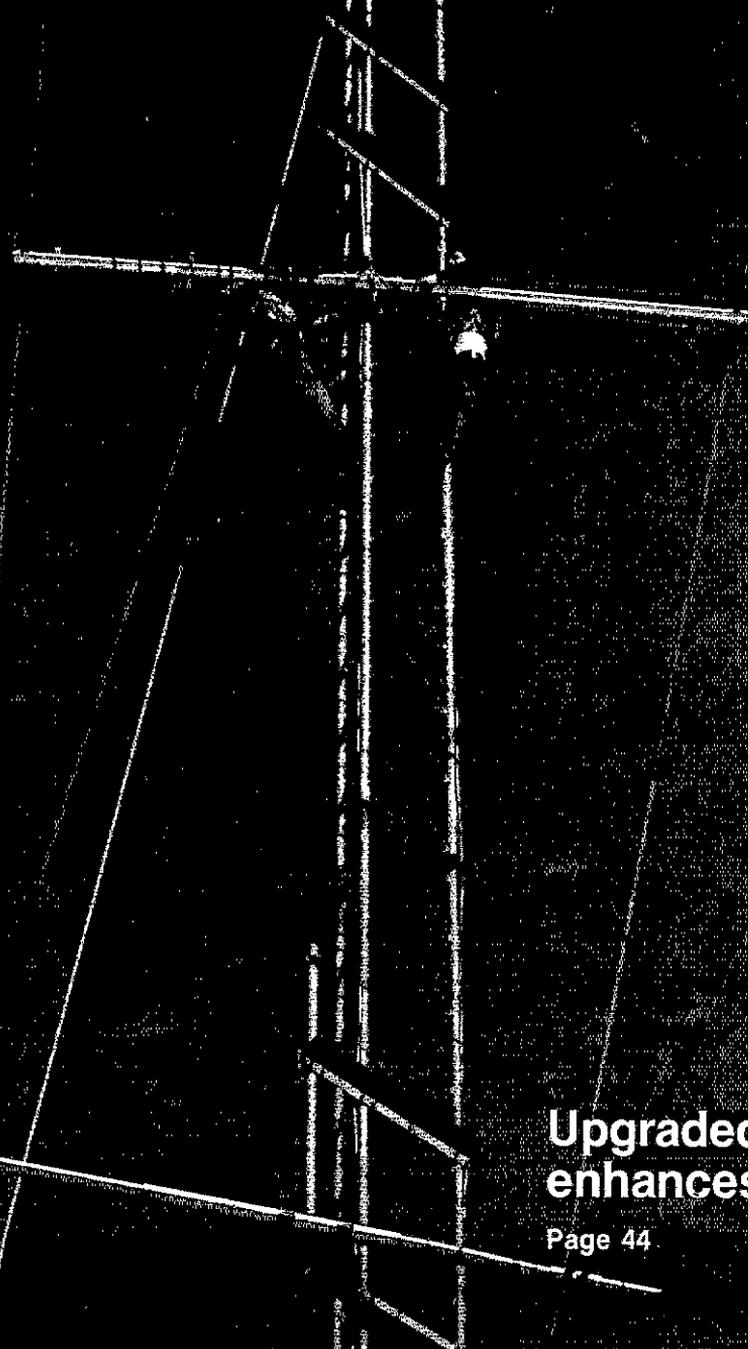


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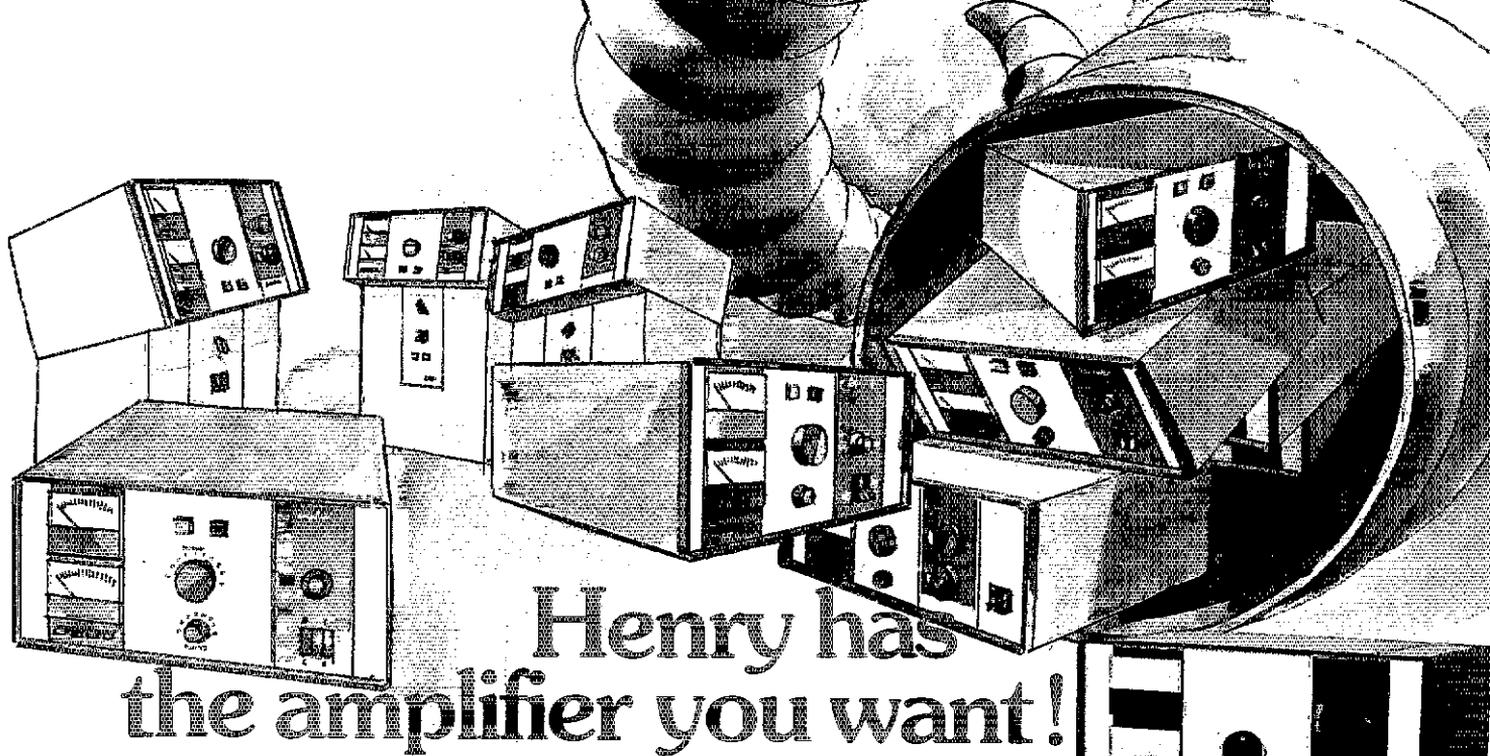
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**Upgraded 40-m beam
enhances W1AW tower**

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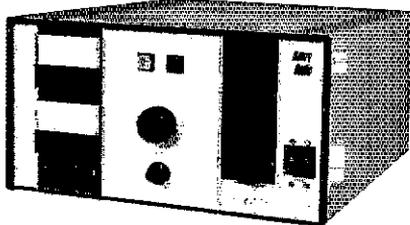
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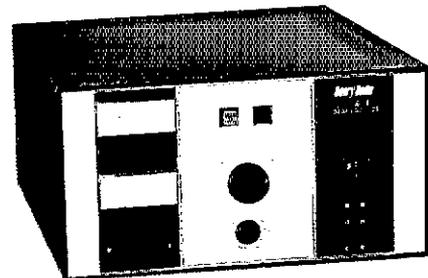
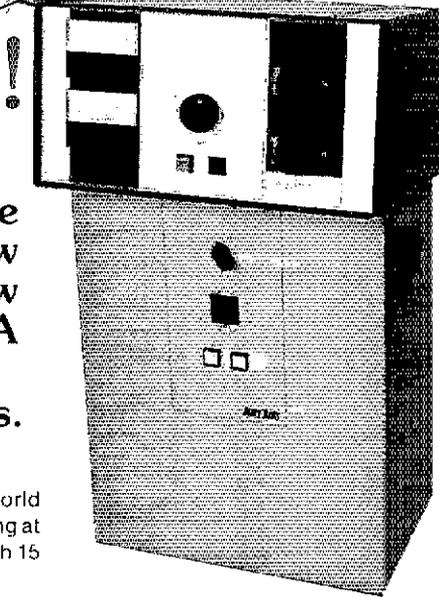
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1002-A A 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for 1/2 power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

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



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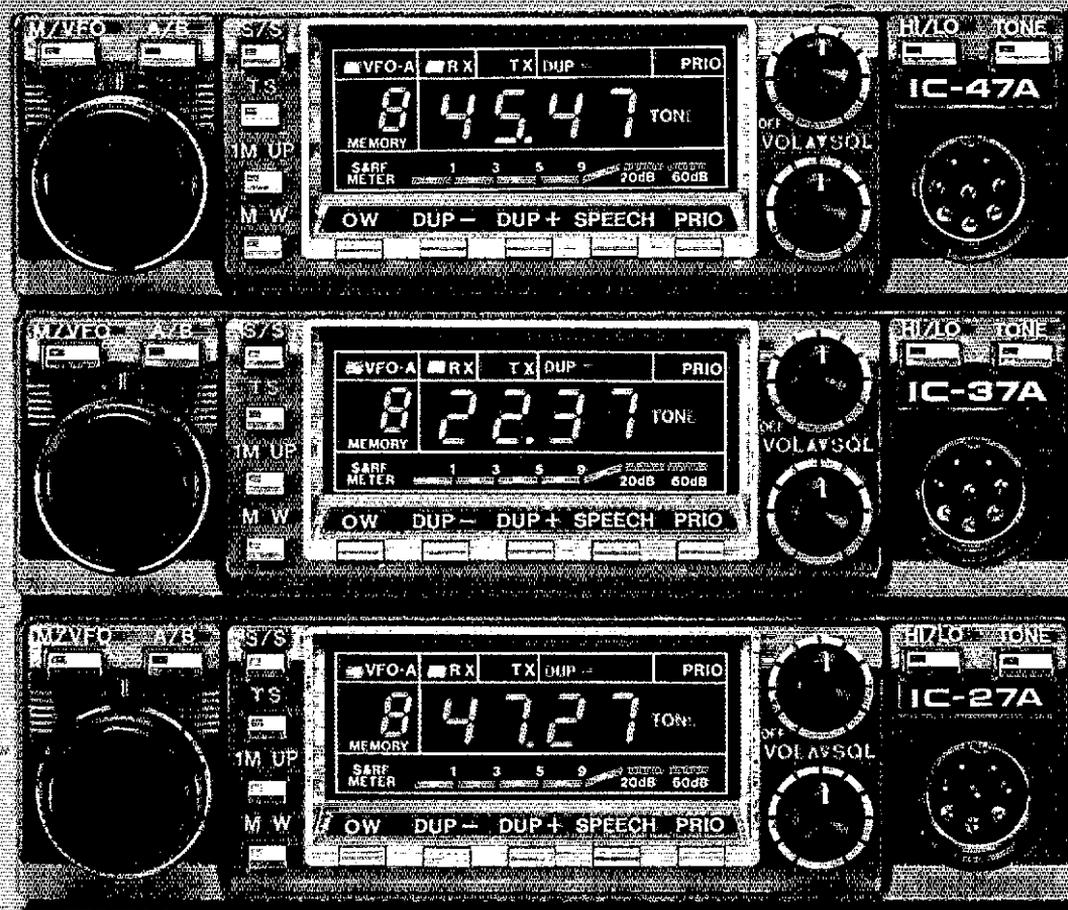
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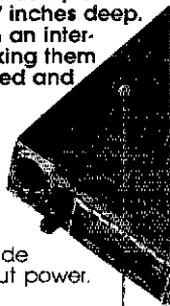
IC-47A
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25 Watts

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25 Watts

IC-27A
2 Meter
25 Watts

ICOM presents three ultra compact mobiles...the IC-27A 2-meter, the IC-37A 220MHz and the IC-47A 440MHz. The smallest mobiles available, the IC-27A/37A/47A series measure only 5 1/2 inches wide by 1 1/2 inches high by 7 inches deep. Yet, they contain an internal speaker making them fully self-contained and easy to mount.

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32 PL Frequencies. The IC-27A/37A/47A come complete with 32 PL frequencies ready to go. Each PL frequency may be selected by the main tuning knob and stored into memory for easy access along with frequency.

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the receiver frequency of the transceiver through the simple push of a button. This allows the operator to hear which frequency he is operating on without looking at the transceiver.

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

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Offices
225 Main St., Newington, CT 06111 USA
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Second-class postage paid at Hartford, CT and at additional mailing offices. Postmaster: Form 3578 requested.

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QST is available to blind and physically handicapped individuals on flexible discs from the Library of Congress, National Library Service for the Blind & Physically Handicapped, Washington, DC 20542.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No., Z1-9421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.



OUR COVER

Hearing W1AW's 40-meter signals better these days? It just may have something to do with the new beam at 90 feet, installed in April by K1WJ (left) and AA2Z. See page 44. (photo courtesy K1ET)

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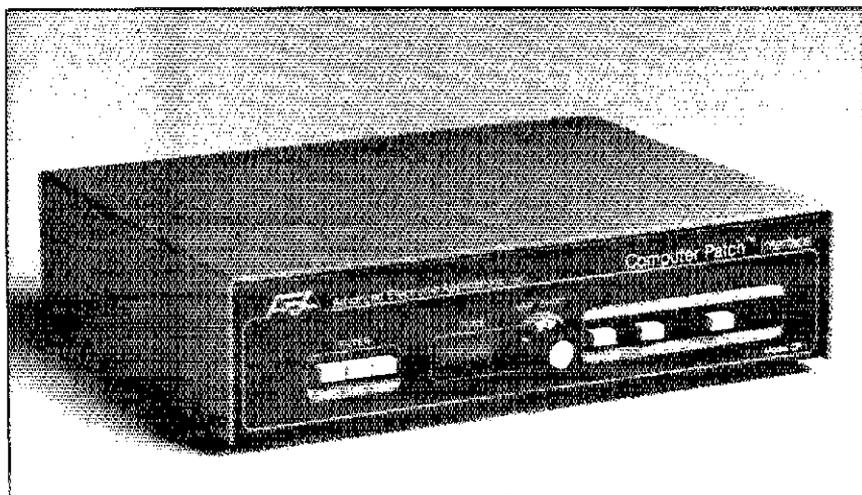
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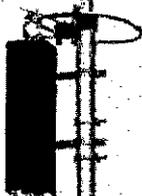


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Optional accessories:

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160-10 remote antenna tuner, 160-10 Hz CW filter.

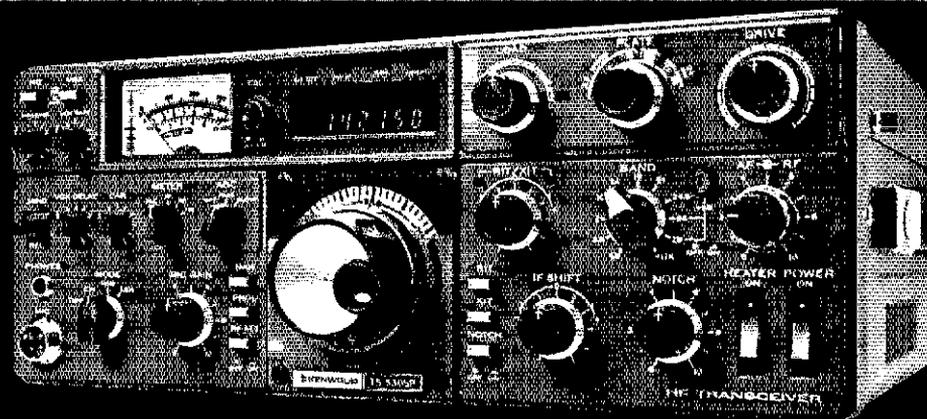
160-10 Hz CW filter, 160-10 Hz CW filter.

160-10 antenna tuner, SWR power meter.

160-10 remote antenna tuner, 160-10 Hz CW filter.

160-10 Hz CW filter, 160-10 Hz CW filter.

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THE AMERICAN RADIO RELAY LEAGUE, INC.



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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI.

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"It Seems to Us . . ."

Our Next Great Challenge

Radio amateurs like to meet challenges. The licensing system almost guarantees that we all possess this trait; if we don't, we probably won't make it past the examination hurdle. Most of us are achievement oriented; we like to compete, either against one another or against personal goals we set for ourselves. If we can't reach a goal through individual action, most of us recognize the need to band together to gain strength in numbers. For the 70 years of its existence, ARRL has been the vehicle we have used most frequently for effective group action.

We take pride in our ability to communicate across barriers that others are unable to breach. We like to think, and like others to think, that we are pretty good at bridging the gap when disaster strikes, and normal communications circuits are out of order or overloaded. Generally speaking, we *are* pretty good if one considers what things would be like if we weren't around. But let's be honest with ourselves: Measured against what we know we *could* do, we're falling short of the mark.

We are also capable, with modest stations at both ends, of communicating with reasonable reliability between any two points on the globe as long as we can tailor our time schedules and selection of frequencies to the prevailing propagation. Thanks to the new allocations (at 10 MHz, and later at 18 and 24 MHz) and to developments such as the OSCAR 10 satellite, the percentage of time we can work from Point A to Point B is growing. But our position is precarious: We're at the mercy of the sunspots, and there's no backup for OSCAR 10. In some ways we're no better off than we were when long-distance radio propagation was first utilized in the early 1920s, and we're certainly a *long* way from 24-hour, 99%-reliable circuits. Again, we can do better — and we should *want* to do better.

How do we address these challenges? We can't do it as individuals; to succeed, it must be a group effort. This is nothing new to Amateur Radio, of course; both the Amateur Radio Emergency Service (ARES) and the National Traffic System (NTS) are fine examples of effective volunteer organizations, working in the public interest. However, a number of astute observers have pointed out that we aren't taking full advantage of the technology at our command. We are victims of our own diversity: Experimenters talk mostly among themselves, public-service communicators do the same, and they seldom work together in pursuit of a common objective. The result is that today, experimenters feel they have a marvelous tool to improve Amateur Radio communications, and particularly our public-service capability, but the rest of us have been slow to recognize that we *really do need* this tool.

What is it? It's called packet radio.

Now, don't turn the page; this isn't going to be a technical discussion. If you want that, look in Chapter 14 of the 1984 ARRL *Handbook*. Right now we want to talk about what it can do for us, not how it works.

Conceptually, packet radio is no different than any other message-forwarding system. When in 1914 Hiram Percy Maxim sent his now-famous message from Hartford to Springfield via an intermediate station, thus triggering the thought that grew into the American Radio Relay League, he had to tell the relaying station who the message was for and he had to make sure the message was copied correctly. Packet radio works the same way, except that the routing and verification are handled automatically, without human intervention. Every station in the network can be used as a relay station, and networks can be connected together practically without limit. Today, local networks are springing up throughout the country and the world, and some have been tied together by HF radio or satellite to show it can be done. The cost of getting involved in packet radio, assuming that one already has a small home computer (or terminal) and a transceiver, is just a few hundred dollars and is bound to drop as interest grows.

There are three potential impediments to packet radio growth. The first is regulatory; some existing rules were not written with packet radio in mind, and modifications (consistent with protecting other spectrum users) may be necessary if we are to take full advantage of the technique. The second is standards. Networks must be able to talk to one another, and this can occur only if common standards are used. The third potential impediment is apathy. A worldwide packet radio network will be truly effective only if there is mass participation, and this means that the average amateur must come to understand and appreciate its promise.

It is significant that ARRL has been involved in packet radio developments for several years. The League has sponsored three packet conferences, most recently on April 15 in Trenton, New Jersey, to bring potentially divergent experimenters together, and the ARRL Ad Hoc Committee on Amateur Radio Digital Communication, created and funded by the League's Board of Directors, has become the recognized medium for presenting standards proposals and resolving differences.

Properly nurtured, packet radio could bring worldwide data communication (and don't rule out digital voice and video!) within the reach of anyone who can sign into a local VHF or UHF packet network. Planning and implementing such a network will be a worthy challenge. We're excited by the prospect — and proud that ARRL is in the forefront of its development. — David Sumner, K1ZZ

League Lines...

Three San Diego, California amateurs have been ordered to "show cause why their Amateur Radio licenses should not be revoked" in connection with interference to local repeaters. According to an FCC news release dated April 20, 1984, Calvin C. Plageman, WD6DSV, James W. Smith, W6VCE, and Anthony M. DiBona, K6PWX, have been charged with violating FCC Section 97.125 regarding malicious interference. Smith and DiBona are also charged with failing to ID properly (Sections 97.84(a) and 97.123), broadcasting (97.113) and transmitting music (97.115). Investigation efforts are continuing, and the FCC says that action against additional offenders in the San Diego area may be initiated in the future.

Edward L. Johnson, WA2JHU, of Syracuse, New York, has paid a \$600 FCC fine and has agreed to turn in his amateur operator and station licenses for a four-month period. Johnson was caught violating FCC Rules by Captain David A. Stevenson of the Onondaga County, New York, Sheriff's Department. Captain Stevenson investigated interference complaints from hams supplying radio communications at the 1983 Empire State Games in Syracuse. Captain Stevenson used direction-finding gear to locate the interference. He submitted evidence to the FCC, which cited Johnson for failing to identify (97.84) and broadcasting (97.113).

"Multiband, Broadband, and Frequency Independent Antennas, an Overview," will be aired by Dr. John "Jack" Belrose, VE2CV, on the June 21 North American Teleconference Radio Net (TRN). Belrose is an ARRL Technical Advisor on antennas and author of many articles. His talk on TRN has been arranged on behalf of all Canadian amateurs by the Canadian Radio Relay League (CRRL). A complete and up-to-date list of the gateway stations providing access to TRN programs is maintained in the CompuServe "Hamnet" X10 database. This, and information on linking repeaters into the net, may be obtained by writing the net manager, Rich Whiting, W0TN at 4749 Diane Dr., Minnetonka, MN 55343. Please enclose an s.a.s.e.

Users of the latest Repeater Directory should note that the 6-meter band plan printed therein is not current. The latest 6-meter band plan as adopted by the ARRL Board of Directors appears in August 1983 QST, p. 72.

The ARRL Volunteer Examiner Program is preparing to serve all U.S. call areas plus locations overseas. The presence of other Volunteer Examiner Coordinators does not block the ARRL from also serving in a given area. Some VECs have already indicated that they will serve on a cooperative basis with the ARRL's VE program once it is in place. (See Happenings, May 1984, p. 63, for details on the Volunteer Examiner Program.)

A new videotape is available from ARRL. Owen Garriott's (W5LFL) talk at the Foothill College Space Science Center in California on his Amateur Radio and STS-9 experiences is captured on an hour-long videotape. If your ARRL Affiliated Club is interested in viewing this videotape, contact Karl Townsend at the Film Library and ask for VT-33 (VHS format only).

The ARRL Club and Training Department is looking for an Assistant Club Program Manager. Duties include editing and contributing to QST's Club Corner and the administration of Affiliated Club and Special Service Club programs. Excellent written and oral communications skills and a Technician class or higher Amateur Radio license are required, as well as a willingness to travel and represent ARRL. Experience with Amateur Radio clubs preferred. Contact Club and Training Department Manager Steve Place, WB1EYI, at ARRL Hq.

QRV for FD? Reserve the last full weekend in June (June 23-24) for the most popular operating event of the year. What better way to generate positive publicity for Amateur Radio -- and get a 100-point bonus to boot! AMSAT has authorized the use of AMSAT-OSCAR 10 during Field Day -- another 100-point bonus. See May QST, p. 99, for Field Day rules.

A temporary third-party-traffic agreement between Zimbabwe (Z2) and the U.S. will be in effect from July 1 through August 31, allowing U.S. amateurs to exchange third-party traffic between the Los Angeles Olympic Village and Zimbabwe, the first of several expected agreements.

Because of a shortage of QST space, Correspondence has been deleted from this issue only. It will be back next month.

Your hobby can be your career! FCC has an opening for an Electronics Engineer to work in the Personal Radio Branch (includes Amateur Radio). BSEE degree a must; General class or above amateur license desired. Salary \$17,000 - \$27,000 to start, depending on qualifications. Send resume to James Shaffer, FCC, Washington, DC 20554.

Keeping Cool: A Thermal Design Primer

Sitting in the shade of a “kind ole tree” is one way to keep cool, but what do you do to keep solid-state amplifiers from overheating?

By Dick Jansson,* WD4FAB

One of the greater mysteries of Amateur Radio is that of thermal design and heat transfer. This is understandable when you realize that thermal design is practiced by relatively few mechanical engineers, even fewer of whom are interested in Amateur Radio. I intend to correct some of these deficiencies by treating one of the most common, but elusive, heat transfer modes.

Natural convection heat transfer is the simplest method to cool electronic devices, but it is not efficient in terms of size and power-handling capability. This method of cooling RF power amplifiers places a heat exchanger (heat sink) on the amplifier, as shown in Fig. 1. When power is dissipated by the amplifier, the heat sink becomes warm. The air in contact with the warm heat sink becomes lighter than the surrounding ambient air and rises. This allows cooler air to come in contact with the heat sink. Air circulation through the heat sink is thus created. Lighter, warmer air moves about through the good graces of the earth's gravity, and it, in turn, becomes cooled by the ambient air.

The advantage of natural convection is that the cooling device is simple and has no moving parts. There are no fans or blowers to create that rumbling background noise so often heard on ham-band signals. But there are some limitations in the use of natural convection to cool amplifiers. It is not practical to dissipate continuously more

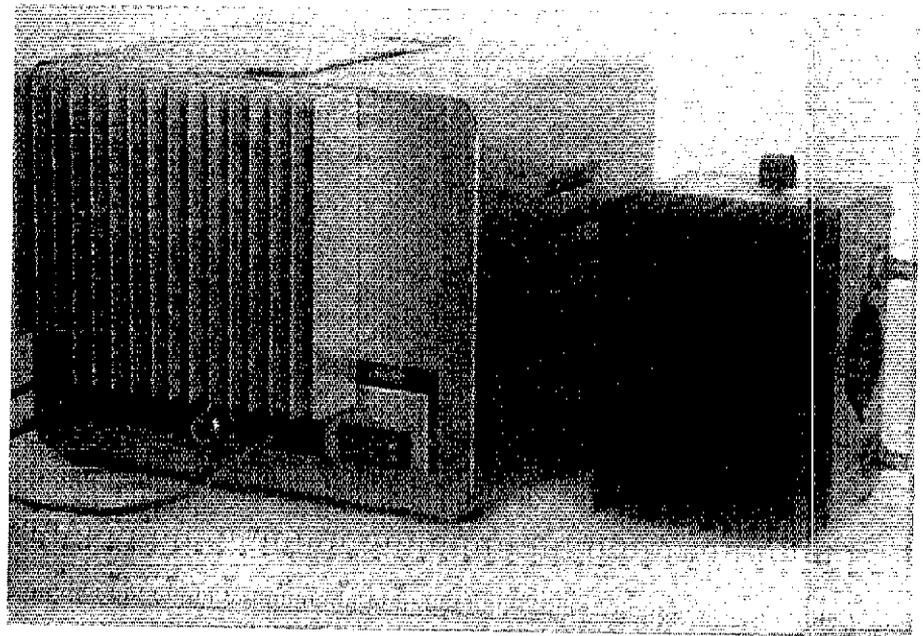


Fig. 1 — The back panels of two solid-state amplifiers built by the author. Note the heat sinks employed.

than 100 W because of the size of the heat sinks required, unless an expensive space-age heat pipe (Fig. 2) is used.¹ Another practical restriction in the use of many heat sinks is that one face of the sink must be flat and unobstructed so the circuit board can be secured intimately to the heat sink.

This rules out some of the better-performing high-power heat sinks.²

Thermal Networks

To apply thermal design precepts to RF amplifiers, a discussion of thermal networks is needed. Thermal networks that look like electrical networks can be constructed. In fact, the basic equations are the same. Heat, measured in watts, flows in the

*1130 WillowBrook Trail, Maitland, FL 32751

¹Notes appear on page 14.

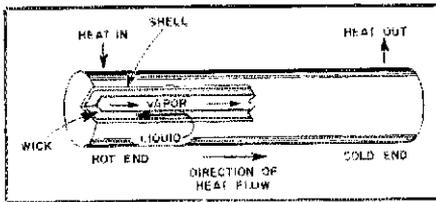


Fig. 2 — The basic structure of a heat pipe.

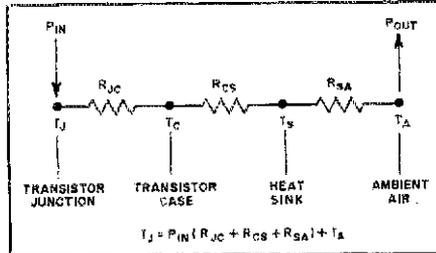


Fig. 3 — Thermal network elements are configured like electronic networks.

network as does electrical current, measured in amperes. Temperature differences, in degrees Celsius, are equivalent to electrical potential, in volts. Resistance to heat flow is expressed in °C/W, and is equivalent to resistance measured in ohms. (Thermal resistors, however, have not yet been color coded!)

A thermal network that describes the flow of heat from a transistor junction to the ambient air, considered here as the ultimate heat sink, is shown in Fig. 3. R_{jc} describes the thermal resistance from the transistor junction to its case. R_{cs} is the resistance of the mounting interface between the transistor case and the heat sink. R_{sa} is the resistance of the heat sink to the ambient air. The upper limit of this thermal network is the safe and reliable operating temperature of the transistor junction. While modern silicon transistors can operate with junction temperatures in excess of 200° C, good practice dictates limiting the junction temperature to 125° C for long-term reliability. Some government-sponsored projects restrict that number to 110° C.

Here are some practical examples. Fig. 1 shows the back of two solid-state amplifiers. The larger unit on the left has two transistors that deliver 60 W of RF output on 432 MHz; the smaller unit on the right employs a single transistor developing 100 W of RF output on 50 MHz. Table 1 lists the thermal characteristics of these two amplifiers.

Values of R_{jc} are supplied by manufacturers' data sheets for the respective transistors.³ Values for R_{cs} are more tenuous and depend on a number of variables. Fortunately, most RF power transistors are electrically isolated from their cases. This permits the case to be mounted directly to a heat sink rather than requir-

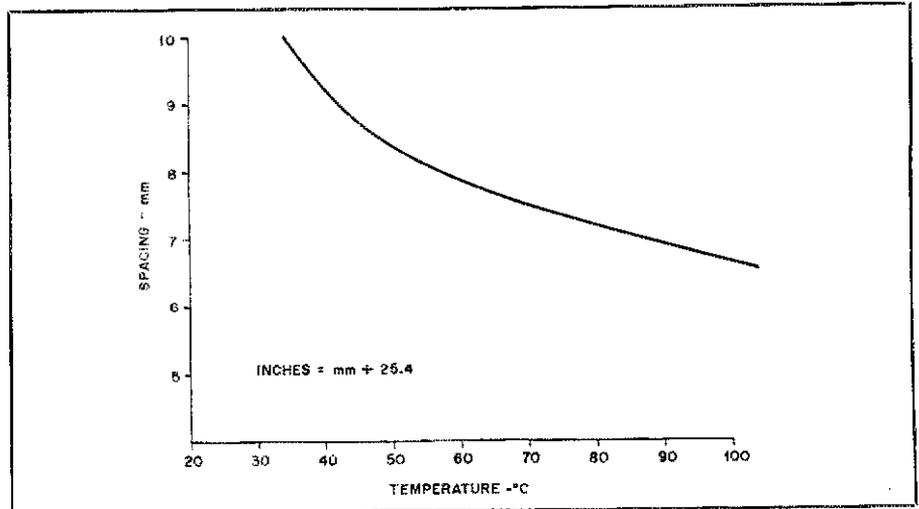


Fig. 4 — Optimum fin spacing as a function of heat-sink temperature is shown here.

Table 1
Amplifier Thermal Characteristics

Operating frequency:	50 MHz	432 MHz
Transistor type:	PT9780	MRF309
Quantity:	1	2
Thermal resistance (°C/W) of each device:		
junction to case (R_{jc}):	0.50	1.20
case to heat sink (R_{cs}):	0.50	0.50
Dc input power (W):	189	158
RF output power (W):	95	63
CCS dissipation (W):	94	63
ICAS dissipation (W), 33% duty cycle:	31	32
Thermalloy heat sink type (see Table 2):	14468(6157)	14288(6190)
Thermal resistance (°C), sink to ambient (R_{sa}):	1.15	0.84
Design ambient temperature, T_a (°C):	27	27
ICAS operating temperatures (°C)		
heat sink (T_s):	63	54
transistor case (T_c):	94	70
transistor junction (T_j):	141	127

ing thin, insulating washers or other insulating material. The variability of R_{cs} is in the "tightness" of the attachment of the transistor to the heat sink, and the methods that are used to ensure excellent thermal conduction between the case and the sink. Typical values of R_{cs} can range from 0.50° C/W down to 0.2° C/W using direct mounting methods and thermal joint compound. Somewhat lower values of R_{cs} can be obtained (at a price) through the use of a 0.05-mm-thick layer of indium foil.^{4,5}

This leaves the thermal resistance of the heat sink, R_{sa} , as the remaining item. Table 2 shows the significant measurements of the two heat sinks used as examples. The fact that the spacing between fins is not small is an acknowledgment of the thickness of the heated air next to each fin employed in natural convection heat transfer.⁶ Optimum fin spacing is a function of the heat-sink temperature, shown in Fig. 4. Average fin spacings less than 8 mm should not be considered, as the air flow will be impeded seriously. Narrow fin

spacings are useful on heat sinks that have fans to move the air. Most force-cooled heat sinks used in natural-convection service might just as well be solid blocks of metal for all the good their narrowly spaced fins do without powered air movement.

Since gravity and air density play a role in convective heat transfer, there are good and bad fin orientations, with respect to the gravity vector, that must be considered. Fig. 5 illustrates the heat-sink orientations and nomenclature considered in this work. Note the indicated air flow, as this is a clue to the performance data.

How Big a Sink?

How does one approximate the heat-sink size needed? Some manufacturers have concluded that heat-sink volume and performance can be loosely related over a wide range of values.⁷ Fig. 6 shows the important portion of the range suitable for RF power amplifiers. These values are identified as *rough order of magnitude* (ROM) sizing of a heat sink. While this graph may

seem too simplistic for a complex subject, the data demonstrates that it is not.

For the purposes of this work, a simple analytic computer program was created.⁴ This provides a closed-form solution (an approximation) accounting for the convective heat transfer and the radiation heat transfer that also affects performance. Consideration of the radiative transfer, while not large, helps avoid oversizing a heat sink. The results of the analysis are shown in subsequent illustrations as the "computed" curves.

I conducted unsophisticated thermal tests in my shop with the highest class of instrumentation being a portable digital voltmeter equipped with a single thermocouple. Other items included a thermometer, masking tape, a house-insulation blanket, some power resistors and an adjustable, regulated power supply. Tests were conducted at several power levels for the three fin orientations shown in Fig. 5.

Figs. 7 and 8 show the test results, along

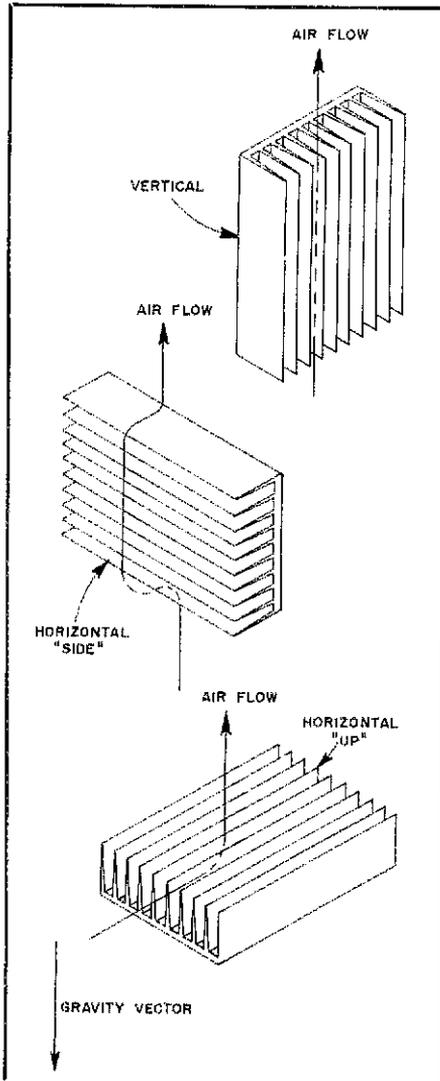


Fig. 5 — Good and bad heat-sink orientation, as discussed in the text.

Table 2
Heat Sink Measurements

Thermalloy part number:	14468(6157)	14288(6190)
Fin dimensions (mm)		
height:	38	35
length:	152	152
mean spacing:	7.9	9.2
Number of fins:	10	16
Heat sink dimensions (mm)		
height:	44	42
width:	104	172
length:	152	152
Emissance:	0.95	0.80
Analytic and test conditions:		
ambient (still) air temperature, °C:		27-28
heat transfer shape factor:		0.555

in = mm/25.4

with the computed expectations. The best performance is obtained with the vertical fin orientation, followed closely by the horizontal-up fin placement. Heat sinks with horizontal-side fin orientations are real losers. The ROM projections for these heat sinks are seen to approximate their practical maximum-power capabilities. This demonstrates that properly selected and used heat sinks do meet the expectations of sophisticated analysis and simple ROM projections. The data suggests that a 15% higher ROM value should be used for simple analysis in this range. For any selected power level, the R_{sa} can be found, with the heat-sink and transistor-junction operating temperatures determined as shown in Table 1.

Note that the safe heat-sink and transistor temperatures are somewhat higher than commonly suspected. Most of us are able to keep our "finger thermometer" on a 50° C heat sink, albeit for not too long. For a full 33% ICAS operating duty cycle, the heat sinks on the amplifiers become warmer than 50° C, yet the transistors are safe.⁹ In practice, my amplifiers have never had heat-sink temperatures warmer than that tolerated by a finger.

The heat sink on the 70-cm amplifier is not black anodized. This fact is accounted for in the computer analysis. The unanodized heat sink has a natural mill finish (certainly not polished), and that, along with its fin geometry, created a rather "gray" surface with a probable radiative emissance (ϵ) in the range of $\epsilon = 0.80$. Shown also in Fig. 8 is the expected performance of a black anodized heat sink, $\epsilon = 0.95$.

In determining the convective performance of a finned heat sink, the dimension of the fin that lies in the gravity direction is important. The shorter dimension of the fin height in the horizontal-up orientation is quite a boost to heat transfer. What counters this effect is that the air pursues a more difficult path to reach the fins. Therefore, a reduced fin effectiveness (η) of only 0.60 is used in those cases. The poor performance of the horizontal-side place-

ment heat sink is quite noticeable in Fig. 7. This case was not analyzed, and only a limited amount of data is presented, as the test heat exchanger was getting quite hot at the lower-power levels.

The Air Path

Prior to these tests, I intuitively felt that having air clearance below a vertically oriented heat sink is necessary. Amplifiers were located to provide good air supply clearance from below (extending over the edge of a shelf). The test data clearly demonstrates that these steps are unnecessary. A vertically oriented fin heat sink can be used effectively even with a blockage at the lower air entrance side of the heat sink. Moreover, the good performance of the horizontal-up oriented heat sinks proves to be another surprise. All this means is that some of us are still learning about the thermal-design profession!

Use of Fans

How does a heat sink perform with some induced air motion? Fig. 9 provides that information in terms of a thermal resistance ratio; i.e., the thermal resistance with forced air motion compared to the natural convection resistance. This data is not universally applicable, so use it with caution. It does show that substantial improvements may be had with only small air velocities through the fins. For example, a two-fold heat sink performance improvement can be obtained with an air-flow velocity of only 300 ft/min. This is at the expense of providing a fan, the power required to operate the fan, and acceptance of accompanying noise. If a station is operating on emergency power, ac fan power may not be available. The data of Fig. 9 may be applied to such items as heat sinks on solid-state transceivers that operate in the RTTY and FM modes. Most of the heat sinks used on these transceivers are not designed for that type of service. A small fan, perhaps slowed to inaudibility through the use of a series power resistor or a capacitor, can save the day and the final amplifier transistors.¹⁰

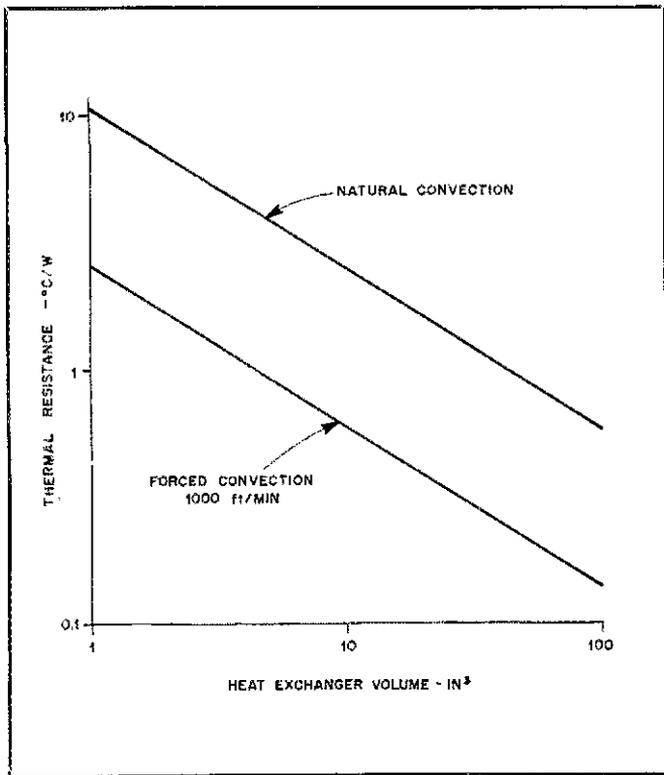


Fig. 6 — Heat-sink size may be approximated from this chart. ($\text{Cm}^3 = \text{in}^3 \times 16.387$.)

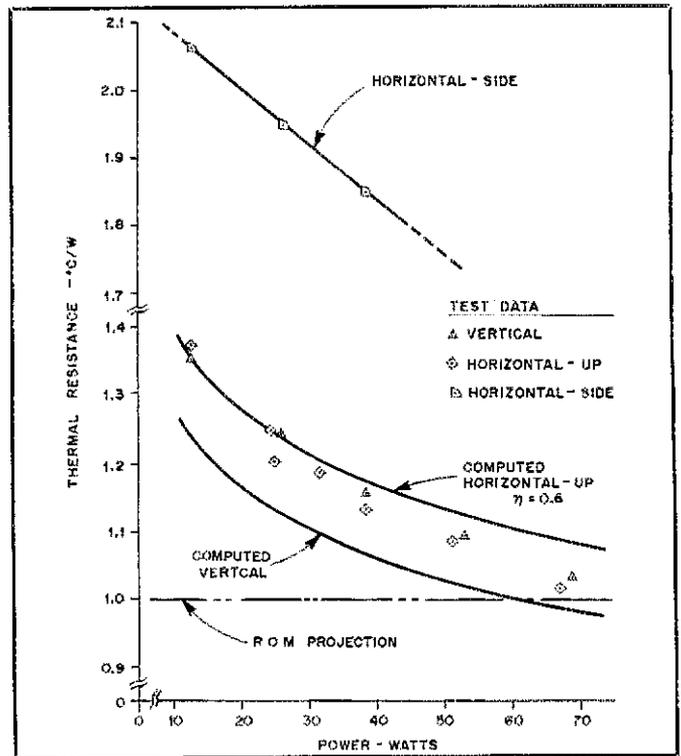


Fig. 7 — Test results using a Thermalloy 14468(6157) heat sink. As shown, test data values for the horizontal-up and vertical fin orientations fall between the computed-value curves.

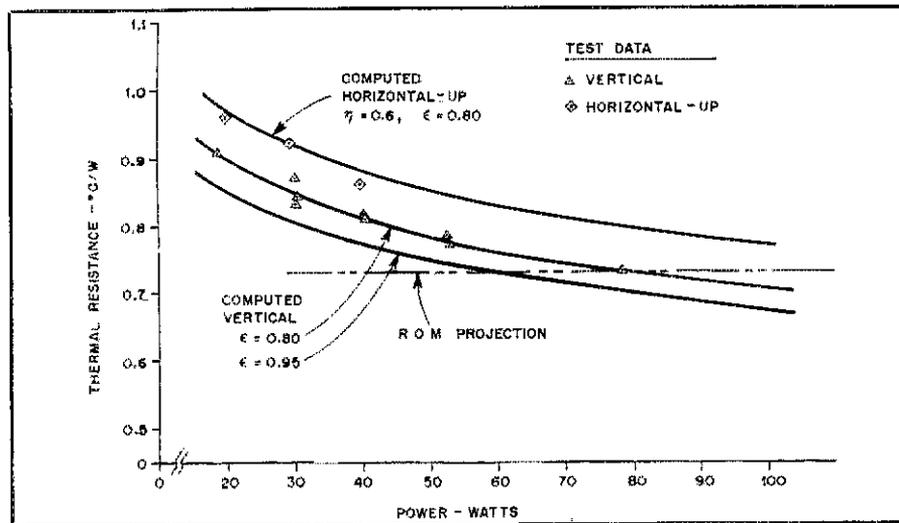


Fig. 8 — Tests results using a Thermalloy 14288(6190) heat sink.

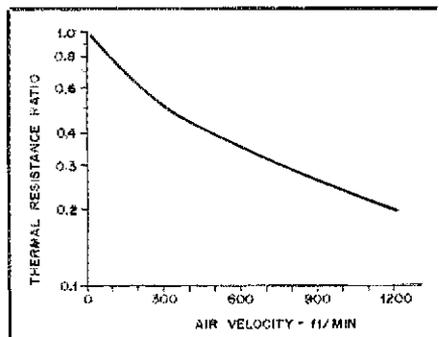


Fig. 9 — Heat-sink performance with induced air motion.

Notes

- ¹The heat pipe is a thermal linkage of very high conductivity. It is a closed, evacuated chamber lined with a wick. Heat is transported by evaporation of a volatile fluid, which is condensed at the cold end of the pipe and returned by capillary action to the hot end. The vapor passes through the cavity. Heat pipes consist of three zones or sections: the evaporator, the condenser and an adiabatic section connecting the other two. In some designs, the adiabatic section may be very short. This device offers a number of important properties useful in electronic equipment cooling systems. It has many times the heat transfer capacity of the best heat-conducting materials while maintaining an essentially uniform temperature and transporting heat over distances of several feet. It requires no power and operates satisfactorily in a zero-gravity environment.
- ²There are numerous manufacturers of excellent heat sinks, although the choices suitable for convection-cooled RF amplifiers are somewhat limited. Refer-

ences to any one manufacturer are not intended to exclude the use of products of any others, nor to indicate any particular predisposition to one manufacturer. The catalogs and products used during the preparation of this paper are from: EG & G Wakefield Engineering, 60 Audubon Rd., Wakefield, MA 01880; Thermalloy, Inc., 2021 West Valley View La., Dallas, TX 75234-9990; and Accel Industrial Heat Sink Corp., 3709 Medford St., Los Angeles, CA 90063.

³PT9780 manufactured by TRW RF Semiconductors, 14520 Aviation Blvd., Lawndale, CA 90260; MRF309 by Motorola Semiconductor Products, Inc., Box 20912, Phoenix, AZ 85036.

⁴ $\text{in} = \text{mm}/25.4$; $\text{m} = \text{ft} \times 0.3048$.

⁵R. M. Jansson, "The Heat Transfer Properties of Structural Elements for Space Instruments," *MIT Instrumentation Laboratory*, E-1173, June 1962.

⁶J. Pritchett, "Optimum Fin Spacing in Natural Convection or Free Convection," *Thermalloy, Inc.*, E.I.R. No. 76-1004, May 1976.

⁷EG & G Wakefield Engineering and Thermalloy, Inc.

⁸This software was written to help the author avoid the pitfalls of failing memory. It requires considerable engineering judgment to use, and is not suitable for distribution.

⁹ICAS — Intermittent Commercial and Amateur Service.

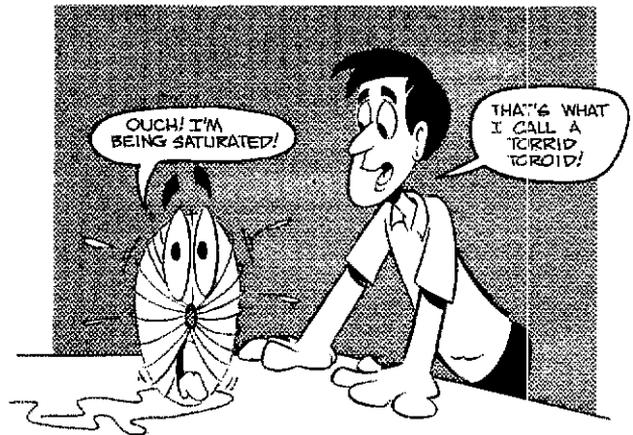
¹⁰Ac motors are terrible variable-speed devices. The ability to slow one down depends on its slip characteristics (the difference between the rotor and stator speeds). I use a Sprite model SP2A2 fan to cool the heat sink on my transceiver. Being quite near the operating position, even this small fan makes an objectionable amount of noise if operated at full line voltage. I experimentally determined that use of a 1-kΩ, 20-W resistor in one leg of the line to the fan slows the fan to inaudibility while still moving enough air to permit CCS (Continuous Commercial Service) RTTY transmissions. (A capacitor can be used to slow the fan, but none of the capacitors I tried would stay in one piece for long; perhaps others will succeed where I failed.) The fan is mounted on the transceiver with a pair of hangers formed from paper clips. The resistor (a metal-cased unit) is bonded to the fan housing with RTV sealant. A plastic locking strap around the motor and resistor adds additional support. (A note of caution: The power supply used to power your transceiver may need to be cooled for CCS service.) I use a slightly different approach with a blower used to cool a high-power solid-state amplifier. A voltage-dropping resistor in the fan power circuit is bypassed by a solid-state ac relay during transmission. REF

A Second Look at Magnetic Cores



In March *QST* we discussed some aspects of toroids and other magnetic cores, but we didn't cover all of the practical considerations. This installment offers additional practical data.

By Doug DeMaw,* W1FB



Still have some unanswered questions about toroids and other cores? Are you looking for more complete data on core size versus power? And what about added uses for some of the units we discussed in March *QST*? Okay, let's take a deeper look at these useful magnetic cores and learn a bit more about how they can be used in our Amateur Radio circuits. We will also examine a practical LC type of CW audio filter, which is being offered as our workshop project for this month. It will give you another occasion to "learn by doing."

It is fair to say that working with magnetic-core materials is no more complicated than is the application of slug-tuned coils. After all, we've been using those gadgets for decades. The concept is the same, but the physical format is slightly different. Slug-tuned coil forms do, indeed, contain pieces (slugs) of ferrite or powdered-iron material. Once again we will skip the high-level theory and concern ourselves with the data that hobbyists need to put these items to satisfactory use.

Materials and Shapes — a Refresher

Fig. 1 shows a number of magnetic cores. They all follow specific geometric forms, hence the names toroid, rod, and so on. Some additional forms are depicted pictorially in Fig. 2. Notice that the beads of Fig. 2E are, in reality, small toroids. The balun-transformer core at F of Fig. 2 can be thought of as two toroids, or two rows of toroids, placed side by side. It is not essential that a balun core be a solid casting of ferrite, even though a number of such

cores are available commercially for use in RF power amplifiers and for many low-power circuits.

The sleeve at G of the figure is similar to a toroid, except that the walls are thinner and the body is longer. It could be used as a toroid if we so desired. A so-called "C core" is shown at H of Fig. 2. This type of core is frequently used in TV set high-voltage (flyback) transformers. E-shaped cores, which are of a more common format for audio and power transformers, are also available.

Ferrite or powdered-iron cylinders (small) with wire leads embedded in the core material are used as foundations for RF chokes. The wire leads are, of course, isolated from one another electrically. Many of the commercial RF chokes we buy are wound on forms of this kind. Some are encapsulated in plastic insulating material for the protection of the choke winding. A

further elaboration is the color banding or addition of colored dots to signify the inductance value of the choke. Many RF chokes, however, consist of only the core and a winding of enameled wire. After the winding is in place, the manufacturer coats it with protective varnish.

I think most of you are aware that the rods and bars of Fig. 2 (B and C) are commonly used as built-in antenna foundations for standard broadcast radios. Some VHF paging receivers use small rods for the same purpose, but with an appropriate core material for the frequency of operation. A common use for the larger rods is seen in filament chokes for high-power RF linear amplifiers, such as we use for QRO (high-power) operation. The chokes are bifilar-wound (two identical windings laid on the core, side by side). They are used between the tube filaments and the filament transformer. RF excitation is applied at the

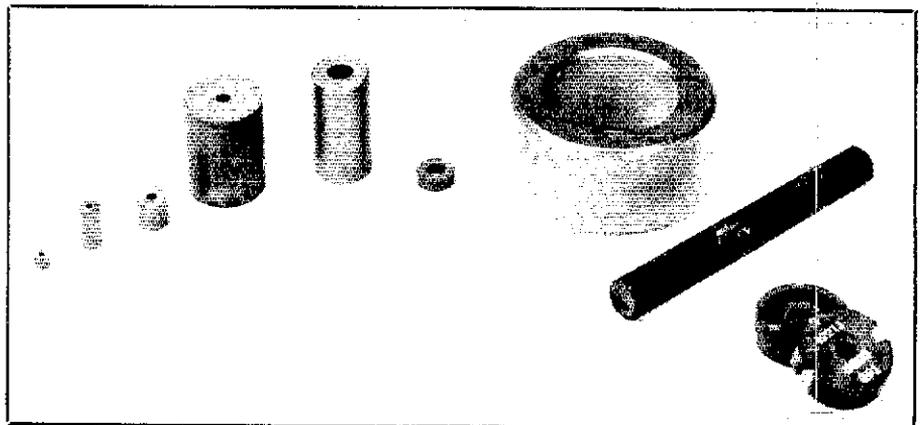


Fig. 1 — Various types of magnetic cores. From left to right are miniature and jumbo beads, small toroid, large toroid, rod and pot core.

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

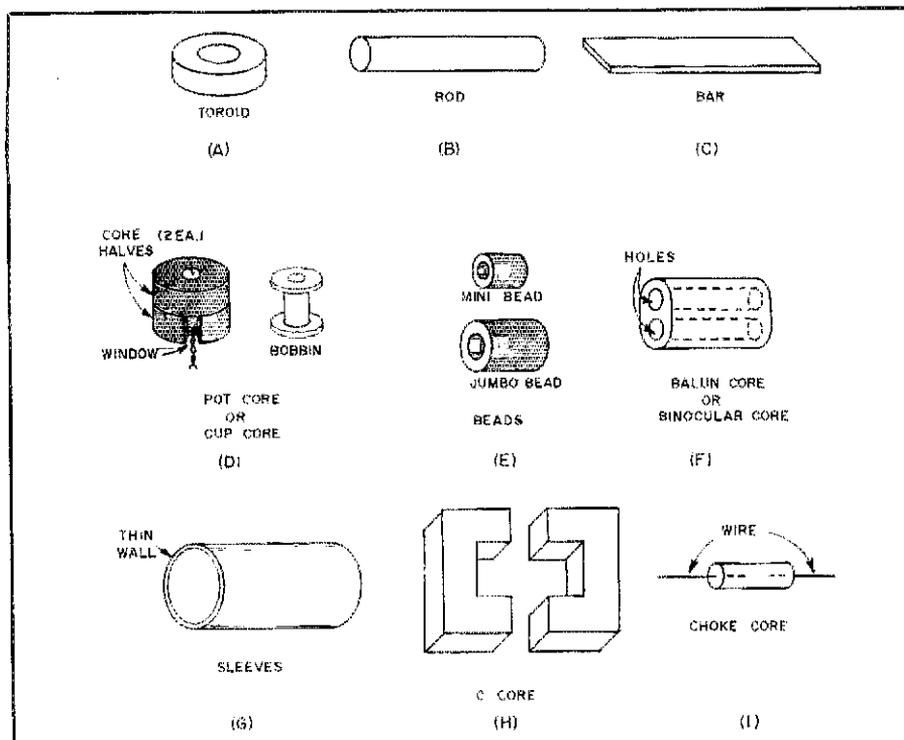


Fig. 2 — Pictorial views of a number of cores used by amateurs. See text for further information.

tube-filament end of the choke, and the choke prevents the RF energy from being lost to ground via the filament transformer.

Even though we have suggested some common tasks for rods, they can be used as cores for conventional inductors, such as the type used in tuned, narrow-band circuits. As a matter of fact, we can use any of the standard core types for most applications. We need only to select the proper core mix, or recipe, for the frequency of interest.

Combining Cores

There may be occasions when we don't have a large enough core to provide the desired winding inductance, or perhaps one core alone will not accommodate the power in a given circuit. What can we do about this? We can combine two or more cores, such as toroids, in a "stack" to increase the cross-sectional area (A_c). The greater the cross-sectional area (given in cm^2 by the manufacturer), the higher the power-handling ability.

Fig. 3A shows how we might stack a pair of toroids to increase the effective A_c . Similarly, two rows of toroids can be used in combination, as shown in Fig. 3B. By following this approach we can build our own balun-transformer core of the type seen in Fig. 2F. In both examples of core stacking, we have indicated the use of epoxy cement. This affixes the cores to one another and helps to maintain the desired shape. This technique also makes them much easier to wind, for when the cores aren't glued the assembly is loose and dif-

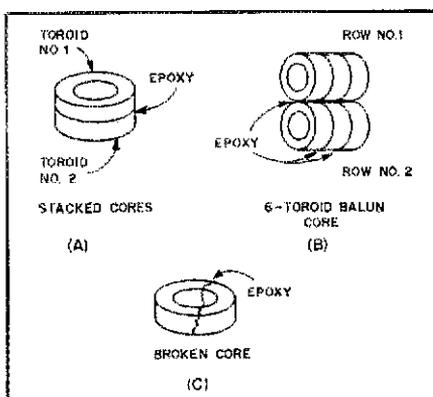


Fig. 3 — Methods for stacking and repairing toroid cores. See text.

ficult to deal with, to say the least!

Suppose you dropped a toroid core and broke it. Is it no longer useful? No, not if it didn't shatter into many small segments. All you need do is cement the broken sections together (as at C of Fig. 3), clamp the core lightly and wait for the glue to dry. I have repaired a number of ferrite cores in this manner, and their performance was just fine. I have also glued ferrite rods together, end to end, in an effort to obtain a truly long rod core for experimental loop antennas. They worked quite well, despite the cementing job. Some amateurs have glued bundles of ferrite rods together for the purpose of increasing the inductance of a coil while boosting the power-handling capability.

Fig. 4 shows a balun-transformer I made

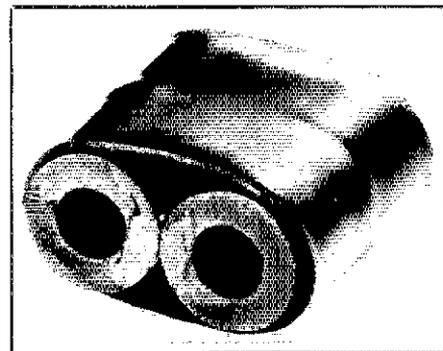


Fig. 4 — An example of stacked toroid cores that have been formed to serve as a balun transformer core. Heat-shrink tubing has been added to aid rigidity. Epoxy cement is used to hold the cores together.

from two rows of stacked $950 \mu_i$ (initial permeability) toroids, two cores per row. This was built to serve as the core for an RF output transformer in a push-pull, 10-W solid-state amplifier. It is shown without the windings. After the epoxy cement had dried, I slipped a section of large-diameter shrink tubing over the assembly and applied heat to shrink the tubing to size. This provided a nice appearance and helped to ensure that the homemade core would maintain its shape.

If you have a can of plastic dip for tool handles, try plugging the holes in the core (after the epoxy glue has set) and dipping the assembly in the compound. This will also provide added strength and enhance its appearance. If this is done, there will be no point in using shrink tubing. In any event, the bare cores will work just as well as the covered ones. Builder's choice!

More About Shielding

As we learned in the earlier discussion about magnetic cores, toroids are inherently self-shielding devices. Other types of inductors must often be enclosed in metal shield cans to prevent unwanted stray radiation or pickup, respective to nearby circuits. Fig. 5 contains pictorial examples of this principle. The assembly at A is a standard type of coil that has a metallic shield enclosure around it. Many of these units are found in radios and transmitters. Adjustment of the coil inductance (assuming a slug is used) is through a small hole at one or both ends of the metal can. By comparison, the small toroidal inductor at Fig. 5B needs no external shield. The pot-core inductor (also at B) is shielded by virtue of the magnetic material being on the *outside* of the coil winding. Conversely, the rod style of inductor of Fig. 5C is not shielded. The main precaution we must take when using open toroidal inductors is to avoid unwanted *capacitive* coupling between the toroid and some sensitive circuit element in proximity to the toroid: Capacitive coupling can take place between any two or more components

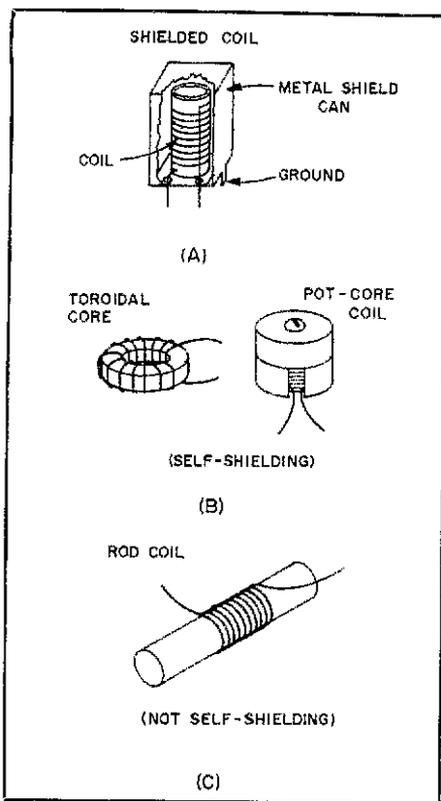


Fig. 5 — A conventional coil with external shield enclosure is seen at A. The toroid and pot-core inductors at B are self-shielding. The rod at C is not self-shielding.

that are near to one another if they aren't enclosed in shields.

Symbology Revisited

It may be helpful to review the electrical symbols for various coils and transformers. Fig. 6 shows the most common designators for three types of coils and transformers. An air-core coil is shown at A. Symbol B is for a fixed-value inductor (such as a toroid); its magnetic core material is identified by the two parallel lines. The coil of Fig. 6C has a movable magnetic core (slug) that can be used to change the coil inductance. This is the standard symbol for a slug-tuned coil.

The transformer symbols at D, E and F of Fig. 6 follow the same rule as for the coils at A, B and C. Transformer F is the type that we find in pocket-size AM receivers for the broadcast band. They are used as RF, oscillator and IF transformers. An example of such a circuit, shown in part, is presented in Fig. 7. We can see that a rod (loop antenna), two adjustable transformers, some beads and an RF-choke core are used. The choke might be wound on a rod form such as that of Fig. 21, or it could be wound on a suitable toroid core or bead.

Core Size and Power Level

In March *QST* we dealt in generalities when we considered core size versus safe power levels. Some readers expressed the

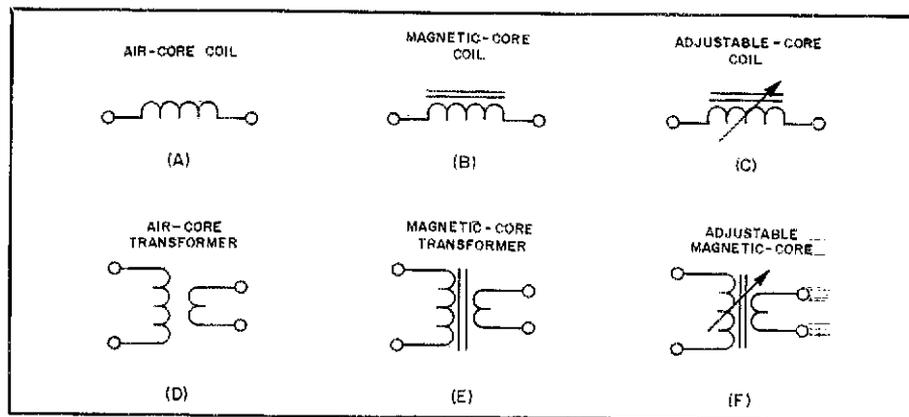


Fig. 6 — Electrical symbols for three types of coils and transformers. See text.

desire to have this matter treated in greater depth. So, we'll avoid repeating the bad effects of too much power for a given core size. Instead, we will learn how to use the equations that pertain to selecting the right size core for the job.

All magnetic core material has a list of operating characteristics. The manufacturers' data sheets contain the facts we must consider before choosing a core for a particular job.¹ A book on this subject is also available.² A dedicated experimenter should acquire as much pertinent literature as possible for a reference file.

In addition to core size is the matter of protection from excessive voltage. Since ferrite and powdered-iron materials are, in

reality, two types of *semiconductor* material, they are not ideal insulators. Ferrite is very brittle and hard, and is a lot like ceramic in this respect. Powdered iron, on the other hand, is quite soft — so soft that we can cut it with a saw. But, irrespective of the material from which the core is made, it can accommodate only so much ac, dc or RF voltage before it will develop an arc between the winding and the core.

Such a catastrophic event can be prevented if we wrap the core with insulating tape. I like to use 3M[®] brand glass tape. Mylar[®] tape (hard to locate) is good also. Wouldn't Teflon[®]-coated cores be great for high-power circuits? To the best of my knowledge, such a "critter" doesn't exist; if it did, the price would be high enough to send a Wall Street broker into nervous spasms. I have, however, wrapped

¹Notes appear on page 20.

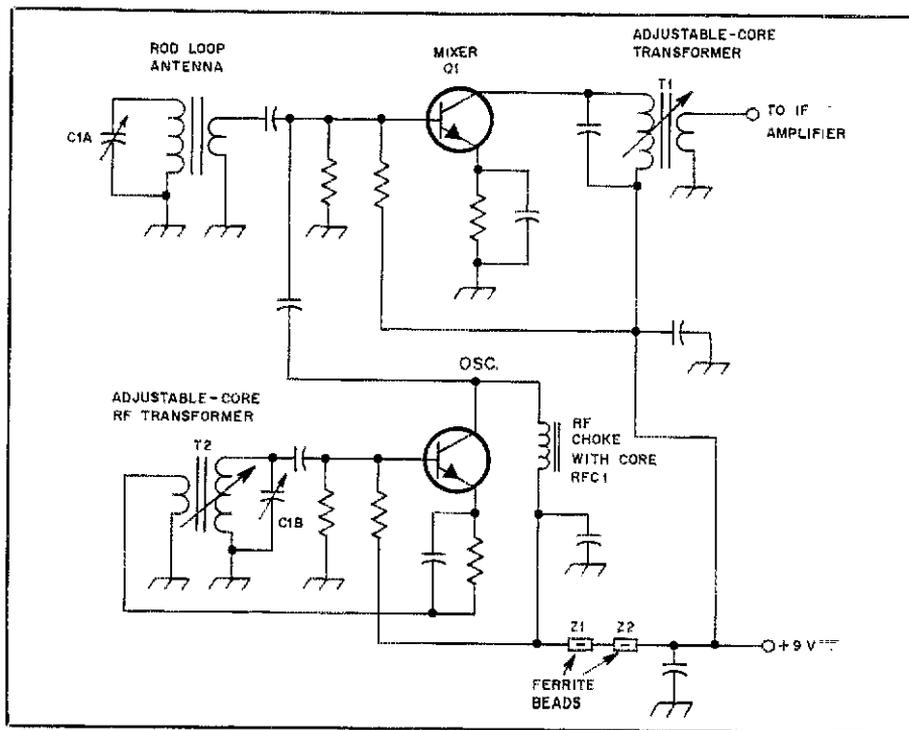


Fig. 7 — Representative diagram of the front end of an AM pocket radio. The use of magnetic cores is illustrated here.

some cores with Teflon-insulated wire (when I was lucky enough to find some at a flea market, priced to fit my frugal way of thinking). Beware of ferrite cores that have sharp edges. It is very easy to scrape off the wire insulation on these raw edges during the winding process. Tumbled cores are much better, for they come with smooth edges.

Getting back to the power-handling capability, we need to be aware of the B(max) rating of the core. This relates to the maximum safe flux density, specified in gauss. The operational flux density for a core in a given circuit is called B(op). This value must always be less than the stated B(max) found in the data sheet. In fact, I like to ensure that B(op) is no more than 0.25 the B(max). Why? Because I am always assured that the core is then operating well within the linear range. Excessive flux density will cause a core to generate harmonic currents, and if the B(op) is excessive, the core can become damaged permanently. When a core generates harmonic currents, TVI and RFI can easily result, to say nothing of poor circuit performance. Hence my motto: "Go big!" Let's always be certain that the core has ample "beef" to do the job.

Powdered-iron cores, per unit size, have greater flux-density ratings than do their ferrite cousins. But, there is a trade-off: The ferrite core is capable of providing much greater permeability per unit size. Also, powdered-iron cores are more suitable for high-Q, narrow-band circuits above, say, 10 MHz.

Let's get down to the nitty-gritty of core size versus power. The following equation is used as the basis for calculating the core size needed:

$$B_{op(AC)} = \frac{E(rms) \times 10^8}{4.44 f N A_e} \text{ gauss (Eq. 1)}$$

where A_e is the core equivalent area of the magnetic path in cm^2 and E_{rms} is the applied ac voltage. N is the number of coil

Manufacturers of Magnetic Materials

Fair-Rite Products Corp.
1 Commercial Row
Walkill, NY 12589

Indiana General Crows Mill Rd.
Keasby, NJ 08832

Ferroxcube Corp. of America
5083 Kings Hwy.
Saugerties, NY 12477

Micrometals, Inc.
228 N. Sunset
City of Industry, CA 91744

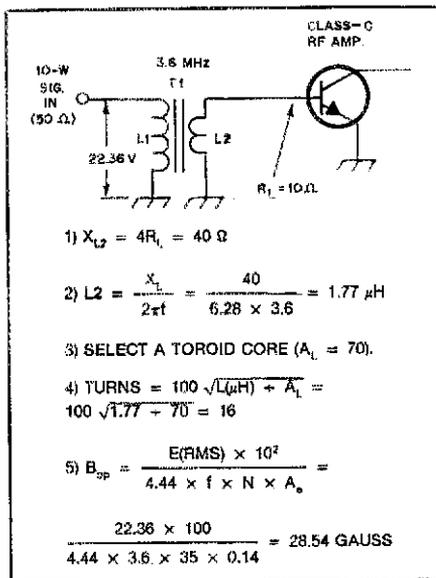


Fig. 8 — A design example that shows how to select the proper core for the application. Data is given also for determining the right number of coil turns.

turns on the core and f is the frequency in hertz. B_{op} is the operating flux density in gauss.

Let's look at a typical design example. Eq. 1 has been changed slightly so we can work with megahertz rather than hertz. Our circuit for the exercise is in Fig. 8. To know the value of E_{rms} we must determine what the voltage versus power will be across the

largest winding (T1 primary). Since the impedance is 50 ohms and the power is 10 W, we will see 22.36 V across the primary winding.

Next, we need to find out how many turns are needed on the core. Always use the smallest winding (T1 secondary) when doing this part of the calculations. The reactance (X_L) of the winding must be at least four times the load impedance (R_L). Since our example indicates a 10-ohm R_L , $L2$ should have an X_L of 40 ohms or greater. If not, losses and SWR problems will result. The winding inductance is obtained from $X_L/2\pi f(\text{MHz})$, which is 1.77 μH for the lowest operating frequency anticipated (3.6 MHz, in this case). Step 2 of Fig. 8 shows how this is derived. Step 4 of Fig. 8 gives the equation for determining the necessary turns for $L2$. We must look at the manufacturer's data sheet first and obtain the A_L factor for the particular core being used. A_L is the index for turns versus inductance. We have chosen for this example an arbitrary core that has an A_L of 70. Next, we can learn how many turns are needed on the primary winding of T1 ($L1$) by calculating the turns ratio needed. In our example the impedance ratio is 5:1, so the turns ratio is the square root of that number, or 2.2:1. This being the case, the primary winding will have 35 turns.

Now, we look up the A_e rating of the chosen core and work the equation in step no. 5. Let's say that $A_e = 0.14 cm^2$ for this problem. By applying the 75% rule, we will make sure the core has a gauss rating of 50 or greater. If dc flows through a transformer winding along with ac, the equation must be altered to

$$B_{op} = \frac{E_{rms} \times 10^8}{4.44 f N A_e} + \frac{N \times I_{DC} \times A_L}{10 A_e} \text{ (Eq. 2)}$$

where I_{DC} is the dc current in amperes and A_L is the manufacturer's inductance index.

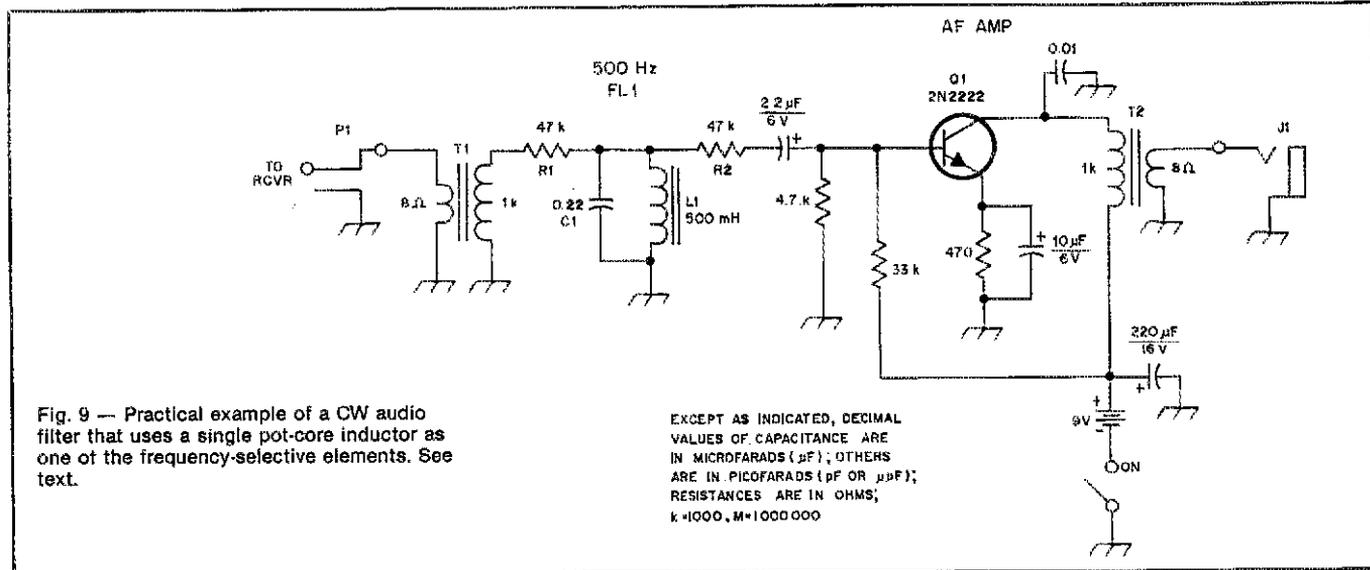


Fig. 9 — Practical example of a CW audio filter that uses a single pot-core inductor as one of the frequency-selective elements. See text.

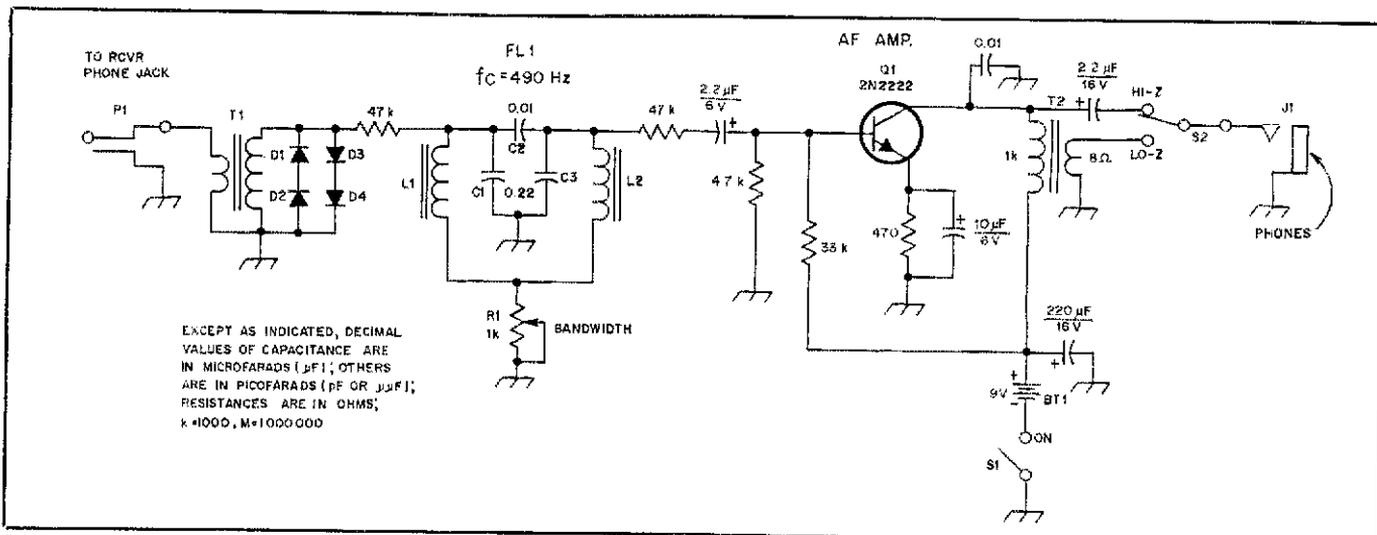


Fig. 10 — The workshop project for this month is an audio filter that uses two pot cores in a double-tuned LC filter. T1 and T2 are miniature audio-output transformers (1 kΩ to 8 Ω). L1 and L2 are 500-mH pot-core inductors (see text). C1, C2 and C3 are 5% Mylar or polystyrene capacitors. R1 is a linear-taper carbon control. Capacitors with polarity marked are electrolytic or tantalum. Fixed-value resistors are carbon-composition, ¼- or ½-W types. S1 is an SPST switch, S2 is an SPDT switch. D1 through D4, inclusive, are small-signal silicon diodes (1N914 or equiv.).

It can be seen from this progression that we can't just pick up an unidentified toroid core, pot core or rod at a flea market and expect proper results in our circuits. It's better to buy new cores and study the information sheet that the supplier can provide. The Amidon Associates catalog (note 1) contains a wealth of information along these lines.

Some Practical Applications

Let's assume we want to construct a simple audio filter for CW reception. We might choose to employ a high-Q audio inductor for the selective circuit. Such an example is presented in Fig. 9. L1 and C1 form a resonator that has a frequency of 500 Hz. R1 and R2 isolate the tuned circuit from the source and load impedances. This prevents loading of the resonator, which would lower the Q and broaden the response. T1 is a small transistor-radio output transformer. It permits us to connect the filter to the 8-ohm output of our receiver. Another such transformer (T2) is used at the filter/amplifier output port to enable us to use 8-ohm headphones. This matching technique reduces losses caused by mismatch. T2 could be replaced by a 2200-ohm resistor and 2.2-µF blocking capacitor if high-impedance phones were to be used. Q1 is an audio amplifier that compensates for filter losses caused by R1 and R2. L1 is a pot-core inductor. It could also be wound on a high-permeability toroid core. An 88-mH telephone toroid could be used at L1 if C1 were changed to a value that would provide resonance at 500 Hz, or the peak frequency of your choice. Some hams prefer a 700- or 800-Hz peak frequency. I find that QRM is not so troublesome when I tune for a CW note in the 200-500 Hz range.

We might choose to adopt the circuit of

Fig. 10 as our workshop project this month. It is an elaboration of the example given in Fig. 9. Here we have a double-tuned audio filter (L1, L2, C1, C2 and C3). This will yield a sharper skirt response than the previous example. D1 through D4 are used as limiters. By placing two diodes in each branch of the back-to-back parallel arrangement, positive and negative audio peaks are clipped at approximately 1.4 V. If this results in too little output in your headphones, you may add a third silicon diode to each branch, and so on. This will increase the clipping threshold. Two or four LEDs can be used in a similar arrangement (as in Fig. 11) one LED in each leg of the limiter.

LEDs have a barrier voltage of 1.5; this is roughly equivalent to a pair of silicon diodes in series. If LEDs are used, adjust the receiver audio gain until the LEDs just flicker on CW peaks while listening to a fairly weak signal (S2 or S3). This limiter provides an AGC (automatic gain control) action that can be very useful when the filter is used with receivers that lack AGC. Because the diodes or LEDs are placed ahead of the filter, the harmonics generated through the clipping action are removed by FL1 before they reach the audio amplifier of the filter board. The limiter also prevents Q1 from being overloaded by strong signals, thereby minimizing distortion. The diodes or LEDs can be eliminated entirely

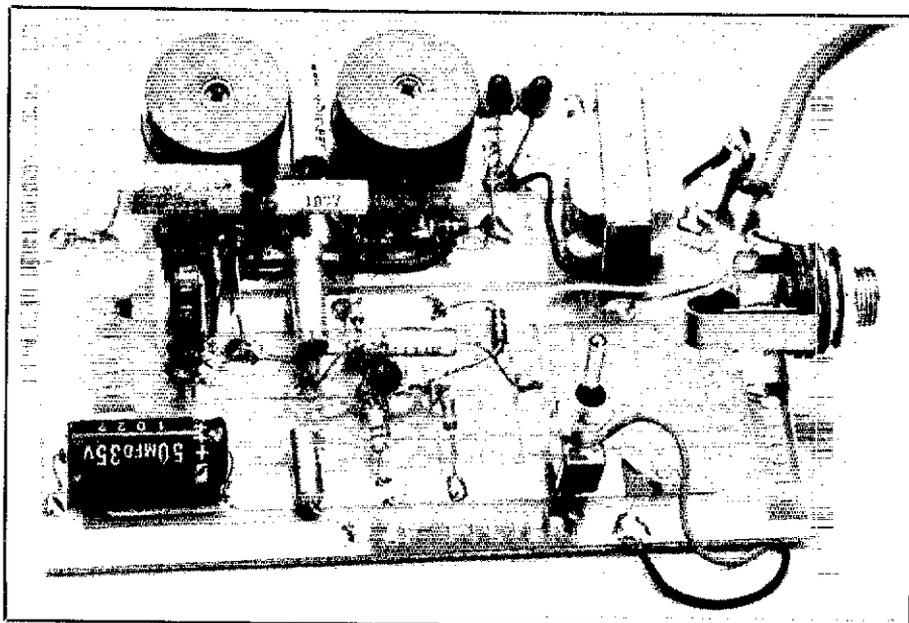


Fig. 11 — The assembled audio filter of Fig. 10.

if you do not need the AGC action, or if you prefer to have maximum gain available.

The pot cores I used are surplus. I obtained them from Diamondback Electronics Co. for 50 cents each.³ The numbers imprinted on them are Wescom 14-600004, 689 and 7231. I notice that a similar inductor is advertised in the All Electronics Corp. catalog for 50 cents each.⁴ I have not checked those units to learn what the inductance is. Both of the surplus pot cores are set up for pc-board mounting, and they have a small adjustment slug for fine tweaking. I suspect that these cores were used for early-model Touch-Tone[®] pads. If you can't locate these cores, you can wind your own. An Amidon pot-core assembly (no. PC-2616-77) with 326 turns of no. 30 enameled wire will get you close to 500 mH. Both cores in a double-tuned arrangement should have precisely the same inductance. If they don't, you will end up with a filter that is somewhat broad, and it may exhibit a double-hump response. The parallel capacitors (C1 and C3 of Fig. 10) should also be closely matched and of high Q. Mylar or polystyrene capacitors are excellent for use in audio filters.

The circuit in Fig. 10 is set up for high-impedance phones. But, you may adopt the output circuit of Fig. 9 if you use 8-ohm

phones. Q1 draws only a few milliamperes of current, so the 9-V battery will last a long time with this circuit.

I added a Q control, R1. When it exhibits no resistance, the filter is operating at its sharpest response point. There is a slight ringing effect under this condition. As resistance is added by means of R1, the filter response broadens, and there is no ringing (howling sound).

Assembly and Use

Fig. 11 shows my version of the filter. It was built on a homemade breadboard that contains a number of isolated PC-board pads. A universal breadboard of this kind is available from Circuit Board Specialists.⁵ If you want to be fancy about your construction, try laying out a circuit board for your project.

Operation is simple. Plug P1 into the phone jack of your receiver, turn S1 to ON, and insert phones at J1. Turn up the receiver audio gain until signals are at a comfortable listening level. Slowly tune through a CW signal and note the point where it is the loudest. This will be the peak frequency of the filter. Tune slowly or you may miss the absolute peak frequency. It may be best to practice with R1 set for the broadest response.

You will be pleased, if not astonished,

to find weak CW signals jumping up out of the noise level as though they gained two or three S units. I find this filter especially effective for receiving weak CW signals amid the noise on 160 and 2 meters. An LC filter, to my way of thinking, has a nicer sound than does a high-Q RC active audio filter. You may agree after trying this circuit.

Conclusion

We have barely abraded the surface with regard to our explanation of magnetic cores and their uses, but I've tried to cover the ground that has historically been a question mark for many beginners. If you absorb what we have discussed here, you should be able to get started with the use of toroids and other magnetic core forms. But don't fail to gather as much literature as possible from the manufacturers.

Notes

¹Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607. Also see manufacturer list.

²D. DeMaw, *Ferromagnetic Core Design & Applications Handbook*, no. 0-13-314088-1 (Englewood Cliffs, NJ: Prentice-Hall, Inc.). Also available from Amidon Associates (note 1).

³Diamondback Electronics Co., P.O. Box 12095, Sarasota, FL 12095, tel. 813-953-2829. Catalog available.

⁴All Electronics Corp., 905 S. Vermont Ave., P.O. Box 20406, Los Angeles, CA 90006. Catalog available.

⁵Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

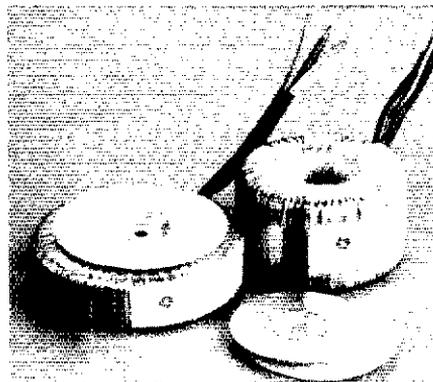
New Products

TOROID CORP. TOROIDAL POWER TRANSFORMERS

□ What are the advantages of toroidal power transformers over the more common I-E core units? Typically, the completed unit weighs half or less the amount exhibited by a stacked transformer. The transformer height is lower, which is desirable when designing low-profile gear. Toroidal transformers are easy to mount: They require but one bolt. The core material is of the continuously rolled type, which prevents buzzing and rattling of the kind we often experience with stacked transformers. Also, the no-load losses are typically less than 1/4 those of stacked-core units. Owing to the self-shielding nature of the toroid, stray fields are minimized. Finally, Toroid Corp. has its secondary winding on the outside of the primary winding. This makes it easy to wind one's own secondary to meet various output-voltage needs. In fact, a company representative stated that Toroid Corp. will be happy to furnish the cores with only the primary winding in place, thereby making it a simple task for the user to add his or her own secondary winding — tailored to the exact design needs. This should be great

for Amateur Radio power-supply applications.

These transformers are available for operation from 50 to 60-Hz mains, and ratings are available from 15 to 3000 VA. Custom designs are handled by the firm, with prototypes promised two to three weeks after the order is placed. Primary-to-secondary insulation consists of three layers of 0.05-mm-thick (0.002 in) polyester film. Two layers are used to provide a 4-kV rating, sustained for at least 1 minute.



I tested the no. 115.152 transformer. It has two secondary windings of 5-A rating, each. The transformer diameter is 3 1/2 inches, and the height is 1 1/4 inches.¹ Secondary voltage is 15. This is just right for building a 12-V, 5-A regulated supply. The 15-V output is low enough that the regulator and/or pass transistors do not have to "agonize" from high power dissipation, as is the case when using a 24- or 28-V transformer in a 12- or 13-V regulated supply.

The manufacturer has a very informative design/application catalog available. It contains all manner of practical data, plus a listing of approximately 45 available transformers. I am personally delighted with the performance of my no. 115.152 power transformer. It is used in a bench power supply that has daily use. It operates cool, quietly and efficiently. The single-lot price for this transformer is \$34.60.

A price list is available from the manufacturer, Toroid Corporation of Maryland, 4720-Q Boston Way, Lanham, MD 20706, tel. 301-459-3292. — Doug DeMaw, W1FB

¹mm = in × 25.4.

Try the "FD Special" Antenna



Looking for an antenna that's simple, inexpensive, lightweight and easy to install? Here's one that fits the description.

By Roy W. Lewallen,* W7EL

While the Field Day "juices" were flowing last year, my Field Day partners and I decided to become more competitive without compromising our general philosophy: Use all homemade gear, pack it in to the site, and don't let operating interfere with watching the scenery. Since most of our gear already ran the accepted QRP power limit of 10-W dc input and had been designed to provide high output efficiency, the antenna seemed like the reasonable point of attack (our high quality superheterodyne receivers have not been the limiting item). The constraints dictated that an antenna be lightweight, portable and easy to put up. It should also have substantial gain.

Because of our West Coast location, the front-to-back ratio was not a concern. But having a reasonably wide lobe toward the East was. We desired a low SWR because of the relatively high loss of our RG-58/U and/or RG-174/U feed line. We were interested only in the CW portion of the band, but this antenna works well over all of the band. It seemed that 20 meters would be our main "money-maker," so we designed the antenna for that band. It can be scaled for other bands, too.

The Research

Although a number of antenna types might have done the job, I settled quickly on a horizontal, close-spaced, driven array. Experience has shown that driven arrays are generally more tolerant of imperfect construction and erection than are parasitic arrays. Experience and much measurement have convinced me that horizontal arrays outperform vertical ones in the high-frequency bands, except perhaps from an exceptional location. In addition, we didn't

want the nuisance of establishing a decent ground system — which most vertical arrays require.

The theoretical gain and front-to-back ratio of 2-element arrays with 1/8-wavelength spacing between the elements are shown in Figs. 1 and 2. Note

the lower curve of Fig. 1. It shows the effect of losses on the gain (losses don't affect the front-to-back ratio, and change only the scaling of the pattern). Fig. 3 shows the patterns of arrays with 135, 160 and 180-degree relative spacing. All are drawn to the same scale. The 1/8-wavelength-

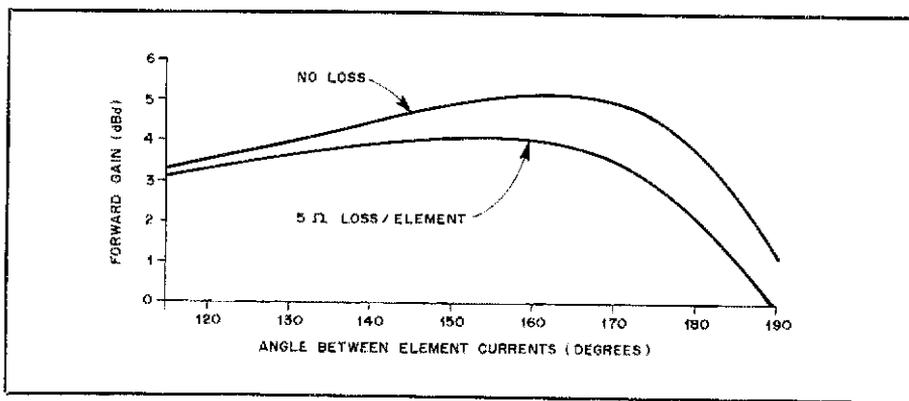


Fig. 1 — Curves that show gain versus phase angle for two-element arrays with 1/8-wavelength spacing.

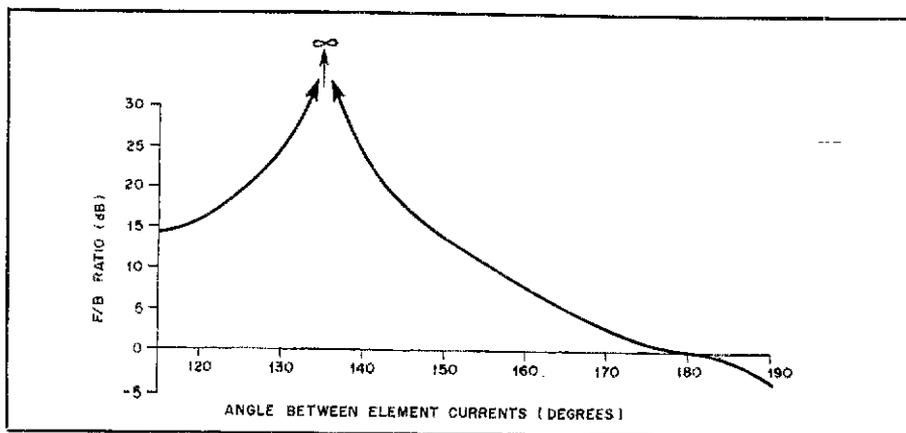


Fig. 2 — Theoretical F/B ratio for a two-element array with 1/8-wavelength spacing.

*5470 S.W. 152nd Ave., Beaverton, OR 97007

spaced, 135-degree-fed array is frequently called the "ZL Special." The close-spaced, 180-degree-fed array is known as an "8JK." From 135 to 160 degrees, phasing was chosen because of the combination of relatively high insensitivity to loss, reasonable gain and wide forward lobes. Note that the gain stays about the same in this range, ensuring good performance if the phasing isn't exactly as predicted. Actually, it's much easier to generate and maintain precise 180-degree phasing than the angles I've chosen — particularly over a wide frequency range.

There's one major flaw (usually fatal) in a simple analysis like the one presented here: It assumes that equal-magnitude currents are flowing in the elements. This is not easy to realize, for even in arrays with elements spaced $\frac{1}{2}$ wavelength or greater, mutual coupling has a profound effect on element impedances. This changes them dramatically and unequally, as a rule. This impedance change is a function of not only "mutual impedance," but also the relative magnitudes and phases of the currents flowing in the elements. In an array as closely spaced as these, coupling is so intimate that it could be argued that the term "driven array" is a misnomer. For example, the feed-point impedances of the elements in a $\frac{1}{8}$ -wavelength-spaced array, assuming equal currents can be made to flow, are

Phase Angle Between Currents (Degrees)	Loading Element (Ohms)	Lagging Element (Ohms)
135	28 - j46	28 + j46
160	13 - j22	13 + j22
180	9 + j0	9 + j0

This shows quite a change from the 74 + j0 ohms value that each element exhibits when it is not coupled to another element. The fact that the resistive parts of the two-element impedances are equal, and the reactances are equal in magnitude, is a peculiarity of the particular element spacing chosen. For other spacings they will be unequal, and the reactances can be different in magnitude, as well as in sign.

This mutual coupling isn't undesirable; in fact, it's essential for obtaining gain in the presence of rather severe pattern cancellation that is common in these closely spaced arrays. The lower impedances cause more element current to flow for a given power input, thereby increasing the fields from the elements. In these arrays, the increased field strength is sufficient to compensate for the fact that the fields from the elements don't add in phase in any direction. They partially or completely cancel instead. But, the lower feed-point impedances make them more sensitive to losses, and the low resistance with relatively

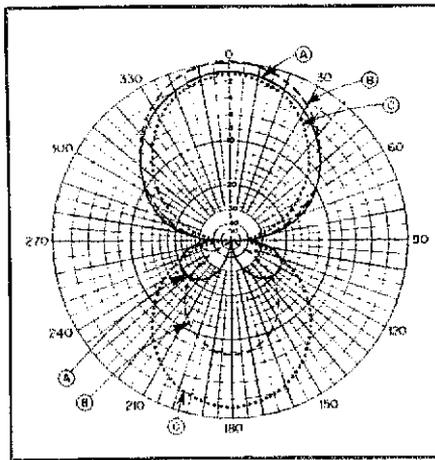


Fig. 3 — Dipole array patterns for 135, 160 and 180-degree relative phasing at $\frac{1}{8}$ spacing. Curves A, B and C, respectively, represent these conditions. Add 5 dB for dBd. These curves are based on the array being fed with equal currents.

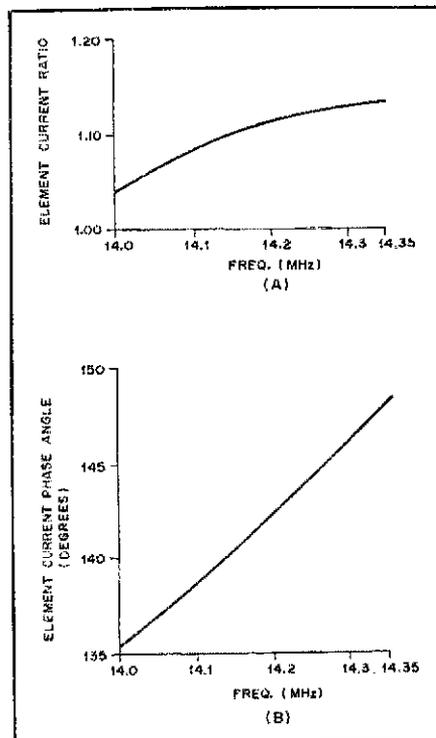


Fig. 4 — Element current ratio (A) and phase angle (B) as a function of frequency.

high reactance makes them tricky to feed properly.

Why do these different and reactive feed impedances make feeding the arrays so difficult? The first problem is that, with few exceptions, the magnitude of current out of a line not terminated in its characteristic impedance won't be equal to the current into the line. In classic "If you can't fix it, feature it!" fashion, this impedance-transforming property is put to good use in the form of the $\frac{1}{4}$ -wavelength Q section.³ The second (and almost always

overlooked) difficulty is that, again with only a few exceptions, the phase delay of current in an imperfectly terminated transmission line doesn't equal the electrical length of the line. This effect isn't minor: The phasing of a casually designed array can easily be off by tens of degrees. In one design I investigated, an 80-degree line produced 139 degrees of phase shift.

The Solution

There are a number of approaches toward correct feeding of an array. My choice was to investigate some simple feed systems to see if any would yield results that came close to the desired characteristics. I wrote a computer program that would solve, iteratively, for element-current magnitude and phase angle, plus feed-point impedances for this one type of array, given the array specifics. Several configurations looked promising, and one of the simplest proved adequate. This was an array of two folded dipoles that were self-resonant, spaced $\frac{1}{8}$ wavelength apart and connected by a taut piece of 300-ohm TV ribbon with one half twist. The feed impedance was close to 50 ohms resistive. There was some inductive reactance that could be corrected by adding two small-value capacitors at the feed point. The element current ratio was 1.13:1, with element phasing that was 154 degrees. This was not the 124 degrees one might expect from the 56 electrical degrees of line — assuming a velocity factor of 0.8 — minus the 180 degrees caused by the half twist.

It was this array that we used for Field Day, with very good results (see section on performance). However, when the array was reconstructed at the home QTH, a dramatic rise in SWR was noticed when operating the antenna at other than the low end of the band. Computer analysis showed that, above the design frequency, the phase angle increased. This caused a substantial lowering of the element feed-point impedance, plus narrowing of the forward lobe. The analysis also showed the antenna to be well-behaved below the design frequency. Consequently, a similar array was designed (figuratively speaking) for 14.5 MHz. It gave good results over the 20-meter band. Element phasing varies from 135 degrees at 14.0 MHz to 148 degrees at 14.35 MHz, with current ratios from 1.04 to 1.13:1 (see Fig. 4). The gain can be calculated as fairly constant from 4.5 to 4.6 dBd across the band. Again, the array feed-point impedance can be corrected easily to provide a low SWR. The calculated patterns for the antenna at the top and bottom ends of the 20-meter band are shown in Fig. 5. These take into account the changes in element phasing, spacing, current magnitude and element self-impedance with frequency.

Construction

The antenna is made from quality

¹Notes appear on page 24.

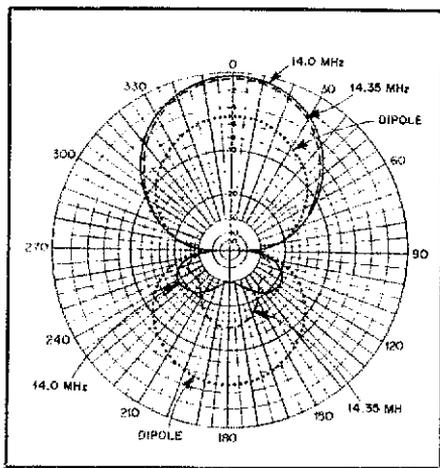


Fig. 5 — Calculated antenna patterns for the high and low ends of the 20-meter band. Add 5 dB for dBd.

300-ohm TV line to the dimensions given in Fig. 6. Sketches of the insulators are provided in Fig. 7. They are made from scrap pieces of epoxy-glass PC-board material. This results in ruggedness and minimum weight. The spreaders are readily available 10-foot lengths of "1 inch" (1-5/16 in OD) schedule 40 PVC pipe. The capacitors are used only to provide a good match to 50-ohm feed line: They don't otherwise affect the performance of the array. Small 500-V mica or monolithic ceramic units may be used for power levels up to a few hundred watts, since they are at a relatively low-voltage part of the system. Open-ended stubs could probably be substituted for the capacitors, if desired. I recommend that a balun transformer be used with this antenna. Attempts to measure the impedance of one element of this array resulted in a unique experience — the first substantial evidence of the need to use a balun transformer. The antenna-bridge readings varied greatly as the measuring equipment was moved, or as I placed my hand around the feed line. This ceased when I added a balun transformer. The phenomenon is explained by Maxwell in a recent paper.³ Nearly any style of balun transformer will prevent the unwanted flow of current on the coaxial cable outer conductor. I use a choke type of balun transformer. It consists of 10 turns of small-diameter coaxial cable wound on a ferrite toroid core. The OD is approximately 1 1/4 inches, and it is mounted at the feed-point insulator by means of small nylon cable ties.

If you use the array for portable operation, as we did, the 10-foot spreaders are out of the question, at least in their original form. We cut ours in half for "packing in," then used PVC cement to glue them together at the FD site. PVC pipe couplings were used to join the sections. The glue container was enclosed in polyethylene sandwich bags, just in case a leak developed. At the end of our FD exercise,

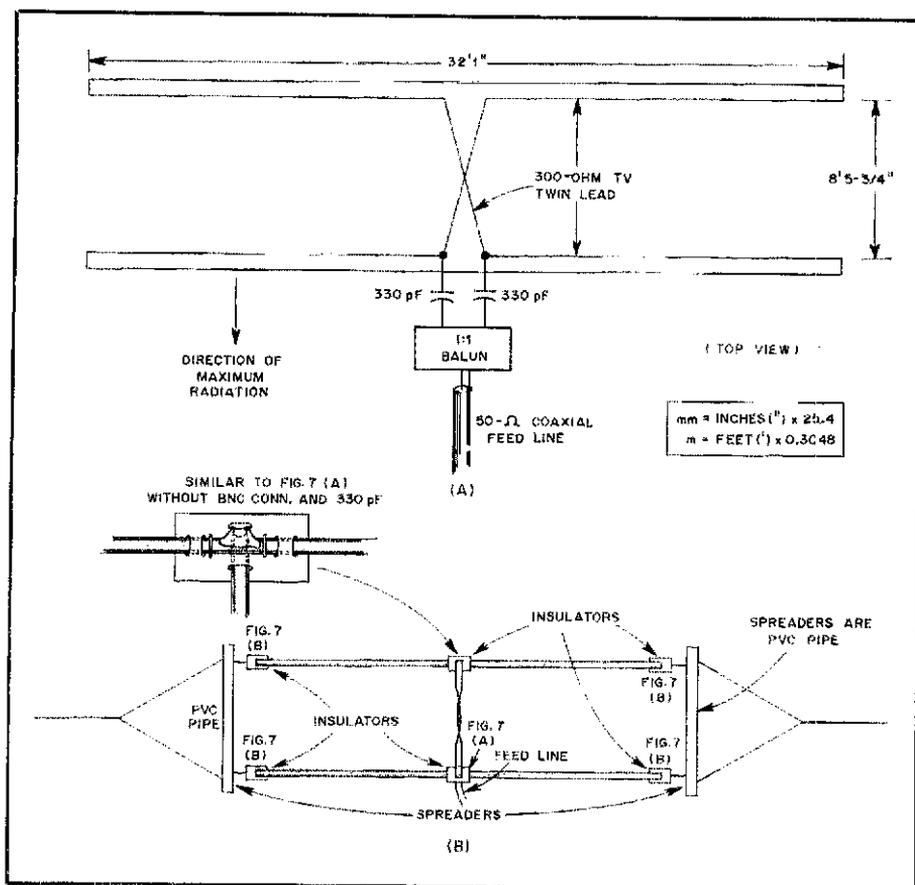


Fig. 6 — Electrical dimensions for the W7EL array (A). Illustration B shows how the antenna is assembled on spreaders of PVC pipe.

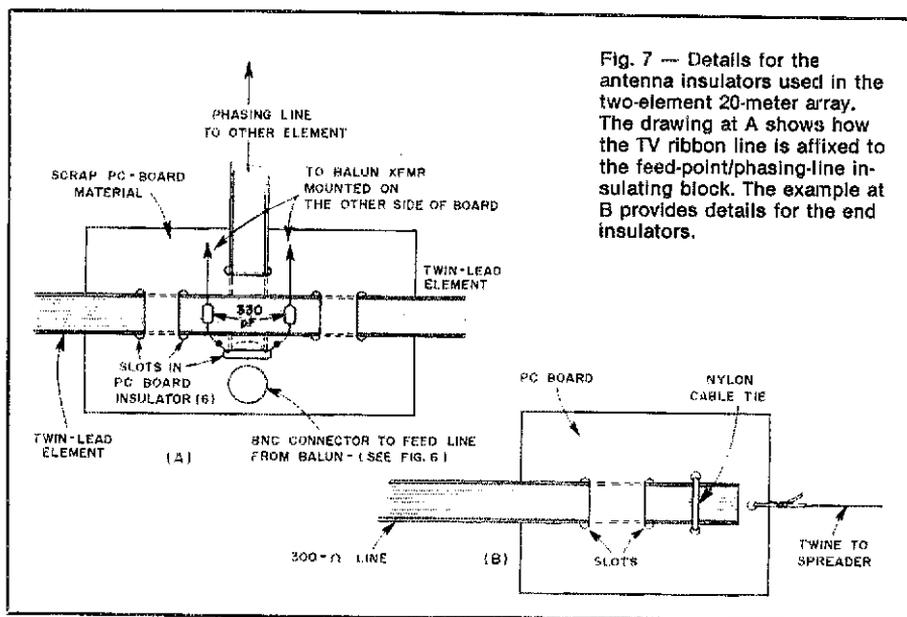


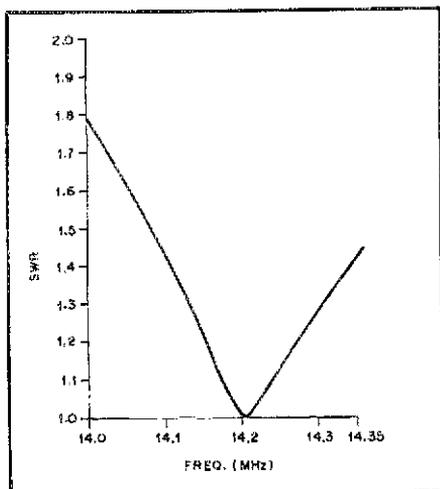
Fig. 7 — Details for the antenna insulators used in the two-element 20-meter array. The drawing at A shows how the TV ribbon line is affixed to the feed-point/phasing-line insulating block. The example at B provides details for the end insulators.

we used the saw blade of KØED's Swiss army knife to cut the PVC pipes again for easy transport. The spreaders were glued together again for use at the home station. The antenna is held horizontal easily by attaching a piece of twine to the nondirectly driven element insulator. This counteracts

the weight of the feed line that is connected to the other element.

Performance

The "FD Special" has been in use at W7EL for some time. Array gain has been compared to that of an inverted V at the



same height. The calculated performance values appear correct within the measurement capability. The front-to-back ratio has not been measured. The SWR at the end of 45 feet of RG-58/U feed line is shown in Fig. 8. The SWR is important only when a lossy line feeds the array, or when it is driven by an intolerant transmitter (with built-in SWR shut down), which is now the norm.

Perhaps the most revealing performance indication was provided by a person who encountered us several times on 20 meters during Field Day. He was operating for

Fig. 8 — SWR cur. obtained at the end of a 45-foot length of RG-58/U coaxial cable.

another, very competitive local club. After the exercise he remarked, "The only reason I believe you guys were running an honest 10 W is that I know Wes Hayward (W7ZOI) was there." Indeed, we used 10 W or less input while operating — and 0 W while watching the mountain scenery!

Notes

¹My apologies to the first person who described or named this antenna. I don't know its history. (See L. A. Moxon, "Two-Element Driven Arrays," *QST*, July 1952, p. 28.)

²Named after W8JK, Dr. John Kraus, "Antenna Arrays with Closely Spaced Elements," *Proc. IRE*, Feb. 1940.

³G. Hall, ed., *The ARRL Antenna Book* Newington: ARRL, 1982).

⁴mm = in × 25.4; m = ft × 0.03048.

⁵W. Maxwell, "Some Aspects of the Balun Problem," *QST*, March 1983.

Strays



CE PROFILES

□ [Editor's Note: From time to time, we'll be publishing a profile on one of our Contributing Editors, to acquaint readers with people not on the Hq. staff who write columns that appear in *QST* month after month.]

Contributing Editor Jean Peacor, K1IJV, was first licensed in 1958, as KN1IJV. It was Ann and Bernie Goyer, W1UPG and W1UPH, who provided the inspiration, says Jean. "They had weekly skeds with (OM) Norm's parents, W1YPH and W1GAG, and invited me to their home to participate in one of the skeds. This resulted in Bernie's giving us a receiver to listen to, books to study and a key to practice code with." (Norm became KN1IJU at the same time Jean earned her Novice ticket.)

As a Novice, Jean met the late WITA, an old-timer who decided there was hope for her CW. As a result of his efforts, Jean has stayed pretty much on the low end of the bands. As a newcomer, she regularly checked into the Western Massachusetts Novice Net. "It was the one place I could be certain I would be answered," says Jean. She's enjoyed CW traffic nets ever since, and is still active on WMN.

In 1963, Jean served as president of Women Radio Operators of New England (WRONE). For several years, she worked with the Federated Eastern Massachusetts ARA (FEMARA) on behalf of YL activities for ARRL's New England Conventions. It was also in 1963 that *QST* invited Jean to conduct the YL News and Views column, which she did until the fall of 1966, when she decided to give full atten-



YL News and Views Editor Jean Peacor, K1IJV

tion to her children. She returned to the column in 1980, and has been covering YL events for *QST* ever since.

Awards are not Jean's specialty, but she does have DXCC, WAC, YLCC and the WRONE certificate. The few others she has she credits to her OM's bookkeeping efforts. "One I'm still working on is WAS on 80-meter CW — I've had all but Hawaii for the past 19 years — and I do prize my AI Operator certificate," says Jean.

Her nephew, K1KZL, was instrumental in Jean's getting into Caribbean vacation/DXpeditioning. "He read an ad in *QST* about a VE3's home for rent on the island of Montserrat and, after a few inquiries, plane reservations and another couple's willingness to give it a try, we were on our way in February 1979," recalls Jean. Since then, it's become an annual

event — VP2MBJ, VP2VFN, K1IJV/VP9, J87BO and VP2KBD — the last call being used most recently in March 1984. "We've made many friends in the process," says Jean, "and have thoroughly enjoyed the thrill of being the 'searchee' rather than the 'searcher' for the two weeks each year."

When it comes to contesting, the YL/OM contest is Jean's perennial favorite, from both the U.S. and DX sides of the key. The ARRL CD contest has always been another favorite. Other activities Jean enjoys are golf, sailing, playing bridge, and china painting and other handcrafts.

Next Month in *QST*

Switched-capacitor filters were introduced in the March issue; the July issue will feature the construction and operation of a practical SCF. (In case you missed part 1, SCFs use digital techniques to provide filtering.) Elsewhere in July *QST*, you'll find

- several items of interest to beginners: articles covering how to set up a station for maximum efficiency, diodes — how they work and how they're used — and how to get the most out of ham radio on a shoestring budget,

- a discussion on keeping our valuable spectrum at 220 MHz, and

- a timely piece on enlivening DX QSOs.

The World of Switches and Relays

Part 6: Mechanical and electronic switches are important parts of most radio circuits. Let's examine mechanical switching devices and become acquainted with how they look and perform.

By Doug DeMaw,* W1FB



What could be more ordinary than a switch? After all, we have them on our appliances, on the walls in our homes and on the instrument panels of our automobiles. Switches are as old as electricity, and they come in many different shapes and sizes. For that reason, we must know how to select the proper switch for each application.

There are many things to consider when selecting even a simple, inexpensive switch. Among them are insulation quality, mechanical durability, the number of switch terminals (poles and contacts), current-carrying ability of the electrical contacts, and physical size. We can add to this list the cost of the switch versus the well being of our hobby budget! In other words, "any old switch is not necessarily the right one for a specific job."

We need to understand the circuit requirements and choose a suitable switch for that circuit. The same is true of relays, which are electrically operated switches. They differ from ordinary switches by virtue of being actuated or energized remotely by a mechanical or electronic switch. In effect, we have a mechanical

switch being used to turn on a remote switch.

In some instances, an event that takes place within an electronics circuit will cause the relay to switch on or off automatically. The TR (transmit-receive) relays in our ham radio transceivers are examples of devices

that are controlled by the circuit within the transceiver. Some are called VOX (voice-operated) relays because they actuate when we speak into the microphone. When we stop talking they disengage, thereby connecting the antenna and certain operating voltages to the receiver circuit. When the

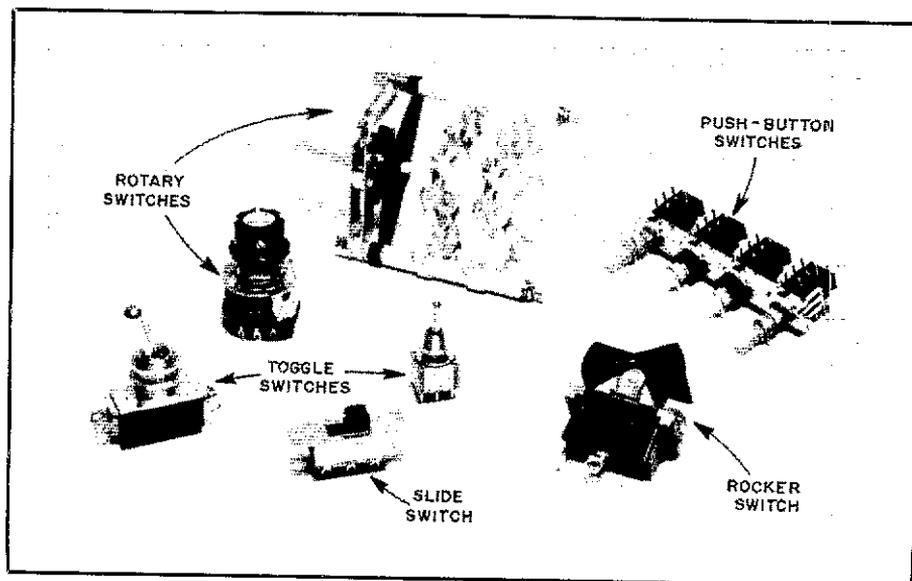


Fig. 1 — Various types of switches.

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

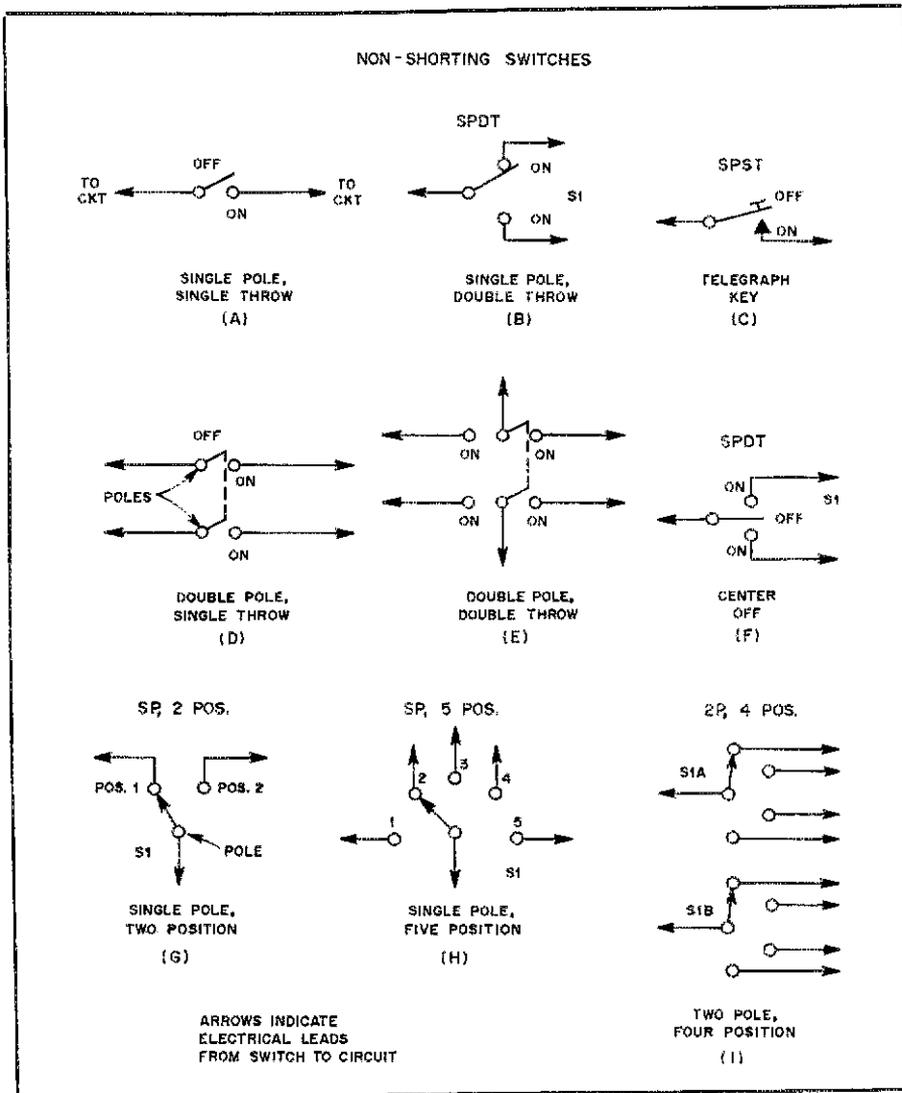


Fig. 2 — Electrical symbols for a number of common switches used in Amateur Radio work.

relay is activated by our voices, the antenna is switched to the transmitter, along with specific operating voltages. Relays are often used to control an antenna function at some point that is a distance from the radio room. Generally, such remote relays are actuated within the ham shack by means of a mechanical switch. There are countless applications for relays and special switches that can be turned on and off from a distant point.

Switches and Their Circuit Symbols

Each style of switch is represented by a different electrical symbol in a schematic diagram. It is important that you become familiar with the symbols if you are to understand the function of the switch when you read a diagram or draw one of your own. I'd like to suggest that you practice drawing these symbols until you have them memorized. Although you will find numerous variations of the basic symbols for switches in amateur magazines, they

follow a pattern that should be easy to recognize. The ARRL employs the established standards for electrical symbols, as used by the industry and the IEEE (Institute of Electrical and Electronics Engineers). As we learned in an earlier installment of this series, many of the other publishers use nonstandard symbols to create a distinctive "style."

Fig. 1 shows an assortment of switches. We can tell from the illustration that switches come in many shapes and sizes. Generally, the smaller the switch assembly the lower its power-handling ability (current and voltage rating). Most reputable switch manufacturers can provide the consumer with maximum safe ratings for voltage and current. Some manufacturers imprint the ratings on the switch for our convenience.

Some of the more commonplace switch symbols are depicted in schematic form in Fig. 2. The simplest switch is shown at A and C. This is what we call an SPST (single

pole, single throw) switch. A telegraph key (C) is actually an SPST switch that we open and close by hand to form the Morse code characters. When we use the switch at A, we can complete only one circuit. This type of switch is common in our TV sets, lamps and household appliances. But, if we want to control two circuits, we must use an SPDT switch (Fig. 2B). Here we have two ON positions. As we examine the progression of switch symbols in Fig. 2, we will recognize the utility of switches with more than one pole and two throws.

The switches from A through F in Fig. 2 are considered to be *toggle* switches. This style of switch has a bat handle or flat lever used to operate the switch. These switches are available also as "rocker switches." This variety is built with a plastic bar that is pressed on one end to operate the switch to close one circuit; the opposite end of the rocker bar is depressed to change to another circuit. There is a rocking action to the bar; hence the name "rocker."

Switches can be obtained also with a "center off" position. We can see this at F of Fig. 2. Here we have two ON positions and a center position that is OFF. In the off condition our switch pole is in midair, so to speak.

The switches shown schematically from G through I of Fig. 2 are what we refer to as rotary switches. This means that instead of an up-down or side-to-side action (as with toggle switches), we rotate the switch shaft and pole clockwise or counter-clockwise. The contacts that the pole conductor touches during rotation are mounted on a thin wafer of phenolic, plastic, ceramic or steatite material. The usual name for these switches is "rotary wafer switch." Rotary switches may contain several decks of wafers, and may have 30 or more positions. These are often called multiwafer or multigang switches.

Some Other Switches

The rotary switch may take another electrical form, as we can observe by looking at Fig. 3. This is known as a shorting type

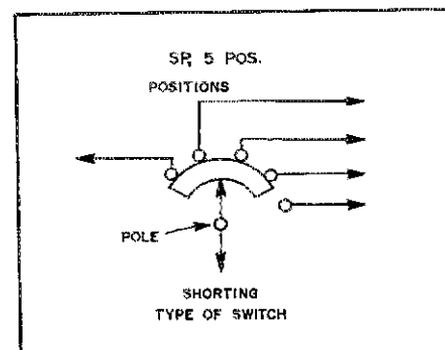


Fig. 3 — One style of shorting switch (see text).

of switch, (the switches of Fig. 2 are non-shortening units). How do these switches differ? Well, if for some reason we want to short out the circuits that are connected to the switch terminals while only one event is controlled by the nonshorted contact, we may use a shorting style of switch. Perhaps a more common type of shorting switch is the rotary type with a pole contactor that is sufficiently wide to cause any two adjacent wafer contacts to be shorted together as the switch is cycled to a new position. Once the switch is in the intended position, the shorted condition ceases. This wiping action is useful when we do not want to interrupt one circuit until another is closed. These switches are not used very often, but we should understand how they can be used in case a special application comes up.

We may hear about *mercury switches* in our discussions with other hobbyists and amateurs. This variety of switch is operated by changing its physical position. It contains two contacts that are open when the assembly is in one position. When the position is reversed, the mercury within the switch changes position and acts as a conductor across the internal contacts. These motion switches are used in automation and burglar-alarm systems, to name only two uses.

Rotary switches are available also for remote actuation by means of electrical current. They are sometimes called "solenoid switches." They are standard rotary switches that have a coil to which an operating voltage can be applied from a distant point. Each time a pulse of current is sent to the switch coil, the pole of the switch will move to a new position. Another version of this switch is the "stepping switch." It contains rows of contacts to which we may attach wires that go to various circuit points. Each time a pulse of current is supplied to the coil on the switch, the pole(s) moves to a new position. Telephone companies used stepping switches in their control circuits for many years.

You will also hear about an interesting gadget called a "proximity switch." It is merely a mechanical or electronic switch that actuates when a conductive object is placed near it. To operate in this manner, it must have some allied electronics to control it. Switches of this variety can be actuated also by changes in light, moisture or heat levels.

Some Aspects of Relays

It is easy to compare a relay to a switch, for in fact it is a switch of sorts. That is, a relay switches circuit connections in accordance with the commands given to it. These commands may be at the direction of a person, or a sensing circuit may respond to some event (such as heat, voltage or current changes) and in turn cause the relay contacts to open or close. For a relay to operate, it must have a cer-

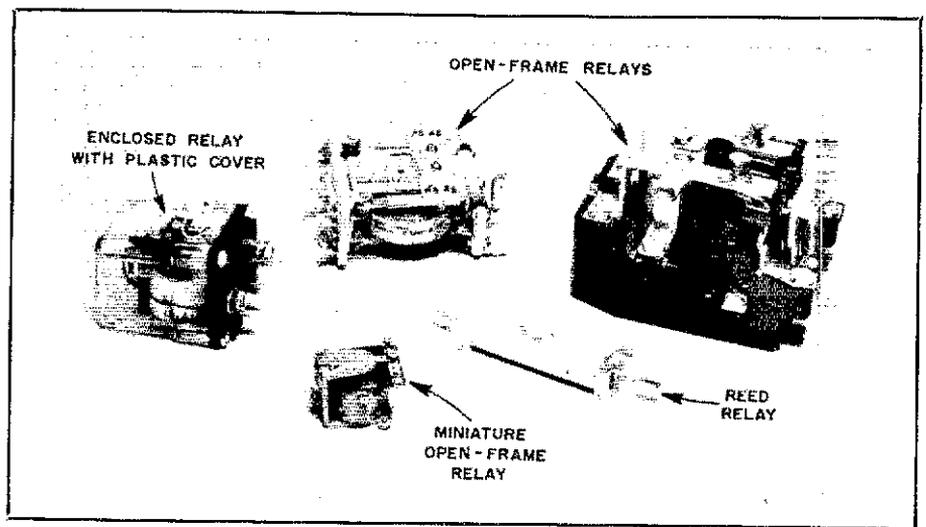


Fig. 4 — Various forms of relays.

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tain ac or dc current flowing through the field coil. A field coil is a multilayer winding of insulated copper wire that is contained on an iron-core bobbin. When the electrical field of the coil becomes intense enough, it magnetizes the iron core and pulls the relay pole (arm) down. This action closes the electrical switch contacts of the relay. When the current flow is removed from the relay field coil, the magnetism ceases and the relay pole returns to the de-energized position.

Relays may have several poles, as do mechanical switches. They can be compared to toggle switches in their capability because, like the toggle switch, a relay is a two-position device. This is not true, of course, with rotary switches.

Ac-operated relays have a copper half-round plate at the top of the field coil. It is positioned to "shade" the field in such a way as to prevent the relay from buzzing when it is activated. This copper plate is known as a "shading pole." The cause of the mechanical vibration of an ac relay is the pulsating 60-Hz current from the wall

outlet. No such problem is found when using dc relays. Sometimes it is necessary to loosen the field-coil assembly and rotate it in an effort to find a position where annoying "chatter" will not occur.

It would be impractical to describe every type of relay that we can obtain. We can generalize by saying that the major differences in relays are the operating voltage, current rating of the contacts, size of the unit, mechanical characteristics and mounting style. Some relays have plastic covers to help keep dust and moisture away from the electrical contacts. Others have no enclosure; they are called "open-frame relays."

We must pay attention also to the type of insulating material that isolates the relay contacts from one another. This material must not break down and burn in the presence of the voltage we apply to the relay contacts. The size of the contacts is important also, for they must be able to pass the current that flows through them. If the contacts are too small, they will become hot and may even melt or become charred. In less-severe cases, the contacts can become pitted and covered with oxide. This makes them incapable of making a proper electrical connection. Under some conditions of pitting the contacts may weld together, which will prevent the relay from operating normally. We can clean dirty relay contacts with a piece of emery cloth or a fine file.

There is a style of relay that has its pole arm *inside* a field coil. When the field is turned on, the pole moves into the contact state, closing the circuit. These devices are known as "reed relays." They are capable of cycling at a fast rate with little "contact bounce." This condition often occurs when large relays are used for fast switching. The contacts bounce apart and cause circuit-performance problems (jitter). Some amateurs use "bug" CW keys that

mechanically send automatic dots. The dashes are made in the usual matter — by pressing the dash paddle. Some hams have been known to stuff a small piece of foam plastic or a filter tip from a cigarette into the loop-shaped dot-contact spring to damp the inertia. This helps to minimize contact bounce at high sending speeds.

The operating voltage for a given relay coil depends on the dc resistance of the coil. In order to set up a magnetic field that is sufficient to close a relay, a specific amount

of current must flow through the coil. Since current is determined by E/R (where E is the operating voltage, and R is the coil resistance in ohms), the coil resistance and applied voltage need to be the correct value. Relays are manufactured for standard operating voltages, such as 5, 6, 12, 18, 24 and 48. It is necessary, then, to select a wire size and winding length that produces the desired resistance to obtain the current needed through the field winding. Each gauge of wire has a specific dc resistance

Glossary

- bobbin — an insulating coil form upon which magnet wire is wound before it is added to a relay or other electrical mechanism.
- contact bounce — a condition that can occur when a relay is cycled, causing the electrical contacts to bounce apart momentarily. This causes the circuit being switched to be interrupted during the period of the bounce.
- electronic switch — an electrical rather than mechanical switching circuit. Generally, such switches consist of diodes, transistors or ICs.
- pole — the movable portion of a switch or relay that makes electrical contact with the remaining conductors of a switch or relay.
- proximity switch: a type of switch that is actuated by the nearby presence of a conducting object or magnet.
- reed relay — a type of relay that has the pole piece contained inside the field coil. The pole arm is like a small, thin reed.
- relay — a mechanical switching device that is actuated when sufficient current flows through its field coil, thereby causing the field-winding core to become magnetized. This action moves the pole arm to make and/or break contact with a circuit.
- rotary switch — a switch that has a shaft that causes the switch pole to come in contact with the mating electrical contacts on the switch wafers. A rotation of the shaft is needed to operate the switch.
- shading pole — a copper, half-round plate that is affixed to the top of a relay field coil when the relay is intended for ac operation. The shading pole prevents the relay from buzzing when it is energized.
- solenoid switch — a switch that can be operated remotely by means of a field coil to which ac or dc voltage is applied.
- stepping switch — similar to a solenoid switch, but with contacts arranged in a row (part of an arc) rather than on a circular wafers.
- VOX — voice-operated relay and control circuit used in a transmitter or transceiver.

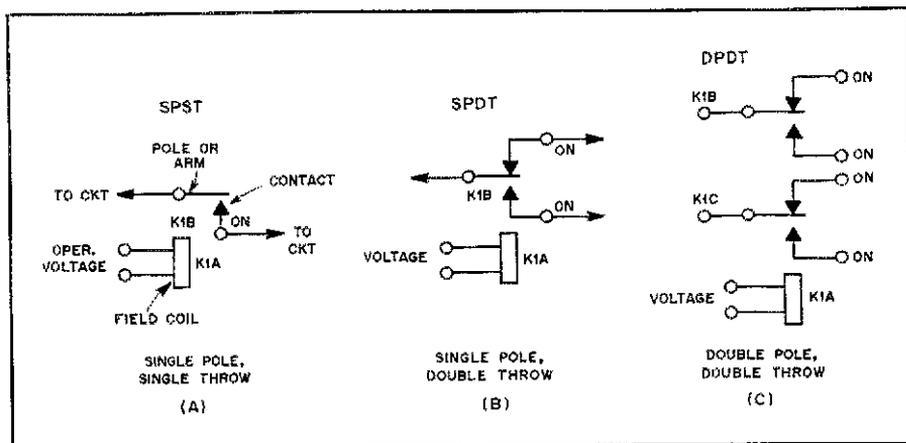


Fig. 5 — Electrical symbols for some common relays.

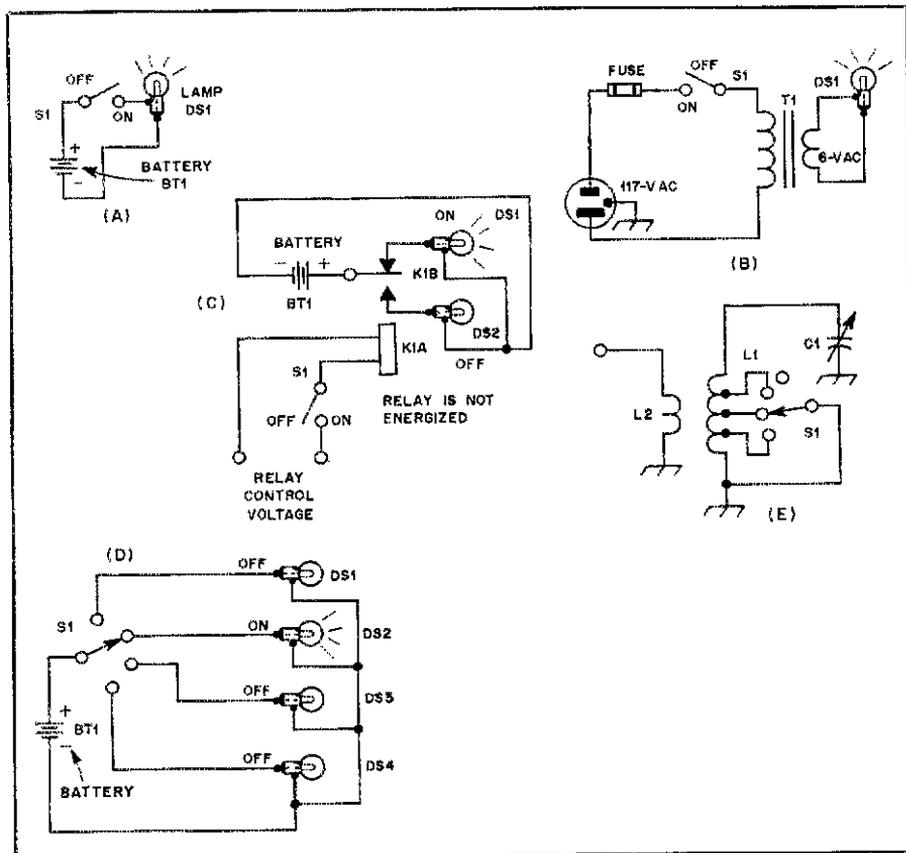


Fig. 6 — Some practical examples of how to use switches and relays. See text.

(in ohms/ft). Hence, it is easy to make a field coil to match the operating voltage and pull-in characteristics of the relay.

Fig. 4 shows an assortment of relays. The symbols for a few relays are provided in Fig. 5. Please note that when multiple-section switches or relays are used they are labeled in accordance with their sections. For example, the relay in Fig. 5C has three parts: the field coil (K1A), one set of contacts (K1B) and a second set of contacts (K1C). This type of labeling permits us to place sections of the switches or relays in different parts of a diagram without losing track of which part belongs with another. The parts may be spread about in a diagram for the purpose of minimizing connecting circuit lines and crossovers. This helps to "unclutter" a diagram and make it easier to follow.

Some Practical Examples

Let's see just how we might use switches

and relays, singly or in combination, to make certain things occur. Fig. 6 contains some simple circuits to demonstrate what can be done with switching arrangements. Circuit A shows how a lamp can be turned on and off with an SPST switch — the kind we will find in most table lamps and wall panels. Fig. 6B shows a lamp being operated from a 6-V ac transformer. We have reduced the ac line voltage from 117 to 6 by means of a step-down transformer, T1. This is necessary to obtain the right operating voltage for DS1, a 6-V lamp.

Fig. 6C shows how we can use a relay to control two lamps, DS1 and DS2. Although this circuit is somewhat absurd and would not normally be used, it does illustrate how a relay can be used to provide remote control of a circuit. When the relay is energized (S1 switched to ON), we will see DS2 illuminate and DS1 will no longer glow.

At Fig. 6D, we find a rotary switch being used to control four lamps. DS2 is illuminated in the example, because the

switch pole and related contact are permitting current to flow through only DS2. The lamps will light in sequence as we rotate S1.

An example of coil-tap selection is shown in Fig. 6E. As S1 is rotated clockwise more and more of the coil is shorted out, decreasing the effective inductance of the tuned circuit. This is a common arrangement in transmitters and receivers when the operation is changed from one band to another. Similarly, the switch could be used to select individual coils for the various frequencies of interest.

Potential Problems

We learned earlier that the insulation on switches and relays must be suitable for the application we have in mind. We can adopt a role of thumb concerning this matter: For operating voltages (dc, ac or RF), we can do rather well with plastic or phenolic insulating material if the voltage is low (less than a couple of hundred volts) and if the RF power is under, say, 25 W. For high voltage and high RF power levels, ceramic

or steatite insulation is recommended. It will sustain high voltage without breakdown, as compared to phenolic and plastic.

Relays with gold-plated contacts cost more, but they are less likely to arc and become pitted. Furthermore, they will not become contaminated by oxidation. Determine the current that your relay or switch contacts must pass, then to be safe, use a relay or switch rated in excess of the current in your circuit. I like to use a switch or relay contact rated for 2 A or more in a circuit that carries 1 A.

Tag Ends

I hope this article has proven informative in your quest for basic data about electronics. I'd like to suggest that you obtain some switches and relays, a few bulbs and some batteries. Spend a couple of hours hooking these devices up in order to see what can be done with them. You might even amaze your friends with an array of flashing lamps! Good luck. 

New Products

KAYPRO COMPUTER RTTY SOFTWARE

Owners of Kaypro computer models II, 4 or 10 now have an RTTY software package available to them. Some of the features of this software include: communication in ASCII or Baudot codes, menu-selectable baud rates and modes, FIFO type-ahead keyboard buffering, word wrap-around, transmit-buffer text entry while receiving, three temporary buffer areas for commonly used text, and transmission and reception of RTTY pictures. The pictures may be stored on disk for later use.

The program supports Baudot speeds of 60, 66 and 100 WPM, and ASCII speeds of 110 and 300 bauds. A modification must be made to the Kaypro clock circuit to enable the computer to use the 60-WPM (45.45-baud) Baudot speed. This is because the baud-rate generator IC in the computer is not set up to generate 45.45 bauds. The user's manual provides a schematic diagram, modification instructions and a section on theory of operation of the clock circuit for those interested in making the modification. Since this is the most popularly used speed, it would seem to be a "must."

The Radioteletype Communications Package may be obtained from Jim Larson, KK7A, Software Design, P.O. Box 2722, Boise, ID 83701. Price class: \$40. — *Paul K. Pagel, N1FB*

MOTOROLA CLOSE-TOLERANCE, HIGH-PERFORMANCE THREE-TERMINAL REGULATORS

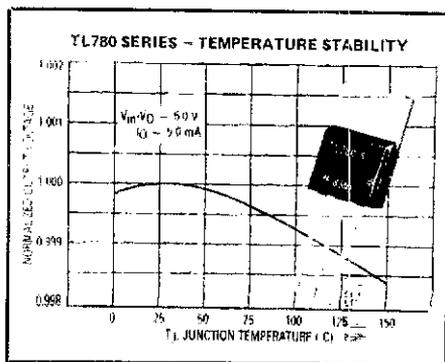
Motorola recently introduced a family of fixed, positive-voltage regulators with a load-driving capability in excess of 1.5 A. The improved regulators, known as the TL780 series, offer extremely tight output-voltage tolerances and noticeably better specifications over existing prime grade, three-terminal regulators, according to the manufacturer.

Available in 5, 12 and 15-V versions, these devices maintain an output voltage tolerance to within $\pm 1\%$ at 25°C and $\pm 2\%$ over the entire operating junction temperature range from 0°C to $+125^\circ\text{C}$. Line regulation is maintained to within 5 mV for the 5-V output devices and 15 mV for the 15-V version. Ripple rejection is also improved with minimum limits of 60, 65 and 70 dB for the 15, 12 and 5-V devices, respectively. Load regulation is 25 mV

maximum for the 5-V regulator and 75 mV for the 15-V regulator over a load range of 5 mA to 1.5 A.

These devices employ internal current limiting, thermal shut-down and safe-area compensation. Although designed as fixed-voltage regulators, they can be used with external components to obtain adjustable voltages and currents. The regulators are available in the TO-220 plastic package.

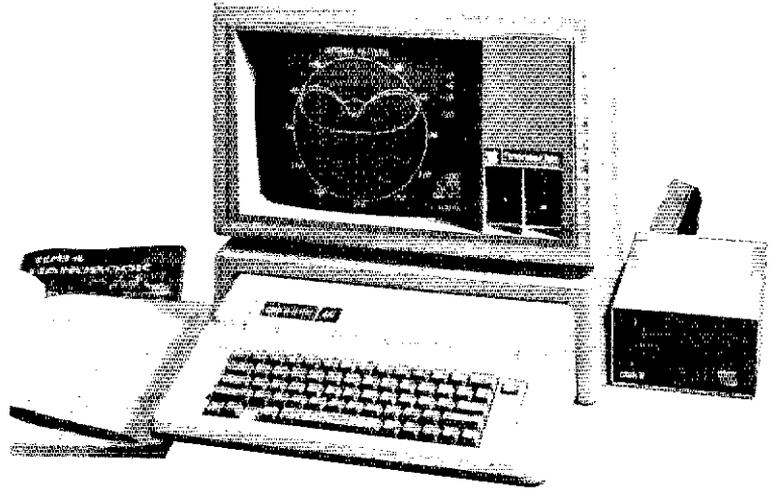
In quantities of 100-999, the regulators are priced at \$1.10 each. Contact your local Motorola sales office or nearest distributor for further information and pricing. — *Paul K. Pagel, N1FB* 



The Effect of Real Ground on Antennas

Part 3[†]: With only modest space, a single tower and less-than-perfect ground conductivity, the sloping dipole is a great way to achieve directivity. This month, we'll get a surprising slant on slopers.

By James C. Rautio,* AJ3K



Financial resources and time — there always seems to be a trade-off between the two. If you have lots of one, there seems to be very little of the other. When I first got into ham radio, at the age of 15, I had lots of time (compared to now, anyway) and lots of space — I lived on a farm near the top of a hill. However, antenna work had an important constraint: It couldn't cost anything.

To solve this problem, my father, WA2PDA, and I set out to the woods one day with a chain saw. We felled a slender 60-foot-high ash tree and hauled it back with our gray Ford tractor.¹ We used the ash to support an 80-meter vertical, which performed moderately well. But the real star came almost as an afterthought. We connected one end of a 40-meter dipole to the top of the pole, and the other end was supported near the ground — a sloping dipole.

The performance of that sloper was remarkable. It was even more remarkable considering the soil was rocky, with lots of clay, which, I now know, means low conductivity. Generally, low ground conductivity means poor performance. So why was that sloper a good performer? To find the answer, we'll use the Annie Antenna Analysis Software.²

Slopers and Directivity

As a starting point, let's analyze a sloping dipole over a perfect ground. This may

present us with the first big surprise. There is no front-to-back ratio at all. The pattern is almost perfectly symmetrical! After some thought, this result is easily explained by Fig. 1.

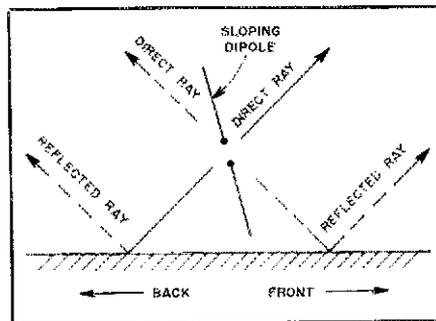


Fig. 1 — In the forward direction, the sloping dipole gets little help from the reflected ray, but the direct ray is strong. In the back direction, with a poor ground conductivity, neither the reflected nor the direct ray is strong.

In any particular direction, the power radiated by an antenna is the vector sum of the direct ray and the reflected ray. In the forward direction of a sloper, the direct ray is quite strong. The ray reflected from the ground will be weak regardless of how good the ground conductivity is because the reflected ray comes off the end of the dipole.

In the back direction (to the left in Fig. 1), the direct ray is weak because it is also coming off the end of the dipole. The reflected ray will be weak with a low-conductance (low-reflectance) ground, and

it will be strong with a high-conductance ground. If we assume a perfect ground, the reflected ray off the back of the sloper will be just as strong as the direct ray off the front and we have no front-to-back ratio. A poor ground will leave the front essentially unchanged, since this radiation is almost all direct ray, while the reflected ray coming off the back will be absorbed by the ground, giving a good front-to-back ratio. This brings us to what would otherwise seem to be a ridiculous conclusion: Not only does the sloping dipole have good directivity with a poor ground, it *needs* a poor ground.

Read the above statement carefully: Note that I said *directivity*, not gain. Directivity means we have a stronger signal in one direction than another. A coat-hanger antenna can have directivity at HF. Gain, on the other hand, is signal strength relative to some reference, usually a reference dipole. A sloping dipole over poor ground will have directivity. But it will not have gain compared to a dipole over perfect ground. This is because a dipole over perfect ground has the benefit of both the direct and reflected ray while, a sloper is mostly just the direct ray.

One situation in which directivity (as opposed to gain) is important is on the 40-meter phone band on the East Coast in the evening. The sloping dipole we had on the farm was pointing west. The European broadcast stations were reduced by the front-to-back ratio of that antenna. This gave stations to the west an improved signal-to-interference ratio, the broadcast stations being the interference. That sloper made earning a low-budget, 40-meter SSB

[†]Parts 1 and 2 of this series appear in February and April 1984 QST.

²Notes appear on page 35.

*4397 Luna Course, Liverpool, NY 13088

Worked All States award relatively easy.

Annie Says . . .

Using Annie, we can see what the sloping dipole pattern is like. Fig. 2 shows patterns of dipoles sloping at angles from nearly horizontal (15°) to nearly vertical (75°). In all cases, the lower end of the dipole is 0.05 wavelength above ground. [This puts a high-voltage point about 6 feet above ground for a 40-meter sloper. Care should be taken to ensure that no one can come in contact with the antenna while you are transmitting. — Ed.] The other end of the dipole is positioned as high as necessary to give the specified slope. The ground is assumed to be relatively poor with $X = 0.1$ and epsilon relative (ϵ_r) = 7. X is the conductance of the ground (mS/m) divided by the frequency (MHz). See Part 1 of this series for more information on ground parameters.

The plots in Fig. 2 are known as theta cuts. Theta is the angle from the zenith (straight up) to the horizon. A theta cut is an antenna pattern taken in a vertical plane with theta being changed and the compass direction, or azimuth, held constant. Thus, we may see how much of that desirable low-angle radiation we have.

Looking at the patterns of Fig. 2, we see that the sloping dipole is a good antenna for low-angle radiation. Even a slight 15° slope on a dipole provides some low-angle radiation. The amount of low-angle radiation increases steadily as we increase the slope angle, until it reaches 55°. After that, there is very little change.

The front-to-back ratio decreases again for angles above about 45°. A slope of 55° provides maximum forward gain with some front-to-back ratio. This would be a good antenna for working Europeans on 40 meters. For maximum front-to-back ratio, a slope of 45° to 35°, or even as low as 25°, should be used. The lower slope will result in better front-to-back ratios at low radiation angles, but this compromises any rejection of interfering signals coming in at higher radiation angles.

Fig. 3 is a series of phi-cut plots. A phi cut shows the directivity of the antenna in a horizontal plane. The slopers are pointing toward phi (or azimuth) equal to zero degrees. Since there is no sky wave radiation at zero degrees above the horizon, we have to look at the radiation a few degrees above the horizon. All the plots of Fig. 3 are taken 30° above the horizon, or at theta equal to 60° (measured from the zenith).

In looking at the phi cuts, we see that the

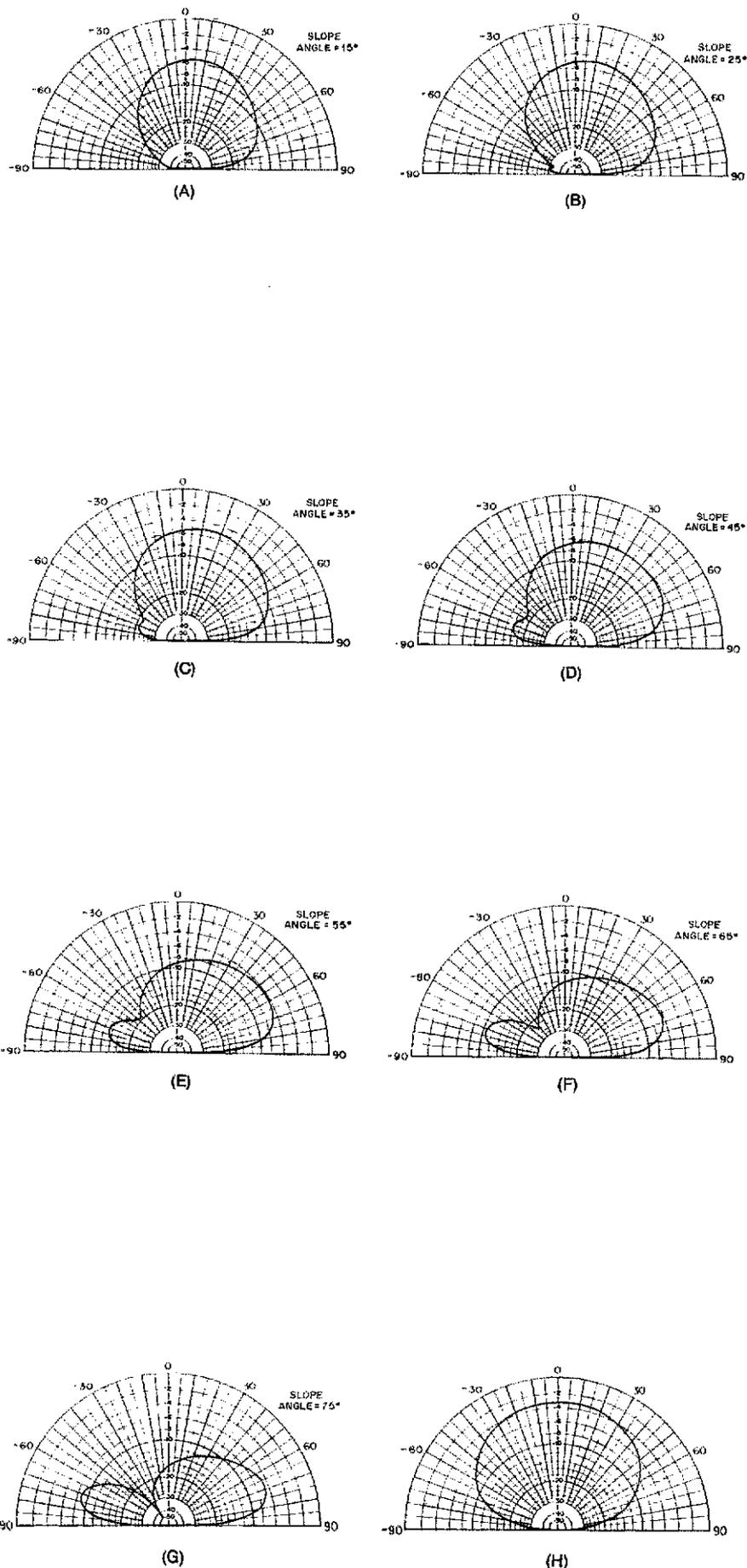


Fig. 2 — Vertical, or theta-plane, patterns of sloping dipoles over poor ground. The low end of each antenna is 0.05 λ above ground. The slope angle, as measured from horizontal, is (A) 15°, (B) 25°, (C) 35°, (D) 45°, (E) 55°, (F) 65°, (G) 75°, (H) a $1/2\lambda$ -long horizontal dipole, $1/8\lambda$ high, for comparison. Add 6 dB to all values.

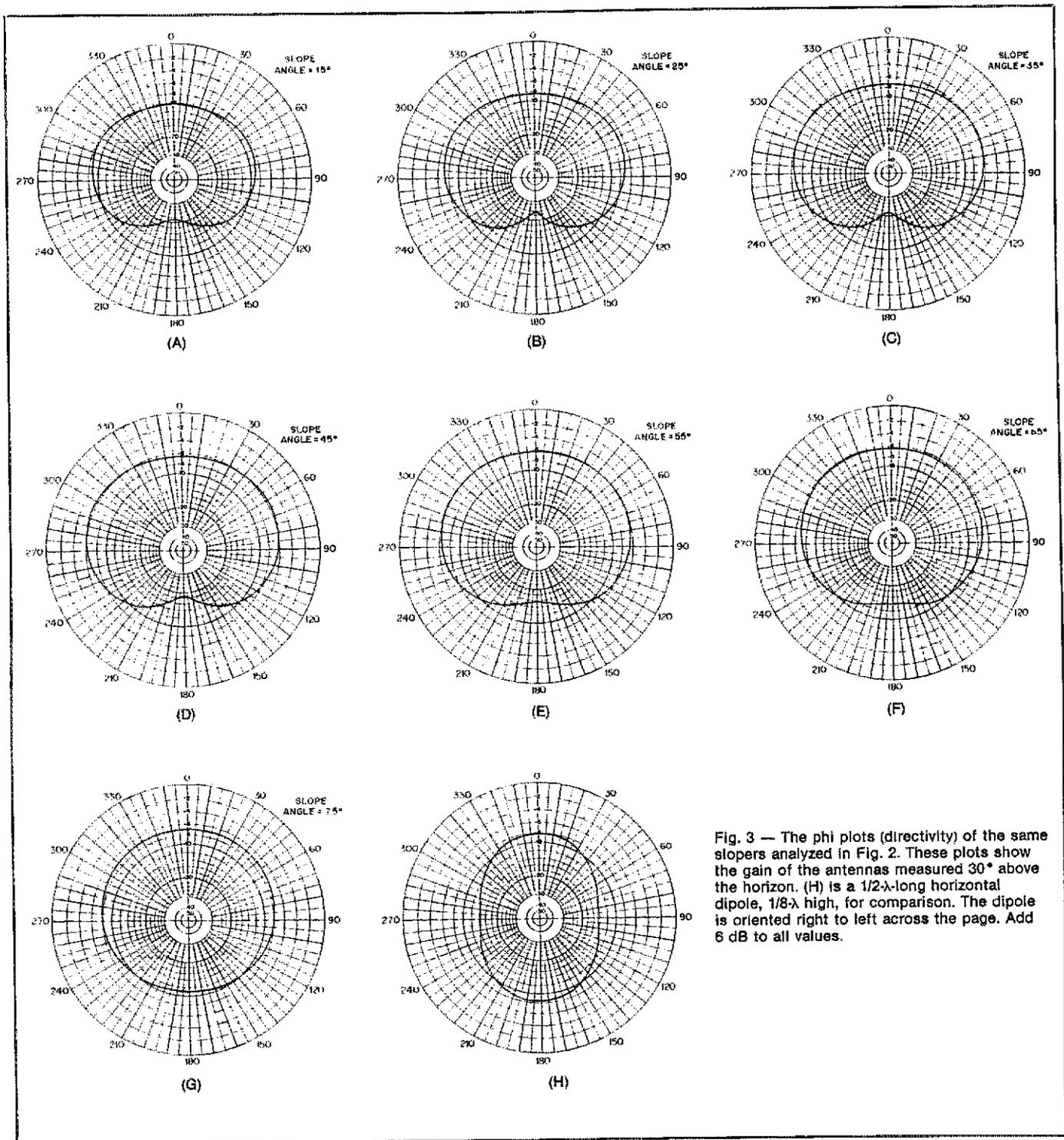


Fig. 3 — The phi plots (directivity) of the same slopers analyzed in Fig. 2. These plots show the gain of the antennas measured 30° above the horizon. (H) is a 1/2-λ-long horizontal dipole, 1/8-λ high, for comparison. The dipole is oriented right to left across the page. Add 6 dB to all values.

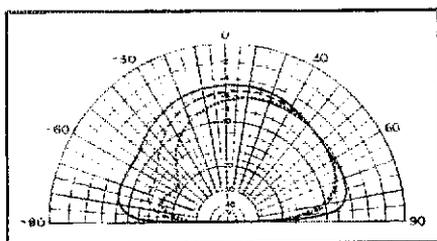


Fig. 4 — These plots illustrate the effect of various ground conditions on the 45° sloping dipole. The low end of each antenna is 0.05 λ above ground. The solid curve is for a high ground conductivity ($X = 10$ and $\epsilon_r = 30$). This gives good low-angle radiation, but almost no front-to-back ratio. The dashed curve is for average ground conditions ($X = 1$ and $\epsilon_r = 15$), and the dotted curve is for poor ground conditions ($X = 0.1$ and $\epsilon_r = 7$). Add 6 dB to all values.

overall gain increases as the slope angle increases. This is partly because we are getting the antenna higher above ground as we increase the slope angle. We can also see that the sloper has a wide beam and a narrow null off the back.

The sloping dipole has still another surprise for us. Note the direction of maximum radiation. It is not zero degrees.

Maximum radiation occurs about 70° to either side. This is because the horizontal dipole radiation is maximum off its broadside. When we slope the dipole, that broadside radiation is still there. Peak radiation off the side is a fact that will be used to advantage when we cover phased slopers. But first we will explore a few more dimensions of single slopers.

What If?

What if you have a better ground than the $X = 0.1$ we have used so far? Fig. 4 shows what happens to the theta-cut plots for a 45° sloper with increased ground conductivity. Extremely high conductivity ($X = 10$) does improve the low-angle radiation, but with a big compromise in directivity.

How about raising the antenna? Fig. 5 shows the effect of raising the entire antenna 0.1 wavelength (low end now at 0.15λ) and 0.2 wavelength (low end at 0.25λ). You can see that raising the sloping dipole does nothing for the forward gain, while some lobes start to develop off the back. The worst-case directivity even starts to degrade. So, don't put much effort into raising your sloper; it won't help matters very much.

What if you have a 40-meter sloper and use it on 15 meters, or use an 80-meter sloper on 30 meters? Some very strange things happen. Fig. 6 shows the theta cut of a 45° sloper above poor ($X = 0.1$) ground. The forward direction (to the right) looks like it is the back direction, while the back (to the left) has some nice low-angle radiation. Fig. 7 shows a phi cut taken at 30° above the horizon (theta = 60°). This is close to a null in the forward direction. It is drastically different from the same dipole horizontally oriented (the dotted curve in Fig. 7). The antenna should perform well, provided the desired signal isn't coming in at one of the nulls. Just keep in mind that the pattern will be different from a half-wave sloper.

Phased Slopers

If one sloper works well, two should work better. This is indeed the case, if the slopers are phased properly. Fig. 8 shows the phi plots (again, with theta = 60°) for two slopers fed in phase. The slopers are identical to the 45° sloper of Figs. 2 and 3. Both slopers of the phased array are pointed toward phi = zero degrees. The slopers are side by side and parallel to each other, separated by 0.5 wavelength and 0.289 wavelength. This array requires two towers for support. Shortly, we'll look at sloper arrays supported by a single tower.

The 0.289 -wavelength separation gives a 270° beamwidth. This would be desirable if there are no interfering signals off to the side of the array. The half-wavelength separation provides an excellent front-to-side ratio with a 3-dB beamwidth of 60° . This would be most useful if you could

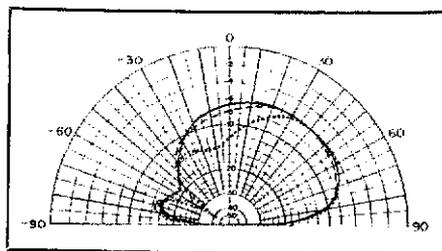


Fig. 5 — These plots show the effect of changing the height of a sloping dipole. All of the antennas have a 45° slope. The solid line is for an antenna with the low end 0.05λ above ground. The antenna with the dashed line is 0.15λ above ground, and the one with the dotted line is 0.25λ high. Add 6 dB to all values.

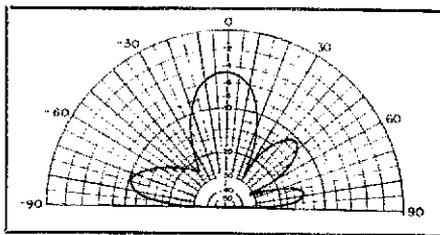


Fig. 6 — The radiation pattern of a 40-meter sloper operated on 15 meters is shown. The antenna slopes at 45° and the low end is 0.05λ high. Add 6 dB to all values.

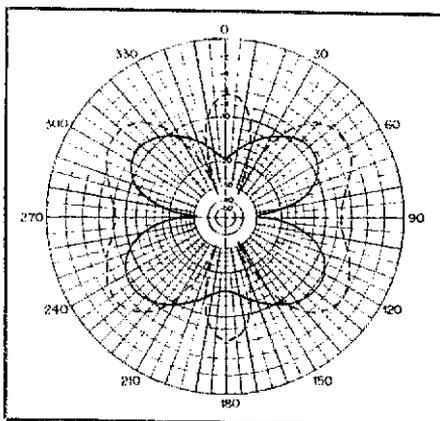


Fig. 7 — The solid line is the azimuth (phi-cut) pattern for the same antenna as in Fig. 6. The radiation is 30° above the horizon. The dashed line is for a horizontal dipole 0.5λ high. Add 6 dB to all values.

physically rotate the antenna to point at the desired signal. This is usually impractical on 40 or 80 meters. Alternatively, a separate array could be built for each direction. Unfortunately, most of us would run up against financial constraints. A third alternative is to adjust the phasing of the slopers.

For any array, with the elements placed side by side (as above) and all elements driven in phase, the maximum gain will be straight ahead. Now suppose we want to adjust the phase for a different direction. Fig. 9 shows how to calculate the right phases. The diagonal lines are an incom-

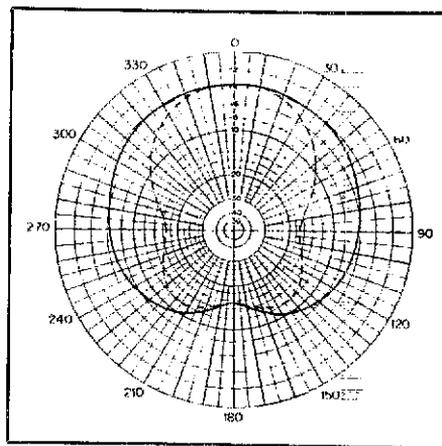


Fig. 8 — Radiation patterns for two side-by-side slopers are shown. The solid line is for a pair of slopers spaced 0.289λ , and the dashed line is for a pair spaced 0.5λ . Both arrays slope 45° and the low ends of the dipoles are all 0.05λ above ground. Add 6 dB to all values.

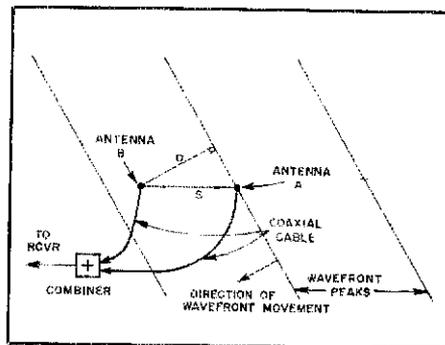


Fig. 9 — Diagram showing how a phasing line can be used to provide directivity off the side of an array. The wave-front peak being received at A will have to travel an additional distance D before reaching B. To combine the signals in phase, the coaxial cable from A will have to be an electrical length D' longer than that from B.

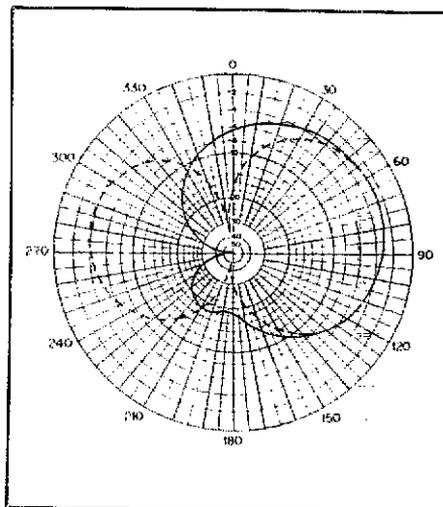


Fig. 10 — When the array of Fig. 8 is phased to receive signals at phi = 60° , the 0.289λ -spaced slopers produce the solid-line pattern. The 0.5λ -spaced slopers produce the dashed-line pattern. Add 6 dB to all values.

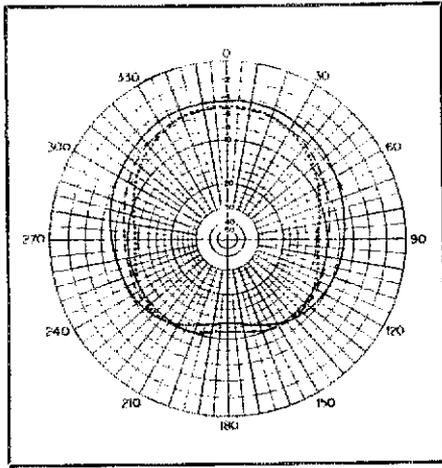


Fig. 11 — The solid line is the radiation pattern for two slopers spread 90°. The dashed line is for a spread of 120°, and the dotted line is for a 120° spread with the top of the slopers separated by 0.1 λ . Add 6 dB to all values.

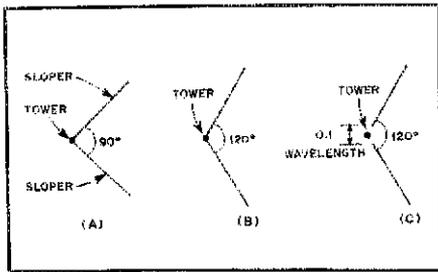


Fig. 12 — Top view of the three pairs of slopers that produced the radiation patterns of Fig. 11. The antenna at A has the solid-line pattern, the one at B has the dashed line; and the slopers at C produce the dotted-line pattern. All of the dipoles slope at 45°, and the bottom of each antenna is 0.05 λ above ground.

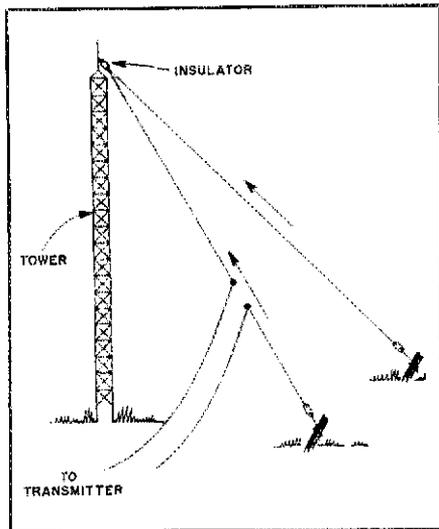


Fig. 13 — To feed two slopers with one transmission line, connect the slopers together at the top. The arrows indicate the direction of antenna current flow at a given instant.

ing wave front (from a rare DX station, for example). The lines represent the peaks of the wave front. In the drawing, one peak of the wave front is being received by antenna A. But the wave front will have to travel an additional distance (D) before being received by antenna B. We want the signals to be in phase at the receiver. This means that the signal coming from antenna A must be delayed by a piece of coaxial cable with an additional electrical length, D'. This way, even though antenna A receives its signal first, both signals arrive at the receiver in phase.

To measure a piece of coaxial cable with an electrical length, D', multiply the physical distance by the velocity factor of the cable you are using. The physical length, D, can be calculated using trigonometry or by drawing the antenna array to scale on graph paper and measuring.

Fig. 10 shows the results of phasing the two dipoles of Fig. 8 to receive stations 60° from the direction of slope. The antennas separated by 0.289 wavelength have a 3-dB beamwidth of a little over 100°, much better than before. In addition, we get a very good front-to-back ratio. The half-wavelength separation provides a bidirectional antenna.

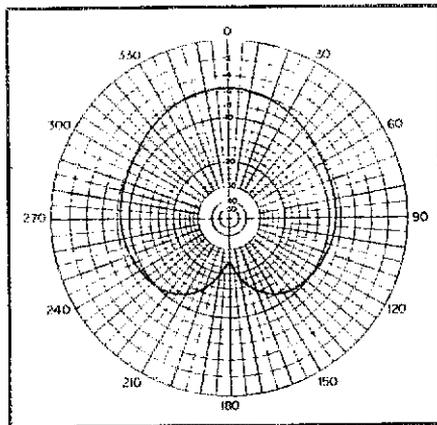


Fig. 14 — The azimuthal radiation pattern for three slopers equally spaced around a tower. The phasing has been adjusted to produce a deep null to the rear. This system forms the basis for an adaptive-array design. Add 6 dB to all values.

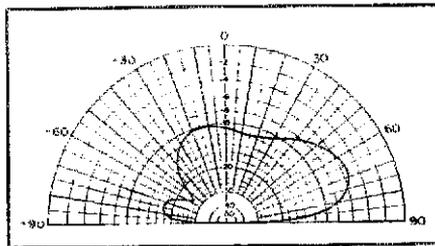


Fig. 15 — The vertical, or theta-cut, radiation pattern of the antenna system from Fig. 14. The null was positioned in the direction of an interfering signal that is coming in at an angle of 30° above the horizon. Add 6 dB to all values.

Be sure to compare the peak gain of Fig. 10 with that of Fig. 8. Phasing the antennas for side directivity results in another decibel or so of gain. Since a single sloper has more gain off to the side, putting two of them together, with the right phasing, improves the situation a bit more.

Slopers with One Tower

It would be nice if we could get good performance with both slopers supported from one tower. We can do this by spacing several slopers around the tower. Fig. 11 shows the calculated response for this kind of array.

The outer pattern is for two slopers separated by 90° (as viewed from directly above the tower). The dipoles have the same 45° slope as before, and the low ends are 0.05 wavelength above ground. The high ends of the dipoles meet at the tower.

The dashed line is with the same two dipoles spread out to 120° (as viewed from above). This is just the right spacing to place three sloping dipoles around the tower. The wider spacing gives a bit more directivity but slightly less gain and front-to-back ratio.

The dotted curve gives the pattern with both dipoles moved away from each other by 0.1 wavelength and separated by 120°. With the dipoles farther apart at the top (requiring a horizontal supporting boom or a slightly higher tower), the front-to-side ratio is again increased. These three pairs of slopers are represented in Fig. 12.

One way to construct the first two antennas of Fig. 12 and still use only one feed line is shown in Fig. 13. Simply take away one feed line and connect the two slopers together at the top. This forms a full-wave sloping inverted V. If you can match to what will undoubtedly be a different input impedance, the patterns might be the same as for two slopers. This possibility merits further investigation.

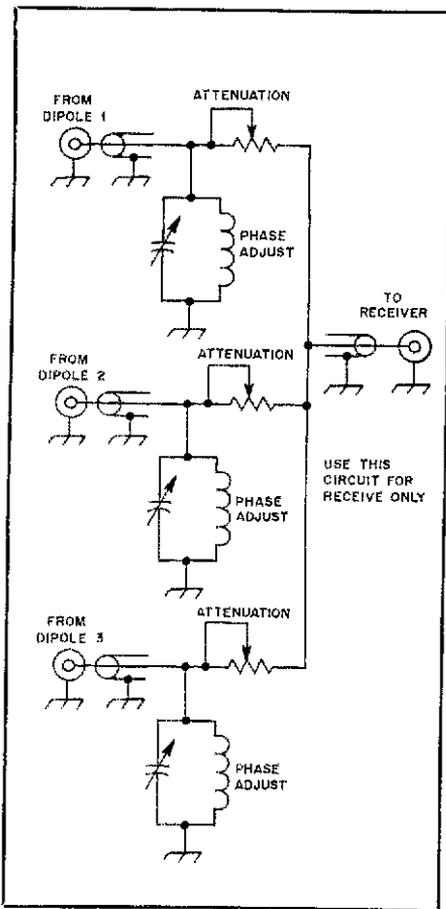
There is an important caution when working with phased sloping dipoles. If the high end of one dipole is connected to the coaxial-cable center conductor, make sure the high ends of all the dipoles are connected to the center conductors; otherwise, you will get an unwanted 180° phase shift.

Adaptive Arrays

Wouldn't it be nice if we had an antenna that would automatically form a null on interference and a beam on the desired signal? This is actually done with a number of military systems and even on spacecraft. While I was working with sloping-dipole arrays, it occurred to me that we could apply many of the same principles.

To test this out, Annie was used to calculate an array of three slopers equally spaced around a tower. One dipole was pointed straight back ($\phi = 180^\circ$) while the other two were spaced 60° either side of the forward direction ($\phi = 0^\circ$).

The amount of power and the phasing



of the antennas were adjusted until there was a nice null to the rear at 30° above the horizon. Figs. 14 and 15 were calculated with the back dipole getting 1/6th of the total power 70° sooner than the other two dipoles. The position of the null could be raised and lowered by adjusting the phase and weight (power) of the back element. The null cannot be effectively moved off the back direction by adjusting only one element. This is because of the different polarizations at other angles. We cannot use power from one plane (the back dipole) to cancel power in other planes (the front dipoles).

It may be possible to place a null on interference in any direction if you can adjust the weight and phase to each dipole. One possible circuit to do this (receive only!) is shown in Fig. 16.

It is definitely possible to put a null in any given direction with four slopers equally spaced around a tower. Any two adjacent slopers may be used to produce

Fig. 16 — A receive-only circuit that may be useful for controlling the phase and signal amplitude to the receiver from each of three sloping dipoles configured to form an adaptive array. The LC circuits should be resonant at the operating frequency. Tuning them off to either side will increase the signal attenuation and shift the phase up to 180°. The variable resistors further control the signal amplitude and isolate the dipoles from each other.

forward gain, and the other two used to place a null in the opposite direction at a desired angle above the horizon. I have not yet performed an analysis of this antenna.

The field of adaptive arrays, which really hasn't seen much investigation for Amateur Radio applications, is an exciting one. It adds a new dimension to communications. When we have an interfering signal at a slightly different frequency, we can use a notch filter. With an adaptive array and interference from a different direction, we could just tune in an antenna null. In fact, there are quite a few similarities between signal processing in the frequency domain (filters) and in the spatial domain (antennas), but that discussion must be saved for a later date. We'll touch on that topic in Part 4 of this series. We will also investigate some vertical antennas in that article. Ground conditions and the Brewster Angle are discussed with regard to vertically polarized radiation.

Notes

¹m = ft × 0.3048.

²Annie runs on an Apple® II+ (48 kbyte) or Apple //c, with DOS 3.3. It is available for \$49.95 plus \$2 handling (NY residents add sales tax). Include full name and call. Alternatively, you may send a description of your antenna and Annie will be used to analyze it for a modest charge. Write for details to Sonnet Software, Dept. Q, 4397 Luna Course, Liverpool, NY 13088. The ARRL and QST in no way warrant these offers.

Strays

CALL FOR QST TECHNICAL ARTICLES

Have you been accused of being "spaced out"? Maybe it's only because you're concentrating your Amateur Radio efforts on satellite work. If that's the case, why not come back to earth for a few moments and write about your exploits? Something as simple as setting up your station for satellite work — or you might brag about a near miss on a satellite and how you inadvertently bounced signals off Uranus.

Before submitting a finished article, send a short summary or outline of your work to Paul Rinaldo, W4RI, Manager, Technical Department, ARRL, 225 Main St., Newington, CT 06111. — Paul K. Pagel, N1FIB, Assistant Technical Editor

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

Wonder what you've been missing by not subscribing to QEX, the ARRL

newsletter for experimenters? Among the features in the May issue were:

- Improving your chances of QSOing with the next ham in space with a "Modification for the Turnstile Antenna," by J. D. Dvorsky, WA3KOF
- Eliminating oscillator pulling with the "Dual-Gate Mixer for the Sony ICS 2002," by Jonathan Towle, WB1DNL
- Part 1 of "The GB3US Mk2: A Microprocessor Repeater Logic System," by A. J. T. Whitaker, G3RKL (a RADCOR reprint)

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

I would like to get in touch with...

anyone who knows where I might obtain a Philco T6126 NPN transistor, or equivalent, for a Sideband Engineers, Inc., SB-33. Wayne Hodgman, W1EXT, 5 Shetland Rd., Nashua, NH 03062.

anyone with a schematic diagram and the crystal multiplication factor for a KAAR FM TR500 transceiver (450 MHz), and a schematic diagram and information on adding FM capability to an R-482/URR-35 receiver (225-400 MHz). Harold Donaldson, WB6SKV, 8850 Phoenix Ave., Fair Oaks, CA 95628.

anyone with information on an adapter that would allow me to use my Navy surplus Panadapter (500-kHz input) with my ICOM 720A receiver. James Hartley, W1DIS, Rte. 302, Raymond, ME 04071.

anyone who knows the whereabouts of a schematic diagram and/or a service manual for a Panalyzer Model SB-6, type 20 K. Thomas Casey, WB2JIA, 855 Oradell Ave., Oradell, NJ 07649.

anyone who has a schematic diagram or an owner's manual for a Dumont/Fairchild oscilloscope, Model 766. Tom Bartello, VE3ELM, 14 Starwood Ave., Nepean, ON K2G 1Y8, Canada.

Macrotronics RM1000 Radio Modem

This Morse/RTTY modem, with the proper software and interface package, can be used with several different types of personal computers: the Atari® 400, 800, 1200, 600XL and 800XL, the Apple® II, II+ and //e, TRS-80® microcomputer models I, III and 4, and the IBM® PC. Provision is made for 40- and 80-column use only with the IBM PC. For the purposes of this review, the RM200 (Apple computer) software and interface were used.

The RM1000 will send and receive CW up to 135 WPM, Baudot at 60, 66, 75 and 100 WPM, and ASCII at 75 and 110 bauds. ASCII operation offers operator selection of 6, 7 or 8-bit code, even, odd or no parity, and has the ability to ignore or respond to parity errors. Other RTTY features include diddle (none, slow, fast), UT4 delay (a selectable, inter-character delay), 170, 425 and 850-Hz shift selection, and narrow-shift CW ID. The operator can toggle these functions on and off: USOS (UnShift On Space), word wrap-around (on receive) and the CW ID. Carriage returns and line feeds may be ignored if desired. The CW receiving-speed algorithm is adaptive, and a key-down toggle for tune-up is provided.

Description

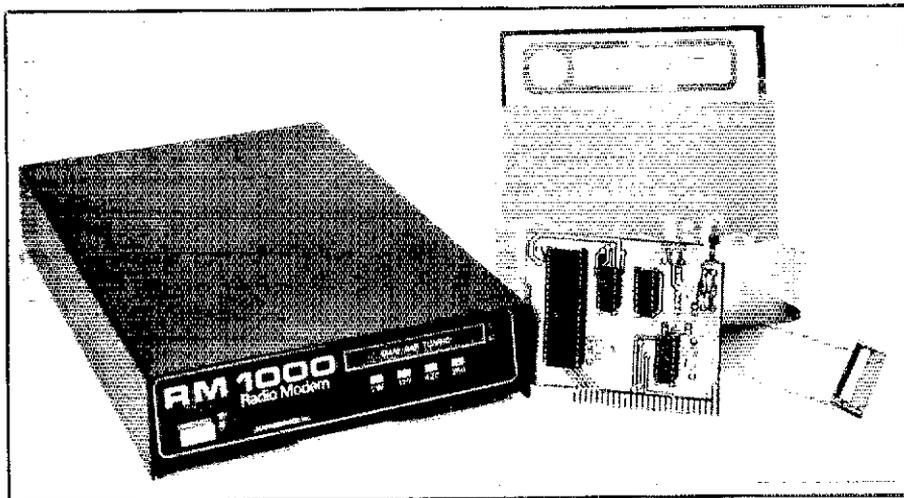
Operator's Manual

The spiral-bound operator's manual is 65 pages. It is augmented by a separate schematic diagram and an 8½ × 7¼ inch (opened) reference card. The latter contains a list of the RM1000 operating commands. With the reference card at the operating position, you can generally avoid having to look to the operator's manual for help. Should you require the assistance of the manual, the reference card also lists the page numbers on which a description of the function in question may be found.

The large, fold-out schematic diagram has a main-board parts-layout drawing on the opposite side of the sheet. No schematic diagram for the interface board is supplied, and no PC-board patterns, overlays or parts list for the main or interface boards are provided. Diodes, capacitors and resistors (except for potentiometers) are not identified by component numbers on the schematic diagram or PC board. There are no alignment instructions given. This information would be of assistance in troubleshooting and/or modification procedures. The schematic diagram copy was a bit weak in spots, but Macrotronics readily supplied another.

If you follow the manual from page one, you'll have the RM1000 in operation quickly. You should, however, read (or at least scan) the manual from cover to cover first. Then, backup the software on another disk (see the last page of Chapter 3). Chapter 4, "Detailed Interfacing," gives you the interconnection information for some Kenwood, Yaesu and ICOM rigs.

Before preparing any cables, note that the pin-out of J2 (AFSK and PTT connections) on page 46



is incorrect. Pin 1 should be labeled pin 3, and vice-versa. Since these pins connect to normally open relay contacts that are floating, no problems should be encountered. Also, the AFSK LO and AFSK HI labels should be swapped. The latter two labels are shown incorrectly on the back panel, too. A minor error occurs on page 31: The WRU (Who aRe yoU) message prompt appears in the upper window, not on status line 2.

Getting Physical

The RM1000 is enclosed in a black, two-piece, slide-apart cabinet. It's an attractive unit; the black case is color-coordinated with the blue and silver identification labels and the red, yellow and green LED displays and indicators. There is only one control on the front panel: the ON/OFF switch. Modem control is handled from the keyboard. The rather spartan, yet attractive, panel gives the operator a sense of freedom.

A dual LED tuning bar on the right-hand side of the front panel displays the level of the incoming space and mark signals. Below the tuning bar are four LEDs labeled CW, 170, 425 and 850. The red CW LED blinks in unison with incoming Morse code when the signal is within the passband of the modem CW filter. Each of the other indicators — 170, 425 and 850 (green, yellow and red, respectively) — are lit, and remain so, once a particular RTTY shift is selected, regardless of the mode of operation.

Connections to and from the modem are made at seven rear-panel jacks and plugs. Two of these are 5-pin DIN types. One is used to attach the external wall transformer to the modem. The second provides AFSK, ground and PTT interconnections. Three 1/8-inch jacks are used for CW KEYING (output), AUDIO IN and HAND KEY (input) hookups. A 5-pin header plug supplies SCOPE MARK, SCOPE SPACE, GROUND, RS 232 IN and RS 232 OUT access. The remaining plug is a two-row, 40-pin connector labeled COMPUTER PORT. This is where the umbilical cord to the computer attaches. At the computer end of this cord is a second piece of hardware that is computer dependent. For the Apple computer, it consists of a

small, double-sided PC board containing four ICs and a few other components. The main ingredient of this interface board is a 6522 VIA (Versatile Interface Adapter). In addition to providing computer/modem interfacing, the 6522 is used as a time-of-day (real-time) clock. This clock uses the ac-line frequency as a reference and must be reset during the next operating period if the computer is shut off.

All versions of the modem, except for the TRS-80 model, will work without modification on 50- or 60-Hz power lines. A simple IC change on the interface card (swap a 7490 for the 7492) converts the TRS-80 for proper operation on 50-Hz lines. This change affects the clock frequency-divider chain.

A CW THRESHOLD potentiometer is the only rear-panel control. It is used to adjust the noise threshold of the modem during CW reception and maximize noise immunity. (A software-controlled noise threshold is also provided; its adjustment is described in the operator's manual.)

Next to the CW THRESHOLD potentiometer is another ¼-inch hole. This hole might be used for modification purposes, such as adding an FSK output jack.

Inside the modem is a single double-sided PC board that contains the majority of the circuitry. A small PC board attached to the mother board at the front of the modem carries the LED displays. One empty 14-pin DIP socket exists. It accepts an SPST DIP relay (optional) for those who wish to use FSK in place of AFSK.

Electrical

The audio input stage output level is amplitude limited, thus providing a fixed amount of gain for the following active filters. There are three filters: one each for the mark and space RTTY signals, and a separate one for CW. (Some modems use the RTTY space filter on CW.) The RTTY space filter center frequency is shifted by keyboard commands using CMOS quad digital bilateral switches. These switches select trimmer potentiometers set for space filter frequencies of

*mm = in × 25.4.

*Assistant Technical Editor

2295, 2550 and 2975 Hz. Signals are sampled at the filter outputs and sent to the mark-hold and tuning indication circuits. Filter output is ORED and sent to the computer.

The CW filter consists of two stages of tuned band-pass filters. These filters are stagger tuned for an overall bandwidth of about 100 Hz and a center frequency of 900 Hz (± 150 Hz) (the manual incorrectly states this frequency to be 1 kHz). Two potentiometers (R1 and R2) allow for filter center-frequency adjustment. Another potentiometer, R3, acts as the CW THRESHOLD adjustment. R3 is adjusted for best noise immunity; the procedure is outlined in the manual. The incoming CW audio signal is changed into a digital signal by means of a comparator, fed to a missing-pulse detector, a buffer, and on to the sidetone and tuning LED stages and the computer.

A crystal-controlled clock is used to generate the AFSK tones. Audio tones are generated only when the modem is in the transmit mode. On its way out, the clock signal is fed through a divide-by-two stage, two programmable divide-by-N stages, another divide-by-two stage and a buffer. The divide-by-N stages are programmed according to inputs received from SHIFT SELECT, RTTY (state) and CW ID lines.

An SPST DIP relay is used to key the PTT line. Another relay is used to key the CW output line. Macrotronics specifies that a maximum of 90 V at 10 mA can be handled by the relay contacts. Chassis (cabinet) ground and PC-board ground are isolated. The output levels from AFSK LO and AFSK HI on the review unit are hefty; I measured 180 mV at pin 5 and 560 mV at pin 4 with the AFSK ADJUST (gain) potentiometer, R14, set for minimum output. Consequently, the microphone gain control on my transceiver was barely open. The manufacturer informed me that a change has been made in later-model units to decrease the levels at these two ports.

Software

The HELLO program is structured so that, from a cold start, the program name and copyright are billboarded and the program halts. You are then prompted to "BRUN RM1000." I think this step is unnecessary; the program should display the copyright and then do the BRUNning itself. The program can be altered easily. With DOS present, LOAD the HELLO program and alter line 230 accordingly — 230 PRINT CHR\$(4); "BRUN RM1000" — that will accomplish the "self-booting."

The disk backup procedure in the manual assumes that you've already run the RM1000 program and have stored some information (messages, codes speeds, etc.) in RAM. At this point, typing ESC-OB BSAVES the program in RAM on the original program disk as "RM1000/COPY." You're then instructed to make a duplicate of this disk and file the original in your archives. Following a program RENAMEing procedure on the duplicate disk, you're ready to go. If you don't follow this procedure, and BSAVE the RAM data on a blank (initialized) disk, you won't have the proper HELLO program to prompt you (or the computer, if you've changed line 230) to "BRUN RM1000." (Most of the software consists of a binary program that is \$3E00 (almost 16 K) bytes long and loads at address \$0800.) Because I have an aversion to doing *anything*, with a new program before backing it up, I used the Apple COPYA program to make a backup copy of the original RM1000 disk files, then proceeded with the backup procedure outlined in the manual.

It is impractical to mention all the features the software offers. Let me say that the features are plentiful; some of them were mentioned earlier. Other features include the ability to SAVE messages and text to disk, LOAD them from disk, activate four separate WRU functions, send copy to a printer and call a "review" window. You can prepare up to 16 messages that are dynamically allocated in memory. Messages can even be placed within other messages. Modem control commands can be embedded in text or messages. Messages and received or transmitted information are saved on disk as text files. The data within these text files are stored in hexadecimal form. As such, they are *not* directly usable with Apple's word-processing program, Apple Writer II. If you wish to use the files outside the modem program, a conversion routine must be employed, unless your word-processing program accepts such text files.

"Upside-down" and normal receive and transmit RTTY modes can be selected separately or in tandem. Rather than showing the inverted receive or transmit mode (or both) as inverse letters (as the manual implies), normal and inverted modes are shown on status line 1 as NORM and INVT, respectively, within parentheses. Transmission speed can be altered without interrupting the flow of information.

The software is aided by the 6522 on the interface card. Both clocks of the 6522 are used for loop timers, thus freeing the software from having to do this. Among other things, this permits the software to perform disk I/O routines without interrupting the time-of-day clock. Reception and transmission are inhibited, however, during disk access.

Macrotronics has informed me that the software does not support many printer interface cards. The Apple and Epson® printer interface cards are supported, but the Grappler™ and (I discovered) the Microtek cards are not. If your card is similar in operation to the Apple or Epson cards, you're all set. Otherwise, you'll not be able to get hard copy using the existing system unless you can devise a way to do so.

Operation

General

If you start the program with your transmitter and RM1000 on, the PTT line will be keyed, so it's best not to turn on the modem until the program has finished loading. Before program configuration, the program asks for the slot number in which the interface card has been placed. Following program configuration, the slot number request is bypassed. Should you change slot assignments, you'll have to reconfigure the program. The second prompt requests your call sign, a hyphen and the start time for the clock.

You can bypass both requests by answering the prompt with RETURN if you do not need or want the ID included in the program. In this case, the clock will start at zero. A second option is ID entry and clock start at zero. Entering a hyphen followed by the clock time starts the clock timing from your initialization figures when you press RETURN and, of course, leaves the ID message blank.

Those, like me, who are used to the relatively standard split-screen display with a "Times Square" transmitted-message scroll in the middle will find Macrotronics has taken a different tack. Basically, the on-air screen consists of an "edit" window at the top of the screen, followed by a pair of status lines and a "dialogue" window. Six lines of transmit text appear in the edit window. This is the display area for the transmit buf-

fer. The status lines indicate: receive or transmit mode, mark/space polarity (normal or reverse), Morse or RTTY operation, transmit and receiving speeds, RTTY shift, carriage width, carriage-return/line-feed status and the time. Below the status lines, the dialogue window displays received and transmitted text. The receive and transmit modes are indicated by inverse letters separating the text. Text scrolls upward and disappears immediately beneath the bottom-most status line. (I'd prefer to have a blank line between the status line and the scrolling-text window.)

The review window allows you to take a peek at received or transmitted text that has passed by the normal or "on-air" screen. This is a feature *all* RTTY software should have — but doesn't! Within the confines of the review window, you can move the cursor about and mark text for transfer to a message (and save the message to disk), or tell the printer where to start printing. (The Atari and IBM PC software versions allow you to edit text within the review window.) Cursor moves are done with CONTROL key commands. Carriage returns and line feeds are represented by the letters "M" and "J," (not in inverse display); their placement describes their function, however. The transmit type-ahead buffer and the review window may be cleared by a keyboard command, but you can't do the same for the normal (on-the-air) transmit/receive window.

A "break" mode is included for rapid answers to questions you might receive while preparing text for later transmission. The prepared text is unaffected. You can interrupt outgoing data with the break mode to insert a comment. When you are finished, the software will pick up the transmission from the point at which you interrupted it.

The software commands make operating a pleasure. You don't have to toggle back and forth between a bunch of menus to get the function you want. With the handy reference card, "remembering" the commands is easy. By embedding control commands in your transmitted text, you can have the modem automatically toggle from transmit to receive, change speeds, etc. Although you can change modes from the keyboard during transmit, all you'll accomplish is locking up the program.

CW

This is the default mode of the program. The supplied program initializes at a transmit speed of 20 WPM. You can configure the program to initialize at a different speed if you desire. During receive, an adaptive algorithm compensates for speed changes. CW keying is accomplished using the VOX feature of your transmitter; the PTT line is not keyed by the modem during CW operation.

Tuning in a CW signal takes a gentle hand on the receiver or transceiver tuning knob, as the CW filter is quite sharp. There are three indicators to watch when tuning in a CW signal: the space and mark (S and M) DUAL BAR TUNING display and the CW LED. The object is to tune in the signal so that a maximum number of segments are illuminated on the S and M DUAL BAR TUNING indicator in conjunction with synchronized flashing of the CW LED. While that may, at first, sound like it's difficult to accomplish, it isn't — as long as you tune slowly. The receive algorithm performs well, but as with *all* the other CW receiving programs I've tried, none can match the trained ear/brain combination for copying under adverse conditions. Until the "pros" who send

Morse with an accent and play "music" (to their ears) learn how to send properly, we'll not get perfect copy — with or without computers — even with signals that are 30 dB over S9! If you think your fist is "machine-perfect," try sending to the RM1000 (via the HAND KEY input) and see what prints on the screen.

The CW prosigns the software provides are *K*, *KN*, *SK*, *AR* and *AS*. For many operators these will be sufficient. A number of special characters are included in the Morse character table, including the plus sign and the ampersand. I would prefer seeing more prosigns substituted for these seldom-used special characters. There are a couple of errors in the character table, too. Appendix B lists a "TM" as the keyboard character to send *AR*; actually, it should be the "@" sign. The second error involves the percent sign. On transmit, it is sent as *WRN* (-----); during receive, the software responds to *WR* (-----) and errs if *WRN* is input.

A number of the special-character Morse code equivalents (including the percent sign) in Appendix B are not internationally accepted. When I inquired about that, I was told there was to have been a standard established among equipment manufacturers regarding these symbols. The standard never took hold, but Macrotronics retained the agreed-on structure.

RTTY

Tuning in a Baudot or ASCII RTTY signal is quite easy using the DUAL BAR TUNING indicator. Simply tune for a maximum deflection on the M and S indicators. If you think you *really* need a scope to tune in an RTTY signal, the hookups are there. Speed and mode (Baudot/ASCII) changes are made quickly using the ESCAPE key commands offered by the software. In the RTTY mode, tuning in a CW signal will light the CW LED if the note is properly centered in the modem filter passband, but the output will be gibberish. The receiver/transceiver audio can be kept to a level that is almost inaudible in the speaker, yet the modem responds properly.

Some Comments

I contacted Macrotronics to make them aware of the areas I thought required attention. Quick and positive action on the part of the manufacturer resulted in the writing of an addendum sheet. I was told that the addendum would be mailed to all RM1000 owners who had sent in their warranty cards. Macrotronics informed me that they prefer RM1000 owners not attempt realignment or servicing of their units; that's why the circuit information is minimal.

If your unit is one that has too high an AFSK output level (as does the review unit), a single resistor change will decrease the level to a more manageable one. The change involves substituting a 200-k Ω resistor for the first series resistor in the fixed output attenuator (a 10-k Ω resistor presently resides there). This modification will be made free of charge by Macrotronics.

Potential purchasers of the RM1000 should be aware that no connectors (other than the 5-pin header socket) are supplied with the modem. An optional connector package is available from Macrotronics, or the connectors may be purchased at a local electronics parts outlet. (Radio Shack stocks the necessary connectors.) Three 1/8-inch, two-conductor plugs and a single 5-pin DIN plug are required. The review RM1000 did not have the 5-pin header socket in the package, but one was obtained from the manufacturer. Some of you may have observed that the two 5-pin DIN plugs can be inserted into

the wrong jack — the ac power source can be plugged into the PTT/AFSK socket, and vice-versa. No damage will occur if this is done.

The wall transformer can be used on 117- and 234-V mains. A slide switch on the back of the transformer selects the proper voltage. The manual cautions that a piece of tape should be placed over the switch to avoid accidental movement to the incorrect position. I would prefer to have a small switch plate (similar to those found on some transceivers, for instance) mounted on the transformer to lock the switch in place.

Macrotronics informed me that TS-520 transceiver owners must modify the RM1000 CW keying circuit. The modification is simple — wiring a transistor switch on a DIP header and plugging it in — and information is available from the manufacturer.

All the RTTY/CW modems I'd used prior to the RM1000 use the Apple game I/O port for interfacing. With an external game-port adapter attached to the outside of the computer, it's easy to connect or disconnect the modem by simply flipping the lever on the adapter ZIF (zero-insertion-force) socket. With the RM1000, the interface card must be plugged into one of the computer mother-board slots and, instead of a four-wire cable, there's a 20-conductor cable between the computer and the modem. The trade-off is in how the modem is controlled. With the other modems, front-panel switches control the operation of the modem. As mentioned earlier, there *are* no modem-control switches (except an ON/OFF push button); modem control is managed from the keyboard. It's a different approach, and I like the idea.

The RM1000 is available from Macrotronics, Inc., 1125 N. Golden State Blvd., Turlock, CA 95380, tel. 209-667-2888. Price classes: RM1000, \$240; FSK option, \$10; software and interface card/cables: Atari 400, 800, 1200, 600 and 800 XL, \$60; TRS-80 Models I, II and 4 and Apple II, II+ and //e, \$100; IBM PC 40/80 column, \$150. Add \$4 shipping within the U.S. — *Paul K. Pagel, N1FB*

MICROWAVE MODULES, LTD., MMS1 AND MMS2

□ As better Amateur Radio instructors will tell you, aural presentation and immediate feedback are keys to a student successfully learning the Morse code. Microwave Modules' Morse code trainers do both nicely. The Morse Talker (MMS1) and Advanced Morse Trainer (MMS2) are sophisticated, self-contained training devices that help students increase their Morse code reception speed and, with the MMS2, improve sending ability. What sets the MMS1 and MMS2 apart is synthesized-voice feedback (referred to as "Talkback" by Microwave Modules): Both units literally *tell* you what characters they've sent; the MMS2 also can tell you what characters you've sent — or quite convincingly announce that your fist is rusty by blurring out a tone suspiciously reminiscent of a raspberry. A more objective critic would be hard to find!

The MMS1 and MMS2 share many features. Each is well constructed on fiberglass PC boards containing two microprocessors, two memory ICs and associated circuitry, and each is housed in a rugged, die-cast aluminum box roughly the size of a large paperback book. The boxes are painted flat black and rest atop four low-profile rubber feet. The attractive front panels consist of aluminum strips that are securely glued to the front of the boxes, though the corners of the panels tend to pull away from the box and are

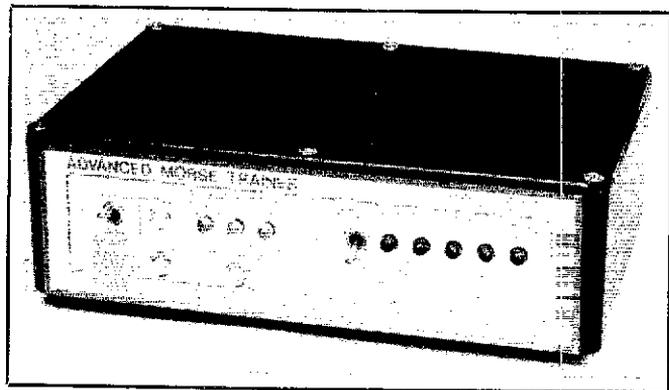
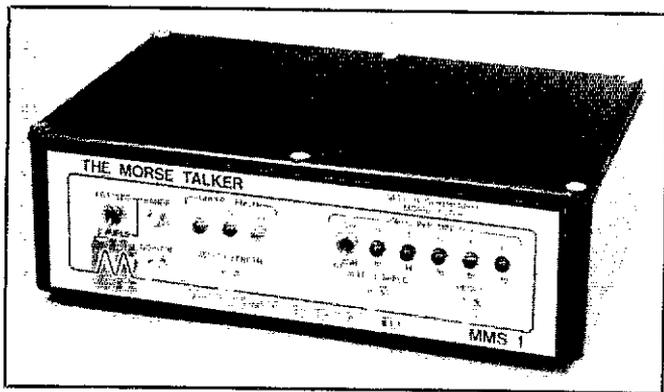
physically sharp. (Had they been rounded before assembly, there would not be a problem.)

Front panel toggle and push-button switches select various options and LEDs that indicate the chosen code speed and character-group length. On the back panel of each unit are 5-pin DIN power connectors (an external power source of 9- to 13.8-V dc at 350 mA minimum is needed), two 3.5-mm mini-phone jacks for connecting 8-ohm headphones or an external speaker (a small internal speaker is provided) and a straight key or keying device (a keyer is not included in either the MMS1 or MMS2), and a phono jack for hooking up a tape recorder to make practice tapes. Both units are reverse-polarity protected and have readily accessible external RESET switches. Neither unit has its own on/off switch; turning them on and off is achieved by connection to, or removal from, an external power source.

The basic function common to the MMS1 and MMS2 is random code practice in a variety of speeds and formats. Code speed is selected by stepping through the range of speeds from the low speed at turn on; this is done using a toggle switch to set low- or high-speed range and then repeatedly pushing the SPEED SELECT button while watching which of a string of five LEDs is lit. In the MMS1, code speeds range from 2 to 20 WPM in 2-WPM increments; an optional EPROM (not available in the review unit) can be purchased to extend the range to 12 to 48 WPM in 4-WPM increments. In the MMS2, the code speed ranges from 6 to 32 WPM in 2-WPM increments to 16 WPM, and 4-WPM increments between 16 and 32 WPM. At speeds less than 12 WPM, characters are sent at 12 WPM and between-character spacing is adjusted for the overall selected speed. This (a variation of what is called the Farnsworth method) forces the newcomer or slow-code student to recognize characters by their rhythm patterns and avoid the beginner's trap of counting dots and dashes. At 12 WPM and above, normal character spacing is used.

Other available options concern the size and composition of the random groups that will be sent. Six character ranges can be selected using a combination of toggle switch and pushbutton: A-F, A-M, A-U, A-Z, 0-9 and 0-Z (all numerals and letters). Punctuation and common procedural signs are not available. Unlike other options, the chosen character ranges are not indicated by LEDs; instead, the units literally *tell* you what range you've selected as you step through the sequence. Be prepared for a few wide-eyed stares from the uninitiated — this is usually the point where the synthesized voice first speaks.

The third option, length of random-code groups, is selected by stepping through the four choices with a push-button switch. When the GROUP LENGTH 1 LED is lit, the MMS1 and MMS2 (after you've also pushed the GO/STOP button) will send one character at the selected speed and from the selected range, pause, tell you verbally what was sent, pause again, send another character, and so on. When the GROUP LENGTH 5 LED is lit, a single group of five random characters is sent before you're told what they were, then another five, etc. When the GROUP LENGTH 50 LED is lit, 10 groups of five random characters each are sent, followed by a synthesized-voice discourse on what they were, followed by another 10 five-character groups, and the sequence is repeated. When all GROUP LENGTH LEDs are extinguished, the voice synthesizer is disabled and continuous five-character, random-code groups are sent with no



Microwave Modules MMS1 and MMS2

Manufacturer's Specifications

	MMS1	MMS2
Speed Range	2-20 WPM in 2-WPM increments; 4-48 WPM with optional EPROM	6-32 WPM in 2-WPM increments to 16 WPM and in 4-WPM increments 16-32 WPM
Character group lengths	1, 5, 50 before Talkback	1, 5, 50 before Talkback
Letter/numeral ranges	A-F, A-M, A-U, A-Z, 0-9, 0-Z	A-F, A-M, A-U, A-Z, 0-9, 0-Z
Power requirements	9 to 13.8 V at 350 mA	
Power connector	5-pin DIN	
Audio output	250 mW into 8 ohms	
External speaker connector	3.5-mm mini-phone jack	
Tape recorder connector	Phono jack	
Morse key connector	3.5-mm mini-phone jack	
Size (HWD)	2 x 7 x 4 1/4 in†	
Weight	2 lb 2 oz.	
Synthesized Voice		
Talkback	Yes	Yes
Reads user's transmission	No	Yes

Manufacturer: Microwave Modules, Ltd., Brookfield Dr., Aintree, Liverpool L9 7AN, England.

†mm = in x 25.4; kg = lb x 0.454

Talkback. The single-character mode is suitable for learning the Morse code while the 5- and 50-character modes are intended for drill and increasing your speed. Continuous group mode is useful for increasing speed when you're secure in your knowledge of the code.

The MMS1 and MMS2 can be used as code-practice oscillators (CPOs) when hooked up to a straight key or bug. The feature that distinguishes the MMS2 from the MMS1 is the former's ability to read what you've sent and tell you immediately thereafter what the characters were (and what you failed to send clearly!). In single-character mode, the MMS2 can recognize well-sent letters and numbers, and tell you what it heard after each character. Send an A and the unit will say, "A." Send a C and the unit will say, "C." Send a C with a poor, sloppy rhythm (N N), however, and you're likely to be told, "N." Send a punctuation mark, prosign, an incorrect character or gibberish and you'll hear an embarrassing 80-Hz tone, the unit's not-so-subtle way of telling you it didn't recognize what you sent.

In GROUP LENGTH 5 mode, you'll have to send five characters before the MMS2 tells you how well you've done. Each time the unit recognizes a new character, the next LED in the string of five on the panel lights. Note that what you might intend to be a C, for example, if sent with poor rhythm, will probably be read as "N N," two characters. When five characters have been recognized, the MMS2 sounds a 400-Hz tone, reads back what it has received, tells you your approximate speed in words per minute and sounds a second 400-Hz tone to signal that it's ready to receive another group.

In GROUP LENGTH 50 mode (the most useful for realistic drill once you've tuned up the rhythm of your sending), you must send 50 characters before you're told what the MMS2 has received. As each successive character is read, another of the five LEDs lights in sequence; recognition of 50 characters causes cycling through the five LEDs 10 times. A 400-Hz tone again signals completion, the 50 characters received are read back, your approximate sending speed is announced, and a 400-Hz tone tells you the MMS2 is again ready. Word spaces are also recognized and included in the Talkback. Should you wish to hear again what the fifty characters were, push the REPEAT button for another recital. Note that although the MMS2 can read speeds through 32 WPM, during Talkback it states speeds only through 20 WPM. Thus, whether you're a 20-WPM "steady striker" or a 32-WPM "speed demon," the MMS2 will say, "20 WPM."

The Advanced Morse Trainer (actually, its recognition algorithm) proved to be demanding, fair and impartial. Good Morse code timing and rhythm are required, but not necessarily machine-ent precision. Well-sent code is rewarded with immediate positive feedback; poorly sent code is negatively reinforced with what you'll soon come to feel is an obnoxious beep. If you've never been told by a machine that your performance is inadequate (particularly embarrassing to the CW "ace" who tries his fist out on the MMS2 at a club meeting!), believe me, you'll be motivated to clean up your fist quickly.

The MMS1 and MMS2 perform reliably and meet the manufacturer's claims. Though the operation of the units is not intuitively apparent,

the instructions are complete, clear and concise — easily learned in a few minutes. The RESET button immediately cured any strange problems that were encountered, and problems were rare. Shortcomings are trivial, consisting mostly of features I would like to see incorporated into the units. Neither unit has a volume control. In some situations, the audio from the internal speaker was too loud (late-night practice while others in the apartment tried to sleep); in others (noisy environment or for large groups), too soft. These situations can be accommodated by using headphones or an external audio amplifier and speaker — but a volume control would be a more convenient solution. The internal speaker is adequate but, as it is mounted on the bottom face of the enclosure, it is most effective when the unit is set unobstructed on a flat surface. Keying is good, and the Morse characters are crisp and well timed. The synthesized voice, which at first encounter sounded a little strange, soon became familiar. No one during the review had problems with the voice after the first 30 seconds of listening.

The only limitation of any real consequence is the lack of punctuation and prosigns. For all Morse code test elements in the U.S. (5-WPM Element 1A, 13-WPM Element 1B and 20-WPM Element 1C), they are required; moreover, these characters are often roadblocks to students simply because they're heard infrequently. Although Microwave Modules claims to cover only the 26 letters of the alphabet and 10 numerals, punctuation and prosigns would be a valuable addition.

The Microwave Modules Morse Talker and Advanced Morse Trainer are sophisticated, effective and novel Morse code instructors. ARRL Hq. staffers found the MMS2 transmission and Talkback addictive. Straight keys and bugs, long since forsaken for the latest in electronic memory keyers, were dusted off and put through their paces. Several people regained excellent fists immediately; a few others, however, after a rude awakening, kept coming back to scrape the barnacles off their long-idle straight-key fists. At a Murphy's Marauders (a New England contest club) meeting the proficient CW contesters left the MMS2 in the dust; those needing the practice (phone operators?) found the unit potentially useful. *Everyone* agreed that the MMS2's transmission and Talkback were a lot of fun. The moral of the story? The MMS1 and MMS2 are best suited to those who know code at slow speeds and want to upgrade, and the latter is an ideal way to improve less-than-32-WPM fists.

The MMS1 and MMS2 are available from Spectrum International, P.O. Box 1084, Concord, MA 01742, tel. 617-263-2145. Price classes: MMS1, \$225; MMS2, \$300. Shipping charges: U.S., \$5.50; Canada and Mexico, \$6.50; other areas, \$7.50. — Steve Place, WB1EYI

TRAP FOR SHUNT-FED TOWERS

□ Frequently, I have needed to "divorce" my tower from wire antennas that were used in conjunction with the tower to form antennas for additional bands. For example, suppose you want to use your tower as a shunt-fed vertical antenna for 80 meters, but also want to use it as an L-shaped Marconi antenna for 160 meters. This can be accomplished using a horizontal extender wire, as shown in Fig. 1A.

Another possibility is to shunt feed the tower for 160 meters (using a top resonator, as with the Minooka Special) while also employing it as a closed loop for 80- and 40-meter operation by means of a slant wire (similar to a half-Delta Loop), as shown in Fig. 1B.¹

In either case, it is necessary to prevent one part of the antenna system from becoming an electrical part of the other section. One simple solution is to place a trap at the appropriate spot in the system. Fig. 2 shows the 1.9-MHz trap I fashioned from a surplus 500-pF, 10-kV ceramic capacitor garnered at a flea market.

The capacitor is inserted into a length of acrylic tubing. The coil for the trap is wound over the end of the tubing opposite the capacitor. This is to prevent any degradation in Q that might occur if the coil were to be wound directly over the capacitor. I have had poor results when attempting to place fixed-value vacuum capacitors within the immediate field of a trap coil. I have had no problems with the construction shown in Fig. 2, however. Other materials of high-dielectric character could be used for the coil form.

My experience indicates that the LC ratio of an antenna trap is not especially critical, provided that the trap Q and resonance are proper. I use a rule of thumb that calls for 3 pF of capacitance per meter of the desired frequency band. The coil is then wound to provide parallel resonance in that portion of the band where trap action is desired. I use a dip meter to adjust the resonant frequency before the trap is installed.

The photograph shows that the trap is affixed to a homemade aluminum L bracket. This bracket has a back plate and two U bolts to provide a secure method of attachment to one of the tower legs. One side of the trap is connected to the tower through this bracket. The other trap connection is at the steatite cone insulator. The wire that connects to the insulator is attached to the tower leg near the trap by means of a short guy line and insulator. This removes any strain from the trap and permits a short loop of wire to reach to the trap terminal. The L bracket helps prevent snow and ice buildup on the trap.

This article illustrates how a trap can be used in a multiband antenna system for which a tower becomes part of the overall radiator. You may have to depart from my construction method in order to adapt existing components for your particular needs. Just be sure to weatherproof the trap. I painted mine with two coats of exterior polyurethane varnish, and it has held up well

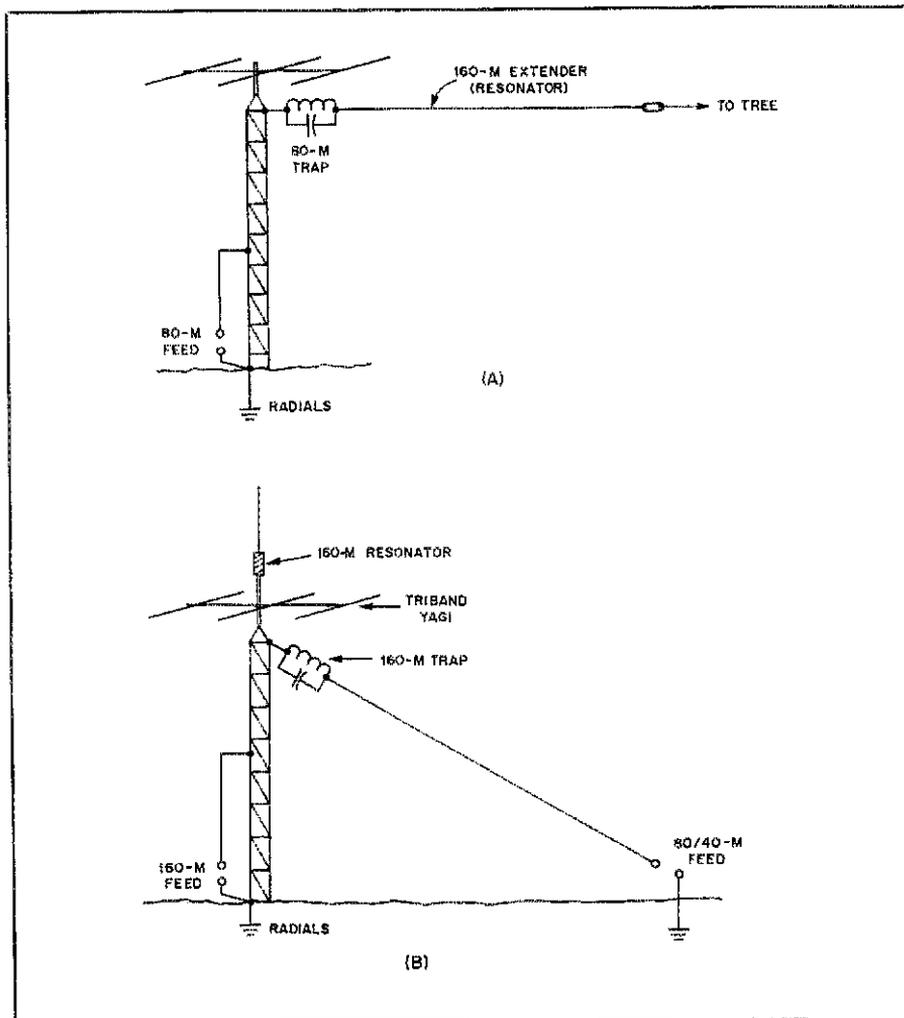


Fig. 1 — Illustration of how a trap can be used to divorce an 80-meter shunt-fed tower from a horizontal extender wire that provides resonance of the entire system on 160 meters is shown at A. B shows how a 160-meter shunt-fed tower can be isolated from an 80- and 40-meter loop.

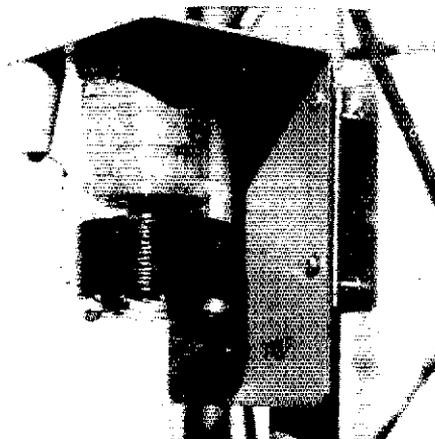


Fig. 2 — A 160-meter, high-power trap built by W1FB.

through more than two years of exposure to the natural elements.

For those who want more specific information about my trap, the 500-pF capacitor required an inductance of 14 μ H to achieve resonance at 1.9 MHz. The coil consists of 15 turns of no. 16 enameled wire, close wound on the form. The outside diameter of the plastic tubing is 3 inches.² — Doug DeMaw, W1FB, Luther, Michigan

HARMONICS AND TRAP ANTENNAS

□ Extender kits to add the 30- or 40-meter bands to triband beam antennas have become very popular. Like so many others, I recently purchased a kit to add 40 meters to my Cushcraft A-3 beam. I was pleased to be able to add

¹B. Boothe, "The Minooka Special," *QST*, Dec. 1974.

*Assistant Technical Editor

²mm = ln \times 25.4; m = ft \times 0.3048.

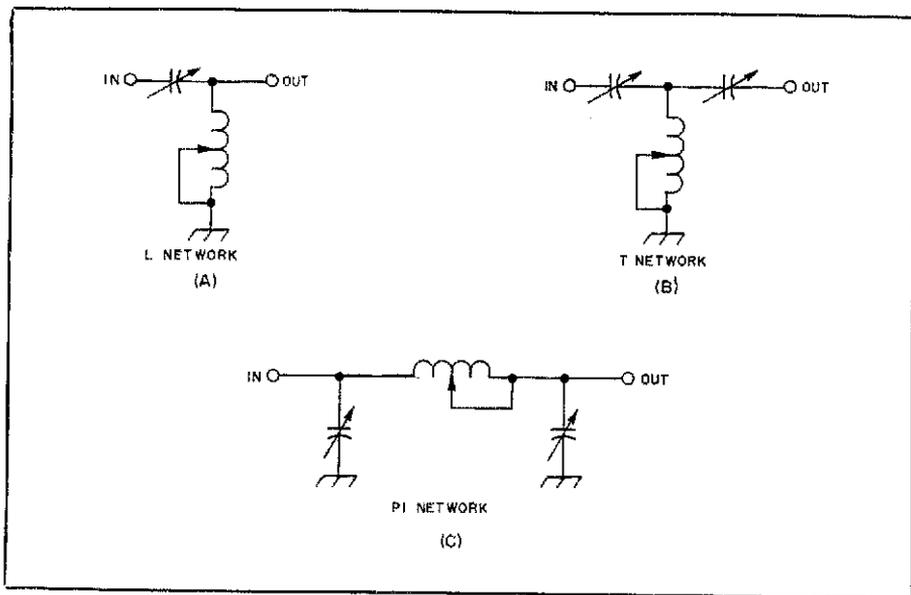


Fig. 3 — Three common types of impedance-matching networks. At A is an L network; a T network is shown at B; and a pi network is shown at C.

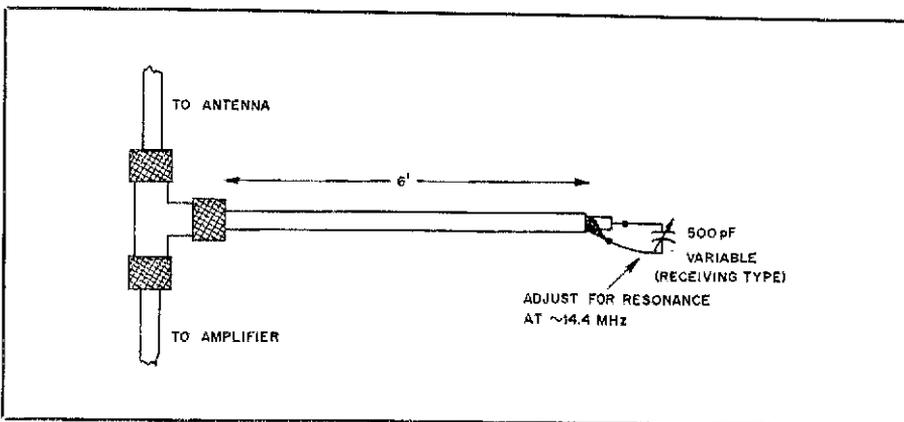


Fig. 4 — A coaxial-stub trap cleaned up a 40-meter harmonic-signal-radiation problem for W4ITD. The length of coaxial cable for the trap seems to depend on the length of your feed line and on where the trap is placed in the feed line for a given frequency. It is not critical, though, and can be tuned over a wide frequency range by means of the variable capacitor.

another band on the same tower and with the same feed line. The new antenna performed up to my expectations, as was proven by the reports from my Australian friends who gather around 7.2 MHz.

I was rather upset and somewhat puzzled when I received notice that I had been heard by the FCC Monitoring Station in Georgia on 14.414-MHz SSB. The report was S 2, but my signal was R 5 and their excerpts from my 7.207-MHz QSO were detailed. Both my Yaesu FT-902DM transceiver and my Heath SB-220 amplifier employ pi-network output circuits. I thought this, along with my Swan ST1A matching unit, provided all the protection I needed against spurious radiation. Then I ran through some quick calculations.

If my amplifier produces 1000-W PEP output power, then even with 40 dB of attenuation on the second harmonic I may have had 100-mW PEP at 14.414 MHz. [FCC rules state that the mean power of any spurious emission from a transmitter operated at a carrier frequency below 30 MHz must be at least 40 dB below the fun-

damental and must not exceed 50 mW. — Ed.] Add the gain of my beam to this and you will discover that I had an effective radiated power of about 1 W. Any QRP enthusiast will tell you that is enough power to work the world!

I studied the circuit diagrams of several commercial Transmatch units and discovered them to be L or T networks, as shown in Fig. 3. High-pass filter circuits use much the same arrangement, so it is easy to see that these units afford no appreciable harmonic reduction. I built a pi-network matching unit using the circuit shown at Fig. 3C, and then conducted some tests with another amateur about 3 miles away.³ Without the amplifier, my signal above 20 meters was S 9 on my friend's TS-830. There was no noticeable difference when I put my Swan matching unit in line, but my homemade Transmatch reduced the signal level to almost nothing. Unfortunately, I did not have components on hand that would withstand the power from my amplifier, so that did not really solve

³km = mi × 1.61.

my problem. Of all the new commercial units I looked at, only the William Nye Co. model MB-V has a true pi-network circuit and is rated for full power. [The Drake MN-2700 also has these features. — Ed.] I purchased one of those units, and tests indicated that it provided enough additional attenuation to prevent my second harmonic from being detected at the FCC monitoring station.

I decided to experiment with a tunable coaxial-stub trap resonant at 14.4 MHz just to be safe. My idea was to use a coaxial T connector in the shack, and to connect the trap to the feed line as shown in Fig. 4. The 500-pF receiving variable capacitor is one that I had in my junk box. I tried various lengths for the coaxial cable and finally settled on 6 feet as a good length.

I tuned my receiver to a commercial RTTY station around 14.4 MHz and then adjusted the variable capacitor. The signal went from 20 dB over S 8 to about S 8 when the trap hit resonance. The idea is for the stub to short out the signal at its resonant frequency.

This stub seems to have almost no effect on loading for 40-meter operation, but you *must* remember to disconnect it when operating on 20 meters! Harmonic radiation on other bands could be reduced by similar traps. A bit of experimenting with different lengths of cable and capacitor values is all it should take. Once a suitable value of capacitance is determined, you could replace the variable capacitor with one of fixed value. I simply coil up the length of cable to a convenient size. The T connector is placed where I can reach it easily to connect or disconnect the stub.

Since receiving my "QSL" from the FCC, I have spent some time listening on the high end of 20 meters. Apparently, there are quite a few others who have the same problem I did. Perhaps by calling attention to this problem, I will alert some operators before they receive an FCC notice. It seems likely that this situation could occur with any trap antenna. So if you have such an antenna and use an amplifier, I recommend that you check for harmonic radiation. — Steve Taber, W4ITD, Lighthouse Point, Florida

HEATH SA-5010 KEYS SHORT

□ After I used my Heath SA-5010 keyer for about nine months, a problem developed. I returned from a short vacation, and when I turned on the keyer, it produced a steady tone and none of the LEDs would function. This seemed to indicate that the batteries used for the memory had discharged. A new set did not cure the problem, however.

Further investigation proved that the real problem was the gray cardboard insulating paper used to prevent the PC board from shorting to the painted code panel that stores the paddles inside the keyer when they are not in use. The paper seems to have picked up moisture from the air and became a conductor instead of an insulator!

I found a brownish-orange discoloration on the paper and some corrosion on the PC board. A check with my ohmmeter showed a resistance as low as 1 kΩ in the problem area and 2 kΩ or more in other areas. This didn't seem like a very good insulator to me.

I used a soft wire brush to clean the corrosion off the PC board. Then I made a new insulator from a piece of Teflon sheet, using the old insulator as a template. My keyer works fine now. — Gilbert Lahullier, W2HIN, Clifton, New Jersey

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

ANTENNA SWITCHING

□ Here is some information on A, B and A + B switches. The basic idea is the application of $\lambda/4$ sections to transform between shorts and opens. The version in Fig. 1A uses (in effect) a single-pole three-position switch that leaves the unselected ports open. If the two loads are $50\ \Omega$ each, the two $75\text{-}\Omega$ sections transform them to $100\ \Omega$, and the parallel combination gives A + B at $50\ \Omega$. With the switch in position 1, the open at port 2 is transformed to a short at the tee, which isolates port 3. The short at the tee is converted to an open at port 1, so position 1 selects A at $50\ \Omega$. If the two loads are $75\ \Omega$, the paralleled $75\text{-}\Omega$ section outputs yield $37\ \Omega$, which is transformed back up to $75\ \Omega$ by the $50\text{-}\Omega$ section. Thus, the same setup works for both $50\text{-}\Omega$ and $75\text{-}\Omega$ antennas.

Fig. 1B shows an arrangement which I first saw in the *National Contest Journal*. This works for switches that ground the unselected ports, like the Heathkit remote coax switch and Barker-Williamson "Protax" switches, but only for $50\text{-}\Omega$ systems. Of course, in either case the A, B or A + B switch only works within one ham band where the coax sections remain near $\lambda/4$. — *Bill Myers, K1GQ, Hollis, New Hampshire*

MICROPHONICS IN CAPACITORS

□ Recently, while troubleshooting an FM receiver, I noted that there was a severe case of microphonics. If the audio gain was advanced to about half scale, the unit would oscillate because of feedback from the speaker to the microphonic circuit. The cause of the microphonic action was traced to several bypass capacitors in the limiter. I removed one of the capacitors from the circuit, and found that approximately $10\ \text{mV}$ of AF signal was available from the capacitor when it was struck lightly with a pencil. This capacitor had been used to bypass the limiter input. The limiter is dc coupled and amplifies the capacitor voltage.

Microphonic action in capacitors is not unusual, and there are several mechanisms that produce acoustic interaction with electronic circuits. In the case of ceramic capacitors, many of the large-value capacitors use material that has a very high dielectric constant; the material is also quite piezoelectric. This is especially true of capacitors with a high capacitance-to-volume ratio.

For plastic-film-dielectric capacitors, the problem is not one of voltage generation, but rather change of capacitance resulting from dielectric-material deformation. The change of capacitance is small, but this can be a problem in high-Q, narrow-band circuits. Although a change of capacitance does change the voltage across a capacitor, this effect is small compared to the piezoelectric effect with ceramic material, if the charge is not altered.

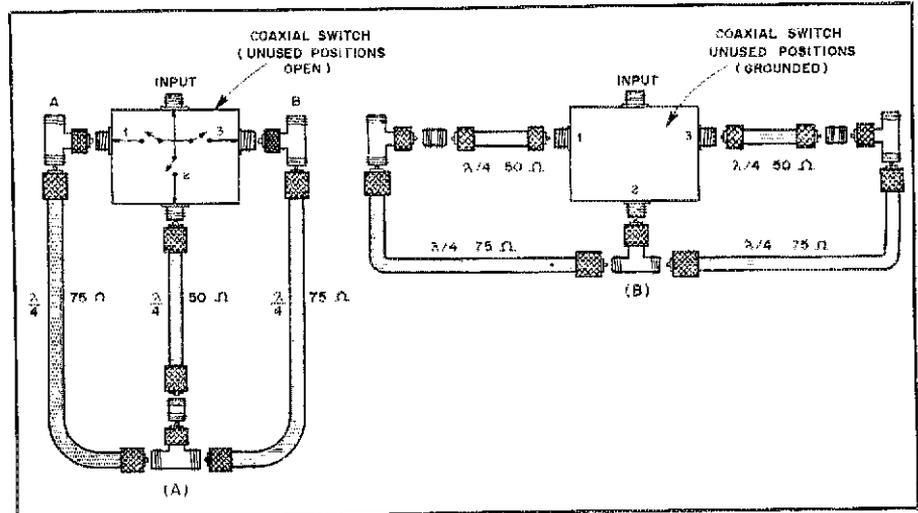


Fig. 1 — Cable arrangements that allow A, B or A + B switching for (A) a switch that leaves unselected ports open and (B) a switch that grounds unselected ports.

There are several simple precautions that can be followed to prevent microphonics generated by capacitors. First, any circuit that has a high gain at audio frequencies (such as FM limiters, and the audio amplifiers of direct-conversion receivers) should avoid the use of large-value, physically small ceramic capacitors. Second, any audio-frequency circuit with a narrow bandwidth (such as an active filter) should avoid the use of large-value, plastic-film capacitors. — *Albert Helfrick, K2BLA, Boonton, New Jersey*

HF DIRECTION FINDING

□ The loop antenna has been valued as a direction-finding device for many years because its characteristic figure-eight pattern provides sharp nulls that can be used to determine the direction of a received signal. The two nulls each form an angle of 90° to the plane of the loop. Conversely, the main lobes occur in the plane of the loop; they are very broad and poorly defined.

In this discussion, assume that the direction-finding station consists of a balanced loop (tuned to the frequency of interest), a preamplifier and a sensitive receiver equipped with an S meter. The preamplifier is necessary to boost the signal level and match the balanced output of the loop to the unbalanced receiver input. In some cases, a ferrite-rod antenna may be used in place of the balanced loop, but it may not work as well as the loop on the higher frequency amateur bands. [The equipment should be installed in a vehicle for convenient mobile operation. This is the "DF station." — Ed.]

Antenna Orientation

Regardless of the directional antenna being

used, the procedure is essentially the same. The frequency of the transmitter signal is monitored by the DF station using a whip antenna. As soon as the signal is heard, the loop antenna is connected to the receiver and the frequency adjusted for maximum S-meter reading. The loop is then slowly spun through a 360° rotation. Two points of minimum signal strength should be noted as the loop is spun about: One indicates the true bearing of the signal, while the other is 180° away from it. Carefully rock the loop back and forth near the position of signal null, and leave it oriented for the minimum S-meter reading.

Time is of the utmost importance, especially if the signal is heard for only short periods and with erratic timing. This means that the investigator should be set up at a proper site, ready to take a bearing as soon as the signal appears.

The Bearing Line

To make an accurate plot of the bearing on a map, a good hand-held magnetic compass, protractor, ruler and several road maps of the area of interest are necessary. A detailed map of the "fix" area will help in later stages of the search.

First, determine the location of the DF station and plot it on the map as a dot. Do not take bearings from unmarked roads unless the location can be spotted on the map. Guesswork leads to unreliable results.

Set the antenna so that a pattern null is on the transmitting station, and read the bearing with the compass: From a distance of 10 to 15 feet, sight the compass along the plane of the loop by circling, around the loop, until the compass sights and the loop edges coincide. Record the compass reading. Add or subtract 90° from the bearing thus obtained to account for the null orientation.

Another small, but important corrective fac-

*Technical Editorial Assistant

tor, for the earth's magnetic deviation from true north, is then added or subtracted from the bearing. This factor varies according to the location of the DF station. It can be ignored for close-in DF, but should be used for long-range bearings. [Correction of compass readings to account for magnetic deviation is explained in texts about navigation. — Ed.]

After calculating the bearing, carefully lay the center of the protractor on the map over the dot that indicates the DF-station location. Rotate the protractor azimuth scale so that the 0° mark aligns exactly with map north and 180° with map south. (This is accomplished more easily with the straight edge of the protractor.) Now, swing the ruler around the protractor azimuth scale to the adjusted bearing. (Be certain to hold the azimuth scale tight against the map so that it does not move.) Draw a line along the full length of the ruler. This represents the line of bearing, and somewhere on that line is the location of the transmitting station.

Triangulation

Next, determine in which direction to proceed. Assume that the two nulls point south and north. Without a sense indicator, it is impossible to know whether to proceed north or south, even if a street or road exactly parallels the bearing line. To overcome this difficulty, more bearings must be taken.

After plotting the first bearing on the map, proceed immediately to another location to take a second bearing. [For best results, travel on a line perpendicular to the previous bearing line. — Ed.] When plotted on the map, the second bearing line should cross the first at some angle, dependent on the location of the transmitting station. To obtain a fix, take a third bearing from yet another location.

A plot of this third bearing would, ideally, cross the intersection of the first two bearings. Usually, the three bearings do not cross at exactly the same point, but enclose a small triangular area. Theoretically, the smaller the area of the fix, the more accurate the bearings. This should be the case, but in practice this is not always so. We can only validate the fix by monitoring the signal (on the S meter) to see if the level increases as we approach the fix area. If the level does not increase, additional bearings are required.

Close-in DF

Once the fix is established, proceed to it using the whip antenna to monitor the signal in transit. If the bearings are fairly accurate, the signal level will increase considerably as you approach the source of the signal. From here on in, depend on the S-meter indications, using the whip antenna. By driving up and down adjoining streets or roads in the area of the fix and watching the S meter for the strongest signal, you can "pinpoint" the exact location of the transmitter. For close-in operations (prior to making the signal strength runs) the length of the whip antenna, as well as the receiver RF gain-control setting, should be reduced so the S meter does not read above S5. [The S-meter reading increases as the RF gain is adjusted in some receivers. In those cases, adjust the RF gain so that the steady S-meter reading is about 20 dB below the desired signal. — Ed.] This provides a sharply discernible reading on the S meter as the DF station passes the transmitter location. In the city, drive in a checkerboard pattern: first in one direction until the signal peaks, then at 90° to the first run, on the street that shows the greatest signal level. Continue testing the signal

levels for a peak signal that pinpoints the location of the transmitter.

DF Tips

Bearings taken with the DF loop can be subject to many factors that affect the accuracy of the bearings. Some of these factors can be avoided. Nearby overhead electrical cables, large buildings, metallic structures and even parked cars can distort the bearings. It pays to pick a site that is free of these objects before taking a bearing. Large parking areas that are comparatively free of parked cars, or country roads and parks that are free of overhead wires, make good DF sites. Hills that overlook the surrounding landscape and meet these criteria are even better.

The accuracy of bearings is also influenced by shifting nulls. This problem arises because of sky-wave propagation; it indicates that the DF station is not receiving only ground-wave signals. Nulls that shift rapidly in azimuth are obviously unusable for any DF purposes. Nulls that vary slightly in azimuth over a period of several minutes, however, give a general direction of the signal source and should be used until the DF station proceeds to a location where more accurate bearings can be taken.

This explanation of DF procedures is not fully detailed because of the many variables that may become involved. DF is an art, requiring a good background of experience as well as ingenuity and patience. Only with experience can you become adept in this technique. Take practice bearings and DF known signals to test your equipment and your abilities. — Ben Berkowitz, W3IC, Baltimore, Maryland

Pin 1 of each 74LS374 IC (U4, U5, U6, U13, U14 and U15) should be connected to ground. On the connections between U1 and U4, pin 3 of U1 should connect to pin 3 of U4, and pin 4 of U1 should connect to pin 4 of U4. IC pairs U2/U5 and U3/U6 connect in the same manner.

Several connections to U16 must be changed to work with the software being offered. The address lines to the chip must be reversed. Relabel the pins of U16 as listed:

from 6 5 4 3 2 1 21 20 19
to 19 20 21 1 2 3 4 5 6

Those pins of U16 that are not listed remain connected as shown on the original diagram.

The capacitor between pins 2 and 3 of U17 should be 100 μF/16 V instead of 100 pF. A 74S04 may not work properly for U18 with the capacitance values shown. A 74LS04 will work.

Y1 should be a 16.777216-MHz crystal. This frequency is wrong on the drawing and in the caption, but is correct in the text.

TRW will send a data sheet for the TDC 1016J-8 IC to anyone who requests it; contact the author. The 27S27 PROM is an Advanced Micro Devices IC. Contact the respective manufacturers for lists of distributors.

A corrected schematic diagram will be sent to all who request a copy of the PROM listing. This is available for \$2 and an s.a.s.e. from ARRL Technical Department, 225 Main St., Newington, CT 06111.

□ Author David D. Meacham, W6EMD, informs us of another source for the "honeycomb" RFI filter material used in "A High-Power 2-Meter Amplifier Using the New 3CX800A7" (April 1984 QST). This material is available from G-O-Metric, 909 Norwich Ave., Delran, NJ 08075, Attn. Marty Manion.

□ During the editing of Roy Lewallen's, (W7EL) item, "Equations for Impedance of Coupled Antennas" (Technical Correspondence, April 1984 QST), a qualification was added to the author's statement that $R_{12} = R_{21}$ and $X_{12} = X_{21}$. The qualification is in error, and Mr. Lewallen is absolutely correct: $R_{12} = R_{21}$ and $X_{12} = X_{21}$.

□ There are several errors in "Receiver Preamps and How to Use Them" by Doug DeMaw, W1FB (April 1984 QST). In Fig. 4, the lower emitter lead and capacitor should be removed from the Q1 package detail; the capacitor on the upper emitter lead should be labeled C4. Also, delete C3 from the schematic.

The drawings for Figs. 6 and 7 are transposed. Add the foil trace and pad for C2 to the etching pattern as shown on the parts layout. Traces to the upper emitter of Q1 and C3 may be deleted or left in place with no connection. The third pad at the circuit input, on the etching pattern, is not used. (A corrected etching pattern is available from the ARRL Technical Department for an s.a.s.e.)

Finally, use care when installing Q1; this single-emitter transistor installs as shown on the parts placement diagram. The package is a 317A-02 (style 2), not a 317A-01 (style 1), as shown in some Motorola data books. If installed as a style 1 case, the transistor will be destroyed!

□ John Findlay, VE7EYF, informs us of an error in "Lightweight Trap Antennas — Some Thoughts" by Doug DeMaw, W1FB (June 1983 QST). Fig. 9B is incorrect. The antenna wire on the right side of the illustration should be connected to the shield of the coaxial cable, not the center conductor.

Feedback

□ Several ICs were not completely identified on the schematic diagram for Paul Newland's article, "Z-AMTOR: An Advanced AMTOR Code Converter" (Feb. 1984 QST). The type numbers that were omitted are:

U13 — 74LS14 U17 — LM340-5
U14 — 74LS86 U18 — 74LS08
U16 — LM324 U19 — 74C14.

□ Several errors crept into the schematic diagram for "A Digital Frequency Synthesizer" (April 1984 QST). John Sheetz, K2AGI, points out that U7 through U12, the 74F283 4-bit binary adder chips, must be cascaded. Pin 7 of U12 should be connected to ground. Pin 9 of that chip connects to pin 7 of U11, pin 9 of U11 goes to pin 7 of U10, and so on down the line. Finally, pin 9 of U8 connects to pin 7 of U7, and pin 9 of U7 has no connection.

The author pointed out several other changes that must be made to the schematic diagram. Pins 16 and 19 of U17, the D/A converter, are shown as NC along the top of the chip. Both of these pins are shown properly connected at the bottom-left corner of the chip. Also, pin 12 of U17 should connect to the clock line that runs just above the IC.

George Grammer, W1DF

We are sad to report the death on April 19, 1984 of George Grammer, for many years Technical Editor of *QST*. Having joined the Headquarters staff in 1929, George began his ham activities in 1920 in Philadelphia with a modest spark station. Three years later this became a spark-coil-powered CW rig when, as 3AIH, he worked six call areas. A "real" tube outfit soon followed, and he was on his way to working the world. He graduated from Drexel Institute in 1926 and went to work for a Philadelphia transit company as an engineer. In 1929, he came to Headquarters to handle the Technical Information Service.

George's first *QST* article, in December 1929, described a single-control one-tube transmitter that shortly became the famous "tnt" beginner design in the *ARRL Handbook*. He soon became *QST* Assistant Technical Editor, and with Jim Lamb's departure from the staff, "GG" (now W1DF) was appointed Technical Editor. During World War II, W1DF was on wartime leave for classified technical work. He returned to Headquarters to the Technical Editor's job, and the title of Technical Director was conferred as more descriptive of his additional responsibilities in laboratory development programs, association with government and industry committees, etc. In 1970, GG retired from the Hq. staff, although he was retained as ARRL Technical Consultant.

In the early '30s, when 28 MHz was a "dead" band with no apparent activity, George helped keep it alive with the *Temegang* bulletin, a sporadic mimeograph sheet reporting the results of a handful of diehards.

Under George's perceptive direction, the League became involved in intensive exploration of new modulation techniques, including wide- and narrow-band FM and SSB. In recognition of the latter, he was elected a Fellow of the Institute of Radio Engineers (now IEEE) in 1959. Later he received the Amateur of the Year award and plaque from the Antique Wireless Association. His methodical work on solving TVI problems established techniques and procedures that held off a major threat to ham operation in the early days of TV.

During the years of George's direction, a reputation for technical excellence of *QST*, the *Handbook*, the *Antenna Book* and other League publications grew steadily. As an example of the esteem held for Grammer by government and industry technical groups, after George completed



Over 30 years ago, George Grammer, W1DF (right), was asked by engineer friends at RCA what hams would like to have in the way of a new tube. His specs later emerged in the famous 6146. When the five millionth 6146 was pulled off the assembly line, it was plated with gold and mounted on a plaque as a retirement gift for GG in 1970. Here, making the presentation on behalf of all the hams in RCA, is George Hanchett, W2YM.

his testimony at an FCC hearing on TV and TVI potential, the audience broke into applause in appreciation of his lucidity (this was a virtually unheard-of reaction in a Washington committee chamber).

George's interests weren't restricted just to Amateur Radio. He had an avid interest in photography, baseball, radio propagation and music — symphonies, ballets and other musical events (he often spent his spare time playing the piano). Other scientific-related subjects intrigued and fascinated his active and inquiring mind. He had an eager interest in astronomy and man-made satellites. He made optimum use of his own telescope until the trees and lights of West Hartford forced him to the country for night observing. Beginning with Sputnik, he enjoyed tracking and making measurements on man-made satellites.

GG's writing ability made technical subjects easy to understand, and he insisted that his staff follow the same path. A very practical ham, he was a competent DX chaser in the pre-World War II days — a "how-does-he-do-it?" type using simple antennas, poor locations and 100 W.

Those of us who knew and worked with him are grateful for the association. His spirit will live on in the rich legacy of technical and editorial expertise he leaves Amateur Radio. □

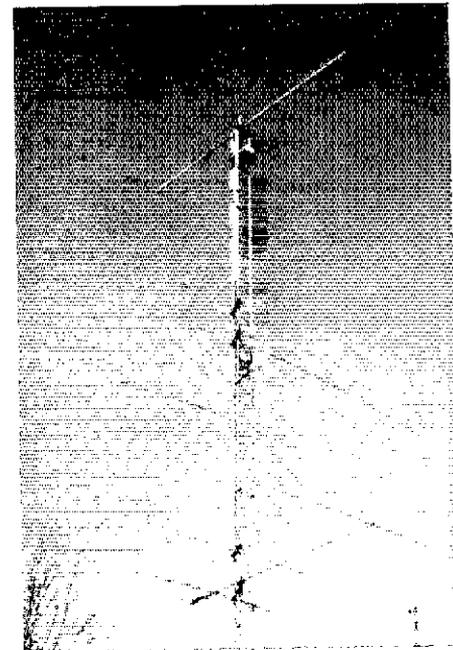
Strays

WHAT'S NEW DOWN ON THE (W1AW ANTENNA) FARM?

- With the addition of the two-element, 40-meter Telrex beam (shown on this month's cover as it was being installed), the main tower at W1AW (120 feet of Rohn 65) looks this way, from top to bottom:
 - rotatable four-element Telrex 20-meter beam at 120 feet
 - center of 160-meter inverted V
 - Decibel Products four dipoles for 2 meters
 - newly installed 40-meter antenna at 90 feet, fixed to the west
 - four-element, 20-meter Telrex beam at 60 feet, fixed to the west.

Other W1AW antennas you have heard lately include Telrex five-element Yagis for 10 and 15, dipoles for 40 and 80 meters, a five-wavelength-per-leg rhombic on 20 meters (usable on 80 through 10 and aimed west), a circularly polarized Yagi for 2 meters, helices for 70 cm and squalos for 6 meters.

Aside from occasional helpers such as this month's "cover boys," Mark Wilson, AA2Z, and Bill Jennings, K1WJ, the W1AW code-practice and bulletins are brought to you by a three-man team: Chief Operator Chuck Bender, W1WPR, Chuck Chadwick, K8AXL, and Bruce Hale, KB1MW.



The main tower at W1AW with the new two-element, 40-meter beam installed. (K1ET photo)

... From the Spacecraft Columbia

By Owen K. Garriott,* W5LFL

Some of you may have noticed that one of *Columbia's* crewmen, descending the stairway a little unsteadily from our "deadstick" landing on the Edwards AFB dry lake bed, carried a brown-mesh bag in one hand. Precious cargo, indeed! It contained the seven microcassette tapes that constitute the official log of ARS W5LFL during our 10-day, 167-revolution flight in space.

I kept those tapes in my possession for the next week of medical tests at Dryden Flight Research Center (colocated with Edwards AFB). On my first weekend at home, I spent about 12 hours reviewing and logging each call sign received, mostly phone, but some CW. Copies have now been rechecked and corrected (several times!) at ARRL Headquarters. At this writing, QSLs are expected to be in the mail shortly.

For me, operating the first ham station in space was an absolutely exhilarating experience. My satisfaction has been further multiplied upon returning home to find that so many thousands of my fellow hams seemed to have had so much fun and excitement in the pursuit of our common interest. If there was a paramount concern before flight (and equally shared by those who planned and worked with me, especially the late Vic Clark, W4KFC), it was that too many hams would be disappointed and dissatisfied when two-way contact could not be achieved. Not to worry! Even though over 300 two-way contacts were made, substantially exceeding our preflight expectations, everyone realized that even this modest number would be a small fraction of the tens of thousands transmitting on the uplink frequencies. It appears that great enjoyment was found in "the chase" alone, and success was marked by even reception of signals from *Columbia*. Over 10,000 QSLs will soon verify this accomplishment.

Amateur Radio operations from space were a long time in coming. Much of the history is carefully reviewed by Roy Neal, K6DUE, in *QST* (July 1983, p. 46; Aug. 1983, p. 50; and Sept. 1983, p. 50) and in March 1984 *73 Magazine*. Without repeating his story, I will only stress the absolutely essential role that Roy played in acquainting NASA Associate Administrator Lt. Gen. James Abrahamson with the capabilities of ham radio and the impact it could produce in the general public. General "Abe" liked the idea, and with his support the details of the operation quickly fell into place.

Of considerable importance was the selection of 2 meters for operation. Not only do a great many hams have 2-meter gear (a disadvantage, some have suggested!), but it is also small, low-



Dr. Owen Garriott, W5LFL (right), accepts a Pacific Division certificate of appreciation from Director Bill Stevens, W6ZM.

Appropriately enough, this acknowledgment of Owen's contribution to Amateur Radio took place at the birthplace of Project OSCAR: Foothill College in Los Altos Hills, California. (KT6W photo)

Postflight Reflections

At a recent gathering in his honor at Los Altos Hills, California, Owen spoke to over a hundred hams about his historic transmissions from the Space Shuttle last December. He emphasized that his ham activity was a tremendous success, only slightly marred by a couple of minor problems: his earphones, which didn't adequately eliminate the local QRM, and the squelch circuit on his receiver, which was not adjustable and occasionally blanked out all incoming transmissions.

Owen also noted that STS-9 Commander John Young was impressed with the project, especially during a demonstration of Amateur Radio as a potential backup communications system for the Shuttle. In that demonstration, hams at NASA's tracking station at Canberra, Australia, linked a 2-meter receiver to leased lines going back to the U.S., allowing Owen to talk with the Shuttle communications team in Houston while *Columbia* was still over Australia.

W5LFL is very optimistic about the future of amateur operations from space. More transmissions from the Shuttle are possible as early as next year. In addition, Owen views hamming as a very likely activity during long space missions, such as would occur during tours of duty on the manned space station currently being planned by NASA. — Patty Winter, N6BIS

powered and lightweight, and can be made to radiate from even a small aperture — like an Orbiter overhead window. It was now possible to obtain a multichannel Motorola transceiver feeding a homebuilt (Johnson Space Center

ARC) split-ring radiator mounted in a shallow cavity, and stow it all in a very tightly packed spacecraft. FM operation was also important, since orbital motion produces Doppler shifts of up to ± 3.5 kHz. The characteristics of an FM discriminator allow detection of signals throughout its passband with little distortion, which make it largely immune to Doppler shifts. While helpful on the ground, this becomes absolutely essential in the spacecraft, where many signals may be present and the strongest (and predominant) signal may jump from one station to another, each with a different Doppler shift. The entire rig was independent of all Orbiter systems, which greatly facilitated verification that it would not interfere with Orbiter operations in any way.

Transmitting from *Columbia* for 60 seconds on each even minute and receiving on the odd minutes seemed to work well, although I frequently cut my transmissions short in order to listen for 90 seconds or so. However, I should have often reminded some of the less well informed hams on the ground that I had no receive channel on 145.55 MHz, my transmit frequency. I expect this would have reduced some of the useless return calls on this channel and lowered the general QRM level.

There are a few more changes to be made "next time." The receiver had a squelch circuit, unknown to most of us before flight, without a manual defeat switch. It operates by comparing noise in the center of the passband with that in the sidebands; if they are of comparable magnitude, squelch is activated. With strong signals Doppler shifted by ± 3.5 kHz, wideband "noise" was frequently present and the desired signals were all squelched! Also, for simplicity, I used my spacecraft lightweight headset, which places a foam-covered earphone over one ear only (see the cover of February *QST*). There was just too much surrounding noise in the spacecraft to record all call signs reliably in the midst of QRM. I logged by hand and reported by voice perhaps a third of all signals now properly deciphered from the tape log of W5LFL. So "next time" we will have a better headset, modified squelch and probably an electronic key for MCW — but keep that tape-recorder log!

Next time? ARRL is presently preparing a proposal to NASA for future flight opportunities. Perhaps other bands can be considered, probably in addition to 2 meters. Perhaps schedules should be arranged with schools or clubs and other more experimental objectives identified, such as sporadic-E propagation at VHF and HF tilt-mode propagation. Your suggestions to ARRL are surely appropriate, and we will hope for a continued enthusiastic response from within NASA.

*NASA, Johnson Space Center, Houston, TX 77058

Computerizing the Novice Test

A personal computer joins the Novice class instruction team.

By Kay Craigie,* KC3LM

In the spring of 1983, when the Mid-Atlantic ARC decided to offer our first Novice license course the following September, we had no idea we would be pioneers. But on August 31, the FCC turned over Novice examining entirely to the amateur community. Now we would be responsible not only to teach theory and code, but also to prepare, administer and grade theory tests.

Where we had to innovate, then, was in theory-test preparation and administration. We identified several objectives, with our goal being to keep a high standard of ethics obvious at all times. Testing had to be objective and accurate. Applicants had to know we expected just as much honesty as we delivered. By first making our rules and principles explicit and understandable to our students, we could then all relax and have a good time teaching and learning radio.

One of our goals was objectivity in test preparation. Though many in the class were total strangers, several were friends' XYLS. How could we eliminate even suspicion of favoritism? How could we be sure we did not make all the tests too hard or too easy, for that matter? The answer lay in randomizing the question selection. The FCC pool contains 20 sets of 10 questions each. I prepared a simple program in BASIC to generate the required number of sets of 20 random numbers from 1 through 10 (see Listing 1). To prevent judgment calls in grading answers, we used a multiple-choice format with the answers based on the ARRL's multiple-choice version.

A second objective was to sample the question pool widely. Nothing, apart from good sense and integrity, stops anyone from teaching the answers to 20 questions and using only those on a test. We wanted to be sure we had really covered all the material. As it turned out, nearly 90% of the 200 questions appeared on the 20 tests we prepared. And, thanks to computerized question selection, no two tests were identical.

Still another objective was fairness and accuracy in test grading. We decided on

```

(Listing 1)
10 REM NOVICE EXAM QUESTION SELECTION PROGRAM
20 REM FAY CANTOIS KA3QPM
30 REM AUGUST, 1983 - MICROSOFT MBASIC-80 version 5.0
40 REM INTRODUCTION AND INITIALIZATION
50 TEST=0: "SEE FULL TEXT SCREEN, CLEAR IF N HOME CURSOR"
60 PRINT "GENERATE NOVICE LICENSE TESTS:PRINT"
70 INPUT "ENTER NUMBER OF TESTS TO PREPARE:"N
80 IF N<=0 THEN PRINT "WE CAN'T DO LESS THAN 1 TEST,150/10 GO"
90 PRINT:PRINT
100 PRINT "THANK YOU. TURN ON YOUR PRINTER NOW."
110 PRINT "THEN PRESS ANY KEY TO BEGIN GENERATING TESTS."
120 GOTO 15
130 REM "RANDOMIZE Q"
140 FOR I = 1 TO N
150 PRINT "TEST #":I:PRINT
160 FOR J = 1 TO 20
170 PRINT "QUESTION SELECTION #":
180 PRINT USING "###":J
190 PRINT USING "###":INT(RND*10)+1: "Produces whole numbers 1 thru 10"
200 PRINT USING "###":INT(RND*10)+1: "Produces whole numbers 1 thru 10"
210 NEXT J
220 PRINT:PRINT
230 NEXT I
240 PRINT:PRINT "FINISHED. PROGRAM ENDED."
250 END
  
```

Note: The seed for the random number generator is the sum of the number of tests to be created and the ASCII value of whatever key the user hits to start the select-and-print routine. Not perfect, but not terrible. Line 205 adds 1 to whatever the formula produces, to suppress zeros.

```

(Listing 2)
DO NOT WRITE YOUR NAME ON THIS SHEET          TEST NUMBER _____
                                     ANSWER SHEET
AMATEUR RADIO NOVICE CLASS LICENSE EXAMINATION
A   B   C   D
1.  A   B   C   D
2.  A   B   C   D
3.  A   B   C   D
4.  A   B   C   D
5.  A   B   C   D
6.  A   B   C   D
7.  A   B   C   D
8.  A   B   C   D
9.  A   B   C   D
10. A   B   C   D
11. A   B   C   D
12. A   B   C   D
13. A   B   C   D
14. A   B   C   D
15. A   B   C   D
16. A   B   C   D
17. A   B   C   D
18. A   B   C   D
19. A   B   C   D
20. A   B   C   D
  
```

“blind” grading of coded answer sheets. The applicant put his or her name on the test paper but copied only a test number onto the answer sheet. This test number matched one on an answer key generated

by the test-printing program. Each applicant's answer sheet was graded by Al Maslin, W3DZL, whose marking was checked by John Bartholomew, WB3ELA. Neither Al nor John knew the identity of the applicant whose test they were grading until after Al, as the official examiner, determined that the marking was correct. Then we matched the answer sheet to the test paper, using the test number.

Honesty in test-taking was another objective. Making each test unique and making sure applicants knew about the uniqueness reduced the temptation to copy another person's answer sheet. Though we believed no one in our class was dishonest, you learn a lot about humanity in working with the public.

Because people are nervous during tests, our list of objectives included an answer sheet whose format helps applicants keep the correct place on the sheet. We wanted no failures caused by putting the answer on the wrong line, owing to nerves or bifocals! Applicants liked my design (see Listing 2), which broke the 20 response lines into four visually distinct areas, each with its own heading line.

Our final objective was to accomplish our other objectives efficiently, developing techniques we could use in future courses. Setting up a computerized test creation process is *not* a snap. It took a lot of work. But now that the work is done, and the process is proved to be a success, all we have to do is update the question files as the FCC puts out revisions.

Briefly, here is how I set up the test-writing program and the files it depends on. Using a word-processing program,¹ I

¹The program and text files were created on a system comprising an Apple II+ micro-computer, CP/M operating system, Microsoft MBASIC-80 version 5.0, WORDSTAR 3.0 and an Epson printer. The author states that the BASIC program requires 48k RAM and one 5¼-inch disk drive; the WORDSTAR text files holding the multiple-choice version of the 200-question Novice question pool require 64k RAM and two disk drives. Computer hobbyists with some experience should be able to adapt the program to their systems. ARRL does *not* offer listings tailored to other systems, but welcomes contributions that may be shared with others; we will list their availability in upcoming In Training columns, giving credit to the programmer.

*128 Berkeley Rd., Devon, PA 19333

(Listing 3)

```

10 REM NOVICE EXAM TEST PRINTER
20 REM READS FILES OF QUESTIONS AND PRINTS INDIVIDUALIZED
30 REM TEST PAPERS AND ANSWER KEYS, WHEN FED QUESTION NUMBERS.
40 REM MBASIC-80 5.0 for APPLE CP/M 48K single drive
60 REM Kay Craigie September, 1983
70 REM Uses files:
80 REM NOVICE.HED = Heading & instructions.
90 REM NOVICE.1 - .20 = Multiple choice questions.
100 REM .1 - .20 are WORDSTAR document files re-processed as
110 REM non-document files to eliminate control characters that
120 REM cause spurious blank lines. Every line of text must end
130 REM with hard carriage return, and every line-ending hyphen
140 REM must be hard.
150 REM END OF QUESTION marker is *. Answer code follows,
160 REM e.g. *A when answer is option A.
170 REM
180 REM PAGE FEED CONTROLS
190 REM MAX = 50 'When LINES equals/exceeds MAX after output, new page
200 REM PAGETOP$ = CHR$(140) 'Form feed command to printer
210 REM
220 REM TITLE SCREEN
230 TEXT: HOME
240 PRINT TAB(25) "NOVICE EXAM TEST PRINTER":PRINT:PRINT
250 INPUT "HOW MANY TESTS ARE WE PRINTING NOW? ";N
260 IF N <= 0 THEN PRINT "WE CAN'T DO LESS THAN 1 TEST.":GOTO 250
270 PRINT:PRINT "THANK YOU. PRINTING "N" TESTS.":PRINT
280 PRINT "PLEASE WAIT WHILE HEADING AND INSTRUCTIONS ARE READ INTO MEMORY."
290 REM
300 REM HEADING/INSTRUCTION READ ROUTINE
310 DIM HS$(50) 'HS array holds heading/instruction lines
320 OPEN "I", #1, "NOVICE.HED"
330 L = 1 'L counts lines in heading
340 LINE INPUT #1, HS(L)
350 IF EOF(1) THEN CLOSE #1 ELSE L = L+1:GOTO 340
360 REM
390 REM PRINT REQUIRED NUMBER OF EXAMS (I LOOP)
400 DIM QS$(20) 'QS array holds selected question numbers
405 DIM ANSWER$(20) 'ANSWER$ array holds answer key for test
410 FOR I = 1 TO N
420 REM
430 REM ON-SCREEN INPUT FORM
440 HOME
450 PRINT"ENTER SELECTED QUESTION NUMBERS FOR TEST NUMBER ";I:PRINT
460 V = 3: H = 1
470 FOR J = 1 TO 10
480 GOSUB 1090 'positions input labels 1 - 10
490 NEXT J
500 V = 3: H = 40
510 FOR J = 11 TO 20
520 GOSUB 1090 'positions input labels 11 - 20
530 NEXT J
540 REM
550 REM FILL IN SELECTED QUESTION NUMBERS
560 V = 3: H = 12
570 FOR J = 1 TO 10
580 GOSUB 1140 'fills in numbers, fields 1 - 10
590 NEXT J
600 V = 3: H = 52
610 FOR J = 11 TO 20
620 GOSUB 1140 'fills in numbers, fields 11 - 20
630 NEXT J
640 REM
650 REM ON KEYSTROKE START SEARCH/PRINT
660 PRINT:PRINT "THANK YOU. WHEN THE PRINTER IS ON AND PAPER IS POSITIONED,"
670 PRINT:PRINT "PRESS ANY KEY TO BEGIN PREPARING TEST # ";I
680 PRINT:PRINT "A BEEP WILL SOUND WHEN IT IS TIME TO ENTER THE NEXT GROUP"
690 PRINT:PRINT"OF QUESTION NUMBERS. ";:GET K$
700 REM-----HEADING/INSTRUCTION WRITE ROUTINE-----
710 FOR K = 1 TO 2:LPRINT HS(K):NEXT K
720 LPRINT HS(3);:LPRINT USING "###";I 'fills in correct test number
730 FOR K = 4 TO L
740 LPRINT HS(K)
750 NEXT K
760 LPRINT: LPRINT: LPRINT
770 LINES = L + 3 'LINES counts # of lines used, for page feed
780 REM-----
790 REM FILE SEARCH/READ AND PRINTOUT ROUTINE (J LOOP)
800 FOR J = 1 TO 20
810 JS = STR$(J)
815 IF LEN(JS) = 2 THEN JS = RIGHT$(JS,1)
ELSE JS = RIGHT$(JS,2) 'The IF test handles an oddity in numerics in
this BASIC,
820 FILES = "NOVICE." + JS
830 OPEN "I", #1, FILES
840 LINE INPUT #1, KS
850 IF LEFT$(KS,2) <> QS(J) THEN 840
ELSE LPRINT USING "###";J;: LPRINT RIGHT$(KS,LEN(KS)-2):
LINES = LINES + 1 'find 1st line of question
860 LINE INPUT #1, KS 'do remainder of question
870 IF LEFT$(KS,1) <> "*" THEN LPRINT KS:
LINES = LINES + 1: GOTO 860
875 ANSWER$(J) = RIGHT$(KS,1) 'Remember correct answer
880 CLOSE #1
890 REM-----PAGE FEED TEST-----
900 IF LINES >= MAX THEN LPRINT PAGETOP$;:LINES = 0
910 REM SPACING SET
920 LPRINT: LPRINT: LINES = LINES + 2
930 REM-----
940 REM END OF SEARCH/PRINT ROUTINE (J LOOP)
950 NEXT J
960 REM-----
961 REM PRINT ANSWER KEY ON SEPARATE PAGE
962 LPRINT PAGETOP$;:LPRINT:PRINT
963 LPRINT "ANSWER KEY FOR TEST # ";I
964 LPRINT:PRINT
965 FOR A = 1 TO 20
966 LPRINT "QUESTION ";A; " = ";ANSWER$(A):LPRINT
967 NEXT A
969 REM-----
970 REM PAGE FEED FOR PRINTING NEXT TEST
980 LPRINT PAGETOP$;
990 REM-----
1000 REM END OF TEST PRINT (I LOOP)
1010 PRINT CHR$(7):NEXT I
1020 REM-----
1030 REM END OF PROGRAM MESSAGE
1040 HOME
1050 PRINT CHR$(7);"TEST PREPARATION IS FINISHED, AND THE PROGRAM IS ENDED."
1060 END
1070 REM-----END OF MAIN PROGRAM-----
1080 REM-----SUBROUTINES-----
1090 REM POSITION INPUT LABELS ROUTINE
1100 V:HTAB H:PRINT"SECTION ";:PRINT USING "###";J
1110 V = V + 1: RETURN
1120 REM-----
1130 REM ACCEPT SELECTED NUMBERS ROUTINE
1139 REM CLEAR FIELD AND ACCEPT INPUT
1140 V:HTAB V:HTAB H:PRINT" ":V:HTAB V:HTAB H:INPUT QS(J)
1149 REM REJECT NON-NUMERIC INPUT
1150 IF RIGHT$(QS(J),1) < "0" OR LEFT$(QS(J),1) < "0" THEN 1140
1160 IF RIGHT$(QS(J),1) > "9" OR LEFT$(QS(J),1) > "9" THEN 1140
1169 REM RANGE CHECK
1170 IF VAL(QS(J)) < 1 OR VAL(QS(J)) > 10 THEN 1140
1179 REM PAD TO 2 CHARACTERS IF NECESSARY
1180 IF LEN(QS(J)) < 2 THEN QS(J) = "0" + QS(J)
1190 V = V + 1: RETURN
1200 REM-----
1210 REM END OF PROGRAM: PRINTEX
1220 REM-----

```

Note: If the run must be interrupted, it can be picked up with correct test numbering by doing the following:

At the prompt in line 250, enter the total for the combined runs. Do NOT adjust this number.

Edit line 410, to make the initial value of I equal to the first test number desired for the present run. Example 410 FOR I = 5 TO N.

created 20 sequential text files of 10 questions each, following the FCC's grouping and ordering, but replacing the FCC's numbering system (2A-1.1, etc.) with numbers 01 through 10. [The FCC's Element 2 Novice questions pool — PR Bulletin 1035-A — can be found in September 1983 QST, pp. 56-59; the ARRL's multiple-choice version is listed in

Tune in the World with Ham Radio, 4th ed., available from ARRL or your dealer for \$8.50 — Ed.] These files are named NOVICE.1 through NOVICE.20. The end of a question is marked with an asterisk on a new line, followed by the letter of the correct answer. For example:
05 Who is buried in Grant's tomb?
A. Grant.

B. Lee.
C. Lincoln.
D. Davis.
*A
The Novice question pool can be downloaded from HamNet (see sidebar), giving one the basis of a usable question set. Unfortunately, we didn't know that at the time and I typed the whole thing myself!

HamNet

HamNet is an Amateur Radio Special Interest Group (SIG) Message Board located on the CompuServe Information Service. CompuServe, Inc., is a remote information-retrieval service accessible by subscription to your computer or data terminal (suitably equipped with modem and communications software) over your telephone line.

For more information on CompuServe, see your local microcomputer dealer or call CIS Customer Service toll free at 1-800-848-8990. If you are a CompuServe subscriber, log on to the system and access HamNet using "GO HOM-11," or contact SysOp Scott Loftness, P.O. Box 23546, San Jose, CA 95153-3546. For a copy of the manual, *A Hitch-Hiker's Guide to HamNet*, send Scott an s.a.s.e. with two units of First Class postage. Also see Alfred Grossbrenner's *The Complete Handbook of Personal Computer Communications* (New York: St. Martin's Press, 1983) for a thorough overview of computer communication and major commercial computer data-base services.

I also created a test-heading file called NOVICE.HED, containing the test title, space for the applicant's name and test-taking instructions. This heading can be shortened or lengthened without affecting program logic. The program requires only that space be left for the test number at the end of the first line.

All the files have to be processed carefully to delete any control characters BASIC cannot cope with, and to insert "hard" carriage returns and hyphens that BASIC does not supply in reading word-processor-created text files. Setting up and proofreading the files is the time-consuming, exacting part of the work. If the files are not precisely correct, the program does not work, the answer keys are wrong or the tests are full of typos.

The test-printing program logic is not complicated (see Listing 3). The user enters the number of tests to be created. The program then reads the heading file into a memory array. For each test, the user is prompted to type in 20 question numbers, 1 through 10; the program stores these in an array. It then prints the heading and

Computer Food for Thought — Take a Byte

Kay Craigie wasn't the only Amateur Radio instructor to recognize the potential of applying a microcomputer to our new Novice-examining responsibilities. George Thurner, W8FWG, however, also looked ahead to the Volunteer Examiner program in a letter to the ARRL Training Branch:

"I have put together a computer program for selecting questions from the Novice PR 1035-A question pool on a random basis, taking into consideration the number of questions per category required by the FCC. With PR 1035-B, -C and -D now available, there is no reason why a similar procedure could not also be applied to Technician/General, Advanced and Extra Class question pools.

"For future versions I suggest that

1) The program contain DATA statements for the questions so they can be updated easily as the FCC updates the pools.

2) The entire pool for each of the various amateur grades (Novice, Technician/General, Advanced and Extra Class) be put on separate disks so they may be accessed easily.

3) By using a modem, information could be exchanged between various groups electronically (by telephone).

4) Such a program would be of tremendous benefit to clubs and instructors who want to generate practice exams for the end of their courses. Practicing under simulated exam conditions is a great way to prepare for the real thing. Once the computer program is input, only DATA statements would need to be deleted and added to keep the program up to date with the FCC's latest revisions."

George offers several good ideas and is undoubtedly working on his version of the program to accomplish his stated objectives. How are you using your microcomputers in your training courses? Let us know what you're doing so we can share the information with your fellow instructors.

Notes

1) W8FWG's address is 225 Kearsage St., Laurium, MI 49913.

2) At the time of this writing, the FCC's rules for the Volunteer Examiner Program stated that the FCC shall design exams (that is, specify which questions are to be used). Neither Volunteer Examiners nor Volunteer Examiner Coordinators are permitted to design the actual tests to be given.

3) For a listing of W8FWG's 16k TRS-80 Level II BASIC random question-selection program (selects question numbers; does not print questions or test papers), send an s.a.s.e. to Dept. PX, ARRL Program Exchange, 225 Main St., Newington, CT 06111. Ask for program number 45, and write the number on the lower-left corner of the s.a.s.e.

goes through each of the 20 files in turn. In each file it finds the matching question number, substitutes the proper sequential question number for the test (e.g., question 5 on the test may be question number 07 from file NOVICE.5), prints the rest of the question and, upon reaching the "*" that signals "end of question," it remembers the following letter in an array for the answer key.

The program counts the lines it is using and eventually performs a page feed to prevent printing on the page split. When the last question has been printed, the program skips to a fresh page and prints out the contents of the answer-key array. Then, if another test is needed, it asks for the next set of question numbers, and so on.

The user has only to tear down the print-outs, remove the answer keys to a safe place

and staple the pages together. Schematic symbols and block diagrams, if any, have to be drawn or pasted in; space is left in the question files for inserting these later by hand.

In sum, we made extensive use of the microcomputer in accomplishing our goals for administering the Novice exam under the new FCC rules. We used both straightforward word-processing and original programming. While someone who just teaches the occasional student may choose not to undertake such a large-scale project, clubs that regularly teach well-attended Novice courses may have members who can cooperatively prepare the files and do the programming. Systems such as this may come to be common tools in bringing along the next generation of hams. 

Strays

I would like to get in touch with...

anyone with information on the Central Electronics 200-V transmitter. Howard Mills, W3HM/DA1AK, HHC 440 Signal Battalion, APO New York 09175.

anyone who has a schematic diagram of the JET-Aire 10-A 12-V battery charger, model BC-100A. Adam S. Macek, WA2HAW, Ratlum Rd., Barkhamsted, CT 06022.

anyone who has modified an Atlas 210X to work AMTOR Modes A and B. Jerry Swartzlander, KG8Y, 120 S. Granville Blvd., Fremont, OH 43420.

any amateurs who served with the 574th-565th SAW Bns. Angel Zaragoza, W6ZPR, 1571 9th, San Bernardino, CA 92411, tel. 714-889-2380.

any amateurs who have served or are serving with a military armored unit. Harry Thomsen, W2PJH, 348 Jefferson Ave.,

Apt. 15, Canandaigua, NY 14424.

QST congratulates...

F. Wendell Tietsworth, W2SUE, of Nutley, New Jersey, on being chosen Elmer of the Year by the Northern New Jersey Chapter of QCWA.

Peter Bradley, N1ADX, a member of the ARRL Committee on the Bio-Effects of RF Energy, on receiving his PhD in biomedical sciences from Worcester Polytechnic Institute.

Weather Spotters Fill the Gap

If a tornado were bearing down on your town, would you be able to mobilize a disciplined Weather Alert Net? In the St. Louis area, WARN lives up to its name.

By Michael G. Redman*

“WBØHSI from WCØAAF ... report from spotter 18016 of a tornado on the ground north of his location ...” That’s a typical message heard on the amateur bands during severe weather in the St. Louis area. Trained weather spotters, many of them hams, are assisting the National Weather Service (NWS) and the St. Louis County Office of Civil Preparedness in providing and relaying vital weather information.

The St. Louis County plan is called *WARN*, for Weather Alert Radio Net. *WARN* is operated by the St. Louis County ARES/RACES organization under the leadership of KBØEA (ARRL District Emergency Coordinator), AGØG (ARRL Emergency Coordinator for St. Louis County) and NØBKH (ARRL Emergency Coordinator for the City of St. Louis), with the assistance of WBØPDK and KØDCQ.

Each prospective weather spotter attends one of several three-hour training sessions held each March. Spotters are required to be retrained every two years. Taught by a meteorologist from the NWS office in St. Peters, Missouri, the sessions cover what to report, where to report and how to report. The meteorologist also teaches spotters how to identify tornadoes and tornado-producing storms through movies and slides of actual storms. There is no charge for any of the training.

An operating committee of five Amateur Radio operators was selected to oversee their portion of the *WARN* system. They form a pool from which hams are picked for duty at WCØAAF, the Emergency Operations Center (EOC). The primary liaison between the County and the Amateur Radio club carries a pager on the

A Message from the SEC

The accompanying article describes an example of high-quality ARES service and good interaction between Amateur Radio operators and governmental agencies and personnel. The *WARN* program covers the Greater St. Louis ARRL District, which is comprised of three counties and the City of St. Louis.

The Missouri Section is in a growth period, now having 10 Districts, each with a District Emergency Coordinator, and EOCs as locally appropriate. There is a potential of 35 Districts in Missouri. Some areas now have emergency-communication programs, but in most cases they could easily benefit from access to the statewide program, better contact with local and state emergency management people, and ARRL guidance, not to mention the needs suddenly presented by a widespread disaster.

Local Amateur Radio clubs of Missouri, or individuals where there are no clubs, are invited to contact the ARRL Section Manager (Ben Smith, KØPCK, RFD #1, Prairie Home, MO 65068) or the Section Emergency Coordinator (Don Blenden, WBØKUW, 1506 North Circle, Columbia, MO 65201) for information and advice on how to establish (or improve) an effective ARRL-sponsored ARES program.

— WBØKUW

County’s paging network so that he can be reached at a moment’s notice. Members of this committee must reside in St. Louis County and successfully pass a background investigation. The program is coordinated by the Communications Specialist, St. Louis County Police/Civil Preparedness.

Activation of *WARN* occurs when a tornado watch is issued or upon NWS request if potentially dangerous thunderstorms are expected. The Communications Specialist and Civil Preparedness Duty Officer report to the EOC (if not already on duty there). The Amateur Radio liaison is contacted to direct at least two amateurs to the EOC. Upon arrival, one operator is assigned to

the St. Louis County Net (WØKUJ/R, 34/94), while the other ham relays information to amateurs at the NWS office via WBØHSI/R (07/67), manned by the St. Charles County Amateur Radio Club. At times, a third unit is utilized on 3963 kHz to contact amateurs elsewhere in Missouri (the Missouri Weather Net). A Missouri Weather Wire teleprinter is also available at the EOC.

If a tornado warning is issued, St. Louis County activates its 206 outdoor warning sirens (the largest such system in the country). The radio-controlled sirens can be activated from either the EOC or the County Police Hq. Most of the sirens are electronic and are capable of public address if desired. Specially designed lighted maps at both activation points show each siren location, and give visual indication of siren use and function.

NWS personnel have praised spotters for their activity reports in areas where weather radar is unable to accurately indicate what a storm is doing. Often, *WARN* members in a particular area assist NWS personnel in evaluating thunderstorm data — a key element in the decision to issue weather warnings. In many instances, spotters identify and track tornadoes *never seen* on radar. And, of course, all spotting is done by trained, concerned citizens — free of charge.

An added tool used by NWS and other agencies is the *NAWAS* (National Warning System). This is an open-line, “party type” telephone network designed for immediate notification in the event of nuclear attack. The *NAWAS* circuits receive heavy use during severe weather and provide an added means of notification. Monitoring the system provides a barometer of conditions to the west of St. Louis in addition to information received via *WARN*.

Each trained spotter is assigned a number, identifying the spotter’s home in

*Communications Specialist, St. Louis County Police Department, 7900 Forsyth, Clayton, MO 63105



WARN volunteer WB0PDK transmits late-breaking weather information over W0KJ/R.



N0BKH transmits a severe-weather advisory over the Missouri Weather Net on 3963 kHz.

distance and direction from the NWS office. For example, spotter number 18016 would be 180° (south) at 16 miles. This data enables the radar operator to plot this location quickly and check it on the radar screen. No time is lost translating other forms of coded numbers or street locations into something the radar operator can quickly use.

Early each morning, the NWS radio station is monitored. The Severe Weather Outlook is broadcast if there is a chance of bad weather. If bad weather is indicated, other indicators are monitored, information from the Missouri Weather Wire is studied, and hourly condition updates are monitored. When a severe-thunderstorm watch is issued, events might unfold as follows.

Severe-Weather Scenario

The Communications Specialist makes contact with the Amateur Radio liaison to advise him of the situation and check on his availability. NWS is also contacted to check on the weather picture. The NAWAS line is monitored for severe weather to the west.

Each afternoon brings a flurry of activity on the NAWAS circuit. A high level of severe thunderstorms is reported in southwest and southern Missouri. Several funnel cloud observations are intercepted. Activity is still some distance from St. Louis. Conditions outside are hot and sticky, with mostly sunny skies.

Late in the afternoon, a tornado watch is issued for the entire St. Louis area. The Amateur Radio liaison is notified to report to the EOC with two additional operators. The Duty Officer for the Office of Civil Preparedness is contacted and will remain at the EOC. NWS advises that storms will enter St. Louis County in one or two hours.

The Communications Specialist then

reports to the EOC. He arrives simultaneously with the amateur operators. The Communications Specialist and the Civil Preparedness Duty Officer check radio equipment that will be used, and begin to plot the path of the storms on a large state map. The Amateur Radio liaison and his staff activate WARN and take check-ins. Available data from the Weather Wire teleprinter is selected for transmission. Amateur Radio contact is made with NWS in St. Peters. The approaching line of storms is about 45 minutes away.

Dark, ominous clouds approach the EOC from the west. The emergency generator is fired up in the event of power failure. Amateurs begin receiving high-wind and hail reports from WARN spotters in counties to the southwest. This information is relayed to NWS via WB0HSI/R. Severe thunderstorm warnings are issued for counties to the southwest. The police communications office is advised of the approaching storms as extra telephone and radio positions are manned. The Civil Preparedness Director is advised of the conditions and continues to monitor the situation closely.

Reports are received of golf-ball-sized hail in the county just west of St. Louis. Severe-thunderstorm warnings are issued for St. Louis County. The amateurs continue to relay information from the network of WARN spotters. An amateur at the western edge of St. Louis County reports an ominous green sky and a rotating wall cloud.

NWS activates (via the NAWAS circuit) the Siren Warning System. Tornado warning in effect! The Radio Warning System is also activated, and key personnel are notified. Amateurs transmit the warnings as sirens sound all over the County. Radios are humming with reports of funnel clouds and severe weather.

Phones at the EOC and Police Hq. are ringing with severe-weather information. All the information is relayed to the NWS via Amateur Radio as quickly as possible.

Spotters continue to follow the funnel sightings across St. Louis County. Tornado warnings are issued for counties east of St. Louis. No damage reports or touchdown occurred, yet trained WARN spotters were able to track the storms accurately while weather radar never detected a tornado! Once the threat of further severe weather has passed, the EOC is secured and all volunteers are released. County staff personnel return to normal assignments.

WARN: There When It's Needed

It is indeed fortunate that most tornado watches do not result in tornadoes. Nevertheless, St. Louis County's Amateur Radio operators assist in many other ways in addition to weather spotting. For example, they provided communications backup and information on vehicular traffic movement during the heavy snowstorm of February 1982. They will work long hours voluntarily since public service is their primary motivation and concern. No one can prevent the onslaught of severe weather and tornadoes, but with a program like WARN, advance warnings will always be given and countless lives will be saved.

Michael G. Redman has served as the Communications Specialist for the St. Louis County Police Department and Office of Civil Preparedness for the past three years. He has attended state seminars on civil preparedness, and designed the Communications Van and County Emergency Operations Center communications facility — one of the best equipped in the Midwest. Redman also developed the current county Weather Spotter Program utilizing Amateur Radio volunteers, and has designed a new radio system for the County Highway Department. He is a member of APCO (the Associated Public Safety Communications Officers, Inc.) and is a past president of the 2500-member Radio Communications Monitoring Association.

Toward a 23-cm Band Plan

ARRL Advisory Committees are working on a plan for our allocation at 1240 to 1300 MHz. Voice your opinion now on how the band should be used.

By Dick Jansson,* WD4FAB

“Why should I care what happens way up there at 1240 MHz and above? I don’t have any equipment for that band. Only experimenters operate there.” If that summarizes your feelings about our 23-cm band, read on.

Fifteen years ago, amateurs active on 2 meters were a minority. Today, those without some form of 2-meter capability are in the minority. Fifty years ago, the average amateur may have believed that 20 meters was mainly for experimenters.

Historically, amateurs have expanded upward to explore and conquer new and higher frequencies. The 23-cm band is gaining popularity, as evidenced by several developments in recent years. The number of amateurs engaged in weak-signal work centered around 1296 MHz is growing. In the more populous areas, FM repeater sub-bands on 144, 220 and 440 MHz are overflowing, tempting amateurs interested in establishing new repeaters to take a look at the next band up. The successful launch of AMSAT-OSCAR 10, with its Mode L (1269-MHz uplink/435-MHz downlink), has whetted appetites. A growing number of manufacturers make it possible to equip a 23-cm SSB/CW, FM or satellite station with off-the-shelf components. It’s no longer necessary to roll your own for this band.

Increasing interest in 23 cm makes it imperative that we decide now how we can best use this band. Although 23 cm is a big band — 60-MHz worth — we need to coordinate the centers of activity on a national level. An organized approach on the other bands has made it possible for amateurs with many diverse interests to coexist with a minimum of conflicts. Now is the time to hammer out a workable plan for 23 cm.

History

The ARRL VHF/UHF Advisory Committee (VUAC) and the VHF Repeater Advisory Committee (VRAC) have been

**Table 1
Proposed 23-cm Band Plan**

Frequency (MHz)	Suggested Use
1240-1246	ATV no. 1, repeater output, — 40 MHz offset from input.
1241.25	Video carrier, VSB.
1246-1247	FM simplex, control links and guard band.
1247-1253	ATV no. 2 simplex.
1248.25	Video carrier, VSB.
1253-1258	ATV no. 3 simplex.
1254.25	Video carrier, VSB.
(Local option: 1246-1258 ATV simplex, DSB).	
1258-1260	Packet & digital repeater inputs, — 30 MHz offset from output, 200-kHz channel raster, e.g., 1258.10, .30, .50, . . . 1259.50, .70, .90.
1260-1270	Satellite uplink, ref. WARC-79.
1270-1271	Alternate narrow-band, weak signals; CW, SSB & AM.
1270.0-1270.1	CW, beacons.
1270.025	EME calling frequency.
.100	CW calling frequency.
.200	SSB calling frequency.
.400	AM (and other modes) calling frequency.
1270.5-1271.0	Experimental.
1271-1275	FM repeater inputs, — 20 MHz offset from output, 20-kHz channel raster, e.g., 1272.01, .03, .05, . . . 1274.95, .97, .99.
1275-1277	Crossband linear transponder & ACSB.
1277-1278	In-band linear transponder & ACSB inputs, — 20 MHz offset from output.
1278-1280	FM simplex 20-kHz channel raster, e.g. 1278.01, .03, .05, . . . 1279.95, .97, .99
1279.99	National Simplex Frequency.
1280-1286	ATV no. 4, simplex, repeater input.
1281.25	Video carrier.
1288-1290	Packet & digital repeater output.
1290-1291	Packet & digital simplex.
1291-1295	FM Repeater outputs, 20-kHz channel raster, e.g., 1291.01, .03, .05, . . . 1294.95, .97, .99
1295-1297	Narrow-band, weak-signal communications, CW, SSB.
1295-1296	CW, beacons.
1296.025	EME calling frequency.
.100	CW calling frequency.
.200	SSB calling frequency.
.400	AM (and other modes) calling frequency.
.600	RTTY calling frequency.
1297-1298	In-band linear transponder & ACSB outputs.
1298-1300	Crossband linear transponder.

working on band plans for 1240 to 1300 MHz off and on for the past six years. The effort has lapsed a number of times for lack of input from committee members and the general membership.

In early 1982, the ARRL Board of Directors approved a plan originated by the Southern California Repeater and Remote Base Association (SCRRA). The SCRRA plan lacked completeness, however, in that FM and repeater standards were not specified. It was returned to committee for further consideration, and a closer examination has been made of many aspects of the plan. Modifications have been made with the goal of fostering a healthy growth of a promising UHF band that will be used by amateurs of many diverse interests. The proposed band plan as it stands now is presented in Table 1. This plan, with any modifications, will be presented to the ARRL Board of Directors for adoption at its October meeting.

The Band Plan

This plan provides up to four channels for ATV, 8 MHz for FM repeaters, 3 MHz for FM simplex and control links, 10 MHz for satellite uplinks and two segments for weak-signal operation. ATV channelization is similar to that suggested by SCRRA. Achieving this many channels presumes the use of suppressed lower sideband (vestigial sideband) AM video modulation occupying channels 6-MHz wide. The use of double-sideband modulation would probably require channels at least 10-MHz wide, while frequency-modulated video may require 20-MHz-wide channels. Clearly, there is not enough spectrum in this band to have many ATV channels and also have them wide. What do the ATV interests want to see here, keeping the other services in mind?

FM/RPT operations are based on 20-MHz input/output offsets and 20-kHz channelization, much like the lower bands. Initially, the channels may be 40-kHz apart. Some of these features are influenced by the announced availability of the first 23-cm mobile FM radio by ICOM. This new transceiver operates only from 1260 to 1300 MHz with a 20-MHz offset program. The FM/RPT segments shown in

*Chairman, VUAC, 1130 Willowbrook Trail, Maitland, FL 32751

the plan are the result of trying to fit the ICOM capabilities into a plan with other services, both desired and traditional. This plan allows a total of (2X) 4 MHz of repeater operation. FM simplex operation is centered at 1280 MHz, the default power-up frequency of the ICOM transceiver.

There may be some question as to why the satellite service is "given" a juicy 10-MHz segment of the band. First, this is a result of the WARC-79 action to which the United States is a party; thus, there are substantial international coordination requirements for this part of the band. The next point is that it is better to set aside the entire segment now, rather than identify a shared usage that may prove incompatible and cause considerable unhappiness at that future time. Some of this segment is in use

today by AMSAT-OSCAR 10 Mode L uplinks. Although the current uplink ERP requirements are immense, we must plan for the day when those requirements will be lower and much more of this segment will see service.

For the narrow-band operator, the traditional 1296-MHz weak-signal segment is maintained. The structure is similar to that seen in some IARU Region 1 band plans. An alternate weak-signal segment is shown just above the satellite portion. This is considered a future growth area. As the satellite service expands, there will be many operators wishing to use their stations for terrestrial or EME communications as well, without having to retune complex equipment that may well be remotely located on a tower. There are segments shown for linear transponder and ACSB operation,

both in-band and cross-band.

Voice Your Opinion

The VUAC and VRAC are looking for constructive comments from the membership on this band plan and the underlying concepts. If you have thoughts or suggestions on the direction the 23-cm band plan should take, please take the time to write them down and send them to your local VUAC or VRAC member (see March 1984 *QST*, page 60), ARRL Hq., or the author. All comments will be considered when drafting the final plan to be presented to the ARRL Board of Directors for approval.

Deadline for comments is August 31, 1984. If you have an opinion, now is the time to voice it. [RECEIVED]

Strays



Recently, Sen. Barry Goldwater, K7UGA (left), learned of excellent grant opportunities available to hams from the National Diffusion Network, a federally funded system that enables innovative teachers to share their methods with other teachers. Bringing the good news (l-r) were Deputy Assistant Secretary of Education Dr. Fred Decker, W7ANX; National Dissemination Programs head Dr. Lee E. Wickline, K3HOU; and NDN Senior Program Officer Dr. Marshall L. Schmitt, WA4PNP. For more information, write to Dr. Decker, U.S. Dept. of Education, 1200 19th St., N.W., Suite 722, Washington, DC 20208. (KA3HSD photo)

QST congratulates...

- the following radio amateurs on 50 years as an ARRL member:
 - Herbert D. Williamson, K7LYT, of Renton, Washington
 - Bruce D. Wyman, K4OP, of Winter Park, Florida
 - Charles J. Fuchs, W2QJN, of Utica, New York
 - Howard J. Klinger, W8PZQ, of Farwell, Michigan

MOVING, CHANGING CALL?

- When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation

Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.



Between the license plate and the custom frame, these two W6-landers convey a fair amount of information to fellow ham travelers.

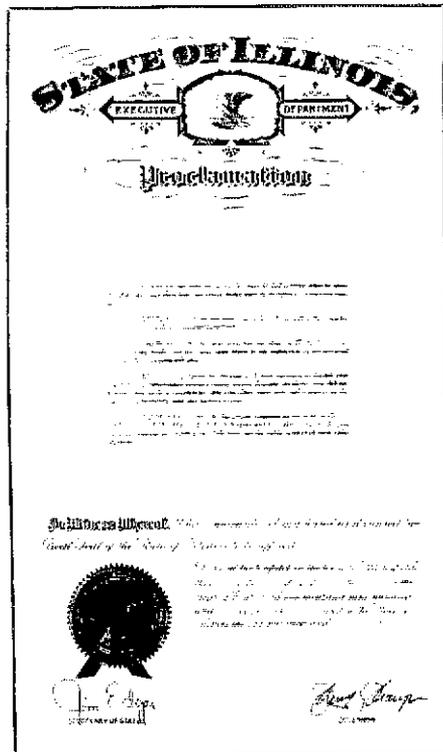
STRAY HINTS

- "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most readers of *QST*. (2) Submit your material before deadline — the 8th of the second month preceding desired publication (i.e., arrive at Hq. before June 8 for August *QST*). (3) Any photographs you send should be good quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce well.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing

in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

Follow the above hints and maybe your Stray will find a home in *QST*. — Andrew Tripp, KA1JGG



ARRL Illinois EC and PIO Donald J. Sprinkle, WD9EED, was able to get an Amateur Radio Week proclamation for Field Day almost three months in advance. Now that's planning ahead!

1984 ARRL National Convention, New York City

Join Owen Garriott, W5LFL, on July 20 for the quindecennial celebration of man's first moon landing, and enjoy a super National in a super location.

By Hank Frankel,* WB2DQP and Greg Grambor,** WB2GMK

Sunday, July 20, 1969, is etched in the history of humanity forever, and Friday, July 20, 1984, will long be remembered by all those radio amateurs and their families who attend the 1984 ARRL National Convention. For on that evening, Owen Garriott, W5LFL, will host a commemorative program in the grand ballroom of the Hotel Penta in New York City, where the convention holds forth from Friday, July 20, through Sunday, July 22. Dr. Garriott, whose accomplishments include the Skylab mission in 1973 as well as his recent successful trip aboard the *Columbia* Space Shuttle, will also be on hand for the Saturday night banquet, where he will address the gathering as the featured speaker.

You will want to be there when Owen begins the Moon Landing party at 8:30 on Friday evening, and at the banquet Saturday night when Owen provides an insight into Amateur Radio and the Space Program. And in between, from Friday morning through Sunday afternoon, you'll want to attend the forums and seminars covering all facets of Amateur Radio — from contests to packet radio — and visit the exhibit area, where manufacturers and dealers will be displaying the latest equipment and answering your questions. You won't want to miss the ARRL and FCC forums on Saturday afternoon, and the opportunity to visit one of the great cities of the world at the special convention hotel rate of only \$56 per night per couple.

Fabulous programs have been prepared for the amateurs, while the nonhams of the family will have New York's famous museums, theaters, restaurants, shopping, and more within walking distance or within easy reach by public bus transportation. Indeed, New York City has so much public transportation available — the Hotel Penta is just across the street from Pennsylvania Station at 33rd Street and Seventh Avenue — that there is no need to drive your car.

Radio amateurs from around the world are expected to share in the festivities and to greet W5LFL, whose recent first ham

radio operation from space was heard by thousands of amateurs and others. Dr. Owen Garriott, who enjoys skiing, sailing and scuba diving in addition to Amateur Radio, earned his doctorate in electrical engineering from Stanford University in 1960, and taught ionospheric physics there until 1965. He is the author of more than 30 scientific papers and one book on this subject, and remains a consulting professor at Stanford. Prior to his mission on *Columbia*, he had logged over 4500 hours flying time — over 2700 hours in jet aircraft, the remainder in spacecraft, light aircraft and helicopters. In addition to NASA ratings, Owen holds FAA commercial pilot and flight instructor certification for instrument and multiengine aircraft.

A Super Program in a Super City

The convention program is packed with forums for just about every interest. Friday will feature a look at a super contest station, a presentation from AMSAT on where state of the art is in space communications and, as a wrap-up, the once-in-a-lifetime NASA program celebrating the 15th anniversary of man's landing on the moon.

Saturday will feature forums and seminars on such diverse subjects as RTTY, AMSAT, fast-scan TV, satellites, computer languages, computers and Amateur Radio, a five-hour-long DX program, a traffic forum, emergency communications in the future, Amateur Radio and the law, tomorrow's communications techniques, packet radio, VHF contesting, AMTOR, YLRL, communications for the largest marathon in the world (New York City), an antenna forum, an introduction to integrated circuits, a super ARRL forum with the Board of Directors — meet and discuss League policy with the newly elected officers — and the FCC forum with Robert Foosaner, chief of the Private Radio Bureau. There will even be an opportunity to meet Dr. Garriott.

Sunday will feature a look at commercial satellite applications, a super 10-meter contest station, future communications techniques and the CP/M computer

operating system plus a review of data-base handling. There will be several technical programs to round out this excitement-packed convention.

Three Days of Exhibits

Between attending the sessions of their choice, hams will have a huge exhibit area to see all the latest gear from such prominent sources as Kenwood, Heath, Hy-Gain, Hal Communications, Ehrhorn Technological Operations, ICOM, and more. Also, the top Amateur Radio magazines and several dealers will be on hand with special convention offers. The exhibit area will be open to all registrants each day, from Friday morning through Sunday afternoon.

For those who plan to go sightseeing in New York, guided tours are available, including the famous Circle Line cruise around Manhattan Island. And at the Penta, programs for the nonham XYL include cosmetics, horticulture and a famous New York chef describing the preparation of vegetable food platters.

Saturday Night at the Penta

Tables at the Saturday night banquet will be reserved only for those who purchase at least eight banquet tickets (tables seat 10) at the same time. So get your club group together now and order your banquet tickets while whole tables are still available. Everyone attending the banquet is sure to enjoy the festivities and, of course, the main address by Owen Garriott.

Hotel reservation forms, which provide for the special convention rate, will be sent to all those who order registration tickets and/or banquet tickets. To get yours, send \$4 (advance price; higher after July 1) for each registration — registered individuals may attend all the forums and programs including the moon landing party — and \$26 for each banquet ticket to Mike Troy, AJ1J, RR 4, Box 19C, Pound Ridge, NY 10576. Please include an s.a.s.e. for a prompt reply.

You'll want to be there for this great "out of this world" event, so act now to reserve your place at the 1984 ARRL National in New York City. 

*1021 Douglas Ave., Wantagh, NY 11793

**43 East Edsall Blvd., Palisades Park, NJ 07650

The KI Edge

Expand your knowledge and DXing abilities with a little help from great circle maps.

By Tom Frenaye,* K1KI

Imagine for a few minutes a world without great circle maps to help you figure out where to point your antenna. You would be looking at a chart of country names or prefixes and the corresponding bearing to orient your antenna correctly (Fig. 1). You may have used this technique when you first put up a rotatable antenna or when you heard an unfamiliar prefix. In fact, without a great circle map, most people think Europe is due east of the USA, Japan is due west, and India even farther to the east or west. This general perception is caused by the way the earth is stretched to fit onto a flat surface on most of the commonly available world maps.

Show someone a great circle map for the first time and their perception of the world undergoes some reevaluation (Fig. 2). Suddenly India is to the north or northeast and Australia is to the west or northwest! Once the concept of a great circle map is understood, it makes perfect sense; but the initial confusion is real.¹

Once you understand the value of great circle maps, it is very easy to figure out which direction to point your antenna, and you may feel there is no more to learn. On the contrary, a great circle map is something that can be used to help you to better understand propagation to give you an "edge" that will improve your contest score or to snare a new country on 20 meters.

Take a look at your rotator control box. If yours is like most on the market today, it has a scale that goes South-West-North-East-South as you look from left to right. Imagine for a moment that the scale is a great circle map centered on your QTH, with the pointer showing the direction of your beam. Instead of looking at a great circle map and seeing that Costa Rica is slightly west of due south (or looking on a table to find it is at 200°), and then pressing the correct switches on the rotator control box to move the antenna to that bearing, you can combine the two tools (rotator control and map) into one, greatly simplifying the whole problem. A few manufacturers of rotators have recognized the in-

DX PREFIX - COUNTRY	DISTANCE		PATH
	MILES	K/M	
TI COSTA RICA	2274	3688	204 89
II* CHINA IS*	2531	4073	204 84
IJ CAMBODIA	3734	6028	89 269
TL CENTRAL AFRICAN EMPIRE	4184	6827	04 268
TN CONGO	6168	9913	02 232
TK GABON	6885	11064	04 234
TE CHAD	5613	9033	78 258
TU LIBYAN COAST	4489	7348	166 258
TY SENEGAL	5858	9448	03 273
TZ MALI	4464	7184	01 271

Fig. 1 — Sample of a prefix/bearing list. (courtesy WA1LOU)

creased efficiency in this approach and have incorporated the design into their control boxes; but most have not.²

Now that you can see one way in which a great circle map can be combined with other tools for greater ease and understanding, take another step. As you become more serious about DXing or contesting, you will begin to think more and more in terms of "when is it possible" to work a particular place in the world or "what can be worked" via grayline sunrise-sunset line, or terminator paths near sunrise or sunset.³ You can approach the problem from a number of angles. There are formulas to calculate sunrise and sunset times, given the latitude and longitude of the QTH and the

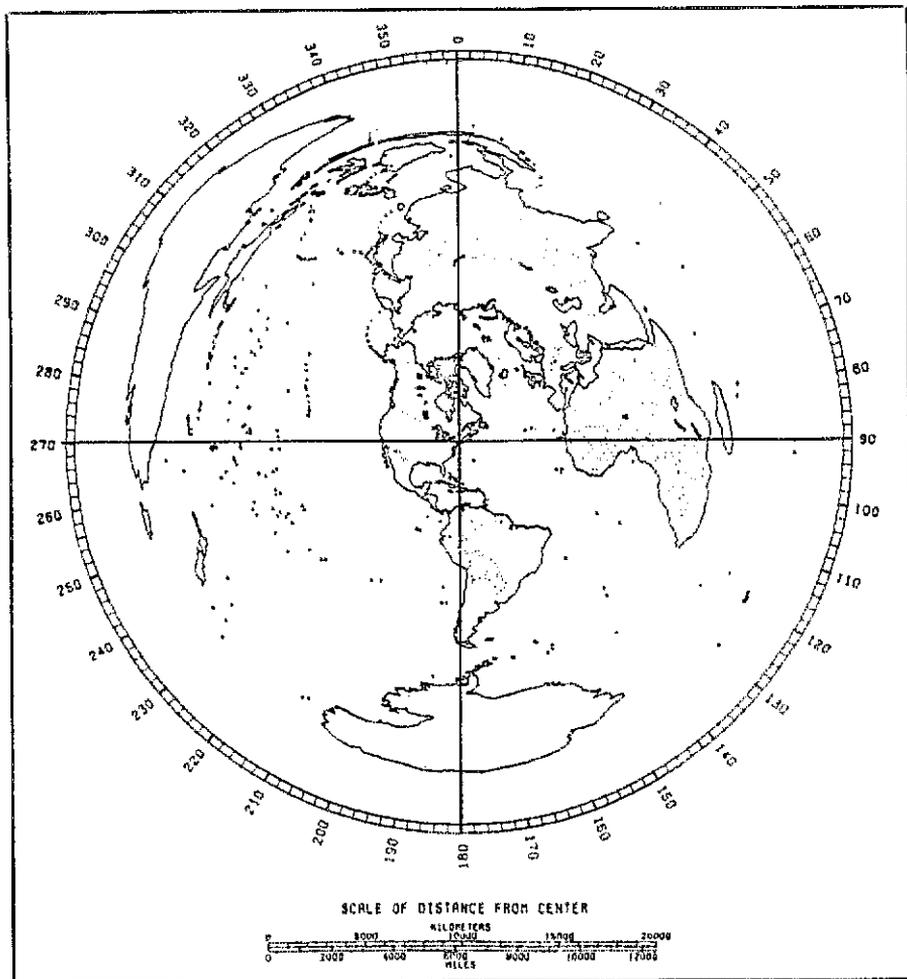


Fig. 2 — N5KR azimuthal equidistant map centered on W1AW.

¹Notes appear on page 56.

*P.O. Box 62, Unionville, CT 06085

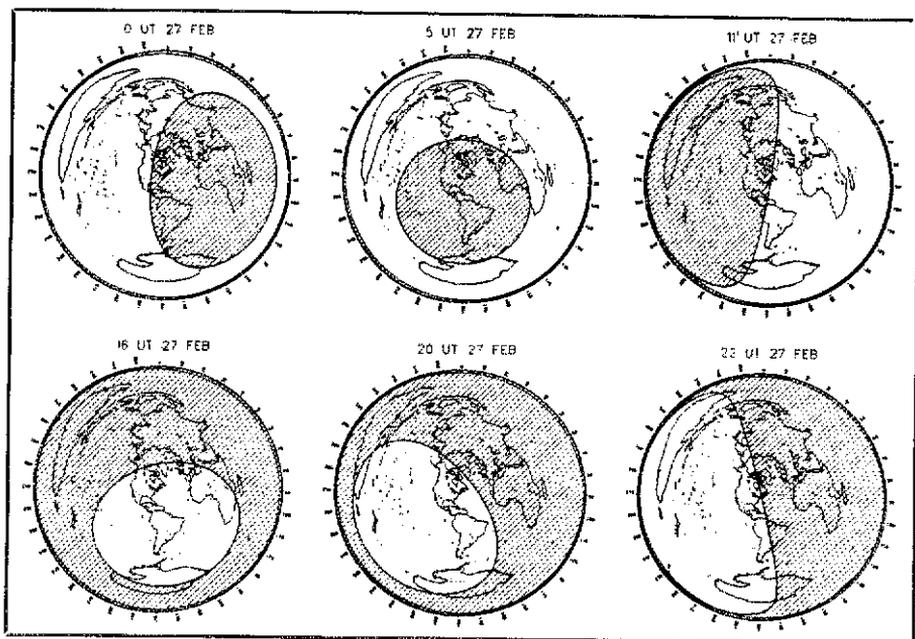


Fig. 3 — The KI-Edge. A complete KI-Edge has great circle maps for each hour of the day, overlaid by shading of the area in darkness. Note how the area in darkness varies considerably from hour to hour.

sun's declination (the number of degrees north or south of the equator the sun is at local noon). See sidebar, next page.

A popular commercial product called the DX-Edge is another solution.⁴ The DX-Edge combines the grayline with the flat projection of the Earth, giving a better picture of which areas are in darkness and which are in daylight. You still have to go through considerable work to convert that "picture" into the steps necessary to turn your antenna in the right direction.

Imagine a rotator indicator that combines the features of a great circle map and directional antenna pointer, and also

displays the areas in darkness/sunlight simultaneously! This is easily within the scope of what can be done with small computers. This article won't show you how to do all of that at once, but it will show you how to make overlays for your great circle map to show those darkness/sunlight areas, and give you the "edge" in understanding propagation and how it affects what you are able to work at different times of the day. You may even be inspired enough to make that all-in-one rotator-map!

Some History

The events that led to this project took

place over the last several years. The seed was planted while watching John Lindholm, W1XX, trying to figure out how to work Europeans during an ARRL 160-Meter Contest strategy session. Once the problem became "How and when do I work someone during a particular time period?" instead of "I'll work it when I hear it," the problem became evident. To chase QSOs aggressively, it is important to know what is going on at both ends of the communications path, and in between as well. The hard part is translating those sunrise-sunset formulas into great circle maps overlaid by darkness/daylight projections. The first couple of tries were tedious but resulted in useful maps. Note that as the sun moves around the Earth, the projection of the area of darkness on a great circle map changes considerably. Different maps are necessary every few hours. Moreover, the maps have to change as the seasons change and the sun gets higher or lower in the sky.

As interesting and useful as the results were, some comments from other people were necessary to see if the maps could be improved upon. Copies were given to a few people in the Yankee Clipper Contest Club (YCCC), and the comments began to come in. Bill Myers, K1GQ, with some mathematical help from John Kenny, W1RR, put together a FORTRAN program that used a plotter to produce the maps with considerable ease (much better than doing it by hand!). The first widespread distribution of the maps was in the YCCC's 1982 operating guide for the ARRL International DX Contest. A portion of those maps is shown in Fig. 3. The FORTRAN program, minus the plotting section, is available so you can run it on your own microcomputer. BASIC and APL versions are also available.⁵

Possible Uses

Once the maps are in the KI Edge format, you will begin to see a number of uses for them. To get you started, here are a few that have seen considerable use within the YCCC.

Learning about propagation. By noting carefully what is being heard on a band and looking at the KI-Edge for that time period, you will soon see why some changes in propagation take place. For instance, on 15 meters you will normally work DX stations during daylight hours only, and those stations will also be in daylight. On 40 meters, just the opposite is the norm. This is probably obvious to you from your own experience. Think about what happens on 15 meters when the maximum usable frequency (MUF) goes to 28 MHz or higher around midday. As midday approaches, the skip becomes shorter and absorption increases. Nearer sunset, as the MUF falls, the skip range lengthens until finally the band closes as you hear the VK/ZL/JA stations fade away long after those stations

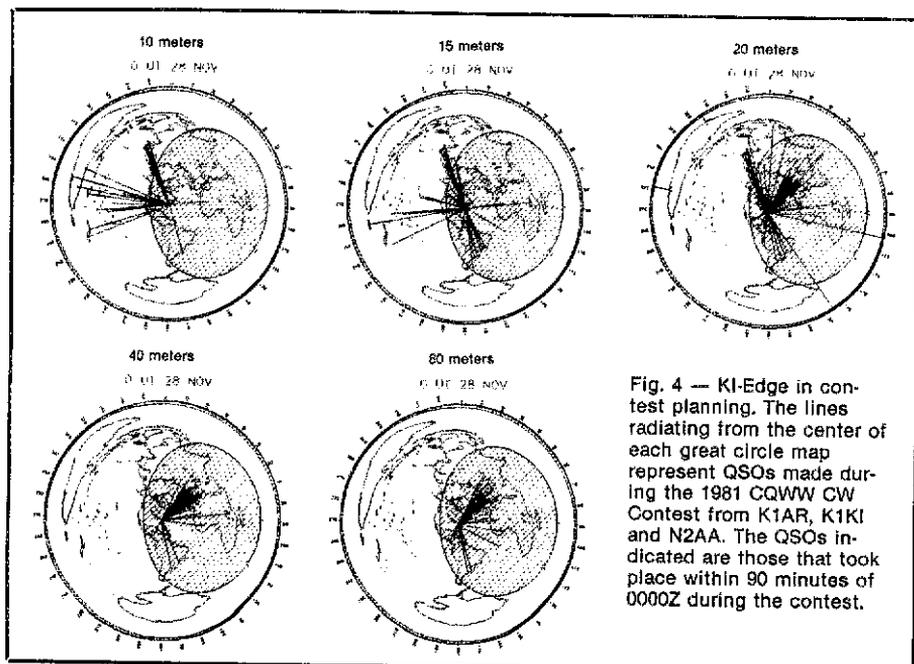


Fig. 4 — KI-Edge in contest planning. The lines radiating from the center of each great circle map represent QSOs made during the 1981 CQWW CW Contest from K1AR, K1KI and N2AA. The QSOs indicated are those that took place within 90 minutes of 0000Z during the contest.

closer to you. For best results, avoid trying to work places that require your signal to follow a path across the area where the sun is overhead.

Working grayline DX. A quick glance at the map in Fig. 3, which corresponds to 1100Z on 27 February, shows that the sunrise line is just about to pass over New England, the center of this great circle map. It is easy to see that grayline opportunities may exist for QSOs with Japan, western Australia and other areas.

Contest operating and planning. By knowing when sunrise happens in South Africa, for example, you will be able to be in the right place at the right time to maximize your chances for that ZS multiplier. If you can convince someone to QSY to another band, you will be able to pinpoint the most likely time for that band to be open for a successful QSO. If you plan for future contests by analyzing past results, you can plot QSOs from past logs on the KI-Edge, marking those areas you were able to work at various times. Now you can find the best times to look for multipliers you may have missed. (See Fig. 4).

Discovering long-path opportunities. Long-path and grayline DXing are similar; both normally take place near sunrise-sunset times. Long-path QSOs usually take place when the short path is less favorable because of propagation differences. In general, long-path openings require that both ends of the QSO be in daylight (anywhere from no more than a few minutes before sunrise to more than an hour afterward, and just the opposite at sunset). The long path is usually open when the short path crosses the daylight zone and the absorption is high. Abnormal long-path propagation can occur when the ionosphere is disturbed by solar storms.

An example of a good time for 20-meter long-path opportunities is shown in the 2000Z 27 February map in Fig. 3. Note that the extreme eastern part of both North and South America, New Zealand and the extreme southeastern portion of Australia are all within an hour or so of the sunrise-sunset line. This is an ideal time for VK/ZL to W1/VE1/PY long path, even though the strongest signals likely to be heard are from Europe. From New England, stations from VK/ZL/T32/FO/P29 and even KH6 and KH2 have been worked via long path during this period.

Effects of solar storms. Consider what happens when the areas of high auroral ac-

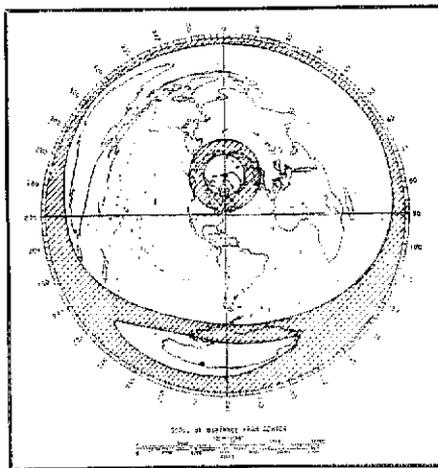


Fig. 5 — This great circle map is overlaid by shading to show the extent of the auroral zone during a relatively strong solar storm. Note how paths from North America to northern Europe, all of Asia, parts of the Pacific and all long paths are affected during a strong storm.

Calculating Sunrise and Sunset Times

$$\text{Sunrise} \left(\frac{\text{long.}}{15} \right) + \frac{\cos^{-1}([\tan A] \times [\tan \text{lat.}])}{15}$$

$$\text{Sunset} \left(\frac{\text{long.}}{15} \right) - \frac{\cos^{-1}([\tan A] \times [\tan \text{lat.}])}{15}$$

Note: Latitude is in decimal degrees north (negative if south). Longitude is in decimal degrees west (negative if east). A is the declination of the sun. Approximation for declination: $-23.5 \times \cos 10 + 0.968 (4 + 30.3 (7 - 1))$. Answer is in decimal hours.
Example: When is it sunrise in New Orleans on July 4? (30° N. lat., 90° W. long.)

$$\begin{aligned} \text{decl.} &= -23.5 \times \cos 10 + 0.968 (4 + 30.3 (7 - 1)) \\ &= -23.5 \times \cos 193.57 \\ &= 22.84 \end{aligned}$$

$$\begin{aligned} \text{sunrise} &= \left(\frac{90}{15} \right) + \frac{\cos^{-1}(\tan 22.84) \times (\tan 30)}{15} \\ &= 6 + \frac{\cos^{-1}(0.42118) \times 0.57735}{15} \\ &= 6 + 5.06 \\ &= 11.06 \\ &= 1104Z \end{aligned}$$

tivity instead of daylight/darkness areas are plotted (Fig. 5).⁶ During solar storms, areas of intense auroral activity shift as the storm level changes. Increased storm intensity causes the aurora belt to move from high

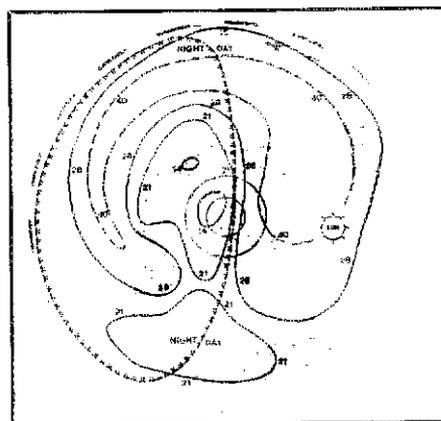


Fig. 6 — Global distribution of 4000-km median MUF contours for 14, 21 and 28 MHz, and day/night zones at 0600 GMT in October (sunspot number = 100). (from Amateur Radio Operating Manual, R. J. Eckersley, ed., RSGB, available from ARRL)

to lower latitudes. With a plot of the auroral area on a great circle map, it becomes clear why signals from over the poles are most severely affected.

Perhaps you have already thought of other uses, or you have figured out how to put together a computer program to display all of this at one time. In addition to a rotator control box with a great circle map in the background and an antenna directional pointer on top, consider plotting the radiation pattern of your antenna on the map or using the MINIMUM program to plot MUF contours (Fig. 6).⁷ It will get pretty complex with all of the information displayed at once but being able to combine some or all of these pieces simultaneously will make their interrelationships all the more clear.

Notes

¹A great circle map (or azimuthal equidistant map) gives the true bearing (direction) and distance of any other place in the world relative to the center point. The border of the map delineates the antipodes, the points on the Earth's surface the farthest distance away.

²A Hy Gain 400 rotator is one example, but it is no longer made.

³Long-haul DX paths between two given areas are enhanced when sunset at one end of the DX path corresponds with sunrise in the area at the other end. This is called grayline, or shadow edge, DXing.

⁴Available from the DX Edge, Box 834, Madison Square Stn., New York, NY 10159. A product of Xantek, Inc.

⁵Send \$1 and an s.a.s.c. to the author for program listings in FORTRAN, BASIC and APL languages.

⁶See "The Aurora," by Sun-ichi Akasofu, *Scientific American*, Dec. 1965.

⁷The MINIMUM program is described in Dec. 1982 QST, p. 36.

Strays

I would like to get in touch with...

anyone who has an owner's or service manual, or a schematic diagram, for a

Midland 13-500 2-meter FM rig. Dan Hancock, N8DJP, 34513 Annapolis, Wayne, MI 48184.

anyone who has replaced the band-switch belt on the Hallicrafters Safari FPM-300. Ray Gulland, K4IKO, 11222

Winn Rd., Riverview, FL 33569.

anyone with a schematic diagram for an EICO Model 232 VTVM or a Knight Kit VTVM. Charles Warren, N9CW, 498 Thunderbird Trail, Carol Stream, IL 60188.

- **ARRL Supports Volunteer Exam Cost Recovery**
- **160-Meter Band Actions — Fast and Furious**
- **2310-2390 MHz Battle Heats Up**
- **WARC Bands Petitions — Action Now!**

Profiles of New ARRL Leadership Team

As reported last month, the ARRL Board elected new officers at its semiannual meeting March 26-27 in Hartford. Larry E. Price, W4RA, is the new President of the League, replacing Carl L. Smith, W0BWJ. Carl had served as President since the passing of President Vic Clark, W4KFC, last fall. Leonard Nathanson, W8RC, is the new First Vice President. Gar Anderson, K0GA, continues as Vice President, with Jay Holladay, W6EJJ, filling the remaining Vice President slot. International Affairs Vice President Richard Baldwin, W1RU, Secretary David Sumner, K1ZZ, and Treasurer James E. McCobb, K1LLU, were reelected to their respective posts. Each officer will serve a two-year term.

Larry E. Price, W4RA, has served as ARRL Vice President since 1980. He was Southeastern Division Vice Director in 1972 and Director from 1972 to 1979. Larry brings to the post a wealth of experience gained as a member of the Management and Finance and Membership Affairs Committees, and as chairman of the former Legal and Regulatory Committee.

Larry is Chairman, Finance and Law Department, Georgia Southern College in Statesboro, Georgia, a position he has held since 1966. He holds BSEE, MBA and PhD degrees. Licensed in 1951, Larry is a past president and vice president of the University of Arkansas Radio Club, and past faculty sponsor and secretary of the Georgia Southern College Radio Club. He has held several call signs, but is best known as W4DQD and (since 1976) W4RA. He resides in Statesboro with his wife, Barbara.

Leonard M. Nathanson, W8RC, new First Vice President, has served as ARRL Great Lakes Division Director since 1980, and as an Executive Committee member since 1983. Licensed since 1948, Len is past president and director of the Detroit Amateur Radio Association and the Oak Park Amateur Radio Club. He is an attorney and electrical engineer, and a member of the State Bar of Michigan. Vice President Nathanson is an avid marathon runner, and resides in Southfield, Michigan, with his wife, Becky.

Garfield A. Anderson, K0GA, has served as a Vice President since being elected to the position in 1982. He was Dakota Division Director for the period 1976-1982, and Vice Director in 1975.

First licensed in 1926, Gar enjoys computer and satellite operations, and has held numerous volunteer positions in local Amateur Radio clubs. A graduate of the University of Minnesota, he was employed by North West Bell Telephone for 40 years until his retirement in 1977. Gar resides in Edina, Minnesota, with his wife, Dorathe.

*Deputy Manager, Membership Services, ARRL



The ARRL Board of Directors and invited participants, First Annual Meeting, Hartford, Connecticut, March 26-27, 1984.



ARRL President Larry E. Price, W4RA

Jay A. Holladay, W6EJJ, has served as ARRL Southwestern Division Director since 1978. He was Vice Director from 1975 to 1978. Jay served as a member of the League's Executive Committee in 1982, the Long-Range Planning Committee from 1979 to 1982, and the Plans and Programs Committee from 1979 to 1982. He was Board Liaison to the League's VHF/UHF Advisory Committee from 1979 to 1982.

Vice President Holladay has served as director and trustee of the Jet Propulsion Laboratory Amateur Radio Club station, W6VIO. He is past president, treasurer and bulletin editor for the Southern California DX Club. Active on the air since being licensed in 1950, Jay holds DXCC Honor Roll, 5-band DXCC, 5-band WAS and

WAS via OSCAR. He is a professional member of the technical staff, Jet Propulsion Laboratory.

Richard L. Baldwin, W1RU, has served as International Affairs Vice President and IARU President since 1982. He was ARRL Secretary and General Manager from 1975 until his retirement in 1982. He served as IARU Secretary for the period 1976-1982.

Dick has been a radio amateur since 1934. He attended Bates College before joining the Navy. He served for five years in the Pacific fleet during World War II. After the war, he earned an MS in Physics.

During his tenure as Assistant General Manager and later as General Manager, Dick was a driving force in the Hq. preparations for WARC-79. He enjoys sailing and life on the Maine seacoast, residing in Bremen with his wife, Phyllis.

David Sumner, K1ZZ, has served as ARRL Secretary and General Manager since 1982. Before that, he was Assistant General Manager, beginning in 1976. Dave's full-time employment with ARRL began in 1972, after service to the organization in several volunteer posts. He was deeply involved with ARRL/IARU WARC-79 preparatory efforts. An active contester, CW enthusiast and antenna farmer, Dave resides in South Windsor with his wife, Linda, KA1ZD, and daughter, Deryn.

James E. McCobb, Jr., K1LLU, continues as ARRL Treasurer, a post he has held since 1980. Along with a BS in Accounting, Treasurer McCobb has amassed more than 12 years of banking experience.

New Division Directors

Fried Heyn, WA6WZO, is the new ARRL Southwestern Division Director, replacing Jay Holladay, W6EJJ, new ARRL Vice President. Fried had served as the division's Vice Director since 1983. He has held other ARRL posts, including Section Communications Manager and Assistant Director. He holds DXCC, 5-band

WAS, BPL and Public Service Honor Roll awards. Fried is active in AMSAT, AMRAD, HANDI-HAMS, MARS and SWOT. He is a member of the Southern California DX Club, the Tucson Packet Radio and the Los Angeles Area Council ARC, and is an ARRL Life Member. He resides in Costa Mesa, California, with his wife, Orange Section Manager Sandra Mae Heyn, WA6WZN.

George S. Wilson, III, W4OYL, is the new ARRL Great Lakes Division Director, having replaced Len Nathanson, W8RC, upon Len's acceptance of the position of Vice President. George has served as Vice Director of the Division since 1982. He has been continuously active in Amateur Radio since the age of 16. George has served as Kentucky Section Emergency Coordinator and Section Communications Manager. An attorney, George holds DXCC and is a member of the A1 Operator Club.

PETITION FILED FOR 18- and 24-MHz ACCESS

Five amateurs have filed a joint petition for rule making with the FCC requesting early Amateur Radio access to the new WARC 18- and 24-MHz bands. Stuart Cowan, W2LX, Doug DeMaw, W1FB/8, Robert Haviland, W4MB, William Orr, W6SAI, and A. Prose Walker, W4BW, all requested FCC to open the two bands to allow A1 Morse code privileges across each entire segment: 18.068-18.168 and 24.890-24.990 MHz. The petitioners proposed A3 phone subbands at 18.118-18.168 and 24.940-24.990 MHz.

The 18- and 24-MHz bands were allocated to the Amateur Radio Service on an exclusive basis, subject to the satisfactory transfer of present Fixed Service stations to other spectrum portions, at WARC-79. Last month, we reported on an ARRL request for 24-MHz access based on the League's contention that a degree of reaccommodation of fixed stations had occurred to the point where amateur access could now be justified.

The joint petition proposed a limitation, to be incorporated in Part 97, that states "for the period the bands are jointly allocated, Amateur stations shall take necessary measures to avoid harmful interference to stations in the Fixed Service." The petitioners gave background on WARC-79 decisions at 18 and 24 MHz, the FCC's decisions implementing the bands, and other administrations' implementation efforts. Each petitioner holds an Experimental license with FCC authorization for special research on these bands. They cited improved communication reliability potential in disaster conditions as justification for an immediate FCC allocation. Another factor is the perception that there is no appreciable equipment "pool," or operator familiarity with the bands, areas that could be improved upon with an immediate FCC allocation. Finally, they suggested that an early opening of the two bands would reduce interference and congestion on the other HF bands.

Concerning their mode proposals, the petitioners characterized code as a "superior operating mode under extremely poor conditions" that must be included in the allocation. For voice (A3), they suggested that it is a faster communications mode in emergency conditions under medium- and strong-signal conditions.

The petitioners further suggested that "normal Amateur Service power is reasonable. It is submitted that noninterference operation by the Amateur Service on the 18 and 24.9 MHz bands is feasible. It is also submitted that the benefits

to the Amateur Service, and, in particular, to capability under emergency conditions, justifies early affirmative action," the petitioners concluded.

The FCC has assigned RM-4781 to the petition.

ARRL SUPPORTS VOLUNTEER EXAM COST RECOVERY

ARRL filed comments with FCC on April 16 supporting rule amendment proposals to allow reimbursement of out-of-pocket expenses incurred by both Volunteer Examiners and Volunteer Examiner Coordinators. The proposals are contained in the *Notice of Proposed Rule Making* in PR Docket 84-265, reported in last month's *Happenings*. Its purpose is to implement recent Communications Act amendments authorizing the Commission to provide for cost recovery in the Volunteer Examiner Program.

In support of its position, ARRL stated that the rule changes proposed in the *Notice* simply implement Congressional mandates contained in the *Federal Communications Commission Authorization Act of 1983*, a measure supported by the amateur community generally. The League recited a portion of Senator Goldwater's statement to the floor of the Senate at the time he introduced the legislation, which strongly supported cost recovery provision along the lines suggested in the *Notice*. The League also noted FCC Chairman Fowler's reply to a Goldwater letter wherein the chairman stated the Commission's belief that "the legislation you propose may also be the most effective means of insuring that volunteers do not incur inordinate out-of-pocket expenses." ARRL added, "for the volunteer examination program to be continuously sustained, the proposed method of reimbursement of prudently incurred out-of-pocket expenses is necessary."

The League said the fact that the *Notice* does not specify how the cost reimbursement amount is to be divided among volunteer examiner coordinators and the volunteer examiners is desirable. ARRL said a more appropriate forum for this issue is in the VEC's proposal to FCC for VEC appointment, reasoning that there may not be any significant VE expenses, depending on the VEC's game plan. The VEC will undoubtedly incur the vast majority of expenses — printing, assembling, distributing, recovering and processing of large numbers of exams. The League urged that the FCC decision in this proceeding reiterate its interpretation that it is a matter between the VEC and its VEs how, if at all, the cost reimbursement amount is to be apportioned and collected.

ARRL concluded by requesting quick action in adopting the new rules so the Volunteer Examiner Program can quickly fill the present dearth of exam opportunities.

FCC DISMISSES 160-METER PETITIONS

In an *Order* released April 18, 1984, the Commission dismissed three petitions for rule making on the 160-meter band. A January 11, 1984 petition filed by Joseph Subich, AD8I, requested that all frequency and power restrictions be removed from the 1900-2000 MHz band inasmuch as Canada no longer operates a Loran A system in that band. The petition further requested that the subband 1800 to 1875 kHz be designated as an exclusive radiotelegraph subband.

Gary Carl Mitchell, KH8AC, filed a petition in January requesting that the subband 1800 to 1825 kHz be reserved exclusively for radiotelegraphy. The ARRL filed a petition on February 2 requesting elimination of the frequency and power restrictions from the 1900-2000 kHz segment in light of the cessation of Loran A operations by Canada.

The Commission said the two requests for deletion of the frequency and power restrictions for the 160-meter band are moot since FCC has already taken the action, by *Order* dated March 22, 1984 (see *Happenings*, May 1984 *QST*).

Subich stated that establishing a CW-only subband at 1800-1875 kHz would eliminate interference to foreign stations with much weaker signals operating between 1825-1855 kHz from relatively high powered domestic SSB stations transmitting voice communications. Mitchell said many new SSB operators are coming from the 75-meter band to the 160-meter band, and that "intentional interference" and "jamming" caused by SSB operators suggests a CW-only subband at 1800-1825 to insulate CW operators interested in long-distance communications. Mitchell also requested FCC rule amendments setting up "DX Windows" at 1825-1830, 1850-1855 and 1910-1915 kHz, where U.S. operation would be prohibited as a courtesy.

The Commission responded to these requests by recounting a December 7, 1981 *Order* that dismissed a petition seeking telegraph-only emissions at various segments at 160 meters. "The grounds for dismissal were that some specialized operations in that band, such as network or international operations, might have to relocate to new frequencies. Moreover, the *Order* noted that establishment of telegraph-only subbands would be an inflexible approach to the constantly changing balance between telegraphy and telephony operations," the Commission said. Further, FCC said that additional subbands at 160 meters would add to its enforcement responsibilities, and pose administrative burdens down the road if further rule makings were necessary to redefine the subbands. FCC had endorsed voluntary band planning at 160 meters, as it provides more flexibility and responsiveness to the needs of the amateur community.

Concerning allegations of SSB-caused interference contained in the petitions of Subich and Mitchell, the Commission said all operators must cooperate in the use of assigned frequencies and that this applies even when different modes of emission are used.

FCC said the reasons discussed in the 1981 *Order* are still valid and apply equally to the present petitions.

ARRL FOUNDATION CHARTS PROGRESS ON SCHOLARSHIP, SATELLITE MATTERS

The Board of Directors of the ARRL Foundation met in annual session March 28, 1984, in Hartford, Connecticut. With ARRL Foundation President Robert York Chapman, WIQV, in the Chair, the Board considered a number of important issues relating to fund-raising efforts and programs. The ARRL Scholarship Honoring Senator Barry Goldwater is meeting with considerable interest in the amateur community. Donations continue to pour in to the Foundation coffers in support of this program in honor of one of America's great amateurs and countrymen. The initial award is scheduled for the 1984-1985 academic year.

The Foundation Board discussed its successes



ARRL Foundation Directors meet at ARRL Headquarters in March.



New ARRL First Vice President Leonard Nathanson, W8RC (left), presents his check for the ARRL Scholarship Fund honoring Senator Goldwater to ARRL Foundation President Robert York Chapman, W1QV, at the ARRL March Board Meeting in Hartford.

in 1983, with satellite support a keynote. The Board disbursed \$30,000 to AMSAT in 1983 in support of the amateur space program.

The Board considered a proposal for funding from the Courage HANDI-HAM System, the organization of physically handicapped hams, and ham radio students. The matter will be referred to the ARRL Board of Directors before action will be taken by the Foundation.

Contributions continue to roll in to the Vic Clark Memorial Fund, testimony to the friendships Vic made all over the world in his 50 years as a radio amateur and a League volunteer.

Secretary Parker reviewed the work of the Scholarship Committee in her position as Chairman. She noted the recipient of the first Paul and Helen L. Grauer Scholarship, Miss Pamela Sue Hayward, WB0MUS.

RADIOLOCATION INTEREST FILES PARTIAL OPPOSITION TO LEAGUE 160-METER RTTY PETITION

Racal-Decca Survey, Inc., a radiolocation service company, filed comments with FCC in partial opposition to the ARRL's request for F1 emissions across the amateur 160-meter band. The April 2, 1984 comment specifically urged the Commission, if it decides to act favorably on the ARRL request, to allow F1 emissions below 1900 kHz only. For background on the League petition, see *Happenings*, May 1984 *QST*.

Racal questions allowing new F1 operations in the upper half of the band, 1900-2000 kHz, because "new radiolocation operations will be moving into that band shortly." ARRL had said that protection of Loran A systems was no longer necessary at 1900-2000 kHz because of the cessation of Canadian operations. Racal anticipates that a rule making will implement the WARC

Be a Charter Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution now and be a *Charter Contributor*. All Charter Contributors will have their name and call listed in a commemorative book to be presented to Senator Goldwater prior to the awarding of the first scholarship in his honor. The deadline for donations by Charter Contributors is August 1, 1984.

If your contribution is \$25 or more, we will list your name and call in *QST*. If your contribution is \$100 or more, in addition to your name and call appearing in *QST*, you will receive a signed photograph of the Senator, suitable for display in your ham shack. And for contributions of \$1000 or more, in addition to the above, we'll put your photo in *QST* and you'll receive a personal thank you call from Robert York Chapman, W1QV, President of the ARRL Foundation, which is administering the Goldwater Scholarship Fund.

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

Contributors of \$25 or more include: Julius Altman, W2DX; Vincent Biancomano, WB2EZG; L. F. Carden; S. F. Carson, KA4VPO; William B. Chapman, W5YJB; Tom Comstock, N5TC; Hans Dankerl, EL2AT/KC2OU; R. A. Desmet; Charles Doggett; Melvin Eleazer, WB4TWB; Eccles family — KB4IMM, KB4IMO, KB4IMN, KE4VT; Robert Feldman, WA5CLA; James Feldwisch, K8LMN; Horace W. Fuller, N1BSG/SV0BT; James M. Gates, W7KXH; Christopher J. Gay, KU4A; Peter W. Glaser, W6OKG; H. Michael Grimes, K5MLG; Henry R. Glinka, W1JEG; Kenneth V. Hardman, W2DV; A. L. Howard; Senator Jesse Helms; Edward Ludin, K2UK; L. W. Linthecome, K9EAT; Cleon L. Lawrence, W1EFK; Montrose Amateur Radio Club; Don B. Myers, NF8Q; James H. McGlumphy, WB2TUD; Donald L. Moon, W2NVW; Mr. and Mrs. West Minear, W9UO; Robert E. McElroy, W1OMN; Mississippi Magnolia Repeater Association; ARRL Vice President Leonard M. Nathanson, W8RC; William H. Owens, KT5Z; Walter Reitz, K4JCA; John T. Schaefer, W7HQA; Raymond Schulze, KA2DJR; Edward Sutton; Grosvenor Tavares; Herb Twitchell, W6BL.

allotment to Radiolocation at 1900-2000 kHz shortly. Racal said, "The existing radiolocation spectrum below 1800 kHz is overcrowded and inadequate as things now stand; but when radiolocation is displaced to make room for AM broadcasting, the 1900-2000 kHz band will become absolutely critical to meeting the important national needs served by radiolocation operations." Racal anticipates that it will have to move many, if not most, of its existing operations from the 1605-1800 kHz band to 1900-2000 kHz.

In conclusion, Racal said "it would be undesirable to encourage investment in Amateur Radio equipment for a new kind of emission in that band . . . Rather, such investment should be concentrated on equipment which operates in bands where amateur operation will be more long term." Part of Racal's conclusion is that "Amateur operations are incompatible with radiolocation, where a high level of reliability is required. Whether Amateur operations involve AM or FM emission has little or no effect on that incompatibility."

ARRL has filed its response, noting that Racal's presumption about the reallocation of 1900-2000 kHz is unwarranted. See *Happenings* next month.

ARRL ATTACKS FCC 2310-2390 MHz GAME PLAN

On April 9, ARRL filed comments in PR Docket 84-186, the Commission's proposal to assign flight test telemetry operations at 2310-2390 MHz, excluding Amateur Radio. The League comments fall on the heels of its bid for reconsideration of the part of the *Second Report and Order* in the WARC implementation proceeding wherein FCC removed amateur access at 2310-2390 MHz. FCC claims the decision was made to protect new aeronautical flight test operations from possible interference. ARRL replied that the exclusive posture of FCC's decision was overkill, and that geographical sharing, with amateurs secondary to flight test operations,

was feasible (see *Happenings*, April *QST*).

ARRL reiterated its contention that it is unable to find any evidence that geographical sharing in the band is impossible. "There was nothing in any of the WARC preparatory proceedings, nothing in the United States proposals to WARC-79 and nothing in the WARC-79 Final Acts which required that the secondary amateur use be discontinued," ARRL said. In fact, the final U.S. proposals to WARC-79 stated that Amateur Radio occupancy would continue, the League indicated.

The League noted that its intent was not to elevate the status of 2310-2390 MHz amateur use, or to infringe on the primary use by aeronautical flight test operations or by Government Radiolocation stations, the coprimaries. ARRL firmly agrees that safety is of paramount concern in any flight test operation, but feels that flight tests are conducted in well-defined areas of the country and that a geographical basis for sharing appears to exist. The Aerospace and Flight Test Radio Coordinating Council would be capable of working with the League to establish an appropriate frequency sharing plan.

In excluding amateurs from the band, the League said, the Commission has violated a basic principle of spectrum management: the Commission placed on an existing occupant, the Amateur Radio Service, the burden of proof of compatibility with a new occupant. Instead, the FCC should have favored continued, yet coordinated, secondary amateur operation unless and until it is shown that such use is not possible. ARRL concluded by requesting FCC to maintain amateur secondary status at 2310-2390 MHz based on frequency coordination efforts between ARRL and AFTRCC.

SM APPOINTMENT

In the Los Angeles Section, John V. Walsh, N6UK, has been appointed to complete the term (until September 30, 1985) of Stan S. Brokl, N2YQ (resigned). [E]

Novice Rules Roundup

If you're hitting the books, getting ready for the big day when you'll take your Novice test, or if you've just passed through this first gate into our great avocation, this is just for you. The following discussion will help you in your quest for understanding the basic rules of Amateur Radio. Not only will this understanding help you pass your Novice exam, it'll come in handy when you light up your transmitter dials for the first time!

Q. Why is there Amateur Radio?

A. Etch the following bases and purposes in your memory bank: (1) Amateur Radio is valuable to the public as a *voluntary noncommercial communications* service, especially during emergencies. (2) Hams must strive to advance the radio art, something we've been doing since radio communication began. (3) We are encouraged to better our skills of communications and technical experimentation. (4) Hams are a growing pool of trained operators, technicians and electronics experts, making us a national resource. (5) We're in a unique position to enhance friendship among peoples of the world — an awesome responsibility! (97.1).

Q. What frequency bands am I, a Novice, allowed to use?

A. On the 80-meter band, you may use 3700-3750 kHz; on 40 meters, 7100-7150 kHz; 15 meters, 21.100-21.200 MHz; and 10 meters, 28.100-28.200 MHz. There's no simple way of remembering these bands except by rote memorization (97.7[e]).

Q. What types of signals may I transmit? May I use a mike?

A. Novices must use A1 international Morse code only. A1 is the technical "code" name for on-off keying of the carrier (97.7[e]).

Q. How much power may I use?

A. All licensees operating in the Novice bands are limited to 200-W peak envelope power output (PEP) (97.67[d]).

The Control Operator

Q. What's the difference between a station licensee and the control operator?

A. The station licensee is the person whose name appears on the Amateur Radio license to which a fixed station is assigned. The station licensee is responsible for the proper operation of the station.

The control operator is the person who performs the control functions of the station. The CO twiddles the knobs, spins the dials and blinks the lights of the transmitter. In most cases, the station licensee and the control operator are the same person. Sometimes, though, a visiting ham friend may operate your rig. In this case, you may designate your friend the control operator. Together, you share responsibility for the proper operation of the station (97.79[b]). If your friend breaks a rule while operating your station, you (as station licensee) could receive an FCC

Definitions of Key Terms: The Key To Success!

Not only are these definitions important to your understanding of the principles of our Amateur Service as you venture forth into its realm, *they're on the test.*

Amateur Radio Service — a radio communication service of self-training, intercommunication and technical investigation carried on by Amateur Radio operators (97.3[a]).

Amateur Radio operator — a person holding a valid license issued by the Federal Communications Commission to operate an Amateur Radio station (97.3[c]).

Amateur Radio station — a station licensed in the Amateur Radio Service embracing necessary apparatus (transmitter, receiver, and so forth) at a particular location used for Amateur Radio communication (97.3[e]).

Amateur Radio communication — noncommercial radio communication by or among Amateur Radio stations solely with a personal aim and without pecuniary or business interest (97.3[b]). **Noncommercial and nonbusiness** — remember these words! They're part of the foundation of ham radio.

Operator license — the instrument of authorization including the class of operator privileges (97.3[d]). An Amateur Radio license actually consists of "two" separate licenses: the **operator license**, which gives your "human" operating privileges (that is, Novice privileges), and the **station license**, which gives the okay for the station to be operated in the Amateur Radio Service and lists the station's call sign. Remember, operator is the "human" part; station, the "hardware" part.

Station license — the instrument of authorization for a radio station in the Amateur Radio Service (97.3[d]).

Control operator — an Amateur Radio operator designated by the licensee of an Amateur Radio station to also be responsible for the emissions from that station (97.3[e]). In most cases, you operate your own station — so you are the station licensee and the control operator all rolled into one! See the question on control operators.

Third-party traffic — Amateur Radio communication by or under the supervision of the control operator at an Amateur Radio station to another Amateur Radio station on behalf of anyone other than the control operator (97.3[v]). For example, if you transmit a message for your grandmother to a ham who lives in her city for delivery, the other ham and you are the first and second parties (control operators); your grandmother is the third party.

Notice of Violation or Notice of Radio Conditions. Both of you will be held equally responsible for the violation. The FCC presumes that the station licensee is always the control operator unless there is some written station record proving otherwise. Remember: Every amateur station, when in operation, must have a control operator.

Q. Do I need to identify my transmissions?

A. Yes. Unidentified transmissions are prohibited (97.123). Remember always to identify your station with your call sign at least once every 10 minutes, and at the end of your QSO (contact) (97.84[a]).

Q. Do I have to make a note of my operations in a station logbook?

A. There is no FCC Rule that requires you to keep a log of your operations. Logging requirements were eliminated by the FCC last year. However, most hams still keep records of their operations as a sort of autobiography of their activities. It's a matter of personal preference and

pride as to how detailed these records are made.

Q. What kind of call sign will I receive from the FCC?

A. Call signs are issued systematically and sequentially from blocks of call letters. The FCC does not honor requests for specific call signs. Novice class operators are issued call signs with a two-letter prefix, a number representing your mailing address call sign district and a three-letter suffix (KA1GQJ, for example). The call sign is assigned to the station, on the station license (97.51). The FCC periodically puts out a public notice listing the call signs most recently issued so a person can "guesstimate" what call letters he or she might receive.

Q. What kinds of stations may I communicate with?

A. You may communicate with other Amateur Radio stations. You may also communicate for civil defense purposes with stations in other FCC services and with U.S. government stations in the Radio Amateur Civil Emergency Service, a subservice of Amateur Radio.

You may communicate with any other station that has been authorized by the FCC to communicate with amateur stations (97.89[a]).

Q. What do I do if I receive an FCC Notice of Violation?

A. Simply send a written answer to the FCC office that sent you the notice within 10 days after you received it. If there's a valid reason you can't respond within this 10-day period (illness, for example), send your answer as soon as possible with a brief explanation of the circumstances for the delay.

Give a complete answer — don't refer to other notices or letters. If the problem lies with an electrical or physical condition of your rig, tell the FCC what you have done to correct it. If the fault lies with the operation, explain the steps you have taken to make sure it doesn't happen again (97.137). Failure to respond to FCC Notices of Violation has caused some amateurs to lose their licenses!

Q. May I intentionally interfere with someone else's transmissions?

A. No. Intentional interference is strictly prohibited (97.125).

Q. May I say "mayday" on the air when there's no emergency?

A. No. False signals of any kind are strictly forbidden (97.121).

Q. May I be paid for handling messages via Amateur Radio?

A. No. Communications for hire are strictly prohibited (97.112[a]).

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

*Deputy Manager, Membership Services, ARRL



Operating Overseas — A Brief Tutorial

[Editor's Note: By reviewing and expanding the files, ARRL Hq. has recently improved to a great extent its assistance to U.S. and Canadian amateurs who would like to operate overseas. The following is based on the information provided by Hq.]

Do you need a permit to operate in a country with which the United States holds a reciprocal operating agreement?

Yes, you do, except in the case of Canada. The existence of such an agreement relieves you only from taking an examination for a license and minimizes the paperwork necessary for a permit.

Where do you apply for a permit, and how?

Send a business-size s.a.s.e. to the ARRL Membership Services Department and let them know which country you're planning to visit. You'll be sent instructions on how to apply and (if available) an application form. If sufficient up-to-date information isn't on hand, you will at least receive the address of the licensing administration or the national Amateur Radio society of the country from which information can be obtained. The general ground rules include writing a letter of request for a permit. This should include the purpose of your trip, dates and places of your stay, passport information and the equipment you intend to use. You should also attach a copy of your FCC license and, in some cases, a letter attesting to your character signed by your local chief of police (or equivalent). If a certified copy of your license is required, a notary public should be able to provide you with one if he can compare a photocopy with your original (and is given the phone number of the FCC, 717-337-1212, for Consumer Assistance to obtain confirmation of the validity of the license). If you're a League member and the foreign administration concerned honors this, you may request Hq. to write the appropriate administration attesting to your membership and license. Be sure to provide Hq. with a photocopy of your license and an s.a.s.e.

How is an application fee paid for?

Some administrations charge for permits. It

is best to send a bank check drawn on a bank that does business in the country concerned. Or draw a postal money order, unless otherwise instructed. Personal checks are rarely accepted in foreign countries.

Is it possible to apply on short notice, less than one month in advance of my projected trip?

You may be taking a chance. But if you do, and if you enclose a fee (or if you're sure there is no charge), you should furnish your address in the host country where you would like your permit, if granted, to be mailed. If you're not sure whether or not a fee is charged, you should promise to pay any charge when you pick up the permit upon arrival in that country.

I've applied well in advance, but haven't received a permit. What to do?

Write to or call the administration. If you prefer calling but do not have their telephone number, call their embassy or consulate in the United States and you will be furnished the number.

I don't have a permit, but want to take a transceiver into a foreign country.

In the case of most countries, you cannot take in such equipment without a license or permit. If you've already applied for the permit and expect to pick it up on arrival in the country, show the customs officer a copy of your application. If you intend to apply for a permit later or are just carrying the equipment before or after operating in some other country, show your FCC license (and permit of the other country). This will help you justify carrying communication equipment for a lawful act. It is quite likely, however, that your gear will be held at customs until you obtain a permit or are leaving the country. Do not try to take in any equipment secretly.

I'd like to operate "on the way" (ship or plane). How can I do this?

ARRL Hq. can furnish you information on how to conduct international maritime mobile operation. If your ship isn't of U.S. registry, let ARRL know the nationality. You'll need a

reciprocal-operating permit before you seek the captain's permission. Commercial passenger aircraft transmission isn't allowed.

Is ARRL's information accurate and up-to-date?

In the case of countries that normally license foreign amateurs, ARRL contacts the administrations (or the sister societies) at least every other year to confirm the information on file. Various DX news sources are followed closely to ascertain the current situation on licensing. It isn't possible to be 100% up-to-date, but Hq. does try.

How do I find answers to other questions?

ARRL's Membership Services Department has a list of countries with which the United States shares reciprocal-operating and/or third-party-traffic agreements. Additionally, you can obtain a list of amateur frequencies and subbands outside of the United States. For any information request, please enclose a return stamped-and-addressed envelope and ask either specific questions or for a copy of the general information package.

There are cautions to keep in mind, of course. Inquiries about regulatory matters (privileges, etc.) should be addressed to the administration concerned. Queries about purely amateur matters (repeaters, local clubs, etc.) should go to the national Amateur Radio society. Subjects of general matters (importing a general-coverage receiver, the limit of territorial waters, etc.), should go to the embassy or consulate here in the United States.

While signing an FCC call /MM, /AM or /VE (Canada), you must observe the FCC-authorized portions that are parts of the amateur frequencies of the Region concerned. You must never use the 50-MHz band while cruising the Mediterranean, operate on 24 MHz before FCC releases the band to U.S. licensees, work SSB on 14.110, etc. But, this does not apply when you are authorized by a foreign administration (except Canada) to sign a portable FCC call, such as W1AW/D2A or G4/W1AW. You are then only bound by the rules and regulations of the host country.

Have a good trip!

USSR CALL SIGN REFORM

The February 19, 1984 issue of *Sovetskiy Patriot* contained a fairly comprehensive explanation of the new call sign procedure for Soviet Amateur Radio operators. Several modifications were introduced to increase the reserve of calls and to enhance the possibilities of identifying the popular oblasts, krais and republics. The article by K. Ivanov, Chief, State Telecommunication Inspectorate, Ministry of Communications of the USSR, was brought to our attention with a translation by W4KM (tux Dex1).

A Soviet call sign can be comprised of two letters and a numeral followed by two or three letters. The first letter will always be an R or U. The second letter will now definitely indicate which republic is being operated from: A, N, V, and Z will represent RSFSR (which traditionally has been UA1, 2, 3, 4, 6, 9, 0); B, T and Y, Ukraine (now UB5); C, Byelorussia (UC2); D, Azerbaijan (UD6); F, Georgia (UF6); G, Armenia

(UG6); H, Turkoman (UH8); I, Uzbek (UI8); J, Tadzhik (UJ8); L, Kazakh (UL7); M, Kirghiz (UM8); O, Moldavia (UO5); P, Lithuania (UP2); Q, Latvia (UQ2); R, Estonia (UR2); E, K, S, U and X are not used. The number remains the same for the RSFSR, but in the other republics it will have no significance.

The third letter (the one following the numeral) will indicate the oblast, in combination with the number for the RSFSR. But, for the other republics, this third letter, in combination with the second letter of the call, will indicate the oblast. The fourth letter may be any letter except WXYZ, and will be for club calls in the republics (not the RSFSR). The fifth letter may be anything, or may be absent.

All collective stations (calls beginning with UK) will be replaced by others identifying the union republic. Collectives will be issued six-character calls with the prefix UZ in the RSFSR, and with the regular republic prefix in the other republics. The distinction between individual and collective ones will appear at the end of the suffix. Individual stations will be assigned three-letter suffixes ending in AA to VZ; collectives will be assigned suffixes ending in WA to ZZ.

It will all "come out in the wash," but it is interesting to observe that once the calls have been adjusted to conform to the new system, hams may elect to keep their calls even when they "upgrade." When hams move from one oblast to another, however, call changes (indicating as they will now do a pretty specific area) will become mandatory. These "changed" calls should have begun making their appearance this past May Day.

FRENCH POLYNESIA VACATION/TIURAI CONTEST

WB6GFJ whets the appetite with his flyer on two weeks in Tahiti, a Special Amateur Radio Charter, leaving Los Angeles July 8. At a modest all-inclusive cost, this trip should leave most participants confirmed South Pacific expatriates. If you've the time and modest wherewithal, call Ross Forbes, WB6GFJ/FO0FB, pronto at 415-948-5193.

Ross faithfully reminds one and all of the week-long Tahitian Amateur Radio operating event, coinciding with French Bastille Day activities. Sponsored by CORA, The Radio Club of French Polynesia, it begins

*19620 SW 234 St., Homestead, FL 33031

0000Z July 14 and ends 2359Z July 21. All who work three stations in French Polynesia on at least two different bands will qualify for this year's certificate; you may contact the same station on a different band. Frequencies to check include 28.6, 21.3, 14.240, 14.180, 14.110, 7.09 (listening there and on 7.25) and 3.8. There is a 12 IRC fee for the beautiful certificate. A trophy will also be awarded to continental high scorers. Last year's winners included EA4BVE, KA5GRP, FK8EH and TO8FB. Complete log information goes to Special Tiurai '84 Competition, CORA, B.P. 5006, Pirae, Island of Tahiti, French Polynesia, South Pacific Ocean.

CLIPPERTON

The weekly newsletters have fully covered the 1984 Clipperton Island DXpedition, which ended so disappointingly on March 18. The chartered ship broke down and became becalmed, leaving the group without transportation. After days of attempting alternative arrangements, the crew had to return to their home bases. We share their disappointment, and all want to go on record as thanking them for the noble try. Thanks to W6SZN, N7NG, W6TPH, KK6X, DJ9ZB, F6GXB, F9LX, F08IW, N6BLN, F08GW, F08HL, W6OAT and W6RGG. Additional kudos to W6SZN for the deluge of information received during the critical weeks just ahead of the planned foray.

THE CIRCUIT

□ Like father, like son: In looking over the March Honor Roll listings, N4IR was reminded of what may be a one-of-a-kind situation on the Honor Roll. In any event, certainly worthy of our attention! Right at the 313/329 level is W4JD (father), and right behind at 312/328 is AB4H (son). Dad, Forrest, is a ham of 60+ years, and remains active and enthusiastic. Obviously, he has passed on a great tradition to son Fritz. The Kingsport, Tennessee, hams are understandably proud to know and be associated with these two fine hams.

□ Korea: HL9JT (N2AEW) is located on a mountaintop and works the pileups on 21.030, 21.270-300 almost daily from 2300 to 0200Z. Jeff also works stateside on 14.290 around 1500 to 1800Z. Cards can go via N2AEW, the HL9 Bureau or direct to Jeff Thomas, 275 Signal Co., APO San Francisco 96301. Other active locals are HLIAPR and HLADE. Check Saturdays 0200-0400Z.

□ HARTS Activity Weekend: June 2-3, 0700Z Saturday to 0700 Sunday. V56 stations will be activated all bands/modes, including Oscar 10. Good hunting for credits toward the three Hong Kong Amateur Radio Transmitting Society popular awards (info via Box 541, Hong Kong).

□ AP2MQ: Mansoor notes that cards with U.S. currency do not normally reach him without being intercepted before their ultimate destination. He says 3 IRCs are the only way to prepay return cards. KF8K wonders about the feasibility of a list of countries that do permit money to come in. A more careful way would be to assume no greenbacks, fellows. Send return postage equivalents (IRCs, stamps) only.

□ BVI: Former ARRL Prexy VP2VI, now President of the British Virgin Islands Radio League, notes that the address of the BVI Bureau is Box 653, Road Town, Tortola, BVI.

□ PJ8USA: Several years ago, W1CDC/VP2MM and WA1ZSW made history with the first contacts from Sint Maarten via the then newly launched OSCAR 8. Many contacts were also made via OSCAR 7, HF, and 6 and 2. DXpeditions such as this one involved the movement of 14 pieces of baggage using conventional air carriers, nigh an impossibility today. Catch W1CDC/VP2MM on CW, early mornings.

□ Help! KA2MXO needs routings for CE0DX (June 82), J3ABW, FM7CX, 9J2LG (1983), J28AG (CQWW 1983), 6Y5AM (May 1983), N41J/KX6 (Oct. 1983) and A9XDD (Oct. 1981). NW6L needs 9U5MC Sept. 1961 info and any info on whether anyone picked up W2CTN's longtime QSL assistance service. W1WAI is looking for VP5SMX (Jan. 1982).

□ USQS: A new service permitting cards to USA (no postage or addresses needed) is being heralded by KM7Z. Info from Box 814, Mulino, OR 97042, tel. 503-829-6797.

□ DXCC Accreditation Criteria: Appearing herein, this text verbalizes long-standing practice at the DXCC desk. Check it; it makes good common sense.

□ ZS6: KAIERN had hoped to operate from mid-April to mid-May /ZS6. If you worked Ron, QSL to his home call.

□ FV6PAX: During June, the amateurs of Calvados will man this special-events station, which celebrates the 40th anniversary of the Normandy landing. QSL via F8BO.

□ KG4DX: Cards for this station go to Bill Crews, WB2CPV, Box 43399, Jacksonville, FL 32203.

□ Faroe Island: From June 18-28, OZ1FFG, OZ5DL, OZ5UR and OZ8AE will operate with their calls /OY. CW spots: 1837 3510 7010 14,015 21,015 28,015 (new bands experimentation will take place on 10,100-10,109, 18,070 and 14,900); SSB: 3645 3795 7045 7070 14,210 21,210 and 28,510. RTTY is a possibility.

QSL Corner

Administered By Joan Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

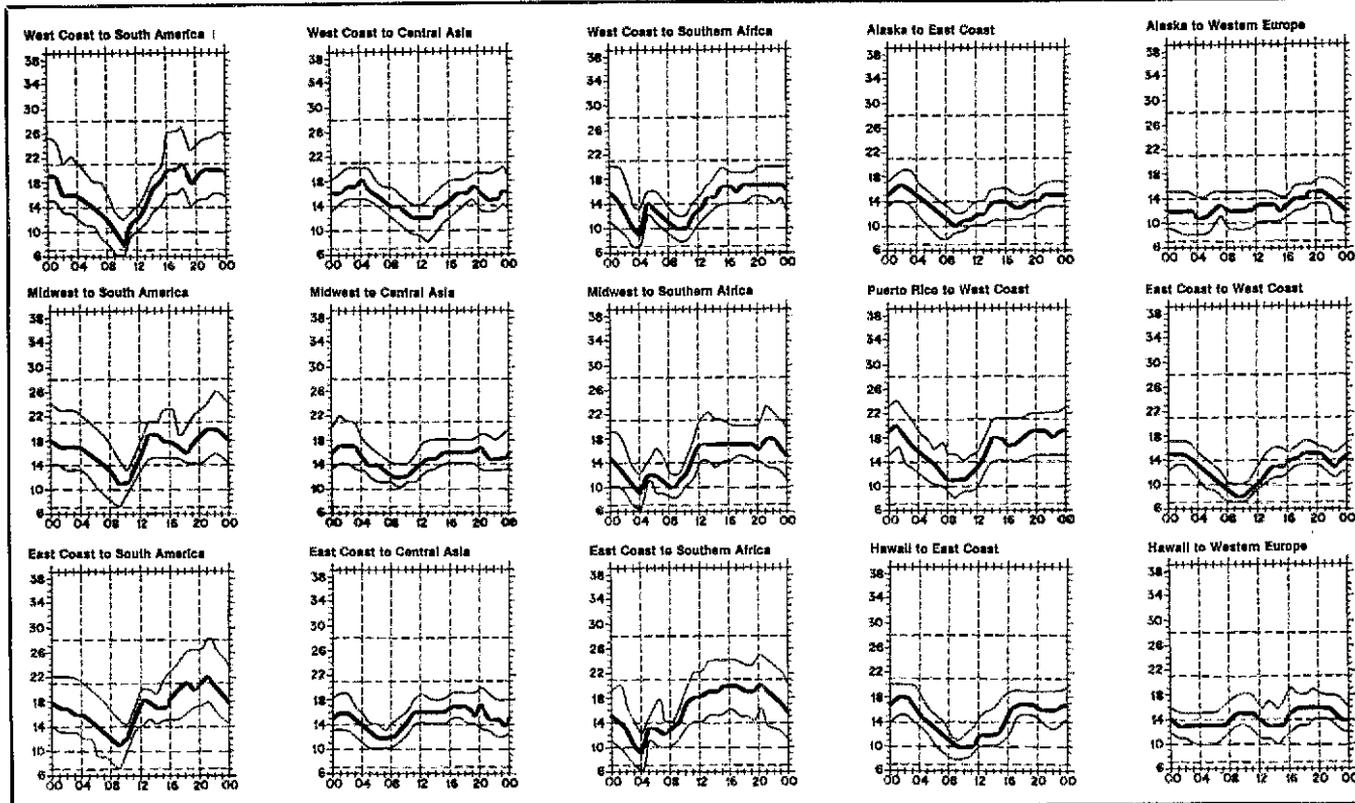
Within the U.S. and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearinghouses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free, and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL Membership Overseas QSL Service. Members send cards to their outgoing bureau, where they are packed aged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an s.a.s.e. for a prompt reply.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

Claiming your QSLs

- 1) Send a 5- x 7 1/2-in s.a.s.e. to the bureau serving your district.
- 2) Neatly print your call sign in the upper left-hand corner of the envelope.
- 3) A preferred way to send envelopes is to affix a 20-cent stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.
- 4) When requesting any information from the bureau serving your district, always include an s.a.s.e. for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of six to eight months, or longer, may take place before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

- Do keep self-addressed 5- x 7 1/2-in envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First Class postage.
- Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.
- Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs is the bureau's biggest problem.
- Do notify the bureau of your new call as you upgrade. Please send envelopes with new call, in addition to envelopes with old call. Please put only one call on an envelope.
- Do include an s.a.s.e. with any information request to the bureau.
- Do notify the bureau in writing if you don't want your cards.
- Do be appreciative of the fine efforts of these volunteers.

DON'Ts

- Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.
- Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in March 1984 QST.)
- Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the WI bureau, not the W2 bureau.

ARRL DX QSL BUREAU SYSTEM

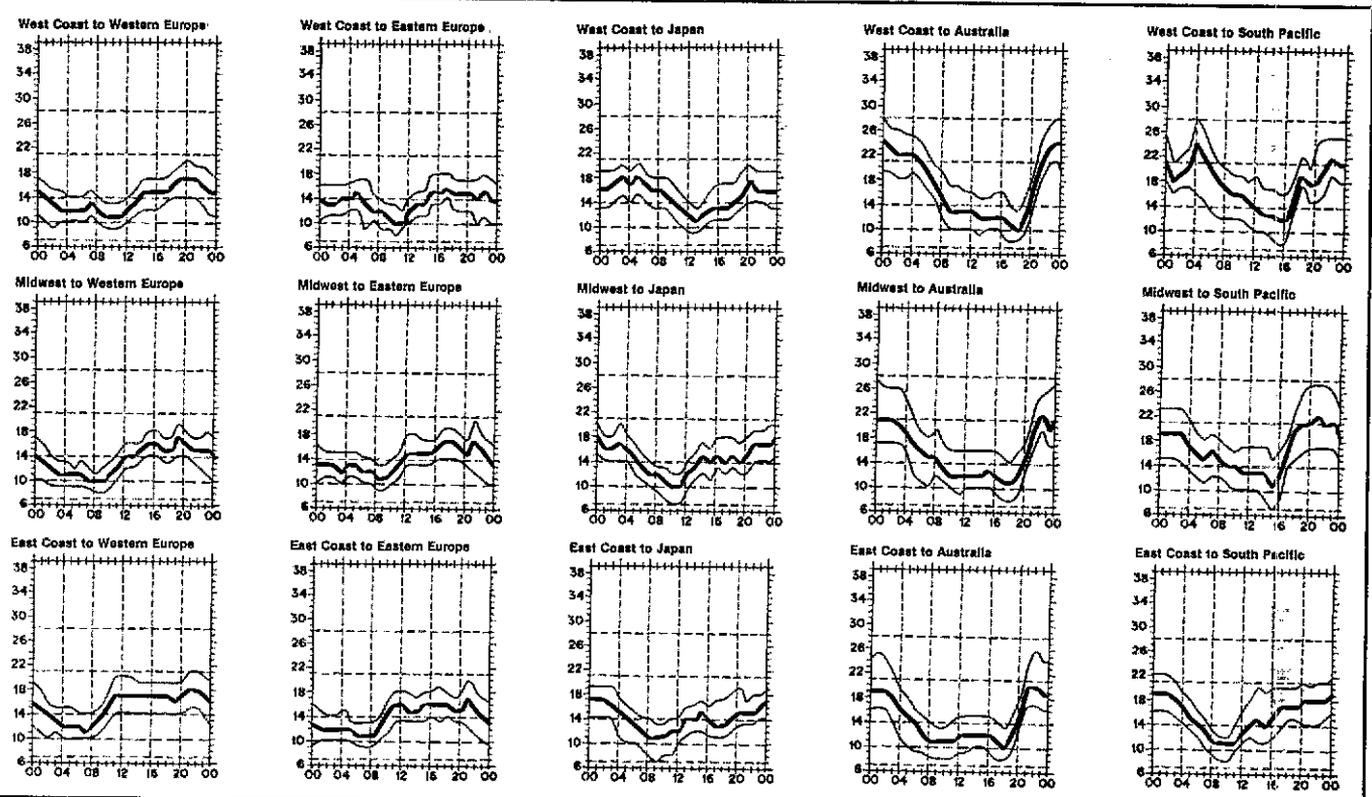
- First Call Area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- Second Call Area: all calls* — NJDXA, P.O. Box 599, Morris Plains, NJ 07950.
- Third Call Area: all calls* — Leon Lapkiewicz, K3GM, P.O. Box 6238, Philadelphia, PA 19136.
- Fourth Call Area: single-letter prefixes — Mecklenburg ARS, P.O. Box DX, Charlotte, NC 28220.
- Fourth Call Area: two-letter prefixes — Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.
- Fifth Call Area: all calls* — ARRL W5 QSL Bureau, P.O. Box 44246, Oklahoma City, OK 73144.
- Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P.O. Box 1460, Sun Valley, CA 91352.
- Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
- Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- Ninth Call Area: all calls* — Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- Zero Call Area: all calls* — W0 QSL Bureau, Ak-Sar-Ben Radio Club, P.O. Box 291, Omaha, NE 68101.
- Puerto Rico: all calls* — Radio Club de Puerto Rico, P.O. Box 1061, San Juan, PR 00902.
- U.S. Virgin Islands: all calls — Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St. Thomas 00801.

- Canal Zone: all calls — LPRRA, P.O. Box 9A-175 Panama 9A, Republic of Panama.
- Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.
- Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.
- Guam: AH2, KH2, WH2 and KG6 calls — MARC, Box 445, Agaña, Guam 96910.
- SWL — Mike Witkowski, WDX9JFT, 4206 Nebel St., Stevens Point, WI 54481.

- QSL Cards for Canada (VE and VO) may be sent to CRRL Central QSL Bureau, Kennebecasis Valley Amateur Radio Club, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual bureaus.
 - VE1* — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS B3J 2T3.
 - VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.
 - VE3 — The Ontario Trilliums, P.O. Box 157, Downsview, ON M3M 3A3.
 - VE4* — Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.
 - VE5 — c/o B. J. Madsen, VE5ADA, 739 Washington Dr., Weyburn, SK S4H 2S4.
 - VE6* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K 0X2.
 - VE7* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.
 - VE8* — Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.
 - VO1, VO2 — CRRL VO QSL Bureau, P.O. Box 6, St. John's, NF A1C 5H5.
 - VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P.O. Box 4597, Whitehorse, YT Y1A 2R8.
- *These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

Special Notes

□ March 1984 QSL Corner, page 65, contains information on the operation of the ARRL Membership Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



lowest curve (optimum traffic frequency, or fof). See April 1983 QST, page 63, January 1977 QST, page 58, September 1977 QST, page 35 and January 1979 QST, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for June 15 to July 15, 1984 assume a sunspot number of 50, which corresponds to a 2800-MHz solar flux of 102.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from March 1 through March 31, 1984. An s.a.s.e will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DF3AO/280 DF3FN/110 DF7KD/113 DK2DE/107 DL2AW/312 DL2GF/129 DL8YBS/105 DU1TV/121 F6FEQ/142	G2DMR/328 G3KMA/343 G4DYO/312 G4KHM/151 GW3MRI/129 JA1CLW/200 JA1EIA/109 JA3APV/182 JE3LZB/114	JH3RNF/105 JA7BE/118 JA7MFL/136 JH7FMJ/286 JA8DIY/129 JA9CXA/321 LA4DM/302 LA5TBA/108 LA5UF/323	LZ1HY/102 OE8NIK/120 OH3RF/202 SM6EAT/106 VK3DFI/105 YU1BEF/135 YU7ORS/185 AQ1I/199 K1FWF/255	K1JIU/106 KB1CH/104 KB1JU/104 W1HJF/234 W1ICH/152 WB1BQJ/101 WB2SZY/107 KA3FB/170 KB3GX/154	KO3N/100 N3BIA/117 K4AOH/108 KA4ZUI/105 KB4IL/288 N4DOF/103 W4BZL/195 W4DTC/107 WA4GOX/102	WA4YOM/284 WB4TAL/192 NE5C/299 NJ5V/102 W5OSH/282 WB5GZQ/103 N6IZM/105 W6MMG/106 KA7BRE/103	W7QN/159 K8ND/210 KC8UH/100 KB8AN/112 N8EQ/202 WB8JM/103 WB8NL/232 KB8NA/120 KC9CZ/103	N9AVY/272 N9BUS/102 N9BXA/105 N9CQB/101 W9HSQ/131 WB9HRC/104 WB9IWN/152 AC8O/104 WA8LLQ/107
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Radiotelephone

DF4TI/109 DL2AW/304 DL8FL/322 G3KMA/327 G3YCW/109 G4HRV/102 HH2WL/109	IK1AIG/131 I8QLI/239 I0ZYA/158 J28DM/176 JA1CLW/176 JR2WGX/101 JR4OPU/103	JH7FMJ/271 JA8DIY/129 JA9CXA/281 LA5TBA/108 OE3WQB/103 OE8NIK/118 OZ8KP/102	TYA11/174 VE3EZU/190 ZD7CW/106 ZL2AQK/103 3X4EX/116 5B4MF/112 K1FWF/242	KA1YK/100 KB1CH/102 W1ICH/149 W1KVM/103 K2APHQ/109 KU2W/101 WA2RTQ/190	KC4LA/102 N4CRI/209 NX4B/159 W4BZL/176 WA4SNU/100 WA4YOM/284 WD4CP6/102	WD4GZI/100 NJ5V/101 K6LM/284 KD8TC/102 W6NOL/137 W6SC/253 W6TUN/108	WD6AFC/108 KA7NLE/102 W7QN/121 K8ND/142 N8CXX/144 WA8RYD/107 KE9C/101	N9AVY/270 N9BUS/101 W9HSQ/129 WA9CYG/110 WB9IWN/103 N8ANJ/229
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CW

DL1CP/105 DL2AW/176 F6FEQ/142 I4YNQ/110	JA1EIA/102 JF1MN/108 JA2JYP/213 JE3LZB/107	JH6XSA/109 JA9CXA/123 LA3BA/103 LA4DM/112	LA5UF/262 LA8CE/153 ZS8BSZ/203 K1ECD/104	K1FWF/116 K1NH/103 W1KEE/105 WA1WTK/103	K2ON/301 WA4PSF/142 K5MC/100 KA5FX/110	KY5B/102 WA5SG/106 K6EID/100 K6LM/280	K6PZ/104 N8QJ/116 W7YAQ/158 K8ND/166	K8TIO/110 KS0U/102 KU8S/102
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RTTY

PY6SL	WB2CJL	W9ZR	W6MI	KA7BDB
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160 Meters

K8MFO	VE1YX	K2DSV	W100	W3AP
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5BDXCC

JA6JPS K5CON UA6AYR UY5OO	KR9O W6HX VE6OU LZ2DP	HZ1AB W9NIO KB5FU F6DCQ	K1FWF J11QPU KC8O K2GBH	K9KU WD9LIC VE7DX	JA8CAK N4BLX N7MW	LA8PT K13L NA4D	DL7MAE UW6DR K8MNG	N2AIF W8RT EA4AXW
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Endorsements

Mixed

CE3GN/300 DF2GD/156 DJ1PT/230 DJI1XT/200 DL1CP/225 DL1ES/310 DL3GJ/152 G4EDG/229 HB9CIR/252 HB9CJX/187 HK3YH/261 JA1QOP/277 JA15VP/307 JH1FDP/265 JA2JYP/291 JH2PYX/267 JJ3AFV/177 JA5NG/291 JH6FQO/278 JA6VA/321 JH6HYC/293 JA8MKZ/293 JA8VHI/228 JW2CF/177 JY5ZM/250 KH6GS/282 LA9GV/306	LA8HC/300 OH3TQ/284 OK1AWH/179 OK3YEB/177 ON7EJ/301 OZ1FAQ/240 K13L/289 SM6BNV/264 SM5AQD/309 SM7BY/307 SM7IDF/229 SM7MS/345 SM8BSB/135 SM8BZH/300 SM8KRN/182 VE1CAW/252 VE3EZU/200 VE3JGC/173 XE1XF/273 YU1GTU/284 YU3DQ/295 YU3SE/227 YU3VM/280 ZP5CE/314 ZS10OU/319 5R8AL/127 9Y4VU/310 K1AA/171	K1AP/303 K1KO/260 K1MM/315 K1NLC/145 K1RIH/290 K1ILA/158 KB1BE/280 KB1ER/130 N3QV/179 KE1K/261 KJ1NN/139 KM1E/225 W1ENE/291 W1FOV/133 W1RED/318 W1SF/200 W1TPK/305 W1VW/250 K2GBH/228 K2ON/301 K2POF/153 K2ZRS/126 N2AMS/251 N2AG/152 W2FGY/310 W2HJ/309 W2QJT/232	W2AJ3/15 WA2CWP/200 WB2CJL/281 WB2LBJ/308 K13N/288 KA3DDT/250 K13L/289 KB3KV/291 N3QV/179 W3ACE/313 W3BZN/285 W3QLW/310 WA3DMH/282 WB3EFQ/231 AA4AR/310 AC4U/225 AK4N/293 K4BIY/293 K4DHJ/143 K4GFH/270 K4NYV/302 K4PR/266 K4QMU/262 K4SE/306 K4UWH/293 K4CMC/126	KB4FQ/299 KC4DY/290 KE4AP/238 KT4G/302 N4AVV/299 N4CRI/234 N4DAZ/287 N4ENX/105 N4FYF/165 N4IQ/137 N4IQ/314 N4NX/315 N4TL/262 N4VG/294 N4VZ/315 NE4G/254 N4ML/263 NN4Q/300 W4BV/120 W4EJH/257 W4FNS/249 W4MAF/274 W4RXT/280 W4TK/321 W4UJH/153 W4VWW/288	WA4JZS/219 WA4KFF/127 WA4VDE/310 WB4AGH/190 WC4K/184 WD4CBA/228 WJ4T/230 WX4A/305 AI5I/302 K5PC/132 K5CT/200 K5RE/303 K5MB/273 K5MD/266 KUSL/232 KW5E/124 N5BA/257 N5IH/297 N5JR/120 N5P/200 K5PWG/181 W5ZPA/111 WB5PLD/260 WB5SSD/301 WB5YCD/272 AA8AA/310	K6HHD/299 KB6U/207 KM6B/315 KT6T/264 N6OJ/310 N6OZ/298 NG6W/234 NN6W/192 W6CS/313 K5MC/132 K6PC/200 K5RE/303 K6DMB/273 K6MD/266 KUSL/232 KW5E/124 N5BA/257 N5IH/297 N5JR/120 N5P/200 K5PWG/181 W5ZPA/111 WB5PLD/260 WB5SSD/301 KA7V/150 KB7QC/267 KB7QD/226	KC7GO/181 KC7JO/261 KX7J/252 N7AIF/230 N7MC/309 NB7Q/220 W7HR/305 W7UZA/320 W7YAQ/223 W8GO/315 W8GYM/259 W8MJ/321 W8NL/232 W8NOL/151 WA8IUM/305 WA8TLA/315 WB6RSE/249 WB6VRE/170 WB6WKM/270 K7AII/276 K7FSN/305 KA7KIS/200 KA7V/150 KB7QC/267 KB7QD/226	WD8NVA/239 K9HA/302 K9MF/306 K9RHY/241 KB9I/279 KC9JP/300 W9ZWH/311 W9EIZ/260 W9ZWH/311 WA9AZL/309 WA9OVL/270 WB9HIP/300 WB9PHQ/290 WB9YX/1310 KC8CF/272 KC8QT/251 KC8XB/181 KN8CO/300 KN8R/290 W7TE/301 K7Y6A/276 N8CXX/159 N8MC/304 W8GE/294 W8QX/307 W8UJ/267 WA8HFN/303 WA8VDC/294
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Radiotelephone

CE3GN/300 CX4BW/203 DF2GD/156 DF3AO/275 DF4PL/270 DJ1HN/202 DJ1JE/225 DJ1YH/155 DJ5JH/292 DK2XZ/267 DL6NX/316 DL8JUI/317 EA6GP/200 F9PFD/126 F5RV/305 G3DOG/311 G3JAS/228 G3ZAY/317 G4DYO/310 HB9CJX/160 HFNX/311 I1JQ/275 I2JSB/284 IN3AN/300 I4BAC/312 I4C6P/262 I7IEH/249	I8OLK/322 I8RIZ/297 J13PD/147 JA1PCY/305 JH1EIG/322 JH2JKV/309 JA2JYP/289 JFA2XT/163 JH2PYX/266 JA5NG/276 JH5FOO/278 JA8BVU/300 JA7BSJ/311 JA8MKZ/273 LA8GV/305 OE1PC/300 G3JAS/228 OZ7OP/322 PT2BW/317 PT2LS/211 PY2GD/303 PY2TM/308 PY2MT/296 PY6CN/314 SL8ZG/204 SM5AQB/324 SM5AQD/308	SM6CTQ/291 SM6VRI/321 SM7BYP/299 SM7IDF/165 SM7CS/260 TB8DJ/213 VE4OX/320 XE1LCH/284 XE1XF/269 Y3AZC/287 W2LSU/316 W2LBOQ/280 ZP5CE/311 ZP5MJO/232 LA8GV/305 OE1PC/300 ON7EJ/297 OZ7OP/322 PT2BW/317 PT2LS/211 PY2GD/303 PY2TM/308 PY2MT/296 PY6CN/314 SL8ZG/204 SM5AQB/324 SM5AQD/308	K2AGJ/309 K2DSV/309 K2KEV/326 KB2TN/126 KC2EB/126 KC2RS/200 KS2C/139 N2LM/308 W2FGY/310 W2LZX/308 W2PSU/311 W2REH/257 W2SM/299 W2SY/321 WB2DND/290 K3UA/305 KB3H/150 KB3K/291 K13L/274 KM3N/155 N3AKD/226 W3ACE/310 W3EYF/270 W3WFM/150 AA4AR/309 AK4T/282 K4CEF/315	K4NJS/307 K4SE/302 K4UEE/276 KB4QF/298 KB4QR/127 KC4DY/289 KE4AR/310 KF4L/278 KN4H/292 KT4G/299 N4AVV/297 N4BYU/287 N4ENX/162 N4FYF/161 N4NX/310 N4TL/252 N4VG/294 N4ZC/319 NA4M/315 NN4Q/292 N5JR/281 N5JW/314 NE5C/299 NG5L/263 WSJME/300 W6MUG/307 W5OSH/282	WA4UJH/151 WA4UNP/292 WA4WMQ/296 WA4JTI/313 WB4XJ/231 WA4PLR/293 WA4VDE/308 WB4QNP/306 WD4HVE/124 WJ4T/230 K5CT/255 K5KR/311 K5OR/314 K5PC/157 K5SIN/262 K5YCP/312 NG6W/169 W6GO/312 W6GYM/259 W6HXW/306 W6LH/300 W6NLG/290 W6OMR/310 W6SNT/245 W6TXL/311 WA6FPB/306	W5VJP/312 W5VT/282 W5ZKQ/211 WASZJ/287 WB5SD/294 WB5SVV/248 AA6AA/309 AA6BB/252 K6HHD/294 K6PZ/317 K6RK/301 K6SMF/316 K6MB/313 KT6T/263 N6MU/312 N6OJ/278 NG6W/169 W6GO/312 W6GYM/259 W6HXW/306 W6LH/300 W6NLG/290 W6OMR/310 W6SNT/245 W6TXL/311 WA6FPB/306	WA8IUM/305 WA8LFN/277 WB6SE/272 K7LJA/280 K7OXB/312 K7RLS/297 K7SP/307 KC7GO/181 KC7JO/261 KC7TO/290 KC7XB/131 KQ7U/204 KQ8V/230 W7EDA/259 W7JXP/176 W7OM/320 W7TE/301 W8YV/258 K8IY/258 K8TL/304 K8VY/296 K8WOW/242 K8ZC/300 K8CQT/245 K8QX/180 KN8CO/260	KN8R/290 NE8Q/202 W8MAK/150 W8SET/309 W8UVZ/285 WA8HFN/298 WB8NVA/239 AB9E/300 K9FY/310 K9HA/301 K9KU/300 K9MF/291 K9OV/302 KB9I/273 KC9JP/299 W9ABM/315 W9DMH/305 W9RY/309 W9ZWH/301 WB9HIP/298 WB9IWN/152 K8CF/272 K8Z/270 KY8A/235 N8AFW/256 N8LZ/300
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CW

CX4LO/222
DJ5JH/270
F3AT/304
HA8UB/224
HH2VP/226
HSBU/278
JA1BW/290
JA1BWA/301
JA1GQ/250
JA1NTK/190
JA1PCY/233
JA1SVP/199
JH1EIG/276

JH1IFS/294
JH1NMQ/280
JA2AAQ/230
JH27PI/154
JA3BQE/297
JA3CMD/237
JA3MNP/280
JJ3AFV/130
JA8BSM/301
JA8VU/274
JA8VA/268
JH6HYC/275
JA7JT/231

JA8RII/158
OH3RF/177
OK1MG/287
ON7EJ/297
OZ1ABA/185
OZ1FAO/230
OZ7OP/271
PT2ACZ/176
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W2LZX/287
K3UA/290
K13L/252
W3EKN/285
W3EYF/287
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K4MG/189
K4PB/125
K4SE/294
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N4MM/300
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N6AN/262
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N56C/284
W6GO/292
W6JI/287
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W7YF/156
K8IP/246
K8NW/302
K8PYD/293
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W8UVZ/302

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K9HA/138
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K9MFI/285
K9VAL/200
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K8IP/246
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W9RY/289
W9ZR/302
K8ZZ/237
W8BW/300
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DXCC Notes

With the concurrence of the DX Advisory Committee, the ARRL Awards Committee has adopted the following Accreditation Criteria to be incorporated into the DXCC Rules:

DXCC Accreditation Criteria

During the course of more than 40 years of DXCC administration, standards have evolved in the acceptance of confirmations for DXCC credit. These criteria codify longstanding practice. The intent is to assure that DXCC credit is given only for contacts with operations that are conducted appropriately in two respects: (1)

properly licensed; (2) physically present in the country to be credited. The following points should be of particular interest to DXpeditions: (1) The vast majority of operations are accredited routinely without any requirement for submission of documents. (2) In some instances, especially DXpeditions and in countries that previously have evidenced some reluctance to license amateur stations, or allow access, authenticating documents may be requested for review prior to accreditation. Such supporting documents could include the following: (a) Photocopy of license or operating authorization. (b) For amateurs foreign to the country, photocopy of passport entry and exit stamps. (c)

For offshore islands, a landing permit and/or signed statement of the transporting ship's captain showing all pertinent data (dates, etc.). (d) For some locations where special permission is known to be required to gain access legally, evidence of this permission having been given may be required. The purpose of these accreditation requirements is to: (1) preserve the program's continued integrity; and (2) ensure that the DXCC program does not encourage amateurs "to bend the rules" in their enthusiasm, thus jeopardizing the future development of Amateur Radio. Every effort will be made to apply these criteria in a uniform manner in conformity with these objectives.

APPROVED APRIL 3, 1984

Honor Roll

The DXCC Honor Roll is comprised of those call signs which have been credited with at least 306 of the 315 current countries on the DXCC list. Total DXCC credits given, including deleted countries, are shown after each call sign. The large, boldface numbers indicate total DXCC credits not including deleted countries.

MIXED

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DL3BK/353
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DL9OH/352
F9RM/350
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GW3AHN/380
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I79ZGY/356

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JA1BRK/344
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OH2BZ/342
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OH5UQ/341
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PY2PA/342
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K2TQC/348
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W2AYJ/359
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W2BMK/352
W2BOK/357
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W2QKM/359
W2QH/361
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W2TQC/354
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W3AFM/354
W3CWG/357
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W3EUV/361
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W3GRS/353
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K4LNM/355
K4PDV/358
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W6ONZ/352
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W6RJ/344
W6RG/341
W6REH/347
W6QNM/350

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W6YA/346
W6ZM/351
WA6OET/340
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W7CB/335
W7DX/349
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W6KUT/359
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EA3NC/322
EA3OJ/319
G3JH/318
I2DEZ/326
I2ZGG/314
I3ADU/321
I8ACB/313
LJ1BR/320
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UA1CK/337
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O4AOS/331
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PY2CY/335
PY2ED/329
PY3CB/331
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SM0AJU/338
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D19ZB/326
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EA4DQ/333
F6I/332
F9IE/332
G3JEC/334
G5AFA/329
I2YBO/341
F3DJ/346
G3NLY/336
G3UML/336
H1APQ/328
I1RBJ/334
I2LAG/331
I2LPA/325
IV3PRK/325
I6FLD/344
I7HJ/329
I9J7/334
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K4BBF/331
K4PDV/340
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ON5NT/309
K3FN/309
N4RJ/310
W6FT/311
K9QV/308

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OZ1LO/308
SM3EVR/308
SM0AJU/308
K4XO/306
K5UR/308
W9ZM/307
N8RF/307

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DJ2BW/307
DL8AN/306
JA1JK/309
JABJL/306
K1MM/305
N5JR/305

300

W4VQ/305
WB6RSE/304

CW

309
K2TQC/313
K6GA/316
W9KNI/317

308

N4WW/316
307
W8AHJ/313
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DL6EN/312
K2FL/310
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K4PI/311
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304

ON5NT/309
K3FN/309
N4RJ/310
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W1NG/307
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DJ2BW/307
DL8AN/306
JA1JK/309
JABJL/306
K1MM/305
N5JR/305

300

W4VQ/305
WB6RSE/304

K8CW/306

K8WW/305
W9WP/306
300
W4VQ/305
WB6RSE/304

6 Meters — Will Its Wonders Ever Cease? What's Ahead For It and the Higher Bands?

Almost everyone who follows the vicissitudes of 6 meters, including this conductor, have been dumbstruck by what the band has been doing for many parts of the world during the early weeks of spring 1984. It is now almost four-and-a-half years since the officially declared peak of Cycle 21 in December 1979. By all rights, we should be experiencing a pronounced downturn in long-haul propagation. Indeed, the lack of any openings for the Eastern part of the U.S. in November and December 1983 appeared to signal the end of the kind of conditions that many had come to regard as "normal."

The cause for the negative results during those months, which are usually the best for the eastern part of the country, along with some idea of why things were so good this spring, can be gleaned from the accompanying graph, constructed from data contained in the weekly NOAA publication *Preliminary Report and Forecast of Solar Geophysical Data*. Observe that both the International Sunspot Count and the 10.7-cm radio flux took a steep dive during the last few months of 1983 and then climbed again as the new year got underway. Nor should the effect of geomagnetic activity be overlooked. A number of disturbed periods were in evidence during the period with many accompanying auroras. North-south 6-meter openings following such conditions have been noted on numerous occasions.

At this time last year, these pages carried reports of "good" South American openings from the Southern tier of states. Now, another year past the peak of the Cycle, conditions rival any of the best springs during the years when we might have expected super DX. For details of these momentous events, see the 50-MHz section that follows.

Nor is the excitement over. As you read this, we are entering the golden time of the year for 6 meters and, indeed, all of the bands above 50 MHz. Even as I type these lines, in early April, a number of sporadic E openings have already been reported. Undoubtedly, they have been instrumental in tying much of the Northern and Eastern parts of the country into the fantastic long-haul propagation that has been taking place over the past few weeks. Even without linking up with F₂ or TE, or whatever has been

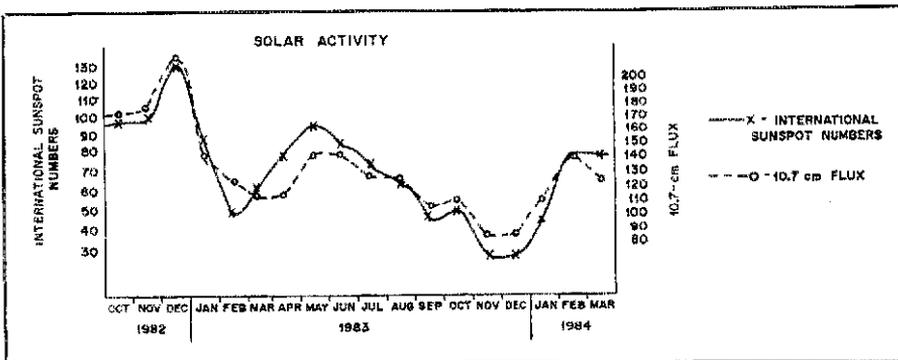


Fig. 1 — Solar activity measured by the International Sunspot number and 10.7-cm radio flux. (from NOAA's Preliminary Report and Forecast of Solar Geophysical Data)

causing these wild conditions, E_s is not to be sneezed at.

Each summer since 1977 we have been treated to some very-long-haul propagation, which is most likely attributable to the E layer. There were the West Coast openings to Japan first reported by WB6NMT and other 6s in early June of that year, as well as the almost annual East Coast contacts into KH6. In the past several years, we have also seen several openings to Gibraltar and the Azores. Certainly, northern South America is worked quite frequently during the summer months. And I need not remind anyone who got in on it of the contacts made with TT9 last year as a result of W6JKV's trip to that nearly uninhabited dot in the Pacific. Jim's 1984 destination is expected to be Greenland, where he plans to operate June 19-26. From there, he should be able to provide most of the U.S. and Canada with a new country. He also says he will be on from some exotic place during the June QSO Party. There are certain to be several other DXpeditions, as well as increasing resident activity in nearby interesting places.

Neither should E_s be considered a 6-meter-only propagation mode. Each year, we witness a number of very exciting 144-MHz E-layer openings. These have often included DX contacts in excess of 1600 miles, with some approaching 2000 miles. So far, I have yet to hear

of a confirmed transcontinental contact, although there have been a number of rumors to that effect. Maybe this will be the year for one or more coast-to-coast contacts. There have been several instances of fleeting 1¼-meter E_s openings, but no two-way QSOs as yet. Could that jinx become a thing of the past before this summer is out?

Sporadic E is not the only game in town. The next few months usually offer the utmost in thrills on all of our VHF and UHF bands with a variety of propagation modes. The warm season of the year brings with it enhanced tropo in many parts of the country. There are several excellent meteor showers, including the "granddaddy" of them all, the mid-August Perseids. If you have never tried the "ping mode," this is the best time to take the plunge. And, of course, there are usually a few good auroras to add additional spice. They are most prevalent during the declining phase of the solar cycle, so take advantage of the "buzz mode" while you can. In a few years, people will be writing in inquiring, "What happened to aurora?"

If you haven't been active on the bands above 50 MHz recently, or if you have never ventured into this part of the spectrum other than via 2-meter FM repeaters, now is the time to get going. You will find excitement and a fine group of hams waiting to welcome you.

MISCELLANEOUS

□ The ARRL Communications Department, which administers League awards, has announced that due to popular demand all VUCC certificates will be serial numbered by band and dated. By now, all of those who have already received a VUCC award should have been sent a replacement.

□ Two new publications aimed at VHFers have been announced. One, the *VHF Trading Post*, is produced by KC0W. It contains articles for VHFers, net and sked news, and a classified section featuring equipment of particular interest to those who inhabit the bands above 50 MHz. Subscription is \$3 per year for 12 issues. Address is 1420 East Sweet Ave., Bismarck, ND 58501.

The other, to be put out by KB7Q, is *The 2 Meter EME Bulletin*. Subscription cost is stated as \$12 per year. For more information, write to 417 Staudacher St., Bozeman, MT 59715.

□ NOAA announces a color slide set of 52 aurora photographs taken by satellite. Cost for the complete set is \$100, but groups of photos are also available for as little as \$15. For further information, contact the National Geophysical Data Center, Solar Terrestrial Physics Division (E/GC2), 325 Broadway, Boulder, CO 80303.

ON THE BANDS

50 MHz — Mere words on a printed page fail to describe the momentous events that have been transpiring on 6 meters over this report period. They are, however, the only vehicle available that can provide widespread dissemination and form a permanent record of the events that will be discussed whenever those interested in 50-MHz propagation

gather for years to come; so, here goes!

K5ZMS SMIRK No. 1 provides a great deal of the information on what has been taking place. Ray's first report for the mid-March to mid-April period is dated March 20. At 0440 he notes LLs and HC2FG with signals of up to S9-plus 20 dB into his San Antonio QTH. This was a continuation of the DX reported last month, and while tantalizing, is particularly not earth shattering. The originator of this column, WH1DQ, writes from his new home in Spring Hill, Florida, that he got in on the fun working LU8YYO and LU2WM March 18. On the 25th, beginning about 2000Z, Ed QSOed LU8YYO again, along with LU1YBV and TG9NX. The following day, he worked LU8YYO again, and added LU7DZ and LU8DIO. During the March 27 meeting of the regular Tuesday evening East Coast 6 Meter Net (2359Z, 3821 kHz), WSDZF/4 in Miami told this conductor that LLs had been in every day for the past few weeks and that the previous evening had produced an opening to TG9NX and YSIECB, along with LUs and XEs. One of the big sur-

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

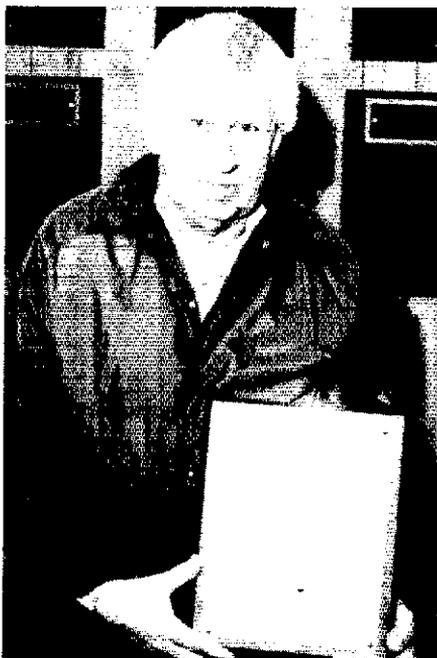
prises came on the 29th when the eastern and northern areas of the country got in the act, too. N4MM Virginia reported working LUs 7DZ, 9AEA, 8YYO, 4DGN, 8DIO and 8AHW between 2120 and 2245Z. Fellow Virginian WA4UAF hooked up with LU4DGN and WB4WTC, also of the Old Dominion, and worked that station plus LU9AEA and LU7DZ. W4CKD in the Washington, DC suburbs also contacted the LUs and added a new country in the form of CE4FMQ. Bob had to resort to FM to snag that one. W3WFM north of Baltimore joined in the festivities, logging LU8YYO and LU9AEA. Another who has been having great fun working the South Americans is K5SW Oklahoma. Sam says that he has been using Spanish, and feels it gives him an edge over the crowd.

As exciting as the South American DX had been, it was only a prelude to what was to come! The first word of really exotic DX came from K5ZMS on March 31. Ray called to report that between 2100 and 2230Z that afternoon, neighbor WA5YX had worked five ZLs: 1AKW, 1MQ, 1BHV, 2AQR and 2FL. It is interesting to note that no ZLs had been worked from the San Antonio area during the spring of 1983. The opening continued into the evening, with XE1s OT, GE and FE in at S9-plus 20 dB at 0025Z April 1. Even more surprising, beginning about 0200Z KH6IAA was received with very strong signals and, "believe it or not," VK2DDG was heard working WA5HNK in Houston. K5ZMS and WA5YX, later that evening, worked the VK for a new country for Ray. Ray notes that the Pacific stations, although never really strong, did not disappear until 0410Z, over seven hours from when the band opened. The West Coast was also being treated to some rare DX, with W6XJ reportedly working many Pacific stations, including FK8EB. Nor was this apparently the first South Pacific opening into the U.S. for the spring of 1984. K5ZMS reported that on March 29 at 2240Z, WA4UAS in Florida completed a two-way with VK2BA. Another Florida station, K4QXX, took good advantage of the South American opening April 1. Along with many LUs and HC2FG, P. B. landed ZP5XDW for a new country. ZP5XDW has been putting quite a few Southern U.S. stations into his log of late, and has become convinced that he can work something on 6 meters. I think we may find Doug on hand to provide Paraguay to many in the months and years to come.

The next major spurt of DX erupted April 5, with KITOL Maine working LU1DZ during an aurora. Lefty told this conductor and KA1PE (who were in QSO at the time) about his accomplishment, but neither of us was able to hear any LUs. It should be noted that there was considerable magnetic activity on many of the days in which exotic DX was being worked. From south Florida, WB4OSN reported QSOs with VK2BA as well as ZL7OY Chatham April 6. Also on the 6th, WA6JRA lists a contact with YJ8RC New Hebrides, and notes hearing VK4LM, FK8EB and ZL7OY. The following day, Sam worked ZL8AFH Kermadec, ZL7OY, FK8EB New Caledonia and VK2FNK. On the 8th, he heard many of the same stations plus VK2DDG and several VK beacons in the 50.100 to 50.110 area. It sure helps to have many of the VKs now able to operate the low end of the band. Nor was the DX on the 6th confined to the southern and western parts of the country. K8EFS Michigan says he worked CE4BQO and CE4ETZ, and heard several LUs April 6. Andy also relays word from TG9NX, via an 80-meter QSO, that he worked some 30 U.S. stations that afternoon, mostly 4s, 5s and 9s.

K5ZMS's report for the 6th says that ZL2KT worked PJ2DW at 51 MHz, after the ZL was forced to QSY because of TV operation. Ray also noted the YJ8RG reported hearing WB4NMA in Georgia, but said that no QSO resulted, apparently because of QRM around 50.110. He laments that many QSOs were apparently lost that great evening because of widespread operation of U.S. stations working each other via E, in the low end of the phone portion of the band. W4CKD makes a similar comment, noting in particular one outstanding and longtime VHFer who was working U.S. stations on the frequency being used by a rare DX catch. Please, fellows and gals: When you finish working a DX station, get off the frequency and give others a chance. Sometimes the DX lasts only a minute or two. A long-winded QSO with a rare station or a follow-on contact with a U.S. station who may call you could ruin an opportunity for many others. Move well off the frequency, preferably above 50.130. And let's use that frequency, or higher, for domestic QSOs. Better yet, start from the domestic calling frequency of 50.2 and QSY up and down from there. In the DX portion of the band, around 50.1, call CQ sparingly, especially when you know the band is open. Few of our CQs are answered by DX stations. Most such contacts result from us calling the DX station. Instead of making lots of noise when the band is open, spend time carefully listening for the weak signals that may be there. If conditions are anything like those of April 6, you might be rewarded with a YJ8 or a VK contact!

Most of the reports of the Pacific area DX and some



When well-known VHF/UHFer Fred Fish, W5FF, of Edgewood, New Mexico, earns another operating award, he takes it seriously. As he was in South Carolina at the time, he drove "a little farther north" to Newington to pick up 220-MHz WAS awards nos. 4 and 5 for K5FF and himself.

of the South Americans involve quite-weak signals. Six meters doesn't always produce S9-plus 20-dB signals. Most of the stations with the good DX totals are those who are willing to dig.

One who was obviously looking beneath the top layer for the DX stations is NØLL Smith Center, Kansas. On the 6th, around 2340Z, Larry worked LU8BF, LU3EX and LU8AHW. An hour later, at 0130Z on the 7th, he added LU8YYO and LU1YBV. The next evening at 2340Z he contacted LU8MBL plus CE3DZ, CE3OK and CE4ETZ. These were followed quickly at the beginning of the new GMT day with T12HL and, at 0027, the piece de resistance, ZK2RS Niue.

K5FF reports that April 8 finally brought the ZLs into the Albuquerque area. Lee said that she and OM Fred, W5FF, had been having great fun working the South Americans and KH6IAA, but the rarer DX had eluded them prior to this. She writes that Fred worked ZL2AQR and ZL2KT at 2030Z. Then, at 2200Z, ZL7OY came in for 14 minutes, long enough for both of them to QSO him and alert K5EWF, who snagged the new country as well. On the 11th, K5ZMS reported PY3AK, PY3BAM and PP5WL, along with CX4BA, V3FB, YS1ECB and a bunch of LUs, into San Antonio beginning about 1920Z. The next day, it was the LUs again, along with XE1OT, with signals appearing as early as 1615Z. Ray's final report for this period has KH6IAA working a KP4 at 0200Z April 12. W4CKD lists QSOs with PP5WL, CE4BQO and CE4ETZ, beginning about 2130Z on the 11th. Bob also heard several other PYs and LUs.

It certainly has been a month to remember!

2 Meters — WA1JXN's DXpedition to the Bahamas furnishes the principal 2-meter news this month. During his stay, April 4-9, when his preamp went west, Lance worked 65 different stations via EME, including 24 U.S. states and 17 countries. He also had many tropo QSOs with Florida stations and an m.s. contact with Puerto Rico. The antenna used consisted of four of the new KLM 16LBX Yagis, using the recently announced Beldon 9913 coax for the phasing sections and the 80-foot feed line required. WA1JXN/C6A operated from Grid FL16, which represented a new field for all of the stations worked via moonbounce and a new grid for many of the tropo stations. Lance says that much of the equipment has been left there, as he intends to make other trips to C6A in the future.

Aurora provided some fun during the month between mid-March and mid-April, although few reports have been turned in. NØLL Smith Center, Kansas, when he wasn't busy logging new countries on 6 meters, caught a good buzz session the evening of April 8/9. Larry says that between 2330 and 0140Z, he completed 12 QSOs. W5FIDL sends along some suggestions on how to



The EME array at W5RCI consisting of eight 13-element homebrew Yagis.

get more out of the E, that should be underway about the time these lines are being read. He advises us to avoid the 144.2 calling frequency once it is known the band is open. Pick a frequency removed from that spot to call CQ or, better still, search for a DX station calling CQ or concluding a contact. Once you have worked a station you have called, move to another frequency to call CQ, or resume your scanning of the band. Above all, use common courtesy. This conductor believes that these are good rules for any band; if followed, they should be especially helpful in alleviating the terrible QRM that develops around 144.2 during E Skip openings.

The Higher Bands — All of the news for this part of the spectrum this month concerns moonbounce, and comes from K2UYH's *432 and Above EME News*. Even more new countries are showing up on 70-cm EME, according to the April issue of the newsletter. All notes that the latest are some familiar calls, CT1WW and PY2BJO. CT1WW is said to be fully operational with an eight-Yagi array, and is looking for skeds. PY2BJO is hampered by being able to operate only when the moon is higher than 45 degrees. This, of course, requires a southern declination. He is also limited so far to manually aiming his dish. Despite these limitations, Junior apparently has an excellent signal. Other new countries that have been active recently include LA1K, EA2BK and UB5GBY. VP9IB is almost ready to go, but is having some difficulty with salt water getting into his baluns.

Ever notice how The World Above 30 MHz is beginning to sound like Ellen White's (How's DX?) column? This merely reflects the fact the VHF and UHF are no longer limited to local communication.

W7GBI has been experimenting with circular polarization on 70 cm. The technique is standard on 23 cm, but has not been exploited on the lower bands. So far, Charlie's results have been encouraging. His own echoes are much stronger and more consistent than before.

GRIDS OR SECTIONS?

What is your opinion as to whether grids or ARRL Sections should be used as multipliers in ARRL VHF contests? Should grids be used in some or all? Please express your feelings when you send in your log for the June VHF QSO Party. Log forms may be obtained from Hq. for an s.a.s.e.

Strays

QST congratulates...

Bill Watson, KDSYO, of Boswell, Oklahoma, on being chosen Boswell Teacher of the Year.

Ralph A. Haller, N4RH, on being named Chief of the Technical and International Branch of the Mass Media Bureau's Policy and Rules Division, FCC.

I would like to get in touch with...

amateurs using sophisticated RTTY programs. John A. Palese, WB9JPH/5, 314 Cedar Bend Dr., Midwest City, OK 73130.

Col. Ron Martin, W6ZF: aka Brass Pounder

As Ronald G. Martin, U.S. Air Force, Ret., describes it, "My life began in Amateur Radio." That was nearly 70 years ago, at age 9, when an illness confined him to bed for a long period of time. "The only thing my parents could find to keep me quiet was a telegraph sounder and key connected to a battery under my bed." His Dad knew the old landline Morse code, so he taught it to Ron at about 25 WPM. By age 11, he had become proficient enough in the international Morse code to breeze through that part of the test for his amateur license. On his 12th birthday, Ron received his first Amateur Radio call letters, 9HW.

In 1925, Ron entered the maritime service as a shipboard wireless operator, which he says "sharpened my operating skills and prepared me for greater challenges in radio communication." Three years later, he began an eight-year association with KUP, the press radio station for the San Francisco Examiner. There, he was witness to many historic events, one of which was Admiral Byrd's expedition to the South Pole. "We handled 1½ million words of traffic for the Byrd expedition. It was an experience never to be forgotten." Other memorable events include Sir Hubert Wilkins's expedition to Antarctica and the flights of the Southern Cross and the China Clipper, both aviation firsts.

In 1936, Ron left KUP to work for the Pacific Telephone Company, where he stayed until U.S. entry into WW II. Because of his radio and telephone communication experience, Ron was commissioned a first lieutenant direct from civilian life and assigned to the fledgling Army Airwaves Communications System. His first assignment was as coordinator between the AACS and communications equipment manufacturers. "It didn't take me too long to find out that transmitters and receivers used by Amateur Radio operators were a lot better than what the military was buying." As a result, AACS started many radio station operators using equipment purchased from amateurs.

After WW II, Ron left active duty but remained in the Air Force Reserves. For the next 21 years, all but one of his assignments was with communications. Also, he helped establish the Air Force Military Affiliate Radio System, and was on the first MARS advisory board at the Pentagon.

In 1967, he retired as a colonel from the Air Force to his home in Napa, California, where he remains very active in many amateur organizations and on the air, as W6ZF. (special thanks to Major Carl Freeman, WA4AQW, for supplying the biographical material)

QST: At an early age you were quite adept at CW. To what do you attribute your skill in this mode?

Martin: I honestly believe it is because I learned the landline Morse at such an early age and became extremely proficient in it before learning the international Morse code. The forming of mere dot and dash characters was secondary, and the letters and numerals were learned to the point that they were actual formed characters. Pride in my fist was foremost in my mind at all times. And practice. I would sit for hours and send items from the newspaper, putting in all the punctuation, spaces and the words. It paid off in many ways.

QST: Getting your amateur license seems to have paved the way for a career in radio communications. Did Amateur Radio help your career in any other ways?

Martin: My amateur license paved the way for everything that has happened in the communications field in my life. It took me into commercial radio, and it also brought my commission in the old Army Air Corps and brought me into the AACS, known today as the Air Force Communications Command. Although my reporting and handling of Byrd's and Wilkins's traffic was handled at KUP, ham radio was the very foundation for it all. In my off hours at KUP, I listened to both WFA and KDZ on 8 Mc. at 6AYC (Berkeley, CA) or on my other station, 6ARD, in San Francisco. I did this, too, to monitor my operators at KUP. Also, I worked the Southern Cross, KHAB, by ham radio.

QST: How did Amateur Radio help you with your duties with the AACS?

Martin: I think the greatest asset we had in the AACS were the radio amateurs. Since I understood their language and they understood mine, it was a natural for me to fit right in with them. Very little training had to be done with



One of the many things Ron Martin, W6ZF, enjoys doing in his retirement is rebuilding old Amateur Radio equipment, like this 1924 100-W tuned-plate, tuned-grid, self-rectifying transmitter. Somehow, Ron also finds time to write and lecture on various amateur matters, be a member of several organizations, and split his operating time between two stations at his QTH. (photo courtesy San Francisco Examiner)

most of the amateurs in AACS because of the wealth of knowledge acquired by every ham from their association in Amateur Radio prior to going into the service. This instilled a confidence amongst us in working together.

QST: In what ways were you involved with starting the Air Force MARS program after WW II?

Martin: At the insistence of Gen. Farman, I took his place on the MARS Advisory Board Com-

mittee at the Pentagon. MARS was formed to create a backup corps of trained radio communicators for the new Air Force. It was totally supported by the Air Force, and a Chief of MARS was assigned to oversee its administration, operation, etc.

The one thing I remember so well is the changing of the name Military Amateur Radio System. Many foreign countries did not sanction Amateur Radio operation, and they certainly protested the use of the word "Amateur" in MARS. At a meeting of the Board at the Pentagon, considerable discussion took place to find a suitable replacement. Ed Handy, then ARRL Communications Manager, and I always sat together at the Board meetings. After listening to all of the wrangling on the subject, both of us said in unison, "How about the word 'affiliate'?" No further discussion took place, and a vote was taken immediately in the affirmative for unanimous approval.

The Air Force MARS of today is certainly a far cry from the MARS operation of yesteryear. Now, there is SSB and RTTY, VHF repeaters for local distribution of traffic, etc. We didn't have all of that in the old days.

QST: You've said that MARS, which normally handles traffic between military personnel stationed overseas and their families stateside, is one of the best communications services available to the Air Force in times of disaster. Can you elaborate?

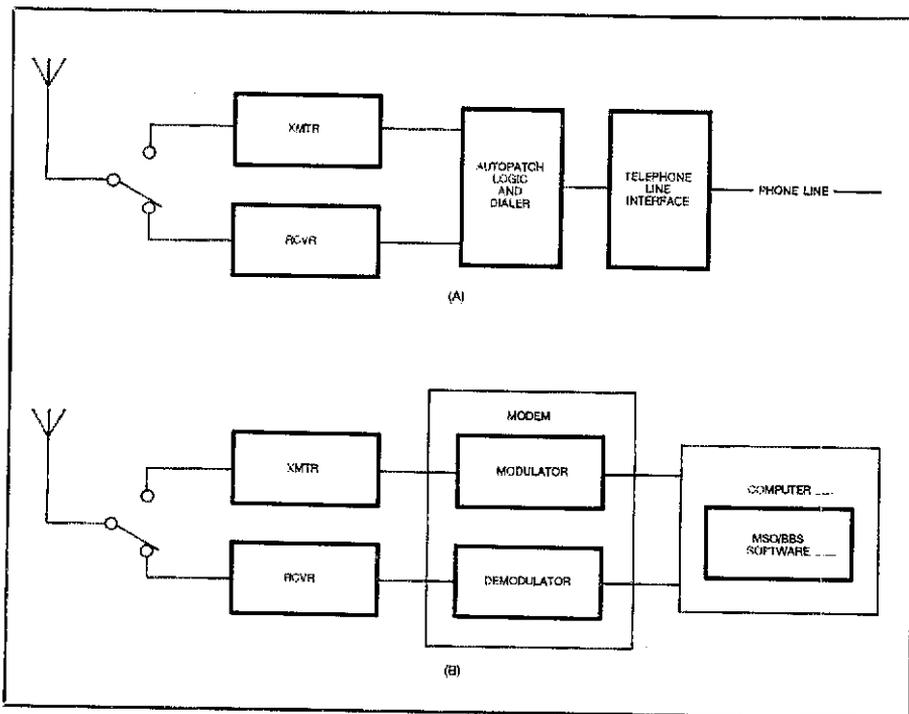
Martin: This is my opinion from a long association with the MARS program. In time of national disaster, the Air Force will have to play its own important part in the overall program. This will take people away from the MARS assignments. It is here that the affiliates can play a very important role — carry on the disaster communications at the Base MARS level. Where else can one find a fully trained operator to relieve a regular MARS operator? A base commander is fortunate if he has a MARS station with affiliates available to help him in times of need. □

Digital Repeater Coordination

The Michigan Area Repeater Council (MARC) recently voted to reserve two frequencies in the 2-meter band for packet radio use. The March issue of the MARC newsletter states that other frequencies for digital repeater operation "may be allocated as needed later." [A digital repeater is a system that receives, stores and retransmits digital information on a single frequency; most packet radio terminal node controllers (TNCs) are capable of operating as digital repeaters. — Ed.]

Packet stations operated as repeaters must be operated within the repeater subbands and are subject to frequency coordination to conform with good amateur practice (as defined by the FCC). These stations may be operated by "automatic control," without a control operator on duty at a control point, provided procedures and devices are employed to safeguard the proper operation of the station. A station controlled automatically must operate just as properly as one with the control operator at the control point.

If you are a packet radio operator, is your digital repeater operation coordinated by your area frequency coordinator? Perhaps you or the coordinator don't feel digital repeater operation requires coordination. Packet radio is starting to grow by leaps and bounds, so now is the time to resolve this issue. I will provide space in this column to serve as a forum, so if you are a digital repeater operator, frequency coordinator or a concerned ham, send your opinion to me at the address listed at the bottom of this page.



A digital repeater, a simplex autopatch (A) and an MSO/BBS (B) have two things in common: They all operate on a single frequency, and they all are discussed in this installment of FM/RPT. A block diagram of a digital repeater system appears in March 1983 QST, page 71.

THE SIMPATCH: TWO VIEWS

At their March 26-27 meeting, the ARRL Board of Directors directed its Executive Committee to initiate a study on the legality, propriety of use and suitability for QST advertising of simplex autopatches. [A simplex autopatch is a device that provides automatic, hands-off telephone communications via a radio transceiver (the autopatch). Since telephone communications is a half-duplex operation, the simplex autopatch either transmits or receives at any one time (unlike a repeater, which transmits and receives simultaneously), and therefore requires only one frequency to function (simplex operation) — Ed.]

On one side are those who feel a device that has no other function except to provide telephone communications has no place in our hobby. Such a device is open to abuse and does nothing to improve the state of the art of radio communications, they maintain. On the other side are those who argue that the simplex autopatch is a very valuable piece of equipment. In times of disaster or emergency, its portability allows it to provide telephone communications where none exists.

If you have a beef with simplex autopatches, or if you are an ardent supporter, now is the time to state your viewpoint on the matter. Write to the Executive Committee c/o ARRL Hq. and speak your mind.

COORDINATION AND GOOD AMATEUR PRACTICE, CONTINUED

Some readers thought I went a little overboard last year when I said that the FCC considered uncoordinated repeaters as not operating in good amateur practice. For example, one reader opined that he rejected my "liberal interpretation" of the opinion of the FCC's Jim McKinney "... to mean that a repeater 'uncoordinated' is at risk should some other repeater appear coordinated on that frequency." Well, read (and weep) the following excerpt of an item that appeared in the March 29 issue of *The ARRL Letter*:

"The action took place in San Diego ... around 2 repeaters separated by 30 miles. One was operating with the blessing of the repeater coordinator while the other had filed for coordination.

"After several months of correspondence with the system licensee, the FCC San Diego Office determined that the uncoordinated repeater was, in their view, the cause of the interference to the coordinated system and sent a letter to the trustee that ordered the uncoordinated system off the air. The trustee complied, but then sent a letter to the Commission requesting clarification as to what authority it had to take this stand. In response, Carol P. Foelak of the Compliance Branch of the Special Services Division, wrote the individual stating 'when repeaters interfere with each other, the Commission must resolve the problem. When an uncoordinated repeater interferes with a coordinated repeater, the conflict is resolved in favor of the coordinated repeater.' As a basis for this decision, she referred to an April 1983 opinion paper authored by Jim McKinney ... Similar enforcement is now expected shortly in several other northern California and northeastern United States cases."

MICHIGAN FREQUENCY COORDINATOR UPDATE

The current frequency coordinator for the state of Michigan is John L. Hackman, WB4VVA. His address is 3934 Hunter's Ridge-No. 4, Lansing, MI 48910. All other names and addresses for the Michigan coordinator are no longer valid.

I welcome all frequency coordinators to send updates to this column. This is the place where they should appear, and I promise that if you send me an update, I will include it in the next installment of FM/RPT. [Notify Hq., too, so the *Repeater Directory* can be kept up to date. — Ed.]

ANOTHER BIG APPLE MACHINE

A new Message Storage Operation (MSO) system has been established in the New York City metropolitan area by Lenny, N2CKA. The MSO operates on 145.68 MHz at 100-WPM Baudot and uses the standard DS3100 format. The system is accessed by sending

MSOCKA. HELP brings up a list of commands, and EXIT will deactivate the system. All amateurs who can access the MSO are encouraged to leave bulletins, items of interest or electronic mail in the system. — N2EO

PL'd TAILS

The following is excerpted from a letter sent by J. A. Wolos of Springfield, Massachusetts:

"One problem that I recently tripped across when I tied a 2-meter transceiver to the 220 repeater as a remote base function was the fact that New England repeaters do not drop output when input drops, which causes a remote base to timeout when the 2-meter radio is on a repeater output frequency! A possible solution would be for repeaters to have a PL tone on the repeater tail that would reset the remote base timers. Since 100.0 Hz is the accepted PL tone for open machines, it might be the frequency to use. PL during repeater identification might also be a way of suppressing the ID of a repeater being accessed via a remote base and its controlling repeater."

NEW ENGLAND 2-METER LIST

A free list of the 2-meter repeaters of Central New England is available from Tim Morrill, NIAPQ, for an s.a.s.e. to him at Box 14, Sandown, NH 03873.

REPEATER LOG

According to reports received between January 10 and April 10, repeaters were involved in the following public service events: 22 weather emergencies, 2 crimes, 5 medical emergencies, 368 vehicular emergencies, 11 fires, 2 search & rescues, 11 public safety events, 60 drills/alerts and 3 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 32, W2ODV 5, K2QIJ 4, WB2RUH 3, W2VL 69, WA2ZWP 8, N3BFL 19, VE3TTT 7, W3UER 12, W4BWS 14, W4HBB 2, N4IXA 7, WB4PGH 2, WB4QES 102, WA4SWF 2, KH6AH 1, WD6AWP 12, W6GNS 5, KH6HHG 4, WB6OQS 10, W6RHC 7, W7EX 116, W7HSG 1, K7OMR 8, K8DDG 15, WA8EFK 3, WB8HSN 5, WD8IEL 12, WA8ULB 4, N9RD 2, K0SCM 1.

*75 Kreger Dr., Wolcott, CT 06716



CRRL Officers and Directors

President: Thomas B. J. Atkins, VE3CDM
Vice President and Secretary: Harry MacLean, VE3GRO

CRRL Box 7009, Station E, London, ON N5Y 4J9, Tel. 519-451-3773
CRRL Outgoing QSL Bureau, Box 113, Rothesay, NB E0G 2W0

Honorary Vice President: Noel B. Eaton, VE3CJ

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Gentlemen's Agreement

Are you a gentleman? (Perhaps in your case, you are a gentlewoman. In this article, however, the masculine will include the feminine, as the lawyers would say.) We hope so, because all of us may be asked to prove it within two years. CRRL recently received a letter from DOC that read in part:

You will be interested to know that we are considering removing most if not all of the present sub-band restrictions contained in the Regulations. To that end, we expect to publish a notice in the *Canada Gazette, Part 1*, in the relatively near future, inviting the comments of amateurs and other interested persons on such a proposal. In the normal course of events, this project may be completed by 1986.

Removal of subband restrictions: That would permit Canadian amateurs to operate CW, phone or RTTY anywhere on their bands, subject only to band plans worked out by their national organizations and "gentlemen's agreement." This would certainly be a comprehensive solution to recent U.S. phone-band expansion on 20 metres and imminent U.S. phone-band expansion on 10, 15 and 80 metres, but it could also create more problems than it might solve. When asked about such an arrangement on last year's CRRL Survey, 14% of the 3016 amateurs who responded said "yes," 67% said "no" and 19% were "not sure." Now, however, perhaps because of U.S. phone-band expansion, reactions seem more mixed. Whatever, amateurs

are going to have to give the DOC proposals lots of thought and give their organizations lots of input. Just to start things rolling, here's one letter we received on the subject. The amateur who wrote it is shy and retiring, and asked that we not publish his name. So we won't.

One of the most frustrating experiences over the years has been the continual drive to expand our phone subbands just after U.S. amateurs expand theirs. I can personally remember several moves by U.S. amateurs that precipitated a corresponding move in Canada: In 1953, when U.S. amateurs moved from 3850 to 3800 kHz (that's when ARRL Canadian Director Alex Reid, VE2BE, sat on 3800 kHz and took a straw vote to see what Canadian amateurs should do); in 1960, when they moved from 14,300 to 14,350 kHz; in 1972, when they moved from 3800 to 3775 kHz; and recently, when they moved from 14,200 to 14,150 kHz. Soon, there will be more expansion, in the 10, 15 and 80 metre bands.

There is no question that U.S. amateurs need more space to operate phone, especially on 80 metres. A casual run through the top 200 kHz of that band tells the story. Our "Canadian" 50 kHz looks like a desert in comparison. But when expansions come, why do we Canadians continually put ourselves through the torture of figuring out the next step? The answer is so simple: Eliminate all the phone subbands in Canada and just run phone by "gentlemen's agreement."

After the 1960 U.S. expansion, the Department of Transport, the licensing authority at the time, circulated a card to every Canadian amateur asking what should be done with Canadian phone bands. The last entry on the card was a suggestion that subbands be removed. In other words, CW, phone and RTTY would be legal anywhere on the bands as long as sidebands remained within band

limits. It seemed so sensible. I was an instant convert to the doctrine.

To understand the reason for having subbands, we must go back to the '20s. Many experiments on the shortwave bands were being carried out by amateurs. A perennial problem was an amateur phone station interrupting a transatlantic telephone call, a radio broadcast or some other commercial service. To combat this, phone subbands were introduced. They were placed in the centre of amateur bands. CW was used as a "buffer." Since then, however, technology has advanced. The need for this kind of protection for commercial services has long ago disappeared.

The other reason for having subbands was the so-called incompatibility of modes. When double-sideband with carrier phone (that's AM, for you "oldies") was king, the large bandwidth and ever-present carrier did detract from CW operation. CW would also spoil phone operation because of the large bandwidth needed to sustain phone reception. But with the smaller bandwidths of SSB phone and the other modes, incompatibility problems have been reduced to the point where they are practically nonexistent.

Nearly all of us have lived with subbands ever since we received our certificates. Outside of North America, however, most jurisdictions do not specify subbands for amateur phone operation. Amateurs operate their various modes subject only to "gentlemen's agreement." Surely, as intelligent adults, we too can work out reasonable arrangements to enjoy what we do without need for subbands. The time for change has come.

Well, that's one amateur's opinion. You may agree or disagree. Obviously, he's done some careful thinking about it and has taken the time to put his thoughts on paper. Now it's your turn.

CRRL NEWS

CRRL President/ARRL Canadian Director Tom Atkins, VE3CDM, represented Canadian amateurs at the ARRL Board Meeting, held in Hartford, Connecticut, on March 26-27. Two items on the agenda were of particular interest to Canadian amateurs. In the future, Canadian League members will no longer elect their ARRL Director and Vice Director directly. They will elect a CRRL President and Secretary, who automatically become ARRL Canadian Director and Vice Director. The elections will be conducted wholly in Canada. Provisions were also made for Canadian Amateur Radio clubs to affiliate with CRRL rather than ARRL. CRRL will be developing an affiliated-club program this year.

□ Congratulations to Noel Eaton, VE3CJ, who was recently elected Director Emeritus of ARRL. Noel served as ARRL Canadian Director from 1960 to 1974, and as ARRL Vice President and IARU President from 1974 until his retirement in 1980.

□ CARF, the Canadian Amateur Radio Federation, has decided to drop its application to register the trademark CARL, which stands for Canadian Amateur Radio League. CRRL had opposed the registration on the grounds that it would cause unnecessary confusion among radio amateurs. This is good news, not in the sense that it is any kind of victory for anyone, but because it will make it a whole lot easier for CRRL and CARF to work together. CARF did ask CRRL to clarify one point: apparently their application did not

involve a diamond logo, as reported in various CRRL Board Minutes.

□ Al West, VE3UT, and Art Stark, VE3ZS, represented CRRL and CARF at a meeting of RABC, the Radio Advisory Board of Canada, held in Toronto on April 4. Both took the position that the standards outlined in BP-23 (Broadcast Procedures 23) should be the minimum standards for leakage of signals from cable television systems, at least for the present. Meanwhile, in Vancouver, no word on the outcome of amateur interventions in the license renewal of a local cable company. The amateurs had asked CRTC, the Canadian Radio-television and Telecommunications Commission, not to renew the company's licence until the company had met the standards in BP-23 and ceased interfering with amateur operation on the 2-metre band.

DOC NEWS

□ CRRL and CARF have received identical letters from DOC, thanking them for their joint input on TRC-24 and for their work in revising the DOC questions bank. DOC is now asking the organizations to improve the questions bank by supplying additional questions. Do you have suggestions for good questions? If so, send them to CRRL or CARF — no matter which. Everyone will be working together on this project in preparation for another one of those joint DOC-CRRL-CARF meetings to be held this fall.

□ DOC has advised CRRL that an amendment to the Radio Regulations that would remove all power restrictions on the 160-metre band was sent to the Privy Council Office on March 21. Unfortunately, the Privy Council Office is working against a five-month backlog. No changes will be possible until September. In the U.S., FCC removed all power restrictions on the 160-metre band on March 28.

TELECONFERENCE RADIO NET

"Multiband, Broadband and Frequency-Independent Antennas — An Overview" is the topic of discussion for this month's North American Teleconference Radio Net, to be held Thursday evening, June 21, at 2030 EDT (that's next day 0630 UTC). Speaker will be Dr. John Belrose, VE2CV, of Alymer, Quebec. John is Director of Communications at DOC's Communication Research Centre in Ottawa, an ARRL Technical Advisor, and author of numerous fine antenna articles in *QST*, *Ham Radio* and *TCA*. His talk was arranged on behalf of all Canadian amateurs by CRRL. Want to link in your repeater and take part? You can, from anywhere in Canada. Contact Net Manager Rick Whiting, W0TN, at 4749 Diane Dr., Minnetonka, MN 55343, USA.

NOTES FROM ALL OVER

□ Ted Reinhardt, VE2FWE, appears to be the first Canadian amateur to legally transmit on the 18-MHz WARC band. Ted was given special permission to conduct tests on 18.073 and 24.895 MHz, two hours a day, on April 12-15. It is not yet known if this permission was the individual initiative of a regional DOC office, or in response to a recent CRRL request that DOC allow certain amateurs to conduct tests on spot frequencies in the not-yet-available 18- and 24.5-MHz bands, to permit them to take part in the ARRL Antenna Design Competition.

□ Prefix hunters, take note. To commemorate the bicentennial of their province, Ontario amateurs will be able to use the special prefix X03 throughout July. To commemorate local events, Yellowknife amateurs will be able to use the prefix CJ8 from June 23 to July 6, and Cornwall amateurs will be able to use XK3 from July 14 to July 29.

*163 Meridene Crescent West, London, ON
N5X 1G3, Tel. 519-433-1198



President: Richard L. Baldwin, W1RU
Vice President: Leonard M. Nathanson, W8RC
Secretary: David Sumner, K1ZZ
Assistant to the Secretary: Naoki Akiyama, JH1VRQ/N1CIX

Regional Secretaries:
John Allaway, G3FKM
Secretary, IARU Region 1
10 Knightlow Rd.
Birmingham B17 8QB
England

Alberto Shalo, HK3DEU
Secretary, IARU Region 2
9 Sidney Lanier Ln.
Greenwich, CT 06830
USA

Masayoshi Fujioka, JM1UXU
Secretary, IARU Region 3 Association
P.O. Box 73, Tushima
Tokyo 170-91
Japan

The International Amateur Radio Union — since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

European Radiotelegraphy Championship

As an event marking World Communications Year, the first European Radiotelegraphy Championship was held during December 3-9, 1983. Sponsored by the E. T. Krenkel Central Radio Club of Moscow and under the auspices of IARU Region 1, this was the first opportunity that European radio amateurs have had to demonstrate their skills in this sort of contest.

The rules of the contest stipulated that each country field a team consisting of an adult male, an adult female, a boy and a girl. For this first radiotelegraphy championship, teams were fielded from the following five countries: the People's Republic of Bulgaria, the Hungarian People's Republic, the Socialist Republic of Romania, the Czechoslovak Socialist Republic and the USSR. The championship was supervised by the jury headed by Eric Godsmark, G5CO, then secretary of IARU Region 1. The panel of judges was headed by At. T. Razumov, UV3EE. Chief of the E. T. Krenkel Central Radio Club is Vladimir M. Bondarenko, UV3BW.

There were two contests — compulsory and high speed. The compulsory program required the reception of five mixed-text messages (letters, numerals, punctuation marks) and the reception of five open English text messages limited in

speed, plus the sending of two messages, one in mixed text and the other in plain English. Each competitor was to receive either all five messages or else register the highest speed in receiving one message. The competitor copying the highest speed received 100 points.

The high-speed contest included the receiving and sending of letter and numeral messages with no limit in speed. The competitor who achieved the highest speed scored 100 points, and the scores of other competitors were based on a percentage of their speeds to that of the top speed.

When the dust had settled, the winner in the compulsory program was Stanislav Selenov (USSR), with second place going to T. Kaikiev (Bulgaria) and third to G. Kympanu (Romania). Among the women, E. Sviridovitch (USSR) was first followed by J. Mana (Romania) and M. Farbiakova (Czechoslovakia).

The Soviet competitors dominated the high-speed event, probably because of their emphasis on high-speed telegraphy and many national contests. Male winner was S. Selenov, who received letters-only copy at 320 marks/min (about 64 WPM) and numbers-only copy at 400 marks/min. Female winner was E. Sviridovitch, copying letters-only at 170 marks/min.

The Soviet team won the team classification,

followed by Romania and Bulgaria; while the title of absolute European champion went to USSR competitors Stanislav Selenov (male) and Elena Sviridovitch (female). The absolute winners in the junior category were Oleg Besubov and Elvira Arutkina (both USSR).

A well-organized contest, excellent hospitality, fair judging, a friendly atmosphere and a high skill of competition laid down a solid basis for future European Championships, at which it is hoped there will be an even greater number of enthusiastic competitors.

HONG KONG ACTIVITY WEEKEND

Looking for a VS6 contact? The Hong Kong Amateur Radio Transmitting Society (HARTS) will hold its Activity Weekend in June, from 0700Z Saturday, June 2, to 0700Z Sunday, June 3. All bands, all modes, including OSCAR 10. This is a good opportunity to make contacts valid toward the three awards issued by HARTS. Catch 22 requires at least 15 contacts with countries located on the 22nd parallel of latitude (one of these must be VS6). Fee \$7. *Nine Dragons* requires a QSO in each of zones 18, 19 and 24-30. Fee \$3. The *Fire Cracker Award* requires six QSOs with different VS6 stations. Fee \$2. HARTS address is P.O. Box 541, Hong Kong.

JAPAN

As of the end of March 1983 (a whole year ago!), the number of licensed Amateur Radio stations in Japan was listed as over 550,000.

*President, IARU

Contest Corral

Conducted by Edith Holsopple,* N1CZC



A Roundup of Upcoming Operating Events

JUNE

2

New York QSO Party, see May *QST*, page 104, for details.

5

West Coast Qualifying Run, 10-35 WPM, at 0400Z June 6 (9 P.M. PDT June 5). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

9

W1AW Qualifying Run, 10-40 WPM, at 0200Z June 10 (10 P.M. EDT June 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See June 5 listing for more details.

9-10

VHF QSO Party, see May *QST*, page 100, for rules.

*Communications Assistant, ARRL

World Wide South America Contest, see May *QST*, page 104, for more details.

16-17

Summer SMIRK Party, sponsored by the Six Meter International Radio Klub from 0000Z June 16 until 2400Z June 17. 50 MHz only. No crossband or one-way QSOs. Single operator only. Exchange SMIRK number and QTH (ARRL Section for U.S. stations, country or province for others). Count 2 points for each QSO with a SMIRK member, 1 point for non-SMIRK QSOs. Multipliers are as follows: ARRL sections in the 48 contiguous states; KH6 and KL7; Washington, DC; VE provinces; foreign states, provinces, prefectures or countries. Entries must be submitted on official forms, available for s.a.s.e. from sponsor. Mail logs by July 8 to Mark S. Anderson, WB5NPK, 8932 Saddle Trail, San Antonio, TX 78255.

9-Land CW Contest, sponsored by the Joliet ARS, from 1700Z June 16 until 1700Z June 17. Everyone works everyone. Work stations once per band. Entry classes: single op, single transmitter; multiop, single transmitter; multiop portable, one or two transmitters. Exchange serial number and QTH (state for W stations, province for VE stations, country name for others). Suggested frequencies: 1.805 and 60 kHz up from lower band edges of 80, 40, 20, 15 and 10 meters. Novices: 25 kHz up from lower band edges. Count 2 points per 9-land QSO (IL/IN/WD), 1 point for others. Multiply

by total states/provinces/countries worked. Take one additional bonus multiplier for each group of 20 9-land stations worked. Awards. Mail logs by July 21 (include large s.a.s.e. for results) to Paula Franke, WB9TBU, P.O. Box 873, Beecher, IL 60401.

All Asian DX Contest, phone, sponsored by the Japan Amateur Radio League, from 0000Z June 16 until 2400Z June 17. (CW contest will be August 25-26). 160 through 10 meters. Entry classes: single op, single band; single op, multiband; multiop, multiband. W/VE call CQ AA. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Multiops may have a maximum of one signal per band. Exchange signal report and a two-digit number denoting the operator's age. YL stations may send 00. Count 1 point per QSO with Asian stations on 7 through 28 MHz, 2 points on 3.5 MHz and 3 points on 1.9 MHz. Multiply by the number of different Asian prefixes (WPX Rules) worked per band. Note: only JD1 stations on Ogasawara count for Asia; contacts with KA stations do not count (they are considered military rather than amateur). Use separate logs for each band. Mark multipliers the first time worked. Provide a complete summary. JARL Asian Countries list: A4 A5 A6 A7 A9 AP BV BY CR9 EP HL/HM HS HZ/7Z JA-JS JD1 JT JY OD S2 TA UA9-UA0 UD6 UF6 UG6 UH8 UI8 UJ8 UL7 UM8 VS6 VS9M/8Q VU XU XV 3W XW XZ YA YI YK ZC4/SB4 IS 4S 4W 4X 70 9K 9M2 9N 9V and Abu Ail. Enclose s.a.e. and IRC for results.

Mail logs to arrive by Sept. 30 (Nov. 30 for CW) to JARL, POB 377, Tokyo Central, Japan.

23-24

Field Day, see May QST, page 99, for rules. Please note: Field Day is the last full weekend in June.

26

WIAW Qualifying Run, 10-35 WPM, at 1300Z (9 A.M. EDT). See June 5 and 9 listings for more details.

July

1

Canada Day Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z-2400Z July 1. Everybody works everybody. 160-2 meters phone and CW. Entry classes: single op, all band; single op, single band; multiop, single transmitter; QRP. Work stations once per band and mode. No crossmode contacts. CW QSOs in CW parts of the bands only. Exchange signal report and serial number starting with 001. VE1 stations must also send their province. Count 10 points per VE QSO, 1 point for others. 10 point bonus for any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band (VO1/VO2 VE1-PE1 VE1-NB VE1-NS VE2 VE3 VE4 VE5 VE6 VE7 VE8 VY1). Suggested frequencies: 1.810 1.840 3.525 3.770 7.025 7.070 14.025 14.150 21.025 21.250

28.025 28.500 50.040 50.110 144.090 146.520 MHz. Suggest phone on the even and CW on the odd hours UTC. Mail logs within 30 days (include s.a.s.e. or s.a.e./IRC for results) to CARF-Contests, POB 2172, Stn D, Ottawa, ON K1P 5W4 Canada.

4

West Coast Qualifying Run, 10-35 WPM, at 0400Z July 5 (9 P.M. PDT July 4). See June 5 listing for more details.

7-8

Venezuelan World Wide Contest, phone, sponsored by the Radio Club Venezolano, from 0000Z July 7 until 2400Z July 8 (CW July 28-29). 80 through 10 meters. Entry classes: single op, single band; single op, multi-band; multiop, single transmitter; multiop, multi transmitter. Exchange signal report and 3-digit serial number. Count 2 points per QSO. Contacts between stations in the same country count for multiplier credit but not for QSO points. Multiply by the total DXCC countries, W/K and YV call areas worked per band. Mail logs by August 15 (Sept. 15 for CW) and include U.S. \$2 or IRC equivalent for results to RCV, POB 2285, Caracas 1010-A, Venezuela.

13-15

SSTV-DX Contest, sponsored by *A5 Magazine*. Contact Mike Stone, WB0QCD, POB H, Lowden, IA 52255-0408, for details.

14-15

IARU Radiosport Championship, May QST, page 89.

14-21

Le Trophee du Tiurai Contest, sponsored by Club Oceanien de Radio et d'Astronomie, from 0000Z July 14 until 2400Z July 21. Stations outside French Polynesia work FO8/θ stations only; single op, multi-band, mixed mode. No cross-mode QSOs. FO8/θ stations send RS(T) plus serial number, others send RS(T) plus CQ Zone. Count 1 point for each QSO with FO8/θ and multiply by the total of FO8/θ stations worked on each band. Work each station once per band/mode. Trophy. Submit log and summary sheet by October 31 to CORA, POB 5006, Pirae, Tahiti, French Polynesia.

15

WIAW Qualifying Run, 35-10 WPM, at 0200Z July 16 (10 P.M. EDT July 15). See June 5 and 9 listings for more details.

21-22

QRP Summer Contest
Seonet Worldwide DX Contest, CW
Colombian Independence Contest

25

WIAW Qualifying Run

Special Events

Conducted By Edith Holsopple,* N1CZC

Lewiston, Idaho: The Lewis-Clark ARC will operate W7VJD during the NAIA World's Collegiate Baseball Tournament from 0200Z June 1, from 1600Z June 2 and from 1600Z June 3. Frequencies: phone — 3.940 7.235 14.270; CW — 7.125 14.130. QSL via Dan Wenstrom, WB7BQV, 630 Stewart, Lewiston, ID 83501.

Portsmouth, England: GB4ODD will be activated in conjunction with a rally of historic military vehicles to commemorate the invasion of Europe on D-Day, 6 June 1944. Operation will take place June 2-3, CW and phone, on 80, 40, 20, 10 and 2 meters. QSL via Dr. A. J. Knell, G6PGL, 13 Northumberland Rd., Leamington Spa, Warwickshire CV32 6HE, England.

Fairview, Kentucky: Pennyroyal ARS will activate a special event station from the Jefferson Davis Monument from 1500Z—0200Z on both June 2 and 3. Frequencies: phone — 3.950 7.260 14.310 21.410 28.610; CW — 3.730 7.130. Certificate and QSL via PARS, P.O. Box 1077, Hopkinsville, KY 42240.

Madison, Ohio: The Wireless Institute of Northern Ohio and the Lake County ARA will operate station KO8O June 2 from 2300Z on 3.910 and 7.235 until 0300Z on June 3; and on June 3 from 1500Z until 2000Z on 7.235 and 21.360 (all phone operation) to commemorate Ohio Wine Week. Certificate via KO8O — WINO Weekend, 7126 Andover Dr., Mentor, OH 44060.

Audubon, Iowa: Audubon County Amateurs will operate WA8GUD from 1500Z June 2 until 0300Z June 3 to celebrate the centennial of Fiscus, Iowa. Frequencies will be 40 kHz up from General and Novice class band edges and on 146.58 MHz. Certificate via Arnie Krauel, WA8GUD, 206 Tracy St., Audubon, IA 50025.

Utah Beach, France: The Association Des Radio-Amateurs De La Manche will operate station TK6JUN from Utah Beach from June 2-10 to commemorate the 40th anniversary of D-Day. Frequencies: phone — 3.780 7.080 14.205 21.305 28.505, CW — 15 to 25 kHz up from band edges. QSL via Jacques Davy, F5JY, Les vielles Maisons, Quietot, 50260, Briquebec, France.

Slapton, England: The Devon and Cornwall Police will operate special event station GB4ANL for a week beginning June 2, to commemorate the 40th anniversary of the Normandy Landings (D-Day) and the part that the village of Slapton played in the preparation for those landings.

Anderson, Indiana: The Madison County ARC will

operate W9VCF on June 8 and 9 from the historic Eighth Street Festival. Phone frequencies: 3.990 7.290 14.340 21.400 28.785. Certificate via Frank M. Dick, WA9JWL, 921 Isabelle Dr., Anderson, IN 46013.

Utica, Michigan: The Macomb Emergency Communications Assn. will sponsor a special events station to be on the air from 2200Z June 8 until 2200Z June 10. Frequencies will be near the lower band edge of the General class bands on CW and phone. FM on 146.07/67. Certificate via MECA, Box 488, Utica, MI 48087.

Stockholm, Sweden: The Swedish ARC (SK0AC) will operate special events station 7SK0AC during the annual European DX Council meeting from June 8-June 10. Frequencies: phone — 3.700 14.320 21.350; CW — 3.550 14.060 21.060.

Brookfield, Illinois: The Chicago Suburban Radio Association will operate N9BAT on June 9 and 10, both days from 1600Z until 2400Z to celebrate the 50th anniversary of the Brookfield Zoo. Phone frequencies will be: 7.250 and 14.250. QSL via N9BAT Special Event, POB 383, Brookfield, IL 60513.

Grand Marais, Manitoba: The Manitoba DX Group will operate CY4CAT for Catfishpedition/84 for the St. Clements centennial on June 9 and 10. Frequencies: Phone — 7.200 14.250; CW — 7.100 14.075. QSL via Manitoba DX Group, POB 28, Group 322, RR3, Winnipeg, MB R3C 2E7, Canada.

Galesburg, Illinois: The Knox County ARC will sponsor station W9GFD on June 9 and 10 from 1300Z until 2200Z both days to commemorate Galesburg Railroad Days. Phone frequencies will be: 7.235 14.280 21.375 28.630. QSL via Knox County ARC, W9GFD, 1694 Bluebird Dr., Galesburg, IL 61401.

Stone City, Iowa: The Jones County ARS will sponsor a special event station June 10 from 1500Z until 2359Z to celebrate the Grant Wood Art Festival. Phone operation will take place 20 kHz up from the General class band edges. Certificate via Callbook address of station worked.

Napoleon, Ohio: The Henry County ARC will operate club station K8THI from June 11-June 17 to commemorate the Napoleon, Ohio Sesquicentennial Celebration. Frequencies: phone — 3.965 14.265 21.365; CW — 3.740 7.065 21.150. Contact club station or any club member. QSL via Roger C. Jaqua, W8SMW, 17136 Mercer Rd., Bowling Green, OH 43402.

Great Smoky Mountains National Park, TN/NC: The Smoky Mountains ARC will operate W4OLB in the park from 1500Z June 15 until 0300Z June 16 to commemorate the 50th anniversary of the park. Operation will be in the General class phone portions of 40, 20

and 15 meters. QSL via Kevin Mack, WZ4E, Rte. 7, Box 76, Maryville, TN 37801.

College Park, Maryland: K3RD will be on the air from 1400Z until 2200Z June 16 to commemorate the 200th anniversary of the first balloon flight in America. Phone only on 7.120 and 14.270. Certificate via K3RD, 9308 Bandera St., Lanham, MD 20706.

North Platte, Nebraska: The North Platte ARC will operate W0CXH from 1700Z-2300Z June 16 and June 17 during Nebraska Land Days from the home of "Buffalo Bill" Cody. Frequencies: phone-7.250 14.290 21.400, CW — 7.125 21.150. Certificate via NPARC, Box 994, North Platte, NE 69103.

Simi Valley, California: The Simi Settlers ARC will operate a special event station in celebration of Amateur Radio Week in Simi Valley on both June 16 and 17 from 1700Z until 2300Z. They will operate in the General class portions of 80-15 meters. Certificate via SSARC, POB 3035, Simi Valley, CA 93063.

French Lick, Indiana: The Spencer County ARC will operate WB9RCW on June 17 aboard Indiana Railway Museum's French Lick West Baden and Southern Railroad. Frequencies used will be the bottom 50 kHz of the General class bands. QSL via WB9RCW Callbook address.

Oconto, Wisconsin: The Oconto RC will operate station N9CQQ from 1400Z until 2000Z June 23 during the Old Copper Festival. Operation will be in the General class portion of 20, 15 and 10 meters. QSL via N9CQQ, 107 Smith Ave., Oconto, WI 54153.

Tuscumbia, Alabama: The Muscle Shoals ARC will operate W4JNB from 1600Z until 2100Z June 29-30 and July 1 in celebration of Helen Keller Festival Days. Frequencies: phone-7.270 14.280. Certificate via Box 2745, Muscle Shoals, AL 35662.

West Milford, New Jersey: The Skyland ARC is sponsoring WA2CCN to celebrate the 150th birthday of the Township of West Milford. Operation will be from 1300Z to 1900Z on June 30 in the General portion of all bands. Phone operation will be primarily on 80 and 40 meters. Certificate. QSL via Callbook.

Hannibal, Missouri: The Hannibal ARC will operate W0KEM from 1500Z until 2100Z on both June 30 and July 1 during National Tom Sawyer Days. Frequencies: phone — 7.245 14.290 21.400 28.770; CW — 7.125 21.125. Certificate via Hannibal ARC, W0KEM, 2108 Orchard Ave., Hannibal, MO 63401.

Strasbourg, France: Special event station TK0MWC will be activated July 24 through July 29 to celebrate the 11th Mennonite World Conference. Frequencies: phone only 3.680 7.080 14.280 21.380 28.885. QSL via PA0HEL, POB 639, 2600AP DELFT, The Netherlands.

*Communications Assistant, ARRL

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

13-cm Moonbounce Notes

The accompanying photographs show two stations that are coming on 13-cm EME. The first two show the shack, or more particularly the new Klystron amplifier, at WB5LUA (Al Ward). The Klystron is of historic interest since it is the same one originally used by W3GKP for his EME contacts with W4HHK 14 years ago. It should be capable of running 1-kW input. As soon as Al finishes a feed for his 24-ft dish, he should be on 13-cm EME. (Txn WA5VJB for photos and information.)

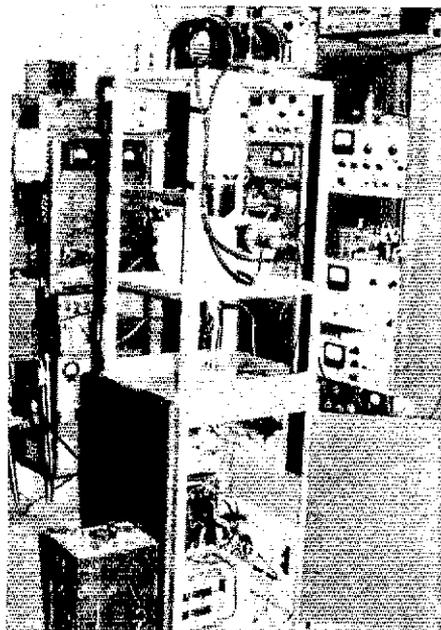
The third photograph shows G3WDG in his shack, with his 1296- and 2320-MHz EME equipment in the background. Because of space limitations, Charlie is limited to using a 13-ft dish. With a two-tube amplifier (2X2C39) putting out about 100 W on 2320 MHz (which is pushing the tubes quite hard), he has heard his own echos off the moon with about 65 W at the dish feed. A new preamp designed by OE9XXI brought the echos up out of the noise. The preamp uses an MGF1403 and produces about 15 dB of gain with a noise figure of around 0.5 dB (I hope to have more details of this preamp in this column in the future). Charlie sees about 9-10 dB of sun noise and has worked a number of stations, including DFØEME (30-ft dish, 700 W, signal peaked 20 dB out of the noise!) and OE9XXI (25.5-ft dish, 70 W).

Performance of this order prompts the question: Just how small an antenna could be used to hear 13-cm EME signals? The answer is surprising. Assuming the transmitting station has a 30-ft dish and about 750 W output (DFØEME), a receiving station with a 1 dB system noise figure and a 3-ft dish should copy signals with about a 3-dB signal/noise ratio in a 500-Hz bandwidth. With the same parameters except a 24-ft transmitting dish, the signal/noise ratio would drop to 1.4 dB, still quite copyable under good conditions. For those who wish to calculate their own link budgets, the procedure is outlined in the December 1980 *QST* New Frontier column (p. 74). The path loss for EME on 13 cm (2304 MHz in the USA, 2320 MHz in Europe) is 277 dB, on average. At lunar apogee it will be 1 dB more, and at lunar perigee it will be 1 dB less. With a number of high-power large antenna systems on the band, many stations may be capable of copying 13-cm EME signals without realizing it. News of 13-cm EME and other EME activity can often be heard on OSCAR 10 (145.95-MHz downlink and Mode L).

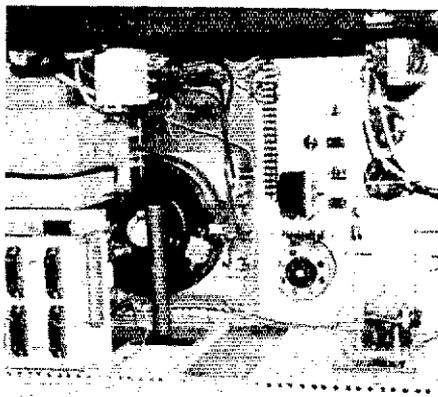
Incidentally, for those interested in the possibility of EME on the other microwave bands, the following is a list of nominal path loss. Add 1 dB for lunar apogee; subtract 1 dB for lunar perigee.

1296 MHz — 272 dB
2304 MHz — 277 dB
3456 MHz — 280.5 dB
5670 MHz — 284.8 dB
10368 MHz — 290 dB

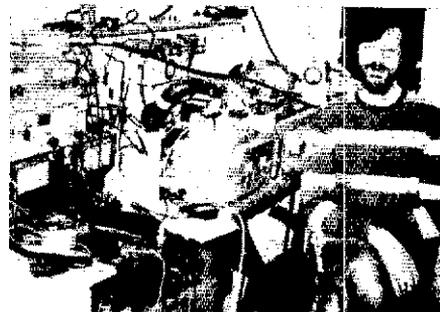
*103 Division Ave., Millington, NJ 07946



The 1-kW, 13-cm Klystron (type VA802B), soon to be in use from WB5LUA.



WB5LUA's 13-cm Klystron power supply.



G3WDG EME shack with 1296- and 2304-MHz systems.

periscope antennas are no longer being built because of problems with energy not intercepted by the reflector being directed toward space. With the increasing number of communications satellites present in earth orbit, it is obviously desirable to minimize the amount of stray radiation directed skyward, particularly on commercial communications frequencies. As far as I know, there are no restrictions on amateur antennas of this type. Stray radiation would be far less than that generated, for example, by EME stations, and it would not be on frequencies used in commercial communications systems.

NEW SERVICE TO SHARE 13 CM

The FCC is expected to approve a proposal to allow the use of the 2310-2390 MHz band for telemetry systems involved with test flights of new aircraft and missiles. It is expected that power output will be limited to 25 W. The present telemetry band is at 1435-1535 MHz.

As has been previously reported in *QST* (see April 1984, pp. 62-63), the FCC has been considering withdrawing from amateur use the 13-cm band segment from 2310-2390 MHz. At this writing no action has been taken, so the current situation (amateur service secondary to radiolocation) remains in effect. Let's hope a compromise can be reached on this issue. There is no proposal to change allocations in the current segment from 2300-2310 MHz.

MAIDENHEAD LOCATORS

The recent IARU Region I conference in Italy adopted a proposal for the use of the Maidenhead locator system in all contests after 1 January 1985. They are also in favor of its general use for other (e.g., awards) purposes.

PHOTOGRAPHS

Readers who have interesting photographs of antennas, equipment or people involved in amateur microwave work are invited to submit them for publication in this column when space permits. Black-and-white prints are preferred, but color prints can be reproduced if necessary. Please indicate if you need the photograph returned. Send the prints to me at the address listed at the foot of this column.

PERISCOPE ANTENNAS

In January 1984 *New Frontier*, I described the periscope antenna system for use at microwave frequencies. W9HXM has written pointing out that commercial

Strays

QST congratulates...

□ Brian Goldinger, KA3KUS, of Ford City, Pennsylvania, on winning a first place award for a computer science project at the Pennsylvania Junior Academy of Sciences conference at Grove City College.

YLRL Scholarship

Applicants for the 1984 YLRL Scholarship are now being accepted. Applicants must hold an Amateur Radio license and intend to seek a baccalaureate degree in an accredited university, college or technical school in the United States. Preference will be given to (but is not limited to) academic study of communications and electronic or related arts and sciences.

The YLRL Scholarship, administered by the Washington, DC Foundation for Amateur Radio, is one of 15 scholarships being offered this year. Awards range from \$350 to \$900. Applicants for the YLRL Scholarship will also be considered for any of the 15 scholarships for which they can qualify. Some of the awards have specific requirements or give preference to

specified geographical areas or the pursuit of certain study programs. For additional information and an application form, write to Foundation for Amateur Radio, Scholarship Chairman, 6903 Rhode Island Ave., College Park, MD 20740. Requests must be received prior to May 31, 1984.

This is the sixth YLRL Scholarship. The program was initiated in 1978 with a \$300 award going to Elizabeth Riemer, N7IT, of Seattle, Washington. Last year's scholarship went to Pamela Sue Hayward, WB0MUS, of Kansas City, Missouri. Over the years, several YLs have also been selected for higher awards offered by the Foundation. One year there were three YL winners.

The Scholarship is financed by the YLRL

through special contributions and is administered by The Foundation for Amateur Radio without cost. No money is taken from the YLRL general funds. This is a very worthwhile effort, and your support is solicited. Donations ranging from \$1 to \$100 built the fund to the point where it could support a \$300 award on a self-sustaining basis. This year, we received a \$2500 contribution from an anonymous OM benefactor who wanted to see us increase the amount of the scholarship, and can now guarantee a \$500 award from now on. Please continue to support this program so we can continue to increase the award in future years or offer additional scholarships. Every dollar will help. — *Ethel Smith, K4LMB, YLRL Scholarship Liaison*

THEY'LL ALWAYS REMEMBER ATHENS

In the spring of 1983, Judy Stowe, WA6GEM, of Saugus, California, and her daughter Gail were given a beautiful bon voyage party and a Saugus-Send-Off as they departed for New York then on to Athens, Greece, and a tour of the Mideast. They were met in Athens by Judy's granddaughter, Dawn Reynolds, who already had received a message from Maria, SV1KN, who was awaiting word of their arrival.

It was more than a week before Judy and Maria were able to meet. When the day arrived, Maria and her OM, Costas, greeted Judy and Gail with much warmth and enthusiasm. Costas, SV1DH, is not new to QST, as he coauthored a two-part article, *The Euro-Asia to Africa VHF Transequatorial Circuit During Solar Cycle 21*, which appeared in the November and December 1981 issues.

Judy, an active member of the YLSSB System, had brought along literature pertaining to the system for Maria. During their visit, Costas conducted a radio room tour while Maria devoured the literature. The term "we believe in the dignity of man" brought Maria running to the radio shack for an explanation. "If this is for YLs, what has man to do with it?" Judy quickly clarified this point!

Costas and Maria invited Judy and Gail to attend the Athens ham club meeting that evening. The club has a membership of 400, and a large portion of the membership were in attendance. The fine dinner that followed the meeting and the enjoyment of many new friends made the evening the highlight of Judy and Gail's entire trip. It is their hope that they contributed to the dedication to the building of friendship among all people through Amateur Radio. They will always remember Athens.

LIA ZWACK, WA2NFY

Born in Switzerland, Lia began her adult life there studying in a clinic for children — healthy children and more often sick children. She loved her work and yet at the same time wondered if she might not accomplish more by working with children in family surroundings. She decided to give it a try. For 25 years, Lia traveled and worked with families in Switzerland, Italy and Germany. She never thought that the day would come when she would really use the languages she learned in the process. Amateur Radio was an unknown field to her at the time.

In 1965, Lia planned a vacation to the United States. During her visit she met Lee Zwack, W2WPF. Meeting Lee proved to be a turning point in her life, as they were married in 1968 and live happily in Rochester, New York.

The first strains of CW Lia ever heard occurred while she was washing clothes in her new home. She found it far from pleasant — in fact, it bothered her. But slowly she started to recognize the sounds. The first time she was able to put words together from these

sounds proved to be the necessary excitement she needed to really study and become WA2NFY. In 1973 she passed the Novice Exam, then followed up the ladder to General and Advanced. Lia will always be grateful to her OM and the many hams who helped along the way.

Lia has been an active member of YLRL, ARES and traffic nets. She enjoys chasing DX and QSOing with new YLs. She sews, knits, skis, and is a nature lover and bird watcher. Ham radio for her means meeting people and helping others as much as she is able.

To this day, Lia maintains contact with many of her former "babies" — many of whom are now married with children of their own. She compares it to feeling like a grandmother with two generations of children dear to her heart. She appreciates, too, their help in paving the way for her becoming the bilingual Amateur Radio operator that she is today.

THE SAGA OF PAT CROSSMAN, N6INN

Pat Crossman wanted to be a ham very badly. She tried taking a licensing course at a local junior college, but was turned off by the math, which was way over her head. Pat is a paralegal and has had little education

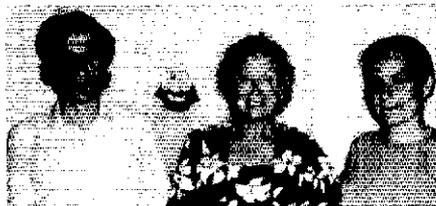
in math and the sciences.

On Veterans Day 1982, she fell and broke her hip. After getting home from the hospital, she spent many hours listening to the general-coverage receiver her OM had gotten her for her birthday. She was again hard bitten by the ham bug.

The General Class License Course arrived on January 26, 1983. Sixty-one days later, Pat went to the FCC and took the 20-WPM code test as a warm-up and passed it. She then failed the General class written exam by three questions. More studying took place and, 96 days after receiving the course, Pat went back to FCC. She passed the General class examination but failed the Advanced.

On June 15, 139 days after starting her studies, Pat passed both the Advanced and Extra class examinations. It must be pointed out that she did have the time to study, and it's obvious that she put it to good use. The important point is that she persisted. She may be very inexperienced, but she's an Extra Class radio amateur with all of the privileges thereof. Pat has progressed from no license to Extra Class in 139 days!

Others may have, or will, go from no license to Extra in a shorter period of time than Pat has, but I'm very proud of her . . . she's my wife. — *K6HAY*



Costas, SV1DH, Judy, WA6GEM, and Maria, SV1KN



Lia Zwack, WA2NFY (photo courtesy N2BNE)



Pat Crossman, N6INN, of Vista, California

*Country Club Dr., Monson, MA 01057

Coming Conventions

GEORGIA STATE CONVENTION

June 16-17, Atlanta

The Atlanta Hamfestival 1984 and Georgia State Convention, sponsored by the Atlanta Radio Club, will be held at the Atlanta Civic Center June 16-17. 70,000 square feet of air-conditioned exhibitor space and over 800 outdoor fleamarket spaces will be available. Fleamarket — \$12.50/space in advance, \$15 at the gate for both days. Hamfest registration — \$5 in advance, \$6 at the door. For you to be preregistered for the fleamarket or hamfest, we must receive your application and check by June 8. Preregistration applications received after June 8 will be returned. Hours are 8 A.M. to 5 P.M. on Saturday, 8 A.M. to 2:30 P.M. on Sunday. Talk-in on 3.975 MHz, 146.22/82 and 146.94 simplex. For preregistration or other information, write to Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

MICHIGAN STATE CONVENTION

June 29-30, Livonia

For the first time in 24 years, the ARRL Michigan State Convention will be held in southeastern Michigan. Dates are Friday, June 29, and Saturday, June 30. The site is Schoolcraft College in lovely Livonia. "Eye-Ball Social" at 7:30 P.M. Friday, June 29, at the headquarter's hotel, the Plymouth Hilton, with a Wouff Hong initiation at the stroke of midnight. Convention opens at 8 A.M. Saturday, June 30, with exhibits, forums, seminars, YL activities, demonstrations, and state nets and organization meetings. Convention banquet, Saturday, June 30, 7:30 P.M., at the Plymouth Hilton. Plenty of parking! Lots to see and do. Convention is sponsored by the Livonia ARC and nine other southeastern Michigan clubs. Talk-in on 145.35/144.75 and 52. Large indoor swap and outdoor trunk-sale area. Admission is \$3 at the door, \$2.50 in advance. Tables, \$1/ft; Trunk sales, \$5/space. Reserve tables, trunk sale spaces, advance tickets or general information requests to Neil Coffin, WA8GWL, Livonia ARC, P.O. Box 2111, Livonia, MI 48151.

WEST VIRGINIA STATE CONVENTION

June 30-July 1, Jackson's Mill

The 26th Annual West Virginia State ARRL Conven-

June 1-3

Northwestern Division, Seaside, Oregon

June 1-3

West Gulf Division, Dallas, Texas

June 2-3

Kansas State, Salina

June 16-17

Georgia State, Atlanta

June 29-30

Michigan State, Livonia

July 7-8

Indiana State, Indianapolis

July 20-22

Oklahoma State, Oklahoma City

August 4-5

Delta Division, New Orleans, Louisiana

ARRL NATIONAL CONVENTIONS

July 20-22, 1984

New York, New York

October 4-5, 1985

Louisville, Kentucky

September 5-7, 1986

San Diego, California

June 19-21, 1987

Atlanta, Georgia

tion will be held on the weekend of June 30-July 1 at the Jackson's Mill 4-H Camp near Weston. This weekend convention features net meeting, DX forum, ARES/RACES meetings, technical forums, MARS meetings, amateur gear auction, flea market, and much more. This year, FCC exams will be offered to the extent that the VE program allows.

Registration and lodging information: WV State Amateur Radio Council, 103 Cleveland Ave., Nitro, WV 25143.

Camping information: Bob Robertson, KU8C, Route 3, Box 302, Fairmont, WV 26554.

FCC Examination Requests: Jerry Fanucci, K8JF, 1313 Anderson Ave., Morgantown, WV 26505.

INDIANA STATE CONVENTION

July 7-8, 1984

The 1984 Indiana Section ARRL State Convention again will be held in conjunction with the Indianapolis

Hamfest. The convention will be held Saturday, July 7, at the Howard Johnson's East, located at I-70 and Post Road. Following a day of meetings and forums, there will be a hospitality hour and a banquet. The keynote banquet speaker will be ARRL President Larry Price, W4RA. Forums at the convention will also include the FCC.

The 14th Annual Indianapolis Hamfest will allow flea market setup to begin after 8 A.M. on Saturday. Free overnight camping at the Marion County Fair Grounds (location of the Hamfest) is provided by the Hamfest. On Sunday, July 8, there will be a commercial exhibition, a flea market and forums. Scheduled forums include one involving ARRL President Price, ATV, RTTY, Packet Radio, FCC and Microcomputers.

For more information on either the State Convention or the Hamfest, write to Indianapolis Hamfest Association, P.O. Box 11086, Indianapolis, IN 46201, tel. 317-894-8522.

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in QST of prizes of any kind and games of chance such as bingo.]

British Columbia (Maple Ridge) — June 30-July 1: The Maple Ridge ARC will hold Hamfest '84 on June 30 at the Maple Ridge Fairgrounds, 30 miles east of Vancouver. Registration for hams is \$5; nonhams over 12, \$2. Preregistration: \$4, hams; \$1.60, nonhams over 12. Food, prizes, swap & shop, commercial displays, bunny hunts, women's and children's programs, and more.

Camper space available with electricity. Talk-in on 20/80 and 34/94. For more information and preregistration, contact Maple Ridge ARC, Box 292, Maple Ridge, BC V2X 7G2.

California (Santa Maria) — June 17: The Satellite ARC will hold its 1984 Santa Maria Swap fest and Santa-Maria style Barbecue at the Union Oil Company picnic grounds, just south of Santa Maria, on Sunday, June 17. General admission will be at 9 A.M., and the barbecue will be served at 1 P.M. For tickets and further information, or to reserve a swap table, write to Satellite ARC, P.O. Box 5117, Vandenberg AFB, CA 93437.

Illinois (Granite City) — June 10: The Egyptian Radio Club Hamfest will be held June 10 at the Egyptian Radio Clubhouse. Tickets: \$1 in advance; \$2 each or 3 for \$5 at the Hamfest. Flea Market spaces available on a first-come basis. First space (approximately 10

feet) free. Additional spaces are \$5. Plenty of free parking. Talk-in on 16/76 and 52. For advance tickets, write to Egyptian Radio Club, P.O. Box 562, Granite City, IL 62040.

Illinois (Chicago) — June 10: The Six Meter Club of Chicago, Inc., will hold its 27th annual hamfest on June 10 at Santa Fe Park, 91st and Wolf Road, in Willow Springs. Gates open at 6 A.M. Advance Registration is \$2; at the gate, \$3. Plenty of parking space; refreshments available. Air Force MARS meeting. Talk-in on 37/97 or 52. For advance tickets, contact Val Hellwig, K9ZWW, 3420 South 60th Ct., Cicero, IL 60650, or any club member.

Illinois (Elgin) — June 21-23: The Antique Radio Club of Illinois will hold Radiofest '84 on June 21-23 at the Elgin Holiday Inn, I-90 and Illinois 31. Antique and classic amateur equipment, as well as all sorts of other vintage radio memorabilia will be on display and for

*ARRL Hamfest

*Convention/Travel Coordinator, ARRL

sale. Talk-in on 52. For further information, write to Joe Willis, Box 14732, Chicago, IL 60614.

Indiana (Crown Point) — June 17: The Lake County ARC will hold its 12th annual Dad's Day Hamfest June 17 at the Lake County Fairground, Industrial Arts Building, Crown Point, from 8 A.M. to 2 P.M. Tickets are \$2. Plenty of parking, food and awards. Talk-in on 84/24 or 52. For further information, contact Bill De Geer, W9TY, 3601 Tyler St., Gary, IN 46408.

Kansas (Overland Park) — July 4-7: The Mobile Amateur Awards Club, Inc. will hold its annual convention at the Holiday Inn in Overland Park July 4-7. Picnic for early arrivals Wednesday evening. Area tours and dinner theater Thursday; antenna and computer forums Friday. Annual business meeting Saturday morning. Hospitality suite open during entire convention. For more information, send an s.a.s.e. to R. L. Dyson, K8AYO, R1, Box 230 M, De Soto, KS 66018.

Louisiana (Alexandria) — June 16-17: The Cenla ARC will host the 1984 Cenfest in Alexandria June 16-17, from 9 A.M. to 5 P.M. Saturday and from 9 A.M. to 2 P.M. Sunday. New equipment dealers, forums, swap tables, special events for nonhams. Admission is free. Talk-in: 93/33. For information, contact Ed Crump, KB5CX, 6035 Navaho Trail, Alexandria, LA 71301 tel. 318-443-4687.

Maryland (Frederick) — June 17: The Frederick ARC will hold its 7th Annual Hamfest June 17 at the Frederick Fairgrounds, 8 A.M. to 4 P.M. Admission, \$3; women and children free. Tailgaters add \$2. Gates open for exhibitors at 8 P.M. June 16; overnight security provided. Overnight parking welcome. Exhibitor tables: 1st, \$10; extra tables, \$5 each. For additional information, call or write to Jim Devillbiss, WA3FUJ, 915 Pine Ave., Frederick, MD 21701, tel. 301-662-5784.

Massachusetts (Dalton) — June 3: The Northern Berkshire ARC is hosting a flea market at the Dalton American Legion at Rte. 9. Admission: \$1. Free overnight camping from 6 P.M. June 2. Breakfast and lunch bar provided by the Dalton American Legion. Talk-in on Mt. Greylock, 31/91.

Michigan (Monroe) — June 10: The Monroe County Communications Association will hold its hamfest June 10, from 8 A.M. to 3 P.M., at the Monroe County Community College on Raisinville Road, just off M-50, west of Monroe. Contests, food and free trunk sales. Table space: 50 cents per foot, 8 feet minimum. Talk-in: 13/73, 71/31 and 52. To reserve tables, send an s.a.s.e. to Hamfest, Box 237, Monroe, MI 48161. For information, call Leroy, KA8LAR, at 313-262-0627.

Michigan (Grand Rapids) — June 30: The Independent Repeater Association of Grand Rapids will hold its annual Hamfest on June 30, from 8 A.M. to 4 P.M., at the Wyoming National Guard Armory on 44th Street, west of US-131. Admission \$3.50. Programs include satellite operation, packet radio, W5LFL Space Shuttle movie, Amtor forum, CW rx contest, antenna forum and shack picture contest. 15,000-square-foot swap area. Free table space for all sellers. Dealer setup at 6 A.M. Talk-in on 165/765. Advanced table reservations accepted. Dealers welcome. For more information, call Linda Hurley, WD8OHW, tel. 616-457-1253, or write to IRA, 562 92nd St., S.E., Byron Center, MI 49315.

Minnesota (Faribault) — July 7: The Faribault ARC will hold its 3rd annual swapfest July 7, from 9 A.M. to 3 P.M., at the Rice County Fairgrounds. Tables by request before July 1. Talk-in on 19/79. For more information, contact Mike Ferguson, NØDGG, tel. 507-744-5145 (after 5 P.M.).

Nevada (Las Vegas) — June 21-24: The YL International Single Sideband System's annual convention will be held June 21-24 in Las Vegas at the Sahara Hotel. Deluxe accommodations and RV parking available. Planned activities include a tour of Hoover Dam, a Lake Mead cruise, a gala stage show, a cocktail party, banquet and breakfast buffet. Other activities include a DX forum and business meetings. YLRLs are invited to meet Thursday evening, June 21, at 8 P.M. A complete station will operate on 14,332 MHz. For complete details and registration packet, send a business-sized s.a.s.e. with 37 cents postage to Jan Weaver, N7YL, 2195 East Camero Ave., Las Vegas, NV 89123.

New Jersey (Deal) — June 10: The Jersey Shore Chaverim Radio Amateur Club will sponsor its Third Ham and Computer Fest June 10 at the Jewish Community Center in Deal. Deal is only 50 miles from New York City, or 70 miles from Philadelphia. For further information, contact Arnold L. Halpern, W2GDS, 450 Brighton Ave., Long Branch, NJ 07740, tel. 201-222-3009.

New Jersey (Dunellen) — June 16: The Raritan Valley Radio Club (W2QW) will hold its 13th annual hamfest June 16 at Columbia Park in Dunellen. Gates open at 8:30 A.M. Sellers' spots are \$5 each (no tables available); lookers, \$2. Advance tickets may be purchased from any club member. Food and drink will be available at the refreshment stand. Talk-in on 025/625

and 52. For further information, contact Jack, W2IWK, tel. 201-756-2546, or Ted, WB2TKU, tel. 201-725-3481 (between 10 A.M. and 10 P.M.).

New York (Cortland) — June 16: The Skyline ARC will hold its second Annual Hamfest & Flea Market June 16 at the Cortland County Fairgrounds in Cortland, off I-81 at Exit 12, from 8 A.M. to 5 P.M. Admission: \$2. Indoor-outdoor flea market. Acres of parking. Reserved indoor tables and space: \$3. Reserved undercover space: \$2. Talk-in on 52. For details, contact Bud Jackson, K2ZER, 8 Sunnyfield Dr., Cortland, NY 13045.

New York (Mahopac) — July 7: The Putnam Emergency Amateur Repeater League will hold its third annual Hamfest July 7 at St. John's School, Monsignor O'Brien Blvd., from 9 A.M. to 4 P.M., in Mahopac. General admission is \$1. Indoor tables are \$5. Outdoor tailgating: \$4. Talk-in on 144.535/145.135 and 52. For advance registration and information, contact Frank Konecnik, WB2PTP, RD 1, 244 C, Carmel, NY 10512.

New York (Alexander) — July 8: The Genesee Radio Amateurs will hold the Batavia Hamfest July 8 at Alexander Fireman's Grounds, Route 98 in Alexander, from 7 A.M. to 5 P.M. Admission is \$3, until June 22; at the door, \$4. Activities include a 6 A.M. breakfast, CW contest, OM and YL programs, 52 check-in contest, flea market, commercial exhibit area (opens 9 A.M.), hot-air balloon rides and chicken barbecue. Camping is free; electrical hookups are \$2. Talk-in on 4.71/5.31 and 52. For information, contact GRAM, P.O. Box 572, Batavia, NY 14020. For tickets, contact Knute Carlson, N2DRX, 26 Burke Dr., Batavia, NY 14020.

North Dakota (Dunseith) — July 14-15: The 21st International Hamfest will be held July 14-15 at the International Peace Garden, between Dunseith and Boissevain, Manitoba. Activities include transmitter hunts, mobile judging and a CW contest. Excellent camping facilities. For more information, contact WDØEMY or WDØDAJ, Box H, Dickinson, ND 58601.

Ohio (Akron) — June 10: The 17th annual Goodyear ARC Akron Hamfest will be held June 10 at Wingfoot Lake Park, near U.S. 224 and SR 43 east of Akron, from 10 A.M. to 5 P.M. Family admission is \$2.50 in advance, \$3 at the gate. Flea market is \$2 per space. Pavilion is \$5 per table. Flea Market and exhibitor setup begins at 7 A.M. Free parking, picnic area and refreshments available. Talk-in on 04/64 or 385/985. For advance tickets and/or reservations, send an s.a.s.e. to Don Rogers, W8SXL, 161 South Hawkins Ave., Akron, OH 44313, tel. 216-633-3665.

Ohio (Belefontaine) — June 10: The Champaign-Logan ARC will host Hamboree '84 June 10 at the Logan City Fairgrounds from 8 A.M. to 3 P.M. Admission in advance is \$2, at the door, \$2.50. Radio and computer activities. Free parking. Tables are \$3. Check-in on 52; information, 7.60/00. For information, contact Steven Kidder, N8ETD, Box 265, Russells Point, OH 43348, tel. 513-843-6099.

Ohio (Hicksville) — June 17: The Defiance County ARC Hamfest will be held June 17 at the Defiance County Fairgrounds in Hicksville from 8 A.M. to 4 P.M. For more information, contact Chris Ballard, KA9LEB, Rte. 1, Roland Rd., Sherwood, OH 43556, tel. 419-899-4209.

Ohio (Bowling Green) — July 8: The 20th annual Wood County Ham-A-Rama will be held July 8 at the Wood County Fairgrounds. Gates open 8 A.M. Free admission and parking. Trunk sales and food available. Advance table rentals \$5 (dealers only). Saturday setup until 8 P.M. Talk-in on 52. For more information or dealer rentals, send an s.a.s.e. to Wood Co. ARC, c/o Craig Henderson, Box 366, Luckey, OH 43443.

Ohio (Louisville) — July 15: The Tusco ARC, W8ZX, and the Canton ARC, W8AL, will hold the 10th annual Hall of Fame Hamfest July 15 at the Nimishillen Grange, 6461 Easton St., Louisville. Tickets are \$2.50 in advance, \$3 at the gate. Flea market is \$2 additional per vehicle. Tables can be reserved. Events include forums, dealers, flea market and food. Talk-in on 72/12 and 52. For reservations or more information, contact Butch Lebold, WA8SHP, 10877 Hazelview Ave., Alliance, OH 44601, tel. 216-821-8794.

Ontario (Milton) — July 14: The 10th annual Ontario Hamfest will be held July 14 at the Milton Fairgrounds from 7 A.M. to 4 P.M. Admission: \$2.50 in advance, \$4 at the gate. Free parking and flea market tables. Commercial exhibits and refreshments. Camping (with hydro) available. Talk-in on 21/81. For details, write to the Burlington ARC, Box 836, Burlington, ON L7R 3X7, Canada.

Oregon (Eugene) — July 21-22: The 9th annual Lane County Ham Fair will be held July 21-22 at the Oregon National Guard Armory, 2515 Centennial, starting at 8 A.M. License exams for all available FCC tests will be held. Computer demonstrations, 2-meter bunny hunt, technical seminars, swap tables, all-day snack

bar, kiddie kornet, free parking for RVs (no hookups) and potluck supper Saturday. Talk-in on 28/88, 86/26 and 52. For more information, write to Tom Temby, WB7WPU, 3227 Crocker Rd., Eugene, OR 97404, tel. 503-689-1761.

Pennsylvania (Milton) — June 10: The Milton ARC will hold their 13th annual hamfest June 10, rain or shine, at the Winfield Fire Co. grounds on Rte. 15, south of Lewisburg and 8 miles south of Exit 30 on I-80, from 8 A.M. to 5 P.M. Registration, \$3; wives and children free. Flea market, auction and contests. Talk-in on 37/97 and 025/625. For further details, contact Jerry Williamson, WA3SXQ, 10 Old Farm La., Milton, PA 17847, tel. 717-742-3027.

Pennsylvania (Harrisburg) — July 4: The Harrisburg Radio Amateur Club will sponsor the Annual Firecracker Hamfest at the Bressler F.C. picnic grounds. Take Exit 1 off I-283 (Rte. 443) and follow signs to Bressler. Admission is \$3; XYL and children free. Free tailgating. Parking for 1000 cars. Shade trees and pavilion with tables. For more information and table reservations, contact Dave, KC3MG, 131 Livingston St., Swatara, PA 17113, tel. 717-039-4957.

Saskatchewan (Swift Current) — June 30: The Saskatchewan Hamfest will be held June 30 in Swift Current. Displays, women's program, banquet, and more. For details, contact the Hamfest committee, Box 6, Swift Current, SK S9H 3V5.

Tennessee (Humboldt) — June 3: The Humboldt ARC will hold its annual hamfest at Bailey Park from 8 A.M. to 4 P.M. Admission is \$2. Flea market and other activities. RV parking. Talk-in on 37/97. For further information, contact Ed Holmes, W4IGW, 501 North 18th Ave., Humboldt, TN 38343.

Wisconsin (Oak Creek) — July 7: The South Milwaukee ARC will hold its annual Swapfest July 7 at American Legion Post 434, 9327 South Shepard Ave., Oak Creek, from 7 A.M. to 5 P.M. Parking, picnic area, hot and cold sandwiches, and liquid refreshments will be available. Admission is \$3. Talk-in on 94. For more details, write to the club at P.O. Box 102, South Milwaukee, WI 52172.

Wisconsin (Sheboygan) — July 14: The fifth annual Sheboygan County ARC Lakeshore Swap fest and Brat Fry will be held July 14 at the Wilson Town Hall, south of Sheboygan, from 10 A.M. to 4 P.M. Free tables. Camping available at Terry Andre State Park. For more information, contact Julian, KR9S, 6400 Hawthorn Rd., Sheboygan, WI 53081, tel. 414-457-3366

Note: Sponsors of large gatherings should check with League Hw. for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.

Mini Directory

As a convenience to our readers, there is a list of items of particular interest and when they most recently appeared in QST.

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Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1DF, George Grammer, West Hartford, CT
W1EYM, James P. Szcwycyk, Adams, MA
W1JFG, Willard D. Cook, Hopedale, MA
W1JPB, Bruce Greening, West Hartford, CT
W1RCA, Robert E. Campbell, Beverly, MA
W2C2NQ, Eugene Schwartz, Hollywood, FL
W2FU, Alexander Zimany, Jackson Heights, NY
W2ALJC, Carlton P. Boynton, Newark, NY
KA2NLZ, Edward J. Van Allen, Huntington Station, NY
W2POA, Joseph J. Mooney, Buffalo, NY
K2RNV, Paul V. Countryman, Gouverneur, NY
K2SQH, Theodore E. Kimmery, Rochester, NY
W2YDK, John White, Ringwood, NJ
W2ZQC, Abraham Anapolle, West Caldwell, NJ
K3BFO, Guilford W. Hamilton, Brookville, PA
W3DGO, Harold S. Benner, Norristown, PA
KA3FBN, Harry L. Greenwald, Sigel, PA
W3FSP, E. Russell Kidwell, Silver Spring, MD
WB3KYR, Nicholas Bielanowski, Dickson City, PA
W3OJA, Joseph P. Daylida, Apollo, PA
WA3URW, Patrick A. Philippi, Myrtle Beach, SC
K4CQB, Herman H. Schneidman, Paducah, KY
K4CTX, Wylie R. Harley, Charleston Heights, SC
*K4DC, David C. Kochendarfer, Mollusk, VA
K4DG, Harold E. LaMarche, Ft. Lauderdale, FL
W4EKW, Francis R. Tiltman, Jr., Tallahassee, FL
W4EQO, Arthur H. Anderson, Dyersburg, TN
W4FXZ, Emmett A. Birdwell, Athens, AL
WD4OYW, Harold L. Brown, Hollywood, FL
W4PFH, Robert C. O'Connor, Ruskin, FL
W4PGK, Asa F. Tift, Albany, GA
WD4PHU, Horace A. Mauney, Griffin, GA
KA4PQZ, William H. Sparr, Tryon, NC
WA4QLG, Leonard "Rick" Ricards, Fort Lauderdale, FL
W4RRM, Milford F. Merrell, Hampton, VA
W4WK, Beryl L. Dassow, Arcadia, FL
W4WZZ, Kendall H. Hartley, Lakeland, FL
K5AXU, Clyde E. Morrison, Shawnee, OK
W5EBO, Robert S. Bryant, Lubbock, TX
K5FYA, Alton A. McReynolds, Tulsa, OK
K5LYM, Robert E. Parks, Altus, OK
W5MYF, Thomas W. Moore, Lubbock, TX
K5QOD, Carl H. Bower, Shawnee, OK
W5OZN, Dominic J. Tomaro, Friendswood, TX

W5UCT, Wilbur P. Waggoner, Hennessey, OK
W5UGN, Roy M. Reece, Jr., Lawton, OK
W5WZB, Caidus A. Cox, Carthage, MS
*WB6AAR, William W. Schenler, Arcata, CA
KA6BMJ, John V. "Jack" Higgins, Modesto, CA
WA6DIH, Elsie E. Hart, West Jordan, UT
WA6EXM, Albert G. Seymour, Point Arena, CA
W6LSN, Albert K. Mealey, Hemet, CA
W6MTK, Charles T. Bethard, Los Osos, CA
KA6PFT, Clifford H. Brainerd, Barstow, CA
W6QH, Anthony J. White, Napa, CA
WA6UAX, Chalmers F. Culbertson, Jr., Red Bluff, CA
KA6WJY, Eric J. Balling, Camino, CA
N6XU, Les J. Wandel, Moraga, CA
W7EBY, Wilbur T. Korb, Kalispell, MT
W7KXY, James L. Garrison, Riviera, AZ
K7PTA, John Schierman, Portland, OR
W7QNC, Henry F. Hudson, Tucson, AZ
WA7TGS, Eldon D. Bibbey, Lakeside, OR
W7THH, Frank W. Jones, Sr., Reno, NV
WA7YCY, John M. Marshall, Gresham, OR
W8ABG, Frank A. Caswell, Dayton, OH
WB8ANR, Jerome Howell, Leonard, MI
K8AQ, Leonard P. Malone, Jr., Loveland, OH
WA8AU, Walter G. Miller, Dayton, OH
W8CAB, Robert R. Brooks, Cumberland, OH
W8CMV, Albert A. Zimanski, Birmingham, MI
W8HJU, Orel Z. Burdick, Muskegon, MI
W8IOR, Bernard H. "Steve" Scheidt, Lake Odessa, MI
W8LPY, Clyde T. Ervin, Lebanon, OH
WA8LZU, Doris L. Kissick, Mount Perry, OH
W8OBA, William W. Hodges, Livonia, MI
W8QLE, Carlton L. Webster, Nancy, KY
W8QU, Robert C. Apple, Union, OH
WD8RZU, Anna Mae Madson, Mission, TX
W8UCG, Charles W. Schecter, Muskegon, MI
WA8WMC, Richard A. Weiner, Ludington, MI
KA9FEE, Marie Nilsson, Ashland, WI
KA9FEM, Delbert S. Laquetment, Mount Carmel, IL
WD9HDV, Frederick H. Fromm, Lakeland, FL
W9LQF, George J. Nesbed, Riverside, IL
W9LTI, Leonard R. Grajewski, LaSalle, IL
W9MTF, Martha M. Young, Evansville, IN

WØEGE, Hubert C. Geil, AImena, KS
KAØEGY, William R. Korlath, Brooklyn Center, MN
*WBØFQD, Richard M. Richardson, Littleton, CO
WØFZD, Charles D. Johnson, Ames, KS
WØGHM, Clarence J. Davis, Norfolk, NE
KAØKFN, Mitch G. Myers, Aurora, CO
KAØNPN, John F. "Doc" Davidson, Lincoln, NE
WØVRF, Oscar "Hug" Huggins, Kansas City, MO
KH6DZB, Thomas P. Tennissen, Los Altos, CA
KL7EQ, Leon "Ole" Johnson, Kodiak, AK
VE1ABW, Don Chisholm, Moncton, NB
VE1ANS, Ralph S. Ramsay, Summerside, PE
VO1BT, Ches Avery, St. John's, NF
VE1JX, Jan W. Klyn, Tantallon, NS
VE1RA, Bazel E. Bragg, Sydney, NS
VE3AKC, Arthur F. Andrews, Galt, ON
VE3VU, Frank P. Kehoe, London, ON
VE6ABN, Thomas H. Clark, Red Deer, AB
VE6BHA, William A. Allwright, Red Deer, AB
VE6VM, Vincent J. McMahon, Edmonton, AB
VE7BC, Howard W. Scott, Kamloops, BC
VE7BQ, Jack Sibson, Coquitlam, BC
VE7DKI, Truman D. Locheed, Vernon, BC
VE7SJ, Sam F. E. Jennings, Vancouver, BC
G8VG, W. H. "Bill" Windle, Dartford, Kent, England
PAØUB, H. M. E. Linse, Bostel, The Netherlands

*Life Member, ARRL
**Charter Life Member

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the reporter as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in QST.

50 Years Ago

June 1934

- Editor Warner speculates whether we can do something to u.h.f. propagation physics — refracting, polarizing, focusing, or whatever — to obtain real DX performance from that part of the spectrum.
- G. Grammer feels that the basic sensitivity of a simple receiver, plus its small cost and ease of construction, adds up to an attractive project even in these days of moving toward superhets. He details the complete design of a 58-37 unit covering 1.75 to 41 Mc. with five plug-in coils.
- The versatility of the new RK-20 beam pentode is shown in two examples from Jim Lamb's workbench. One is a 50-watt amplifier with minimal excitation requirements, and the other a one-tube crystal (tri-tet circuit, of course) oscillator-transmitter. Either can be modulated with no great worry about stability.
- W5VU likes high-power but not the attendant expense of multiple stages, so his 1/2-kw (212D) oscillator is locked in frequency with a crystal stage by means of a twisted pair inductive link.
- W2BSL's transceiver design replaces the usual Type 30 tube with a Type 19, resulting in a tenfold increase in power (to two watts!), uses a unity-coupled tank and a superregen receiver — all for portability. It led to Frank's formation of the Radio Transceiver Laboratories, which produced the popular rig (\$22.50 plus tubes) and a number of advanced versions through the 1930s — Ed].
- At the annual Board of Directors meeting, the by-laws were changed so that only members with amateur licenses can henceforth vote in League elections. A new post of Alternate Director was established to fill in when the Director might be incapacitated. And the Board went officially on record as opposed to the elimination of the code requirement in the amateur exam!

- The new 2B7 diode-pentode makes practical in ham receivers the use of diode detection with a.g.c. W. Smith adapts the tube as a combined i.f. stage and second detector.
- W2AOE shows us a ham station "analyzer" — basically a v.t.v.m. with pickup coils to obtain comparative field strength readings from different antenna adjustments.
- W6CAL suggests using fixed condensers in series in a tank circuit to give the same performance as a split-stator unit, with improved neutralization effectiveness. Much impressed, Technical Editor Grammer adds some thoughts of his own.
- League membership is the highest ever — topping 20,000. The Pacific Division is now split, with its southern portion comprising a new Southwestern Division.

25 Years Ago

June 1959

- W3TLN has built a mobile transceiver for sideband, using surplus xtals and ARC-5 components to keep costs down. A VXO circuit contributes to stability even on rough roads.
- The G4ZU beam design has been popular for several years. ON4BX found he could dispose of the usual matching networks and housing by using coax line of a specific computed length, confirmed experimentally.
- Audio compression improves the effectiveness of voice communication, sideband or a.m., and W3LYP shows us a simple unit made with transistors.
- W2LYH is sold on the use of separate converters feeding a BC-312 surplus unit for good reception on

- the higher bands, and describes three he built for 14, 21 and 28 Mc.
- To support his new 8-element, 6-meter Yagi, K6JKK built a 40-foot tower of 2 x 2 Douglas fir with 1 x 2 furring strip crosspieces.
- Project Supervisor W1VLH summarizes successful results of volunteer amateur performance in the International Geophysical Year study of v.h.f. propagation.
- For the ham with limited space, W2AWH describes several miniature versions of antennas that still provide effective radiation, including one modified from a TV receiving antenna.
- Inexpensive surplus crystals in the 8-Mc. range have put a lot of us on common 6-meter frequencies. W3LCK avoids much such QRM with a simple 6AU6 v.f.o.
- Even a beginner should have some basic measuring equipment, and W1ICP suggests as a first project a "junk box" d.c. volt-ohmmeter.
- Most break-in systems have used relays. W4HBO worked up a circuit for blocked-grid keying systems using the receiver a.v.c. for muting, plus a side tone.
- K5JOK and W9PDK give us some excellent suggestions for both individual and club approaches to obtaining better public relations for amateur radio.
- Top 'phone scorer in last November's Sweepstakes was K6EVR. Frankford again won the club award.
- President Eisenhower sent greetings via amateur radio to several hundred foreign dignitaries attending the international technical radio conference in Los Angeles. W3WTE (White House communications) originated the traffic to K6USA, a special show station set up for the visitors.
- And there's an important worldwide allocations conference set for Geneva, Switzerland, later in the year. The United States proposals provide for continuance of every amateur band now assigned.
- W1TS joined the Arctic explorer ship *Bowdoin* for its final voyage, re-creating his pioneering North Pole expedition communications feats of 1923. — W1RW

SSCs RENEW THEIR COMMITMENT

June 1 marks the start of the second annual cycle of the Special Service Club Program. The first 13 SSCs were reviewing their first year-long performances and renewing their commitments as this was being written in early May. Over the past 12 months, our SSCs, Affiliated Club Coordinators (ACCs) and we at Headquarters have learned a lot!

Many of our affiliated clubs at first questioned whether they would be able to meet the challenge. Those who applied and were approved as SSCs learned that by focusing on those activities that local clubs are best equipped to carry out, taking the time to assess and organize their particular local talents, and setting reasonable annual objectives, they were equal to the task. Though many of our more than 100 SSCs found they qualified with little additional effort, several used the process of applying to focus their efforts and revitalize otherwise-faltering clubs. Some worried that their clubs were too small to undertake the commitment; at least three clubs with a "mere" 15 or 16 members each, however, are serving Amateur Radio well in their local communities as SSCs. Is the task beyond your reach? The evidence suggests it is not.

Likewise, we at Headquarters have learned a lot, or, more accurately, we have had reaffirmed our belief that we have some very special affiliated clubs and a host of talented club members in the field. Moreover, we've sincerely grown to appreciate the talent and dedication of your ACCs; whether you're an SSC or not, you'll do yourself a disservice if you don't get to know your ACC — he has a lot to offer. Seeing the quality of the work being done in the field and the skill with which our SSCs are creating a very effective local presence for Amateur Radio in their communities is heartening.

For our part we've also learned that some of the benefits to which SSCs are entitled were a little more difficult to accomplish than we'd expected. But again, this has been a learning process. We've ironed out the administrative problems and are now pleased to report that the *SSC Manual*, *QST* listings, *Repeater Directory* listings, bimonthly new-ham and new-ARRL-member referrals, complimentary *ARRL Letter* subscriptions, VUCC awards checking authority and certificates of appreciation are routine. SSC insignia are just about ready, and work is progressing on leadership training.

Yes, the program is working. Each month additional clubs come aboard, making the formal commitment to improve their effectiveness in serving Amateur Radio and the local community. If you're having problems or if you have questions about becoming an SSC or renewing your annual commitment, contact your Affiliated Club Coordinator. He's there to help you overcome obstacles and achieve your objectives.

When you're nearing the end of your annual commitment, you'll be notified by us at Headquarters and by your ACC. Go over your previous year's work with him, noting both your successes and those areas in which you could stand some improvement. Propose ways of upgrading your efforts in weaker areas and outline a few specific objectives for the coming year. Try out a few new ideas and expose your members to unfamiliar aspects of Amateur Radio. Your *SSC Manual* is full of ideas for new programs. And with your help, it will continue to grow during the second year.

When you've made your commitment for year two and your ACC, SM and Director have approved, we'll continue to do our best to support your special efforts. Let us know what additional benefits will help you serve more effectively in the year to come.

To the SSCs who are with us again for another year, welcome back! To those of you who are just beginning, welcome aboard! — *Steve Place, WB1EYL, Manager, Club and Training Department*

FILM LIBRARY ADDITION

Now available from the ARRL Film Library is a videotape of a talk given by Dr. Owen Carriotti, W5LFL, at Foothill College on February 24, 1984 (VT-33; 60 min., VHS). For further information, contact Karl Townsend, ARRL Film Librarian, 225 Main St., Newington, CT 06111, tel. 203-666-1541, ext. 219.

*ARRL's Special Service Club Program was kicked off in March 1983; affiliated clubs that applied for and were approved as SSCs between March 1 and May 31 began their annual cycle June 1, 1983. SSCs officially begin their annual cycles on the first day of the quarter following approval (March 1, June 1, September 1 and December 1).

*Club Program Manager, ARRL

SSC Kudos and Contacts

Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Anderson Radio Club

c/o P.O. Box 506
Anderson, SC 29622
Club membership — 65

Clark County Amateur Radio Club

c/o P.O. Box 1424
Vancouver, WA 98668
Club membership — 60

Framingham Amateur Radio Association

c/o P.O. Box 3005
Framingham, MA 01701
Club membership — 119

Gallatin Ham Radio Club

c/o 48 Hitching Post Rd.
Bozeman, MT 59715
Club membership — 44

Hastings Amateur Radio Club

c/o P.O. Box 128
Hastings, NE 68901
Club membership — 35

Hernando County Amateur Radio Association, Inc.

c/o P.O. Box 1721
Brooksville, FL 33512
Club membership — 82

Metropolitan Amateur Radio Club

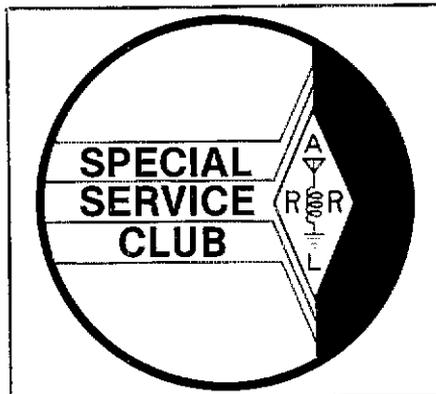
c/o P.O. Box 9050
Little Rock, AR 72219
Club membership — 47

Norwood Amateur Radio Club

c/o 20 Hemlock St.
Norwood, MA 02062
Club membership — 40

San Antonio Radio Club, Inc.

c/o 90 Brees Blvd.
San Antonio, TX 78209
Club membership — 234



Jeffrey Duquette, K1BE, was the artist whose design was selected by your Board of Directors to be ARRL's Special Service Club logo. See July *QST* for a full rundown on the competition and the runners-up.



Members of the Newington Amateur Radio League, Murphy's Marauders and Chippens Hill Repeater Association (all from Connecticut) help assemble and mail more than 7000 requests for W5LFL/STS-9 QSL cards. Earlier, the Poughkeepsie (NY) ARC had processed the other 5000 requests. A very special thanks for a job well done.

Moved and Seconded...

LIFE MEMBER APPLICANTS March 25, 1984

Robert J. Adamitis, K9MDO; Orville E. Allen, KD4QF; George M. Austin, III, KY7O; Nelson E. Bailey, K5TML; Cyril Balwah, 9Y4VT; Barry S. Berg, N0ATP; Richard L. Boop, KF8T; William D. Briscois, KC8IU; Floyd Bryant, Jr.; John H. Burgess, N7DCQ; Larry Charson, N5BYJ; Ford Cole, N8ARA; Peggy L. Collins, KS4J; John W. Cunningham, Jr., KD4KG; Ressie Del Conte, WD6EKQ; Harold L. Dellinger, N4DYL; Paula P. DiGennaro, KA8HQJ; Joseph E. Dion, KA4VAU; M. Michael Dorr, KA4VAU; William C. Dorsey, N4BOP; Dennis G. Eksten, W9SS; James Fell, N7DNJ; Robert B. Gettys, III, N1BRM; Nancy Goodbreath, KA4KZU; Linda Gillig, N9BHU; Jerald P. Goodchild, K4DZR; Henry L. Gravley, K5DGN; Herman R. Green, KF5R; Timothy C. Groat, KR0U; R. B. Harris, KW8B; Allen A. Hawley, WB7PEU; John J. Holman, N0BOR; Sarah K. Huber, KB4GOA; Alan E. Huygens, WD0FOY; William F. Kaiser,

KC9CU; Nicholas Kilburn, VE3LLJ; Lawrence Knapp, KC8JX; Mitchell A. Kosoff, KB1U; Dannie H. Lauer, KA9FRC; Daniel L. Lavrich, AF4U; Alfred J. Loveless, N3BJT; Frederick A. Lucas, Jr., K1EFI; George S. MacLauchlan, K1IFV; Charles Ray Martin, N6IUV; T. Martin, WD4AON; Neil D. McMillin, KK0C; Howard B. McNeely, WB4DRM; Kyle Byron Merrill, KA5LBM; Robert P. Newkirk, Jr., K3RN; James T. Olive, N1CED; Carl Olson; John A. Orr, Jr., KX6A; Robert I. Partridge, KA7FRW; J. L. Pate, Jr., KA5OXO; John M. Pate, WB5EUC; Myron S. Perry, K7MLU; Christopher J. Potalivo, WA3ZY0; Harold E. Prust, WA0CMC; Walter J. Pufflett, VE7BZP; Sheldon Remington, N16E; Orphas Dale Rusk, WB4GOG; Henry L. Schultz, Jr., KA3GXP; Olin Craig Scott; Robert L. Sikes, KE4VR; Walter L. Smith, Jr., WB1FJK; John J. Spack, KN9R; Hadley V. Stacey, KE0F; Hanne Steinhauser, DX3XJ/W9; S. L. Stout, N3BML; Frank Tripp, Jr., W4HVV; Gilbert J. Van Blaricom, WB9TFH; Thomas Scott Walton, KC9LZ; Linda D. Whitney, NF8C; Arthur W. Wiles, KA2KFB; Ronald W. Yingling, N3CBD.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

SECOND AMATEUR RADIO SPACE SHUTTLE EXPERIMENT

The voice of W5LFL from the Space Shuttle *Columbia* will long live in the memory of those who heard those first signals from space. Some say that after the W5LFL mission any others that follow won't be as exciting; I disagree. Earlier events such as signals from Sputnik were certainly exciting, but I fail to find any space event involving two-way communication routine.

There are a lot of exciting experiments coming up. This next experiment is called MARCE (Marshall Amateur Radio Club Experiment), described briefly in this column in March. The voice on this mission will be nonhuman from a Digitalker voice-synthesizer system.

The Amateur Radio part of this mission will involve transmitting data in English from the experiments inside the Get Away Special (GAS) #007. The primary downlink for Shuttle to earth will be 435.033 MHz FM. This signal can also be relayed through AMSAT-OSCAR 10 with a resulting downlink of 145.972 MHz, Special Service Channel H1.

This one aspect of the mission has some very exciting possibilities. The communication access time for Shuttle to a particular QTH on earth is only a few minutes, this can be expanded to several hours via OSCAR 10. Starting to get the picture?

The 007 GAS experiment is scheduled to transmit in three, 8-hour cycles during the 5-day experimentation period. The flight is scheduled for 10 days. The data sent back will be information on the onboard student experiments dealing with alloy solidification, plant physiology and crystal growth. Since this data is being transmitted in the FM mode, it will be possible for nonamateurs also to monitor using programmable scanners. This will enable anyone to take part in the experiment vicariously. Within the next few months we will bring you up to date on the progress of this next Amateur Radio Space Shuttle mission.

W5LFL Two-Way Contact List Completed

The following call signs have been added to the W5LFL log from the incomplete-calls list published in February

QST on page 14: WA7RVV, W5ULZ, WB5DBT, WD5CGS, WA4DNS, N8CSL, WB5LNI, NN6E, WB2JSJ and W7YKN. NN6E and W7YKN were already on the main list. Two call signs were modified on the main list: K3NV and WD4VCS were changed to K3NW and WD4BCS, respectively.

The remainder of the incomplete calls are not identifiable. We have made every effort possible to reconstruct the call signs on the W5LFL tapes. The list published in February 1984 QST, page 14, with these modifications, constitutes the final official W5LFL log.

ARRL still has a supply of W5LFL-listener QSL cards. If you heard W5LFL during the STS-9 mission and do not have a QSL, send a 4- x 6-in s.a.s.e. marked "W5LFL QSL."

Keplerian Elements

AMSAT-OSCAR 9

Catalog number: 12888.
Epoch time: 84099.40458635.
Sun. Apr. 8 09:42:36.260 1984 UTC.
Element set: 613.
Inclination: 97.5844 Deg.
RA of node: 72.9486 Deg.
Eccentricity: 0.0003141.
Arg. of perigee: 30.1444 Deg.
Mean anomaly: 329.9951 Deg.
Mean motion: 15.25230384 rev/day.
Decay rate: 9.573e-05 rev/day/day.
Epoch rev: 13890.
Semi. major axis: 6865.197 km.
Nom. period: 94.411967 min.
Apogee: 494.507 km.
Perigee: 490.195 km.
Beacon: 145.825 MHz.

AMSAT-OSCAR 10

Catalog number: 14129.
Epoch time: 84097.34280771.
Fri. Apr. 6 08:13:38.586 1984 UTC.
Element set: 97.
Inclination: 25.7059 Deg.
RA of node: 206.1228 Deg.
Eccentricity: 0.6092647.
Arg. of perigee: 260.5025 Deg.
Mean anomaly: 30.1701 Deg.

Mean motion: 2.05857411 rev/day.
Decay rate: -1.42e-06 rev/day/day.
Epoch rev: 613.
Semi. major axis: 26105.470 km.
Nom. period: 699.513315 min.
Apogee: 35636.380 km.
Perigee: 3826.098 km.
Beacon: 145.8100 MHz.

OSCARLOCATOR Now Available

The second revision of the ARRL OSCARLOCATOR is now available from ARRL or your radio store book dealer. You may also order from AMSAT. A description of this new package is in Amateur Satellite Program News, April 1984, page 83. Price is \$8.50 U.S., \$9.50 elsewhere.

Monthly Listings

ASR (Amateur Satellite Report) is available for \$22 (\$30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

AMSAT Membership is available for \$24 per year (\$26 outside North America). Life Membership is \$600. Subscription to six issues of *Orbit* magazine each year is inseparable from membership. Write to or call AMSAT Hq., P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

ARRL members only send a 4- x 9-in s.a.s.e. with your call sign to ARRL for a complete, monthly orbit schedule for all operating Amateur Radio satellites. Please mark the s.a.s.e. with the month needed, to help us ensure that the envelopes are filled properly. A year's supply of s.a.s.e.'s may be sent in at one time, but be sure to affix 2 units of postage to each s.a.s.e.

The OSCARLOCATOR package second revision is now available for \$8.50 U.S., \$9.50 elsewhere. This package and *The Satellite Experimenter's Handbook* contain all the information you need to get started using the Amateur Radio satellites.

A free package of information about AMSAT and the Amateur Satellite Program is available from ARRL Hq. This package is intended for those with no knowledge of the program.

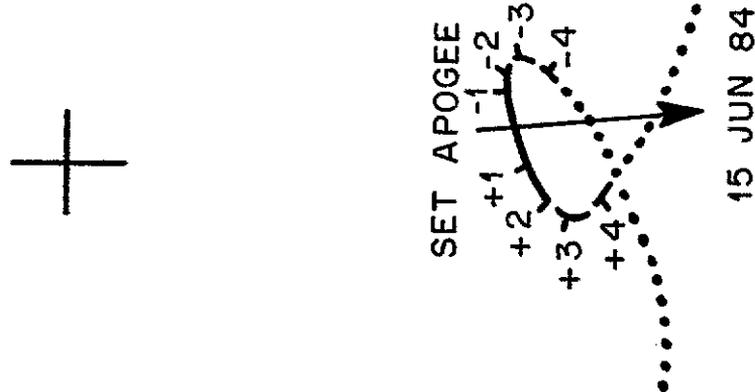


Fig. 1 — AMSAT-OSCAR 10 ground-track cursor.

Anatomy of a Traffic Handler

In peddling traffic from my Transcontinental Corps (TCC) sked, I checked the *Net Directory* to determine meeting times and frequencies of several section National Traffic System (NTS) nets. I doped out that I could dispense my traffic by net hopping to five different nets during a one-hour span. The schedule would be tight. Hardly a moment could be spared. Since some nets operate on SSB and others on CW, I carefully plotted the most efficient order in which I would take them. I had learned this technique well by mapping the most expeditious route in going to tag sales (a.k.a. garage and yard sales) on Saturday mornings.

I never got past the third net.

Everything went well on net number one, the Atlantica Section Net on 75-meter SSB. I checked in two minutes after the hour and identified myself as a TCC station. The net control not only knew what that meant, but he also realized that I should be cleared of traffic first, since I probably had other nets to make. The receiving station "rogered" my traffic without reading back the entire text. I was out of there in five minutes. I was impressed. As I left, however, I heard someone chide the out-of-state check-in (me!) for circumventing the System. I spun the dial to the next net frequency.

Things did not go quite so well on my second stop, the Transyltucky Phone Net. This net had started at the same time as net number one, but they were still heavily engrossed in a cumbersome roll call by counties. I knew I was in trouble as they called Colpitts County. Fortunately, I had some Pepto-Bismol in the shack to dispel the oncoming heartburn. With valuable time ticking away, I pondered whether I should drop my call in on Xerxes County, since all was quiet on frequency. I resisted the temptation, remembering that the NCS is boss, no matter what. I waited patiently for my turn during the call for out-of-state check-ins. My indication of TCC was apparently Greek to the net control. I took another slug of Pepto. I finally had an opportunity to explain my time dilemma. It was only two informals later that I was directed to send my traffic on frequency to a net old-timer who needed only three fills. Running only 20 minutes behind schedule, the NCS signed me out with the invitation to join them anytime.

My next stop did me in.

The Fredonia Section Net informal comments were in full progress when I zeroed in on frequency. It was soon evident that not even the sudden appearance of a tornado would dispel them from their appointed rounds. The Fredonia Section Manager was on the soapbox for eight minutes and 33 seconds (I timed it) before he timed out (figuratively) and I had the opportunity to list my traffic for Fredonia City. It didn't matter. Traffic had no priority here, as the informals droned on.

I'll spare you the details of my body writhing in agony. Suffice it to say that I never made it to nets four and five. It was not until some time later that I reflected on the day's frustration. It then occurred to me that traffic handlers are not

a single breed, but are made up of two entirely different species. During over 25 years of traffic handling, it had never occurred to me that traffic cats are a dichotomous bunch. There is really no such thing as traffic handlers. In ham radio language, they are either *contesters* or *ragchewers*. And *both* are equally important.

A self-analysis revealed clearly that I liked to handle traffic in a snappy, well-ordered procedure with no wasted words, be it oral or Morse. Therefore, I'm a *contester*. This concept is epitomized by the NTS TCC and Area and Region nets. The aforementioned Atlantica Net was a prime example of a section that advocates efficient traffic handling. I was in and out of their net — *bing-bang-boom*, next case. These folks were real *contesters*. They conducted the net like a DX Contest or Sweepstakes, following all the ARRL propaganda on how a net should operate — a necessity if NTS is to function well.

I had been impatient with the good ole boys of Transyltucky and Fredonia. That's because I perceived they did everything wrong, as they ragchewed the time away while traffic withered on the vine. In reality, the System needs the less structured approach as much if not more than the "rate hogs." What good is passing traffic at the region and area level if it never gets to its ultimate destination for delivery? In order to produce such a broad base for delivery of traffic, nets that appeal to the ragchewing instincts are a necessity. It may frustrate the *contesters* of traffic handling, but all hands are needed to provide public service communications.

Armed with that basic realization, the following week I again checked into the Fredonia Net as the Section Manager was just beginning his description of the eating characteristics of bovines. This time the furrow in my brow relaxed, as I calmly pushed away the Pepto-Bismol, prepared for a long siege on frequency.

W1AW Schedule

April 29 — October 28, 1984

MTWThFSSn = Days of Week Dy = Daily

W1AW code practice and bulletin transmissions are sent on the following schedule:

Time Zone	Code Practice	Fast Code Practice	CW Bulletins	Teleprinter Bulletins	Voice Bulletins
UTC	MWF: 0200, 1300; 2300; TThSSn: 2000; Sn: 0200	MWF: 2000, TTh: 0200, 1300; TThSSn: 2300, S: 0200	Dy: 0000, 0300, 2100; MTWThF: 1400	Dy: 0100, 0400, 2200; MTWThF: 1500	Dy: 0130, 0430
EDT	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M.; 10 P.M.	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.	Dy: 9:30 P.M., 12:30 A.M.
CDT	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M.; 9 P.M.	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.	Dy: 8:30 P.M., 11:30 P.M.
MDT	MWF: 7 A.M., 5 P.M.; TThSSn: 2 P.M., 8 P.M.	MWF: 2 P.M., 8 P.M.; TTh: 7 A.M.; TThSSn: 5 P.M.	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.	Dy: 7:30 P.M., 10:30 P.M.
PDT	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M.; 7 P.M.	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.	Dy: 6:30 P.M., 9:30 P.M.

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2230 UTC they are beamed south.

Code practice texts are from QST, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1984 QST, pages 9 and 84" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 84.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2230 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8:30 A.M. to 1 A.M. EDT and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you.

W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on July 4 and September 3.

Station staff: Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Charles Chadwick, K8AXL, Bruce Hale, KB1MW.

*Communications Manager, ARRL

Results, 37th ARRL VHF Sweepstakes

By Edith Holsopple,* N1GZC and Bill Jennings,** K1WJ

The cold winds of January on the 14th and 15th blew in a weekend change of pace in the form of the 37th ARRL VHF Sweepstakes. It was an opportunity for winter-weary VHFers to stir up some excitement and fill the void between the fall and spring VHF/UHF Sprints, and find some contest competition to help ease the wait until the June VHF QSO Party. What better way to get those competitive juices flowing than to have a go at the SS?

VHF SS number 37 started the 1984 VHF contest season in grand fashion with 782 of the faithful submitting entries for individual honors and helping to bolster the aggregate club scores. Although the number of entries was down from the 950 logs received in the aftermath of the 1983 contest, the contest excitement and enthusiasm ran at its usually high pitch. The seeming lack of official entries in no way hampered the efforts of the top-scoring stations. The average score among the Top Ten Single Operator stations in 1984 was 5 kilopoints higher than the comparable scores of the same group in 1983.

The single operators were led by WA3AXV (yes, Ron, you still are the king!). Ron's 101k single-op score comes as no surprise to those who have followed his progress in the SS. He has been in the single-operator Top Ten listings each year except 1974 since 1972. 'AXV is the only single operator in the 1984 contest to earn a new division record, thus bettering his own Atlantic Division record set in 1983. Ron's secret? Sharpen your operating skills and maximize your station capabilities. WA3AXV uses a 6-element beam on 6 meters, a 19-element beam on 2 meters (7 elements on FM), a 12-element beam on 220 MHz (a Super Station Master on FM), 19 over 19-element beams on 432 and 45 over 45 loops on 1296. Good job, Ron. Other single-operator stations who made the Top Ten list in 1984 as well as 1983 were WA2DPU, N2ASC, W3HQT, W3HFY, WA3NUF and W2EIF. Congrats!

Hard work and patience paid off for the multioperator stations, too. It took an average score of 10,000 points more to make the multioperator Top Ten listings this year than in 1983. The folks at W1VD did it again. They



AA4Q and KA6VRW operated 144, 220 and 432 MHz from this Santa Barbara mountaintop.

came up with the right combination and led all multiop stations with their fine 167-kilopoint score, setting a new multiop New England Division All-Time record and bettering their 1983 division record by nearly 50k points. WA2OMY, W3KKN and WB3CZG are all stations on both the 1983 and '84 Top Ten multiop list. N2SB and friends added 32 kilopoints to the one-year-old Atlantic Division multiop record set by WA2OMY, and they are now the mark to shoot for in that division. WØRGU and WØVB out in Minnesota broke the old 1979 Dakota Division record. The nine operators at K2XR worked hard for their 1014 QSOs to break their own 1981 Hudson Division record. W4IY had five hard-working operators who, after the smoke had

Affiliated-Club Competition

Club Name	Score	Entries	Single-Op Winner
Unlimited Category			
Mt. Airy VHF Radio Club	1,558,994	72	WA3AXV
Rochester VHF Group (NY)	449,802	100	K2YCO
Medium Category			
South Jersey RA	172,284	16	N2FY
Waminstar ARC	171,695	30	N3DQZ
Hampden County RA	132,964	31	K1FO
West Jersey Radio Amateurs	94,772	15	KX2W
Mt. Tom Amateur Repeater Assn.	57,204	11	K1ZJH
Rochester ARC (MN)	28,098	40	KØTS
Six-Meter Club of Chicago	24,538	11	WA9FIH
Mobile Sixers RC	22,770	13	WA3JMM
Local Category			
Delaware Valley VHF Society	251,354	10	K3HP
Potomac Area VHF Society	124,332	10	W3IP
Suburban ARC	98,536	7	WB2YEH
Meadowlands ARA	80,460	9	KA2BD
Ramapo Mountain ARC	73,498	6	WB2OOQ
Murgas ARC	64,594	4	WA3YON
Dutchess County VHF Society	63,536	7	WA2TIF
Penn Wireless Assn.	36,278	7	KØ3FT
Yankee Clipper Contest Club	33,814	4	W1XX
Drumlins ARC	30,672	8	KC2GZ
Wellesley ARS	29,208	5	W1CGI
Anne Arundel RC	27,766	3	WA3KCY
Wheaton Community RA	19,928	8	KR9K
Granite State ARA	16,938	6	AC1J
Chicago Suburban RA	10,978	5	KC9NF
Mitre-Bedford ARC	7844	3	W1FM
Keystone VHF Club	7754	4	W3FLD
Northern New Mexico ARC	2446	4	K5MAT
Birmingham ARC	1944	6	WA4QLA

Top Ten

Single Operator	Score	Multioperator	Score
WA3AXV	101,188	W1VD	187,972
WA2DPU	83,300	N2SB	117,546
N2ASC	72,160	WA2OMY	108,592
W3HQT	69,510	K2XR	96,018
W3HFY	47,808	N3BOW	60,608
WA3NUF	47,040	W3KKN	57,780
WB3JYD	44,660	WB3CZG	48,816
K3MTK	42,408	WA3YUE	44,040
K3HP	41,720	W2DMC	41,974
W2EIF	41,094	W8DJY	39,032

Division Leaders

Single Op	Division	Multiop
VE3ASO	Canadian	VE3LNX
WA3AXV*	Atlantic	N2SB*
WB9NTL	Central	W9RVG
W8XC	Dakota	WØRGU*
W8RCK	Delta	N4VC
W8BISK	Great Lakes	W8DJY
N2BJ	Hudson	K2XR*
W4ØNOK	Midwest	WAØDCB
K1FO	New England	W1VD*
WA6NHB	Northwestern	WB7DTI
K6GSS	Pacific	---
K2UOP/4	Roanoke	W4IY*
KAØMQA	Rocky Mountain	KXØO*
WB4NMA	Southeastern	---
WD6AUP	Southwestern	WA6PZL
WB5KTC	West Gulf	WA5VJB

*new all-time record

*Communications Assistant, ARRL
 **Assistant Communications Manager, ARRL



WAØDCB, NØCIH and WD9FSA made the highest score in the Midwest Division.



N2SB, WB2NPE and WB2RVX were working hard to break the Atlantic Division multiop record. Did they succeed? You betcha! They also ended up in the number two slot in the Top Ten listings for multioperator stations.



Steve, WD4GDF, in Tennessee, is stirring up the 220-MHz ether.



WA3AXV, "King Ron," is again the top single operator in the VHF SS.

All-Time Division Leaders

Single Operator

Call	Score	Year
VE1ASJ	21,158	79
WA3AXV	101,188	84
K9RO	32,220	83
WØRGU	18,000	81
WB4JGG	16,884	80
KBLEE	41,080	76
WB2WIK	63,070	80
WBØZKG	16,776	81
WA1MAO	55,130	81
WA7KYZ	10,296	79
WA6JUD/6	23,868	76
K3ICH/4	23,744	80
N6NB/7	6,120	80
W4GDS	26,400	73
N6NB	25,880	79
K5CM	14,100	78
C6ADV	320	82

Multioperator

Call	Score	Year
VE3LNX	27,420	83
N2SB	117,546	84
K9HMB	72,424	81
WØRGU	8016	84
WB4HEL	8880	73
K8II	30,984	79
K2XR	96,018	84
NØIS	16,030	83
W1VD	107,972	84
WB7DTI	10,008	81
WA6BMV	24,814	77
W4IY	31,784	84
KXØO	11,200	84
W4VO	18,966	78
N6NB	46,750	81
N5KW	16,644	82
—	—	—

Single Operator Call Area Leaders — QSOs per Band

Call	50	144	220	432	1296
K1FO	—	457	—	—	—
WA2DPJ	216	426	107	109	29
WA3AXV	175	413	134	123	33
K2UOP/4	36	165	11	30	3
WB5KTC	19	90	—	12	—
K6GSS	38	128	28	42	12
WA6NHB	59	166	—	22	—
WB8ISK	65	173	3	20	2
WB9NTL	38	118	5	10	—
WØXG	52	58	—	16	—
VE3ASO	22	160	—	16	—

Multioperator Call Area Leaders — QSOs per Band

Call	50	144	220	432	1296
W1VD	441	653	105	205	—
N2SB	329	482	138	142	34
WA2OMY	230	468	129	104	18
W4IY	127	231	27	68	—
WA5VJB	—	92	1	—	1
WA6PZL	42	82	4	2	—
WB7DTI	52	69	11	14	1
WB8JV	123	213	21	43	—
WØRVG	18	134	17	30	—
KXØO	48	114	—	31	—
VE3LNX	76	179	21	51	7

cleared, found themselves in possession of the new Roanoke Division multiop record. Last, but certainly not least, KXØO and ND2X jumped on the "time machine," went all the way back to 1968 and bettered that 16-year-old mark in the Rocky Mountain Division by 3000 points.

In the affiliated club competition (the reason so many VHFers make the SS their only contest of the year), the Mt. Airy VHF Radio Club (Pack Rats) found 10 entries and 200k points to add to their 1983 totals and again take the gavel (is that 23 or 24 wins, 'Rats?) in the unlimited category and lay claim to the title of Top Club in the SS. In the medium club category, The South Jersey Radio Association, number two in their class in 1983, soared to the heights in 1984 and will receive a gavel as the top medium class club. It looks like the Delaware Valley VHF Society is out to start a dynasty in the local category to rival the record of the Pack Rats. With the same number of entries, they added 20 kilopoints to their 1983 aggregate score and hammered their way to the top of the local class heap.

All in all, the '84 SS was a pretty good show — nothing spectacular in the way of conditions or participation, mind you, but a pretty good time and a chance to beat the winter doldrums with a little friendly competition.

Certificates are due to hit the mails on or about the 15th of June.

Good luck and CU in SS '85!

SOAPBOX

I worked the contest with an indoor 4-element broomstick Yagi and 30 W and managed to get three new states. Of course, being on the 5th floor at 7200 ft at the U.S. Air Force Academy didn't hurt (KX7V/Ø). We thought the squeaking was a sick linear amp blower, but it turned out to be a field mouse finding a home in the shack (W1QK). WD9FSA offered a surprise challenge, teaming up with WAØDCB in eastern Iowa, but it was his surprise when they found out we lost 2 and 432 towers and antennas to an ice storm. Well, Pete, maybe next time, hi hi (WBØZKG). This year, I ran enough power to melt the snow off my Yagi. Next year, I'm buying an amplifier to unfreeze my rotator (WA2BYX). In my first contest on VHF,

I noticed some other stations were going at it tooth and nail for any contact. I learned some things and made mistakes on most things, but had fun anyway (N2ESD). With N6ICV right on my tail, I hated to quit early, but rain, cold and 40-MPH winds dictated an early exit from my 3500-ft mountain (K6GSS). One can't do much with a whip antenna mounted on a card table in an apartment, but W1VD in Burlington, Connecticut, acknowledged my signal (W1JWV). I know what it feels like to contest, but I wonder what it feels like to win (KA6VVD). Murphy came to call several hours into the contest and zapped my amplifier. It was a real challenge to work the last ¼ of the contest barefoot ... I gotta get that 220 beam up! I turned green listening to others work stations I couldn't hear even though I was closer (WA3UFE). I still think grid squares would precipitate more activity away from the northeast VHF sector. I have to go over 400 air miles to get out of the state of Florida to get my third section with only one station on the air in southern Georgia. It would be more fun with more activity and more incentive (W3ZR). I recommend the exchange and logging of "handles." There is always plenty of time for this, plus about half of the exchanges already do this. Such use encourages more friendliness in the ham community (W3JPT). Conditions were terrible on 6 meters. I'll have to acquire 432 SSB to stay with the "big boys," hi hi (W6PFE). I appreciate ops who have patience with QRP CW (KL7GLL/4). I could not get rid of Murphy. The power amplifier, microphone, headset and XYL all took their toll. I lost seven hours of operation. Please incorporate grid sections as multipliers next year. This would encourage more operators and enthusiasm. It is now a matter of ax grinding for working contacts only (KC2PX). Is there an award for working stations of seven call areas, but all operating portable in Florida? How about extra points for utilizing airline aeronautical radio on 2½ meters over VE3, W4 and 6Y5 during the contest? I missed morning scatter due to airline flying and military reserves again. Activity was stinko on Saturday night and not much better on Sunday. I only worked two stations in greater Miami (K1FJM)! Can we get the boys in WPA to wake up and get on? Every contest there is only a handful of ops on from WPA. Also, Ohio should be a local contact. Why don't they turn their antennas out this way more often (WA2FXB). This contest is boring. I much prefer the June and September VHF contests (N4MM). I just got a TR-9130 for Christmas and put up an 8-element quagi three days before VHF SS. I found out that I could work off the back of my beam better than the front (broken reflector). What a way to win a contest, hi (WB6COT). So many stations asked if I had 432 that I may just get it for the June Party (WB3BGU). Scatter signs were booming Saturday night. I had four brief E openings during the contest to WØ and W4. I suggest replacing signal reports with consecutive serial

numbers (KITOL). To all those scatter ops in the north-east who wondered where we went: No, we didn't fall asleep at the switch. Our plate transformer failed the smoke test at about 2 A.M. Sorry about that (N4VC). I stumbled across the contest Saturday afternoon. I decided to give 432 a try so I soldered a 26-in piece of wire to the end of 50 ft of RG-8. I hung it on the TV antenna, and amazed myself by working four

sections with this crude antenna (KM1P). I put up my 432 antenna a few minutes before the contest. This was my first time on 432, but it was well worth it (WB0YWW). The continuing decline in 220-MHz activity has been somewhat offset by an increase in the number of 2-meter stations that were on (W1AIM). I was very surprised at the low activity on 432 MHz, particularly with so many having OSCAR 10 capabilities.

It can't be due to low antenna height, as I worked 23 stations off my KLM 2-meter up 15 ft. Overall, I enjoyed myself (KE5EP). I had Mr. Murphy with me the whole cotton pickin' time. The west feed rotor got too cold, then the power supply for IC-260A was in trouble. I replaced the diodes in it and went out with my XYL for a light 10 P.M. "lunch." When I got back, the linear went south (W8HBG).

Scores

Call, score, QSOs, multiplier, bands operated (A = 50 MHz; B = 144 MHz; C = 220 MHz; D = 432 MHz; E = 1296 MHz; F = 2.3 GHz; G = 3.4 GHz; H = 5.7 GHz; I = 10 GHz).

1	2	3	4	5	6	7	8	9	10
Connecticut	W1CJJK 3564 81-12-B W1BGLZ 3154 03- 9-AB WA1UZX 2924 06- 7-B WB1APD 2800 70-10-B WB1BPJ 2314 09- 3-B KA1CRX 2160 90- 2-B WB1CXG 1938 51- 8-B K1MAL 1848 77- 2-B WB1DLH 1776 74- 2-B K1IUR 1680 53- 5-ABC W1UWX 1536 56- 2-BC WA1UJ 1520 40- 9-B WA1YYK 1512 63- 2-B N1CDB 1488 62- 2-B W1UFP 1464 61- 2-B KA1HSP 1200 50- 2-B KB1Y 1152 48- 2-B W1JVV 1152 48- 2-B N1ABJ 1120 40- 4-B KA1DNX 1008 42- 2-B N1PFF 884 26- 7-B WA1EYF 816 34- 2-B K1JG 576 16- 8-B KA1GAX 552 23- 2-B W1ALL 552 23- 2-B K1IUB 468 18- 3-B W1RED 408 17- 2-B KA1CQL 288 12- 2-B WB1DTZ 288 12- 2-B N1COT 72 3- 2-B K1BE (+ KA1DNX) 7912 168-13-ABD	W2M8M 896 28- 6-B K2XR (K2JWE,K2QWR,KD21,KT2B,WA2a PID,VUN,WB2aEGL,TSY,WIK,oprs.) 96,018-1014-20-ABCD N2BOW (+ N2ACE,IEOC) 60,608- 787-22-ABCD K2BJG (+ WB2RFB) 17,232- 286-14-ABCD	W2DUC 5406 159- 7-AB W2EQW 5404 193- 4-AB WA2ZNC 5220 163- 5-ABCD WB2MNO 5160 164- 5-ABCD WB2YJH 5180 172- 5-AB KA2KVF 5070 181- 3-ABC W2VVG 4932 137- 8-AB K2MQY 4900 98-15-B W2EBF 4732 168- 4-ABD K2SPO 4620 112-11-BCD WA2EKT 4620 144- 5-BC WB2IEY 4608 100- 8-ABCD AF2K 4396 157- 4-B KB2NU 4200 150- 3-AB WA2MYG 4160 131- 3-BCD W2SNI 4032 143- 4-AB KC2NU 4004 143- 4-B KA2KDA 3948 136- 4-BC K2OEQ 3814 100- 9-ABD K2CQQ 3740 110- 7-B K2JA 3724 133- 4-AB K2SA 3892 129- 3-BC WA2YPT 3640 130- 4-AB WB2HJV 3510 135- 3-B WA2ECD 3380 130- 3-AB KA2HNX 3276 126- 3-B K2TTI 3000 80-15-B W2OWF 2940 70-11-AB KB2XI 2912 112- 3-B W2LLS 2904 121- 2-B KC2AW 2884 103- 4-AB KA2JRK 2832 114- 2-BCD K2KWK 2808 117- 2-B N2TW 2472 103- 2-B W2PHT 2376 99- 2-B KA2OMX 2328 94- 2-BC WA2YUO 2314 84- 3-ABCD WA2TMC 2304 64-16-ABD K2GK 2278 60- 7-ABD WA2YTM 2268 81- 4-AB KC2JO 2254 49-13-AB N2BUL 2232 93- 2-B K2JEL 2210 85- 3-B K2WWW 2200 100- 1-B WA2NFR 2200 100- 1-B WB2FRG 2200 100- 1-B KB2UN 2178 99- 1-B WB2ZFS 2160 90- 2-AB K2EAW 2132 82- 3-B W2OZY 2112 96- 1-B WA2ELC 2112 88- 2-B WB2CBX 2080 80- 3-B KA2EFC 2054 79- 3-B KA2BHD 2040 85- 2-B K5HX 1924 73- 3-BCD KA2HGH 1924 74- 3-B N2CSY 1898 73- 3-B WB2NOJ 1870 65- 1-B WB2ZJY 1870 95- 1-B K1J2P 1840 86- 2-B WB2JD 1584 70- 1-B N2CSB 1474 67- 1-B N2PEO 1464 61- 1-B K2JD (N2ZDS, opr.) 1440 80- 1-B WB2QMY 1440 80- 2-AB K2QR 1360 17-10-D WA2UD 1298 59- 1-B KATE 1232 56- 1-B WA2GBU 1224 51- 2-B K2NC 1168 54- 1-B N2AL 1168 53- 1-B N3CKH 1122 51- 1-B WB2BWQ 1100 50- 1-B KA2POD 1034 47- 1-B WA2AIV 990 45- 1-B WB2JOR 924 42- 1-B AB2F 902 41- 1-B K2OIU 902 41- 1-B K2LCL 902 23- 1-BCD WB2JLR 838 31- 1-B K2BVS 726 33- 1-B WA2SZY 680 10- 7-D K2BLB 872 28- 1-B N2BUC 816 58- 1-B WA2HFU 594 27- 1-B N2DOT 504 21- 2-B W2LC 440 20- 1-B KA2KGM 308 7- 1-B WA2ENW 136 68- 1-B N2WK (KA2HSK,KX2J,WA2a LAQ,MOP,SHN,oprs.) 26,244- 401-17-ABCD	NA2O (+ KA2OZ,WB2CDH) 8106 174-11-ABD WB2GNR (N2TW,WA2F0E,KA2a OMQ,TOU,K2S2,WB2PN,oprs.) 7174- 207- 7-ABD KB2JUN (+ N2GMF,K2OEX,WB2SUN, KA2a,RDT,RDU) 6120- 147- 6-BCD WA2AAZ (AB2F,KA2a HFS,JQV, NZCOT,NA2D,WA2SOK,oprs.) 2548 98- 3-AB WA2SDY (KA2GCZ,N2EHA,W29GAY, WA2YMS,oprs.) 728- 28- 4-B	Delaware K4CHE7 8802 178-13-ABCD WB3LGC 7130 132-13-BCD WB3BD 3200 80-10-B WB3JLM 714 21- 7-A W3CGV 616 11- 4-D	Eastern Pennsylvania WA3AXV 101,188 878-31-ABCD 69,510 695-25-ABCD W3HPY 47,808 565-22-ABCD WA3NUF 47,040 598-18-ABCD WB3JYD 44,660 612-19-ABCD K3MTK (WA3KRP,opr.) 42,408 589-21-ABCD K3HP 41,720 539-18-ABCD AK3Q 40,824 521-18-ABCD WB3RSJ3 38,840 457-20-ABCD WA3AAJ 37,478 543-17-ABCD K3JUV 36,984 522-14-ABCD KB3NQ 34,020 492-17-ABCD W3JIT 28,858 468-14-ABCD WB3ESS 24,896 251-18-BCDEF W3CL 23,520 403-11-ABCD N3BBI 23,400 361-20-ABC N3ADC 22,904 343-18-ABCD WB3LIZ 22,690 378-15-ABCD KB3ZS 22,288 363-18-ABD N3BHS 22,264 380-13-ABCD WA3AQA 21,574 358-13-ABCD WA3AIO 21,574 386-13-ABCD KB3IB 21,112 327-18-BCD K3EHE 20,768 383-12-ABCD N3DQZ 20,496 380-14-ABD WA3PUL 20,010 351-13-ABCD K3ONW 19,904 312-7-BC N3CX 19,296 268-14-ABDE WA3HMK 18,660 311-30-B KM3T 18,630 345-17-B WB3CJU 17,640 310-11-ABCD K3M3M 16,094 288-13-ABC WB3EPU 14,798 259-17-BC W3NSI 14,400 235-11-BCD K3IWK 14,040 257-6-ABD K3QQ 14,028 274-11-BC K3NHX 13,986 269-11-ABCD K3BPP 13,772 237-12-ABCD K3ACR 12,780 313- 8-ABC K3VYG 12,720 253-10-ABC K3GFT 12,888 244-16-B WA3YON 12,388 194-17-ABCD AK3M 12,240 295-14-B WA3JUF 12,160 156- 9-ABCD N3MW 11,880 233-10-ABC N3AAY (N3DCR,opr.) 11,878 243-11-BC K3DMA 11,210 244- 9-ABC K3GAS 11,124 244- 8-ABCD W3CXU 10,716 178- 9-ABCD W3GJC 10,400 200-26-B K3KTY 9558 154-17-ABC K1RS 9168 184-14-BCD WB2BJH3 8888 881-14-B WA3TEM 8288 219- 4-BC W3HK 8160 188- 7-ABC W3AUF 8094 165- 3-ABC WA3IWT 7938 157-11-ABC K3EPL 7286 165- 3-ABC WB3HMO 7056 189- 4-BC W3HHU 8840 132- 3-ABCD WA3VMM 6384 165- 9-ABC WA3VJM 6156 155- 9-BC WA3KEY 6080 160- 9-A KA3FBP 6072 138-12-B WB3JLR 6040 151-10-B K3EBZ 6000 190-15-AB N3CFE 5436 136- 8-ABC W3ZAA 5310 177- 5-B K3KM 5292 189- 4-B			

Results, 1984 Novice Roundup

By Edith Holsopple,* N1CZC



KA3KYY/N was the top scorer from W3-land with her 42,680 points from the MDC Section.

Novice Roundup week — for some the shortest week of the year — has come and gone. Only the operators know for sure how much agony, sweat, grief, fear and trembling went into making these NR QSOs. The 1984 Novice Roundup, from January 28 through February 5, brought 295 Novice/Technician entries sailing in, plus 90 checklogs and non-Novice logs for a total of 385 entries.

This is the week that everyone has an opportunity to gain in operating skills and cooperation. During Novice Roundup week, we as radio amateurs show our true colors as we help each other improve operating techniques. As with most new hobbies, getting started is a great equalizer. Old and young, rich and poor, men and women all have to start at the bottom and then grow in proficiency and confidence, born of experience into skilled communicators. This year, Novices and Technicians were out in full force, making those QSOs and racking up experience and points. And we are grateful to the seasoned operators who were out there, too, patiently working and providing multipliers and QSOs.

Some of you expressed frustration at the typical speed of operation during the NR. Dave, KA5IFE, sent in some suggestions for next year's Novice Roundup:

"Here's a word that might help the new Novices contact the fast CW contesters who are sending just too fast for them to copy. Try waiting until their QSO is over; just as they clear, most times, they will stop and listen for just a few seconds to see if any others will give them a call. At that time, take advantage of this and send DE, which means "this is," then your call. Like this: DE KA5IFE K. Send it even if it's three times slower than what they have been sending. Remember: Just once. They will usually come back to you at a speed you can copy. Try it; it works. We all enjoy helping each other to enjoy and have fun in the NR."

KB4DOV/N jumped forward from 10th place in '83 to 5th in '84. Likewise, KA7HBK/N hopped from 8th to 6th position, KA9KKD/N skipped from 6th to 4th and KA2KGD/N from 4th to 3rd. KA5IFE/N dropped from 5th to 7th place, and KA8JBK/N dropped from 7th to 10th place. Meanwhile, KA5SBS/N and WP4COF/N materialized out of anonymity to take the honored 1st and 2nd positions. What is this —



"Grandma" Carmenza, KB6ANC, realized a 40-year-old dream when she got her Novice license.



KA2QXU/7N put in a fine effort from Washington. Next year, he plans to be in HBØ-land for the NR.



After receiving his Novice ticket a scant five months ago, 12-year-old Chuck, KA5SBS, put his newly acquired operating skills to use to claim the top slot for Novice operators in the '84 NR.

musical chairs? Thanks to Sean, WH6AVA/N, who kindly provided the Pacific multiplier for many. Nice work, people!

Congratulations are in order for KB4EJE,

Top 10

Novices		Technicians	
KA5SBS/N	77,310	KA1JIR/T	34,706
WP4COF/N	57,510	KA5QAA/T	29,463
KA2KGD/N	54,352	KA7NFW/T	23,936
KA9KKD/N	50,784	KA8OAT/T	23,925
KB4DOV/N	47,163	KA3EEO/T	22,995
KA7HBK/N	45,899	N4JGV/T	22,971
KA5IFE/N	42,912	KB6AXH/T	22,776
KA3KYY/N	42,680	N8FEB/T	22,632
KA2RDO/N	42,104	KA8LAG/T	20,262
KA8JBK/N	41,038	N1CPC/T	19,875

N3DBX and any others who made their first CW contacts as hams in this NR. Also, congratulations to those who upgraded as a result of NR increasing their code speed. Thanks to all who weathered the week and made this year's NR a success. Certificates will be in the mail shortly after the 15th of June. CU in NR '85.

SOAPBOX

It was all fantastic (KB6ANC). I was getting a good start on the second day when I had a mild heart attack. Nothing serious, but it did put a crimp in the day's activity! (KA7RAD). For a first contest it was fun, but "where is the DX? I don't think there's any out there" Hi (N6JPA). I was able to increase my states worked from 20 to 38 (KA7NSZ). I was amazed at the number of higher class licensees who participated... bless them for their patience and understanding. Kudos to my wife and four kids for their temporary loss (30 hours) of ham-crazed husband and father. I'm eagerly looking forward to the next contest (KA2SKO). I had no intention of really taking part; just thought I'd make a few QSOs to give MN to a few serious contesters. I got hooked and decided to try for 200 (KAØRDM). I learned at least 11 lessons and gained three insights as to the advantages of participating in NR (KA8OMM). My thanks to all the many Generals, Advanced and Extras who participated. At one point so many Extras answered my CQ that I thought I was out of band (KA9JKK). It seemed as though the whole country was working NR on 80 meters with the resulting QRM being almost unbearable. I could only work about one hour at a time without headaches occurring (KA5PVB). QRM, Murphy and the like were no stranger to my shack. One problem I had to contend with was using my 40-meter dipole on 80 meters. This was accomplished with my tuner, and I was excited with the results. A more unusual problem was being interrupted from the contest by my obligations as a volunteer fireman. I guess I will have to put an HF mobile rig in my car, hi (KA2QEE). The contest motivated me to get on the air for the first time (KB4EJV). Wow! Had lots of fun operating my first contest. It was a bit crazy at times on 80 meters at night. Somebody was actually fooling around with me, and I thought I was getting some good DX. But this interference didn't deter my enthusiasm (KA3KYY). My rig, a used HW-16 with VFO, died the last night of NR. My mother recently said she would rather help me buy a new rig than a car (KA7QVN). If you don't have a well insulated basement shack, it's going to be very uncomfortable to stay active for the whole contest. My

*Communications Assistant, ARRL

fingers kept developing little icicles, I needed to thaw out over my finals. Band conditions on Saturday the 4th were the worst I've ever seen. Everybody left 15 meters in disgust and headed for 40 meters at 11 A.M.! As a reward, I went out and passed my General code exam (KA7NYB). The new Novices at times have very slow code speeds so ya work 'em while yer restin' and everybody gets some points (KA9LAE). A special thanks to the General who was butchering the code worse than I do. It gave my ego a big boost (KB4FIJ). Here I am a 14-year-old Novice for one year, and I am

a veteran contester. I improved about 1 million percent over last year (KA2RDO). The 30-hour limit is a good one because I probably would have stayed on till I passed out from nervous exhaustion (KA1IEK). I made more contacts during the contest than the entire year that I have been a ham. You don't have to win in order to have fun in contesting (N4JGV). NR-84. What a way to spend my birthday (KA1JRR)! I thought the contest was great, but it will take some time to gain the respect and admiration of my wife and two kids after deserting them for something called NR, hi hi

(KA8CMA). Gee, do I have to wait a whole year for another NR? (KA9QPC).

FEEDBACK

See page 93 of June 1983 QST for the following correction: The soapbox comment was made by KA9OIH not KA9IOH. His previous Novice call sign was WN9ICB. KA3EEO/T's score from EPA was overlooked. Carol's linescore should read 17,460-281-60-22. This would make her the number 9 Tech in the 1983 NR.

Score Listings

Score listings indicate call sign, score, number of QSOs, multipliers (number of ARRL sections + DXCC countries) and total hours.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																																																																																																																															
Connecticut	WP4BX/P	3956	92-43-10	KA3DFB/N	2730	58-35-14	Louisiana	KA5QMO/O	17,088	252-64-22	Montana	KA7HBK/N	45,899	556-79-29	KA9ONB/N	132	12-11-4	Indiana	KA9JKK/N	15,517	263-59-30	KA9IWP/T	15,512	277-56-30	WD9BDW/N	13,808	201-63-27	KA9OR/N	12,400	200-83-24	KA9PGD/N	6636	148-42-20	KA9QWP/N	6264	106-54-18	KA9CP/N	5382	107-48-24	KA9QVM/N	5040	126-40-7	KA9QBI/N	4840	121-40-13	Wisconsin	KA9QPP/T	11,343	191-57-26	N9DM/G	7791	147-53-29	KA9OQT/N	2415	89-39-19	KA9PQ/T	779	41-19-24	0	Colorado	WB9BV/N	24,288	352-69-28	KA9IJO	3168	96-32-14	KA9RSJ/N	2018	56-36-12	Iowa	KA9QMP/N	13,260	245-52-30	KA9ONW/N	5123	109-47-30	N9FB/C	1766	52-34-15	KA9RSJ/N	1560	33-20-9	KA9RP/N	135	15-9-9	Kansas	KA9QVW/N	20,569	287-67-30	KA9IT/N	15,120	240-83-30	KA9POT/N	8738	158-59-28	KA9OS/N	4488	102-44-26	Minnesota	KA9RDM/N	14,384	232-62-25	KA9PP/N	522	24-18-22	KA9RJJ/N	7800	150-52-17	Missouri	KA9KCV/N	4797	113-38-10	Nebraska	KA9OSK/N	13,568	212-64-30	North Dakota	KA9NUQ/T	360	20-18-5	South Dakota	KA9ME/N	19,998	283-66-21	KA9QXA/N	3600	215-40-15	KA9QY/T	2160	60-36-21	KA9OU/N	99	11-9-4	Non-Novices	K3TX	15,792	KA6GIS/7	13,120	NAJHN	12,992	W1EMF	12,982	KA2PGY	10,441	W5HPG	9738	KA8PQH	9200	W9LHW	8728	W0ADZ	6435	W3ADE	6345	NOZA	6338	W9AB	(W9EY - op)	5928	N9DPV	5880	K1QVF	5412	W4WQ	5200	K9SQ	5096	N1RC	5025	W1HC	4800	KA5KWX	4784	W3ABC	4095	K0BNU	3157	KT7H	2898	WB8HF	2775	W1ECC	2378	N1DF	2108	K2SX	2077	W4GHV	1848	K1Z	1708	WB9IHH	1588	KE2B	1555	W43RGH	1480	KV8B	1278	KT7U	925	W4YOK	814	H1AC	777	N2EPC	736	W3COM	580	N8EH	568	K0BET	432	W1HTA	154	K0CJ	140	KA2QJ	126	KA8SQJ	121	K1KJ	123	W1DD	64	W6SKM-SJV	49	WNEAO	36	W6SKM-ORG	30	N1CZ	9	Checklogs	VE5ACY	VE4AAU	K8KES	W8UE	KA2KAG	WB1Z	KV8U	W9ABT	W9FSO	WB5TM	K8BNCR	KATLOR	KD1GW	K8HGE	KATLW	W4GWN	W4ASD	K1JZ	KW2J	K7WE	W8AGN	N8ESV	KA8ODQ	W3QEL	WBVLU	KA3CHY	KA3DLV	N7FXU	N4HLU	KA9QPN	W7VYS	W3ARK	KA9GHW	W4V7J	KV8N	KAUSUN	K8LAB	N1ADX	W9PNE	W8DD

Results, 1983 ARRL VHF/UHF Fall Sprints

By Edith Holsopple,* N1CZC

For everything there is a season under the sun. The Fall Sprints made for a spicy autumn contest peppered with activity. The shorter length (7 P.M. to 11 P.M. local time) took a smaller bite out of the evening, and the dash of meteor scatter iced the cake. Although some commented that conditions were poorer in general than during the last Sprints, turnout was high, with 354 entries received.

The 1296-MHz Sprint on Nov. 10 was the least attended, with only 19 brave souls sending in their logs. Most of the 1.2-GHz activity was clustered in the New Jersey area. If you live in another part of the country, do not abandon hope. There will be another chance.

We received a whopping 59 logs for the 432-MHz Sprint on Nov. 16. The major area of action was in call areas 1 and 2, with another

hot spot in the Northwest U.S. All the U.S. call areas reported some 70-cm activity except W0-land.

November 22 brought a good turn-out on 220 MHz. Forty-five logs came bounding in, reporting quite a bit of activity. The top scorers worked 30 to 40 other stations.

The 144-MHz Sprint on Nov. 28 was again outstanding, bringing in 163 entries. K9MRI in Indiana had the highest number of multipliers

— an amazing 42 — but the top score was taken by WA2DPU of SNJ by virtue of his high number of QSOs. This year, the high scorers on 2 meters made fewer contacts but more multipliers than last spring. K2LWR of WNY and WA8ZHE of Ohio each had 38 multipliers. Second and third place scores go to K9MRI and N2SB, respectively.

The 50-MHz Sprint, a favorite for many, brought in 69 logs. The Dec. 11 contest made K1JX (operating station W1VD) a winner this year. His score of 8670 is still below last spring's winner, WB8IGY from SFL. WB8IGY wasn't hard to beat this year since he only made one contact on 50 MHz (see his soapbox comment). K1JX's 51 multipliers on 6 meters are nothing short of phenomenal, considering the mediocre propagation that weekend. What a fine effort.



Curt, K9AKS, at the 432 operating position, digging out another contact. The 432 amplifier cavity is visible in the foreground.

SOAPBOX

These short weeknight contests are a good idea. I would like them to be even shorter (2 hours), particularly on 220 MHz and up, and start at a later time (AF1T). Activity lasted longer for this one than the other sprints. Had to quit for Channel 2's *Masterpiece Theater* at 9 P.M. Aurora was nice, although only netted 3 grids (KA1DHO). An enjoyable contest. This was my first try at VHF contesting. I really got clobbered by the local kW stations, though. Keep up the good work (N1ABY). The new time periods are good. There was plenty of time to work all the stations there were to work (W1AIM). A short period of aurora spiced it up a bit. I had several nice scatter contacts. Keep the sprints coming (K8ZES). Please do not have 6-meter Sprint on Sun. evening, prime time TV for stations with TVI. Try for a Sunday afternoon (N2BJ). I would like to see a separate power class for 25-W-and-under stations. I would also like to see these one-night contests more often, maybe one for each season (KA2OQZ). Could have been an excellent contest, but not enough activity in my listening area. It was fun, though (W3KJM). Conditions were bad. Participation was very low. Must be too close to Christmas and right after the 10-meter contest (N4MM). I got on late and spaced out antenna patching — wondered why everyone I normally worked had so much trouble hearing me. Hll (and why they didn't peak!) (N0KV). I found the band very noisy and without activity because of bad weather. We had three tornadoes go through EL-86 a couple hours later. Better luck next time. I would like to see the grid system tried on 10 and 160 meters. This type of contest gives the working people a chance to compete against the big guys and still get up the next morning and have a straight head on to go to work (WB8IGY). Very short burst — made it very difficult to work complete contacts (W5NZS). Good meteors, little activity — let's have the next 6-meter Sprint from 7 to 11 A.M. on a

activity, a fun evening (K2JIO). Had a high local noise level, but lots of local SSB activities in the Hudson Valley. Sure do like the grid-locator system (WA2RUW). After waiting for this night for months, I could not operate because of heavy icing (WA2ZPX). There was some nice activity. We are north or northwest of most stations, and they may not look in this direction (KA2Q). Conditions were horrible. I guess I was the only EM-35 and only Arkansas station on! Keep it going anyway. One never knows what to expect (K5VY). The Sprints are great! Now we gotta get more people involved (KB7G). This was a tough contest! Band openings were very sporadic and short in duration. I copied WB2OGK in SC on several occasions, but did not produce a contact. We had a short auroral opening, but it produced no contacts at my low power station (KA8IFC). The Sprints are great. Just the right length (W8NJR). Enjoyed the contest very much. Signals were like a light switch: on or off. I feel there should be winners from each state on this type of contest, because with little to no openings there is no way a station in my location can compete with the stations in the Chicago-Gary and south area. They have 10 hams to my one within 100 miles of their stations, and when there are little or no openings, the points add up faster than the grids (WD9HOZ). I noticed no entry for MO during the spring so I was really looking forward to entering the Fall Sprint. Conditions were so-so, but spirits were high. I'll have to get a key next time — it would have helped my score. Thanks for supporting contesting on VHF/UHF bands (WB0LRF). I wish that there was more activity, but those on the air were enthusiastic. The time period is perfect (KB0FT). I wish more stations would point beams at central PA, and less would operate FM and get on SSB or CW. It's pretty discouraging to be beat by some guy with an HT and a duckie in the city (KC3CL). I had fun and got a feel for 220 in the southeast, and a start on 220 VUCC (N3AHL). Seven round trips to the top of a 120-ft tall fire lookout tower netted three QSOs, hi (N5AF). Someone should tell all the folks transmitting on 435 to listen on 432 once in a while (K6GSS). Great fun. By all means retain these Sprints. I would like to see grid format used for all contests above 50 MHz (K9LCR).

Sunday and, please, not on the same day as another major contest (K6GSS). There was pretty good m.s. action. I had m.s. QSOs with N7DB, W7F1 and KB7N (also partial with N7E1J). The calling sequence was not always uniform, sometimes making things tough (NR6E). Conditions on 220 were very good at times to Seattle. Having the 6-meter Sprint during the Geminiids sure helped on getting grids via m.s. (N7DB). I got a late start, but had a good time anyway. This was the first time that I used my computer for any ham radio function. It was different not writing anything down (KA1CEL). Conditions were poor, as rain fell and turned to ice on antennas (W1JR). Activity was great the first 15 minutes (W1GXT). I enjoy the Sprints and like the one evening (K11SW). We just had enough time to work the locals. Where was the W8 activity? They certainly didn't have their antennas east. Great contest (K2LNS). Lost some QSOs and grids with rain static (K2LWR). New amp arrived the day of the contest. Don't go back to six hours. Hasn't anyone told the 4s they can work this contest? (W2WW). Summer may have good propagation, but winter has the activity (KR2Q). The grid square hunters made for lots of

*Communications Assistant, ARRL

Results, 1983 Simulated Emergency Test

By Jim Clary,* WB9IHH and Robert Halprin,** K1XA

Each October, thousands of radio amateurs flex their public service muscles on that great electronic Nautilus machine known as the ARRL Simulated Emergency Test (SET). Through the various emergency communications scenarios implemented at the state and local level, radio amateurs are able to test their operating agility. The vast majority of SET activity flows from the League's volunteer Field Organization, particularly the Amateur Radio Emergency Services (ARES) and the National Traffic System (NTS). A statistical chronicle of the 1983 SET, tabulated from written reports submitted to ARRL Hq., appears herein. The SET is just one of many ways dedicated ARRL volunteers serve in the public interest; this is well recognized at all levels of government and generally throughout the public at large. For those who like to participate in public service activities, contact your ARRL Section Manager, whose name and address appear on page 8 of this issue.

As this is being written, the concept of "new ideas" is very much in vogue in the political realm. While it is in vogue, it's also vague. New ideas without substance to back them up have little worth. As far as SET is concerned, activity has been substantial, particularly in recent years, from the efforts brought to bear by the dedication of volunteers from coast to coast. One new aspect of SET has been the trend toward section-wide events, followed-up by summary messages to National Communications System (NCS) Headquarters. An update on an ongoing series of tests sponsored by NCS is detailed in this month's Public Service column.

But having stated all this, perhaps for some SET has become muscle-bound. This creates inertia, the kind that is synonymous with immobilization. Therefore, perhaps a new approach, new ideas if you will, are needed to revitalize the October event. This has indeed been suggested by some interested amateurs at their own initiative.

We'd now like to request such ideas from the broad spectrum of radio amateurs reading this report. What are your suggestions? For example, should we have an SET that has more of a national focus, or one in which selected regions are disaster-struck on SET weekend, with the affected League officials notified by sealed

1983 ARES/Local Activity SET Summary

Reports submitted	304
ARRL sections active	58
Number of emergency-powered stations	3886
Number of emergency-powered repeaters	243
Total number of points	59,677
Top section	Ohio

1983 NTS/Net SET Summary

Nets reporting	236
States/provinces reporting	42
NTS affiliation or liaison	700
Number of messages handled	12,265
Number of amateurs participating	7565
Number of emergency-powered stations	2563
Total number of points	44,821
Top state	Florida

envelope shortly before it all happens? Please forward your creative thoughts, and remember that the most creative ideas of this nature are those that are provocative and at the same time doable. Unnecessarily complex ideas prevent any realistic hope of implementation. The rule of thumb: Maintain a fundamental awareness that this is SET, not Star Wars!

While we're on the subject of creativity, the following SET summary contributed by Canadian correspondent Carol Brunt, details the SET excitement in greater Toronto:

"At 7:12 this morning, an earth tremor registering 5.7 on the Richter scale struck at a point 30 km south of Metropolitan Toronto, in Lake Ontario. The resultant tidal wave, traveling at 10 km per hour, struck the downtown core of the city at 10:12 A.M. The entire area has been evacuated. Telephone exchanges located throughout the downtown core have been disabled by severe flooding. Beginning at 0930 Saturday, October 15, 300 volunteers participated over the course of the next two days in a response to this 'disaster.'

"No such disaster occurred, of course. This year's SET for the Toronto area was designed and organized by a joint committee of Metro Red Cross Emergency Response personnel and Toronto ARES personnel. Radio communications during the disaster were supplied by the Toronto ARES group, headed by Dave Enright, VE3FOB, Emergency Coordinator for Toronto.

"This was the most ambitious exercise to date, according to John Buckley, VE3LNN, Assistant Emergency Coordinator for Toronto,

particularly because of student involvement in 'play acting' the citizens' responses. The Dramatic Arts Consultant for the Toronto Board of Education was responsible for coordinating the activity, which was held at the three shelter locations. The weekend provided a test for both the amateurs and the Red Cross in practising emergency procedures and communication between the established shelters and a central registry (the file-keeping location), which for the first time had been removed from the scene of the action.

"Students from high schools throughout the Metro Toronto area were involved in creating the confusion, tension and problems of a disaster situation according to prewritten situations designed by students at Oakwood Collegiate in Toronto. Red Cross personnel would have to deal with any problems arising from the situations (e.g., heart attack or lost children). 'The students handled themselves very well,' said VE3LNN. Once inside the shelter, the students were registered, using the Red Cross forms as if it was a real shelter operation, as members of 1000 fictitious families provided by the Red Cross. To simplify identification inside the shelter, all personnel wore coloured tags to represent their position. Included among these were outside observers to the exercise.

"Because of the telephone blackout, ARES assistance was required to transmit all registration of persons at shelters and other locations to central registry at the Metro Red Cross Building. ARES also provided a link between all shelters to handle requests for supplies and personnel. Transmissions were through the VE3XUU repeater, on 145.23 MHz. Communication to the rest of North America also was available through NTS. Messages were conveyed through emergency sessions of the local Open Line Net on the VE3RPT repeater, 147.06 MHz, to special sessions of the province-wide Ontario Emergency Net on 7.055 MHz.

"Each of the three shelters required one radio station; two were required at central registry, with two operators for each of three shifts during the seven hours. Sunday's activities included the continuing transmission process to central registry from shelters at Red Cross branch locations in Scarborough and in Toronto.

"Considered a success by all, the weekend's proceedings were helpful in identifying what the Chairman of Emergency Services for Metro Toronto Red Cross and President-Elect of the Toronto Central Branch termed 'weak spots.'

*Communications Assistant, ARRL
**Deputy Communications Manager, ARRL

Also, a group of volunteers have registered their names and equipment with the ARES, and are committed to being available in the event of a disaster to provide whatever communication is necessary.

"The need for this type of commitment and organization was demonstrated when a train carrying toxic chlorine gas derailed in Mississauga, Ontario, November 1979 (see March 1980 QST, p. 50). With the help of CRRL members, 200,000 residents were evacuated. As

a result of the hams' efforts, the Ontario Division of the Canadian Red Cross signed an agreement with the CRRL to provide the official communication system in the case of emergencies. Though the ARES has always had a yearly drill, it will now include Red Cross participation. "If the Red Cross is involved (in an emergency), then we're involved," said VE3LNN. The weekend provided invaluable experience in emergency communication for the amateurs who participated."



Local Activity

Local Activity	Reported By	Points	Local Activity	Reported By	Points	Local Activity	Reported By	Points
VE Alberta	(175)	1745	Armstrong County	N3DOL	97	Harris County - Clear Lake Sector	K5BY	140
Calgary	VE8AFO	1745	Beaver County	K3NFX	1132	6		
Ontario	(2140)	1017	Crawford County	WA3ZSC	19	Orange	(2259)	1542
Algona District	VE3EUI	117	4			ARES/RACES/Red Cross	W6RE	176
Brockville - Prescott	VE3LBU	149	Alabama	(1033)	1103	Blythe	N8ANL	81
Bruce County	VE3LCZ	49	Jefferson County	WA4RNP	731	Coachella Valley	W6VMR	143
Northwest Ontario	VE3JJA	301	Lauderdale County	K4HJX	28	Inyo County	W68YZ	150
Peterborough	VE3KXB	72	Macon County	N4HTG	217	Inyo County - South	W6DHK	87
Toronto	VE3FOB	448	Shelby County	N4HTG	217	North Orange County	W6GUC	122
Saskatchewan	(105)	534	Tuscaloosa	KF4VQ	30	Riverside County ARC	WA6KOM	86
Prince Albert	VE5RP	104	Georgia	(1403)	78	Riverside County District 1	KG6U	248
Regina	VE5AEJ	272	District 22	W4FIZ	78	Riverside County District 2	W6BHF	70
Saskatoon	VE5RP	158	District 3	(2827)	1103	Riverside County District 3	W6BPHX	399
1			District 5	WD4CWT	140	Riverside County District 4	(423)	250
Connecticut	(1265)	376	District 6	WB4NHO	445	Paicifi	KHS	121
Goshen	KA1HGH	41	Woodford County	WA4YFQ	188	Kauli County	KH6H	129
Putnam	WB1DXZ	335	North Carolina	(1895)	645	Mau County	(73)	1005
Eastern			Caldwell & Catawba Counties	WB4HRR	165	Sacramento Valley		
Massachusetts	(327)	519	Cumberland County	N4ANU	102	Butte & Glenn Counties	K6EP	237
Bellingham	W1XA	86	Davidson County	K4SWN	92	Sacramento County	K6GJF	608
East Falmouth	WA1ORP	114	Durham County	W4LEN	66	Trinity County	W6ZJQ	102
Lincoln	WA2GFZ	10	Forsyth County	WA4TCR	200	Yolo County	N6EPG	58
Sections 2A & 2B			Northern Florida	(1895)	1403	San Diego	(-)	144
RACES	WA1OEZ	247	Beaches of Jacksonville	WB4K	206	San Diego County - Southern District	WD6CSS	144
Shirley	W1IPZ	62	Clays County	K4BI	102	San Francisco	(-)	403
Maine	(785)	853	Highlands County	KD4QZ	180	Humboldt County	K6BLF	403
Aroostook County	WA1YNZ	754	Leon County	KC4N	67	San Joaquin Valley	(502)	83
York County	WB1FBE	99	Marion County	WD4RJL	442	East Kern County	WA6KZV	83
New Hampshire	(412)	288	Orange County	WA4QPA	221	North Santa Barbara County	KA6Q	315
Coos County	K1OIQ	86	West Pasco County	N4DWY	185	San Luis Obispo County	WB6IY	123
Stratford County	K1ACL	202	South Carolina	(303)	7	Santa Barbara	(918)	438
Rhode Island	(482)	227	Marion County	NG4S	7	Salinas & Salinas Valley	WD6EKR	384
Newport County	W1JFF	188	Southern Florida	(6978)	5867	Santa Cruz County	WA6OCV	320
Providence County	AE1S	59	Dade County	K7LCA	749	7		
Western			Gladys & Hendry Counties	W4YTY	899	Idaho	(53)	70
Massachusetts	(629)	672	Hardree County	AA4BN	59	Cassia County	WA7NRP	70
Berkshire County	WB1DBN	248	Highland County	WD4KBW	118	Montana	(511)	421
Franklin County	WB1HRN	345	Hillsborough County	WB4WDK	125	Gallatin County	KB7BJ	125
North Worcester	K1JHC	79	Lee County	KR4X	487	Yellowstone County	KC7HP	247
2			Hills County	WB2OUK	373	Nevada	(385)	393
Eastern New York	(718)	584	Manatee County	WD4CRR	273	Western Nevada	K7HRW	393
Albany County	WB2ZCM	180	Marin County	K4ZK	238	Oregon	(430)	397
Orange County	WB2SON	178	Palm Beach County	K64VR	198	Jackson County	WB7RQJ	61
Rensselaer County	WB2JJE	63	Pinellas County	W4GPL	1156	Klamath County	W6HSW	338
Schenectady County	N2AIG	163	Polk County	NW4R	144	Utah	(-)	148
New York City-Long Island	(480)	1044	South Brevard County	KA4ZPM	1032	Davis County	WA7JLJ	148
Islip Township	KA2HRX	522	Tennessee	(1331)	576	Washington	(1058)	1135
Smithtown	KA2CHD	522	Anderson County	KY4L	58	District 7	KC7SZ	152
Northern New Jersey	(554)	388	Blount County	N4AOX	102	Idaho County	W7GHI	215
Bergen County	W2CC	48	Cannon County & Area-4	WA4GZQ	54	Jefferson County	K7RBT	97
Hudson County	W2JB	90	Claborne County	WB3RCR	13	Kitsap County	KC7FA	274
Monticello County	WB2VUF	156	Coke County	WA4SJV	94	Okanogan County	W7LUP	103
Passaic County	K2SE	74	Coffee County	WB4FUR	159	Spokane County	WB7VZ	294
Southern New Jersey	(386)	425	Scott County	KA4BSG	23	Wyoming	(-)	48
Camden County	WB2JVB	79	Sullivan County - East	WD4EKA	0	Berlin County	W8KSK	113
Cumberland County	KA2ANJ	179	Sullivan County - West	WD4BGU	86	Branch County	KA5JTM	228
Mercer County	AA2H	187	Virginia	(694)	182	Cass County	WD8I2H	11
Western New York	(1591)	1878	Vienna	W4NFA	53	Clifton & Ingham Counties	W8BAP	304
Chemung County	WA2OVT	170	Virginia Beach	WA4TCJ	129	Crawford County	WB0T	353
Delaware County	W2TFL	67	5			Genesee County	WBULIN	1000
Erle County	WB2PID	104	Louisiana	(-)	576	Idaho County	W8LCU	191
Genesee County	W2FEY	87	Northwestern Louisiana	WB5USS	449	Kalamazoo County	K8QCB	117
Lewis County	W2QEP	85	Webster Parish	K5WOD	127	Monroe County	WA8EFC	382
Livingston	W2QB	15	Northern Texas	(4974)	722	Montmorency - Oscoda - Otsego	WB8POL	298
Monroe County	N2EH	307	Border & Scurry Counties	KB5UL	3	Oakland County	N8DEI	811
Niagara County	WB2QZL	105	Childress County	N5CAN	77	Ottawa County	WB8ZF	192
Oneida County	K62DP	508	Ellis County	K5ASU	174	Sanilac County	W8CUP	56
Onondaga County	WA2PUJ	154	Grayson County	WB5SBO	141	St. Clair County	K8UPE	507
St. Lawrence County	KA2CMQ	64	Hunt County	K2SGU	76	Washtenaw County	W8KJ	215
3			Lamar County	WB5JFL	81	Wayne County	W8EJ	439
Eastern Pennsylvania	(743)	318	McLennan County	W5JGV	117	Ohio	(9000)	9981
District 2	AA3C	219	Nolan County	K5ISD	53	Allen County	N8CZV	136
Lehighton	WB3JYY	97	Oklahoma	(981)	31	Ashtabula County	K8BIZ	114
Maryland - DC	(412)	55	Payne County	WSZTN	31	Athens County	WBKVK	323
Calvert County	W3ZNW	55	Southern Texas	(1314)	927	Auglaize County	K8LMM	82
Western Pennsylvania	(898)	1288	Brazos County	W5R5N	400	Belmont County	KB1P	110
			Fort Bend County	N5ETD	273	Butler County	K8BI	92
				W5WVX	114	Carroll & Stark Counties	WD8AYE	1085
						Central Ohio Counties	WB8KO	1174
						Champaign & Logan Counties	K6NNM	305
						Clark County	WB8RYA	251
						Clermont County	W8BTSX	520
						Columbiana County	K8JDI	175
						Cuyahoga County - West	WD8AYH	166
						Darke County	W8LZR	155
						Fayette County	W8BPHL	88
						Greene County	K8BBCD	87
						Guernsey & Noble Counties	WB8TRK	114
						Hamilton County	K8EJ	1443
						Hancock County	N8AEH	50
						Hardin County	W8OQL	200
						Hocking County	N8AAW	15
						Jefferson County	WD8SAB	128
						Knox County	W8NLQ	249
						Lorain County	K8BYU	414
						Lucas County	W8BDYW	974
						Marion & Wyandotte Counties	WB8NEE	54
						Medina County	K8DJZ	39
						Mercer County	WB8N	40
						Miami County	K86Z	160
						Perry County	K8GJ	25
						Portage County	W8BMPV	97
						Preble County	W8BDJR	232
						Putnam County	WB8SGL	211
						Richmond County	WB8GGH	286
						Scioto County	W8NLCQ	249
						Seneca County	WB8VE	152
						Summit County	WB8HFZ	110
						Trumbull County	K8CGI	70
						Washington County	WB8UHF	79
						Williams County	K8B0F	52
						West Virginia	(713)	353
						Brooke County	WB8MJE	86
						Hampshire County	W8FZP	4
						Hancock County	K8JEW	115
						Kanawha County	W8NLCQ	249
						Pleasants County	K8KXE	8
						9		
						Illinois	(1140)	1035
						Centerville & Boone	K8DCG	37
						Christian County	W8HLX	22
						Fulton County	W8MLU	57
						Jackson County	W8CJX	84
						Lake County	K8AJMG	578
						Lee County	W8SRJM	104
						Montgomery County	WD8EEJ	122
						Platt County	A9H	137
						Wabash County		
						Indiana	(8334)	4512
						Bartholomew County	W8SIO	170
						Clark County	W8TDI	373
						Decatur County	W8PRD	74
						DeKalb County	W8CWI	127
						Floyd County	K8BFD	562
						Franklin County	K8VJ	204
						Grant County	K8JYJ	13
						Hancock County	K8BRE	227
						Hendricks County	W8TIZ	109
						Lake & Porter Counties	N8CQD	705
						Marion County	N8AJD	224
						Marshall County	K8BDE	37
						Martin County	WB8ENK	65
						Montro County	W8BVK	174
						Morgan County	W8ZSK	140
						Owen County	WB8BKA	57
						Pike County	W8BCE	256
						Putnam County	K8BIE	69
						Randolph County	W8VJK	122
						Ripley County	WB8OTX	85
						Rush County	N8DGO	148
						Southeast Indiana	N8AST	694
						Vigo County	W8MJI	264

NCS Update

The National Communications System (NCS) was established on August 21, 1963 by Presidential Memorandum. A confederation of 22 federal departments and agencies, the NCS was established to provide a centrally planned, programmed and operational Federal Government Telecommunications System that would be responsive to the Federal Government's needs under all conditions. These conditions could range from a normal situation to national emergencies and international crises. The principal assets of the NCS include telecommunication networks of the Departments of State, Defense, Interior, Commerce, Energy, Transportation (including the Federal Aviation Administration and the U.S. Coast Guard), Agriculture and Treasury, the Federal Emergency Management Agency, the U.S. Information Agency, the National Aeronautics and Space Administration, the General Services Administration, the Central Intelligence Agency, the Veterans Administration and the Federal Communications Commission.

The League and the NCS have signed a formal Memorandum of Understanding establishing a broad framework of cooperation and a close, working relationship. Through joint coordination, the nationwide posture of telecommunications readiness for any conceivable national emergency is enhanced.

To evaluate the potential utility of using volunteer radio operators, NCS is conducting an ongoing series of exercises. These exercises demonstrate that amateur operators can be used as alternate communications resources during national crises. The League acts as a focal point for NCS to coordinate Amateur Radio activity during these tests:

Exercise NIGHT TANGO I was conducted in the Southeastern United States on February 10 and 12, 1984, and Exercise NIGHT TANGO II was conducted in Louisiana, Texas, New Mexico and Arizona on March 22 and 24, 1984. These communications exercises evaluated the capability of volunteer radio operators to support national-level emergency communication requirements. Volunteer operators from the League, Civil Air Patrol (CAP), Air Force Military Affiliate Radio System (MARS), Army MARS and the Navy/Marine Corps MARS provided enthusiastic support for this program.

The objective of this exercise was to evaluate the capability of ARRL, CAP and MARS existing networks to establish orderwire connectivity and pass critical message traffic between senior government officials at selected locations in a simulated post-attack environment. Specific areas of evaluation for this test included:

- a) Testing and coordination procedures (including interoperability)
- b) Message accuracy and handling times
- c) Initial connectivity establishment
- d) Exercise message formats
- e) ARRL, CAP and MARS message handling and intranetwork routing procedures
- f) Interfaces between originating officials, ARRL, CAP and MARS networks
- g) Circuit establishment of direct point-to-point links to bypass damaged networks in high-risk areas (including telephone patching)
- h) Data collection and message audit trails (acknowledgment)
- i) Methods of multiple routing critical messages
- j) Message relay procedures
- k) System(s) reliability.

In most instances, the operators had prior knowledge of the exercise objectives and the schedule of events. In several instances, however, some operators were asked to participate just prior to the start of the exercises. All participating operators provided exceptional support to this evaluation effort.

Fifty-six messages were transmitted during Exercise NIGHT TANGO I. Forty-five messages were received within an hour of initial request by the NCS representative. The longest time for message reception was 3 hours 37 minutes, well within established criteria for a priority message.

Exercise NIGHT TANGO II likewise proved to be successful. A total of 104 messages were transmitted with an overall reception rate of 78%. Several messages were not received because of last minute cancellations by scheduled players. Experience indicates that if this had been a real emergency rather than an exercise, the reception rate would have been higher.

These exercises demonstrated that the volunteer radio systems could be used to support national-level emergency telecommunication requirements. The exercise series will continue with Exercise NIGHT TANGO III, scheduled for late May in the eastern United States. This exercise will include using the AMSAT Corporation's Amateur Radio satellite.

The National Communications System wishes to express its thanks to the many volunteer amateur and MARS operators and communicators of the Civil Air Patrol for their assistance in making these communications exercises a success. — *Chuck Cavanaugh, K4VKU, NIGHT TANGO Coordinator*

EVERYBODY TALKS ABOUT THE WEATHER

A severe weather warning is broadcast on Milwaukee radio and TV stations; you can be reassured that ham radio is helping to provide the timely, accurate and reliable data. Besides using sophisticated electronic equipment, weather forecasters still rely on field observations. That's where Amateur Radio operators with battery-powered hand-helds, transceivers and mobile equipment at various locations provide an ideal weather-spotting system. Hams are instructed by the Milwaukee National Weather Service (MNWS) to report serious weather situations: tornadoes on the ground, funnel clouds aloft, hail (½ inch or larger), strong winds (50 MPH or greater) and actual damage (power or phone lines down, trees down, structural damage or flooding).

The control room of the MNWS Forecast Office at Milwaukee's Mitchell Field Airport is nearly wallpapered with weather maps. Today, inside weather control, the WITT-TV camera spotlights Elroy Jagler, Meteorologist in Charge of the MNWS Forecast Office, who will present an award to John Leekley, WB9SMM, Milwaukee County Emergency Coordinator.

The cue to begin is given, and Mr. Jagler proudly announces, "This award is given in recognition and grateful appreciation for communications and storm-spotter services rendered in the public interest to the National Weather Severe Weather Warning Program for over 15 years. The eyes and ears of trained volunteers to search out, identify and report dangerous weather events is to effectively carry out its public-warning responsibility.

"Amateur Radio groups, such as the Milwaukee Amateur Radio Emergency Service (ARES), are ideally organized and a vital element to the warning process. Members of the Milwaukee ARES have voluntarily contributed their time and talents to staff communication centers at the Weather Service Forecast Office, County Sheriff's Office, Emergency Government Offices and the Red Cross building. The network functions with a high degree of reliability, not only for data gathering, but also for warning and advisory dissemination. The organization contributions are worthy of commendation and are gratefully appreciated."

Handshakes and smiles are exchanged while kind

words continue to fill the room for a job well done. In addition, a letter of commendation is awarded to hams from the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. Although both awards are presented to the Milwaukee ARES group, they are intended as a well-deserved thanks and recognition to the more than 500 hams throughout southeast Wisconsin who help during emergency weather conditions, and to those hams in other parts of the state who relay information to the weather warning system.

If you're interested in weather-net activities or other public service events, listen for the Milwaukee ARES Net on 147.67/07 MHz, Mondays at 9 P.M. local time. Many Milwaukeeans monitor the net with VHF scanners during severe weather conditions to hear weather data being gathered by hams. If you can't receive Milwaukee signals, contact your Emergency Coordinator for information about weather-service activities in your area. As Mark Twain may have said, "Everybody talks about the weather, but nobody does anything about it." Here's your chance to do something. — *Richard Regent, K9GDF, ARRL Section Manager, Wisconsin*

CALIFORNIA AIRPLANE CRASH RESCUE
The emergency preparedness of Lake County, Califor-

*Deputy Communications Manager, ARRL

nia, radio amateurs was put to the test on Friday, January 20, 1984. At about 8:30 P.M., a single-engine Cessna plane crash-landed on the slopes of Mt. Konocti, which overlooks Clearlake in north central California.

The plane crashed on the heavily wooded slopes, and was reported to the Lake County Sheriff's Department by several nearby residents. The California Highway Patrol was also notified, as normal procedure dictates in the sparsely populated areas of Northern California. An on-duty CHP officer in turn contacted Fred Plante, W6LOU, who notified the Lake County amateurs via the 146.775-MHz repeater and asked for assistance in providing communications for the search teams that were being organized. W6LOU, KA6JJW, KR6G and WB6UVO reported to the primary control point which was located at the base of Mt. Konocti. KA6IPV, N6GJM, KB6ALT, KB6BYI and WA6MLG provided 2-meter support communications.

The search parties assembled in the approximate area that the airplane went down, and using the knowledge of the mountainous area and the Emergency Locator Transmitter (ELT), the search parties homed in on the plane's location. The amateurs at the search site were deployed with each of the volunteer search groups provided by the "K-Corps," a local high school search-and-rescue organization.

At about 10 P.M., Bill Sooman, WB6UVO, ARRL Lake County Emergency Coordinator, heard one of the plane's female passengers yelling to his rescue party. WB6UVO retraced his path and then continued through the thickly wooded slopes to where the voices seemed to be coming from. The rescue team had to crawl on their hands and knees, and sometimes on their bellies, to reach the crash site because of the heavy underbrush.

WB6UVO's search group reached the crash site at 12:30 A.M., about 2½ hours after the search began, and reported that all of the plane's occupants were alive, but each had suffered some injuries. He then reported that the return route from the crash site was impassable for transporting the injured persons and that a different route would have to be found. He helped the Lake County Sheriff's Department and the Kelseyville Fire Department to find the site. To bolster the hopes of the base camp personnel and the family in the downed craft, a woman used the Amateur Radio facilities and spoke to her husband and two daughters who were on the plane.

At about 5:30 A.M., an Inmate Search and Rescue Team from the California Department of Forestry successfully cut an access trail from a different direction and was able to remove the injured persons with "Stokes litters." Soon afterward, the crash victims were on their way to the hospital for treatment. (Bob Smith, N46T, ARRL Section Manager, San Francisco, and Bill Sooman, WB6UVO)

PUBLIC SERVICE DIARY

□ Ravenna, Nebraska — March 11. While traveling on Highway 2 near the town of Ravenna, N8BJW came upon a two-car accident in which five persons were injured, one fatally. N8BJW used the A10A repeater to call KA8BJP, who notified authorities. Emergency vehicles were at the scene within about 20 minutes. (K0GND)

□ San Diego County, California — April 9. KE6HI was driving behind a motorcyclist in rush-hour traffic on Interstate 5 when the motorcyclist crashed and suffered a leg injury. KE6HI pulled up just behind the cyclist, who was lying in the highway, and turned on her car's hazard lights to warn approaching traffic. She used her 2-meter rig to contact KF6TF, who notified authorities. Police, fire and rescue personnel and an ambulance arrived within 10 minutes. (W7QQ)

□ Longmont, Colorado — February 16. A construction crew was using a backhoe, which accidentally severed the main trunk line supplying telephone service to several hundred users. The Longmont United Hospital also lost its service for about six hours, creating a life-threatening crisis. Members of the Longmont Amateur Radio Club provided a 2-meter rig and outside antenna, which, along with the WB0FQB repeater (147.75/15), were used by hospital staff requiring phone links to discuss medical treatment. (N0DM)

COMMUNICATIONS SERVICE OF THE MONTH

The ski industry is a mainstay of Colorado's economy, and it often turns weekend travel along the state's front range into a trial of patience and endurance. If inclement weather further hampers travel, the concern rapidly changes from simple inconvenience to safety and welfare. Such was the case on February 25, 1984.

Several weather disturbances were expected to converge, and the National Weather Service predicted the



W0RJB (left) and N0DM were among the members of the Longmont (Colorado) Amateur Radio Club who provided emergency communications for the Longmont United Hospital when telephone service was lost. (photo courtesy Longmont Times Call)

possibility of snowfall for the front range, including Denver and the foothills communities. By Saturday afternoon, the low-pressure area was forming over the Oklahoma panhandle. The result was an "upslope" storm pattern, which usually accounts for the greatest snowfall in eastern Colorado. Therefore, the weather service upgraded its predictions to a "winter storm warning," with possible snow accumulations of eight inches along the foothills.

At 1513, Dick, K0QBA, the Colorado Severe Weather Net Coordinator, received the tone-alert weather monitor warning. He started monitoring the 146.34/94 Squaw Mountain repeater (WB0GQL/R) for reports of snowfall and other problems the storm might be causing.

It quickly became apparent that the snow was falling on warm road surfaces and was creating a glaring ice hazard in the mountain towns and highways. A number of hams were caught in a massive traffic jam along Interstate 70 between Georgetown, near the Continental Divide, and Floyd Hill, about 30 miles west of Denver. A homeward trip that usually took an hour turned into a possible 5-10 hour trip or even an overnight stay.

As the afternoon wore on, many of the hams being delayed asked for help in making phone calls to reassure friends and relatives waiting for them to return to the Denver area. By the dinner hour, the amount of storm-related traffic on the Squaw Mountain repeater had increased to the point that stations were often doubling with each other and some calls were not being adequately handled. There were suggestions that a net might be necessary, and K0QBA stepped in as an informal coordinator to facilitate orderly handling of the repeater traffic. This informal operation continued into the evening hours.

Monitoring of local law-enforcement scanner frequencies indicated that some roads were being closed by 2000 because of the combined storm and traffic conditions. It became clear that the situation was growing more serious.

At 2117, Clear Creek County Emergency Coordinator WA0REX was contacted by the director for Clear Creek County Civil Defense that shelter was being set up because of icy roads and massive traffic jams. Provisions to handle health-and-welfare traffic from the shelters were then established.

Because of the late hour and the uncertainty of timely progress, shelters were being opened in the small mountain community of Idaho Springs for motorists who were delayed or stranded by the road closure. WA0REX immediately began assigning radio operators to the shelter sites to handle any further communications that might be necessary. He further requested that K0QBA maintain a core group of operators in the metro Denver area to handle message traffic.

There are only a few hams normally available in Idaho Springs, and K0QBA began "drafting" some of the operators who had been caught in the highway snarl to assist in the shelter operation. Hundreds of motorists took advantage of the open shelters at the Idaho Springs High School, the elementary school, the fire house and the Georgetown church. (Later, it was found that nearly 700 persons had been temporarily housed.)

At approximately midnight, the highway was officially reopened. Although travel was not encouraged (because plowing, sanding and towing operations continued), motorists slowly began leaving the shelters to continue their homeward trips, which normally would have ended some six hours earlier. At 0130 Sunday, the

27 hams were released from the alert and the communications network was secured, having handled about 100 pieces of traffic. (Dick Schroeder, K0QBA, and Duane Lewis, WA0REX, Clear Creek County EC)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

□ For March, 36 SEC reports were received, denoting an ARES membership of 21,466. Sections reporting were: AZ, CO, CT, ENY, IN, KS, ME, MI, MN, MS, MO, NE, NH, NFL, NFX, OH, OK, ON, ORG, PAC, SV, SDG, SF, SJV, SC, SD, SFH, TN, UT, VA, WV, WMA, WNY, WPA, and WI.

NATIONAL TRAFFIC SYSTEM

After several years of service, K2KIR has decided to step down as Chairman of the Eastern Area Staff. Bud will remain as manager for EAN/c4. AKIE has been appointed assistant net manager for 1RN/c2. CAN/c4 certificates were awarded to KW9J, W0KK, WB0ED, KTSY and W5TUM. An RN6/c4 certificate was awarded to W6INH, and TWN/c2 certificates went out to N0CXI, WA0YI, WA0YNP, KB0Z and W0EJD.

March Reports

	1	2	3	4	5	6	7
Cycle Two							
Area Nets							
EAN	31	1442	46.5		928	97.3	
CAN	31	1026	33.1		709	100.0	
PAN*	62	683	11.0		409	98.4	

	1	2	3	4	5	6	7
Region Nets							
1RN	61	611	10.0		404	92.1	100.0
2RN	62	520	6.4		394	83.9	100.0
3RN	31	219	7.1		375	89.5	93.5
4RN	62	1185	19.1		608	77.0	100.0
RN5	62	866	14.0		503	97.4	100.0
RN6	62	483	7.8		346	95.2	100.0
RN7	62	502	8.1		584	91.5	96.8
8RN	62	510	8.2		467	100.0	96.8
9RN							100.0
TEN	62	566	9.1		404	83.7	100.0
ECN							93.5
TWN	61	222	3.6		227	79.0	98.4
TCC							
TCC Eastern							
TCC Central	81 ¹	527					
TCC Pacific	109 ¹	434					

	1	2	3	4	5	6	7
Cycle Four							
Area Nets							
EAN	31	1672	53.9		1391	96.8	
CAN	31	964	31.1		1017	99.5	
PAN	30	1000	33.3		980	95.2	

	1	2	3	4	5	6	7
Region Nets							
1RN							96.8
2RN	93	624	6.7		496	93.8	93.5
3RN	62	238	3.8		506	97.3	93.5
4RN							100.0
RN5	62	653	10.5		602	91.7	98.4
RN6	62	660	10.6		608	95.9	96.8
RN7	62	557	9.0		775	95.4	96.8
8RN	60	388	6.5		411	91.0	96.8
9RN	62	484	7.8		517	98.0	99.5
TEN	61	391	6.4		433	85.4	100.0
ECN							100.0
TWN	58	345	5.9		366	87.1	87.1

	1	2	3	4	5	6	7
TCC							
TCC Eastern							
TCC Central	57 ¹	413					
TCC Pacific	116 ¹	649					
Sections ²	6476	29,915	4.6				
Summary	7891	48,249	6.1				
Record	12,111	56,408	18.1				

*PAN operates both cycles one and two.
¹TCC functions not counted as net sessions.
²Section and local nets reporting (203): ACN ATEN HARC (AZ), SWN (AZ/NM), BCEN (BC), RTTY/V SCN SCN/V (CA), CN CPN NVTN RTN WCN (CT), DEPN DTN SEN (DE), CFRN DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN LCEN LSTN NFPN PBTN PEN PRVAN QFN SEFTN SPARC SVTN SWFTN TPTN (FL), I75EN I75MN ICN ITEN TLCN (IA), ILN ISN ITN (IL), ICN IRN ITN QIN (IN), CSTN KMWN KPN KSNB KWN QKS QKS-S (KS), KNTN KSN TN KYN MKPN (KY), CITN EM2MN EMRI EMRIPN EMRISN HIHTN RIEM2MTN WMEN WMFN WMN WMTN (MAJRI), MEPN MPM TN WRIN (MI), AEN CMEN MFSN OXRACES PTN SGN (ME) MNAMWXTN MSN MSPN MSSN PAW (MN), CMEN HBN IFN LO2RN MEOU

MON MOSSB RRARN SARN WARESN (MO), MTN (MS), MTN (MT), GEN CMN CNCTN PSTN RARS (NC), CN C6N (NC/SC), GSFM GSPN NHH (NH), HCATEN JSARS OBTTN (NJ), NSN (NV), CDN CNYTN EPN HVN NCVHFTN NLI NLPN NYPON NYS NYS/M OCTEN SDN WDN (NY), CARA EATN NWOSN OLZ ONON OPEN OTSN OCWA-83 STN (OK), KTN OLN OPN OSN OSN2 QWND TIN (OR), BSN LBLARES OHNN ORARES OSN PTTN THN (OR), PTN (PAC), QSN (PO), A2MM GPD2MM LC2MM SCNTN SCSSBN (SC), BHN SDEEN SDTIN WCEN (SD), TNCN TNPN TNVN TSNR (TN), DFW NET TEX TSN TTN (TX), BUN DCVEN UCN (UT), STARES SVEN VLN VN VBSN VSN VTN (VA), VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA), BEN BWN NWTN WCWTN WVN WNN WBSN WSSN (WI), WINB WINS (WIN), WVAR WVEN WYMDN WVN WVNN.

1 - NET 4 - AVERAGE 7 - % REP.
2 - SESSIONS 5 - RATE TO AREA NET
3 - TRAFFIC 6 - % REP.

121 VE2GFH
WF4Y
KA0EPEY
K4KDJ
W6OYH
W1RWG
W6RNL
119 AL7W
118 KB2HM
117 K4JST
AF3S
WB4WYQ
W4ANK
116 KX7W
WDBLRT
WB1HHH
114 AA4AT
KC2QQ
WB3GZU
W1E0F
WDBMIO
113 NG4J
WA4PFK
KA1BBU
W9YCV
112 NG4HI
AG2R
W7VSE
KB0MB
111 ND0N
N2ESY
110 KR4V
WB2RBA
KA4GUS
N4PL
KABARP
91 KT5Y
K6SI
K4VWK
KS7I
WB2EAG
KC2TF
107 WA4JDH
W1PUO
106 KB4WT
W3VYQ
KAASAA
WB1GXZ
105 N2XJ
N9BDL
104 WA7MEL
WA5EIC
WD4CNQ
103 WD4KWB
K19J
K2VY
W1KK
WB2MCO
VE3BDM
W9JUU
102 KJ3T
KK1E
WDBRHH
101 KZ8Q
WB6QBZ
AG9G
KD7ME
KB4OZ
100 AE5I
KT8U
K7GXZ
W6VOM
AE5I
W6INH
WBUE
99 WD4ALY

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern				
TCC Central	93	87.1	1162	527
TCC Pacific	124	87.9	868	434
Summary	217	87.5	2030	981

1	2	3	4	5
Cycle Four				
TCC Eastern				
TCC Central	62	91.9	801	413
TCC Pacific	124	93.6	1279	649
Summary	186	92.7	2180	1062

1 - AREA 4 - TRAFFIC
2 - FUNCTIONS 5 - OUT-OF-NET TRAFFIC
3 - SUCCESSFUL

TCC Roster

The TCC Roster (March) Cycle Two - Eastern Area (W2CS, Acting Director) - AA4AT N1BHH WB1BYR N3COY WB2EAG K1EIC KA1GBS VE3GOL WB3GZU KO2H KB2HM VE3HTL K4JST WDBLRT W2MTA K8OZ W8PMJ W8QHB W1QYV W4J8R W3RZR KA1T KB3UD KR4V AK1W N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) - N5AMK N5BT W5CTZ N5DFO KA8EPEY KW9J W4JL WA4JTE W9JUU K5KJN W5KLV KD5KQ WB9NVN WB5OXE KD5RC KB5UL K5UPN WF4X WB5YDD. Pacific Area (W9HXB, Director) - KT6A N7CSP N0CXI KA1UGS W0EJD W05ESV KB7FE W7GHT N6GIW W0HXB W5J0V KR7L KB0MB K6OWA KF7R ND5T NV6T W7TGU K6UYK KO7V WB7WOW K6YBV. Cycle Four - Eastern Area (W2CS, Director) - AA4AT VE3AWE K1BA W3BBN K13C WA4CCK N3COY W2C8 N8CW KA3DTE WB2EAG W1EFW W2FR WD4FTK KA1GBS W2KZK VE3GOL WB3GZU KB2HM WB9IHH W1ISO K4JST KN1K N4KB AH2M W2MTA W1NJM WB4PNI W3PQ W8QHB W1QYV W2RQ K3RZR KA1T KB3UD WB4UHC W4UQ W2VY VE1WF W2XD N2XJ W1XX N8XX WB8YDZ K4ZK W2Z0J. Central Area (K5GM, Director) - W0AM W9CXV K0EZ W5GHP K5GM W8HI K5OAF W5RB N5TC W5TBF K5TL WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) - AD8A K8BN KA7CPT KC0D W7DZX N0EBM W6EOT W7EP W7GHT K7HLR N2IC W6INH W5J0V W7LG W7LYA W7NHR W00GH ND5T WA7TEH W5UH W7VSE W6VZT KM7Z W7ZB VE7ZK.

Public Service Honor Roll March 1984

This listing is available to amateurs whose public service performance during the month indicated qualifies for 80 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from ARRL HQ.

331 K7VW	139 N1BGW	129 WA4QXT	125 WF4X
150 KB0Z	131 WX4J	128 KB3F	122 KA1KML
142 WA4CCK	130 K4SCL	127 KA1GBS	

KA1EXJ
AK1W
98
K4KDJ
W6OYH
W1RWG
W6RNL
97
KD2BE
WX4I
WB2OHR
N8EBC
KA5HDT
96
KC3Y
K2VX
N5BT
N6DKW
N1CPX
KT9I
W4CKS
K2ZM
K8ND
KB7FE
AF8V
95
W7GHT
WB4WII
W2PKY
94
KA2BHR
N6AWH
WB0TED
KF8J
KA9OBP
KA8CPS
93
N2ESY
92
KR4V
WB2RBA
KA4GUS
N4PL
KABARP
91
KT5Y
K6SI
K4VWK
KS7I
WB2EAG
KC2TF
107
WA4JDH
W1PUO
106
KB4WT
W3VYQ
KAASAA
WB1GXZ
105
N2XJ
N9BDL
104
WA7MEL
WA5EIC
WD4CNQ
103
WD4KWB
K19J
K2VY
W1KK
WB2MCO
VE3BDM
W9JUU
102
KJ3T
KK1E
WDBRHH
101
KZ8Q
WB6QBZ
AG9G
KD7ME
KB4OZ
100
AE5I
KT8U
K7GXZ
W6VOM
AE5I
W6INH
WBUE
99
WD4ALY

11B
KX7W
WDBLRT
WB1HHH
114
AA4AT
KC2QQ
WB3GZU
W1E0F
WDBMIO
113
NG4J
WA4PFK
KA1BBU
W9YCV
112
NG4HI
AG2R
W7VSE
KB0MB
111
ND0N
N2ESY
110
KR4V
WB2RBA
KA4GUS
N4PL
KABARP
91
KT5Y
K6SI
K4VWK
KS7I
WB2EAG
KC2TF
107
WA4JDH
W1PUO
106
KB4WT
W3VYQ
KAASAA
WB1GXZ
105
N2XJ
N9BDL
104
WA7MEL
WA5EIC
WD4CNQ
103
WD4KWB
K19J
K2VY
W1KK
WB2MCO
VE3BDM
W9JUU
102
KJ3T
KK1E
WDBRHH
101
KZ8Q
WB6QBZ
AG9G
KD7ME
KB4OZ
100
AE5I
KT8U
K7GXZ
W6VOM
AE5I
W6INH
WBUE
99
WD4ALY

11B
KX7W
WDBLRT
WB1HHH
114
AA4AT
KC2QQ
WB3GZU
W1E0F
WDBMIO
113
NG4J
WA4PFK
KA1BBU
W9YCV
112
NG4HI
AG2R
W7VSE
KB0MB
111
ND0N
N2ESY
110
KR4V
WB2RBA
KA4GUS
N4PL
KABARP
91
KT5Y
K6SI
K4VWK
KS7I
WB2EAG
KC2TF
107
WA4JDH
W1PUO
106
KB4WT
W3VYQ
KAASAA
WB1GXZ
105
N2XJ
N9BDL
104
WA7MEL
WA5EIC
WD4CNQ
103
WD4KWB
K19J
K2VY
W1KK
WB2MCO
VE3BDM
W9JUU
102
KJ3T
KK1E
WDBRHH
101
KZ8Q
WB6QBZ
AG9G
KD7ME
KB4OZ
100
AE5I
KT8U
K7GXZ
W6VOM
AE5I
W6INH
WBUE
99
WD4ALY

Brass Pounders League March 1984

BPL Medallions (see April 1979 QST, page 77) have been awarded to the following amateurs since last month's listing: KV8Q, N1BGW. The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
73CUL	680	931	1444	92	3147
KA9CPA	19	1411	101	947	2478
N0BQP	33	1372	148	790	2343
WA0HJZ	0	1205	25	744	1974
KA1GBS	14	839	872	31	1756
W1E0F	0	439	664	18	1121
W9JUU	2	518	537	2	1059
WA4JDH	0	553	503	1	1057
W3VR	294	173	309	27	803
N4PL	116	268	368	38	790
WA4STO	79	293	335	75	782
WDBMIO	48	328	347	35	758
WF4X	5	353	343	29	730
WA4QXT	17	331	330	33	711
W7VSE	2	360	291	11	684
WD4IIO	292	26	308	28	652
W5CTZ	0	309	334	0	643
WA3DUM	7	278	327	26	638
WD4PBF	21	308	291	13	633
K55V	2	290	293	4	589
WB5LBR	24	270	270	22	586
WB8MTD	71	226	197	80	574
K87W	190	95	256	24	565
86	3	261	288	6	558
KX7T	0	322	31	200	553
W3DKX	81	227	206	4	516
N6CVF	12	242	257	5	516
W4HON	12	255	239	3	509
65	0	269	233	0	502

Multioperator stations:
W4LO 550 0 550 0 1100
WA2SDY (Feb.) 1137 16 112 38 1303

BPL for 100 or more originations plus deliveries:
WD4KWB 166
KA1BBU 159
KA0CIR 130
WA1YZN 123
WD9AEP 114
KC0UJ 111
W0QAU (Feb.) 109

1 - CALL 4 - SENT
2 - ORIG. 5 - DLVD
3 - RCVD. 6 - TOTAL

Independent Nets (March 1984)

1	2	3	4
Amateur Radio Telegraph Society			
Central Gulf Coast Hurricane	31	835	354
Clearing House	29	156	3073
Early Bird	31	1105	434
Empire Slow Speed	31	57	482
Golden Bear	31	144	1925
IMRA	27	823	1575
Midwest RTTY	30	29	198
Mission Trail	31	133	265
New England Novice	31	189	371
North American SSB Traffic	27	90	289
Vermont Sideband	31	542	116
West Coast Slow Speed	31	142	523
20-Meter ISSB	27	958	352
75-Meter ISSB	31	374	1091
7290 Traffic	49	554	3652

1 - NET NAME 3 - TRAFFIC
2 - SESSIONS 4 - CHECK-INS

ARRL January QSO Party, 1984

Scores list call, score, QSOs, multipliers, hours operated, ARRL Section.

CW	K8LL	K1XA	KB1W	WBAC (WABOTU, opr.)	K4BAI	AJ6V	N8NF	WB4E	KT5Y	WAZTBA	K3UEI	K1ZZ	N2ECD	K5LZO	K1TR
40,496-623-85-10-AZ	37,248-582-64-10-CT	31,374-488-63-10-WMA	30,095-463-65-10-LAX	29,421-467-63-10-GA	26,548-468-61-10-SCV	26,210-455-82-10-SCV	27,060-410-66-10-NFL	24,948-396-63-10-NY	24,738-298-62-10-EMA	23,241-381-61-10-EPA	22,968-396-58-6-CT	22,631-371-61-10-ENY	21,900-365-80-10-STX	21,472-352-61-8-NH	

Phone	K8LL	N8NF	W4VW	WB4E	KB4JK	KT5Y	W4VWV	W0QSK	W4WQK	KT1N
67,032-931-72-10-AZ	58,236-844-89-10-SCV	58,210-803-70-10-SFL	49,104-682-72-10-NFL	38,808-539-72-10-EB	32,982-478-69-10-WA	30,601-431-71-8-IA	26,500-415-64-8-CC	23,920-368-65-9-NFL	22,644-333-88-7-EMA	

Section News

Coordinated By Jim Clary, WB9IHH

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. AISM: VE6AMM, STM/DECI/M (APSN & ATN): VE6ABC. Two old timers, VE3DZ and VE6KM, became Silent Keys. At best, life seems to be so short, but they will be remembered. Our sympathy is extended to their families. NARC was the communication link for the Old timers Hockey Tournament again. Discussion is underway to see whether NARC can and should participate in the Popes visit in mid-Sept. Traffic: VE6CHK 36, VE6ABC 27, VE6VZ 4, VE6YW 2, VE6HD 1.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB — British Columbia Emergency Net net manager asst. NM and recorder VE7CTJ reports check-ins 789, traffic 203, total time 745 minutes. The NM has printed a 1984 calendar with pictures of the net members at their wireless apparatus. British Columbia Public Service Net, VE7QC NM and Ford asst. NM reports high check-ins 203, low 124, total 5544. VE7YY is improving from his operation. VE7KG is doing an excellent job as OO, East Kootenay ARC is preparing for his fifty year anniversary as a club in 1985. VE7BO is a silent key. His XYL Alice is being assisted by many amateurs for her to obtain her amateur ticket and then to obtain Jack's call. Traffic: VE7BNI 302, VE7CDF 144, VE7ZK 142, VE7CDN 81, VE7FB 22, VE7BZ 8.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: VE4AJE, SEC: HK, NMs: VJ NM IX TE. The new Manitoba Callbook is out. If you want a copy, ask VE4HK. We welcome newcomers VE4A AME ALY AMO ABG to the CW net. Under leadership of VE4IX this net has improved considerably. It's a pleasure to hear that VE4IA is again OK and out of the hospital. VE4FK will be taking over from VE4HK the position of SEC on July first. VE4AGR will assume the duties of DEC in the Winnipeg area, replacing VE4HR. We thank both VE4HK and VE4HR for jobs well done. MTN QNI QTC 45, SSS 15, MHR QNI 877, QTC 32, SSS 31, MEFN QNI 1295, QTC 20, SSS 21, WRN QNI 303, QTC 2, SSS 9. Traffic: VE4PS 39, VE4RO 36, VE4TE 32, VE4AJE 30, VE4AD 18, VE4BI 14, VE4DT 8, VE4FK 8, VE4HK 7, VE4LB 6, VE4AD 5, VE4AET 4, VE4HA 3, VE4AL 2, VE4BD 2, VE4CR 2, VE4LS 1.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3IBV, PGL: VE3AR, SEC: VE3GV, STM: VE3HTL, TC: VE3EGO. The Scarborough ARC placed first in Ontario for the 1983 Field Day, not the NORTON ARC as reported in my March QST column. I apologize to both clubs and their members for the confusion and any embarrassment or inconvenience this may have caused. VE3JTV has been appointed EC for Atikokan. VE3WAW (34/94) at Wawa has received a new face lift thanks to VE3DVI and the range is now about a 20-mile radius of town. Further improvements this year will link several repeaters. Plans are in full swing to link several repeaters in the "Soo" using a 440-MHz UHF repeater at VE3JL. First two repeaters to link will be VE3JL/VHF and VE3YAK, the autopatch repeater in the "Soo" with others to follow later. VE3FOB, busy EC for Metro Toronto, is sporting a new printer from his XYL to help with his letter writing. VE3DAP and VE3KK placed 8th and 15th respectively in the top 25 out-of-state stations in the popular Pennsylvania QSO party. VE3GFN, after spending a week cruising on a sloop with VE3QJ in the Bahamas, spent another two weeks in Antigua. VE3JT has been awarded the "Worked 100 QCWA" membership award number 11. The Heritage ARC has just celebrated their 5th birthday. Congrats to VE3CE on the acceptance of his article for publication in QST and to VE3CQM as the London ARC's choice of Amateur of the Year. The Russian call sign structure has undergone major changes. All calls are now starting with the letter R or U. The second letter will indicate the republic, and will be followed by a number. VE3MTR, atop the Blue Mountains, celebrated his 7th birthday. New life members of the Ontario Trilliums are VE3COH VE3KWS & VE3LZU. For the Field Day enthusiasts, don't forget, your FD group earns 100 bonus points for a message to your SM during this month's annual event. Traffic: VE3QK 240, VE3HGJ 145, VE3KIL 129, VE3DNP 121, VE3DPO 91, VE3GT 100, VE3AAWE 90, VE3VJG 93, VE3KSM 90, VE3BZ 87, VE3JAN 77, VE3BDM 72, VE3KXB 72, VE3KZC 68, VE3VW 45, VE3MPF 31, VE3EVD 30, VE3BAJ 28, VE3WM 21. (Feb.) VE3HTL 113, VE3GNW 64.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EO, BM: VE2ALE, PIO: VE2YU, TC: VE2ED, NMs: VE2EJO VE2FSA. Appointments for SEC, OO and ORS are open; please contact your SM. Clubs wishing to show "NEWEST FRONTIER" your SM has a 28-minute video cassette (VHS). The bulletin on RTTY est transmi tous les vendredis a 1330 hrs (locale) sur 3625 MHz. Felicitations a VE2ZG, qui a ete reelue presidente de VE2MO, et VE2FJR, comme directeur. Le Hamfest de Sorel sera le 27 mal. Traffic: VE2GFH 159, VE2EOD 114, VE2BP 52, VE2EKC 36, VE2EC 29.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — STM: VE5HG, SEC: VE5RP, TC: VE5G. NMs: SPN-VE5NJ; SATN-VE5BAF; PWNX-VE5G. RA: RA2-ES01; SKTN2-VE5HG; MJARC-VE5AFA. With the return to spring, ham classes are winding down. Good luck is extended to the students with the exams. Welcome back to all the SK hams that chose the sunny climes for the winter. The ARES Canada Net is gaining popularity and is wished continued success. An introduction to SWLING and Amateur Radio was presented to grade seven students. It was well received. There's very little traffic to report; would like to see this area increase. Traffic: VE5AGM 14, VE5VM 7.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX, SEC: W3PO, PIO: N3DIP, PSHR: K3JL WA3DJM W3DKX. The snowbirds have returned from Florida. W3WD recently became a Silent Key. He was liked, respected and admired by his peers & will surely be missed by all. DTM: QNI 845, QTC 72 in 22 sess. DEP: QNI 91, QTC 16 in 5 sess. SEN: QNI 38, QTC 6 in 4 sess. Traffic: W3QO 96, W3BDUG 60, WA3DJM 45, WA3WJY 27, N3SJ 26, K3JL 25,

W3DKX 23, WA3ZBI 23, K3ZXP 9, N3AXH 8, KC3JM 7, KC3FW 6.

EASTERN PENNSYLVANIA: SM, Mark J. Pierson, KB3NE — ACC: KB3NE, PIO: W3AMQ, SEC: WA3PZO, SGL: N3CJQ. STM: KB3LF, DEC: K3QXC KB3LR KB3UD N3AIA N3BFL W3EEK A3AC.

Net	Time	Freq.	QNI	QTC	Sess.
EPAEPTN	6 PM DY	3917	595	201	31
EPA	7/10 PM DY	3610	439	155	58
PTTN	6:30 PM DY	3810	283	124	

Local and VHF net reports (QNI/QTC/secs.): D3ARES 100/21/4; PWAARES 99/14; ATN 43/18/9; D6ARES 38/3/4. OO report: W3FAP KB3UWJ, OBS reports: W3CL W3VA, PSHR: N3CQY KB3UD W3VA, Mid-Atlantic ARC just graduated 16 new Novices: KA3A LK3 LYA LYB LYC LYD LYE LYF LYG LYH LYI LYJ LYK LYL LYM LYN. Upgrades: N3CSG to KR3W; N3DPX to KS3D; KA3FE to Advanced; WA3EYD to General. KA3LEZ is now N3DTK, and is now working on his Advanced ticket. Quite an achievement when you consider the fact that Bob is a CW operator using a sip and puff apparatus to operate. He copies everything in his head. KA3LEZ received a QSL from W5LFL for his SWL of the flight. I want to wish W3VA the best on his full retirement, and I'm sure all of us in the E. Pa. section will miss him. This is my first report, and I do hope that all the clubs in this area will keep me informed on the events, etc., necessary to continue making E. Pa. the fine organization it is today. Traffic: N3CQY 256, KB3UD 170, KA3DI 149, A3SE 70, KC3L 60, N3CD 60, W3TWW 53, W3VA 48, W3FAP 22, W3DE 19, WA3CKA 16, W3CL 14, K3YD 10, W3BFPK 8, W3AZE 4.

MARYLAND — DISTRICT OF COLUMBIA: SM, Karl R. Meadow, W3FA — Congrats to K3JL's new MEPN net manager. Chesapeake Bay WX and tlc net started 1 April ends 15 Nov meets every weekend day and public holiday at 1100 and 1500 local time 147.105 output. 147.705 input for Bay boaters! K3GM puts his bulletins on the WB3LAB Radio Bulletin Board 144.91 simplex. How is that for being modern! K3ORW and KB3NL are hosting the MEPN/MDD/MSN picnic 8 July in Taneytown. Tnx to W3YVQ and W3YOH for help at the ARRL Forum at the BARC Hamfest. From the LARC Feedback congrats to K3Q35 BWAS. W3BWW visited FAR. K3JT is getting set up in Pensacola. W3CDQ's skeys are DX1 W3ZNN ain't going in that time! KC3EK got some multi-op time in at WA3EKL. K3JLT has long been converted from VHS to ORS. W3FZT and W3OYV report net activities, and welcome back to Jerry. W3LDD is a happy ex-MEPN board member. KC3Y is recruiting more net help. KA3EWW is splitting duty with K3JE. WA2ERT has added phone to his activities. KK3F had the rig blow up on him. W3DQI was forgotten last month! N3T surprised the traffic net by showing up on the late nets. W3B3FK has rig will NCS. KC3DVI is doing great despite no operation permitted from the apartment. KC3AV recruits anybody for the MSN 37.17 MHz nightly 1930 local time. Get your feet wet here! RACES plan all written. W3FZ is a state QSO party contest. N3QA holds down one of the Bay Enties. KB3WL is about to become a West Virginia. STM W3BGZU just made it this month. KA3BEN PIO; WA3TAI SEC; WA3KCY OO/RFI; KA3DRO ACC; KA3ERF SGL. See 'em for help. With the nets: Net/manager sessions/traffic/QNI avg. WC 2-Mtr/W3FZT 411/113; MDP/OPNW/W3CYY 510/17.8; WR/OPN/W3B3FK 234/115; MSN/K3CAV 31/25/9.3; Traffic: W3BGZU 383, KC3DM 162, KC3Y 153, K3JL 139, K3F 126, W3JT 115, KB3WL 83, W3L 78, K3NN 77, KA3EWW 72, K3FT 62, N3QA 51, W3B3FK 49, N3IT 48, W3YVQ 42, K3CAV 35, W3FZV 33, WA2ERT 30, W3ZNN 25, W3DQI 21, W3LDD 18. (Feb.) W3DQI 70.

SOUTHERN NEW JERSEY: SM, Richard Baler, WA2HEB — SEC: K2NE, STM: WA2HE, OO/RFI: BK: BM: W2UVE. SGL: W2XQ, TC: W2JX, PIO: W2BRV. As in sure most of you are aware, June 23 and 24 is Field Day weekend. I hope your group will take advantage of the extra bonus points you can add to your total score by having your FD leader or club president send me a radiogram stating the club (or non-club group), number of operators, FD location and number of ARES members participating. See page 8 for my address. Field Day is a great emergency preparedness exercise and reminds me that we still need Emergency Coordinators (ECs) for 3 of our 9 counties. I would like to make a personal appeal to any amateur in Salem, Atlantic or Camden Cos. to seriously consider becoming an EC. You don't need to give up a whole lot of your spare time and you don't absolutely have to have experience. The important thing is to want to help the community if and when disaster strikes. Remember that rain/snow and wind storm that swept through our area in late March? Many SNJ amateurs played a vital communications role during the evacuation of coastal areas. If you are interested in the EC's position, please contact SEC K2NE or myself. Traffic: WA2HEB, 98, WB2IKL 67, KA2BNY 20, KC2PO 20, KA2ANJ 9.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH, STM: W2ZQJ, PIO: WA2PUU, ACC: N2EH, TC: K2GR, OO/RFI: W2AET, SGL: KO2X, BM: W2GLH. Appointments: EC-N2BQV Madison; N2EH Monroe; W2MXW Cayuga; ORS-W2AET AE FF JJ MTA K2KTR VZ ZM AFZK WA2CIB WB2QJL KC2QJL KB3RG. Central NY Chapter QCWA lost a fairway W2SDA is a Silent Key. Affiliated Clubs now at 48; get annual reports in to qualify; other clubs contact Affiliated Club Coordinator N2EH for assistance. HAMFESTS: Rome June 3, Cortland June 16, Batavia July 8, NYC National July 20-22, Trumansburg August 25, Hamburg Sept. 8, Elmira Sept. 29, Syracuse Oct. 13. Thanks for club newsletters, other clubs invited to send info to Section Manager, PSHR: W2AET KA2BHR WA2FJJ VE2FMQ W2GJ K2GXT W2BIDS WA2KOJ W2MTA WA2NKC W2OZO K2QIK WB2QIX KC2QJ WB2RBA ND2S K2XT. League members in WNY now 2821.

TTN/OSCAR	145,888	0000/Dy	W2MTA	000-00-13
NYS/IS	3677	1700/DY <td>WB2EAG</td> <td>424-282-31</td>	WB2EAG	424-282-31
Mike Farad	3925	1300M-S <td>VE2FMQ</td> <td>232-100-27</td>	VE2FMQ	232-100-27
NYPON*	3913	1700/DY <td>WA2KQJ</td> <td>790-372-31</td>	WA2KQJ	790-372-31

NYSPTEN	3925	1800/Dy	WB2HQU	631-063-31
ESS	3560	1800/DY	W2W5S	492-057-31
OCTENE/*	34/94	1830/DY	WB2HLY	709-080-31
Q Net	31/91	1830/DY	K2CQM	408-040-30
WDN/*	04/64	1830/DY	KC2QO	741-152-31
Blue Line	93/33	1900/DY	WA2SEF	313-022-31
NYS4*	3677	1900/DY	WB2MCO	630-288-31
JCARCN	10/70	2000/DY	WA2WAX	320-014-30
OARC Net	25/85	2000/DY	K2VTI	042-000-04
Black River	055/855	2100/DY	WB2OFU	373-030-30
CNYNT*	90/30	+ 2115/DY	WB2PUU	378-083-31
OCTEN/L*	28/88	+ 2115/DY	WB2LY	237-039-30
STAR*	99/39	2130/DY	N2BLX	—
WDM/L*	04/64	2130/DY	KC2QO	653-135-31
NYS/IS*	3677	2200/DY	WB2MCO	442-350-31

*NTS net. Traffic Handlers into Net 3913 Sn, 1600. VHF THIN 04/84 Tue 2000. Club officers: Oswegatchie — WA2NAN N2EBG WA2TSR; Rochester RA — KC2EI N2CUN AC2K W2DHW; Black River Valley — W2TMS W2OFR; Jefferson Co. — WA2WAX WA2ZB KA2OTM KA2OTR; SVERA — KA2PFR WB4JUN WA2KUT WA2ZSC. Novice classes: LARC — NA2C; Ogdensburg — K2JPM WA2RXX; Lewis Co. — WA2OPE; FRAGS — N2CQE/WB25HS. Comms: K2DTC completed ten years of Southern Tier Traffic Watch; Red Cross Assessment Teams — WB2PID/WB2QZL OBS SKED: K2KWK Sun. 2045 on 146.79 or .88; Mon. 1215 on 145.11 and 1930 on 145.31. OBS and COBS are needed; contact W2GLH for information. BPL to WA2SDY Traffic: WB2IDS 448, WB2WQ 477, WA2FJJ 359, KC2QO 325, VE2FMQ 293, W2MTA 259, WA2ET 219, WA2KQJ 173, W2FR 163, KA2BHR 140, WA2NKC 129, W2KQJ 110, NV2S 90, WB2RBA 80, W2GJ 77, K2XT 70, K2GXT 69, K2GD 62, AF2K 57, W2ZQJ 55, KA2BED 51, W2TZ 43, KA2DOA 38, WB3CP 32, WA2FGW 24, KB2KJ 23, WA2OPE 17, WB2PID 16, KA2QIK 15, NF2G 12, K2JUT 12, WB2NAO 10, WA2RXX 10, K2RN 4, K2VR 4, KC2SJ 1. (Feb.) WA2SDY 1303, WB2KCT 78, WD9GAY 55, KA2EUD 43, K2OR 24.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q, STM: AC3N, ACC: N3EE, OO/RFI: KN3B. PIO: WB3ZJ. TC: W3PE, BM: WN3VW, SGL: K3HWL. Net QNI QTC Sess. kHz T/D

WPACW	381	145	31	3585	7	PD
WPAFTN	506	126	31	3953	6	PD
WPAZMTN	412	76	31	146.28/88	8	PD
NWPAZMTN	—	—	—	—	—	—
PFN	233	252	31	3958	5	PD

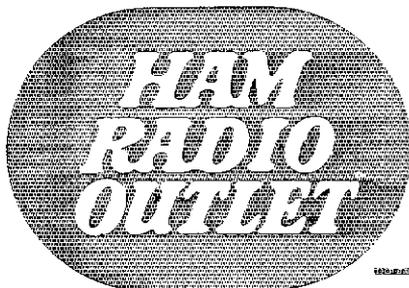
I would like to congratulate our section traffic handlers who consistently turn in high counts. They are W3EKG W3OKN AC3N (STM), K3CR N3FM K3GM WA3JUN, K3OT all of whom report monthly. Traffic has dropped with only 25 stations reporting. Upgrades Novices KA3MIG & KA3MIG. To Tech-KA3LSX KA3KFC; to General-KA3KFP. 1984 officers-Crawford ARC WA3ZSC, pres.: WA3JDI v.p.: WA3KZO, secy.: N3CUT, treas.: K3YAK KF3F, dir. Western PA DX Assn officers are: ADJ. pres.: K3UA, v.p.: KB3KJ, secy.: K3JQ, treas.: WB3GP, membership: K3MC, newslet.: K3VOC, DX info. The repeater is 144.77 in/145.37 out. If DX is your thing, they are glad to have new members. From *Sine of the Times* (ICAPC), WA3JUG has taken a position with the State Dept. as a communicator. When his training is over he will move to the city of Athens, Greece and will work at the American Embassy there. His family will go with him. I would like to see more operators sign up for the ARES and RACES. The SEC CAN tell who the E.C. in your county is or if you have one. He will be glad to sign up anyone desiring to take this crucial position. Disasters do not wait for us to get our act together. Be prepared! Traffic: W3EKG 403, W3OKN 262, AC3N 155, K3CR 117, N3FM 117, K3GM 81, K3PNW 72, WA3JUN 72, W3L 47, K3SMB 47, WA3ZJ 46, WN3VW 30, KC3JQ 27, KA3CQ 26, N3CYY 25, W3NGO 25, W3MML 24, W3KUN 20, K3LTV 20, W3KANT 15, WA3DWB 10, KB3L 6, K3NXP 4, W3SMV 3, K3BNV 2, N3KB 1.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EQ — SEC: W9QBH, STM: KB9X, OO/RFI: K9MX, BM: K9ZDN, PIO: WD9ED, SGL: W9KPT, ACC: W9BSFT, ASM: K9ORP.

Net	Freq.	Times (Z Win)	QNI	QTC	Sess.
ILN	3690	0030/0400 DY	747	257	62
ITN	3705	0100 DY	331	76	31
ILPN	3915	2230 DY (X Sn)	683	76	31
NCPN	3915	1300 DY (X Sn)	480	51	27
NCPN	7270	1815 DY (X Sn)	240	101	25
IEN	3940	1500 Sn	128	3	4
IARES	3915	2230 1-4 Sn	74	—	2
ISN	3905	0000 Dy	500	140	31

Illinois was represented 100% to 9RN by stations K9AZS KBVE K9GM K9EW K9SW N2OP N9EM N9TN Z9I KW9J KW9T KD9K KB9X W9INZ W9NXX. Illinois was represented 100% to D9RN by stations BA2S KW9J KA9FEZ W9NXX W9BNN and W9BODN. D9RN was represented 100% to CAND. Illinois stations were W9GWL W9BNN W9NXX K9AZS KA9FEZ and KW9J. The first Tuesday in March saw another Illinois statewide tornado drill, which was conducted in cooperation with Illinois ESDA and the National Weather Service. As has been the case the past several years, Illinois amateurs and ARES members participated by checking into local SKYWARN nets. Checkin participation info was collected after the drill by W9QBH on 3915 kHz and also on the ILPN. A message detailing ARES participation was then sent to IL ESDA in Springfield on the ISN. Congrats to newly appointed OES N9DVS, who will be keeping things rolling along in Kane Co. with EC A9DD. AASD reports that SKYWARN participation in that area has increased significantly since last year. If patience is a virtue, W9DBO should be at the top of the list. He reports that after 52 years on the air, he finally got the last QSL needed for WASI W9MJM is in good company; he sent along word that he is waiting for good "antenna erection and ground rod-driving weather." Special thanks to DD W9PNN for sending along ECAC and FCC reports from the recent annual board meeting. They included the results of the recent SM survey and recommendation developed by the FCC over the last year. Appointees will be glad to know



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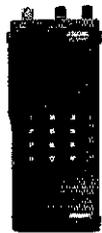
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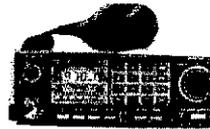
- 1) VS-1 Voice Synthesizer \$39.95 value.
- 2) TU-4C sub-audible tone generator. \$39.95 value.
- 3) MA-4000 Duo-band Mobile Antenna. \$44.95 value.

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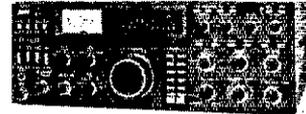
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that many of the recommendations center around providing more support to the public service field organization by HQ. One move in that direction was the appointment of WF4R as Assistant Communications Manager for Public Service. It is my understanding that he is at HQ to work more closely with ARES/NTS and other public service interests. This should open lines of communication between the field and HQ for matters regarding ARES and NTS that have been sort of sluggish in recent years. Congrats are in order for the members of the Southern Illinois University RC who received their charter of affiliation with ARRL this month. The club has been active in recent years on the Carbondale campus of SIU under the leadership of faculty advisor W9CJW. Traffic: W9S2 507, KA9EE 333, K9Z 236 WVA, K9AZS 231, WB9NVN 173, KW9J 167, W9NXX 129, K9BVE 102, K8X 100, W9HLX 99, N9EM 86, W9RJV 82, K9QEW 74, W9QBH 74, W9DBQ 54, K9KJ 59, K9ELJ 44, K9GMZ 42, W9SBE 32, N9BAM 31, K291 30, W9HOT 30, N9DR 24, KA9EUN 22, N9TN 22, W9TCO 21, W9IBH 15, W9DHW 13, K9QX 13, KA9PK 12, W9KR 11, W9VEV/M 9, W9DPC 7, W9RTD 7, W9ARUM 6, K9VMP 5, W9JMG 2, N9DVS 2, KA9NBH 2.

INDIANA: SM, Bruce Woodward, W9UMH -- SEC; WB9ZQE, STM: W9UJU, ACC: K9TUS, TC: W9DADB, SGL: WA9VQO, BM: K9JTA, PIC: K9DJI, SRC: N9WB, SHC: WA9FUD, OO/RP: K9TG, NMs: ITN-W9QYY, QIN-K9JL; ICN-KA9CZD; IRN-K99SU; VHF-W9PMT; IWN-KA9ERC. Nat. Freq. Time (Daily) QTR QTR QTR QTR
ITN 3910 1330/2130/2300 2227 396 247 396
QIN 3955 0111 1822 93
IRN 3708 0015 02 33 688 29
ICN 3529 0000 328 56 1264 31
IWN 3910 1310 1812 13 485 31
IWN VHF Kokomo 888 7 296 31
IWN VHF Bloomington 891 2790 31
Hoosier VHF Nets for March: QIN 8012, QTC 216, QTR 6493, bulletins 109 for 28 nets. 9RN/cycle 4 QNI 403, QTC 464, QTC 937, sess. 62, in 100% stns. N9AEI W9EJ N9HZ KJ9J WA9CQF W9UJU W9UJYU K9WVJU, CAND 1026 messages in 31 sessions. D9RN 100% IN stns. W9UJU W9UJQ, Appts: ECs KK9G for Johnson Co.; KA9DFD for Floyd Co.; W9RTH for Jackson Co.; W9BUIK for Knox Co.; W9COT for Gibson Co.; K8LBI for Putnam Co.; K9BJK for Scott Co.; K9BGJ for St. Joseph Co.; WA9OHX for Tippecanoe Co.; ORSs W9AHX, W9A9HX, W9QLW W9RTH. Silent Keys W9RAG Terra Haute, WA9NRA Fort Wayne. I have deleted the appts of Section Contest Coordinator and the Section DX Coordinator. I still feel these positions might be helpful, but they are not in line with the ARRL field organization thinking and have not contributed to the present state program. This month shows another decline in QIN. With the average check in at 7 it would seem that some people are really carrying a load. I wish to thank those on QIN for a heroic job. I hope more people will return to the net. Start checking in, they need you. Thanks to all who participated in the March 17th meeting with the National Weather Service. Let's hope we have a safe Spring. Remember all Indiana repeaters should be coordinated with N9WLB K9LSB or WA9CWE. If you know that the information we have is incorrect or obsolete, please let us know. K9LSB has promised a new system survey form in the near future. D9RN 368 messages in 1047 minutes. IN 100% stns W9UJU K9CQS W9UJQ. We are planning for a great Indiana State ARRL Convention for Sat., July 7. Would hope to see many of you there. Traffic: W9UJU 1059, K9J 210, W9EJ 150, KM9B 134, W9CNE 130, W9UJQ 112, W9QYY 112, K9BHH 51, N9AEI 49, W9UMH 47, W9BAM 46, W9CQF 46, W9UJYU 36, W9JZY 30, K9CQD 28, K9CQF 28, A89N 21, W9DWD 19, K9WV 18, K9DXX 15, K9BQ 14, W9BART 13, K9FVN 13, W9DGE 13, W9ZGC 11, W9B9ZZ 11, K9BRF 9, W9CIV 8, K9DJI 9, W9AOKK 8, W9JKT 7, W9RTH 7, W9DKP 5, K9OUP 5, W9XD 5, W9BDF 4, W9QLW 3, K9SBW 3, N9DHX 3, W9DEI 2, W9UPI 2, W9ZQE 2, W9B9J 1, W9B9TOW 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI -- SEC; W9OAK, STM: K9UTQ, BWN 3984 1200Z QNI 1399, QTC 1564 W9DIB, BEN 3985 1800Z QNI 827, QTC 223 WB9ESM, W9BN 3985 2300Z QNI 1126, QTC 284 K9ANV, WNN 3723 000Z QNI 196, QTC 32, KA9OBP, W9SSN 3845, 0030Z QNI 217, QTC 7, KC9CJ, W9E 3622 010Z QNI 370, QTC 160, W9S2, W9N 3982 0400Z QNI 21, QTC 98 K9JGH, XPO 3925, 1831Z QNI 353, QTC 30, K9AKG, NW7N 31/91 0030Z QNI 406, QTC 63, N9BDL, WCW7N 31/91 0030Z QNI 499, QTC 39 KC9VM, KA9IRE is now K9WH, KA9NPO has Extra, KA9EOJ has Advanced. Effective April 1, W9BICH will take over as NM of WIN-E. Thanks to W9YCV for a job well done as manager. W9IAL has worked 5BWAS, CW and SSB, Jefferson hamfest was well attended; lots of goodies, and lots of eyeball QSOs. K9TQT has Extra. BPL to KA9CPA. Thanks for your very hard work; we all appreciate for what you do for our nets. How did your simulated tornado watch and warning go? I understand some counties did not have any. This was supposed to be state wide. The local repeater here was very busy. Thanks to all who check D9RN and CAND. It's really very much appreciated. Please, fellows and gals, I need more input from you for this column. Traffic: KA9CPA 2478, W9DIB 350, W9CJY 345, WA9WYS 304, KC9CJ 303, W9CBE 217, K9GDF 197, KA9EHL 188, W9YCV 182, KA9OBP 123, W9UCL 115, K9AKG 108, N9BDL 103, K9FHI 98, N9BGE 91, KC9KQ 69, W9DND 59, WB9ESM 65, AG9G 63, K9UTO 61, W9S2 57, KC9VM 57, N9CBX 56, W9BICH 56, N9DHT 49, K9B8 36, WA9ZTY 35, W9LDO 32, N9AUG 30, W9BJSW 29, KA9AF 28, K29V 28, W9JGA 27, W9JFR 26, W9IHW 26, N9DCF 24, K9HDF 21, K9SFM 17, W9UW 16, K9VU 10, KA9BTH 9, W9IEM 9, WA9USD 9, K9N9P 7, K9V60 7, KA9N0T 4, (Feb.) K9LGU 41, K9BED 40.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WB9HOX -- SEC; KA9ARP, STM: KD8CI. Hello again! A bill in the Minnesota Senate stirred up some controversy recently. A rider attached to this bill (Senate File 1365) was rumored to include a provision to make phone patching illegal in the state. After inquiring into this, involving a few phone calls to senate aides, and receiving a copy of the bill itself, it became evident that this bill in no way affected Amateur Radio. It was aimed at UNAUTHORIZED connections by any means into telecommunications systems or into cable television services. A spokesperson for Northwestern Bell, the company pushing this bill, was quoted as saying "It was the furthest things from our minds" when asked whether this bill was directed towards Amateur Radio operators. The legislative aides agreed that an attempt to pass such a bill would face a battle in court, but that was not the purpose of the bill. Copies of this bill are available to anyone. Just contact the State Senate Office in St. Paul. Net News: KA9ARP has been named Asst. Net Mgr. on MSSN. I'm pleased that all our section nets now have

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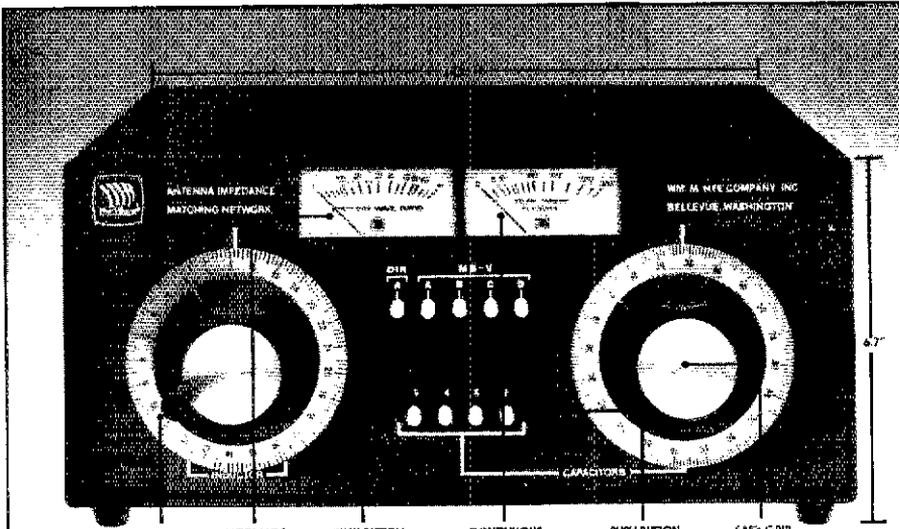
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assistant NMs. WD0BGS is now the Net Mgr on MSPN/E. He will be assisted by KA0EY. K0BJU resigned as NM during March. Now, all we need is some help with liaison: any volunteers? K2ZH has been named as training coordinator for the nets. He will be conducting on-the-air seminars on net and traffic procedures in the near future. Also helping will be KA0EY for CW net procedures. Call sign change: N0EJZ now K0BNZ. Upgrade: Tech to General, KA0GKI. A reminder that the annual Amateur Fair is coming up soon, the first of many summertime hamfests around the state, and certainly the biggest! In closing, our deep regrets to the family and friends of K0KMA who became a Silent Key. Net Mgrs (& ANMs): MSN/1 W0EHI (W0GFW); MSN/2 KA0EY (W0GJH); MSS/1 W0BWX (KA0EY); MSPN/1 K0BJU (W0GJL); MSPN/E W0BGS (KA0EY); MNAMWXNT W0BAC; PICONET W0ZHU (W0TFC).

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3885	6:30P	354	150	31
MSN/2	3885	10:00P	299	69	31
MSSN	3710	6:00P	148	35	26
MSPN/N	3945	12:05P	708	112	31
MSPN/E	3929	5:30P	1325	243	31
MNAMWXNT	3929	6:15P	737	524	31
PICONET	3925	Daily	3885	293	27

Traffic: K0MBB 585, W0TFC 415, K791 398, K0BJU 268, KA0CJR 260, KA0EY 225, W0EHI 215, KD0CI 185, W0HJ 178, KA0JUX 172, KA0AR 147, K0T91 143, K0GJ 119, W0BHD 106, W0BHOX 89, W0AGNE 88, N0CLS 86, W0MFW 76, N0JP 63, K79R 62, K2ZH 41, K0CSE 38, K0CVD 30, KA0EY 25, K0BJU 24, KA0AJF 18, K0BVM 18, K0BKK 16, W0MJP 16, W0KYG 13, W0BJUL 12, W0BGS 8, N0ED 8, K0IKU 7.

NORTH DAKOTA: SM, Ron Roche, K8ALL — It is with regret that we must report the passing of Prof. W0DM. Prof was past SM of North Dakota and was respected by all. He did much to promote the cause of Amateur Radio in our State. The Three Rivers ARC at Wahpeton-Brackinridge meets every 3rd Thursday at 8 P.M. at the Wahpeton Law Enforcement Center. They just reelected K0BJM as pres., W0GHC as secy/treas., and elected W0BPS as vice pres. Many reports from EOs indicate gearing up for the tornado season. The National Weather Service will rely heavily on us in the future. Know about and support the SKYWARN program! Gossie River 74 QNI, 2 QTC. DATA Net 40 QNI, 29 QTC. Another increase over the previous month, thanks.

SOUTH DAKOTA: SM, Fredric Stephan, K000 — SGL: N0DD. STM: W0KJZ. SEC: W0YMB. BM: N0CFS. TC: K0AS. Official bulletins were sent total of 98 times. Mobbidge Area ARC went to the Hub City ARC in Aberdeen for two-part joint session relating computers and radio and satellite tracking techniques. Would your area clubs find coordination like this valuable? Hope so. This is the time of the year for volunteering your services for severe weather and disaster emergency communications coordination. Call W0YMB. New appointments recently are N0EEH as an OBS and W0BXY as EC. Brule Co. NIS DTEN stations K000 K00AF W0BLTV, PSHR, N0CFS K000 K000. South Dakota Emergency Net Emergency Net QTC 78; South Dakota Traffic Net QTC 42; Walworth Co. Emergency Net QTC 8; Southern Hills Emergency Net QTC 2; S.D. Independent Noon Net QTC 40, QNI 745. Traffic: N0CFS 121, K000 77, N0EEH 31, W0YMB 29, N0BD 8. Informal and other traffic: W0BOMF 30, W0BVE 30, W0BZD 25, W0BLTV 3.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, W851G — STM: A05L. SEC: N5BPU. SGL: W5LTC, W5FD, PLO: K5WV, ACC: A05H. Big thanks to W5LU for help last month. KSUR worked 104 contacts on 160 meters in 4 months last season, and then lost his antennas in a tornado. K052M from Pine Bluff is operating the grand prize from the Ark. Hamfest (IC-745). W5AUI is now active from the state Office of Emergency Services in Conway during severe weather. K5DW has been appointed Public Information Officer for our section. He has been in the broadcast industry for many many years and will be a big help to us in this area. Ark Nets: Phone 3937 kHz at 6 A.M.; Mockingbird 3927 kHz at 4:30 P.M.; Razorback 3995 kHz at 6:30 P.M.; OZK CW 3760 kHz at 7 P.M. Traffic: W5TUM 82, W5UJU 56, W5QGF 28, W5JGF 24, W5VLG 2.

LOUISIANA: SM, John Wondarpen, K6KR — ACC: K5DH. SGL: K05L. Be sure to visit the Amateur Radio exhibit at the World's Fair in New Orleans from 12 to Nov. 11. The theme is Marconi to Garnett and features Marconi equipment, modern ham gear, visual displays and operating stations. It's located to the left of the main entrance to the Louisiana Pavilion. Financial help is urgently needed. A \$100 contribution payable to the Louisiana Amateur Radio Exhibition, Inc. via their treasurer, Wes Strauch, W5VBX will include you as a charter member with a nice certificate for your wall. You're invited to use the New Orleans VHF Club W5MCC repeaters on 146.96 (-600) and 146.76 (-600). SEC W44MUW resigned owing to increased travel assignments. We lost an effective and energetic leader. The new date for the New Orleans Hamfest is Sept. 15-16 at the Landmark Motor Hotel in Metairie. N5ADF received the 1983 Baton Rouge ARC award for service and support.

Net	Freq. (kHz)	Time	NM
LTN	3910	6:30 P.M. Dy	N5ANH
LAN	3615	7 & 10 P.M. Dy	N5BFV
LSN	3703	7:30 P.M. Dy	W5ANV
LEN	3910	8:00 P.M. Mon	KA5PFB
CCTN	148.01/61	6:45 P.M. M-F	GNOARC

Traffic: W5GHP 91, W5NCOM 90, KA5HDT 50, N5ANH 35, W5LBR 30, K5W0D 25.

TENNESSEE: SM, John C. Brown, N04Q — ASM & ACC: W44GLS. CO/RFI: W0FZV. PIO: WK4V. SEC: W44GZC. SGL: W44GZZ. STM: NG4J. TC: W44HJ. The severe weather conditions are upon us as indicated by the devastation that occurred across the Carolinas. It is with much appreciation and thanks to some of our Tennessee amateurs went to North Carolina and rendered a service in support of the Baptist Convention emergency van. Your SM has been advised that this van will not go without the amateur operators. Our thanks go to N4FE KA4MNH W4OPJ and KA4YXY. A job well done and am sure the recipients are very appreciative. They were involved in the feeding of about 6,000 persons. Again, be ever watchful of the possible severe weather in the coming months. Keep the emergency equipment ready to go and assist where ever you hear of a need. The CW net's Honor Roll has been active with KA4B5G W4DD, W4E, K5MI, NG4J, K4HVA and KA4ZU receiving honors. FB, TD, DRNS net has covered by TN 98% but still in need of help. The section traffic was as follows: LF sessions 91, QNI 4248, QTC 184; CW sessions 58, QNI 503, QTC 165; VHF sessions 78, QNI 1081, QTC 516; RTTY sessions 22, QNI 76, QTC 0. Sure

200 METERS & DOWN by Clinton B. DeSoto. Chronicles the exciting evolution of Amateur Radio from the pioneers who perfected the "wireless art" up through the technical advancements of the mid-1930's. Tells first-hand how the ARRL came about and how the League saved Amateur Radio from certain oblivion during the early years. Copyright 1936 (reprinted in 1981). 184 pages \$4.00.

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Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.

Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.

Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from

the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.

Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.

"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.

Automatic CR/LF: While transmitting, CR/LF automatically sent every 64, 72 or 80 characters.

WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.

LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.

WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.

"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.

Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.

MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.

Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.

Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.

CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.

CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for**

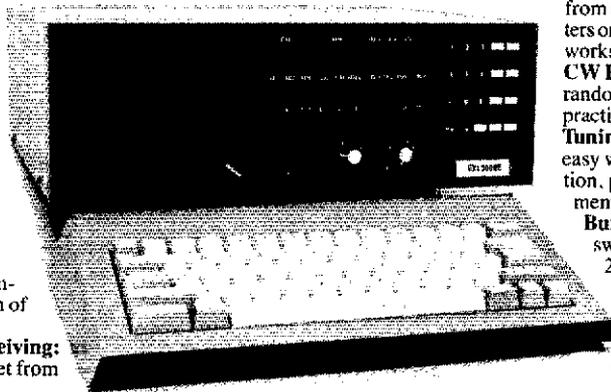
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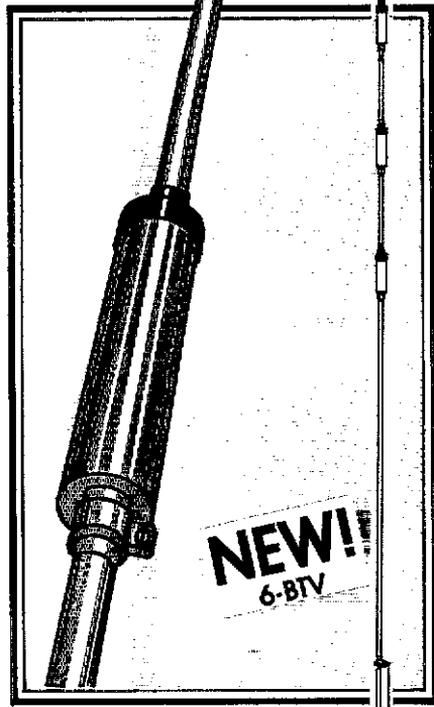
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would like to hear from more of you fellows and gals with station activity reports. The section staff will be looking forward to seeing you at a hamfest somewhere in the section. Traffic: NG4J 254, W9FZW 187, W4DDK 121, K4WVQ 71, W4ZJY 62, K4WOP 33, WD4GYT 31, W4MRD 23, W4WE 21, W4PPP 16, W4YPO 15, K4JGW 12, NN4S 11, W4PMP 10, K14V 6, W4P6N 6, WD4SGS 5, WA4RMP 3. (Feb.) K4JGW 20.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Jackson, K44GFU — SEC: WA4JAV, STM: KA4BCM, BM: WA4AGH, OOIRFI: N4GD, PIO: K4TAJ. KY clubs are invited to send their nomination for the new Affiliated Club Coordinator to the SM along with biographical data. The former ACC, W4OYI — The new Great Lakes Div. Director — resigned because of his new duties. KYN and KSN have been combined at 10:30 P.M. Eastern time to create a strong CW net. CW reports will check into KNTN and KNTN relay nets to 9PM. Volunteers are needed. Please help promote the CW and phone nets by encouraging Novices to check into KNTN where they will get code practice and excellent traffic-handling training. All clubs are asked to send the address of new Novices to the STM for a direct invitation. The weekly KY Emergency Net has been disbanded. DECs and ECs may contact the SEC on MKPN, KTN or KYN. Net reports: MKPN 1160 103, KTN 1075 83, KYN 120 80, KSN 147 60, KNTN 300 68. Welcome back Pennyrile Area WX net on 148.61/01 in Madisonville. WD4KNU is manager. Traffic: WA4JTE 178, KA4SAA 126, KA4BCM 79, WD4H1 77, K4MJK 75, K4B4O 71, WD4SC 46, K4AMZY 43, KA4SKV 35, KA4MTX 31, WA4EBN 28, W4A0V 20, WB4DZ 19, WA4AVV 16, K4HOE 16, WD4IXS 15, WA4YPO 15, WA4AGH 11, WD4CJQ 11, WD4COF 11, WA4NOG 11, WA4SWF 11, KA4GBZ 10, WD4PBF 9, WK4D 8, W4PKX 8, KA4YIV 8, N4HTZ 6, WD4IYH 5, W4TPB 2.

MICHIGAN: SM, James R. Sealey, W8BMTD — ASM: WA8DHB, SEC: WA8EFK, STM: W8BFRH, ACC: K8SB, PIO: K8BK, SGL: N8ONY, TC: W8BBGY, BM: K8BV, QMN* 3663 1800 Dy** 1157 276 93 KVB8
MITN* 3953 1900 Dy 750 266 31 W8BEJB
MACS* 3953 1100 Dy** 651 208 31 K8BNE
MNN* 3722 1730 Dy** 308 79 61 K8BNCR
UPN* 3922 1700 Dy 302 68 35 WA8DHB
GLETN 3932 2100 Dy 929 61 31 W8BIBY
W8SBN 3935 1900 Dy 789 37 31 W8BEM
TASYL 3722 1900 M 24 7 4 W8BUDG
W8CUP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS N, 1300. ARS net N, 3932, 1730. ARRL Info Net, Sn 3953, 1500. Traffic Workshop Sn, 3953, 1800. 3932 is MI HF emer. frag. Silent Keys, with deep regret: W8CMV W8D8JT, PIA (Public Information Assistant) appointments to N8ESK K8MU & K8OLG. These are the first for MI under the new programs. Many more are needed. Ideally, every active, general interest club should have a PIA. Most clubs DO, in everything but the name, and without the advantages: more direct contact with the League through the PIO and the rest of the section field organization, hence more help, is more readily available. Who does the work in your club? Have him or her get in touch with K8BK, MI's PIO, to find out more about this valuable and vital program. About the Sunday afternoon Info Net: I will try to keep it going through the summer months at the usual time even though participation is expected to dwindle. I and other MI leaders will be there as time and other activities permit and your continued interest is invited on the same basis. I will not attempt to go back to an evening time! I note that some of our newer leaders, notably TC, PIO and SGL, are being sought for club programs. This is good. Their fresh thinking and different insights can help generate new enthusiasm for any group. Computer enthusiasts: How are you putting your computer to work in your ham shack? What are your views on digital techniques for routine and emergency traffic handling? Drop me a note or catch me on the air with your answers. (Good topic for net discussion, too.) Traffic: K8CPS 447, W8QHC 410, K8AOWN 204, W8UE 198, AFBV 148, K8BNCR 124, W8BLRT 116, W8BMTD 107, WA8YMH 90, W8BYDZ 81, W8BRHU 80, W8BSIV 73, W8CUP 72, N8BNC 69, WA8DHB 69, K8GVX 68, W8BOUD 58, K8EGC 55, K8KQJ 54, K8UPE 50, N8CNY 45, W8VIZ 45, W8SCW 43, K8ZJU 42, W8BHX 41, W8YIQ 33, N8EBG 32, KA8JCL 30, K8OCP 30, KA8PQO 30, W8DMJ 26, W8BWA 20, K8MJK 14, K8BQ 14, K8C 14, K8S 13, W8BSYA 12, W8BLY 11, W8BLS 9, N8YB 8, W8BZ 8, W8BZ 8, W8BTA 6, W8BTP 5, W8BURM 5, K8BTD 4, K8TB 3, W8BHSN 2, W8BWJV 2. (Feb.) W88EIB 37.

OHIO: SM, Allan L. Severson, AB8P — SEC: KBAN, STM: K8OZ, ACC: K8US, PIO & SGL: N8CVK, TC: K88MU.
Net QNI QTC Sess. Time (local) Freq.
BN 406 225 62 8:45/10 P.M. 3.577
BNR 358 101 31 6 P.M. 3.605
BSSN 398 169 54 9:45 A.M./7:15 P. 3.927
ONN 188 38 30 6:30 P.M. 3.708
OSN 312 101 31 6:10 P.M. 3.577
OSSBN 2508 903 93 10:30 A.M. 3.9725
4:15 & 6:45 P.M.
OSSN 172 79 30 8:45 A.M. 3.577
O6MN 289 18 31 9 P.M. 3.577

is it just my optimistic nature, or are amateurs and the general public becoming increasingly aware of our public service role? When the National Weather Service wanted to hold statewide meetings prior to the tornado season, who did they contact for assistance? One question! When our recent snow emergency started, who did Stark County's emergency preparedness director call? W88AYE, Carroll and Stark Counties' EC, NWS and Amateur Radio have enjoyed a long relationship in Cuyahoga Co., Toledo, Cincinnati, Columbus, Mansfield, etc. Why? Because we deliver. Columbus' COARES continues its over 3-year record of not having a month without a public service event. Congrats again to their membership and major donor W8BK. March was a most fruitful month for me in spite of more than three weeks of business travel. I attended two hamfests, one major ARES meeting, two club dinners, a NWS meeting, and a public service event. It all added up to meeting an re-meeting several hundred old friends and new. Friendship along is compensation for the hours we all spend on this aspect of our hobby. I wish I had more time so I could accept every kind invitation. If only retirement was nearer... Upgrades: to Extra N8BY. New affiliated clubs: Centerville ARS, Huber Heights ARC and Radio Amateur Club of Elyria. Congrats all!

Local Nets	QNI	QTC	Sess.
ALERT	110	110	35
BRIN	316	139	35
MASER	132	5	4
Medina Co.	333	41	31
NCTW	41	32	20
RARA	55	2	5
TSRAC	1037	154	35
VWCEN	34	2	4

Traffic: W8BMO 758, W88FKN 273, K8OZ 240, N8FCO

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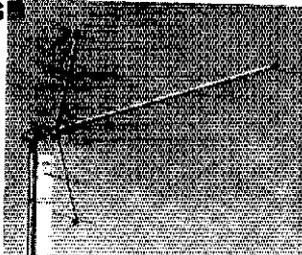
410B:
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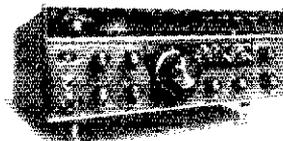
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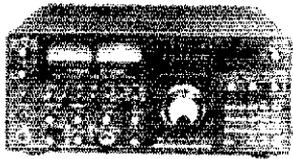
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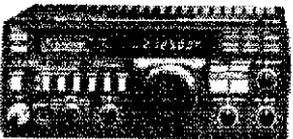
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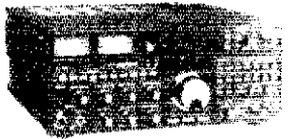


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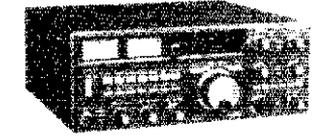
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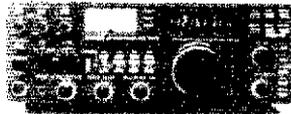


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RG-8/U foam	0.27/ft.	Rotor cable-hvy. duty	(solid)	0.10/ft.
RG-8X	0.15/ft.	(6-18, 2-16)	12 ga. copperweld	0.12/ft.
			(solid)	

ARX-2B	\$34.95
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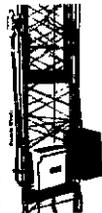
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239, WB8DMF 210, WB8QZ 210, WB8KWD 182, AB8P 163, KFBJ 181, KA8CGF 153, K8ND 152, KA8GV 146, N8EE 132, WB8O 126, K8AN 122, WB8SS 122, KV8O 120, K8BTAN 120, N8EBC 118, W8EK 116, N8CV 107, WB8MEK 105, WB8GMT 104, N8AKS 92, WB8VEG 79, WB8HGH 71, N8E8 63, N8CV 57, W8BRG 53, W8SHED 50, W8DJK 48, K8JDI 44, K8BCE 43, W8BKB 40, W8BYD 40, W8ZKEK 38, W8RGS 35, W8BHZ 32, K8VOY 31, N8AEH 29, W8BHM 28, W8BJGW 28, W8BHL 27, W8BMR 25, W8BAYH 24, W8BPD 24, W8DXY 21, K8NJC 20, N8PPH 19, K8CKY 18, W8DXY 18, K8DXX 17, W8BRSR 17, N8C8Q 15, W8BHV 13, W8DHD 12, N8CJS 10, N8DZA 10, W8FUP 10, K8AFI 10, K8LMQ 9, W8OQL 9, K8GGZ 8, K8B8 8, K8Z8 7, W8RG 7, K8C8M 6, K8JE 6, N8AJU 5, W8BEK 5, W8BOY 5, N8CGM 4, W8BDS 4.

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ESS	2200Z	3.590	W2WSS
NYS/E/L	2300/200Z	3.677	WB2MCO
NYS/M	1400Z	3.677	WB2EAG
NYPON	2100Z	3.913	WA2KOJ
NYSPTEN	2200Z	3.925	
ODN	2230Z	148.34/94	WB2ZCM
HVN	2330Z S-S-M	144.535/135	N2BDW
HVN	2330Z T-F	148.37/87	N2BDW
SDN	0130Z	147.56/81	K2VLI
SCRN	0130Z	147.735/135	KV2U

Net: EPN QNI 209, t/c 115; NYS/M QNI 424, t/c 282; NYPON QNI 730, t/c 372; NYS/E/L QNI 972, t/c 818; ESS QNI 482, t/c 57; CDN QNI 834, t/c 80; SDN QNI 384, t/c 99; AESN QNI 47; ATEN QNI 21, t/c 6. Club News: Rip Van Winkle ARS planning a fishing picnic in June. Schenectady ARA reports new members are WA2LD & KA2OBT. Albany ARA reports Silent Key K2DRZ. Note: error in April column KA2UDY, son of W2UU and WB2CQK, got Notice. Good luck to N2ESY on his way to Hawaii! See you all at National Convention in NVG1 PSHR: WB2EAG KC2TF, WB2MCO, WB2OHR, K2ZM, W2PKY, N2ESY, WA2LBO, WB2VUK, K2ZBIW, K2ZVI, WA8MAZ, KC2ZO, KA2OPG, N2EQM, K2ZTO, Traffic: KC2AZ 328, WB2EAG 265, W2P 190, W2ZM 170, WB2MCO 146, WB2VUK 143, K2ZVI 103, KC2ZO 88, WA8MAZ 79, N2ESY 74, WA2JBO 60, W2BIW 58, WB2OHR 57, N2EKS 50, W2SWA 38, K2HNW 28, N2EQM 24, WB2SON 18, KA2MYJ 16, AA2Y 16, N2AWI 11, N2BFG 11, WB2HCK 11, KA2OPG 10, KA2TOC 10.

NEW YORK CITY — LONG ISLAND SM, John Smale, K2JZ
 — SEC: WA2SUB, STM: K2GCE, ACC: WB2IAP, OO/RFI: NB2T, TC: W2JUP, PIO: W2IYX.

NLI CW*	3630	1900/2200	N2AKZ
NLIPN*	3928	1815	K52G
NCVHF	6,145/745	1930 M-F	K2MT
SCVHF	4,775/37	2030 M-F	WA2ARC
BAVHF	6,07/67	2100 M-F	WB2NA
ESS	3590		W2WSS
NYS/M	2877	1000	WB2EAG
NYS	3877	1900/2200	WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. It's almost time. Have you made your reservations yet? It's not too late yet to plan to attend the 1984 ARRL National Convention, July 20-22 at the New York Statler. Dr. Owen Garrett, W5LFL, will be the guest speaker at the banquet. See the ads in QST for further info. K2TV has been appointed Radio Officer for the Town of Babylon. Directions to any meeting of the Larkfield ARC can be obtained on the 147.21 rpt. W2GZD reports that the listing in April column referring to the local community Yellow Pages, not the New York Tel. Yellow pages. Congrats to KA2INN who was named to the Honor Roll at Rocky Point H.S. Congrats to KA2OKW who upgraded to General and now has a new HT for 2 mtrs. W2GZA K2PWG and K2RPZ also joined the QCWA during the latter part of 1983. K2RPZ also reports a new "machine" coming soon on 145.33. The antenna will be located in Hauppauge near the L.I.E. KOZP is back from Europe. LIMARC once again handled communications for the Long Island Marathon. They have been doing so since 1975. WB2WAK and K2CFG have been doing a good job with LIMARC's repeaters while they are waiting in April for a new repeater to come through. WB2IAP reports that LIMARC is now close to 500 members. Du-Boro ARC has applied for Special Service Club appointment. Traffic: N2AKZ 250, K2GCE 121, K2YQK 50, W2GKZ 41, WB2BNA 21, KS2G 20, K2MT 9, (Feb.) K2MT 114.

NORTHERN NEW JERSEY: SM, Robert E. Neukomm, KB2WI — SEC: WB2VUF, STM: W2XJ, BM: N2BOP, ROC: W2CG, SGL: W2KB, PIO: WB2NOV, TC: AD71, ACC: KK2U, KY2S. NMs: W2CC KB2HM WB2RMJ WB2ANK WB2IQJ KY2D N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3895	1000 Dy	31	230	118
NJPN	3950	1800 Dy	35	393	95
		0900 Sa			
NJSN	3735	1900 Dy	31	178	51
NJNE	3685	1900 Dy	31	370	220
NJNL	3895	2200 Dy	31	237	161
TCETN	147.255	1930 Dy	30	152	51
OBTTN	147.12	2050 Dy	—	—	100
NJVN	49149	2230 Dy	30	269	93
NJRTTY	147.51	Autostart			

RAVEN — the Ramapo Valley Emergency Network — had its hands full during the recent flooding in the Oakland-Pompton-Wayne area, the worst flood on record. It needs more members; please call K2SE for particulars or send him a radiogram. News from Mountain Spark Gaps the New Providence ARC states that they had WA2AKJ speak on county hunting. Sta. WB2IAP, a recipient of the County Hunters award for working all 3,075 counties in the U.S. The Ramapo Forty-Niner reports KB2ZN upgraded to Extra and got one of those new fangled calls: ND2T. K2KJL gave a demonstration on the ICOM product line. Armed Forces Day at West Point — May 12-13 the Meadowlands ARC will operate from West Point under the call N2BMM from 1400-2000Z on the 12th and from 1400-1700Z on the following frequencies: 144.225, 146.550 (FM), 50.125, 7.250 and 14.310, all on SSB except as noted. Congrats to Barbara Skold and KA2UAF, both new Novices and students of KA2IDH's training course. HEY GANG: Field Day is just around the corner, and several clubs are reporting news of readiness already. Garden State ARA has its act in order. BARR is also the way to go. There's a good evening get together ARE two other very good programs in MARS with both Navy and Army. All report lots of surplus R-390s

JUST RELEASED!

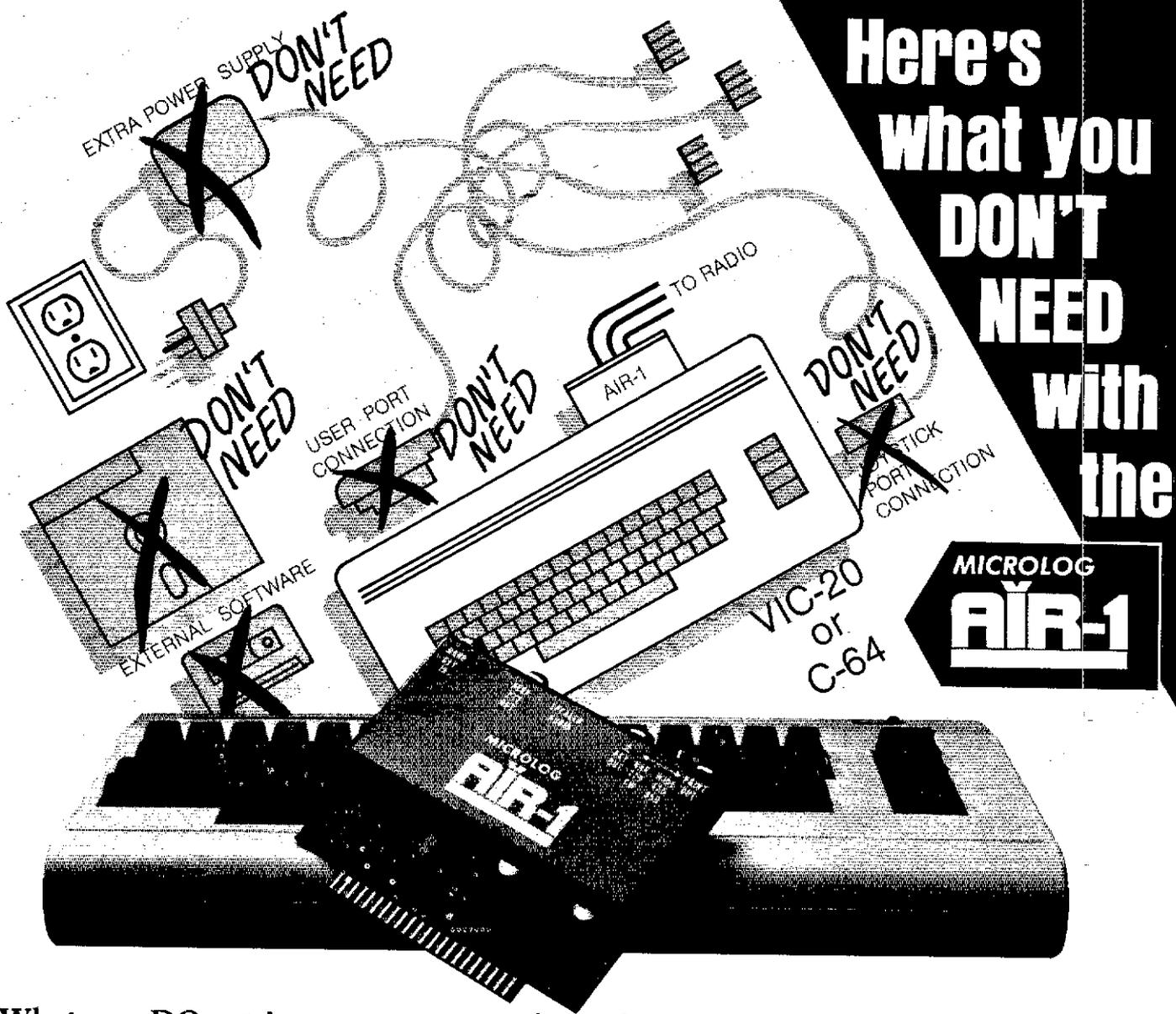


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KLM Electronics is fueling the Moonbounce and Oscar 10 revolution with Antenna Equipment that delivers truly Out-of-This-World performance.

For the Moonbouncer, our New 2M-16LBX is designed to be the highest gain 2 meter antenna available on the market today by more than a full db, making the 2M-16LBX an outstanding performer as a single antenna or in Moonbounce (EME) arrays.

The New 432-30LBX follows the same pattern as the 2M-16LBX, and soon will become the industry's standard of comparison.

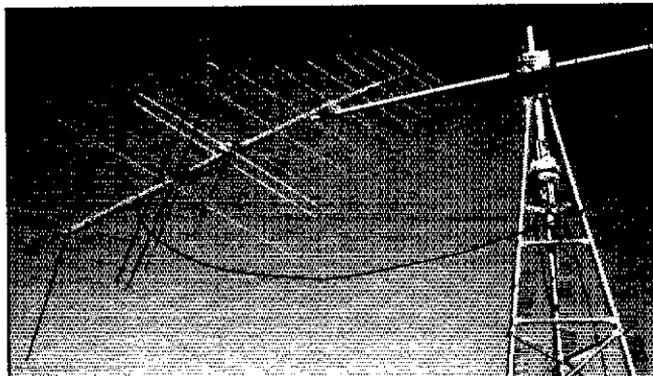
Featuring straight forward construction, and an innovative tapered boom that greatly reduces windload and adds strength and durability. Virtually unbreakable, insulated, 3/16" rod parasitic elements are anchored through the boom to insure years of trouble-free performance.

For the satellite enthusiasts, the 2M-22C high gain 2 meter, circular polarized antenna, features the same rugged construction and total flexibility as our very popular 2M-14C with a 2db increase in gain.

Four or more 2M-22Cs make an excellent array for Moonbounce (EME) by eliminating Faraday fading.

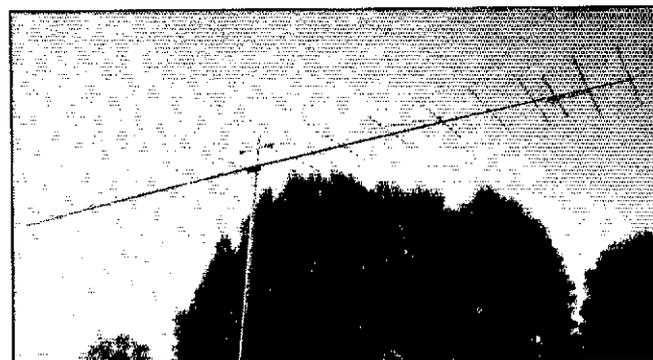
Fiberglass/aluminum stacking frames are available as well as 2 and 4 port power dividers and phasing harnesses to optimize the performance of these type arrays.

Watch for our new elevation drive system coming soon.



2M-22C

BANDWIDTH	144-148 MHz
*GAIN	
BEAMWIDTH	(E) 32°, (H) 32°
FEED IMP	50 ohms unbal.
BALUN	(2) 4:1 coaxial
BOOM LENGTH	19 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	1.85 sq. ft. max.
ELLIPTICITY	± 1.5 dB max.
CIRCULARITY SWITCHER	CS-3 included
WT. (lbs.)	11 lbs.

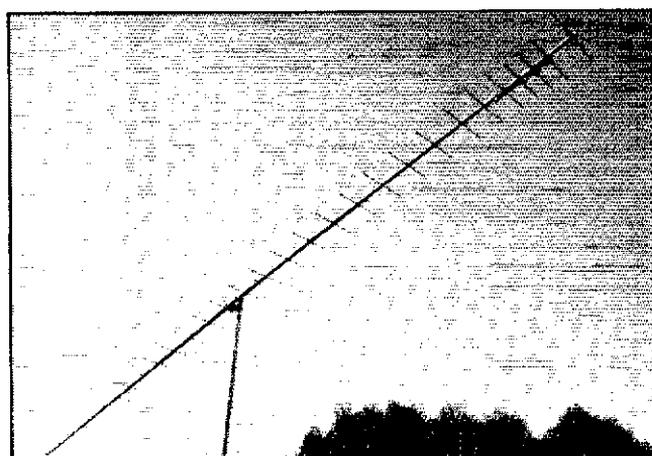


2M-16LBX

BANDWIDTH	144-146 MHz
*GAIN	(144 MHz)
BEAMWIDTH	(E) 26°, (H) 29°
FEED IMP	50 ohms unbal.
BALUN	4:1 coaxial, 2 KWPEP
BOOM LENGTH	28 ft. 1 in. (tapered)
VSWR	1.5:1
WINDLOAD	(H) 1.75 sq. ft. (V) 2.44 sq. ft. max.
WT. (lbs.)	10 lbs.
TURNING RADIUS	15 ft. 5 in.

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* To provide a more accurate and consistent gain figure, performance of this KLM antenna has been carefully measured and correlated in accordance with National Bureau of Standards Note #688. This gain figure may appear somewhat conservative when compared with others commonly found in conventional industry literature and based on older, less exacting rating methods.



432-30LBX

BANDWIDTH	430-440 MHz
*GAIN	
BEAMWIDTH	(E) 19°, (H) 20°
FEED IMP	50 ohms unbal.
BALUN	included
BOOM LENGTH	21 ft. 11 in.
F/B	F/S
VSWR	1.5:1
WINDLOAD	1.71 sq. ft. (max.)
TURNING RADIUS	12 ft. 4 in.
WT. (lbs.)	9 lbs.

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YAGI ANTENNAS
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CONTROL OF REQUIREMENTS
M-S-T REPORTING SYSTEM
TELEGRAPHY SPEED
ZERO-BEATING SIGNAL
TRANSMITTER TUNE-UP
TELEGRAPHY ABBREVIATIONS
RADIO WAVE PROPAGATION
SKY WAVE AND SKIP
GROUND WAVE
HARMONIC INTERFERENCE
SWR READINGS
SIGNALS AND EMISSIONS
HACKWAVE
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COMPUTERS
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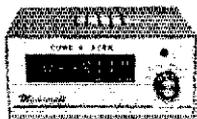
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for participation of at least 6 months, so join up. New Jersey hams got together with Jersey hams during the week of April 1-7. The NJDX Assn. spent a week there, and we hope you got a chance to work those Joiseyites from the Isle of Jersey. The FCC has named Metroplex as the Volunteer Examiner Coordinator for the Second call district. We need plenty of volunteers to serve under this committee so ALL CLUBS send in your volunteer list to KK2U. The QCWA North Jersey chapter reports that it had a very nice day at League Hq. April 4th. We'll be looking forward to some PIX in QST, fellows! Tri-County PA reports a new meeting location at the Franklin State Bank in Scotch Plains, NJ. They meet every Monday so join them. W2LJ spoke of noise bridges and antenna matching. On April 16th they had a Show and Tell exhibiting home-brew products by members of the club — and yes "home-brewing" still exists. Apologies for the absence of last month's Station Activities report. It got to the Hq. in part as some was listed under PSHR but fellows YOU MUST GET REPORTS IN ON TIME, with the SIXTH of the month is my deadline! Traffic: KB2HM 395, N2XJ 325, AG2R 202, K2VY 175, K2VX 144, W2BRX 100, W2XD 57, KD2BE 52, N2EOV 44, W2ZEP 44, KA2OIV 23, W2CC 22, K2Y2G 21, W2NKO 20, W2UH 20. (Feb.) W2VY 459. (Jan.) K2SE 10.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, K0CY — SEC: WA4VVV. STM: KA6B. BM: K0IIR. ACC: WB0CAM. The 3900 Club at Sioux City has been selected to host the 1984 ARRL Iowa State Convention. Watch for more details on OUR convention. I wish to thank Humboldt and Ft. Dodge for their hospitality during my recent visits. Tower ordinance resolved in Altoona owing to the efforts of concerned hams. FMARC is very close to being a 100% club; any more? Welcome to our newest affiliated club, the Central Iowa Tech Society (CITS). Iowa City assisted with Riverfest 10K run. DVNPT assisted with the Silver Gloves, and DSM assisted with Drake Relays Parade and Marathon. The Burlington club has contributed ARRL bookshelf to public library; good idea. Hope to hear everyone out on Field Day. Be sure to send me a radiogram for those extra 100 points. I hope to be on the winning station, W0RPK/2A, so let's compare scores if you think you have a chance. W09FQD/0 now NEOR; KA6QOP to General; WB0UFA to Adv.; KA6KOP to Extra. Nice going to upgrades.

Net	Freq.	UTC	Days	QNI	QTC	QTC	Seas.
75M Phone	3970	1830/2330	M-S	1996	117	55	
TLCN	3580	0030/0400	Dy	361	138	62	
ICN	3713	0100	M-F	93	48	21	
ITEN	3970	2230	Sn	107	16	4	

Traffic: W00FWB 281, K0QP 173, W0SS 110, W0YLS 104, N0RF 61, KA0QA 47, W0BAVV 35, W0HTP 36, W0B0JF 34, K0XL 34, K0CY 33, K0BI 32, W0BW 30, KA0ADF 29, KA0JQG 25, K0BOZ 14, K0FTT 20, N0CWW 18, W0LFF 6, K00BG 4, K0Z3 3, W00FVY 2, W00GVY 2, N0SCK 2.

KANSAS: SM, Robert M. Summers, K0BFX —
Net Sess. QNI QTC Mgr.
K0BN 31 1167 76 W0FRC
KPN 22 432 21 W0FRC
KWN 31 812 638 W0LBB
KMWN 31 677 603 W0LBB
CSTN 31 2284 110 W0OMB
QKS 58 322 98 W0BZEN
QKS-SS 14 55 13 W0MYM

Received bulletins this month from the following clubs: Boeing Employees ARC (The Bear), Pittsburg Flight Club, Pilot Club SRC (QAZ), Central KS ARC (QSP), Wichita ARC (Grounded Grid), Jayhawk ARC (Midwest Chirps), and the Kansas DX Newsletter. Either the postman is still reading a few and hasn't delivered them yet or for some reason your SM has been dropped from the mailing. If your club issues a monthly bulletin please see that I and your newly appointed Public Information Officer, KD0JM, are on your mailing list. KS was well represented at the Division Convention at Kearney, NE and also at the PHD hamfest in KC, MO. I hope you all put the KS State Convention at Salina the first weekend in June on your calendar. Congrats to K0BHF for being appointed Asst. Director for the Division. Traffic: W0FRC 197, AC0L 158, W0FIR 140, W0LBB 124, W0KLI 111, W0HI 110, W0OYH 88, K0BFX 72, W0FBJ 59, K0BU 56, W0QMT 53, W0MYM 15, W0RBO 13, N0BDG 12, KD0JM 12, K0GSC 11, W0CHJ 6, KA0E 3.

MISSOURI: SM, Ben Smith, K0PCK — The PHD of Kansas City began a training net on April 9 in the greater Kansas City area. It is on 21.114 kHz, Mon, Wed, and Fri, at 2100 local time. Plans call for code practice on the net frequency starting in June. W0BROQ will be net manager and N0EVC being the liaison to MTN and MON. The net will be known as PTN. I hope the amateurs in the Kansas City area will support the net. 1984 club officers for the Marcon ARC are: W0EJL, pres.; W0ACH, VP.; W0BHLW, secy/treas. N0EVC has received an O.D. appointment. Severe weather during the month of March was the cause of activation for ARCS groups in different parts of the state. Severe thunderstorms in central, south and eastern Missouri activated many storm nets. An ice storm in the greater Kansas City area gave an opportunity to provide public service to their community. Many club generators were put to use for emergency power. Amateurs in central Missouri were asked to assist the CAP with communications during the search of a downed aircraft. The Jefferson Barracks ARC amateur auction was well attended again this year. They are making plans for their 25th auction next year. Many club activities are coming up this summer; send me reports so we can use them in the Missouri Section News. We want to hear from clubs and individuals both.

Net	Sess.	QNI	QTC	Mgr.
MON	62	449	244	K0SI
MOSSB	31	924	85	KT5Y
HBN	22	482	34	K0DSQ
MEOU	32	648	31	K0DSQ
RRARN	29	400	7	K0BKR
LAESN	5	45	3	W0BHH
IFN	4	35	2	W0KNF
LOZRN	6	124	1	W0RTL
CMEN	6	108	1	K0PK
SARN	4	49	0	W0ENJ

Traffic: W0BMA 358, AIG 202, KTSY 187, K0SI 183, K0PCK 107, W0BAL 102, N0DN 101, W0BYX 101, K0BM 74, N0EVC 39, W0BUD 36, K0DSQ 32, K0ZAS 28, K0ZNP 25, K0YU 16, W0BOP 11.

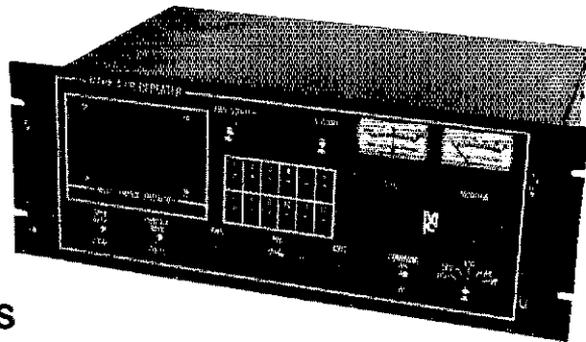
NEBRASKA: SM, Reynolds Davis, K0GND — Congrats to W0BSUW, new pres. of the Mid-Way ARC in Kearney. New ARRL appointments include K0COG, VHF Awards Manager; W0COX K0JFE are new Official Bulletin Stations; and KA0BWM W0GQM and K0G0F are new Official Observers. On the net side, AG0N is calling a net for folks who operate motorcycle mobile nightly at 0300Z near 3967 kHz. Don't forget the Nebraska Noise Net at 0200Z near

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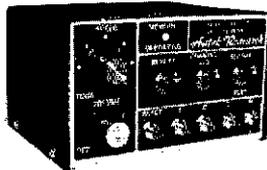
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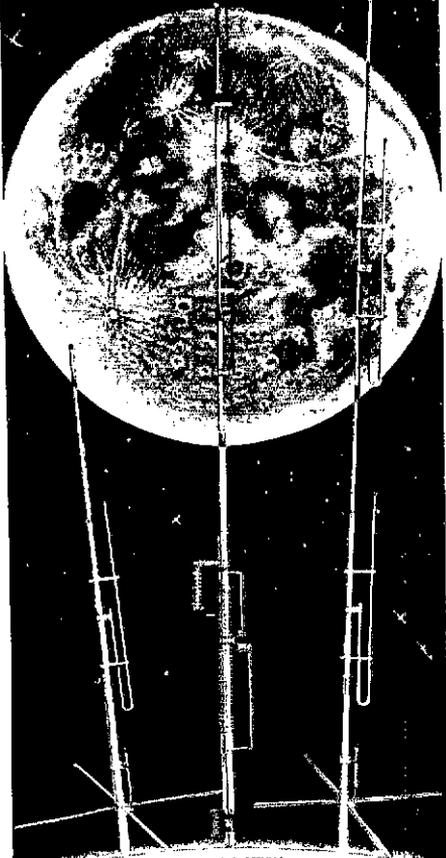
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Model HF6V
Model 2MVC-5 "Super Trombone"

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Model 2MVC-5 "Super-Trombone" - Same advanced features as the basic 2MVC but a full wavelength taller with additional "Trombone" phasing section for additional gain. Height: 15.75 ft/4.8 meters.



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3737 kHz. The "NINN" has a good group of regulars & a constant 3 wpm speed. The Nebraska Section Bulletin is sent via RTTY at 80 wpm & is repeated in 110 baud ASCII at 12:15 Central Saturday afternoons. Good info on section activities & late ARRL & FCC news. We need more ORS stations to copy the WDEMR feed and to relay into local VHF nets. Have a good month. Traffic: WB7ED 172, W0KK 132, K0DKM 112, KA0BCB 53, WA0SCP 38, K0IXY 28, W0N1K 28, KA0FEW 25, WA0PH 18, WA0DX 14, K0GND 14, N0DGM 11, K0B0C 10, WA0BOK 10, KA0BWM 10, WA0PCC 10, KA0ELI 8, W0RAM 8, W0BGMQ 5, KA000M 3, W0GWR 1.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD - SEC: K1WGO. STM: K1EIC. BM: K3ZJJ. OO/RFI: KA1ML. SGL: K1AH. PIO: WB8TDA. TC: W1HAD. ACC: N1AZC.

Net Freq. Local Time QTC QNI NM
CN 3640 1900/2200 227 328 K1E1R
CPN 3965 1800/1000 Sn 138 309 KA1BHT
NVTN 28/88 2130 57 329 WA1EMI
WCN 78/18 2030 137 439 WB1GXZ
RTN 13/73 2100 138 276 KA1JAN

Upgrades: Extra - W9GMS KA1KA KA1KB KA1MN; Novice - KA1LZ KA1LBV. New Ecs: Newington KA1BRD; Goshen KA1JVN. Welcome on board to efforts in keeping RASON running smoothly. WING is now the first radio operator in Connecticut to receive 5BWAZ. Attention all repeater owners/clubs: In mid June, an important meeting will be held, under the auspices of the New England Division of the ARRL to discuss 2-meter frequency coordination. Your input would be appreciated. Good luck to all in this year's Field Day. Section officials will be available on all nets to receive bonus traffic. Welcome to the Milford Amateur Rptr Assn. ARC on becoming our section's latest affiliated club. NARL provided communications for the St. Patrick's Day parade in Hartford. NARL flea market will be on at Newington High School. The Nutmeg Chapter of the QCWA is now forming. Consult W1EFW for details. Silent Key: W1WEM. Call changes: KA1HGHIKU10; KA1KEXIN1DBD; KA1JQM/N1DBH. Happy Father's Day. BPL: WB1GXZ. Congrats to W4RA on his election to the ARRL Presidency. A reminder: The ARRL has a dual pricing structure reduced membership rates are available for senior citizens, students and handicapped individuals. If you renew your membership through an affiliated club, then your local organization benefits too. Now is the time to begin planning for the Sept. start-up of Novice and upgrade classes. For assistance contact the ARRL. Ig. for ideas and supplies. Traffic: WB1EZF 100, WB1W 423, K1E1R 160, WA1JFE 108, KA1JCE 102, WB9IHH 98, KO1K 84, KA1GWE 82, KA1XG 78, KA1EGE 72, KA1BHT 61, K1UQE 59, K1AQE 46, W1BDN 43, W1DPR 32, KA1KD 31, K3ZJJ 13, WA1WQG 9, W3DZD 4.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD - STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. OO/RFI & BM: WA4STO. TC: KA1IU. PIO: WA1IDA. SGL: K1BCN.

Net Mgr. Freq. Time (loc)/Dy QNI QTC
EMR1 WA1LPM 3.658 1900/2200/Dy 380 544
EMR1PN N1BGW 3.959 1730/Dy 290 292
EM2MN N1BNI 23/63 2000/Dy 375 217
EM2MN (Feb.) 3.945 2000/Dy 315 87
NEEPN K1BZD 3.945 0830/Sn 74 8
HHTN KA1MI 04/64 2330/Dy 500 447
EMR1SS N1BHD 3.715 2330/Dy 143 87
O2MN N1BYS 045/645 1930/Dy 220 130

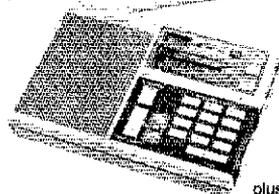
N1BET is back from sea after the winter cruise of the Maritime Academy's training ship. Owing to mechanical problems with the ship, he was not able to send as much traffic as anticipated. Good contact was maintained, however, and all traffic was passed efficiently. Bulletin Manager WA4STO reports that his CBBS system is available 24 hours per day with ARRL bulletins. Contact him for details. State Government Liaison K1BCN provided testimony for our friends in West Mass regarding Senate Bill S-1625. This bill will enable the state to enter into a long term lease with the Northern Berkshire Club so they can keep their antenna for the 31/91 repeater on the tower at Mt. Greylock. A favorable report out of committee is expected. It is also hoped that the same site will eventually support a packet radio digipeater as well. STM KA1GBS is making all traffic related appointments for the section now and as such should receive directly your monthly traffic reports. So effective immediately, all ORS and NM stations please send your reports to KA1GBS and we will take care of combining her report with mine for this column. Algonquin club has purchased a 16-foot trailer as a communications vehicle. Sturdy Memorial Club preparing for the spring road races (communications that is). N1DM and A1JE gave talk at the Middlesex club about the best way to work the Space Shuttle. Norwood Club celebrating another successful flea market. 1979 member KA1AFE is new board member replacing KC4WJ who moved out of state. North Shore club is gearing up in a big way for the Volunteer Examination program. Barnstable and Falmouth clubs teamed up to provide communications for the Hyannis Marathon with 17 hams in attendance. Colonial club seems to have gotten agreement from the cable company in Concord to staff off channels E and K. Billerica Club had its annual banquet. Traffic: KA1GBS 1756, WA4STO 782, KA1EPO 589, N1BGW 574, KA1BU 341, KA1EXJ 199, K1CB 190, KA1BHD 187, N1AJJ 159, W1DPR 151, N1BQG 150, WA1BTB 143, W3SFOC 113, K1ABO 84, K1GN 64, K1BZD 62, KA1AMR 40, W1ZHC 40, WA1FNM 35, K1LQ 7, W1XA 4, WA1FCD 2, K1OGF 1. (Feb.) W1BNS 70.

MAINE: SM, Cliff Lavery, W1RWG - ACC: K81JF. BM: W1JTH. OO/RFI Coord: W1KK. PIO: KA1TJ. SEC: KL7JG. SGL: K1NIT. STM: AK1W. TC: KQ1L. Bulletin Mgr reports five stns transmitted 12 ARRL bulletins 65 times. Also sending other info on CW phone and RTTY. Official Obs coord reports apprising 8 stations of discrepancies. He needs more OOs, PAWA, Sandy River, Merrymeeting, Presque Isle, Mid-Coast and Waldo clubs are making Field Day plans. State Gov't Liaison distributed a copy of *This is Amateur "Ham" Radio* to each Maine legislator. Abbott 'test Aug 11; Windsor test Sept. 8. FSHR: AK1W W1RWG WA1YNZ N1BJW KL7JG W31GLH.

Net Sess. Checks Traffic NM
SeaGull 27 1050 178 K1GUP
Pine Tree 53 418 157 AC1G/
WA1YNZ
SeaMeEmerg 9 206 28 W1WCI
MePubSvc 4 88 4 KL7JG
Aroostook 4 59 3 WA1YNZ
RACES 4 52 1 W1RWG

Traffic: AK1W 211, W1RWG 104, N1BLZ 93, N1BJW 87, WB1GLH 85, WB1CBP 83, W1SO 83, WB1BYR 79, W1BWX 69, WA1YNZ 33, KL7JG 31, KA1KFC 28, W1WCI 19, W1AHH 15, W1GCB 14, KA1FTL 13, KA1ENM 8, W1VEH

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LA-1000A 1200 WATT AMPLIFIER



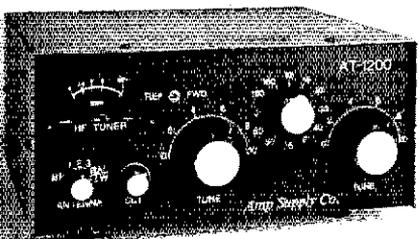
LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 800 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A \$449.50*

AT-1200 TUNER



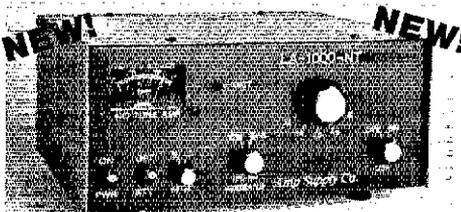
AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

AT-1200 \$189.50*

BL-1500 9:1 5 KW Balun \$29.50*

THE NEW NO TUNE — LA-1000-NT



More contacts, eliminate tune-up time, and less tune-up interference are yours with the NEW LA-1000-NT. The NO TUNE LA-1000 offers full coverage of the 160-15 meter amateur bands. A powerful 1200 watts PEP input and 800 watt DC input is the power rating of the LA-1000-NT. As with all Amp Supply Amplifiers, the NO TUNE LA-1000 features QSK, full break-in CW. Computerized CW and Keyboard Operators will love conversation-like full break-in (QSK) CW. If you desire a compact kilowatt amplifier that needs no tuning and you have a transceiver capable of delivering 100 watts PEP—The LA-1000-NT is the perfect addition to your radio station!!

LA-1000NT No Tuneup \$529.50*



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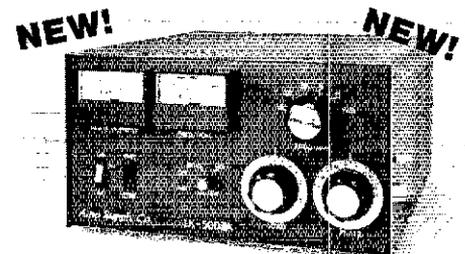
The AIM-1 is an antenna impedance matching network for random, long wire or loop antennas. It provides continuous coverage from 500 KHz - 30 MHz, is completely automatic, no knobs to turn or coils to tap. Installation is simple; hook on wire antenna, ground, coax cable to station and balancing module at opposite end of wire. The antenna is ready for transmission from 1.8 - 30 MHz at up to 3KW PEP.

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- wire lengths should be 1/2 wave on lowest frequency for maximum efficiency.
- inverted V, inverted L, rombic, random wire or loop antennas
- weatherproof • 2 year warranty

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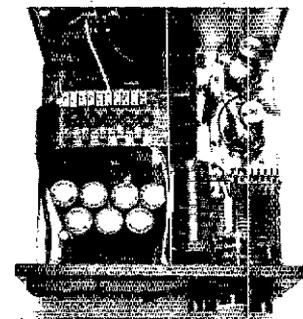
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The all new Amp Supply LK-500ZA 2.5 KW Input Amplifier is the right amplifier, with the right features at the right price. The LK-500ZA comes completely assembled and covers 160-15 meters. Two Eimac 3-500Z triodes in grounded grid are featured with a dual cooling system, one for the power supply and the other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world that sells for under \$900.00.

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- 1 KW SSTV, RTTY Input: 600 Output
- QSK Full Break-in CW
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- 1500 Watt Output with Hipersil Transformer



Interior view of LK-500ZA with "Peter Dahl" Hipersil Transformer

LK-500ZA

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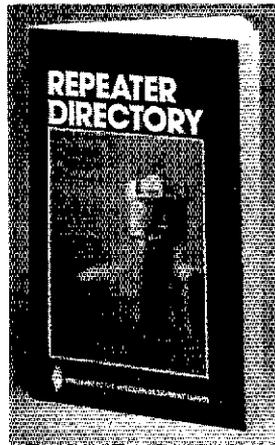
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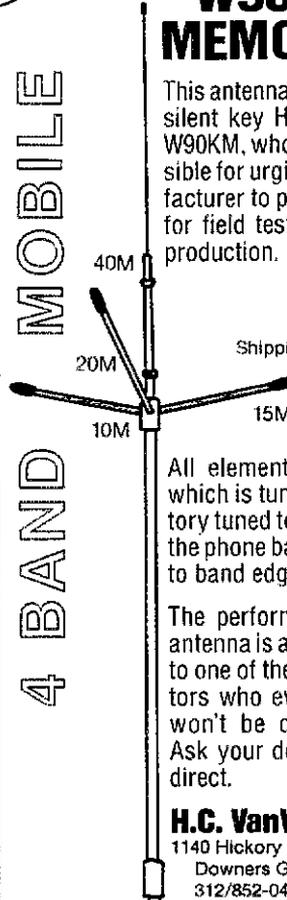
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This antenna is a tribute to silent key Henry Kampe, W90KM, who was responsible for urging the manufacturer to produce it and for field testing it before production.

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8, WBME 7, KA1ENL 6, W1OTO 4, W1KX 9.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: Open. NMs: N1NH K11M KK1E. Don't forget the Charlotte VT hamfest Aug. 11 & 12. Amherst RC officers: W1XC, pres.: K0UNJ, v.p.: W1FBX, secy.; WA1HXH, treas. Phonepatch capability added to Amherst repeater. The Vermont Net will be held at W1KRIV in July. Contact KA1HSW of the new 4H ARC in Manchester. They need parts, equipment or anything to help youngsters get started in Amateur Radio. Everyone enjoy the long awaited summer. Traffic: KK1E 303, WA1YZN 280, N1CPX 246, W1TN 167, K11M 132, AK1E 82, N1AKS 77, W1MHX 62, K1YMH 61, W1CYR 45, K1JOP 45, W1CUE 41, W1ALE 32, W1ALM 32, W1VTP 23, K1JQZ 21, KA1HPO 14, WA1PEL 10, N1BVI 6, K1TQY 6, K1OIQ 5, W1OKU 4, W1HJF 4, N4FDL 4, KA1HP 4, K1UQX 4, K6UXO 3, KA4HRH 2, K1ACL 2. (Feb.) K6UXO 6.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — STM: W1EOP. TC: AB1D. NM: WA1OSL RIEM2MTN. ACC: N1BEE. SGL: K1DA. WA1OSL reports for RIEM2MTN sess. 22, QNI 144, QTC 12. New appts: KA1IEK ORS. Sorry to lose KA1EHR as SEC owing to business commitments. It was a well done. KA1KML has made BPL third month in a row and will soon receive the BPL Medalion. Newport Co. ARC holding auction May 7th at Seamans Church Institute. W1EOP has been appointed to TCC and will run traffic from PAN to EAN (Pacific to Eastern). Traffic: W1EOP 1121, KA1KML 638, WA1CRY 77, KA1IEK 67, WA1CSO 43, K1AOS 18.

VERMONT: SM, Reed Garfield, WB1ABQ — HI gannl Winners in VT QSO Party are W2DMC1 multi-op, N1BRT single. Great job done by the CVARC group. VTN Picnic at W1KRIV's July 21 or 28, so start planning and will keep you posted. As you should all know by now, KD1R will be new SM effective 1 July. Thanks to all for your support during my term. Nets: VTN (NTS) 31/162/73, VSBN 31/542/118, VFMTN 31/390/66, GMN 27/410/31, VPN 4/6/6, Carrier 27/680/31, CVFMN 5/45/4, RFD (Feb.) 4/84/20. Traffic: KD1R 110, N1ARI 101, AET1 86, W1KRIV 73, N1COB 67, WB1ABQ 48, W1OAK 25.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — STM: W1UD. TC: KA1JMM. OO/RFI: N1CQM. PIO: WB1CJH. SEC: WB1HH. Creativity abounds in K1BE whose design was selected for SSC logo. Congrats. HCRJA has decided to retire from W1QSL. Bureau sponsorship as of July 1. All our thanks and appreciation to HCRJA, the untiring sorters, and especially to KA1GVC, all of whom have forwarded those precious cards to us for almost 16 years. NoBARC and UMass handled comms for cross-county ski race up Greylock; rumor has it that someone went up on a skimobile though. NoBARC Flea Market on June 3. UMass even busier with traffic, as W1PUO named NM for WMTN/c3, PSHR: WB1HH W1PUO W1JRA W1KK K1JHC KA1EKQ KA1T. Traffic: W1PUO 259, W1JRA 248, W1UD 148, KA1T 92, W1KK 75, K1JHC 65, WA1YYW 61, K1PUG 49, WB1HH 48, WA1OPN 23, KA1EKQ 17, KR1R 15, W1ZPB 13, W1SVJ 12, K1JUV 11, W1JP 8, WB1FSV 5, WB1HKN 4.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, K17FE — STM: K17T. SEC: K17OS. PIO: K17CP. OO/RFI: K17FL. Congrats to the Alaska DX Assn. for their planning and trip to the Pribilof Islands. Hopefully, the Pribilof Islands will soon have their DXCC status. K17OW has been appointed as an Emergency Coordinator for the Wasilla area. W18SFO is the assistant EC. They will be conducting an ARES net on 146.25/85 at 2100 local Sunday. Thanks goes to WA6AXO for Korboshing HB 520 and SB 504 meant to be illegalized "... other telecommunications services," and "... earth stations." He saved us from a needless anti-antenna bill. Traffic: AL7FL 49.

IDAHO: SM, Lem Allen, W7JMH — SEC: KD7HZ. STM: W7GT. PIO: WB7PFO. DEC (North): K7TWZ. DEC (SW): WA7LVX. DEC (SE): WA7UHW. Club News: Pocatello ARC meets 2nd Wed each month at 7 P.M. Talk-in on 36/06. Boise ARC meets 3rd Wed each month at 7 P.M. Talk-in on 34/94. People and Things: W7HZL has moved to Grants Pass, OR. K7CXG & XYL visited in Hawaii. W7IWW KC7UN & WB7ARG went trailing to CA & NV. WA7RUT back from winter stay in NV. W7HPH has new motorcycle. W7JMH on trip to OR & CA with new house trailer and puppy, and visited swapfest, clubs, hams and relatives. W7DOH has new Icom 740.

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935	7 P.M.	31	2184	40
Idaho CD	3990	8:10 A.M.	M-F	22	830
IMN	3635	8 P.M.	M-F	22	847
				24	88

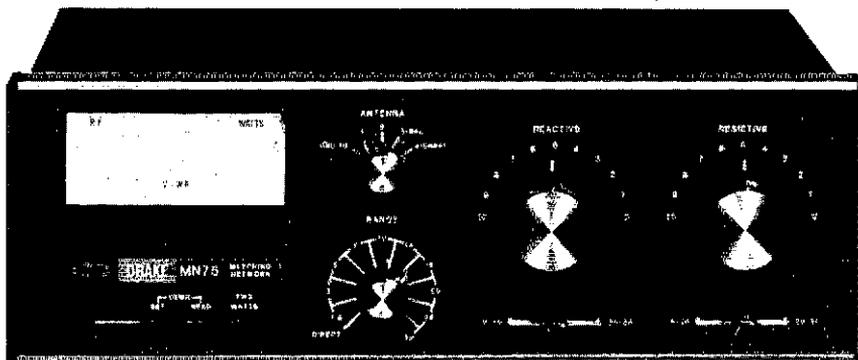
Section Activities: SM and SEC met with Bureau of Disaster Services to set operational and organizational priorities. SEC met with them to coordinate highway districts. CD, ARES to work together. SM, SEC, STM had staff meeting at Milton-Freewater Swapfest. W7QGP W7JIE W7JMH W7YSE met at Medford, OR ARC meeting and discussed VEC program, AIRS and budget matters. Traffic: W7GHT 188, KA7GQP 55, W7JMH 45, K7TM 7.

MONTANA: SM, Les Belyea, N7AIK — SEC: W7LR. STM: KF7R. OO/RFI: K87U. ACC: WB7TWG. PIO: WA7GQO. SGL: W7JMX. ASM & TC: K0PP. BM: KB7SE. Upgrades reported last April are: Extra — K7KCR N7EOM (15 yrs old); to Adv — N7DYM N7EOL; to Tech — KA7RRR. The Yellowstone ARC is making plans for a Montana QSO Party this October. Congrats goes to the Gallatin ARC for becoming an ARRL Special Service Club. WB7UTJ held the second annual Day Picnic at her home in Sidney last month with a good turnout. KB7Q is Bozeman put on a Earth-Moon-Earth demonstration for a group from as far away as Billings. DX note, W7LR recently worked and got a QSL card from BY1PK. The Lower Yellowstone ARC had 2 takers for the first-time ARRL membership drive. Both these amateurs got 5 bucks off their new ARRL memberships, but WA7GVT of LYARC got certificates in the membership referral program, so the \$5 was not lost. PSHR: KF7R.

Net	Sess.	QNI	QTC	Mgr.
IMN	22	247	86	W7JMH
MIN	31	1660	139	KB7SE
MSN	4	51	0	K0PP

Traffic: KF7R 76, WB7WVD 52, N7AIK 40, KD7JZ 6. **OREGON:** SM, William Strader, W7OMU — STM: W7V6E. SEC: N7CPA. PIO: KC7YN. SGL: KA7SK. ACC: WB7WSD. RFI: AK7T. OO: N7SC. Upgrades: KA7SPZ KA7SOA KA7SQB KA7SQC KA7SQD KA7SQE KA7SQF KA7SQG KA7SFT KA7SAG KA7SEI, all new Novices and KD7UC (Advanced). KA7MDM was chosen as "Fireman of the Year" in McMinnville. KA7NPN was winner in the OTVARC January "Rusty Key" nite with KA7RNS as the top Novice scorer. K57P got 540 points as the only Oregon entry in the Pennsylvania QSO Party. N7EYS is a new member in the Society of Wireless Pioneers. New officers in the Klamath Basin ARC are KD7AD, pres.: WB4NMG KA7NEN, v.p.: K7TDX, secy.: W7IED, treas. WB7RQG was awarded

COMPLETE YOUR STATION!



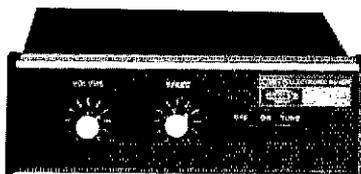
DRAKE MN75 ANTENNA TUNER

The Drake MN75 matching network will optimize your system performance with a surprising range of features and flexibility. From 1.8 to 30MHz., the MN75 matches balanced lines, coaxial lines, or random wires. (Optional B-1000 balun required for balanced lines.) RF output and VSWR readings are available at the push of a button. The rugged MN75 is rated at 200 watts continuous duty and features antenna switching as well as bypass capability. Get maximum power to your antenna system with the Drake MN75.



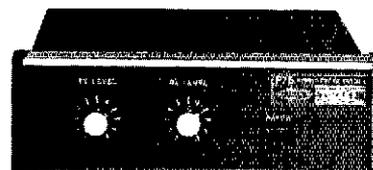
DRAKE SP75 SPEECH PROCESSOR

The Drake SP75 Speech Processor packs the punch it takes to be heard! The SP75 is an RF type speech processor designed to give your signal that needed boost when the going gets tough. Connect the SP75 between your microphone and your Drake TR7 or TR5 — that's all! Front panel switching gives you a bypass option as well as phone patch or tape player input. Special muting circuitry even allows you to operate VOX while using the SP75. The clipping level is adjustable and the LED indicator shows the proper audio input level.



DRAKE CW75 ELECTRONIC KEYS

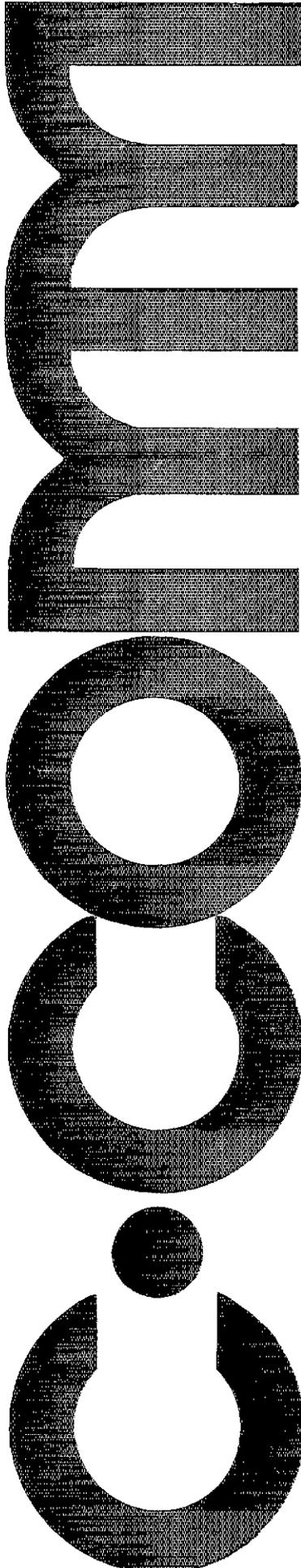
A no-nonsense keyer for the '80's: the Drake CW75. Smooth iambic keying (grid block or direct) is at your fingertips with either a squeeze key, semi-automatic "bug", or straight key. 5 to 50 WPM capability with front panel speed control. Built-in side tone monitor with volume control. Operates from an external 7 to 14 volt supply or a nine volt optional internal battery.



DRAKE P75 PHONE PATCH

Use your station to its fullest! The Drake P75 Phone Patch puts you on the front lines of amateur radio public service. With the P75, your station can be that vital link between the remote location and the folks back home. The P75 is a hybrid patch for use with the Drake 7-line or other transmitter/receiver combinations. Features such as in/out switching and adjustable RX/TX level controls make the P75 Phone Patch the choice you can count on.





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New 3 watt full-featured 2M, and 440MHz handhelds! Scanning, 10 memories and programmable subaudible tones are just a few of the MANY features of these terrific new radios. AND THEY ARE COMPATIBLE WITH ALL ICOM HT ACCESSORIES!

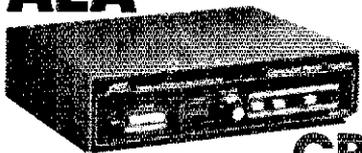


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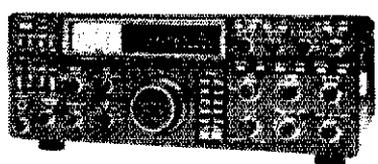


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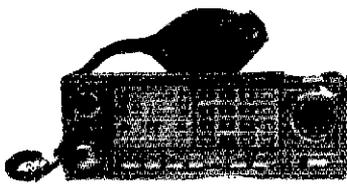


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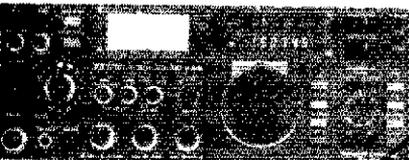


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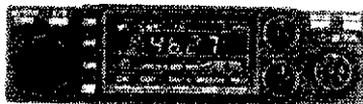
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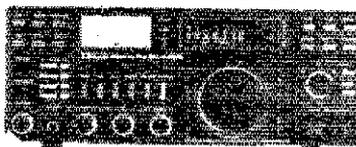


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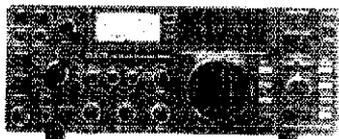
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Third ARRL Amateur Radio Computer Networking Conference

This booklet contains papers presented at the "Packet" Conference held in Trenton during April, 1984.

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"HF Packets: Modems and Gateways"	6
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an ARRL Certificate of Merit for an outstanding job as EC for Jackson Co. and as a repeater operator for ARES system in So. Oregon. WB7RQG is also chairman for communications for the Pear Blossom Festival and Run. A very hearty CONGRATULATIONS to all!! The Pacific Maritime Net will certainly miss WA7GMP who passed on unexpectedly. He spent many many years dedicated to working with the Pacific Mariners. W7QGP, W7JIE and W7JMF (Idaho SM) visited So. Oregon. Code practice by WB7RFJ on 3600 kHz Tues and Friday at 8pm local time. Klamath Falls picnic on July 6, 7 and 8, don't miss this one. QSN traffic QNI 610, QTC 612. Traffic: W7/S 68, W7ZB 292, KX7V 234, AL 7W 200, K7OV 130, K7GV 128, KX77 78, K1TY 70, WB7OEX 57, KV7E 51, N7BGW 44, W7LNE 39, K7AID 38, W7DAN 13, K7TDX 4.

WASHINGTON: SM, Joe Winter, WA7RWK -- STM: K7GXZ SEC: W6IHH, PIO/SGL: W7CKZ, ACC: K7RS. CO/RFI Coord.: KB7WC, BM: KD7G, TC: K7JUL.

Net	Freq.	Time (Z)	QNI	QTC	Sess.
WARTS	3970	0200	3217	251	31
WSN	3590	0245/0545	614	248	62
P8TS	145.33	0130/0630	180	103	62
NTN	3970	2000	1089	57	31
EWTN	146.04	0130/0630	64	70	62
NWSSB	3945	0230	771	45	31

Field Day is here, June 23 & 24! Hope you are ready, if not better hurry! See you on the air. Let's practice for the Wenatchee HF & the Northwest Div. Conv. on the same weekend June 1-3. Okanagan Int'l HF July 28/29. AUGUST NW country Cousins 3-5, Washougal CBN 4/5, Swyak Park, Tacoma Hamfair 11/12, PLU, Int'l Picnic 19th in Port Angeles. SEPT. Walla Walla HF 22/23 Milton Freewater. ARRL Board directed Gen. Mgr. to sign FCC agreement to recoup VEC expenses. Exams by Labor Day looks good. Register with ARRL Hq. and get your VE teams ready! The Boeing EARS and some local clubs became an FCC-approved 7th call area VEC. BEARS mbr, WA7RCK gave a program on cellular radio. N. Sea. ARA: KA7NYB & KB7RR are heading up Field Day. Eighteen finish Novice course taught by KA7NYB & N7FHZ. Congrats. W7VDC N7AY gave a fascinating program on his experiences operating radio in the Yukon. Alan "Underground" during WW-2. Pres. K7JUL rpts DXpeditions to the Laccadives, Malpelo & Karmadec were run very smoothly. This helps further our cause for more DXpeditions. Radio Amateurs of Skagit Co. 1984 officers: KF7K, pres.: N7AXJ, v.p.: KA7ACY, secy/treas. KA6NVO from AEA gave a program on using VIC-20/Comd'r-64 computers for comm's. OARS: W7CKZ/PIO & KV7E had good success with WA birthday Party at S. Sd. Shopping Mall demo, getting 10 possible new hams, made 27 QSOs, incl. 1 JA. W7CKZ heads Capital Hill Hobby Show, Inland Emp. VHF RA has 358 mbrs. W7WIL is in charge of Lilaac Parade comm. KA7OSP said more monitors are needed for WIX spotter system in NE Wash. Spokane Reg. Am. 1984 officers K7EFB, pres.: KC7IC, v.p.: WB7VSZ, secy/treas. of W7NBR is N7ER; treas. of K7LRD is WB7JFH. N7BHB rpts the Licon Co. RG is operating 146.121.72 north of Davenport. Improved coverage is in the future. Kamiak Butte AHA has a goal to promote ham comm. in SE WA & northern Idaho. They run 146.141.74 & 444.951.95. Kootenai ARS HF N. Idaho Fairgrounds June 9. WA7LNC & KA7OSP installed permanent 2-mtr station in the Spokane NWS office. N7BGG, WB6JFH and WA7LNC donated the gear. The June 21st Teleconference Radio Net (TRN) features Dr. Beltrac, VE2CV, a worldwide authority on antennas. Traffic: W7ZX 62, K7WZ 56, K7BT 25, KR7 273, K7GXZ 230, N7ANE 202, W7WVOW 112, W7LG 90, W7HNA 89, W7BG 87, WA7BDD 78, W7CTP 75, W7IEJ 75, KR7 53, W7APK 34, K7AJT 28, K7INX 23, W7LUP 10, K7OXL 13, WA7RWA 6, W7AIB 2 (Jan.) KR7L 332.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W8RGG -- ASMs: W6ZM N6DHN, EC: W6LKE, STM: N6IA. Welcome to new ECs W6SJA for Napa Co. and N7BV for the City of Alameda. I regret that there was no column last month. I was in Mazatlan, Mexico, waiting with DUBB F6GVB F9LX F08GW F08HL F09IW K0NX K6GB N6BLN N7NG W6OAT W6SZN and W6TPH for the chartered vessel to take us to Clipperton Island on a DXpedition. I had hoped to write of my experiences on the DXpedition in this column, but our ship did not arrive and no suitable substitute could be found, so the trip was never made. I will give you a report on the completion of our next attempt. New HRC officers: N6BNY, pres.: N6IYO, v.p.: N6IUH, secy.: W6BLG, treas. Traffic: N6IA 225, W6VOM 144, W6DOB 78, NV67 76, K6APW 70, K6AGD 65, (Feb.) N6IA 388, K6AGD 159, W6VOM 157, NV67 98, W6DOB 83, K6APW 59, W6OUZ 30, (Jan.) N6IA 251, W6DOB 84.

NEVADA: SM, Leonard M. Norman, W7PBV -- SEC: W6SVDV, STM: W7BS, W7CX attended Division Cabinet meeting. WA7PLQ, KD7PD, WA7GAE new OTH Smoke Valley, Round Mtn. N7ERN busy in the Walker Lake area. W7PBV attended dinner get together with Las Vegas gang. KA7BRE now KS7SP. Northern NV ARS: WA7BWF, pres.: W7UPS W7QYK, club historians. N7EAG running Novice class, assisted by KB7VU KD7QJ W6NSG and W6SIZC. KD7PD celebrated his 70th birthday. K7HRW reports Western NV ARES now has 54 members. Sagebrush Net on 3906; NV Weather Net on 3992; NV CD RACES Net on 3996; each would enjoy more check-ins. K7ZOK active with a computer. Traffic: W7BS 83, W7PBV 29.

PACIFIC: SM, James Wakefield, AH6CO -- All appointments will continue if desired and I will be happy to appoint additional persons by request. Aloha and mahalo to all of you for past and future Kokuu to me and your Section. I will need your help and cooperation to make this column interesting and make the section really function. KH6TR was active at Pahoa for the March eruption of Kilauea. No ham activity needed for Mauna Loa. KH6JUJ KH6BZF and KH6XX lost points in WPX by aiding in the SOS hoax. Sorry, but it might have been real! KH6VD now AH6FG; WH6AYO now NH6BA. Seventeen Maui ARES members provided public safety communications for the Maui Marathon on March 4. Kaula 5-KW generator now functional after help from KH6S and KH6DXO. We are allowed 16 Q57 lines! Help me fill them. Traffic: KH6HUJ 69, KH6H 38, KH6RQ 32.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB -- STM: KY6O, SGL: W6WFG, CO/RFI: W6S7NC, SEC: W6ZUP. STM is seeking all those interested in belonging to SV health and welfare traffic team. CO/RFI Coordinator is looking for volunteers to serve as GOs. Contact each by mail for more info. Many section clubs having trouble -- paying too much -- for liability insurance! Contact Club & Training Dept. at Hq. For full details of League's group liability policy, it'll save you bucks. Most winter Novice and upgrade classes are now over. Let me know results for publication here and monthly newsletter. Y.A.R.S. QSO

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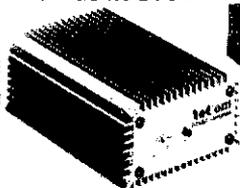
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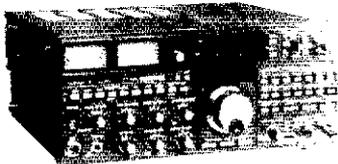
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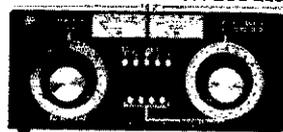
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IC-47A, IC-271A/H, IC-2KL, IC-471A, IC-290H.



SMART PATCH

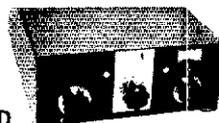
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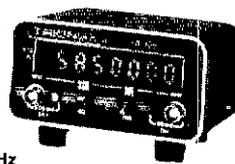
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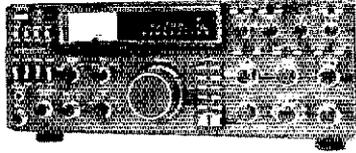
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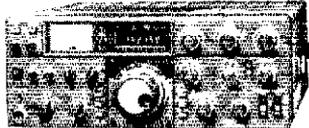


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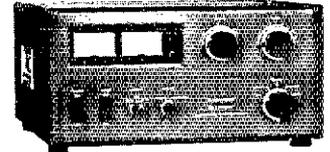
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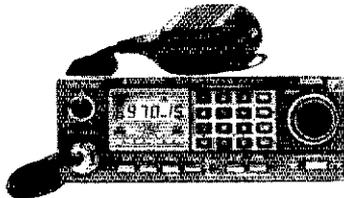
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TL-922A Linear Amplifier

- 160-15 Meters
- 2KW PEP Input Power
- Pair of Rugged 3-500Z Tubes Included
- Compatible with all Kenwood Transceivers and Many Others
- Built-In 110V-220 VAC Power Supply

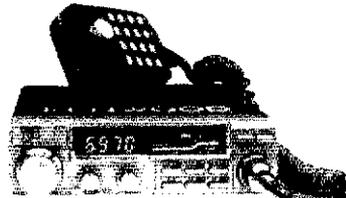
TL-922A List \$1229.95
CALL FOR SPECIAL SALE PRICES!



TR-7950/7930

- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- 45 Watts (TR-7950) 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

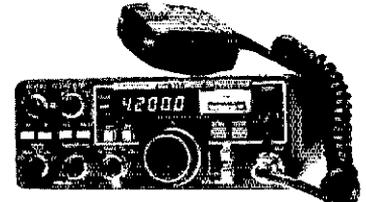
TR-7950 List \$399.95 TR-7930 List \$359.95
CALL FOR SPECIAL SALE PRICES!



TM-201A/TM-401A 2m/70cm FM Transceiver

- 25W Output (TM-201A) 12W Output (TM-401A)
- Ultra Compact
- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

TM-201A List \$369.95 TM-401A List \$399.95
CALL FOR SPECIAL SALE PRICES!



TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
- Memory and Band Scan
- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List \$529.95
CALL FOR SPECIAL SALE PRICES!



TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price \$329.95
CALL FOR SPECIAL SALE PRICES!

- TR-2500 Options:**
- ST-2 Base Charger \$89.95
 - MS-1 Mobile Charger \$42.95
 - VB-2530 25W Amplifier \$99.95
 - BT-1 Battery Case \$11.95
 - SMC-25 Speaker Mic \$34.95
 - LH-2 Deluxe Leather Case \$37.95
 - RA-3 Telescoping Antenna \$14.95
 - BH-2A Belt Hook \$4.95
 - PB-25H Heavy-Duty Battery Pack \$39.95
 - DC-25 13.8VDC Power Adapter \$19.95

All TR-2500 Accessories in Stock for Immediate Shipment!
TR-3500 Also in Stock at Sale Prices—Call!



List \$599.95

TW-4000A Dual Bander 2m and 70cm FM in One Compact Package!

- Big LCD Readout
- 25W Output—Both Bands
- 10 Memories w/Scan and Back-up
- Dual VFO
- GaAs FET Front End
- 16 Key Up/Down Mic

VS-1 Voice Synthesizer and Other Accessories in Stock—CALL FOR SPECIAL PRICES!

TS-780 2m/70cm Dual Band—All Mode Transceiver



- Dual VFO
- 10W Output
- VOX
- Noise Blanker
- Band Scan
- 10 Memories
- Memory Scan
- AC Power Supply

TS-780 List \$999.95
CALL FOR SPECIAL SALE PRICES!



R-2000 Receiver

R-600—R-100S—R-2000 Receivers in Stock!
CALL FOR SPECIAL SALE PRICES—SAVE \$!



TS-660 Quad Bander—All-Mode Transceiver 6m, 10m, 12m and 15m

- Dual VFO
- IF Shift
- 10W Output
- 5 Memories
- Noise Blanker
- VOX, Narrow Filters, AC Supply and Other Accessories Available

TS-660 List \$699.95
CALL FOR SPECIAL SALE PRICES!

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special KENWOOD Sale Prices and Save \$\$\$!

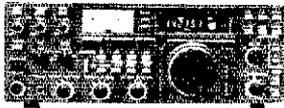


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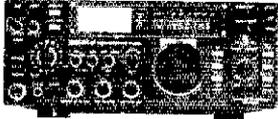
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COMMUNICATIONS EQUIPMENT SALE!



ICOM IC-751A LIST PRICE \$1399
CALL FOR SPECIAL SALE PRICE!



ICOM IC-745 LIST PRICE \$999
CALL FOR SPECIAL SALE PRICE!



IC-02AT
NEW 2 METER
TOP OF THE LINE HT
• Digital LCD Readout
• Scanning
• Programmable PL Tones
• Optional 5W Battery
• 5-meter Function
• 10 Memories
• Offset Storage
• Lithium Memory Backup
• 13 VDC Operation!
• Sealed Case
SUGGESTED LIST PRICE \$349
CALL FOR SALE PRICES!



TS-930S LIST PRICE \$1799
CALL FOR SPECIAL SALE PRICE!



TS-430S LIST PRICE \$899.95
CALL FOR SPECIAL SALE PRICE!



TR-2500 2.5W/300 mW
(Switchable) 2 Meter
Handheld Transceiver
Small Size— Small Price—
Big Performance!
• LCD Readout
• Ten Memories
• w/Lithium Back-up
• Band and Memory Scan
• Built-In Sub-tone Encoder
• Built-In 16 Key
Autopatch Encoder
• Slide Lock Battery Pack
TR-2500 List Price \$329.95
CALL FOR SPECIAL SALE PRICES



FT-757GX LIST PRICE \$829
CALL FOR SPECIAL SALE PRICE!



FT-726R LIST PRICE \$829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List \$319
FT-708R 440 MHz HT
List \$319
• LCD Display
• 10 Memories



CALL FOR SPECIAL PRICES!



NEW ST142µP
2M HT

- 3.5W/1W/0.1W
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

List 339.95
SALE \$299.95!



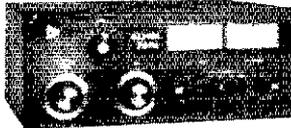
ST144µP \$259.95
ST222µP CALL!
ST442µP CALL!

SANTEC Accessories

- SM3 Speaker Mic \$34.95
- ST-LC Leather Case. . . . \$34.95
- ST-500 NiCad Battery. . \$29.95
- ST-4QC Base Charger. . \$69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ETD ALPHA SALE!



76PA \$1899!

Model	List	Sale*
76A	\$1985	CALL
76PA	\$2395	CALL
76CA	\$2695	CALL
374A	\$2595	CALL
78	\$3495	CALL

*Sale Prices Too Low To Print—
CALL & SAVE \$\$!

TEN-TEC SALE!



CORSAIR List \$1169
Deluxe AC Supply List \$199
Both Items— Yours for \$1169!
All Ten-Tec Accessories in Stock
for Fast Shipment!



TEN-TEC
New 2M HT
Full Featured!
List \$319
Sale \$279.95!

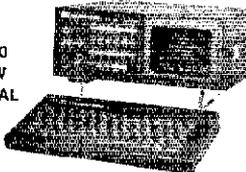
4229 2KW Tuner Kit \$189.95!

HAL SALE!
NEW RTTY/CW COMPUTER
INTERFACES



CRI-100 List \$249 SALE \$229.95!
CRI-200 List \$299 SALE \$269.95!

CWR6850
RTTY/CW
TERMINAL



List \$999 SALE \$749.95!

Other HAL Products On Sale

3WR6700	\$439.95	DS3100ASR	\$1699.95
CWR6750	\$629.95	MPT3100	\$2199.95
CT2100K/B2100	\$749.95	RS2100	\$299.95
CL2200K/B2100	\$949.95	ST1500	\$219.95
DSK3100	\$1049.95	ST1600	\$649.95
ARD1000	\$649.95	KG-12	\$169.95

TOKYO HY-POWER LABS



HL-30V Reg. \$69.95
SALE \$59.95

HL-82V \$139.95
HL-160V \$289.95
HL-20U \$99.95

HL-90U \$329.95
HC-200 \$69.95
HC-2000 \$269.95

KDK FM2033

List \$339.95 Sale \$299.95



JANEL QSA5 PREAMP \$39.95!
QSA-6 \$41 432PL \$59
PB-30 \$25 PB144 \$25
PB-50 \$25 PB220 \$25

MIRAGE AMPLIFIER SALE!



B1016
\$249

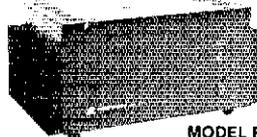
Model	Band	Pre amp	Input	Output	DC Pwr	Sale Price
A1015	AM	Yes	10W	150W	20A	\$249
B23	2M	No	25W	19W	5A	\$179
B215	2M	Yes	25W	150W	22A	\$269
B101	1M	Yes	10W	50W	10A	\$159
B1016	2M	Yes	10W	100W	20A	\$249
B3016	2M	Yes	10W	100W	17A	\$199
C22	220	No	2A	20W	5A	\$79
C106	220	Yes	10W	60W	10A	\$179
C1012	220	Yes	10W	120W	20A	\$259
C24	440	No	2W	40W	8A	\$179
DU10N	440	No	10W	100W	20A	\$249

RC-1 Remote Control for Mirage Amplifiers
MP-1 and MP-2 Peak-Reading Wattmeter \$24 \$39

ASTRON POWER SUPPLIES

- Heavy Duty - High Quality - Rugged - Reliable
- Input Voltage 105-125 VAC Output 13.8VDC ± 0.5V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	\$39
RS7A	5	7	49
RS12A	8	12	69
RS20A	16	25	89
RS30A	20	30	109
RS35A	25	35	135
RS35M	25	35	149
RS40A	30	40	199
RS50M	37	50	229

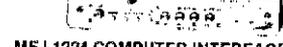


MODEL RS-50A



CP-1 COMPUTER PATCH
List \$239.95 SALE \$189.95!
CP1-20 \$219 CP1-64 \$219
MP-20 \$219 MP-64 \$219
VIC-20 MBAText. \$79 C-64 MBAText. \$79

All AEA Keys, Antennas & Accessories
In Stock!



MFJ 1224 COMPUTER INTERFACE \$89.95

- 202B Noise Bridge \$59.95
- 250 2KW Oil Load \$35.95
- 422 Kever/Paddle \$89.95
- 901 300W Tuner \$59.95
- 941C 300 W Tuner \$89.95
- 989 Deluxe 2KW \$299.95

KANTRONICS



The Interface Reg. \$169.95 Sale \$129.95
The Interface II Reg. \$269.95 Sale \$239.95

Apple Antec	139	VIC-20 Hamsoft	49
Soft/Hamsoft	139	Hamtext VIC-2U	99
Vic 20 Antec Soft	89	Hamtext Model 64	99
Model 64 Antec Soft	89	Alan Hamsoft	49
Apple Hamsoft	29	TRS-80C Hamsoft	39



METRON
MA1000B
AMPLIFIER
Solid State
1KW Amplifier

- No Tuning
- Remote Bandswitching
- 13.8 VDC Operation
- Compact
- Heavy-Duty Construction

List Price \$995 SALE PRICE \$895.95



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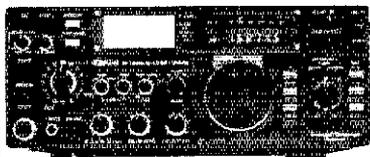
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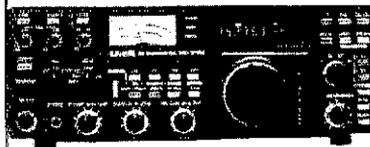
ICOM SALE! SALE! SALE!



IC-745
NEW GENERAL COVERAGE-ALL MODE
COMPACT HF TRANSCEIVER

- All Solid State
- SSB/CW/AM/RTTY
- FM Option
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE \$999—CALL FOR SPECIAL SALE PRICE!



IC-751-ICOM'S BEST!
NEW-HIGH PERFORMANCE-
SSB/CW/AM/RTTY/FM TRANSCEIVER-
GENERAL COVERAGE RECEIVER

- All Solid State
- High Dynamic Range
- Full QSK Operation
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation or
Optional Internal AC Supply
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

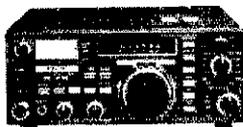
LIST PRICE \$1399—CALL FOR SPECIAL SALE PRICE!



IC-2KL 500 WATT LINEAR AMPLIFIER

- 160-15mtr Coverage
- SSB/CW/RTTY Duty Cycle
- Auto Bandswitching
- IC-2KLPS Power Supply
strapable 120V/240VAC Operation
- Broadband Tuning
- 500 Watts Output
- Full Final Protection

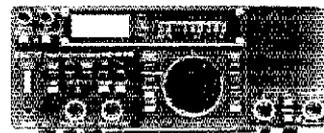
**LIST PRICE \$1795—
CALL FOR SPECIAL SALE PRICE!**



IC-730 COMPACT 80-10mtr SSB/CW/AM TRANSCEIVER

- All Solid State
- 100 Watt Output
- 12VDC Operation
- 80 - 10 Meters
- Dual VFO
- CW Filter Option

**LIST PRICE \$829—
CALL FOR SPECIAL SALE PRICE!**



H-70 HF GENERAL COVERAGE RECEIVER

- .1 - 30MHz Coverage
- Passband Tuning
- Notch Filter
- CW Filter
- SSB/CW/AM/RTTY
- FM Option
- Built-in 120VAC Supply
or 12VDC Option

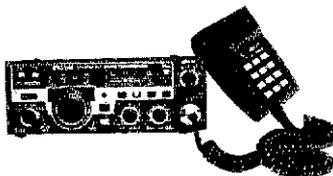
**LIST PRICE \$749—
CALL FOR SPECIAL SALE PRICE!**



IC-271A 2 Meter All Mode Base Transceiver
IC-471A 430-450MHz All Mode Base Transceiver

- SSB/CW/FM
- Dual VFO Tuning
- 32 Memories
- Programmable Sub-audible Tones
- 12VDC or Optional 120VAC Operation
- 25W Output - 2mtrs
- 10W Output - 430-450MHz
- Low Noise PLL Design

IC-271A List \$699 IC-471A List \$799
PLEASE CALL FOR YOUR SPECIAL PRICE!



- All Solid State
- 100 Watt Output
- 12VDC Operation
- 80 - 10 Meters
- Dual VFO
- CW Filter Option

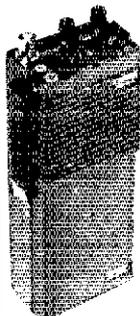
IC290H List \$549 IC490A List \$649 IC580 List \$489
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



IC-25A/H 25/45W 2mtr FM MOBILE TRANSCEIVER
IC-45A 10W 440-450 MHz FM MOBILE TRANSCEIVER

- Green LED Readout
- 12VDC Operation
- Dual VFO Tuning
- 5 Memories

IC-25A List \$359 IC-25H List \$389 IC-45A List \$399
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



WORLD'S MOST POPULAR HT'S
PLEASE CALL FOR SALE PRICES!

IC-2AT 2METER H.T. List \$269.50
IC-3AT 220MHz H.T. List \$299.95
IC-4AT 440MHz H.T. List \$299.95
**PRICES SHOWN AS LIST—
CALL FOR YOUR SPECIAL PRICE!**

- 1.5W Output - All Models
- Complete w/Nicad & Charger

All Accessories in Stock!

BP2 Battery Pack.....	\$39.50
BP3 Battery Pack.....	\$29.50
BP4 Battery Case.....	\$12.50
BP5 Battery Pack.....	\$49.50
BC30 Base Charger.....	\$69.00
CP1 Lighter Cord.....	\$9.50
DC1 DC Cord.....	\$17.50
HM9 Speaker/Mic.....	\$34.50
LC10 Leather Case.....	\$34.95

IC-02AT
NEW 2 METER TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function

- 10 Memories
 - Offset Storage
 - Lithium Memory Backup
 - 13.8VDC Operation!
 - Sealed Case
- All These Features and Much, Much More!

SUGGESTED LIST PRICE \$349
CALL FOR SALE PRICES!

**PLEASE CALL FOR INFORMATION AND PRICES
ON NEW ACCESSORIES FOR IC-02AT.**

IC-RP3010
440 MHz REPEATER

- 10 Watts Output
- Microprocessor
Controlled
CTSS/DTMF/ID'ER
- Built-in 120VAC or
12VDC Operation
- Crystal Controlled

LIST PRICE \$999
CALL FOR YOUR SPECIAL PRICE!
MOUNTING CABINET AVAILABLE—ONLY \$249

IC-120
NEW 1200 MHz FM Mobile Transceiver

- 1 Watt Output
- Green LED Readout
- Programmable Offset
- 1260-1300 MHz Coverage
- 6 Memories
- Scanning

**List Price \$499—Please Call For Price and Delivery Informa-
tion on the IC-120 and RP-1210 Repeater.**

**IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a
Big Texas Towers Discount! Call today for our Special ICOM Sale Prices and Save \$\$\$!**



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YAESU SALE!



FT-ONE

**GENERAL COVERAGE—ALL MODE
DELUXE SOLID STATE TRANSCEIVER**

Buy Now and Receive These Accessories Free:
300Hz CW Filter, \$FREE 600Hz CW Filter, \$FREE
800Hz CW Filter, \$FREE 6KHz AM Filter, \$FREE
Memory Backup, \$FREE Installation, \$FREE

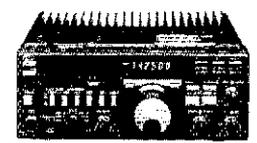
List Price \$3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!



FT-980

CAT SYSTEM—Computer Aided Transceiver
• Wide Dynamic Range • Low Noise Front End
• General Coverage • 10Hz Digital Readout
• All Mode Transceive—CW/SSB/AM/FM/FSK!
• Full Break-in CW • HF Speech Processor
• Variable Bandwidth • IF Shift • APF/Notch
• AC Power Supply • Adjustable Noise Blanker
• 12 Internal Digital VFO's with Memories
• Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price \$1499
Call For Your Special Price Today!!

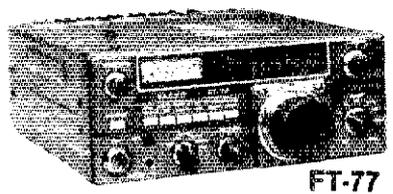


FT-757 GX

Compact General-Coverage Transceiver

- General-Coverage Receiver
- USB/LSB/CW/AM/FM
- Dual VFOs
- 8 Memories with Lithium Backup
- IF Shift/IF Width Controls
- Memory/Band Scan
- Speech Processor
- CW Filter and CW Keyer Included
- 100 Watt Output/100% Duty Cycle
- Many, Many Other Features

List Price \$829. Call for Special Low Texas Towers Discount Price and Save \$\$\$



FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
- CW/SSB/FM Modes
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available
- Adj Noise Blanker
- CW Wide/Narrow

List Price \$599—Call for Special Low Texas Towers Discount Price and Save \$\$\$



FT-230R 2mtr FM \$359
FT-730R 440Mhz FM \$399

- 10 Memories
 - LCD Readout
 - Memory or Up/Down Scan
 - Two VFO's
 - 25W Out
- Call today for Special Discount Price & Save \$\$\$



FT-726R VHF/UHF All Mode Tri-Band Transceiver

- 50-54 Mhz
 - 144-148 Mhz
 - 10 watts output on all bands
 - 430-450 Mhz
 - 21, 24.5 & 28 Mhz option available soon
- Please Call For Price & Delivery Information



VHF/UHF Multimode Portables

FT-690R 50Mhz \$379
FT-290R 144Mhz \$399
FT-790R 430Mhz \$399

Call today for Special Discount Price & Save \$\$\$



FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

Manufacturer's List \$499—Call today for Your Special Discount Price!!

FT-208R 2mtr HT \$319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT \$319
RF Out: 200mw/1.0W

- LCD Display
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant
- 10 Memories

Accessories Available:
LCC-8 Leather Case \$35
YM24A Spkr/Mic \$39
FNB-2 Nicad \$29
NC-8 Base Chgr \$99
Call for Special Yaesu Discount Prices!!



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hy-gain

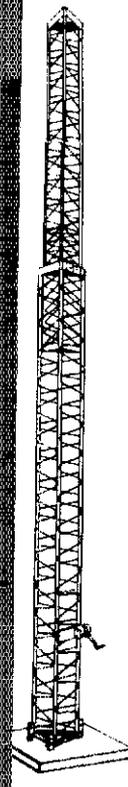
CRANKUP SALE!

All Models Shipped
Factory Direct—
Freight Paid*!

- Check these features:
- All steel construction
 - Hot dip galvanized after fabrication
 - Complete with base and rotor plate
 - Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq ft.,	\$ 679
HG52SS	52 ft.	9 sq ft.,	\$ 959
HG54HD	54 ft.	16 sq ft.,	\$1499
HG70HD	70 ft.	16 sq ft.,	\$2399

Masts—Thrust Bearings—
Other Accessories Available
—Call! Prices Shown Are
Your Total Delivered Price
In Continental U.S.A.L.



These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

- Check these features:
- All steel construction
 - Hot dip galvanized after fabrication
 - Complete with base and rotor plate
 - Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq ft., 50 mph	\$579
WT-51	51 ft.	9 sq ft., 50 mph	\$999
LM-354	54 ft.	16 sq ft., 60 mph	\$1599
LM-470D (Motorized)	70 ft.	16 sq ft., 60 mph	\$2999

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!



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Telephone
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NATIONAL TOWER COMPANY
P.O. Bx. 12286 * Shawnee Mission, Ks. * 66212
Hours 8:30-5:00 M-F 913-888-8864



INTRODUCING ALL NEW ROHN 55G \$122.00

Complete line of 55G accessories available, call for price.

25G	10' section	\$46.90
25AG	model 3 or 4 top section	\$59.90
45G	10' section	\$110.00
1B-3	Thrust bearing	\$48.00
M200	10' mast, 2" o.d.	\$21.50
BX-40	40' self supporting [6 sq.ft.]	\$164.00
BX-48	48' self supporting [6 sq.ft.]	\$206.00
BX-56	56' self supporting [6 sq.ft.]	\$276.00
HBX-48	48' self supporting [10 sq.ft.]	\$255.00
HRX-56	56' self supporting [10 sq.ft.]	\$339.00
HOBX-40	40' self supporting [18 sq.ft.]	\$249.00
HOBX-48	48' self supporting [18 sq.ft.]	\$319.00
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A147-11	11 Element 146-148 mhz. Beam	\$44.00
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15-4CD	4 Element 15 mtr. "Skywalker"	\$115.00
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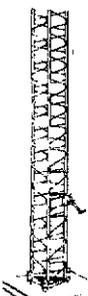
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153BAS 3 Element 15 mtr.	\$83.00
155BAS 5 Element 15 mtr. "Long John"	\$174.00
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204BAS 4 Element, 20 mtr.	\$229.00
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is among best newsletters we receive. With spring here, be sure your club files their public service activity reports with me and HQ. Still not getting my monthly newsletters to your club? Please let me know. Bumper Snicker we liked. "The way some people find fault, you'd think there was a reward!" Traffic: NCGVFC 56, WA6WJZ 34, WA6ERZ 16, N6AUB 15, WB6SRQ 8, KY6G 7, WA6ZUD 6.

SAN FRANCISCO: SM, Bob Smith, NA6T - The Section Emergency Communications Revamp is progressing; District 1 DEC is KB6CD, District 4 DEC is WA6FA, District 5 DEC is KE6LF. We still need Marin and Sonoma Co. positions filled; any takers? K6LRN is close to a home station with the new 54-foot tower and a 2045A stored in the vertical position. Does this mean that W6SG will need a new chief, top? TX hunts are booming VOGUE in Sonoma Co. Get your METER DE equipment in shape and come and join the fun. Check on 146.73 MHz rpt for the time and dates. HARC-FWRA had a neat computer program for CW with the TRS-80 models 1, II & III. Write KA6PGN or W6GGR if you would like a copy with interface circuits included. N6BLN is home from Mexico and the ill-fated Clipperton DX-pedition. Best of luck for the next try. A lot of us were pulling for the group and needed it for the country. Traffic: W6RNL 396, W6IPL 259, W6NLL 224, N6TP 126, K6TJW 99, KR1A 62, KE6LF 33, KY6F 24, KY6E 21, W6GGR 20.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6PDD - SEC: WA6YAB, STM: N6AWH, TC: WA6YAB, 1984 officers of CCAAC are: WB6FC, W6BZC, v.p.: W6BJT, secy.: WA6JL, treasurer: The club operates 144- and 450 mhz repeaters and meets the 3rd Monday in Fresno. Officers of the Mountain ARC are N6EJP, pres.: N6JYM, v.p.: W6JBH, secy.: W6NTK, treas. This new club meets the 4th Thursday in Oakhurst. W6GDDQ is a Silent Key. WA6VFC visited in Fresno. WA6ZLO is Advanced. KB6DDVV is Tech. WA6VIS is KF6ZQ. N6HWJO is KB6FX, WB4WEV is N6KCP. KB6CCQ is N6KDJ, KB6DXX KB6DXM and KB6DXB are Novices. KB6FX has an IC-225 and Atlas 210X. W6SBE has a FT-757. KA6YSW has a 220 handheld. This is the month for big Field Day scores. Try to beat the Future ARC (WA6BA) score. Get reservations in for the 1984 Pacific Division Contest in Santa Clara on Labor Day weekend. Traffic: N6AWH 123, WA6YAB 45, W6SX 16, K6PMS 4, W6DDP 3.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV - Working on the new SCV section Technical Coordinator, K6LLE. He is a longtime amateur in this area and very technically oriented. He will be in charge of the technical sessions for the upcoming 1984 ARRL Pac. Division Convention to be held at Marriott Hotel on Labor Day weekend. One of the duties for the TC is the collection of names of speakers on technically oriented Amateur Radio subjects. If your club has recently had a good technical speaker, let K6HLE know about it in the event other clubs in the section are looking for a speaker on the same subject or on a related one. W6GZY has assumed the chairmanship for the upcoming convention and is doing a great job of pulling the whole thing together. Clubs in the section were recently sent a form by ARRL HQ to complete to update ARRL records about club officers, meeting days, etc. If your club has not completed that information, please do so and forward it to ARRL HQ. KB6ZV, or W6MKM, the section Affiliated Club Coordinator. If your club has a public service event going, or if you want to let the section members know about the program at your upcoming club meeting, make the announcement on one, or both, of the SCV section nets. SM KB6ZV is the net control and runs two separate nets to cover the entire section. They are:
Tuesday 9 P.M. 146.76 (WB6OQS)
Tuesday 9:30 P.M. 146.225 (WA6STO)
Thanks to the efforts of N6IUU and W6SVUL, the Palo Alto Red Cross now has a complete HF and VHF station on the air. P.A. Red Cross recently had an open house to show off the new set up; it is quite impressive. Be sure to check into the following nets if you're interested in emergency communications and emergency preparedness:

145.27 (SPECS)	8 P.M. Mon.
146.715 (SVECS)	8 P.M. Tue.
145.45 (ARES)	7 P.M. Wed.
146.79 (S. Cruz/ARES)	7:30 P.M. Mon.

WB6OTB reports that if you work him (OTB) his wife, WB6FCX, his son, W6EER, and daughter, W6BMAH, then you will receive a "W.A.M." Award that's "Worked All Mercers". Speaking of awards, the Gabilan ARC will send you a "W.A.G."; certificate if you work 20 or more Gabilan club members. The certificate even comes with "one bulb of fresh, locally grown garlic." Contact KB6GV for details. The Santa Clara Valley RS received some nice words from the Santa Clara Co. Diabetes Society for their annual participation in the Bike-a-Thon. SCVRS usually handles all communications for the March of Dimes Walk-a-Thon in San Jose each year. The Silicon Valley Emergency Comm. System recently held a breakfast attended by over 50 amateurs in the central part of Santa Clara Co. The group was recently reformed to rough the efforts of WB6OML and others and is now a ready and willing pool of amateurs ready to help with communications in an emergency. W6TYP reports that there is much activity within the section on 160 meters and that on any evening you can find about 25-30 regulars around 1.995 MHz between 7-9 P.M. Most are working AM. WB4WNO is running a CW training session on 144.15 on Mon., Wed. and Friday evenings at 8 P.M. for those who want to increase their code speed. Anyone is welcome to check in. WB4WNO can usually be found on 146.76 for further details. W6TUV was recently presented with a Net Manager certificate by STM W6PPL at a Santa Cruz ARC meeting. He is the net manager for the combined Santa Cruz Co. ARC and ARES net on 146.79 on Mon at 7:30 P.M. W6ASH reports that SPECS participated in the Medex held in late April and it appears that group will be involved in handling communications for the Olympic events taking place at Stanford University this summer.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN - SEC: AB4W, STM: K4NLK, BM: K4IWW, SGL: AB4W. In this first report, I would like to sincerely thank those who supported me in the SM election. To you, the membership, this is YOUR column so I look forward to receiving your monthly reports and newsletters. I must receive your reports by 8th of each month. I welcome suggestions from you and look forward to close relations among the League and the membership. NC State Convention/Charlotte Hamfest was very successful. With statewide repeater linkup, more traffic is being passed on VHF, with larger QNI than on HF nets, thanks to lots of Technicians. League affiliated clubs will become more involved in the new Volunteer Examiner program. Need more NC Extra Class hams to apply for

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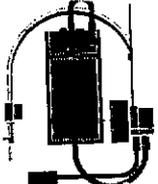
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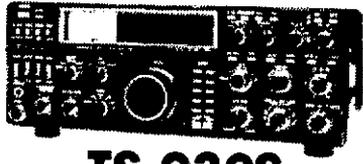
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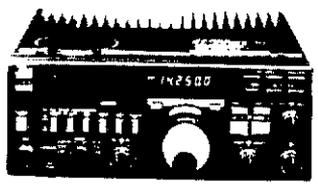
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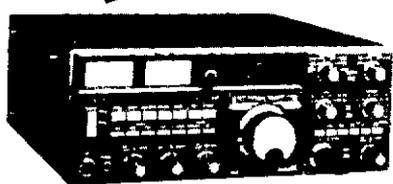
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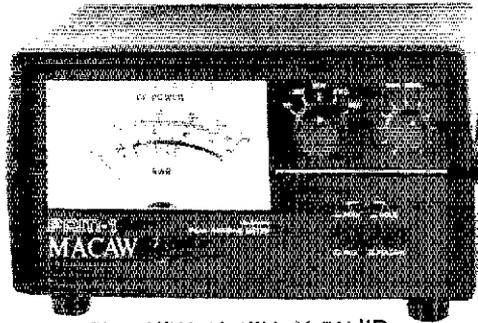
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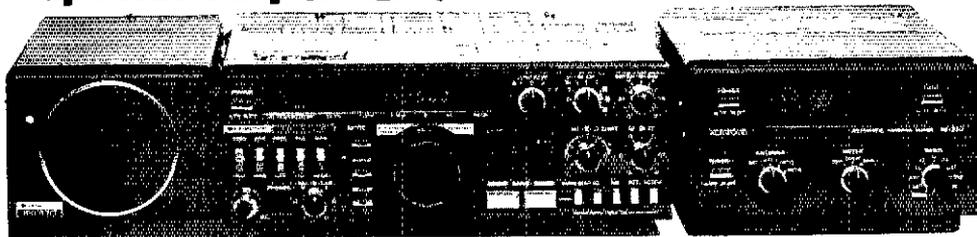
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VE. The program may start Sept. 1. Congrats to new ARRL President, W4RA, and to newest League affiliated club, Data General Research Triangle Park ARC. NC needs some Special Service Clubs, so League affiliated clubs respond. Forsyth Co. ARES provided communications for marathon races and found that simplex operation much better than on repeater. Fessenden ARC is planning a special events station for America's 400th anniversary celebration starting July 13. FCC said no to a request for special call signs — i.e. 400 in lieu of 4 for NC amateurs to use in celebration. KF4WY and WC4T accepted the Division best club newsletter award from Dir. Millius for Mecklenburg ARC, W4BFB. Hope everyone is making plans for big Field Day. Send me your news and letters on FD. I will be operating FD from W4PAR. The Carolinas Slow Net (CSN) needs more participation from across the state. It meets nightly at 8 P.M. on 3715; in summer months on 7115. Novices/Technicians especially welcomed. Tornado disaster devastated eastern NC March 28. Amateur Radio was called to provide emergency communications. Over 300 amateurs answered the call using K4ITL's link repeater system on VHF provided 24-hour service. Gov. Hunt thanked all amateurs as state government was impressed. SEC will have more reports and we will learn from this tragedy. Does your county have an EC? Are you a member of ARES? Contact SEC AB4W. Traffic: WD4LRG 241, K4NLK 229, WD4CQJ 226, WB4HRR 150, WB4WII 144, WA4OBR 142, N4JL 137, KA4KJI 118, WA4MNR 107, WA4SRD 61, K4IWW 48, KB4BXA 41, NT4K 35, NE4 29, K4DDY 25, WB4CYN 12.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — As you all know, SC and NC suffered the most severe disaster in more than 50 years. For some, March 28 will be forever imprinted in their minds. The sign will be vivid by their loss of family or personal property, but as amateurs we will endure and survive. Let us take example from two members of our ranks. KA4BGX is a student at USC. He returned home that very night to find his home demolished by the tornado. KA4NLW was not to be denied the hardships felt by so many during this disaster. His wife lost three members of her family at the hands of this tornado. Jeff and Ernest did not hesitate. Each felt a deep obligation as amateurs to provide emergency communication for Marlboro Co. Each of us should ask, Have I used my Amateur Radio license and equipment for such generous reasons. As the story unfolds on this disaster, the public will realize the vital role played by you in support of this emergency. Your commitment built an organization that functioned at maximum efficiency during this disaster. WE THANK YOU. Traffic: K4WJR 502, K4ZN 245, W4FMZ 188, W4ANK 162, W4IKT 75, W4NTO 68, KA4LRM 64, K4ZB 57, WD4FJP 46, WB4UDK 45, KA4AUR 30, WA4JWS 15, W4DRF 2.

VIRGINIA: SM, Claude Feigley, W3ATQ — This is my first report as your new SM, and I am looking forward to working with you during the next two years. WD4ALY will continue as STM, WB4UHC as SEC, W4HU as OORFI Coordinator, and WD4KQJ as ACC. Volunteers are needed as Official Observers and bulletin stations; contact W4HU or W3ATQ for application forms. Plenty of activity reported in Va. QSO Party. WB4EYK, WB4FDI, N4FTK and WB4HUP were active mobile. The Eastern Shore ARC has filed for Special Service Club recognition. WB4UHC led a group of ARES stations to the Eastern Shore to provide emergency communications during the March tornado storm. K4JST, WA4RBC, N4JCB, WA3VJB, W4MWC, KB4AXR, WD4JNV, W4JX, WA3DXY, N4CGJ, and N4GOI provided communications for the Colonial Half-Marathon. KR4V has replaced W3ATQ as a VN Net Mgr. AA4AT, N4GHI and WA4CCK made BPL. N4BJX has moved to North Carolina. K4EK is on the air from his new QTH in Va. Beach. K3RZR has been appointed an Assistant Director of the Roanoke Div. and is QRL with his new job. N4EXQ has been active on the daytime traffic nets. Many of the ARES nets are doing a fine job of training by using the local 2-meter repeaters for practice in message handling procedures. Many clubs report they are preparing for Field Day. Is your club participating? Thanks to WB4FDI for serving as SM for the past two years. I would appreciate receiving your club newsletters so I can keep abreast of any activities that should be reported. Traffic: AA4AT 633, N4GHI 588, WA4CCK 558, W3ATQ 487, WD4FTK 375, WD4OCW 230, K4KDJ 196, N4EXQ 190, KR4V 156, WB4PNY 153, WD4ALY 143, K4SDT 135, W3BBN 107, K4JST 107, K4IUM 81, W4JLS 79, K4JN 79, KB4CG 59, K4VWK 57, N4TE 41, KB4WT 41, NT4S 33, K4GR 30, K4MLC 29, WB4UHC 26, KA4JXZ 25, KA4ZTB 23, WB4CQJ 22, K3RZR 20, WB4EDB 17, W4LXB 14, WB4KIT 11, W3BBO 10, WB4DZJ 10, K4DHB 9, NN4I 8, N4FNT 7, W4PYA 7, W4TCZ 6, WA4VRL 6, WA4TVS 5, WB4ZNB 4, K4LMB 3, N3RC 3, W4KX 2, K44HN 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: KRQEW. STM: KDBG. ACC: WA8CTO. SGL: K8BS. TO: K8CG. KA8RUM is new EC for Cabell Co. WV State ARRL Conv will be held June 30, and July 1 at Jackson's Mill. See June QST for details. Huntington HF will be June 10 at Hunt Mall, K8WYH is new EC for Upshur Co. Good luck to all in Field Day. Hope to CU all at the Mill!

Net	Freq.	Time	QNI	QTC	Sess.	NM
W4N	3567	7:00	201	60	31	W8LYV
WVFN	3900	6:00	586	105	31	N8AJC
WVMD	7235	11:45	295	58	31	W8FZP
WYNN	3730	6:15	237	37	31	KA8SWA
Hillbilly	14290	1600Z	151	33	4	K8YRU

Traffic: KZ8Q 325, WD8LDY 196, WA3NJI 60, KA8OQF 55, K8KT 50, K8TPF 50, N8EMC 49, W8JWX 47, K8QEW 36, W8FZP 30, WA8KCJ 29, W8HZA 26, N8CB 8.

ROCKY MOUNTAIN DIVISION
COLORADO: SM, Bill Sheffield, K0AJ — Thousands of people attended the 9 Health Fair. As usual amateurs handled the communications. It is impossible to mention every ham who helped, but a special thanks to the coordinators, K0WDP & W4HJZ outstanding job, one of the best ever. The Rocky Mt. Div. Conv. was a huge success. Everyone had a good time, a lot of people took home some great prizes, the forums were well prepared. My personal thanks to WB8DUV & KA0MQA; without their help, we could not have ever made it happen. Most of the clubs are now gearing up for Field Day. Send SASE for Gov's proclamation & don't forget to send me a message through the nets for your FD bonus points. A team of contesters are gathering to assault Mt. Evans for the June UHF/VHF contest. Get on the air & participate in both events. The Grand Mesa Swap tripled in size this year. Congrats, it was a fine event, also their repeater linking has made excellent strides. Coming events: Superfest 6, June 2nd, McMillan Bldg.; Loveland Mt. ARC Swap/Campout, July 7-9, Red Rocks Campground; Ski County Hamfest & CCARC Meeting, July 28th, Glenwood. Plan a caravan for lots of fun. 73, K0BJ. Nets: Col QTC 56, Inf 158, QNI 857, Time 752, 20 sess.; CWN, QTC 104, QNI 162,

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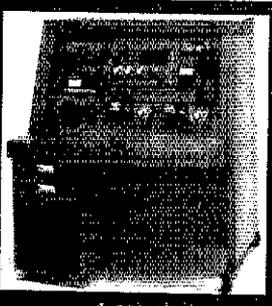
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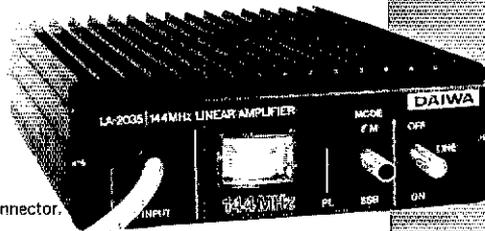
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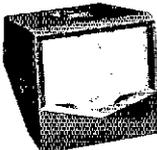
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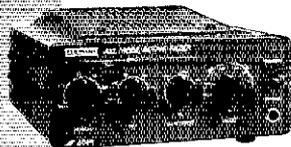
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time 672, 29 sess. CWVQ 3433, QNI 2899, time 2970, sess. 31; HNN QTC 33, Inf 452-QNI 1953, time 1809, 26 sess. Traffic: NDBC 2343, WA0HJ 3197, K8JAN 553, WBACH 402, K8RXX 390, NDBAJN 33, N8CQ 198, K8OZ 170, WDBAIT 140, W8EJD 140, W8BSZ 104, N8EBM 44, W8BNA 41, W8NFW 30, W8LQ 11, N8CYR 1.

NEW MEXICO: SM, Joe Knight, W5PDY — DEC: K85XD. STM: KV5UJ. NMS: WASUMO K8LL, W5VFO, TC: W8GY. ACC: W5HL, Southwest Net (SWN) meets daily on 7099 at 1930 local and handled 135 msgs with 293 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 91 msgs with 1117 stations in. New Mexico Breakfast Club meets daily on 3939 at 0830 local and handled 110 msgs with 1364 stations in. Yucca 2-Mtr Net 78/18 & 93/33 handled 10 msgs with 439 checkins. Caravan Club 2-Mtr Net 68/06 handled 12 msgs with 128 checkins. SCAT 2-Mtr Net 66/06 handled 24 msgs with 882 checkins. Good reports from the Midland Swapfest, Sorry to report the passing of K5FQY of Los Alamos. 1 traffic: W5UH 420, W5DAD 232, W5ENI 118, W5JOV 109, N5EXC 66.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: K87XC. PIO: N7BHC. TC: K7RJ. Now that fine weather is here, I do remind all to pursue your antenna activities with all minds tuned in on safety. Don't ignore that safety on Field Day either. I dislike making of SK reports. The time to register for WIMU and get in your lodging reservations is running short, don't miss this annual event which will also be our Section ARRL Convention. Back to FD, good luck to all and will be waiting for your FD messages. DARC should be an SSC by the time you read this. Congrats to that fine group on becoming the first SSC in the section. Traffic: K7HLR 285, WA7KHE 90, WA7MEL 45, W7OCX 11, N7BOE 4.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W8OGH. PIO & ACC: K7CQJ. Anyone interested in volunteering for a Leadership Official position, please contact me. Just returned from the Midwest Div. Convention in Kearney, NE. Congrats to the Midway ARC for a very fine hamfest. The Wyo. Hamfest is July 14 & 15 at Meadow Lark Lake. There will be a WCARC meeting at same time. New officers of SHY-WY RC in Cheyenne are: KA7DKH, pres.; KA7DXK, v.p.; KA7DXJ, secy/treas. V20/C64 Net is Sunday at 1 P.M. on 7260 KHz. KCTAR power the Wyo. Cowboy Net held 22 sessions with 832 QNI & 22 QTC. WA0PFJ reports the Wyo. Jackalope Net held 27 sessions with 746 QNI & 4 QTC. Traffic: W87NHR 287, W7HKA 63, W8OGH 35.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP — SEC: N4DJA. STM: N4JAW. SGL: KA4WVU. PIO: W04W. BM: KF4VY. OO/RFI: K4ELV. This is the month for Field Day and I hope all of the amateur organizations in the section will participate because this is our one big practice session that might make the difference if we were to be needed for something really big. You are 59 Alabama, and good luck on Field Day. Congrats to former SCM Jim Bonner who is back from the VA hospital in Tenn with a good report on his health, and to former SCM and present "M" net manager W4BU is recouping nicely from some surgery. The East Alabama ARC (Auburn/Opsilka area) officers are: W84BYQ, pres.; KA4MG, v.p.; W4JJB, secy/treas. There are two silent keys at this writing: WA1SG of Gadsden and N4BJN of B'ham. Nets: CAND passed 1026 messages in 31 sessions. DRN5 passed 866 messages in 82 sessions. Alabama represented by WA4JDH NW4X KC4GS WB4IXA W4CK6 WAJWF WX4I W4ENW W4CK6 and W4CUE. BPL: WA4JDH, PSHR: WA4JDH WX4I WA4LXP W4CK6 WA4RNP. Traffic: WA4JDH 1057, NW4X 172, W4CK6 129, WX4I 118, WA4LXP 70, K4AOZ 41, WA4RNP 27, KC4GS 14, W4DGH 10, K4HJX 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4BY. STM & OO/RFI: K4VHC. ACC: WA4ABY. BM: W4BIA. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. WX & a gud crowd fer both days made the Columbus hamfest an order success. GA Tech ARC was one of two stations in GA to get on STS-9 tape & one of two club stations to do same. The Atlanta ARC hosts the GA State Convention & Hamfestival on June 16 & 17. I have been promised that this one will be the best yet. Congrats to both the Stone Mt club & the Douglas Co. ARC on becoming ARRL affiliates. Trx to the Gwinnett ARS, Stone Mt ARC & the Macon ARC for the hospitality shown me on my recent visits. W4RA, our new ARRL President, is looking for a lot of help from his own section. If U have any new ideas, gripes, etc., please write them to me or to W4RH, our SE Div Director. We then can get them to the League. From all in the Georgia section we are proud to have U as the ARRL President & wish U nothing but success. March & April brought us some terrifying WX into the section. Trx to all who helped with emergency communications. Once agn, if U hear of a Silent Key, please get the obituary out of the paper & send the info to me or to the ARRL Hq. This is one way of getting it into the column a lot quicker. ARC of Savannah participated in the Rattlesnake Round-up, Canoe Race & the Motorcycle Race. Atlanta ARC agn awarding three \$750 scholarships to high school students. For further info contact W4GTS. Deadline is June 30th. MALARC net on 148.28/88 meets on Mon eves. at 8 P.M. Won't U check in? Reports have been slim lately. Our vy capable SEC is still looking for ECs in certain sections of the section. Write to WB4ABY if U can help. It was great to see many of U FB GA hams in Columbus. Trx to those who didn't make it, maybe we'll get together at one of the future hamfests. Traffic: N4BIM 65, WB4NTW 41, KA4ATM 24, W4BIA 21, K4VHC 16, N4UZ 15, AA4EI 4, K4BAI 3.

NORTHERN FLORIDA: SM, Billy F. Williams, N4UF — Dade City hams provided communicators for an Olympic class bicycle race and was the only source of information when a 20-cyber pileup occurred. The EMT unit was summoned via 2 meters. Marion Co. ARES members exhibited Amateur Radio at a Girl Scout Expo at Dunnellon Plaza. K4RX presented a program at HCARA on his recent travels to the Orient. HCARA celebrated its 7th anniversary as well. The 07/87 OPARC repeater has been relocated owing to heavy interference to its input. The Gainesville ARS planning for Field Day at Santa Fe Community College. LMARS presented KA4ASJ with a plaque in appreciation of years of dedicated service as treasurer & secretary. KA4UWA NE4I and WD4BMN have produced an introductory brochure about LMARS to be handed out. The St. Augustine ARS operated at Ponce de Leon Mall during Community Service Day. Participants were KF4MX WA4MST WA4YJY KA4FCW K4ZED. That group also has a weekly lunch get together at the Western Steer on US 1. Occurs each Friday at noon. The Playground ARC is reestablishing its Scholarship Program. PARC also assisted with the Special Olympics. RANGE held its annual auction with WB4RCY as auctioneer. W4FX has been

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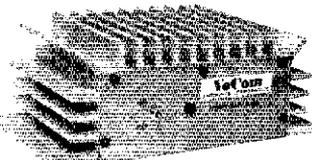
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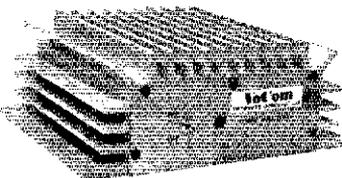
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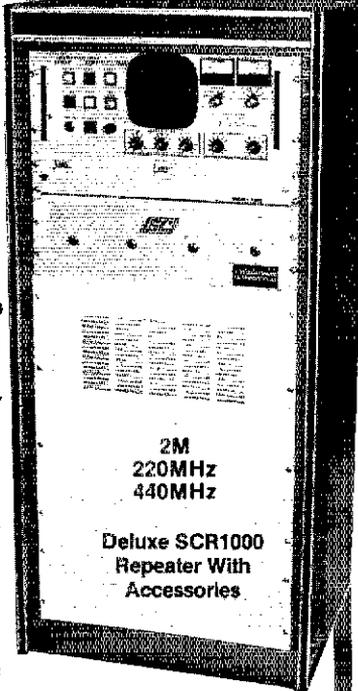
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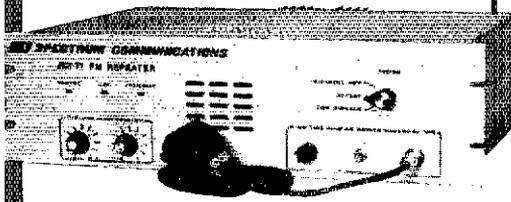
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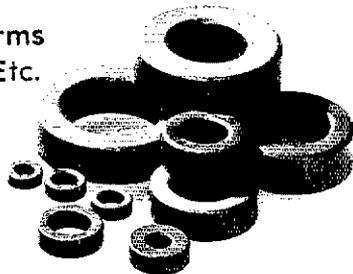
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declared SM for the term July 1, 1984-June 30, 1986. I have reached my limit of two consecutive terms as SCM and SM and therefore decline. Phil currently is serving as STM and will make a fine SM in am sure. Starting with July, all reports and input should be sent to Jim before the 6th of the month. Traffic: WF4X 73D, N4PL 790, WA4OXT 711, WD4ILO 652, WF4Y 303, WX4J 283, WB4ADL 274, WD4HBP 212, KB9LT 208, WA4EYU 168, AA4FG 165, W4MGO 149, WB4TZR 145, NF40 141, WD4UIJ 140, NY4E 134, KD4KK 133, W4GUJ 130, WB4GHI 126, KF4U 122, KB4LB 117, NA4F 67, WD4MLO 65, N4ADI 60, N4GMU 48, WB4YOP 44, KD4QZ 40, NS4C 32, N2AMG 31, NQ4P 29, KA4ETX 29, WA4STZ 29, WD4HUZ 24, N4EDH 23, W6IM 22, WD4EGE 22, N4JHI 22, N4UJ 22, WB4FY 20, W4KAG 19, KA4AG 17, N4AG 17, WA4I 17, WA4IP 14, KA4BY 11, KA4RBY 10, WY4O 8, W4LW 8, N4JWX 8, W4DTV 7, WTHXK 4, WA4PUP 4, N4HTU 1, KV4HI 1. (Feb.) W4KIX 88.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC. WA5S, STM: K4ZK, TC: K14T, BM: WA4EIC, ACC: AA4WJ, PIO: W4WYR, SGL: KC4N, OOR/FF: WA5SS. A high point in the month for the Motorola hams in Sunrise was a visit by Owen Garriott — I'm sure everyone remembers that the Motorola hams built the radio which W5LFL used. VE3BSY reported for the message center operation of W4TJM at the Lakeland Sun and Fun Fly-in. WB4SOU was Director of Operations and VE3BSY was traffic coordinator. Engineers were K4EBE and KB4ALV with K4EBO as logistics. WA4EIC reported a total of 240 for bulletin activity. The following bulletin stations were active during the month: WA4EIC 120, W4LW 63, WD4KBW 33, AA4BN 14, K4EK 20. New bulletin stations appointments are AA4MI of Merritt Island and W4TAF in Lakeland. W4TF was active in two marathons as well as the Lakeland Fly-in. KB4LB has been appointed assistant manager of the Florida Phone Traffic Net, replacing N4ET who had to give it up owing to health. KA4FZI became a proud grandmother this month; congrats, Miss Phil! K8BXI, assistant EC for Martin Co., said new officers for the Sealfish Chapter QGWA for 1984-85 are K8BXI, pres.; W8KEB, v.p.; W8BIX, secy/treas. K8BXI also reported that Martin Co. ARES, St. Lucie Co. ARES, Palm Beach Co. ARES and Indian River Co. ARES provided communications for the American Red Cross during the nuclear power plant accident near Hutchinson Island. W4LLA reported 46 phone patches this month. W4LLA has been doing the "Traffic Hounds" column in *Florida Skip* during K4ZK's absence. W5KLV, manager DRNS, reported Florida represented 100%. I received a list of actively affiliated clubs but approximately 300 reports had not been entered at the time of this printing. Another listing will be run around the end of May so I will publish the clubs in this column at that time. If you have not sent in your annual report form, now is the time! The Florida Repeater Council is in dire need of assistance. If you have an interest in this area please let me know. Thanks to W4GCF and K4KE for their work — AND THANKS TO W4GCF and W4BULH who has volunteered as frequency coordinator for the council. Your SARs are much appreciated; 134 stations reporting this month. However, there is a significant number of active traffic handlers who do not report routinely or, in some instances, not at all. You may remember that for 1982 we missed being the number one section for traffic handling by one or two SAR's. I would like all net managers to report their own activity as well as encourage their net members to report. Many thanks to those who do both! The National Communications System has scheduled another Operation Night Tango for May 17 and 19, Miami will be one of the cities involved this time. WA4FK Traffic: W3CUL 3147, W4LLO 1100, W3VTR 803, W4TJM 466, WA4EIC 447, WA4PFK 441, WD4KBW 409, W4YCL 389, K4SCL 327, K4JA 301, AF3S 300, K4EUK 275, WD4AEP 257, WB4WYV 256, KY4U 121, VE3BSY 216, K4FOS 206, WB4AID 203, W4PKP 192, KA4GUS 186, KF4JA 170, NC4H 170, W4SME 161, W1NJM 153, W4DL 149, W8BZY 140, WA4HXU 133, W4LLA 128, WB2NVJ 107, KF4RL 103, K4JLL 96, KA4NFX 76, AA4BN 72, WD4VO 72, WD4AWN 69, WD4MCC 69, K4J1 63, NJ4O 59, W4HYB 58, W4TF 57, W4LX 56, WA4GYR 51, W3STLY 51, WD4CHO 44, WB4GOK 44, KA4AA 41, KA4TB 41, K6HH 37, KA4BBA 30, KB8XZ 30, W3JJC 27, KB4AXD 28, W4FSH 26, K7LCA 25, KB4AX 24, KA4FZI 19, KA4YHS 17, K4IL 16, KA4KDD 16, N2WX 16, NA4PE 13, WB2OUC 13, W4WYR 13, W8ARW 12, K4FOU 11, W4MFD 11, W4VAF 9, KB8GT 9, N4AKA 7, K8ABA 7, W4KAF 7, KA4GDU 7, K4VSN 7, KD4IZO 6, WD4PPA 6, KA4SIH 6, KA2IXY 5, K9EHP 4, N4EVU 4, N4HAS 4, W4JM 4, WB4LPX 4, KY0T 4, W3JJC 3, N4IXO 3, KB8BLN 2, W8BJP 2, W88SN 2, N4BXU 1, K8CXQ 1. (Feb.) NC4H 181, W8BZY 129.

WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2230 UTC). West Indies Net Borinquen (WINB) on 3.930 MHz. (LSB 2230 UTC). Preparation and planning are being made for the next Field Day activity by the PRARC. Some other groups are also planning to participate in this year. It was with great regret that we learned the passing away of KP4MS in the last week of March. He was a former president of the PRARC. The mini-hamfest celebrated by the PRARC on April 1st at the Arclebo Country Club was a successful one. Credit for its success is awarded to KP4AET, who was the hostess and organizer of same. Congrats. KP4DJ reports the following totals for WINS: QND 425, QNI 110, QTC 44, 31 sess. Traffic: KP4DJ 100, NP4D 50.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP, NME: WA7KQE K8LL WA7FDN. Scottsdale ARC reports the following participated in providing communications for the 4th Annual Phoenix Marathon: WB8IBZ KA7FVW WB7OAR K7RUD N7FVN W7HUG WB7PXP WB7BP WB3LQQ KA7BTB KC7MC N7RDC N7FVQ KB7CH. ARA reports the following provided comm. for the Fountal Hills-Channel 8's Great Fair. The participants were: WB7OZR K7LKL WA7ZCC WB9VMP K7CMP WB6TIX KA7DIT N7DFH W3KMD KA7FQO WB7DQ WB7CHQ N7AIY KA7FYJ KA7NEM WA7ZZT K7VCI K7DCS W7IXA N7EJJ WB7BYK. The following ARA members provided comms for the Continental Homes 10K run: KA7DTI KA7DTS KA7DRV W7WGW W7TPW KA7PA KA7NEM W3KMD K7VCI WB7OZR K7YOE N7A7W WB9VMP and KA7FQO. K8LL reports that the SWN will welcome additional CW ops from AZ. KB7FE reports that he and others participated in the filming of a cable TV series in the Phoenix area; sounds like some good PR. PSHR: KB7FE KOTV. ATEN: QNI 1104, QTC 123, Cactus Net: QNI 782, QTC 83. SWN: QNI 293, QTC 135. Traffic: KB7FE 214, KOTV 202, W7AMM 108, K6LL 89, W7EP 81, W7EP 81, W7LVB 59, W5KMF 41, W7KXE 31, WA7KQE 26, W7LWB 14, KA7HEV 10, WA7NXL 8, N7COY 5, N7EH 5, WB3LQQ 5, K7NMQ 5, KE7W 4, K7POF 3. (Feb.) W7LVB 95, WA8ZVN 18, KE7W 7.

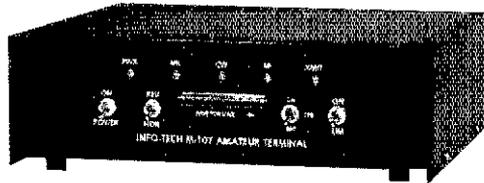
ORANGE: SM, Sandra Heyn, WA6WZ — SEC: W6UBQ.

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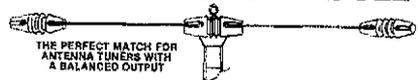
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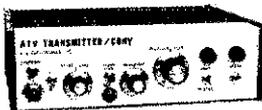
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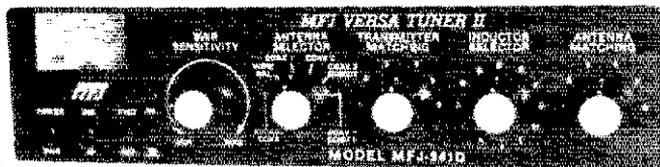


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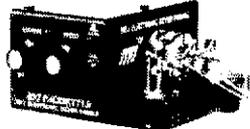


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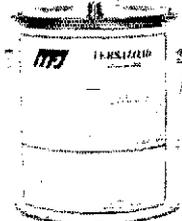
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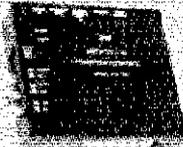
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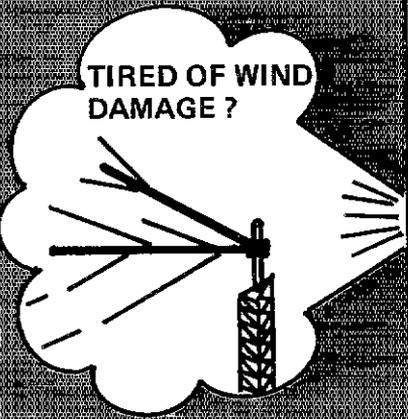
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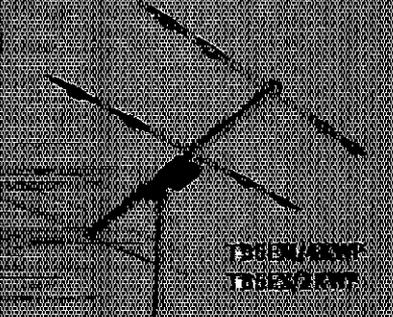
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STM: WA8QGA, ACC: KA6NLY, BM: W6DKL, OO/RFI Coord: N6PE, PIO: NSGW, SGL: N6HQ, TC: AA6DD, DEC: (by counties): W6BJI (Orange), W6LKN (Riverside), W6BKJ (San Bernardino), KA6HJ (Inyo). Congrats to W6EJL on election of ARRL V.P., also Congrats to N6NB on appointment as Director since WA6WZO became Director. Past SCM ADDBA (ex-W6SGZ) has moved back to the section and continues to be an active ORS including TCC. Congrats to W6AQ on winning "Dxer of the Year" award at the International DX convention sponsored by the So CA DX Club. OCARC will head up the Amateur Radio booth at the Orange Co. Fair to be held in July. Victor Valley ARC held FB T-hunt/potluck dinner. Many members of the Fullerton ARC participated in the star party hosted by WA6JKZ near Anza-Borrego Desert State Park. A recent meeting between local OC service groups that included IDEC, FACT, HB RACES, MESAC & OC RACES agreed on the following common freq for emergency mutual call out and coordination simplex: 144.470 and RACES repeater 146.295/600 PL. AZ: WA6JMR of the Yucca Valley ARC is heading up licensing classes. Anyone interested in traffic is encouraged to contact Zero Beat editor A1GE to receive SCN net bulletin. W6VQL of So Org ARA is heading up licensing classes. For ham classes including Extra at Cerritos College contact AA6DD. Tri-County Area will hold annual hamfest Aug 4 at Palomares Park. W6BUFX is chairman. For RTTY procedures and message handling contact KA6HJK or AA6SC for their booklet. The current Inland Empire RTTY network (WB6ZIR/R 144.52/145.120) schedule is: ARES Mon 8 P.M., picture night Tues 7 P.M. and ASCII night Wed 8 P.M. New club officers: Orange Co. Communicators Club (RA6CIB, pres. Jase RN, pres. Jase, radio officer: N6HQ, training: W6BILZ, tech officer: N6BVU PIO: Radio Amateur Transmuting Society (RAT6/Palm Springs), W6BBY, pres.: N6JZH, v.p.: K6JUA, secy.: K6BUTK, treas.: Hughes Fullerton Employee Assn. ARC: N6BU pres.: AB6R, v.p.: NX6U, secy.: KA6PMT, treas. Beach Cities Wireless Society: W6SKQE, pres.: K6WO, v.p.: W6GGF, treas.: W6FLA activities. Southern Counties Amateur Teleprinter Society (SCATS): W6DFVZ, pres.: N6GZP, v.p.: N6CPP, secy.: W6BINV, treas. PSHR: W6QBZ KA6BNW A1GE WA6QCA N6GIW KA6HJKT:

10:45 A.M. RN6D	7275 kHz	SSB and CW
3:30 P.M. RN6D	7275 kHz	SSB and CW
7:00 P.M. SCN/1	3598 kHz	CW (20+ WPM)
7:45 P.M. RN6	3655 kHz	CW
8:00 P.M. NCTN	146.13/146.73	W6NWG/R FM
8:15 P.M. SCN/2	3598 kHz	CW (15 WPM max)
9:00 P.M. SCN/V	147.045/147.645	W6AWP/R FM
9:30 P.M. RN6	3655 kHz	

Traffic: WA6QCA 184, A1GE 178, N6GIW 164, KA6HJK 135, W6QBZ 124, W6RE 111, K6GGS 102, KA6BNW 91, AD6A 68, N6GOT 54, W6NTN 38, K6ZCE 36, W6PNS 14, W6TKV 5.

SAN DIEGO: SM, Arthur R. Smith, W6INI — PIO: WA6CUP, ACC: WA6COE, TC: N6NR, BM: WA6HJJ, STM: N6GW, SEC: W6INI. "Amateur Radio's Newest Frontier" is available in San Diego. Contact W6INI at 273-1120 for info. ARC of El Cajon awarded certificate of appreciation to W6BDW for the outstanding support of the club. New ARES members in Southern Dist are: W6KIN W6NIU KD9CW. Club officers for '84: ARC El Cajon K6BWB, pres.: KA6VBH, v.p.: W6GGJ, secy.: N2BJ, treas. San Diego RA W6AIL, pres.: NF6E, v.p.: W6GC, secy.: N6ICC, treas. South Bay ARS KE6VB, pres.: W6ZVA v.p.: W6TKS, secy.: KF6BB, treas. 220 Club W6INI, pres.: W6PDA, v.p.: N6IMN, secy.: W6JZL, treas. Convair ARC KF6WL, pres.: K6DBJ, v.p.: K6JK, secy.: W69COY, treas.: W6GCT is active on ARES CW Net (Sun 0930, 3.770 MHz). San Diego Amateur Radio Council will sponsor a booth at So. Co. Fair. To participate, volunteer thru member clubs. Santa Ana winds create high fire hazard condx. Assn Cal Dept of Forestry by volunteering for Red Flag Patrols. Contact W6INI (273-1120) or W6TQF (277-6779) for details. NCTN held 30 sessions and handled 111 msgs. Traffic: KT6A 398, KU6D 209, W6HUJ 155, K6BA1 62, N6AT 49, KF6TF 34, N6GW 21, KM6I 6. (Feb.) N6GW 21.

SANTA BARBARA: SM, Ernest L. Kapphahn, W6HJW — Sunday, June 17 is the date for the Santa Maria swapfest and barbecue. Hope to see you all there. BBQ is held at Union Oil picnic grounds (10 miles south of Santa Maria). W6HWK reports 198 check-ins for Ventura Co. ARES net. Clubs in section are preparing for Field Day. FD is a great opportunity for everyone to get involved in emergency preparedness and to hone your operating skills. Even if you're not a "club joiner" there's no excuse to miss the fun. Any amateur or group of amateurs who wish to assist the set up a station, and get mosquito bit with the rest of us. Here is a list of active clubs and a contact from each: Conejo Valley ARC, Bill Poole, AA4Q (Thousand Oaks); Estero ARC, Ben Wetzel, W6ELK (Morro Bay — SLO); Lompoc ARC, John Cantrell, W6QEV (Lompoc); Paso Robles ARC, Ron Wenstrom, KJ6R (No. County SLO); Poinsettia ARC, Gery Kyle, KA6BPH (Ventura); Santa Barbara ARC, Bill Talanian, W1UQU (S. Bay); Satellite ARC, Dave Clary, N6BEA (Santa Maria/Vandenberg). Clubs can compete to win the Tri-Counties FD Award and rules have been sent to area affiliated clubs. W6ZRR in SLO is sending RTTY bulletins Fri at 1830L on 146.70 MHz. SCN/SB traffic 84, check-ins 291. Traffic: W6ZRR 90.

WEST GULF DIVISION
NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: N15V, SEC: W5GPO, STM: W5VMP, PIO: N5DFL, BM: W5QXK, SGL: W5UXP, OO/RFI: W5BJP, TC: W5SIR, The Lewisville story. I am very proud of the amateurs of Denton Co., its fine ARES group, the four very active clubs, and the universal dedication to public service work and the betterment of our hobby. Most especially I am proud of the Lake Area Amateur Radio Club and the amateurs of Lewisville. As a club project about two years ago, we decided to "take it" to City Hall. We had a well trained ARES unit, and an active and competent SKYWARN group. Many of us were involved in the Wichita Falls and Paris disasters, and were very concerned about the lack of a warning system in a city of 30,000. We marched on City Hall, filled the Council Chamber on many occasions, supported political candidates sympathetic to our cause, and got out the vote on election day. We graphically demonstrated to city officials the deadly difference that a lack of emergency preparedness can make. The result was that Lewisville now has one of the finest and most comprehensive public warning systems in existence today! The LAARK has spent many hours and hundreds of dollars to see this project through. The bottom line is that it does not always require a killer tornado or other disaster to bring a community around to closing the barn door before the horses get out! We all sleep a little better these spring nights, and enjoy our hobby just a little bit more! Was it worth it? Just ask a LAARK member, or any citizen of Lewisville, Texas! PSHR: KA5AZK KD5CR N5GKF AE5I N5BT KD5FR N5EZW K5EVI

N5DKW Traffic: N5GT 268, N5GRZ 162, K5DRC 149, KA5AZK 118, KD5FR 99, KB5UL 85, N15V 82, AE5I 69, W9OYL 53, K5EVI 51, N5DKW 47, N5JQ 24, KA5QWN 23, W6ERT 18, K5PC 13, A1JF 10, N5EZW 8, N5GKF 8, N5FDL 5, W5VMP 4, W5UCJ 3.
SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — ASM: N5TC, TM: K5QEW, SEC: Open, O. Report: K5DL, BPL: W5CTZ W5YDD. OBS W5KLV gave 27 bulletins, 29 satellite bulletins, 4 propagation fcsts, 5 DX bulletins and 3 CRRL bulletins 92 readings on 8 nets. OBS N5DFO came right along with 47 readings on 8 nets. COBS W5F5CO kept ARRL bulletins posted and upgraded on Austin's Armadillo computer system. Those boys really spread the word! ORS N5AF is putting up a new antenna system. ORS W5GKH reports his garden is looking good. B-VARC in Missouri City reports W5SHEH is running the Blue Ridge Computer Bulletin Board. Williamson Co. ARC reports KA5RQC upgraded to Advanced, KA5BY up to General and KA5RD up to technician. Congrats all! Texas Slow Speed Net Mgr N5DKW reports steady increase in check-ins, traffic and representatives to other nets. Sounds as though he is doing a real good job. Brenham ARC reports activating speed dialing on their repeater for easy access to law enforcement and emergency services. DRN5 Mgr W5YDD reports Southern Texas represented 100% by N5DFO K5SV W5CTZ W5KLV W5URN N5EFG W5ATP W5EPA W5F5QJ N5AMH KD5KQ W5A5RV W5YDD. CAND Mgr W5KLV reports DRN5 represented 100% by 51X stations N5DFO W5KLV KD5KQ W5YDD N5EFG N5AMH. Rio Grande Valley Amateurs assisted with communications at Rio Grande Valley Livestock Show, Mercedes 4 days in March. Traffic: W5CTZ 843, W5YDD 531, N5DFO 233, W5KLV 221, W5TFB 97, N5TC 78, K5SV 39, KV5W 34, W5KR 19, K5HZR 14, W5GKH 8.

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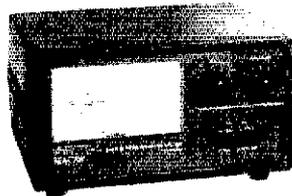


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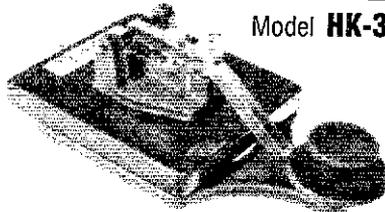


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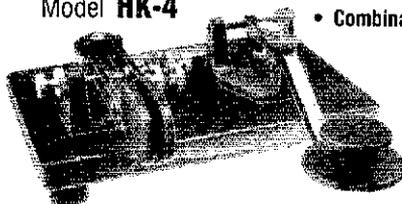
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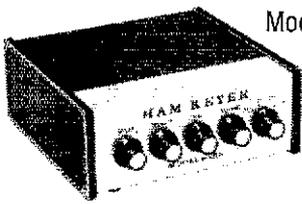
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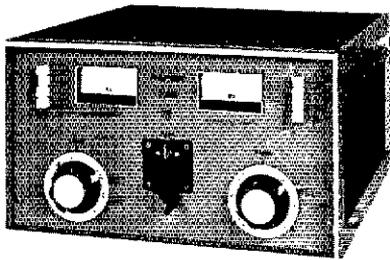
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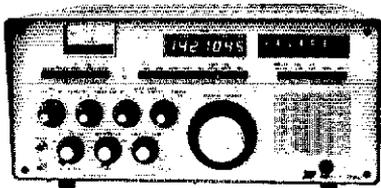
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| RT-1004/APQ-122 | DT-371/ASQ-8 |
| RT-524/VRC | DT-239/ASQ-10 |
| RT-865D/PRC-86 | RO-32/ASQ |

WE BUY MILITARY PARTS
 AND NEW TUBES.

SPACE ELECTRONICS
 35 Ruta Ct. So. Hackensack, N.J. 07606 (201) 440-8787
 "OUR 24th YEAR"

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" x 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November QST. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in QST advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of QST will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryor Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925. Invites your inquiries and application for membership. Write VWOA, Ed. F. Pleufer, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

W.A.R.A. Warren Ohio Hamfest Aug. 19, 1984 at Kent State University, Trumbull Campus.

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

ATLANTA HAMFESTIVAL 1984! Sponsored by the Atlanta Radio Club. June 16th and 17th will be held at the Atlanta Civic Center. 70,000 square feet of air conditioned exhibit space and over 800 outdoor flea market spaces will be available. Write: Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

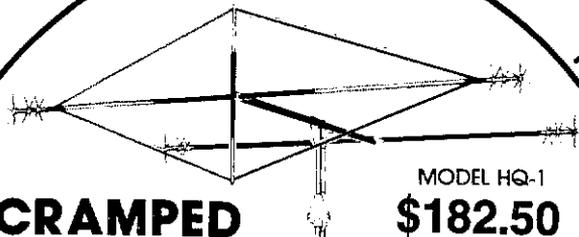
ATLANTA HAMFESTIVAL 1984!! Flea market — \$12.50/space in advance, \$15 at the gate, both days. Hamfest registration — \$5 in advance, \$6 at the door. To be preregistered for the flea market or hamfest, we must receive your application and check by June 8th. Preregistration applications received after June 8th will be returned. Hours 8:00 AM to 5:00 PM on Saturday, 8:00 AM to 2:30 PM on Sunday. Talk-in on 3.975 MHz, 146.22/82 and 146.94 simplex. For preregistration or other information, write: Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

FOX-TANGO Newsletters — Since 1972, the prime source of modifications, improvements, and repair of Yaesu gear, free to Club members. Calendar-year dues still only \$8 US, \$9 Canada, \$12 elsewhere. Includes five-year cumulative index by model numbers, or send \$1 for index and sample Newsletter. Fox Tango Club, Box 15944, W. Palm Beach, FL 33416.

FREE QRP into kit. Large S.A.S.E. w/37¢ postage to QRP-ARC, Box 12072, Austin, TX 78711.

MUSEUM for radio historians and collectors now open. Free admission. Old time amateur (W2AN) and commercial station exhibits. 1925 store and telegraph displays. 15,000 items. Write for details. Bruce Kelley, AWA, Holcomb, NY 14469.

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NOW-SILICONE SEALED

MODEL HQ-1 CRAMPED FOR SPACE—WANT DX?

Then you want the antenna that's known around the world for its small size and superior performance... The Multiband HYBRID QUAD for 6-10-15 & 20 meters.

If not stocked by your dealer order direct. We pay shipping in USA. Send for free catalog of other models and more data.

- WING SPAN—11 FT.
- BOOM—54 INCHES LONG
- WIND AREA—1.5 SQ. FT.
- 1200 WATTS P.E.P. INPUT TO FINAL
- FEED LINE—50 OHMS
- EACH BAND FREQUENCY ADJUSTABLE

Mini-Products, Inc.
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AVOID OBSOLESCENCE**

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YAESU FT 757 GX UNDER \$730.00

If this months special is not what you are looking for send Call letters name & phone # for personal price quote. Over 5,000 ham related items in stock.

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Telephone (208) 852-0830 Closed Monday at 2:00

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OPTIONAL BACK LIGHTED KEY PAD ADD \$10.00

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WITH LED LIGHTED KEY PAD ADD \$10.00...
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THE AZIMUTH WORLD-TIME DUAL ZONE CLOCK
Efficiently Conquers Time & Space! A perfect addition to your station...at an affordable price. Great for DX'ers, field day, emergencies or daily operating fun. Specially designed for the discerning radio amateur.

ONLY
\$24.⁹⁵
Plus P&H

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5:26

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AZIMUTH
WORLD TIME

• **READ-EASY-TO-READ LCD DUAL READ-OUTS**—each liquid crystal digit is 5/8" high...no more squinting at your watch.

• **LOCAL TIME DISPLAY (Left)**—flashes Time & Date (AM & PM). Helps keep you on time without that 24 hour notation mix-up.

• **UNIVERSAL GMT DISPLAY (Right)**—shows time in 24 Hour/Zulu notation...helps make logging your contacts easy & accurate.

• **MODERN DESIGN IN BRUSHED BLACK METAL CONSOLE**—sharp looking with easy to set accessible buttons. Measures 4-1/4" x 1-5/8".

• **QUARTZ ACCURACY**—gives you legendary accuracy of quartz in a magnificent, desktop chronometer... perfect in any station.

• **BATTERY OPERATED**—each unit runs on efficient, long lasting large watch batteries...included.

PRICE BREAKTHROUGH...ORDER TODAY...AND SAVE with this SPECIAL MONEY SAVING OFFER!
Mail to: AZIMUTH CLOCK • 11030 Santa Monica Blvd. Suite 200J, • Los Angeles, CA 90025

Yes please rush me _____ Azimuth Dual Zone Clock(s) at \$24.95 plus \$1.95 to cover Postage & Handling. (California residents add 6-1/2% sales tax). Enclosed is my check or money-order, or charge my MasterCard or VISA account # _____ InterBank _____ Expires _____

SAVE! Order 2 clocks, just \$22.95 each (Total \$45.90 plus \$3.50 P&H, plus Sales Tax where applicable).
You SAVE \$4.40! Order Now! FOREIGN ORDERS- Please Include \$4.95 For Postage & Handling - U.S.\$ Only.

Name _____ Address _____ Apt _____
City _____ State _____ Call _____

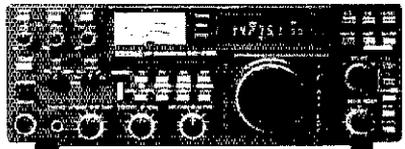
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| Regular SALE | |
| IC-751 9-band Xcvr./1-30 MHz Rcvr | \$1399.00 Call |
| PS-35 Internal power supply | 160.00 144 ⁹⁵ |
| FL-52A 500 Hz CW filter | 96.50 89 ⁹⁵ |
| FL-53A 250 Hz CW filter | 96.50 89 ⁹⁵ |
| FL-33 AM filter | 31.50 |
| RC-10 External frequency controller | 35.00 |
| CR-64 High stability reference xtal | 56.00 |
| IC-745 9-band Xcvr./1-30 MHz Rcvr | \$ 999.00 Call |
| PS-35 Internal power supply | 160.00 144 ⁹⁵ |
| CF5-455K5 2.8 KHz wide SSB filter | TBA |
| IC-271 H 100w 2m FM/SSB/OW Xcvr | TBA |
| IC-271A 25w 2m FM/SSB/CW Xcvr | 699.00 Call |
| IC-471A 10w 430-450 SSB/CW/FM Xcvr | 799.00 Call |
| PS-25 Internal power supply | 99.00 89 ⁹⁵ |
| EX-310 Voice synthesizer | 39.95 |
| IC-290H 25w 2m SSB/FM Xcvr. | Call |
| IC-22U 10w 2m FM non-digital Xcvr. | 299.00 249 ⁹⁵ |
| EX-199 Remote frequency selector | 35.00 |
| IC-25A 25w, 2m, gm leds | |
| up-dn-TTP mic. | 359.00 319 ⁹⁵ |
| IC-25H as above, but 45 Watts | 389.00 349 ⁹⁵ |

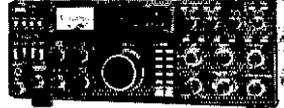


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|----------------------------------|--------------------------|
| IC-27A 25w 2m mobile Xcvr. | TBA |
| IC-45A 10w 440 FM Xcvr, TTP mic. | 399.00 359 ⁹⁵ |
| EX-270 CTCSS encoder | 39.00 |
| BU-1 Memory back-up | 38.50 |

- RP-3010 10w 440 MHz FM repeater 999.00 899⁹⁵
- Hand-held transceivers:**
- Deluxe models**
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| IC-02A for 2 meters | \$ 319.00 289 ⁹⁵ |
| IC-02AT w/DTMF | 349.00 314 ⁹⁵ |
| IC-04A for 440 MHz | TBA |
| IC-04AT w/DTMF | TBA |
- Standard models**
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|--------------------|--------------------------|
| IC-2A for 2 meters | 239.50 214 ⁹⁵ |
| IC-2AT with TTP | 269.50 219 ⁹⁵ |
| IC-3A for 220 MHz | 269.95 234 ⁹⁵ |
| IC-3AT with TTP | 299.95 239 ⁹⁵ |
| IC-4A for 440 MHz | 269.95 234 ⁹⁵ |
| IC-4AT with TTP | 299.95 239 ⁹⁵ |



New IC-R71A Short wave receiver Call



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| Regular SALE | |
| TS-930S/AT | 1799.00 Call |
| TS-930S | 1599.00 Call |

COMPANY SPECIAL SALE

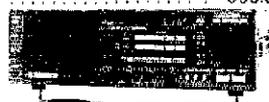
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|---------------------------|--------|------|
| TM-201 | 369.00 | Call |
| TR-2500/PB25H | | Call |
| TR-3500/PB25H | | Call |
| TS-830S (choice CW filter | | Call |
| 500 c/s or SP-230) | | Call |
| TS-430S | | Call |
| TS-530SP | 749.00 | Call |
| VFO-240 | 169.95 | |
| AT-230 | 194.95 | |
| AT-130 | 144.95 | |
| TS-430 | 895.95 | Call |
| PS-430 | 149.95 | |
| AT-250 | 399.95 | |
| TS-130SE | 629.95 | Call |
| TS-66D(GM) | 699.95 | Call |



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|----------------|-----------|------|
| TL-922A 2K AMP | \$1229.95 | Call |
| SM-220 | 359.95 | |



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|----------|--------|------|
| TW-4000A | 599.95 | Call |
| VS-1 | | |
| TR-9130 | 529.95 | Call |
| TS-780 | 995.00 | Call |
| TR-7950 | 399.00 | |
| TM-401 | 399.00 | |



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|----------------------------|------|
| R-2000 Short wave receiver | Call |
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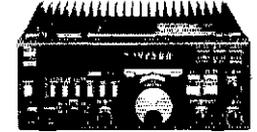
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| Regular SALE | |
| FT-One/All Optional | 1995 ⁰⁰ |
| (except key unit) | |
| FT-980 | \$1495.00 Call |



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|---------------------------|--------|-------------------|
| FT-757GX | 829.00 | Call |
| FT-726R | 899.00 | Call |
| Optional modules in stock | | Call |
| FT-230R | 359.00 | Call |
| FT-730R | 399.00 | 359 ⁰⁰ |

SPECIAL SALE

FT-102, YR-901
IC-25H, IC-45A
IC-720A, IC-745.

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| FT-203R New | 239.00 | 215 ⁰⁰ |
| FT-208R | 319.00 | 279 ⁰⁰ |
| FT-708R | 319.00 | Call |
| FT-102 | | Call Special |
| FRG-7700 | 549.00 | 395 ⁰⁰ |
- Short wave receiver

MIRAGE

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| B-3016 | 239.00 | 199 ⁰⁰ |
| B-1010 | 319.00 | 289 ⁰⁰ |
| B-1016 | 279.00 | 249 ⁰⁰ |
| B-23 | 89.00 | 79 ⁰⁰ |



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| ST-142 | Call |
| ST-220 | Call |
| ST-440 | Call |



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| CP-1/20 | 229 ⁰⁰ |
| CP-1/64 | 229 ⁰⁰ |

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| Interface | 169.00 | 129 ⁹⁵ |
| Interface II | 269.00 | 239 ⁰⁰ |
| DK-1000 | 595.00 | Call |

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(702) 827-5732

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NEW JERSEY — The Jersey Shore Chaverim are sponsoring the third annual Ham & Computer Fest on June 10, 1984 9 A.M. to 4 P.M. at the Jewish Community Center, 100 Grant Avenue, Deal, N.J. We have indoor space, 7,300 sq. ft. Admission is \$3 per person (children under 12 and XYL's free). Refreshments available. Awards. Indoor table \$8 and tailgating \$3.50 per space. Spaces may be reserved by SASE and advance payment to "Jersey Shore Hamfest", P.O. Box 192, West Long Branch, N.J. 07764 by June 1. For information call Arnold W2GDS 201-222-3009. Talk-in on 147.045 +.6: 145.110 — .5 146.52 simplex. Deal, N.J. is less than 50 miles from NYC and 70 miles from Philadelphia.

THE Central Kentucky ARRL Hamfest, sponsored by the Bluegrass Amateur Radio Society, will be held Sunday, 8:00 AM to 5:00 PM August 12, 1984 at Scott County High School, Longlick Road and US Route 26, Georgetown, Kentucky (Off I-75/84). Technical forums. Awards and Exhibits in A/C facilities. Outside Flea Market space, no charge. Tickets \$3.50 advance and \$4 @ gate. For more information or tickets write Edward B. Bono, WA4ONE, P.O. Box 4411, Lexington, KY 40504.

NORTHWEST DX Convention July 28, 29, 1984, by the Willamette Valley DX Club at the Greenwood Inn, Beaverton, Oregon. DX forums, banquet, DX breakfast, hospitality suite Saturday. Contact W7XN, Bob Herndon, 503-232-2740 or write P.O. Box 555, Portland, OR 97207.

WHEELING WV Hamfest, Wheeling Park, Sunday, July 22. Major cash awards. Dealers most welcome, tables available, all under roof, only \$3 admission fee required but reserve space. Contact: TRAC Box 240, RD 1, Adena, OH 43901. Phone 614-546-3930.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

QSL samples — 25c Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

GADILLAC of QSLs — Completely different! Samples \$1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — 1) Famous K0AAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. State your sample wants. 3c self addressed business size envelope required. Mary W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Layden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From \$285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

QSLs, Quality and fast service for 24 years. Include call for decal. Samples 50c. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSLs by W6BA "customized" \$19.75 per 1000. Star Route 2, Box 241, 29 Palms, CA 92277.

NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing and SWL's. Stamp appreciated.

RUBBER Stamps custom made to your satisfaction. Free literature. J. Glass, WB6ZTI, 14316 Cerecila Drive, East Whittier, CA 90604.

CLUB Call pins: 3 lines 1-1/4 x 3-1/4 \$1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner, WA2ZHA, 2041 Linden, Ridgewood, NY 11385.

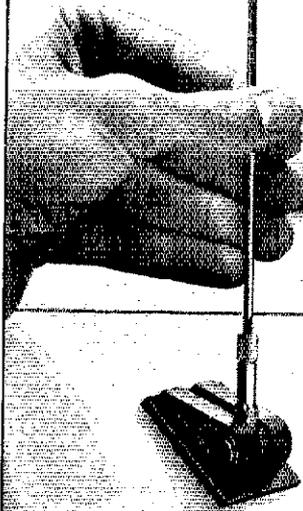
QSL's by W4TG: Prices from \$16 per 1000. Send SASE to PO Box F, Gray, GA 31032.

BE SURPRISED - get a variety of cards - 100 for \$8 or 200 for \$13. Samples \$1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST custom QSLs, large cut catalog and samples \$1 refundable on first order. Fitz Print Shop P.O. Box 45018, Westlake, OH 44145.

PICTURE QSL cards of your shack etc. from your photograph of black ink art work. 500 \$22; 1000 \$32.50. Send stamp for illustrated literature. Generous sample pack \$1; half pound of samples \$2. Custom printed cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, PA 19140. Phone 1-215-228-5460. Closed July 15th to August 15th.

AVANTI. The on-glass, halfwave, mobile antenna that installs in 15 minutes.



- **Co-inductive coupling** establishes highly tuned circuit through glass with no measurable signal loss.
- **No ground plane:** Full halfwave design — performance equal to practical 5/8 wave installations.
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- **No holes:** NO vehicle damage; fast, easy installation.
- **Four models** for 2 meter, 220 MHz and UHF amateur bands.

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NEW! Designed Exclusively for the 80/160 Meter DX'er!

Easily erected, this dual-band, quality-crafted tilt-up 42 foot vertical is constructed from rugged 60-61-T6 aluminum. Upper guy provides "top hat" loading for efficient, broadband operation. The base impedance is much higher than achieved with conventional, base-loading. On-air tests show negligible difference in performance compared with taller radiators! Antenna options provide remote electrical band switching. Ideal for reliable, all season home station operation. UPS shippable! Dynamite for DX-Expeditions. The prices below allow you to get big on the low bands fast and still keep your marriage and pocketbook intact.

42 ft. 80 meter Vertical Element w/Top Hat (80-160S).....\$179.00
OPTIONAL ACCESSORIES:

160 meter Center Loading Adjustable Inductor (160SI).....\$68.00
Base Pipe 1 5/8" OD, 5' Galvanized Pre-Drilled w/SS Hardware (BP-1).....\$15.00
Remote RF Switch for Use w/42' and 61' Verticals (SW16).....\$52.00
Power Supply for SW16 (16 VDC 0.4 A) (PS16).....\$77.00
16 AWG Soft Copper Wire for Radial Systems (1000' min.).....\$26/1000'

Want to travel first-class? Then go for our heavy-duty, 61 foot vertical for 80/160 meters (shipped only by truck):

80 meter Vertical w/Base Mount and Guys (80160L).....\$299.00
160 meter Center Loading Adjustable Inductor (160LI).....\$68.00
40 meter 32' Vertical w/Mounting Pipe (40-32).....\$99.00

All prices are F.O.B. Carlisle, MA. Massachusetts residents add 5% sales tax.



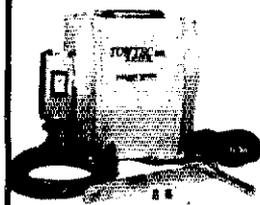
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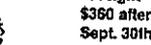
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- CLOTH BOUND \$17.75 U.S., \$20.00 Elsewhere

- ARRL Amateur Radio Call Directory, U.S. listings \$15.75 U.S., \$19.75 in Canada and Elsewhere.

- TUNE IN THE WORLD WITH HAM RADIO. \$8.50

- ARRL ANTENNA ANTHOLOGY \$4.00 US, \$4.50 Elsewhere

ARRL ANTENNA BOOK

- SOFT COVER \$8.00 U.S., \$8.50 Elsewhere
- CLOTHBOUND \$12.50 U.S., \$13.50 Elsewhere

- ARRL CODE KIT \$8.00

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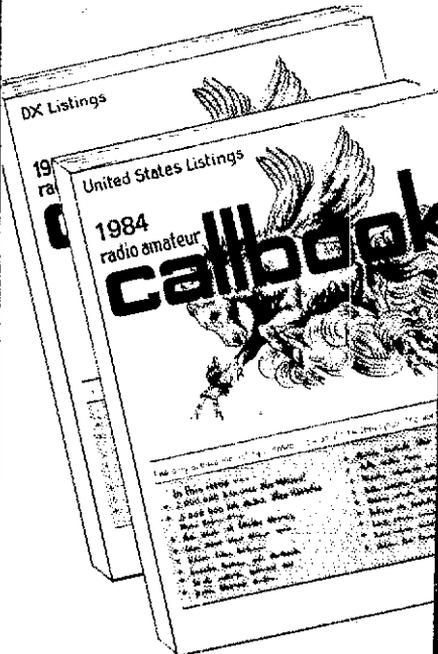
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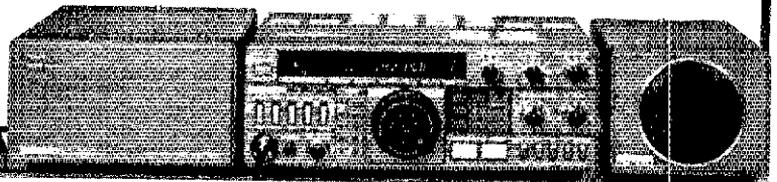
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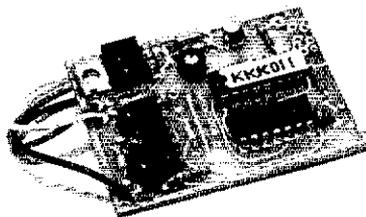
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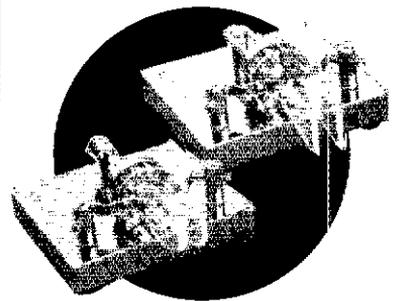
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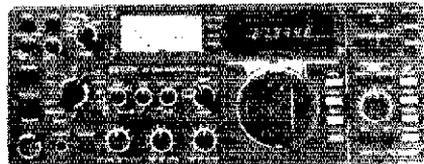
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- PS-35 Internal power supply..... 160.00 144⁹⁵
- PS-15 20A power supply..... 149.00 134⁹⁵
- IC-271A 25w 2m FM/SSB/CW xcvr..... 699.00 619⁹⁵
- AG-20/EX-338 2m preamplifier.... 56.95
- IC-471A 10w 430-450 SSB/CW/FM xcvr 799.00 699⁹⁵
- PS-25 Internal power supply..... 99.00 89⁹⁵
- EX-310 Voice synthesizer..... 39.95
- HM-12 Hand microphone..... 39.50
- SM-6 Desk microphone..... 39.00

VHF/UHF mobile multi-modes

- IC-290H 25w 2m SSB/FM xcvr, TTP mic 549.00 489⁹⁵
 - IC-490A 10w 430-440 SSB/FM/CW xcvr 649.00 579⁹⁵
- VHF/UHF/1.2 GHz FM** Regular SALE
 IC-22U 10w 2m FM non-digital xcvr 299.00 249⁹⁵
 EX-199 Remote frequency selector 35.00
 IC-25A 25w, 2m, grn leds, up-dn TTP mic 359.00 319⁹⁵
 BU-1 Memory back-up..... 38.50
 IC-25H* as above, but 45 watts..... 389.00 339⁹⁵

***FREE BU-1H memory back-up with IC-25H purchase**

- IC-27A 25w 2m mobile transceiver... 369.00 329⁹⁵
 - UT-16/EX-388 Voice synthesizer... 29.95
 - RP-3010 10w 440 Mhz FM repeater 999.00 899⁹⁵
 - EX-339 3-digit DTMF decoder..... TBA
 - IC-37A 25w 220 FM xcvr w/TTP mic 449.00 399⁹⁵
 - IC-120 1w 1.2 GHz FM transceiver.... 499.00 449⁹⁵
 - RP-1210 10w 1.2 GHz FM repeater... 1199.00 1089
 - Cabinet for RP-1210 or RP-3010.... 249.00
 - Duplexer 1210 10w 1.2 GHz duplexer 1199.00 1089
- 6m portable** Regular SALE
 IC-505 3/10w 6m port. SSB/CW xcvr \$449.00 399⁹⁵
 BP-10 Internal Nicad battery pack 79.50
 BP-15 AC charger..... 12.50
 EX-248 FM unit..... 49.50
 IC-10 Leather case..... 34.95
 SP-4 Remote speaker..... 24.95



Hand-held Transceivers
 Deluxe models Regular SALE
 IC-02A for 2 meters \$ 319.00 289⁹⁵
 IC-02AT w/DTMF..... 349.00 314⁹⁵
 IC-04A for 440 MHz TBA
 IC-04AT w/DTMF..... 379.00 339⁹⁵

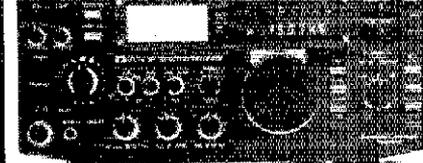
Standard models Regular SALE
 IC-2A for 2 meters \$ 239.50 214⁹⁵
 IC-2AT with TTP..... 269.50 219⁹⁵
 IC-3A for 220 MHz..... 269.95 234⁹⁵
 IC-3AT with TTP..... 299.95 239⁹⁵
 IC-4A for 440 MHz... 269.95 234⁹⁵
 IC-4AT with TTP..... 299.95 239⁹⁵

Accessories for Deluxe models Regular

- BP-7 800mah/13.2V Nicad Pak - use BC-35 67.50
- BP-8 800mah/8.4V Nicad Pak - use BC-35... 62.50
- BC-35 Drop in desk charger - all batteries... 69.00
- BC-16A Wall charger - BP7/BP8..... 10.00

Accessories for both models Regular

- BP-2 425mah/7.2V Nicad Pak - use BC35... 39.50
- BP-3 Extra Std. 250 mah/8.4V Nicad Pak.... 29.50
- BP-4 Alkaline battery case..... 12.50
- BP-5 425mah/10.8V Nicad Pak - use BC35 49.50
- CP-1 Cig. lighter plug/cord - BP3 or Dlx..... 9.50
- DC-1 DC operation pak for standard models 17.50
- LC-2AT Leather case for standard models.... 34.95
- HM-9 Speaker microphone..... 34.50
- HS10 Boom microphone/headset..... 19.50
- HS-10SA Vox unit for HS-10 (dlx only)..... 19.50
- HS-10SB PTT unit for HS-10..... 19.50
- ML-1 2m 2.3w in/10w out amplifier..... SALE 79.95
- ML-25 2m 2.3w in 20w out amplifier..... SALE 179.95
- 3A-TTN Optional T Pad - 2A/3A/4A..... 39.50
- SS-32M Commspec 32-tone encoder..... 29.95



Shortwave receivers Regular SALE

- R-71A 100 Khz-30 Mhz digital receiver \$799.00 689⁹⁵
- FL-32 500 Hz CW filter..... 59.50
- EX-310 Voice synthesizer..... 39.95
- RC-11 Wireless remote controller... 59.95
- CR-64 High stability oscillator xtal 56.00
- R-70 100 Khz-30 Mhz digital receiver 749.00 599⁹⁵
- EX-257 FM unit..... 38.00
- IC-7072 Transceiver interface, 720A 112.50
- FL-44A SSB filter (2nd IF)..... 159.00 144⁹⁵
- FL-63 250 Hz CW filter (1st IF).... 48.50
- SP-3 External speaker..... 49.50
- CK-70 (EX-299) 12v DC option..... 9.95
- MB-12 Mobile mount..... 19.50



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 621 Commonwealth Ave.
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 Fla. WATS 1-800-432-9424
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T199/4-4A Basic, Extended Basic, Assembly Language programs. CW RECEIVE/Transmit, CW Practice, DX Log/Call Locator, Amateur Call Locator, SSTV Keyboard, 1010 Record, WAS, Programs for Hamkids. Write Sam Moore, AC5D, Box 368, Sfigler, OK 74462.

"And Part Of Which I Was — Recollections Of A Research Engineer" by George H. Brown. My adventures with antennas and color TV. \$20 postpaid. Angus Cupar Publishers, 117 Hunt Drive, Princeton, NJ 08540.

SELL — R-390A modules and parts. SASE for list. Bob, W6ME, 4178 Chasin Street, Oceanside, CA 92056.

YAESU FT-1012D, narrow CW filter, just returned from Yaesu overhaul, new finals, excellent. \$475. W0VTP, 402-391-0188, 218 So. 95, Omaha, NE 68114.

CLASSIC Teletype — Model 15, Model 19, both machines completely rewired and in really nice condition. Both machines have Paper Winders. Also, Terminal Unit designed to work with both machines. Write for complete description. W4MRJ 404-252-3779.

IC-25A & HM8 — excel - \$200. N2WS - 212-596-7500 days.

TWO-METER, five-eighths wave, magnet mount antennas. Satisfaction guaranteed \$19.95 plus \$3 per order shipping. Write for catalog of many similar mobile antenna and accessory bargains. WD4BUM, Rt. #7, Box 258, Anderson, SC 29624.

KDK 2016A - clean cond. \$150. N2WS - 212-596-7500 days.

COMMODORE-64 Owners! Get "HAMFILE," a professional, automated logging system. Optional printer output. Full data search features. Unlimited data capacity. Cassette only. \$10.95 p.p. John Kenney, 107 Foxwood Dr., Hendersonville, NC 28739.

WANTED: Kenwood TS-900 XF3 3.395 MHz CW filter. Call Witt, KA1KVZ, 617-522-8406.

COLLINS: Mint 75S3C & 32S3 Round Emblem plus 312 speaker ps. Package only \$1500. Lyn, K4VBJ, 1124 Plantation Road, Martinsville, VA 24112 703-632-3805.

COLLINS-32S-3, 75S-3B, \$600 takes both. Hy-Gain TH6DX & tower, \$450. Robot 70A, 80A, make offer. WA7WOC (Phoenix). 602-867-2378.

WANTED: Model 8010 remote VFO for Tempo 2020 xcvr. Call collect 913-267-1575 or Compuserve E-Mail User No. 71336, 1270. Will pay all shipping charges. Tim Gorman WA0LYJ.

WE BUY, Sell & Trade all types of new & used amateur radios, scanners, antennas & accessories. Huge selection. Shaver Radio, 1378 S. Bascom Ave., San Jose, CA 95128. 408-998-1103.

WANTED: McIntosh tube gear! Marcus, WA9IXP, Box 385, Elm Grove, WI 53122.

CALL Toll-free 800-327-7798. Ask for Bob Hoffman, Jaro Electronics Corp. We buy all types of tubes. Top prices paid for Varian, Elmac, Amperex, RCA, Western Electric, Raytheon, in Florida Call toll free: 800-432-8524. Address 412 27th St., Orlando, FL 32802.

QUADS *dB QUADS* 2.3 & 4 elements, complete kits, fiberglass spreaders, components, wire. 3 first class stamps for complete brochure. dB + Enterprises, Box 24, Pine Valley, NY 14872.

THE DX BULLETIN — America's Oldest Weekly Amateur Radio Publication. Large S.A.S.E. for samples. Box DX, Andover, CT 06232.

WANTED: TS-600 transceiver SP-70 speakers, and MARS 7600 adapter. C.T. Huth, 130 Hunter St., Tiffin, OH 44883.

OLD Tube-Types from 1940's and 1950's — also 4-digit industrial types (e.g.: 5647) brand-new \$3. Send me your wants. Bud 7 x 9 x 15 cabinet, new \$15. Will pay \$1 for 60-10 meter xtals. K7WPC, P.O. Box 187, Coos Bay, OR 97420.

EXPERT SERVICE by W2YJ: all type Amateur Gear from newest handhelds to older tube rigs. 20 years experience. G. Krckovich, 47 Wren Ave., Lancaster, NY 14086, 716-684-3562 after 5 P.M.

ANTIQUES: 75A-4A, filters, speakerless. \$300. NC-300: runs, better for parts. \$40. Pick-up. K11FJ, 203-438-5944.

SALE: Drake R4C, T4XC, PS150 speaker. 3 CW filters and xtra xtals in both. \$549. New one-month-old Icom ICR70 general coverage rcvr with FM board. Accept VISA or Mastercharge. KC5FQ, 504-293-6943.

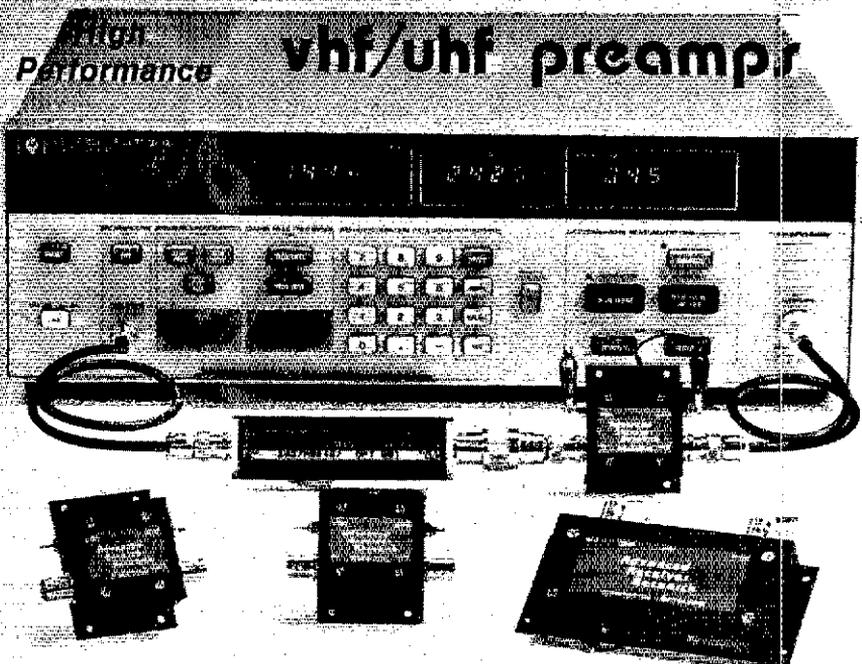
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SELLING OUT: Maxi-tuner, B&W, Tailtwister, Bencher (gold), 12-cond. cable, Bird, Rohn 45-68' tilt-over, Cubex HD, Heath, Omega & more. S.A.S.E. for list, W1AGA.

WANTED: KT-88 tubes. WA9IXP, Box 385, Elm Grove, WI 53122.

COLLINS CP-1 Crystal Packets. Bargain prices. W9ELR, 317-825-0226.



Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	< 1.1	15	0	DGFET	\$29.95
P50VD	50-54	< 1.3	15	0	DGFET	\$29.95
P50VDG	50-54	< 0.5	24	+ 12	GaAsFET	\$79.95
P144VD	144-148	< 1.5	15	0	DGFET	\$29.95
P144VDA	144-148	< 1.0	15	0	DGFET	\$37.95
P144VDG	144-148	< 0.5	24	+ 12	GaAsFET	\$79.95
P220VD	220-225	< 1.8	15	0	DGFET	\$29.95
P220VDA	220-225	< 1.2	15	0	DGFET	\$37.95
P220VDG	220-225	< 0.5	20	+ 12	GaAsFET	\$79.95
P432VD	420-460	< 1.8	15	-20	Bipolar	\$32.95
P432VDA	420-450	< 1.1	17	-20	Bipolar	\$49.95
P432VDG	420-450	< 0.5	16	+ 12	GaAsFET	\$79.95

Inline (rf switched)						
Model	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
SP28VD	28-30	< 1.2	15	0	DGFET	\$59.95
SP50VD	50-54	< 1.4	15	0	DGFET	\$59.95
SP50VDG	50-54	< 0.55	24	+ 12	GaAsFET	\$109.95
SP144VD	144-148	< 1.6	15	0	DGFET	\$59.95
SP144VDA	144-148	< 1.1	15	0	DGFET	\$67.95
SP144VDG	144-148	< 0.65	24	+ 12	GaAsFET	\$109.95
SP220VD	220-225	< 1.9	15	0	DGFET	\$59.95
SP220VDA	220-225	< 1.3	15	0	DGFET	\$67.95
SP220VDG	220-225	< 0.55	20	+ 12	GaAsFET	\$109.95
SP432VD	420-460	< 1.9	15	-20	Bipolar	\$62.95
SP432VDA	420-460	< 1.2	17	-20	Bipolar	\$79.95
SP432VDG	420-450	< 0.55	16	+ 12	GaAsFET	\$109.95

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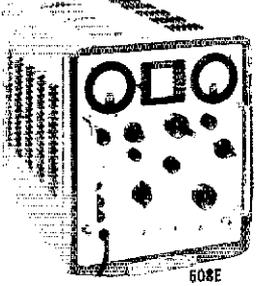
AEA	
MBA-RO Reader	\$129 f
CES	
510-SA Smart patch	\$249 w
COLLINS	
32S-1 Transmitter	\$179 m
KWM-2 Xcvr	439 f
KWM-2 Xcvr/Waters rej	449 m
516F-2* AC supply	149 mwfc
*Not sold separately	
PM-2 AC supply	119 m
DAIWA	
AF-306 Active audio filter	\$ 24 w
CN-620B Wattmeter	79 e
CNA-1001 Auto tuner	229 c
RF-66D Speech proc	49 w
DENTRON	
MT-2000A Ant tuner	\$119 e
AT-1K 1.2kw ant tuner	99 m
W-2 Wattmeter	69 v
WP-2A Wattmeter	49 c
DRAKE	
R-4 Ham Rcvr	\$129 e
R-4C Ham Rcvr	269 e
MS-4* Speaker	19 fcve
*Not sold separately	
FL-250 250 Hz filter	35 e
FL-500 500 Hz filter	35 e
SC-2 2m rcv conv	59 m
SC-6 6m rcv conv	59 mf
CPS-1 Conv ps	19 m
SCC-1 VHF calib	19 m
CC-1 Conv console	39 m
IC-2 2m Xmit conv	269 m
R-7 SW Receiver	799 fc
R-7A SW Receiver	999 e
IR-4 Xcvr	229 c
TR-4C Xcvr	269 m
TR-6/NB 6m Xcvr	389 f
AC-3* AC supply	59 m
AC-4* AC supply	89 mwfc
*Not sold separately	
DC-4 DC supply	59 wf
TR-7 Xcvr	699 mf
TR-7/6 KHz filter/fan	739 w
TR-7/300/500 Hz	749 m
TR-7/500 Hz/6 KHz	749 w
TR-7/500 Hz/NB	749 m
TR-7/NB/fan	769 w
TR-7/300 Hz/1.8/6 KHz	775 m
TR-7/500 Hz/1.8/6/aux	799 m
TR-7/500 Hz/1.8/6/NB	825 m
TR-7/500/1.8/6/NB/fan	849 m
TR-7/300/500/6/NB/aux	849 m
TR-7/300/500/1.8/nb/aux	849 e
PS-7* Power supply	199 mwfc
*Not sold separately	
PS-75 Power supply	99 m
RV-7 Remote VFO	99 m
7037 Ext card svc kit	35 m
SP-75 Speech proc	79 f
7077 Desk mic	29 mf
SL-4000 4 KHz filter	45 m
LA-7 Line amp	29 m
L-7 Linear	869 w
700DE Terminal	299 mw
900DE Terminal	499 m
IUV-3 3-band Xcvr/TTP	589 v
ESR-24 Satellite Rcvr	469 m
ESR-224 Sat Rcvr	269 m

GILLASPIE	
7600A Sat Rcvr (Demo)	\$299 m
HAL	
RGB-1 RTTY keyboard	\$ 59 m
ST-5000 Demodulator	149 m
KB-2100 Keyboard	99 m
DS-2000KSR Terminal	199 m
DS-3000KSR Term vers 2	469 m
DS-3000KSR Term vers 3	569 e
CWR-6700 Rcvr/telemeter	269 m
HENRY	
1KD-5 Linear	\$449 mc
HY-GAIN/GALAXY	
R-1530 SW Rcvr	\$369 m
IRL	
FSK-1000 Demod w/keyst	\$289 f
ICOM	
IC-701PS AC ps only	\$ 89 fc
IC-720 Xcvr	649 m
IC-740/FM Xcvr	649 f
IC-740 w/internal ps	699 m
IC-740/FM/FL-44/FL-45	749 f
FL-53A 250 Hz CW fult	59 w
AT-100 100w auto tuner	239 m
AH-1 Mobile ant/tuner	169 m
R-70 SW Rcvr	459 c
R-71A SW Rcvr	589 e
IC-502 6m SSB port	139 f
IC-22S 2m FM Xcvr	109 c
IC-25A 2m FM Xcvr	249 m
IC-25H/BU-1H 2m Demo	289 m
IC-202 2m SSB port	139 w
IC-211 2m Xcvr	349 we
IC-215/batts 2m SSB port	109 m
IC-251A 2m Xcvr	399 f
IC-255A 2m FM Xcvr	189 v
IC-290A 2m Xcvr	299 w
IC-451A 430-440 Xcvr	499 mwfc
BU-1 Memory back-up	25 w
SM-2 Desk mic	25 f
HM-12 Hand mic	25 m
KANTRONICS	
Interface for computer	\$ 89 w
Hamsort for VIC-20	29 w
Hamsort for VIC-20	59 w
Mini-Reader	149 w
KENWOOD	
TS-120S Xcvr	\$389 ve
TS-130S Xcvr	469 m
PS-30 Power supply	99 fe
TS-130V 25w PEP Xcvr	399 f
VFO-120 Remote VFO	99 v
DFC-230 (new close-out)	169 ⁹⁵ mwfc
TS-180S Xcvr	449 f
TS-180S/DFC/CW filter	529 mf
TS-520 Xcvr	399 fcv
TS-520S Xcvr	429 wf
TS-520S/CW filter	459 f
TS-520SE Xcvr	449 mwe
TS-520SE/CW filter	479 m
VFO-520S Remote VFO	99 m
TS-530S Xcvr	489 ve
TS-820/DG-1 Dig Xcvr	529 e
TS-820S Xcvr	549 wfe
TS-820S/CW filter	579 m
TS-830S Xcvr	659 w
TS-930S Xcvr	1089 m
AT-930 Ant tuner	139 m
TS-930S w/ant tuner	1269 f
SM-220/BS-8 Scope/pan	319 mwfc

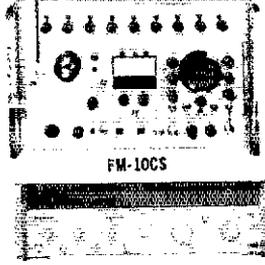
R-300 SW receiver	169 e
R-600 SW receiver	259 e
R-820 Rcvr/2 CW filts	549 m
R-1000 SW receiver	299 m
TV-502 2m transverter	169 e
IV-502S 2m transverter	189 m
TS-70DA 2m Xcvr	349 mc
TS-780 2m/430 Xcvr	699 v
TR-7600 2m FM Xcvr	129 mw
TR-7850 2m FM Xcvr	269 w
TR-9000 2m Xcvr	289 m
TR-8400 440 FM Xcvr	269 mw
KPS-7 6A power supply	59 f
PS-20 4.5A ps	34 m
TR-2400 2m FM HT	199 m
MFJ	
200BX Calibrator	\$ 25 f
402 Keyer	29 f
496 Super Keyboard II	199 e
496/clock/loop module	229 m
624 Phone patch	39 c
949B Ant tuner	99 v
MACROTRONICS	
IA-650 Interface/Apple	\$ 99 m
CA-650 Interface/Apple	99 m
MICROLOG	
ACT-1 Terminal	\$299 mw
PANASONIC	
RF-3100 SW receiver	\$189 e
REGENCY	
HRT-2 2m FM HT	\$ 59 m
ROBOT	
800 Terminal	\$299 mf
800H/800CH kit Term	399 c
SONY	
ICF-6500W SW Rcvr	\$ 89 w
SWAN/CUBIC	
Astro 102BX Xcvr	\$469 e
Astro 103 Xcvr	599 v
PSU-6 AC supply	119 e
PSU-6A AC supply	119 v
TEU-TEC	
574 Century/21 digital	\$289 mt
525D Argosy II Dig Xcvr	429 f
276 Calibrator	19 f
225 Power supply	89 fc
540 Xcvr	299 c
580 Delta Xcvr	429 c
283 Remote VFO	129 w
Omni A mod to series B	329 v
252M Power supply	79 v
260 Power supply	139 m
262G Power supply	89 c
280 Power supply	99 c
227 Ant tuner	59 c
229 Ant tuner	179 c
214 Desk mic	29 m
215PC Desk mic	25 v
234 Speech proc	69 e
TRAC	
TE-464 Keyer/CW proc	\$ 59 m
WILSON	
YM-1000 Sat Rcvr	\$399 m
YAESU	
FT-101B Xcvr	\$389 w
FT-101E Xcvr	449 m
FT-101E/CW filter	479 mwfc
FT-101EE Xcvr	429 m
FT-101EE/CW filter	459 fv
FT-101EX Xcvr	399 m
FT-101EX/CW filter	429 f
FT-1012/CW filter	499 m
FT-1012D Dig Xcvr	499 mf
FT-1012D/CW filter	529 w
FT-1012 Remote VFO	89 mf
FT-301AD Xcvr	369 c
FT-301AD/CW filter	399 f

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special. Closeouts, etc.

USED AES SHOP TEST EQUIPMENT

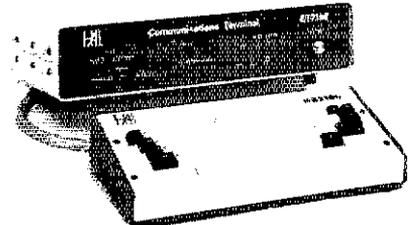


HEWLETT-PACKARD
608E 10-480MHz sig gen 1895
8640B 5-1024MHz sig gen w/options 002/003 5895



SINGER-GERTSCH
FM-10CS w/RFM-10A, FIM-3 & UDM-1 4995
OAM-1 AM module for FM-10C 395

HAL CT-2100/KB-2100 Combination Sale



CT-2100 Communications Terminal with KB-2100 Dedicated Keyboard
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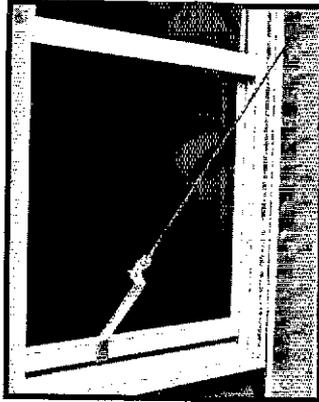
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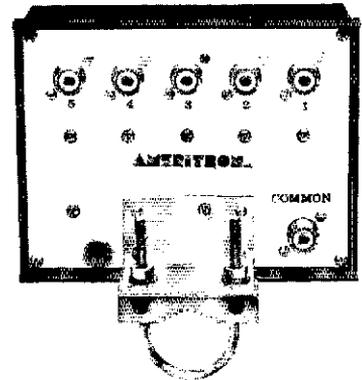
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The RCS-8 operates from 120 VAC 50/60 Hz line voltage. A 240 VAC export model is available.



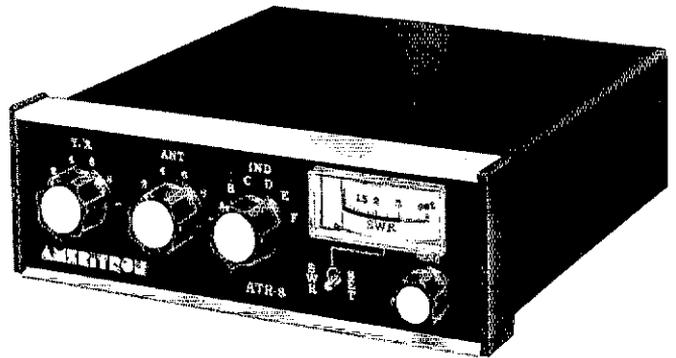
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BENCHER Paddles, black/chrome.	\$37.00/\$46.75
DRAKE TV-3300 1kw low pass filter.	\$31.05
VIBROPLEX prod.	ALL AT BIG DISCOUNT
SHURE 444D dual imp. mic.	\$19.95
DAIWA Meters \$20/\$40/\$50.	\$39.75/\$68.95/\$76.00
DAIWA Meters 620B/630/720B.	\$105.00/\$124.95/\$148.95
DAIWA Keyers DK200/210.	\$66.98/\$79.20
DAIWA Audio Filters AF 406K/606K.	\$81.50/\$97.96
ALPHA DELTA MAGC 8 pos./4pos.	\$71.50/\$33.95
AMERITRON AL-80.	\$39.95
NYE VIKING MBV-02/MBV Tuners.	\$374.00/\$441.00
NYE VIKING 3kw low pass filter.	\$25.50
TELEX Headphones C1210/1320.	\$27.50/\$39.25
TELEX Headsets Procom 250/350.	\$103.75/\$166.65
MFJ products.	ALL AT BIG DISCOUNT
ASTRON Power Supplies	
RS-7A/RS12A.	\$48.55/\$68.30
RS-20A/RS-20M.	\$87.00/\$103.00
RS-35A/50A.	\$131.00/\$198.00
RS-35M w/meter.	\$148.75

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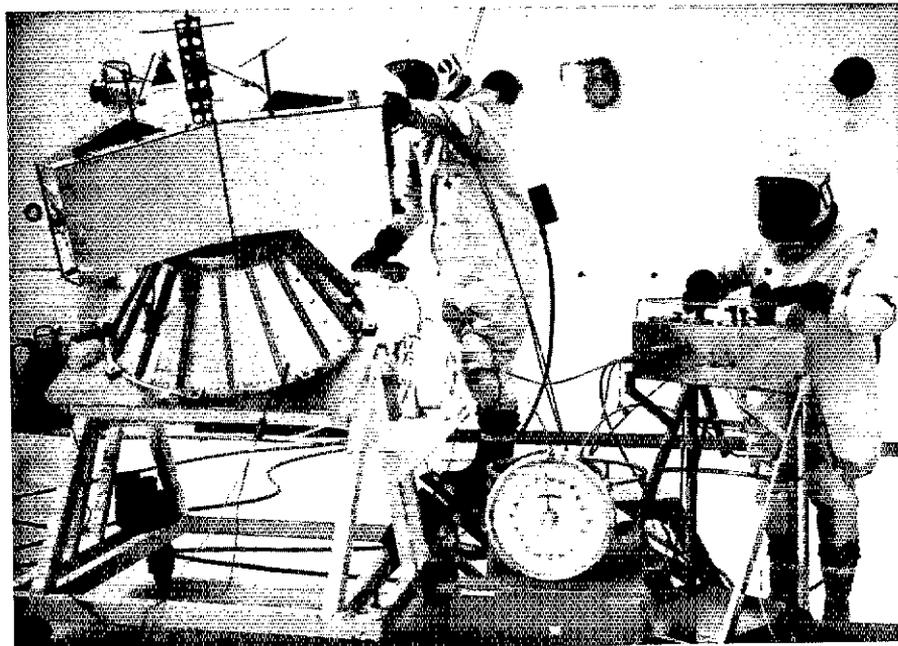
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ARSENE?

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Rotation
Fading?



Spin
Fade?

JAMSAT?

UoSAT?

N_2O_4 ?

Doppler
Shift?

Ham Radio? You bet! That's W4PUJ (right) loading fuel into AMSAT-OSCAR 10 (Phase III B) mounted on the cart at the left. Launched last summer, AO-10 now tops the world giving global DX for those who know how to use it.

...is not that hard now!

Staying on top in Amateur Radio today means Satellites. OSCAR.

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ICOM IC-751

The New Standard of Comparison



IC-SM6
Desk Mic

The IC-751 is the most advanced amateur HF transceiver available on the market today... new standard of comparison.

Receiver. ICOM's 100kHz — 15MHz general coverage receiver (a specially designed DFM Direct Feed Mixer) utilizes FETs in the receiver front end which has extremely low intermodulation distortion, -19dBm intercept point, and a high dynamic range, 105dB. With cascaded filters the IC-751 is virtually immune

to spurious signals. The 8-pole IF filter in the third IF is standard and provides exceptional receiver selectivity.

Transmitter. An extremely low-noise PLL and conservative transmitter design give extremely low distortion products (-38dBm , third order) for a crystal clear transmit signal. A microphone tone control is provided to personalize the set to your particular voice. The 9 band solid-state transmitter is also a full 100% duty cycle

(internal cooling fan standard) rated. For the CW operator, semi break-in or full QSK is possible.

32 Memories. An ultra versatile memory system allows storage of frequency and mode in each of the 32 memories. Data may be transferred from VFO to memory or from memory to VFO.

Standard Features. FM, FL-44A 455kHz high-grade SSB filter, SSB and FM squelch, built-in marker unit, convenient large controls, a new high-visibility fluorescent

display and HM-12 Hand Mic.

Options and Accessories.

Voice synthesizer, high stability master reference crystal, a wide range of CW filters, an external IC-PS15 or PS30 power supply, an internal IC-PS35 power supply, CT-10 computer interface unit, RC-10 keyboard frequency controller, IC-2KL solid-state linear amplifier (160 — 15 meters), IC-AT500 automatic antenna tuner, IC-SP3 external speaker and IC-SM6 desk mic.

IC-PS30 System Power Supply.

The IC-PS30 25 Amp Switching Power Supply consolidates your power requirements by supplying up to four pieces of ICOM equipment, eliminating the need for independent AC power supplies for each. The IC-PS30 is designed to match all of ICOM's amateur equipment.



ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

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ICOM IC-R71A

The Best Just Got Better



IC-GC4
World Clock

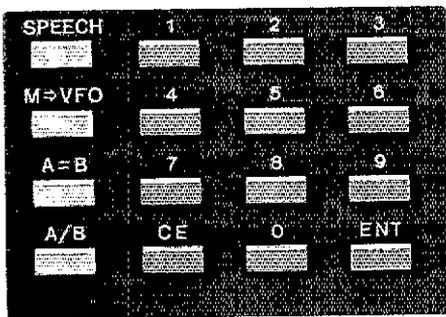
ICOM introduces the IC-R71A 100KHz to 30MHz superior-grade general coverage receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to worldwide communications. Demanding no previous shortwave receiver experience, the IC-R71A will accommodate an SWL (shortwave listener), Ham (amateur radio operator), maritime operator or commercial operator.

With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (optional), dual VFO's, scanning, selectable AGC and noise blanker, the IC-R71A's versatility is unmatched by any other commercial grade unit in its price range.

Superior Receiver Performance. Utilizing ICOM's DFM (Direct Feed Mixer), the IC-R71A is virtually immune to interference from strong adjacent signals, and has a 100dB dynamic range.

Passband tuning, a deep IF notch filter, adjustable AGC (Automatic Gain Control) and noise blanker provide easy-to-adjust clear reception, even in the presence of strong interference or high noise levels. A preamplifier allows improved reception of weak signals.



Keyboard Entry. ICOM introduces a unique feature to shortwave receivers... direct keyboard entry for simplified operation. Precise frequencies can be selected by

pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control. Memory channels may be called up by pressing the VFO/M (memory) switch, then keying in the memory channel number from 1 to 32.

VFO's/Memories. A quartz-locked rock solid synthesized tuning system provides superb stability. Three tuning rates are provided: 10Hz / 50Hz / 1KHz.

32 Tunable Memories. Thirty-two tunable memories, more than any other general coverage receiver on the market, offer instant recall of your favorite frequency. Each memory stores frequency, VFO and operating mode, and is backed by an internal lithium memory backup battery to maintain the memories for up to five years.

Options. FM, synthesized voice frequency readout (activated by SPEECH button), RC11 wireless remote controller, CK DC adapter for 12 volt operation, MB12 mobile mounting bracket, two CW filters FL3 — 500Hz, and FL63 — 250Hz, and high-grade 455KHz crystal filter FL44A.



IC-RC11
Infrared
Remote

ICOM
The World System

ICOM IC-730

Proven, Reliable HF Compact Transceiver



**BUILT-IN
SWR BRIDGE**

**BUILT-IN
RECEIVE
PREAMP**

**ONE MEMORY
PER BAND**

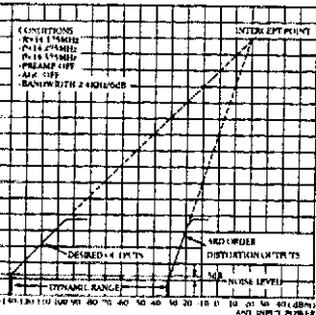
**DUAL
VFOs**

**TUNING
KNOB LOCK**

**LARGE RIT
TUNING
KNOB**

ICOM's IC-730 go-anywhere HF all-band SSB/CW/AM transceiver, the best value on the market, has a proven record of high performance, ease of operation and durability. Compact in size, yet full-featured, the IC-730 has gained an unparalleled reputation.

Receiver Performance. Utilizing ICOM's DFM (Direct



Feed Mixer), the IC-730 obtains a dynamic range of 100dB and an intercept point of 19.5dBm.

Superior front-end receiver performance, coupled with a switchable preamplifier and IF shift or passband tuning (optional), gives the IC-730 receiver flexibility yet allows it to be easy to operate.

Compact. The IC-730 is sized to be used mobile — either in a car, airplane or boat — to be carried in a suitcase, or to be used as a base station. Only 3.7 inches high by 9.5 inches wide by 10.8 inches deep, the IC-730 is a very compact package. Still the IC-730 sports a large tuning knob, large RIT knob, and large bandswitching knob to make mobile operation easy. The RIT control is conveniently located in the lower right corner to make access by touch easy while operating the unit mobile.

Convenience Features.

The IC-730 has important features that make the unit easy to operate in a mobile environment. Two VFOs are easily accessed at the push of a button. Normal or split operation and three separate tuning rates for fast QSY or slow tuning are available. The dial lock deactivates the main tuning knob for rock-solid stability without the possibility of moving off frequency. One memory per band is provided to allow storage of net frequencies or favorite frequencies at the push of a button.

Full-Featured. The IC-730 has additional features which make it a joy to operate. A full 200W PEP input transmitter provides a powerful signal on SSB and CW (40W carrier power on AM). Eighty through 10-meter coverage is provided including the bands at 10, 18, and 24MHz. A speech processor

is included as standard. Popular features such as digital readout, selectable AGC, VCX, SWR meter and noise blanker are also included as standard in the IC-730.

Complete. The IC-730 comes complete with a handheld microphone and power cord. The IC-730 is ready to use and ready to go when you are.

Affordable. Dollar-for-dollar, the ICOM 730 packs more punch and performance into a small package than ever thought possible.

Listen to IC-730s on the air and hear the sound of ICOM quality. The IC-730 is your best buy for a second rig for mobile portable operation or for your main HF station. See the IC-730 at your local ham equipment supplier today!



The World System

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USER FRIENDLY

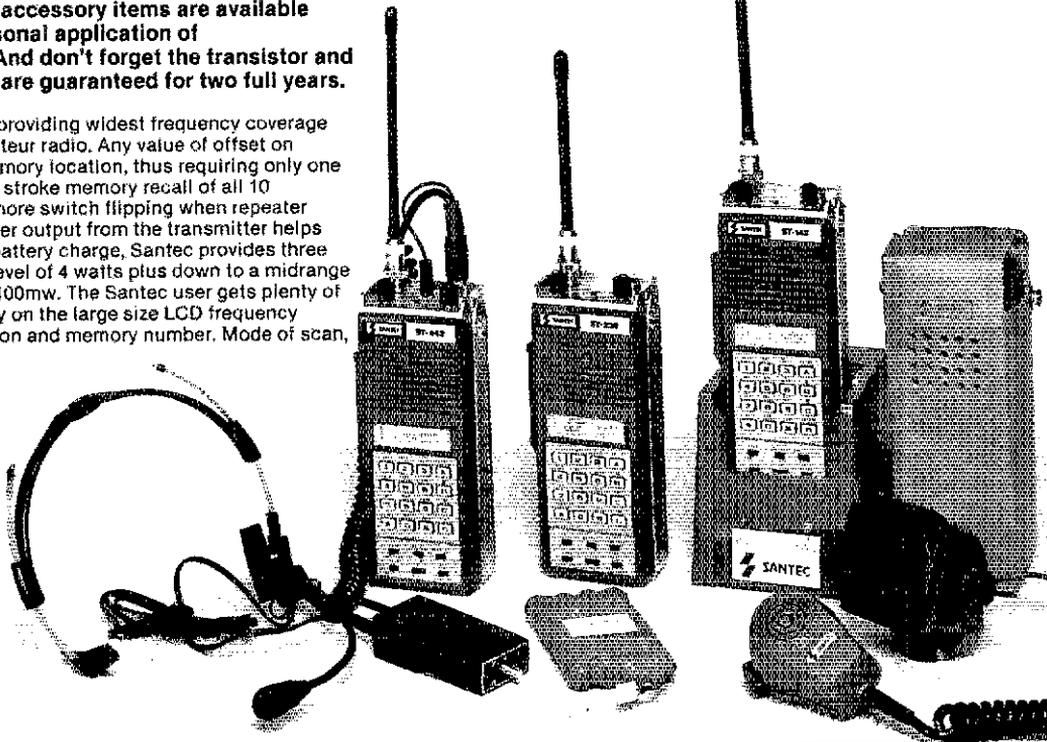
- SOFTWARE
- FEATURES
- VALUES



Smart enough to be user friendly means the newest Santec radios are more useful in your hands. Without sacrificing features and functions you really want, you can have an easier to use, yet smarter handheld from the broad line of models for the most popular VHF and UHF bands 144, 220, and 440 MHz. Plenty of accessory items are available for the Santec radios to make your personal application of Santecology (TM) the smoothest yet. And don't forget the transistor and semiconductors in all Santec products are guaranteed for two full years.

Santec's smarter handhelds help the user by providing widest frequency coverage for MARS and CAP operations as well as amateur radio. Any value of offset on 10 KHz steps can be set and stored in any memory location, thus requiring only one memory per transceiver frequency pair. Single stroke memory recall of all 10 memories and the required offset means no more switch flipping when repeater frequencies are changed. Because lower power output from the transmitter helps the user to get longer service times on each battery charge, Santec provides three switchable power levels from the full power level of 4 watts plus down to a midrange of around one watt and a battery conserving 100mw. The Santec user gets plenty of helpful information from the complete display on the large size LCD frequency display using six digits plus the offset direction and memory number. Mode of scan, PLL lock and the receiver and transmitter indicator are all usable at the same time without any extra effort. All the neat features you expect plus a good, solid performing transceiver section with excellent sensitivity and high quality audio make Santec your best choice for a handheld transceiver. For specifications and a full catalog of Encomm, Inc. products send us a QSL. Specifications subject to change without notice or obligation. Information in this ad does not constitute warranty.

144 MHz • 220 MHz • 440 MHz



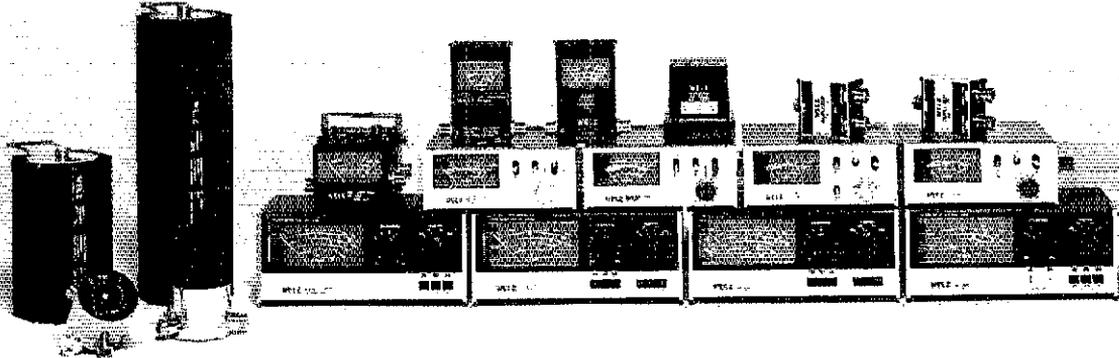
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THE WELZ CORPORATION LINE OF STATION ACCESSORIES

SUPERIOR ACCESSORIES

WELZ specializes in WATTS. Measuring Watts and switching Watts, radiating Watts and dissipating Watts is what the WELZ line of winners is all about. Welz is the source for top quality, superior performing, affordable products to compliment your mainframe radio equipment from any source. Increase the versatility of your measuring capability with WELZ WIDE-Z Sensor (TM) power and V.S.W.R. meters, precision 50 ohm terminations. Conserve your coax dollars with the dual band Diamond Antennas for 144/430-440 MHz for base and mobile applications. Welz dual band duplexers let you feed two antennas on two different bands with one feed line with no switching or two transmitters onto one dual band antenna simultaneously. WELZ has wattmeters and V.S.W.R. bridges from 200 mW to 2000 Watts from 500 kHz to 500 MHz frequency range. When you need to measure in RF Watts WELZ has a winner for you. The full line of Wattmeters encompasses many different models, some of which are shown in this family portrait. In addition to both in-line and terminating type wattmeters the WELZ line of Winners includes several high quality dummy loads for testing and tuning plus applications requiring precision 50 Ohm terminations. Frequency ranges of the WELZ loads are typically wider than similarly priced items from other sources. WELZ has winners in the economy circle also. The performance value of the economy line of Wattmeters from WELZ is really superior. The instruments from WELZ are extremely well built and very easy to view. The portable units such as the SP-10x and the SP-380 provide reliable service in the field as well as in the fixed station. Send QSL type card for complete catalog of WELZ products.





2m 25W Mobile Maxpack

- Liquid Crystal Display with soft orange lighting for direct sunlight viewing plus night viewing.
- Repeater Offsets (+, -, S) Stored in memory along with the frequency information.
- WIDE frequency coverage for MARS and CAP capability (142-149.995 MHz)
- New chrome front with soft pearl gray cabinet for today's auto decor.
- Memories with valid data scanned, blanks are skipped.
- Repeater reverse switch for monitoring repeater's input frequency.



The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the user. The KDK '33' series provides excellent readability in any lighting condition for the operating frequency and the memory channel in use. Warm orange background LCD displays improve readability by providing easy-on-the-eyes contrast.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall from memory of the desired repeater offset, the FM-2033 provides relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end-of-memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142-149.995 MHz to operate in balance with most repeaters and provide quieting for simplex operations. MARS (Navy tool) and CAP frequencies are also accommodated even with their unusual repeater splits.

You want convenience, reliability and easy operation for your mobile station and a tough-to-beat dollar value, right? Then check out the FM-2033 at your local dealer TODAY or send QSL for specifications. We think you will want one for yourself. Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

- 440 MHz—FM-6033
- 440 MHz—FM-7033
- 220 MHz—FM-4033



AMPLIFIERS • PREAMPS • COUPLERS

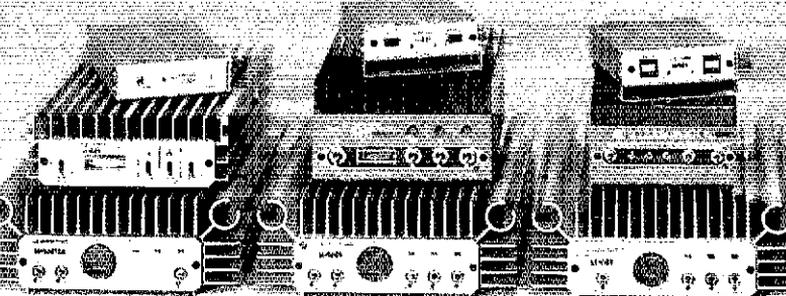
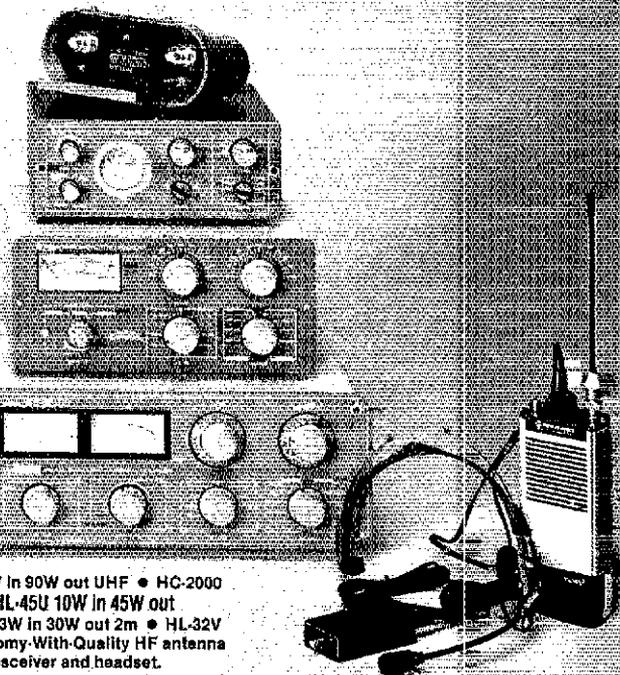
The helpful line of handsome products.

The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.



- Bottom row: HL-160V25 25W in 150W out 2m • HL-160V-3 or 10W in for 160W out 2m • HL-90U 10W in 90W out UHF • HC-2000 2KW antenna tuner • Second Row: HL-110 3 or 10W in 100W out 2m • HL-32V 10 in 80W out 2m • HL-45U 10W in 45W out UHF • HC-400 200W antenna tuner and VSWR Power Meter • Third Row: HL-30V economy HT amp 3W in 30W out 2m • HL-32V 3W in 15 or 30W out 2m SSB or FM portables • HL-20U .2 or 3W in 20W out UHF • HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 • Also shown is the MICRO-7 Utility UHF transceiver and headset.

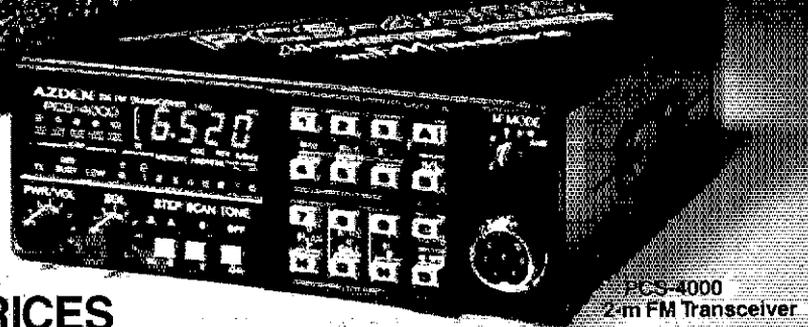
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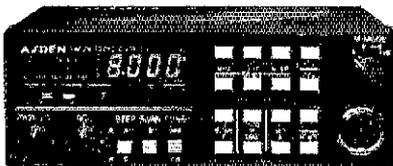
THE 4000 SERIES



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PCS-4800 10-m FM Transceiver

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PCS-300
2m Handheld
FM Transceiver
142-149.995 MHz

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142,000-149,995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220,000-224,995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440,000-449,995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50,000-53,995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28,000-29,990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2" H x 5.5" W x 6.8" D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 kHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; auto-resume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
- **TWO PRIORITY MEMORIES:** Either may be instantly recalled at any time. COMPARE!
- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies,

no matter what the offset.

- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/R/F METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE[®] PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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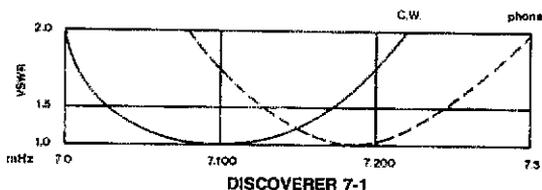
Rediscover 40 meters with the **DISCOVERER SERIES** Rotatable Dipole or Monoband Beams

This 40 meter antenna series gives you three choices. The Discoverer 7-1 which is a rotatable dipole. Or the Discoverer 7-2, a two-element beam you can upgrade to three elements with a kit.

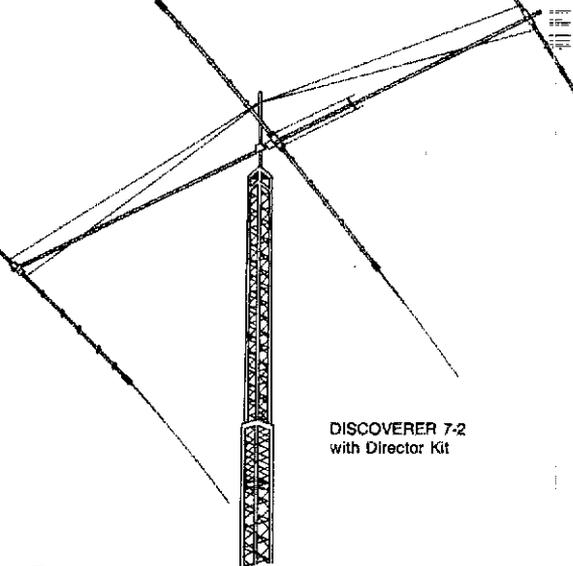
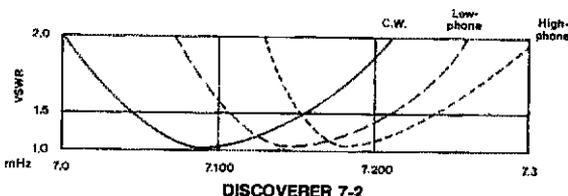
Whichever you choose, you'll get Hy-Gain's superior mechanical design. Such as tapered tubing to reduce weight and wind surface area. Maintenance-free stainless steel hardware and preformed clamps for an easy, rugged assembly.

You also get superior performance. Wide bandwidth with SWR of 1.5:1 or less at resonance. High-Q efficiency because there are no high-loss coils. A low voltage feed point that eliminates insulator failure and assures that the antenna can handle twice the new legal power limit.

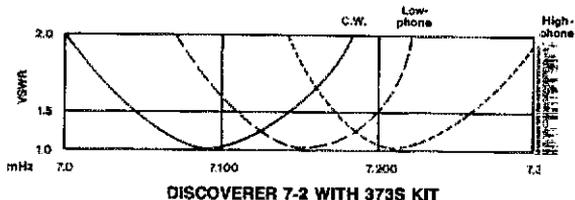
The Discoverer 7-1 dipole can be added to most existing rotatable beam installations. This model can be tuned to either 30 or 40 meters.



The Discoverer 7-2 requires only a 25 ft. (7.6 m) turning radius and opens communication doors you previously thought possible only on 20 meters. Combining the advantages of high forward gain and a high front-to-back ratio lets you hear and work stations you couldn't read on a dipole or vertical antenna. Best of all, you can upgrade this antenna anytime with the 373S Director Kit.



By adding the Director Kit to the Discoverer 7-2 you create a three-element beam on a boom of only 35 ft. (10.7 m), that outperforms many of the heavy-weight giants with much longer booms. In fact, the kit doubles the effective radiated power of the Discoverer 7-2, and nearly doubles the front-to-back ratio. And, because the antenna is still more compact than a "giant", you only need a medium-duty tower such as the HG52SS. All of which saves you money and space without compromising safety or performance.



The Hy-Gain Discoverer series gives you three choices, just when declining sunspot activity lends renewed importance to the 40 meter band.

TELEX hy-gain®

TELEX COMMUNICATIONS, INC.

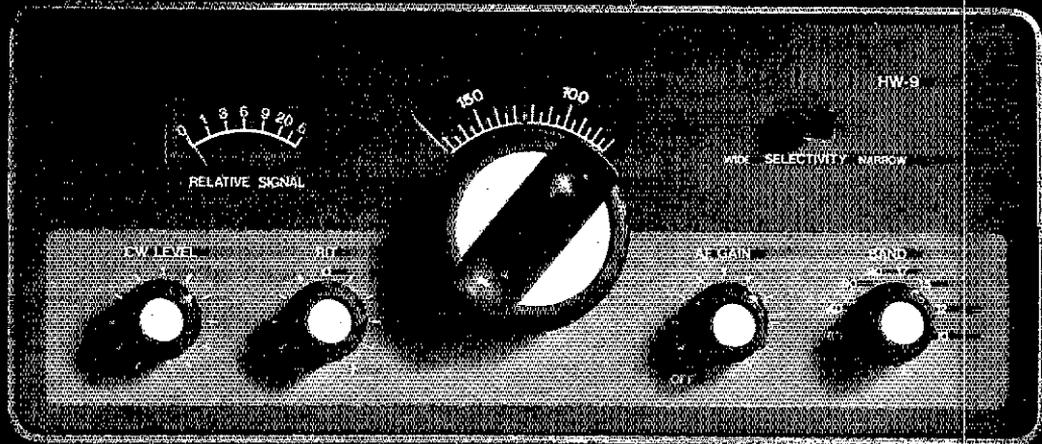
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The Tradition Goes On.

HW-7
1972

HW-8
1975

HW-9
1984



Exceptional Performance in a Great New Design. The All-New HW-9 Deluxe QRP CW Transceiver.

Setting the competitive standard in QRP CW has been our tradition through two generations of Transceivers. Now that tradition for excellence in performance, price and value brings to a new generation Heathkit Transceiver state-of-the-art micro-electronics and lightweight portability.

Designed for broadband coverage of 250 kHz of CW on 80, 40, 20 and 15 meters and expandable to the 30, 17, 12 (WARC bands) and 10 meters, the HW-9 brings greater versatility, reliability and ease of use to the field.

The HW-9 eliminates the necessity to fine tune each band. Its wide-band front end uses a double balanced mixer and 4-pole crystal filter to

pull in wide dynamic range signals. Solid state T/R switching provides for full break-in on any band. And the automatic AGC provides superior receiver performance and audio response.

The unit features single conversion in the main signal path, greatly reducing spurious responses while attaining outstanding image rejection. A full four watts of RF output power (three watts on 10 meters) is available on transmit. RIT (Receiver Incremental Tuning) permits tuning the receiver 1 kHz above or below the transmit frequency. And the tuning dial is calibrated in 5 kHz increments for easy identification of frequency.

Rugged and lightweight, the HW-9 is ideal for portable operation. Transceiver can be powered from batteries, a lighter socket, solar power units or 120/240 VAC with the HWA-9 compatible power supply.



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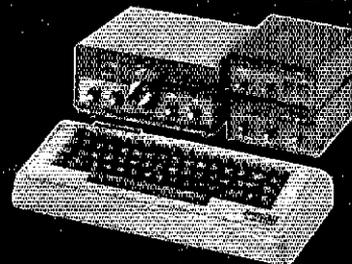
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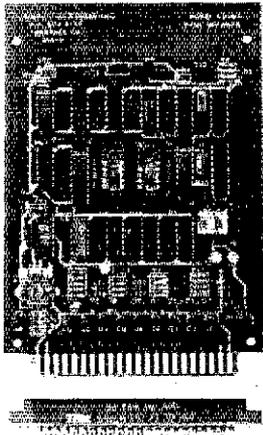
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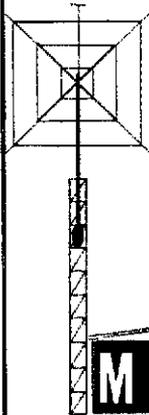
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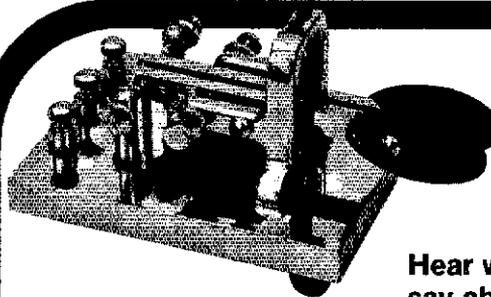
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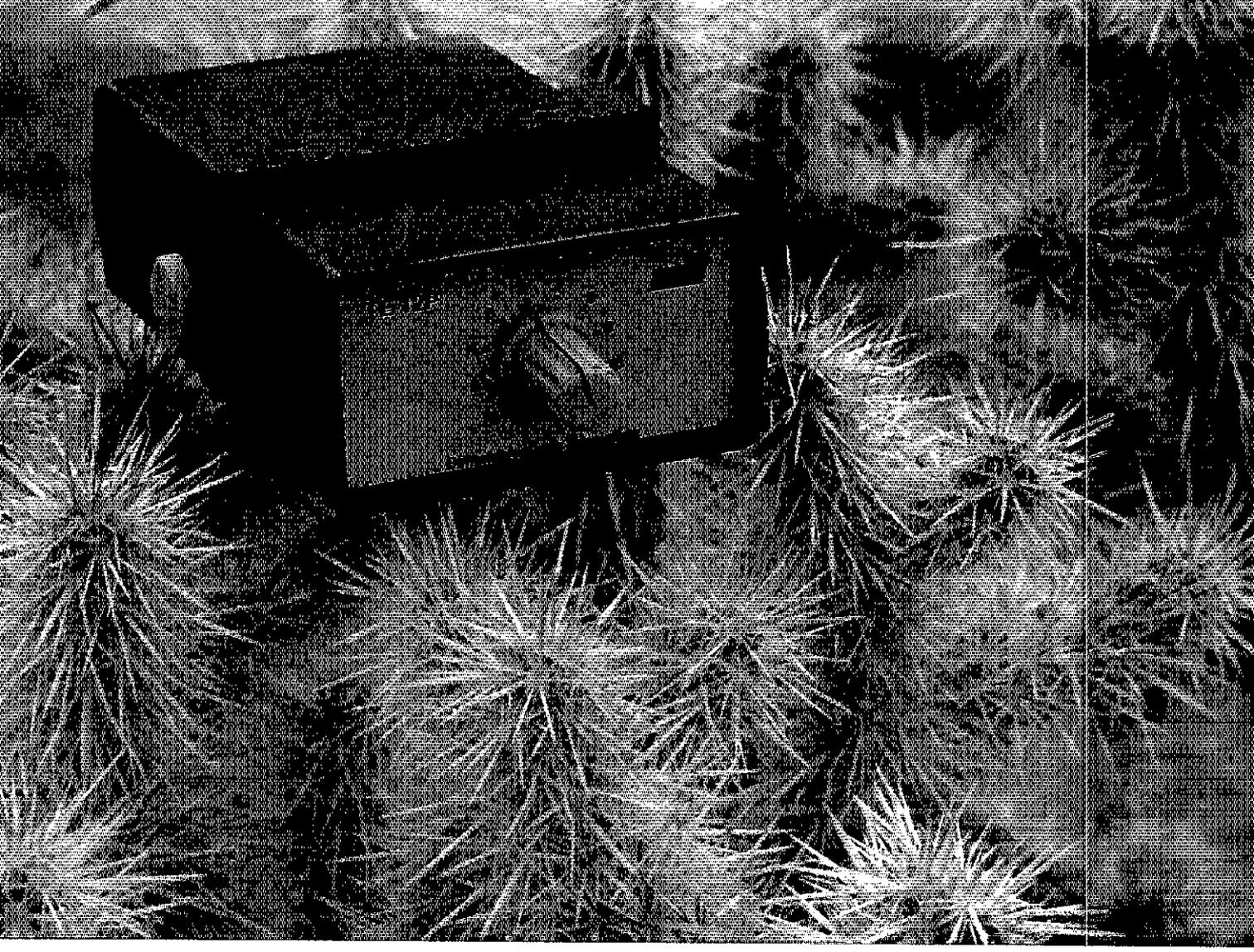


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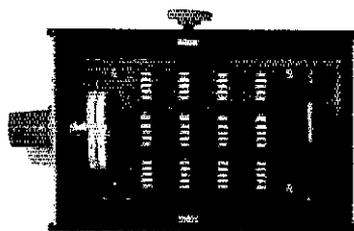




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74.4 WA	91.5 ZZ	110.9 2Z	136.5 4Z	167.9 6Z	
77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
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1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy, ± 1 Hz maximum -40°C to $+85^{\circ}\text{C}$
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

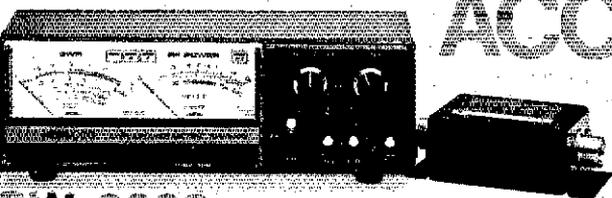
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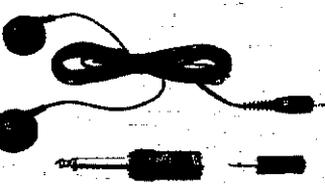
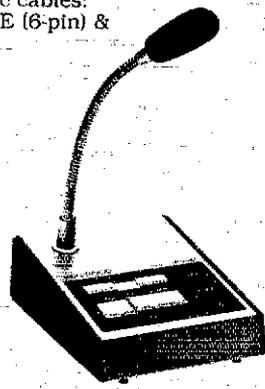
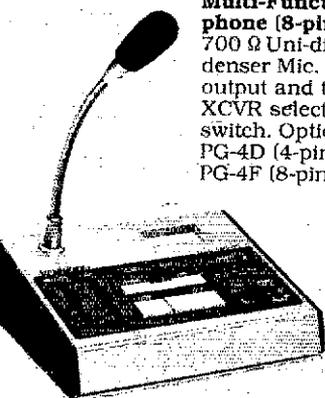


SW-2000

160~6-m 2 KW SWR/PEP-Power Meter
Up to 3 separate directional couplers may be connected.
One SWC-3 is supplied. Optional couplers:
SWC-2 (2-m/70-cm, 200 W) & SWC-3 (160~6-m, 2 KW).

MC-85

Multi-Function Desk Top Microphone (8-pin)
700 Ω Uni-directional Electret Condenser Mic. Built-in mic-amp with output and tone control, meter, XCVR selector and UP/DOWN switch. Optional mic cables: PG-4D (4-pin), PG-4E (6-pin) & PG-4F (8-pin).

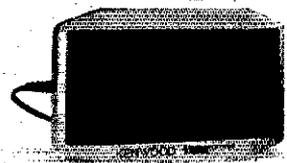
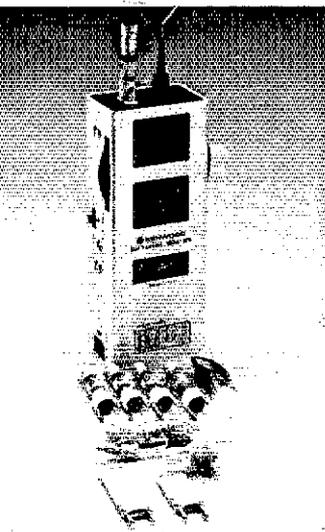


MC-80

Desk Top UP/DOWN Microphone (8-pin)
700 Ω Uni-directional Electret Condenser Mic. with "FLEX" type boom. Built-in mic-amp and UP/DOWN switch. Optional mic plug adaptors: MJ-84 (8p-4p) & MJ-86 (8p-6p).

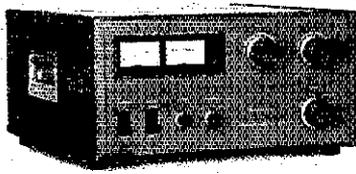
HS-7

Micro Headphones (16 Ω)
Ultra light weight and portable ear-fitting headphones supplied with two audio adaptor plugs.



SP-50

High Quality External Mobile Speaker



TL-922A

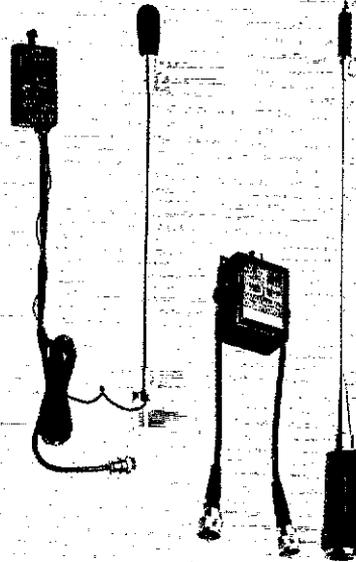
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MC-55 (8P/6P)

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MA-4000

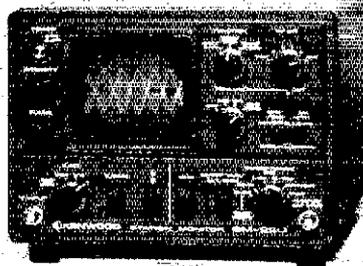
2-m/70-cm Dual Band Mobile Antenna

5/8 λ for 2-m and stacked 5/8 λ for 70-cm. Duplexer is supplied.



PC-1A

Phone Patch (FCC Part 68 registered)



SM-220

Station Monitor/High-Performance Oscilloscope
Pan-display capability with optional BS-8 (for TS-830S/820S/180S) or BS-5 (for TS-520 series). Transmitted waveforms and/or receiving signal waveform monitor. Built-in 2-tone generator.



SW-100A/B

A: 160-m~2-m. B: 2-m~70-cm. 150 W SWR/POWER/VOLT Meter
Compact design with separate coupler. Ideal for mobile use. Built-in 0-20 V voltmeter.

MICROPHONES:

- **MC-60A** Deluxe desk top microphone with UP/DOWN switch. (8-pin) Pre-amplifier. 500/900 Ω
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included). (4-pin) 50 k/500 Ω
- **MC-50** Desk top microphone. 50 k/500 Ω (4-pin)
- **MC-48** 16-key auto patch UP/DOWN microphone. (8-pin)
- **MC-46** 16-key auto patch UP/DOWN microphone. (6-pin)
- **MC-42S** Hand microphone with UP/DOWN switch (8-pin)
- **MC-35S** Noise-cancelling hand microphone. 50 k Ω (4-pin)
- **MC-30S** Noise-cancelling hand microphone. 500 Ω (4-pin)

MICROPHONE CABLES:

- **PG-4A/4B/4C** For MC-60A/60N4: PG-4A (4-pin)/4B (6-pin)/4C (8-pin)
- **PG-4D/4E/4F** For MC-85. PG-4D (4-pin)/4E (6-pin)/4F (8-pin)

MICROPHONE PLUG ADAPTORS:

- **MJ-48** (4-pin mic to 8-pin XCVR)
- **MJ-84** (8-pin to 4-pin)
- **MJ-86** (8-pin to 6-pin)

HEADPHONES:

- **HS-6** Lightweight headphones
- **HS-5** Deluxe headphones
- **HS-4** Standard headphones

GENERAL PURPOSE AC POWER SUPPLIES:

- **KPS-7A** 13.8 VDC/7.5A intermittent
- **KPS-12** 13.8 VDC/12A intermittent
- **KPS-21** 13.8 VDC/21A intermittent

ANTENNAS:

- **RA-3** 2-m 3/8 λ Telescoping antenna with BNC connector
- **RA-5** 2-m 1/4 λ /70-cm 5/8 λ Telescoping dual-band antenna with BNC connector

Other accessories:

- **RD-20** Dummy load, 50 Ω , DC-500 MHz, 50 W intermittent
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- **AL-2** Lightning & static protector, 50 Ω 1 KW output
- **PG-3A** DC line noise filter for mobile

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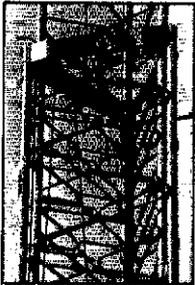
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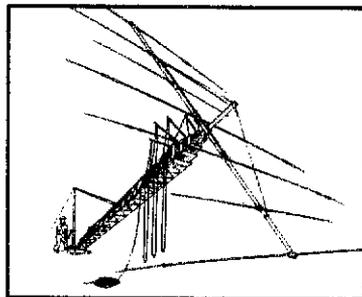
	Tower Sections	Height Extended	Height Retracted	Width at Base	Antenna Windload Limit	Weight
HG-52SS	3	52 ft. 15.8 m	21 ft. 6.4 m	16.44 in. 417.6 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	455 lbs. 206 kg
HG-37SS	2	37 ft. 11.3 m	20.5 ft. 6.2 m	13.75 in. 349.3 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	265 lbs. 120 kg
HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
HG-70HD	4	70 ft. 21.3 m	21.5 ft. 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg

Hy-Gain crank-up towers come complete with hinged base, installation steelwork, pre-drilled rotator plate and a manual winch.

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Electric winch/Remote control
 • Mast • Thrust bearing • Coax arms • Rotators • Tower Gin Pole



An accessory tilt-over gin pole allows one person to tilt the tower over to ground level.

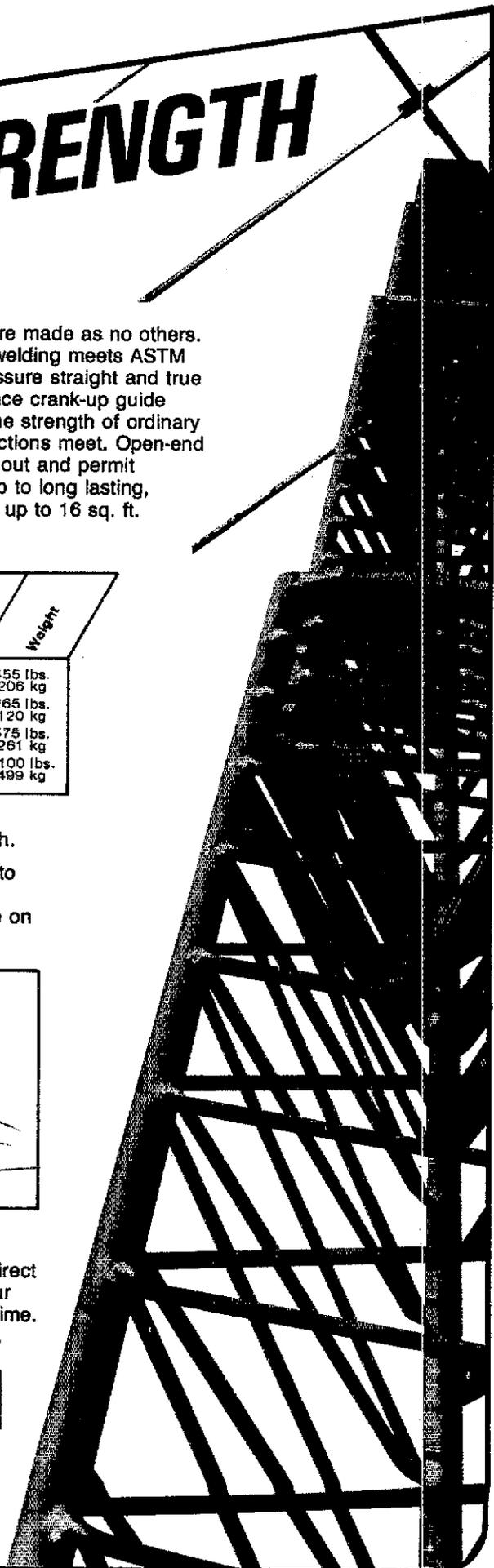
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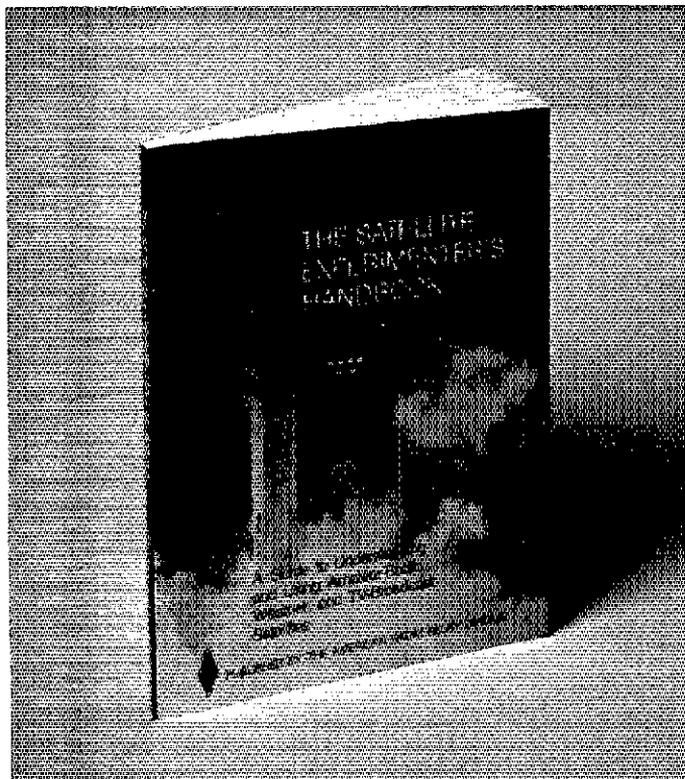
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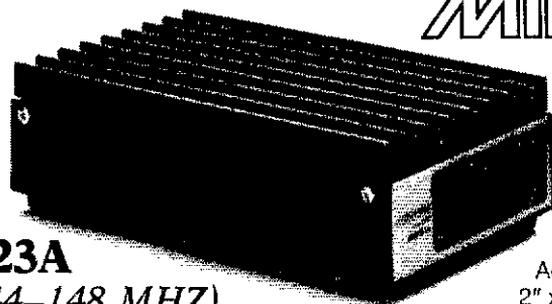
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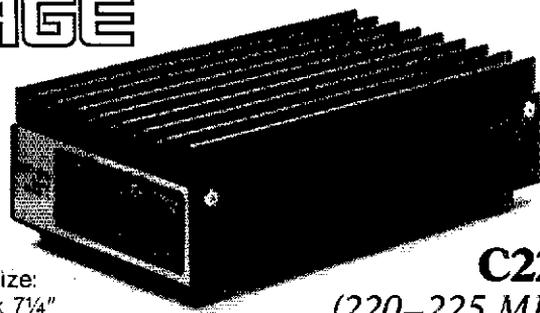
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(144-148 MHz)

- 2 Watts in = 30 Watts out
- Built-in Receive Preamp.
- All mode operation (FM, CW, or SSB)
- Automatic Antenna Changeover



C22A
(220-225 MHz)

- 2 Watts in = 20 Watts out
- Built-in Receive Preamp
- All mode operation (FM, CW, or SSB)
- Automatic Antenna Changeover

Actual Size:
2" x 3 1/2" x 7 1/4"

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SIGNAL GENERATORS: HP616A 1.8-4.2 GHz, covers MDS/ITFS bands. HP618B 3.8-7.6 GHz, Covers satellite up/down links. \$150 each, manuals included. R. Hall, KA4WSV, Falls Church, VA 703-534-7107.

VIC-20 RTTY station, 16K, cassette, expander, Kantronics Interface, Hamsoft, games, programs. \$395, N6UC, 714-544-5369.

COAX RELAYS: SPDT, BNC 24 Vdc enclosed coil, Amphenol type, silver-plated, 2 GHz, super value at \$14.95 ea PPD, others in stock. W3ZD, 520 Centennial Road, Warminster, PA 18974, 215-675-4539.

SELL: Hallicrafters SX-101, \$135; Collins 75A-4, speaker, vemler, 3.1, \$295; Viking I, VFO, \$75; Viking II, VFO, \$75; Collins 310B-1, \$115; Vallant I, \$135; Vallant II, SSB adapter, cables, \$275; 1939 Silvertone-Howard, speaker, \$85; HT-18, \$45; 3000 Watt Sears Generator, \$475; EICO 200 W 80-40-20 xcvr, \$75; pair of 1000T's linear, \$3,000; BC-610 I, \$275; Dentron 160KV, \$90; 100-foot pneumatic trailer-mount mast, compressor, \$2,900; Alpha PA775, \$4,500; Signal-One Mil-spec 1030, CW filter, multi-color LED, 200 W, all-freq, options, \$5,500, FOB. Want: 200 to 500-foot Robin self-supporting tower, Telrex 40M, Hy-Gain 80-10, 40-10 log periodic, R-3503. K8CCV, 216-427-2303, 6-9 PM EST weekends.

DIGITAL DISPLAYS for FT-101's, T8-520's, Collins, Drake, Swan, Heath and others. Write for information. Grand Systems, P.O. Box 3377, Blaine, WA 98230, 604-530-4551.

FOR SALE: Hammarlund Super Pro SP400S transceiver w/spk and mike, appearance mint. Best offer. KA4HRI, Paul Beck, 4 White Ln., Long Beach, NC 28461. Tele: 919-278-5542.

SELL Ten-Tec Argosy-525 with 225-pwr sup. \$450. W6XM, 619-459-5527.

WANTED: Collins KWM-1 front panel crystal plug-in unit with crystals. Richard WB7NYM, Box 1, Pima, AZ 85543.

YAESU FT227RB w/scan, tonepad \$175. Kenwood ST-1 base stand charger for TR-2400, \$60. KLM 2-25 amplifier \$65. Yaesu FP301D power supply 13.5V/25A clock, speaker \$80. Byron Looney, K6FI, 6540 Buckley Dr., Cambria, CA 93428, 805-927-8733.

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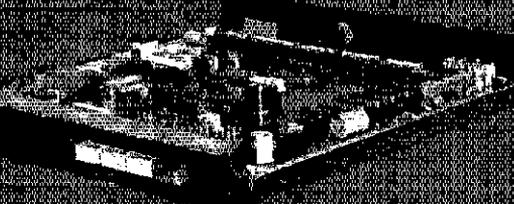
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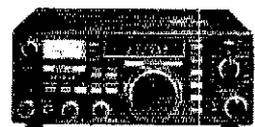
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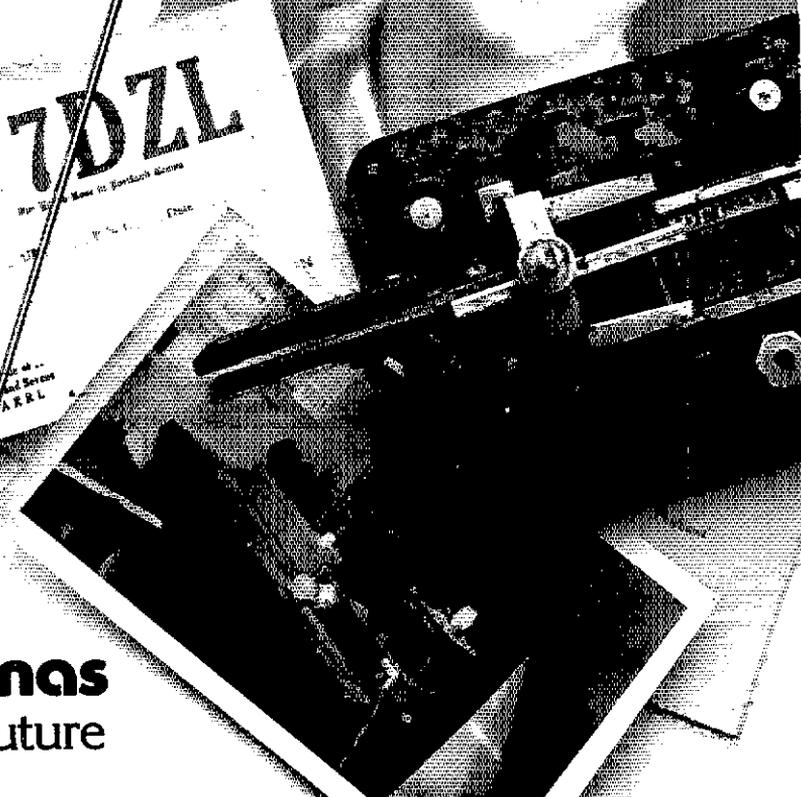
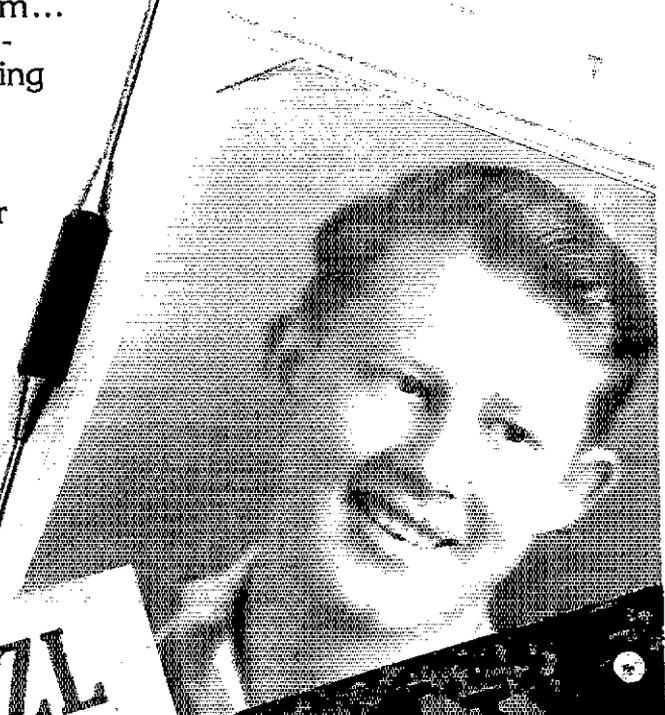
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HEATHKIT SALE: SB-200 linear amplifier, excellent condition, \$300. Contact K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

SELL: Dentron MLA-2500 with 10 meters and spare set of 8B75 tubes \$775. DS1 3250 counter \$25. MFJ SWR meter \$25 plus a couple Radio Shack SWR meters for less. You ship. W6GMC, 328 Harsin Lane, Santa Maria, CA 93455.

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WANTED: Collins KW-1 transmitter. Paul Kluewe, Box 84, Manchester, MI 48158. 313-428-7200.

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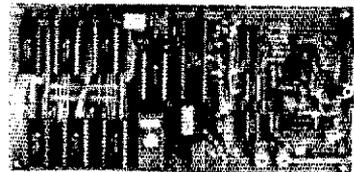
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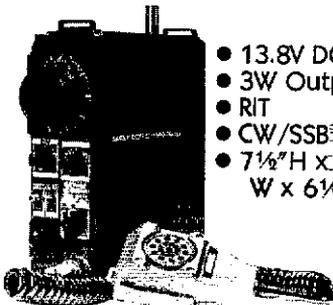
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IBM-PC RTTY: CompRtty is a comprehensive RTTY communications program for the IBM-PC. Features include: all standard ASCII and BAUDOT speeds, selectable parity, split screen display with status, hardcopy, diskcopy, key-string detect for autostart/stop, text file transfer, auto-logging, 12 programmable messages. Ideal for traffic handling. Requires 64k PC-DOS 1.1 or 96k PC-DOS 2.0, disk, IBM compatible serial port and an RS-232C compatible TU. \$50. David A. Rice, KC2HO, 7373 Jessica Drive, North Syracuse, NY 13212.

GR-295 25" Heathkit TV in walnut console, \$125; Tangberg Model 64 tape recorder, \$100. St. Louis Metro Area, K4LAP, 618-344-3400.

FOR SALE - Hammarlund HQ-129-X speaker & microphones. Best offer. Ph. 516-944-9348, Sundstrom.

SELL: Heath, Drake, accessories, equipment. Reasonable. S.A.S.E. for list, prices. Joe Bedioviets, 241 Dover St., Bridgeport, CT 06610.

WANTED: UTC S-48 plate transformer and S38 choke. F. R. Claus, W3QM, 310 McKinney Rd., Wexford, PA 15090.

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ADRIAN WEISS, K8EEG/W0RSP, CQ's QRP Editor, explains strategies for successful QRP operation for your set-up, objectives and location in 7 detailed chapters. (1-2) Overview: activities, clubs, awards. (3) Factors to consider in planning QRP operation—objectives, operating times, location, antenna capabilities, propagation/band selection. (4) Equipment: QRP to QRP mods. (5) Homebrewing first QRP station. (6-7) Operating techniques: General. Specific types/events. (about 160 pages), 5 1/2 x 8 1/2, 38 illustrations. Postpaid: \$10.95 (U.S.), \$11.95 (Foreign)

ADRIAN WEISS, 83 Suburban Estates Vermillion, SD 57069 - Available June 15, 1984



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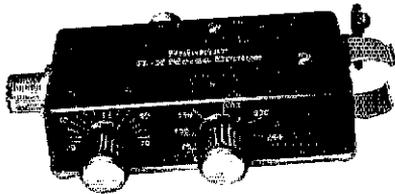
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Lee Aurick, W1SE, Advertising Manager
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Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

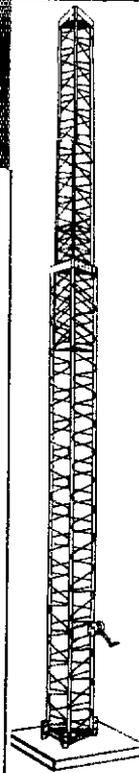
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And - Save even more - include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HGX40	48 ft.	10 sq ft.	164	BX86	289	24	313
HGX48	48 ft.	10 sq ft.	303	BX87	389	26	395
HGX56	56 ft.	10 sq ft.	385	BX88	449	30	479
HDX40	48 ft.	18 sq ft.	281	BX87	339	26	385
HDX48	48 ft.	18 sq ft.	363	BX88	429	30	459



hy-gain

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All Models Shipped Factory Direct - Freight Paid*

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting - no guys needed!

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Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

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Upto 600 Itria UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X \$.19/ft \$179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket
- Foam Dielectric

Cable Type	Imped	10MHz	30MHz	150MHz	450MHz
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RG8X	52	8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
1/2" Alum	50	3	5	1.2	2.2
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Lowest Loss for VHF/UHF!

- 1/2" Alum. w/poly Jacket. \$.79/ft
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Cable Type	UHF FML	UHF MALE	N FML	N MALE
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(Motorized)						
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(Motorized)						

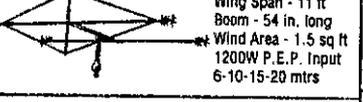
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Model	Height	Ant Load*	Price
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FK4544	44 ft	34.8 sq ft	\$1159
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25G Foldover Double Guy Kit. \$249
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*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid! Foldover prices 10% higher west of Rockies. All Rohn 25G & 45G Accessories in stock - Call!

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12 in Wall	\$25	\$49	\$59	\$79
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25 in Wall	\$69	\$129	\$189	\$249

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- HDT-15 15 ft Tripod. \$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

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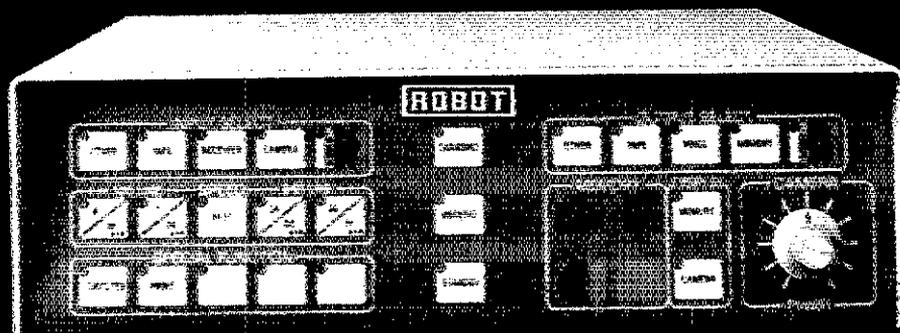
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COLORED SSTV



Introducing the Robot 450C and 1200C Single Frame Color SSTV Converters

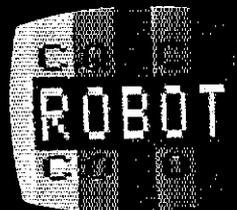
Robot's new color slow scan TV converters provide you with a whole new dimension of Amateur Radio activity. Now you can exchange color pictures of your latest DX QSL card, the best stamp in your collection, or even that terrific sunset scene you shot last summer.

Robot's microprocessor controlled color SSTV equipment provides a significant breakthrough in the transmission of single frame color images known as "Time Multiplex Color Component System" (TMCCS). This method was chosen as being faster, easier to use and more reliable than the cumbersome frame or line sequential systems now in use, as well as being black and white compatible with the thousands of slow scan stations already on the air world wide.

In addition to having fast, single frame color capability as with the Robot Model 450C, the Model 1200C also offers

sharp, high resolution color pictures that rival commercial broadcast television! With all their flexibility, interfaceability and dependability, the Models 450C and 1200C will be in the forefront of technology for years to come. Their new multi-dimensional SSTV standards will be the pace-setters in the industry.

There are even more features and capabilities too numerous to be listed here, such as computer interface, automatic fine tuning, multi speed operation and many more, so see your dealer today for literature and a demonstration, or write:



ATTENTION MODEL 400 OWNERS: Now you can have single frame color SSTV capability too by installing the Model 400C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.



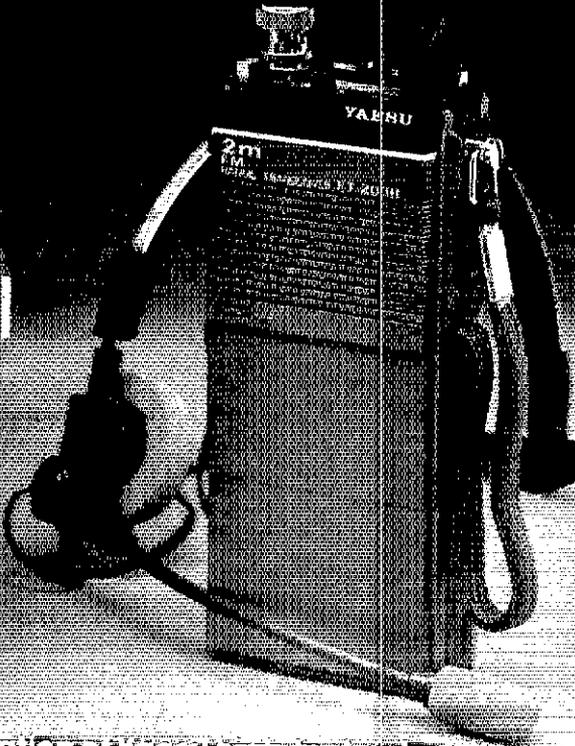
Also introducing the new Robot Model 800C Super Terminal with color graphics capability when used with the new Robot color scan converters. Also has expanded memory with lithium battery back-up, and has both serial and parallel printer interface. A complete terminal for RTTY and Morse Code.

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THE NEW LOOK AT YAESU



tired of paying too much for your Ham gear. The new generation of Yaesu high technology equipment is designed with you in mind! New advances in computer-aided design and robotics manufacture help you save money while being assured of the best... from Yaesu!

FT-9B7GX Line Affordable Excellence

FT-203R Line The Compact Companion

GENERAL COVERAGE
Continuous coverage on RX from 500 kHz to 29.99 MHz in 10 Hz steps with easy modification for MARS TX outside the Ham bands. WARC bands factory installed.

ULTRA-COMPACT DESIGN
Chip components installed by Yaesu's assembly robots significantly reduce circuit board size resulting in a rugged, reliable transceiver with a weight of only 450g, including the standard FNB-3 battery.

ACCESSORIES FACTORY PACKED
Electronic keyer, 600 Hz CW filter, speech processor, AM and FM units, all-mode squelch, Woodpecker noise blanker, and receiver preamp... all included in the base price, not expensive options!

HANDS FREE VOX
A VOX (voice-actuated transmit) unit is built-in, allowing hands-free operation when the optional YH-2 Headset is used. Ideal for tower work, public safety, or other applications where manual PTT control is inadvisable. Level control provided.

FULL PERFORMANCE
Full CW QSK, full 100 watts output at 100% duty cycle (SSB, CW, FM), and full microprocessor control with dual VFOs, eight memories with bilateral memory, VFO swap, and personal computer (CAT) System compatibility make the FT-9B7GX a winner, at home or away.

FULL FLEXIBILITY
Built-in S-meter, thumbwheel frequency programming, HI/LO power switch, busy channel and transmit indicators are standard. DTMF Encoder versions, as well as 220 MHz and 440 MHz lines, are coming soon!

FT-9B7GX ACCESSORIES
FP-757GX Switching Power Supply, FP-757HD Heavy Duty Power Supply (for 100% duty cycle operation), FC-757AT Automatic Antenna Tuner with Memory, FAS-1-4R Remote Antenna Selector, SP-102 Speaker with Audio Filters, MD-188 Desk Mic, MH-188 Hand Mic, FIF-232C Computer Interface Module.

FT-203R ACCESSORIES
FIS-7 CTCSS Module, FBA-5 AA Cell Case, YH-2 Headset, MH-12 Speaker Mic, FNB-4 High Capacity Battery, PA-3 Mobile Adapter, MMB-21 Mobile Hanger, NC-15 Quick Charger, AC Adapter, FTI-3 DTMF Keypad.

Whether you're in the market for a portable or desktop radio, Yaesu's design team will create and build a radio for you. Yaesu will be your first choice.



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YAESU CINCINNATI SERVICE CENTER 20710 W. Chester Road, Cincinnati, OH 45244

KENWOOD

the answer in a portable radio

TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contesters. Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10-meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB,

CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up. (batteries not supplied). Dual mode adjustable noise blanker, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and side-tone control. IF notch filter, tuneable audio peaking filter. Unique six digit white fluorescent tube digital display, easy on-the-eyes during those long contests. RF speech processor, for higher average "talk-power". SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in. 120, 220, or 240 VAC.

TS-930S Optional Accessories:

AT-930 automatic antenna tuner, SP-930 external speaker with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (16 kHz) AM filter, all plug-in type. 50-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-47S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160-6-meter, SW100A SWR/power/volt meter, 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Ico-Kenwood Communications, 111 West Walnut Street, Compton, California 90220.



Specifications and prices are subject to change without notice or obligation.

