipment for OSCAR. A. Bill Meinhardt, WB4SBA 8406 NW 59th St., Tamarac, FL 33321 305-721-6179.

SIMPLIFYING: High voltage capacitors (mica vacuum, variable, oil, etc.), resistors, misc components, s.a.s.e. for list. SX-130 160-10M genera coverage receiver: $110. W8KAJ, 2386 Queenston Cleveland, OH 44118.

TEN-TEC Model 405 Linear, $125 never used warranty card; trade for TC-6 or TC-2. WA4NEU Box 321, Marble, NC 28905. 704-837-6844.

COLLINS 75S-3 Mint $400. firm. Tower freestanding EZ Way HD40 tiltover 4 years well maintained Mosely TA33 Junior 2 years Sacrifice all $200 if you take down. K2BHL

SELL Eico 753 with 751 ACPS, excellent, $150. DX-100, good, $75. TR108, 2 meter a-m, good, $75. HE45, 6 meter a-m, fair, $30. Write K1DBA or call 203-583-3111.

WANTED: Hallicrafters HT-33A or B linear amplifier Fred Findling WA1VSG, Box 161, Bethlem NH 03574.

R-392URR, manual, power transformer $169. FOB. Mike Bae, Box 246, Flagtown, NJ 08821.

ICOM 2M ssb IC-202 slightly used, guaranteed, $179. Triton II with cw filter, perfect, $400. TEMPO AC-1 supply for TEMPO ONE, $65. 351-Rq Collins racks for S-Line, $20 each. One only new IC-230 $319. ICOM IC-21A, $250. Signal One CX7B with LED readout $1050. CX7A good condition, $750. South Texas most complete amateur supply. Mastercharge, Bankamericard. Douglas Electronics, 1118 South Staples, Corpus Christi, TX 78404. 512-883-5103.

SIGNAL One CX7/CX7A for sale by original owner. Always kept under dust cover. Prefer local pickup. $1250. 203-767-1125. W1CDO.

HAMMARLUND service manuals $6.50 each postpaid. Will align your rcvr to original factory specifications. 15 yrs factory experience. Also service Hammarlund/Outercom and Aerotron 2-way equipment. Wayne Cordell, K4HCS, Blue Ridge Communications, RT4, Weaverville, NC 28787. 704-645-7070.

WANTED: SB-600, SB-610, good condition. Frank McKenna, W2GNT, Netherwood Drive, Salt Point, NY 12578 — 914-266-5924.

SELL: Collins KWS-1 transmitter, 75A-4 receiver, mint condition, $1100 plus shipping. WANT Swan TV-2C transverter with 50 MHz I.F., for use with Swan 250 C. K5EFW - 2727 Norment Rd. SW Albuquerque, NM 87105.

FOR Sale: SB-614 station monitor used 1 hour, beautifully built, $150. prepaid. W4DXJ 919-756-5024.

WANTED — National PW-O or NPW-O and Type B dial drives, in like new condition, K6QQ, POB 951, Goleta, CA 93017.

COLLINS 75S1 with Waters rejection tuning $325. 801-254-1253. 2476 West 12340 SO., Riverton, UT 84065.

PARABOLIC Dishes for sale. Spun aluminum dishes, without antennas or mounts: One 12-footer with two-piece fiberglass windscreen, $300; One 8-footer with two-piece fiberglass windscreen, $150; and two 4-1/2 foot dishes each with a very rugged foldable tripod, $50 each. You arrange transportation. We can supply photos and additional details. Contact W A. Monahan, K6KH, Trustee, Northrop Radio Club, Dept. 1263/5, 3901 W. Broadway, Hawthorne, Calif., 90250 or call days 213-970-6064 or nights 213-374-8289.

SELL: Heath HW-101 transceiver, HP-23B AC supply, SB-600 speaker, plus mobile mount SBA-100-1 and HP-13B mobile DC supply, All power cables, all manuals (except speaker) & all in fine working condition, $350. You ship. WB2AHC — 98 Hanover Lane, Williamstown, NJ 08094.

WANTED: Hammarlund HQ-170C in excellent condition. Richard LeVeque WA2HFU 126 Edgemont Rd., Rochester NY 14620 716-271-2748.

SB-102, SB-600, HP23A, cw filter. Sell with demonstration, by appointment only. $485. W2GNN NJ 609-799-2865.

SELL Ten-Tec KR40 $75 Parks 2 meter converter $20 WA1RIT 11 Glenwood Rd., Andover, MA 01810.

HALLICRAFTERS FPM300 Mark-II: Guaranteed like new. No marks or scratches. With manuals, in original carton. First $325 takes it. Ship UPS. Hoffman 814-695-0031.

COAX: RG-58/U $.06/ft; RG-59/U $.07/ft; RG-8 $.20/ft Connectors: SO-239 $.39; PL259 $.59; UG175/U $.19; UG176/U $.19; UG88 $.85; UG260 $.95; UG290 $.95; UG1094 $.85. S.a.s.e. for free catalog. Pasternack Enterprises 8538 Hamilton Avenue, Huntington Beach, CA 92646 714-536-7511.

SWAN 400 AC/PS VFO 299. Swan 250 AC/PS 249. Swan 500-C AC/PS DC/PS 440. WA4HYA 703-7503.

WALKIE-Talkie, mint Standard SRC-146, 1.8-2W, 5-chan. SR=CSA base master charger, SR-CMA mobile master adaptor, SR-CMP08 handmike, nicads, manuals, crystals: 94/94, 34/94, 22/82, 28/88, 16/76, 37/97, 25/85 19/79, 81/21 $275. W4BUZ, 1703 Verdun Dr., Greensboro, NC 27410 919-292-1538.

STATION WA6PWI Swan equipment: 600R ser. no. 1624 with speaker, 600T ser no. 2121, Shure mike 1040V 4-trap antenna, 128' coax, homebrew key, Drake TV-1000-LP low pass filter, bug, manuals. Everything; first $750. Excellent condition. 702-453-1234.

80 foot tower located Fairfield Connecticut for sale. 14 foot triangular base, bolted angle iron, very strong. You take it down, make offer 203-938-3731.

TELETYPE Model 28 LPR45AWA Typing Reperforator, LBXD9 Transmitter-Distributor, used, good condition, $15 each. Al Walker; 6000 North 27th St., Arlington, VA 22207.

HEATHKIT SW-717, covers. 5-30 MHz Mint condition, $50. Call Stan 814-435-8813.

FOR SALE: Yaesu FT-101/EE, with fan and 600 Hz cw filter. Used only 5 times. Excellent condition $600. 516-872-9120. Jack — WB2INX, 1044 Woodcliff Drive, Franklin Square, NY 11010.

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DIGIT-AMP — big digits at little cost; quality optical enlarger for most readouts; counters, clocks, instrumentation, many rigs. Clear flat lens can give 100% height increase, no loss color, light; snap fit for TS820 and similar. Enlarging area one-inch high, centered on 1¼"-high strip. 2-inch length, $3.00 2½-inch, $3.50; 3-inch $4.00. M. J. Becker, 15W, 215 E. 68th St., NY 10021.

ICOM 21A and DV21 digital VFO/scanner for sale. Mint condition always covered, never mobile. $450. W1CDO. 203-767-1125.

BUY-Sell-Trade. Write for free mailer. Give name address and call letters. Complete stock of major brands new and reconditioned equipment call for best deals. We buy Collins, Drake, Swan etc. SSB & FM. Associated Radio 8012 Conser, Overland Park, KS 66204 913-381-5901.

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FOR Sale: Heath SB-303 with cw filter $290, SB-401 $275, both professionally wired and recently realigned. pair for $490. SB-600 $15, HW-7 $50, Johnson TR switch $15, Eico Grid dip oscillator $20, Telechron 24 hr. digital clock $5. Bill Cotter, WA4GRS, 376 South Broadway, Lexington, Kentucky, 40508, 606-255-0425.

SELL: Collins 32V3, R392 with converter for RTTY. WB2ZKU, 43-34 Union Street, Flushing, NY 11355.

ALLIED SX-190 receiver. Crystals for Midland 13-505. Thurber, 372 Crabapple, Wright-Patterson AFB, OH 45433.

DON and Bob guaranteed new buys. CDE Bigtalk rotor, for tribanders, 2M $79; KLM KR400 rotor plus 100ft cable $100; Raytheon B11A $16/pair; Mallory 2.5A/1000PIV epoxy diode 19c ea; Raytheon 572B/T16AL 21.95 ea; no. 22GA phosbronze longwire antenna wire $3.50/1000ft; Ham-2 $129; CD44 $104; Belden 8 wire rotor cable 14c/ft; Belden 8214 RG8 foam coax 23c/ft; 8237 RG8 19c/ft; Amphenol PL259 59c ea; CDE .001/10KV doorknob cap $1.95 ea; Call us for quotes: TS520, TS820, Tempo 2020, Atlas 350XL, FT101E, Multi 2700A, TR7400A. Prices fob Houston. Quotes good 30 days. Madison Electronics Supply, 1508 McKinney Ave., Houston, Texas, 77002. 713-658-0268. Evenings: 713-497-5683.

HAM-M Rotator, overhauled. $60 plus shipping. W2MQB 516-324-2546.

WANTED: Heath HG-10B VFO. In working order. Please reply to R. Schwarz, 5 Wayne Ct., Ardsley, NY 10502.

MINT Condition TR-3 serial 12805A, AC-3 serial 14321, MS-4, manuals and boxes. This one is as close to being fresh out of the box as you will find anywhere. Probably has less than 40 hours on it. $380 firm WA6JMQ 714-479-3442.

LINEAR — 4-811A, 1200 WPEP 80-10. Professional construction, $160. stamp for pictures and details. Mort Caldwell, W8IFN, 1068 Windsor, Morgantown, WV 26505.

WANTED: ARRL Handbooks. W9SS, 5006 North Second, Rockford, IL 61111.

WANTED: Collins S line. Must be mint. Also consider Drake. 404-766-6585 no collect. P. O. Box 87102, College Park, Georgia 30337 W4LL.

WANTED: Round Label Mint KWM 2A less than year or year and half old; socket for 4CX1000A. WA5CVI 806-795-0728.

GENERAL Ticket? Code, theory, test-taking hints and tips, 28 pages, $1.50. Slow learners, worry-warts only. If I did you can. WBØPTM, 516 9th Ave. Brookings, SD 57006.

HEATH HW-101A 80-10 ssb/cw transceiver, HP-23B ac supply, mobile mike, all new and perfect. $235, UR postage, 716-548-2532, Fred.

SPECIALS!! Bearcat 101 scanner $259., Yaesu FT-101 series shop manual $25., IC-22S $269., IC-245 $449., HAM-II $129., Yaesu FRG-7 $270., All prices are for new gear, including UPS delivery to your door. Write for our price list. Ham Radio Outlet, 13754 Victory Blvd., Van Nuys, CA 91401. 213-988-2212.

SELL: Hallicrafters S40A. Receives only the strongest signals. John WB9PKO 312-759-8610.

COLLINS 6251 VHF transverter, $695. FOB. C. Smallhouse 803 Mora, Los Altos CA 94022. 415-948-1778.

COLLINS 75S-3C, round, with cw filter $950, 32S-3 $700, 312B-4 control $200, 516F-2 AC supply $145. All mint. W8KMP 35912 Old Homestead, Farmington Hills, MI 48018, 313-476-7769.

LINEAR, NCL2000, mint, $660, Pickup W2EHM 201-352-0981 after 5 P.M.

MORSE Keyboard Software for CDP-1802 Microcomputer, 256 Bytes, $3.00. WA6UYV, 4956 Andrea Blvd., Sacramento, CA 95842.

HEATHKIT HW-16, brand new $150. WN8YTQ, 906 Broadway, Bedford, OH 44146, 216-232-8132.

WANTED: Audio amplifier, power supply chassis, and diversity S-meter for Hallicrafters Skyrider Diversity receiver. Nagle, 12330 Lawyers, Herndon, VA 22070.

TRI-EX W51 tower, new, $600 (Calif orders add tax), freight collect, Cashiers check. Universal towers, save to 40 percent, send s.a.s.e. for brochure. Antenna King, P.O. Box A, Lomita, CA 90717.

WANTED: Galaxy 2000 linear, prefer without power supply. State condition, price first letter. Barry Taylor, 1422 Young St., Richmond, VA 23222.

KWM-2, 516F-2, round, immaculate, $995. 75S-3 immaculate $325. Wanted 4K-Ultra, 77D. Payne Radio 615-384-2224.

SPECIAL — New factory boxed 6GH8-A tubes $1.50 each plus shipping — Resistors — Capacitors — Tubes new and surplus — send 25c for list to Tommy, WB9CUL/4, Comm-Tech, 104 N. Third Richmond, KY 40475.

SELL Hammarlund HQ180 receiver w/manual & spare set of tubes $325. Hallicrafter HT33B 2kw PEP Linear amplifier w/new Eimac 8295A, manual & spare set of tubes $350. Both units for $650. FOB San Diego, CA 92117.

NEW HR-10B W/HRA-10-1 calibrator used 2 hours electrically sound, needs alignment, — $69. DX-60B w/xtals excellent condition — $69 both $130 HR-10 w/preamp needs alignment — $35 Dave WA4AMQ 205 Barker Elizabethton TN 37643. 615-543-3674 after 1600.

TOWER — Tristao free standing 55' CZ454-FS, tilting and raising fixture TRZ-80, Co-ax standoffs CZX-30 5' mount, and Basebolt template. Like new $365. — you pick up. W. T. Neill, K2GXP, RFD no. 2, New Canaan, CT 06840 914-533-2101.

183D Receiver with Speaker — mint condition general coverage plus short wave and bands 80M thru 6M $185. J. Miller 6580 Cranberry Road, Clarkston, MI 48016 313-625-3754.

JOHNSON Kw Match Box complete — like new $195. J. Miller 6580 Cranberry Road, Clarkston, MI 48016 313-625-3754.

NCX 1000 Transceiver, 1KW in one package. $950. Have (2) must sell one, moving to smaller quarters. J. Miller 6580 Cranberry Road, Clarkston, MI 48016 313-625-3754.

SELL Large prop pitch, very clean, unmodified, checked, $150 FOB. Wanted — S-Line S meter, 200 Hz xtal filter. W9KNI.

GOOD KWM-2 and 516F2 with bad transformer. $585 plus shipping. Les Carpenter, 635 South Hobson Mesa, AZ 85204.

ATTENTION: Announcing a new ham radio dealer in New Orleans. Digital Electronics, Inc., 1201 Annunciation Street is an authorized representative for many major manufacturers of ham radio equipment and accessories. Large inventory! Competitive pricing! Write for quotes or call collect to place your order 504-568-9879. Bank Americard or Master Charge accepted. Digital Electronics, Inc. P.O. Box 30566 New Orleans LA 70190.

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WANTED for summer 1977: Instructor in electronics and ham radio. Must have FCC license. Small boys' camp in Pennsylvania. Apply: Donald Wacker, 43 Franklin Street, Cedar Grove, NJ 07009.

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THE **REGENERATIVE "E"** BY DOVETRO

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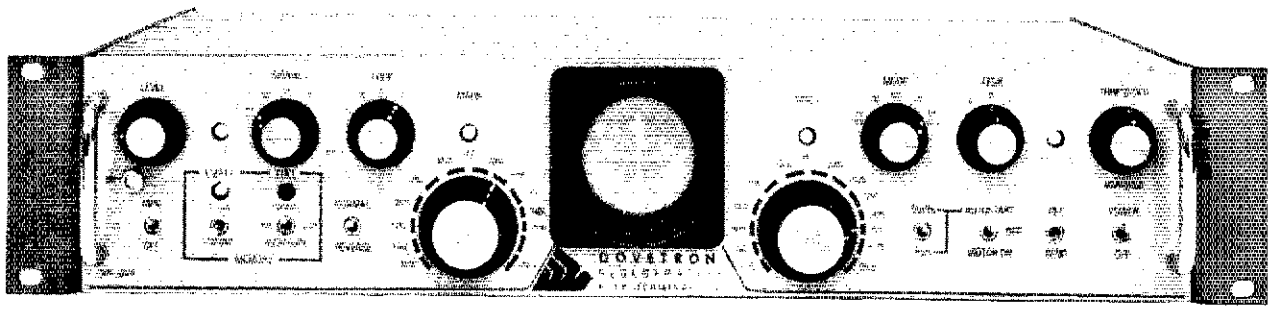

THE MPC-1000R REGENERATIVE RTTY TERMINAL UNIT

The MPC-1000R REGENERATIVE Terminal Unit features automatic MULTIPATH CORRECTION, IN-BAND DIVERSITY operation, SIGNAL REGENERATION, up-down SPEED CONVERSION, automatic BLANK or LTRS CHARACTER generation and variable CHARACTER RATE.

An 80 character **FIFO buffer MEMORY** provides a full line of storage and may be PRELOADED and RECIRCULATED. Preloading of the memory may be accomplished from either the local keyboard or the incoming signal.

A unique Character Rate over-ride and TD INHIBIT circuit prevents character over-runs during down-speed conversion.

The crystal-controlled **UART REGENERATOR** may be programmed for 5, 6, 7 or 8 level codes, PARITY and the various stop-bit options. The UART's tri-state mode may be utilized to generate a PHASING pulse for crypto peripherals.

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The optional Station Identifier (TID-100) may be programmed in Morse, Baudot or ASCII codes and used in either a narrow or full shift configuration.

The internal high level loop supply is strappable for 60 or 20 mils operation. EIA, MIL and TTL FSK outputs are available simultaneously.

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LEDs monitor the status of the high level loop, the Mark and Space channels, the Memory section and the TD Inhibit and Signal Loss circuits.

The automatic Markhold Threshold may be manually controlled for optimum copy of signals buried in noise.

The variable tone channels are CONTINUOUSLY tuneable from 1200 Hz to 3100 Hz and the front panel VFOs are calibrated at the most commonly used tone frequencies.

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CMOS digital circuits in the Multipath Corrector and Regenerator section guarantee high immunity to noise pulses associated with local teleprinters.

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An inquiry on your letterhead or QSL will bring all the other features and complete specifications, or call 213-682-3705.

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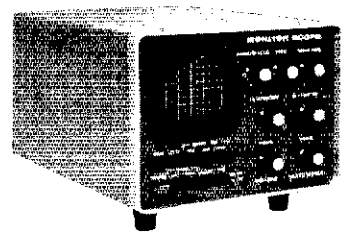
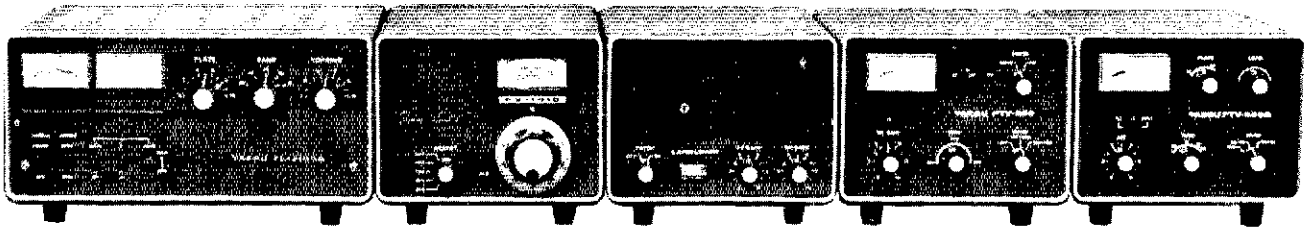


YO-100
MONITOR SCOPE



FL-2100B
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SP-101PB
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FTV-250
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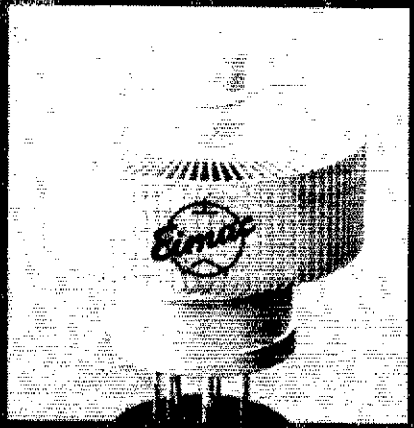

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