QST

December 1979 $2.00

devoted entirely to Amateur Radio

Excitement in store for users of Phase III

*Shown with accessory touch tone pad

PROVEN DEPENDABILITY

...THE TEMPO S-1 KEEPS WORKING WHEN THE GOING GETS TOUGH

By now most of you have heard the same words of praise on the air that we (gratefully) receive over and over. The quality that is built into the S-1 has been attested to by the outstanding performance and dependability of the thousands of units in daily use. It's simple to operate and the high level of innovative engineering that brought forth the Amateur world's first hand held synthesized radio also designed into this compact beauty exciting performance and features at a very affordable price. A price that also includes a ni-cad battery pack, charger, and a telescoping whip antenna. The optional touchtone pad shown in the illustration adds greatly to its conveneince. In addition we offer superior quality 30 and 80 watt solid state matching power amplifiers that give the S-1 the flexibility of operating as a portable, mobile, or base station rig.

Remember...the Tempo S-1 is the original and proven 800 channel synthesized hand held transceiver. Don't be fooled by substitutes.

The TEMPO S-2... the world's first synthesized 220 MHz hand held transceiver. With an S-2 in your car or pocket you can use any 220 MHz repeater in the United States. It offers all of the advanced engineering, premium quality components and exciting features of the S-1. It is completely synthesized, offering 1000 channels in an extremely lightweight but rugged case.

If you're not on 220 it's about time you try it and this is the perfect way to get started. With the addition of a matching Tempo solid state amplifier you can use your S-2 as a powerful mobile or base station as well. It's all you really need. And if you already have a 220 MHz rig, the S-2 will add versatility you never dreamed possible.

Also . . . the price is right. The ni-cad battery pack, charger, and telescoping whip antenna are included. Although not a necessary option, the touch tone pad shown in the illustration adds greatly to its convenience at a low price.

The time has never been better to expand your horizons . . . there has never been a better little rig for 220 than the S-2.

Price...$349.00
With touch tone pad...$399.00

The Tempo line also features a fine line of extremely compact UHF and VHF pocket receivers. They're low priced, dependable, and available with CTCSS and 2-tone decoders. The Tempo FMT-2 & FMT-42 (UHF) provide excellent mobile communication and features a remote control head for hide-away mounting.

The Tempo FMH-42 (UHF) and the *NEW* FMH-12 and FMH-15 (VHF) micro hand held transceivers provide 6 channel capability, dependability plus many worthwhile features at a low price. FCC type accepted models also available.

Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

SPECIFICATIONS

Frequency Coverage:	144 to 148 MHz
Channel Spacing:	Receive every 5 kHz, transmit Simplex or ±600 kHz
Power Requirements:	9.6 VDC
Current Drain:	17 ma-standby 500 ma-transmit
Batteries:	8 cell ni-cad pack included
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")
RF Output:	Better than 1.5 watts
Sensitivity:	Better than .5 microvolts

Price... $349.00

With touch tone pad... $399.00

SUPPLIED ACCESSORIES

Telescoping whip antenna, ni-cad battery pack, charger

OPTIONAL ACCESSORIES

Touch tone pad (not installed): $39 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Rubber flex antenna: $8 • Leather holster: $16 • Cigarette lighter plug mobile charging unit: $6 • Matching 30 watt output 13.8 VDC power amplifier (S30): $89 • Matching 80 watt output power amplifier (S80): $149

HENRY RADIO 51 YEARS OF SERVICE

NEW TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

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Butler, Missouri 64730 816/679-3127

Henry Radio

Prices subject to change without notice.

The VBC Model 3000, the world's first and only narrow band voice modulation system is now a proven success. Leading communications engineers were enthusiastic about the NBVM system from the beginning. Now the idea of more QSO's per kilocycle has fired the imagination of Amateurs everywhere. The benefits of this advanced communications system are being demonstrated all over the world.

For present VBC users we can provide a list of other happy owners. For those Amateurs, who have not experienced NBVM yet, "why not add your name to the list?"

The VBC Model 3000 provides full audio level compression and expansion... complete intelligibility in only 1300 Hz bandwidth. It permits you to take full advantage of other stations' RF speech clippers and processors... similar to the amplitude compression and expansion used for many years in telephone and satellite communications.

The Model 3000 is for mobile and fixed station use and requires no modifications to your existing equipment. It is completely self contained, including its own audio amplifier. The unit automatically switches into transmit mode when microphone is keyed or voice operation is used. It connects just after the microphone on transmit and just prior to the speaker on receive. In addition to its basic function of operating in a narrow bandwidth, the Model 3000 also increases the performance of your station in the following ways:

- Reduces adjacent channel interference
- Increases signal to noise ratio
- Increases communications range

Some of its outstanding features include:

- High quality narrow band speech
- Self contained transmit/receive adapter
- Built in audio amplifier
- 5 active filters with a total of 52 poles
- Rugged dependable hybrid IC technology
- Low power consumption

Receive only features, such as sharp voice and CW filtering and amplitude expansion, provide improved reception without requiring a unit at the transmitting station.

For the more advanced experimenter the Model 3000 is available in a circuit board configuration for building into your present transceiver.

Henry Radio is ready to offer technical assistance and advice on the use and servicing of the Model 3000 and will help introduce new owners to others operating NBVM units. Get in on the ground floor... order yours now.

Price: VBC Model 3000 $349.00
Circuit board configuration $275.00

For more detailed information please call or write. The Model 3000 will be available from most Tempo dealers throughout the U.S. and abroad.

NEW TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

HENRY RADIO 51 YEARS OF SERVICE

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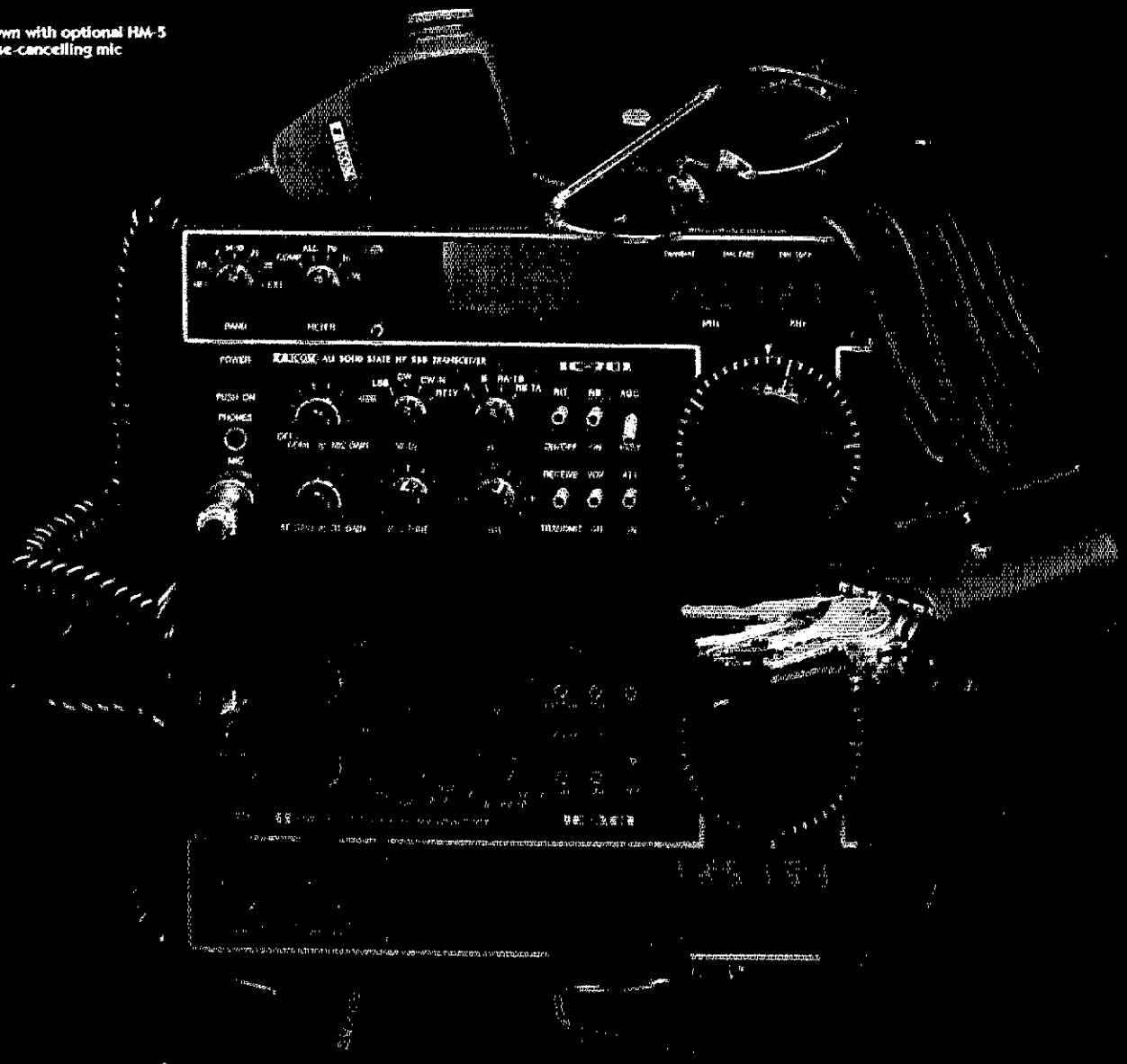
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

Henry Radio

Prices subject to change without notice.

Shown with optional HM-5 noise-cancelling mic



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When you're ready for the maximum in mobile HF, you're ready for the IC-701.

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ICOM and mobile HF: nobody does it better.

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Bellevue, WA 98004

Please send me: ☐ IC-701 specifications sheet; ☐ full color ICOM Product Line Catalog; ☐ List of Authorized ICOM Dealers.

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THE COVER

The AMSAT-OSCAR Phase III test unit undergoes prelaunch tests at Toulouse, France, earlier this year (AMSAT/DL photo). See page 61.

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DID YOU WORK THIS DX-PEDITION?

This photo was taken during the Spratley Island expedition to the South China Sea. During this DX-pedition there were thousands of contacts made with help from several Clipperton L's. If you weren't a part of this excitement maybe it's time you hooked up with DenTron.

The DX-peditions listed to the right have all carried our products for two reasons: performance and reliability. But you don't have to be in the far reaches of the world to need dependable equipment. As a DenTron owner you too can rely on your gear to get you into the fun of a DX-pedition.

Running DenTron equipment is the next best thing to being there!

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and many more to come.

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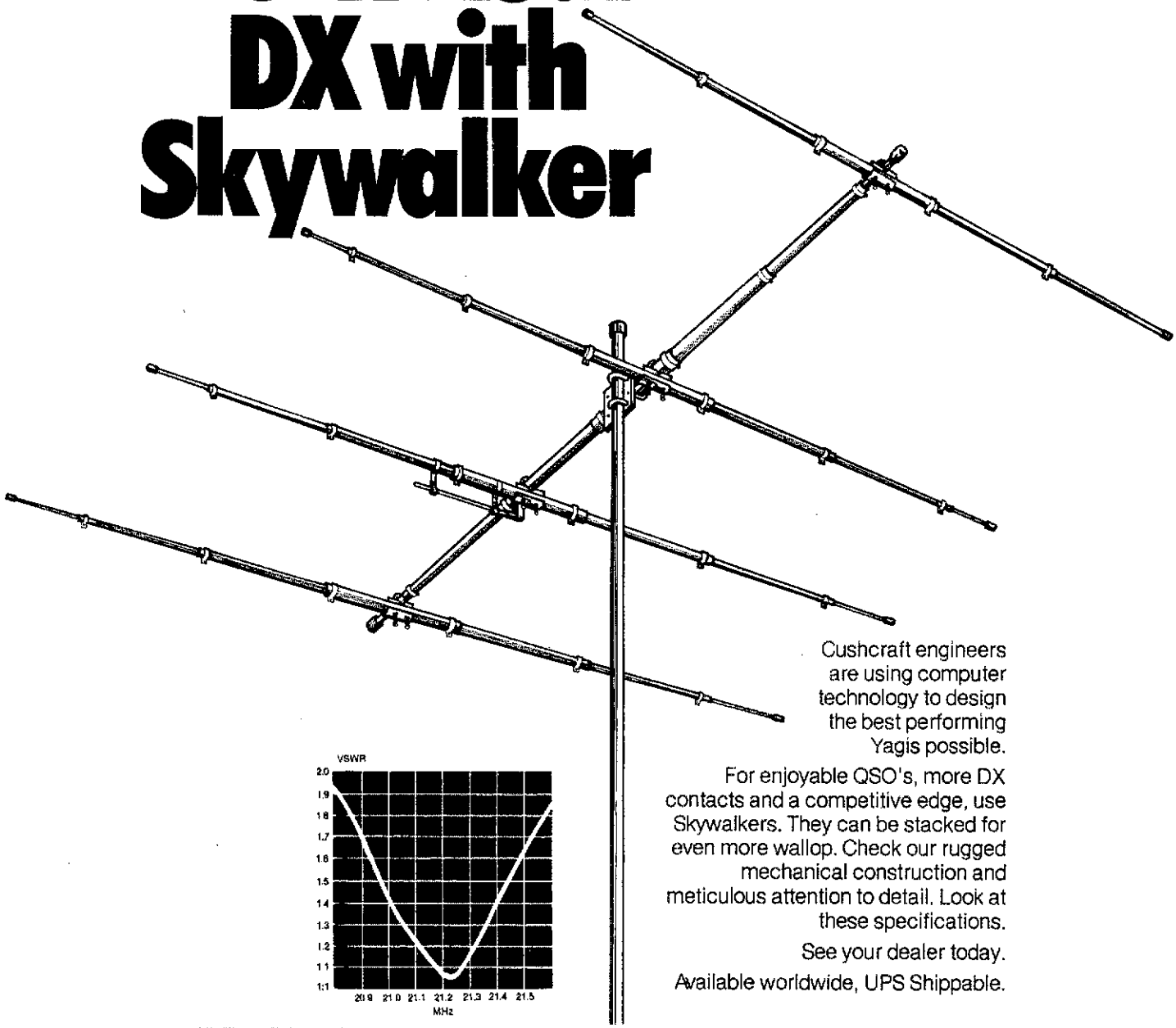
For a free 17" x 22" poster of this Spratley Island photo, stop in and see your nearest DenTron Dealer.

Work Real DX with Skywalker



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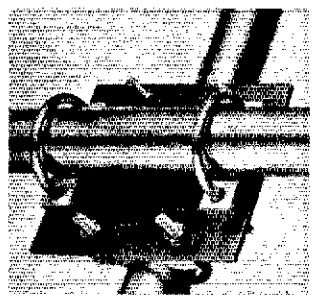

MODEL	BAND	ELEMENTS	LONGEST ELEMENT	BOOM	BEAM WIDTH	TURNING RADIUS	WEIGHT
20-4CD	20	4	35ft 10in	32ft	57°	23ft 4in	50lbs
20-3CD	20	3	35ft 8in	18ft	56°	20ft	30lbs
15-4CD	15	4	23ft 4in	20ft	57°	15ft 6in	25lbs
15-3CD	15	3	23ft 2in	14ft	56°	13ft 6in	20lbs
10-4CD	10	4	17ft 5in	16ft	57°	14ft 3in	18 lbs
10-3CD	10	3	17ft 8in	10ft	56°	10ft	11lbs

MATERIALS: 6063-T832 hard drawn aluminum

cushcraft CORPORATION

The Antenna Company
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

TR-7600 TR-7625

RM-76

TS-700SP

Compact in size... big on performance!

TR-7625
Featuring 25 watts RF output (switchable to 2 watts low power), the TR-7625 is a high-performance 2-meter FM transceiver with memory and is designed to permit multi-channel (800-channel)* operation. Compact and perfect for mobile as well as shack use. When used with optional RM-76 Microprocessor Control Unit, the TR-7625 offers a whole new dimension in channel memory and scanning capability.

TR-7600
Looks the same as the TR-7625, but offers 10 watts RF output (switchable to 1 watt low power). Also uses RM-76 Microprocessor Control Unit. For the Amateur Operator who's looking for optimum versatility in a 2-meter FM transceiver.

RM-76
Combined with either the TR-7600 or TR-7625, this optional Microprocessor Control Unit allows the operator to store frequencies in six memories (simplex/repeater), scan all memory channels automatically, scan up the band in 5-kHz steps; manually scan up or down in 5-kHz single or fast continuous steps; set lower and upper scan limits; clear scan (for transmitting); stop scan (with HOLD button); scan for busy or open channel; select repeater mode (simplex, transmit frequency offset ±1.600 kHz or ±1 MHz), or one memory transmit frequency. Operates on 143.85 MHz simplex (MARS) and is adaptable to all MARS frequencies. Display indicates frequency (even while scanning) and functions (such as autoscan, lower scan frequency limit, upper scan limit, and error, i.e., transmitting out of band).

TS-700SP
Here's an outstanding 2-meter all-mode transceiver that provides an extra dimension of versatility over the entire 2-meter band. Feature-packed and equipped for SSB, FM, CW and AM. Complete with built-in digital frequency readout, receiver preamplifier, VOX, sidetone, and microphone.

SPECIFICATIONS	Models TR-7600/TR-7625*	Model TS-700SP	Model TR-8300
Frequency Range:	144.00 to 147.995 MHz	144.0 to 148.0 MHz	TX 445.0 to 450.0 MHz RX 442.0 to 447.0 MHz
Mode:	FM	SSB (USB, LSB), CW, AM, FM	FM
Dimensions:	151mm (6-5/16") wide 61mm (2-3/8") high 230mm (9-1/16") deep	278mm (10-7/8") wide 124mm (4-7/8") high 280mm (12-5/8") deep	180mm (7-1/16") wide 60mm (2-3/8") high 240mm (9-7/16") deep
Weight:	1.75Kg (3.85 lbs) Approx	11.0kg (24.2 lbs)	2.3kg (5 lbs)
RF Output Power:	High 10(*25) watts (nom.) Low 1(*5) watt approx. (adjustable to 10 watts)	SSB, FM, CW - 10 watts AM - 3 watts FM (Low) - Approx. 1 watt	High 10 watts Low 1 watt Approx.
Modulation:	Variable reactance direct shift	SSB Balanced modulation FM Variable reactance frequency shift AM Low power modulation	Variable reactance phase shift
Microphone:	Dynamic microphone with PTT switch 500 Ω	Low-impedance microphone (500 Ω)	Low-impedance microphone (500 Ω) with PTT switch
Sensitivity:	Less than 0.4 μV for 20 dB quieting	Less than 0.4 μV for 20 dB quieting SSB & CW, 0.25 μV for 10 dB (S + N)/N AM, 1.0 μV for 10 dB (S + N)/N	1 μV for 30 dB (S + N)/N 0.5 μV for 20 dB noise quieting
Squelch Sensitivity:	Less than 0.25 μV	0.25 μV	0.3 μV
Selectivity:	More than 76 dB at 30 kHz of adjacent channel	SSB, CW & AM, 2.4 kHz/-6 dB 4.8 kHz/-60 dB FM, 12 kHz/-6 dB, 24 kHz/-60 dB	20 kHz/-6 dB 40 kHz/-70 dB
Image Rejection:	More than 70 dB	Better than 70 dB	

ACCESSORIES – VFO-700 remote VFO; SP-70 external speaker, KPS-7 power supply; MC-50 base microphone, MC-30S mobile noise-cancelling microphone, and MC-45 Touch-Tone microphone.

See your Authorized Kenwood Dealer for more details

TR-8300
Designed for use in the 70-cm amateur band. Unique design of the TR-8300 makes it a great choice for mobile or fixed-station use. This FM transceiver is capable of F3 emission on 23 crystal-controlled channels (three supplied). Transmitter output is 10 watts.

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TRIO-KENWOOD COMMUNICATIONS INC.
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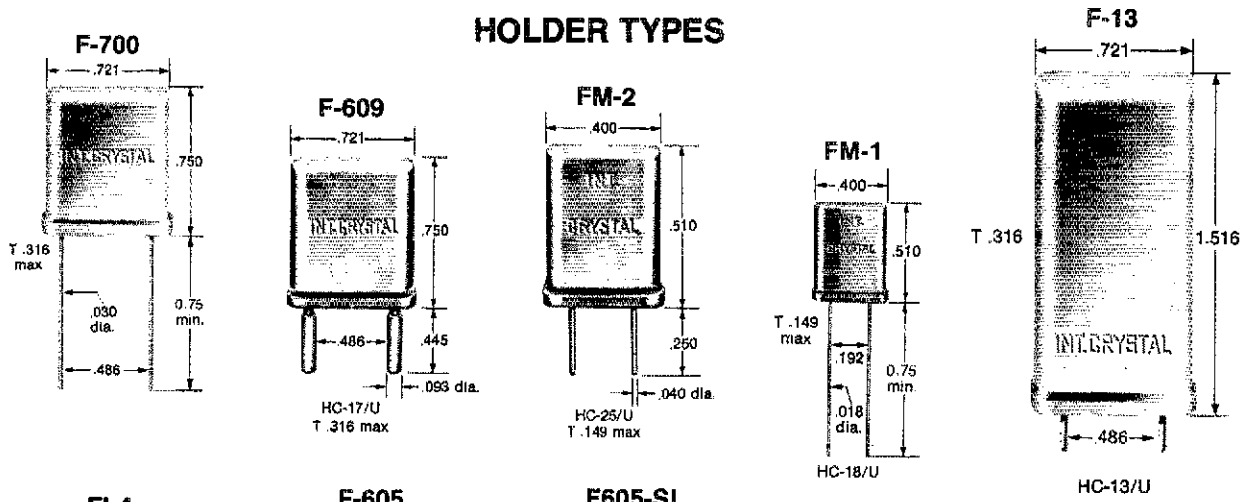

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THE AMERICAN
RADIO RELAY
LEAGUE, INC.

"It Seems to Us..."

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, 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.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worthwhile amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in Amateur Radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

ASCII — at Last

Last month's editorial was highly critical of the FCC and its proposal to amend Article 41 of the ITU Radio Regulations concerning the Amateur Radio code speed requirement for operation below 144 MHz. And we will continue to criticize the Commission whenever we feel its actions are not in the best interest of the Amateur Radio Service.

But the reverse should also be true. When the Commission accurately senses the wishes of the amateur community and acts accordingly, we should show our appreciation. This month we come to praise the Commission, not to bury it.

In the midst of all the stir and debate concerning Article 41 — a highly emotional issue among radio amateurs — it is possible to lose sight of the fact that the FCC has recently taken an action which amateurs have been seeking for years, and which will be of immense value to the future growth of Amateur Radio. In a public meeting October 10, 1979, the Commissioners directed their staff to prepare rules which would authorize amateurs to use ASCII (American National Standard Code for Information Interchange) in their transmissions. Details are in "Happenings" this month. Presently, amateurs are restricted to the five-level Baudot Teletype code in accordance with Section 97.69 of the Commission's rules. With the advent, growth and wide acceptance of computer technology, ASCII has taken a lead position as a standard code for information exchange. Yet the Amateur Radio Service, a primary purpose of which is to contribute to the advancement of the radio art, has been denied its use. True, specific waivers have been granted allowing the use of ASCII on the OSCAR satellites, but as a whole the Amateur Radio Service has lagged behind technology in this area.

While we are grateful for the Commission's decision leading to the early authorization of ASCII, we feel it could have come sooner — about two years sooner to be more precise. It was late 1977 when a former FCC bureau chief announced at a public forum that amateurs would be allowed to use ASCII by January 1, 1978! Amateurs saw a ray of light at the end of the tunnel, but were dismayed when they realized the tunnel was two years long.

We can understand that the Commission may have had plausible reasons for the delay. There was a change of command at the Private Radio Bureau. Then the Private Radio Bureau was completely reorganized along functional lines in an effort to make it more responsive to the needs of the public. Offices and the people in them were moved. During such shufflings certain things receive secondary priority, get sidetracked, perhaps even lost.

Moreover, the amateur community itself was not unanimous in its expression of the manner in which ASCII should be authorized. Virtually everyone wanted ASCII, but some wanted only a standardized form of ASCII while some wanted complete deregulation of radioteletype codes so amateurs could have complete flexibility for experimentation and innovation. The Commission wisely chose to treat these points of view as separate issues. Since there is little controversy concerning ASCII per se, the staff was directed to amend the rules to permit the use of a standardized form of ASCII without the necessity of soliciting further input from the public. This will minimize any further delay. The standards which will be chosen for ASCII are not public at this time, but presumably will be compatible with most commercially available equipment.

Where there *is* controversy concerning the further deregulation of amateur radioteletype codes, the Commission directed its staff to issue a *Further Notice of Proposed Rulemaking*. The principal conflict in this area concerns the ability of the FCC and of amateurs themselves to monitor the content of amateur transmissions. The Commission seems particularly concerned that if radioteletype codes are completely deregulated the ability of the Amateur Radio Service to police itself will be impaired. This issue will receive much discussion during the coming months.

So we thank the Commissioners for giving their go-ahead to ASCII. But at the same time it must be recognized that this will allow amateurs to merely *catch up* with technology. And we look forward to seeing the *Further Notice of Proposed Rulemaking* looking into the further deregulation of radioteletype codes, for such deregulation will allow the Amateur Radio Service to *lead* technology, as it is supposed to do.

Finally, in spite of all the delays in this proceeding, we are hopeful — for there are some within the Commission who recognize that regulatory delays are good neither for the FCC nor for those it regulates, and who are striving to improve the situation. And there are some within the Commission who speak of the Amateur Radio Service as a developmental, experimental and innovative service which deserves the flexibility to fulfill one of its fundamental purposes. These are promising signs, but actions — not words — will be the determining factor. — *Hal Steinman, K1FHN*

League Lines...

To all of those hundreds of members who wrote in response to our October editorial -- thanks! Your response exceeded our fondest hopes, and we can't help but think that your outpouring of letters, along with the October and November editorials, must have made clear the desire of ARRL memoers for continued high standards in Amateur Radio -- W1RU

New rules for the ARRL DX Contest! Changes (page 94) include DX-to-DX QSOs, single-band categories, and an expanded awards program. How about you or your club sponsoring one of the more than 50 plaques offered? For example, who will be the first to donate $35 for the top W/VE 28-MHz phone score? Contact Tom Frenaye, K1KI, at Hq. to nail down your bid. Complete donor list will be published in February QST.

John Huntoon, W1RW, has been working for ARRL for well over 40 years-- as an unpaid SCM and as National Convention secretary, then in staff positions of assistant secretary, assistant general manager, and general manager, and again as a volunteer secretary and most recently treasurer. Understandably, he'd like to try some other things now, and will not stand for reelection in January. An "Availability Committee" headed by ARRL Director Richard Egbert, W8ETU, is screening possible candidates for the non-salaried position of Treasurer, ARRL, in advance of the Board meeting. He'll appreciate suggestions directly or via Hq.

Your help is needed. The explosion in the world amateur population, healthy growth here in the States, FCC's Cute Callsign Caper and good propagation conditions at the top of the sun-spot cycle have conspired to overload the volunteer incoming QSL Bureau system. But the workers -- all of them giving up some operating time to perform this service -- probably can cope with the heavy flow of cards if all amateurs cooperate by having envelopes or mailing credits on hand all the time, even if they're not really expecting many cards. See page 87, November 1979 QST, for a complete list of U.S., Canadian and foreign bureaus. How about sending a few envelopes with stamps right now, while we're both thinking about it?

ARRL Club and Training Department needs a person to fill their Assistant Manager, Training job. Experience or schooling in education is required. Send resume and writing sample to Rosalie White, WA1STO, at Hq.

Do you have an answer to the energy crisis? QST is looking for information about non-traditional power sources for Amateur Radio stations. Send your contributions, with accompanying b&w glossy photos to Editorial Assistant Dave Bristol, KA2BNV, at Hq.

Both standard and expanded versions of Smith Charts are available from League hq. Cost of each single type is 5 for $1.00.

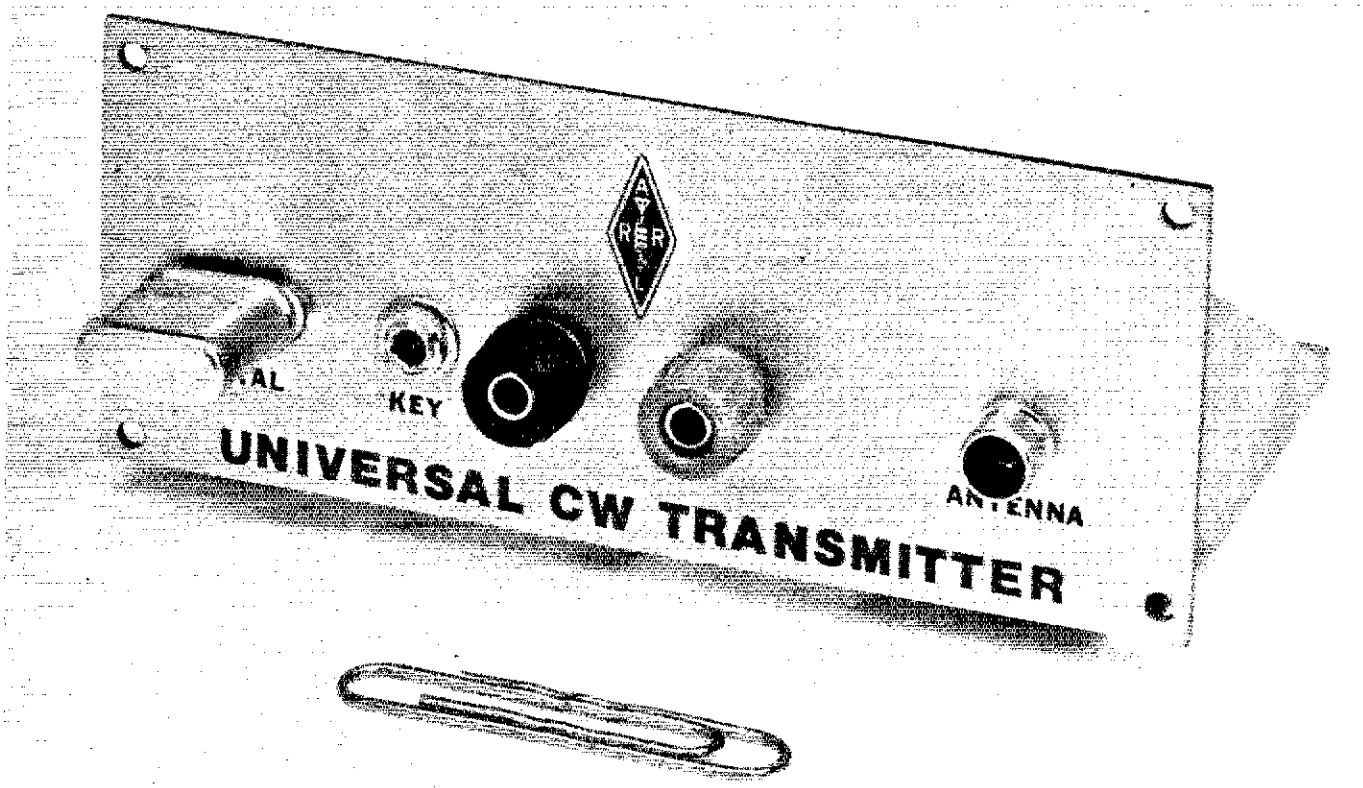
ARRL members who are interested in insuring Amateur Radio gear against theft, fire and other hazards may now find an application form as close as the local radio club; G & H Insurance Administrators have mailed several copies to each ARRL affiliated society. The clubs can use them, too, to protect equipment owned by the group. The program is administered by Bonn A. Gilbert, president of G &H Insurance Administrators, Inc., with offices at 8330 Moberly La., Dallas, TX 75227. Toll-free IN-WATS lines are provided for your convenience. Please call 800-527-3304 should you need assistance or information. Sorry, but toll-free telephone service to members in Canada, Alaska, Hawaii, Texas or U.S. Territories is not available. Please call direct, 214-388-4455.

U.S. officials are hearing about the "Woodpecker!" Senator Barry Goldwater, K7UGA (R-AZ), has brought the problems this signal has caused amateurs to the attention of his colleagues in Congress. See page 78 of this issue. President Carter has also received a letter from ARRL President Dannals about the problem. We hope to have the text of that letter in next month's "Happenings."

Help us cope with paperwork! ARRL hq. staffers can serve you more efficiently if you'll put each request on a separate sheet of paper not smaller than 3 by 5 inches nor larger than 9 x 12. Please print your name, address and Zip Code legibly on each sheet, and enclose a label or s.a.s.e. to help speed the reply.

● *Basic Amateur Radio*

Transmitter Fundamentals



Front-panel view of the workshop project. Double-sided pc board is used for the transmitter front panel and side brackets.

Learn how a simple solid-state transmitter works, then build this month's project for QRP fun on 80, 40 or 20 meters.

By Doug DeMaw,* W1FB and Bob Shriner,** WAØUZO

Transistors are no good! They're noisy, burn out easy, cost too much and generate TVI!" Yup, we've heard this false lament many times, and we're sure that you have, too. Nothing could be more removed from the truth, because transistors are as good as, or better than, vacuum tubes in all but high-power applications — provided they are used correctly.

In this installment of our continuing Basic Radio series we will examine the circuit of a simple cw transmitter, stage by stage, and define the roles of the various significant components. The foundation for this circuit is the "universal breadboard" described in September 1979 *QST*.[1] The transmitter can be used with the Basic Radio power supply from November 1979 *QST*, or any regulated dc source of 12 to 14 volts, at 300 mA or greater.

What Is a Transmitter?

A transmitter, by definition, is *a device which sends out a signal by means of radio waves or wire.* Therefore, the element in the mouthpiece of an ordinary telephone can be considered a transmitter. In Amateur Radio we may send out a variety of signals, such as cw, ssb, fm, TV, RTTY, FAX or even a-m. The essential differences in the transmitters for these special signal modes are the extra circuits needed to generate the type of signal being sent. But, the basic transmitter in each instance contains one or more oscillators, low-power amplifiers and higher-power amplifiers.

The most basic style of transmitter for use by amateurs is the cw variety which is crystal-controlled. Our discussion this month concerns that kind of transmitter, since it will be easier to grasp the basic concepts if we keep the circuit simple.

Oscillators

The most fundamental of transmitter circuits is the *oscillator*. A crystal-controlled single-stage oscillator can be used as a cw transmitter. Transmitters of this variety have been built and used by amateurs for decades, even though they

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[1]Pc boards, negatives and complete parts kits for this transmitter are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002.

leave much to be desired by way of performance. Fig. 1 shows a circuit of this kind.

An oscillator is actually an amplifier. In order to make the circuit "oscillate" it is necessary to take a portion of the output power and feed it back to the input of the amplifier. This is known as *positive feedback*. Normally, it requires 25 percent or less of the output power, as feedback, to make the stage oscillate. The feedback path in Fig. 1 is between the collector and the base of Q1, via the crystal (Y1).

The crystal must be cut, ground, or etched (depending on the manufacturing process used) for the desired operating frequency, as shown in Fig. 1. When Q1 oscillates, the thin sheet of quartz in Y1 vibrates at its natural resonant frequency (14.030 MHz in this example) to generate our 20-meter signal. It is mind-boggling to realize that Y1 is vibrating 14,030,000 times per second! Similarly, a 1-MHz crystal would vibrate 1,000,000 times/second and a 10-kHz crystal (if one were practical) would oscillate 10,000 times/second. Therefore, as the operating frequency is made higher, the crystal must be made thinner in order to permit it to vibrate faster. Present-day limits for fundamental-cut crystals are in the area of 21 MHz. To generate higher operating frequencies it is necessary to use a lower-frequency crystal and multiply its frequency in a harmonic-related fashion to some higher desired operating frequency. Heterodyne frequency generation or frequency synthesis can be used for this purpose, but those techniques are beyond the intent of this article.

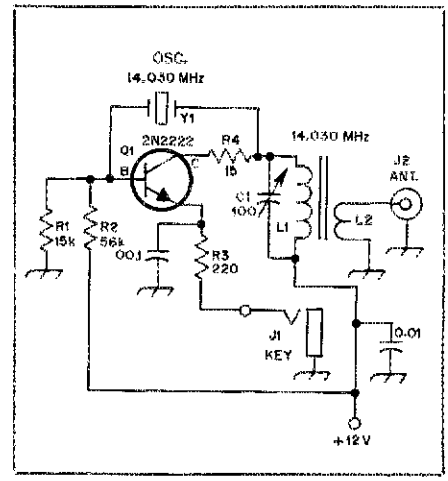


Fig. 1 — Schematic diagram of a simple one-transistor QRP transmitter for use on 20 meters. L1 would have an inductance of 2 μH (22 turns of enameled wire on a T50-6 toroid core). The output winding (L2) would be formed with 3 turns of insulated wire. See text for circuit details.

Now that we have established how the operating frequency is determined for the circuit of Fig. 1, let's look more closely at the one-stage transmitter. R1 and R2 place what is known as *forward bias* on the base of Q1. This is normally a small voltage (3.2 V in this circuit). The ratio of the resistor values for R1 and R2 may vary from 10:1 to as little as 2:1, depending on

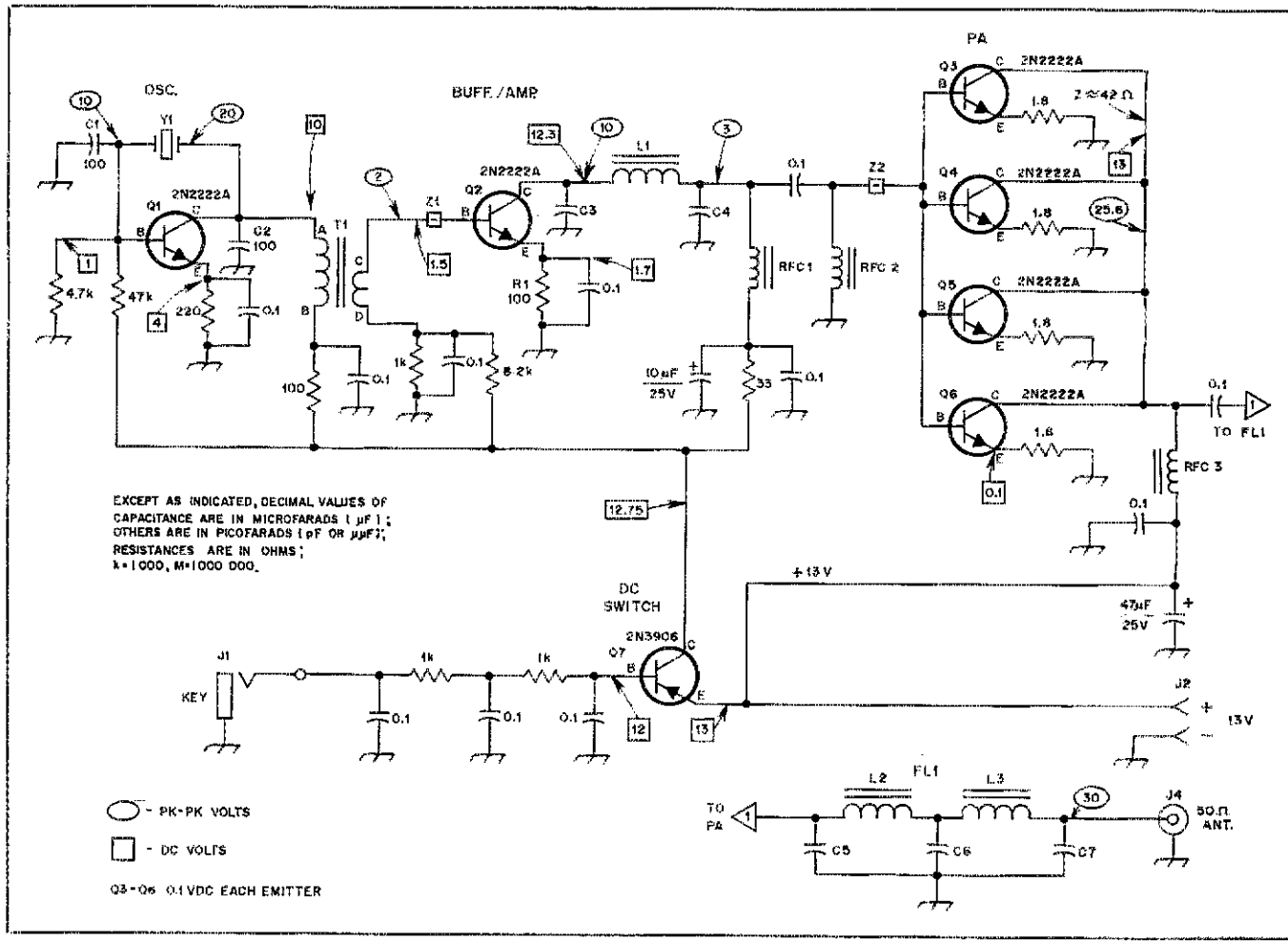


Fig. 2 — Schematic diagram of the 2-watt QRP transmitter. Capacitors are disc ceramic except those with polarity marking, which are electrolytic or tantalum. Resistors are 1/2-watt composition, 10 percent types.

C1, C2 — 100-pF silver-mica feedback capacitor.
C3-C7, incl. — See Table 1.
J1 — Two-circuit key jack.
J2, J3 — Insulated binding post, one red (+) and one black (−).
J4 — Single-hole-mount phono jack.
L1-L3, incl. — See Table 1.
R1 — See text.
RFC1, RFC2 — 2-μH toroidal inductor. 6 turns no. 22 enam. wire on an Amidon Assoc. FT-50-61 ferrite toroid.
RFC3 — 8-μH toroidal inductor. 12 turns no. 22 enam. wire on an Amidon Assoc. FT-50-61 ferrite toroid.
Y1 — Fundamental crystal for 80, 40 or 20 meters, HC-6/U case, 30-pF load capacitance. International Crystal Co. type GP. Surplus FT-243 crystals are suitable if a different Y1 socket is installed.

the type of transistor used and the style of oscillator chosen. A 5:1 ratio will usually yield good results if emitter bias is used (R3 of Fig. 1).

C1 and L1 are tuned to the crystal frequency. The output link, L2, has the proper number of turns to transform the collector impedance of Q1 to the antenna impedance — usually 50 ohms for the latter. Therefore, L1 and L2 can be considered as a transformer, even though L2 and C1 form a tuned circuit. The net result is a *tuned transformer*.

R4 may not be necessary, but can be installed near the collector of Q1 to prevent unwanted vhf parasitic oscillations. If a high gain vhf or uhf transistor is used at Q1, it is entirely possible that the stage will oscillate randomly at vhf or uhf in addition to the desired frequency. R1 will prevent that from happening.

The one-stage transmitter is keyed at J1. When the key is open Q1 can't conduct. Hence, no oscillation takes place. When the key is closed, Q1 oscillates and the signal passes from L2 to the antenna system. The same results would be obtained if we keyed the +12-volt line and grounded R3 permanently. Power output from the circuit in Fig. 1 would be approximately 50 milliwatts — *real* QRP, indeed! But, plenty of QSOs could be had if an effective antenna were used.

Additional Transmitter Stages

The circuit of Fig. 1 is generally impractical for all but experimental or emergency use. When an antenna is connected directly to an oscillator the cw signal can become quite chirpy, especially if the antenna characteristics change during operation. This could be caused by an antenna swinging in the wind, or by rain or icing. Also, oscillators of that type are not very efficient.

The usual practice, and one which we recommend, is to operate an oscillator at very low power into a load which remains fairly constant in resistance. The power level can be built up inexpensively if we add some amplifiers after the oscillator. This method is illustrated in Fig. 2, where we present the complete circuit for our 2-watt-output transmitter which serves as the workshop project this month.

Q1 is a crystal-controlled oscillator which is similar to the one we studied in Fig. 1. The basic difference is that a *broadband transformer* is used in the collector rather than a tuned transformer. The broadband transformer enables us to use the oscillator over a wide range of frequencies without changing the coil and capacitor values each time we change ham bands. It becomes necessary with this kind of circuit to use some feedback capacitors (C1 and C2) to ensure that the stage will oscillate. This was not necessary with the kind of circuit we presented in Fig. 1. The oscillator in Fig. 2 will function well from 3.5 to 21 MHz with no circuit changes.

Table 1

Band (Meters)	C3 (pF)	C4 (pF)	C5 (pF)	C6 (pF)	C7 (pF)	L1	L2	L3
80	910	2700	1000	1800	820	1.8 μH 19 turns no. 22 enam. wire on T-50-2 toroid core	1.75 μH 18 turns no. 22 enam. wire on T-50-2 toroid core	2 μH 20 turns no. 22 enam wire on T-50-2 toroid core
40	560	1500	560	910	400	1.0 μH 15 turns no. 22 enam. wire on T-50-6 toroid core	0.93 μH 15 turns no. 22 enam. wire on T-50-6 toroid core	1 μH 15 turns no. 22 enam. wire on T-50-6 toroid core
20	250	750	270	470	200	0.48 μH 11 turns no. 22 enam. wire on T-50-6 toroid core	0.47 μH 11 turns no. 22 enam. wire on T-50-6 toroid core	0.53 μH 11 turns no. 22 enam. wire on T-50-6 toroid core

Q2 operates as a buffer-amplifier. The term "buffer" means that it serves as a stage of isolation between the oscillator and the final amplifier (Q3 through Q6). This is desirable because it helps to isolate the load (antenna system) from the oscillator. This will help to prevent a chirpy cw signal.

Q2 also serves as a low-power amplifier. With the circuit values shown it amplifies the 30-mW signal from Q1 to as great a power level as 300 mW, depending on the value of the resistor (R1) used in the emitter of Q2: The higher the emitter resistance the lower the output power of Q2. Also, Q2 operates as a Class A linear amplifier. This makes it easier to excite at low power levels, such as that from Q1. If no forward bias were applied to Q2 it would operate Class C, and hence would require more power output from the oscillator to obtain the same drive for Q3 through Q6.

Z1 is a miniature ferrite bead which is installed near the body of Q2 on the base lead. It prevents unwanted parasitic oscillations just as R1 of Fig. 1 does.

A simple pi network (low-pass filter) is used to match the collector of Q2 to the bases of Q3 through Q6. It also reduces the harmonic energy which is present in the collector of Q2. L1, C3 and C4 must be selected from Table 1 for the band of operation. Because this network is a low-pass type of filter, harmonics of the crystal frequency are attenuated greatly as the signal passes to the final amplifier. The operating frequency is allowed to pass through the network unimpeded, as would be true of any rf energy *below* the crystal frequency. It is important to keep the harmonic energy as low as possible; this will help prevent TVI and will allow the final amplifier to operate more efficiently. Ideally, only the *desired* signal should be fed to our last-stage amplifier (Q3-Q6).

RFC1 of Fig. 2 keeps the signal energy where it belongs rather than allowing it to be lost to ground through the 12-volt supply line from Q7. RFC2 provides a dc return for the bases of Q3-Q6 while blocking the signal energy from ground.

The Final Amplifier

The final amplifier — sometimes referred to as the PA (power amplifier) — contains four low-cost 2N2222A transistors (Fig. 2). In fact, 2N2222As are used for all stages except the keying transistor, Q7. This was done because 2N2222As are easy to find and can be bought at flea markets and from surplus sources for as little as $1 for five or more. They are quite rugged, work into the vhf region and have reasonable gain. Either the plastic or metal versions of the 2N2222A can be used, likewise with the plain 2N2222s.

The bases and collectors of the four transistors in the PA stage are wired in parallel. The emitters, however, are returned to ground separately through 1.8-ohm resistors, as shown. The resistors "ballast" the transistors to prevent any one of the four from drawing excessive current when drive is applied. In other words, the resistors tend to equalize the current among the four transistors, even though the gain of each device might be slightly different: It is unlikely that a set of four matched transistors could be pulled at random from a box of 2N2222As. Excessive current taken by one or more of the devices could cause those transistors to be destroyed.

Z2 is used near the PA bases as a vhf parasitic suppressor. The best way to do the job would be for us to place a bead at *each* transistor base, but the simplified and less costly method shown works okay in this circuit.

FL1 is a double pi-network, low-pass filter. The common name for this network is a *half-wave filter*. It is designed to match the 42-ohm collector circuit to a 50-ohm load (antenna). Here again we not only filter out the harmonics but use the network for transforming one impedance to another. FL1 will have different values of capacitance and inductance for the various ham bands. Table 1 contains the information we need for the filter. This

transmitter should always be operated into a 50-ohm load to ensure proper filter action and to prevent damage to the PA transistors. A Transmatch can be used to maintain a proper match between the transmitter and the antenna (end-fed wire) or antenna feed line.

Keying Circuit

Q1 through Q6 are npn transistors. The keying transistor or dc switch (Q7 of Fig. 2) is, however, a pnp device. It operates in the same fashion as a mechanical switch to turn on and off the operating voltage for Q1 and Q2. The similarity ends there. When the key is open (J1) the dc switch (Q7) does not conduct, hence no voltage reaches Q1 and Q2. When the key is closed, Q7 is forward-biased into saturation. This permits current to flow through its junction, thereby supplying operating voltage to the first two stages of the transmitter. Q3-Q6 draw no current during key-up conditions because they operate in Class C. Therefore they need not be switched by means of Q7.

The keyed wave form from the transmitter should be "shaped" correctly to prevent offensive key clicks on the air. Conversely, if too much shaping is used the cw note can sound "soft" and mushy. If carried to extremes, it can take on the sound of a bell ringing. Too much capacitance in the shaping network is the cause of that malady. Our shaping network consists of two 1-kΩ resistors and three 0.1-μF capacitors in the base lead of Q7. The resultant cw note is fairly "sharp," but not clicky. This type of note is easier to copy in the presence of QRN and QRM. Additional shaping can be had by making the three capacitors higher in value, up to perhaps 1 μF. If a keyer is used with this transmitter it should be capable of *positive* keying. Q7 and the related circuit can be omitted from the transmitter if the +13-volt line to Q1 and Q2 is keyed directly. This would require insulating J1 from the front panel of the rig.

Construction

Now that we've covered the basics of how the cw transmitter operates, let's talk about building the unit. Fig. 3 shows a rear view of the assembled circuit. It can be seen that the "universal breadboard" serves as the foundation. Dimensions for the side brackets and front panel were given in "A Simple RF Sniffer," October 1979 *QST*, page 16. The various components are soldered to the copper pads on the breadboard. C2 is mounted between the crystal socket and ground, while one of the 0.1-μF shaping capacitors is soldered from J1 to the front panel. The important consideration is to keep all the component leads as short as possible; excessive lead lengths can cause unwanted self-oscillations in the buffer and PA stages.

The parts you acquire may not look exactly like those in the photograph, but don't worry as long as the values are the same. The authors used odds and ends which were on hand when the circuit was developed. Disc-ceramic capacitors can be used for all but the units marked with polarity (electrolytic or tantalum). However, it is recommended that silver-mica capacitors be used at C1 through C7, if they are available. They are more stable than ceramic capacitors in circuits where feedback, frequency control or filtering is used. The photograph shows a mixture of silver mica, disc-ceramic, mylar and tantalum capacitors, but the values are the same as those shown in Fig. 2.

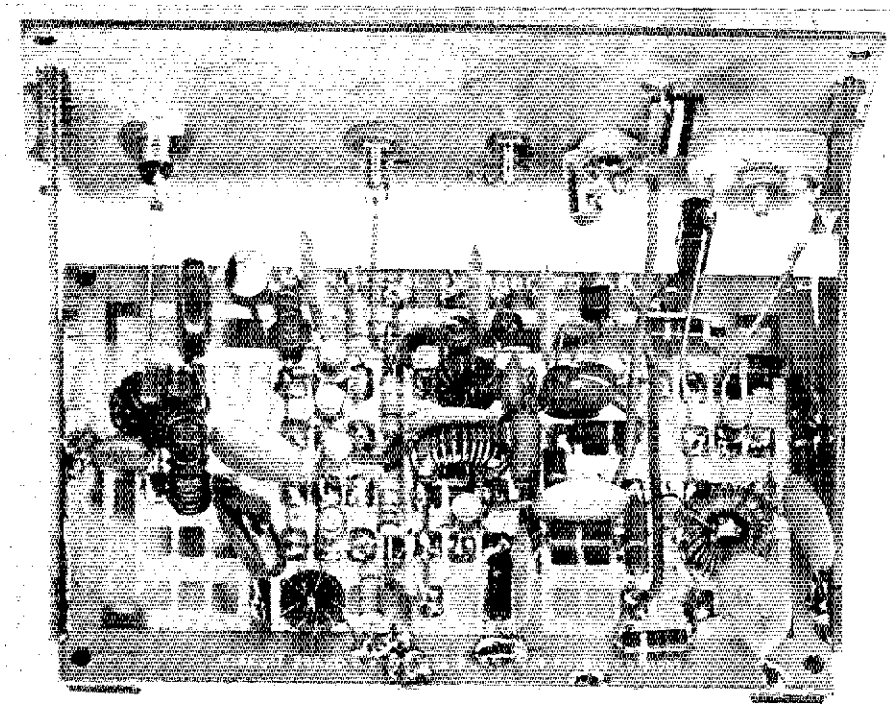


Fig. 3 — Rear-top view of the assembled transmitter. The "universal breadboard" serves as the foundation for this project.

A parts-placement guide is provided in Fig. 4. Since there is nothing especially sacred about this layout (as long as the leads are kept as direct and short as possible) you may wish to change the parts placement to your liking. If you've had experience in laying out etched-circuit boards, that route may appeal to you more than the breadboard format. Don't be afraid to experiment!

You will notice in Fig. 4 that one of the long copper elements has been cut at the upper end (1/8 in. — 3 mm — of copper removed with a knife) to separate it from the +13-volt circuit-board bus. A jumper wire has been soldered between each free end and the ground bus (outer foil) to convert the conductor to a ground strip. This was done to provide a short-path ground for the emitter resistors of Q3, Q4, Q5 and Q6.

Checkout and Operation

Before power is applied to the transmitter we must inspect the circuit board carefully to make certain that no solder blobs are shorting adjacent pads together. A magnifying glass is excellent for the purpose. Also, make sure that none of the leads on the individual transistors are touching one another.

The proper terminal on the key jack (J1) must be wired to the shaping network of Q7. When the key is closed, the input to the shaping network must be grounded. Check the jack with an ohmmeter before wiring it to the circuit. This will help prevent errors. Check also to ensure that J2 (+13-volt jack) is insulated from the panel.

Start the preliminary tests at reduced voltage. A suitable starting point is 6 or 8 volts. This is a good idea in case there are short circuits in the transmitter: The lower operating voltage will prevent serious damage to the components.

A 2-watt, 56-ohm resistor can be soldered temporarily from J4 to circuit ground for use as a dummy load. If a scope or VTVM with rf probe is available, connect one or the other across the dummy load. Key the transmitter and note whether or not there is rf output. If all is as it should be, a small rf voltage will be observed. At this point we can raise the supply voltage to +13 and repeat the test. Note: Do not attempt operation with other than fundamental-cut crystals for the desired band. Any effort to make the transmitter double in frequency will destroy the PA stage.

There should be approximately 2 watts of power output across the 56-ohm load. If a scope is being used to measure the

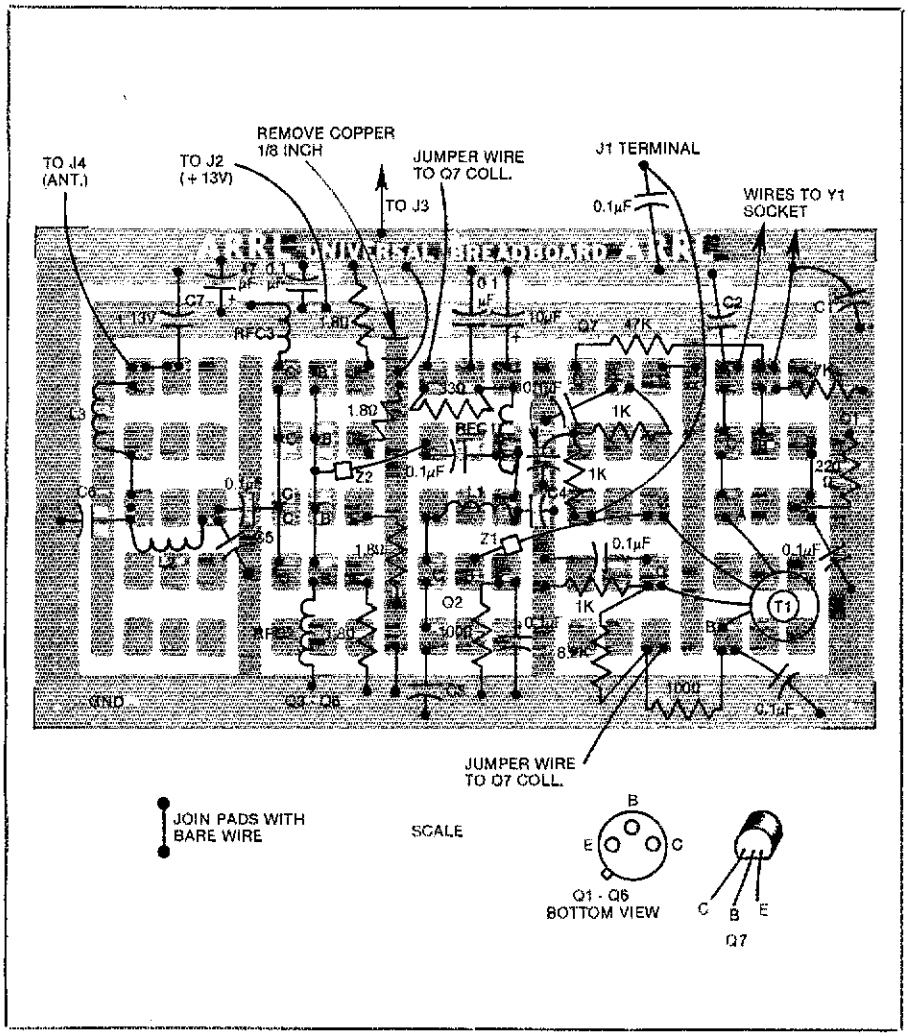


Fig. 4 — Pictorial layout of the transmitter. The four PA transistors are in line at the left center. The oscillator (Q1) is at the far right. The etching pattern for the circuit board is given in September 1979 *QST*, page 47.

peak-to-peak rf voltage, there should be approximately 30 volts. If an rf probe is employed to read the rms voltage, a reading of 10.6 is normal.

Our next and final step is to listen to the signal on a receiver and make sure the cw note is not clicky or chirpy. It is best to disable the receiver age, turn the audio gain wide open and turn down the rf gain of the receiver for comfortable volume. This technique will prevent the receiver age characteristics from making the signal seem faulty, when indeed it is okay.

Normal key-down current for the complete transmitter is approximately 225 mA at 13 volts. If you have no rf probe or scope for checking the performance, assume that roughly 2 watts of power is being delivered to the load if the current is close to 225 mA.

Although more power can be obtained from the PA by increasing the drive from Q2, the PA transistors will burn up from excessive heating if this happens. At one point during the development of this circuit we had 5.25 watts of output on 40 meters, but the 2N2222As nearly melted! More power could be generated safely if each of the PA transistors was fitted with a heat sink. Increased drive from Q2 can be obtained by lowering the value of the Q2 emitter resistor, R1. A 56-ohm resistor was installed at the time we noted 5.25 watts of output. This suggests that a 500-ohm pc-board control could be substituted for the Q2 emitter resistor, this would act as a drive control for those who wanted to experiment with very low power-output levels.

Summary Remarks

Not only is this transmitter easy to build and operate, it is capable of spanning thousands of miles with its signal when band conditions are average or better. Good results can be had with a simple dipole antenna or vertical ground plane radiator. If a beam antenna is available, you might become the DX baron of your city with this 2-watter!

In the coming months we will feature accessories for this project. Among the items we're working on are a QRP Transmatch with SWR indicator, a VFO and a mating receiver. Stand by! QST

Feedback

☐ There were some editorial errors in the November 1979 *QST* article, "Building an Operating Impedance Bridge." Author Luetzow built the unit as part of his senior electrical engineering *technology* project. The coupling between the two transmission lines in the directional coupler is −100 dB, not −40 dB. Also, the labels for items 10 and 12 in Fig. 4 are transposed. Reference 5 should refer to page 22 of the *Delta Electronics OIB-2* instruction manual. Luetzow has some other comments on the OIB; they will be published in the "Technical Correspondence" column of a future issue.

☐ Two errors appeared in the list of *QST* abbreviations (October *QST*). VTVM stands for vacuum-tube voltmeter, and SYNCART means Synchronous Satellite Carrying Amateur Radio Transponder.

☐ Ed Blaszczyk, N7EB, 12802 Sun Valley Dr., Sun City, AZ 85351, writes that he will soon complete his 20th year as QSL manager for Father Marshall Moran, 9N1MM (September 1979 *QST*, page 38). Several changes of Ed's QTH have resulted in much mail being diverted to incorrect addresses.

☐ In minute 62 of the 1979 second meeting of the Board of Directors (September 1979 *QST*, page 65), the date for the Milwaukee Radio Amateurs Club award presentation should read December 5, 1979.

Strays

DECEMBER-EARTHALITE-1979

☐ Earthalite is a word to express earth and light and to help light the earth with added recognition. The United Nations has designated 1979 as the "International Year of the Child." Today's children are the hope of tomorrow, for the love of a child is universal and they know neither barriers nor boundaries. Earthalite is also a hope in its mission of people to people. While it has been said that "peace is the happy, natural state of man," let us dedicate this Earthalite greeting to the happy children everywhere. For it is they, whose natural gift of happiness is known around the world, who bring joy to all mankind. During the week of December 17-24, 1979, help light the world with thoughts of "Peace on Earth" and spread the Earthalite in print and by voice with your goodwill wishes. — *George H. Byer, Hemet, CA*

Simple, Band-Switching Receiver Design

Itching to build something? Drag out the iron and "follow the yellow brick road" from antenna to speaker! Simplicity and low cost are the keynotes of this receiver.

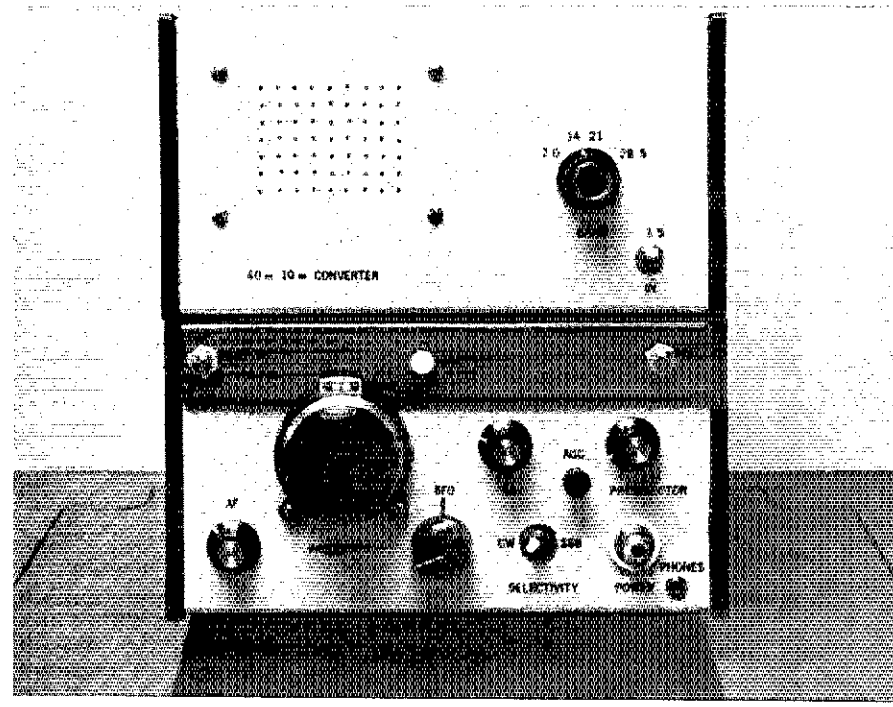
By Willie L. Baber,* WB6UAG/4

The Beginner's Receiver, described in past issues of *QST*, represents a radical change in the usual design philosophy for the beginner.[1] Contemporary receiver designs published in *QST* and geared toward the neophyte constructor were usually limited to the direct-conversion method. These designs have become popular because of circuit and construction simplicity. Utilizing basic design features, the Beginner's Receiver offered greater selectivity through single-signal reception, using a 455-kHz i-f.

Cost and Complexity in Receiver Design

A change in design philosophy is made possible by relaxing two design parameters — cost and circuit complexity. Constructing a modest (but modern) superheterodyne receiver, as opposed to the direct-conversion type, involves added expense. Where cost limitations are a prime factor, one might consider the direct-conversion method. For those who can manage the extra expense of a ceramic or mechanical filter, a few additional parts can make the difference between the D.C. 80-10 Receiver and a multiband "superhet" with little or no additional construction difficulty.[2] "Rolling your own" may still be the best bargain.

The "Beginner's" was my first home-built unit. Before building it, I hardly knew the difference between an npn and a pnp transistor! The following information is intended to add to the ideas illustrated by the Beginner's Receiver and whet the appetites of would-be constructors. I would suggest a perusal of the referenced articles and other ARRL publications for basic information on solid-state receiver design and construction techniques.[3]



A front view of the 80-meter receiver and the mating 40- to 10-meter converter. Both units are built in Ten-Tec enclosures. A large knob has been substituted for the original on the vernier drive for ease in tuning.

Design

The front end of the 80-meter receiver (Fig. 1) uses a 40673 MOSFET mixer and single tuned circuit, L1. The 40673 exhibits excellent cross-modulation characteristics and the dual gates provide isolation between the VFO and the input stage. No "pulling" of the VFO is experienced.

Additional attention is given to dynamic range. No rf amplifier is used, and the mixer input is tapped down on L1 to provide better cross-modulation and overload performance. The front-end

*P. O. Box 851, Tuskegee Institute, AL 36088
[1]Notes appear on page 21.

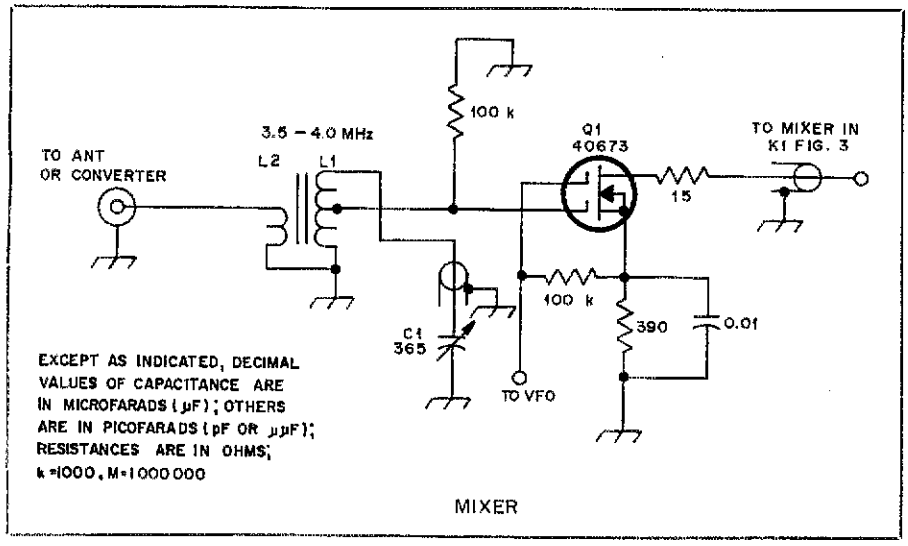


Fig. 1 — Diagram of the 80-meter MOSFET mixer.
C1 — 365-pF variable.
L1 — 4 turns no. 28 enam. wire over bottom end of L2.
L2 — 36 turns no. 28 enam. wire on a T-50-2 core. Tap at 18 turns.

design offered by DeMaw is a route to outstanding dynamic range.[4]

The VFO — Q11, Q12 and associated components — is the same as that used by DeMaw (Fig. 2). It tunes 3955 to 4455 kHz, thus providing mixer injection for conversion of the incoming 80-meter signals to the i-f of 455 kHz. Output from the emitter-follower (Q11) is filtered by means of a half-wave network to reduce harmonic currents in the output to a low level. In the interest of oscillator stability, a Zener diode is used to regulate the collector supply voltage. While silver-mica capacitors were used in the original unit, recent VFO designs stress the use of polystyrene capacitors as an approach to VFO stability without the need for additional temperature compensation techniques; their use is recommended.[5]

In an earlier version of this receiver, only the J. W. Miller no. 8814 ceramic filter was used in the i-f strip. Later, a 400-Hz-bandwidth Collins mechanical filter became available.[6] K1 was added to switch from either FL1 or T1, providing selectable bandwidths for single-sideband or cw reception. The relay in the i-f does not seem to cause any problems other than a slight "thump" in the speaker or headphones when switched from one position to the other.

The 455FD-04 Collins mechanical filter was not supplied with termination data. The capacitance values shown were taken from DeMaw's 160- to 15-meter receiver described in the 1975 *Radio Amateur's Handbook* which uses the same filter.[7] The gain of the preamplifier (Q2) is reduced effectively by tapping the gate down on the output of FL1. Proper termination of the Miller ceramic filter requires the 180-pF capacitor, as shown in Fig. 3.

The i-f filters are followed by an MC1350P i-f amplifier, U1, which supplies approximately 55 dB of gain. The application of this IC is as simple as that of the transistor used by DeMaw.

Additional i-f gain is provided by means of Q2 in order to compensate for the insertion loss introduced by the Collins filter. With this arrangement, cw signals "thump" into a quiet background, with QRM reduced or eliminated by the filter.

The product detector also employs a 40673 MOSFET. It provides excellent conversion gain. This circuit can be found in a number of *QST* receiver articles. It is highly recommended by DeMaw and Hayward. T1 and T2 provide impedance matching between the output of the MC1350P and gate 1 of the MOSFET detector. BFO injection for this circuit is approximately 1.5 V rms.

The variable BFO circuit was chosen to avoid the expense of crystals. Also, the use of T1 and FL1 require slightly different BFO settings. This circuit normally appears using a Varicap for tuning, but since I was unable to locate the proper component (an MV104), I used a small 15-pF variable capacitor.

Output from the product detector is fed directly to U2 through the audio-gain control, R4 (see Fig. 4). U2 is designed to develop 1 watt of output from a 40-mV input signal. Because of the high conversion gain of the product detector, more than this amount is available, thus eliminating the need for an audio preamp. If speaker operation is not required, one could

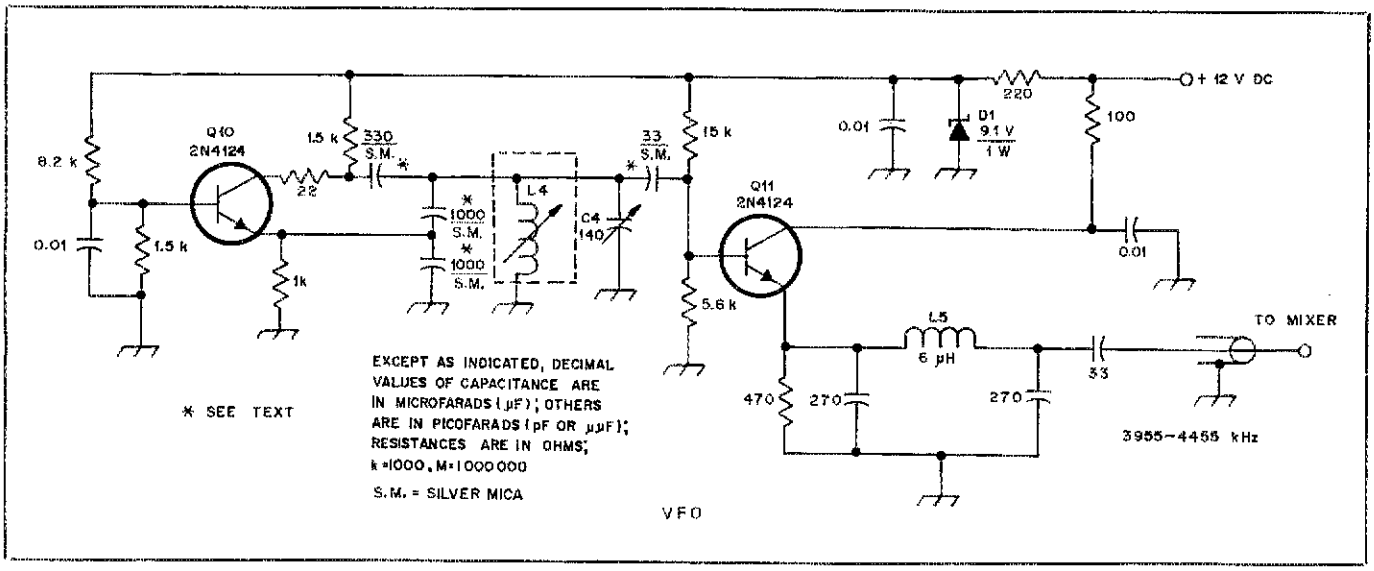


Fig. 2 — Diagram of the VFO. It is recommended that polystyrene capacitors be used at those places marked with an asterisk.
C4 — 140-pF variable.
D1 — 9.1-V 1-watt Zener diode.
L4 — Miller 42A226CBI.
L5 — Miller 4610 with one turn removed.

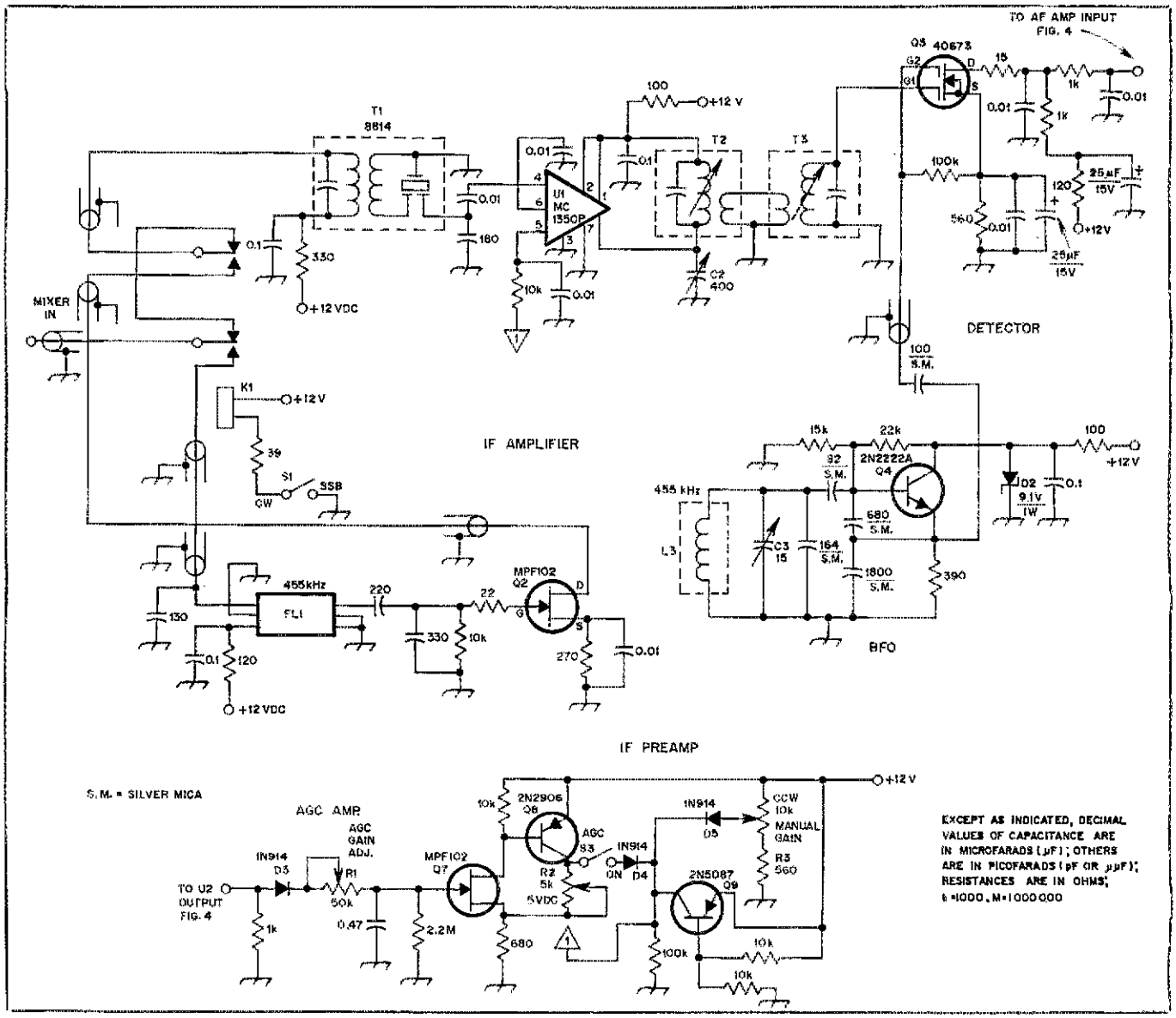


Fig. 3 — Circuit diagram of the i-f strip, BFO and age circuitry used in the receiver described in the text. The age circuit may be eliminated. See text.
C2 — 400-pF trimmer.
C3 — 15-pF variable.
D2 — 9.1-V, 1-watt Zener diode.
FL1 — 455-kHz mechanical filter, 400-Hz bandwidth, Rockwell-Collins 455 FD-04. (See text and footnote.)
K1 — 12-V dc miniature relay, Radio Shack 275-206 or equiv.
L3 — Miller 9057.
S1, S3 — Spst toggle.
T1 — Miller 8814 ceramic filter.
T2, T3 — 455-kHz i-f transformer, 30 kΩ to 500 Ω.

employ an af amplifier similar to that used in the Beginner's Receiver.

Automatic Gain Control

Age is *not* required since one can adjust the rf/af gain controls as needed under varying signal conditions. However, I wanted to try a simple age system, so that of Fig. 3 was employed. Audio-derived age systems, often easy to build, leave much to be desired when receiving cw signals. This was pointed out by Hayward and DeMaw. I experienced similar results.[8]

Without an audio preamplifier following the detector, drive for Q7 had to be taken from the output of U2. This resulted in a variable age action which was dependent upon the setting of the audio-gain control. Despite these problems, I did find the age useful for monitoring ssb nets. When receiving cw, the age may be disabled by means of S3.

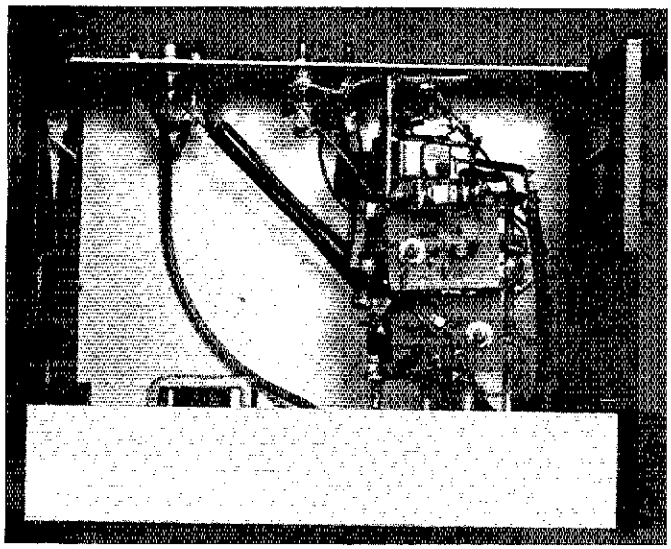
The Converter

Building a band-switching converter can be difficult. Separate converters for each band help overcome complicated switching arrangements, optimize performance and reduce problems related to isolation of critical circuits. This can become expensive, however, because of the number of parts required. The unit shown in Fig. 5 is a good compromise.

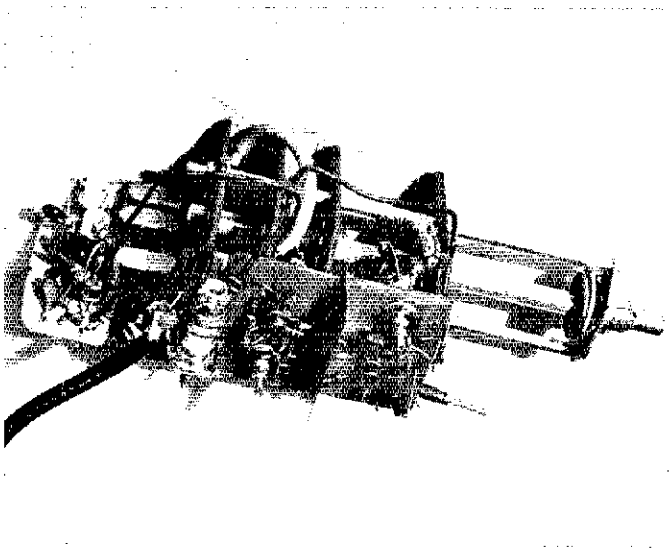
Circuit Description

The rf amplifier and mixer circuits of the converter utilize 40673s. Approximately 2.5 V dc is applied to gate 2 of Q5 in order to increase the gain of the stage. This additional gain was found to be useful on the 15- and 10-meter bands. The output of Q5 is fed to gate 1 of the mixer, Q6, while gate 2 is coupled to the crystal oscillator, Q12. Link coupling is used on the input and interstage coils to improve the rejection of signals from outside the tuning range. The mixer output tank has a low Q. It exhibits a broad response which is sufficient for coverage from 3.5 to 4.0 MHz.

Several items should be noted. First, a peaking control is not used in the rf amplifier or mixer circuits. The addition of a dual-section capacitor creates



A top view of the converter. The converter circuit is built around a four-pole, six-position switch located at the right-hand side of the cabinet. The two coils mounted on the rear cabinet wall are L15 and L16.



A close-up view of the converter band-switching assembly. The two coils shown at the rear of the band switch are L15 and L16. These coils were later relocated at the rear wall of the converter cabinet.

isolation and constructional problems which require care to overcome. Then, unlike the "Universal" converter described in the '75 *Handbook* there aren't as many tuned circuits before the rf amplifier stage.[3] Also, the rf and mixer coils used in this converter are configured so that switching in additional inductance or capacitance will result in a correctly tuned circuit for the 40- through 10-meter bands.

Another unusual practice is employed in the crystal-oscillator circuit. Note that L17 is used on 40 and 20 meters. This is possible by using 11-MHz and 10.5-MHz crystals. With this arrangement, 40 meters will tune "backward" with respect to the other bands. L17 is adjusted to the point where Y3 just begins to oscillate. This point should also allow 40-meter operation. The perfectionist may prefer to incorporate an additional tuned circuit for either of the two bands. As shown in the photo, these shortcuts allow a very compact, simple unit to be built around a four-pole, six-position wafer switch.

Construction Notes

I found packaging this receiver to be more difficult and time-consuming than building the actual circuits! This is demonstrated by the fact that the receiver has been packaged twice — first in a cabinet and chassis measuring 4 × 11 × 7 inches (100 × 279 × 178 mm) HWD. Later, two Ten-Tec enclosures were used, each measuring 4-1/2 × 8 × 6-1/2 inches (114 × 203 × 165 mm). The first cabinet was more appealing: I had added an S meter, front-panel-mounted speaker and used a dual-reduction, dial-drive mechanism. These features offered easy tuning and an illuminated dial. But, all this resulted in overly crowded circuitry in an insufficiently sturdy cabinet. This placed mechanical stress on the VFO capacitor causing the oscillator to drift slowly. Since repackaging, the attractive S meter and lighted-dial tuning mechanism are gone, but so is the annoying drift of the VFO.

All of the receiver circuit is contained on pc boards. The mixer, VFO, i-f strip and audio amplifier are placed on separate boards. The i-f board is backed to a 3 × 5 inch (76 × 127 mm) board which contains the mechanical filter and K1. This assembly is mounted vertically within the cabinet. The VFO is positioned in the left corner and the tuning capacitor is mounted by means of an L-shaped bracket of 16-gauge aluminum. It raises the capacitor about one inch (25.4 mm) from the bottom. It is extremely important to mount the VFO capacitor firmly and align the tuning mechanism as carefully as possible to eliminate mechanical stress. Ample spacing was used between the BFO and VFO boards to reduce unwanted coupling.

The mixer board is secured to the rear wall of the cabinet, while the BFO (partially enclosed using pc board material) is mounted to the left of the i-f strip. A 13-V dc power supply occupies the right-hand side of the box and is isolated from the remainder of the receiver by the i-f board.

The Beginner's Receiver circuit

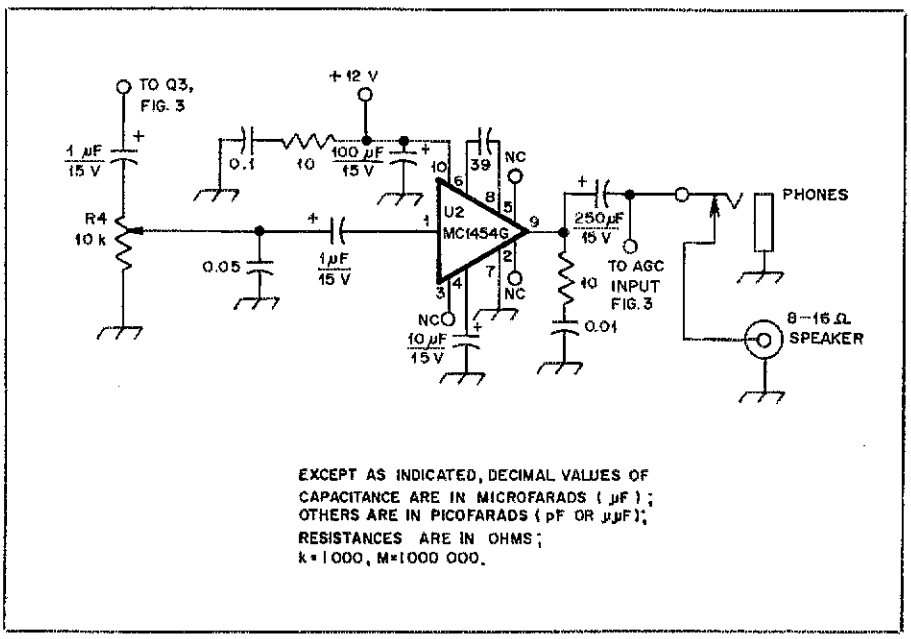


Fig. 4 — Diagram of the 1-watt audio amplifier. Discrete components may be used in lieu of the IC. See text.

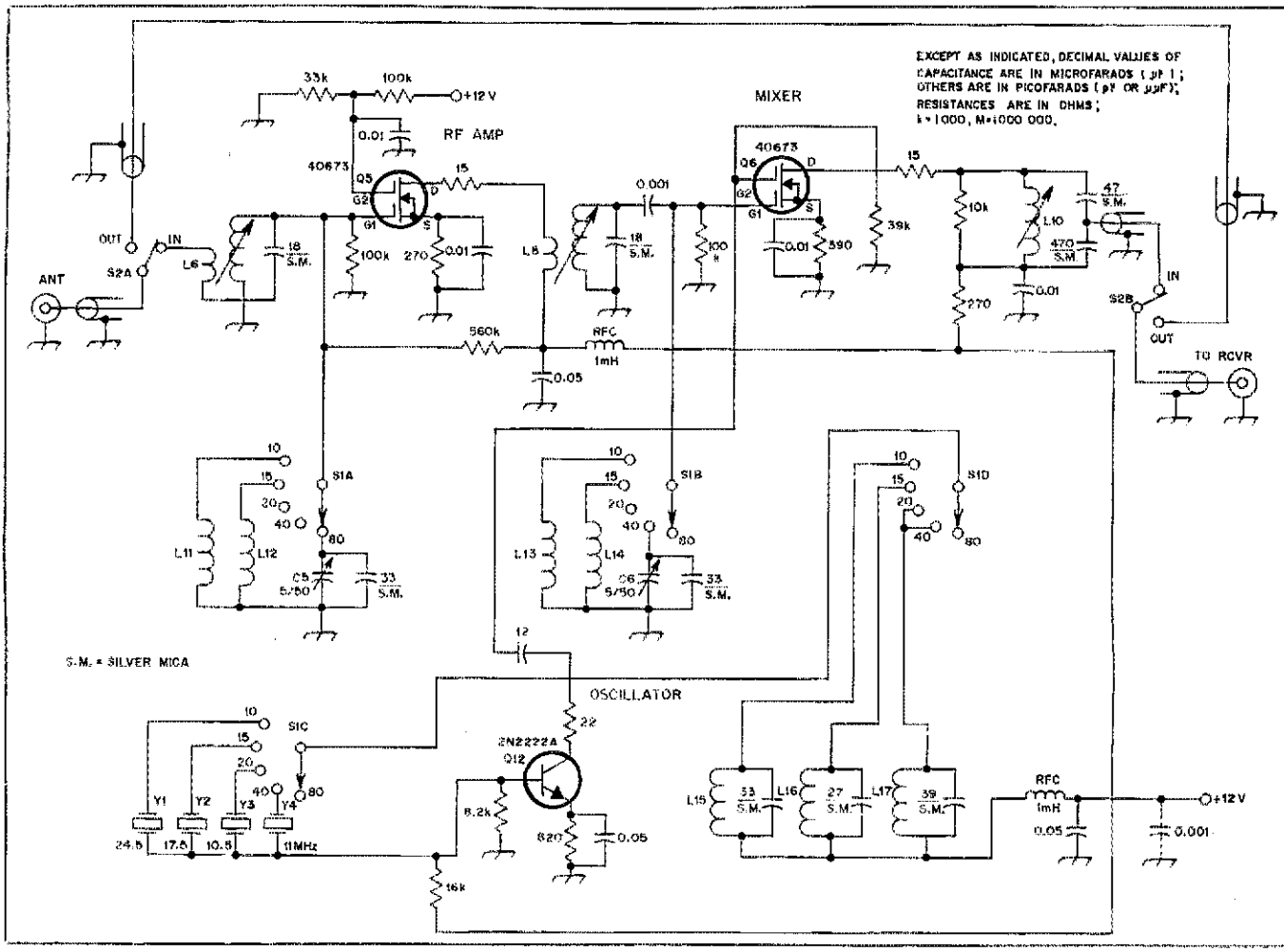


Fig. 5 — Diagram of the 40- to 10-meter converter. See text for discussion of L17.
C5, C6 — 50-pF trimmer.
L6-L9, incl. — See coil table.
L10 — Miller 46A255CPC.
L11-L17, incl. — See coil table.
Y1 — International Crystal Mfg. Co., type EX crystal, cat. no. 031081.
Y2-Y4, incl. — Same as above except cat. no. 031080.

construction used the isolated-square technique of building pc boards. This method might be used here, although mounting the MC1350P and the 455-kHz i-f transformers may be somewhat awkward. It is just as easy to fabricate boards while using etchant; just remember, the board doesn't have to look nice in order for the circuit to work well! No matter which technique you choose, patience and care are required during the process. Look upon each circuit as a "mini-project" which is connected to another "mini-project." It will not take long before you are listening to 80-meter signals — and more!

Receiver Alignment

With an antenna connected, initial reception of signals may be somewhat weak and/or the audio distorted. Tune T1, T2, T3 and C2 for maximum audio output. Some trial and error is required when setting the VFO. Adjusting C1 and L4 will allow the oscillator to tune the 3.5-to 4.0-MHz band. Cw signals at the low end of the band and ssb signals at the high end will help you align the oscillator frequency. The BFO can be adjusted in a similar manner: Adjust L3 and C3 until lower-sideband signals are understandable. The tuning range of C3 is sufficient to allow reception of both upper- and lower-sideband signals and accommodate the two filters, which each require slightly different settings of the BFO.

With the VFO at or near 3750 kHz, peak T1, T2, T3 and C4 for maximum audio output. The age circuit should be adjusted with the audio-gain control at 12 o'clock and R2 set for 5 V dc.

Coil Table

L6, L8 — 4-1/2 turns over L7 and L9 respectively.*
L7, L9 — 25 turns.
L11, L13 — 10 turns.
L12, L14 — 20 turns.
L15 — 11 turns.
L16 — 15 turns.
L17 — 25 turns.

*Note: All coils listed above are wound with no. 28 enam. L6 through L9 are wound on Miller 4500-2 forms. L11 through L14 are wound on Miller 4500-3 forms.

Converter Alignment

Adjust L15, L16 and L17 in the crystal oscillator until the crystals just start to oscillate. L17 and L10 should be adjusted with the band switch set for 20 meters. With the VFO at 14.250 MHz, L7 and L9 should be peaked. Adjust C5 and C6 for maximum output on 40 meters at 7.250 MHz. The 10- and 15-meter bands are aligned similarly, peaking the appropriate inductors. A signal generator and oscilloscope can be used for alignment, but the foregoing procedure will produce good results.

Overall Performance

Initially, the VFO stability of this receiver was rather poor because silver-mica capacitors were used in construction. I later changed these capacitors to polystyrene types. After a 15 minute warmup, the receiver barely moved from zero-beat during a three-hour period. I used a crystal-controlled calibrator as a reference.

Despite the modest rf selectivity, I have not experienced cross-modulation problems while using this receiver. Receiver sensitivity is very good, as is the selectivity when using the Collins mechanical filter. The age circuit is usable, but in my opinion, it is not worth the construction effort, especially if the receiver is to be used primarily for cw.

Additional Thoughts

I would enjoy the challenge of building a receiver similar to the exceptional one depicted in Hayward's "An Integrated Contest Grade CW Station," but I could almost duplicate this receiver for the cost of 14 poles of crystal filtering alone![10]

The basic similarity between my little receiver and Hayward's is (as Hayward states): "Above all of the features listed, the station is personal. Not only does operation of such equipment offer more satisfaction than might be realized with an 'appliance,' but the operator has gained the experience of learning and understanding. That's where it's at!"[11]

Notes

[1]DeMaw and McCoy, "Learning to Work with Semiconductors," *QST*, April through September 1974.
[2]DeMaw, "The D.C. 80-10 Receiver," *QST*, May 1969. (A modified and improved version of the same receiver appears in *The Radio Amateur's Handbook*, 52nd edition, 1975, pp. 284-289.)
[3]Rusgrove, DeMaw and Grammer, *Understanding Amateur Radio*, ARRL, 1977.
[4]DeMaw, "His Eminence: The Receiver," *QST*, June and July 1976.
[5]Hayward and DeMaw, *Solid-State Design for the Radio Amateur*, ARRL, 1977.
[6]J. W. Miller Co., 19070 Reyes Ave., Compton, CA 90224. Collins Radio, 4311 Jamboree Rd., Newport Beach, CA 92663.
[7]DeMaw, "A Receiving Package for 160 to 15 Meters," *The Radio Amateur's Handbook*, 52nd edition, 1975, pp. 277-284. [Editor's Note: Another possible candidate is the Collins Radio CB-type mechanical filter, Rockwell International no. 5269939010, 453.55-kHz center frequency. See *The Radio Amateur's Handbook*, 56th edition, 1979, pp. 8-31 to 8-35.]
[8]See note 5.
[9]"A 'Universal' HF Receiving Converter," *ibid.*, pp. 274-277.
[10]Hayward and DeMaw, *Solid-State Design for the Radio Amateur*, ARRL, 1977, pp. 225-235.
[11]See note 10, p. 235.

Strays

THIS IS K3KMO, MOBILE ON THE STEAMBOAT *MISSISSIPPI QUEEN*

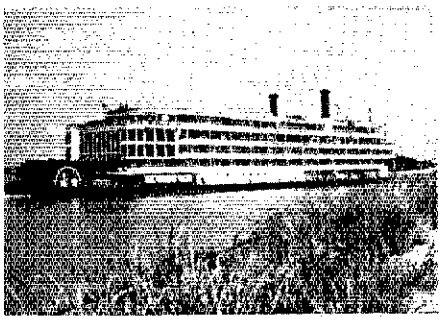
☐ Many of the hams I have met have interests in more than one hobby. I'm no exception; I play trombone in my own dixieland band.

One Friday afternoon, I received a long-distance phone call from the Delta Queen Steamboat Company, owners of the steamboat *Mississippi Queen*. They had heard a recording of my band and offered a two-week engagement. We were hired to provide evening entertainment as well as afternoon parties and rehearsals. This left ample time to operate a mobile station and enjoy the cruise. Since playing dixieland is fun, it was like an all-expense-paid vacation!

It was a pleasant surprise to find that I could fit everything for the ham station into a piece of luggage that fit under the seat of the 727 that carried us to New Orleans. I took my compact high-frequency rig and power supply, 2-meter rig, antenna tuner, a large roll of no. 30 white insulated wire and a roll of white nylon twine. The white wire and twine were selected to blend in with the superstructure of the *Mississippi Queen*. A collapsible 2-meter fm J-pole antenna, basic hand tools, soldering iron, fuses, antenna components and log sheets rounded out the equipment.

The *Mississippi Queen*, built in 1976, is the world's largest cruise steamboat. It can accommodate 375 passengers and a crew of 135. It's like a luxury hotel and first-class restaurant built on a steamboat hull. The only radio equipment on board is two small short-range voice transceivers used for contact with other river craft and to receive NOAA weather broadcasts.

After we had been on board for a few days I obtained permission to operate my rig and began getting set up. There was a convenient place to string my antenna between two sections of railing. Two pieces of nylon twine were used to support and insulate the antenna. One end of the antenna continued past the insulator and dropped to the deck below, where I could sit in the shade to operate.



The *Mississippi Queen*, which operates on more than 3000 miles of the Ohio and Mississippi rivers, provided an ideal working location for K3KMO, mobile.

My operating was generally reserved for the middle of the day, since I was playing music until midnight and usually slept until midmorning. After a late breakfast I could take my suitcase station up to the promenade deck and set it up on a small cocktail table. I usually left the station set up until just before dinner. Some days I operated for only an hour or two, and on other days I was on the air for up to five hours.

Although my personal preference is cw, I found that it was easier to stir up replies on ssb, where I could identify as "mobile on the steamboat *Mississippi Queen*" and get people interested. I never did get a long string of contest-style QSOs going, but I could usually stay busy, working stations one right after the other. With the simple antenna and low power I found that I didn't do well on 20 meters because of the competition from the big guns. I did very well on 15 and 10 meters and found several real pipelines open to the West Coast. Several European and South American stations were also contacted during the two weeks.

There was a great variety of responses from the hams that I worked when I told them I was on a steamboat. Some acted as if they worked steamboats all the time, while others were pleased at the different sort of mobile QSO. I often transmitted when the captain blew the whistle. A typical response was, "Now I know you're on a steamboat, because I just heard the whistle in the background." The best response I got was from a retired ham on the West Coast. He was born and raised in Missouri, and his father had been on the crew of a working steamboat. He was really excited and had several steamboat stories to tell me.

Although most operations were on hf, I did manage to make a few 2-meter fm contacts through the repeaters along the way. When we were docked in New Orleans, I found that it was possible to work one of the local repeaters from inside my stateroom, through two bulkheads.

QSL cards were made from picture postcards of the ship. They will make good conversation pieces and fancy wallpaper for the many fine hams that I was lucky enough to work from my unique operating location.

We are looking forward to a return engagement aboard this ship. If you hear K3KMO operating mobile on a steamboat again, give a call. It would be nice to work you and send you a card. — *Al Brogdon, K3KMO, Damascus, MD*

Build a VMOS Audio Amplifier

That homemade receiver you're building will need a low-distortion audio amplifier. Perhaps now is the time to go VMOS with this simple 2.5-watt circuit.

By Doug DeMaw,* W1FB

What's the point in using a VMOS power FET in an audio amplifier? If that question is in your mind, it may be worth considering the relative simplicity of the circuit described here. Sure, a single-ended Class A bipolar-transistor audio-output stage could give good service and ample output, but the device used would be subject to thermal runaway and secondary breakdown. Furthermore, the transistor would probably be destroyed if it were delivering power while the load (speaker) opened up or shorted. VMOS power FETs are immune to those forms of damage. Also, the VMOS transistor is somewhat more efficient than its bipolar cousin. Maximum audio output from this amplifier is 3 watts with 10 percent distortion. This equates to an efficiency of roughly 41 percent. A bipolar Class A amplifier would exhibit lower efficiency — roughly 30 to 33 percent. To obtain 2.5 watts of clean audio output, assuming a 12-volt power supply, the collector current would be approximately 666 mA. Owing to the high input impedance of the VMOS device, matching between the preamplifier and the output stage is simplified: Only an RC network is required.

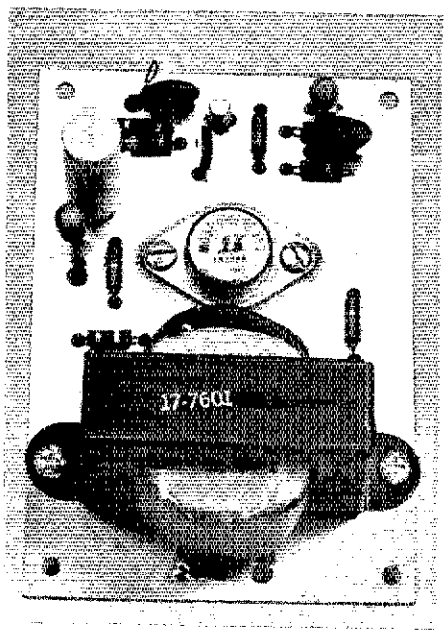


Fig. 1 — Photograph of the completed VMOS audio amplifier.

The Circuit

Fig. 2 contains the schematic diagram for the VMOS amplifier. Q1 is a dual-gate MOSFET which is connected as a single-gate FET. Alternatively, a JFET could be used at Q1, such as a 2N4416. Siliconix specifies one of their low-noise E231 FETs for use at Q1 (this circuit is an adaptation of one which appears in the Siliconix literature). R1 and R_{fb} are feedback resistors. The circuit provides 10 dB of negative feedback to minimize distortion.

The input impedance of Q1, as shown in Fig. 2, is 100-kΩ. A level of 2 volts pk-pk is required for 2.5 watts of output if the input signal is applied across the 100-kΩ gate resistor.

C1 is used to prevent hf self-oscillations. It serves also to roll off the high-frequency audio components. Instability was noted before C1 was added. Additional instability problems were cured by using double-sided (copper on both sides) pc board: The surface on the component side of the board serves as a ground plane.[1] Q1 and Q2 will operate efficiently into the vhf region; hence the tendency toward rf instability. This characteristic also aids in obtaining hi-fidelity audio, although a 3-dB roll-off should commence at 2500 to 3000 Hz in the audio section of a communications receiver. Without C1 in the circuit the audio response was flat from 100 Hz to 15,000 Hz.

A forward gate voltage is needed at Q2, since the transistor is an *enhancement-mode* device. This means that a forward voltage is required to turn the transistor on so that it can perform its assigned function. Q1, conversely, is a *depletion-mode* transistor. It does not have to be turned on to function. In order to bias Q2 into the Class A operating region, 3.5 volts is applied to the gate.

Some Problems

D1 and D2 were placed across the primary winding of T1 to prevent drain-source breakdown at Q2. VMOS power FETs have a frailty which isn't mentioned in the manufacturers' literature. Despite their immunity to the sources of destruction which plague bipolar transistors (discussed earlier), they are highly sensitive to over-voltage excursions. Excessive voltage peaks, only slightly beyond

*Senior Technical Editor, ARRL.

[1]Circuit boards and parts kits for this project are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81001.

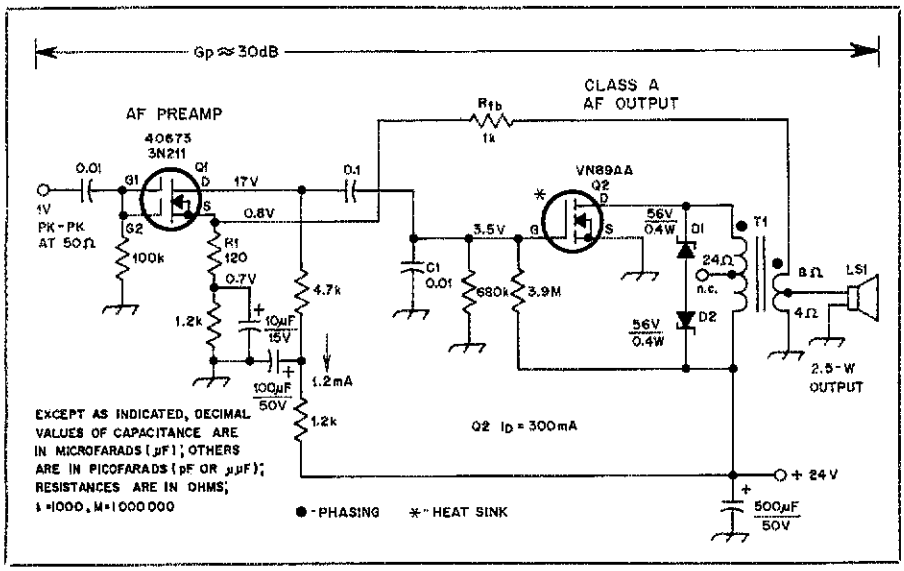


Fig. 2 — Schematic diagram of the audio amplifier. Resistors are 1/2-watt composition. Capacitors are disc ceramic except those with polarity marked, which are electrolytic or tantalum. Dc voltages are noted at significant points.
C1 — Stabilizing capacitor (see text).
D1, D2 — 56-V, 400-mA Zener diode.
Q1 — RCA 40673, TI 3N211, or equiv. (see text).
Q2 — Siliconix VN89AA or equiv.
R1, R_{fb} — Feedback resistor.
T1 — 24-Ω to 4- and 8-Ω secondary audio output transformer. Must handle at least 350 mA in primary. Triad TY-29X or equiv. Primary ct not used.

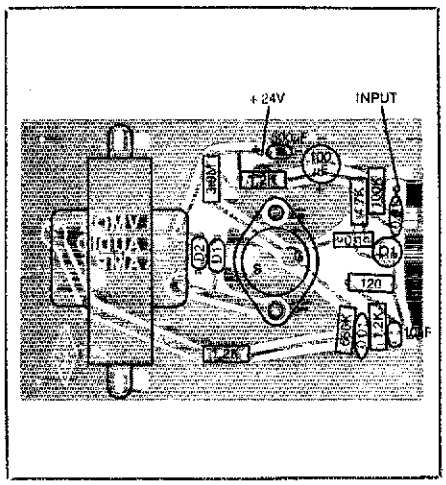


Fig. 3 — Parts-placement guide for the audio amplifier, not at actual size. The etching pattern appears in the "Hints and Kinks" section of this issue.

the published maximum safe values, cause instant failure. The damage is permanent. Before adding D1 and D2, several VN89AAs were observed to "go away" without apparent cause. The frustration was resolved when it was learned that transients from the function generator (when the switches were cycled) were causing high spikes across the primary of T1. D1 and D2 cured the problem. It is unlikely that voltage spikes would appear in this circuit once it was committed to a composite receiver, but the Zener diodes should be included as a safety precaution.

The VN89AA has a built-in 15-volt gate-source Zener diode. It will protect the gate from damage. However, the gates of VMOS power devices (especially the "un-Zenered" varieties) will go "poof" instantly from excessive voltage or current. Only a few μA of abnormal gate current will destroy the transistor.

Construction Notes

There are no special instructions to offer for a circuit this simple. The parts-placement guide is provided in Fig. 3.

A heat sink must be used at Q2. It consists of a U-shaped channel of 16-gauge (or heavier) aluminum or brass. The vertical portions of the U are 1-1/2 inches (38 mm) high. The bottom of the U is 1-1/4 inch (32 mm) wide. A long dimension of 1-3/4 inches (44 mm) is used.

Operation

It is important that the polarity of the T1 windings is observed. If the ground and 8-Ω ends of the secondary are reversed, positive feedback will result. If you want a "hot" code-practice oscillator, this is one way to get it! But don't let it happen, for the strong self-oscillation will probably dispatch your VN89AA immediately — if not sooner!

An 8-Ω speaker should not be attached to the 8-Ω tap on T1. The feedback ratio will be affected if this is done, and distortion will rise considerably. Use a 4-Ω speaker, or hook an 8-Ω speaker to the 4-Ω transformer tap. Low-Z headphones should be connected to the 4-Ω point if they are used.

Oh yes, it should be mentioned that a TO-3 size mica insulating washer is needed between Q2 and the heat sink. Both sides of the washer should be coated with silicone heat-transfer compound. This material should also be used between the heat sink and the pc board. QST

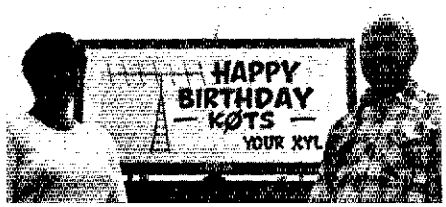
Strays

ATLAS: GONE BUT NOT FORGOTTEN

☐ Over the years, 18,000 Atlas transceivers were produced. These rigs were used on land, sea and air. One unit went aboard Thor Heyerdahl's raft, *Tigris*, then later made a trip up the side of Mount Everest. It is now aboard a 39-foot trimaran on a round-the-world, nonstop cruise. With all of these units still in use, where can one go for warranty, service, parts, and so on? Steve Crossman, WA3UCS, and Bill Trabold, WA3UCR, of Specialty Communications, 2523 Peach St., Erie, PA 16502, are handling this kind of service for the Atlas rigs. You can call them at 814-455-7674.

HELP FOR THE PHYSICALLY HANDICAPPED

☐ The Lake County (IN) ARC has developed a program designed to aid physically handicapped amateurs in the ninth call district. The club has formed a technical group which will, at no charge to the handicapped amateur, build, or complete the process of building, Amateur Radio-related commercial kits. The only charge would be for shipping, and missing or defective part replacement. For more information write to: HAM HELP, c/o Lake County ARC, P. O. Box 1909, Gary, IN 46409. Club inquiries invited. — *Joel Iacono, WA9DJP*



Joe Fishburn, KØTS, of Rochester, MN, recently received this most unusual outdoor birthday card from his wife, Alice. Joe, who is the Olmsted County emergency coordinator, president of the Rochester Repeater Society and vice president of the Rochester ARC, didn't have much to say about the novel greeting.

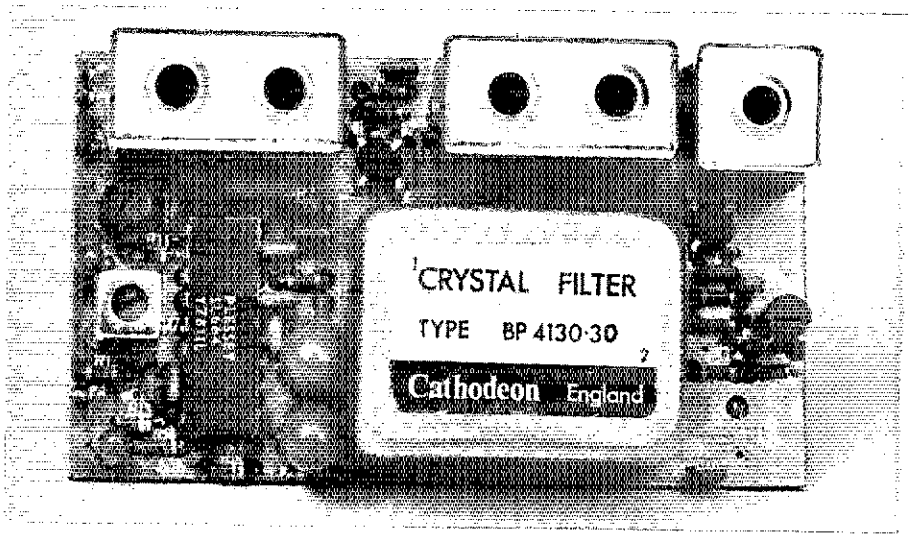
A Single Channel VHF Monitor Receiver

Looking for a simple, high-performance receiver to monitor your favorite repeater? This compact and easy-to-build unit may fill the bill!

By James M. Bryant,* G4CLF

This article describes a miniature, high-performance vhf fm receiver using the Plessey SL6640 integrated circuit. The SL6640 is a complete i-f strip, detector and audio system designed for narrow-band fm signal reception. The chip requires a minimum number of external components, consumes only 3.5 mA of current on standby and has an audio output power of 200 mW.

The receiver can be operated in the amateur 2- or 4-meter bands or in the high or low mobile radio bands. Overall receiver sensitivity for a 20-dB S + N/N ratio is less than 0.4 μV. This receiver is so simple that it may be built by inexperienced constructors. All components occupy a circuit board that measures 1-3/4 × 3-3/4 inches (46 × 82 mm).



Circuit Description

The circuit diagram of the receiver is shown in Fig. 1. The rf amplifier consists of a double-tuned input circuit feeding a dual-gate MOSFET which exhibits a gain of approximately 18 dB. The choice of a dual-gate MOSFET as the rf amplifier was made on the grounds of noise and intermodulation performance. MOSFETs offer a noise figure of around 4-6 dB and will handle large off-channel signals with a minimum of intermodulation distortion. The prototype receiver made use of the 3N210 in a plastic package, but 3N201, 3N211 or 40673 types in metal TO-72 cases will fit the board and work equally well.

A second double-tuned circuit couples the output of the rf amplifier to a second dual-gate MOSFET which serves as the mixer. This stage has a conversion gain of roughly 12 dB. The input signal is applied to gate 1 and gate 2 is connected to the oscillator tank circuit. Approximately 2 V_{rms} of local oscillator energy is available at gate 2. As can be seen in the schematic diagram, both gates are at dc ground. Better conversion gain and a lower local oscillator requirement could be obtained by biasing gate 2 to about 2.5-4.5 V; however, this would be at the expense of reduced strong signal performance. The prototype unit could tolerate two strong signals at a level of 100 mV each, 50 and 100 kHz off channel without receiving an intermodulation product. Even better performance could be obtained at the sacrifice of front-end gain and, hence, sensitivity.

The local oscillator makes use of a pnp type vhf bipolar transistor. A pnp type device reduces the number of components of the stage since the collector load coil is at dc ground. No coupling or bias components are needed for gate 2 of the mixer MOSFET. This oscillator circuit is very simple — only nine components — and is very reliable. The use of more expensive overtone crystals is justified by the savings in complexity and power involved in designing *out* the multiplier stages. The values of C12 and C13 may need to be modified to suit the particular oscillator used, but the values given are a good starting point.

Should one desire to modify the receiver to work on more than one channel, it is *not* possible to use long leads to the extra crystals. Rather, some sort of dc switching arrangement should be used. Dc switching is ideal for use in scanning systems. A suitable switching system is

*c/o Plessey Semiconductors, Cheney Manor, Swindon, Wiltshire, SN2 2QW, England

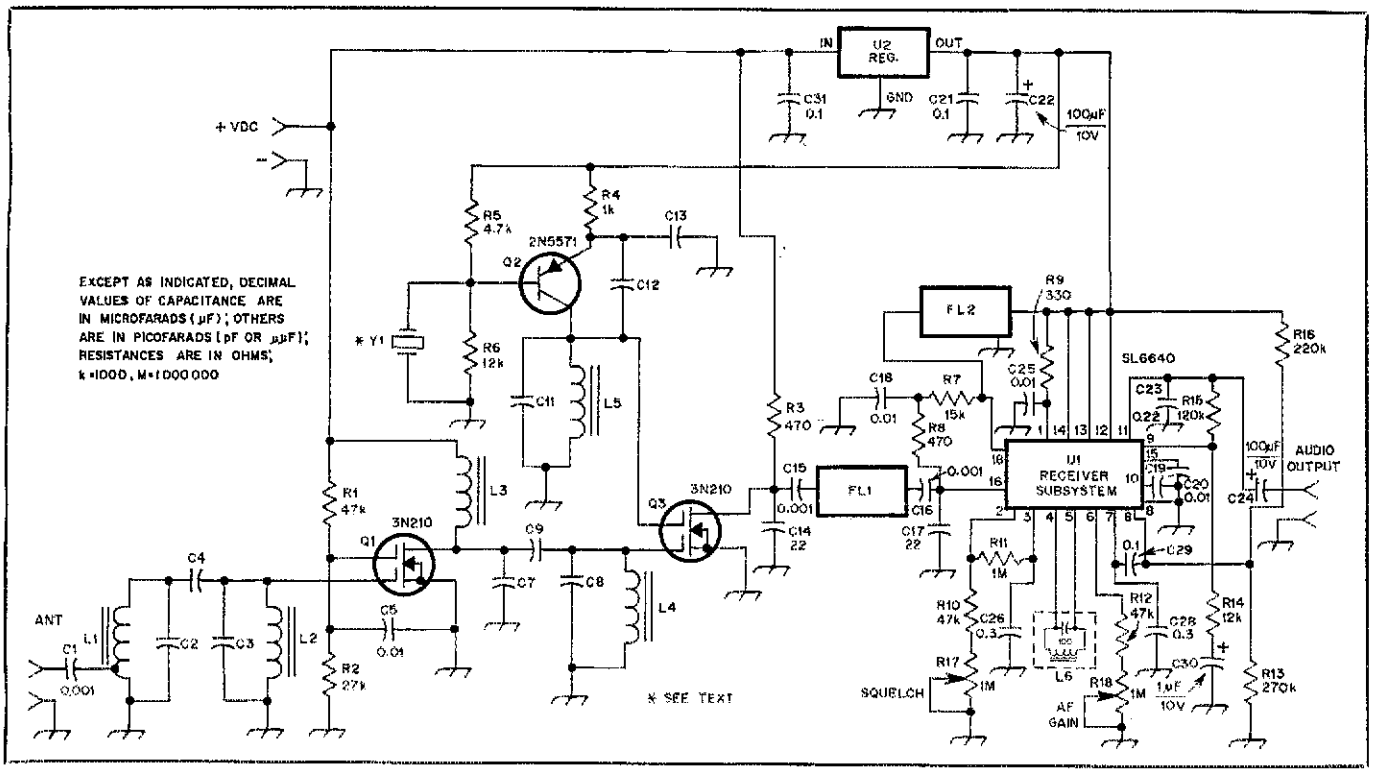


Fig. 1 — Schematic diagram of the receiver. All resistors are 1/8-watt composition types. Component values shown on the diagram but not shown in the parts list are for text reference only. C values listed below are for receiver operation in the 2-meter band.

C2 — 12 pF.
C3, C7 and C8 — 6.8 pF.
C4, C9 — Capacitance provided by close proximity of L1, L2 and L3, L4. No physical capacitor is installed at these positions.
C11 — 2 pF.
C12 — 1 pF.
C13 — No capacitor installed for 2-meter operation.
FL1 — Crystal filter, Cathodeon BP4130-30 or KVG XF10.7/S96.
FL2 — Ceramic filter, Murata SFE 10.7 M.A. or Piezo Technology 5581.
L1-L5, incl. — Toko type S18 number 301SN-0300 or Miller 48A177mpc. L1 is tapped 3/4 turn above ground end. The coils are housed in 1/2 × 1 × 3/4-inch (12.7 × 25.4 × 19-mm) aluminum cans. Neosid type 73-010-91 or equiv.
L6 — Toko 85-4402-SEJ or equiv.
Q1, Q3 — 3N210, 3N201 or 40673.
Q2 — 2N5771.
U1 — Plessey SL6640.
U2 — Regulator, 78L08C or equiv.
Y1 — Overtone crystal. Receive frequency – 10.7 MHz. HC-18/U holder.

depicted in Fig. 2. The diodes should be low-capacity types such as 1N916 or, better still, the 1N4313.

The output from the mixer is applied to a crystal filter. This filter should be chosen to have a suitable bandwidth for the signal to be received. The prototype receiver used a Cathodeon BP4130-30. These filters fit the board layout and should be terminated in 470 ohms paralleled by 25 pF. Other filters, such as the KVG XF10.7/S96, are also suitable, but filters with different terminating impedances may present problems. Although C14 and C17 may be changed if necessary, it is not possible to increase R3 and R8 above 820 ohms without upsetting operation of T3 and U1. If the values are made too low, receiver gain will suffer.

The signal from the filter is applied to the preamplifier input, pin 16, of the SL6440. The preamplifier has a gain of 46 dB and an output impedance of 330 ohms which just matches the interstage ceramic filter between the output (pin 18) and the main i-f amplifier input (pin 14). The preamplifier is biased via R7 and R8 from its own output. R8 sets the input impedance and C18 decouples the bias line. Similarly, R9 and C25 provide bias and decoupling for the main i-f amplifier input.

The interstage filter is intended only to limit broadband noise in the i-f — not to define the receiver passband. An inexpensive ceramic filter may therefore be used. A Murata SFE 10.7 M.A. was used in the prototype unit.

The main i-f amplifier has approximately 60-dB gain giving the SL6440 as a whole roughly 10-μV sensitivity. Such high gain makes bias decoupling essential, and C19 and C20 perform this function. Output from the main i-f is applied to the quadrature detector and squelch system.

In the SL6440, the squelch system works by detecting the amount of limiting in the i-f amplifier and the preset potentiometer, R17, sets the squelch threshold. This can be an external control, but the operation of the squelch is so stable that it may be set permanently. R11 sets the hysteresis of the squelch (the amount by which the input signal must drop after the squelch has turned on the receiver before it will turn off again). With 390 kΩ for R11 and an 8-volt supply, the hysteresis is approximately 7-9 dB. The level may be reduced to 4-6 dB by increasing R11 to 1.5 MΩ.

The squelch system controls the power to the detector and the audio stages. In the absence of an input signal both stages are turned off to the keep the total device current under 3.5 mA. When the squelch is broken by a signal, the consumption rises to 8 mA plus whatever the output stage draws. There is also a squelch output at pin 3 which is high in the absence of a signal and low when one is detected. This logic signal may be used to operate an LED indicator (via the buffer shown in Fig. 3) or to control a scanner if a multichannel system is used. C26 connected to pin 3 prevents the squelch from "flutter-

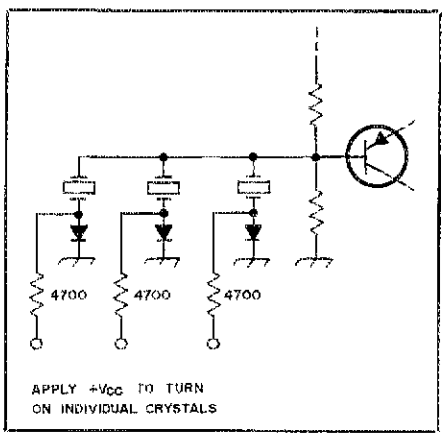


Fig. 2 — Shown here is a circuit for adding additional diode-switched crystals to the single frequency receiver.

ing" if the signal strength changes rapidly.

The detector is self-contained with the exception of the quadrature coil connected between pins 4 and 5. Unlike devices such as the CA3089, TBA 120 and CA3189 which are primarily intended for use in television and fm broadcast receivers with wide bandwidths, the SL6440 is intended for use in narrow systems and works well with a 10.7-MHz i-f. This is because the Q of the quadrature coil is not loaded by the resistance of the integrated circuit. It is quite easy to get a S + N/N ratio of 50 dB a deviation of only 2 kHz at an i-f of 10.7 MHz with the SL6440. To achieve the same performance with a CA8089 would require either a 455-kHz i-f or a crystal quadrature element (which is expensive!).

Detected audio is routed to the audio output stage. Any remaining rf is filtered by C28. C29 is an interstage coupling capacitor. R18, a 1-MΩ potentiometer controls the audio gain, which is highest when the resistance is highest. This control is not mounted on the board since front-panel adjustments are normally required.

The output stage is biased by R16 and R13 and has negative feedback via R14, R15 and C30. The overall output stage gain may be altered by varying R14, but it should not be made less than 1.2 kΩ or excessive distortion may result. The output is coupled to a loudspeaker of 8 ohms or more through a 100-μF capacitor. This stage will supply up to 200 mW with an 8-volt supply, but is somewhat "happier" at the 120-mW level. The output is decoupled to ground with a 0.22-μF tantalum capacitor to prevent hf instability.

The receiver uses an 11- to 15-volt power supply and a three-terminal regulator (μA78L08C) to provide a regulated 8 volts to the crystal oscillator and the SL6640. The supply is decoupled in several places with 0.1-μF ceramic capacitors and if the supply source impedance is likely to exceed a couple of ohms, it should also be decoupled at lf with a few hundred microfarads.

Construction and Alignment

The receiver is built on a double-sided printed circuit board using the top side of the board as a ground plane. If a board with plated through holes is not used, ground connections should be made on both sides of the board. The printed circuit layout uses a minimal inductance technique which is very effective at vhf. Circuit devices should be soldered right down close to the board to minimize lead inductance.

If a signal generator, rf millivoltmeter and oscilloscope are available, adjustment of the receiver is quite simple. The crystal oscillator coil (L5) is adjusted for maximum output consistent with reliable starting (to avoid loading the oscillator the probe should be connected to the drain of the mixer MOSFET). Coils L1, L2, L3 and L4 are adjusted in turn for maximum gain from the antenna terminal to the same test point.

The quadrature detector coil is adjusted with a 10.7-MHz fm signal fed to the input side of the crystal filter. With full audio gain and the squelch resistor set to minimum resistance, tune the quadrature coil for minimum distortion at the output. If clipping should occur reduce the audio output.

Adjustment without test equipment is less precise, however, satisfactory. In the presence of a strong desired signal, adjust L5 until the signal is heard at maximum volume and minimum distortion. Turn the receiver on and off a few times to ensure that the oscillator always starts.

The quadrature coil (L6) is next adjusted for minimum apparent distortion with the squelch potentiometer set to minimum resistance. Then, the test signal is reduced (perhaps by using a progressively smaller antenna) and L1, L2, L3 and L4 are tuned for maximum received signal strength.

Finally, the squelch control is set so that

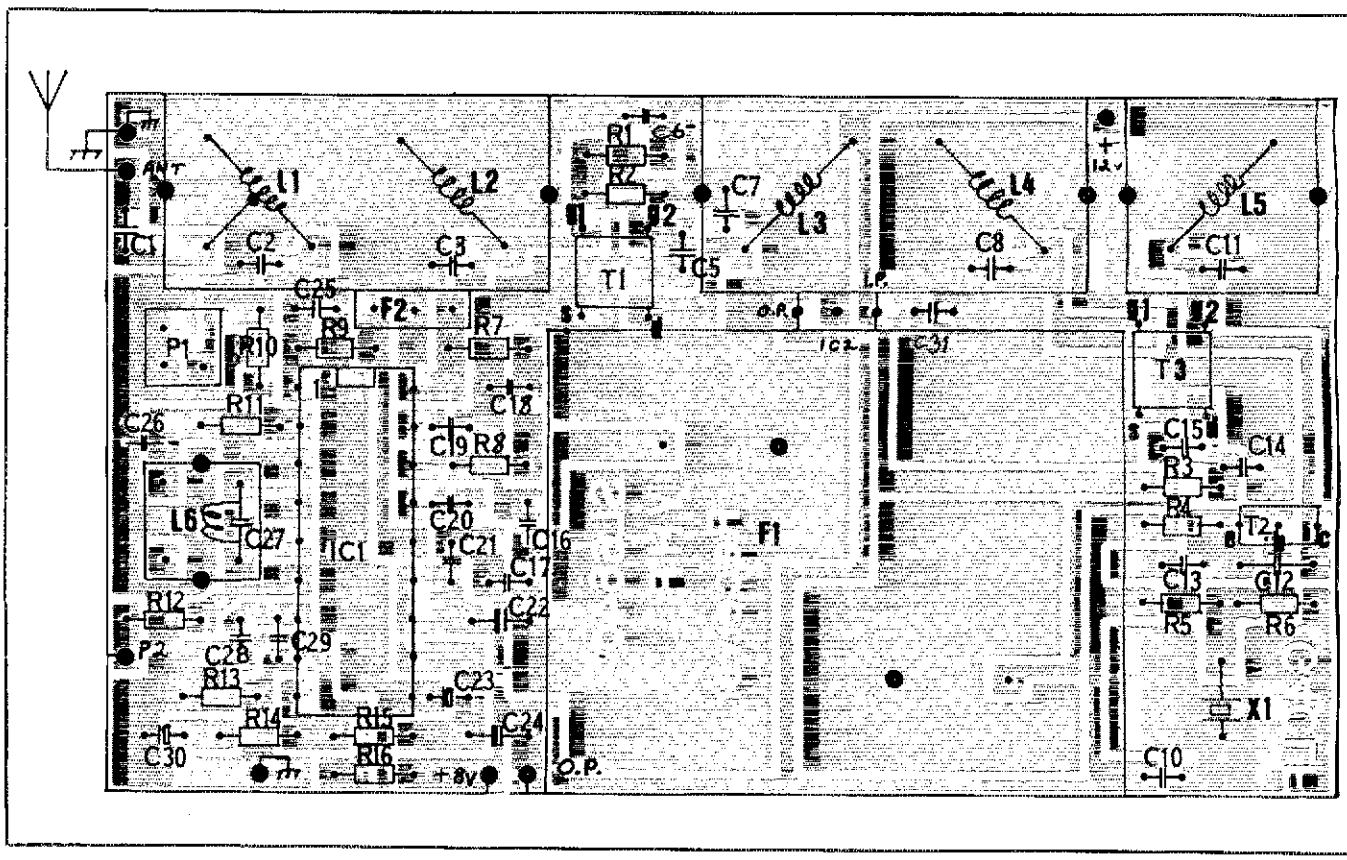


Fig. 3 — This is the parts-layout guide for the vhf receiver as viewed from the component side of the board. This drawing is not to scale. The etching pattern, which is shown in the "Hints and Kinks" section of this issue, is drawn to scale.

the receiver is muted when the received signal level becomes unacceptably low. If measured with a calibrated signal generator, this level should be between 0.15 and 0.5 μV. However, it is better to set the squelch control at a desired S + N/N ratio rather than to an absolute input voltage as differences in devices will provide some variation as far as operation is concerned.

A case for the receiver has not been designed since it is so small that it may be fitted into all sorts of places. For example, it could be included in an existing broadcast receiver with a switching system to turn off the broadcast program when a vhf signal is received. Or, the receiver could be used as part of a transceiver package. Besides, this author is not particularly adept at case design! QST

ARRL Numbered Radiograms

☐ Messages containing ARL texts have the same form as any other message, except that the letters ARL are inserted in the preamble before the check and in the text before spelled-out numbers, which represent texts from this list. *Example:* NR 1 R W1AW ARL 5 NEWINGTON CONN JUNE 1 DONALD R SMITH AA 164 EAST SIXTH AVE AA NORTH RIVER CITY MO AA PHONE 733-3968 BT ARL FIFTY ARL SIXTY ONE BT DIANA AR. For additional information about traffic handling, consult *Operating an Amateur Radio Station*, published by ARRL.

Group One — For Possible "Relief Emergency" Use

ONE	Everyone safe here. Please don't worry.
TWO	Coming home as soon as possible.
THREE	Am in _____hospital. Receiving excellent care and recovering fine.
FOUR	Only slight property damage here. Do not be concerned about disaster reports.
FIVE	Am moving to new location. Send no further mail or communication. Will inform you of new address when relocated.
SIX	Will contact you as soon as possible.
SEVEN	Please reply by Amateur Radio through the amateur delivering this message. This is a free public service.
EIGHT	Need additional _____mobile or portable equipment for immediate emergency use.
NINE	Additional _____radio operators needed to assist with emergency at this location.
TEN	Please contact _____. Advise to stand by and provide further emergency information, instructions or assistance.
ELEVEN	Establish Amateur Radio emergency communications with _____ on _____ MHz.
TWELVE	Anxious to hear from you. No word in some time. Please contact me as soon as possible.
THIRTEEN	Medical emergency situation exists here.
FOURTEEN	Situation here becoming critical. Losses and damage from _____ increasing.
FIFTEEN	Please advise your condition and what help is needed.
SIXTEEN	Property damage very severe in this area.
SEVENTEEN	REACT communications services also available. Establish REACT communications with _____on channel _____.
EIGHTEEN	Please contact me as soon as possible at _____.
NINETEEN	Request health and welfare report on _____. (State name, address and telephone number.)
TWENTY	Temporarily stranded. Will need some assistance. Please contact me at _____.
TWENTY ONE	Search and Rescue assistance is needed by local authorities here. Advise availability.
TWENTY TWO	Need accurate information on the extent and type of conditions now existing at your location. Please furnish this information and reply without delay.
TWENTY THREE	Report at once the accessibility and best way to reach your location.
TWENTY FOUR	Evacuation of residents from this area urgently needed. Advise plans for help.
TWENTY FIVE	Furnish as soon as possible the weather conditions at your location.
TWENTY SIX	Help and care for evacuation of sick and injured from this location needed at once.

Emergency/priority messages originating from official sources, must carry the signature of the originating official.

Group Two — Routine Messages

FIFTY	Greetings by Amateur Radio.
FIFTY ONE	Greetings by Amateur Radio. This message is sent as a free public service by ham radio operators here at _____. Am having a wonderful time. Will let you know when I return.
FIFTY TWO	Really enjoyed being with you. Looking forward to getting together again.
FIFTY THREE	Received your _____. It's appreciated; many thanks.
FIFTY FOUR	Many thanks for your good wishes.
FIFTY FIVE	Good news is always welcome. Very delighted to hear about yours.
FIFTY SIX	Congratulations on your _____, a most worthy and deserved achievement.
FIFTY SEVEN	Wish we could be together.
FIFTY EIGHT	Have a wonderful time. Let us know when you return.
FIFTY NINE	Congratulations on the new arrival. Hope mother and child are well.
*SIXTY	Wishing you the best of everything on _____.
SIXTY ONE	Wishing you a very merry Christmas and a happy New Year.
*SIXTY TWO	Greetings and best wishes to you for a pleasant _____holiday season.
SIXTY THREE	Victory or defeat, our best wishes are with you. Hope you win.
SIXTY FOUR	Arrived safely at _____.
SIXTY FIVE	Arriving _____on_____. Please arrange to meet me there.
SIXTY SIX	DX QSLs are on hand for you at the _____QSL Bureau. Send_____ self-addressed envelopes.
SIXTY SEVEN	Your message number _____ undeliverable because of _____. Please advise.
SIXTY EIGHT	Sorry to hear you are ill. Best wishes for a speedy recovery.

*Can be used for all holidays.

ARL numbers should be spelled out at all times. This list becomes effective January 1, 1980.

EDMUND B. REDINGTON, W4ZM

☐ We regret to report the death, on November 1, of Edmund B. Redington, W4ZM, a member of the ARRL RFI Task Group since 1975. Ed, of Springfield, VA, had just passed his 80th birthday anniversary when he succumbed to multiple medical problems. He had discovered wireless in the Boy Scout Handbook in 1911 and received his license as 8AQM just as he turned 16.

Ham radio took Ed into a career: Navy Radio School, ship's operator on the American Hawaiian Line, time out for Union College and eight years as teacher and principal in New York and Pennsylvania public schools. Then back into electronics: instructor in math and radio at Capitol Radio Electronics Institute (CREI), Washington; instructor-in-charge, U.S. Coast Guard Radio Engineering and Maintenance School, Groton, CT (where he coauthored *Basic Radio* with J. Barton Hoag); and then across the river Thames to the Coast Guard Academy as an instructor. Duty in New York and then Washington followed; Ed retired from the Coast Guard in 1957, as a Commander, and promptly went to work for the Electronics Industries Association, until a second retirement in 1966.

Since then, Amateur Radio kept Ed more than busy: He was chairman, Washington Chapter, Quarter Century Wireless Association; president, Washington Chapter, Old Old Timers Club; treasurer, Washington Chapter, Society of Wireless Pioneers; secretary, Springfield/Annandale Amateur Radio Club and a member of the Tri-City Radio Club (New London, CT), Potomac Valley Radio Club, Antique Wireless Association, Northern Virginia Amateur Radio Council, Radio Club of America, Radio Society of Great Britain, A-1 Operator Club, First-Class CW Operators Club (FOC), Life Member of ARRL (elected when he was 72!) and holder of the ARRL 60-Year Membership Award (see photo, page 79, November *QST*).

Ed leaves his wife, Peggy; sons Ebby, N4AGS, Robert and George; and daughter Mary Elizabeth Galbraith. He was buried near his birthplace, Troy, PA. — *W4GF, W2ICE, W1QV and W1UED*

An Inexpensive High-Z Accurate Transistor Voltmeter

Short-term projects appeal to most of us who build and test amateur gear. This voltmeter from *Radio Communication* for May 1979 will tempt you to heat up that soldering iron!

By R. E. Barber,* G3NEF/ZC4RE

Some time ago, the author was faced with the problem of how to measure a wide range of voltages with series impedances of megohms. The measurements had to be accurate within 2.5 percent and, furthermore, they had to be repeatable with time. No commercial instrument capable of meeting the required specifications and priced within the limited budget of the project was available, so it was decided to build an instrument which featured:

- Measuring range: 10 mV to 400 V.
- Input impedance: Better than 15 MΩ on all ranges.
- Accuracy: Better than 2.5 percent on all ranges.
- Power supply: Two 9-V batteries, self-contained.
- Low drift with time and temperature.
- Capability (with modification) to measure rf, af and mains voltages, rms and peak values.
- Small size and easy portability.

Because of the requirements of low drift, high sensitivity and small size, the author decided to use operational amplifiers as the active part of the instrument. The very high loop gain in the open-loop configuration of these amplifiers (approximately 80 dB) makes them ideal for gain control by means of negative feedback, as the gain can be very accurately set; as accurately, in fact, as the resistance values of R1, R2 and R3 in Fig. 1, where the gain is equal to

$$\frac{R1 + R2}{R2}$$

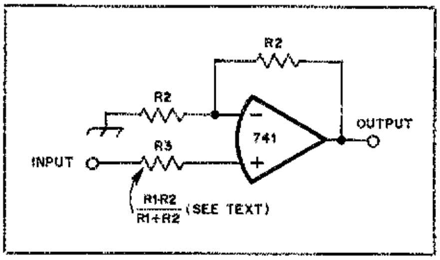


Fig. 1 — Basic operational amplifier circuit.

To obtain the required ranges of 10 mV to 400 V without resorting to extremely high values of input-attenuator resistance, it was decided that two operational amplifiers should be used in series, with the gain of the second amplifier made variable.

Circuit Data

The initial circuit design is shown in Fig. 2. With the component values indicated, it was found that the instrument met all the requirements except one: On the 10-mV range only, the resulting input impedance was 2.5 MΩ. For most applications, this limitation would not be significant. Therefore, the circuit is included as a very inexpensive and versatile high-Z voltmeter.

One problem found was that it is necessary to zero-set each time the range is changed, because of the relatively high input current of the 741. In practice, however, this problem was found to be insignificant.

The 10-mV range was critical to the author, so the circuit shown in Fig. 3 was evolved at some extra cost. The circuit uses an FET-input op amp in place of the first 741 and meets all of the design criteria after calibration. In addition, S1B and R17 are no longer required, leading to simplification. The current drawn from the supply is reduced somewhat as the LH0042C consumes less power than the 741 does.[1] The input impedance on all ranges is better than 18 MΩ. This was calculated and measured while using an impedance bridge at a frequency of 1 kHz. In addition, the accuracy after calibration is better than 2.5 percent on all ranges and has a better stability with time than the circuit of Fig. 2. A point of note is that the accuracy is determined primarily by the accuracy of the resistors used. Hence, the cost of the instrument may be reduced if lower-tolerance resistors are used (e.g., five-percent resistors will provide an accuracy of approximately five percent). Finally, the problem of constantly resetting the zero each time the

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[1]National Semiconductors, Ltd., 331 Cornelia St., Plattsburgh, NY 12901

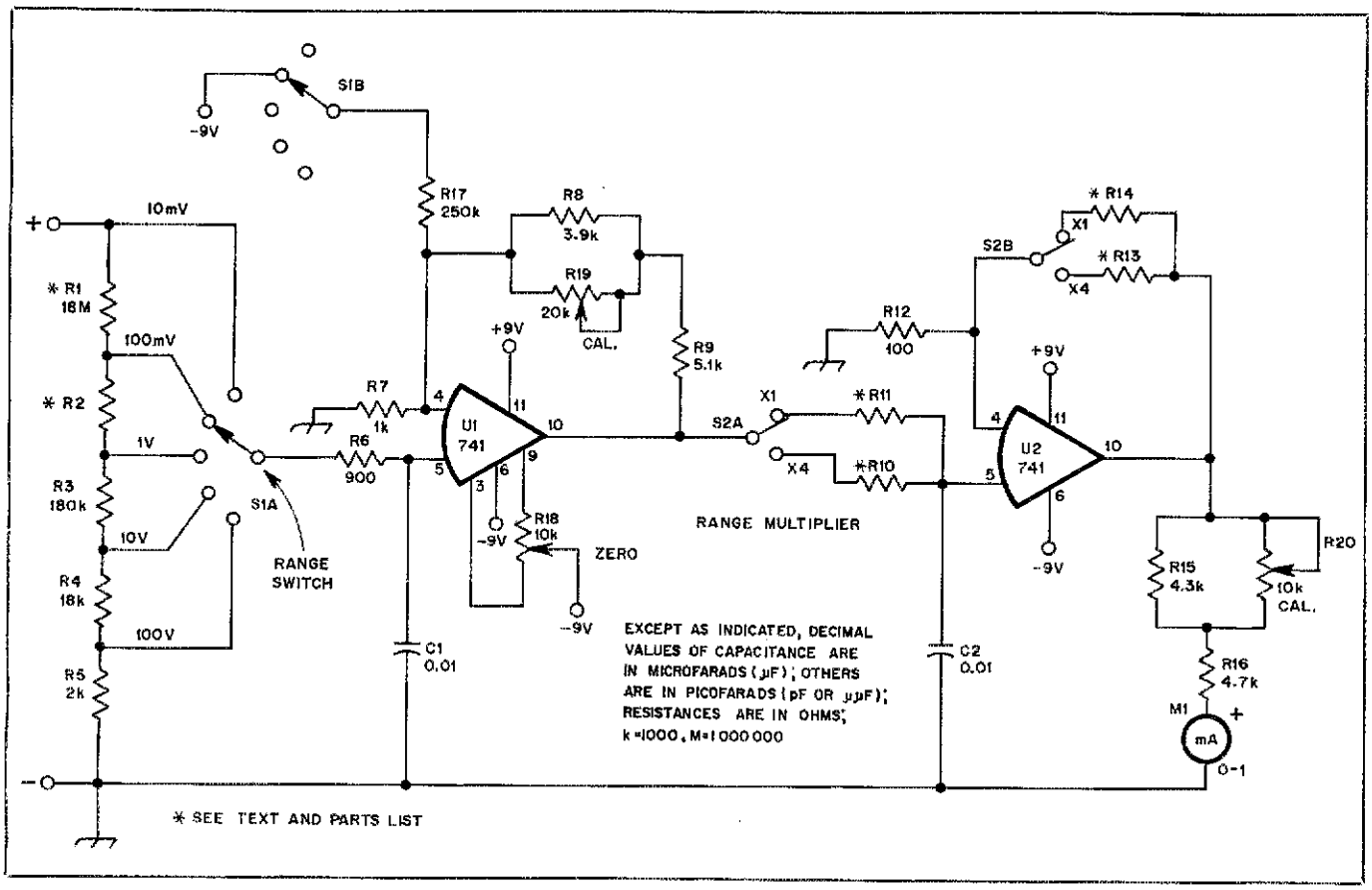


Fig. 2 — The prototype circuit of the high-impedance voltmeter. All resistances are 1/4 watt. See text and parts list for components marked with asterisk.

C1, C2 — 0.01 μF, 50 V.
M1 — 0- to 1-mA meter.
R1 — 18 1-MΩ resistors in series.
R2 — 1 MΩ + 750 kΩ + 51 kΩ in series.
R10 — 2.4 kΩ in parallel with 100 Ω.
R11 — 180 Ω in parallel with 220 Ω.
R13 — 2.4 kΩ in series with 100 Ω.
R14 — 9.1 kΩ + 750 Ω + 51 Ω in series.
S1 — 5-position, 2-section wafer.
S2 — Dpdt toggle.
U1, U2 — 741 op amp., 14-pin DIP.

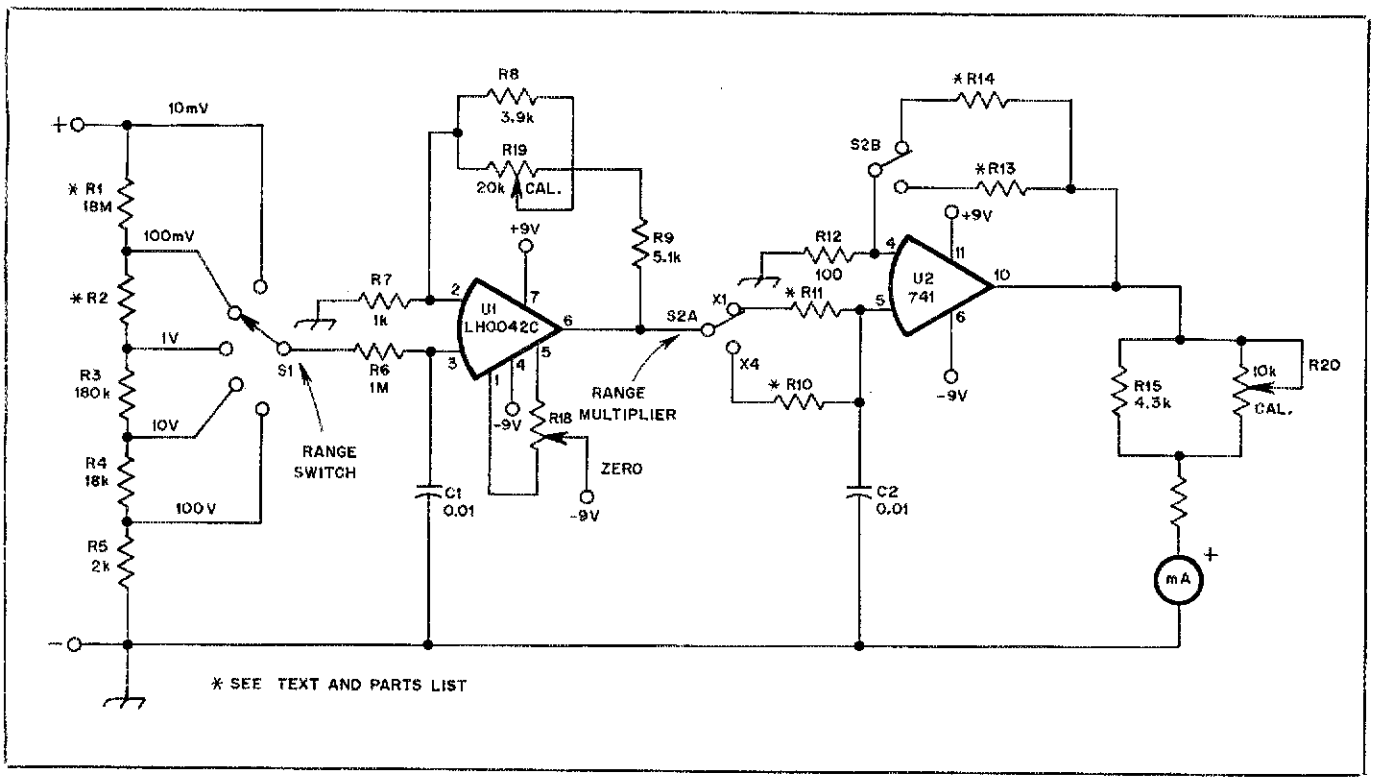


Fig. 3 — The final circuit of the high-impedance voltmeter. All resistors are 1/4 watt. See text and parts list for components marked with asterisk. All as listed above except:

R6 — 1 MΩ.
R17 — omitted.
S1 — 5-position, 1-section wafer.
U1 — LH0042C FET op amp.
U2 — 741 op amp.

range was changed was reduced to insignificant proportions.

Construction

The component layout is not critical. In fact, both ICs are mounted close together in the final instrument. On the prototype they were well spaced with no noticeable difference in operation. Care should be taken in soldering. Use the shortest possible leads on all components (especially the input attenuator) as noise picked up here will be very noticeable. The author used small-gauge Veroboard as the circuit base and soldered the ICs directly to this board which in turn was affixed directly to the meter terminals. All other components were fixed and soldered onto the board. Care should be taken not to overheat the chips when soldering them or other components. The input attenuator is also built on Veroboard of the same gauge. All resistors used are one percent, high-tolerance and stability types except the variables which are 20-percent units connected as shown to minimize their variations with time.

Setting Up

When construction is completed, carefully check all wiring for errors. Switch the instrument to the 10-mV range and set R20 to maximum. This ensures that the meter cannot exceed full-scale deflection when the instrument is switched on. Turn the instrument on and connect 20 mV dc to the input. Set R20 so that the meter reads full scale plus about two percent. Remove the voltage and short-circuit the input; adjust R18 for zero on the meter. Connect 10 mV dc to the input and adjust R19 for full-scale deflection of the meter. Calibration of the active parts of the circuit is now complete. It should hold to within one percent on all ranges, including the divide-by-four, activated by S2. When using the 741 op amp (Fig. 2), S1B is required to bias the first stage so that the offset voltage fed back through the chip (caused by the poor transfer impedance of the 741) comes within the range of R18, the ZERO control. When using the FET op amp, LH0042C, this biasing arrangement is not required. If the circuit of Fig. 2 is used, however, then the additional contacts on S1B could be used to set the zero on each range by adjusting R18. The author felt that this added complication of the circuit was not worthwhile, as the biasing needed to set the zero accurately varies with the 741 used. The variation is quite considerable and the values of biasing resistors can only be found by trial and error.

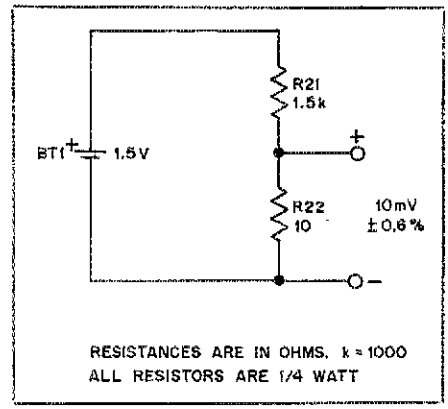


Fig. 4 — Calibration circuit used to obtain the required 10-mV level required. The battery should be checked for proper output voltage.

Future Developments

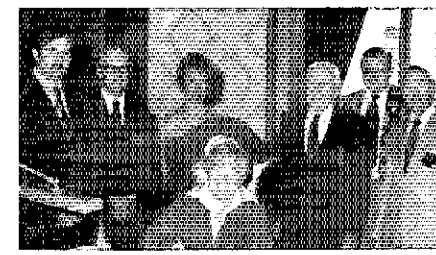
A design is in hand to build a constant-current rectifier section for this instrument, thus giving it a linear scale for ac voltages up to 400 V peak. This rectifier board will be placed between the meter and the amplifiers and thus will be easily switchable. It is hoped that with suitable modifications the resultant instrument will be capable of measuring voltages to within five percent over the frequency range from dc to 100 kHz. At the time of this writing, problems were experienced obtaining linearity at very low meter deflections and accuracy above 50 kHz.

To obtain the required calibration voltage of 10 mV, the accuracy of the 20-mV signal not being that critical, the author used a 1.5-V cell and a potential-divider network. The circuit and values used are shown in Fig. 4. An accurate voltmeter can be used to first check that the cell is "up to scratch" at 1.5 V.

If one wishes to measure dc currents, this can be done by measuring the voltage drop across a known resistor. By using unity-value resistors (i.e., 0.1, 1, 10 Ω) an almost direct-reading meter can be obtained. A 1-W, 0.01-Ω, one-percent resistor could be used to measure the current drawn in ranges from 1 A to 10 A, full scale.

Strays

Did Amateur Radio exist in 1887? It's hard to argue that it didn't based on this rare print, "The Shrimpers," from the archives of the Royal Photographic Society of Great Britain. That chap in the background sure looks like he is carrying a 6-meter beam! *(Thanks to the Polaroid Corp., Scientific American, April 1977, and W2RZJ)*



Amateur Radio Week, celebrated in Washington recently, included an exhibit featuring Amateur and Commercial Radio. The display, at the State Capitol Museum, opened with a live broadcast over station KGY, one of the oldest commercial radio stations in the country. KGY had its beginning in the early part of this century as experimental Amateur Radio station 7YS. Governor Dixy Lee Ray, center, is shown signing the proclamation of Amateur Radio week. Pictured with Governor Ray are, from left: ARRL Northwest Division PRA W7CKZ; WA SCM W7IEU; Judy Tennant of the State Capitol Museum; W7OS of the Radio Club of Tacoma; KGY Station Manager Herb Anderson; and WA SEC WA7RWK.

Compatible RTTY

How about putting RTTY on your fm repeater . . . simultaneously with voice! Here's how it works, and how you can put this system on your machine.

By Everett L. Gayhart, Jr.,* WB2IXW

How many members of your fm repeater group also operate RTTY? How many of them would like to have an RTTY repeater, but haven't been able to swing it? Here is a system that will not only add RTTY capability to your present repeater, but will permit use of that mode simultaneously with voice operation, with no interference, thereby doubling the usefulness of the machine and at the same time keeping everyone happy. Basic modification of the repeater requires no more than adding another receiver with antenna, connecting an RTTY converter, and wiring a capacitance diode into the transmitter to provide fsk.

Some time ago, a couple of members of the Westchester Emergency Communications Association who were interested in RTTY operation conceived the idea of simultaneous voice and RTTY transmission through the WR2AIS repeater. The objective was to provide autostart RTTY operation entirely independent of any voice transmissions.

The original approach was to split a portion of the audio spectrum to provide a channel for narrow-shift afsk. A system was set up using a notch filter in the voice channel, with RTTY transmission in the notch on 2125 and 2295 Hz.

Although this system offered the distinct advantage that any standard terminal could be used, its overall operation was somewhat less than satisfactory. The notch filter (automatically switched in when an RTTY transmission took place) degraded the audio noticeably. Attempts to run the tone at an unobtrusive level resulted in poor copy caused by voice interference. On the other hand, on transmissions of appreciable duration, the use of adequate tone levels resulted in howls of protest from monitoring stations.

While experimenting with this system, the WR2AIS group chanced to meet a ham who had an idea and was looking for a group that would be interested in trying it out. The idea was to convey the teleprinter signals by means of shifting the repeater carrier. W2BK, originator of the idea, modestly disclaims having devised anything new, since the concept of simplexing wire voice circuits to provide telegraph channels is almost as old as the telephone itself. It has also been applied to a-m radio systems, but as far as the WECA group knows the application of this technique to an amateur fm repeater is entirely unique. Over WR2AIS it *is* being done, and it works very well!

System Operation

The system layout is quite simple. (See Fig. 1.) RTTY access is on a separate frequency, to a separate receiver, using standard vhf practice: carrier frequency modulated by the customary tones (2125-Hz mark and 2295-Hz space). At the repeater, the teleprinter audio is fed to a conventional demodulator (ST-5). Data-level output, rather than loop keying, is used to operate the fsk circuit in the transmitter, which has been adjusted for approximately 850-Hz shift. A universal

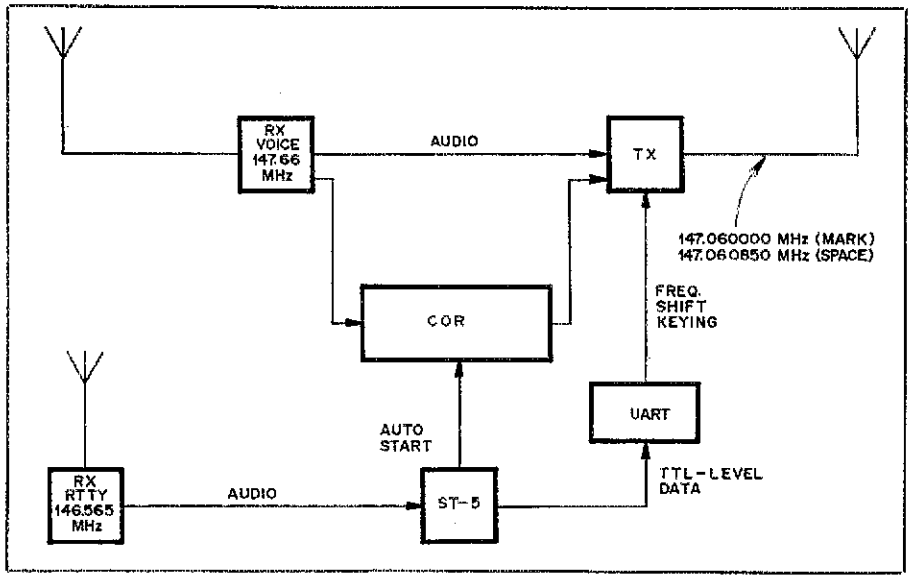


Fig. 1 — System layout for compatible RTTY at WR2AIS. A separate RTTY receiver on a frequency different from that used for standard fm inputs is connected to a terminal unit. The TU then provides both auto-start and TTL-level signals to the carrier-operated relay and UART regenerator respectively. Both of these are connected to the transmitter, where frequency-shift keying is done with a capacitance diode.

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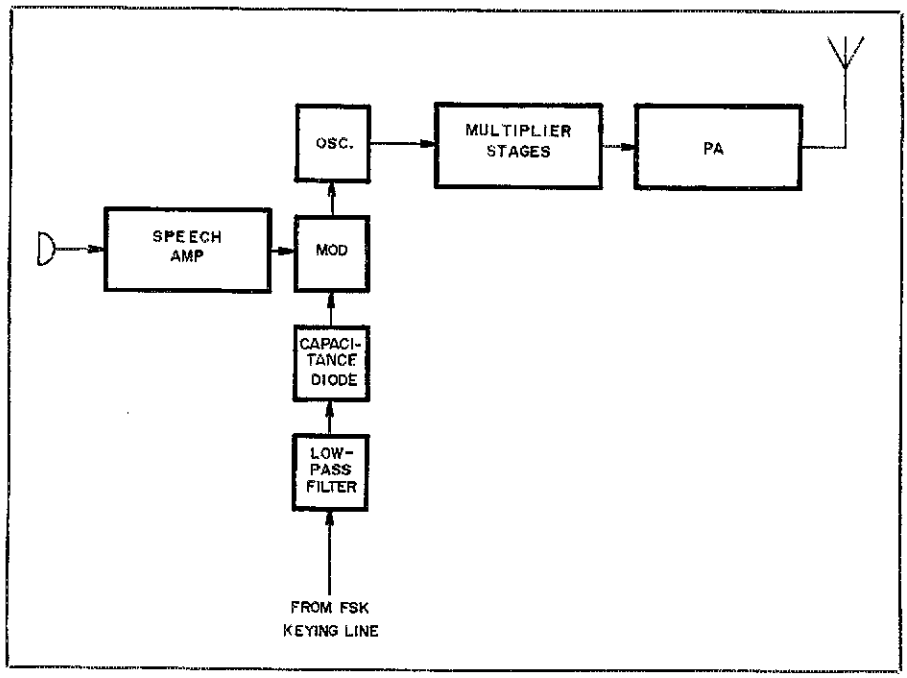


Fig. 2 — Method used to fm the transmitter at WR2AIS with the RTTY signal provided by the UART regenerator. (See Fig. 1.)

asynchronous receiver-transmitter (UART) regenerator is used between the demodulator and the fsk circuit to remove possible distortion that might be present on the incoming signal, but this is a refinement and not an essential part of the system. The autostart circuitry associated with the demodulator is used to bring up the repeater for teleprinter operation.

Repeater control techniques are numerous, of course, but at WR2AIS it is arranged so that either input will activate the repeater, a tone being required on the RTTY input. The teleprinter signal will continue during a voice time-out, even though the audio has been cut off. The result is virtually error-free copy, entirely independent of voice activity — in fact, the printer may even be typing away while the operator is listening to a voice QSO on the same receiver.

Fig. 2 shows in block diagram form how the repeater transmitter is modulated. Because of differences in various repeater transmitters, exact details for incorporating fsk circuitry cannot be given. However, some comments can be made by way of outlining the requirements to be met. If the teleprinter signal is to be inaudible in the voice output, then extremely "soft" keying must be used. Bear in mind that an abrupt shift in frequency represents a high audio-frequency pulse to an fm receiver and comes through as a sharp click. Therefore, mark/space transitions must be slowed to below 200 or 300 Hz. Let's think clearly here: It's the *rate of change* we're talking about, not bits per second, and the rate of change going from mark to space (or the reverse) must be no higher than the rate of change of a 200- or 300-Hz sine wave. This may sound a bit heretical to distortion-conscious RTTY enthusiasts, but there is no need for concern — the ideal square-wave shape of the fsk signed will be restored by the receiving slicer. The desired result can be obtained by placing a suitable low-pass filter in the keying line, which in turn must control an analog type of device such as a capacitance diode. Any fsk switching device having an inherent "snap action" might well restore the clicks despite any amount of filtering, and should be avoided.

RTTY Reception from the Repeater

Demodulating the teleprinter signals from the repeater requires the use of a special converter. The circuit in Fig. 3 is simple, inexpensive, easy to assemble, and has given several users a lot of perfect copy. It can be interconnected readily with existing systems. The basic unit was designed by W2LTJ and reworked by the author to simplify parts procurement. The system uses a conventional 2-meter receiver, one which normally uses a discriminator — a circuit that produces some dc voltage level (usually zero) when the receiver is tuned to a carrier. The discriminator varies that voltage positive or negative as the incoming carrier is shifted above or below the tuned frequency, thus producing a replica of the original audio waveform.

Since the RTTY transmission causes a shift in the basic carrier frequency about which the audio deviation takes place, the discriminator output will show a relatively slight change in the "center" voltage of the audio waveform. The RTTY receive converter is designed to recognize that change in center voltage. Many receivers provide a test point for the discriminator output for tuning adjustment purposes, and this is the point to which the converter must be connected.

The low-pass filter, using two op amps (U1 and U2 in Fig. 3), is an active type with unity gain and a cutoff frequency at 30 Hz. An "RY" signal having alternate mark and space bits of 22 ms each represents a square wave with a 44-ms cycle and a fundamental frequency of slightly less than 23 Hz. This is the *highest* frequency that will be encountered at 60 wpm. The filter upper limit of 30 Hz is adequate to pass it, while at the same time effectively blocking the voice modulation. A scope connected to the filter output will show data pulses rounded to the point of resembling sine waves.

The odd values of capacitance called for in the filter design may be easily obtained by paralleling more common values: 0.047 μF and 0.01 μF for 0.057 μF (C2 in Fig. 3), and a slight liberty may be taken by combining 0.47 μF and 0.22 μF to make 0.69 μF (C3) with entirely satisfactory results.

The op amps are used as differential amplifiers; they respond to the *voltage difference* between the two inputs. Therefore, the bias control (R5) at the input sets the switching threshold by establishing the voltage applied to the inverting input of the first op amp, U1. The signal is applied to the noninverting input. Only a slight variation in bias is required; a swing of plus or minus 0.1 volt should be more than ample. A value of 500 ohms for R5 (sandwiched between R4 and R6 — two 22-kΩ resistors) gives about the right range and rate of control, but *R4 and R6 must be closely matched*, otherwise the pot will not be at the center of the string and will not be able to reach or cross the zero-voltage point.

The author first tried a simpler version of the terminal unit (TU) that was direct-coupled throughout, with the output of the low-pass filter going right to the slicer. This arrangement gave perfect copy, but receiver tuning was so critical that warm-up drift resulted in loss of copy, and the crystal trimmer just wouldn't stay put accurately enough for practical use. Several arrangements were tried, but all shared a common problem: shifting of the center point with signal content. For example, a series of blank characters, each being five consecutive space bits, would resolve itself into a string of "Ts" on paper (the code for a T is four consecutive space bits followed by one mark bit). After much experimenting, W2LTJ came to our rescue with his "automatic zero centering device" (AZCD) which completely solved our problem. Although he has published a description of the circuit elsewhere in conjunction with conventional "low band"

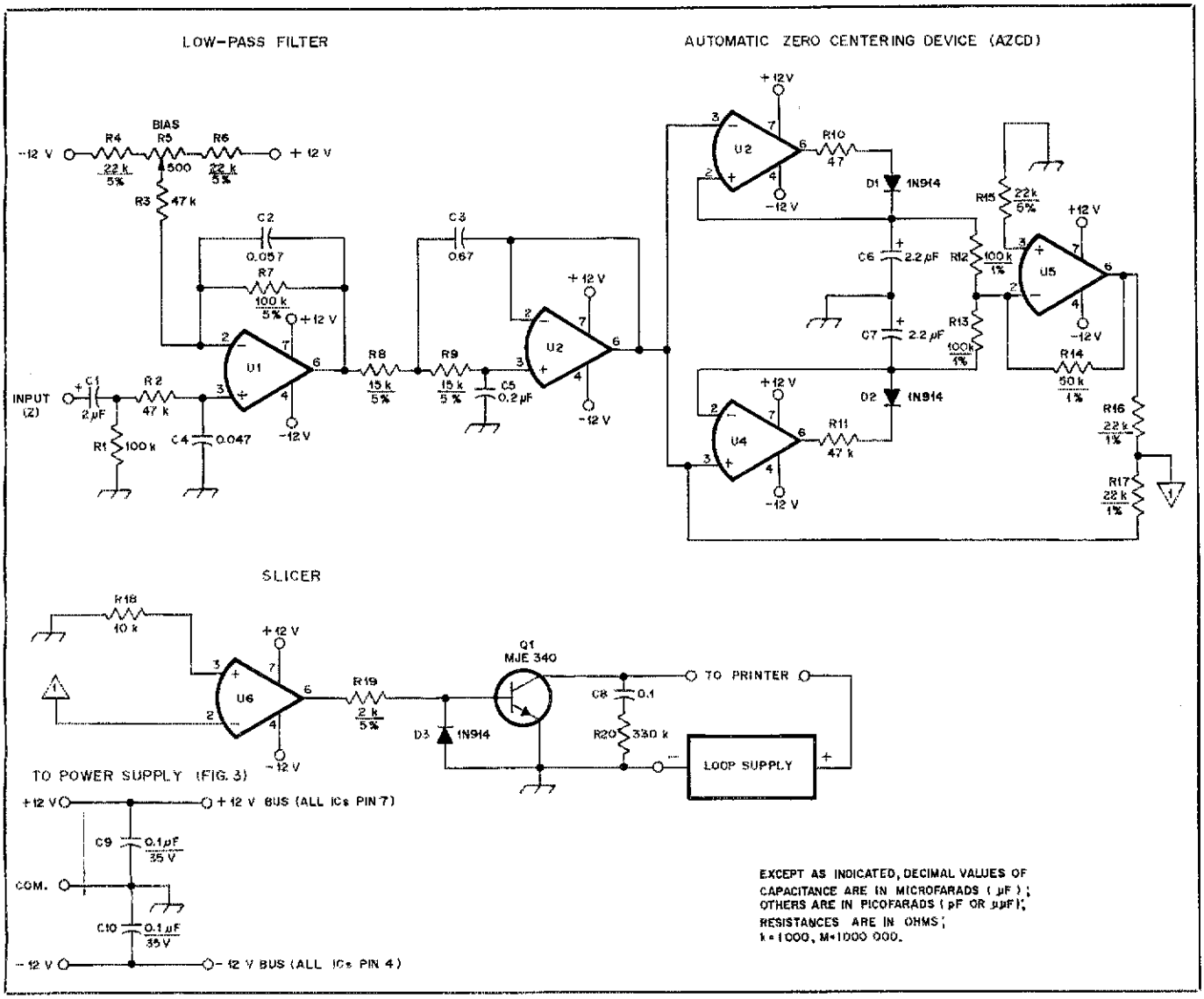


Fig. 3 — Schematic diagram of the basic receive terminal unit for compatible RTTY. Part numbers in parentheses are Radio Shack unless otherwise indicated. All resistors are 1/4 or 1/2 watt.

C1 — 2.0 μF minimum (272-997).
C2 — 0.057 μF (0.47 + 0.01 μF).
C3 — 0.67 μF (0.47 + 0.22 μF satisfactory).
C4 — 0.047 μF.
C5 — 0.2 μF.
C6, C7 — 2.2 μF, 35 V.
C8 — 0.1 μF, 600 V.
C9, C10 — 0.1 μF, 35 V.
D1-D3, Incl. — Small-signal silicon diode, 1N914 or equiv.
Q1 — Motorola MJE 340 (Circuit Specialists, Tempe, AZ).
R1 — 100 kΩ.
R2, R3 — 47 kΩ.
R4, R6, R15 — 22 kΩ, 5 percent.
R5 — 500-Ω trimmer potentiometer (271-226).
R7 — 100 kΩ, 5 percent.
R8, R9 — 15 kΩ, 5 percent.
R10, R11 — 47 Ω.
R12, R13 — 100 kΩ, 1 percent.*
R14 — 50 kΩ, 1 percent.*
R16, R17 — 22 kΩ, 1 percent.*
R18 — 10 kΩ.
R19 — 2 kΩ, 5 percent.
R20 — 330 kΩ.
U1-U6, Incl. — 741 op-amp DIP IC (276-007).
*Allied Electronics, AE Division. (Min. order, 10 each.)

RTTY reception, a brief explanation is in order at this point. Two op amps, U3 and U4, are used as positive and negative peak detectors, followed by a third op amp, U5, wired as a summing amplifier. The circuit produces a voltage output equal to half the difference between mark and space, whatever their absolute levels may be. It works very well, and tolerates wide variations in receiver tuning. The remainder of the TU is straight-forward: an op-amp slicer, U6, followed by a switching transistor to key the loop.

Because the UART in the repeater system will not repeat upside-down transmissions correctly, no reversing switch has been included in the TU. At WR2AIS, upward shift is used for space. The author's receiver has discriminator phasing and output that produce positive space pulses of about 50 mV in amplitude. This combination works well. Either or both of two conditions may be encountered, but are easily dealt with. One is *low signal level*, the other is *opposite phase* (that is negative rather than positive space pulses).

For the second condition, signal inversion between the receiver and TU is recommended. Merely reversing the slicer input won't do it — the TU operates while biased one side of center so that it will "rest" in mark, and cannot satisfactorily be reversed. For the first condition, a preamplifier is needed. Fig. 4 gives circuit arrangements for operational amplifiers in both inverting and noninverting configurations, together with formulas for the required gain. Wiring an additional 741 op amp in the right combination as may be needed will solve either or both of these problems nicely.

Construction

Construction of the terminal unit should present no problems, provided reasonable care is exercised in the layout. The circuit-board and parts-placement guide of Fig. 5 may be used. Gross "leapfrogging" of high- and low-level leads may cause motor-boating, and strong ac

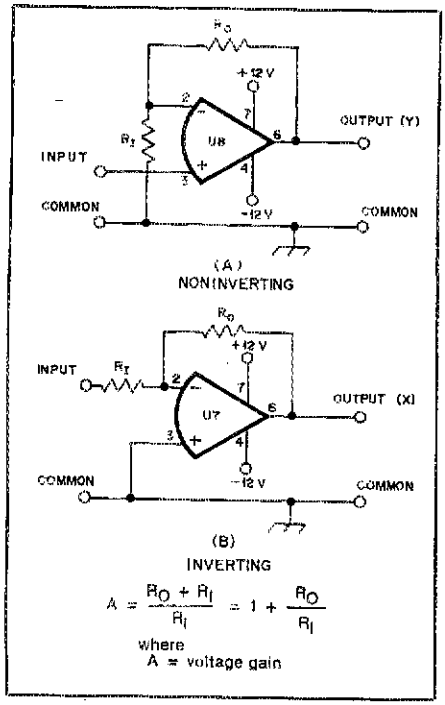


Fig. 4 — Preamps can be used in front of the TU shown in Fig. 3 to increase low signal levels from the discriminator. Also, opposite phase problems can be corrected by using an *inverting* preamp to "flip" the signal to obtain positive space pulses. See text for details. U7, U8 — 741 op-amp DIP IC.

fields should be avoided. Values are not critical with the following exceptions: In the AZCD section, the 100-kΩ resistors (R12 and R13) should be matched for balance, and the 50-kΩ feedback resistor (R14) should be exactly one-half the absolute value of one of the 100-kΩ resistors. The 22-kΩ resistors (R16 and R17) should also be matched for balance. W2LTJ promises satisfactory operation if the junk box yields combinations within two or three percent of an exact match. Otherwise, precision resistors are recommended in this application. In the low-pass filter, wide liberties should not be taken. Thus, you will avoid altering the frequency characteristic of the filter.

The author's prototype is running on regulated plus and minus 12 volts. The power supply diagram is shown in Fig. 6. The rated high limit for the op amps is 15 V, but they will work on substantially less than 12. We made no attempt to determine just what the low limit might be.

After the converter has been completed, hook it up and apply power. While receiving a carrier, try turning the bias adjustment back and forth. This should cause the unit to switch between mark and space. For an approximate adjustment, set the pot just beyond the point where a mark condition occurs. For a fine adjustment, another station should be asked to make a test transmission consisting of a series of blank characters at machine speed from a TD. The pot should then be set to the point where the printer stops printing Ts and responds correctly to the blanks. After a long pause in mark, say 10 seconds or more, the first character may print incorrectly — the AZCD needs a few pulses to adjust itself. Careful setting of the bias pot will minimize this effect. When the system is in use, strong transient pulses may cause the printer to run open momentarily, but mark condition should be restored within a second or two.

There is one factor that deserves mention — it might be important, as it was in our case. After a preliminary trial, the system was set up with fsk installed in a new repeater. Persistent difficulty was experienced from voice interference, especially at high deviation levels, and it took quite a bit of time to track down the cause. The culprit was ultimately found to be nonlinearity in the voice modulator, which had the effect of shifting the center frequency during modulation peaks. Since the RTTY converter filters out all deviation at an audio rate, it sees only the center point (unmodulated carrier), whether voice deviation is taking place or not. Since the converter is designed to

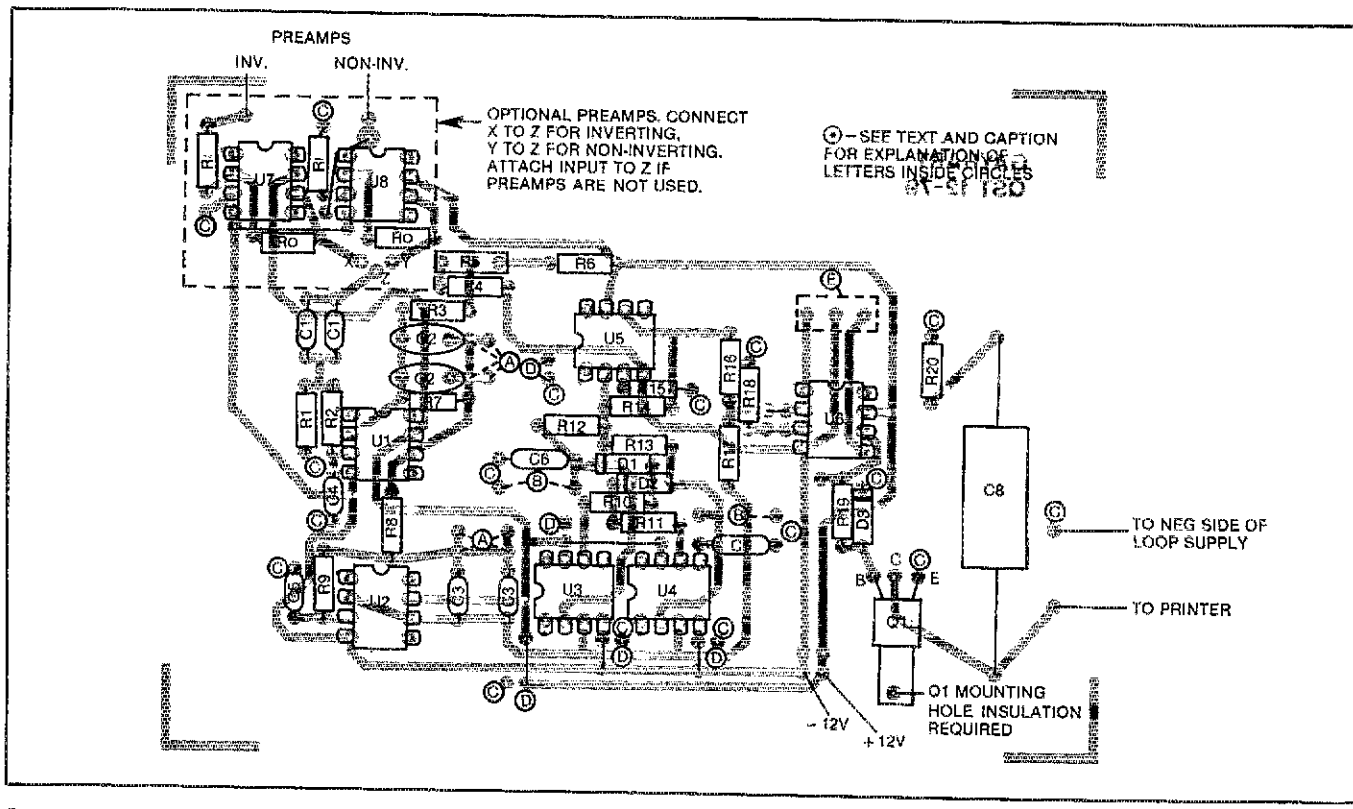


Fig. 5 — Parts-placement diagram for the receiver TU board. A full-scale pc etching pattern is located in the "Hints and Kinks" section of this issue. Parts are shown from the component (unetched) side of the board, which is a solid copper ground plane. Parts located within the large broken line are optional preamp parts. (See text, and Fig. 4 for more details.) Part values are listed in the captions for Figs. 3 and 4. Circled letters indicate special notes: "A" indicates optional pads to accommodate various sizes of capacitors. "B" marks extra pads provided so that capacitors can be paralleled if necessary. "C" indicates points that should be drilled through and component lead soldered to ground foil on *component* side of board. *All other pads* should be drilled through, and the ground-plane foil should be countersunk slightly on component side. This should be done with a large bit. The countersinking will provide adequate clearance for component leads, so they don't short out to the ground foil. "D" indicates pads provided for bypass capacitors (C9 and C10), not required at every point. "E" marks the location of an optional offset control (5 kΩ), although this is usually not required.

recognize an upward shift as a space condition, it did so regardless of whether that shift came from the fsk circuit or voice modulation nonlinearity. In our case, the "false shift" was about equal in magnitude to the data pulses and caused severe teleprinter garbling when it occurred. Yet the audio did not sound noticeably distorted.

A quick solution was reached by converting the transmitter to phase modulation, thereby eliminating the offending frequency modulator. For us this was a simple change because the repeater had originally been designed for phase modulation and was later modified by the manufacturer for direct fm, catering to the popular myth that "true fm" is superior. As of this writing, the exact cause of the problem has not been investigated, and no implication is intended that direct fm is necessarily nonlinear; in our circuit it was, and the conversion was merely a quick fix. It does show, however, that it is important that the voice modulation be as symmetrical as possible.

Options

Two additional features are very desirable. One serves to prevent the printer from running wild and printing garble when no signal is present. The other provides motor control, permitting automatic reception in the operator's absence. Circuits for both of these features are in the works, but neither is ready for publication at this time.

Conventional converters generally make use of the tone signals to operate the automatic features. Here there are no tones, so carrier and space pulses must serve for RTTY signal recognition. It should be noted that although fm receivers are themselves equipped with squelch circuits, the gating takes place in the audio stages, and the discriminator continues to produce full noise level when the carrier drops.

Identification

FCC regulations require that a station be identified on all frequencies used for the transmission. Through a repeater, this means the user must be identified at the output as well as at the input frequency. If the UART option is chosen, as it was at WR2AIS, then nothing will be repeated unless it conforms to RTTY character timing. The UART will not regenerate anything it receives unless it recognizes a stop bit at the proper time. This means that a conventional keyed-cw i-d will not appear on the output because the regenerator will ignore it. A solution has been devised that satisfies the UART and will form crude dits and dahs by fsk on the output. The BLANK key generates six consecutive space bits (start pulse plus five space data bits) and can be heard as a relatively long deflection. The LTRS key transmits one space bit (start) followed by a return to mark for five data bits, heard as a short deflection. Typed in the proper rhythm (BLANK for dah, LTRS for dit), a somewhat crude but clearly readable cw can be sent that will come through as fsk in the output.

Fig. 3 shows the receiving converter set up as an independent unit without provisions for transmitting. A suggestion or two might be helpful to those interested in incorporating the unit into a station layout. The author uses the arrangement shown in Fig. 7, making the built-in loop supply of his ST-6 do double duty. Since the ST-6 provides for keying an afsk oscillator in the positive leg of the loop, this makes transmit capability practically automatic. The negative return must go

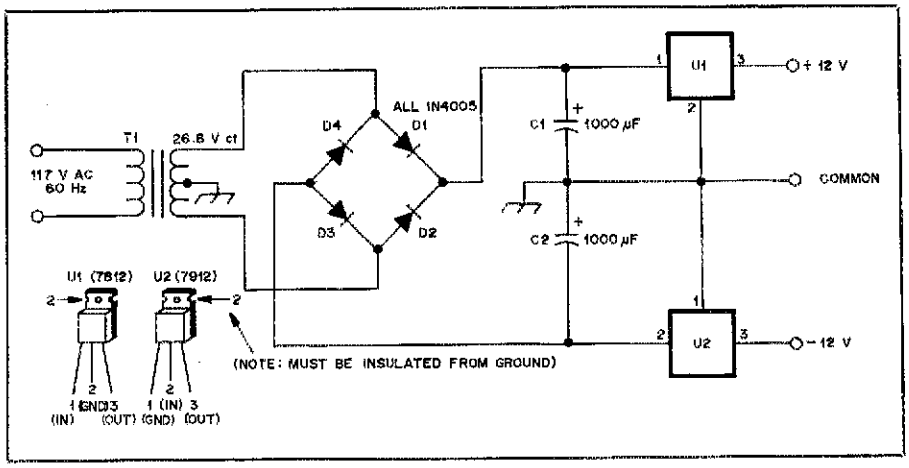


Fig. 6 — Power supply for ±12 V dc, for use with TU shown in Fig. 2. Note that negative voltage regulator, U2, must have tab insulated from ground.
D1-D4, incl. — 1N4005.
C1, C2 — 1000 µF, 35 V.
T1 — Power transformer, 117-V pri., 26.8-V c.t. sec., 1 A, Stancor P8609 or equiv.
U1 — Voltage regulator IC, type 7812.
U2 — Voltage regulator IC, type 7912.

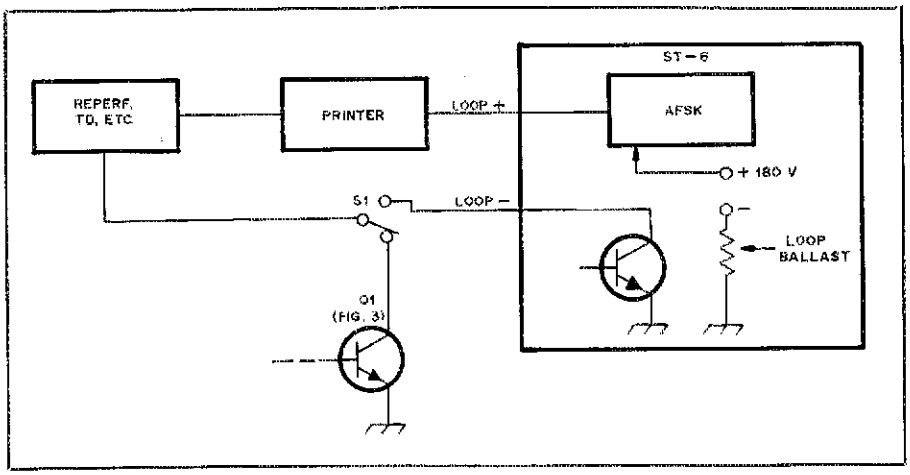


Fig. 7 — The ST-6 T-R arrangement used at WB2IXW. See text for details.

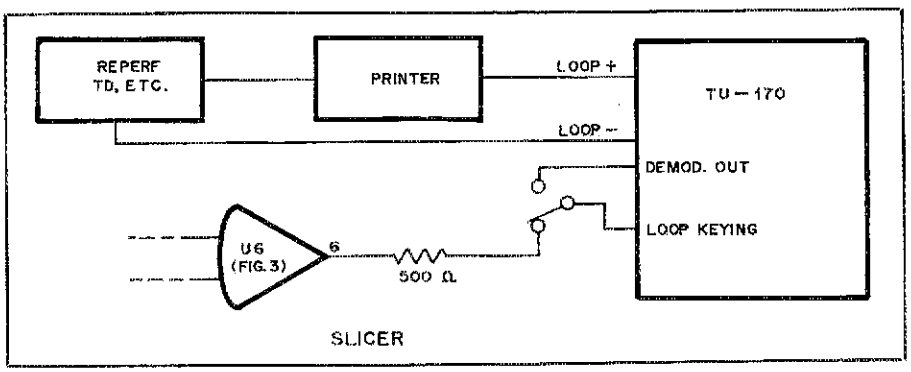


Fig. 8 — KB2JG uses this setup to put his Flesher TU-170 on compatible RTTY. See text.

directly to ground, however, because the ST-6 keys the loop in the negative leg; putting both terminal units in series would short out the ST-6 keying. Warning: the standard precaution about grounding all units applies here as well — that loop high voltage can suddenly appear in some surprising places!

Fig. 8 shows the arrangement devised by KB2JG in conjunction with the Flesher TU-170. He found it expeditious to feed the slicer output directly into the Flesher TTL-level loop-keying input, making that unit's loop keying serve both systems, and he reports that it works nicely.

Besides W2BK and W2LTJ, whose design contributions have already been mentioned, credit is given to K2LOZ and K2UTB, not only for initiating the original project, but for the design of much of the basic circuitry in use at the repeater site. Technical Assistant WB2HOL, in conjunction with Director AC2T, incorporated the required keying and control functions for the simultaneous system. WB2VUK and KB2JG not only helped with construction and experimentation, but, together with W2IIF, provided many test transmissions, blanks, RYS, and QUICK BROWN FOXES ad nauseum during the tedious period of debugging. In addition, a debt of gratitude is owed the general membership for providing alternating periods of shouting into the microphone and periods of silence, and above all, a tremendous amount of patience.

Our system has been in operation for more than a year now, and though participation is still limited, several other members are in various stages of preparation to join the activity. Our local bulletin station now transmits simultaneously by voice and RTTY, and we hold a net regularly one evening a week — simultaneously with a voice net! It is interesting to note that one member whose "fringe" location makes voice copy extremely marginal reports consistently good print on the page! All in all, we are extremely pleased with the results — they are without question all we could have hoped for.

Moved and Seconded...

LIFE MEMBER APPLICANTS
September 15, 1979
List 1

Robert L. Addy, WB4NBK; George A. Anderson, WA1TJQ; William W. Barnes, W2GBU; Violet Barrett, W6CBA; David A. Baysinger, WBØBAE; Randall A. Bell, WB4ORM; Gary Bernstrom, KC4V; Barbara B. Berntsen, WB6RXP; Scott D. Blessley, N1AJX; George Pat Brayton, WB4EXA; Joseph R. Bridges, K6CU; Tim Burgess, WBØLFR; Thomas K. Cardinal, WB2FKW; Marcel Castonguay, VE8YH; Richard E. Chambers, W3WZL; Dale Colby, WD8AUI; Paul E. Cooper, N6EY; Nathan Copeland, W1ODA; Charles N. Coryell, WA6JBT; William F. Cranz; Lawrence D. Deline, WD8LCE; Dwight F. Dover, KA4C; David R. Edens, WB4AKC; James E. Falkner, WA7VQO; Michael Fiore, WB8VNH; Anthony I. Franc, WA7JRL; Kathleen M. Freeman, KL7IFF; William J. Garrett; Alexander N. Gerli, AC1Y; Ronald T. Gill, WA4LMP; W. E. Goswick, K5WG; Carlton B. Greene, Jr., W3CQE; Peter M. Greig, WD4GOM; Edward A. Gribi, Jr., WB6IZF; Lorne W. Gustafson; William J. Hallmark; Joseph H. Hardy, KC4G; Francis E. Harrington, WDØCON; Irvin F. Haworth, VE7CVL; James H. Haynes, W6JVE; Glenn M. Hinze, W9TF; Michael J. Hoegler, K8UKG; Edward W. Howe, K7NHK; Edward B. Hula, AA4EH; Gary W. Jones, WB7DIE; Herbert E. Kehlstrom, K8SLE; John Hartadi Kertayasa, YBØAR; Stanley D. Korzep, K4HKI; Daniel J. Kovatch, W8CAR; Thomas P. Krohn, K3IJ; Norbert D. Larky, WA6DMO; Clayton J. Larson, WA9UMT; James A. Leavitt, WBICAO; Bobby J. Lee, WB4GQB; David Lesher, WB8FOZ; John G. Lewis, K8QAW; George W. Lockin, W9KAC; Garrett Lysiak, W4SUN; Charles E. Mann, KØVQN; Kenton E. Marshall, W5TXV; Frank C. Martin, WA2YIZ; James R. Maynard, III, K5ZC; Byron O. McCollum, W3TYX; A. L. McMurtrie, Jr., WB4SSL; Harold A. Mellen, Jr., K2UCO; Edward A. Monahan, WB2YVC; Richard P. Morency, W5VPJ; Kumihiko Okuma, JA1JDX; Valerie V. Orgera, K2KQC; Quentin Owen, WBØPMU; Paul E. Platt, WB4KDA; Joseph J. Price, WA4TOF; Robert G. Priez, WB5FBS; Steven K. Radoff, WA1MBF; Robert G. Rauterkus, WBØYNV; William C. Rea, W6VZZ; Jean L. Rehbock, WA1ZVQ; Jack L. Renner, N8AN; Carolyn L. Richards, AI8V; Mark N. Richey, WA7UGB; Paul S. Richter, W4ZB; Mack D. Rutledge, WB9UAC; Charles B. Ryder, N6AIP; David Schwartz, W1GAJ; T. Joseph Shank, Jr., W8QY; David W. Slay, W5CKP; Richard A. Smith, W9LDB; Frank M. Snodgrass, KA7CEU; Irene H. Sprague, KA7DMA; James A. Steffen, KC6A; Grant Stevens, VE7DNQ; Jay S. Stevens, AC8L; S. W. Stokes, K6YZG; Robert T. Stouffer, WB5SHG; F. Stephen Stringham, W7ZOR/W6BQJ; David H. Stroud, K7MQ; Alfred J. Taylor, WB8ZJW; Michael A. Tenore, WB2LCW; David E. Thomas, K4SAN; Steven S. Thomas, N6ST; Vinson C. Thompson, K5VT; Carleton W. Todd, AE1H; David S. Turner, WB5TCW; Charles J. Vaughn, AA6G; Dean Vaughan, WD5AEJ; Pasquale J. Villani, WB2GBF; Dennis B. Voegler, WA4QMS; Douglas Waddington; John H. Waters, III, WBØBMD; Randall Webb, WB5LQC; Charles W. Wells, W4BOT; John J. Wesline, III, WA2LTE; Michael R. Whalan, WA6IUT; David S. Wharton, KA3AIZ; Theodore W. Whipple, W4CVQ; Denver White, WD5CRK; James H. Whitmire, KD4M; David Mark Wilson, WB5UCX; Ulrich Wintzer, DL7FZ; David Terry Wofford, WA4JMW; Glenn R. Wright, WB7SPD; James R. Wright, Jr., WA4IVM; Robert M. Zone, WB5QMT.

Season's Greetings from the Hams at ARRL/IARU hq.

(Listed in alphabetical order of call sign.)

Kathy Kearman	WB1AAE	Ed Tilton	W1HDQ	Arline Bender	WA1VMC
Thomas Matus	WB1ACZ	Lew McCoy	W1HP	Bill Jennings	K1WJ
Bobbie Chamalian	WB1ADL	Jean Peacor	K1IJV	Chuck Bender	W1WPR
Richard K. Palm	K1CE	John Pelham	W1JA	Bob Halprin	K1XA
Jeannie DeMaw	W1CKK	Stu Leland	W1JEC	John Lindholm	W1XX
Laird Campbell	W1CUT	Joe Moskey	W1JMY	Alexander Gerli	AC1Y
George Grammer	W1DF	Clarke Greene	K1JX	Joel Kleinman	WA1ZUY
Elizabeth Karpiej	KA1DTU	Tom Frenaye	K1KI	Dave Sumner	K1ZZ/K1ZND
Joan Merritt	KA1DTV	Brian Downey	WA1KSF	Dave Bristol	KA2BNV
Maureen Thompson	KA1DYZ	Stan Horzepa	WA1LOU	Don Search	W3AZD
Chris Schenk	W1EH	Mike Kaczynski	W1OD	W. Dale Clift	WA3NLO
Michelle Fuini	WB1ENT	Jeanie Zaimes	AB1P	William A. Tynan	W3XO
Steve Place	WB1EYI	George Woodward	W1RN	Bob Cooper	W5KHT
Paul Pagel	N1FB	Dick Baldwin	W1RU	Bruce Johnson	WA6IDN
Doug DeMaw	W1FB	John Huntoon	W1RW	John Troster	W6ISQ
Hal Steinman	K1FHN	Lee Aurick	W1SE	Chuck Chadwick	K8AXL
Marian Anderson	WB1FSB	Rosalie White	WA1STO	Bernie Glassmeyer	W9KDR
Marjorie C. Fenney	WB1FSN	Jerry Hall	K1TD	George Collins	ADØW
Barbara Johnson	WB1GHT	Perry F. Williams	W1UED	Maxim Memorial Station	W1AW
John Nelson	W1GNC	Jay Rusgrove	W1VD	ARRL Hq. Station	W1INF

The Phantom Stub

Introducing the Phantom Stub to the quad loop yields an efficient multi-band antenna. It can be applied to single- or multiple-element quads. W7AAK tells why and how.

By Harold E. (Hal) Gullstad,* W7AAK

As you settle down in your easy chair on a blustery winter evening, your mind turns to the better days of spring that for the moment seem so distant. A feeling of restlessness besets you, even though there is comfort in that radiant glow from the fireplace. You sense an urge to start or at least plan a project. "But, plan for what?" you ask yourself. Your hand unintentionally reaches toward that antenna book you left on the coffee table two weekends ago. At first, you thumb rather aimlessly through the pages, your attention divided between the news on TV and the quantum of information in your lap. The affairs of the world appearing on the "tube" are soon dismissed, however, as your attention focuses on information about quads.

From the past come recollections of the 1969 *QST* articles by Lew McCoy that introduced you to quad antennas. Mighty effective radiators as you remember. Why yes, you'd even considered constructing one. Now, although it is a decade later, the seeds of thought for your spring project seem to have been planted. A quad it will be!

While this hypothetical situation very likely has little relationship to you, you may well be considering the installation of a quad in one form or another. If so, let me tell you about the Phantom Stub and the W7AAK antennas.

I shall not attempt to convince you of the advantages of the quad antennas *per se*. Your antenna book should suffice for that. Rather, I wish to explain the function of the stub and how it will enhance performance of your antenna.

Simply stated, the advantage of the Phantom Stub is that it allows a quad loop to operate on the fundamental, half and quarter frequencies. The writer uses the loop on 20, 40 and 80 meters with the aid of such a stub. Component dimensions may also be doubled for efficient use on 40, 80 and 160 meters. If the dimensions are halved, excellent results are to be expected on 10, 20 and 40 meters as well as 15.

Five Configurations

Various quad configurations, including the delta loop and the way in which the stub is applied, are illustrated in Figs. 1, 2 and 3. There are five permissible configurations of the full-wave loop. These

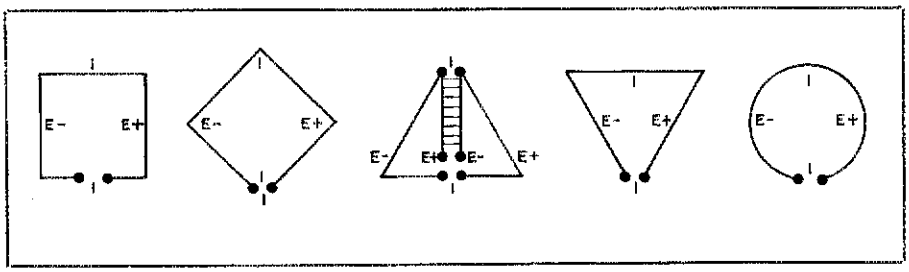


Fig. 1 — Common configurations of quad-type antennas. Shown at the center is a delta loop with a Phantom Stub connected to the apex of the triangle. Locations of both current and voltage maxima and minima are indicated by the letters I and E.

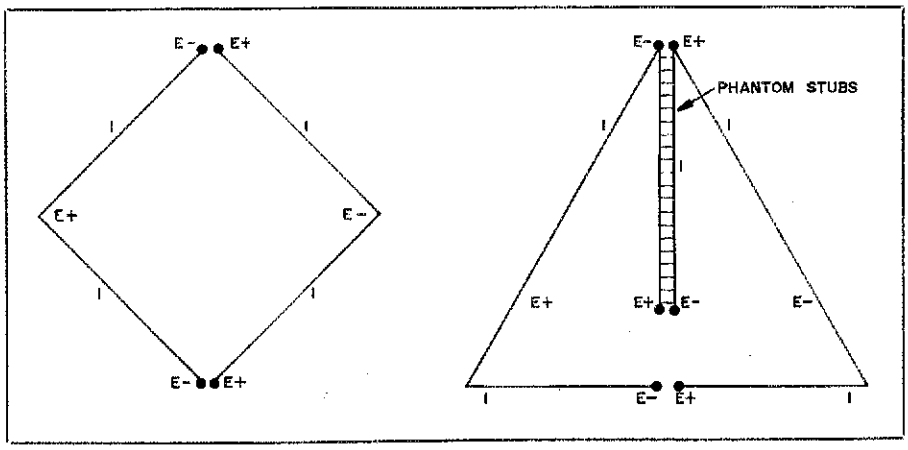


Fig. 2 — Two of the five configurations shown in Fig. 1 are arranged above representing the expanded quad. The perimeter in each of these cases is two full wavelengths.

*1130 154th St. N.W., Marysville, WA 98270

are shown in Fig. 1.[1] The expanded loop (X-Q or bi-square) is open circuited at the top where the ends of the full-wave sides come together. A short-circuit at this point changes it into a conventional quad loop, causing it to be operational at half frequency. Use of a frequency-switch trap has been suggested for this purpose.[2] Instead of a lumped trap, an appropriate length of ladder (open-wire) line fulfills this requirement most adequately, permitting efficient operation on both the fundamental and half frequency. A bonus effect of the stub is that it top loads the loop, relocating the point of maximum radiating current from the base center to halfway up the sides. This allows the quad loop to operate more efficiently on the quarter frequency.

Fig. 2 contains two of the five configurations, but the difference here is that these illustrate the expanded quad with a perimeter that is two wavelengths long.[3] Current and voltage maxima are indicated in Figs. 1 and 2. Fig. 3 portrays the current/voltage distribution on the bonus quarter-frequency antenna. A block diagram of the tuned transmission line, balun and tuner along with key dimensions is also presented.

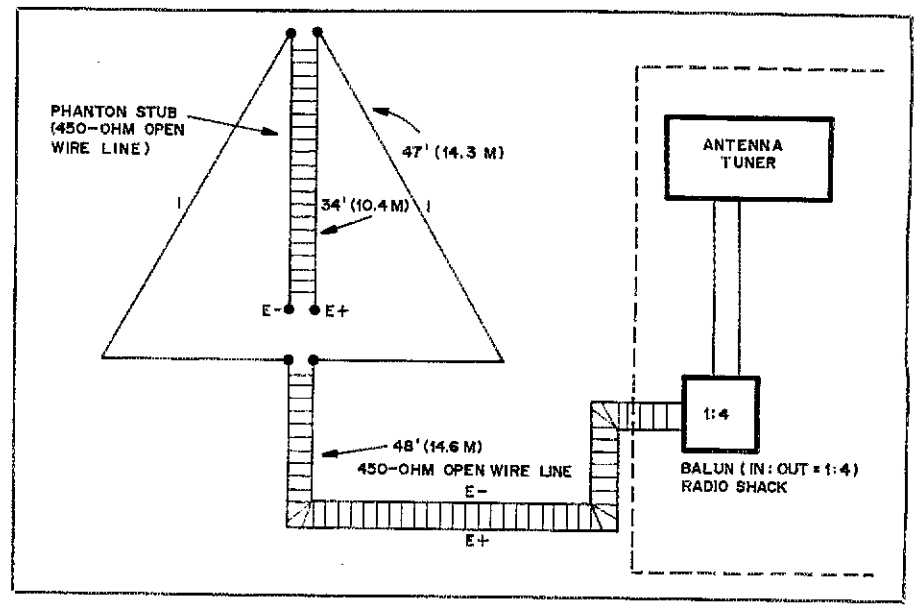


Fig. 3 — A delta-quad quarter-frequency antenna equipped with a Phantom Stub and tuned feed line. The drawing indicates component dimensions and the current-voltage distribution of the system.

The Author's Antenna

For the reason that a triangular antenna is most easily hung, the author chose to use that configuration. Later in this article is a description of the efficient two-element beam employing ladder-line stubs in the driven and parasitic elements that the author constructed.

As you can determine from Fig. 3, the single delta-loop antenna has three sides, each measuring 47 feet (14.33 m) from corner to corner. Dimensions are not critical if a tuned transmission line with a matching network is used. There are several ways to feed such a loop, but a balanced-wire line provides a most expeditious way. The feed system at the author's station consists of 48 feet (14.63 m) of 450-ohm ladder line between the base of the loop and a 4:1 balun at the output of the matching network in the shack. The stub consists of 34 feet (10.36 m) of 450-ohm ladder line and is tied straight down with 50-pound fishline.

Corresponding components in either side of the array and feed line should be symmetrical to maintain balance. Polarization is horizontal on all bands.

Wire for this antenna is tinned, stranded copper that is equivalent to no. 18 gauge wire. It has two thin but tough coats of plastic that help maintain the measured length. Insulators at the apex and base midpoints are made from rugged surplus circuit-board material. The lower corners of the triangles may be tied back with fishline. Operation over a period of time has established that the antenna handles maximum legal power nicely.

The compromise frequencies 14.2, 7.1 and 3.55 MHz are chosen for computation of the components. The perimeter of the loop is derived from the typical 1005/frequency ratio, which at 7.1 MHz is 141.55 feet (43.14 m) or 47.18 feet (14.38 m) on each of the three sides. I've rounded the latter figure to 47 feet (14.33 m).

Length of the stub is determined as follows:

$246/7.1 \times 0.98 = 33.95$ feet

where

0.98 is the velocity factor of 450-ohm open wire line.

Feet $\times$ 0.3048 = m

Notice in Fig. 3 that the loading stub (frequency switch) is in the plane of the loop bisecting the top angle. It is perpendicular to the antenna polarization. Though the stub itself is indeed visible, it performs as if it weren't there — like a *phantom*.

Unlike the conventional loop, the top of the phantom-modified X-Q loop (in this case the 20-meter loop) is open-circuited. There is no decrease in perimeter from "end-effect" so computation of dimensions can readily be determined with the relationship 1005/frequency in MHz.

The W7AAK Two-Element Delta-Quad Beam

A two-element delta quad is suspended above the grounds of the W7AAK QTH. Each element has a phantom stub 33 feet (10.06 m) long. A tuning stub in the parasitic element is made from two Radio Shack Archer telescoping instrument antennas (no. 21-1156) mounted upside down at the midpoint of the triangle base. These telescoping units are spaced one inch apart. Ends of the instrument antennas telescope together being bridged at the tips with an insulator. On 20 meters the parasitic element is a reflector with the tuning stub open. On 40 meters the element is a director with the ends shorted. For 80-meter operation, the parasitic element can be used as a director for good front-to-back ratio, with some forward gain. In this case, the tuning stub functions more like a telescoping variable capacitor (a reason for the 1-inch spacing).

Sides of the equilateral triangles of the two-element quad are 44-1/2 feet long (13.56 m) each. Compromise spacing of 13 feet (3.96 m) turns out to be 0.2, 0.1 and 0.05 wavelength on 20, 40 and 80 meters respectively. It was satisfying indeed to find that more than a quarter wavelength of a *long* (shorted) tuning stub for 20 meters could be chopped off and the remaining very short stub left open-circuited. Another function of the phantom stub in the parasitic element may be to maintain balance in this instance.

Supporting the W7AAK Beam

Because masts or towers are tabu in our area, the beam is suspended from a 3/8-inch (10-mm) diameter nylon rope pulled taut between two trees, away from trunks but over branches, which can act like springs and prevent snapping in a windstorm. A 13-foot (3.96-m) spar is tied 2 feet below the rope. Ends of the spar support the triangles and are spaced with 13-foot spreaders. Presently, the triangle base spreaders are supported by a 45-foot

[1]Notes appear on page 39.

(13.72-m) frame that turns on an 8-foot (2.44-m) high post. This post is set directly under the center of the overhead spar. The parasitic loop end of the middle spreader supports the upside-down telescoping instrument-antenna tuning-stub capacitor. A 16-foot (4.88-m) length of ladder line droops between the driven element end of the middle spreader and a 2-foot (0.61-m) stake. This stake protrudes from the ground at a point 5 feet (1.5 m) from the post and supports the antenna end of the tuned transmission line. The overall length of the line between the driven loop and the 4:1 balun and tuner in the shack is 48 feet (14.63 m). A dpdt disconnect switch in the transmission line provides means for lightning protection. This is mounted on the 2-foot stake. Lightning discharges can be shunted to ground through the switch and a good ground rod driven into the earth. [Electrician's type copper-clad ground rods are excellent for this purpose. — Ed.]

Conclusion

An antenna-adjustment method practiced by some TV technicians may be applied to tuning the Phantom Stub. It eliminates the trouble of shortening or lengthening the loop perimeter, thus saving much time. Tuning is accomplished by wrapping a piece of aluminum foil around the Twin Lead, then moving the foil up or down until the optimum adjustment is found.

I employ this procedure when testing scaled down arrays, including Yagis, on my 2-meter range. It serves the purpose well, whether the loop being adjusted is a director, reflector or driven element. Once the adjustment is made the foil is taped in place.

The stubs, made from 300-ohm Twin Lead wire, are cut slightly shorter than an electrical quarter wavelength. Where the stub is shorter than 246/146 × 0.82 or 16-1/2 inches, a 2-inch long piece of foil is sufficient. For collinear elements, the stub is shorted at the bottom in order to reflect high impedance. (Inches × 25.4 = mm.)

Further plans at W7AAK include the installation of a rotator to be set on a low platform and connected by a vertical member to the frame. Perhaps the loop area centers can then be elevated from the present 21 feet above ground to a half wavelength at 20 meters.

The *All American Kid (Kibitzer?)* is also considering expansion of the array to include three elements. Meanwhile, it is hoped that some of you kids from fewer than seven to more than 70 years find some of this information useful.

My appreciation is extended to Bill Orr, W6SAI, for his practical information on quads. Thanks to him and all, my beam works! Initial tests in conjunction with the "PHO Net" on 14.225 MHz convinced me that my efforts were indeed not in vain.

Notes

[1]Orr, *All About Cubical Quad Antennas*, Radio Publications, Inc., second edition, p. 97.
[2]*Radio Communications Handbook*, Vol. II, fifth edition, RSGB, Fig. 12.126d.
[3]See ref. 1, p. 98.

Strays

MUHAMMAD ALI EXPOSED

☐ Former heavyweight boxing champion Muhammad Ali has been exposed to the novelty and efficiency of Amateur Radio. Following a live guest appearance on a Los Angeles TV station, Ali noticed a 2-meter hand-held on the desk of KB6IZ. He asked about it, and wondered if he could make a local call to his family. After a brief description of Amateur Radio, Ali was put in contact with his family. The conversation lasted less than 90 seconds, but it did expose him to the proper and legal use of Amateur Radio. — *Jay Reisman, KB6IZ, Marina del Ray, CA*

Even though there were 50 or more telephones available, Muhammad Ali chose a 2-meter hand-held to make a call to his family. Will the champ ever get a ?6ALI call? Anything is possible, especially where Muhammad Ali is concerned. *(photo by Reggie Mitchell)*

NEW RSGB AWARDS MANAGER

☐ The Radio Society of Great Britain announces that Peter Miles, G3KDB, Box 73, Litchfield, Staffs, England, will assume the position of RSGB awards manager effective January 1, 1980. Peter will take over the post from C. R. Emary, G5GH, who has served well for over 10 years.

IOWA SCHOOL CHILDREN ADOPT A SHIP

☐ Last September Ms. Sue Pogge and her fifth grade Crossroads (IA) Elementary class began to participate in the "Adopt a Ship Program," which involves communication between school children and a ship at sea. Each child would write a letter to the ship's captain and crew asking about life on an ocean-going vessel. The program has been going on for about 20 years now, and both the ships involved and the children have found it a very enjoyable experience.

As the school year was coming to a close, the captain of the vessel, Tom, WB5YKZ, asked Ms. Pogge if it would be possible for her to contact a ham in Des Moines to initiate a phone patch so he could talk to the students. Arrangements were made and contact was established on the high end of 20 meters. For over an hour the students asked "Captain Tom" many questions and heard tales of the high seas. He told a true-life story of being actually attacked by modern pirates off the coast of Ecuador. The Captain commented that this was the first time that he knew of that the "Adopt a Ship Program" has used Amateur Radio as communication, but he will encourage it in the future.

Everyone had a good time, including the ham. The kids really enjoyed the experience, as attested by 35 carefully written thank yous. This was a good project which benefited many prospective hams. — Static Sheet, *Des Moines Radio Amateur Association*

Dave Bell, W6AQ (left), producer of *The World of Amateur Radio*, Bruce Alan Johnson, WA6IDN (center), and Stu Gilliam, WD6FBU, actor/comedian, are shown at the Hollywood premiere of the new ARRL film, a benefit event for WARC and the ARRL Foundation. *(W6VGQ photo)*

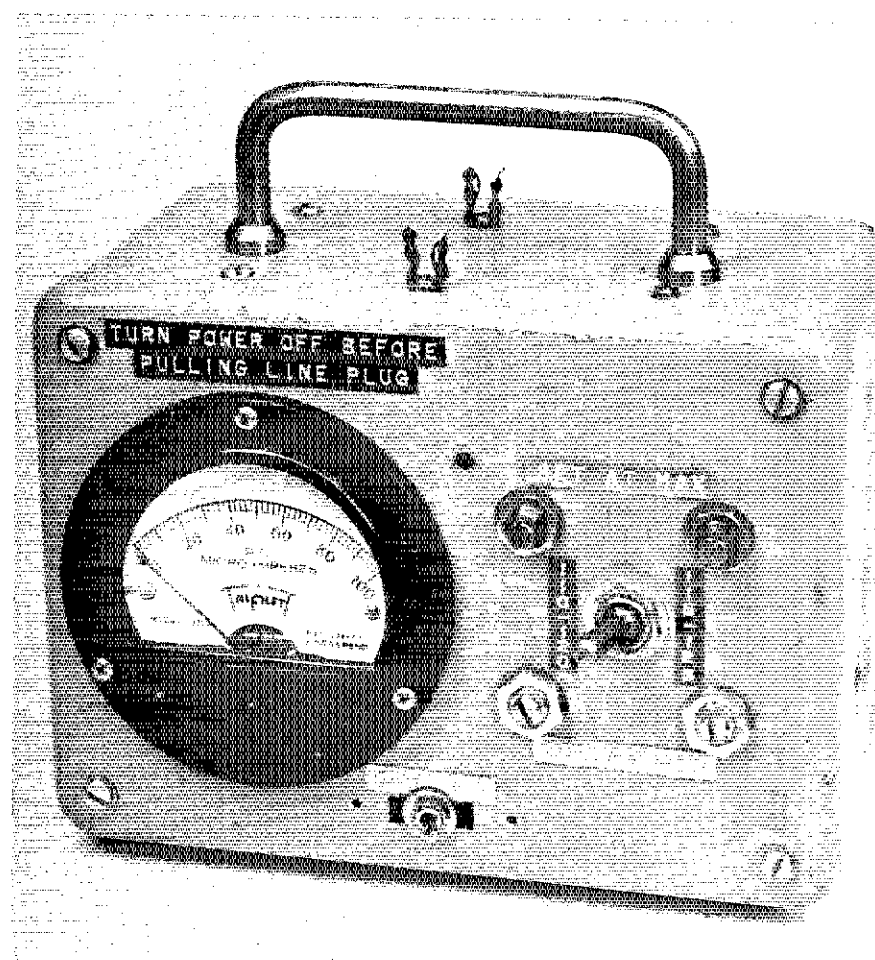
Expanded-Scale Power-Line Voltage Monitor

Build this expanded-scale monitor to provide continuous readout of line voltage for accurate equipment checks. All it takes is a spare weekend and a few parts.

By Robert Mason,* W8NN

During one of my many chats with Ben Bjornsen, W2JAU, the subject of a good, expanded-scale, power-line voltage monitor was brought up. The idea bounced around inside my head for quite some time until I finally came up with the finished design for this monitor. Now not only Ben, but anyone, can build a line-voltage monitor that is accurate, linear and stable as a rock. Modestly priced and inexpensive to operate (about 13 cents per month based on current rates), this power-line monitor is an excellent addition to any ham shack or experimenter's lab.

The monitor is equipped with two 10-volt overlapping ranges: one from 110 to 120 V ac and the other from 115 to 125 V ac. This allows for accurate measurement of line voltage over a full 15-volt range. The monitor is capable of responding to changes in line voltage that occur in as little as 0.1 second. Total power consumption by the monitor is low: Only 4.25 watts is dissipated by the power transformer and a scant 46 mW by the remaining circuitry. The power transformer represents 99 percent of the total power consumption and still the unit runs stone cold.



Front view of the line voltage monitor. The monitor is housed in a surplus meter cabinet. All the operating and calibration controls are located on the front panel. The test jacks are mounted on the left side, fuse holders and ac input on the rear panel.

Design Notes

The monitor operates by comparing the varying ac line voltage against a standard reference voltage. See Fig. 1. The purpose of T1 is to reduce the varying ac voltage to a level compatible with the metering

*1800 Reservoir Rd., No. 722, Lima, OH 45804

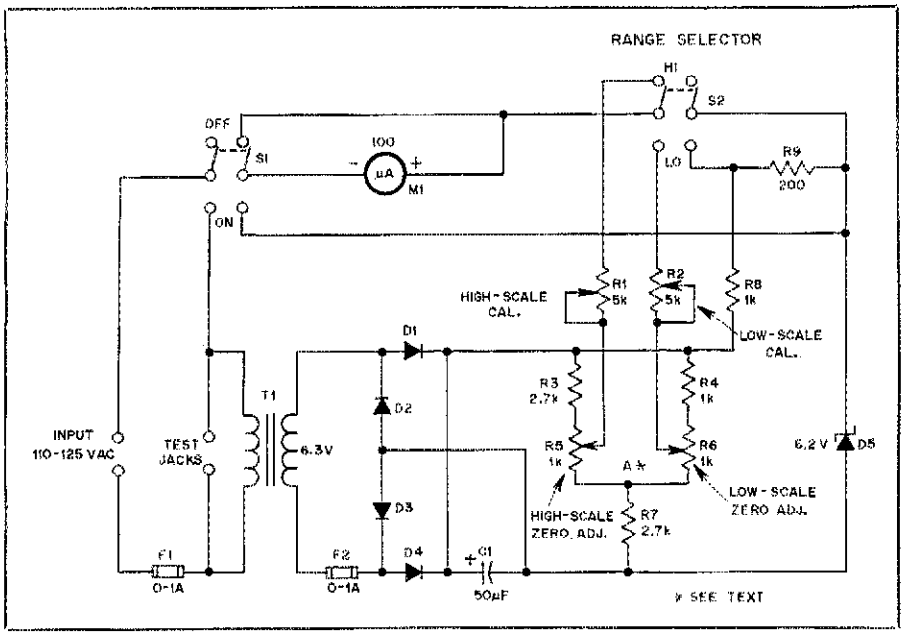


Fig. 1 — Schematic diagram for the expanded-scale power-line voltage monitor. Resistors are 1/2-watt composition types. Values of capacitance are in microfarads (μF); resistances are in ohms; k = 1000. Part numbers in parentheses are Radio Shack.

C1 — 47-μF electrolytic, 35 V (272-1027).
D1-D4, incl. — Silicon diode, 1.4 A, 50 PRV (276-1151).
D5 — Zener diode, 6.2 V, 1 W (276-561).
F1, F2 — 0.1-A fuse.
M1 — 0- to 100-μA meter.
R1, R2 — 5-kΩ potentiometer.
R5, R6 — 1-kΩ potentiometer.
S1, S2 — Toggle switch (dpdt) (275-666).
T1 — Filament transformer, 6.3-V, 300-mA sec (273-1384).

circuit. The 6.3-volt secondary voltage is then rectified and filtered (D1 through D4 and C1), and compared to the 6.2-volt reference voltage (D5). Any variations between the two voltages are registered by the meter. Both the primary and secondary of the power transformer are protected with 0.1-A fuses. The two fuses were used because if 1 A of current passes through the primary winding, a resulting 2 A would be induced in the secondary — a little too much to handle for the 300-mA winding.

The switching circuit also required some special design considerations. When S1 is switched from the ON position to the OFF position, the meter *could* be subject to a 500-percent reverse-current overload. This problem was eliminated by arranging S1 in such a way as to disconnect the meter first, and then short-circuit it. The short circuit also helps to protect the meter during handling. Care should be taken to *make sure S1 is in the OFF position before unplugging the monitor*, preventing possible damage to the meter.

Construction

I selected a 5 × 7 × 4-inch (127 × 178 × 102-mm) case to house my line-voltage monitor, although a much smaller enclosure could have been used. The determining factors are the physical sizes of the meter movement, transformer and adjustment controls. All the operating and calibration controls are mounted on the front panel. The two fuse holders and ac input to the monitor are located on the rear panel. Four silicon rectifiers and one filter capacitor are mounted on a small printed-circuit board attached to the inside of the case. These components could just as easily have been wired point-to-point using terminal strips as connection points.

Calibration and Operation

Adjustment and calibration of the monitor are straightforward. The only equipment you will need is an accurate ac voltmeter and a variable ac power supply capable of delivering 110 to 125 volts. It will be necessary to remove the back cover from the cabinet in order to have easy access to the metering circuit while making calibration adjustments. Set S1 to the OFF position and remove one connection from M1. Now mechanically zero the meter movement. Adjust the high- and low-scale calibration potentiometers for maximum resistance, and connect an ac voltmeter to the two test jacks connected to the primary of T1. This completes the preliminary setup for calibration.

At this point, a variable ac supply should be connected to the *input* terminals of the line-voltage monitor — an autotransformer such as a Variac or Powerstat is ideal for this. Adjust the ac supply for 115 volts and place S2 in the HI position. With S1 in the ON position, measure the voltage across Zener diode D5, making sure it is 6.2 V dc. This 6.2-volt source is the reference voltage for the monitor and it is very important to have it accurate. Measure the voltage across the high-scale adjustment potentiometer and rotate the control until a reading of 6.2 volts is obtained. Place the range switch in the LO position and adjust the ac supply for 110 volts. Again measure the voltage across D5 to make sure it is the required 6.2 volts. Monitoring the voltage from the wiper arm of R6 to point "A," adjust the low-scale zero control for 6.2 V dc.

All that remain are the final scale adjustments for the low- and high-voltage ranges. These will ensure that the meter is linear over both voltage ranges. Reconnect M1 and zero the meter using the low-scale zero adjustment — the ac supply should still be delivering 110 volts. Now adjust the supply for 120 V ac and set the meter to full scale with the low-scale calibration adjustments until the meter tracks properly across its range. Adjust the ac supply for 115 volts and check the low-range midscale calibration. If the meter does not read properly, repeat the low-scale calibration steps.

High-scale calibration is accomplished in a similar manner. Place the range selector in the HI position and zero the meter with the high-scale zero adjustment. The ac supply should be delivering 115 volts during this step. Now adjust the supply for 125 V ac and set the meter to full scale using the high-scale calibration control. Repeat the high-scale calibration adjustments until the meter tracks properly. Remove the ac voltmeter from the test jack connections. The line-voltage monitor should now be properly calibrated and ready to use.

If the meter has a tendency to surge when S1 is operated, transpose the primary and metering leads at the terminals of S1. This is done by exchanging all connections from one side of the dpdt switch to the other. Since S1 is actually constructed like two spdt switches connected together, one set of contacts will open sooner than the other. Connecting the metering circuit to the proper set of contacts ensures a smooth downscale decay when the switch is operated. The only other problem I have run into with the monitor was some difficulty with the calibration adjustments. It wasn't until after several attempts that I discovered the ac voltmeter I was using for calibration drifted down scale at a rate of two volts per hour! Be sure to let your voltmeter stabilize *before* you attempt to calibrate the monitor.

I hope others will enjoy building this little monitor as much as I have. It has proved to be a valuable addition to the shack and was built at a fraction of the cost of commercially made units. ham-

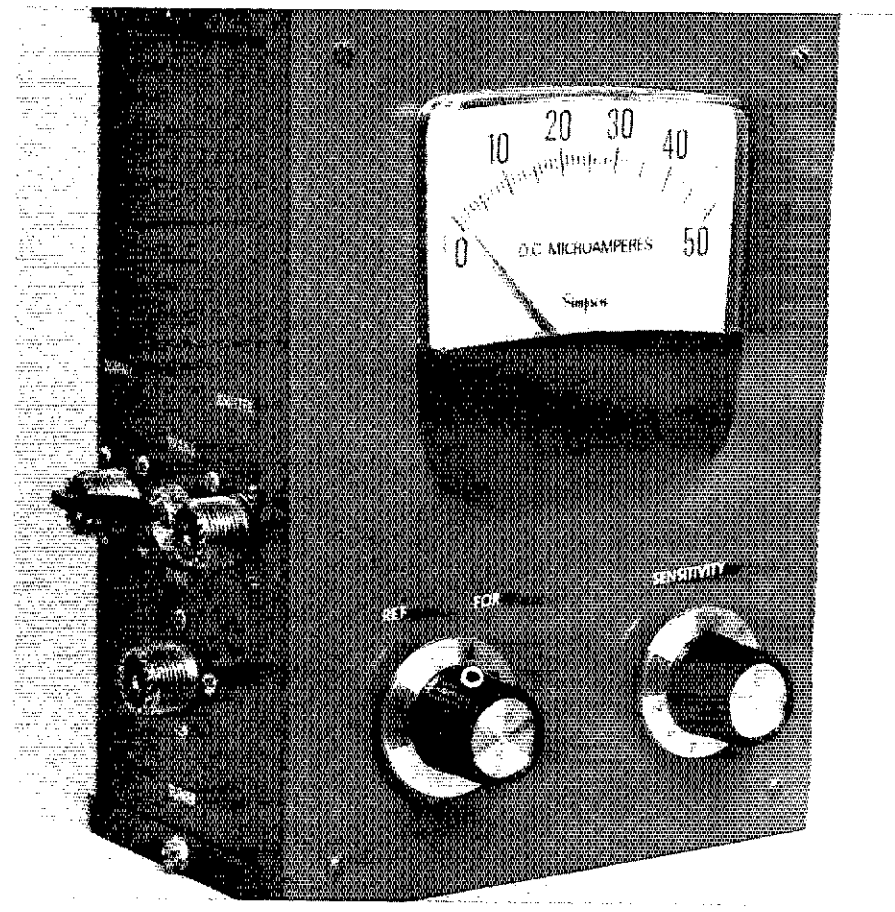
● *Basic Amateur Radio*

Tune Up Swiftly, Silently and Safely

Looking for an easy way to adjust your antenna-matching network? This tune-up indicator takes the guesswork out while it protects your equipment.

By William Vissers,* K4KI

A bit of experimentation on my part led to the development of a simple SWR bridge that has several real advantages when used with an antenna system requiring a matching network. It allows the transmitter to be operated directly into a dummy load while the antenna system is adjusted. It also keeps the radiated signal (during tune-up) at an extremely low level. Finally, it will shorten the time needed to get a rig on the air. The great amount of interest generated when the completed unit was shown to several local amateurs led me to believe others would also be interested in this project.



The completed tune-up bridge. Front-panel controls select forward or reflected voltage and adjust the sensitivity of the bridge. Connectors on the left-side panel are for the dummy load, transmitter and antenna matching circuit.

Circuit Operation

Basically, the idea is extremely simple. The transmitter is operated into a dummy load and a small amount of voltage is sampled by means of an rf transformer in the bridge. This voltage is then used to excite a simple Wheatstone bridge designed for 50 ohms. When the antenna matching system is connected to the bridge, a null of the bridge meter indicates that the antenna system is presenting a 50-ohm load. A dpdt switch allows switching from the TUNE to the TRANSMIT position. In the TRANSMIT position, the transmitter is connected directly to the matching network, and from there to the antenna. In addition, a switch (S2) and sensitivity control (R6), allow either forward or reflected voltages to be indicated. The meter can then be calibrated easily in terms of VSWR to aid in transmitter adjustment. The schematic diagram for the bridge is shown in Fig. 1.

The circuit worked well from the first test. No parts values were found to be critical. All of the items came from my junk box with the exception of the 50-μA meter, which I had picked up at a hamfest for only $2. The accuracy of the bridge is determined by the accuracy of the three 50-ohm resistors (R3 through R5) comprising this circuit. The resistors were originally 47-ohm, one-watt, carbon resistors. In order to obtain the required 50-ohm resistance, each resistor was hooked up to a small resistance bridge and the side of the resistor was ground away slightly until the resistance measured exactly 50 ohms. A grinding wheel or simple hand file can be used for this process. Later, I realized that many amateurs

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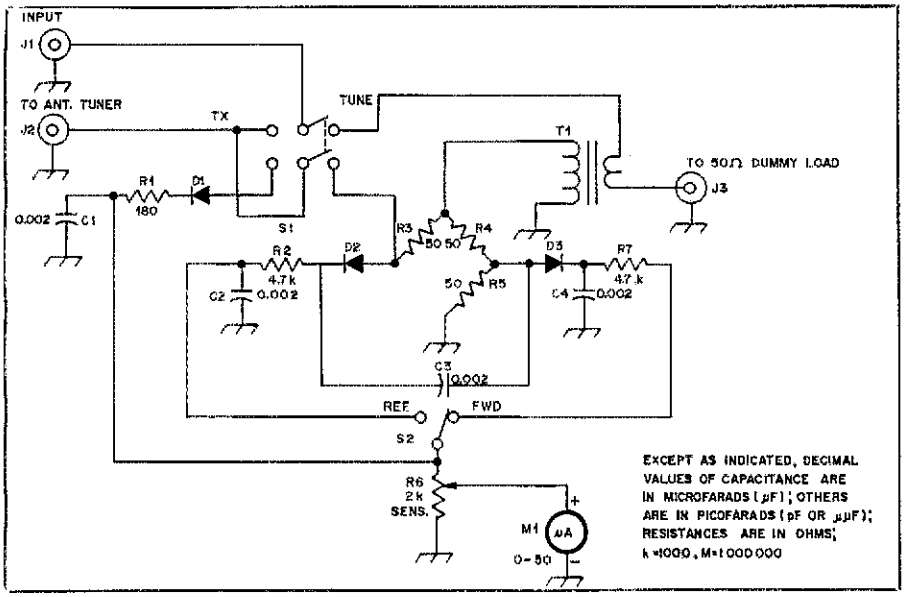


Fig. 1 — Schematic diagram of the tune-up bridge. The fabrication of the bridge resistors is described in the text. Capacitors are disc ceramic; resistors are 1/2-watt carbon unless otherwise specified.

D1-D3, incl. — General purpose germanium diodes, 1N198, or equiv.

M1 — Dc meter, 0-50 μA.

R3-R5, incl. — 47-Ω, 1-watt carbon resistors adjusted to 50 Ω. See text.

T1 — Primary: 2 turns no. 20 insulated wire. Secondary: 10 turns no. 24 insulated wire. Core material: Amidon T50-6 toroid core, or equiv.

might not have access to a resistance bridge, so I developed a simple substitution method for obtaining the accuracy desired in the bridge. I first measured the resistance of my dummy load, which I knew was 50 ohms. For this I used an ordinary ohmmeter. My ohmmeter read high, actually showing a reading of 59 ohms. But that didn't bother me, for all I wanted was the exact indication on the meter. So again I ground down three 47-ohm resistors until the indicated resistance was 59 ohms (actually 50 ohms). Now I had the three precision resistors needed for the bridge.

The purpose of D1 and R1 is to provide a monitoring circuit to indicate when the transmitter is putting out power with S1 in the TRANSMIT position. This circuit can also be used as a output-power meter (when the VSWR is 1:1) if the setting of the sensitivity control is noted at the time the unit is calibrated against an rf wattmeter of known accuracy. I did this using my Swan WM-1500 wattmeter and it worked well. As calibration curves will vary with each unit (because of variations in parts), however, my results are not supplied here.

Operation

The operation of the unit is extremely simple. First, set S1 in the TUNE position and S2 in the FORWARD position. Then, adjust the transmitter for proper operation. Next, set S2 to the REFLECTED position and adjust the antenna tuner for a null on the bridge meter. S1 can now be thrown to the TRANSMIT position. To read the output, place S2 in the FORWARD position. For example, with my own Yaesu FT-101B, I just throw switch S1 to the TUNE position and adjust the Transmatch until the meter reads zero. This indicates a VSWR of 1:1. The nice thing about this procedure is that you can do the adjustment of your matching unit *without* having to go back and adjust your transmitter controls. This is a real advantage in many cases since the variation in impedance as the matching network is adjusted causes the transmitter loading to change. This often makes it necessary to have to readjust things all over again — you might even wish you were an octopus so you could keep everything under control! But with this device, all you have to do is throw the switch to the TRANSMIT position and you're ready to go on the air. Perhaps the greatest advantage of using this method is that you don't have to put out a strong signal on the air when you're tuning up. In fact, I couldn't even notice any movement of my wattmeter when set for greatest sensitivity. My own rough calculations indicate a port-to-port isolation of about 22 dB between the TRANSMIT and TUNE positions of the switch.

I took my unit to a friend who has a transistorized rig that occasionally "kicked out" when the SWR got too high when tuning up. This unit cured that problem instantly; likewise for the other amateurs, as it will dispel any fear of damaging equipment when tuning up.

Table 1
Calibration Chart for the Calibrated Meter Face

Meter Readings		*Resulting VSWR*
Fwd	*Ref*	*SWR*
50	0	0
50	4.5	1.2
50	10.0	1.5
50	16.7	2.0
50	25	3.0
50	30	4.0
50	33.3	5.0
50	35.7	6.0
50	37.5	7.0
50	38.9	8.0
50	40.0	9.0
50	40.9	10.2
50	45.2	20.0
50	50	∞

See Fig. 2

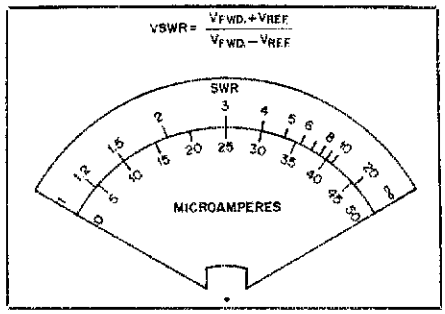


Fig. 2 — Sample calibrated meter face for the tune-up bridge. The meter scale is a real advantage if direct SWR readings are required.

A provision was made in the circuit to measure either forward or reflected voltage (VSWR) and I thought it might be helpful to show a theoretical SWR scale with the corresponding meter readings. The dial scale shown in Fig. 2 is for a perfectly balanced linear circuit. However, the circuit of Fig. 1, as is common for circuits of this type, is not perfectly linear and the scale is an approximation only. For general amateur comparison purposes, however, the scale was found to be adequate.

No attempt was made to optimize the circuitry. Undoubtedly other amateurs will be able to contribute further modifications and improvements to the basic concept and circuit. As can be seen in the photo, the coax connectors and switch are placed close together in order to keep circuit leads as short as possible. Tests showed the effect of the small reactance (primary winding of T1) in series with the dummy load is negligible — even on 10 meters.

The small 6 × 8 × 3-1/2-inch (152 × 203 × 89-mm) Minibox used to house the unit was donated by a friend. The front panel was already filled with holes, so I found it necessary to patch it with a piece of scrap aluminum. A coat of gray enamel paint that was dried overnight and then baked in an oven at about 250°F for 20 minutes provided a hardened, well-finished surface. Some dry-transfer lettering completed the project.

I feel this project will be of great help in reducing QRM caused during tune-up periods. It will also be a great aid in adjusting antenna-matching networks, as it eliminates much of the guesswork. I'll be happy to answer any questions on the project and would enjoy hearing comments from others who build it. My only request is that you include an s.a.s.e. when you write.

Low-Pass Filters for Amateur Radio Transmitters

These filters should keep you, your transmitter, the FCC and your neighbors happy. A BASIC computer program is included in the appendixes to help you design custom filters.

By Edward E. Wetherhold,* W3NQN

According to a 1978 FCC ruling, all spurious rf energy from amateur hf-band transmitters operating with more than 5 watts of mean power must be more than 40 dB below the mean fundamental power. Since most well-designed, solid-state transmitters have levels of spurious rf energy only 32 to 38 dB below the fundamental, additional filtering of the transmitter output is necessary to ensure that the spurious energy levels will never exceed the specified limit.† This additional filtering is usually achieved with separate low-pass filters for each band, and an article and several tables of filter design information have been published for amateur application.[1] A table of eight 5-element, 50-ohm half-wave filter designs has frequently appeared over the past several years.[2,3] This type of filter has low VSWR and is relatively easy to construct, but it does not have appreciable attenuation[4] at the second harmonic (of the low end of the amateur band), and the capacitor values are inconvenient to obtain because they are nonstandard values. Also, a separate half-wave design is required for each band. A more recently published table of low-pass filter design information is based on the 5-element 1-dB ripple Chebyshev filter.[5] This filter type has about twice the attenuation at the second harmonic frequency as compared to the half-wave design, but it also has a much higher maximum VSWR (2.66) and a 1-dB maximum attenuation ripple in the pass-band. Such a high VSWR may cause an operational problem with some commercial solid-state transmitters containing a VSWR sensing circuit that shuts down the PA in the presence of an impedance mismatch. The 1-dB Chebyshev filters are also inconvenient to construct because four of the six published designs require nonstandard capacitor values. What would be more useful is a family of low-pass filter designs combining the best qualities of each filter type with none of the disadvantages. The optimum harmonic filter should have low VSWR, about 30 dB of attenuation at the second harmonic frequency and require only standard-value capacitors to simplify construction.

This article discusses a group of optimum 50-ohm low-pass filter designs, and a selection of 11 designs is provided for the 160- to 10-meter bands. Sufficient background information is also included to enable the reader to apply the design techniques to other filtering applications.

A Family of Chebyshev Low-Pass Filters

The filter type selected to meet the proposed design performance characteristics is the 7-element Chebyshev low-pass filter having a reflection coefficient of less than 4.8 percent and a theoretical maximum VSWR of less than 1.1. The desired minimum attenuation at the second harmonic frequency is achieved by using seven elements instead of the five used in previously published designs. For this application, it is better to use two more elements to obtain additional attenuation instead of increasing the filter VSWR as was done with the 5-element filter. The inconvenience of needing two additional capacitors is reduced by using a special design procedure that allows the selection of only those designs having standard catalog capacitance values. Such a design procedure is feasible because there are infinitely many Chebyshev designs having reflection coefficients between zero and 4.8 percent. One has only to find a design that has the proper ratio of standard capacitor values and the actual cutoff frequency sufficiently near the desired cutoff frequency. This ensures that the second harmonic attenuation will be adequate.

Table 1 lists 11 7-element 50-ohm Chebyshev low-pass filters that will reduce harmonics from amateur hf transmitters of reasonably good design to levels well below the present FCC limit. The filter schematic and a typical attenuation curve are shown in Fig. 1. Because this filter design is based on identical values of source and load resistance, the values of C1 and C7 are identical, as are the values of C3 and C5. Also, the values of L2 and L6 are the same. Consequently, these filters are relatively easy to construct. Another advantage of these designs is the resultant low VSWR as indicated in column six where all calculated values are less than 1.1.

The F-A_p design cutoff frequencies (second column) were selected to be slightly above the upper frequency edge of the amateur bands. Sometimes the constraints of the design procedure resulted in the cutoff frequency being very close to the upper edge of the band. When this

*Honeywell, Inc., Defense Electronics Division, P. O. Box 391, Annapolis, MD 21404

†See Page 47.

[1]Notes appear on page 47.

Table 1
Design Parameters and Component Values of 7-Element Chebyshev Low-Pass Filters

BAND[1] (MTRS)	F-HF[1] (MHZ)	F-3DB (MHZ)	ATTEN[2] (DB)	R.C. (%)	VSWR ----	AP (DB)	C1,7 (PF)	C3,5 (PF)	L2,6 (UH)	L 4 (UH)
160.	2.02	2.34	38.0	4.10	1.086	.00731	1200.	2700.	5.42	6.41
160.	2.17	2.59	29.4	2.70	1.055	.00317	1000.	2400.	4.86	5.88
80.	4.11	4.82	33.0	3.40	1.070	.00502	560.	1300.	2.62	3.13
40.	7.98	9.28	36.5	3.90	1.081	.00661	300.	680.	1.37	1.62
20.	15.16	17.55	40.7	4.10	1.086	.00731	160.	360.	.722	.854
20.	16.81	19.28	34.5	4.70	1.099	.00960	150.	320.	.658	.773
15.	21.69	25.90	40.4	2.72	1.056	.00321	100.	240[3]	.486	.588
15.	25.22	28.93	34.2	4.70	1.099	.00960	100.	220.	.439	.515
15.	27.71	31.79	26.8	4.70	1.099	.00960	91.	200[3]	.399	.469
10.	33.02	39.05	31.9	3.10	1.064	.00418	68.	160.	.323	.388
10.	36.85	42.34	26.8	4.60	1.096	.00920	68.	150[3]	.300	.352

NOTES:
[1]The "F-A_p" column lists the filter design cutoff frequencies in MHz. The F-3dB frequencies are calculated from the F-A_p values.
[2]The "Atten. (dB)" column lists the attenuation levels at twice the low-edge frequency of each band. For example, the low-edge frequency of the 40-meter band is 7.0 MHz, and the attenuation at 14 MHz is 36.5 dB.
[3]The Erie Button-Mica bulkhead-mounted feedthrough capacitor is recommended for extended stopband performance above 100 MHz. The indicated capacitor values are available in the Button-Mica type.

happened, a second design having more separation between the upper band edge and the cutoff frequency was calculated and listed. Some separation between the upper band edge and the filter cutoff frequency is advisable to minimize the chance of some attenuation intruding into the amateur band. This might occur if the component tolerance variation is in the wrong direction. However, if too much separation occurs, the attenuation of the second harmonic may be too low. The listed designs provide a reasonable compromise between these two constraints.

The fourth column of Table 1 (Atten., dB) lists the calculated attenuation that occurs at the lowest possible second harmonic frequency of each band. This frequency is equal to twice the frequency of the low edge of the amateur band.

Two of the three 15-meter band designs (C3, C5 = 240 and 200 pF) are included because these capacitor values are available in the Erie Button-Mica series. This capacitor type should be installed on partitions on both sides of L4 if extended stopband attenuation is desired above 100 MHz. If extended stopband attenuation is not needed, a design is included (C3, C5 = 220 pF) which provides greater separation between the upper-edge frequency and the cutoff frequency while providing 34.2-dB attenuation at the second harmonic frequency. Two 10-meter designs are included for the same reasons.

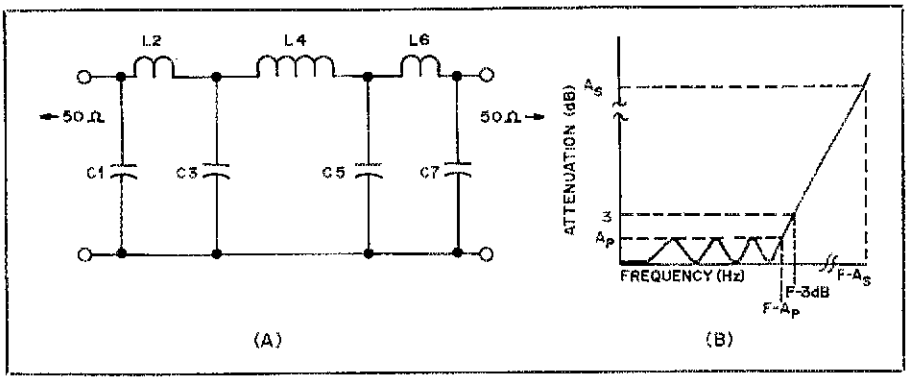


Fig. 1 — Schematic diagram of a generalized Chebyshev low-pass filter (A) and its attenuation vs. frequency plot (B). The component designations are as shown to facilitate computer synthesis of the values. In the frequency response graph, A_p is the passband attenuation or peak-to-peak ripple. A_s represents the stopband attenuation. Tables 1 and 2 give complete component and performance information for filters for the hf amateur bands.

The reader may confirm the tabulated values of reflection coefficient (R.C.), VSWR and A_p by using equations 1

Table 2

Filter Inductor Construction Data

Band (Mtrs)	L2 & L6 µH	L6 Turns	L4 µH	L4 Turns	Toroidal Core T-No.	$L_{(\mu H/10T)}$
160	5.42	20.0	6.41	21.8		
	4.86	19.0	5.88	20.9	106-2	1.35
80	2.62	13.9	3.13	15.2	(Red)	
		10.1		11.0		
40	1.37		1.62			
		10.9		11.8		
20	0.722	7.9	0.854	8.6	106-6	
	0.658	7.5	0.773	8.2		1.16
	0.486	6.5	0.588	7.1	(Yellow)	
15	0.439	6.2	0.515	6.7		
	0.399	14.4	0.469	15.6		
10	0.323	13.0	0.388	14.2	106-0	0.192
	0.300	12.5	0.352	13.5	(Tan)	

Equation for calculating the number of inductor turns (N) for a given inductance (L)

$$N = 10\sqrt{L/L_{(\mu H/10T)}}$$

where

L = given inductance,

$L_{(\mu H/10T)}$ = inductance/10 turns.

For example, the number of turns (N) required for the 80-meter band inductor L2, where L = 2.62 µH and $L_{(\mu H/10T)}$ = 1.35 is

$$N = 10\sqrt{2.62/1.35} = 10\sqrt{1.9407} = 13.9 \text{ turns.}$$

through 4 of Appendix A, if any one of these parameters is known. Also, for a given value of R.C. and F-A_p, the stopband attenuation at any frequency can be calculated by using Eq. 5 or Table A-1 in Appendix A. For example, the attenuation for the first 160-meter design can be calculated at 3.6 MHz. Assume the reflection coefficient is 4.1 percent and the F-A_p cutoff frequency is 2.0 MHz. The normalized stopband frequency (Ω_s = F-A_s/F-A_p) at 3.6 MHz is 3.6 MHz/2.0 MHz = 1.8. Referring to Table A-1, the stopband attenuation, A_s, at Ω_s = 1.8 is 38.8 dB. The A_s value given in Table 1 for this filter is slightly lower than 38.8 dB because the actual Ω_s for this design was also slightly lower (3.6/2.02 = 1.782).

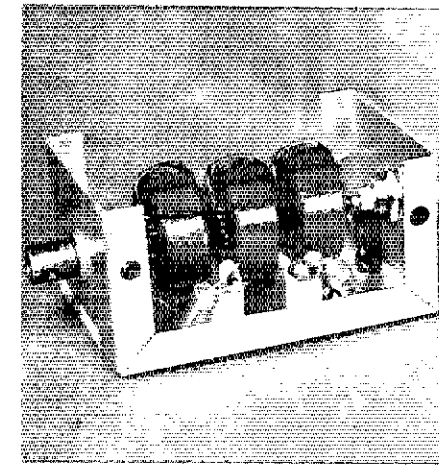
The reader should exercise caution when planning to use tabulated data such as those in Table A-1. Such data should not be assumed to be correct until some simple test can be performed to provide an indication that the data are reasonable. For example, the likelihood of the listed value of A_s versus Ω_s in Table A-1 being correct can be tested by calculating the change of attenuation over one octave. The A_s values for n = 7 at Ω_s = 1.4 and 2.8 are 19 and 69 dB. The attenuation slope over this portion of the response curve is 50 dB per octave. Since we know that a 7-element Butterworth filter (zero reflection coefficient) has a 6 dB per octave slope for each element or 42 dB per octave for a 7-element filter, and we know that a 7-element Chebyshev filter (with low R.C.) will have slightly more attenuation per octave, the value of 50 dB per octave for the tabulated filter appears reasonable and very likely is correct. Consequently, we can be relatively confident of the accuracy of the data in Table A-1. The same test can be applied to the 5-element A_s values in Table A-1. For a more thorough test, the value of A_s can be calculated using equation 5 in Appendix A. Of course, the values of Ω, ε and $Cn_{(\Omega)}$ must first be calculated before proceeding with equation 5.

Filter Construction

Table 2 lists the inductance values for the filters in Table 1 and includes the winding details of the toroidal inductors. The cores may be obtained from Whitehouse, Amidon Associates or Palomar.[6,7,8] No. 18 enameled wire is recommended for winding the inductors. Quite a few of the inductance values require windings having fractions of turns. It is suggested that for those fractional parts equal to or greater than 1/2 turn, the total winding should be increased to the next full turn. For fractional values less than 1/2 turn, the winding should be reduced to the next lower full turn. The inductance may be adjusted to the exact value by bunching or spreading the turns. Be careful to avoid crossovers on the winding as this will degrade inductor Q. In some cases, two core types are listed in Table 2. Generally, the core requiring the greater number of turns will have slightly higher Q.

The photograph shows the 80-meter filter assembled in a 2-1/8 × 1-5/8 × 3-1/4 inch (54 × 41 × 83 mm) Bud Minibox (CU-3001A). Because of the self-shielding property of toroidal inductors, they may be mounted close together as shown without appreciable coupling. The inductors are supported by their wire leads, but a generous bead of silicone rubber spread between the inductor cores will provide additional rigidity. The capacitors may be silver-mica or polystyrene types. Mica capacitors are recommended because they have slightly lower loss than polystyrene and the mica capacitor case is not as easily damaged by a hot soldering iron.

The measured attenuation response of this filter was in good agreement with the calculated response. The 3-dB and 33-dB attenuation levels occurred at the calculated frequencies and the passband was flat up to 4.1 MHz. The maximum measured VSWR in the 80-meter band was 1.28 at 4.0 MHz. This measured VSWR was slightly higher than the calculated value and the difference is probably due to slight differences between the actual component values and the calculated values. The maximum measured insertion loss was approximately 0.4 dB at 4.0 MHz. When the filter was operated at the 1-kW level in the ARRL lab, inductors L2 and L6 became warm to the touch and the center inductor was somewhat hotter. No evidence of heating was observed in any of the mica capacitors (for the operational test, the polystyrene capacitors C3 and C5 were replaced with silver-mica units). If these filters are used in high-power installations, the capacitor voltage rating must be adequate for the rf voltage encountered. For low-power applications, such as the output filter of a VFO or exciter, the smaller T-50 or T-68 powdered iron core sizes are recommended, wound with smaller wire, such as no. 20 or 22.



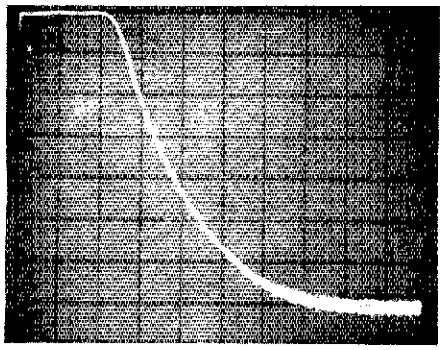
An 80-meter low-pass filter with the cover removed. The self-shielding property of the toroidal inductors allows a compact assembly. All of the components except one terminating capacitor are visible.

The method of calculating filter attenuation has been explained and demonstrated, and the associated equations are presented in Appendix A. The other aspect of filter design is the calculation of the component values. This will be discussed next to complete the explanation of the mathematics associated with the design of the 7-element Chebyshev low-pass filter.

Calculation of Filter Component Values

To conveniently calculate the normalized filter-element values, one must have access to a computer or have a table of normalized element values. But, most radio amateurs do not have access to a computer and even though the published normalized data are usually available in most technical libraries, these tables do not have sufficiently small increments in the values of the reflection coefficients to provide a large selection of designs. For example, two commonly used filter references provide normalized Chebyshev data for reflection coefficients up to 5 percent in steps of 1 percent.[9,10] However, in order to completely explore all possible designs using standard-value capacitors, a table of normalized data is required with reflection coefficient increments of about 0.1 percent.

Appendix B shows the computer pro-



Measured amplitude vs. frequency response of the 80-meter filter. The horizontal scale is 2 MHz per division and the vertical scale is 10 dB per division. This measurement was performed in the ARRL laboratory using an HP 8554B spectrum analyzer with an 8444A tracking generator.

gram used to calculate the normalized values of a 7-element Chebyshev filter for any given range of reflection coefficients. Table B-1 is the computer printout for reflection coefficients of from 2 to 5 percent in increments of 0.1 percent. The author has confirmed the validity of the normalized data for G1 through G7 by comparing the Table B-1 data for the reflection coefficients of 2, 3, 4 and 5 percent with the normalized values published in references 9 and 10. The values are identical. This indicates that the computer program as given is correct, and consequently, all the values calculated by this program must be correct. The column headings (G1, G7), (G3, G5), (G2, G6), and G4 list the normalized component values of a 7-element low-pass filter having termination resistances of 1 ohm and an A_p cutoff frequency of one radian per second. Also tabulated are the G3/G1 ratio, reflection coefficient, VSWR and the ratio of the 3 dB to A_p frequencies. The use of these data will be demonstrated in a design example in which the values of the 80-meter filter will be determined.

The element values will be calculated for the configuration shown in Fig. 1. In this case, the normalized values of G1, G3, G5 and G7 are used to calculate the corresponding capacitance values of C1, C3, C5 and C7. Likewise, the normalized values of G2, G4 and G6 are used to calculate the inductance values of L2, L4 and L6.

Step 1. Select one of the normalized filter designs from Table B-1 for a trial calculation. The design with R.C. = 3.4 percent appears promising because of its nominal VSWR and because the second harmonic attenuation probably will be adequate. (A filter design with much lower VSWR probably would have a much lower value of second-harmonic attenuation.) The trial $F\text{-}A_p$ frequency is chosen to be 4.2 MHz, or slightly higher than the upper edge of the 75-meter band.

Step 2. Calculate the values of C1 and C7 for the chosen cutoff frequency of 4.2 MHz and the normalized G1 and G7 value of 0.7231, using the following equation where R is the 50-ohm termination resistance and $\omega = 2\pi F\text{-}A_p$:

$$C1 = G1/(R\omega);$$

$$C1_{(pF)} = (G1 \times 10^6)/(\pi \times F\text{-}A_{p(MHz)})$$

$$= 7231/(\pi \times 4.2) = 548 \text{ pF}$$

Unfortunately, 548 pF is not a standard value, but we now have an idea of what the nearest standard value must be.

Step 3. Select the nearest standard value for C1 that simultaneously gives a cutoff frequency above 4.0 MHz, and allows C3, C5 to be a standard value. The G3/G1 ratio column will assist in the selection. For the R.C. = 3.4 percent design, the G3/G1 ratio = 2.319. If 510 pF is tried for C1 (the closest standard value below 548 pF), the resulting value of C3, C5 = 510 × 2.319 = 1183 pF. This is not a standard value, but it is within 1.4 percent of 1200 pF, which is a standard value. If these capacitors are the only ones available, this design could be used. But first, the alternative design should be checked out for 560 pF (the closest standard value *above* 548 pF). In this case the resulting value for C3, C5 is 1299 pF which, for all practical purposes, is 1300 pF, a standard value. Because the calculated value of C3, C5 is closer to a standard value for C1 = 560 pF than for C1 = 510 pF, the value of 560 pF is selected. If the 3.4 percent normalized design did not provide a suitable ratio that would give standard values for C1 and C3, other designs (for R.C. values between 2 and 4.7 percent) would be tried until a suitable selection was found.

Step 4. Calculate the exact value of $F\text{-}A_p$ that is related to C1 = 560 pF:

$$F\text{-}A_{p(MHz)} = (G1 \times 10^4)/(\pi \times C1_{(pF)})$$

$$= 7231/(\pi \times 560) = 4.11 \text{ MHz}$$

If the new value of $F\text{-}A_p$ had been below 4.0 MHz, the design with C1 = 510 pF would have been investigated.

Step 5. Calculate the F-3 dB frequency:

$$F\text{-}3 \text{ dB} = F\text{-}A_p \times 1.174 = 4.11 \times 1.174$$

$$\text{MHz} = 4.825 \text{ MHz}.$$

(The F-3 dB value in Table 1 is 4.82 MHz instead of 4.83 because 4.106 was used as the $F\text{-}A_p$ value to calculate C1 and C3. This was done to make C3, C5 equal to exactly 1300 instead of 1299 for cosmetic purposes.)

Step 6. Calculate the attenuation at the second harmonic frequency to see if it is adequate. The value of Ω_s is calculated for $F\text{-}A_p = 4.11$ MHz and $F\text{-}A_s = 7.0$ MHz; $\Omega_s = 7/4.11 = 1.703$. Using equations 3b and 6b in Appendix A, the value of ε for R.C. = 3.4 percent and the value of Cn for n = 7 are calculated. $\varepsilon = 0.03401967$, and $C7_{(\Omega)} = C7_{(1.703)} = 1319$. Using these values of ε and $C7_{(\Omega)}$, the value of $A_{s(\Omega)} = A_{s(1.703)}$ is calculated to be 33.0 dB. This is the value listed in Table 1 under the Atten. (dB) heading. Since this level of attenuation is adequate, the design calculations may be continued.

Step 7. Calculate the inductance of L2 and L6 using the following equation:

$$L2 = R \times G2/\omega;$$

$$L2_{(\mu H)} = (25 \times G2)/(\pi \times F\text{-}A_{p(MHz)})$$

$$= (25 \times 1.353)/(\pi \times 4.11) = 2.62$$

Step 8. In a similar way, calculate the inductance of L4, substituting the value of G4 in place of G2 in the above equation:

$$L4_{(\mu H)} = (25 \times G4)/(\pi \times F\text{-}A_{p(MHz)})$$

$$= (25 \times 1.617)/(\pi \times 4.11) = 3.13$$

This completes the mathematical background and calculations associated with the 7-element Chebyshev filter. The reader may now independently confirm the data in Table 1, or may use this information to design other filters for different applications.

The author gratefully acknowledges the assistance of John Kirby, N3AAZ, for the construction of the filter shown in the photograph, and Rex Cox for his review and comments on the article. The author will respond to questions related to this article if a 4 × 9-1/2-inch (102 × 241-mm) s.a.s.e. is included.

†[Editor's Note: The author's remark refers mainly to home-built transmitters of broadband design. The FCC ruling cited is 97.73. Rusgrove explains the meaning of this regulation in his article "Spectrum Analysis — One Picture's Worth a . . ." in August 1979 *QST*. While pre-1977 transmitters are exempt from specific levels of spurious emissions, the catch-all "good engineering practice" clause applies. Including one of Wetherhold's filters in your design is *very* good engineering practice.]

Notes

[1]Shubert, "Lowpass Filters for Solid-State Linear Amplifiers," *Ham Radio*, March 1974.
[2]*ARRL Electronics Data Book*, Table 6-5.
[3]*The Radio Amateur's Handbook*, ARRL, 1979, Figs. 18 and 19, pages 6-10 and 6-11.
[4]16 dB for the 160- and 80-meter filters and up to 24 dB for the 40- to 10-meter filters.
[5]*The Radio Amateur's Handbook*, ARRL, 1979, Fig. 68, page 6-43.
[6]G. R. Whitehouse, Newbury Dr., Amherst, NH 03031.
[7]Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607.
[8]Palomar Engineers, Box 455, Escondido, CA 92025.
[9]Saal, *The Design of Filters using the Catalog of Normalized Lowpass Filters*, Telefunken, 1966.
[10]Zverev, *Handbook of Filter Synthesis*, John Wiley and Sons, 1967.

References

Getfe, "EDN Designer's Guide to Active Filters," *EDN*, March 5, 1974.
Wetherhold, "Passive LC Filter Design (Part 1), Home Study Course 69/51," *Measurements and Control*, and *Medical Electronics*, both June 1978.
Wetherhold, "A Computerized Lowpass Filter Design Procedure," *ITEM 1977*, R & B Enterprises, Plymouth Meeting, PA.

Appendix A

Equations for Calculating the Stopband Attenuation of 5- and 7-element Chebyshev Filters.

Equations for ρ, A_p, ε, and VSWR where:

ρ = absolute value of reflection coefficient,

A_p = maximum amplitude of passband ripple in dB,

ε = ripple factor, and

VSWR = voltage standing wave ratio.

(1a) $\rho = (1 - 10^{-1A_p})^{.5}$

(1b) $\rho = (\text{VSWR} - 1)/(\text{VSWR} + 1)$

(2a) $A_p = 10 \cdot \log (1 + \varepsilon^2)\text{dB}$

(2b) $A_p = -10 \cdot \log (1 - \rho^2)\text{dB}$

(3a) $\varepsilon = (10^{.1A_p} - 1)^{.5}$

(3b) $\varepsilon = \rho/(1 - \rho^2)^{.5}$

(4) $\text{VSWR} = (1 + \rho)/(1 - \rho)$

For example, if $\rho = 0.041$, then:

$A_p = 0.00730664$ dB,

$\varepsilon = 0.0410345$, and VSWR = 1.086.

Note: VSWR is the ratio of the absolute magnitude of the filter input impedance (measured with the filter output terminated in its design resistance, R_o) to the design termination resistance, R_o. VSWR is always greater than 1, thus:

VSWR = $|Z_{in}|/R_o$ or $R_o/|Z_{in}|$, for VSWR ≥ 1.

(5) $A_{s(\Omega)} = 10 \cdot \log[1 + (\varepsilon \cdot Cn_{(\Omega)})]$ dB

where:

$A_{s(\Omega)}$ = stopband attenuation in dB at Ω*,

Ω_s = F-A_s/F-A_p (for low-pass filter),

Ω_s = F-A_p/F-A_s (for high-pass filter),

F-A_s = filter stopband frequency (in Hz) at A_s,

F-A_p = filter cutoff frequency (in Hz) at A_p,

ε = ripple factor [from Eq. (3)],

$Cn_{(\Omega)}$ = the value of the Chebyshev polynomial for "n" elements as a function of Ω; where:

(6a) $C5_{(\Omega)} = 16\Omega^5 - 20\Omega^3 + 5\Omega$, and

(6b) $C7_{(\Omega)} = 64\Omega^7 - 112\Omega^5 + 56\Omega^3 - 7\Omega$.

*Note: "Ω" is the symbol for normalized frequency.

Table A-1. Values of $Cn_{(\Omega)}$ and A_s for n = 5 and 7 and ρ = 0.041.

Ω_s	$Cn_{(\Omega)}$		A_s (dB)	
	$n = 5$	$n = 7$	$n = 5$	$n = 7$
1.0	1.0	1.0	0.0073	0.0073
1.2	11.25	39.0	0.84	5.5
1.4	38.17	216.1	5.4	19.0
1.6	93.85	761.8	12.0	29.9
1.8	194.7	2116	18.1	38.8
2.0	362.0	5042	23.6	46.3
2.8	2329	68.3k	39.6	69.0

Appendix B

BASIC Computer Program for Calculating Design Parameters of 7-Element Chebyshev Low-Pass Filters

```
10 INPUT L,U,I
20 PRINT
30 PRINT " G3/G1  P.C. VSWR F3DB/FAP G1,7  G3,5  G2,6  G 4"
40 PRINT " RATIO  (%)  ----  -------   (F)    (F)    (H)   (H)"
50 FOR R=L,U,I
60 V=(1+R/100)/(1-R/100)
70 A=-4.3429*LOG((1-(R/100)^2)
80 K=(4.17^.14286)/(A^.07143)
90 D=.5*(K+1/K)
100 B=A/17.37
110 X=LOG((EXP(B)+EXP(-B))/(EXP(B)-EXP(-B)))
120 Y=.5*(EXP(.071429*X)-EXP(-.071429*X))
130 G1=.44504/Y
140 G2=.554956/((Y^2+.188255)*(.44504/Y))
150 G3=2.24698/((Y^2+.611261)*G2)
160 G4=3.603876/((Y^2+.95048)*G3)
170 PRINT,120, G3/G1, R, V, D, G1, G3, G2, G4
180 FMT F6.3, F6.2, F6.3,  F6.3,  F7.4, F6.3, F6.3, F6.3
190 NEXT R
```

Table B-1

Normalized Component Values and Related Parameters of 7-Element Chebyshev LP Filters

G3/G1 RATIO	R.C. (%)	VSWR	F3DB/FAP	G1,7 (F)	G3,5 (F)	G2,6 (H)	G 4 (H)
2.506	2.00	1.041	1.224	.6300	1.579	1.282	1.575
2.489	2.10	1.043	1.219	.6378	1.588	1.289	1.579
2.473	2.20	1.045	1.215	.6453	1.596	1.295	1.583
2.458	2.30	1.047	1.211	.6526	1.604	1.302	1.587
2.443	2.40	1.049	1.206	.6596	1.611	1.307	1.591
2.428	2.50	1.051	1.202	.6666	1.619	1.313	1.594
2.415	2.60	1.053	1.199	.6734	1.626	1.319	1.598
2.401	2.70	1.055	1.195	.6800	1.633	1.324	1.601
2.388	2.80	1.058	1.192	.6865	1.640	1.328	1.603
2.376	2.90	1.060	1.189	.6929	1.646	1.333	1.606
2.364	3.00	1.062	1.185	.6991	1.653	1.338	1.608
2.352	3.10	1.064	1.183	.7053	1.659	1.342	1.611
2.341	3.20	1.066	1.180	.7114	1.665	1.346	1.613
2.330	3.30	1.068	1.177	.7173	1.671	1.350	1.615
2.319	3.40	1.070	1.174	.7231	1.677	1.353	1.617
2.308	3.50	1.073	1.172	.7289	1.683	1.357	1.619
2.298	3.60	1.075	1.169	.7346	1.688	1.360	1.620
2.288	3.70	1.077	1.167	.7401	1.694	1.364	1.622
2.279	3.80	1.079	1.165	.7457	1.699	1.367	1.623
2.269	3.90	1.081	1.162	.7511	1.704	1.370	1.625
2.260	4.00	1.083	1.160	.7564	1.710	1.373	1.626
2.251	4.10	1.086	1.158	.7618	1.715	1.376	1.627
2.242	4.20	1.088	1.156	.7670	1.720	1.378	1.628
2.234	4.30	1.090	1.154	.7722	1.725	1.381	1.629
2.225	4.40	1.092	1.152	.7773	1.730	1.383	1.630
2.217	4.50	1.094	1.151	.7823	1.734	1.386	1.631
2.209	4.60	1.096	1.149	.7873	1.739	1.388	1.632
2.201	4.70	1.099	1.147	.7923	1.744	1.390	1.632
2.193	4.80	1.101	1.145	.7972	1.748	1.393	1.633
2.186	4.90	1.103	1.144	.8020	1.753	1.395	1.634
2.178	5.00	1.105	1.142	.8068	1.757	1.397	1.634

Technical Correspondence

Conducted By
Doug DeMaw,* W1FB

MORE ON "HALF SLOPERS"

[ ] The July 1979 *QST* article on quarter-wave slopers has prompted me to write you on the subject. I have had considerable experience using them on 160 and 80, and I have tried them on 40.

The first one I know who used this type antenna was W3AU. His success with the system on 160 caused him to recommend it to W7RM and me. The original configuration used more than one sloping element fed in parallel against the tower. It resembled a top-loaded vertical with a simulated ground system. All my results have supported the view that this is an omnidirectional, vertically polarized radiating system, even when only one sloping element is used.

All the antennas of this type I have tried have been at my father's station, W6UA, and have been on a single tower. The tower is 82 feet (25 m) high, approximately 1-1/2 feet (0.45 m) in uniform triangular cross section, and has a single set of guys at the 70-foot (21.3-m) level. The guys are broken with insulators at about 20-foot (6-m) intervals, and the top section of each guy is electrically connected to the tower. The base has whatever insulation the concrete provides and there are 10-, 15- and 20-meter Yagis on top of the tower. (This is an AB105 tower, the same as is used by W3AU and W7RM.)

The first antenna of the type in question was tried on 80 meters. It was attached at the 60-ft (18-m) level, so that top-loading effects of the guys, as well as the rotaries, were probably effective. The attached wire came off at 30° to vertical and was trimmed for minimum VSWR. The resultant length was within 2 feet (610 mm) of the formula length, and the antenna then had a VSWR less than 1.5 from 3.5 to 4.0 MHz. It worked well on transmit but was extremely noisy on receive. The original wire sloped east, so I put up an identical system, attached to the same tower level, sloping west. Electrical characteristics were nearly identical, and no directivity difference between the two could be detected either on transmit or receive. This is logical considering how little of the antenna current in the sloping wire has any horizontal component, other antenna systems used on 80 at W6UA have been dipoles, inverted Vs, and a delta loop. The quarter-wave sloper is better than any of the others for transmitting, but it is poor on receiving. I have taken down all but the two slopers. They are used for transmitting and receiving, with frequent use of a 40-meter collinear antenna on receiving weak signals.

I also tried this system on 40, with a wire attached to the tower at 30 feet (9 m), coming off at 30°. Perhaps because there was so much tower electrically above the attachment point — at least half a wavelength — this one was much harder to tune. The wire length, which was very critical, was some feet shorter than expected, and the VSWR behavior across the band less benign. Not much time was spent on this particular antenna because it seemed no better than a λ/2 vertical. Both worked well, but neither was the equal of the collinear types available.

The most recent quarter-wave sloper system I have used has been on 160 meters. My first attempt was a single sloping element from the 75-foot (22.8-m) level. This places whatever contribution there is from the top guy sections below the point of attachment. I couldn't get this antenna to match by altering the length of the sloping wire, even while making rather severe adjustments. There did seem to be some promise for the system, so the next season I used two sloping elements of about the "correct" length and fed the arrangement with a matching network at the bottom of the tower, with 300-ohm twin-lead going up the tower (Fig. 1). This was the best antenna I have used on 160 at W6UA. Previously I had used an inverted V, a center-fed 80-meter dipole at 90 feet (27.4 m) and a λ/2 inverted L. Since the wires must come off the tower at about 45-50° to vertical, the rationale of using two wires instead of one was to attempt to cancel the horizontal current component. As a matter of curiosity I tried adding a third wire and could find no change in setting of the matching components or in the overall effectiveness. Using some rough estimates of component values required for matching, length of feed line, etc., I calculate the feed impedance of the antenna itself to be approximately 100-*j* 300 ohms.

My estimate of how well this antenna performs must be tempered by realization that conditions during the past two years have been much worse than the period before. During the 160-meter contests, openings to W1, W2 and W3 have been marginal. I have worked nothing with this antenna I hadn't worked before, but the impression remains that the antenna is better than those used earlier. It has done a consistent job into the Caribbean, SA, Pacific and Japan, as well as across the USA. Receiving remains a problem because of the noise. I have taken down the 160-meter version of this antenna. If I put it up again I will definitely install some auxiliary receiving antennas.

The net result seems to be that this is an effective antenna. Getting a good match directly

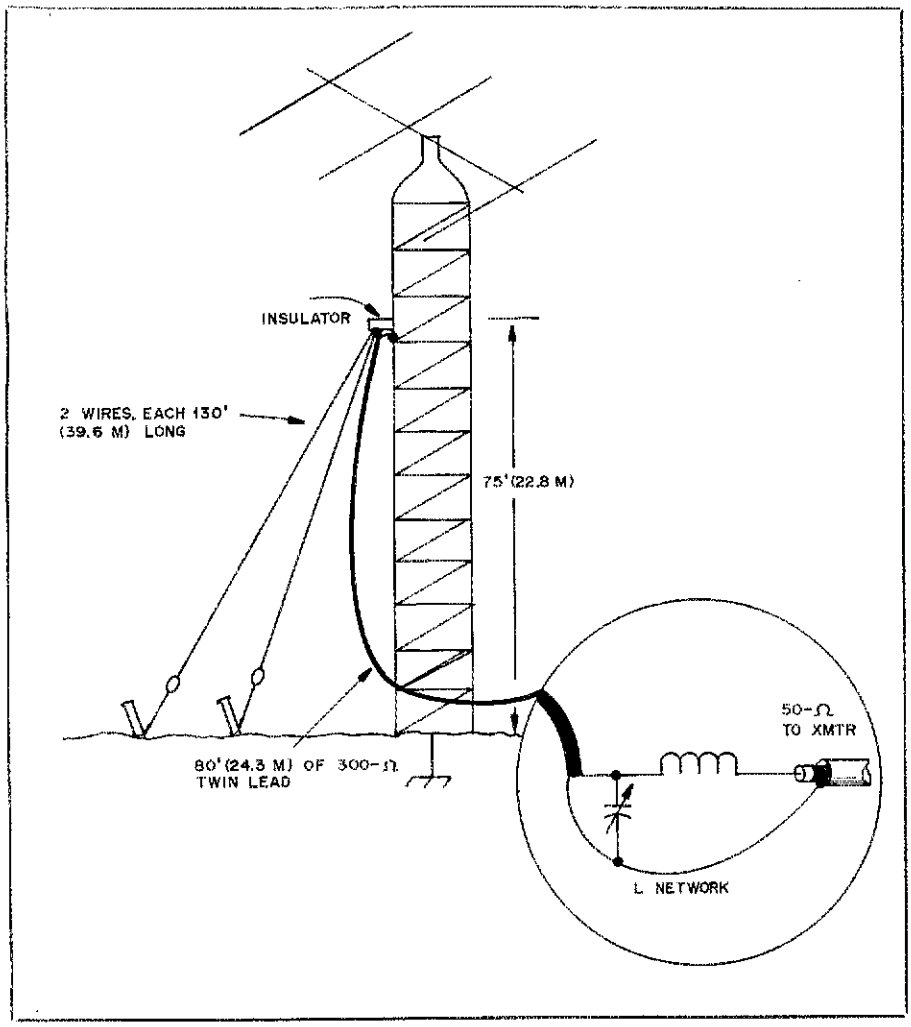


Fig. 1 — Illustration of the arrangement used at W6UM for a 160-meter half sloper.

*Senior Technical Editor, ARRL

into coax appears easier if the sloping wire is more nearly vertical and if there is not too much loading above the attachment point. The system should be more efficient, up to a point, as there is more vertical structure above the feed point. There is no compelling reason to insist upon using a resonant configuration. The next attempt I make on 160 might well be with the existing 80-meter system, fed at 60 feet (18.2 m) and with 80-meter sloping elements, but using a transmission line and matching network at the bottom of the tower as before.

Given that the antenna does work, the areas I feel need further investigation are better characterization and description of it for different parameters, e.g., measurement of the feed impedance as a function of frequency for different sloper attachment points, lengths, angles and conditions of top loading. I would also like to see the current flow on all of the structure mapped via a probe. If some of the results are forthcoming I hope to see them in an early issue of *QST*. — *Charles Weir Jr., W6UM, Box 3194, Seal Beach, CA 90740*

HALF-SLOPER VARIATION FOR 160 M

☐ I read the July *QST* article by W1CF with great interest. I enjoyed it very much and learned something.

A few days ago I was looking at my 80-meter sloper and it occurred to me that by using a loading coil and some more wire it would work on 160. So I took a 4-inch (102-mm) diameter coil of 10 turns of no. 10 wire out of the junk box, attached the coil to the far end of the half sloper, added about 30 feet (9.1 m) of wire and ran the wire to the corner of my garage. The noise bridge indicated it was too short, so I added another 10 feet (3 m). Presto! Resonance at 1830 kHz with an SWR of 1.1:1.

I think that by using a larger (higher inductance) loading coil, the added wire could be shortened considerably without seriously affecting the 2-to-1 SWR points on the curve.

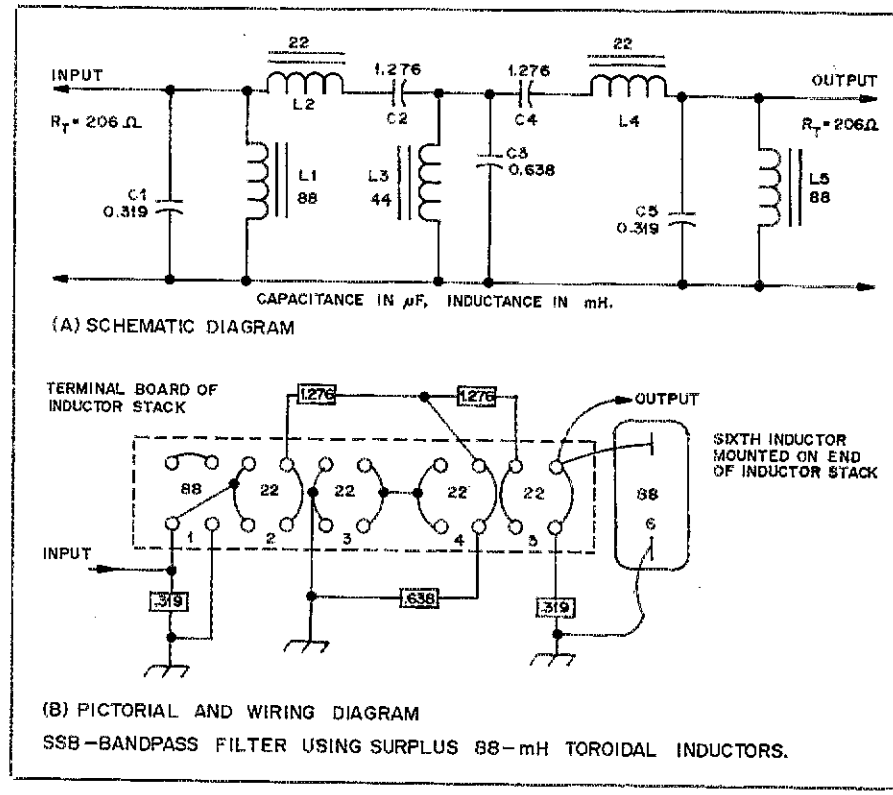
I have not made too many contacts on 160 yet, as there is very little activity this early in the season around here. I have had several contacts though, always getting at least as good a report as I have given. — *Philip True, W7AQB, 419 15th Ave., S.E., Payallup, WA 98371*

PASSIVE AUDIO FILTER FOR SSB

☐ In a letter from W1FB he requested a band-pass filter design for ssb applications. I have completed a design in accordance with his suggestion, and have built and tested the filter. The details of the test results are included (Fig. 3).

Fig. 2A shows the schematic diagram of the band-pass filter, and Fig. 2B shows the wiring diagrams. All inductors are the 88-mH surplus toroidal type with their two coils wired either in series or parallel to get the required 88 or 22 mH of inductance. Five inductors from a single stack are wired so as to obtain 88, 22 and 44 mH for L1, L4 and L3, respectively. The sixth inductor (88 mH) is obtained by mounting a single 88-mH inductor on the end of the inductor stack using GE RTV 108 Silicone Rubber Adhesive or its equivalent. Because the terminal board of the inductor stack is used for all filter circuit interconnections and terminations, the filter is easy to wire.

The 0.319-μF capacitors were selected from



SSB–BANDPASS FILTER USING SURPLUS 88–mH TOROIDAL INDUCTORS.

Fig. 2 — Ssb-band-pass filter using surplus 88-mH toroidal inductors.

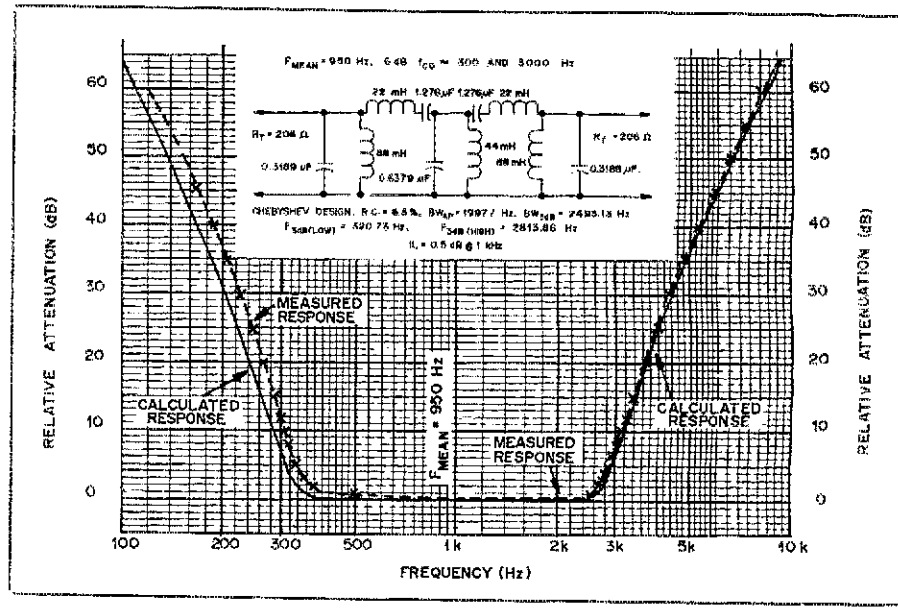


Fig. 3 — Attenuation response of ssb-band-pass filter.

several 0.33-μF capacitors which were about 3 percent on the low side. The 0.638-μF value was obtained with a single 0.68-μF capacitor which was about 6 percent on the low side. The 1.276-μF values were obtained by paralleling 1-μF and 0.33-μF capacitors, selected to give 1.28 μF within 3 percent.

Fig. 3 shows the measured and calculated attenuation responses of the filter, and the design parameters. The desired 3-dB frequencies were 320 and 2814 Hz. The measured 3-dB frequencies were about 350 and 2730 Hz. Because of the better Q at the high end of the response curve (above 3 kHz), the measured attenuation is almost identical to the calculated attenuation. However, at the low end (below 500 Hz), there is a definite difference between the measured and calculated responses, and this is probably due to the much lower Q of the inductors. Nevertheless, the filter performance appears to be adequate for amateur applications and I suggest this design be published as an example of the application of modern filter design and of another example of how the surplus 88-mH inductors can be used. For optimum convenience, the five-inductor assembly (stack) should be used in the filter construction, with a single extra 88-mH inductor (either obtained separately or removed from another five-inductor stack) for the sixth inductor.

The termination resistance of 206 ohms is nonstandard, and it was necessary for this value to be used if the values of inductance as shown are to be used. That is, the design was started with the idea that all inductance values would be 22 mH or multiples of 22 mH to permit the 88-mH inductors to be used exclusively. A value of F_{mean} was selected to approximate the usual 300- and 3000-Hz band edges. With these constraints, the R term was left to be whatever it came out to be. This termination resistance is not too inconvenient: Most amateurs can accommodate it within their receiving setup. For example, a 200-ohm resistance can be connected between the receiver phone jack output and the filter to correctly terminate the filter input. If a headset of 200 ohms is available, it can be connected directly to the filter output and thus properly terminate the filter output. If a very low-impedance headset is used (such as 4 ohms), a matching transformer probably will be required. — *Ed Wetherhold, W3NQN (ARRL TA), 102 Archwood Ave., Annapolis, MD 21401*

A_L FACTOR CLARIFIED

☐ I congratulate Doug DeMaw, W1FB, on his interesting and informative article "The Practical Side of Toroids" in June 1979 *QST*. It was just what I lacked when first getting into the magnetics of power supplies (after a variety of other electronic disciplines), in that he deals with the *practical* side of coil winding. However, I did notice an obscurity in regard to units which I would like to clarify for the benefit of other *QST* readers. On page 32 he gives the equation:

$$A_L = \frac{L_{\mu H} \times 10^4}{N^2}$$

("where A_L = the desired inductance index"). Further in the column, Mr. DeMaw gives a similar equation slanted toward toroid cores other than powdered iron:

$$N = 1000 \sqrt{L_{mH} \div A_L}$$

From the above two expressions one might assume that the A_L of both has the same units; this is not actually the case. In his first equation A_L is actually in *microhenrys* per 100 turns whereas in his second it is in *millihenrys* per 1000 turns. Without this distinction the two are not compatible.

Again, my thanks for a most helpful article. — *Ernie Gordon, Research Specialist, Lockheed Missiles and Space Co., Inc., Sunnyvale, CA 94088*

LOGIC-PROBE UPDATE

☐ The article, "Vest-Pocket TTL Logic Probe," July 1979 *QST*, was quite unique. Use of a seven-segment readout device to indicate TTL logic levels was certainly ingenious and simple. However, I felt that a pulse stretcher (a circuit to detect pulses too short in duration to observe on the readout) was a requirement for a logic probe. With the intent of placing the entire probe circuit into a small package, it was necessary to devise a pulse stretcher that was as small as possible; say, one 14-pin IC in size. The 74121 resettable monostable multivibrator was selected for this purpose. The 74123, dual version of the 74121, can be used similarly, but it is a 16-pin device.

Incorporation of the 74121 into the present probe required one connection. Pin 4 of the 7402 will always be pulsed low when the probe is connected to a logical 0 (zero) or 1 (one), so this functions as the trigger input to the 74121 (Fig. 4).

The RC combination for the 74121 was derived experimentally to give an output pulse with sufficient time for observation. This can be tailored for any time duration desired. Pulse width for the values used here is approximately 300 milliseconds.

To keep parts within my size requirements, I used 1/4-watt resistors, a miniature tantalum capacitor and a miniature MV-50 LED. The LED was placed directly at the top of the seven-segment readout to ease in observation. Using point-to-point wiring, the entire probe was mounted in a 5/8-inch OD × 3-3/4-inch (16 × 95-mm) long HI-LITER felt-tip marker tube removed from service. It was required only to slot the tube for the readout. Results were quite pleasing. To keep total parts to a minimum, I used a Pinlite DIP-630 readout device (or DIP-650). It does not require resistors for current limiting and is TTL compatible.

I hope the information above will help other readers to incorporate a worthwhile feature into an already worthwhile device. — *Mike Mosko, K3RL, 519 E. Station Ave., Coopersburg, PA 18036* QST

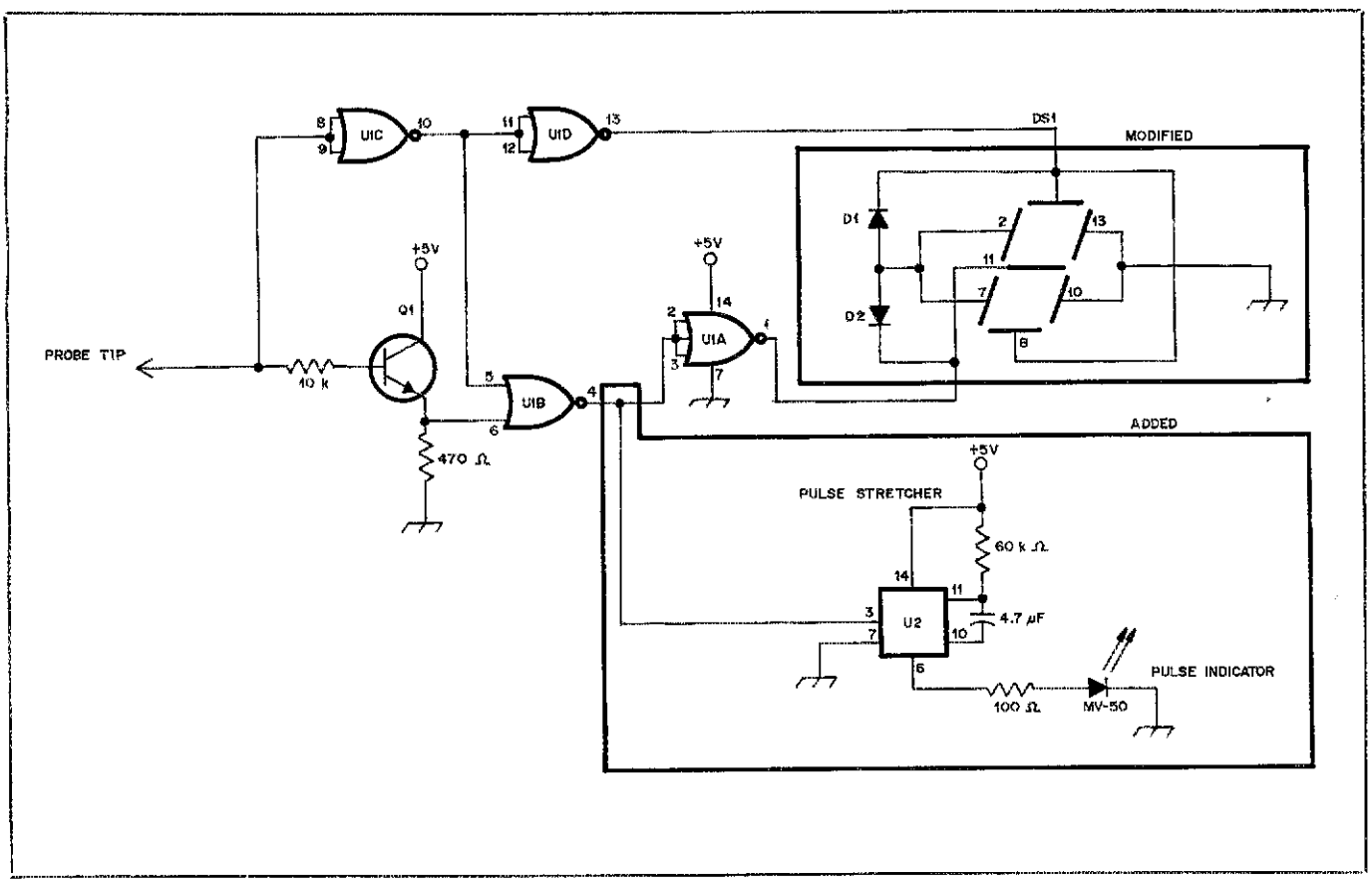


Fig. 4 — Schematic diagram of the logic probe. D1 and D2 are 1N914 silicon diodes. DS1 is a Pinlite DIP-630 or 650 seven-segment readout with V_{cc} on pin no. 3. Q1 is an npn switch (2N3904 or equiv.). U1 is a 7402 and U2 is a 74121. Resistors are 1/4-watt composition. The 4.7-μF capacitor is tantalum.

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu FT-101ZD Transceiver

Another FT-101 series transceiver? Well, "yes," but more definitively, "no." The similarity to previous FT-101 models ends with the equipment number. The main frame and the innards are completely different. In the writer's opinion, a more appropriate equipment designator would have been the FT-901-S (S standing for simplified). Outwardly, the '101ZD closely resembles the FT-901DM. Internally, one notices that the fundamental circuitry is that of the '901, but with fewer circuit geegaws.

Notable among the features which have been deleted from the fancier '901DM are the RC active audio filter, built-in Curtis Keyer, PA protective drop-out circuit and frequency-memory programming system. Most of the other significant and useful features remain, such as RX-TX RIT, digital frequency readout, analog readout, noise blanker, speech processor, variable i-f bandwidth from 300 Hz to 2.4 kHz, provision for a 600-Hz cw i-f filter and front-panel VOX controls. For those who wish to use the transceiver as a mobile rig, there's even a dimmer control for diminishing the intensity of the LED frequency display and panel-meter lamp. This feature is especially beneficial during nighttime operation when too bright a display might distract the driver.

The push-button switches at the lower center of the front panel are used for programming an external VFO — the FV-901DM, which is a synthesized, scanning type of external VFO. It can't be used with the FT-101Z, which is the less expensive analog-only version of the transceiver. This is because the FV-901DM has no digital readout of its own. The VFO can be used for establishing an external transceiver, transmit or receive frequency through proper actuation of the push buttons on the FT-101ZD panel. The outboard VFO sells for $415.

The Yaesu FT-101ZD transceiver makes a really compact package. The unit is completely self-contained (including the power supply). Both the digital display and the analog dial are amber tones, complementing the two-tone gray enclosure. The optional dc-to-dc converter plugs in at the rear of the transceiver. As with other Yaesu equipment, a carrying handle and additional side-mounted feet make for easy portability of the unit.

Equipment Performance

With due respect to the manufacturer of an early product (FT-101B) which filled a great amateur need for equipment compactness and portability at moderate cost, Yaesu has taken giant strides forward in transmitter and receiver performance. Many of us were willing to trade off poor receiver dynamic range (very poor) and transmitter spurs (minor — which in some areas were troublesome to the operator) for a rig which worked on 160 meters and could be hand-carried almost anywhere. The FT-101 and '101B rigs were, for many, almost as basic as apple pie — despite their foreign origin.

The FT-101ZD has good spectral purity from the transmitter and the receiver dynamic range is similar to that of the better transceivers on today's market. Fig. 1 shows the worst-case spectral condition of the six amateur bands covered by the transceiver. Here we see the 80-meter output at full rated power. The vertical divisions are 10 dB and the horizontal ones are 5 MHz, as viewed on a Hewlett-Packard spectrum analyzer. The full-scale pip is the 3.5-MHz carrier. To its left is a low-level spur. The large response at the far left is the zero-frequency reference of the analyzer. Immediately to the right of the carrier we see the second harmonic. It is 45 dB below peak power. Next, to the right, is the third harmonic — 62 dB below peak power. The fourth, fifth and sixth harmonics are down near the base line of the display. The seventh harmonic, however, at 24.5 MHz, is some 58 dB below peak carrier power, suggesting that the

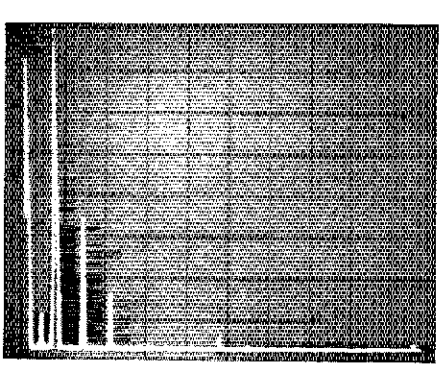


Fig. 1 — Spectral display of the FT-101ZD output on 80 meters (see text).

Yaesu FT-101ZD HF/MF Transceiver

Claimed specifications

Size (HWD): 6 × 13-1/2 × 12.8 inches (157 × 345 × 326 mm).
Weight: 33 pounds (15 kg).
Power requirements: 85 W (receive) and 330 W (transmit) from 117-V ac line. For dc operation, 13.5 volts at 1.1 A (receive) with heaters off, or 5.5 A (receive) with heaters on. Transmitter draws 21 A, key down.
Frequency coverage: 1.8-2.0, 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5 and 28.0-29.9 MHz. WWV/JJY band is from 5.0-5.5 MHz.
Color: Two-tone light and dark gray.
Price class: $900.
Manufacturer: Yaesu Electronics Corp., 15954 Downey Ave., Paramount, CA 90723. Phone: 213-633-4007.

* Assistant Technical Editor, ARRL

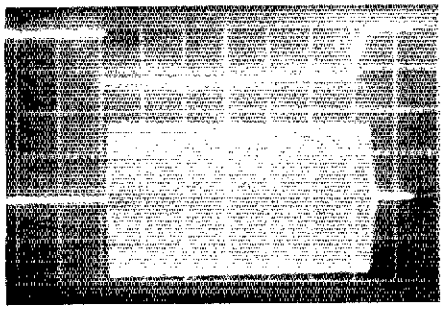


Fig. 2 — The cw keying waveform of the Yaesu FT-101ZD is shown here and in Fig. 3. Tests were performed in the ARRL lab. Each division of the horizontal axis is 5 ms. The upper trace shows the actual key-down time. Roughly 2 ms after key-up, the wave starts to decay. Note the difference in the leading edge (left-hand side of the photo) of the waveform in this photo and that of Fig. 3. Here, the drive control was adjusted for maximum output.

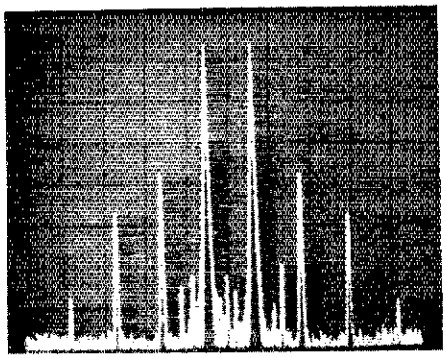


Fig. 4 — Spectral display of the transmitter IMD characteristics at 14 MHz during a two-tone test. Vertical divisions are 10 dB; horizontal divisions are 1 kHz. Third-order distortion products are down approximately 38 dB from the PEP output. The individual tones are 6 dB down from the PEP output. All measurements were taken in the ARRL lab.

transmitter PA pi network may have poorer rejection (or switch leakage) on 80 and 20 meters than on the other bands. This trait is observed only on 80 and 20 meters. However, the harmonic level is so low that it is of no consequence: FCC requirements are that all spurious energy is 40 dB or greater below peak power in the hf spectrum. This transceiver uses a pair of 6146B tubes in the final amplifier rather than a pair of sweep tubes, as were used in the 101B and 101E models. A 12BY7 tube serves as the driver.

During tests being performed in the ARRL lab, the spectrum analyzer showed the third- and fifth-order distortion products to be down only 20 dB from peak carrier power on 20 meters. This was quite far from the acceptable norm of 30-32 dB. Yaesu was informed of the findings and proposed that rf feedback into the mic amplifier was the problem. The factory suggested bypassing the mic and PTT leads with 0.01-μF disc-ceramic capacitors. This was done and the problem was eliminated. The results may be seen in the accompanying spectrum analyzer photo of the transmitter IMD characteristics. At this time, Yaesu is installing these bypass capacitors in all production models.

The sidetone oscillator of the FT-101ZD was noted to be "clicky." There are definite "key clicks" (on the break) audible during cw keying which can be annoying. These clicks do not appear on the transmitted signal and may be eliminated easily by the addition of a single electrolytic capacitor. To avoid altering the transmitted waveform of the 'ZD, the added capacitor must be placed correctly. The proper location for the capacitor is at the anode end of the D06 on the af board, PB-1964. This point may be accessed by scraping off the coating on the upright lead of R38. The positive lead of a 12-μF, 25-V electrolytic is attached at that point. The negative lead of the capacitor may be soldered to the ground lug of the terminal strip on the chassis wall nearby. A larger value of capacitance will provide a softer break and may be tailored to give a characteristic "bell-like" tone to the monitor signal.

The keyed cw waveform of the FT-101ZD is well shaped and has sharp, clean sound on the air. Figs. 2 and 3 show the cw keying waveform of the FT-101ZD. These tests were performed on 80 meters. Two traces are shown in each photo. The upper trace shows the actual key-down time. This amounts to 30 ms. The lower trace is the output of the transmitter. The sharp edges of the waveform shown in Fig. 2 would tend to produce some on-the-air clicks. By reducing the drive slightly (as was done during operation of the review unit), the leading edge of the wave becomes slightly rounded, thereby eliminating harsh clicks. The trailing edge is a bit sharp, though, and a smoother decay would remove any traces of clicks. Most of the time, clicks (and chirps in some instances) go unnoticed and are not reported to the transmitting operator.

Fig. 4 shows the transmitter IMD characteristics as displayed on the spectrum analyzer. The third-order two-tone distortion products are approximately −38 dB. The fifth-order products are down 47 dB from peak power. This spectral display is one of the cleanest we've observed in recent years at the ARRL lab, respective to transmitter IMD.

With regard to receiver performance, relative tests were performed over a period of many weeks at W1FB (two blocks from W1AW). At no time, other than when the 3-element triband Yagi was bore-sighted on W1AW, was it necessary to employ the receiver front-end attenuator to prevent blocking or cross-modulation effects from W1AW. Receiver dynamic-range tests performed in the ARRL lab yielded these results: MDS (minimum discernible signal) = −139 dBm. Blocking above MDS = 112 dB. IMD = 78 dB. These are worst-case numbers which were measured on 20 meters with a 600-Hz i-f filter. This equates to an input intercept of −22 dBm.

Although definitive measurements of local-oscillator noise output are beyond the present capability of the League's lab, it appears that the FT-101ZD has an exceptionally clean LO system. The residual noise in the receiver is very low. This becomes especially important when strong signals are in the i-f passband. A noisy LO chain will have a number of undesirable effects on overall receiver performance, but the most apparent is observed when tuning off a strong signal: Hash can be heard in the receiver output, even though the signal itself is not discernible. The hash appears each time the strong-signal operator speaks into the microphone or keys the carrier on cw. When the LO chain is clean, as in the '101ZD, nothing other than man-made or atmospheric noise is heard between signals. However, if the strong signal originates very near the operator's QTH, white noise from the other station's amplifier may be heard across the band during key-down periods. This does not indicate a receiver design fault.

Power input to the transmitter PA stage is 180 watts dc. Frequency stability shows a drift of less than 300 Hz after a 10-minute warmup period and is less than 100 Hz after a 30-minute warmup. The microphone input impedance is 500 to 600 ohms. Audio output from the receiver is 3 watts at 10 percent THD into a 4-ohm load, although loads up to 16 ohms are suitable.

Unwanted sideband suppression is rated at 40 dB or greater, with carrier suppression in excess of 40 dB. Transmitter audio response is 300 to 2700 Hz at the 6-dB points of the curve. Receiver sensitivity is 0.25 μV for a 10-dB signal-to-noise ratio. Image rejection is in excess of 60 dB on 160 through 15 meters. It is better than 50 dB on 10 meters.

A PA cooling fan can be added as an optional feature. Similarly, a plug-in dc-to-dc converter for mobile operation is available. It attaches to the rear panel of the transceiver.

Yaesu enthusiasts from the '101B days should find this new gray box a fine replacement for their earlier units. It certainly is a top performer, comparatively speaking, and the price tag is probably on par with that of the early units in view of present-day inflation in the USA. — *Doug DeMaw, W1FB*

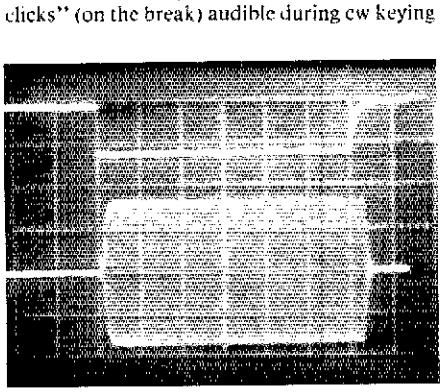


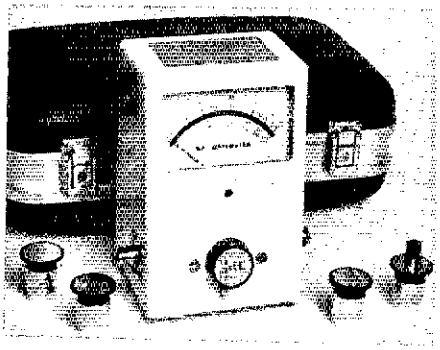
Fig. 3 — In this photo, the drive control of the FT-101ZD was adjusted for slightly less than full drive. This resulted in a much more suitable leading edge (note rounder corners). The sharp edges of the trailing edge of the wave could produce mild clicks.

DIELECTRIC RF WATTMETER MODEL 1000-A

The model 1000-A is a directional rf wattmeter designed for 50 ohms. It measures power flow and load match in coaxial lines. It may be used with all types of modulation — cw, a-m, ssb, fm and TV. The wattmeter should *not* be used to check pulse transmitters.

Description

The cabinet style, large, square easy-to-read meter and dielectric-white color make this a very attractive wattmeter. When hooking up the model 1000-A, this reviewer found that its "bench stability" was very good. The large rubber feet mounted on the base, which measures 4 × 5 inches (101 × 127 mm), prevented movement during testing. With a



The Dielectric Communications 1000-A wattmeter. The optional carrying case is immediately behind the meter with an array of elements (also optional) at each side. Note that the scale is expanded at the low-wattage end for easier reading.

Dielectric RF Wattmeter Model 1000-A

Specifications

Power rating: Determined by means of plug-in elements (5-5000 watts).
Impedance: 50 ohms nominal.
Insertion VSWR: 1.05:1 max., with N connectors.
Finish: White.
Weight: 4 lbs (1.8 kg).
Case dimensions (HWD): 7-1/2 × 5 × 4 inches (190 × 127 × 101 mm).
Element weight: 3 oz (85 gm).
Accuracy: ± 5 percent of full scale.
Frequency range: 2 to 1000 MHz.
Power requirements: None.
Price class: $125, less plug-in elements and carrying case.
Plug-in elements: $41 to $48 each.
Carrying case: $27.50.
Warranty: 2 years parts and labor.
Manufacturer: Dielectric Communications, Raymond, ME 04071.

shock-mounted meter, the unit should withstand quite a bit of abuse. The optional carrying case should add to its survivability because it appears to be almost indestructible. Inside, the case is lined with a spongy material that is cut out to the size of the wattmeter and has six cut-outs for accessory plug-in detector elements and coax connectors. Three connectors were provided with the test wattmeter and made hookup to type N or UHF coaxial fittings easy. These quick-match connectors are changed by removing four screws and pulling the connector free from its quick-match socket. Then, the desired connector may be installed. The whole operation takes but a few minutes. On the back of the wattmeter are two holes for transporting additional plug-in detector elements.

The most outstanding feature of the model 1000-A wattmeter is the square meter with mirrored background and expanded lower scale. The meter face is divided into 50 divisions which are graduated for 25, 50 and 100 full scale. These three scales are all that is needed with the large selection of plug-in detector elements available which have power measurement ranges from 5 to 5000 watts and frequency ranges from 2 to 1000 MHz. Simple placement of the decimal point makes direct power readout a snap.

Theory of Operation

The operation of this wattmeter is based on the traveling wave concept of rf transmission. As rf is supplied to the transmission line there is a forward wave traveling from the transmitter to the load and a reflected wave traveling from the load to the transmitter. The closer the load is matched to the transmission line, the smaller the reflected wave will be. To determine the rf power dissipated in the resistance, it is necessary to determine the rf power of the forward wave and the rf power of the reflected wave. The difference between the two will indicate the power absorbed by the load.

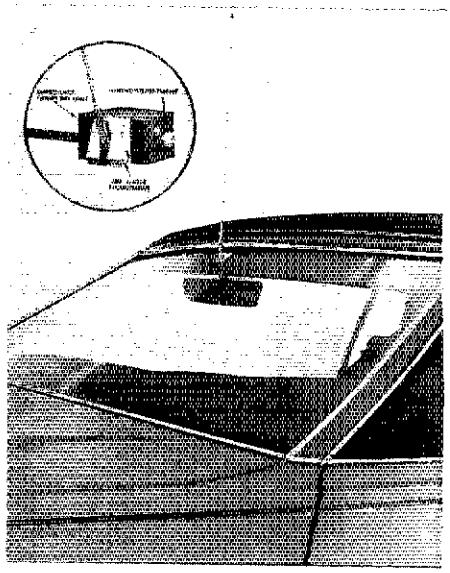
When the wattmeter is inserted in a transmission line, the rf power flows through a precision section of 50-ohm air-dielectric line. The plug-in detector element, when installed (with proper wattage and frequency ratings), is coupled capacitively and inductively to the main line. Voltages proportional to the rf voltage and current in the main line are therefore induced into the element circuitry. These voltages are rectified and the resulting dc current is applied to the meter, which is calibrated to represent the rf power in the main line.

Uses

In addition to indicating accurate rf measurements, the model 1000-A wattmeter may be used to test lines, connectors, filters and related components. These tests are necessary if optimum equipment performance is expected. Many suspicious and unknown conditions can be solved by simply checking the transmission line. The solid-state rigs in use today are very reliable, but design specifications are often accepted "as is" and not confirmed. One such elusive problem was discovered with a popular 2-meter all-mode transceiver. When it was used to drive a solid-state amplifier, the amplifier put out the specified power on fm, but not on cw and ssb. A call to the transceiver equipment service center determined that the magic cure was to touch up a transformer slug to balance the power output between fm and cw operation. Using the model 1000-A in the line made the work simple and gave a positive indication that everything was working properly.

Another use during testing included finding quite a bit of "lossy" coaxial cable and bad connectors. Procedures for testing are outlined in the well-written instruction manual.

The model 1000-A wattmeter will adapt to home-station, mobile and field use with no difficulty. The only maintenance required is a periodic cleaning. Using this instrument was a real pleasure and it helped solve several problems that had plagued my station for some time. — *Bernie Glassmeyer, W9KDR*



The Avanti AH 151.3G/2 window-mount antenna. The insert depicts the tuning box at the base of the antenna.

AH 151.3G Manufacturer's Claimed Specifications

Gain: Equivalent to 5/8-wavelength types.
2-meter VSWR bandwidth: Better than 1.5:1
Maximum power: 150 watts.
Nominal impedance: 50 ohms.

AVANTI AH 151.3G WINDOW-MOUNT 144- TO 174-MHz ANTENNA

Being one who does not like to drill holes in my auto, my interest in the Avanti AH 151.3G Window Mount antenna was a natural. My skepticism that the rf could "seep through" the window without a direct wire connection gave way to enthusiasm after following the meticulous installation instructions.

The AH 151.3G is a 31-1/2-inch (800-mm) half-wavelength antenna that is ideal for fm mobile use, but could also be used in an apartment situation. An antenna of this type is basically an "it works" or "it doesn't work" proposition, and this antenna indeed works!

For mobile installation it is recommended

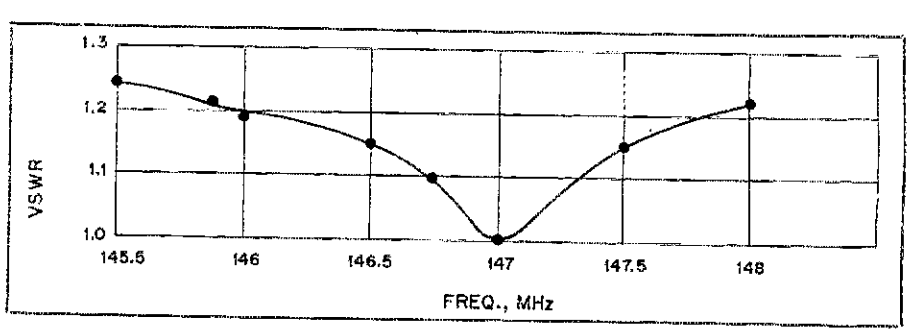


Fig. 5 — A VSWR plot of the Avanti AH 151.3G/2 window-mount antenna. This plot is one obtained with the antenna mounted on the reviewer's car. Refer to the text for details.

that the antenna be mounted near the top center rear (or front) window. I located mine on the rear window. Should you have a be antenna or defroster wires imbedded in the glass, some precaution must be taken for proper clearance, lest you end up with a multielement array. Installation instructions cover this point clearly.

The antenna is attached to a mounting foot which is glued to the outside of the window by means of a standard A-plus-B epoxy mix, which is provided. The otherwise extensive instructions are a bit unclear on this point at first reading; the *thick* part of the mounting foot should be on the *bottom* side. It is best always to read *all* instructions before taking hammer in hand. The impedance-coupling unit is adhesive-attached to the inside of the window; just peel away the paper covering. A grounding plate is provided to prevent the coaxial cable shield from conducting antenna currents. This was found to work quite well when the VSWR measurements were made. Alternative directions for grounding to the window molding of the car were found to result in flaky VSWR readings. No doubt each car installation will be different.

Power measurements were made with a Dielectric 1000-A directional rf wattmeter. Output from a popular 10-watt fm transceiver ranged from 9.4 watts on 145.4 MHz to 11.1 watts at 147.00 MHz. A simple screwdriver adjustment of the coupling unit resulted in a 1:1 VSWR at 147.00 MHz, with no trimming of the antenna. With the adjustment made at 147.00 MHz, the VSWR was still a low 1.25:1 at 145.5 MHz. See Fig. 5 for the VSWR curve.

Tests were also made with fm signals on 146.52 simplex in both the receive and transmit modes. The antenna performed as well as a 5/8-wave "mag-mounted" comparison antenna.

After the foregoing preliminary measurements were made, I could hardly wait to "open 'er up" on the interstate to view the antenna becoming airborne. At 70 mph (no, make that *55*) it did not budge.

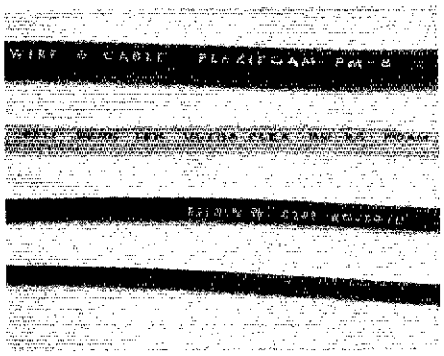
Because of a previous sad experience of losing a mobile antenna in a parking lot, security is a major concern. The Avanti has the added feature of not looking like the standard CB antenna and is thus not a prime candidate for removal by unauthorized parties. Should you find yourself in a high-risk area, the antenna element can be removed in 1.27 seconds. An appropriate plastic lustre cap is provided to fit over the aperture.

Should you ever trade in your car (or your condo living room), there are instructions for removal of the mounting foot from the glass by means of a 60-watt soldering iron. I cannot attest to the reliability of this extraction procedure, as I am such a satisfied user of the Avanti window-mounted antenna. I have no immediate intention of removing it!

The Avanti AH 151.3G window-mounted antenna is available from Avanti Research and Development, Inc., 340 Stewart Ave., Addison, IL 60101. The price class is $34. — *John F. Lindholm, W1XX*

BERK-TEK RG-8X COAXIAL CABLE

When choosing coaxial cable, an amateur must consider the engineering trade-offs between size, convenience, loss and power-handling ability. If you run high power or require low



This photo shows the relative size of RG-8X with respect to other popular cables.

loss, you're committed to a cable from the large RG-8/U family, right? Not any more! Berk-Tek manufactures RG-8X (trademark), a small, highly flexible, 52-ohm cable having low loss. Berk-Tek specifies the nominal attenuation to be 1.35 dB per 100 feet (30 m) at 27 MHz, compared to 1.1 dB for the best grade of RG-8/U. We measured something less than 1.0 dB on our 90-foot (27-m) piece in the 10-meter band. The power-handling capability is 1300 watts at 27 MHz. At higher frequencies, the derating curves for loss and power handling closely parallel those of RG-8/U. RG-8X has a velocity factor of 0.84.

The center conductor is composed of 19 strands of no. 28 copper wire, justifying the inscription "ULTRA FLEX" on the outer jacket. Expanded polyolefin foam is used for the dielectric. The shield is bare copper braid, having 95-percent coverage. A low-permeability (non-contaminating) vinyl jacket encases the cable. Those concerned with the aesthetics of their installations may be interested to know that the cable is available in white, black or silver. Here's the really good news: RG-8X has an outside diameter of 0.242 inch (6.2 mm), the same as RG-59/U. In fact, when installing PL-259 connectors, you treat it just like RG-59/U, using UG-176/U inserts.

Several applications immediately come to mind. A low dipole frequently exhibits a feedpoint impedance closer to 50 ohms than to 75. One must then choose between the evils of high loss (RG-58/U) or excessive sag and stress on the dipole (RG-8/U). RG-8X neatly sidesteps this dilemma. Of course, for extremely low loss over longer runs, especially at vhf and above, the large cables are the ones to use. However, RG-8X has application even in these situations. Where the transmission line must go through a wall, a short length of RG-8X can fit through a much smaller hole while adding negligible loss to the system. I plan to construct the broadband balun described by W1JR in September 1978 *Ham Radio*. RG-8X represents a much more cost-effective solution than the exotic RG-141/U used by Reisert. A few turns of coax passed through a ferrite toroid are sometimes helpful in choking off conducted vhf chassis radiation. RG-58/U winds well, but what to do at high power levels? Right again — RG-8X.

RG-8X isn't really new anymore, but plenty of hams are unaware of its existence, perhaps because it's aimed primarily at the CB market. The cost saving is 20-40 percent over RG-8/U types. You can purchase this cable from several *QST* advertisers. For more information, contact Berk-Tek, Inc., Box 60, Reading, PA 19607. — *George Woodward, W1RN*

New Books

CBer's Guide to Ham Radio, by George W. McCarthy, W6SUN, 1st edition. Published by Van Nostrand Reinhold, 135 West 50th St., New York, NY 10020. Hardcover, 9-1/2 × 6 inches, 306 pages, $14.95.

The title says it all. You have no reason to read this book unless you're a CBer. The author is a CBer as well as a ham and the book takes the form of a conversation between a ham and a curious CBer. McCarthy discusses a large variety of amateur subjects, with varying degrees of competence.

McCarthy displays photos of his 1940 homebuilt station, but his text generally encourages a strictly nontechnical interest in radio communications. In his chapter on license examinations, he conveys the impression that one can pass the test simply by memorizing the contents of the *License Manual* or its commercial counterparts. Hams who have recently attempted to upgrade tell a different story! The author's statement that over half of the applicants fail the code test cannot help but be discouraging — regardless of its possible accuracy.

The *CBer's Guide to Ham Radio* hangs out some dirty laundry. "Trashing" mobile nets, repeater jamming, poor DX manners and phone-patch abuse are exposed in vivid detail. In the author's comparison of 2-meter fm to CB, CB is rated slightly ahead in operating procedure and adult behavior. Also included is a comment on the legitimacy of some mail-order Technician class licenses. We admire McCarthy's journalistic obligation to the truth, but we can't help thinking that simple emphasis of good operating practice would be more appropriate to this type of book. McCarthy acknowledges half of his readers to be "hfers." Since "hfers" have little respect for the law, we question the wisdom of recruiting them into Amateur Radio. Displaying the seamy side of our hobby might encourage them to bring some of their own tricks into the ham bands. Some of McCarthy's suggestions for terminating a boring contact are in rather bad taste. But his intended audience will love it.

There are some bright spots in this book. McCarthy implores his potential hams to tune up into a dummy load. He urges prudence and moderation in speech processing. And his advice to improve the antenna system before adding a power amplifier deserves applause from all of us. Oh, yes — the detailed explanation of the "listen before you transmit" rule lends socially redeeming value to the work.

The author devotes a chapter to the cost of equipment. His estimates of prices for commercial gear are realistic, but he completely ignores the possibility of building one's own modest station. He rationalizes the cost of a transceiver by suggesting that it be resold to a CBer if the new ham loses interest. Very sad.

The CB boom is over. The rapid growth of Amateur Radio has just about stabilized. Two years ago, *CBer's Guide to Ham Radio* might have been a big hit. With the generally gloomy economic outlook, we doubt many CBers will want to invest the cost of a new power mic in a book about ham radio. — *George Woodward, W1RN*

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

A HANDY AUDIO AMPLIFIER

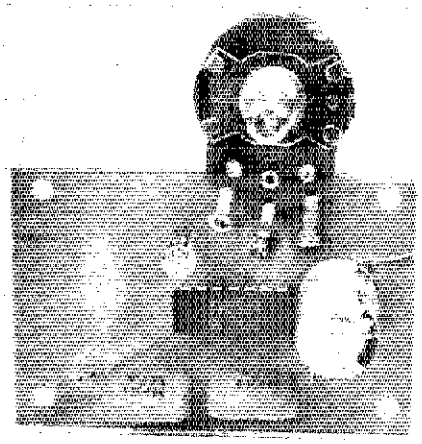
In almost every aspect of Amateur Radio there is use for an audio amplifier at one time or another. The little handful of audio amplifier, shown in the accompanying photograph, will satisfy almost any requirement including wide-range frequency response (5 Hz to 100 kHz). Gain is of the order of 30 dB. The power output can be as high as 5 watts, but for distortion-free response the amplifier should be kept at the 1- to 2-watt level.

The most important feature of this unit is that any supply voltage from 6 to 24 V dc may be applied with negligible difference in the apparent output volume. This characteristic is easily observed with the use of a variable-voltage power supply.

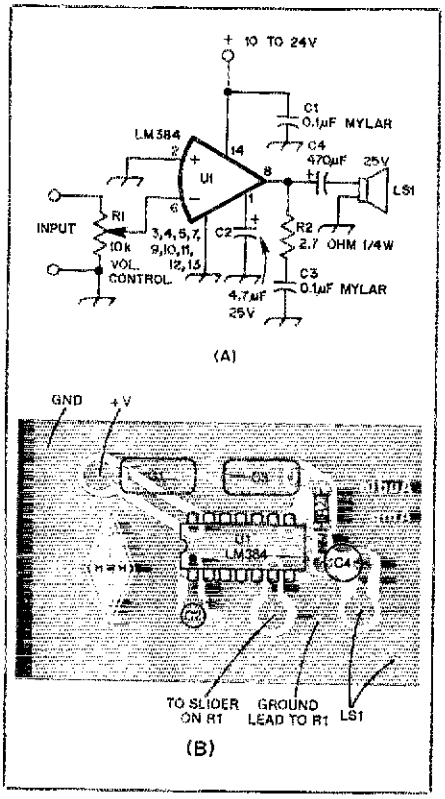
At the heart of the amplifier is an LM384 chip that embodies preamplification and contains the equivalent of a Darlington pair at the output. This IC has low quiescent (static) current drain. Also, the output of the LM384 is short-circuit proof.

Suggested uses for such a device include phono amplifiers, intercoms, line drivers, teaching-machine outputs, ultrasonic drivers, and TV or AM-FM radio sound systems.

Building the amplifier on a printed-circuit board is recommended because the copper foil serves as a heat sink. Layout is critical; Some component arrangements can be conducive to stray oscillations and noise. A 10-kΩ volume control and shielded audio-input lines are suggested. — *Robert D. Shriner, WAØUZO, Pueblo, CO*



A multipurpose, single IC audio amplifier built by WAØUZO. It has a frequency range of 5 Hz to over 100 kHz. Circuit-board information is shown elsewhere on these pages.

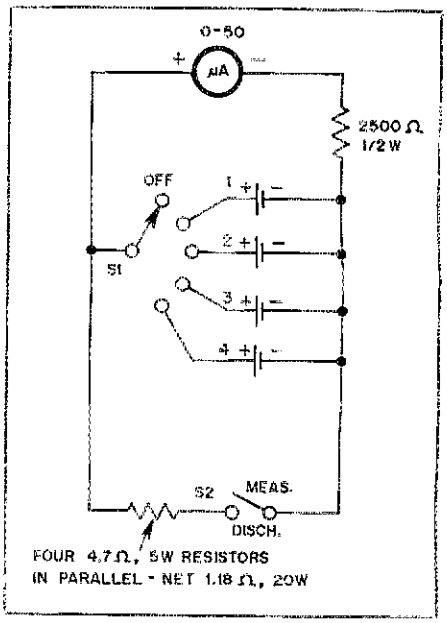


Circuit diagram for WAØUZO's miniature audio amplifier. Supply voltage may range from 10 to 24 V dc with no noticeable change in audio level. As little as 6 V will operate the unit, but a higher supply voltage is desirable in the interest of available output power.

NICAD-CELL DISCHARGE UNIT

During a recent Simulated Emergency Test, my Wilson 1405SM battery failed after two minutes of a 5-watt transmission. Having had no experience with NiCad power, and with my retirement income precluding replacement of the battery, except as a last resort, assistance was solicited from the local ham fraternity. WB6KZN provided the solution. He suggested three discharge/charge cycles as a probable method of restoring the battery.

By means of a haywire circuit containing flashlight lamps, each cell was discharged one at a time. The three-cycle discharge/charge took three days to complete and restore the battery to normal operation. Some form of time savings and better control of the discharge cycle seemed essential. The accompanying diagram illustrates the system I produced to answer that need.



Schematic diagram of W6RTK's NiCad-cell discharge unit.

Table 1

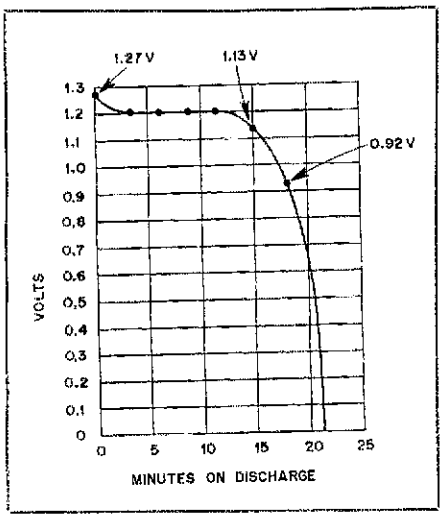
Cell Number	*Minutes on Discharge*
1	15
2	23
3	20
4	19
5	21
6	21
7	26
8	27
9	19
10	25

Record of discharge. Total discharge time: 3 hours, 48 minutes. Start voltage of each cell — 1.27 V. Discharged voltage per cell — 0.5 V.

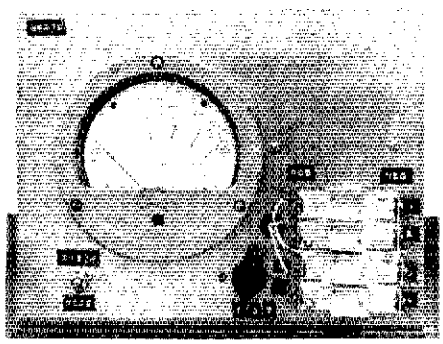
For a dollar I obtained a 50-μA movement meter from a local surplus house. One of the full-scale readings is 2.5 V dc (appropriate for the intended purpose). Results of the checkout and first discharge run are indicated by the table.

Each of the 10 cells measured 1.27 V when discharge began. In all cases, discharge was continued until each cell dropped to 0.5 V. A typical voltage-versus-discharge time curve is shown by the accompanying graph. Total time

*Assistant Technical Editor, *QST*



A typical voltage versus discharge time curve for NiCad cells. Load resistance is 0.9121 ohms.



W6RTK's NiCad discharge unit. A surplus military test instrument meter is mounted on the front panel. Rotary switch S1, near the bottom center, selects the cell under test and discharge. Toggle switch S2 at the left of the panel selects either the measure or discharge function.

required to discharge 10 cells is 3 hours, 48 minutes including time required to change cells. During discharge, no appreciable temperature change was observed in the cells or in the discharge resistor.

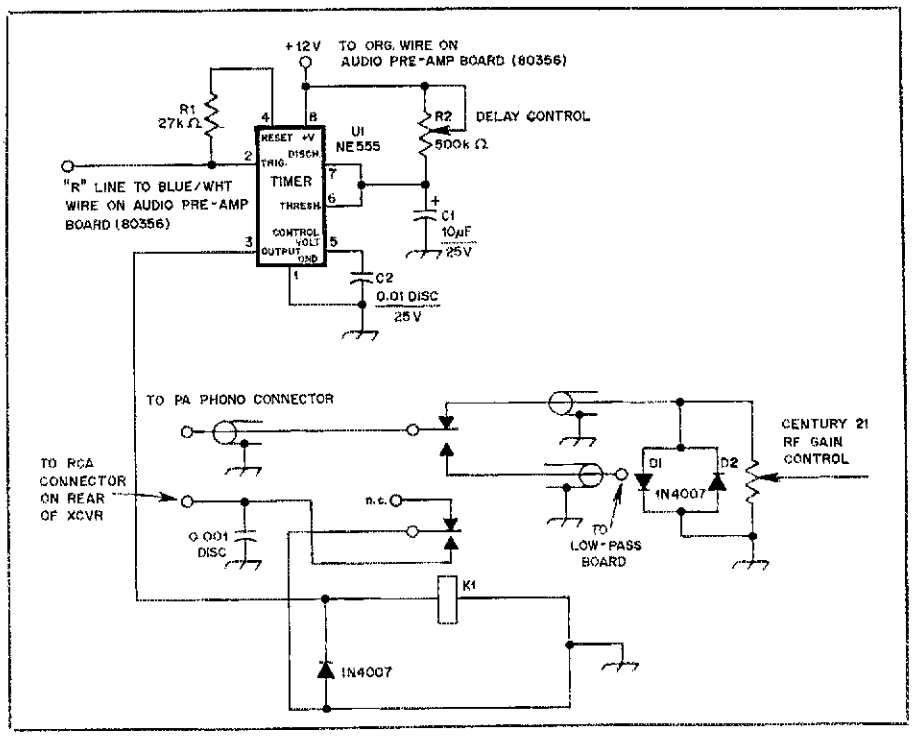
Wilson specifications state that battery drain during transmission is 900 mA. The Wilson charger delivers 60 mA and is said to fully charge the battery in six to 10 hours. My unit, operated during a bicycle race for five hours, provided almost continuous transmitting. The battery performed satisfactorily.

I should add that the cell voltage, as indicated by this instrument, is 1.27 V. This is a little high for a NiCad cell. I attribute the questionable reading to a faulty 2500-Ω multiplier resistor, soon to be replaced.

Appreciation is expressed to WB6KZN for furnishing the NiCad data. Thanks go to WA6ITE for the photograph. — *Marchal H. Caldwell, Sr., W6RTK (ex-W4DFM, ex-WA6TBU, ex-JA0IJ), Sacramento, CA*

SEMI-BREAK-IN FOR THE CENTURY 21

Believe me, full break-in and the electronic keyer are two great ideas for cw operation. When you want to add an amplifier to your transceiver, however, you may be faced with a problem. The difficulty is that there are many new and used amplifiers today which lack circuits for providing full break-in. I resolved this perplexing situation by settling for a modification that provides semi-break-in. I'm well pleased with this arrangement. It may be of interest to other owners of those fine Ten Tec Century 21 transceivers.



K8GZQ's semi-break-in circuit for the Century 21 when used with a linear amplifier. Coaxial leads are RG-174/U.
C1 — 10-μF, 25-V electrolytic.
C2 — 0.01-μF, 25-V disc.
C3 — 0.01 disc.
D1-D3, incl. — 1N4007 diodes.
K1 — Dpdt relay, 12 V, Radio Shack no. 275-206.
R1 — 2.7-kΩ, 1/4 watt.
R2 — 500-kΩ potentiometer.
U1 — NE555 timer.

My modification involves the use of an NE555 timer, a relay and a few other parts which I mounted on a piece of perforated board. The board is secured to the underside of the Century 21 by means of small L brackets. An area near the low-pass filter section at the rear of the transceiver is suited for this purpose.

The first step is to remove the top and bottom of the transceiver. Use care to avoid breaking the speaker leads. Locate the coaxial lead connected to the rf gain control. Unsolder it from printed-circuit board no. 80360, rerouting the lead to the underside of the radio: This is the receive line. Install two 1N4007 diodes back-to-back across the rf gain potentiometer (see the accompanying drawing). These diodes provide protection against backwave and high-level signals.

Next, locate the small coaxial cable wired to the amplifier. Remove the connector from the cable and reroute the line to the underside of the chassis. This cable is to be connected to the wiper of the relay on the NE555 board. Attach a phono connector to the end of a 1-foot (305-mm) length of RG-174/U cable. Route this cable, the transmit line, under the chassis. It is to be plugged into the power amplifier. Assemble the components on the perforated board and install the board as instructed above. The work should take about an hour.

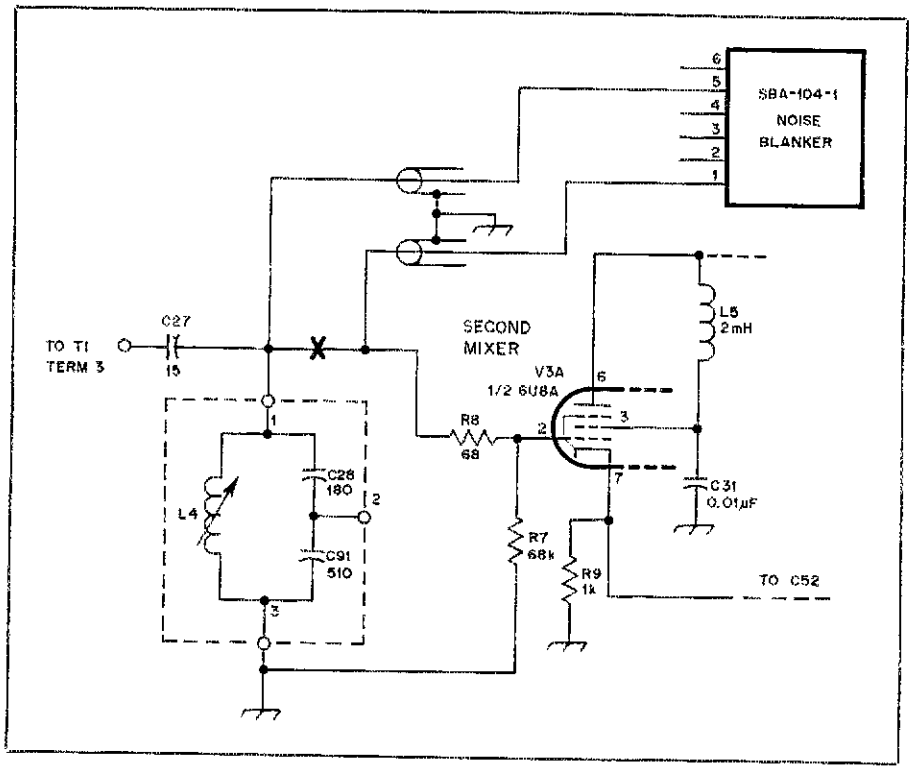
The 555 IC operates as a monostable multivibrator. Operating voltage (+12 V) is obtained via the orange wire on the Century 21 audio preamplifier board (no. 80356). The R line is also obtained from this board. In the receive mode, this line is high (+12 V), going low in the transmit mode. This condition is required to start the NE555 which, I should mention, is capable of operating a 12-V relay with up to a 200-mA current draw. A 1N4007 diode is placed across the relay field coil (note polarity) to prevent field-collapse transient voltages from affecting the 555. Such transients could cause lockup. A 2.7-kΩ resistor from pin 2 of the 555 to pin 4 keeps the 555 constantly resetting. If this resistor is not included, the 555 will restart, causing the relay to trip during long transmissions of dits and dahs. Manufacturer's specification sheets provide detailed information on the 555. — *Charles Darrow, K8GZQ, Olmstead, OH*

ADAPTING THE HEATH NOISE BLANKER TO OLDER 75S-SERIES RECEIVERS

A recent article described the adaptation of the Heath SBA-104-1 noise blanker to the Collins 75S-3C receiver.[1] While this particular arrangement would work for that series of receivers, the earlier 75S-3 (no suffix) and 75S-1 models are mechanically arranged differently beneath the chassis; an alternative mounting procedure must be used if the noise-blanker feature is desired.

The most readily available place for the blanker board has one item, the fuse holder, denying access to that area. The obvious

[1] Lask, "A Noise Blanker for the Collins S/Line," *QST*, February 1979.



The Heath SBA-104-1 noise blanker may be used with the older Collins 75S-series receivers by connecting the blanker to the second mixer as shown in this diagram.

solution is to move the fuse holder. The rear lip of the chassis provides sufficient room in the vicinity adjacent to the rf amplifier tube socket to permit relocation of the fuse holder. Two holes may then be drilled in the vacated area to provide clearance for mounting bolts which secure the blanker board to the chassis. Metal spacers are used to allow the foil side of the board to clear the chassis. The board is positioned so that the connecting pins face the rear chassis lip. An insulated spacer may be placed at that end of the blanker and affixed by means of epoxy. By locating the spacer properly, support from one of the terminal strip lugs beneath the board may be used to keep the unit level. Coaxial cable runs to the second mixer are made with RG-174/U.

Since the area surrounding the audio output tube, V10, is crowded, it is suggested that the Zener diode and the associated filter capacitor be mounted directly on the blanker board. There is sufficient room on the left-hand component side of the board (in the proximity of the serial number) to do so.

The wiring is basically similar except that the older receivers do not have some of the additional components found in the newer models. R8 (68 Ω) is lifted from the junction of C27 (15 pF) and L4, pin 1. The blanker is then wired between L4, pin 1, and R8. Reference to the original article will aid in installation. — *Paul Pagel, N1FB, Assistant Technical Editor,* QST

BETTER SELECTIVITY FOR THE SX-117

The crowded conditions on the phone bands may make some owners of Hallicrafters SX-117 receivers wish for a narrower passband than offered by the 2.5-kHz position. This can be accomplished very easily if sacrificing the 5-kHz passband for a-m reception is not important. If the modification is made, the 2.5-kHz band-pass position would then be used for a-m reception with some loss of reception quality. The 5-kHz band-pass position can be modified to a passband of one's choice by simply connecting two capacitors and two resistors in parallel with existing components.

After removing the receiver from the cabinet, note the areas referred to in the accompanying drawing. Then proceed to make these changes:

1) Bridge C110 (4700 pF) with a 0.033-μF, 400-V capacitor. Observe the foil polarity if tubular capacitors are used. C110 is a tubular capacitor located on the front of the selectivity switch S4A.

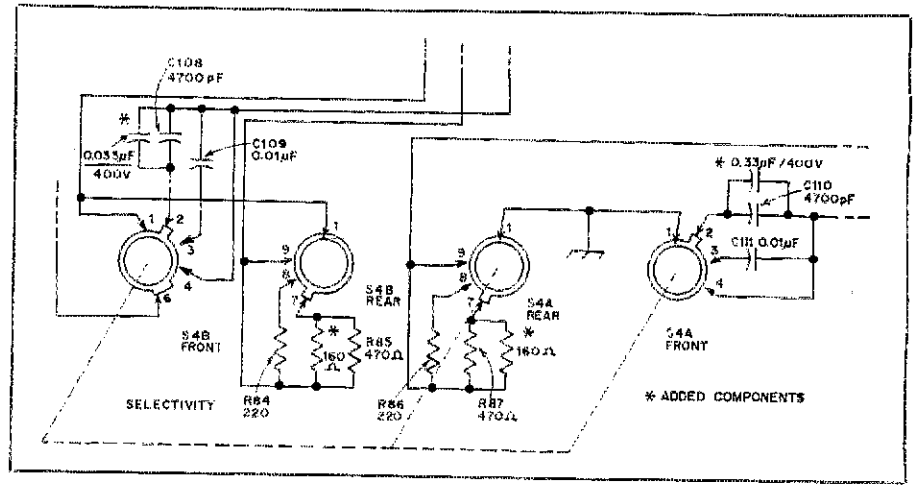
2) R87 (470 ohms) is bridged with a 160-ohm, 1/2-watt resistor. This resistor is located on the rear of S4A.

3) Install a 160-ohm, 1/2-watt resistor across R85 (470 ohms) located on the rear of S4B.

4) C108 (4700 pF) is bridged with a 0.033-μF, 400-V capacitor. C108, a tubular capacitor, is located on the front of S4B.

These values will give a passband of approximately 1.5 kHz. The selectivity can be changed by using different values of capacitors with the 160-ohm resistors in parallel with R85 and R87. I tried values of 0.05 μF, which gave a very narrow passband, up to 0.02 μF which was just a little sharper than the existing 2.5-kHz position.

Be sure the receiver is disconnected from the ac line before proceeding with the modification. Removal of the four new components is all that is necessary to restore the original selectivity. — *Paul R. Queer, W3YT, Irwin, PA*



W3YT reports improved sideband reception on the Hallicrafters SX-117 receiver with the addition of two capacitors and two resistors. The modification provides a 5-kHz passband with S4 in position 1, a 2.5-kHz passband for position 2 and a 0.5-kHz passband for position 3. See text.

KINKS

☐ Having recently become a father, I'm somewhat amazed at the variety of baby items that are useful around my radio station. For instance, small parts bags are easily made from Playtex Nurser bottle bags (approximately 3 × 6 inches or 76 × 152 mm) available at most discount stores. A box of 100 costs around $2. In addition, there is a disposable towelette sold in a handy plastic box (4 × 5 × 5 inches or 102 × 127 × 127 mm). This container can be used for sorting small parts or for storing project items. — *John S. Jolly, WA7NWL, Phoenix, AZ*

☐ HW-202 users having difficulty keeping the metalized stick-on numbers on the push buttons of the respective channel selectors should try the self-stick file-folder labels available at stationery stores. Typing one number *black* and the other number *red* would follow the present push-button labeling scheme.

Also, the self-stick file-folder labels can be cut into strips, circles or triangles for use on pc boards as "resist" for patterns. The small circles cut from these labels with a hole punch for use as resist make fine pads on pc boards. — *James B. Christmas, WA4SIH/KL7, Ft. Richardson, AK*

☐ As an alternative to W5FR's suggestion for curing an inactive S meter on an SB-101 (April 1978 *QST*), I prefer to use 91-percent isopropyl alcohol to clean the relay. I use a cotton swab to apply the alcohol to the base and contacts of the relay. A four-ounce bottle of the alcohol is available at many drugstores. This grade of isopropyl alcohol is preferred for cleaning magnetic heads on tape transports and disc drives in computers. Do not use the common 70-percent rubbing alcohol which will leave a troublesome residue. I've found that the problem described by W5FR is also responsible for a malfunction of the alc when the SB-101 is in the transmit mode. — *Harlan Bercovici, WØMYN, Littleton, CO*

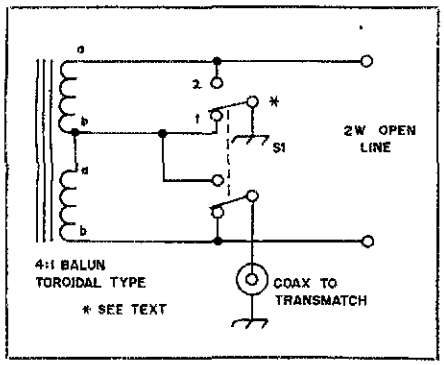
☐ When a transmitting capacitor arcs over, a small spot is often left which makes the capacitor susceptible to further arcing. This spot is easily removed with an ignition file, a useful tool in any radio amateur's tool box. — *Mike Marmer, KB8GH, Dayton, OH*

☐ To avoid solder bridges to adjacent turns on coils being equipped with taps, I thread a small piece of aluminum foil into the coil on one side of the tapped turn and back out through the other side. The solder does not adhere to the aluminum, which is removed easily after installing the tap. — *Leland S. Lovell, W8JXI, Newaygo, MI*

☐ I remember reading a Hint and Kink some two years ago about preventing coaxial-cable braid from fraying by wrapping it with small-gauge bus wire. I've successfully used burglar alarm window foil instead of the wire. It works especially well with RG-8/U. — *Robert Doane, K1EMU, Newtonville, MA*

SWITCHING ARRANGEMENT FOR BALANCED OPEN-WIRE-FED ANTENNAS — 10 TO 160 METERS

A switching arrangement can be added to the standard 4:1 toroidal balun that will allow almost any balanced open-wire-fed antenna to work from 10 to 160 meters in conjunction with a Transmatch. See the accompanying diagram. S1 is a dpdt ceramic wafer switch. Position 1 of the switch provides the normal 4:1 balun configuration. For 160-meter operation, the switch is placed in position 2. In this position, one half of the antenna performs as an inverted L with the other half as a grounded counterpoise. — *Richard B. Stevens, W1QWJ, Ashuelot, NH*



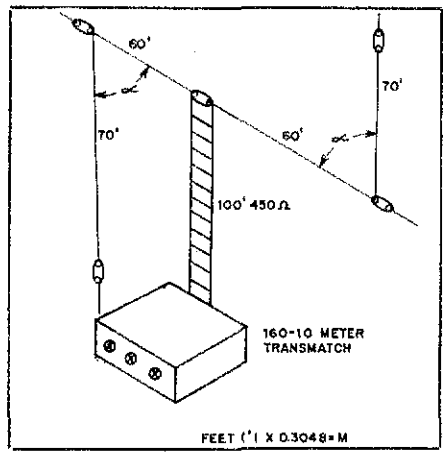
A modification for using a balun with open-wire-fed antennas from 10 through 160 meters. Information was supplied by W1QWJ.

A "Z" ANTENNA FOR THE 10-160 METER BANDS

One of my interests in ham radio is designing and constructing antennas for both general amateur use and for the Army MARS system. For the amateur who has limited space, I have designed a "Z" antenna that covers the bands from 10 through 160 meters. It is easily constructed from wire. Spreaders for the transmission line are fabricated from Lucite strips or Plexiglas rods. (Refer to the yellow pages of telephone directories for the names of dealers who handle Plexiglas or the equivalent.) For two no. 14 wires, a 2-inch (51-mm) spacing is adequate.

Although a height of 100 feet (30 meters) is indeed desirable for this antenna, hams who settle for elevations between 30 and 50 feet (9 and 15 meters) will still obtain good results. The angles α between the wire segments will depend on individual situations such as the placement of trees or other supports. Generally, the wider the angle, the better the performance.

W1NH, the New Hampshire SCM, who is really into antennas, says my design is "FB." My evaluation of the antenna is that the "aerial" is great. — *John N. MacInnes III, WB1FPD, ADN1JD, Hampton, NH*



A 10- to 160-meter horizontal Z antenna. Inexpensive no. 14 copper-clad (electric fence) wire may be used. For complete information on open-wire transmission lines, see *The ARRL Antenna Book*, any recent edition.

MORE ON SOLID-STATE CONVERSION OF BC-221/LM FREQUENCY METERS

Although I've converted several BC-221 frequency meters to solid state following the guidelines set by R. S. N. Rau's February 1977 *QST* article, I admit that finding octal plugs posed one problem. As an alternative, appropriate metal tubes were dismembered and conversion parts mounted in the tube shells.

Later, an LM-II with built-in modulation and 77, 6A7 and 78 tubes was encountered. In this case, some old 5, 6 and 7-pin tubes were broken from their bases and those bases employed to mount conversion parts. Bare, tinned hookup wire was soldered into the appropriate pins and cut off even with the top of each tube base. The JFET leads were then soldered (bug style) to the respective wires from the pins. To prevent microphonics, a small glob of clear silicone cement similar to that used for bathtub sealer, was placed between the top of the leads and the inside wall of the tube base. This prevented any "guitar effect" from the rigid wires. An alternative is to saw off the tube-base cylinder and mount the components as close as possible to the tube pins in order to avoid mechanical movement.

Anyone attempting to convert a BC-221 or an LM frequency meter for the first time will do well to convert one stage at a time, isolating any problems if and when they occur. There may be a substandard FET or one could become overheated from soldering. Start with the audio stage first: It's the easiest!

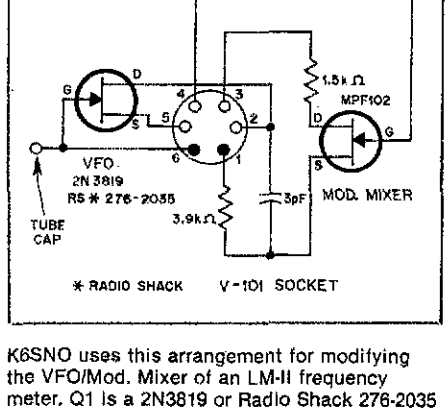
Next, isolate the B+ from the stage. Temporarily connect the 9-V battery in its place. There should be almost as much audio from the solid-state stage as there was from the tube stage. Following this, modify the crystal oscillator and converter stages.

Once the VFO has been converted, check the calibration points. If some are too weak or missing, put a potentiometer in place of R2 and R3 and adjust for best output. (See Fig. 2 in Rau's article.) Install appropriate fixed-value resistors in place of the potentiometer. Keep in mind that not all FETs respond alike.

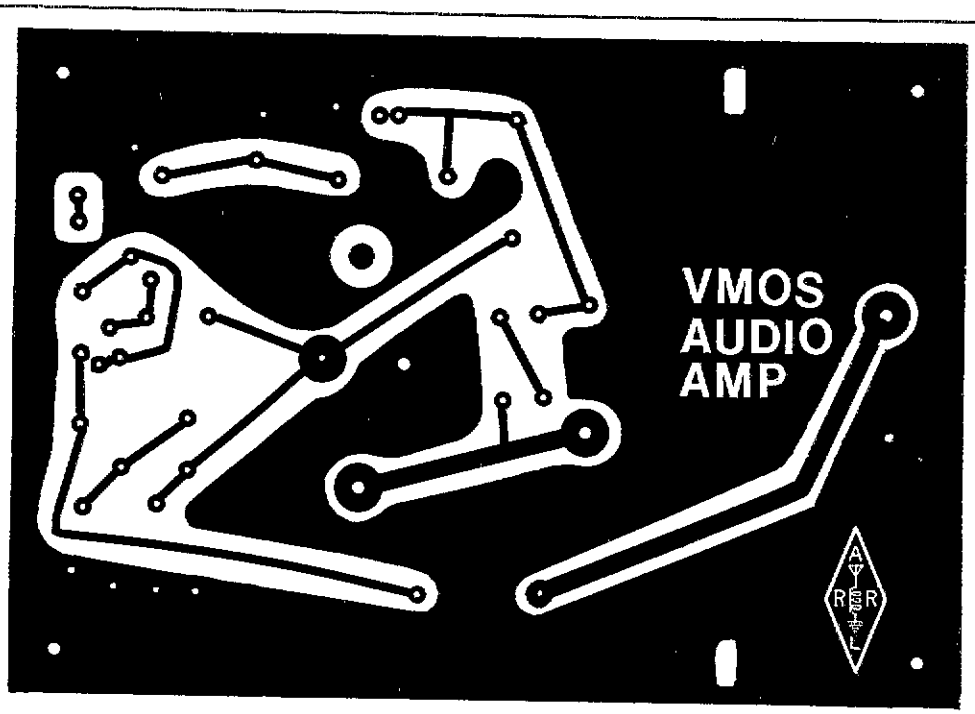
No method could be found for direct-coupling the modulator to the VFO stage. The tube version used suppressor-grid modulation. Therefore, I added a mixer or converter stage, using light coupling from the source lead of the mixer to the drain of the VFO JFET. If source-to-source coupling is used, the VFO stage is detuned to the extent that the corrector capacitor will not bring it back into calibration. With drain modulation, the error is small and easily corrected. The circuit for this state is shown in the accompanying illustration.

Disconnect the lead to pin 6 of V101. Pin 1 remains as is to provide the source return to ground. R105 in the mixer gate load should be shorted out. R114 provides proper loading for the gate return since it holds the modulation level to about 80 percent.

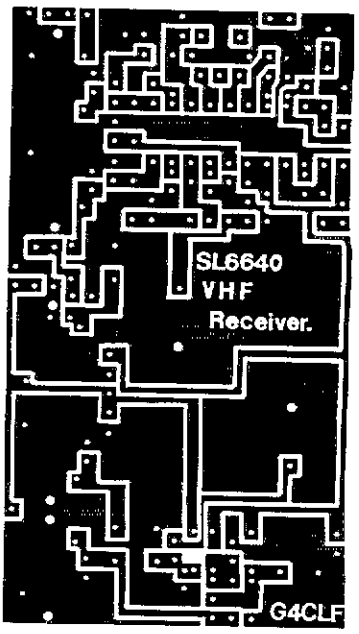
R115, in series with audio choke L104, should be shorted out and R103, the high-voltage regulator resistor also should be shorted when converting to the 9-V supply. This particular LM drew only 1.7 mA with all stages functioning. The rf output, however, was only about 25 percent of that normally produced by BC-221s. Still, that's an adequate signal for alignment work. The small physical size of the LM and the modulation feature provides advantages over the BC-221 instrument. — *Floyd K. Peck, K6SNO, Hemet, CA*



K6SNO uses this arrangement for modifying the VFO/Mod. Mixer of an LM-II frequency meter. Q1 is a 2N3819 or Radio Shack 276-2035 JFET while Q2 is a Motorola MPF102 JFET. Connections are shown in relation to the V101 socket.



(A)



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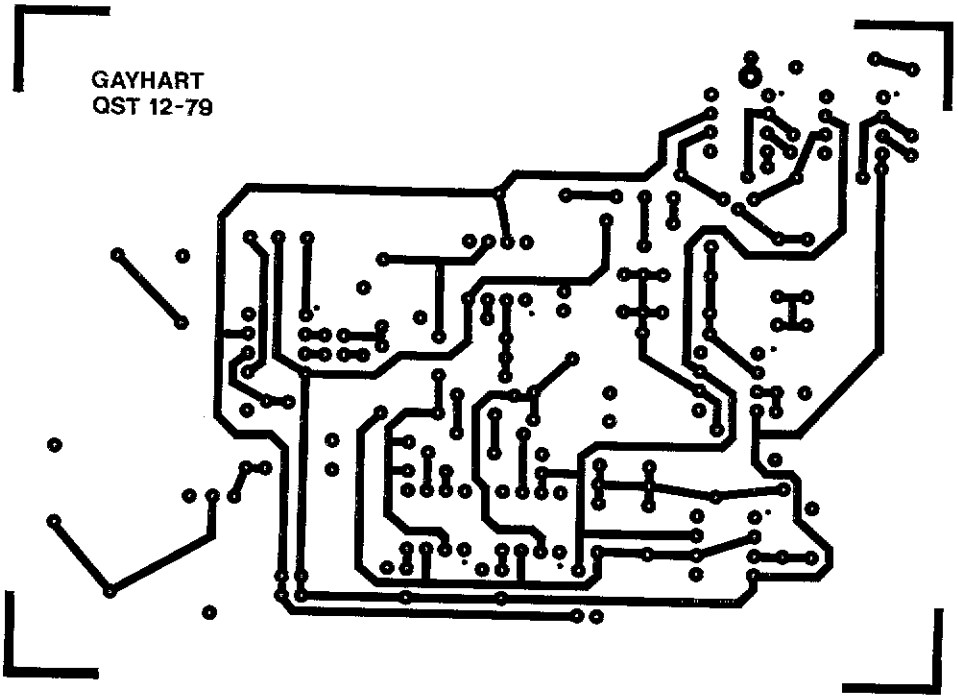
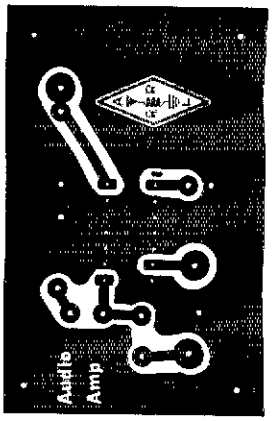


(C)



(D)

Circuit-board etching patterns for projects in this issue of *QST*. Patterns are shown at actual size from the etched side of the board. Black represents copper. The boards represented at A and B require copper on both sides. The unetched side is a ground plane, having only clearance holes for component leads. The boards represented at C and D have copper on one side only. The pattern at A is for the VMOS Audio Amplifier (see Fig. 3, p. 23), and the pattern at B is for the single-channel vhf receiver (see Fig. 3, p. 26). At C is the pattern for the receiver TU board (Fig. 5, p. 34, and at D for the WAØUZO audio amplifier board described elsewhere in the "Hints and Kinks" section.

AMSAT-OSCAR Phase III on the Horizon

Part 1: It's not too early to prepare for the first amateur satellite to provide worldwide communications.

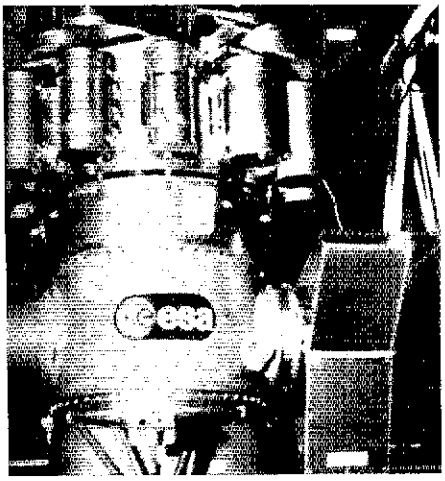
By Steve Place,* WB1EYI

Brace yourself! We've got a new DX band that's predictable to a very high degree of accuracy. It will be open to all parts of the world *on schedule*. The vagaries of propagation that have plagued us for so long (usually just as we've comfortably settled into our contest easy chairs or are halfway through that urgent message) will have a minimal effect on this band. It will be just about as reliable as anything we presently have. Some sort of "WARCian" magic? No. In fact it isn't a new allocation at all! As you've probably guessed, we're talking about the soon-to-be-launched AMSAT-OSCAR Phase III-A, the first in a series of long-lived, high-altitude Amateur Radio satellites.

What is Phase III? What will it mean to the average ham — if there is such an animal? Better yet, what will it provide for the ragchewer? The serious experimenter? The public-service minded traffic handler? The DXer? The contester? The RTTY, SSTV, nbvm or computer buff? The science teacher or nonham student with an eye toward getting a ticket? The Tech or General who needs that little extra help in coaxing his code speed up above 13 or 20 wpm? For that matter, what will Phase III mean to *you*, regardless of where your on-the-air interests lie? Let's get acquainted with the newest member of our satellite family.

Evolution

Two decades ago, imaginations fired by the launch of Sputnik 1 and challenged in an article in *CQ* magazine (April 1959, page 84) by Don Stoner, W6TNS, a handful of radio amateurs in California banded together to explore the potential of orbiting communications hardware in the Amateur Service. Drawing on their resourcefulness and ingenuity rather than on a high-powered heavily funded engineering effort, the men in Project OSCAR led the way in providing us with our first series of low-orbit, short-lived, Phase I spacecraft.



AMSAT-OSCAR Phase III-A engineering test unit (ETU) shown mounted on the side of the ESA CAT (Application Technology Capsule) during the preliminary interfacing tests run in Toulouse, France, earlier this year. Above Phase III is the Firewheel, the primary payload. Its cannisters contain lithium, barium, explosives and other compounds that when exploded will provide a visible, "glowing," steam-like cloud enabling scientists to study the earth's magnetic field patterning. Phase III will be separated from the CAT and be clear of the experiments long before the fireworks begin. (*AMSAT-DL photo*)

Then a little over one decade ago, the baton was passed to a like-minded group of hams in the Washington DC-Maryland area. In the years since, AMSAT, incorporating longevity-extending solar panels, rechargeable NiCad batteries and protective measures (system telemetry and earth-based telecommand capability), has produced a series of long-lived, low-orbit, Phase II spacecraft. From the beginning, however, dreams of convenient, globe-spanning communication over our amateur allocations at vhf and higher have lingered. The lessons learned at each step along the way, the steady advance of technology and a tremendous spirit of international cooperation have now brought us to the point where yesterday's dream is soon to become today's reality.

The Mission[1]

In the early summer of 1980, a European Space Agency Ariane mission will lift off from a site at Kourou, French Guiana, 5.5° below the equator, on the northern coast of South America. Phase III (to be called AMSAT-OSCAR 9 after successfully achieving orbit) will be just below the primary payload, Firewheel. Attached to the side of the launch vehicle, the new amateur satellite will be a hitchhiker, much as its predecessors have been aboard USAF and NASA missions in years gone by. The product of years of hard work by volunteer radio amateurs in the Federal Republic of Germany and the United States, with significant contributions by others in Japan, Canada and Hungary, Phase III will be carried to a preliminary orbit dictated by the needs of the primary mission — when hitchhiking, you can't expect to be taken directly to your doorstep.

This initial, or "transfer" orbit, is poorly suited to our needs. The angle of inclination[2] (angle at which the satellite's ground track crosses the equator and, consequently, the highest *latitude*

*Associate Manager, Club and Training Department

[1]Notes appear on page 64.

reached) will only be about 17.5°, apogee will occur at 3.2°N latitude and perigee will fall a mere 200 km above the surface of the earth. Simply put, left in this orbit, Phase III would not provide desirable communication coverage for the majority of radio amateurs around the world, and would soon go the fiery way of Skylab; with the atmospheric drag at 200 km the orbit would quickly decay.

All will not be lost, however, as Phase III has a few tricks up its attach fitting! For the first time in the Amateur Radio satellite program, one of our spacecraft will carry both an onboard computer and an onboard "kick motor." Within three or four weeks of launch and separation, the computer, "reading" several tiny specialized sensors, will determine exactly when Phase III is properly oriented with respect to the sun, the earth and the orbital track. At precisely the right instant, the spherical kick motor (about the size of a 10-pin bowling ball) will fire. This irreversible, one-shot firing (expulsion of propellant through a fixed nozzle) near apogee will last about 20 seconds: no second chances.

With a successful firing, the angle of inclination will be raised to 57° and perigee "lifted" to a much more secure 1500 km. During each orbit, Phase III's groundtrack will trace a path between 57° N latitude and 57° S latitude, crossing the equator at a 57° angle (measured ccw from east = 0°). Apogee, the point in this elliptical orbit where the spacecraft is farthest from earth, will be 34,385 km in altitude, occurring at 24.8° N latitude.

Note that the highest latitude reached and the point where the spacecraft is farthest from earth do not coincide. In fact, apogee will occur at a slightly different latitude each orbit, shifting a little over 0.05° per day. In about two and one-third years, when it does occur over 57° N latitude — the highest possible latitude in this orbit — the trend will reverse and apogee will shift to the south at the same rate. Some four to five years after launch we can expect apogee to occur over the equator. The daily shift will pose little problem in itself, and only the cumulative effect will prove significant. Every two months, adjustments to the shape of the groundtrack will have to be made on tracking devices and plotters.

Sound complicated? At first, yes, because we're most familiar with the simple case of low, circular orbits. Take heart, though; you won't really need a tracking device for routine operation. If the satellite is within range, you'll hear it with a good 2-meter receiver. Simply move your antennas to peak the signals. Plotters, however helpful in planning your activity in advance (meeting skeds, working into particular geographical regions, or "milking" every last drop of access time from horizon to horizon), won't be needed for casual operation.

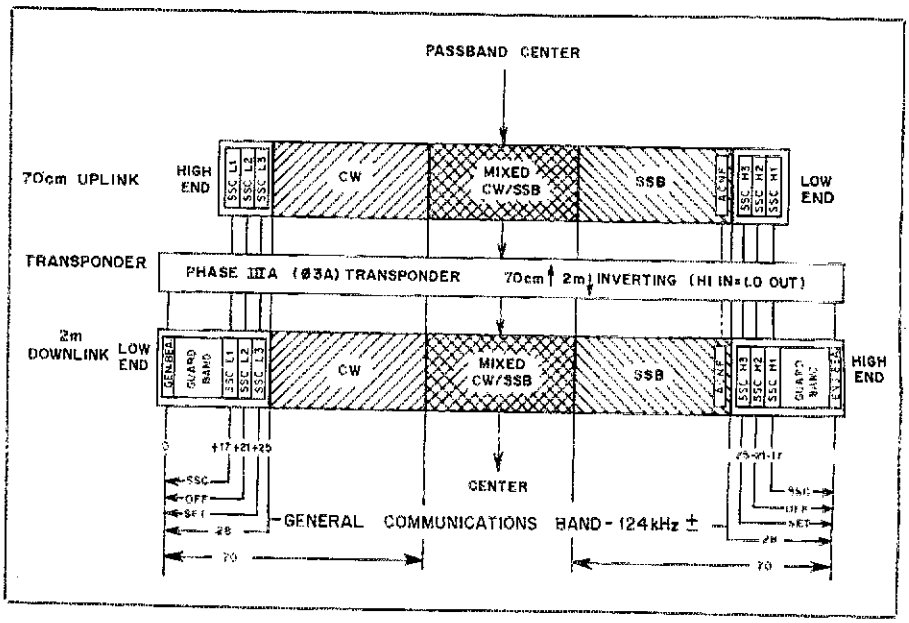


Fig. 1 — AMSAT-OSCAR Phase III-A Bandplan: ACNF = AMSAT Coordination and Network Frequency; SSC = Special Service Channel: Beacons: General (GB) = 145.810 MHz; Engineering (EB) = 145.990 MHz; Mixed cw/ssb subband tentatively 40 kHz wide. Lower edge = f_{GB} + 70 kHz, upper edge = f_{EB} − 70 kHz. All frequencies subject to final calibration. (Thanks to WA2LQQ for his assistance.)

One final note: During the transfer orbit, AMSAT personnel will be taking precision ranging measurements to determine the orbital parameters as accurately as possible for the critical kick motor calculations. Although explanatory voice bulletins will be found near apogee on certain orbits, the satellite will not be available for general use until a short time after firing.

Access Time and Range

As we have learned from using previous OSCARs, greater altitude means greater communication range and access time during each orbit. OSCAR 8, for example, orbits at an altitude of 901 km and takes about 103 minutes to complete each of its nearly 14 orbits per day. A typical ground station has access for up to 17 minutes per orbit, during a couple of orbits in the morning and a couple in the evening. Phase III, on the other hand, in its journey out to 34,385 km and back, will take about 10-1/2 hours per orbit, making merely 2.3 orbits a day. You won't be limited to an all-too-quick maximum of 17 minutes, however, but will have up to 9-1/2 hours of continuous access! No longer will your family have to keep dinner warming on a back burner while you work an ill-timed OSCAR pass — you can plan all the operating you want around dinner and a late-night snack!

Unlike earlier OSCARs that orbited at constant, low altitudes, Phase III's altitude is constantly changing. So, too, is its communication range. Maximum communication range, the greatest possible distance between two stations that are simultaneously line-of-sight to the satellite, will extend far beyond the 6500-km range of OSCAR 8. At perigee, well into the Southern Hemisphere, the range will approximate that of OSCAR 7, but at apogee, nearly the entire hemisphere below the spacecraft will share access. No longer will East Coast hams have a lock on the Europeans via satellite. In fact, during some orbits, W3GEY in Maryland may find his conversation with DJ4ZC in Marburg and G3IOR in the U.K. interrupted by W6SP in Southern California . . . *and* 5Z4TV in Nairobi, KL7HDS in Anchorage, OA8V in Lima, YV5ZZ in Caracas and even a UJ8 in a remote corner of Tadzhik. At one time or another, every few orbits, we in North America will be able to work just about every location on earth, with stations at very high latitudes somewhat more restricted than those at lower latitudes.

Passband and Bandplan

To eavesdrop on the DX, you must know where to listen. Phase III will carry a single Mode B transponder similar to the one flown on OSCAR 7. Unlike OSCAR 7, though, the passband will be 150 kHz wide (see Fig. 1). The uplink passband (the range of frequencies you transmit and the satellite receives) will be centered around 435.22 MHz (the final, precise, center frequency may differ slightly) which falls within our satellite allocation. The 432-MHz uplink for OSCAR 7 did not fall within this allocation and was used only under special authorization. The downlink passband (the range of frequencies the satellite transmits and you

Jan King, W3GEY, Phase III project manager and AMSAT vice president for engineering, and Dick Daniels, W4PUJ, builder of all the Mode A transponders to date and very active in the construction of other subsystems and in the satellite-systems integration phase, inspect the newly arrived Phase III-A flight structure. It, with the structure for Phase III-B, was constructed of sheet aluminum by a highly skilled metalsmith, and then irridited with a noncorrosive dye, sealing the surface. Before final assembly the structure will be painted a flat black for thermal control and cleanliness.

Jan is employed as an engineer by NASA at the Goddard Space Flight Center in Maryland and Dick as budget analyst at NASA headquarters in Washington. Both have volunteered enormous amounts of their time in each of the OSCAR projects since AMSAT was formed. (*AMSAT photo*)

receive) will be centered around 145.9 MHz. As with the original Mode B transponder, the passbands are inverted. Upper sideband on the uplink will become lower sideband on the downlink; signals at the high end of the uplink passband will be found on the low end of the downlink passband and vice versa. For example, a usb transmission at the low end of the uplink passband, say at 435.170 MHz, will be received as a lsb signal at about 145.950, near the top of the downlink passband. Again, a caution: These are preliminary figures. Only when the final version of the Phase III-A spacecraft is integrated and calibrated will we have the actual figures. Even with these, however, direct linear translation between the up- and downlink passbands won't be accurate, as such phenomena as Doppler shift will introduce a little error. Realistically, you should take these figures as estimates that will place you within a few kHz of your signal in the downlink.

To date, all of the planning, coordination and scheduling has focused on the downlink passband. The Phase III bandplan specifies where you should listen to find the type of activity you want. Bulletin stations and all other users transmitting through the transponder will adjust their transmit VFOs to maintain a stable, constant downlink frequency. Incidentally, since Doppler shift within a few hours either side of apogee will be negligible, you'll need to make adjustments very infrequently.

As mentioned earlier, the entire user passband is 150 kHz wide, delimited by a passband filter with extremely sharp cutoff and very steep skirts. About 15 kHz beyond the edges are two beacons: the General Beacon (GB) at 145.81 MHz and the Engineering Beacon (EB) at 145.99 MHz. We'll use these beacons as references in specifying various activity regions.

General Communications Passband

Where do you go when your fist is itching for a cw ragchew or you want to try out the new RTTY board in your computer? Head for the 124 kHz of the General Communications Band. Beginning 28 kHz up from the General Beacon and extending up for 40 kHz is a portion of the passband set aside for cw work only. It will be available for any legal use of cw. Similarly, 28 kHz down from the Engineering Beacon begins a 40-kHz segment dedicated to the exclusive use of ssb. By amateur satellite convention and tradition, hams have transmitted on usb and received their downlink as lsb. You will, of course, find the inevitable "wounded duck" squawking away on the wrong sideband wondering why no one answers his call — I suspect we've all had the switch in the wrong position at one time or another. For the best results, though, stick with the gang and transmit usb.

In the remaining 40 kHz or so, in the very center of the passband, 70 kHz in from both the GB and EB, is an area set aside for mixed ssb/cw. If past history is any indication, you'll find a lot of fast and furious action in this region. Some AMSAT philosophers have explained this using the "Central Limit Theorem," while others have attributed it to a latent fear of falling off the edge of the earth. Whatever the reasons, you shouldn't forget that you have a full 124 kHz at your disposal.

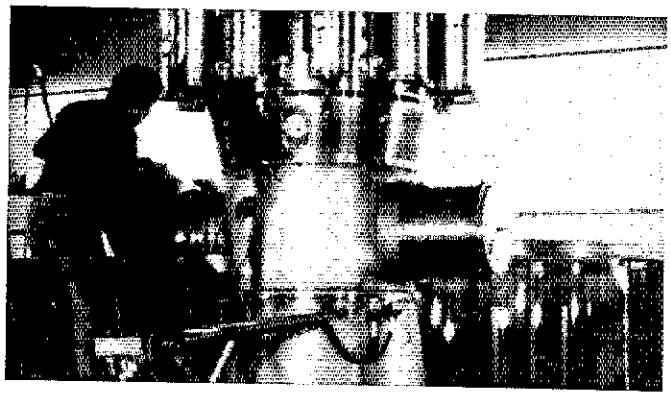
If you're looking for others who share your interest in RTTY, they'll be found at the seam between the cw and mixed ssb/cw segments, about 70 kHz up from the GB. And when no one answers your CQ SSTV call on 14.230 MHz, you'll probably find them all clustered around the seam between the ssb and mixed ssb/cw segments, about 70 kHz down from the EB. As with the Phase II OSCARs, fm and a-m transmissions will not be allowed. Constant-carrier modes are not power efficient and place an undue strain on the spacecraft's power budget, threatening the satellite's functional longevity.

Special Service Channels

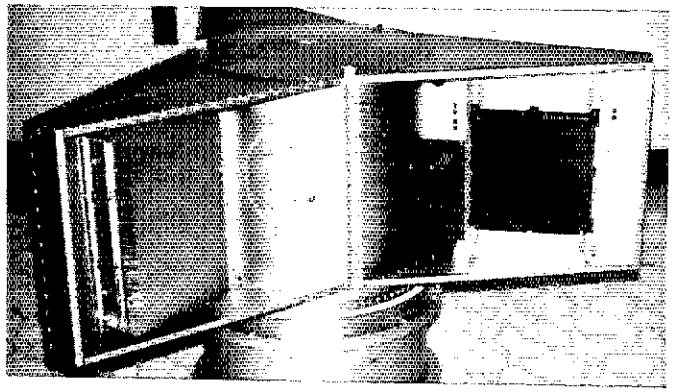
Recognizing the tremendous potential of Phase III in providing a variety of valuable, innovative services, AMSAT's Phase III Operations Planning Committee set aside six 4-kHz-wide "channels," three at the upper and three at the lower ends of the passband, to be dedicated to specific functions. Each of these Special Service Channels (SSC) will be governed by a set of guidelines developed by the SSC Coordinator in conjunction with future users and AMSAT officials. As the volunteers who will assist in operating each of the new channels are still organizing throughout the world, establishing channels of communication and exchanging their views, no formal calendars, schedules or guidelines have yet emerged. There is still time to share your opinion and volunteer your services. For now, then, let's take a brief look at each of the six channels to get a taste of what's in store.

At the lower edge of the passband, numbered from the outer edge in, is SSC L1, Scientific, coordinated by NIDM. This channel is reserved for serious scientific research and will be open only to those applicants whose formal proposals meet the criteria and are accepted. Next is SSC L2, AMICON (AMSAT International Computer Network), with WA2LQQ coordinating. Two-way computer links, packet radio and computer networking will take place here, using an official protocol that will be announced in the near future. Finally, SSC L3, NTS, coordinated by K1XA, will carry only formal, record, cw traffic — it will not be a net, but a clear frequency for TCC skeds and QSY from nets.

At the upper edge of the passband, numbered from the upper edge in, is SSC H1, cw/RTTY Bulletin, cw Practice, coordinated by W1EH. Here you'll find RTTY and cw bulletins from societies around the world with the latest Amateur Radio news, and scheduled cw practice. Next down is SSC H2, Education, coor-



Technicians measuring the fit of Phase III-A on the ESA Applications Technology Capsule during testing at Toulouse, France. At the time of this writing, plans are for the mount to the right to be flown vacant. *(AMSAT-DL photo)*



Phase III-A flight structure perched atop its attach fitting in the AMSAT lab. The internal units from left to right are the IHU (Integrated Housekeeping Unit — computer), half the primary battery and the battery-charge regulator. *(W4PUJ photo)*

dinated by WB1EYI. The primary purpose of this channel will be to enrich the OSCAR Education Program, with secondary goals to supplement Amateur Radio licensing classes and instruct the amateur community in new technological developments. Finally SSC H3, General Bulletin channel, coordinated by G3IOR, will provide phone bulletins from societies around the world. As with SSC H1, this will, in effect, be a one-way channel.

Should you be interested in helping with any of these channels or if you have comments and suggestions to offer the various planning committees, contact the appropriate coordinators now through AMSAT, P. O. Box 27, Washington, DC 20044. Your input is needed and there is still time to be heard.

General Beacon and AMSAT Frequency

Finally, we come upon two sources of invaluable information if you're new to the satellite. The General Beacon, located at 145.810 MHz, will be a good place to listen at the beginning of any operating session. On it will be basic orbital data, telemetry data, and a "bulletin board" or satellite directory of activity and events sent in both cw and RTTY, with a week's orbits listed in RTTY. All of this information will be stored in the onboard computer's memory and transmitted every hour!

Each hour will be formatted the same (see Table 1 for a suggested format) so you will know exactly when to listen to pick up the information you need. Code speed will be at 15 wpm, though you can steal a trick from OSCAR Ed student listeners and tape the 15-wpm transmission at 7-1/2 ips, playing it back at half speed, 3-3/4 ips, or 7-1/2 wpm. Telemetry will normally consist of the 20 most interesting and useful channels chosen from a possible 64, and will relay data on a variety of voltages, currents, temperatures, powers and even the spin rate. Unlike earlier OSCARs, though, the computer will calculate actual values from the sensor readings and transmit processed data, not meaningless, seemingly arbitrary numbers. Each channel will be sent in a five-character format, the first two digits being the decimal channel number, followed by the three-digit value.

The second source of information is the AMSAT Coordination and Network frequency, located at the upper end of the ssb segment. It is here that you'll find the AMSAT nets with the latest-breaking satellite news and answers to your satellite questions. It's a sort of poetic justice that after 20 years of truly amazing progress and countless thousands upon thousands of volunteer manhours, the Amateur Satellite Program now has a spacecraft with broad enough coverage to easily share information and coordinate plans for such future satellites as UOSAT, Phase III-B . . . but more on these later.

Much is left to tell in the AMSAT-OSCAR Phase III-A story. What types of equipment will you need? At what power levels? What special techniques will ensure the most successful operation? How can you construct your own tracking device? These and other topics will be addressed in future articles in this series. QST

Table 1

Suggested General Bulletin Time Formatting

Time	Interval	Duration (Minutes)	Content
TØ	Ø-1	1	Cw i-d preamble
T1	1-3	2	Basic orbital data
T2	3-6	3	Cw telemetry data
T3	6-21	15	Cw bulletin board
T4	21-26.5	5.5	RTTY rescan of above
T5	26.5-30	3.5	Cw telemetry
T6	30-31	1	Cw i-d and preamble
T7	31-33	2	Basic orbital data
T8	33-36	3	Cw telemetry data
T9	36-51	15	Cw bulletin board
T10	51-56	5	RTTY week's orbits
T11	56-60	4	Fill to the hour with cw telemetry

Notes

[1]Exact date and time of launch to be announced; check *QST*, *AMSAT News*, W1AW bulletins and AMSAT Net for latest information.

[2]Values of orbital parameters stated in this article were the latest projected figures from AMSAT officials (K1HTV and W3PK) at the time of this writing. precise values will not be known until after the launch sequence is completed.

Strays

***QST* congratulates . . .**

Dr. William J. Hamm, W5FMG, who is attempting to develop an extremely short-pulsed laser that would help to determine radiation damage to the eye retina, and thus better understand the formation of cataracts. Last year Dr. Hamm was one of eight distinguished American educators named an associate in a new National Institutes of Health program for on site study and research at Bethesda, MD. — *San Antonio Radio Club Bulletin*

RADIO-FREQUENCY THERAPY

Although researchers have known since the 1930s that cancer cells succumb to heat more quickly than normal cells do, the problem of how to best administer heat to tumors in patients has yet to be solved. Dr. Pierre Greeff of St. Joseph's Hospital in Houston is experimenting with radio frequencies to heat and kill tumors in patients. Radio-frequency therapy works much like cooking in a microwave oven. Radio waves passing between electrodes placed on a patient's skin produce heat along their lines of travel, ideally creating enough heat to kill cancer cells but not enough to damage normal cells. — *Rick Palm, K1CE*

Long-Range Planning

What will Amateur Radio be like 10 or 15 years from today? We obviously don't know the answer to that question. Certainly no one could have forecast the many changes that have taken place in Amateur Radio during its 60- to 70-year lifetime as a social institution. It has both influenced — profoundly — and been influenced by the progressing state of the radio art. Economic, educational, social and political changes have had their effects, too, and some of these have been significant.

What purpose, then, is to be served by long-range planning efforts in an activity so prone to environmental change and the unpredictable influences of an exploding technology? None at all, we would say, if it is to be an attempt to blueprint Amateur Radio's future course. Innovation and discovery are too much a part of the game, and these require the freedom to move off in uncharted directions. We surely cannot plan the inspirations that lead to them.

What we *can* do, however, is to try to learn from past successes and failures and attempt to assess the shape of the internal and external influences to which Amateur Radio may be subject in the years ahead . . . and perhaps through such an assessment take steps to preserve and improve the crucible in which our innovating and creative talents can most effectively function.

This, at least, is what ARRL's Long-Range Planning Committee will be endeavoring to do during the months ahead (see page 9, April 1979 *QST* editorial). The committee's success will depend in large measure upon the inputs received from a concerned and thoughtful membership.

Amateurs everywhere have been invited to make their views known to LRPC, and many have already done so. Some amateurs have written two and three letters, setting forth their thoughts and ideas concerning matters that they feel need to be given attention in developing plans for the years ahead. As you might suspect, these range over a wide variety of topics. In subsequent issues of *QST* we will include excerpts from some of them.

Members of the LRPC are attempting to glean ideas from other sources, too, and are engaging in discussions with knowledgeable individuals in industry, government, military and education. They're also meeting and talking with amateurs and government officials at the WARC in Geneva.

It isn't enough to know a lot about Amateur Radio or radio amateurs, for we must be increasingly concerned about governmental attitudes and the social environment within which the Amateur Radio Service functions . . . and both are changing in ways that are sure to reshape our privileges and our public-service role down the road. So LRPC is looking for perceptions that will enable us to avoid some of the pitfalls that may lie ahead, as well as to take advantage of new and hitherto unsuspected opportunities to improve the Amateur Radio Service as an educational avocation.

We're not expecting miracles from LRPC. With the best help we can give them, they can't be expected to come up with all the answers to our future . . . but certainly it should be possible to get a clearer picture of Amateur Radio's future opportunities and perhaps gain time for us all in defining action needed to capitalize on them and to head off serious problems. We think making the effort beats reacting with belated surprise, and there is no denying that we have all been guilty of that on occasion.

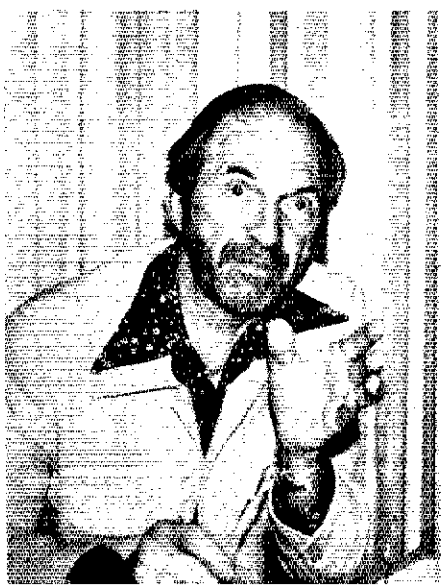
Now . . . can we persuade you to take a few minutes of your time to let LRPC have the benefits of your thoughts on the future? Here are some of the questions they will be considering; your comments on them would be appreciated:

- Should we be satisfied with the current growth rate of Amateur Radio? What *is* considered to be a satisfactory growth rate? Are the examinations too easy? Too difficult? Should the Morse code proficiency requirement be changed?
- In light of increasing RFI problems, tower legislation, concern over rf radiation hazards and other matters affecting the public, is it desirable to seek closer relationships with government leaders at various levels? If so, how best to accomplish this?
- How do radio amateurs view ARRL? Are its services adequate and is proper attention being given to the needs of the many special interest groups? What is the member's opinion of the League's publications? Its management?
- Is there a need to more fully involve the membership in League affairs? If so, how can we best do this?
- What can be done to improve on-the-air behavior? Beyond notification of FCC, what steps do you see as possible to curb the activities of individuals who engage in deliberate abuse of privileges?
- Are we satisfied with the rulemaking and enforcement performance of FCC? If not, what steps can be taken to persuade them to make improvements?
- Are we satisfied with the public image of Amateur Radio? If not, can steps be suggested for further improvement?
- Are societal, economic, political, demographic, or international changes perceived that appear likely to influence the future of Amateur Radio, and can steps be suggested to adapt to them?

What do *you* regard as the major problems facing the Amateur Radio Service in the years ahead, and can you suggest action that should be initiated *now* to prepare to meet them? What opportunities for improving the level of public service do you foresee (for example, in the technical training, particularly of younger amateurs, the fostering of international goodwill, provision of emergency communications services, and the advancement of the radio art)? Are there other areas of public service in which radio amateurs could and should be active?

Please drop a line to LRPC, in care of its chairman, Vic Clark, W4KFC, 12927 Popes Head Rd., Clifton, VA 22024, and make *your* contribution to long-range planning for Amateur Radio.

At its recent meeting in Los Angeles, LRPC members heard presentations by West Coast amateurs Robert Dyruff, W6POU, George Hatherall, K6LK, and Armond Noble, N6WR. In the photo, Bob Dyruff describes to the committee the results of a recent symposium of Southern California amateurs dealing with the future of Amateur Radio. (*W1RU photo*)



Without Warning

When an unexpected tornado devastated a small part of North Central Connecticut, area hams were on hand to lend valuable assistance.

By Bill Clede,* K1AH

The sky darkened and the rain exploded from the menancing thunderheads above. The possibility of thunderstorms had been forecast but the sudden deluge caught the Hartford, CT, area unprepared. By 3 P.M. there was flash flooding and St. Francis Hospital in Hartford was calling for a generator. Hams managed to locate one and started it on its way. The Air National Guard at Bradley International Airport keyed up the autopatch on the Pioneer Valley Repeater Association's (PVRA) Vernon machine, WR1ADJ, to contact the State Armory headquarters in Hartford. They reported that communications and electric power were down. The seven helicopters on the pad outside had been literally "rolled over" — destroyed. The MARS station nearby had been knocked out.

News broadcasts reported that the Koala Inn, near the airport had lost its roof, but the report was "unconfirmed." Windsor Civil Preparedness Director Leroy "Spunky" Coburn was called from work in nearby Hartford. He responded to what he thought was a multi-injury bus accident.

Town police were sent into the area but, as one official said, "It was like sending them into a 'black hole.' They went in, but no reports came back." Lieutenant Doris Hughes, commander of the Connecticut State Police Troop at the airport, was in Hartford at 3 P.M. She headed north, skirting blocked traffic lanes on Interstate 91, on her way back to Bradley. Lieutenant Hughes reached the area and saw extensive damage along Route 75, just east of the airport. She activated the State Police.

Shortly after 3 P.M., the Windsor Locks Fire Department radio sent an alarm for a roof collapse. One minute later the statewide Emergency Broadcast System (EBS) was activated for a severe-thunderstorm watch.

It was several hours before enough information was available to State officials in Hartford to realize the full scope of the problem — that a tornado had hit the Poquonock section of Windsor, parts of Windsor Locks and Suffield at 2:57 P.M., Wednesday, October 3, 1979. The precise time is known because that's when clocks in the area stopped. Two persons were killed, 143 hospitalized, 350 injured and some $254 million in property destroyed. A third victim died 18 days after the tornado.

Unusual Situation

Normally you'd expect some warning of approaching severe weather, but on that day there was no inkling of a "developing threat." The thunderstorm turned into a tornado right over the heads of the National Weather Service (NWS) office at Bradley. Electricity, telephone and radar all went down. NWS Boston called NWS Bradley some time later to confirm that a tornado had actually struck the area.

By using the airport's emergency-power generator, NWS Bradley was able to contact the State Civil Preparedness headquarters on the EBS remote pickup radio. That was their only input to the national warning system (NAWAS). Then the generator went down and NWS was again deaf, mute and blind.

Hams Go Into Action

Within minutes after the tornado struck, Bill Kolouch, K1DZI, started operating an emergency net on the Vernon repeater, handling autopatches for the Air National Guard and arranging for the generator for St. Francis Hospital. Northern Connecticut ARES activated its emergency net on their c.d.-coordinated 2-meter simplex frequency. Bud Collord, KA1BUE, a volunteer fireman, called for amateurs with handie talkies (HT) to report to Windsor Civil Defense (c.d.) Then his fire duties took precedence.

Navy Chief Clayton Hill, WA4VCW, listened to the Vernon repeater on his way home from the submarine base in Groton. Hearing of the disaster he headed for the Windsor area. "My military experience paid off," Hill says. "There was confusion, as you'd expect, so I checked in with the Civil Defense (c.d.) director and, under his direction, organized the amateurs on the scene.

"The State Police command post was already set up in the disaster area when we arrived. State and local police had sealed off the roads leading into the stricken area. Amateurs checked in at the Windsor c.d. office to get identification cards to allow them to pass the police checkpoints."

Hill was already at the Poquonock firehouse where Windsor c.d. Director Coburn had established his command post. Amateur stations were operating at this command post, the c.d. Emergency

*Chairman CT State Emergency Committee, FCC

What a mess! It took several weeks for area residents, along with scores of volunteers, to sift through the remains of what once was a quiet suburban community. The weekend following the sudden storm, as many as 60 volunteer amateurs were on the scene. To express his town's appreciation, Mayor Warren P. Johnson of the Town of Windsor, CT, wrote a letter that said, in part: "The key to our disaster relief effort has been the ham radio operators who have kept our communications system working. Without the assistance of hams, our whole network would break down . . ." *(photo courtesy of the Hartford Courant)*

Operating Center (EOC) at the town hall and at the c.d. field office trailer in the heart of the disaster area.

Windsor c.d. Communications Officer Norbert Hluchnik, WB1GIL, at the EOC, sent amateurs to the shelters set up in Windsor High School. Russ McClintock, WA1EMI, of Northern Connecticut ARES, set up communications at the Windsor Locks command post, the two shelters in that town, and between the disaster team chief medical officer and the

Northern Connecticut ARES hams set up this amateur station at the Windsor Command Post. From left, Vince Motto, KA1BFN, c.d. Deputy Director for Operations, John Jackson and Gordon Barnard, W1VNO. *(photos by K1KBQ)*

hospitals. Rescue operations continued throughout the night.

The Next Few Days

At first light Thursday, the State Civil Preparedness communications van moved to the Windsor Locks command post at the town's police-fire complex. State Police moved their command post to the same area. Governor Ella Grasso was on the scene.

With things pretty much under control in Windsor Locks, amateurs were released to assist in Windsor. Coburn organized damage-assessment teams to go into the area; Hill had a ham with an HT for each one. A reserve of hams with HTs was also kept at the command post. A ham was assigned to each town official, as they checked in.

Throughout the Windsor operation every official, including State Representative John Pier, was never without his own personal ham and, thereby, instant communications with the command post. Police and National Guardsmen, manning traffic control points, each had an amateur link directly to the command post. When the Salvation Army and Red Cross food vans came in, a ham went with each one. These operations continued, around the clock, for the next five days.

The control net was operated on the wide-area-coverage Vernon repeater, as it has the best coverage for HTs in the disaster zone. Local foot patrols operated on 52 simplex, with a mobile control station on a hill. I know! I've read the arguments against using 52. But that's the only simplex frequency available in most crystal-controlled HTs.

Health-and-welfare traffic was generally handled on the privately owned W1TUW repeater in Tolland. Autopatches were being run on the PVRA's Hartford repeater, K1GHJ/R. Traffic for Springfield, MA, went to the Mount Tom (WR1ABX) repeater. In all, six different frequencies were used until the situation settled down enough to allow consolidation to three primary networks.

The situation didn't stay settled for long. On Friday, just two days after the tornado, a weather front approached, with conditions much like those of the previous Wednesday. NWS activated the EBS for a severe-thunderstorm watch.

"Right then we needed immediate observations of the weather," Hill said. "Roger Jeanfaivre, K1PAI, of Wethersfield, was monitoring aviation weather reports. CARWRS, the Connecticut Amateur Radio Weather Reporting Service (October 1979 *QST*, page 58), gave us half-hourly summaries. We tracked that front all the way from Albany." By Monday night, October 8, amateur operations were secured — temporarily.

A short time later trailers, provided by the Federal Emergency Management Agency, started arriving. While the trailers had State Police escort, hams were called upon to provide communications with town officials. Fifty-two families are now living in trailers on lots that were once occupied by their homes.

Hundreds of volunteers came to help with the cleanup operations. Amateurs provided communications for them and also for town officials in the area.

Looking Back

There is no way to list all the amateurs who volunteered their services. More than 156 different hams checked in at Windsor c.d., while many more performed functions outside the affected area, providing interface links to the Connecticut Phone Net on 75 meters and to other repeaters. Monday morning quarterbacking is never fun. This was a very unusual situation; not even state officials had an accurate assessment of the situation for quite some time. Important lessons were learned.

Connecticut has a well-organized State Office of Civil Preparedness. It's the first state with an Emergency Broadcast System-Amateur Radio Service interface plan. Windsor has an active c.d. group, with a strong director. But the agency that would normally have triggered response, NWS Bradley, was knocked out of commission.

Without an accurate initial assessment, procedures for activating support services cannot be followed. By the time a responsible authority realized the scope of the disaster, he was embroiled in it. Amateurs assisting c.d. must have authorization so that the governments concerned cover them with insurance. Windsor signed in each ham as he came into town. "There needs to be something like 'Good Samaritan' law," said Ed Gebelein, W1YYY, of Harwinton. "Then people in the program can respond immediately, without waiting for someone to remember to call them."

The critique pointed out some other needs that can apply anywhere. Activation procedures are fine when you have some advance warning. But there should be some automatic authorization procedures to cover shortfuse emergencies. You can't rely on officials to think of everyone who needs to be notified.

While it is important that operators taking part in emergency communcations use formal and concise radio procedures, this discipline can be enforced by a strong net control operator. The most critical need is for a well trained and efficient net control with a separate communications manager.

In an emergency situation, the ARRL emergency coordinator (EC) must *manage* communicatons operations. He must quickly assess communications needs, design networks to meet those needs and then *supervise* their operation to provide sufficient operators for relief and replacement. The EC should maintain a supply of log sheets and message forms so that they are available on short notice. A VOX-controlled cassette recorder would be great for documenting actions taken during the disaster.

The net control must set the example, by using efficient radio procedures and insisting that others do the same. He must quickly remind anyone who offers opinion or supposition that the amateur's job is strictly communicating specific information directed by designated authorities.

The amateur community provided valuable assistance during this emergency situation. The following is an example of the plaudits passed on by area officials. "If it had not been for the Amateur Radio operators, we would have had serious communications problems," c.d. Director Coburn said. "With the hams' help, we were able to expedite response, by our town officials, to problems created by the tornado. Until this happened, I was only vaguely aware of what hams are capable of doing. You can bet they will play a big part in our planning for the future." QST

Navy Chief Clayton Hill, WA4VCW (standing), managed amateur operations supporting Windsor Civil Defense.

The League's Technical Oracles

Many hams fit the description "unheralded hero," but few are more firmly entrenched in that category than the League's technical advisors. This heretofore silent cadre of field appointees deserves a great deal of credit for the technical integrity of many *QST* articles and most of our other publications.

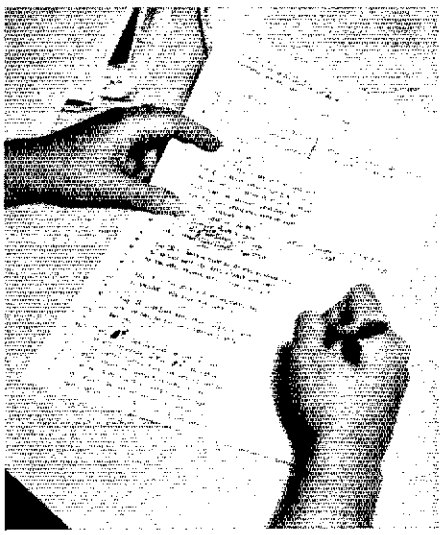
What is a TA? Where does the League get them, and what do they do as ARRL appointees? They are exactly what their title denotes, technical advisors. For example, if the editorial staff at Hq. received a comprehensive paper on some specialized subject which was beyond the practical experience of the editors, a qualified TA would be called upon to critique the manuscript. His or her input would help determine the acceptance or rejection of the article.

There was a time when the technical staff of most amateur publications could deal with any phase of the electronics technology; they could feel confident in critiquing nearly any manuscript. But suddenly the communications technology burst wide open to bring us ssb, FAX, SSTV, ATV, EME, OSCAR, digital/logic, semiconductors, microprocessors and, finally, nbvm. The era of specialization was upon experienced editors, just as it was upon those in the medical and other scientific fields.

The ARRL technical editors necessarily narrowed their fields of individual expertise and became specialists. Some studied to stay current in the area of antennas, others became digital/logic whizzes, while a few addressed themselves to such areas as semiconductors, vhf/uhf practices, receiver technology and so on.

A Practical Solution

To help the staff with its increased responsibilities, the ARRL Board of Directors sanctioned the addition of TAs to the list of existing field appointees. Immediate effort was put forth by the technical department manager to locate willing volunteers for this new and vitally important appointment, and a set of basic criteria was developed. Technical advisors (1) should be licensed amateurs; (2) must be League members; (3) must be employed by the industry in the field of expertise for which the appointment is made; (4) should be willing to critique manuscripts and accept letters and phone calls from ARRL officials concerning technical matters; and (5) will be asked to critique League technical publications and offer advice for improving them. Additionally, TAs are encouraged to write *QST* articles and give technical lectures at club meetings, hamfests and ARRL conventions. All in all, that's a pretty big chunk of good-hearted dedication on behalf of the volunteers!



A *QST* editor prepares a technical advisor's manuscript for publication.

A Gratifying Response

Solicitations for the TA position brought gratifying results. At least 95 percent of those approached were willing to serve a two-year term as TA. Skilled persons from many facets of our technology became field appointees. There are TAs whose expertise ranges from industrial safety through high-level solid-state design. Their specific areas of skill include passive filter design, computer technology, receiver design, EMI/RFI, and VMOS power FET applications.

Some TAs have provided new theory and practical material for the *Handbook*, while others have gone into the field to give technical talks at hamfests. Still others have done specific design work for *QST* and some of the ARRL technical books. All of this work has been done without monetary reward. The results are beneficial to all radio amateurs, including those who aren't League members.

Privileges

Technical advisors, as part of the "official family," may participate in ARRL CD Parties using "TA" as the appointment designator. They receive a TA certificate that is suitable for framing. Technical advisors are sometimes invited to speak at ARRL-approved hamfests and conventions, with *advance coordination* through the Membership Services Department at ARRL hq. In such circumstances, the TA is considered an ARRL speaker with routine travel expenses paid for.

We're seeking additional League members to serve as technical advisors. At present, we need to round out our expertise in such areas as microwave technology, EME, repeaters, SSTV, FAX, propagation, antenna design, and test procedures for communications equipment. Those who meet the criteria discussed earlier are invited to contact this writer for details.

Being a TA is one of the finest ways you can serve Amateur Radio in this time of technological expansion. We need you for this important program, so if you're a specialist let's get together and talk about an appointment!

League officials and the Hq. staff wish to express their appreciation to those TAs who have served so well since the program was initiated. Their dedication has helped to maintain the high technical standards of the many League publications. — *Doug DeMaw, W1FB*

ARRL Technical Advisors

Nathan Sokal, WA1HQC, Lexington, MA
Dave Geiser, WA2ANU, New Hartford, NY
Jerry Sevick, W2FMI, Basking Ridge, NJ
Edward Wetherhold, W3NQN, Annapolis, MD
Al Markwardt, W5PXH, Richardson, TX
Rick Olsen, N6NR, San Diego, CA
Ed Oxner, KB6QJ, Santa Clara, CA
Edward Kane, W6ONT, Cypress, CA
Helge Granberg, K7ES, Phoenix, AZ
Roy C. Hejhall, K7QWR, Phoenix, AZ
Wes Hayward, W7ZOI, Beaverton, OR
Mike Metcalf, W7UDM, Beaverton, OR
Patrick Adamosky, K7BEP, Portland, OR
John Champa, K8COL, Columbus, OH
John Montague, WØRUE, Mahtomedi, MN

A Tradition in History

Today's Amateur Radio clubs have some of the same activities and problems that the "old-time" clubs did.

By Rosalie White,* WA1STO

Date: December 1919. The first transcontinental relay since the war takes place — between California, 6EA, and Chicago, 9ZN. Club members take on QRM control of spark-gap transmitter interference. The first 11 clubs in history affiliate with the ARRL.

Backing up a step, we see in August 1919 *QST* that Hiram Percy Maxim, himself, realized the benefits of the union of clubs and the ARRL. In mutual strength we all "gain in our efforts for legislative protection." The ARRL could "better represent the vast body of amateurs" by hearing from the clubs what they needed and wanted most. He expressed the potential of all radio clubs forming an association to handle relay work. Thus club affiliation began with an "interlocking of hands" for "the furtherance of Amateur Radio." Hiram knew what he spoke of and it is all true today too, on the 60th anniversary of club affiliation.

*Manager, ARRL Club and Training Dept.

First Affiliated Clubs

There are a few societies, such as the Hartford Radio Club (ancestor of the ARRL), that existed in the very earliest days of Amateur Radio, but the 11 listed in Table I were the very first to be ARRL affiliated. What has happened to these clubs during the past 60 years? In digging through the old club records we found no early files for the New England Amateur Wireless Association, Radio Traffic Association, Armour Villa Radio Association, Northern Indiana Radio Association, Ravenswood Radio Association or Council Bluffs YMCA Radio Club. Files of the first 10 years of affiliation are sketchy, and so to the next step — check out 1919 and 1920 *QST*s.

September 1919 *QST* mentions that New England AWA members were glad to have the Radio Inspector (FCC) back from the service. October 1919 *QST* tells of the New England AWA second annual banquet with a count of 350 amateurs in attendance! The club eventually died out and little is known of later activities.

"The prevalence of inefficient operating was responsible for the organization of the Radio Traffic Association of Brooklyn, New York, in January 1917" (November 1919 *QST*). The club's purpose? The same reasons many clubs give today: fellowship, relay system and minimizing interference. In December 1919 the club's 20 members applied for affiliation. Further reports of 1920 tell of traffic-handling activities and semi-monthly club newsletters. No records or information exist that tell why the club folded.

No Records Until 1947

Austin Radio Club is not often mentioned in early *QST*s and Hq. records on the club are missing until 1947. Johnny Paul, WA5BGO, today's president, checked around and found several people who helped form the club back in 1916. Dave Harrel, W5CVQ (ex-5DD), and John Teykl, W5SD, were most helpful.

Ten local hams decided that they wanted to form a club. They met in 5DD's ham shack, a small building in his yard, and elected 5ZU, 5EM, 5GQ and 5DD as officers. Members wanted to listen to long wave cw stations and set about building amplifiers for doing so. A code proficiency class ran continuously. Streetcar interference was horrendous in those days. In 1916 when U.S. government officials chased Pancho Villa through Mexico, they shut down the hams for fear that hams would accidently give out information on where the government agents were. There were also fears that the broad-signal, spark-gap equipment would interfere with government communications. In 1921, Dave left for Yale and thus

H. C. EMERROD, JR. W5ZG, Pres. A. D. TENNANT, W5TD, VICE PRES. LEO HAVARD, W5BKW, SEC. TREAS

HOUSTON AMATEUR RADIO CLUB

AFFILIATED WITH AMERICAN RADIO RELAY LEAGUE, INC.

DAVE E. CALE, W5BBO
6725 Avenue Q

P. O. BOX 707
HOUSTON, TEXAS

Feb.27th,1932

American Radio Relay League
West Hartford Conn.

Gentleman-

The Houston Amateur Radio Club at our last meeting voted to attempt to get all members of our club to become members of A.R.R.L. and I will have a club membership for Q S T soon.

Early Houston ARC correspondence discussed ARRL memberships.

RUDOLF A. TESCHAN, Secretary
ROY A. PELISHEK, Business Manager

LOY S. BAIRD, President
CLARENCE N. CRAPO, Vice-President

THOMAS C. WESTON, Treasurer
C. M. PRINSLOW, Sergeant-at-Arms

Weekly Meetings
8:00 P. M.
Thursday Evenings
Trustees' Room
Milwaukee Public Museum

The Milwaukee Amateurs' Radio Club

EXECUTIVE HEADQUARTERS
TESCHAN LABORATORIES

WEST 395

2319-2329 WELLS STREET
MILWAUKEE, WIS., U. S. A.

BOARD OF DIRECTORS
LOY S. BAIRD, Chairman
A. BERTRAM LORD, Vice-Chairman
ROY A. PELISHEK, Man. Director
RUDOLF A. TESCHAN
THOMAS C. WESTON

October 24th, 1919.

The American Radio Relay League, Inc.,

Hartford, Conn.

Gentlemen:

Milwaukee Amateurs' Radio Club letterhead stationery was a PR billboard, all its own in 1919. It told when and where the meetings were and who to contact. This letter was the initial request for affiliation.

can't comment on further club activities.

The club reapplied for affiliation in 1947 under the name Austin Amateur Radio Club. At that point 65 people belonged to the club, 53 as licensed amateurs. Emergency drills and Field Day were the highlighted activities. Club functions increased in the '50s to regular club bulletins, code classes and volunteer examiners, safety programs, mobile judging, PR activities, purchasing club station equipment and finding a station location, and Red Cross liaison. In 1979, the members regularly report club happenings through their club bulletin, *AARCOVER*. Club badges denote member call signs. Two club repeaters keep members in contact between meetings. DF hunts help to train members to find illegal operators who are using stolen equipment. A recent Novice class graduated two men and six women. Field Day was prefaced with emergency traffic for the Red Cross from the Wichita Falls tornado disaster area, handled through the club station, W5KA.

More Clubs Die Out

News blurbs on the Northern Indiana Radio Association, Armour Villa Radio Association and the Council Bluffs YMCA Radio Club were not found in early *QST*s, other than the actual affiliation information. Off-shoots of the Council Bluffs club cropped up later, however, affiliating as Council Bluffs Radio Operators Club in 1933. This organization died out, reemerging in 1937 and becoming inactive again in 1962. Clubs, then and now, go through cycles. Great activity caused by a spurt in growth in the Amateur Radio Service, ups and downs with changes in the few workhorses of a club, new officers, or any of a number of other reasons may cause a rise or fall in club activity. Most clubs are active, die out for a while, reactivate and the sine wave goes on.

Ravenswood Disbanded

November 1919 *QST* states that all Ravenswood Radio Association members had commercial licenses and all were ARRL members when the group applied for affiliation. The club instituted a junior membership for youngsters in March 1920. In 1921 the club disbanded — the reasons unexplained. An active club folded only a few years after it had sprung up. It still happens today.

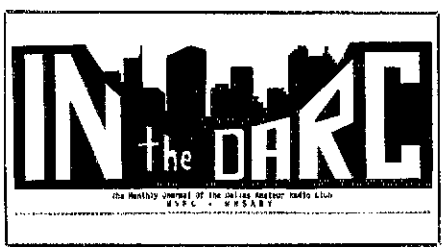
In the Center

Milwaukee ARC members labelled themselves "right in the center of things" back in the early days, and right they were. The club, founded by 9HO and others in January 1917, affiliated along with the other original clubs. In 1920 the club members were so well organized that the club stationery contained all the

Table 1

The first ARRL-affiliated clubs, as listed in January 1920 *QST* and the official Board of Directors' minutes.

New England Amateur Wireless Association — MA
Radio Traffic Association — NY
Austin Radio Club — TX
Council Bluffs YMCA RC — IA
Northern Indiana Radio Association — IN
Armour Villa Radio Association — NY
Ravenswood Radio Association — IL
Milwaukee Amateurs' Radio Club — WI
Dallas Radio Club — TX
Houston Radio Club — TX
New Mexico State College Radio Club — NM



Present-day club bulletin head for Dallas Amateur Radio Club.

MILWAUKEE RADIO AMATEUR'S CLUB

MEETS THIRD THURSDAY OF EACH MONTH
(EXCEPT JULY AND AUGUST) AT 7:30 PM
WAUWATOSA SAVINGS AND LOAN BUILDING
7500 WEST STATE STREET

INTERESTED PERSONS ALWAYS WELCOME TO ATTEND
PLENTY OF FREE PARKING

MRAC - FOUNDED IN 1917

THE MILWAUKEE AMATEURS' RADIO CLUB

EXECUTIVE OFFICE
PHONE GRAND 1716
601 ENTERPRISE BLDG.
SECOND & SYCAMORE STS. INC.
MILWAUKEE, WISCONSIN

THE A. R. R. L.

WEEKLY MEETINGS
EXCEPT THIRD MONDAY OF
EACH MONTH
8:00 P. M. MONDAY EVENINGS
TRUSTEES' ROOM
MILWAUKEE PUBLIC MUSEUM

1922

Milwaukee RAC present and past meeting announcement cards.

necessary information for good PR work. Between 1920 and 1922 club membership certificates, cards and information brochures were developed. It sounds like a club of today. Sixty years later their club members are just as enthusiastic. In 1920 they visited the Ravenswood Radio Association in Illinois to see how a successful club works. From early accounts of their club activity it is apparent that they did well on their own. The club met weekly and in 1923 half the members were licensed. The remainder provided good potential to keep the club going for several more years. Club activities included picnics, QSO parties, spark-gap interference control, conventions and PR in newspaper and other media resources. The club name was changed to Milwaukee Radio Amateurs' Club. In 1924 over 100 people became members and all belonged to ARRL. Outstanding!

Early 30s club functions included a garbled message contest, Field Day, the emergency group WERS, Sweepstakes, DX tests, classes and a safety contest. The club met continuously for 30 years, even during the war years. Today the Milwaukee RAC news sheet tells of regularly scheduled classes, year-round at all levels of licensing, RFI/TVI committee sleuthing, large exhibits at malls, social events, feature articles in the *Milwaukee Journal* Sunday Magazine "Insight" and interesting club guest speakers. The club now labels itself as the "World's Oldest Continuously Active Club." The two file folders of records that we have on hand certainly show this to be true. This is quite an accomplishment, deserving of our heartiest congratulations.

Dallas Still Active

Dallas Radio Club's second meeting was held in October 1919, whereupon members decided to apply for club affiliation. In 1921 this club held an exhibit at their state fair, an annual activity for clubs of today, too. Back then members pushed Mexican government officials for a traffic relay route into that country, quite a task to take on. Club secretary correspondence tells of statistics on presidential election returns sent via cw to area residents, as was the World Series, play-by-play and the Dempsey-Carpentier fight, blow-by-blow! One hundred members belonged to the club in 1923, and in 1925 a watermelon feed took place, a popular club social event today. The club developed off-shoots, a Dallas Amateur Wireless Association, affiliated in 1924 and Dallas Radio Research Society in 1928. The original club, renamed the Dallas Amateur Radio Club, reaffiliated in 1932 and has been quite active since then.

Recently, John Hill, WB5UEV, interviewed some of the old-timers of the present Dallas ARC. He found that club activity slowed between 1925 and 1928. In 1928, area hams asked Frank Corlett, Jr., club president in 1920, '21 and '23, to help stir up the group again. They even bought Frank a rig to show that they really wanted his assistance in reorganizing. Frank didn't like or use the rig because he liked his old spark-gap transmitter better! About half the members of the renovated 1928 club were members from the early days and about half were new hams. The older members were telegraph operators who, today, reminisce about how they weren't spoken to if they sent code poorly. Another old-time member and club secretary from 1920-21, Porter Bennet, owned a radio store for years, that all area hams went to.

Austin Amateur Radio Club
P. O. Box 13473
Austin, Texas 78711

Non-Profit Organization
U S Postage Paid
Austin, Texas
Permit No. 2942

ARRL
225 Main Street
Newington, CT 06111

AARCOVER AUGUST 1979

MEETING AUGUST 14, 1979

The club bulletin for Austin Amateur Radio Club, *AARCOVER*, loudly proclaims the date of the next meeting on the outside mailing cover.

Today the club is alive and well, with over 200 members. Their club bulletin often runs to 14 pages. This year's Field Day sported a four-transmitter station operation — phone, cw, YL and Novice. The club has T-shirts with their logo on the back. These are worn at the many public-service events for which the club provides communications. A club communications trailer is being made self-sustaining with battery power.

Houston Alive and Well

August 1919 *QST* reports that Houston, TX, area hams were making preparations to form a club that would affiliate with the League. In September, the first meeting of the Houston Radio Club took place. The area people had met since 1915, but not as Houston Radio Club, ready to affiliate. In October members applied for affiliation. The club was active for three years, dried up for a bit, and finally took off in a big way in 1925. Members met at the same location from 1919 to 1954. Through the 20s and 30s officers corresponded regularly with the League, sending in newspaper clippings on the club. These told of station photo contests, Sweepstakes activity, division-wide conventions, club bulletins, Field Day activity, DF hunts, classes and more. The club, as many other clubs now, reports the same types of things today. In 1955 members totalled 175; in 1977, 200.

Today the club, named the Houston Amateur Radio Club (HARC), continues to be active. A statement on their annual report: "Ninety per cent of the club effort is directed toward training of amateur operators." *HARC News*, the club bulletin, tells of sponsoring regular classes, Field Day, TVI/RFI committee work, a PR campaign, members' upgrading and club station, W5PDA.

The Only School Club

New Mexico State College Club reported on their station as follows: "1/2 kilowatt set of the highest type," circa January 1920. Not much else can be found on this club, other than that the name changed at some point to State College Radio Club. In 1979 this club boasts 10 members, a PR campaign with radio demonstrations and the revised name of New Mexico State University ARC. College faculty advisors will testify to the fact that it is always tough to keep a school club consistently alive over the years, because of student turnover. This club was the only one of the original 11 that was a school or youth group. Today school and youth clubs represent 331 of the total 2200 active societies.

Binding Force

Clubs made up the binding force in the early days of Amateur Radio, the beginning of what could have been much less cohesive if not for these societies. As Hiram Percy Maxim put it in December 1919 *QST*: "In these hectic days of trying to get going with something really good, don't overlook the matter of the value of a Radio Club. We know whereof we speak, because we have seen the dark days of going it alone, playing the lone radio hand, and we have seen the brighter days when once a week we have rubbed elbows with others who are interested in the same problems that are perplexing us."

Reading further in that article, a lesson can be found for today, the 60th anniversary of the affiliation of these first 11 clubs. "The value of the Radio Club is more than the help it gives to the individual members by providing the opportunity to talk things over. It makes for strength of Amateur Radio generally." We wouldn't change a word, Hiram.

WARC Countdown

Conducted By David Sumner,* K1ZZ

Mid-Conference Report from Geneva

Reading a monthly journal can be a confusing business — almost as confusing as writing for one. In last month's *QST* you were treated to three separate WARC reports: this column, which for last month's issue was written September 12; a "League Lines" update, composed on October 4; and the editorial, which was inserted at the last possible minute on October 8. If you read your *QST* from back to front, then you read the items in the order they were written and they may have made sense to you. This month, we'll try to make our reporting a bit more straightforward.

At this writing, four weeks of the scheduled 10-week conference have slipped by. They have been busy weeks for the IARU Team and for the members of national delegations. Even before WARC-79 opened, we found ourselves occupied with activities connected with TELECOM-79, a mammoth telecommunications exhibition held across town. Then came the unexpected drama of the selection of a chairman for the Conference: That honor went to Sr. Roberto Severini of Argentina, by consensus of the heads of delegations.

Once the initial three-day delay was past, the Conference got right down to business. A committee structure was adopted which is very similar to that pictured in October *QST*, page 70 (see Fig. 1). Fewer Working Groups were formed than we had planned for, owing to the desire of the smaller delegations to keep the number of simultaneous meetings to a minimum so their delegates could cover them all. This places a heavy workload on the Working Group chairmen. It already has been necessary to subdivide one of the Working Groups, 5B, because of the large number of proposals and controversial issues which faced it. Thus, in Fig. 1 we have Working Group 5BA, for frequencies below 4 MHz, and 5BB for frequencies between 4 and 27.5 MHz.

The amateur community can be proud of its representation among the committee chairmen. The chairman of Committee 2 is C. J. Martinez, YV5FI; Committee 3, Z. Kupczyk, SP5ZK; Committee 6, M. Joachim, OK1WI; and Committee 8, O. Lundberg, SMØCKV. In addition, the chairman of Working Group 5BA is L. Cook, YV5FJL, and of 5BB is P. D. Barnes, VK3GH. In all, we know of at least 140 amateurs who are participating in WARC-79 in some official capacity. We have said time and again that an interest in Amateur Radio often leads to or enriches a professional career in telecommunications. The WARC-79 attendance list provides some persuasive support of that argument!

During the first week of the Conference, the IARU distributed pocket calendars to all attendees. The calendars were designed especially for WARC-79, with tear-out sheets to record a full week's schedule of meetings and with background information, in three languages, on Amateur Radio and the IARU. The second week, the IARU Team hosted a two-part reception for 400 heads of delegations, amateurs, and others in order to say hello to old acquaintances from past conferences and to meet new ones. An IARU reception has become something of a tradition at ITU conferences, but none had ever been quite as big as the one for WARC-79. Delegates welcome the opportunity to talk with one another in comfortable surroundings, so they appreciate the sponsoring of such receptions. This time the IARU reception was supplemented by one hosted by the Deutscher Amateur Radio Club on behalf of the IARU Region 1 Division, on September 22, just before the scheduled opening of the Conference. A similar affair will be hosted by the Japan Amateur Radio League on October 30.

You might think that, with 40 percent of the Conference now over, about 40 percent of the issues should have been settled. Not so! In fact, at this writing, on October 21, the Conference has not met in plenary assembly since the opening day, and it is only the plenary which can make "final" decisions. All of the work has been taking place in the committees, working groups, and some special-purpose ad hoc groups. As of yet there has been no formal discussion of amateur bands, old or new, below 25 MHz.

The flow of Conference work on allocations matters goes something like this: In a Working Group, the chairman indicates that a given block of frequencies (for example, 28.0-29.7 MHz) is open for consideration. If there are any proposed changes, he either summarizes them or permits the delegations to introduce their own proposals if they so desire. The chairman then permits a discussion of the proposals to develop, and tries to guide the discussion toward a consensus. A solution which is acceptable to all delegations is the objective; it is very rare for formal votes to be taken. Once the decision is reached on a given frequency band, it is put into a document and circulated to the conference participants to ensure that everyone's understanding of the decision is the same. The Working Group meets again, a few days later, to approve this document and to send it on to Committee 5. Committee 5 places the document on the agenda for its next meeting (about once a week at this point, but much more frequently later on) and either approves it, modifies it in some way, or sends it back to the Working Group for further work. Once approved by Committee 5, the document goes through a similar process with the plenary. Approval by the plenary usually is just a formality, but it isn't safe to assume that!

As of this writing, the only allocations matter affecting the Amateur and Amateur-Satellite Services which has made its way through Committee 5 is the "no change" at 28.0-29.7 MHz, mentioned in last month's "League Lines." This was approved by Committee 5 on October 11, but has not yet been considered by the plenary. Beyond that, about all we can report at this point is that there has been considerable support for some much-needed Amateur-Satellite allocations between 1 and 10.5 GHz, and for new allocations for the Amateur and Amateur-Satellite Services above 40 GHz. It is too early to say just what form these allocations might take, but the signs are encouraging. QST

*Assistant General Manager, ARRL

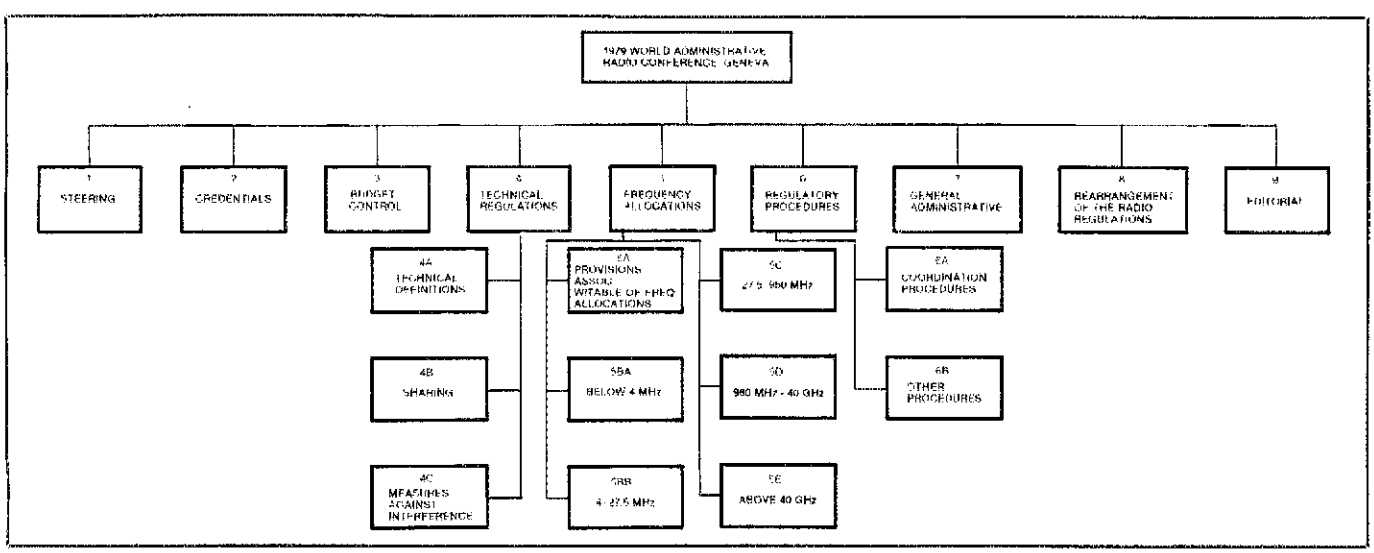


Fig. 1 — Committee and Working Group structure of the 1979 World Administrative Radio Conference as of mid-October. Those boxes with heavy borders are of particular interest to amateurs. Names of Working Groups are not official, but generally describe their scope.

International News

Conducted By Bruce Alan Johnson,* WA6IDN

High Praise for Amateur Radio in Geneva

Geneva, Switzerland — As you read this page, the World Administrative Radio Conference should have drawn to a close. Since this column is being written on 22 October, it is obviously impossible to predict how the Amateur Service will have fared on 1 December. We would, however, like to offer here some general observations on the atmosphere in Geneva just prior to WARC's convening.

Immediately prior to the commencement of WARC, the world's largest exhibition of telecommunications equipment and capabilities was held in Geneva, at the Grand Palais des Expositions. Titled TELECOM-79, it is also the site at which the League's new film, *The World of Amateur Radio,* produced by Dave Bell (W6AQI), won a special prize for its "human qualities." Many readers already know of the magnificent Amateur Radio booth set up by Jaap van den Herder, PYØYJ, and 37 fellow amateurs of the European Center for Nuclear Research (CERN). Appearing elsewhere on this page are some photos only hinting at the highly professional display which was visited by thousands during its one-week life.

Virtually every aspect of Amateur Radio's wide horizons was covered in some form. Films and slide shows were running continuously, and thousands of pieces of literature in several languages were given away to interested visitors. Of course, a large number of these visitors were delegates to the WARC, and this additional exposure to Amateur Radio and its many offerings, particularly to developing countries, was helpful.

At the Saturday afternoon symposium devoted exclusively to Amateur Radio, talks were presented to visitors, delegates and the general public by Dr. Dain Evans, G3RPE (on amateur achievements in microwaves); Tom Lott, VE2AGF (on the new Narrow-Band Voice Modulation pioneered by radio amateurs); and by Dr. Karl Meinzer, DJ4ZC (on the OSCARs and amateur satellite communication in general).

We were especially honored by having our symposium opened by the Secretary-General of the International Telecommunication Union, Mr. Mohamed Mili — no stranger to readers of this magazine. We offer here a few highlights of Mr. Mili's words, which formed high praise for radio amateurs. [Editor's Note: The CCIR to which Mr. Mili refers is the International Radio Consultative Committee, an important committee of the ITU which undertook a major portion of the preparatory work for WARC.]

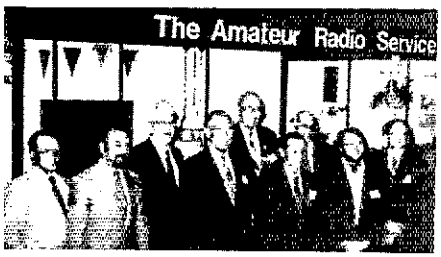
"Ladies and gentlemen, the Third World Telecommunications Exhibition is particularly glad to receive today radio amateurs from all over the world. On behalf of the ITU, therefore, I wish you a cordial welcome . . . I have no intention of retracing the history of the radio amateur organizations or of citing the well-known examples of their valuable contributions to international cooperation and human brotherhood. But as tomorrow we shall be holding a solemn ceremony to celebrate the 50th anniversary of the CCIR, I should like to point out that it was during the first CCIR Plenary Assembly, held in The Hague from 18 September to 2 October 1929, that the delegates of 23 countries signed the "Special International Arrangement Concerning the Regulation of Amateur's Licenses." This arrangement, . . . set out the conditions to be met by an amateur in order to be authorized to operate a transmitting station, while leaving every country its sovereign right to regulate the operation of its amateur stations in its territories.

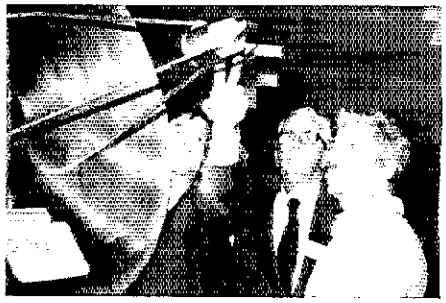
"It provided, in particular, that administrations should allocate frequency bands, not specific frequencies, and that no one should be authorized to operate a transmitting station before demonstrating the requisite skills . . .

"Radio amateurs have not been forgotten, of course, and all aspects of your activities have been taken into account for the WARC, including the Amateur Satellite Service. We are aware of the great importance you attach to this, since it has given a new dimension to your activities.

"The importance of the Amateur Radio Service, widely demonstrated over the past half century, has enlisted the sympathy of many experts for your cause. That is why I am optimistic that the conference will be favorably disposed to your service." QST

*International Services Officer, ARRL





Photos, left to right: PJØYJ greets the Hon. Willi Ritschard, Swiss Federal Councillor for Transport and Communication, and the Hon. Mohamed Mili (center) at the opening of the Amateur Radio Symposium of TELECOM-79. Radio amateurs' achievements in microwave work were especially appreciated by visitors and delegates — virtually every facet of Amateur Radio's wide reaches was covered in the display booth (nearly 100 feet long), many with multilingual explanations and some even offering headsets with recorded explanations or (as in the case of the NBVM exhibit) a sample recording of what it sounds like.

Some of your IARU WARC team gathered one morning to visit the booth and were caught in the rogues' gallery. (l-r) W1RU, HK3DEU, VE3CJ, WØBWJ, W4KFC, JA1NET, ZL2AZ, WA6IDN and K1ZZ.

The self-training nature of the Amateur Service makes it particularly attractive to developing countries, and this display emphasizes as well the simple but effective equipment available through, for example, Project Goodwill.

This shot shows the density of the crowd at the amateur booth, as well as a model of the French rocket Ariane, slated to carry the amateur satellite Phase III into orbit soon. *(photos by Photo Trepper Geneve)*

Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

Moved and Seconded . . .

INTERIM MINUTES OF THE FIRST MEETING OF THE BOARD OF DIRECTORS OF THE CANADIAN RADIO RELAY LEAGUE

October 12th, 1979

1) Pursuant to due notice, the Board of Directors of The Canadian Radio Relay League (incorporation applied for) met in session at the Skyline Hotel, Ottawa, ON, on October 12, 1979. The meeting was called to order by President Hesler at 1600 hours and the following directors were present: W. W. Loucks, VE3AR, vice president; Gordon Steane, VE3BMG, secretary; Albert Daemen, VE2IJ, Eastern Region; Tom Atkins, VE3CDM, Central Region and George Spencer, VE4IM/6, Western Region. Also in attendance as a member of the board, without vote, was ARRL President Harry Dannals, W2HD. Also present at the invitation of the Board as a nonparticipating observer was Mitch Powell, VE3OT, assistant director. There was also present Bob Benson, VE2VW, general counsel of the CRRL.

2) President Hesler welcomed all present on this historic occasion and, in his introductory remarks, gave the board a current report from IARU with respect to the World Administrative Radio Conference.

3) A discussion was held with respect to the possibility of establishing a Canadian checking point for some or all of the ARRL awards. It was decided that, for the present, no further action was necessary.

4) The current status of the Canadian intruder watch received discussion and, without formal action, it was agreed that this watch would be reactivated in the future.

5) Introduced by President Hesler, a lengthy discussion resulted in regards to the areas of responsibilities vis-a-vis the CRRL president and the director of the ARRL Canadian Division (CRRL vice president), in addition to the future role and responsibilities of assistant directors and public relations assistants. Upon MOTION, it was unanimously adopted that henceforth assistant directors and PRAs would be appointed by the executive committee, upon the specific recommendation of the regional directors. These officials would be line responsible to the CRRL vice president and, in turn, through him to the CRRL president. It was further stipulated that there would be a minimum of one AD and one PRA in each of the League's Canadian sections, reporting directly to the regional director concerned. Such appointments would be made by the executive committee at the commencement of each and every calendar year.

6) The matter of liaison among the ARRL Canadian Communications Department officials received consideration and discussion. It was MOVED and unanimously adopted that a special ad-hoc committee be appointed by the president to study the situation and to make a report to both the CRRL and ARRL Boards. President Hesler then appointed the following committee: W. W. Loucks, chairman; Noreen Nimmons, VE3GOL; Gordon Steane, VE3BMG; and, with the concurrence of ARRL President Dannals, John Lindholm, W1XX, ARRL communications manager.

7) Director Spencer reported on an earlier meeting of even date with DOC officials with respect to current examinations procedures.

8) President Hesler advised that approval, prior to the CRRL incorporation, had been given for a CRRL National Convention to be held in Saskatchewan in 1982. The matter of other CRRL National Conventions received due consideration without formal action.

9) It was MOVED and unanimously ADOPTED that henceforth applications for League affiliation of clubs and associations, plus conventions, would be submitted to the executive committee for approval prior to submission to the ARRL for their approval.

10) It was unanimously AGREED that early in the next year the creation of a Novice license would be aggressively pursued by the CRRL. The desirability of such a new license class was clearly indicated by the Canadian membership in a referendum.

11) The recent DOC 900-MHz proposals for the General Radio Service were discussed and President Hesler was instructed by the board to designate a member to contact the Radio Society of Ontario in an effort to establish a committee which would be charged with making a combined submission to the Department. Director Atkins was nominated by the president. Following the board meeting it was reported that the CARF president was also agreeable to the formation of such a committee in order that the resulting proposals to the Department would be that of a combined submission of CRRL, CARF and RSO. President Hesler appointed Vice President Loucks and Director Atkins the CRRL representatives.

12) The meeting concluded with informal remarks by all participants present. There being no further business, upon MOTION the Board adjourned.

[The above interim minutes of our first board meeting are reported here without any inference as being those of the official transcript. Due to the *QST* publishing deadline for this issue, it was not possible for your editor to receive the official version in time; however, this report is authentic insofar as subjects discussed and resultant actions.]

RADIO CLUB RECEIVES FEDERAL GRANT

A group of Beaverlodge Senior Citizens, organized under the name of the Peace County Seniors ARC, will receive a grant of $6731 under the New Horizons Program. The grant is to obtain the necessary equipment to establish a repeater. The club, which has been in existence for several years, hopes to further promote the enjoyment of Amateur Radio by other senior citizens in the Peace River district. In addition, the repeater will enable the club to offer a safety and information service to tourists traveling the Alaska Highway. Tnx to W6SPC for submitting the above article from the *Advertiser* of Beaverlodge, AB.

RADIO FREQUENCY INTERFERENCE

The middle of September, pursuant to a request from the Department of Communications for our consideration, a temporary amateur license was issued to the Ford Motor Company of Canada to enable that company to check the immunity from amateur transmitters to the cruise control and other solid-state devices in vehicles manufactured by them. The license issued was for a period of eight days only with a further stipulation that operation be restricted to two hours daily. We feel that the Ford Motor Company is to be commended for this action.

The Oxford County Amateur Radio Club was presented with a Charter from the ARRL for affiliation at a recent meeting. Shown here is Harry Maclean, VE3GRO, CRRL public relations assistant, presenting the charter certificate to club President Tom Griffin, VE3IAZ.

POTPOURRI

☐ We are pleased to announce that the immediate past SCM of Alberta, Percy Crosthwaite, VE5RP, has accepted the appointment of assistant director for Saskatchewan.

☐ The Club Ondes-Courtes du Quebec, formed in 1974 and which has a current membership of over 340, has recently enlarged their monthly publication, *L'onde*, to include sections devoted to shortwave broadcasting. It is an interesting all-French-language radio publication. Further details can be had by writing to 3420 Chemin Ste. Foy, Apartment 5, Ste. Foy, PQ G1X 1S6.

*Director, Canadian Division

The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr.,* W5KHT

Italian 10-GHz Ingenuity

A few more details on the 10-GHz activity in Italy (and neighboring countries) add some flavor to the DX work from this past summer, reported last month. Italian sources indicate that interest in 10 GHz is increasing at a rapid rate. There are currently five fulltime beacons operating in the north of Italy and some of this gear is quite sophisticated. The I4X beacon is on top of a 2000-meter mountain feeding an omni-directional antenna that measures at 7-dB gain. The 120-mW thermostatically controlled Gunn oscillator feeds a pair of phased collinear dipoles mounted inside of a biconical horn. The whole assembly is mounted inside of an insulated fiber-type housing with the electronics located inside of a hollowed-out section. Careful attention to the harsh environment found at the more than 6000-foot elevation has resulted in a highly efficient, very reliable 10-GHz test and propagation analysis signal source for the Italian microwave experimenters. Voltage stabilization is supplied and F2 modulation identifies the signal every 90 seconds.

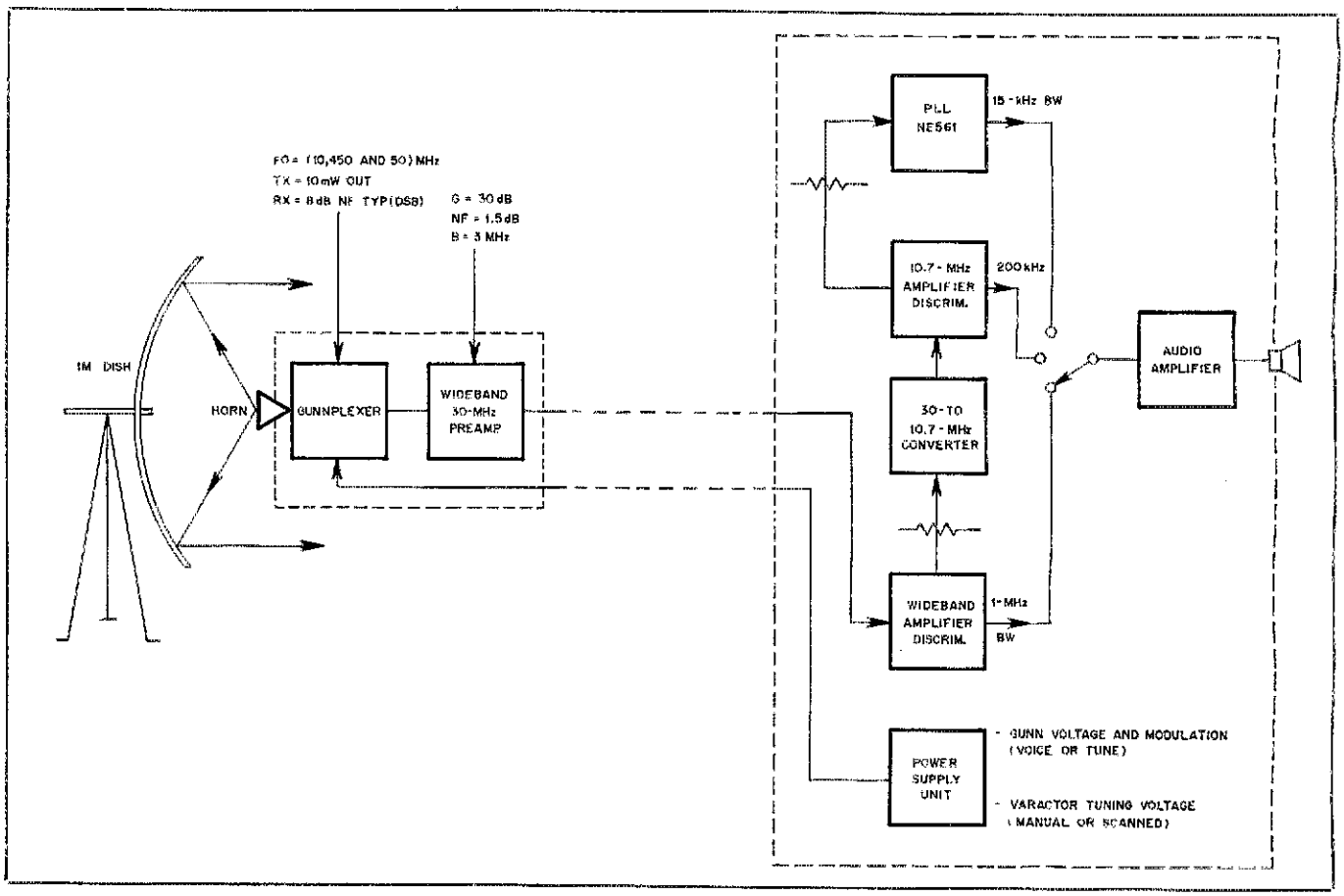
Much of the Italian interest in 10 GHz can be pegged to two factors. Something approaching a "standard station" has been designed, widely duplicated and carefully tested. A block diagram of the standard station appears here. By following this approach, newcomers to microwave are assured that if they follow the widely distributed plans they will be working on a complete station system which has been extensively tested, refined and debugged by hundreds of other enthusiasts before them. While "club" projects are hardly new in Amateur Radio, the adoption of a national project built around a single proven design is hard to beat when you are tackling a new frontier where everything is new to virtually all participants. This is similar to the appearance nearly 20 years ago on 2 meters of the Heath Two'er. Thousands were sold, and put into operation at prices virtually any amateur could afford. Between the price being right and the system being proven and easy to duplicate, 2-meter activity mushroomed. There is, as always, a message here for North American shf enthusiasts.

The second factor contributing to the growth of 1 station 10-GHz use (one Italian source reports "more than 7000 QSOs made") is of course the beacons. There is nothing more frustrating than to have a "dead band" and not know whether the band is dead for lack of activity, or because something is haywire in your equipment. Second most frustrating is to go to some time, effort and expense to assemble a station, and then have to beg others to get a signal on the air for you to check out your own station. The beacons in Italy overcome these problems plus they have paved the way for widespread 10-GHz DXing. With wide-area coverage, their presence is felt 24 hours per day, 365 days per year. The Porto Tolle beacon is regularly monitored in Trieste some 140 km away. By placing a chart recorder on the beacon as received in Trieste, Italian amateurs determined super refraction across the Adriatic Sea was present a whopping 88 percent of the time in the month of May alone. Few would have suspected such a high percentage of DX potential, of course, and the beacon system dotting northern Italy has proven just how enticing the 10-GHz assignment can be.

*Rte. 5, Box 364, Guthrie, OK 73044

Closer to Home

A trio of Lake Michigan area hams who are set up for 10 GHz are looking for others to test the shoreline and overwater paths in the upper Midwest. Don Lawson, WB9CYY (707 Hawthorne, S. Milwaukee, WI 53172), is looking, with WB9JIA and WA9LZM, for interested parties. Gunnplexers and dishes on 10.25 GHz are ready and waiting in the Milwaukee area; contact them directly!



FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Stocking Stuffers

As the year winds down and visions of sugarplums dance in our heads, I find my files full of topics that need to be discussed in this month's column. After digging down deep into my bag of goodies, I've come up with the following fistful of subjects. Until next time, Happy Holidays to all readers of FM/RPT.

Snowy TV Reception

Perhaps the most depressing commercial on television these days (and there are a lot of depressing ones) is that promotion for snowblowers. You know . . . the one that shows a snowplow scraping along the street while an announcer asks "Remember the mountains of snow we had last year? They're coming again . . . "

The snowblower pitchmen are trying to sell us their products with scare tactics and maybe we should listen . . . but not only about snow-removal equipment. The time to prepare for an emergency is before the emergency happens, not while the fur is flying.

It hardly seems necessary to remind any of you readers about the potential for service of a well-organized vhf repeater system. The numerous reports of public assistance testify to our ability to do the job. But now is the time for planning and that is what we want to remind you about.

When a heavy snowfall (or any other emergency situation) begins to develop, switch on your radio, at home or in the car. Listen, there's no need to let anyone know that you're there unless you hear a call. Nothing is as frustrating as trying to get help on the air and hearing: (a) a chatty, inconsequential QSO locking up the repeater or (b) nothing. Be the person to respond when needed.

Okay, the rig is set up for mobile use and if you get into trouble or see a problem, you can yell for assistance. Do you have an extra mic in the glove compartment for the moment when that mic cord gives out? Do you have a list of emergency phone numbers? . . . a copy of your Repeater Directory? . . . pencil and paper for notes? . . . flashlight?

Are you a four-wheels-only ham? Do you have a power supply ready at home to move the mobile rig indoors? Phones have been known to fail in storms. How about a second list of emergency phone numbers and a list of the hams you can call on? . . . an emergency antenna to replace the big one that collapsed in the ice storm?

And maybe a snowblower . . . — *W9IWI, (reprinted from* 220 NOTES*)*

Radio Control/RPT

Christmas time is here again. During this holiday season members of the ham radio fraternity, young and old alike, may receive radio-controlled model airplanes and ships as gifts. When these hams carry their new craft outdoors for the initial flight or maiden voyage, they may be forced to hit the silk or abandon ship prematurely.

The cause of that miniature *Titanic* sinking or that plastic 707 nose-diving is radio interference, counteracting rf on the same frequency as the radio control frequency. The source of this interference may be a 6-meter repeater!

For years, R/C enthusiasts have been using channels in the 50-MHz band to fly and sail their model craft. Recently, some repeaters have encroached on these frequencies, forcing the R/C enthusiasts to abandon the band. Abandonment is the only choice because it is impossible for a repeater and R/C operation to coexist on the same frequency. The keying of a repeater is unpredictable. Someone may be happily flying his model plane and unbeknown to him a repeater on his R/C frequency is keyed. The plane goes out of control and becomes a hazard to person and property.

Repeaters on the R/C channels are not numerous and how they wandered onto these frequencies is unknown. The 6-meter band plan included the R/C channels with the proviso that in the event additional repeater channels were needed, some R/C channels could be allocated for repeater operation. Have we reached the point where all the available 6-meter frequency pairs are full and more are needed? If this is indeed the case, perhaps the 6-meter band plan should be revised to accommodate the growing 6-meter repeater population. Please let this writer know how you feel about this situation. All of your comments will be forwarded to the VHF Repeater Advisory committee for their consideration. Until further word, it is strongly recommended that fm activity on these channels, both repeater and simplex modes, be avoided. (The accompanying table lists the frequencies to eschew.)

Table 1

6-Meter Radio Control (R/C) Channels

52.09/53.09	52.41/53.41
52.11/53.11	52.49
52.19/53.19	52.59/53.59
52.21/53.21	52.61/53.61
52.29/53.29	52.69/53.69
52.31/53.31	52.71/53.71
52.39/53.39	53.51

1979 will be noted as the year of the synthesized handheld transceiver. This is part of the crowd that populated the Kenwood booth at the recent ARRL New England Division Convention in Hartford. The hams were checking out the Kenwood's new synthesized 2-meter handheld. The crowd reminded this writer of the scene at the Yaesu booth at the Dayton Hamvention, this past spring, where the Yaesu synthesized 2-meter handheld was first displayed.

Tone Alert Standards

The Wisconsin Association of Repeaters (WAR) recently adopted a proposal which established a standard set of audio tones and procedures for emergency alerting, via repeaters, throughout the state. The system is similar to that used by the NOAA weather radio system which permits receiver speakers to be muted until an alert tone is received.

Two levels of urgency were defined. The first level would be used in the more common emergency situations. For example, a mobile in a traffic accident may urgently need assistance to protect life or property. If he receives no response, he may hit zero on his tone encoder pad for five seconds. This tone will break through the receiver muting and should bring a response.

The second level is of a higher urgency. It would only be transmitted at the direction of an ARES emergency coordinator or a government emergency official. This proposed ARES emergency tone would be a 1050-Hz blast that would break through the receiver muting and sound an alarm. (This tone would be sounded to call up a severe-weather net, for example.) While the response to the zero emergency tone may be defeated, every receiver would still respond to the ARES emergency tone.

WAR has suggested that this plan be adopted on a national level. Their proposal has been presented to the Emergency Communications Advisory Committee. Your comments and suggestions on this topic should be directed to the Communications Department at ARRL hq.

*72 Stiles St., Waterbury, CT 06706

Happenings

Conducted By W. Dale Clift,* WA3NLO

ARRL Advisory Committee on Biological Radiation (RF) Hazards

The ARRL Advisory Committee on Biological Radiation (rf) Hazards met recently at Southwest Reasearch Institute, San Antonio, TX, to plan a response to the FCC's Notice of Inquiry (NOI) about possible biological effects of radio frequency (rf) radiation. (See September 1979 *QST*, page 68, General Docket 79-144.) The Inquiry asks users of the rf spectrum, and other interested parties, to comment on whether FCC should become more involved in regulating exposure to rf (nonionizing) radiation.

Though the Amateur Radio Service accounts for only a very small portion of the rf energy emitted in the world, the League's Board of Directors' concern that such regulation could affect the Amateur Radio Service led it to establish the Committee. Members of the Ad Hoc Committee on Biological Radiation Hazards were appointed by ARRL President Dannals on the basis of their individual knowledge of, and expertise in, this area.

ARRL Advisory Committee on Biological Effects of RF Radiation: (l to r) W. Dale Clift, WA3NLO, Hq. liaison; Peter Bradley, N1ADX; Roger Stephens, K5VRX/4; Hal Steinman, K1FHN, ARRL Washington Area Coordinator; Chairman Ray Wangler, W5EDZ; and Kerry Sandstrom, K5KS. Meeting room courtesy of Southwest Research Institute, San Antonio, TX.

Committee Chairman Ray Wangler, W5EDZ, vice director of the ARRL West Gulf Division, called for a Committee meeting on October 19, 1979. Attending were Peter M. Bradley, N1ADX, a cell biologist involved in Ph.D. studies at Worcester Polytechnic Institute; W. Dale Clift, WA3NLO, ARRL headquarters liaison; Kerry Sandstrom, K5KS, M.S., a senior research engineer for Southwest Research Institute; and Roger Stephens, K5VRX/4, Ph.D., an ergonomist for the Occupational Safety and Health Administration (OSHA). Committee member Lieutenant Colonel R. B. Graham, N5AQO, O.D. chief, Technical Services Division, USAF Occupational and Environmental Health Laboratory at Brooks AFB, was unable to attend. Hal Steinman, K1FHN, ARRL Washington area coordinator, also attended to advise the Committee on responding to FCC Notices of Inquiry.

The Committee outlined plans and set up a timetable for making recommendations to the Executive Committee of the ARRL Board of Directors by November 18. Because of the short time available for responding to the Inquiry, the Committee decided to limit its present concern to that matter.

The ongoing charge of the Committee is to monitor the political, social and technical environment for trends in the area of the biological effects of rf radiation, submitting recommendations to the board concerning policy in this area. It also hopes to set up a program whereby Amateur Radio and ARRL will be represented at all hearings and other forums at the local, state and national level, where actions in this area may potentially impact the Amateur Radio Service.

ASCII APPROVED FOR AMATEUR RADIO SERVICE

Teleprinter and computer enthusiasts have reason to be more enthusiastic — at a recent FCC meeting, a majority of the Commissioners approved the use of ASCII in the Amateur Radio Service. ASCII, the American National Standard Code for Information Interchange, is recognized by the National Bureau of Standards as the standard information interchange code in the United States. A present Amateur Radio Rule, §97.69, requires that Amateur Radio teleprinter signals be transmitted in Baudot code, a "single channel five-unit (start-stop) teleprinter code."[1] The Commission has directed its staff to prepare a report and order implementing its decision to allow ASCII. *QST* will carry details of the amended rules as soon as they are known.

During the meeting, the Commissioners discussed three major questions: (1) Should amateurs be allowed to use ASCII? (2) Should amateurs be allowed to use other teleprinter codes? (3) Should all standards concerning teleprinter codes be eliminated? The focus of the discussion was the Commission's ability, and the ability of amateurs, to monitor the content of teleprinter transmissions. One Commissioner in particular became concerned that enforcement of the rules would be difficult if FCC were unable to monitor the contents of the transmissions. A spokesman for the FCC Field Operations Bureau staff emphasized the importance of amateurs knowing the content of all transmissions for their self-policing efforts.

After further discussion, FCC Chairman Charles Ferris determined that the Commission's sentiment favored a report and order in Docket 20777 authorizing ASCII with certain standards to be determined by the staff. He also directed the staff to prepare a Further Notice of Proposed Rulemaking to explore the possiblity of further deregulation of teleprinter codes.

[1]A special waiver permits ASCII on amateur satellites.

*Deputy Manager, Membership Services, ARRL

U.S. SENATE HEARS ABOUT THE WOODPECKER FROM K7UGA

The following item concerning the "Russian Woodpecker" was inserted into the *Congressional Record* of October 4, 1979, by Senator Barry Goldwater (R-AZ), K7UGA:

"SOVIET INTERFERENCE IN THE AMATEUR RADIO BAND

"Mr. President, I want to bring to my colleagues' attention a matter which I am afraid demonstrates once again the one-way street that cooperation with the Soviet Union has become.

"Recently, the Amateur Radio frequencies have been subjected to an increasing amount of radio frequency interference. The source of this interference has been traced to the operation by the Soviet Union of an over-the-horizon radar system in the amateur band. Both the Federal Communications Commission and the Department of State have attempted to resolve the problem, but have been met by a lack of cooperation from the Soviet Union.

"Mr. President, in my view — both as an Amateur Radio operator and a U.S. Senator — this is a serious matter which must be resolved satisfactorily. The public service that this country's amateurs perform must be able to continue.

"I do not pretend that this is a matter which should hold up the SALT treaty. However, I hope that my colleagues at least will have this in mind as we hear about Soviet cooperation and good intentions from the White House."

FCC PROPOSES ACTION ON STANDARD BANDWIDTH FM ON 6 METERS

Responding to petitions filed by ARRL and the Southern California Repeater and Remote Base Association (SCRRBA), FCC has issued a Notice of Proposed Rulemaking, PR Docket 79-285, on the subject of enlarging the 6-meter subband on which radio amateurs may utilize standard bandwidth fm emissions. Standard bandwidth fm, 16F3, on the 50-MHz band is presently limited to 52.5-54.0 MHz. ARRL's petition (RM-3313) requested that the lower limit be dropped to 52.0 MHz, thus allowing the use of standard bandwidth fm on the entire 52.0-54.0 repeater subband. SCRRBA's petition (RM-3207) would drop the lower limit even further to 50.1 MHz. The Notice of Proposed Rulemaking proposes the more flexible of these two alternatives, that of SCRRBA. Comments are due at the Commission December 10, 1979; reply comments December 26, 1979. Members may request a copy of PR Docket 79-285 from ARRL hq. S.a.s.e., please.

Albert Helfrick, K2BLA (right), was presented the June cover plaque award by ARRL Hudson Division Vice Director George A. Diehl, W2IHA, at a recent meeting of the Splitrock Amateur Repeater Association.

PETITIONS DENIED

Proof of license to purchase Amateur Radio equipment

FCC has denied three petitions which sought to require sellers of Amateur Radio equipment to obtain from purchasers proof of having a valid Amateur Radio license. RM-2866, filed by Frank W. Napurano, K2OKA, and RM-3018, filed by Paul H. Lee, WB4AIJ, suggested various ways in which sellers would record purchasers' names, addresses, call signs, serial numbers, and other information. This information would then be made available for inspection by the Commission. The San Antonio Repeater Organization (SARO) filed RM-2839, which coupled its proof-of-license proposal with a request that the Commission institute a dealer-licensing program for retailers of amateur equipment.

The Commission noted that most of the comments on this proceeding filed by Amateur Radio operators were favorable. Some equipment manufacturers also filed comments, essentially supporting the proof-of-license idea but not the proposal for a dealer-licensing program. Nevertheless, it found that a program of this nature is not feasible at this time. "Enforcement would greatly tax if not exceed the Commission's available resources of manpower and funding. Moreover," the Commission continued, ". . . this form of record keeping imposed on members of the public runs counter to the current trend against the proliferation of paperwork and government regulation, especially in light of the questionable cost-effectiveness of such a program." FCC did promise to continue to study the problem of improper use of amateur equipment by nonlicensed persons, however.

Amateur operation on 11-meter (CB) band

The Commission has also denied a petition seeking amendment of the rules to permit General class or higher licensees to operate with full amateur privileges on frequencies in the 11-meter band on a shared basis with CB licensees. The petition, RM-2728, was filed by Steven Putnam, of Fairborn, OH. FCC said it found the proposed amendments were in serious conflict with the nature and purposes of the Citizens Band and Amateur Radio Services. It said that while the Amateur Radio Service was intended primarily for hobby-type operations and is internationally recognized, the CB Radio Service was intended to provide the general public with private, short-distance domestic radio communications, for personal use and business communications. Moreover, the Commission said, CB operators would suffer severe interference from amateur operators who use more powerful equipment. Such interference could lead to increased use of illegal power amplifiers by CB operators, which is already a problem, the Commission added.

Split FCC management of amateur and CB radio

The Commission has denied RM-2617, a petition filed by Ted Carver, of *CB News*, which sought to establish a "completely separate division for Citizens Band Radio" within FCC. Mr. Carver asserted that management of the CB Service is by a staff whose loyalties are with Amateur Radio interests, resulting in "haphazard" programs for CB radio and a lack of attention to the special needs and problems of CB operators.

When Mr. Carver filed his petition, the CB Radio Service was administered by the Amateur and Citizens Division of the Safety and Special (SS) Radio Services Bureau. In January 1979, the Commission reorganized the SS Radio Services Bureau and renamed it the Private Radio Bureau (PRB). The new Bureau is subdivided into the Policy Development, Rules, Licensing, and Compliance divisions. Each division is responsible for managing its function for all radio services assigned to the Bureau. According to the Commission, since no unit within the PRB can advance the special interests of a particular radio service, the petitioner's request was dismissed as moot.

Extension of time to comment on petitions for rulemaking

The FCC also denied a request from Stephen A. Ballo, KN3TFM, of Plymouth, PA, that the comment period for four petitions for rulemaking be extended. Mr. Ballo wished to address RM-3456, a petition to amend Part 97 to grant examination credit for previously licensed amateur operators; RM-3457, a petition to permit retransmission of NOAA weather broadcasts; RM-3458, a petition to change frequency and emission privileges to provide incentives to upgrade license class; and RM-3461, a petition to require endorsement of amateur licenses to permit repeater operation (see November 1979 *QST*, page 78). The Commission stated that it is aware of the fact that newsletters and other Amateur Radio periodicals frequently have publication dates which prevent current notice of Commission proceedings and that the petitioner learned of the petitions near the close of the comment period. In view of this, it will entertain a petition for acceptance for filing of late comments; however, it will not extend the actual comment deadline. [Editor's Note: As a general rule, FCC will accept written comments on an informal basis, even though the comment deadline has passed.]

AMATEUR RULES FOR LICENSE MODIFICATION CHANGED

FCC has amended the Amateur Radio rules, Part 97, to require that *all* requests for license modification be made on FCC Form 610 or, in the case of a club or military recreation station, FCC Form 610-B. The old rule permitted licensees to notify the Commission of name and/or address changes by letter.

The Commission also changed another license modification rule. Now, whenever FCC modifies a license, it will *automatically* renew the license for a five-year term. The old rule kept the expiration date the same.

Amateurs wishing to make a note of the exact wording of these rule changes in the ARRL *License Manual*, 77th edition, 1st and 2nd printings, should turn to pages 143 and 145.

In §97.13, paragraph (e) is deleted.

In §97.47, paragraph (c) is deleted.

Section 97.59 is amended to read as follows:

§97.59 License Term.

a) Amateur operator licenses are normally valid for a period of five years from the date of issuance of a new, modified or renewed license.

b) Amateur station licenses are normally valid for a period of five years from the date of

The TV crew from *Kid's World* visited ARRL hq. recently for a story about Amateur Radio. Jeffrey Bernstein (right), the 12-year-old who suggested the program to the Kids' World organization, is shown interviewing Bob Kenney, K1BOP, an instructor at Har-Bur Middle School, Harwinton/Burlington, CT. Students Brian Gouin, WB1ARF; Richard Lickwar, KA1CIF; Ruth Frost, KA1DPR; and Beth Mix, KA1DPQ (granddaughter of the late W1TS), along with instructor Don Gouin, K1CMM, also took part in the program. KA1CIF, a 14-year-old General class operator, made contact with WB9LJW from W1AW during the program.

issuance of a new, modified or renewed license. All amateur station licenses, regardless of when issued, will expire on the same date as the licensee's amateur operator license.

e) A duplicate license shall bear the same expiration date as the license for which it is a duplicate.

These changes became effective November 12.

RERUN OF ARRL ELECTIONS: CANADIAN AND GREAT LAKES DIVISIONS

Additional information relating to the eligibility of one of the candidates for ARRL director from the Canadian Division has caused a reballoting of the membership in Canada. The Executive Committee of the ARRL Board of Directors has found Fred Hammond, VE3HC, to be ineligible to run for director because he is director of the Hammond Manufacturing Company, which has only recently advertised linear amplifiers for amateur use. New ballots for director have been sent to members in that division and must be returned to ARRL hq. no later than noon on December 14, 1979. Balloting for vice director of the Canadian Division is unaffected.

In the Great Lakes Division, reballoting for director became necessary when it was learned that important pieces of information had been omitted from the director biographical resumes on the first ballot. The Executive Committee decided that such omission was likely to be prejudicial to the candidates involved, so corrected biographical resumes, together with new director ballots for the Great Lakes Division, have been mailed to members eligible to vote in that division. The second ballot for director must be received by ARRL hq. no later than noon, December 14, 1979. The vice director election in that division is not affected.

ARRL RESPONSE TO SECOND FCC FEE-REFUND PROPOSAL

ARRL agrees in part and disagrees in part with FCC's Second Notice of Inquiry which proposes a plan to partially refund fees of $20 or less collected under fee schedules adopted since and including 1970. The refund program in General Docket 78-316 has come about as a result of a number of decisions, in 1976, by the U.S. Court of Appeals for the District of Columbia Circuit, which held that fees collected under these schedules were unlawful. For more information, refer to October 1979 *QST*, page 76.

The League has disagreed with the Commission in its determination that the cost of processing an application for a simple renewal is equal to the cost of processing an application for a new license or for a new class, i.e. $5.72 for each. ARRL feels that processing a renewal application is merely a routine administrative task, whereas processing an application for a new license or new class of license involves far more, including administering an examination, grading of written examination papers, and passing certain legal qualifications. The League also disagrees with FCC cost figures for license-renewal and -modification applications. The cost of processing a simple renewal application clearly should be no more than the cost of processing a modification and renewal application. The Commission's calculated cost for processing an amateur application for both modification and simultaneous renewal is $2.05. If this is the case, the Commission's cost for processing a simple renewal application could be no more than $2.05, for a renewal is a less complicated procedure than a modification with renewal.

The League supports the Commission's desire to make the refund procedure as simple as possible, consistent with FCC's approach to simplify the administration of the refund program. In conclusion, the League urges that the Commission modify its cost schedule so that amateurs who paid $9 for a renewal, or modification with renewal, under the 1970 fee schedule would be entitled to a refund of not less than $6.95 for each.

The League also urged the Commission to keep the refund procedure as simple as possible and not require applicants to produce evidence such as a cancelled check or money order receipt, as many applicants paid in cash and/or did not anticipate a need to save these receipts. — *Richard K. Palm, K1CE*

BEHIND THE DIAMOND

This month, Behind the Diamond visits Alexander Gerli, alias "Sandy, America's Craziest / Yet." A native "Conn Man," Sandy hails from Greenwich. He was graduated from the University of Vermont with a BS in Business Administration in 1970. Thereupon, he worked for his hometown bank as a senior clerk and international loan service representative. In 1977, he arrived at ARRL hq. and found a home in the Technical Department as a technical information specialist, answering questions by letter and phone. He found that hams wrote more letters in the winter than in any other season; it must be too cold to be out playing with antennas! In September, 1977, he joined forces with the Membership Services Department, where he was involved with FCC rules-and-regulations interpretations, reciprocal licensing, RFI information and working as a coauthor of the League's new "Q & A Manuals." He also wrote many Behind the Diamond columns, but this month, the tables have turned! Sandy is presently assistant manager of the Advertising Department. First licensed in 1965 as WN1EEA, his station consisted of a DX-40 and an HQ-129X with a BFO that worked when it wanted to. Relicensed in 1976 as WB1ANO, Sandy passed the Advanced in 1977 and the Extra Class in 1978. In 1979, fresh out of licenses to try for, he took up square dancing, thanks to fellow staffer Marge Tenney, WB1FSN, a prominent promenader from the Membership Services Department. If this isn't enough, he also is a member of two opera companies. His specialty is Gilbert and Sullivan, and he operates the *very* low bands as a first tenor! So, if you hear a melodious CQ on 75, give Sandy a call — he's got a great singnal! — *Richard K. Palm, K1CE*

Alexander Nicoll Gerli, AC1Y

Washington Mailbox

Conducted By Richard K. Palm,* K1CE.

New Ham and Regs

As the proud owner of a new Novice ticket, you will soon be making the transition from an "off-the-air" type person to an "on-the-air" type person via the legendary *first contact* interface. This edition of Washington Mailbox will attempt to provide guidance among some of the first rules and regulations you will encounter.

Q. What is the basic purpose of the Amateur Radio Service, and what does it have to do with me?

A. The Amateur Radio Service is a *public service*, particularly with respect to providing emergency communications (97.1[a]). It contributes to the advancement of the radio art (97.1[b]), both in the *communications* and *technical* phases (97.1[c]). It is also the purpose of the Service to provide and expand a reservoir of *trained* operators, technicians, and electronics experts (97.1[d]) who continue to *enhance international goodwill* through the use of their unique abilities (97.1[e]). Of course, you knew this for the exam, but start off right by developing an operating attitude embracing this fundamental philosophy of Amateur Radio (97.1).

Q. Having just received my new ticket, where do I keep it?

A. Every Amateur Radio operator must have his or her original operator license whenever operating any Amateur Radio station (97.82). Additionally, at each fixed location from which an amateur call sign is being used there must be posted in a conspicuous place, or kept in the possession of the operator, either the original or a photocopy of the station license (97.83).

Q. The rules state that you must actually have two licenses to operate a station, but I received only one.

A. The Amateur Radio primary license consists of the station license and the operator license (97.3[d]).

Q. Now that I have my Novice class license, can I give my friend the Novice exam?

A. Negative. Novice examinations are conducted only by volunteer examiners who must be 18 years of age or older, hold a General class or higher class license and are unrelated to the applicant (97.28[b]).

Q. What must I do to legally identify my station while in operation?

A. Every amateur must identify at the beginning and end of a contact and every 10 minutes during a contact (97.84[a]). In net operations or contacts involving more than two amateurs, it is permissible to identify the net name followed by your call or one of the net stations followed by your call (97.84).

Q. That's all very well, but . . . what's a net?

A. A net is a group of Amateur Radio operators meeting at a certain time and frequency for direct contact. When involved in net operation, a legal station identification would be the net name, or net control station followed by your call: EMRISS NET DE KA1BJY, for example (97.84).

Q. After a contact, what should I enter in my log?

A. By regulation, if you are the station licensee, you are required to enter your call sign and signature, as well as the location and date that you initiated and terminated fixed-station operation (97.103). Also required are the dates and time periods the control operator was other than the station licensee, and the signature and call of that control operator. A notation of third-party traffic sent or received, including names of all third parties, is to be entered. Although the Commission requires only the above minimal information, many amateurs prefer to keep a more detailed log. It provides a useful history of the station; and many amateurs are proud of their well-kept log. Remember that it must be kept for one year following the date of the last entry (97.105).

Q. How can I be sure that I'm operating within the limits of the Novice subband?

A. You are required to employ a means of measuring your transmitting frequency independent of the transmitter (97.74). A good stable receiver is sufficient, if you calibrate it from time to time against a known frequency standard. Many hams use the National Bureau of Standards station, WWV, on 2.5, 5, 10 and 15 MHz for this purpose; others use Canadian station CHU, on 7.33 MHz (97.74).

Q. What if I am operating outside the limits of the subband unintentionally and receive a notice of violation from the Commission?

A. Any licensee receiving official notice of violation, shall, within 10 days, send a written reply direct to the office of the Commission originating the notice. If the notice relates to some violation that may be due to the physical or electrical characteristics of transmitting apparatus, the answer shall state fully what steps, if any, are taken to prevent future violations, and if any new apparatus is to be installed, the date the apparatus was ordered, the name of the manufacturer and the promised delivery date. If the notice of violation relates to some lack of attention to or improper operation of the transmitter, the name of the operator in charge will be given. If the answer is satisfactory to the Commission, that's the end of the matter. Another violation of the same rule within a year, however, would probably bring a "Notice of Apparent Liability for Forfeiture" — a fine, in plain English (97.137).

Q. Who is ultimately responsible for the operation of my station?

A. You are, as the station licensee, and any control operator you may designate (97.79).

Q. A ham friend wants to operate my station; how would he properly identify?

A. The call sign of the station that is being operated is always used. If the visiting operator has a higher class license and exceeds the limits of the station licensee's privileges, he would sign the station's call sign followed by his call sign (97.84).

Q. What does third-party traffic mean?

A. Third-party traffic is communications on behalf of anyone other than the control operators of the stations in contact. For example, a birthday greeting from an unlicensed friend to his grandmother (97.3[b]).

Q. Can amateurs handle third-party messages anywhere?

A. Third-party traffic is permitted between parties in the U.S. and possessions, but in order for U.S. amateurs to legally handle traffic between the U.S. and a foreign country, a special agreement must have been signed between the two governments. Traffic of a business or commercial nature is strictly forbidden (97.114).

Q. When should I renew my license?

A. An Amateur Radio license expires five years from its date of issuance (97.47). The Commission requires that you submit an FCC Form 610 (available from League hq., please include an s.a.s.e.) to their office in Gettysburg, PA, "within 90 days but not later than 30 days prior to the end of your license term." The Commission does not notify amateurs in advance of expiration. You are responsible for filing a renewal application. There is a one-year grace period under which you may still renew and retain your present call sign (97.47[b]), but you will not be able to operate until your renewed license is received. There is a five-year grace period during which you may renew without having to retake the examination (97.13[d]).

Q. Is it permissible to have fun while operating a station in the Amateur Radio Service?

A. *Yes.* These rules, after all, are mainly common sense and permit Amateur Radio to be a disciplined service where one amateur's fun does not spoil another ham's enjoyment.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by FCC staff. Interpretations contained herein concur with those of the Personal Radio Branch of the FCC. Numbers in parentheses refer to specific sections of the FCC rules.]

*Membership Services Assistant, ARRL

Correspondence

Conducted By Perry F. Williams,* W1UED

CODE A REQUIREMENT

☐ In response to your "Speak Up" editorial on page 9 of October *QST*, my wife WB3LNX and I have sent our disapprovals of changes to Article 41 of the ITU Radio Regulations to our senators, our representative and Private Radio Bureau Chief Carlos Roberts.

It is a *must* that the Morse code requirement be retained so that the standards for the Amateur Radio hf bands will not be lowered. — *James E. Cox, WB3EKC, Greensburg, PA*

☐ The editorial in October *QST* has caused me much concern about the future of the Amateur Radio avocation. Naturally I immediately fired off letters to the FCC and my Congressmen. However, I feel that the threat is of such a magnitude that everything possible should be done to stop the possibility of relaxing the code requirement at the WARC.

I have, since reading the editorial, gone on the air at least once a night and brought the editorial to the attention of at least one other amateur, convincing him or her to write both FCC and Congress. By October 10 I had received over 50 pledges! — *Vern A. Weiss, WA9VLK, Kankakee, IL*

☐ It is hard to get individual members to write the Bureau Chief, so we did the next best thing — our club members all signed a letter, expressing our opposition to any change in Article 41 of the ITU Radio Regulations. We do not want the world to eliminate the Morse code requirement below 144 MHz. — *Larry Lambert, NØILL, Smith Center, KS*

☐ I have sent letters to FCC and the State Department relative to the issue of eliminating the code requirements from Article 41 of the ITU Radio Regulations.

The Northern California DX Club suggested writing to the State Department to enlist their support in this matter. — *Hal Godfrey, N6AN, San Carlos, CA*

[Editor's Note: What a response! More than 400 people sent us copies of letters written in support of retaining the requirement in Article 41 of the ITU Radio Regulations that ". . . Any person operating the apparatus of an Amateur station shall have proved that he is able to send correctly by hand and to receive correctly by ear texts in Morse code signals." We have made sure that these letters reached the Department of State and Senator Goldwater, K7UGA, who is a member of the Subcommittee on Communications and who was to have visited the World Administrative Radio Conference during November. More information on how Article 41 is faring at Geneva appeared in the November *QST* editorial. We haven't been able to acknowledge all the letters from members. Let us just say thanks, here and now, to all of you who wrote.]

"SEND TO ARRL?" NO, TO ARRL *HQ.*

☐ Last night at a Quarter Century Wireless Association gathering it was mentioned that some comments should be sent to one's U.S. Representative, the Federal Communications Commission, and "to ARRL," with the inference at least that ARRL was located in Newington, Connecticut. I agreed with everything except the last!

We are ARRL, and *we* run ARRL through our duly elected director. A copy should be sent to him, and sending copies to the headquarters of ARRL in Newington is also advisable.

Often I see words equating the Hq. staff with ARRL, and ARRL being in Newington. Well, ARRL *is* in Newington, but it is equally in any place where there is a member! Let's make it more clear that ARRL is the membership, and it is simply its headquarters which is in Newington. — *Henry R. Greeb, W8CHT/N8XX, Cincinnati, OH*

STRANGE MAGIC, INDEED!

☐ I don't normally write to complain but after reading "Strange Magic" in the Public Service column of October *QST* I cannot remain silent.

Bob Halprin's remarks, about amateurs being inactive by choice and having no conception of how much fun Amateur Radio is, are ridiculous. "Getting on the air is fun," Halprin says. It is fun for some of us but not all. There are many activities in Amateur Radio that don't require handling traffic, chasing DX or working Field Day.

The U.S. Amateur Regulations, Section 97.1 (b) say that one of the bases and purposes of the Amateur Service is "Continuation and Extension of the amateur's proven ability to contribute to the advancement of the radio art." Paragraph (c) mentions "advancing skills in both the communication and technical phases of the art." The next section talks about "the existing reservoir of trained operators, technicians and electronics experts."

Technical aspects don't require a great love for being "on the air" every night or every week. But where would the state of the art, concerning radio, be without these technical people who don't get on the air? — *Stanley A. Sines, WA3QGZ, Laurel, MD*

RADIOLOGICAL MONITORING

[Editor's Note: The following report of a public service performed via repeater tied in so well with the letters in the September and November issues of *QST* that we decided to run it here instead of in the Public Service column.]

☐ The Triangle Amateur Radio Club and repeater station WR8AJL are conducting tests of background radiation levels on a weekly basis. Each Tuesday evening at 10:30 P.M., each operator reports the background radiation at his location, averaged over a five-minute period. The purpose is to determine what the normal radiation level is, over several weeks time, and to make sure that the radiation-monitoring equipment is functioning. The net is monitored by the Columbiana County Disaster Services Office, and the information is reported by them to the State Capitol at Columbus. William Maxey, WB8EDN, is the head coordinator for the project. — *Richard Feldman, K8HGY, East Liverpool, OH*

OFFICIAL THANKS

☐ The key to our disaster relief effort following the freak tornado of October 3, 1979, has been the ham radio operators who have kept our communication system working. Without the assistance of hams, our whole network would break down.

Please extend to all the ham operators my personal thanks for the time, effort, skill and patience with which they have handled this difficult task.

I know that they have now been working 24 hours a day for the past four days, but I have to ask you to have them stay on a little longer. We will continue to need their assistance for the next few days. — *Warren P. Johnson, Mayor, Town of Windsor, CT*

[Editor's Note: And three weeks after this letter was written on October 7, some of the operators were still engaged in relief work! Some information on amateur efforts appeared on page 110, November *QST*; more is featured in this issue.]

KUDOS

☐ Thanks for October *QST*, one of the finest I have read. Nearly every department earned my attention. The editing, artwork and consciousness of the variety of readers were outstanding.

To the volunteer editor of *Canadian News/fronts*, pages 70 and 71, special thanks. In 29 years of Amateur Radio, I never knew most of what you put into words this issue!

By all means let's have more international cartoons. Your first choice, the Finns ("International News," October *QST*), was a dandy.

Straight-Key Night sounded great. I seem to have missed one of the best times ever; I'll definitely be on in 1980!

And "Washington Mailbox" and "Happenings" fit right in with what we're doing in the Baltimore Amateur Radio Club. — *Donald C. Friedmann, W3QYL, Baltimore, MD*

AN UNCLE IN THE BUSINESS

☐ I blundered into electronics, and floundered around in the field during my first years of ex-

*Manager, Membership Services Dept., ARRL

perience, making a lot of mistakes in the process.

Having an "uncle in the business" sure would have helped. And there's an organization like that: Electronics Technicians Association, 7046 Doris Dr., Indianapolis, IN 46224. *QST* readers who are electronic technicians should find out about ETA and what it can do for them. — *Ed Jones, Jr., WB2DVL, Somerset, NJ*

SNIFFING OUT GOOD GADGETS

☐ I've just finished reading "A Simple RF Sniffer" in the October issue. Enjoyed it very much and am anticipating others in the series, which I'm sure will be equally enjoyable. These articles are a good start at putting us, the learning hams, back on the track to simple effective gadgets that do the job. — *Harry G. Bellows, KA8EZM, Mount Clemens, MI*

☐ I sense a new direction, or perhaps a resumption of original direction, for *QST* with its publication of "A Simple RF Sniffer," under the heading, "Basic Amateur Radio." The monthly continuation of this type of article should certainly appeal to those of us with five years or less experience, an article to solve a personal problem and an opportunity to review our own individual proficiencies. — *Marshall Gooden, KA8GWX, Taylor, MI*

AUTHOR, AUTHOR

☐ In the early 30s *QST's* George Grammer, W1DF, wrote me, obviously a young fellow, a beautiful two-page letter of appreciation and encouragement. He informed me that the Tri-Tet oscillator, a crystal-controlled electron-coupled oscillator I had suggested, would be covered in the next issue of *QST*.

The spirit of ARRL, The Old Man and George influenced this kid to become a Radio Inspector in Seattle. Duties at the laboratory in Laurel, Maryland, the Investigation and Certification Branch in Washington, Airways Communications Service, Coast Guard and Philco's TechRep Division followed.

It is hoped that the enclosed submission might interest some of the kids, perhaps not so unlike me. — *Hal Gullstad, W7AAK, Marysville, WA*

[Editor's Note: The "enclosed submission" mentioned turned out to be the quad antenna article on page 37 of this issue.]

QUALITY VS. QUANTITY IN CONTESTS, ROUND 2

☐ If VE3JRZ's letter in September *QST* had been published in the April issue, I would have laughed my head off. Sadly, though, it looks like he is serious!

His letter is like someone saying to a few hundred marathon runners: "Hey, guys, don't run like mad because I can't keep up with you. Take it easy, it doesn't matter who is faster. Let's sit down and talk with spectators about your running shoes, food, car, girl friend, job. Show how high you can lift your legs, demonstrate your style, keep you head up — we'll give you points for that. All this will make a nice collection of marathon stories, and people will love to read it."

Nobody forces anyone into contesting. If one likes to be competitive, then he had better start working on himself. There is a lot to do, and nothing comes easy.

I will be happy to have a nice, million-point ragchew with VE3JRZ — but not during the contest! — *Yuri Blanarovich, VE3BMV, Don Mills, ON*

OUTGUNNED

☐ Well, once again you people back there in never-never land have made me angry enough to write. The latest article to set my hair on end was Clarke Greene's column, "How's DX?" in the October issue of *QST*.

The communications mistakes made by his mythical WE4AA were certainly accurate, and I have no quarrel with them. I did, and do, object strongly to K1JX's obvious anti-hunting bias. It is not appropriate for *QST* to publish this sort of trash.

I'm not naive enough to believe that you people pay any attention to the members of the League. But I submit that the best thing that could happen to Amateur Radio would be to move ARRL hq. out of Newington, in fact out of the East, and replace most of the staffers with hams from other areas. I do not feel I'm represented within the League. The only hams really represented live in the East or in California. — *R. Lee Hendricks, KL7JEB, Concrete, WA*

[Editor's Note: Columns in *QST* are, of course, "signed opinion" and don't necessarily represent the viewpoint of anyone other than the columnist. This reader, unhappy with *one* columnist, has cast a shadow on the whole Hq. staff. One point worth making: The staff of ARRL has come East from most parts of the country (and South, from Canada!). WI calls prevail only because it is more convenient for active hams to modify to the area they are operating from. Even so, in the list of Hq. ops on page 36 you'll find several staff members who have retained their "native" call signs.]

MARS TIMES THREE

☐ Thanks for the article about MARS on page 57, September *QST*. My only concern with the story is that it singled out the Army branch of MARS for recognition in the Wichita Falls tornado disaster last spring. In fact, all three MARS services took part in the exercise.

For example, Bill Cadwallader, WB5NPR/NNNØETB, was the first Navy MARS operator sent into the disaster area; All other NAVMARCOR operators in that city were knocked off the air.

Bill arrived with a complete hf station, but the Air Force requisitioned his antenna to handle incoming and outgoing traffic for the air base!

We'll be looking for more MARS stories in the future. — *Lloyd Colston, WB5AXH/NNNØKIC, Ketchum, OK*

NOT QUITE THE FIRST

☐ The Wisconsin license plates bearing the words Amateur Radio, as shown on page 21, October *QST*, are not quite the first. North Carolina put these words on call letter plates in 1978. — *John G. Humphrey, WA4LWO, Horse Shoe, NC*

☐ Illinois license plates for the past 20 years have had "Amateur Radio" on them. — *Donald W. Johnson, K9MEC, Elgin, IL*

OUTRAGED AND DISMAYED

☐ As president of, and on behalf of, the Williamsburg Amateur Radio Club, I wish to submit the following observations and proposals for your consideration.

During the recent crisis involving Hurricanes David and Frederick we were outraged and dismayed by the frequent jamming of the Hurricane Watch Net on 14,325 kHz as well as other nets.

It was bad enough to have amateurs tuning up on frequency, making pointless, unnecessary check-ins or simply making comments critical of the jammers. This is a situation we do not like, have always had and must simply live with. Fortunately, for every one of these kids there were a thousand hams who simply listened, ready to step in if necessary, but not transmitting because there was no real need.

But the real tragic aspect of the situation was the deliberate jamming by unidentified stations. At times there were several stations at once jamming the net. This situation is simply intolerable. A massive effort will be required to counter this jamming.

We recommend that ARRL take the following actions:

a) Investigate the availability of direction-finding units capable of operating in the amateur hf bands. The unit must be portable and should be as inexpensive as possible without sacrificing sensitivity and accuracy.

b) Undertake a campaign to convince the Government that it is in the national interest to have amateur hf communications in time of emergency and that a grant of, say a million dollars would be a reasonable contribution to the furtherance of the communications capabilities.

c) With such a grant obtain several thousand such df units and distribute them to selected amateurs throughout the country, perhaps through the OO organization.

It is to be admitted that amateurs chasing around with df units have no police powers and particularly do not have rights of entry and search. But at least some of the time they should be able to identify the particular site of the jammer and could convey this to the FCC. Even the knowledge that there are several thousand df-equipped amateurs out there would hold down on the jamming.

In summary, the proposed approach is quite radical by amateur standards and involves government participation in amateur affairs to a greater extent that ever before. But no simple solution exists and something must be done. — *Robert M. Stewart, WD4CNG, Williamsburg, VA*

[Editor's Note: This letter was picked, almost at random, from some dozens received at Hq. since Hurricanes David and Frederick, to represent a great many concerned writers, and to serve as a springboard for discussion. The jamming was bad, all right. But some observers felt the problem was made worse by other amateurs, making comments over the air about the jammers. Their remarks simply showered attention on sick people craving it! The thought of vigilante-type action will make many of us nervous; that may not necessarily be the way to go. Some greater government/amateur cooperation is already underway, under the sponsorship of Representative Corman of California, looking toward devoting a portion of FCC's resources to helping amateurs with the hard-core cases among us. With that support for the one percent, amateurs can be self-policing the other ninety-nine percent of the time. Whatever, there *is* a problem; perhaps your club will want to devote some time to discussing it.]

In Training

A SIMPLE 3.5-MHz RECEIVER AS A GENERAL CLASS PROJECT

The response was clear. Over half of you who requested more information on the 80-meter VFO project featured in September's column asked when we were going to feature a receiver. "This is great," you said. "Now let's have a receiver to go with it!"

Here it is. This receiver first appeared in November 1968 *QST*. The authors are Wes Hayward, W7ZOI and Dick Bingham, W7WKR. It was later included in *Understanding Amateur Radio* (ARRL, $5), pages 120-122. The schematic is shown elsewhere on this page with the parts listed in the caption. For space considerations, however, we've left it to you to look up the construction data and circuit description.

This receiver would make an excellent General class construction project. While any simple circuit would work well, there are some things about this one that make it ideal for classroom use.

First of all, it's *simple*. Our concern in teaching should be with understanding the basics of radio. The important thing is that this project is clear and easy to comprehend. State-of-the-art projects can come later.

Second, its three main circuits are easily built on three small (2- × 2-1/2-in. — 51- × 64-mm) perforated vector boards. This modular construction not only makes it easy to assign as homework, a unit at a time, but comprises a *working block diagram* of the receiver, as well.

Third, the parts are relatively easy to find. The air-variable capacitors and the 88-mH toroid are the only ones that might present a problem. The only tricky wiring occurs when sorting out the leads on T1 and T2. The easiest way to ensure proper wiring of these trifilar toroids is to use multicolored wire. Special wire is available for this purpose or you can buy three colors of no. 28 enamel wire and use one length of each to make up the three strands. Fig. 2 shows how to connect the leads. Proper wiring is crucial as the circuit must be kept in phase.

Last, but not least, it is powered by a 9-volt battery. This makes it possible to avoid assigning a power supply project, as well.

Each of the modular units can be worked into the week's lesson covering that topic. Use the circuits, in addition to the ones in the *ARRL Official Instructor's Manual*, to illustrate the lesson. By incorporating the project into the course, each student not only gains skill in homebrewing but achieves a working knowledge of a direct conversion receiver. Such knowledge is not likely to be forgotten, even under the pressure of exam jitters.

This is a good time to mention that I *do not* recommend the use of printed circuit boards for classroom projects. It is too easy to drop the components into the holes as marked and *still* have no idea of how the circuit is wired. This project is so simple that pc boards are not a logistical necessity. I leave them for the convenience of experienced builders. *Understanding* is the prime objective here.

For hints about pre-course preparation, see the 80-meter VFO course outline mentioned in September's column. It is available from C&TD for 25 cents and an s.a.s.e. Also, don't forget to register your General class with C&TD for free *General Workbooks* and graduation materials. — *Jeunette M. Stumbo Zaimes, ARIP*

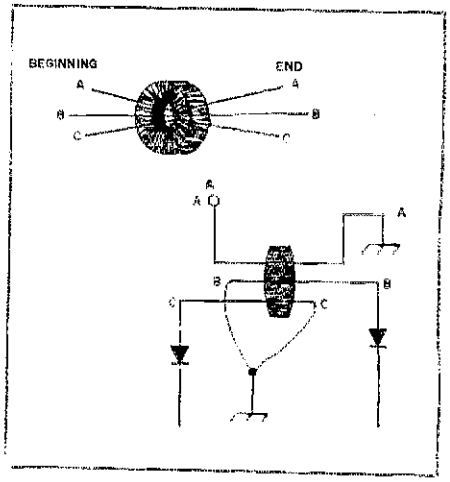


Fig. 1 — How to connect T1 and T2 of the 80-meter receiver.

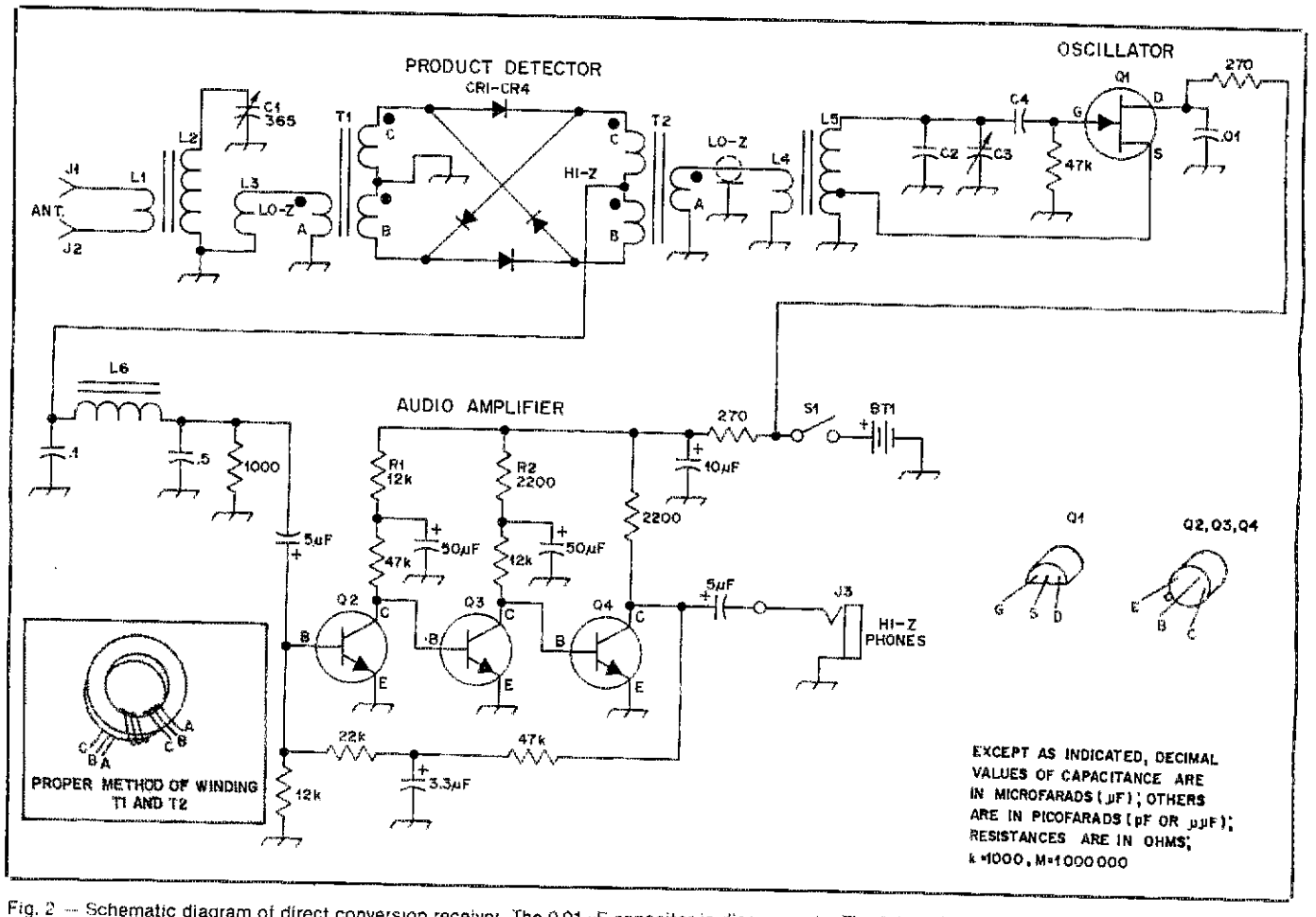


Fig. 2 — Schematic diagram of direct conversion receiver. The 0.01-μF capacitor is disc ceramic. The 0.1- and 0.5-μF capacitors are paper or mylar. Polarized capacitors are 15-volt electrolytic. Fixed resistors are 1/2-watt carbon.

BT1 — 9-volt transistor radio battery.
C1 — 365-pF variable.
C2 — 470-pF silver mica.
C3 — 140-pF variable.
C4 — 680-pF silver mica.
J1, J2 — Insulated banana jacks.
J3 — Phone jack.
L1, L3 — 3-turn link, no. 28 enameled wire, wound on L2.
L2 — 40-turns, no. 28 enameled wire, wound on 0.68-inch diameter toroid.
L4 — 5-turn link, no. 22 enameled wire, wound on L5.
L5 — 22-turns, no. 22 enameled wire, wound on 0.68-inch diameter toroid; tapped 5 turns from ground end (T-68-2).
L6 — 88-mH toroid.
Q1 — Motorola MPF-102.
Q2, Q3, Q4 — Npn, RCA 40233 or equiv.
S1 — Spst toggle.

YL News and Views

Conducted By Jean Peacor,* K1IVJ

An Even Dozen

The original question was "How many licensed women are there out there?" The year, 1939! Most of you know, that's how YLRL was born.

As we approach 1980, it seems appropriate to again ask the same question. How many licensed women are out there? Census has it, according to the 1979 *Callbook*, as 22,438 licensed women Amateur Radio operators in the U.S. alone. But, where are you and what are you doing? We'd like to hear from you.

The Young Ladies' Radio League is moving into its 41st year. Originally formed by what has become the "famous 12," its membership has increased to over 1300 in 40 years. This is the only international organization for licensed women Amateur Radio operators. October *QST*, page 80, has information on how to join; membership is open to worldwide YLs.

Why join any league? Because they bring together a group of persons united by common goals and interests.

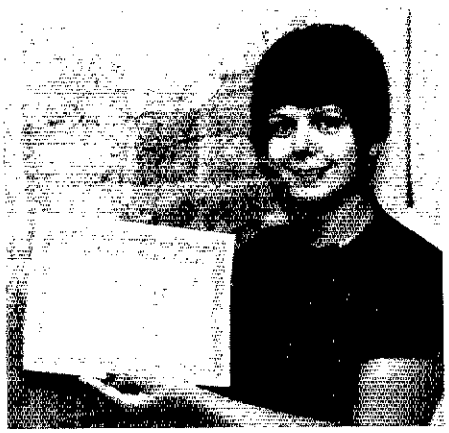
YLRL's recent election of officers has produced a fine slate for 1980. Starting January 1, Blanche Randles, K1IZT/W4GXZ, will be president. She is married to Wes, W4COW/K1HTK, and they live in Marlboro, MA. First licensed as W4GXZ in Jacksonville, FL, Blanche joined YLRL in 1954. She later served as secretary, vice president and then as president in 1964. She's a past president of Women Radio Operators of New England (WRONE) and is a charter member of Yankee Chapter QCWA. Blanche is widely known, much respected and very friendly. 1980 will be an exciting year under her leadership.

YLRL's newly elected president, Blanche Randles, K1IZT/W4GXZ.

Officers who will also serve are Vice President Ione O'Donnell, WA2DMK; Secretary Kay Eyman, WAØWOF; Receiving Treasurer Ruth Jank, K5OPT; Disbursing Treasurer Gladys Zickler, WB2RWT. District Chairmen: 1st — Kathryn Wilson, WA1WQM; 2nd — Bernice Hanrahan, W2UGY; 3rd — Ruthanna Pearson, WB3CQN; 4th — Jo Frances Melton, WB4NKO; 5th — Joyce Kepler, W5MWK; 6th — Jeanie Parker, WA6UVF; 7th — Shirlee Moore, WB7QOM; 8th — Donna Burch, W8QOY; 9th — Marilyn Backys, WB9TDR; 10th — Dorothy Johnson, WBØSNZ; KH6 — Amy Jo Ruehle, AH6AE; KL7 — Cynthia Henry, WL7ACV; VE — Tess Hardie, VE3H1R.

October *QST* also listed YLRL's many contests and certificates which they sponsor. Certificate rules are listed below.

The original 12 now have added two zeroes to their number. 1980 could easily add another.



WAS YL Custodian, Stella McPherson, WA4WPN. Interested in all aspects of Amateur Radio, Stella also enjoys photography and home decorating. Her OM is AF4C.

WORKED ALL STATES — YL — WAS/YL

Custodian: Stella McPherson, WA4WPN, 2029 Elbow Rd., Chesapeake, VA 23320.

1) Contact with a duly licensed YL in each state. DC may be substituted for Maryland. Any and all amateur bands may be used. ARRL "Single Community" rule applies. No time or band limitations.

2) Fifty QSL cards or written communication from stations worked confirming the necessary two-way contacts should be submitted by the applicant with an alphabetical by state list, showing call of station worked, date, band, and whether A1 or A3.

3) Sufficient postage must be sent to finance return of QSLs by first-class mail to the custodian. The YLRL will not be responsible for any loss or damage to same.

WORKED ALL CONTINENTS — YL (WAC/YL)

Custodian: Miriam Blackburn, W3UUG, Box 2, Ingomar, PA 15127.

1) The Young Ladies Radio League issues a Worked All Continent-YL (WAC/YL) Certificate to any licensed amateur in the world.

2) Two-way communication must be established on the Amateur Radio bands with the six continents: North America, South America, Europe, Africa, Asia and Oceania. Any and all authorized Amateur Radio bands may be used. Crossband contacts are permitted; contacts may have been made over any period of years.

3) Contacts with all six continents must be made with duly licensed women operators.

4) Contacts with all six continents must be made from the same location. Within a given community, one location may be defined as from places no two of which are more than 25 miles apart.

5) Six QSL cards or other written confirmations, showing proof of contacts must be submitted with a list of contacts. Sufficient postage (or IRCs) must be sent to finance their return by first-class mail. The YLRL will not be responsible for any loss or damage to same.

6) Decisions of the WAC/YL custodian regarding interpretation of these rules as here stated, or later amended, shall be final.

DX-YL CERTIFICATE

Custodian: Emma Berg, WØJUV, RFD 2 — Box 171, Lawrence, KS 66044.

1) Available to licensed YL operators only, for working 25 other licensed women operators outside their own country on or after April 1, 1958. (U.S. and possessions are counted as separate countries as well as Alaska and Hawaii.)

2) Contacts do not have to be with 25 different countries, just 25 DX YLs.

3) All QSOs must be made from one QTH, or within a 25-mile radius.

4) Do *not* send QSL cards for this award.

5) Send copy of log to DX YL custodian. Log must show: date, time, station, band, mode, RST reports and your own QTH and name.

6) Endorsements: Stickers will be awarded for each group of 10 additional DX YLs, subject to the same confirmation as above.

7) YLs in the U.S. may send postage stamps in any amount to help with cost of mailing their certificates, but no charge is made for the certificate.

DX-YLCC CERTIFICATE

Custodian: Phyllis Shanks, W2GLB, 7 Lake Circle Dr., Vicksburg, MS 39180. Assistant certificate custodians: I8KDB and DL3LS (DX stations send to the one nearest you).

1) Two-way communication must be established on authorized amateur bands with stations fixed or mobile, operated by 100 different licensed DX YLs with not more than two (2) YL contacts from any one country, to total the 100 contacts for certificate.

2) All contacts must be made from the same location, or community not to exceed 25 miles from base station.

3) Any band or mode (except crossband contacts) may be used.

4) Contact with all DX YLs located in countries on the present ARRL Countries List to be counted, provided that the confirmation clearly indicates the station was operated by a duly licensed woman amateur operator.

5) QSLs are to accompany all requests for certificates, along with a list in alphabetical order by countries of call, name, band and mode. Sufficient postage (or IRCs) must be sent to finance the return of cards by first-class mail. YLRL will not be responsible for any loss or damage to same.

6) Endorsements: After receiving certificate, a Silver Sticker will be awarded for any 25 different DX YL contacts, representing five countries. Same list and postage requirements as on the original application.

7) Decisions of the custodian regarding interpretations of these rules or later as amended shall be final.

*Country Club Dr., Monson, MA 01057

Silent Keys

It is with deep regret that we record the passing of these amateurs:

WA1CTI, Carl C. Wilson, Sanbornville, NH
ex-W1GYX, Robert Greenway, Providence, RI
WA1ILN, Robert E. Holmes, Plymouth, MA
W1JZO, Edward S. Barrows, Guilford, CT
W1KFJ, Anthony C. Rosselli, Somerville, MA
WA1NGK, George E. Howser, Amherst, NH
WA1QAJ, Charles W. McKinnon, Kingston, MA
W2BED, Samuel Levin, Jamaica, NY
WB2HUE, Alan S. Thomas, Millville, NJ
W2JSU, Sylvester E. Brendel, Maspeth, NY
K2LRV, William A. Hall, Rome, NY
WB2MBX, Edwin M. Koch, Deposit, NY
W2QPC, Richard H. Holland, Sr., Hamesport, NJ
WB2RFO, Malvern B. Ehlers, Sr., Stony Point, NY
W2SWE, Edward Malecki, Toms River, NJ
W2VTR, Bruce L. Elle, E. Bloomfield, NY
W2XT, Edward W. Dunn, Fairport, NY
*W2ZDP, Andrew P. Dachnowicz, Mountainside, NJ
KA3BCE, Clifford H. Eley, Annapolis, MD
W3EDC, Leonard A. Apfelbaum, North Hills, PA
K3RUN, Lt. Col. William C. Poole, Laurel, MD
W3UD, Harold J. Caum, Altoona, PA
W3VW, William J. Taylor, Pittsburgh, PA
W4AKB, Charles W. Schiffer, Jr., Coral Gables FL
ex-W4AMP, John H. Fessenden, Tampa, FL
W4AX, David P. Shafer, Richmond, VA
WA4BWA, Hugh W. Granberry, Brandon, FL
N4BY, Charles H. Intvre, Port Richey, FL
WD4CZS, Yewell M. Hodges, Jr., South Hill, VA
W4EOR, Olin B. Robinson, Macon, GA
K4JPC, Harry D. Young, Stuart, FL
k4kVF, Victor N. Chambless, Jr., San Antonio, TX
*Life Member

W4NAJ, Robert Farrell, Dunedin, FL
W4NUQ, Bethel P. Brown, Henderson, KY
*W4TXL, Zachary T. Reynolds, Winston-Salem, NC
W4ULL, Russell B. Taylor, Chesapeake, VA
WB4UYC, Wade H. Myers, Durham, NC
WB4YKJ, James G. Housman, Melbourne, FL
WA4YNY, John D. Knight, St. Petersburg, FL
W4YYA, Sharon F. Willett, Frostproof, FL
W4ZM, Edmund B. Redington, Springfield, VA
W5AKU, Verie H. Huckaby, Brownwood, TX
WD5DVQ, Charles H. Edwards, Jr., Ruston, LA
W5DYA, Emily W. Bird, Ft. Worth, TX
W5IJV, Harry T. Sullivan, Hobbs, NM
K5LRY, William F. Anderson, Albuquerque, NM
W5MZO, Arthur Kepner, Tyler, TX
W5QFI, Douglas E. Stewart, Shreveport, LA
K5ZTZ, James G. Dryden, Houston, TX
WA6ANS, Alvaro C. Mincher, South Laguna, CA
K6BIG, Kenneth W. Herkimer, Orange, CA
N6BMG, Dr. Stuart C. Cullen, Belvedere, CA
W6DAE, Alphonse Spatola, San Jose, CA
WB6DYL, Virgil N. Broadstone, Alhambra, CA
W6EPZ, Horton C. Kessler, Coronado, CA
K6GDP, Ralph O. Parker, Granada Hills, CA
WB6GGT, Harold J. Palethorpe, Temple City, CA
W6HFT, Alfred L. Callahan, Paradise, CA
K6HM, Martell E. Montgomery, Banning, CA
WB6LLF, John D. Rathman, Diamond Bar, CA
K6MPI, Lawrence G. Dodd, Palmdale, CA
WB6OEZ, Almon G. Ing, Los Angeles, CA
W6PJ, Charles W. Endres, Lake Isabella, CA
WB6QDX, William J. Kennedy, Vista, CA
W6QEW, Jeff S. Davis, Yucaipa, CA
W6QPF, Robert B. Series, Dinuba, CA
W6SR, Carl L. Louis, Petaluma, CA

W6TUS, Zolton J. Hollub, Camarillo, CA
W6ZX/W6PQQ, Ernest M. Griffith, Coronado, CA
ex-W7CYW, Paul R. DeChamplain, Chehalis, WA
K7HAW, George M. Algeo, Cheyenne, WY
K7MKI, Ray B. Votaw, Naco, AZ
W7VT, Edward S. Hill, Tucson, AZ
WB7WOL, Herbert J. Harris, Scarsdale, NY
WD8DSS, Francis R. Wagner, Williamsburg, MI
W8DZD, Raymond E. Carroll, Ann Arbor, MI
KA8FTA, John J. Bor, Fremont, OH
W8GYJ, George A. Wilson, Mason, OH
W8ICK, John Gorsky, Lester, WV
W8IDJ, Fred A. Baker, Belmont, OH
W8RNZ, Russell S. Forgrave, Columbus, OH
W8TXZ, Arthur I. Ludlow, Lorain, OH
W8VUY, George J. McDonald, Newark, OH
K9BOC, Dorothy E. Galitz, Chicago, IL
W9EIV, Joseph A. Chasey, Indianapolis, IN
WD9HFF, Charles J. Joachim, Chicago, IL
W9IOW, William J. Moriarty, Indianapolis, IN
*WA9KZV, Horace T. Keigwin, Walnut, IL
K9PPI, Harry L. Rondeau, Marinette, WI
KØAHV, Kenneth W. Miller, Sioux City, IA
WØBAU, William H. Parker, Kansas City, MO
WØFUH, Leonard H. Guldman, Greenwood Village, CO
KØIAL, Cloyd A. Harnish, Bellevue, NE
WAØNDB, Arthur L. Stigers, Golden, CO
VE1XW, Stewart T. Delo, Moncton, NB
VE2DS, Andre Dandurand, Montreal, PQ
VE3BEK, Auvo Olavi Este, Thunder Bay, ON
VE3XL, Eric N. Rush, Kitchener, ON
VE4VY, Michael Sawczynski, Winnipeg, MB
VE7CEK, M. A. Kuczerepa, Vancouver, BC
TG9MY, Nathan R. Myers, Guatemala City, Guatemala

Club Notes

Peanut butter and jelly, flowers and springtime, ARRL and affiliated clubs — all these go together naturally. ARRL affiliation of clubs works as a two-way street of togetherness; the League provides things for clubs and clubs provide things for the League. A club, as an example, may put on an ARRL National Convention; we provide backup support, ARRL staffers as speakers and other aids. Or, we ask a club to set up a display at a nearby public library whose librarian has contacted us about Amateur Radio week; we supply and ship exhibit materials. Affiliated clubs are the workhorses of the League and the backbone of organized field activities.

ARRL affiliated clubs are non-commercial amateur radio groups "... of kindred aims and purposes with a view to forming a homogeneous organization for unity of action in matters affecting amateur welfare." So states the ARRL Articles of Association. Approximately 2200 societies across the United States and Canada (and even a few in other countries) are actively affiliated with the League. Actively affiliated means that we receive annual reports from them and that they receive regular mailings from us.

One hundred percent supporters of ARRL — that's what a 100 Percent Club is. Of the 2200 active affiliates, one in 20 is a 100 Percent Club; that is, *all* of their *voting members* are ARRL members. These societies, many requiring ARRL membership as one of their membership prerequisites, express their sympathy with, and allegiance to, the aims and policies of the League. ARRL can't please everyone all of the time; but we keep trying to perfect our act by making the most members and clubs happy. The 100 Percent Clubs know that! Total support and constant faith in the system, working through it to perfect it, are these clubs' attributes. These clubs are the elite.

Below is a list of the 100 Percent Clubs for 1979. This is our way of honoring them for their trust and work. A certificate attesting to such goes to these special groups. Congratulations and thanks!

100 Percent Clubs

Alamo DX Amigos, San Antonio, TX; AMT ARC, Stanford, CA; Anderson RC, Williamston, SC; Apple Valley ARC, Cranston, RI; Azalea Coast ARC, Wilmington, NC; Bedford RC, Carlisle, MA; Central Florida DX Association, Casselberry, FL; Central Kansas ARC, Salina, KS; Charles River Wireless Society, Walpole, MA; Chattanooga ARC, Chattanooga, TN; Chicago Radio Traffic Association, Chicago, IL; Communications Club of New Rochelle, Mt. Vernon, NY; CW Operators, Santa Rosa, CA; Datapoint Amateur & Technicians Association, San Antonio, TX; Eastern Ohio Amateur's Association, St. Clairsville, OH; Elkhart County Red Cross ARC, Osceda, IN; Fort Wayne DX Association, Fort Wayne, IN; Fountain City RC, Knoxville, TN; Gratiot ARA, St. Louis, MI; Greater New Orleans ARC, New Orleans, LA; Inglewood ARC, Los Angeles, CA; Jessamine Amateur Wireless Society, Nicholasville, KY; Lake Area Radio Klub, Watertown, SD; LaSalle ARA, Trout, LA; Long Island Chapter QCWA, Wantagh, NY; Loudon County ARC, Lenoir City, TN; Louisville Gas & Electric Co. ARC, Louisville, KY; Marinette & Menominee ARC, Stephenson, MI; Massillon ARC, Massillon, OH; Mason County RC, Ludington, MI; Miami County ARC, Osawatomie, KS; Mid-South DX Association, Germantown, TN; National Capitol DX Association, Derwood, MD; Norfolk County Radio Association, Norwood, MA; Norfolk RC, Norfolk, NE; North Alabama DX Club, Huntsville, AL; North Augusta-Belvedere RC, Aiken, SC; North East Nebraska RC, Norfolk, NE; Oldfield ARC, Gaffney, SC; Pacific Radio Amateur Transmitting Society, Kaneohe, HI; Paducah "ARES" Club, Paducah, KY; Paynesville ARA, Paynesville, MN; Point Radio Operating Society, Pittsburgh, PA; Potomac Area VHF Society, Damascus, MD; Radio Operators Assn. of New Bedford, Wareham, MA; Reynolds ARC, Corpus Christi, TX; Rockaway ARC, Ridgewood, NY; Rocky Mountain VHF Society, Boulder, CO; Saginaw DX Association, Saginaw, MI; Shelby RC, Shelby, NC; Skagit ARC, Kirkland, WA; Skokie Six Meter Indians, Skokie, IL; Skylands ARC, Pompton Plains, NJ; Smoky Mountain ARC, Maryville, TN; Society Radio Operators; Chicago, IL; South Bay ARA, Fremont, CA; South Florida DX Association, Margate, FL; South Jersey DX Association, Egg Harbor, NJ; South Kansas DX Association, Wichita, KS; Southwestern Oklahoma Repeater Association, Altus, OK; Student Pace ARC, Hudson, NY; Tamaqua Pennsylvania Transmitting Society, Tamaqua, PA; Valley ARC, Apple Valley, MN; Virginia Century Club, Norfolk, VA; Wellington ARC, Wellington, KS; Wildcat ARS, Fresno, CA; W/K ARC of Greater Milwaukee, So. Milwaukee, WI; Whidbey Island DX Club, Oak Harbor, WA; Woodland Baptist ARC, Louisville, KY; Idaho Society of Radio Amateurs, Jerome, ID. — *Rosalie White, WA1STO*

Strays

QST congratulates . . .

☐ Stan Kaisel, K6UD, who has been elected to the Board of Directors of the Northern California DX Foundation.

☐ Alex Benn, N2ATT, of West Deal, NJ, who obtained his Novice at nine years of age, Tech and General at 10 and Advanced at 12 years of age. Good work, Alex, and enjoy the sixth grade.

☐ Ivan S. Coggeshall, KA1AVG, author of "Amateur Wireless Watch Over Atlantic Sea-Lanes — Newport, 1908-1911" and "Maritime History of Electrical Communication." Coggie drove back to his home in RI from Canandaigua, NY, on his 83rd birthday, with the Antique Wireless Association's Houck Award for Documentation. This plaque is awarded "for outstanding documentation of the history of early wireless."

☐ Steven L. Gumport, M.D., WB2RVU, recipient of the coveted Skin Cancer Foundation Award. The award is accompanied by a sizable grant which will allow Steve's further research, study and treatment programs in melanoma.

☐ Petty Officer First Class John Gibson, K7DTS, of the Naval Training Center, Orlando, FL, Basic Electricity and Electronics School. John recently received a check for almost $1200 for suggestions which saved the taxpayers many times that amount. His money-saving ideas included improvements to such things as a microfilm viewer, a small circuit board for electronic analysis training, an oscilloscope and a function generator. John is familiar to many local hams on 2 meters and is also active on MARS as AD1NRZ. — *from* Listening Post *Orlando, ARC*

☐ Richard William Gotta, N2HF, for being elected and installed as a Grand Master of the Independent Order of Odd Fellows of New Jersey. The Odd Fellows are a worldwide fraternal organization and Brother Gotta is now its leader in New Jersey. He is also a member of the Odd Fellows ARC, whose members meet on the air in the spirit of Odd Fellowship.

How's DX?

Conducted By Clarke Greene,* K1JX

"Some Prefer the Mountains, Others Choose the Beach"

Back in elementary school, most of us spent the first week of each school year writing about how we spent our summer vacation. Here is a letter from three Greek hams describing theirs:

"On July 20, 1979, we were notified that we would be permitted to operate from Mt. Athos. We started out from Athens on the afternoon of Monday, the 6th of August. Thanks to SV1DC, who put in 12 straight hours of driving, Mt. Athos was on the air Tuesday afternoon, August 7.

"Due to the long distance over which heavy equipment such as the generator and the transceiver had to be carried, we were not able to bring along antennas for 40 or 80 meters. Only a compact 12AVQ trap vertical for 10, 15 and 20 meters was taken. The rig used was a Kenwood TS520 along with an external VFO for split frequency operation. Power was provided by a Honda generator.

"Our total time of operation was 70 hours. Over 8000 QSOs were made during that time. That makes about 114 QSOs per hour. SV1JG was top scorer with 2800 QSOs. Most of the contacts were made on 20 and 15 meters because propagation on 10 meters was very poor. Conditions were excellent to Europe, North and South America, Africa and Oceania, but were very poor to Asia so only a few stations from that area managed to get through.

"Mt. Athos stopped transmitting at 0200 UTC on August the 11th. The DXpedition to Mt. Athos was the outcome of long discussions with the Community of the Holy Mountain, and great efforts on the part of all of us. Our special thanks go to OK2BKR, WB8ZJW, UA6JAD, OH2BH and OH2BBR."

That letter was signed by SV1DC, SV1IW and SV1JG. A summer trip spent in the mountains like *that* would be enough for most of us. An attached letter continues:

"After the Mt. Athos expedition two of the operators, SV1IW and SV1JG, along with SV1KP, went to the island of Crete for a vacation style DXpedition.

"In 10 days of staying on the island, the three made 6000 QSOs. Top scorer this time was SV1IW with 2200 QSOs (a thousand of them on cw). An extra on that expedition was Natasha, SV1KP, who became the first YL to operate from Crete. Activity was spread all over five bands on both cw and ssb. Propagation was excellent to Asia and Oceania but was very poor to North America.

"We also wish to thank all amateurs for their cooperation on that effort too."

SV1IW, SV1JG and SV1KP signed that letter. See photo, next page.

How did you spend your summer?

ABOUT THOSE SURVEYS

Whew! When we printed those dotted lines on page 89 of September *QST*, we really didn't anticipate the response we ultimately received. By the time those last few envelopes postmarked September 20 dribbled in, over *1200* surveys had been collected in a cardboard box. As promised, we reached into the box, groped about a bit, and pulled out three surveys. Those three surveys were torn out of (or photocopied from) the magazines of WD9ION, WA6TKT and NØAYM. All three will be receiving 1980 DX *Callbooks*, just about in time to ring in the new year.

While we can only personally thank three of you with these tokens, we really want to thank all of you who took the time to fill out a survey and mail it in. Several of the suggestions people made have already been implemented, and you'll hear of more of them in the months to come. If you are pleased with some of the changes, let us know. Furthermore, if you are unhappy with something we may say or do, don't wait until the next reader's survey to let us know.

Along the lines of letting people know your likes and dislikes, we have two suggestions. The first concerns DXCC matters. If you have a specific question or problem with your DXCC, contact W3AZD at ARRL headquarters. He is the person most qualified to help you out. The second suggestion involves DX political matters; topics such as whether a country should be deleted, what constitutes a country, amendments to the DXCC rules or whatever. Whenever you wish to voice your opinion on any of these topics, contact your representative on the DX Advisory Committee. He is in a position to not only listen to your ideas, but actually act on them. Just as with specific DXCC problems, we at "How's DX?" are very willing to listen to what you have to say, but the fellow at the DXCC or DXAC desk is the only one who offers more than just a sympathetic ear.

FOR UP-TO-THE-MINUTE REPORTS

A few months ago, we presented a list of up-to-the-minute sources of DX information. It seems DXers can't ever get enough. A couple more have surfaced or resurfaced, as the case may be.

The West Coast DX Bulletin was for 10 years one of the staples of DX information. Under the guidance (reporting, editing, publishing and mailing, too!) of Hugh Cassidy, WA6AUD, WCDXB grew into a weekly newsletter of more than 10 pages. To keep this one-man show humanly possible, the readership was held to a maximum of about 3000. Others wanted to be included in the subscription ranks too, but there are limits as to what one man can do.

When "Cass" decided to retire last summer, the DX world felt a void about to descend. Relief arrived on the scene in the forms of K5AAD, K5RC and K1TN. *The DX Bulletin*, as it is now called, began life when the WCDXB passed on. The tradition of quality is still being maintained, and best of all, anyone can subscribe. For further details contact: *The DX Bulletin*, 306 Vernon Ave., Vernon, CT 06066.

A very extensive QSL manager listing is published monthly by the QSL Management Association of Japan. Not only are over 150 managers listed each month, but the address of the manager is published also. Lest you all fear the same thing, most of the bulletin, including all the aforementioned listings, is printed in English. For information on this one, contact Hiromichi Katsurashima, JH1HWN, 5-2236-33 Iriya, Zamacity, Kanagwa, Japan.

This last bulletin requires appreciating a little background. For untold years, W9BRD slavishly wrote "How's DX?" In addition to his legendary wit, as related by Jeeves, Rod had periodical listings of what was worked where, and who was on when. These listings were literally reference tables for DXers; indeed many a DXer's station sported the current month's "How's DX?" column taped to the station loudspeaker.

When we (editorially we) began coordinating "How's DX?" we were faced with a dilemma. How does one successfully replace such institutions as Whence and Where? To further complicate the situation, lots of things had changed since W9BRD began printing his listings. Perhaps the most obvious change is the proliferation throughout the world of the transceiver. DX stations just aren't crystal controlled as they once were. It wasn't that long ago that a person wishing to work Turkey would automatically know to go to 7026 after 2300 UTC where TA2s held forth. Today the DX moves all around. A second problem is the speed of today's travel. The miracle of the passenger jet allows expeditions to the most exotic places to take place virtually overnight. This is tremendous for the DXer, but causes ulcers in those few who have to chronicle these events and maintain a two-to-three-month publication lead time. Even the best of the weekly newsheets is subject to the shortcomings of the postal system. It appears two-month activity listings just aren't practical any more.

Is There Any Hope?

We think so. Early last summer, we approached W1XX at ARRL headquarters with our idea. Why not avoid the delays wrought by publishing and mailing DX Bulletins? Since every DXer needs a radio to work DX, why not utilize that very resource to provide DX information?

The outcome of all this has been heard on W1AW for over two months by the time you read this. Every Friday, UTC, all the W1AW official bulletins are superseded by W1AW DX bulletins. These bulletins provide the very latest in DX information as provided by the members of the National Capital DX Association. In this way, the information is at *most* seven days old by the time it reaches you. No reporting system can replace on-the-air diligence, but this might help out, just a bit.

Back at the Polls Again

One of the questions asked on the reader's survey was whether or not you belonged to a DX club. One earnest fellow replied that no, he didn't belong to one, but he would join if he knew who to contact in his local DX club. Many of you might feel the same way, so here's a list of DX-oriented clubs and who to contact if you want to join.

Fraser Valley DX Club, Henry Thel, VE7WJ, Box 3112, Langley V3A 4R3 BC Canada.

Winnipeg DX Club, W. A. Stunden, VE4BJ, Secretary, 578 Oxford St., Winnipeg R3M 3J9 MB Canada.

Yankee Clipper Contest Club, John J. Kenny, Woodman Rd. RFD 1, South Hampton, NH, c/o Amesbury, MA 01913.

Southern New England DX Association, Richard Hughes, W1GTJ, President, 3 Hillview Terr., Medway, MA 02053.

Wireless Institute of the Northeast, Philip T. Johnson, W2SQ, Secretary, 282 Lafayette Ave., Chatham, NJ 07928.

South Jersey Radio Association, P. O. Box 1734, Cherry Hill, NJ 08034.

Long Island DX Association, R. Darress, 75 Olive St., Lake Ronkonkoma, NY 11779.

Buffalo Area DX Club, R. E. Nadolny, WB2YQH, Secretary/Treasurer, 2536 William St., Buffalo, NY 14206.

Niagara Frontier DX Association, John Driscoll, W2SSC, President, 8550 Howard Dr., Buffalo, NY 14221.

Point Radio Operating Society, Roger W. Lory, K3TP, President, 2559 Giant Oaks Dr., Pittsburgh, PA 15241.

Frankford Radio Club, Jay Gerber, N3AW, President, 811 Triumphe Way, Warrington, PA 18976.

Potomac Valley Radio Club, Fred A. Heutte, W3XY, Secretary, 1600 Newton St. NE, Washington, DC 20018.

National Capitol DX Association, Burt Cohen, W3GG, Secretary, 17709 Lisa Dr., Derwood, MD 20855.

Southeastern DX Club, Wayne Mueller, W4LVM, President, 130 Sunset Ct., Roswell, GA 30075.

North Florida DX Association, B. F. Williams, Jr., WA4UFW, Secretary/Treasurer, 911 Rio St. Johns, Jacksonville, FL 32211.

Central Florida DX Association, R. W. Lucas, K4HTU, Secretary, RD 2 Box 1155, St. Cloud, FL 32769.

North Alabama DX Club, Col. D. H. Steenburn, WA4VLB, Secretary/Treasurer, 2102 Manassas Dr. SW, Huntsville, AL 35803.

Flyweight DX Group, Jim Roller, N4IR, President,

*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770

Here are SV1JG, SV1KP and SV1IW on the beach on the island of Crete.

714 Foothills Rd., Kingsport, TN 37663.

Mad River Radio Club, Jeffrey A. Maass, K8ND, President, 4410 Norwell Dr., Columbus, OH 43220.

Fort Wayne DX Association, Vic Keller, N9GK, President, 4011 Daner Dr., Fort Wayne, IN 46815.

Michigan DX Association, Robert Epstein, K8IA, Secretary/Treasurer, 21820 Ridgedale Ave., Oak Park, MI 48237.

Greater Lansing DX Group, Thomas E. Knott, WA8LTX, 4011 Windward Dr., Lansing, MI 48910.

Eastern Iowa DX Association, Fred Benson, KØAT, Secretary, 182 Chatham Rd. NE, Cedar Rapids, IA 52402.

Sheboygan County DX Association, Art Pahr, K9XJ, Secretary/Treasurer, Route 4, Plymouth, WI 53073.

Twin City DX Association, Jim Spaulding, WØUD, Secretary/Treasurer, 2624 Fairlawn Dr., Stillwater, MN 55082.

Northern Illinois DX Association, Howard Huntington, K9KM, Secretary, 75 South Burr Oak Dr., Lake Zurich, IL 60047.

Lake Cook DX Association, Charles Leech, WA9SLD, Secretary, 2935 W. Bonnie Brook Ln., Waukegan, IL 60085.

Mississippi Valley DX Contest, Jim Glassock, WØFF/KØRTH, President, 3416 Manattan, St. Louis, MO 64118.

South Kansas DX Association, Donald Davis, WØWU, Vice President, 1203 E. Douglas, Wichita, KS 67211.

Richardson Wireless Klub, P. O. Box 232, Richardson, TX 75080.

Texas DX Society, John W. Stevens, K5JS, Secretary/Treasurer, 12011 Mulholland Dr., Stafford, TX 77477.

Alamo DX Amigos, Peggy L. DeLay, WA5GZO, Secretary, 2431 W. Mistletoe, San Antonio, TX 78228

Mile-Hi DX Association, Max Gilliland, WØKU, Secretary/Treasurer, P. O. Box 39092, Denver, CO 80239.

Central Arizona DX Association, Allan Lovett, WA7YRP, Secretary, 20024 N. 18th Dr., Phoenix, AZ 85027.

Arizona DX Club, Liscum Diven, W7IR, Secretary/Treasurer, 5821 Canal Bank Rd., Scottsdale, AZ 85253.

San Diego DX Club, Al Gordon, Secretary/Treasurer, 3222 Hill St., San Diego, CA 92106.

Southern California DX Club, Dr. Cleyon O. Yowell, WB6EHT, President, 2731 Adams Ave., Orange, CA 92667.

Northern California DX Club, Box 608, Menlo Park, CA 94025.

Northern California DX and Contest, Chuck Breeding, K6UWR, 3130 Raleigh Ct., Fremont, CA 94536.

Petaluma DX and Experimenter Society, Chuck Ternes, WB6AGP, 517 Baker St., Petaluma, CA 94952.

Honolulu DX Club, J. P. Corrigan, KH6DD, President, P. O. Box 698, Kaneohe, HI 96744.

Whidbey Island DX Club, Bill Gosney, WB7BFK, President, 2665 N. 1250 East, Oak Harbor, WA 98277.

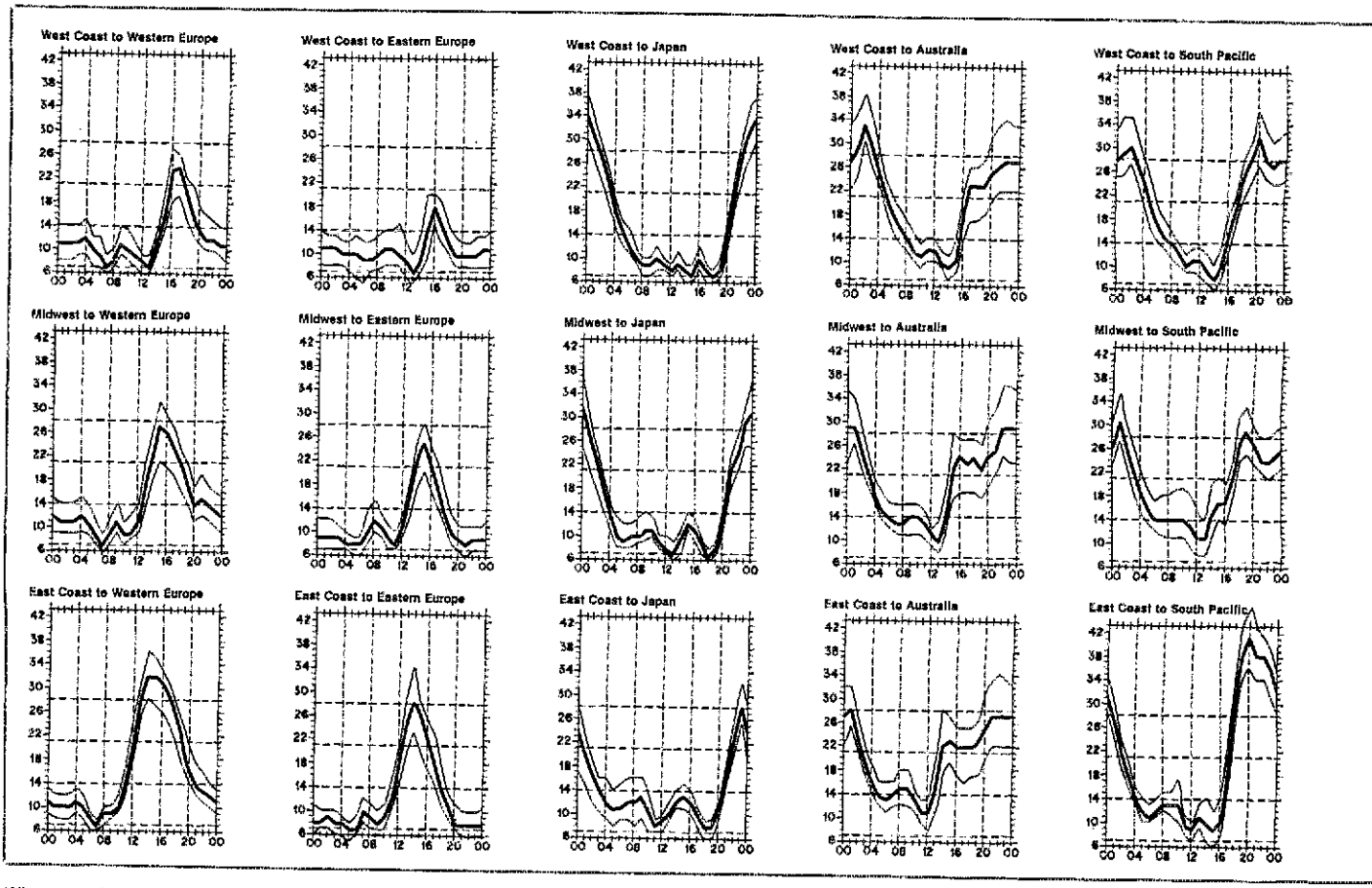
Alaska DX Association, Tony Smaker, KL7AF, Secretary/Treasurer, Box 1614, Kodiak, AK 99615.

QSL Corner

Administered By Joan Becker

Jesse Bieberman, W3KT, retired QSL Bureau manager.

We salute you, Jesse Bieberman, W3KT, after an impressive, outstanding and hardworking 32 years. Accrediting testimonials: W3KT, Malvern, PA, age 74, Extra Class, operated outgoing QSL service; vice director 1966-1967, assistant director 1968-1969, Atlantic Division ARRL; past president, past vice president, past secretary, Frankford Radio Club; member, executive committee, past vice president, Southern Chester County Amateur Radio Club; third call area QSL Bureau manager, 1947-1949; holder of first DXCC/CW Award; all countries confirmed on DXCC list, phone and mixed modes; 5BDXCC; member, QCWA; ARRL 50-year plaque; Life Member, ARRL; first licensed in 1920.



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

Here is QSL information for those who wish to QSL direct. Remember that the accuracy of this listing cannot be guaranteed.

Bill Rumley (KA1NC), Torishima, is home after one year of operation from Marcus Island. Listen for him as KN4BPL from Washington, DC.

ZD7BW, Gerry Smillie, Island of St. Helena, South Atlantic Ocean

SVØAE, P. O. Box 564, Athens, Greece

9X5PP, Peter Pike, P. O. Box 863, Tigali

SVØAC, Mike Woolverton, AFRTS, Box 3078, APO New York, 09223

K9EF/8R1, will be operating here for two years, on 80-10 meters, ssb and cw. QSL information is 8R1AG for DX and directly to Woody Minar, K9EF/8R1, American Embassy, Georgetown, Dept. of State, Washington, DC 20520.

CN8CG (F6FTL)	3C1AA (EA4MY)
HZ1TC (I8YCP)	3V8ONV (IØAMU)
J6LCT (WA1ZXF)	4NØMP (YU1BCD)
SQØOW (SP2JS)	5T5JA (JA3KWJ)
WB4LRB/8R1 (N4PP)	7P8BL (K5PMF)

Many thanks for this information to DL1FL, K2TV and AA4MI.

DX QSL MANAGER VOLUNTEERS

KA3ARF	N7AUQ	WB5MJR
N3AID	WB3KUH	WD8NKT
N6BLN		VE5QY

New East German Prefixes

New East German prefixes in the Y2-Y9 block have just been announced, with special call signs for individuals, clubs and special purpose stations. Under the new system, DM2AAO would become Y21AO, while DM2CAO would be Y23AO. Club stations will begin with Y3 (Y31AA, Y37AB, for example). Short calls are for repeaters (Y21A-Y29Z), contest teams (Y31A-Y39Z), beacons (Y41A-Y49ZO) and bulletin stations (Y61A-Y69Z).

Wishing you and yours a most joyous holiday season.

ARRL DX QSL BUREAU SYSTEM

The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 × 7-1/2-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp, unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL hq.

Please note that there are *two* bureaus for the fourth call area. The bureau in Boyce, VA, handles cards for single-letter prefixes only, while the bureau in Sterling Park handles cards for all other four-land stations.

☐ First Call Area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

☐ Second Call Area: all calls* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.

☐ Third Call Area: all calls* — Leon Lapiewicz, K3GM, P. O. Box 6238, Philadelphia, PA 19136.

☐ Fourth Call Area: K4, N4, W4 — National Capitol DX Assn., Box DX, Boyce, VA 22620. (Single-letter prefixes only.)

☐ Fourth Call Area: AA4, WA4, WB4, WD4, WN4 — Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.

☐ Fifth Call Area: all calls* — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.

☐ 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* — WØ 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 — Graciano Berlardo, KV4CF, P. O. Box 572, Christiansted, St. Croix, VI 00820.

☐ Canal Zone: all calls* — KZ5 QSL Bureau, Box 407, Balboa, CZ.

☐ 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.

☐ SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

☐ QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, P. O. Box 663, Halifax, NS B3J 2T3. 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* — W. A. Stunden, VE4BJ, 578 Oxford St., Winnipeg, MB R3M 3J9.

☐ VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3.

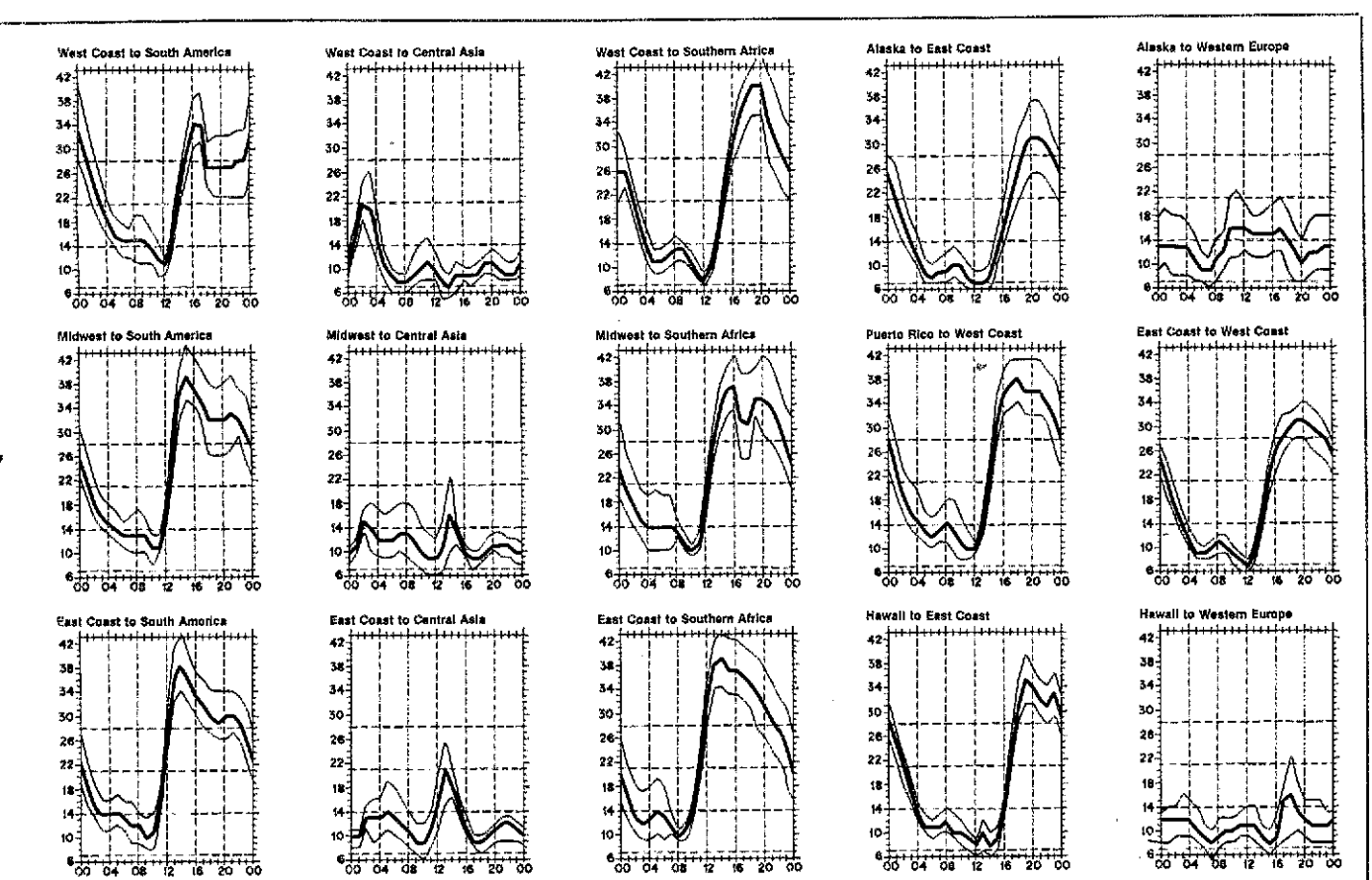
☐ VE6* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K 0X2.

☐ VE7* — Howard Martin, VE7AFY, No. 45-9960 Wilson Road, Ruskin, BC V0M 1R0.

☐ VE8* — Al Sturko, VE8NS, P. O. Box 72, Fort Smith, NWT X0E 0P0.

☐ VO1, VO2 — CRRL VO QSL Bureau, P. O. Box 6, St. John's, NF A1C 5H5.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information. QST



lowest curve (optimum traffic frequency, or fot). See 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, CO. These predictions for December 15 to January 15, 1980, assume a sunspot number of 156, which corresponds to a 2800-MHz solar flux of 198.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from August 1 through August 31, 1979. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

CM2HB/119, JE2IBV/120, PP5AJA/114, W1RHN/137, W3GVR/107, W4DJJ/276, K5VR/103, N7CC/101, WD8KKF/146
CP1CQ/100, JA4AEZ/144, PY2ZEM/164, WA1AER/262, W3IGK/100, W4PTH/210, W5IYR/104, W7BCS/101, WD8KSB/101
CT1GC/104, JA5NG/141, SMØDJZ/237, WA1SSQ/110, WB3CAI/103, WA4HVL/100, W5TU/103, WA7FRP/108, N9AFE/109
DF3TJ/112, JH5FQO/109, VE1ACB/100, WB1AHF/121, WB3IGR/100, WA4LYL/PA/100, WA5BYG/100, WB7BQA/102, WA9JWL/153
DF8XP/130, JA7ARH/131, VE3XM/106, WB1ASL/127, WB3IVL/101, WA4ORG/102, WB5UZK/100, WB7FFG/104, WD9EMI/104
DF9ZO/109, JA9BJ/325, YB7AAU/272, N2MM/224, WB3IXF/108, WA4RQH/111, WD5JQB/106, WB7PST/104, WD9EPG/104
DL3GK/109, JA9CZF/221, YU2RJT/105, W2KGR/101, WB3JLF/100, WA4TQD/100, AK6A/102, AC8R/104, AFØQ/103
EA2IK/132, JHØCAZ/216, ZS6ABA/105, WA2EWC/101, AA4CK/221, WB4DYU/101, K6ELQ/104, AJ8L/109, KØCN/176
EA6EU/171, JHØHWP/103, ZS6ALS/102, AF3B/102, AA4FL/100, WB4EGX/107, N6OB/100, AK8A/100, NØDC/100
F2BS/300, KL7JAI/110, 4U1UN/106, AI3N/107, AC4R/102, WD4GCE/102, N6YI/172, K8PCZ/181, WØJN/224
G3YOG/159, OH1EH/110, 4Z4TZ/110, K3FN/294, K4HVC/101, WD4IKI/102, W6IC/101, KB8CR/106, WBØJQH/102
G4BWP/154, OH2BKT/106, AA1M/146, K3RH/153, K4VNM/108, AK5B/103, WA6BXT/100, WB8HIW/111, WBØNHD/254
HB9BLQ/141, OZ8AE/142, AD1S/100, N3ATQ/102, KB4E/105, K5GY/112, WA6YOU/DU2/102, WB8YQX/100, WBØPVO/100
HB9BOI/115, PAØGMM/254, K1PCE/102, W3GRW/123, N4AVV/209, K5QNE/100, WB6NHV/105

Radiotelephone

CT1VY/127, HK3AQP/110, LA9TQ/135, W1RHN/133, WB3HLJ/103, WD4CTG/171, W5TU/102, WB6GNS/105, WD9DNL/113
DF7FB/104, I2UBT/194, OH2CE/105, WA1AER/260, K4DHE/100, WD4CWR/100, WB5JJD/108, WB6NHV/104, WD9FOE/100
DF8XP/115, I5VSW/120, PAØGMM/254, WB1AHF/121, N4ADH/105, WD4JDV/106, WD5JQB/105, WB6TDY/101, WD9HAW/100
DK4QO/117, JA1RCE/101, PY1CZL/104, WB1ASL/122, N4AVV/209, WD4JMH/108, K6BKU/106, AF7M/110, KØARY/106
EA3AOC/230, JA4AEZ/105, SMØDJZ/207, K2UGH/100, N4BCV/103, K5BG/106, K6JEN/109, W7KZE/101, NØAMI/102
EA6EU/170, JA5NG/141, SMØGMZ/152, KB2AM/105, N4DT/100, K5GY/100, K6ZSB/100, WB7BOA/102, WØZRA/119
F2BS/298, JH5FQO/109, TG9VN/105, KB2DE/108, W4KGH/110, K5HKG/106, N6AIW/100, K8PCZ/180, WBØJLY/100
G4BWP/140, JA9BJ/323, YB7AAU/204, WA2KLI/101, WA4CYR/101, K5MCB/102, W6CQR/114, W8JRW/103, WBØNHD/253
HB9BLQ/120, JHØCAZ/148, ZL3VF/103, K3RH/118, WA4EAV/110, K5MK/105, W6DPD/100, W8BYQX/100, WBØWAY/110
HB9BOI/114, JHØHWP/103, 4U1UN/101, K3UC/120, WA4PKQ/105, N5AML/102, W6TPC/139, K9LCR/107, WDØCHO/104
HI8UN/160, KL7JAI/105, 9L1JT/205, W3GRW/107, WB4WHE/102, W5GVP/151, W6YMH/107, W9DMH/101

CW

HI8LC/113, JA7ARH/113, OZ8AE/100, SMØGMZ/137, K1CBR/100, K2JT/101, AA4CK/106, W5AS/100, N9WA/113
JA1FNA/135, JHØCAZ/151, PY2CYE/104, YB7AAU/138, K1UO/149, N2EF/107, AG5C/102, W8NPF/100, WDØFZJ/111
JA5SIX/108, OH1EH/104, SMØDJZ/149, ZE4JS/111, W1RED/108

RTTY

VE2QO

160 Meters

PY1RO

5BDXCC

OK1DH, K7ZA, SP2AJO, N4DW, W8SET, UB5GBD, JA1DUH, W8YA, W4UW
K2KA, SMØDJZ

Endorsements

Mixed

CT1DF/182, KL7H/248, YU3TFA/221, WB1ANT/181, AA4T/260, WA4GHO/140, WB5ZGP/160, K8DL/141, W9HR/182
DJ1BV/280, KP4EBQ/249, YU3UAR/149, K2OLG/252, AA4VK/260, WA4HDD/262, AA6DX/158, K8NA/290, W9PIO/289
DJ6RX/326, LA8CJ/265, XE1KS/325, KB2EN/182, AB4X/275, WA4PSW/150, K6JEN/138, K8RA/309, W9SS/315
DL1DC/343, LA8LF/323, AC1O/186, W2DPL/271, AB4Z/260, WA4TLI/280, K6UD/288, K8WD/129, W9TA/271
DL3ZI/315, OE1BFW/237, K1BW/319, W2FC/216, K4AEB/281, WB4DBK/136, K6WD/275, KB8KW/240, W9VIN/300
DL7BK/338, OH2CE/128, K1CC/270, W2FHY/242, K4JNM/252, WB4KSQ/165, K6XN/152, WB8E/295, WB9EIW/201
DL7HZ/343, OH2SB/304, K1EM/233, W2GND/201, K4RA/322, WA4VXG/180, N6ANN/202, WB8EY/143, WB9NKH/231
DLØAA/213, OH2VZ/273, K1KTB/183, W2HAZ/280, K4RZ/271, WB4PAB/260, N6HR/315, W8GIO/283, WB9NOV/165
EA2HW/168, OK1DH/251, K1RM/330, W2HKE/180, K4SM/356, WB4PRU/220, N6OZ/240, W8PBO/229, WB9TIY/189
EA3RF/205, PAØFX/350, K1SF/263, W2JB/313, K4SV/281, WD4KRK/158, W6AYQ/241, WA8KEM/180, WD9DNL/137
F8VO/183, PAØVO/320, K1VJH/184, W2JVZ/220, K4TSJ/300, WD4RCO/160, W6INH/258, WA8LSO/273, WD9IIX/180
F9GL/342, PY2CK/362, K1ZSI/304, W2LNB/335, KB4BU/180, AB5P/200, W6KPC/278, WB8UIA/202, KØAL/180
G3GIO/300, PY2DFR/324, N1ACW/243, W2PSU/305, KD4M/220, AD5O/199, W6MUS/243, WB8ZRL/219, KØBS/322
G3JAG/327, PP5UG/323, N1NA/171, W2SY/319, KI4M/280, AG5X/150, W6NPY/271, WB8ZRV/250, KØBX/164
G3KAA/295, SM1CXE/335, N1UN/253, W2YD/310, N4AOB/167, K5AQ/317, W6OMM/225, WD8BOH/234, KØCS/242
HB9AQW/293, SM3RL/317, W1AA/352, W2YWK/141, N4ATK/279, K5BDS/261, W6PKA/190, K9BG/234, KØDN/140
I7TGT/300, SM5ACQ/201, W1ELR/330, W2ZZ/320, N4JJ/300, K5KV/204, W6SN/324, K9BQL/145, KØKES/224
ISØLYN/199, SM5AZU/332, W1ESN/296, WA2ECA/160, N4UH/300, K5RE/147, W6VBI/309, K9GX/212, KØYST/260
JA1FNA/288, SM5BBC/302, W1EWD/220, WA2LMW/261, N4VG/161, KA5ACC/127, W6YQ/225, K9IUF/305, WØDP/200
JA1TNV/250, SM6CST/260, W1ID/217, WA2MVO/162, W4CEB/219, KB5DO/204, WA6TOO/241, K9KQ/200, WØELA/362
JR1TNE/240, SMØGMZ/220, W1NU/353, WA2DFC/144, W4CZU/292, KB5FH/199, WB6ZUC/280, N9KV/252, WØNGJ/300
JA2AH/311, SP3DOI/319, W1RBU/193, WB2HJW/180, W4FLA/315, N5AB/262, K7AII/170, K9NB/208, WØNQ/200
JA3EMU/300, SP8MJ/200, W1RED/289, K3EH/310, W4HY/279, N5HB/180, K7AOZ/240, K9QVB/261, WØRJW/120
JA4BBN/264, VE3FRA/289, W1WLW/270, K3GYD/299, W4JFE/273, N5IH/162, K7BR/310, K9RU/262, WØSYK/357
JH6RYY/181, VE3IPR/197, WA1HJZ/229, K3QIA/160, W4KA/287, N5MM/199, N7RP/271, K9UR/160, WØUY/140
JR1VAY/127, VE3LAX/200, WA1KUU/228, N3RT/291, W4LVM/300, N5UT/256, W7FR/282, N9BB/255, WA0TKJ/282
JA7BMR/200, VE4EW/236, WA1LOU/140, W3GTL/204, W4NO/319, W5FL/248, W7ZR/214, W9ABA/330, WBØNAA/200
JA8AYN/303, VE4OX/332, WA1TPR/253, W3KH/249, W4OYI/140, W5VD/141, WA7GVM/250, W9DDX/200, WBØSNG/200
JA8KB/311, VE7IG/320, WB3DNA/153, W4WXZ/250, W5ZDO/240, WA7RKJ/190, W9HI/149
KG6RT/180, WA4DAN/240, AB8Y/252

Phone

CT4YG/157, JR1VAY/125, VE3LAX/170, W1KSZ/251, WB2HJW/140, N4VG/158, K5AQ/298, W6ZPV/180, K9GX/212
DJ1BV/268, JA2AH/310, VE3MC/228, W1YOU/172, W3FZE/269, W4DJJ/275, K5ZH/282, WA6OUA/139, K9QVB/190
DK2BL/326, JH6RYY/181, VE4AT/219, WA1KUL/226, W3IQS/230, W4EBO/254, KA5V/160, N7DS/160, KB9DU/154
DL7FP/280, JH8GWW/141, VE4OX/311, WA1TPR/250, WA3AXV/232, W4JFE/290, KB5DO/193, W7FR/220, N9BB/216
DL7SP/221, KH6IIP/135, VP2SV/168, WA1WMS/140, WB3CIW/220, W4LVM/286, KB5FH/177, W7ZR/219, W9BEK/333
DL9CQ/260, KL7H/237, XE1KS/325, WB1DQC/218, WB3EFC/160, W4NYS/171, N5AJW/200, WA7GVM/247, W9DDX/200
EA2HX/338, LA8LF/314, XE1XF/144, K2OLG/250, AA4VK/260, W4TAC/199, N5IH/160, WA7ZWG/200, W9MDP/158
EA3SA/293, OE1BFW/229, YV5CWO/300, K2OPJ/179, AK4E/137, W4TXQ/187, W5FL/202, AI8S/247, W9SS/315
EA7GF/330, OE3KTA/240, ZL1AAS/270, K2YIY/221, K4AEB/281, WA4DAN/200, W5VD/140, K8NA/287, W9TA/260
F3DJ/337, OH2VZ/175, ZL3QN/319, W2GHV/259, K4LSP/310, WA4FDE/243, WB5PGF/205, K8WD/129, WA9JWL/152
F9GL/336, OZ8EA/244, K1KTB/183, W2HXF/200, K4ONF/242, WA4HDD/261, K6UD/279, W8BE/216, WB9NKH/214
I1EVI/160, PY2CK/361, K1SF/257, W2IJB/200, K4SM/343, WA4INQ/200, K6XN/131, W8GIO/280, WB9NOV/162
I2GGJ/160, PY2CYK/328, K1ZSI/289, W2PSU/296, K4TSJ/230, WA4TLI/260, N6AHU/201, WA8LSO/150, KØBS/321
I4KET/120, SM5AZU/329, N1ACW/237, W2SNI/285, KB4BU/160, WB4KSQ/163, W6CN/201, WB8WZS/202, WØPSH/184
I7SCA/324, SM5VS/221, N1NA/148, W2SY/297, KB4IT/214, WB4TIN/253, W6KPC/275, WB8ZRL/216, WA0QIT/150
I7TGT/300, SMØATN/319, W1AA/351, WA2DXJ/282, KB4TE/139, WB4TZA/211, W6MBV/305, WD8BSX/180, WB0CGJ/240
JA1FNA/277, VE3BX/309, W1ESN/275, WA2WYR/CX/160, KD4M/220, WD4IKM/157, W6MUS/242, K9BQL/140, WBØTNY/145

CW

DL1PM/233, JA7BMR/140, OZ1DYU/121, W1WLW/139, W4JFE/188, WA4QMQ/120, W5JW/175, WB6ZUC/243, W9HR/144
DL3BK/181, KL7H/160, VE7CNE/180, K3QIA/131, W4LVM/238, N5RF/134, K6WD/136, N8BM/180, KØKES/209
DL7DX/143, OK1MP/142, AC1O/182, WA3GJZ/144, WA4JTI/160, W5FL/175, W6YQ/150, K9RL/223, WØBW/240
F3AT/250

DXCC NOTES

Deleted Country

The Canal Zone (KZ), as of October 1, 1979, became a deleted country on the DXCC list. All contacts made before October 1, 1979, will count as the Canal Zone. All contacts made on and after October 1, 1979, will count as Panama (HP).

The DXCC list stands at 319 countries current and 47 deleted.

Reminder

Those wanting to update their Honor Roll standings or make the Honor Roll, must have their cards into Hq. no later than December 31, 1979. Those arriving after December 31, 1979, will not be included in the Honor Roll listing.

There is no Honor Roll application. If you qualify for the Honor Roll you will be placed on it. *It is done* automatically. You do not make Honor Roll until it is published in *QST*.

Coming Conventions

1980

January 4-6
North Florida Section, Orlando, FL

January 26-27
Southeastern Division, Miami, FL

ARRL NATIONAL CONVENTIONS

July 25-27, 1980
Seattle, WA

March 13-15, 1981
Orlando, FL

NORTH FLORIDA SECTION CONVENTION

January 4-6, 1980, Orlando, FL

Orlando ARC presents the North Florida Section ARRL Convention and Hamcation '80 at the Sheraton Twin Towers, site of the 1981 ARRL National Convention. Over 100 exhibitor booths will be occupied and over 300 swap tables will be available. Dignitaries from Headquarters and FCC are expected to highlight ARRL activities, with Larry Price, W4RA, Southeastern Division director, heading up the program. Many symposiums, meetings and activities are scheduled.

Advance registration will be amateurs $3, spouses free; groups of 10 or more, $2.50, ladies free. At the door: amateurs $4; spouses $1; children, 14 and under, free. Swap tables are $10 each for the three days.

Al Canning, general chairman, and his great committee welcome "You-all." For all reservations, write: Hamcation Chairman, P. O. Box 191, DeBary, FL 32713. Info: 305-668-8437. QST

Hamfest Calendar

Florida: The Sarasota Amateur Radio Association will hold a hamfest January 19-20, 1980. For more info contact SARA Inc., P. O. Box 3182, Sarasota, FL 33578.

Indiana: South Bend Swap and Shop will be held January 6, 1980, at the New Century Center, downtown on U.S. 31 Oneway North, across from St. Joseph Bank Building. Half acre in one large room, ground level. Food, museum and art center in same building. Four-lane highways from all directions. Talk in on 52 and area repeaters. For info contact Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616.

Nevada: SAROC, January 10-13, 1980, at the Dunes Hotel and Country Club, Las Vegas. Exhibits, technical sessions. Advance registration $15 per person. SAROC special room rate $33 plus room tax per night, single or double occupancy. Dunes Hotel accommodations request will be sent to SAROC-registered delegates. Contact SAROC, P. O. Box 945, Boulder City, NV 89005. QST

50 Years Ago

December 1929

☐ Careful advance planning and wholehearted local cooperation made a whopping success of amateur volunteer communications for the National Air Races, reported by W8BAH for the Cleveland Wireless Association.

☐ K. B. Warner reports that after the C.C.I.R. Hague meeting, European nations agreed regionally to limit amateurs to 50 watts, and only 3500-3600 kc. at 80 meters, but the U.S. was successful in preventing these limitations and others from applying worldwide.

☐ The "Single Control Transmitter" design by George Grammer is so clean and simple that thousands of potential amateurs will find it ideal as their first rig, copper tubing coils and all.

☐ W1AOF has some novel features in his receiver, including a coil turret for efficient band changing, peaked audio, and variable bandspread.

☐ The DX Competition will be held again in 1930, with a two-week period in January for U.S./Canadians only, and another two weeks in February for international working, with advance entry required and transmission of test messages necessary for contact credit.

☐ Paul Oscanyan gives details on his observations of aurural interference during an expedition to Greenland, fathoming reasons for reflection of radio signals.

☐ League books show a gain of $885 for the third quarter, an improvement over the $2,600 loss the previous three months.

☐ I.A.R.U. welcomes new member societies in Denmark, Norway and New Zealand.

☐ The excellent installation at W2FL is featured in the last of the *QST* series on station descriptions.

☐ If the 199 or 222 tube in your receiver is too microphonic, W7JN suggests switching to a 227.

25 Years Ago

December 1954

☐ Editor Warner explains that the League support of FCC's proposal to put Technicians on 50 Mc. is primarily based on the need for occupancy (in the face of TVI), and our opposition to their use of 144 is simply that it would dilute the basic purpose.

☐ W1VLH meanwhile has a dandy rig for Techs to build for 220 and 420 Mc.

☐ W5JXM provides some helpful notes on the use of grounded-grid amplifiers for sideband. But amplitude modulation is not dead, and George Grammer relates the desirable characteristics of 6146s in a 120-watt modulator requiring minimum drive.

☐ Electronic keys are more and more the rage, and W5HZB's contribution is the use of a Thyratron as the pulser.

☐ W4DFR explains how we can use a receiver b.f.o. as an interpolation oscillator to measure frequencies between 10-kc. multivibrator points.

☐ Novice shepherd W1ICP this month describes a 40-watt rig covering 7 and 21 Mc., complete with a two-band antenna design.

☐ More than 8,300 participated in the June Field Day, again smashing all records for entrant and score totals.

☐ W6REF's earlier story on a 10-meter crystal controlled converter to a broadcast receiver is now expanded, through reader demand, to cover other amateur bands.

☐ The "Dual Regulated General-Purpose Power Supply" built by W5RVD is ideal for any ham testing new gear in his workshop.

☐ *QST* sadly records the passing of W1FWH, for many years conductor of the League's Technical Information Service, helping thousands, particularly newcomers, with design and construction problems. — *W1RW* QST

Strays

Joe Cowan, WA5TUM, secretary of the Beeville (TX) ARC, presents the ARRL's National Certificate of Merit before a large television audience in South Texas to Judy Wenger, host of a talk show featuring Amateur Radio. Looking on (left) is Bob Douglas, W5GEL, also a guest on the 30-minute program which was highlighted by the ARRL's *Moving Up to Amateur Radio* movie, narrated by NBC News Correspondent Roy Neal, K6DUE. Judy received the award in recognition of outstanding achievements in serving the public interest of the community and for her efforts to help spread the word about the public service benefits of Amateur Radio. *(W5PIL photo)*

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

The Role of OVS

OVS, or Official VHF Station has been a League appointment since the mid 60s, having replaced OES, or Official Experimental Station. The interests and talents of those currently holding OVS appointments vary all the way from the highly experimentally minded, trying to coax that last tenth of a dB of noise figure out of the latest GaAs FET, to the individual whose sole vhf activity consists of working through the local repeater. With such a wide divergence of interests, it is difficult to define a specific function which the OVS appointment fills in the League's operating organization. The same is not true of the other appointments, such as OTS and OO. These appointments are made to fill specific functions that can be carried out anywhere in the spectrum where we have frequencies. Note that there is no such appointment as Official 160-Meter Station, although there was some talk a few years ago of creating Official DX Station and Official Contest Station appointments. While these activities are general in nature, in that they do not necessarily take place in particular portions of the spectrum, they do not serve a specific function in the League's operating organization. Furthermore, one does not need to belong to an organized group in order to participate. Thus there appears to be no need for appointments to an operating organization through which to funnel reports on progress, or the lack of it. I am sure that this is why the decision was made that there is no need for such appointments.

Could not the same line of reasoning be applied to vhf activity and to the need for OVS? I receive many reports each month. Some of these come in the form of OVS reports through the Communications Department. Many others come directly to me in the form of letters and postcards and via the telephone message machine. Are not those who are reporting directly to me taking part in the League's encouragement of vhf and uhf just as much as those who report on OVS forms to their SCMs? As a matter of fact, I find the reports sent directly to me more useful than those coming through OVS because they arrive quicker and most are more applicable to the area of interest traditionally covered by "The World Above 50 MHz." This is not surprising since OVS appears to be aimed toward general vhf operation, including nets and traffic, not merely at equipment and propagation which I believe to be the principal interests of this column's readers.

One can then ask: Is the OVS appointment necessary or could its function be served just as well by giving those who wish to handle traffic on vhf an OTS appointment, or those who wish to transmit bulletins an OBS appointment? What do you think? Should OVS be done away with and those wishing to participate in vhf operating activities given another appointment appropriate to their particular operating interests? If such a course were to be followed, should an experimental appointment be reinstituted and, if so, should it be limited to vhf/uhf, as it was when it existed previously, or should all whose principal interest is experimentation with circuits and techniques anywhere in the spectrum be included? Or should things be left pretty much as they are?

Your views on this are solicited. It would be best to write directly to Communications Manager John Lindholm, W1XX, at League Headquarters, as matters such as appointments reside in his department. I would appreciate receiving a copy of your "words of wisdom" on the subject, as well.

CONFERENCE REPORTS

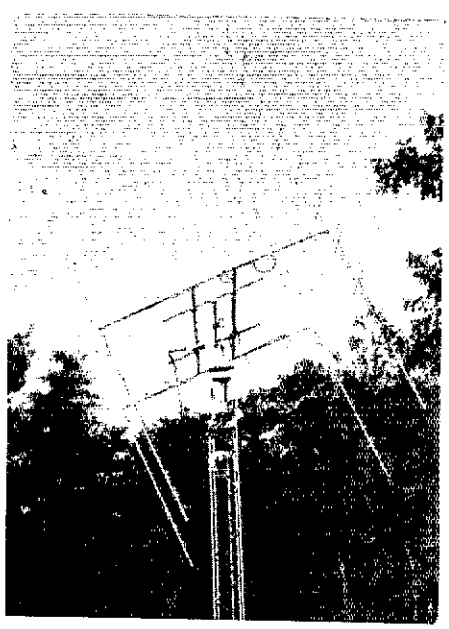
Normally, the report on the Central States VHF Conference held in Dallas August 17-19 would have been presented in the November column, but the huge tropo opening, which took place about the time of the September contest, preempted the available space. As usual, this year's Central States gathering was a bang-up affair. A fine program was assembled by WB5LUA and his able crew, including a number of ladies' activities arranged by AI's XYL, Emily. Among the interesting presentations was a talk on his favorite subject, Es, by old friend Mel Wilson, W2BOC. Mel, who has been comparing the drift behavior of the ionized clouds in recent years and back in the 40s, has come up with some interesting observations. He pleads for us to do a better job in making measurements of various phenomena we might observe, as actual measurements are the only kind of evidence which will be acceptable to the professional scientific community. A fascinating paper was given by K5CM describing the oblique-incidence ionospheric-sounding experiments which he has been conducting with K5SW. Connie showed that we can actually probe the ionosphere to see where the band is open, or if it is. A very interesting talk was given by K4GFG, who began by saying that he is not a propagation expert and then proceeded to do a very creditable job of describing the newly discovered mode which has supported 2-meter FL-to-KP4 contacts as well as producing an opening between FL and FX (see the October 1979 column). Tom attributes these weak fluttery openings, in which beams must be aimed off path, to field-aligned irregularities. K5WXZ gave the group the lowdown on receiver designs for high dynamic range and impulse noise reduction, and the capabilities of the forthcoming Phase III satellite were described by W3IWI.

The antenna gain competition was a cliff hanger with K1WHS taking first place with a 29-foot, 17-element Cushcraft design which measured 14.4 dB over a dipole. Dave's other entry was a Boomer which came in at 14.1 dBd. A 19-element, 22-foot boom F9FT entered by W5UPR also measured 14.1 dB, while a 21-foot, 16-element F9FT brought by WA5HNK showed 13.2 dB. The top homebrew entry was a 23-foot, 14-element job entered by N4PZ. Its gain was measured at 13.0 dB. It was barely nosed out by K1WHS's third entry, a 14-element, 2.2-wavelength Cushcraft which measured 13.1 dB. K4PKV's 20-element Cushcraft collinear also measured 13.0 dB. In the 70-cm antennas, WA5HNK's 21-element F9FT was out in front with 14.5 dB, while the top homebrew contender was entered by WB0YSG. It was a 19-element Yagi which measured 13.9 dB.

In the noise figure test, the hottest competition was with the 70-cm preamps. W6PO and WB5LUA took top honors with DXL-3501 GaAs FET jobs both measuring an incredible 0.5 dB. Then followed a string of NE-64535 preamps ranging from 0.75 dB to 1.25 dB. Most of these were homebrew but two were Lunar 432-5s.

This year's CSVHF Conference was the biggest yet with 186 registered, including such outside-U.S. notables as VE4s MA, AP and MJ; TI2NA; XE1GE; YV5ZZ and YV6ASU; KH6IFP and Franc Tonna of F9FT fame. Next year's officers will be AA0L president, K0KE vice president, WA5HNK treasurer and the always-reliable W4FJ secretary. The 1980 conference will be held in Colorado Springs, as usual the weekend following Perseids. You can bet that I'll be there!

The Third Annual Mid-Atlantic VHF Conference was held at Willow Grove, PA, October 6. Unfortunately, other commitments prevented my being there, but I understand that it was a great session. Such vhf/uhf luminaries as K1FO, K2RIW and W1JR presented talks of interest to anyone who inhabits the world above 50 MHz. Next year, I'm going to make it for sure.



The trailer-mounted array of four 13-element KLM Yagis used by K6LEW in DE and WV moonbounce operations.

ON THE BANDS

6 Meters — As this is being written, in mid-October, we are still being tantalized by the gods of F2. The West Coast and southern midsection of the country have caught a few openings to South America. PY2XB was in for an hour around mid-day October 7, working over 50 4s and 5s as well as W2IDZ. Ed always seems to be able to grab the DX. The following morning between 1230 and 1330 UTC, the FY7THF beacon (50.038) was heard by this conductor and by many others from NS to FL. The signal was well over S9 for a good bit of the time, but unfortunately no

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

2-Meter Standings

For WAS holders, listing is WAS number, call, state and call areas. For others, call, state, U.S. states worked and call areas. Call areas are 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico.

WAS Holders

1 KØMQS	IA	12	
2 K5CM	OK	12	
3 NØJA	MO	12	
4 K9HMB	IL	12	
5 K1WHS	ME	12	
6 WA4MVI	NC	12	
7 K5JL	OK	12	
8 WA9DOT	WI	12	
9 WBØZXU	IA	12	
10 K9CA	IL	10	
11 WØSD	SD	20	
12 K5BMG	LA	12	
13 K5GW	TX	—	
14 WB5LUA	TX	17	
15 K4GL	SC	11	
AA1A	MA	47	20
K1FO	CT	43	18
WA1JXN	VT	42	23
K1MNS	NH	42	11
W1JR	MA	41	10
K1HTV	CT	39	14
K1BKK	VT	37	10
WA1OUB	NH	36	8
W1XJ	RI	36	8
W1FZA	NH	35	10
K1PXE	CT	35	8
W1AZK	NH	34	8
W1JSM	NH	33	8
W1YTW	ME	33	8
WA4MMP/1	RI	31	8
K1UGQ	ME	30	8
K1GVM	MA	29	8
W1VTU	CT	29	8
W1AAI	MA	28	7
N1GD	CT	27	11
W1FJH	MA	27	8
K1MTJ	ME	26	7
W1AIM	VT	24	8
W1HDQ	CT	24	7
K1RJH		22	7
K2RTH	NY	44	11
W2AZL	NJ	41	10
N2MB	NY	39	11
W2CUX		38	8
W2CXY	NJ	37	8
W2ORI	NY	37	8
W2NLY	NY	37	8
W2BLV	NJ	37	8
W2AV	NY	35	11
WB2WIK	NJ	35	8
K2OVS	NY	34	8
WA2FGK	NJ	33	8
WA2PMW	NY	31	8
K2QR	NY	30	11
W2PGC	NY	30	11
W2CRS	NY	30	8
WB2CUT	NJ	30	8
W2EVW		29	8
K2CEH	NY	29	8
WB4NXY/2	NJ	29	8
WB2VWW	NJ	28	8
W2UZL	NY	27	8
W2CNS	NY	27	8
K2BWR	NJ	27	7
K2DNR	NY	27	7
K3VGX	PA	46	12
AB3D	DE	40	10
W3TMZ	MD	38	11
WA3USC	MD	37	10
K3QCQ	PA	37	8
K3CFY	PA	37	8
W3XO	MD	37	10
K3WHC	PA	37	8
W3RUE	PA	36	8
W3IWI	MD	33	12
K3AP	MD	33	10
W3OMY	PA	33	8
W3BDP	DE	36	9
WA3UFU	PA	31	8
AE3T	PA	31	8
K1GSR/3	MD	29	11
K3HCE	MD	29	10
WA3DMF	MD	29	9
W3LNA	PA	28	8
K3CFA	PA	25	8
W3ZD	PA	24	8
WA3JUF	PA	22	8
K3GNC	PA	22	8
W3TFA	MD	21	8
K3OBU	PA	21	7
WA4GPM	VA	47	10
WB4EXW	NC	46	12
K4PKV	NC	44	10
WA4CQG	AL	43	8
K4IXC	FL	40	10
W4HJQ	KY	40	10
W4DFK	VA	39	11
W4HHK	TN	38	9
K4CAW	NC	38	9
WB4NMA	GA	38	9
WA4LYS	FL	37	11
WD4MUO	VA	37	9
WD4GXN	VA	37	8
WB4LHD	TN	36	10
K4QIF	VA	36	9
W4VHH	NC	36	8
K4KAE	SC	36	11
W4WD	FL	35	8
W4ZD	FL	35	8
WA4FBH	GA	35	8
W4MKJ	TN	34	9
W4LNG	GA	34	8
W4FJ	VA	34	8
W4ISS	GA	33	8
WB5LBT	LA	48	20
W5FF	NM	46	15
K5FF	NM	46	14
K5MB	OK	46	12
K5MWH	AR	46	10
K5SW	OK	45	10
W5UGO	OK	43	10
W5RCI	MS	42	9
N5KW	OK	42	10
K5WXZ	TX	40	10
W5HN	TX	39	12
W5JTL	MS	39	10
W5HFV	OK	38	10
WA5HNK	TX	35	12
W5SWV	TX	34	8
K5VWW	TX	33	10
W5UKQ	LA	33	9
W5UWB	TX	30	8
WB5BKY	OK	29	9
WD5CRK	OK	29	9
K5PTK		29	9
W5SXD	TX	25	6
WA5TBE	TX	24	
W6PO		32	10
WB6NMT		26	11
K6QEH		21	10
W6GDO		18	5
W6WSQ		16	4
K6HAA		13	4
K6JYO		13	4
WA6JRA		11	5
K6HMS		11	4
N6CA		8	3
N6TX		7	4
K6GAO		6	6
K7CAD/6		6	2
K7NII	AZ	41	12
W7CI	AZ	38	14
WA7KYZ	WA	30	10
WA7BJU	OR	30	10
W7JF	MT	28	9
W7VEW		24	7
WA7BBM	AZ	21	7
K7CVT	AZ	20	5
K7ICW	NV	19	4
K7QXA	AZ	13	4
W8IDU	MI	49	22
W8WN	MI	47	10
K8AT	OH	45	10
WA8HTL	MI	40	9
K8AXU	OH	38	11
K8KJN	OH	38	
WB2DIN/8	WV	36	9
W8IDT	MI	36	8
K8HWW	MI	36	8
W8YIO	MI	36	8
WA8NLC	MI	35	9
K8DEO	OH	35	8
K8WKZ	MI	35	8
WB8PAT	OH	34	9
K8IE	MI	34	8
WB8IGY	OH	33	8
W8NOH	OH	31	8
WB8FEZ	MI	30	8
WA8LLY	MI	28	8
W8TIU	MI	24	8
W8LI	OH	24	7
N8TG	OH	22	9
K8ZES	OH	22	8
K9SGD	IL	45	12
W9UD	IL	45	12
W9YF	IL	45	10
K9UIF	IN	45	10
K9CT	IL	42	9
W9AAG	IL	41	9
K9AAJ	IL	41	9
WB9CAS	IL	41	9
W9VI	WI	41	9
N9SS	IL	41	9
WA9WHJ	IL	41	
WB9VEM	IL	40	12
W9IP	IL	40	9
K9UNM	IN	38	8
K9XY	WI	37	9
W9BRN	IN	36	9
W9VWY	IL	35	9
WA9EUA	WI	35	6
W9PBP	IL	34	8
WA9UHB	IL	33	9
WB9QBU	IL	34	
W9NLP	WI	30	10
W9JDJ	WI	29	8
WB9TPV	IL	28	9
K9RVG	IL	22	7
WØVB	MN	50	16
WØRWH	MO	46	11
WØLER	MN	46	10
WØRLI	MN	45	9
WØOHU	MN	45	9
AIØL	MO	44	11
WØEMS	NE	44	10
KØDAS	IA	44	9
KØCJ	MN	43	9
WØRRY	IA	43	9
KØSE	MN	43	9
WØDGY	IA	41	9
WØPN	MN	40	11
WBØVYY	CO	40	9
WØTG	KS	37	10
WBØUFQ	MO	36	9
WØPW	CO	35	9
WØENC	SD	35	9
WBØWFY	MO	35	8
KØALL	ND	32	11
WØRAP	IA	30	10
KØTLM	MO	29	9
WØVHQ	MO	29	7
WBØBVC	KS	28	8
WØDRL	KS	27	9
WBØIUT	NE	24	8
KH6IHP		22	13
KH6NS		3	2
WAØLPK/KL7		26	9
K6YNB/KL7		15	11
VE1ASU		18	6
VE1ZN		7	2
VE2DFO		41	10
VE2YU		32	8
VE2HW		18	6
VE3ASO		38	9
VE3FN		37	11
VE3BQN		37	8
VE3UH		35	11
VE3DSS		37	8
VE3EZC		33	8
VE3AIB		29	8
VE3EVW		29	8
VE3EMS		27	8
VE3FKX		27	7
VE3AQG		18	8
VE4MA		8	4
VE7BQH		12	3
SM7BAE		15	9
G4DZU		11	8
W1NV/VP9		8	3
VK5MC		7	7
SM6CKU		5	4
VK3ATN		4	4
ZL1AZR		2	2

other stations were heard. Attempts to place a phone call to FY7AS were unsuccessful. That station is active, however, as witness a contact made with him by KH6IAA the evening of October 13. Al also worked KP4Q as well as HC1s JX and BI on that occasion. Speaking of HC1JX, who was formerly known as K4ERO/HC1, John caught his first JA opening in early October. He has also worked FY7AS and had a marginal contact with an LU. South is not his best direction, as he must aim through the HCJB shortwave antenna about 300 yards away. However, the fact that he has now worked stations other than U.S. and Canadian has certainly heightened his already great enthusiasm for 6 meters. Incidentally, one of the stations he recently worked for a new country is HC1BI, 15 miles away.

Other fragments which serve to whet our appetites include reception of the 5B4CY Cyprus beacon (50.498) for a few minutes, on October 3, by VE1ASJ. It is also understood that the ZB2VHF beacon was heard by several East Coast stations the morning of October 14. TV signals are heard widely, almost daily, on 41.25 (French sound), 41.50 (BBC sound), 45.00 (BBC video) and 48.25 (both sound and video in various parts of Europe and Africa). How much longer can it be? We should know by the time this is being read!

As an example of what we have in store for us if conditions get anywhere near as good as they were during the Cycle 19 peak, here are a few of the 6-meter state totals from "The World Above 50 Mc" for December 1961: KL7AYV 44; XE1GE 39; KH6UK 37; EI2W 37; ZS3G 32; SM6ANR 30; SM7ZN 29 [I never received a QSL from him. — Ed.]; PZ1AE 28; SM6BTT 28; LU3DCA 27; LU3EX 27; ZE2JV 26; LU9MA 26; CT1CO 24; LA9T 21; SM5CHH 20; LA7Y 20; VQ2PL 18; JA8AO 18; JA8BU 17; JA1AAT 17 and JA1AUH 16. That's enough to make any 6-meter operator's mouth water!

CX8BE, who many have worked but from whom few have received cards, writes that his *Callbook* QTH is wrong. Send QSLs to Jorge de Castro, CX8BE, Lieja 7184 Montevideo, Uruguay, South America.

2 Meters — Each month brings word of one or two more who have accomplished the feat of working all 50 U.S. states on the 2-meter band. The latest to report this achievement is Terry, WØVB, who finished the last two in one weekend, working KH6IHP on October 6 and WAØLPK/KL7 on the 8th. He will join the select WAS list as soon as his QSLs are checked by Headquarters. Not only are congratulations due to WØVB but commendations should go to those who were on the other end, especially KH6IHP and WAØLPK/KL7, who have both been very busy of late running skeds with eager WAS seekers. Well done, fellows, and keep up the good work.

Another group providing hard-to-get states to many, especially western U.S. and foreign stations, is the roving EME operation of K6LEW and K3LFO. Over the weekend of September 15-16, Owen and Jim set up their portable 2-meter EME station at the QTH of K3JL in DE. Something quite unusual in such operations, they succeeded in completing 100 percent of their schedules and worked a few additional stations on CQs. Their list of contacts is very impressive indeed, including G5CSZ, WBØQMN, WA7JUO, KH6IHP, SM7BAE, W7FN, W7UBI, N7NW and WB9VEW. The station features an 8877 transmitter installed in a Land Rover, pulling a trailer on which is mounted a short tower supporting an array of four 13-element KLMs. It all seems to work. In addition to completing all of their skeds, Owen reports that they heard their echoes the entire time while operating from DE. As this is being written, Sunday evening October 14, it is understood that these two are at it again, this time from WV. They solicit suggestions on other states needed. K6LEW can be reached at 703-941-9389 or write Lt. Col. Owen Wormser, 6841 Pacific La., Annandale, VA 22003.

In order to promote activity on an evening not now covered by any area nets, WD4CXU in central VA has started a new SWOT net on Thursdays at 2130 EST. Roy would appreciate all the checkins he can get.

The Central States VHF Society has prepared a very attractive and informative EME Directory listing active moonbouncers on 2 meters through 23 cm. For a free copy, send a self addressed 9- × 12-inch envelope with 80 cents postage on it to: Terry Vanbenschoten, WØVB, 2326 11th St. N.W., Rochester, MN 55901.

70 Cm — The 70-cm EME gang was shaken up early in August when they heard FB moonbounce signals from TI2NA. They soon learned, however, that Eric was operating / W5 from the QTH of K5JL. No wonder he had a good signal! That experience was all that was needed to whet a good vhf man's appetite, so TI2NA should be on EME by the time this appears. Eric has ordered an Arcos amplifier and eight F9FT Yagis. His preamp is working well, so Costa Rica should be in many logs soon. Another relatively new 70-cm EME station is K1LPS, VT. Larry has worked eleven stations as of early October, eight of them between the 3rd and the 7th. During his first three QSOs, in July and September, he was running only 280 watts output. The low power was traced to an antenna matching problem, which has since been corrected, and output is now up to about 500 watts. At this level results are noticeably better.

As if K2RIW's 70-cm signal wasn't strong enough already, Dick is putting up a new array consisting of 16 19-element Yagis at 100 feet. Eventually it will have elevation as well as azimuth control, so K2RIW should be joining the moonbounce ranks. The mechanical design of the new system is quite novel. I am sure that those interested can get details by sending an s.a.s.e. to K2RIW at his *Callbook* address.

KØAH L, ND thinks we're missing many 70-cm aurora contacts. He suggests that, during buzz conditions, we call and listen for 10 minutes following each hour.

23 Cm and Down — The 23-cm linear translator planned for the Bay Area is now on the air. That's the word passed by W6XN at the recent AMSAT Annual Meeting. John said that the device went into operation September 9, with the first QSO between himself and WB6MYC. Located at the Bay-Comm site on the slopes of Mt. Umunhum, about 15 miles south of San Jose, it provides good coverage of the Bay Area and all directions except southeast. Input frequency band is 1296.2 to 1296.4 while the output is 1239.6 to 1239.4 MHz. Note that the translator inverts the passband, like some of the OSCAR satellite transponders. This arrangement, when used with a 23-cm transverter having a 28 MHz i-f, allows transceive operation, with receiving accomplished on the image frequency. Output power is 23 dBm, or 200 mW, and input noise figure 4 dB. It will be interesting to see how this experiment works out. It should do well in this hotbed of 23-cm activity.

K1FO, CT, reports that he now has 250 watts out from a pair of 7211s feeding a 28-element loop Yagi through 7/8-inch Heliax. Receiver noise figure is 3 dB. Steve believes that recent station improvements have really paid off. One station worked on several occasions is K4QIF, VA, at 405 miles.

WB5LUA notes another Dallas-to-Corpus Christi tropo opening October 7. He and W5HN both worked W5GIVE, whose 2-1/2 watts was putting in a 40dB/noise signal across the 365-mile path.

Feedback

Last month's photo showed one of K4GL's creations, not the 2-meter array described in the caption. Jack is one of our most dedicated vhf practitioners.

Rules, 1980 ARRL International DX Contest

This year's program features DX-to-DX QSOs, single-band categories and a new awards program. CW: February 16-17, 1980. Phone: March 1-2, 1980

We have some exciting good news for DX contest enthusiasts! To stimulate DX activity, a number of significant changes have been made for the 1980 ARRL International DX Contest. DX-to-DX contacts and single-band entries will be allowed. A liberalized multi-single rule allows you to pick up those elusive multipliers on other bands. The awards program has been expanded, with (sponsored) handsome, engraved plaques slated for distribution to over 50 deserving DXers, the world over. All in all, it will be a boon to the DX operator who can now work the world and thus provide more DX for the USA-Canadian contingent to work. The object is more fun for all in this, the premier DX operating event of the year.

For sample entry forms send an s.a.s.e. to: ARRL DX Contest, 225 Main St., Newington, CT 06111 USA.

Rules

1) **Eligibility:** Amateurs worldwide.
2) **Object:** Amateurs worldwide to work as many amateur stations in as many DXCC countries of the world as possible using frequency bands 1.8 to 30 MHz.
3) **Dates:**
(A) **CW** — Third full weekend in February (February 16-17, 1980).
(B) **Phone** — First full weekend in March (March 1-2, 1980).
4) **Contest period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.
5) **Categories**
(A) **Single Operator:** One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted.
(1) All band.
(2) Single band (one only). It is recommended that single-band entrants who make contacts on other bands submit logs for checking purposes.
(B) **Multioperator:** More than one person operates, checks for duplicates, keeps the log, etc.
(1) Single transmitter: one transmitter on any one band during the same time period. Stations must remain on a band for 10 minutes once a contact is made on that band, with one exception. **One** other band may be used during the 10-minute time period if the stations worked are new multipliers only.
(2) Multi-transmitter: no limit but only one signal per band.
(C) **QRP:** single operator only. QRP is defined as 10 watts input or less.
6) **Contest Exchange:**
(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) exchange signal report and state or province.
(B) DX stations: signal report and power (three-digit number indicating approximate transmitter input power).
7) **Valid Contact:** The same station may be worked once per band. Cross mode, crossband and repeater contacts will not count for contest credit. Incomplete contacts (includes call sign and exchange) do not count for points or multipliers. Aeronautical and maritime mobile stations may be worked for QSO credit only.
8) **QSO Points:** Contacts with your own country count for multiplier credit only.
(A) W/VE stations earn three (3) points per DX (non-W/VE) QSO.
(B) DX stations earn three (3) points per W/VE QSO, and two (2) points for other DX QSOs.
9) **Multipliers:** DXCC countries worked on each band.
10) **Scoring:** Multiply QSO points by the sum of multipliers per each band. Example: 4U1ITU works 500 W/VE stations (1500 QSO points) and 300 DX stations (600 QSO points) for a total of 2100 QSO points. On 14 MHz, 70 DXCC countries are worked and on 21 MHz, 60 DXCC countries are worked for a total of 130 multipliers. Final score = 2100 (QSO points) × 130 (multipliers) = 273,000 points.
11) **Reporting:**
(A) All entrants are encouraged to use forms available from ARRL (s.a.s.e. or one IRC) in reporting contest results.
(B) Logs should indicate times in UTC, bands, calls and exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets (dupe sheets).
(C) All logs must be in chronological order except for multi-multi entries. All operators of multioperator stations must be listed.
(D) Entries must be postmarked within one month of the last contest weekend (April 2, 1980). All stations are requested to send their entries as early as possible. Entries received after mid-July may not make *QST* listings.
12) **Awards:** Plaques will be awarded in the following categories for both the cw and phone contests.
(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), multioperator-single transmitter and multioperator-multitransmitter.
(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, multi-single and multi-multi categories will receive plaques.
(C) Top W/VE and top DX QRP scores.
(D) A listing of plaque donors will be published in February 1980 *QST*. Depending on sponsorship, additional plaques may be awarded.
(E) Certificates will be awarded to top single operator, all-band and single-band entries from each country and ARRL section; top multioperator entries (both single and multitransmitter) in each country, U.S. call area and in Canada. DX entrants making more than 1000 QSOs will receive certificates.
13) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium, and local clubs. Details will be listed in January 1980 *QST*.
14) **Conditions of entry:**
(A) Each entrant agrees to be bound by the provisions of this announcement, by regulations of his licensing authority, and the decisions of the ARRL Awards Committee.
(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made for unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the *QST* contest results.

Results, Second ARRL UHF Contest

Activity was way up on the microwaves.

By Tom Frenaye,* K1KI

The ARRL UHF Contest is here to stay! A total of 159 entries were received this year, up nearly 35 percent from last year, showing that the enthusiasm and activity on the uhf bands are really on the upswing.

Despite average to poor conditions, all but one of the division records were broken. Activity was still very sparse in the Great Plains and Rocky Mountain States but the population centers of Los Angeles and the Philadelphia-New York-Boston corridor had excellent activity.

A careful look through the entries received showed a lot more people making contest contacts than had been expected. Of the 686 different call signs in the logs received, only about 25 percent sent in entries. Most activity was on 220 MHz with close to 500 stations active; 430 had nearly 300 and 1215 had 67. Only 11 stations used anything above 1215 MHz.

Many people felt that there was no good reason to restrict fm on 430 MHz while allowing it elsewhere. While others wanted fm eliminated completely. Maybe some allowance should be made for the distances involved in QSOs. For weak signal work with no QRM, there isn't that much difference between an fm and an ssh signal, though a cw signal will always be the best. Those 1° by 1° longitude-latitude blocks are about 70 miles from north to south and 55 miles from east to west. Would a listing of longest QSOs (no EME) stimulate more weak signal work?

One thing about uhf enthusiasts became very clear — they're very opinionated and very serious about uhf. The percentage of entries that include comments about the contest, the rules, their equipment, etc., is greater than any other ARRL-sponsored contest. On the other hand, prying pictures out of uhfers of their prize construction projects is very difficult.

The battle for the biggest point total was won by N6NB with 27 points more than K1FO not even one QSO difference, though uhf in Southern California, with a big 220-MHz fm advantage, can hardly compare with the 432-MHz Connecticut edge. The biggest increases in scores came from several areas.

W3HQT (above) at the 220-1296 station and N3AHI (below) at the 432 station put W3HQT/3 on the map from eastern PA.

*Assistant Communications Manager, ARRL.

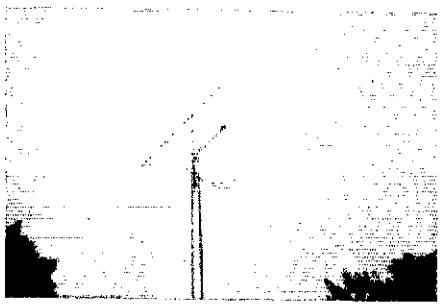
Division Leaders — Single Operator

Canadian	VE3BQN*	3906
Atlantic	K2UYH*	14,835
Central	WB9SNR*	6384
Dakota	WØVB*	429
Delta	AA4ZZ*	1728
Great Lakes	K8WW*	8190
Hudson	W2VC*	9030
Midwest	WBØZXU*	528
New England	K1FO*	19,239
Northwestern	K7HSJ*	1512
Pacific	W6XN	3540
Roanoke	K4QIF*	8520
Rocky Mountain	W5FF*	60
Southeastern	WB4NMA*	1197
Southwestern	N6NB*	19,266
West Gulf	WB5LUA*	1344

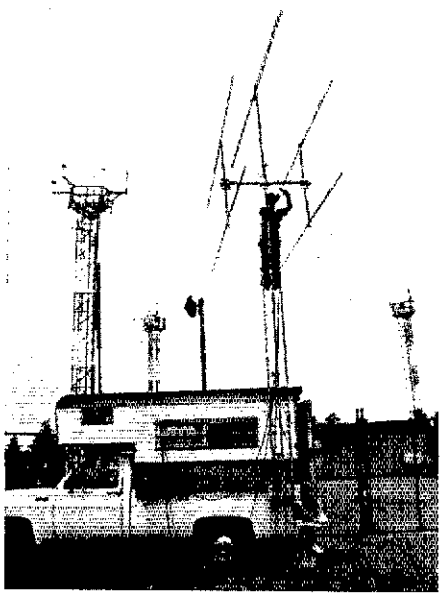
*New Division record

Total Activity

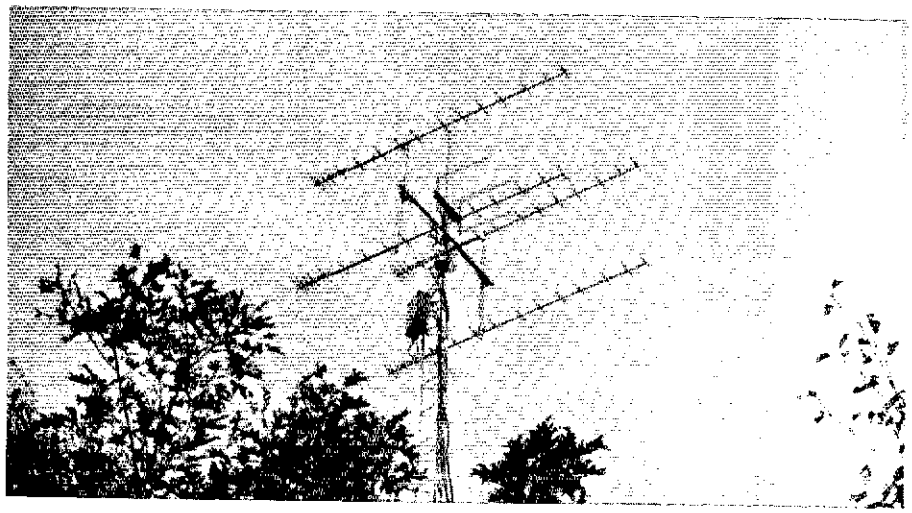
Band	*Different Stations*
220 MHz	494
430 MHz	298
1215 MHz	67
2.3 GHz	5
3.4 GHz	2
5.8 GHz	3
10 GHz	9
All Bands	686



The 12-foot dish shown here brought K4QIF the Roanoke Division record again this year.



The W4ATC/4 group set up on top of Whitetop Mountain, VA, next to some other uhf gear. WD4MBK is on the tower putting on the finishing touches: *(N4BYK photo)*



The NNJ 432/1296 antenna setup helped earn them the Hudson Division winning multiop score.

WB9SNR more than tripled his Central Division record of last year, while K4QIF's Roanoke Division total this year was about seven times that of last year. AA4ZZ in the Delta Division and WB4NMA in the Southeastern Division completely demolished the old records. The most competitive scores showed up in the Atlantic Division, where K2UYH edged past W2EIF, and in the New England Division where K1FO edged a strong challenge from K1PXE.

Multioperator scores were also up with the W2SZ/1 group from RPI adding 20 percent to last year's winning score. The close battle in the Great Lakes Division was won by W8DJY over WA8HGX. The Tektronix group (K7AUO) went at it again with a couple of portables driving around western Oregon but found an inversion layer prevented big microwave results. Nevertheless, their score was up more than 20 percent.

The most interesting multioperator effort was put in by the K6TZ/6 group who flew to Santa Cruz Island off the Southern California coast. They backpacked to the top of the island and ran 10 watts on 220 fm, 2 watts on 432 and less than one watt on 1296, all powered by solar cells. Watch out for them in the years ahead!

If you've wondered what uhf is like in the sparsely populated parts of the West, W7LUX and W5FF can tell you. W7LUX says there is only one other uhf station within 120 miles of his Prescott, AZ, location, though he notes 1215-MHz activity is on the rise. W5FF never did work his own state of New Mexico. His nearest QSOs were over 200 miles away and farthest nearly 400.

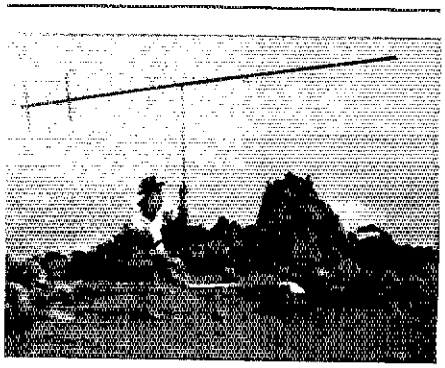
A number of comments were received indicating that August wasn't the best time of year for many people because of vacation schedules. The Contest Advisory Committee is studying UHF Contest dates and a change may be made for the 1980 contest. The UHF Contest is here to stay.

Not enough room for a map showing activity across the country this year, but if you'll send an s.a.s.e. and ask for the "uhf activity charts" for the August UHF Contest you can get a listing that shows the total number of stations active on each band in each 1° longitude/latitude block.

Certificates go to the top combined DXpedition score, to all division winners, to second-

Centers of Activity

Overall (1° × 1°)	*Active Stations*
Los Angeles-S.F. Valley	50
Los Angeles-Long Beach	48
Santa Barbara-Ventura	37
Philadelphia-North	36
Portland	32
Anaheim-Orange County	30
San Diego	27
Philadelphia-South	26
Cincinnati	23
Hartford	19
220 MHz	
Los Angeles-Long Beach	46
Los Angeles-S.F. Valley	45
Santa Barbara-Ventura	36
Philadelphia-North	33
Portland	29
430 MHz	
Philadelphia-South	16
Cincinnati	16
Hartford	13
San Mateo-S.F.	11
Boston	11
1215 MHz	
Portland	9
Boston	7
San Mateo-S.F.	5
Santa Barbara-Ventura	4
Los Angeles-Long Beach	3
Philadelphia-South	3



The 2500-foot K6TZ/6 QTH on Santa Cruz Island overlooked much of the Southern California coastline, though a plane ride, 1-1/2-hour jeep ride and 2-1/2-hour hike on sheep trails make it pretty remote.

Multiplier Leaders

220 MHz		430 MHz		1215 MHz	
N6NB	19	K8WW	42	K1FO	12
W2EIF	16	GW3NJY/W9	35	K2UYH	11
K1FO	16	WA8TTS	33	W2VC	11
K1PXE	14	K2UYH	32	WA3JUF	11
WA2TEO	13	W3IP	30	K4QIF	10
K2DNR	13	K4QIF	30	W2EIF	9
VE3BQN	10	WB9SNR	29	K1PXE	9
W1GXT	10	K2RIW	28	W3CXU/2	8
WA2FUZ	10	K8AT	28	K3IUV	7
WA3JUF	10	WA4IPI	26	W1JR	5
WA8EUU	10	K1PXE	26	N6NB	5
W2SZ/1*	23	W8DJY*	30	WA2SNA*	12
W3HQT/3*	18	W2SZ/1*	29	W2SZ/1*	11

*Multioperator

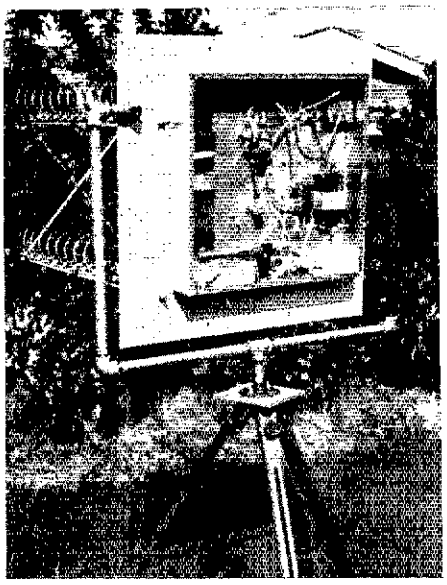
place entries where five to 10 entries were received, and to the top three where more than 10 entries were submitted.

FEEDBACK

The only correction from last year's results is that K2UYH was the single-operator winner from the Atlantic Division (SNJ).

SOAPBOX

Last year I worked all the stations I could find on uhf within 300 miles. I totalled 144 points. There was simply no one else to work using normal equipment. I object to being in the same division as all the stations in Southern California (W7LUX). I hope that the remainder of the country had as large an increase in activity as the Southeast had (WA4WZQ). A 220-fm rule like that of 146.52 in the VHF Contest should be implemented. Heard the KH6HME 432 beacon during the contest which parallels last year's opening (WB6NMT). Was amazed at the good ears/operators at most stations. My vote for most active station on 432 goes to W2SZ/1 who was going at 4:30 A.M.! (K2GK). My first successful try at 432 was the day before the contest! (WA2BPE). I believe operating time should be 24 out of 35 hours like the other vhf contests to allow for two evenings of openings and one morning shot (WA4IPI). I just got my feet wet, both on uhf and in contests (WB4AYE). I enthusiastically support the multiplier method and scoring scheme presented by this contest (WØVB). Activity did tend to follow band conditions, which were generally bad Saturday. Sunday did come through with many short-lived openings (mostly short range and intense) which did bring in low-power stations in the 200- to 300-mile range and could be pushed to 400-500 miles with high power (WB9SNR). New England lend an ear. We listen and call but they never turn the beams on us (W4ATC). This contest is certainly more enjoyable and challenging than the ones in September and June (W1JR). QST



WA6EJO's homebrew 1296 station attaches directly to the quad helix antenna.

Scores list:

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 430 MHz, E = 1215 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.8 GHz, I = 10 GHz).

Canadian Division

VE3BQN(VE3CRU,opr) 3906-11-10-C ONT
27-19-D
2- 2-E
VE2BBK 330- 9- 9-D QUE
1- 1-E
VE3FN 330-11-10-D ONT
VE2SH 189- 7- 6-D QUE
1- 1-E
VE3IHB/3 96- 8- 4-C ONT
VE3IQZ 27- 3- 3-D ONT

Atlantic Division

K2UYH 14,835-89-32-D SNJ
13-11-E
W2EIF 13,530-48-16-C SNJ
40-16-D
11- 9-E
K3IUV 11,118-38- 8-C EPA
53-19-D
9- 7-E
WA3JUF 6930-12-10-C EPA
32-12-D
13-11-E
W3CXU/2 6417-12- 6-C SNJ
39-17-D
9- 8-E
W3IP 6222- 4- 4-C MD
57-30-D
N3MW 2337-20- 6-C EPA
21-13-D
W3CL 1620-33- 6-C EPA
12- 6-D
W3XO 1620-30-18-D MD
K2GK 990-22-15-D WNY
K3BWD 726-22-11-D EPA
N2AQJ 690-14- 5-C SNJ
9- 5-D
K3QQJ/M 651-31- 7-C EPA
WA3DMF 594- 1- 1-C MD
17-10-D
W2HXF 540-18-10-D SNJ
WA2BPE 351-13- 9-D WNY
K3VYG 305-34- 5-C EPA
WB2KIW 72- 6- 4-D WNY
K3GAS 63- 7- 3-C EPA
W4NVW/3 18- 6- 1-C MD
K3DLS 12- 4- 1-C EPA
W3HQT/3(+N3AHI) 19,635-25-18-C EPA
66-27-D
14-10-E
K2BWR(+K2ZRJ) 5310-15-10-C SNJ
38-17-D
3- 3-E
W3GNR/3(+K3TFL,WA3FFC) 4794- 8- 8-C WPA
39-26-D
WA2ZJF(WA2RQC,WB2MYZ, oprs) 108- 6- 6-D WNY

Central Division

WB9SNR 6384- 5- 5-C ILL
41-29-D
5- 4-E
GW3NJY/W9 5250-50-35-D ILL
W9IFA 180-10- 6-D ILL
WD9EME 147- 7- 7-D IND
WB9NTL 126- 7- 6-D IND
KA9ASH 126- 7- 6-D IND
WA9CUH 60- 5- 4-D WI
K9XY 18- 1- 1-C WI
2- 1-D

Dakota Division

WØVB 429- 3- 3-C MN
10- 8-D
KØVXM 360- 1- 1-C SD
11- 9-D
WØOHU 297-11- 9-D MN
WBØYQS 24- 4- 2-D SD

Delta Division

AA4ZZ 1728-16- 6-C TN
16-12-D
WB4JGG 126- 7- 6-D TN
WA4QYK 90- 6- 5-D TN
W5UCV 36- 4- 3-D MS

Great Lakes Division

K8WW 8190-65-42-D OH
WA8TTS 4455-45-33-D OH
K8AT(W9IP,opr) 3696-44-28-D OH
WA4IPI 3159- 8- 3-C KY
31-26-D
K8DW 2625-11- 8-C OH
24-17-D
WA8EUU 2046-13-10-C MI
18-12-D
WA8VPD 2046- 6- 5-C MI
25-17-D
K8DIO 1539-27-19-D OH
WB8PAT 1440- 6- 6-C OH
16-13-D
1- 1-E
WA8ULQ 1404- 6- 3-C MI
20-15-D
W8DJY(+W8ULC,WB8NFJ) 7548-21- 7-C OH
47-30-D
WA8HGX(+WB8BKC) 7353-19-14-C MI
34-25-D
4- 4-E

Hudson Division

W2VC 9030-58-24-D NNJ
28-11-E
WA2FUZ 8118-26-10-C NLI
56-23-D
K2RIW 6972-83-28-D ENY
WB2WIH 2142-14- 9-C NNJ
20-12-D
WA2TEO 1008-16-13-C ENY
5- 3-D
K2SHB 897-23-13-D ENY
WB2TFH 828-23-12-D NNJ
K2DNR 663-17-13-C ENY
WA2ANZ 36- 4- 3-C ENY
WA2SNA(K2BJG,K2LPG, KA2AVA,N2AAZ,W2s LVT MJA,WA2UPK,WB2CAM,oprs) 22,752-62-17-C NNJ
64-19-D
16-12-E

Midwest Division

WBØZXU 528-16-11-D IA
WBØTEM 297- 2- 2-C IA
9- 7-D

New England Division

K1FO 19,239-25-16-C CT
62-25-D
17-12-E
K1PXE 17,640-25-14-C CT
71-26-D
12- 9-E
W1JR 11,100-15- 7-C EM
59-23-D
9- 5-E
1- 1-F
1- 1-I
W1GXT 2835-21-10-C EM
15- 8-D
5- 3-E
W9KDR/1 2451-10- 7-C CT
33-12-D
K1ZZ 1944- 4- 4-C CT
32-14-D
W1UHE 1845-41-15-D RI
AC1J 1782- 7- 4-C NH
26-14-D
WA1PBR 1632-10- 7-C RI
22-10-D
N1QG 1377-11- 8-C CT
13- 8-D
1- 1-E
WA1VUW 1312-31-14-D CT
WB1PKF 1125- 7- 4-C EM
12- 9-D
3- 2-E
K1VYU 792-24-11-D CT
WA1HYN 600-20-10-D CT
K1LPS 528-16-11-D VT
WA1GTP 360-15- 8-D CT
K1SU 288-12- 8-D CT
WB1CWZ 150-10- 5-D CT
K1JD 144- 8- 6-D CT
K1WGN 105- 7- 5-D EM
K1COW 96- 8- 4-D WM
W1JOT 72- 6- 2-D EM
1- 1-E
W1AY 54- 6- 3-D EM
W1AY1a 12- 2- 1-E EM
K1JG 3- 1- 1-D WM
W2SZ/1(WB1CBH,K2TR, W2GN,WA2s FKS GFP,WB2s BXP PKO,WA8USA,oprs) 36,465-67-23-C WM
81-29-D
18-11-E
1- 1-I
W1XM(W1XG,WA4TTG,oprs) 8208-19-11-C EM
31-16-D
13- 9-E
WA2JHR/1(+WB4RVA) 1218- 4- 2-C WM
19-10-D
3- 2-E

Northwestern Division

K7HSJ 1512-21- 6-C OR
11- 6-D
2- 2-E
W7TYR 1350-15- 6-C OR
11- 7-D
2- 2-E
N7DB/7 132- 6- 2-C OR
5- 2-D
K7AUO/7(W7s ADV BKN UDM,WB7FHF,oprs) 9288-30-18-C OR
12-15-D
3- 1-E
2- 2-F
1- 2-G
2- 1-H
1- 2-I

Pacific Division

W6XN 3540-13- 6-C SCV
22- 8-D
10- 5-E
1- 1-I
K6JKQ 1458-14- 9-C SJV
11- 8-D
1- 1-E
WA6UAP 1287-17- 8-D SCV
8- 5-E
AJ6T 156-13- 4-D SCV

Roanoke Division

K4QIF 8520-47-30-D VA
12-10-E
WA4SBC 1782-33-18-D VA
WA4ZIA 1404-11- 5-C NC
15-13-D
N4CD 540- 2- 1-C VA
16- 9-D
W4FJ 480-16-10-D VA
WA4GBE 264-11- 8-D
WA4MVI 189- 9- 7-D NC
K4KAE 105- 7- 3-D SC
WB4AYE 18- 3- 2-C VA
W4ATC(AA4OO,WA4DFS, WD4s AHS MBK,oprs) 2673- 7- 6-C VA
26-21-D
WA4WZQ/4(+K4YBC, KA4HKK,WA4WZP, WB4HIE,WD4GQU) 2112-12- 5-C NC
20-17-D
WA4PGI(+WA4ZRP) 900-18-14-D VA
1- 1-E

Rocky Mountain Division

W5FF 60- 1- 1-C NM
4- 3-D

Southeastern Division

WB4NMA 1197-21-19-D GA
W4ISS 864-18-16-D GA
WA4CQG 324-12- 9-D AL
W4ODW 189- 9- 7-D NFL
W4EQR 105- 7- 5-D NFL
WB4BSZ 72- 6- 4-D NFL
W4GCB 48- 4- 3-D GA
W8UT 27- 3- 3-D WVA

Southwestern Division

N6NB 19,266-127-19-C SBAR
32-14-D
5- 5-E
WB6NMT 7521-64- 9-C SDGO
29-10-D
8- 4-E
AC6C 6480-93- 8-C ORG
19- 7-D
4- 3-E
WA6EJO 1560-42- 7-C SBAR
3- 2-E
1- 1-I
W6NXB 1440-60- 8-C LA
K6BRD 1368-57- 8-C ORG
K4JSI/6 1071-61- 7-C LA
W6CN 1032-43- 8-C LA
WB6OKJ 888-37- 8-C LA
W6ABW 780-52- 5-C LA
WA6QCA 735-35- 7-C ORG
WA6DCT 528-22- 8-C LA
WA6TRW 525-25- 7-C ORG
K6KH/6 495-31- 5-C ORG
N6AVW 462-22- 7-C ORG
KA6DGV 450-25- 6-C ORG
W6ABN 336-14- 8-D ORG
N6NO 336-16- 7-C LA
W7LUX 240-10- 8-D AZ
W6VIO(W6ABW,opr) 105- 7- 5-C LA
W7HZJ 18- 3- 2-D AZ
K6TZ/6(WA6s GNY MBZ, WB6s HOZ OUZ QDS,oprs) 9135-112- 9-C SB
19- 9-D
9- 5-E
AA6DD(+K6LPF) 3696-34-10-C SBAR
12- 8-D
5- 4-E
WB6ESQ(+WA6PMX) 1302-21-10-D ORG
5- 4-E

West Gulf Division

WB5LUA 1344-22-13-D NT
3- 3-E
WB5KIA 54- 6- 3-D NT

DXpeditions*

K7RUN (4 locations) 118- 8- 8-C ORE
4- 4-D
K7WWR/7(+WB7CHK) (8 locations) 1320-22-17-C ORE
13-13-D
2- 2-F
2- 2-G
2- 2-H
2- 2-I
K7UUH(Multiop) (4 locations) 278-10- 7-C
4- 3-D
1- 1-F
1- 1-H

* Combined score from all locations

Check Logs

K4EJQ,K4GMJ,W6YKM

Rules, 33rd VHF Sweepstakes

VHF Sweepstakes precedes the Super Bowl as surely as day turns into night and sure enough, 1800 UTC on January 12, 1980 kicks off the 33rd running of the ARRL VHF Sweepstakes.

If your club is going to enter one of the three tiers of *Affiliated Club Competition*, be sure to comply with the club competition rules (see January 1979 *QST*, page 85), especially the part of the rules that states that the club secretary (or other officer) must submit a list of *all* members eligible to enter scores for the club. Do not forget the mailing deadline.

If you've ever wondered when to find activity on some of the higher bands, try 220.05 at 8 P.M. local time, 432.1 at 9 P.M. and 1296 at 10 P.M. The more sparsely populated areas may find 146.52 useful at 8 P.M. and 223.5 at 9 P.M.

Any station, whether or not it is manned by only one operator, that receives or gives assistance to another station during the contest (this includes spotting or coordinating nets/repeaters) is classified as a multioperator station. See rule 7, below.

Per rule 6 (below), there should be only one valid entry under one call sign during the contest. This is meant to prevent an operator from working stations, then jumping into the car with the rig and working the exact same stations from the same ARRL section, signing the same call/M. This type of QSO will not count for the person making them or for those who work this station.

The starting time will be 1800 UTC on Saturday (1 P.M. EST, 10 A.M. PST).

The three-tiered club competition will continue, with three club gavels awarded — one for each category (see page 85 of January 1979 *QST* for full details).

Remember to note complete exchanges — signal report, section and serial number — in the log and check for duplicate QSOs. Watch the deadline for mailing your log.

Send an s.a.s.e. in early to get summary, dupe and log sheets. Please ask for only one of each unless you are unable to make copies.

Rules

1) *Eligibility:* Amateur operators in any ARRL section (see page 8) operating at home, or mobile or portable *under one call*, on or above 50 MHz, are invited to take part. Yukon-NWT (VE8/VY1) and Newfoundland-Labrador (VO1/2) count as a separate multiplier.

2) *Object:* Participants will attempt to contact as many other stations in as many ARRL sections as possible.

3) *Contest periods:* The contest begins at 1800 UTC Saturday, January 12 and ends at 0400 UTC Monday, January 14, 1980.

4) *Exchanges:* Amateurs in the U.S. and Canada transmit the signal report, ARRL section and a consecutive serial number (starting with 001). Multioperator stations may elect to give out blocks of consecutive serial numbers on each band. Foreign stations will give their country name rather than ARRL section. One-way or partial contacts for partial point credit are *not* permitted. Contest operations are limited to only one signal per band at any given time (band, not mode). Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 1000 feet.

Scoring Example

Band	Contacts	QSO Points
50 MHz	5 × 2 =	10
144 MHz	17 × 2 =	34
220 MHz	3 × 4 =	12
432 MHz	3 × 4 =	12
1215 MHz	2 × 8 =	16
2300 + MHz	2 × 16 =	32
Totals	32 QSOs	116

Final score = (number of QSO points) × (the number of ARRL sections plus 10).

5) *Scoring:* (a) Complete contacts on the 50- and 144-MHz bands count two points each, complete contacts on the 220- and 420-MHz bands count four points each, contacts on the 1215-MHz band are worth eight points each and contacts on 2300 MHz or any higher amateur band count 16 points each. A section only counts once for multiplier credit regardless of band. (b) Foreign entries: All contacts with foreign countries (such as Mexico and the Bahamas) count for score. Each foreign country counts as a separate multiplier. Foreign stations may only work stations in ARRL sections for contest credit. (c) Final score is obtained by multiplying total contact points by the sum of the different ARRL sections (plus VE8/VY1 and VO1/2) worked plus 10. (See the example.)

6) *Conditions for valid contact:* (a) Repeat contacts on different bands may be counted for each different station worked. (Example: K4QIF works W3HMU on 50, 144 and 1215 MHz; 2 + 2 + 8 = 12 contact points, but only one section multiplier.) (b) Crossband work may not be counted. (c) Portable or mobile station operation under one call, from one location only, is permitted. (d) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (with the exception of family stations, where more than one call is assigned to one location by FCC/DOC and then this rule will allow for only the duly licensed family members to operate the station). (e) Contacts with aircraft mobiles cannot be counted for section multipliers.

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

Contacts made by retransmitting either or both stations do not count for contest purposes. In addition, use of the 146- to 148-MHz segment of 2 meters is restricted as follows: Contest contacts may be made only on these recognized simplex frequencies: 146.49, .52, .55, .58 and 147.42, .45, .48, .51, .54, .57 MHz. Contest contacts may *not* be made on any other frequency between 146 and 148 MHz; this restriction includes all repeater frequencies (including 146.76 and 146.94 MHz). Also, use of the national calling frequencies (146.52 and 223.5 MHz) is restricted to four hours total operating time for each participating station on each band during the contest period (including both listening and transmitting time). These four hours may be taken in operating periods of not more than one hour each and must be clearly indicated in the log. After each operating period on 146.52/223.5, the participating station may not transmit on 146.52/223.5 MHz for at least 15 minutes. Multioperator stations may not include QSOs (for scoring credit) with their own operators except on frequency bands higher than 2.3 GHz.

7) *Awards:* Entries will be classified as single or multioperator, a single operator being defined as one manned by an amateur who neither receives nor gives assistance to any person during the contest period. Certificates will be awarded in each ARRL section to the top-scoring amateur in the single-operator classification. Multioperator work will be grouped separately in the official report of results in *QST*; outstanding multiop efforts will receive certificates.

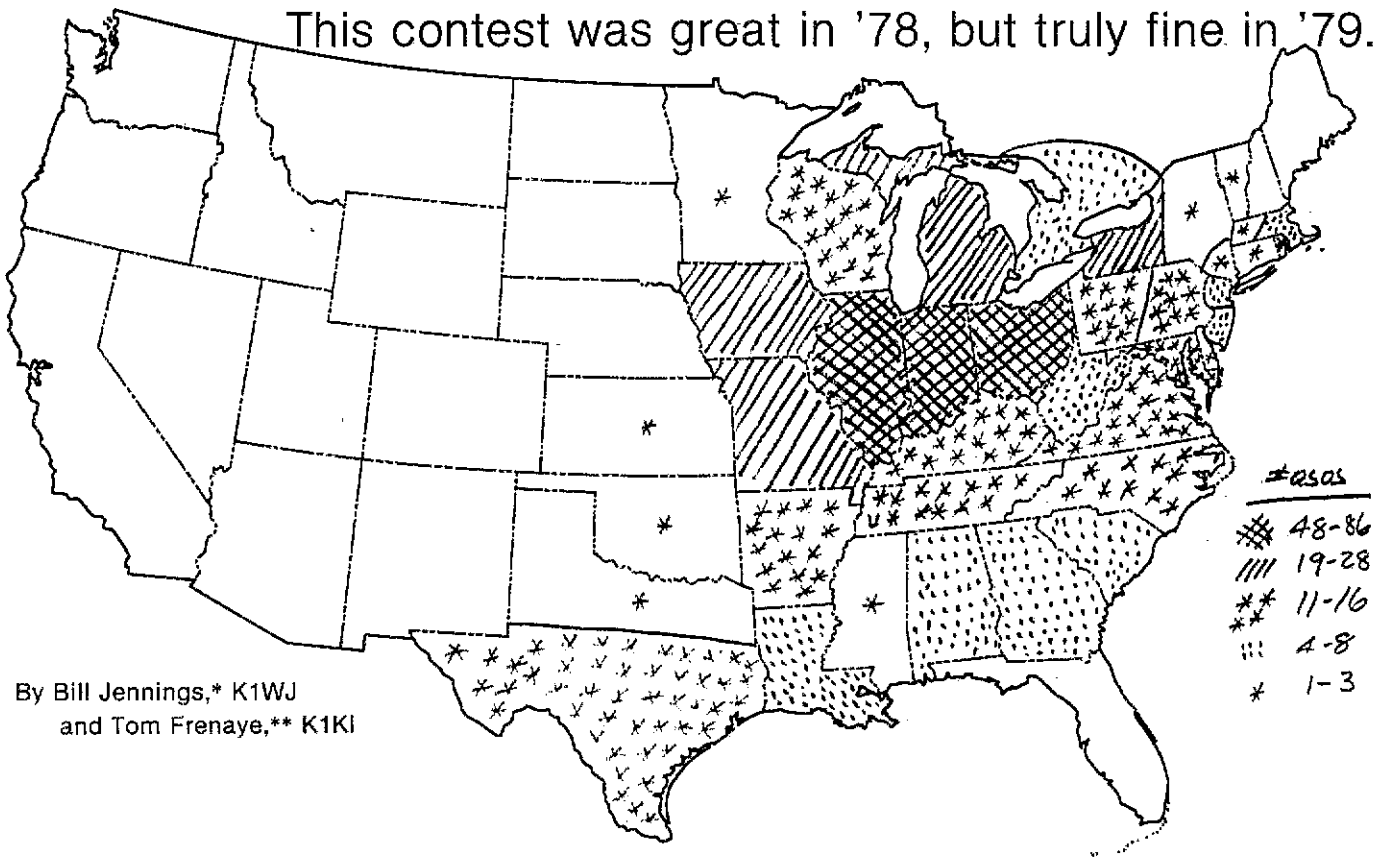
8) *Conditions of entry:* Each entrant agrees to be bound by the provisions of this announcement, the regulations of his licensing authority, and the decisions of the ARRL Awards Committee.

9) *Reporting:* The log should indicate the date/time, band, call sign, signal report, section and serial number for each QSO. Reports must be postmarked no later than February 11, 1980, to be considered for awards. Dupe/check sheets (by band) must be included with every entry of 200 or more QSOs.

10) *Information on affiliated club competition and disqualification criteria will be in January 1980 QST.*

Results, 1979 ARRL September VHF QSO Party

This contest was great in '78, but truly fine in '79.



Mike, W9IP, likes to plot 2-meter QSO density by section on a map, after the contest, to see where the action was.

By Bill Jennings,* K1WJ
and Tom Frenaye,** K1KI

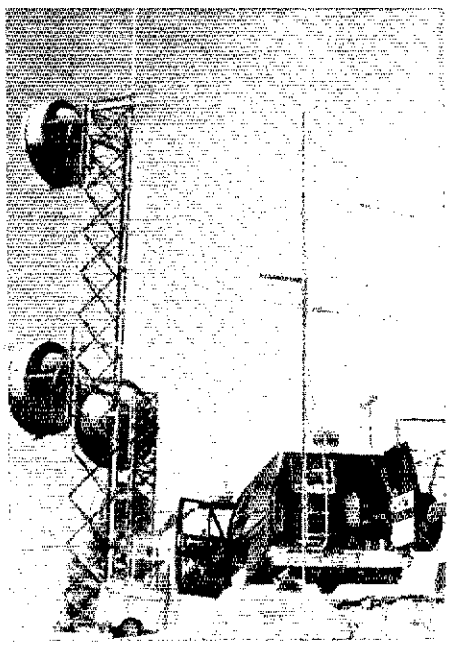
When things are bad, they're very bad, but when things are good, they're great. Pardon our taking the liberty to "adjust" that old saying to describe the increased participation (in terms of entries submitted) and those FB conditions, especially that dandy tropo that intensified late Sunday evening, extending from Northern Texas through Northern New England. Those "things" *were* great.

The 422 entries received for this September contest are not only an increase of 25 percent from the 338 logs checked in 1978, but represent the largest turnout since 1963.

When we say that individual and multiop division records were broken we're putting "gross understatement" in a new category. Check the division leaders' box for yourself. See all those asterisks? Each call sign that has an asterisk after it has broken the previous all-time division record and now holds the new record for that particular division. Mind you, these are now the record holders, not counting all those in the same ARRL division that also broke the old division record but were just shy

*Communications Assistant, ARRL
**Assistant Communications Manager, ARRL

W6SFH and WA6KOD multioped from 'KOD's "portable shack" from the Sacramento Valley Section. They relate, somewhat unhappily, that those dishes on the tower next to the van belong to Western Union and were not used during the contest.



of the score submitted by the new record holder.

The overall, all-time, single-operator high score is just slightly over 102K points (yes, you read that correctly — 102 with three 0s after it) by N6NB. Wayne operated portable from Vermont, and we don't think that it would be improper to mention that a single-operator score of over 100K points had never before been achieved in *any* ARRL VHF contest. To make our point a little clearer, scan the score listings and the scoring leader boxes in this report and see how many single operators managed to break K1FO's one-year-old, 45K-point, single-operator high score for the September contest.

The multioperator stations were not about to be outdone by their single-op counterparts. Those starred call signs, denoting new all-time division leaders are as plentiful on the multioperator side of the division leader box as on the single-operator side. It might be casually mentioned that a new all-time-high multioperator score appeared in the September bash. Ho hum, another of those giant multis from the Northeast found a "bonus opening" on 432 while everyone else was asleep? Not quite. The Roanoke Division multiop leader is also the all-time multiop leader. Who? Who else? W4BFB. After several frustrating years of good solid effort, some "nice try — but, wait 'til next year," division, but not overall, winning efforts, the gang from the Mecklenburg ARS got down and got hot to the tune of better than 190,000 points. After "well done," what else need be said? The 175K-point score at W2SZ/1 "ain't no shabby effort." 'BFB, 'SZ, and the old WA1MUG group (from whence evolved the W2SZ team) are the only multiop entries to ever break into that magic 100,000 point circle in September.

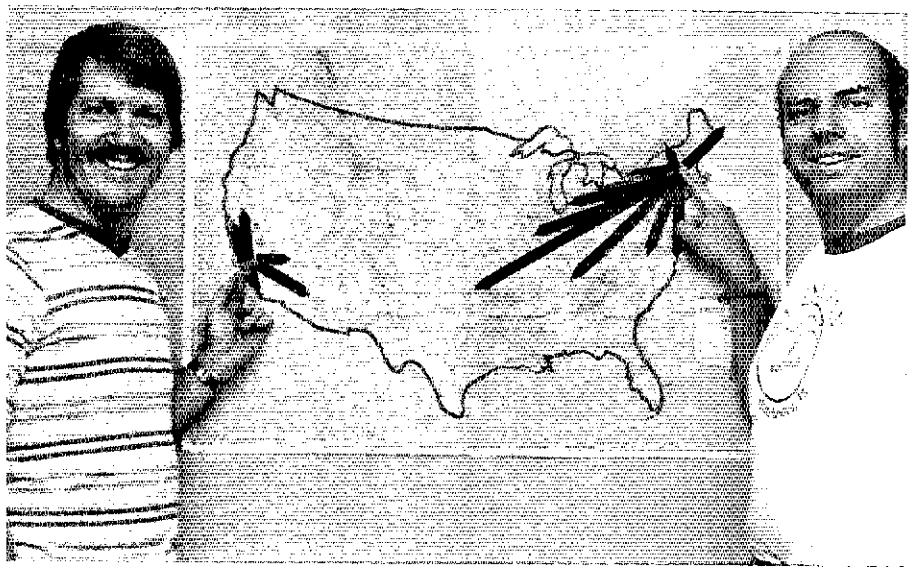
Ted Goldthorpe, WA4VCC, vice president down at Mecklenburg, sends the following narrative on how the winning effort really came together. "The goal was set. Over 70,000 points were needed to comfortably take a 12-year-old record for the Roanoke Division. WA8PLZ, the Drake Radio Club, signed portable 8 in WV and came home with 67,000 points. 'BFB wanted that record, to own all three contest certificates (January SS, June and September VHF QSO Parties) for the Roanoke Division.

"Plans were made, the best equipment secured and permission obtained for us to be atop 6300-foot Roan Mountain for the contest. On Friday afternoon, September 7, 16 fired-up Mecklenburg operators began the assault on the North Carolina side of Roan Mountain.

"The first antenna was in place before nightfall on Friday and the last in place by 2:30 P.M. (local) on Saturday. Ten elements on 6 meters, 32 elements on 2-meter ssb, 14 elements and a Hustler G-7 on 2-meter fm, a Ringo Ranger on 220 fm, and 38 elements on 432. Whew!

"At 2:45 P.M. a procedural meeting was held by the group and operating schedules were handed out. At 2:57, those on Roan Mountain heard a loud cheer carry across the mountain and at exactly 3, four stations were going full-bore.

"How were conditions? Unbelievable. Right off the bat, the 2-meter station had Midwestern stations stacked up waiting to work us. By 3:30 P.M. the 220 station had logged seven states. By midnight on Saturday, we were still caught up in our frenzy of enthusiasm; it sounded like a pep rally. Over 70,000 points were now in the bag and a new goal of 100,000 points was established.



Who said "east is east and west is west and never the twain shall meet"? N6VI (left), the top single-op scorer on the West Coast in the September Party meets "Mr. 10^5," N6NB, who came up with the first-ever 100,000-point single-op score in an ARRL-sponsored vhf contest, just back from his successful contest operation in Vermont. Martin ('VI) and Wayne got together after the contest to compare (see the arrows on the map) the difference in the DX each worked in the 'test.

Division Leaders

Single Operator			*Multioperator*	
Call	*Score*	*Division*	*Call*	*Score*
VE3BQN*	16,254	Canadian	VE3AEA/3	6798
WA2DPU*	45,360	Atlantic	WA3CPH/3*	52,298
GW3NJY/W9*	35,310	Central	W9IP*	84,739
KØCJ	1008	Dakota	KØSE*	10,492
WB4JGG*	28,424	Delta	WB4LHD/5*	58,050
WA8TTS*	33,495	Great Lakes	W8DJY*	53,382
WB2WIK*	54,202	Hudson	WA2SNA*	98,746
NØIS*	20,119	Midwest	KØTLM*	7470
N6NB/1*	102,795	New England	W2SZ/1*	175,835
WA7RTA	2641	Northwestern	—	—
K6KLY	5084	Pacific	W6SFH/6	1734
N4CD*	14,112	Roanoke	W4BFB*	190,210
—	—	Rocky Mountain	NØKV*	2970
WA4EWA*	9108	Southeastern	W4VO*	24,426
N6VI	21,756	Southwestern	K6MEP*	18,960
WD5FZM*	6020	West Gulf	KA5AAW	1802
JA1RJU*	8	DX	—	—

*Indicates new division record

"The trend carried on through the night and into Sunday afternoon. The crew was dead tired, but enthusiasm kept the sandman at bay. The new goal was 200,000 points, but the bands had been worked out. Only stragglers were being logged. So the stations came down, one at a time, as individual band conditions dictated. At about 3:30 P.M., our last contact in the contest had been logged. At 5:00 P.M., now 20 strong, we left the mountain with 75 log sheets clenched in our tired, sweaty but happy little hands.

Number two, single operator, Eastern Massachusetts Section, WB1FUB.

"Score? It's hard to believe but — over 190,000 points. It is interesting to note that some 1000 QSOs had been logged on 2 meters and a total of 115 section multipliers had found their way into the logs.

"Sure, the Mecklenburg ARS, W4BFB, was happy with their performance, but you can't rest on your laurels, with at least a couple of dozen multioperator stations across the country capable of winning the whole ball of wax. Wonder how we can improve the operation for next year?"

Can you imagine what second thoughts may have occurred when the 'BFB gang got home and discovered that they missed the big tropo opening Sunday night? Other Southeastern stations were working 5s, 9s and Øs until the end of the contest. Scheduling required off time can be a difficult decision.

The Sunday night tropo seemed to be centered over the lower Ohio River Valley

Top Ten

Single Operator		*Multioperator*	
N6NB/1	102,795	W4BFB	190,210
K1FO	62,128	W2SZ/1	175,835
WB2WIK	54,202	WA2SNA	98,746
WA2DPU	45,360	K2OWR	92,204
GW3NJY/W9	35,310	W9IP	84,739
WA8TTS	33,495	WA4WZQ/4	80,352
WB4JGG	28,424	K2GE	64,657
K1PXE	28,045	WB4LHD/5	58,050
WA2FGK/2	26,940	W4ATC	53,977
WA1NGR/3	22,632	W8DJY	53,382

Call Area Leaders (QSOs — Multipliers)

	50 MHz	*144 MHz*	*220 MHz*	*430 MHz*	*1215 MHz*	*10 GHz*
N6NB/1	193-27	502-31	58-18	78-25	4-4	
W2SZ/1*	348-28	667-30	78-18	140-26	25-12	1-1
WB2WIK	187-29	318-27	33-10	45-16		
WA2SNA*	239-25	372-26	105-18	76-21	15-7	
WA1NGR/3	102-20	80-21	22-10	48-16	2-2	
WA3CPH/3*	214-27	344-32	—	52-20		
WB4JGG	88-31	248-33	—	19-12		
W4BFB*	345-34	1017-39	78-16	68-26		
WA5FDF	5-2	235-30	—	4-4		
WB4LHD/5*	165-28	380-33	—	65-25		
N6VI	53-11	291-11	87-5	26-7	6-3	
K6MEP*	65-9	297-7	205-5	9-3		
WA7RTA	42-9	46-5	9-2	12-2	3-1	
K7UA/7*	2-1	60-2	4-1	1-1		
WA8TTS	153-26	166-25	5-1	53-25		
W8DJY*	148-30	319-25	35-6	57-21		
GW3NJY/W9	92-17	311-25	—	66-24		
W9IP*	144-32	515-38	17-7	73-24		
NØIS	—	191-29	—	75-30		
KØSE*	86-23	114-11	4-3	18-6		
VE3BQN	35-21	168-21	6-5	40-17	2-2	
VE3AEA/3*	71-13	101-13	—	17-7		

*Indicates multioperator station

KØTLM (front) and WBØDRJ, 2-meter and 70-cm stations, respectively. KØTLM, multiop, Missouri.

where even the low-power stations ran up the multiplier totals. Those on the edge of the tropo, WB5LUA in the Southwest and N6NB/1 in the Northeast, had to rely on the kWs or altitude to pick up the numbers. The tropo was bounded by the remnants of Hurricane David, over the Canadian Maritime provinces; Hurricane Frederick just moving south of Florida and a cold front trying to sweep down across the Plains States.

Who would have guessed that 430 MHz would outdo 50 MHz in the September contest? The biggest 430 multiplier came out of MO where NØIS snagged 30. On 2 meters the big totals came from NC (W4BFB), IL (W9IP) and Western NY (K2OWR).

Sure is nice to have a contest weekend fall on the same weekend as the good propagation.

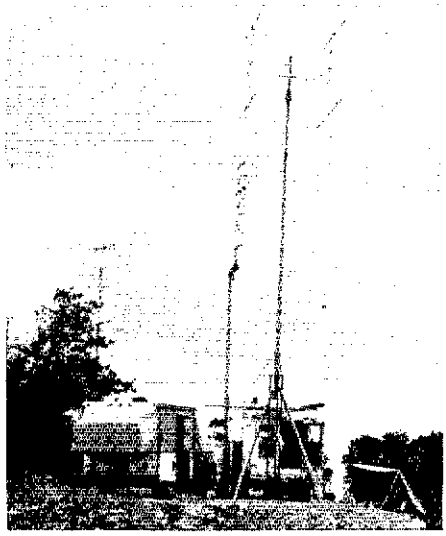
Don't forget to send an s.a.s.e. for summary, logs and dupe sheets for the 1980 VHF SS — January 12-13, 1980.

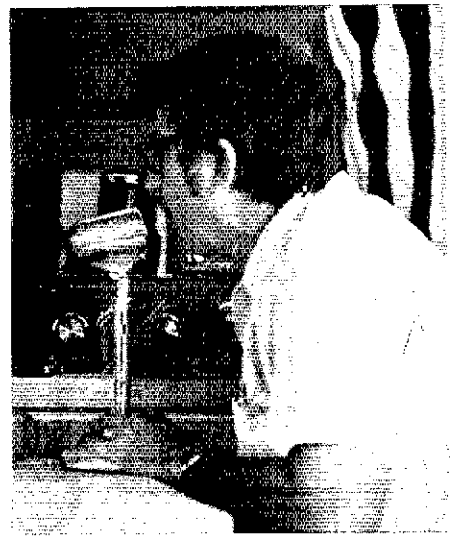
SOAPBOX

Where were all the 220 and 440 "fmers"? Worked only one Virginia station on each band on simplex (W3MSN). The *big* opening really didn't get here until midnight on Sunday. I ran out of time at 0142 local and the opening really got cooking about 0200 local (K1FO). Conditions below average but 432 activity was very good. It was really frustrating to listen to WNY and Southern ON working W5s on Sunday night (VE2DFO). Our operation was portable (battery-powered) from Mt. Sedgewick, NM. Band conditions and activity in the Albuquerque area generally very poor. Longest DX was to Phoenix, AZ (WD5GNW/WØZYF). Had a great time with the tropo session even though the rotator had quit. Having a 15-degree beam width makes it tough (W2AV). Lost 42 minutes on the first night in having to explain to the police what I was doing and why (WB3ERE). Even though no contacts were made, the enthusiasm of the Phoenix 1296-MHz operators for conducting tests was very encouraging (W7LUX).

This vhf contest came in an off-year for me. Hurricane David did in my 144-MHz beam, so I mainly played around on 432 (W1JR). I wish more of the participants would submit logs after the contest. I won top spot in the SF Section for the June contest, but I only had one other competitor, thus didn't feel too overwhelmed by the accomplishment. There were many other stations on here in the section that seemed to be doing real well in June, but I guess none of them sent in their logs. Hopefully we'll see better results this time! (WB9LOZ). Highlight of the contest was working WA4WZQ/4 in NC on 220 with 10 watts fm and a small Yagi (distance covered — 483 miles) (AC3T). Propagation conditions on 6 meters were rather disappointing. Heard KØSE in MN plus two IA stations on brief bursts of scatter at approximately 0200 UTC on September 9, but that was it as far as openings were concerned (WA1GDR). My first VHF QSO Party from the home QTH — seems strange not to be signing VE7ASM/7. Heard Oregon on 432 but no QSO. No enhancement on 432 — poorest weekend for some time. More activity on 432 and 2-meter ssb than on 6! (VE7ASI). I'm sure that many other operators in this part of the country experienced the same frustrations that we did, but this didn't help our morale any, knowing that the ops to the south and southwest of us had a monster tropo opening, while we apparently had a duct too high for us to use. I wish someone would explain why W4BFB should be so strong and consistent on 144 into MO, IA, NE and KS, but nonexistent

The Bug Mountain Boys, WA3CPH/3. The players and the playing field. (From the left): Larry, W3IW, on 432; the station including 2 × 4-elements on 6 meters, 80-element collinear on 432, and 4 × 8-element Yagis on 2 meters; and Ralph, WA3QKM, handling the 6-meter operations.





Multiplier Leaders (Call — Multiplier)

50 MHz

W2SZ/1*	28
N6NB/1	27
K1TOL	25
WB1FUB	24
K1FO	21
KA1BRD	19
K1FWF	19
K1MON*	19
W1XM*	19
K2OWR*	31
WB2WIK	29
WA2WVL*	28
WA2SNA*	25
W2YX	24
WA2DPU	23
K2CBA*	21
WA3CPH/3*	27
N3AHI	25
WB3CZG*	25
K9MRI/3*	23
WA1NGR/3	20
W3IWU	20
W3KWH*	20
W4BFB*	34
WD4IIS*	32
WB4JGG	31
WD4EKA/4*	29
W4VO*	27
WA4WZQ/4*	24
WB4LHD/5*	28
N5DL*	25
N6VI	11
W6YKM	11
K6KLY	10
WA6HCI	10
N6AMG	9
K6MEP*	9
WB9KMO/6*	9
WA7RTA	9
W7KNT	5
W7YOZ	5
WA7ADK*	5
WA7WXI/7	5
W8DJY*	30
W8VP*	27
WA8TTS	26
K3LNZ/8*	23
W9IP*	32
W9ZX*	26
K9RO	19
GW3NJY/W9	17
KØSE*	23
KØTLM*	20
WBØZKG*	19
WBØPKN	14
VE1ASJ	22
VE2DFO	22
JA1RJU	4

144 MHz

N6NB/1	31
W2SZ/1*	30
K1FO	26
W1FJH	25
K1WHS	24
K1PXE	23
W1BAT	23
W1XM*	20
K1GVM	19
WA1VUW*	19
K2OWR	37
W2YX	30
WA2FGK	29
K2GE*	29
K2QR	27
W2AV	27
WA2TIF	27
WA2DPU	27
WB2WIK	27
WA2SNA*	26
WB2RRK*	26
WA3CPH/3*	32
WB3FWF*	32
K3ARN	31
WB3CZG*	30
K9MRI/3*	30
K3HCE	27
K3HZO	27
K1GSR/3	27
W3ZR	27
WB2DNE/3*	26
W4BFB*	39
W4ATC*	35
WA4WZQ/4*	35
WB4JGG	33
WD4EKA/4*	28
WB4IXU	27
WD4IIS*	27
W4VO*	25
WA4IPI	25
W3IY/4	24
WB4LHD/5*	33
N5DL*	30
WA5FDF	30
N6VI	11
WB6ESQ	11
K6BPC*	10
K6KLY	9
W6YKM	9
WA6ALA	8
WB9KMO/6*	8
WA7JTM	7
WA7EPU	5
WA7RTA	5
K8AT*	30
K3LNZ/8*	28
W8IDU	27
W8VP*	27
WA8TTS	25
W8DJY*	25
WB2DIN/8	24
WA8SQL	22
WD8CTX	22
WD8RMT	22
W9IP*	38
GW3NJY/W9	25
K9RO	24
WB9NTL	23
WD9EME	21
K9UNM	20
N9AZC	20
W9ZX*	20
NØIS	29
WØFY	27
AIØL	20
WØRT*	17
VE3UH	34
VE3FGU	26
VE3BQN	21
VE2DFO	18
VE3FN	17

220 MHz

N6NB/1	18
W2SZ/1*	18
K1FO	14
K1PXE	13
W1EJ	12
W1XM*	11
WA2SNA*	18
K2OWR*	15
W2EIF	12
WA2FGK	12
WA2FUZ*	11
WA1NGR/3	10
WB3CZG*	8
W4BFB*	16
WA4WZQ/4*	12
WA4IPI	8
K6KLY	5
N6DN	5
N6VI	5
W6YKM	5
K6MEP*	5
K6TZ*	5
WB9KMO/6*	5
K3LNZ/8*	7
W8IDU	6
W8DJY*	6
AA9D*	7
W9IP*	7
WB9SNR	4
WBØPKN	3
KØSE*	3
VE3BQN	5

432 MHz

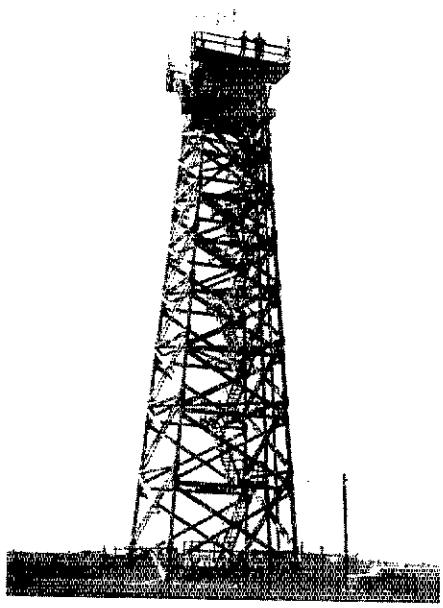
W2SZ/1*	26
N6NB/1	25
K1FO	20
K1PXE	20
W1JR	18
K1MON*	14
W1XM*	14
K2RIW	25
W2VC	23
K2CBA*	23
K2GE*	22
WA2DPU	21
WA2SNA*	21
K2OWR*	20
N2CB	18
WA2FUZ*	17
WA3CPH/3*	20
WB3CZG*	18
K3IUV	17
N3AHI	17
K3IVO*	17
WA1NGR/3	16
K3HCE	15
K3HZO	13
W4BFB*	26
W4ATC*	26
WA4IPI	22
WA4WZQ/4*	22
K4QIF	17
W3IY/4	14
WA4EWA	13
W4VO*	13
WB4JGG	12
WB4LHD/5*	25
WB5LUA	22
N5DL*	21
K6KLY	7
N6VI	7
W6XN	7
WB6ESQ	7
WB9KMO/6*	6
K7ND	3
W7YOZ	3
K8WW	27
WA8TTS	25
W8DJY*	21
K8AT*	19
K3LNZ/8*	15
K8DIO	14
W8IDU	14
GW3NJY/W9	24
W9IP*	24
WB9SNR	14
NØIS	30
WBØTEM/Ø*	12
KØTLM*	11
VE3BQN	17
VE2DFO	12

1296 MHz

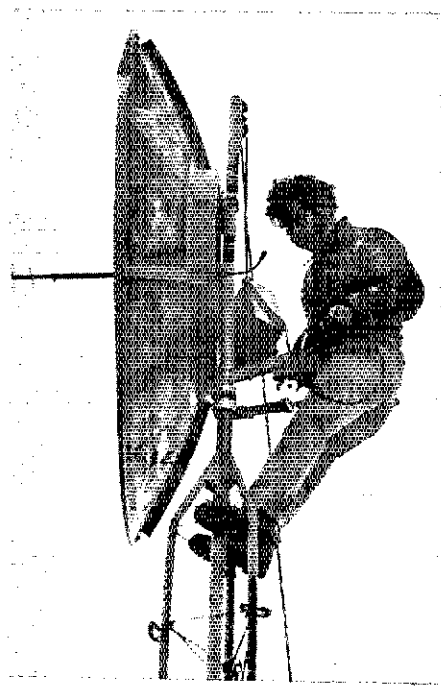
W2SZ/1*	12
W1XM*	8
K1FO	7
K1PXE	5
W1JR	5
W1EJ	5
WA2SNA*	7
W2VC	5
W2EIF	5
K2CBA*	4
K2GE*	4
K3IUV	4
K4QIF	5
W6XN	5
WB9KMO/6*	5
W6SFH/6*	4

*Indicates multioperator station

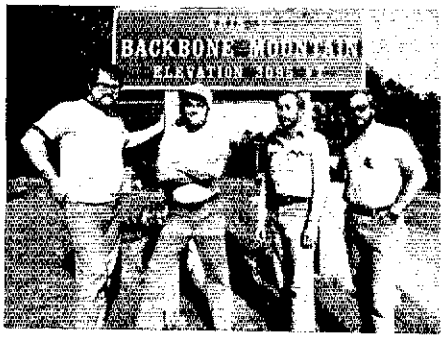
on 432 MHz. The main redemption for our score was 50-MHz meteor-scatter, which was really quite good (KØTLM). In spite of no big 6-meter openings, we did quite well. Two meters and 432 seemed to be helped along by the hurricane activity (WA3CPH/3). Although mine was strictly a single-operator effort from Mt. Equinox in Vermont, I don't think that I could have made it without the pre- and post-contest logistics and morale support of people like W1SL, WB2WIK, K2OWR, KB2M and N2ADH (N6NB/1). One group out here was told about their very poor signal quality *before* the contest began, but still they chose to start the contest putting out a very distorted signal. Maybe in future contests if everyone will avoid making contact with those ops who have distorted signals, then they will get the message (WB5JAR). This was the first time we have been at a decent location for the contest. It is amazing what you can work on the uhf bands when you are not *behind* a mountain. The high point of the weekend was working WB9KMO/6 in the Santa Barbara Section on 1296, using about 1 watt of power (distance about 250 miles) (W6SFH). Conditions were very poor with only a very short opening on 6 meters Saturday night. Mostly scatter contacts on 6 anyway. Highlight was 2-meter EME QSO with K3NSS, which only took 10 minutes. We had 1296 all set up and ran several schedules but no luck. Our best effort ever in terms of participation — 14 ops. We also had our local radio club picnic/meeting at our contest site thereby exposing the rest of our local amateurs to a full scale uhf contest effort (KØSE). Near the beginning of the contest, we heard a W7 under a pileup of Midwestern stations. They (the Midwestern stations) did not hear him. The nearest W7 to our location would've been a 1400-mile drive to Cheyenne, WY . . . WB5LUA and K4QIF heard us off the moon . . . we had line noise and closing clouds so we were unable to copy WB5LUA (with whom we had a sked). Could hear K4QIF well enough to tape and use as a good EME tape . . . WB5LUA removed all of his preamps and heard us in Dallas, TX, on a Bic pen stuck in the mixer input



W9IP and K9AKS atop the 120-foot wooden tower near Champlain, IL. The antennas are six elements on 6 meters, eight-element Quagi on 220, four × five-element Yagis on 2 meters, and 16 elements on 432. The third op at W9IP was Emil, W3EP, who took the photo and still had all those stairs to climb.



Dick, WB2BXP, is attaching the converter to the 1296 dish for W2SZ/1 on Mt. Greylock in Western Massachusetts. Dick has been the man in charge of planning the W2SZ/1 contest strategy.



The K9MRI/3 mob from the left are Joe, K9MRI; Wayne, K9SLQ; Bill, K9TVZ and Larry, WD9FAO. Considering the 30 multipliers on 2 meters and the 23 multipliers on 6, it appears to have been a pretty worthwhile trip up to Backbone Mountain in Maryland.

WA4MMP/1, Rhode Island.

At multiop station, W9CSF/9, Indiana, K9DZE operates the station while AG9S goes in for a little relaxed kibitzing.

That Signal/One, CX-7 and Hallicrafters HA-2 Transverter feed a KLM 13-element, long-boom antenna. Howard, WA3EOQ, does 2 meters for K3LNZ/8 — number-one multiop station from West Virginia.

(WD4MBK/W4ATC). Before this, my first mountaintop contest, I expected fierce QRM, frayed tempers and lots of jamming. However, I found widespread patience and cooperation, especially with the other "big signals." I don't think I made any enemies and I know that I made some friends (N6VI). After the tropo started on 2 meters, I believe we worked every W8 and W9 there is. Very lucky that the opening shifted to the east, which gave us four more sections on 2 meters. Before it was over, we had *fed* the 432 amp at least 10 diodes (WD4IIS). Six meters was rather quiet, little scatter until early Sunday morning, 1000 UTC. Two meters was unbelievable, W4VO, W4BFB consistently S-9 for almost the entire contest. Two opened up Sunday morning and late Sunday evening to TX and the northeast — QRM all over the band . . . 432 put on the biggest show of 'em all! Sunday morning called CQ Contest and W5LDV comes back from South Texas (1000-mile path) S-8 to S-9 . . . I've never heard a band opening on 432 like this. We overheard K8AT make a sked on 2 meters with N6NB/1 for 432. They moved up to 432.150, we listened, and to our surprise, he was in there about S-3. As soon as Kelly signed, I called him and he came back for my first 432-VT QSO. I'd like to tell him how well his 432 quagis work, all eight of them (W8DJY). We think that our section total of 38 on 2 meters is a new record for that band in any ARRL vhf contest (unless someone did better in this contest). All that, and we didn't work a couple of sections that are usually within range from here in central Illinois (NE, SD). It would have been nice to have gotten them (40 sections), but I guess we'll just have to settle for 38 this time around (W9IP). Last June, the guys east of me had the tropo and this September the guys west of me had the good conditions. Maybe one year it'll be my turn! (VE3FN). After suffering some problems with mountain sickness last year (due to long-term oxygen deficiency, operating from Pike's Peak — elevation 14,110 feet), we decided to try some supplementary oxygen this year. Several of us slept a few hours on Saturday night with about two liters of oxygen flow and were able to get a lot more rest than is otherwise possible. Even so, manual dexterity needed for keyer operation degraded pretty badly by late in the day on Sunday! (NØKV). Murphy dealt us his worst blows this time (no relation to my helper Mike Murphy, WA1VKO!). The 144-MHz-amplifier power supply shorted out, two VFOs completely ceased to oscillate, the 432-MHz exciter blew up in a cloud of thick black smoke, and the 220-MHz transverter never got off the ground. January should be better, because it couldn't be any worse (AFIT).

FEEDBACK

Reference December 1978 *QST*, page 89.

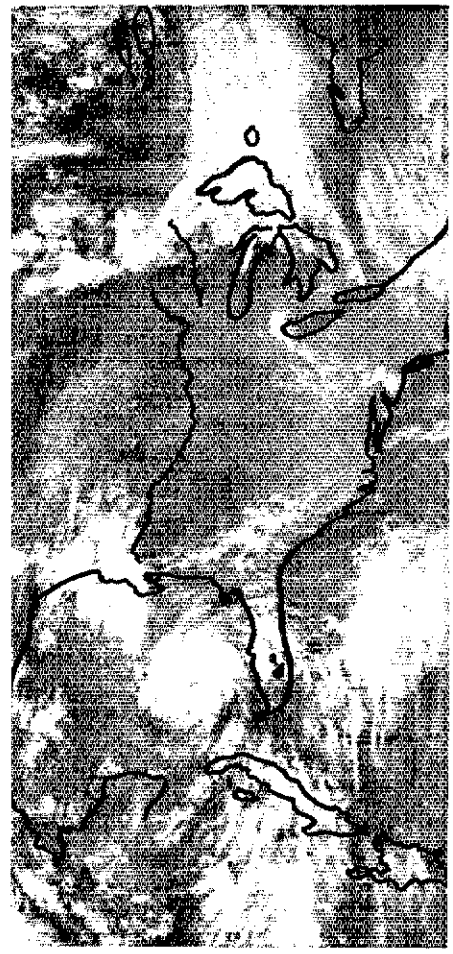
Through no fault of theirs, the New Hampshire multiop score of WA1TZV and WA1TFH (operating WA1TZV) was omitted from the score listings of the *1978* ARRL September VHF QSO Party. The line score should read: 17,595 - 291 - 51 - ABCD.

Again in the 1978 September contest, correct the line score of WA4WZQ/4, multiop in North Carolina to read as follows: 6300 - 193 - 28 - ABCD.

WA8TTS should have been credited with a score of 18,304 - 309 - 52 - ABD for his Great Lakes Division leading effort from OH.

In the sorting of the January '79 VHF Sweepstakes logs, the Roanoke Division leading score from WD4LGR was attached to another entry and overlooked. Credit Woody with a score of 13,680 - 176 - 26 - ABD and a very slim victory over arch rival K4DCZ. QST

WBØRMT, number two, single operator, Iowa Section.



Weather Satellite photo from Tiros-N taken early on September 11. Hurricane Frederick can be seen about 200 miles west of Key West, FL. The remnants of Hurricane David are just off this photo, to the north and east of Nova Scotia. Tnx, David and Frederick, for some FB condx for the contest. *(Thanks to W4TNT for the photo)*

K2MM learns that you handle a 96-element 2-meter array with kid gloves. W2SZ/1 multiop.

Scores are listed in order, single-operator stations first within each section. From left to right: call, score, number of QSOs, number of multipliers, bands operated (A-50 MHz, B-144 MHz, C-220 MHz, D-430 MHz, E-1215 MHz, F-2.3 GHz, G-3.4 GHz, H-5.7 GHz, I-10 GHz).

U.S.A.

1

Connecticut

K1FO 62,128-563- 88-ABCDE
K1PXE 28,045-288- 71-ABCDE
K1EM 12,188-248- 44-ABD
WB1ALW 11,832-299- 34-BCD
WA1UQC 8028-207- 36-ABD
W9KDR/1 5460-113- 39-ABCD
KA1BRD 4669-161- 29-AB
WA1ZNT 3666-141- 26-AB
KA1BU 1950-130- 15-B
K1VMI 1695-113- 15-B
W1WHL 1456- 91- 16-A
WA1GTP 1440- 60- 24-AB
K1KI 728- 56- 13-A
N1IQG 672- 36- 14-ABCDE
K1THP 594- 54- 11-B
WB1CZX 161- 23- 7-B
W1XX 92- 22- 4-BC
WB8PBC/1 39- 11- 3-BC
WA1VUW(+G8EKB/W1)
14,670-309- 45-ABDEI

Eastern Massachusetts

W1JR 12,264-135- 56-ABCDE
WB1FUB 8733-203- 41-ABD
W1GXT 7371-134- 39-BCDE
K1GVM 5304-143- 34-ABD
WB1FKF 5010-138- 30-ABCDE
K1FWF 3969-141- 27-ABD
WA1AYS 3952-134- 26-ABD
W1FJH 3350-134- 25-B
N1AIS 1428-102- 14-B
K1DAT 720- 45- 16-AB
WB1FOD 616- 56- 11-AB
W1AY 333- 21- 9-BD
W1XM(AG1E,K1MK,W1XG,
WB2TXI,WA4TTG,oprs)
42,696-470- 72-ABCDE
W1XA(+WA1UMA)
1275- 85- 15-AB
N1AMF/1(+K1LPJ,WB1GZM)
793- 61- 13-B

Maine

K1WHS(K1LL,opr)
9396-131- 54-ABCDE
K1TOL 2700-108- 25-A
WA9NGO/1 333- 37- 9-B
K1MON(+K1s BA CE IO KEC,
N1XO,WA1s KPS PBU RCY TFH
TZV,WB1AAF,WA2NKL)
29,016-387- 62-ABCDEI

New Hampshire

W1EJ 20,996-281- 58-ABCDE
AC1J 11,025-209- 45-ABCD
W1JSM 1072- 67- 16-B
WA1GDR 658- 47- 14-AB
AF1T(+WA1VKO)
5460-214- 36-ABDE
WB1CAG(K1ZJY,N1ARR,
WB1s FGV FGW HJO,oprs)
1122- 66- 17-AB
K1TK/1(+K1s OGF UR,N2AWG,
WA1YOJ) 430- 43- 10-B

Rhode Island

WA1PBR 3850-100- 35-ABCD
W1BAT(K8BGZ,opr)
3266-142- 23-B
WA4MMP/1 2496- 96- 26-AB
K1DS(+K1GNW,W1OH,
WA1HYN) 14,805-276- 47-ABCD
WB1EUY(+KA1s BGG CJA)
2584-136- 19-AB

Vermont

N6NB/1 102,795-835-105-ABCDE
K1LPS 3852- 90- 36-ABCD
W1AIM 3472- 99- 31-ABC
K1GAO 3335-145- 23-AB
K1GYI 1020- 51- 20-AB
WA1LYR(K1EN,WA1KLB,
oprs) 128- 16- 8-B

Western Massachusetts

K1WGN 6408-157- 36-ABCD
WB1ABF 4900-175- 28-AB
W1JP 4480-160- 28-AB
WA1WRM 700- 50- 14-AB
WA1UWX 492- 41- 12-AB
K1COW 468- 19- 18-ACD
WB1AKT 324- 36- 9-B
K1JG 63- 8- 7-BD
W2SZ/1(K1DH,K2s MM TR,
N2FU,W2GN,WA1s HCO UGF
ZMA,WB1CBH,WA2s FKS GFP,
WB2s BXP CFP PKO QCJ,
WA8USA,oprs)
176,835-1259-115-ABCDEI

2

Eastern New York

W2YX 22,302-413- 54-AB
WA2ANZ 2496- 98- 24-BC
N2CB 2016- 56- 18-D
K2CBA(+AG2X,KA2s APN DIJ
EVC EXY,WA2s FPF OQN OUS,
WB2MCO) 38,799-389- 81-ABCDE
AF2C(+WB2GTP)
342- 38- 9-B

New York City - Long Island

K2OVS 6888-168- 41-AB
K2RIW 5250-105- 25-D
WA2SLY 3500-125- 28-AB
KA2DLL 2115-141- 15-B
WA2WZW 1110- 74- 15-B
WA2FUZ(+WA2YJF)
20,088-239- 62-ABCD
WB2RYY(+WA2YWP)
19,323-308- 57-ABCD

Northern New Jersey

WB2WIK 54,207-583- 87-ABCD
WA2FGK/2(K2LNS,opr)
26,940-420- 60-ABC
WB2WIH 9520-191- 40-ABCD
WA2CWA 9020-220- 41-AB
WB2QOQ 7524-187- 33-BCD
W2VC 5488- 93- 28-DE
WB2CUT 5280-220- 24-B
WB2TFH 3776-100- 32-ABD
WA2ZWH 3000-125- 24-B
WB2NCF 2223-171- 13-B
WA2KKZ 368- 23- 16-B
WA2SNA(AG2N,K2BJG,KA2s
AVA EPL FWB,N2AAZ,W2s
IHM LVT,WA2s DJT JSW JUO
UPK,WB2s ARS JCP LHG QEA,
WD2AAI,oprs)
98,746-807- 97-ABCDE
K2OWR(+AC2U,K2s JWE XR,
KB2M,N2ADH)
92,204-840- 89-ABCD
K2GE(K2s FD GIC JAS KFE VVE
YSR ZGF,K3GNZ,K9ZBV,KA2s
AVV BCS BTA CYZ FQG,
KB2FE,N2AAR,W2s AZL TIN,
WA2s GUM NXK CHN OJH BGG
YWA,WB2s NXK OJL ONA BUR
SNN QMK UYX,oprs)
64,657-635- 83-ABCDE
WB2YMW(+KA2BNF,WA2UZW,
WB2WAB) 3780-252- 15-B

Southern New Jersey

WA2DPU 45,360-456- 81-ABCD
W2EIF 22,540-252- 70-ABCDE
WB2SZK 11,596-172- 52-ABCD
WA2KOK 5889-139- 39-ABCD
K2JF 3444-164- 21-AB
WB2NPE 2120-106- 20-A
W3CXU 1440- 36- 20-CD
N2ALA 780- 78- 10-B
KN2QWO 220- 55- 4-B
WA2DKB(+KA2CDF,N2AZY,
WA2HEB,WB2s JGQ,VWW)
4305-106- 35-ABCD

Western New York

K2LWR 18,019-487- 37-B
K2YCO 15,022-210- 58-ABCDE
WA2IKO 8094-194- 38-ABCD
K2GK 7760-165- 40-ABD
WB2KIW 7548-188- 37-ABD
W2PGC 7416-176- 36-BD
K2LZF 7100-120- 50-ABCD
WA2TIF 6858-254- 27-B
W2AV 4428-164- 27-B
W2VO 3875-125- 31-AB
K2QR 2700-100- 27-B
W2DUC 2178-121- 18-AB
WA2EFE 1664-104- 16-A
W2AET 1377- 78- 17-ABC
WB2FLR 945- 53- 15-BD
W2WGL 936- 52- 18-B
K2JIQ 528- 44- 12-B
K2OEQ 528- 48- 11-AB
WB2JFL 49- 7- 7-AB
WA2WVL(+K2LOU,W2s CNS
IOG,WA2GTK,WB2JLR)
30,168-381- 72-ABCDEI
WB2RRK(+WA2YFB,WB2s FFY
KFN MMB YIK)
21,420-329- 60-ABCD
WB2UEE(KB2I,WA2CJT,WB2s
BGI KLO,oprs)
15,012-240- 54-ABCD
WA2ZJF(K2RKW,KA2DON,
WA2RQC,WB2s FBP MYZ NFB,
oprs) 11,638-214- 46-ABCDE
W2OW(K2OC,N2HR,W2IE,
WA2RBJ,WB2SGS,oprs)
5053-154- 31-ABCD

3

Delaware

WA1NGR/3
22,632-254- 69-ABCDE
AC3T 360- 27- 10-BC
W3BNN/3(+K3HVG)
2992- 63- 34-ABD

Eastern Pennsylvania

N3AHI 19,825-247- 65-ABCD
K3IUV 9522-122- 46-ABCDE
K3IWK 8924-178- 46-ABD
N3MW 6612-233- 38-ABCD
W3IIT 6138-173- 33-ABC
WA3JUF 3596- 72- 31-ABCDE
W3ETB 2091-100- 27-ABCD
W3IWU 1820- 71- 20-A
AE3T 1311- 69- 19-B
AA3W 920- 38- 20-BC
W3AWA(WA3KFT,opr)
42- 14- 3-AB
WB3CZG(+WA2UKS,AI3G,K3s
MKZ SAE,KA3AQF,N3AVC,
WA3NVS,WB3s ELY IWZ,oprs)
43,011-461- 81-ABCD
WB3FXJ(+WB3GZE)
6792-254- 24-BC
WB3JYO/3(+K3OQ,N3AMM,
W3ICC,WA3ZPA,WB3FEH)
5450-163- 25-ABC
W3LP(W3s GFN,JUZ,oprs)
5024-157- 32-AB

Maryland - D.C.

K3HCE 17,168-260- 58-ABCD
W3XO 9898-172- 49-ABD
K3HZO 7554-158- 41-BD
K1GSR/3 5670-210- 27-B
K3ARN 5580-180- 31-B
K3AKR 3627-108- 31-ABD
K3ZJ 1494- 83- 18-AB
W3MSN 440- 38- 11-ABCD
WA3JUF 210- 15- 14-B
W3ERD 81- 9- 9-B
K9MRI/3(+K9s SLQ TVZ,
WD9FAO) 37,620-547- 66-ABD
K3IVO(K3YDX,W3s FG IP,WB3s
EKH ICL,oprs)
16,165-243- 53-ABCD
WB3FWF(+WB3LJK)
7936-248- 32-B
W3PGA(K3s ERX PHH ROJ YZY,
N3s AID IT,W3s JDF VRD,WB3s
AXP KUH,oprs)
4200-150- 28-AB
AC3F(+AC3P,WB3EBB)
390- 39- 10-AB

Western Pennsylvania

W3KWH(WA3FYJ,opr)
11,438-265- 43-AB
WB2DNE/3
10,035-223- 45-AB
W3ZR 9761-227- 43-AB
WA3FFC 4118-129- 29-BD
W3CSA 1596- 76- 21-AB
WB3ERE/3 630- 42- 15-B
WA3TLT 207- 23- 9-AB
WA3CPH/3(+KB2AH,K3SPI,
N3AGW,W3IW,WA3QKM,WB3HHS)
52,298-610- 79-ABD

4

Alabama

WA4EWA 9108-115- 46-ABD
WA4FHY 84- 12- 7-B

Georgia

WA4NJP 6560-160- 40-ABCD
W4ISS 612- 25- 17-BD
W4WTA 455- 35- 13-B
WA4SJI 72- 12- 6-A
N4UZ 24- 12- 2-B
W4VO(K4s AEK CKS,WA4s KPU
LXU,WB4s AEG AEH LRA YWK,
oprs) 24,426-329- 69-ABCD
WD4IIS(+WA4OYH,WB4NMA)
22,190-299- 70-ABCD

Kentucky

WA4IPI 19,432-258- 56-BCDI
K4UKI 1328- 83- 16-B
W4SMU 826- 58- 14-BD
WD4EKA/4(+K4LSP,W4VBH,WA4s
CBX KMG)
24,795-435- 57-AB

North Carolina

WB4IXU 8036-187- 41-ABD
WB4HFL 840- 56- 15-AB
W4ZZ 403- 31- 13-B
W4BFB(AA4SC,AA4ZZ,K4s
SLC LVV RVW MQG SE,KK4L,
KD4E,WA4s VCC ZQQ,WB4s
RCS ZND QCS FDU TLX,WD4s
FPL ABZ LMM JWO,oprs)
190,210-1508-115-ABCD
WA4WZQ/4(+K4YBC,KA4HKK,
WA4WZP,WB4HIE,WD4GQU)
80,352-757- 93-ABCD

Northern Florida

W4ODW 1520- 69- 20-ABD

South Carolina

N4DT 6320-145- 40-ABCD
K4GMJ 1056- 48- 22-AB

Southern Florida

K1FJM/4 15- 5- 3-AB

Tennessee

WB4JGG 28,424-355- 76-ABD
AF4K 5017-165- 29-ABD
WA4QYK 1360- 64- 20-ABD
WA4DFS 1035- 69- 15-B
N4VC/4 210- 21- 10-A
W4TZG(+WA4KJY,WD4EEI)
6384-145- 38-ABCD

Virginia

N4CD 14,112-268- 49-ABCD
W3IY/4 11,076-184- 52-ABD
K4QIF 2850- 51- 30-BDE
N4AJO/M 1701- 77- 21-BD
KA4CKI 1680- 84- 20-B
N4APK 144- 16- 9-A
W4ATC(AA4s NC OO,WA4OFP,
WB4TQD,WD4s AHS MBK,oprs)
53,977-619- 77-ABCD

5

Arkansas

WA5FDF 8928-244- 36-ABD
WB5JAR 1003- 59- 17-AB
WB4LHD/5(KA4ADV,WA4NVM,
WB4s CHZ NWE OVT,WD4s GXI
JHD,WD5FBX,oprs)
58,050-610- 86-ABCD
N5DL(+N5BIM,WA5JEV,
WB5JEY,WD5s CAN CAP)
39,824-479- 76-ABD

Louisiana

KA5BIY 697- 41- 17-AB
WB5LBT(+W5DC)
1207- 71- 17-AB

Mississippi

W5UCY 168- 12- 12-ABD

New Mexico

WD5GNW(+W0ZYF)
74- 37- 2-B

Northern Texas

WD5FZM 6020-172- 28-ABD
WB5LUA 3038- 57- 31-ABD
WD5HDM 2556-127- 18-ABD
N5BHZ 1026- 57- 19-B
WB5KTC 110- 10- 10-ABD

Oklahoma

WB5CTS 1615- 75- 19-ABD

Southern Texas

KA5AAW(+N5FO,WD5HPD,
WN5GBX) 1802- 95- 17-ABD

6

East Bay

WB6NMV 1920-131- 12-BD
N6DN/6 1340-106- 10-BC
N6AMG 1072- 66- 16-ABD
WD6FGA 2- 2- 1-B

Los Angeles

W6ABW 1400-107- 8-BC
W6NXB 560- 70- 4-C
W6VIO(W6ABW,opr)
245- 30- 7-BC
W6PFE 155- 31- 5-B
WA6OCT 152- 19- 4-C
W6CN 110- 22- 5-BC
WA6FMS 12- 6- 2-B
K6BPC(+WA6HXD)
6388-200- 24-ABCD

Orange

WB6ESQ 2856-102- 21-BDE
K4JSI/6 2260-151- 10-BC
WA6PMX 1090-109- 10-AB
K6LPF(+AA6DD,N6ME,WA6s
BFH TRW) 2640-150- 12-ABC

Santa Barbara

N6VI 21,756-463- 37-ABCDE
K6LMN 654-109- 6-B
K6MEP(AC6I,K6s ELQ VMN,WA6s
DJS IJZ,oprs)
18,960-876- 24-ABCD
K6TZ(+K6LPZ,WA6s KTZ MBZ
SRJ VNN,WB6s HOZ RIJ OUZ,
oprs) 9840-275- 24-ABCDE
WB9KMO/6(+W6OAL,WA6EJO)
9207-194- 33-ABCDE
WD6AGY(+WB6WGI)
924- 53- 14-ABC

Santa Clara Valley

K6KLY 5084-135- 31-ABCD
W6XN 3749- 99- 23-BCDE
WA6GYD 2457- 80- 21-ABDE
WA6HCI 2300- 91- 20-ABD
W6YX(W8ZI,opr)
2023-108- 17-ABD
K6MPN 224- 32- 7-B
AJ6T 152- 19- 4-D

San Diego

KB6GU 145- 29- 5-B

San Francisco

WB9LOZ/6 288- 32- 8-BC

San Joaquin Valley

W6YKM 3360- 81- 30-ABCD
WA6ALA 424- 53- 8-B

Sacramento Valley

W6SX 8- 4- 2-B
W6SFH/6(+WA6KOD)
1734- 67- 17-ABDE

Hawaii

KH6FLD 80- 16- 5-AB

7

Arizona

WA7JTM 320- 40- 8-AB
W7LUX 140- 22- 5-BD
WA7EPU 80- 8- 8-ABD

Idaho

WA7WXI/7 144- 18- 8-AB
K7TAK 20- 5- 4-A

Montana

W7KNT 308- 44- 7-AB

Nevada

K7NV 6- 3- 2-A

Oregon

WA7RTA 2641-112- 19-ABCDE
W7TYR 1584- 98- 12-ABCDE
K7HSJ 1060- 75- 10-ABCDE
W7UDM 1001- 69- 11-ABCDE
N7DB/7 180- 22- 6-ABCD
WB7TYR 22- 11- 2-B

Utah

K7UA/7(+K7JL)
360- 67- 5-ABCD
WA7ADK(+N7BHC,WB7QVZ)
336- 42- 8-AB

Washington

W7YOZ 2004-155- 12-ABCD
K7ND 1027- 67- 13-ABCD
W7IDZ 9- 3- 3-AB

Alaska

WB4WXE/KL7 2- 2- 1-A

8

Michigan

W8IDU 7990-144- 47-BCD
WA8SQL 4352-136- 32-AB
WB8AAX 2470-130- 19-B
WB8TGY/8(+WA8OJR)
410- 41- 10-AB
KA8FAS(+WA8TAQ)
125- 25- 5-B

Ohio

WA8TTS 33,495-377- 77-ABCD
K8DIO 7752-191- 34-BD
WD8RMT 5678-167- 34-AB
K8DW 4699-108- 27-ABCD
WD8M5F 4290-143- 30-AB
K8WW 3996- 74- 27-D
WD8CTX 3591-133- 27-AB
WB8VSU 1387- 73- 19-B
N8AXA 1220- 61- 20-AB
WD8QME 1192-149- 8-B
WA8RCN 380- 38- 10-A
WD8JPP 374- 17- 17-BC
K8MR 78- 13- 6-B
W8DJY(+N8TM,W8s FEJ ULC,
WA8s BBR LXJ WXT,WB8s
EEX NFJ,WD8JFR)
53,382-559- 82-ABCD
W8VP(W5UA,K8s AL ZWF,KA8s
G BDZ DUI DFX ERZ,W8PR,
WA8s AHD FHI,WB8s ERB TSI
TRK,WD8s AHV KNY LUJ LEO,
oprs) 40,880-516- 70-ABCD
K8AT(+WA8SVY,WD8EGO)
37,120-522- 64-ABD
K8UZW(WA8GMT,WB8YTQ,WD8s
IQJ RZG,oprs)
6633-201- 33-AB
KA8EKH/8(+WA8WOB,WB8IOW,
WD8s ALH LOP)
1037- 61- 17-AB

West Virginia

WB2DIN/8 9020-188- 44-ABD
W8AEC 3393- 66- 39-ABD
W8UT 360- 20- 9-D
K3LNZ/8(WA3s EOQ NZL OYW,
W4s NVW PSJ,oprs)
28,324-346- 73-ABCD
WB8ZZL(+K3FY,AB8J,WD8s CPT
PNT) 1343- 79- 17-AB

9

Illinois

GW3NJY/W9
35,310-469- 66-ABD
K9RO 14,535-270- 51-ABD
K9MBX 7301-242- 29-BD
WB9SNR 6592-133- 32-BCDE
WB9QBU 3950-103- 25-BD
K9BQL 532- 38- 14-B
W9ABA 459- 51- 9-B
W9IFA 300- 24- 10-ABD
WA9AHZ 48- 12- 4-A
W9IP(+W3EP,K9AKS)
84,739-749-101-ABCD
W9ZX(+WB9s PZC VDV)
16,008-260- 58-ABD
AA9D(+WD9EBQ)
8240-186- 40-ABC

Indiana

WB9NTL 8480-201- 40-ABCD
WD9EME 4655-119- 35-ABD
K9DZS 2697- 93- 29-AB
WA9PKL 2610- 90- 29-AB
WB9FNR 1001- 68- 13-BD
K9UNM 660- 33- 20-B
W9LTU 525- 35- 15-B
N9AZC 420- 21- 20-B
N9AWJ 185- 37- 5-B
WB8HUC/9(+WB8s GEU GEX
GEW GEY GFA,WD8MQG,oprs)
7425-225- 33-AB
W9CSF/9(AG9S,K9s DZE ET
URA,KA9BSL,WB9YHH,WD9s
BDR BLP EIX,oprs)
6169-185- 31-ABD

Wisconsin

WA9KGQ 2040- 76- 24-ABD
WA9CUH 1248- 67- 16-ABD
WD9ACY 792- 88- 9-B
N9AV 781- 71- 11-B
WA9LZM 507- 31- 13-ABEFI
K9XY 492- 35- 12-ABCD
N9TD 297- 33- 9-B

Ø

Colorado

NØKV(+K4AJQ,KB5KD,AAØL,
KØYXC,NØs BZ DV,WØYNE)
2970-128- 22-ABCD
KØIPH(+ACØY,KAØDEH,KBØCV)
188- 45- 4-ABC
KAØDGV(+KAØs CPM DGT DGU)
156- 52- 3-AB

Iowa

KAØCSI 1496- 85- 17-ABD
WBØRMT 1215- 81- 15-AB
WBØTEM/Ø(+KØVXM,WDØFOY)
5208-159- 31-ABCD
WBØZKG(+AKØP,WDØEIF)
3770-130- 29-AB

Kansas

WØQOA 400- 40- 10-B
NØLL 352- 32- 11-AB
KAØAEA 161- 23- 7-B
WØRT(+KØOBY)
4200-142- 28-ABD

Minnesota

KØCJ 1008- 49- 14-ABD
KØSE(+KØGJX,WØs VB RGU JE
OHU,WAØs QWY ULE,WBØs MBD
ONK,WDØs FCX HEB,NØAVB,
KAØEDF) 10,492-222- 43-ABCD

Missouri

NØIS 20,119-266- 59-BD
WØFY 5664-171- 32-BD
WBØPKN 3335-102- 29-ABC
AIØL 2400-120- 20-B
KØCB 1500- 66- 20-ABCD
WBØTNX 900- 64- 12-ABCD
WBØGLT 660- 44- 15-AB
WDØAPH 472- 59- 8-B
KØTLM(+NØAJI,WØY.Y5,
WAØWPJ,WBØDRJ,WDØHTC)
7470-140- 45-ABCD

Nebraska

WAØIWF 1836- 89- 17-ABCI
WBØYSG 525- 30- 15-BD

VE

Maritimes

VE1ASJ 1798- 62- 29-AB
VE1UT 1120- 58- 16-BD

Quebec

VE2DFO 9568-160- 52-ABD
VE2KV 6720-198- 32-ABD
VE2BBK 1512- 49- 24-ABD

Ontario

VE3BQN(VE3CRU,opr)
16,254-251- 54-ABCDE
VE3UH 11,050-316- 35-AB
VE3FGU 9275-265- 35-AB
VE3FN 2625- 86- 25-BD
VE3CKU 540- 60- 9-A
VE3HAB 231- 33- 7-B
VE3AEA/3(VE3s FDP HCI IQZ
IRW,oprs) 6798-189- 33-ABCD
VE3ESE(+VE3IXF)
670- 67- 10-B

British Columbia

VE7XF 666- 64- 9-ABD
VE7ASI 165- 24- 5-ABC
VE7UBC(VE7s BKX CGG COR,
oprs) 124- 27- 4-ABD
VE7CSJ(+VE7s CDC CGJ)
40- 20- 2-B

DX

Japan

JA1RJU 8- 2- 4-A

Check Log

N3AFM

Public Service

Conducted By Robert J. Halprin,* K1XA

A Christmas Memory

Can you imagine having a whole army of bicyclists in a city 3000 miles away waiting to deliver messages that you transmitted on your radio? Impossible? Well, it happened to Roger (WA1KZE) and Hans (WA1NRV) Strauch in December 1972, when a devastating earthquake smashed Managua, Nicaragua. For eight consecutive days, their Boston-area Amateur Radio station served, around-the-clock, as one of the main communications links between Nicaragua and the outside world. The telephone company estimated that the Strauchs' number was called about 8000 times! Roger, who was then 16 (a year older than Hans), is now a grad student in engineering at Stanford. He recently reflected, seven years later, on his role in this Christmas tragedy.

QST: How did you get involved in the emergency?

A: I was not the one who "discovered" the Managuan earthquake, but I found out about it only a few minutes after it happened. I was just casually tuning around 20 meters when I heard someone finishing a conversation with a ham reporting the quake. The U.S. op signed off with "I'll report it to the State Department." Then another Managuan ham came on the air. I contacted him to find out what the situation was. I took down as much information as was given to me. The Managuan hams knew very little, except that it had just happened, it was a serious situation and there was much damage. They feared there had been a great loss of life.

QST: What did you do next?

A: My immediate reaction was to call people. My first call was to a local radio station. I said, "Look, if there's anybody out there that has family in Managua, have them give me a call at the following number — I will try to find out their condition." By this time, the press was aware of the earthquake. In any case, I expected that maybe 10 or 20 people in the Boston area would have family in Managua. In the next hour, we got 40 phone calls. Then CBS put my offer on their wire and within the next two hours, my telephone number was broadcast all over the country. From there, things started rolling. I got lots and lots of requests from families who wanted to know about their relatives. We then decided not only to handle health and welfare traffic, but to also try to get medical aid to the Managuans and increase communications between our two countries.

QST: You must have been subjected to a quick course in maturity.

A: It's easy to understand that when someone is thrown into a situation where he suddenly gets a lot of attention, a new rationalizing process is required. You have to sit down and figure out just exactly what is going on here. When you get the press calling every two hours, and they were calling from all levels — local, national and international — when you were used to just the hometown newspaper, it's a little hard to deal with. So you start looking at things in a broader scope. Seeing your efforts having a big effect on an emergency situation can be a nerve-wracking experience for a teenager. Hans and I had to deal with the staion in as mature a way as we possibly could, and do our best. Basically, we had to think about what was to be done and do it *fast*. I would do it the same way again. Approach the situation in as mature a way as possible and to do what needs to be done, i.e., finding a solution to various problems, medical care, health and welfare information, that kind of thing. I learned how to deal with situations under pressure; I've never had an experience, before or since, where I was under more personal stress.

QST: What was the most gratifying incident?

A: Without a doubt, it was this: With the assistance of a number of doctors and Pan Am, we spent three days organizing a Boeing 707 flight to Managua transporting 20,000 pairs of shoes, a dialysis machine, doctors, nurses, lots of medical and food supplies. But just as the flight was about to leave, Nicaragua posted a ban on all incoming air travel. We went crazy.

We hadn't slept in four days; the last three of which were spent organizing this thing. And now Nicaragua wouldn't let it in. At this point, I was calling government officials such as the Nicaraguan ambassador to the United Nations, the vice president of Nicaragua, plus other important people. Finally, I got a message to the general (himself an amateur) who was coordinating the emergency and asked him to contact the President of the country. Within an hour, I was talking to the President of Nicaragua via phonepatch. My parents got a big kick out of it; here I was, 16 years old and talking to a president of a country!

QST: Was the situation resolved?

A: I presented the story to him, what we had done and what we'd like to do and I convinced him to let the airplane in. He gave it the okay. Then I proceeded, using ham radio, to organize a convoy of trucks to unload the plane when it arrived and to take the supplies to a town called Matagalpa, where a makeshift hospital was to be set up.

By this time, I was dead tired. We had been giving news conferences every three hours, television film crews were in our house all the time and national news media called us until their own reporters finally got into Nicaragua. But things started to cool down and I managed to get a little sleep.

The next morning I had to go to school for a play practice; I was the stage manager for our high school musical. Three hours after I got to school, I received a phone call from home. The plane had landed, the trucks were waiting and the hospital was now being established!

QST: By the same token, didn't you have some terribly sad tasks confronting you?

A: Yes, I had to tell a police officer that his fiancee, who he was to marry at the end of the week, was dead. I found that very difficult to do. I said, "In response to your telegram, I'm sorry, I have to read you the following message." I gave him the death message verbatim. And I said "If you have any questions (I remember using his first name), please call me. I'm very sorry." I didn't break down then, but a few hours later I couldn't control myself. We received a radiogram saying that a woman's two children had died. I decided that I couldn't go through it again; my brother wasn't willing to do it either. So I called the American Red Cross and left it up to them. It was just too tough . . . but there were only a handful of bad reports. We provided good news for hundreds and hundreds of people. Those were good feelings; people were so relieved to find out that their family was fine.

QST: Do you ever hear from people that you helped?

A: I'm still hearing from people who we helped or those who heard about us. Some people still remember us. If they don't remember our name, they remember us as the "duo brothers" who were recognized for their work with Nicaragua on Christmas Day. There were pictures of us in almost every newspaper in the country and in Canada and Europe as well. Millions saw us on TV. We received hundreds of thank-you notes from people. We definitely had the sense of accomplishment and satisfaction, although we might have been able to do even more.

QST: Often, emergencies go hand-in-hand with disorganization and intentional QRM, unfortunately. What was the on-the-air mood circa 1972?

A: At first, believe it or not, there was a lot of competition among the hams, everyone wanted to help. That was understandable. But as time wore on, we were getting more information than anyone else, so we got priority on the nets. Thanks to the publicity afforded us by the news media, people started taking us seriously. The government officials in Managua with whom I was working directly realized that I was pretty informed and would always stand by for me when I signed my call. Stateside hams were very cooperative and went out of their way to help. They protected our frequency, asking others not involved to QSY and would also round up operators to come to our frequency to handle traffic destined for their areas. The hams were very, very helpful.

QST: All this personal fame is pretty heady stuff.

A: I'm a normal human being. It's nice to know that what you did was recognized and people thought it was important. But the national notoriety was somewhat scary as opposed to something that made me feel good. I really didn't feel comfortable with lots and lots of people either counting on us or praising us. I felt that teenagers should not have that kind of

*Asst. Communications Manager, ARRL

burden. A few months after the emergency, an article appeared in "Science News" (a newsletter for grade-school children) about us. Hans and I started getting letters from all these elementary-school kids, saying they'd love to meet us and they thought what we did was great. *That* was really special!

QST: Any final comments for this discussion?

A: An emergency like this only makes me realize the importance of Amateur Radio. It disturbs me to hear individuals criticize the allocation of frequencies to the Amateur Radio Service, when, in fact, ham radio can be the sole lifeline for a nation when a natural disaster occurs. Ham radio is unparalleled in this way.

NEW RADIOGRAM NUMBERS

Elsewhere in this issue is the new ARRL Numbered Text list, which becomes effective January 1, 1980. This revised list has been put into effect in response to popular demand that the list be updated and simplified. Our thanks to WA6HAD, whose specific suggestions closely resemble the revisions.

MINDING YOUR Ps AND Qs DEPT.

Now that amateurs retain their call sign regardless of where they wind up living, it is important that traffic handlers don't jump to any conclusions concerning the *correct* routing of a given piece of traffic. Traffic should be relayed exactly as received. For example, say a message is coming through the system addressed to K8AXL, Newington, CT. Some hero thinks "that can't be right," whips out his *Callbook* and readdresses the message to K8AXL's listed location, which happens to be beautiful downtown Muskegon, MI. Meanwhile back in the Nutmeg State, K8AXL waits and waits and waits for his traffic to arrive. So, resulting from an editorial (and unauthorized) change made by a relay station somewhere in radioland, next to the Maytag repair man, K8AXL becomes the loneliest man in town.

LI ARRL Section Emergency Coordinator Reports. For September, 31 SEC reports were received, denoting a total ARES membership of 16,276. This is an 18 percent decrease as compared with reports received last September (38) and a 0.3 percent decrease in ARES membership (16,339). Sections reporting were Alta, Ariz, Del, EMass, EPa, Ind, Iowa, Kans, KY, Mich, NFla, NTex, Ohio, Okla, Ont, Org, SV, SDgo, SF, STV, SBar, SCV, SFla, SNJ, STex, Va, Wash, WVa, WMass, Wisc, Wyo.

COMMUNICATIONS SERVICE OF THE MONTH

Operation Morvi — (VU hams' first major emergency venture). Morvi, a sleepy little town on the banks of the river Machchu, with a population of about 70,000, lies about 400 km north of Bombay. Known all over the country for their skills at making pottery, sanitary ware, roof tiles and wall clocks, the people of Morvi were a happy and contented lot — till. . . .

It happened on Saturday, August 11, 1979. Dam no. 1 upstream on the river had been overflowing for the past few days but it did not constitute a cause for alarm. Incessant rains since Friday afternoon changed the situation. On Saturday morning dam no. 2 at Morvi was dangerously overflowing at 187 feet. The sequence of events was so sudden. At about 3 P.M. on that unfortunate day, the earthen embankments on both sides of dam no. 2 burst and a 25- to 30-foot wall of water was let loose. When the floodwaters reached the streets of Morvi, people were just preparing to go to work after a post-lunch siesta. At first they thought it was an overflow from the river. Aided by a 60- to 80-mile per hour wind the water rose at the alarming rate of over a foot a minute. "The dam is broken," they cried and ran for the highest rooftops. About 100 youngsters who had gone to see the dam overflowing were instantly swept away, never to be heard of again.

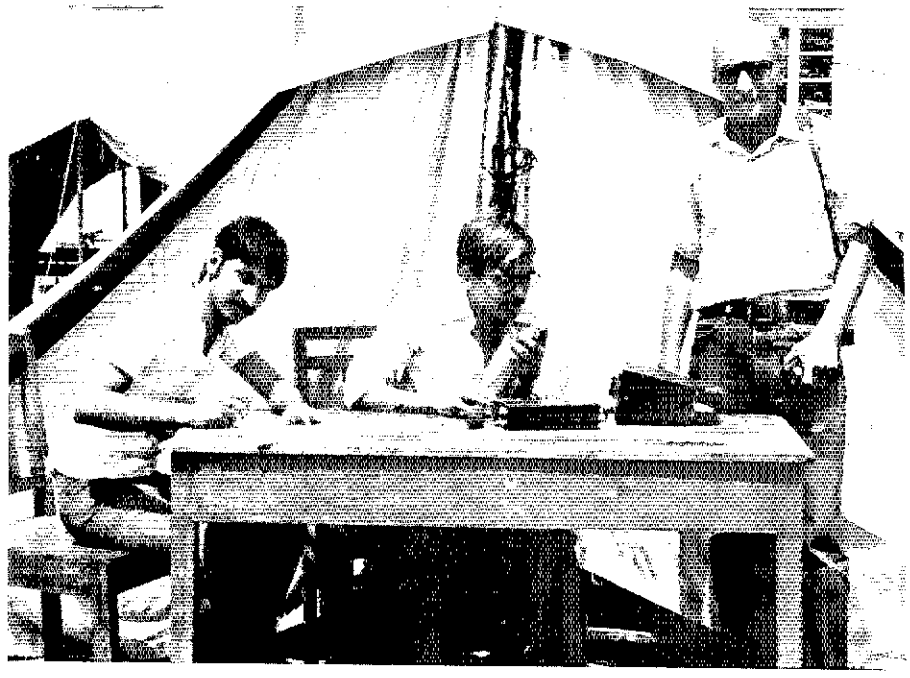
As the flash flood swept the town with the fury of a hurricane, house after house, big and small, collapsed as if they were mere toys, trapping the residents in the debris or sweeping them away in the swirling floodwaters. The force and fury of the flood was so great that heavy girders were twisted several times as if they were mere half-inch round bars.

As the evening wore on, the floods receded — leaving Morvi a desolate, dead town with 70 percent of the houses destroyed, about 20 percent badly damaged and about 10 percent standing safe — a sad witness to a four-hour nightmare. To those who entered Morvi the following day from outside, it was a scene from a horror story. Human corpses and animal carcasses were hanging on telephone poles, trees and rooftops. Streets were full of several feet of mud, strewn with dead bodies. There was no sound, no movement and no life. Kilometer after kilometer of telephone wire was twisted into a mass of worthless junk and all communication lines had come to a grinding halt.

The news of the calamity trickled out slowly. It was evident that for any rescue work, communication was vital. The civil authorities had no previous experience in utilizing the services of hams for emergency communications. It was therefore not expected that they would ask for help. I called a group of hams at my residence and suggested that we volunteer our services and establish communications at flood-ravaged Morvi. All the hams present at the meeting accepted the suggestion and volunteered their services as well as equipment. Encouraged by this and by an initial grant of funds from the local Lions Club, I took on the responsibility of raising the necessary funds for Operation Morvi. The response from friends in the electronics field was overwhelming. The stage was now set. We were not sure how the authorities would react to our offer, but it was worth a try. The first group with myself, VU2RX, Jimmy, VU2IJ, and Chris, VU2KIT, left Bombay enroute to Rajkot, a district town from which all rescue work was being coordinated. The advance party carried two ht transceivers, a pair of 2-meter hand-held ssb sets, and a pair of 2-meter fm sets. All equipment was capable of operating on batteries or 230 V ac. At Rajkot, the meeting with the District Commandant of Home Guards, a burly, friendly guy, was held at midnight — the only time he was free to talk. A demonstration using a hastily erected antenna in the hotel room, with a Bombay station who was standing by, was enough to convince the Commandant that we could do it. "Tomorrow we go to Morvi," he said, over a cup of strong boiled tea. We had sold ham radio public service. We drank a toast of the concocted tea.

The first station was established at the Home Guards headquarters at Rajkot. Leaving Chris and Deepak, VU2DCD, to complete the details, Jimmy and I left in a Jeep for Morvi, 65 kilometers away. We were forewarned by the Home Guards officer who drove our Jeep. The havoc slowly unfolded: fallen houses, twisted railway lines, mangled electric and telephone poles. The unbearable stench of rotting grain and decomposed human and animal flesh had to be experienced and could not be described in words. We had reached a dead town.

The 40/20-meter parallel dipole was stretched between a school building and a tree — both had survived the fury of the flood. The RG-58/U dropped vertically into a canvas tent below in the open grounds which was going to be our radio station for the next 15 days — temperature 110°F at noon.



"The tent" at Morvi with (left to right) Chris, VU2KIT; Jayu, VU2JAU and Jimmy, VU2IJ on duty.

After a few initial birth-pangs, Rajkot came in, loud and clear. "Rajkot this is Morvi, how do you read?" we asked. "Like a ton of bricks," said Deepak, manning VU2RES, the club call sign of the Radio and Electronic Society of India, at Rajkot.

"Where is Chris?" we asked. "He is still fixing the bamboo pole on the neighbor's house for our dipole." "Morvi, this is VU2TP. Reading you 59 plus 20 dB in Bombay." So it went. The Morvi-Rajkot-Bombay link was now established. The faces of a dozen Home Guard personnel including the Commandant were lighted up. "We did it," said Ushakant Mankad, the District Commandant, with a twinkle in his eye. But there was not even a cup of tea to celebrate the achievement with. It was 5 P.M. and we just realized that we had skipped our lunch. Even drinking water was at a premium.

Once the link was established, official messages poured in. We did not realize it was past 9 P.M. A paraffin lamp illuminated our little tent. It was time to go back to Rajkot for no one could stay in Morvi at night. That night we had some real rustic food at a wayside inn well past midnight. But we were all very happy for a job well done.

Next day, VU2GC at Ahmedabad was activated along with VU2YY and VU2XX at Baroda. The 2-meter mobiles were used for survey in Morvi Town as well as for surveying adjoining villages affected by the floods. At one stage communication between the small town of Mahya, about 35 km north of Morvi, was effected by a 40-meter dipole tied to the ends of two 8-foot poles held by hand by two "assistants," it was possible, with this human-held antenna, to communicate with VU2RX in Bombay delivering the *first* health and welfare message to relatives in Bombay, 15 days after the disaster. The frequencies used on hf throughout "Operation Morvi" were 7050 and 14,150 kHz, plus or minus QRM.

The following hams actively participated in "Operation Morvi." Morvi and Rajkot: VU2s RX IJ KIT DCD JAU STZ JF ED ST XX XW. Ahmedabad: VU2s UD MQ PCD CC INT JAU. Baroda: VU2s YY XX XW RX. Bombay: VU2s TP AE FP ED RX BEJ AID PCD. New Delhi: VU2TN.

There were hundreds of other hams, both Indian and foreign, who monitored the frequencies, told DX stations to keep them clear and even lent a helping hand once in a while, when the going was rough. A task voluntarily performed in the true ham spirit.

An average of about 50 official messages was handled every day. The nonofficial messages, including those for locating missing persons, were too numerous to be recorded.

We express our gratitude to all hams, official and nonofficial agencies, friends and service organizations who helped us in "Operation Morvi." This was our first experience at emergency work. There were a few shortcomings. We welcome suggestions, guidance and assistance from experienced ham groups abroad. — *Vasant Bhatt, VU2RX*

REPEATER LOG

According to reports received between September 20 and October 20, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Miscellaneous	Total
VE1CBC							1	1
WR4ACY		3	4	37			3	47
WR5ABA		1		4				5
WR5ABY		3		19	1			23
WR5AJG				3				3
WR5APK				1				1
N5DD		1		1				2
WR7AEF						1		1
WR7AEL			1					1
WR7AII						1		1
WR9ADU	1							1
WBØGJH							1	1
Simplex						1		1
TOTAL	1	8	5	65	1	4	4	88

NATIONAL TRAFFIC SYSTEM

W4SHJ reminds us that 1979 marked the 30th year of NTS. Congratulations; let's go for another 30!

A more organized liaison with the Alaska section has been started, this quasi-TCC arrangement is working smoothly. K2NY stepped down as an FAN net control, W2JJ admits that he will be missed.

September Reports

Area Nets

1	2	3	4	5	6	7
EAN	90	3318	36.9	1,135	90.0	
CAN	90	1739	19.3	.565	98.9	
PAN	60	1555	25.9	.664	97.8	
Region Nets						
1RN	104	801	7.7	.456	86.0	96.7
2RN	131	1145	8.7	.648	88.2	97.8
3RN	90	517	5.7	.453	99.7	98.9
4RN	120	1459	12.2	.437	83.5	100.0
RN5						99.2
RN6	120	977	8.1	.300	84.7	36.7
RN7	120	915	7.6	.675	99.8	100.0
8RN	117	653	5.6	.326	57.5	75.6
9RN	120	629	5.2	.414	—	100.0
TEN	89	635	7.1	.352	63.9	97.5
ECN	60	243	4.1	.384	76.1	71.7
TWN	89	488	5.5	.252	80.4	96.7
TCC						
TCC Eastern	176[1]	866				
TCC Central	186[1]	868				
TCC Pacific	107[1]	711				
Sections[2]	5564	23,300	4.2			
Summary	6,964	40,819	5.9			
Record	6261	32,403	15.4			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (183): ASN (AK), AENB AEND AENJ AENK AENM AENS (AL), ARN OZK SCARC (AR), ATEN HARC SWN (AZ), NCN NCN/VHF NCTN SCN/RTTY (CA), CN HNN (CO/WY), CN WESCON (CT), DEPN DTN (DE), AFPN DEN FPON FPTN GN MEN PBTN PEN QFNS SCARES SPARC SWFTN TPTN (FL), CGAVHFN GSN GTN MAEN (GA), I75MN IACN TLCN (ID/MT) IMN MTN (IA), ILN ILPN (IL), ICN ITN OIN (IN), KPN KSBN QKS-SS (KS), 4DARES 5DARES KNTN KRN KTN KYN MKPN SEKEN (KY), LSN LTN (LA), (MA/RI) EM2MN EMRI EMRI/SS EMRIPN HHTN RIEM2MN WMN WMPN (MA/RI), APN (MAR/NF), MEPN (MB), MMN MTN (MD/DC), AEN CMEN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN PAW RARES (MN), ACE MON NEMOE (MO), MTN (MS), NCSSBN (NC), WNN (NE), GSFM (NH), MCN NJN NJPN NJSN NJVN OBTTN SPARTN UCETN (NJ), NMRRN (NM), BAVTN CDN HVN NLI NLIVHF NYPON NYS OCTEN SDN STAR WDN (NY), BN OSN OSSBN (OH), OAN OLZ ONON OPEN OSSN OTWN STN (OK), CMN LN ODN OLN OPN OSN (ON), 16/76 ARESTN BSN JCARES OARESN OSN PDXAARES (OR), EPA EPAEPTN PFN PTTN WPA WPA2MTN WPPTN (PA), WQV/UHF (PQ), CMN CN CNN SCSSBN (SC), NJQ SDMN SDN SDSSBN TSEWN (SD), SATN (SK), MCRN RCARESN TLC TN TNN WTVHFN (TN), DFW SWTN TEX TTN (TX), BUN UCN (UT), SVEN VN VNTN VSBN VSN (VA), WARTSN (WA), BEN BWN WIN WNN WSBN (WI).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP
7 — % REP TO AREA NET

Transcontinental Corps

TCC Pacific welcomes K7KSA to the roster. K1XA received third annual TCC-E(E) certificate. TCC-C(D) had 100 percent successful functions.

1	2	3	4	5
TCC Eastern	184	95.7	2533	866
TCC Central	190	97.9	1751	868
TCC Pacific	120	89.2	1422	711
Summary	494	94.3	5706	2445

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (September): Eastern Area (N2YL/K3KW, Directors) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH XA, W2s CS CQB FR GKZ MTA RQ, K2NY, WA2s ICB SPL, W3s FAF PO, WA3WQP, K3s KW NGN, W4s JK MEE SQQ UQ, WA4CCK, WB4PNY, K4s BKX KNP, N4s KB NK, KB6FR/3, W8PMJ, WA8WPW, WB8WTS, K8KMQ, VE3s GOL SB. Central Area (W5GHP/W9JUJ, Directors) — W4ZJY, WD4HIF, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ IQU RKU, WB5s MVR OXE SDD YDD, WD5HHK, K5s GM MC, N5s TC TS, W9s CXY DND HOT JIJ JUJ NXG, N9TN, WØs AM HI, WAØTNM, KØs CW EZ, AFØO. Pacific Area (W5KH, Director) — N5s MR NG, W5KH, N6s GW PZ WP, W6s EOT OA SX VZT, WA6s AMK UAZ, W7s DZX EP GHT LYA VSE, K7s HLR KSA MC, ADØA, KØs BN TER, VE7ZK.

Independent Nets (September 1979)

1	2	3	4
Amateur Radio Telegraph Society	30	1715	365
Central Gulf Coast Hurricane	73	755	4411
Clearing House	30	229	463
Empire Slow Speed	28	102	324
Hit and Bounce	30	364	482
IMRA	25	323	818
Mission Trail	30	263	1297
New England Novice	28	97	221
North American SSB	24	262	228
Washington Region PON	17	17	287
West Coast Slow Speed	30	89	300
75-Meter ISSB	30	553	1109
7290 Traffic	43	682	2644

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll September 1979

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SCM). 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, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points

372
N4NK
332
K5OWK
319
WA4JDH
307
W4NWM
298
VE3APK
277
WD4COL
260
VE3GOL
233
K4TH
181
WA2SPL
180
W4ANK
178
WB5YDD
165
K4BKX
163
W9JUJ
156
N4CCT
149
W2ZOJ
140
VE3JIR
139
W7VSE
135
WB2EAG
129
WB2HDU
128
KB6FR
124
WD8LRT
123
W4WYR
WB8OMQ
WA4PFK
121
KØPIZ
AJ5F
120
WD4HIF
119
WB8YRY
WA4LJI
WB1CPF
118
AA2H
117
WA3NAZ
115
WA3PXA
114
W4JK
WA4CCK
WB2RMI
113
N5RB
AF2L
112
WA6UAZ
WA4VKD
W2UEZ
111
WA2MFV
110
KA1CC
109
WB5NKD
WA2UWA
108
WD8KZX
WA1TBY
107
W4OGG
WB3JZA
106
WA4STO
104
WD8NKA
WB5NKC
WB3JYZ
103
WD4EPO
K8AZ
WB2TOM
W2MTA
102
W9HOT
WA5RVT
KB4N
WB2MCO
WA2MVQ
101
KB4OZ
WØOYH
N2APB
100
W6NTN
99
AF8V
WA8HGH
98
WD5AHH
N5EK
K4DZM
W2SQ
97
KB8GC
KL7HSF
W6DXL
AF4T
VE1WF
96
WBØZBJ
W7GHT
W5HMR
K4SGL
95
N8ABA
K5TL
94
WAØTNM
N6GW
N5ES
N4WA
WA4CNY
AA3S
WA2ZJP
93
WD8NYN
WB5LAT
W5KLV
WA4EYU
92
K7GXZ
N5TC
91
W8GGX
WD5EUE
90
W7EP
K6YD
WB4FVV
VE3DPO
89
W5DTR
88
N6AWH
K4JGW
87
W2YJR
VE5AE
86
WB6OBZ
WD4AWN
W1HL
85
AA5J
WB5LBR
K3ORW
84
K3JL
83
AFØO
WA5QFD
K4XE
82
WB8MTD
W4ZJY
N3AIU
81
N4LE
KØEZ
K2GCE
80
VE3JRT
N3AKC
KB2HM
79
WØOTF
W1EOF
78
VE5HG
WØFT
WA4YIU
K2VX
WB1BYR
77
WB8SYA
76
W8VPW
W1RWG
75
W7LNE
W6OA
W5VMP
WB2IDP
K1BSO
74
WB4ZOJ
KA1BMJ
73
W9XD
72
WD4EUV/T
WA8GMT
N5AWG
71
WD9BCM
WB8YDZ
W4MNZ
W4IBU
W1TM
AF1L
69
WBØHOX
WB7WOW
WA7IHS
W6AUC
KB4OW
KA2CNN/T
WA1MJE
68
KØSI
W7JMH
W4CKS
67
KK4M
N3EE
66
W6RFF
W5JOV
WD4PDK
WB3GZV
WA2CUW
65
WDØBMR
WB8WTS
KA6A
WB1FZX
WB1CGK
64
W4HON
N8CW
W6JXK
KA4BUI
63
KA2DBW/T
KØAIT
VE5WM
WB1ANT
62
W7LYA
W7FJZ
W4FMN
WB3GZU
WA1LOU
61
W9JIJ
W9IEM
W5SBE
K4VHT
W2PZL
WA1ZAZ
60
WD4CNO
YE3JRO
VE3GT
54
WB2KTR/T
50
KA2BGX/T
49
WB2AIU/T
48
WD5JYI/T
45
WA2MEE/T
44
WB2RMJ/T
WD4CFZ/T
43
KA2CDF/T
N2BDW/T
41
KA5EAQ/T

Brass Pounders League September 1979

BPL Medallion (see April 1979 *QST*, page 77) has been awarded to the following amateur since last month's listing: WA2MFV

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	755	896	1362	49	3062
WØWYX	55	1405	314	1091	2865
WB5MVR	659	216	891	7	1773
WA3WQP	1	580	526	20	1127
WA2SPL	15	498	505	25	1043
WA4JDH	8	509	512	12	1041
W9JUJ	5	490	506	7	1008
KA9CPA	15	635	73	250	973
WB4PNY	9	448	329	68	854
W3VR	297	152	341	6	796
KB4N	63	305	381	6	755
W4MEE	3	349	349	22	723
W4JK	7	340	351	3	701
WD4HIF	10	336	305	45	696
N4NK	2	316	332	28	678
N4CCT	49	307	289	10	655
K1BCS	141	180	281	44	646
W5KLV	10	338	280	18	646
K5OWK	43	200	339	48	630
W7DZX	24	292	300	2	618
W3BBN	218	106	260	27	611
W7VSE	8	302	262	38	610
KB6FR/3	127	212	211	58	608
WA4LJI	138	159	303	7	607
WAØHJZ	0	376	12	194	582
W9JIJ	39	258	251	7	555
WA4CNY	26	244	235	37	542
K4BKX	0	287	200	54	541
WB2EAG	6	253	244	28	534
WA4VKD	10	265	234	17	526
K4TH	20	222	165	104	511
N5AMK	20	233	253	3	509
K8AAZ	2	262	221	14	502
Multioperator stations:					
K3NSN	1568	96	1568	96	3328

BPL for 100 or more originations plus deliveries:

WA3ATQ	227	WD4EPO	118
WB8OMQ	181	WD4COL	113
W4WYR	149	W3EGJ	112
K9OUK	145	AD2X	111
W4OKN	128	VE3JJK	105
W6DXL	124	N3AQV	101
		W8WPO	100

Multioperator stations:

K2ZWT	348
N4NK/4	166
WA2SDY	145

1 — CALL
2 — ORIG.
3 — RCVD
4 — SENT
5 — DEL
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

H1, a Life

The Phase III satellite will soon be welcomed into our Amateur Radio family and like the typical expectant father, we're pacing the hallways in nervous anticipation. In fact, many of Phase III's eager "uncles" have been planning for its future for some time now. Will Phase III the ham be a traffic handler? An instructor? An experimenter? A DXer? A ragchewer? A bulletin station? The answer is a resounding YES to all!

Earlier in this issue of QST, *the article "AMSAT-OSCAR Phase III on the Horizon" will update you on what can be expected from a healthy, 75-kilogram bundle of joy — spacecraft style, that is. Here, W1EH, Chris Schenck, W1AW operator and AMSAT volunteer special service channel coordinator for SSC H1, cw/RTTY bulletin and cw practice channel, gives us a little insight into the personality of his "nephew."*

The question has been asked, "What would a day in the life of the code practice/bulletin channel, H1, be like?" In order to answer that, we must presume that a frequency actually has life. But only a person can live. It is at times like this that a metaphor comes to the rescue. If a frequency were a person, what would his day be like? More specifically, what would *he* be like? That's not too hard to answer in the case of the low end of 20 meters. These DX frequencies, slugging away for each rare one, can only be pugilists, feisty and tough. On the other hand, 75 phone is a garrulous old gent, a master of the gift of gab.

H1, is more difficult to classify. He is an educator, a reporter and a linguist, all rolled into one. H1 provides code practice at a variety of different speeds. His primary qualification as a teacher is that he speaks in a loud, clear voice, free of QRM and QRN. He also sends cw news bulletins along with make and break baudot RTTY bulletins. Since information can be disseminated by radio almost instantaneously, H1 as reporter is able to "scoop" anyone else.

Perhaps one of the strangest, most eclectic things about H1 is that he has no nationality and speaks just about any language imaginable. This unique ability permits him to report on late-breaking developments direct from individual IARU societies. Such a polyglot sometimes has difficulty being understood by monoglots, so he sometimes supplements his utterances with Special English. This tongue can be called a "stripped down" version of the English language. With a core vocabulary of only 600 words and simple syntax, it can be learned by almost anyone with a minimum of effort and can also be understood by a native English speaker immediately.

H1's dazzling talents would amount to nothing, were it not for his unique personality. Perhaps it can best be understood by a remark the philosopher Wittgenstein made concerning grilled cheese sandwiches. When asked what he would like for lunch, the logician retorted, "I don't care what I eat, just as long as it's always the same thing." Like the enigmatic philosopher, H1 cares less about *what* he does at a given moment than the consistency of his actions over the long term. He always shows up for work, providing reliable services without fanfare. His desk is never empty. The only time one sees him changing his schedule is during a communications emergency. At such times, a special signal, consisting of a series of dahs, is sent. This activates automatic alarms around the world, alerting their owners that an emergency bulletin will follow.

We know what H1 does and something about his personality, but his real identity has not been divulged. For all we know, H1 might be The Old Man himself. Rest assured that this is not the whole truth. The Maxim Memorial Station, W1AW, will be heard frequently on H1, especially in the first few months of Phase III operations. However, as interest swells, other national IARU societies will share the channel. If you are not intrigued by the unassuming H1 after reading this tale, you deserve to knock it out with the macho crowd on 20! — *Chris Schenck, W1EH*

FREQUENCY MEASURING TEST

Four times a year everyone is given an opportunity to compare their own frequency measuring results against those of a professional lab. September 16 was the third scheduled period for 1979. The umpire reported good to excellent propagations but, owing to "circumstances beyond control," was unable to produce a late 20-meter measurement. His official readings were early run — 14,079.418, 7039.084 and 3523.119 kHz; late run — 7100.734 and 3544.430 kHz.

A total of 1323 measurements were taken by 89 participants that submitted entries. Of these, 76 measured within 100 Hz of the umpire (class 1 OO qualifications). They are listed as follows with average error preceeding their calls: (0 Hz) W1BGW W1PLJ K2TO WB3AHI W3KCM K3NZS WA4AXA K4BE W4IBU W4NTO AA4RP W5IJW K5QH W5ZTN W6RQ W7SC W8CUJ W9TJ WDØFDD WØUSL Herr, (1) K1BC W1UI K4NWE WA5QMI WB6AAL W6CBX W6CDF W7BUN ex-7HM KØBRS KØUER VE2HN, (2) W1JH W5FMO W7GCI WØKL VE3AC, (3) W4RZH K5FSA WA7HGB W7SJQ, (4) AI3E WB8STQ, (5) K5MT W8ZM W9HPG, (6) K5DL W7ANF, (11) W8YA KH6CZ, (12) N4CDE W4HU, (13) K5GE, (17) W8LX, (23) WB9VUO, (26) N4PY, (29) W3FYK, (31) N2XS, (32) W9TGN WAØYCY, (34) WB1CZE K6CL WØCQE, (39) W4AWS, (40) K9WMP, (43) W4QN, (48) WD4AMP, (51) W7SK, (52) W1VH, (53) W3BFF, (57) W8PZT, (66) W8HZA, (70) W4UCL WB4PMG, (72) W3ADE. All entries measuring over 100 Hz have been notified.

Excerpts

My measuring apparatus is quite simple and consists of a BC 221 Frequency Meter used as a beat oscillator and an Opto 8000.1 Frequency Counter. I adjust the BC 221 signal until it is zero beat with the incoming signal and then observe the readout on the Opto. I believe my main source of error is the fact that the BC 221 fundamental frequency is in the 3.5-MHz range and I must listen for zero beat of the second or fourth harmonic for 40-meter or 20-meter readings, respectively. Naturally, I have to multiply the reading of the Opto by the same number to arrive at the transmitted frequency. With a plus-1 count uncertainty from the Opto, my error can be 2 Hz on 40 meters or 4 Hz on 20 meters. This is precisely what happened in the last test I participated in. Enjoyed the test and am looking forward to the next one (K2TO). Early-run data submitted somewhat tongue-in-cheek as equipment failure less than one minute before run made a change in zero-beat-detection necessary. Change in method eliminated my ability to integrate out most interference and FMT QRM prevented any data from last three periods of early run on 40 meters. Thank you again for the opportunity to participate (W9TJ).

My equipment consists of a homebrew temperature-controlled frequency standard and frequency meter, general-coverage receiver (with BFO turned off), and 80-meter VFO used as transfer oscillator. The VFO is offset for exactly 1 kHz beat note, which is checked on an LED indicator using a reference precision 1 kHz from the frequency standard. The final reading is corrected for the 1-kHz offset (VE2HN). My equipment is all homebrew and this is a real test of its accuracy (K3NZS). This is my 107th consecutive FMT (W6RQ).

My measurements were made using a transistorized LM-14 oscillator and a fourth harmonic amplifier. A counter was used to measure the fourth harmonic of the oscillator. The measured frequency was divided by two and four to give the 7-MHz readings and was used directly for the 14-MHz readings. The standard oscillator was a TXCO crystal at 10 MHz. The standard was calibrated by measuring the time required for 100 beats with WWV. To determine whether the deviation was plus or minus, the LM was set to 3,750,000 by adjusting the beat of this signal with WWV at 15 MHz and using the counter reading to determine whether the reading was above or below 15,000,000 (W6CDF).

The next scheduled FMT will be on November 3rd at 0300Z and 0600Z. Please check the "Contest Corral" column (page 113) of October *QST* for complete details. — *Jeannie DeMaw, W1CKR*

*Communications Manager, ARRL

	OSCAR 7			OSCAR 8			SOVIET RS		
DATE (UTC)	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*
1 Dec.	23068	00:48	78.8	8863J	01:28	66.3	4795	01:44	60.1
2 Dec.	23081	01:42	92.4	8877J	01:33	67.2	4807	01:48	61.3
3 Dec.	23093	00:41	77.2	8891A	01:38	68.5	4819	01:53	62.5
4 Dec.	23106	01:36	90.8	8904AJ	00:00	44.2	4831	01:58	63.6
5 Dec.	23118	00:35	75.7	8918X	00:05	45.2	4842	00:02	34.7
6 Dec.	23131	01:29	89.3	8932A	00:10	46.5	4854	00:07	35.9
7 Dec.	23143	00:29	74.1	8946AJ	00:15	47.8	4866	00:11	37.9
8 Dec.	23156	01:23	87.7	8960J	00:20	49.7	4878	00:16	38.2
9 Dec.	23168	00:22	72.6	8974J	00:25	50.3	4890	00:21	39.4
10 Dec.	23181	01:16	86.2	8988A	00:31	51.6	4902	00:25	40.6
11 Dec.	23193	00:16	71.7	9002AJ	00:36	52.8	4914	00:30	41.7
12 Dec.	23206	01:10	84.6	9016X	00:41	54.1	4926	00:35	42.9
13 Dec.	23218	00:09	69.5	9030A	00:46	55.3	4938	00:39	44.1
14 Dec.	23231	01:04	83.1	9044AJ	00:51	56.6	4950	00:44	45.2
15 Dec.	23243	00:03	67.9	9058J	00:56	57.9	4962	00:49	46.4
16 Dec.	23256	00:57	81.5	9072J	01:01	59.1	4974	00:54	47.6
17 Dec.	23269	01:52	95.1	9086A	01:06	60.4	4986	00:58	48.7
18 Dec.	23281	00:51	80.5	9100AJ	01:11	61.7	4998	01:03	49.9
19 Dec.	23294	01:45	93.5	9114X	01:16	62.9	5010	01:08	51.1
20 Dec.	23306	00:45	78.4	9128A	01:21	64.2	5022	01:12	52.3
21 Dec.	23319	01:39	92.3	9142AJ	01:26	65.4	5034	01:17	53.4
22 Dec.	23331	00:38	76.8	9156J	01:31	66.7	5046	01:22	54.6
23 Dec.	23344	01:32	90.4	9170J	01:36	68.2	5058	01:26	55.8
24 Dec.	23356	00:32	75.3	9184A	01:41	69.2	5070	01:31	56.9
25 Dec.	23369	01:26	88.9	9197AJ	00:03	44.7	5082	01:36	58.1
26 Dec.	23381	00:25	73.7	9211X	00:08	46.6	5094	01:40	59.3
27 Dec.	23394	01:20	87.3	9225A	00:13	47.2	5106	01:45	60.4
28 Dec.	23406	00:19	72.2	9239AJ	00:18	48.5	5118	01:50	61.6
29 Dec.	23419	01:13	85.8	9253J	00:23	49.7	5130	01:54	62.8
30 Dec.	23431	00:13	70.6	9267J	00:28	51.5	5142	01:59	64.2
31 Dec.	23444	01:07	84.2	9281A	00:33	52.3	5153	00:03	35.7
1 Jan.	23456	00:06	69.1	9295AJ	00:38	53.5	5165	00:08	36.2
2 Jan.	23469	01:01	82.7	9309X	00:44	54.8	5177	00:13	37.4
3 Jan.	23481	00:00	67.5	9323A	00:49	56.1	5189	00:17	38.5
4 Jan.	23494	00:54	81.1	9337AJ	00:54	57.3	5201	00:22	39.7
5 Jan.	23507	01:48	94.7	9351J	00:59	58.6	5213	00:27	40.9
6 Jan.	23519	00:48	79.5	9365J	01:04	59.9	5225	00:31	42.9
7 Jan.	23532	01:42	93.1	9379A	01:09	61.1	5237	00:36	43.2

Have you listened to OSCAR 8 yet? It is available to anyone with a good-quality, 10-meter or 70-cm receiver. To track it, you'll need an OSCARLOCATOR and the above reference-orbit information (also available on W1AW bulletins). It orbits the earth every 103 minutes; the morning and evening passes occur at approximately the same times each day. Decoding the telemetry from the beacon is a simple matter using the ARRL OSCAR telemetry forms, available from Hq. for an s.a.s.e. When you return it, we'll send you a colorful OSCAR 8 QSL card.

To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW. AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (international net at 1800 UTC Sundays on 14,280 kHz usb).

Notes

1) The times and longitudes are for the satellites' first equator crossing each day, which is called the reference orbit.
2) Due to spacecraft problems, OSCAR 7 will not be maintained in any specific mode.
3) All Monday orbits are reserved for QRP use only. Use a maximum of 10 watts erp. Wednesdays are reserved for special experiments. Schedule O 7 experiments through AMSAT, O 8 experiments through ARRL. At no time exceed 10 W erp using Soviet RS.
4) The OSCAR 7 Mode B and OSCAR 8 Mode J transponders invert signals. Upper sideband into the uplink becomes lower sideband on the downlink.
5) O 7 progresses an average of 28.737782° W. per orbit in a period of 114.944764 minutes. O 8 progresses an average of 25.804515° W. in a period of 103.218062 minutes. RS period is 120.3900 minutes. RS progresses 30.097° W.
6) O 8 modes of operation are Mondays and Thursdays — Mode A, Tuesday and Friday — Mode AJ, Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz
RS			
Mode A	145.880-145.920 MHz	29.360-29.400 MHz	29.401 MHz

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. OSCAR locators for O 7, O 8 and Soviet RS are available in the new *Satellite Communications* package at your dealer or direct from ARRL; $4.75 U.S., $5.50 elsewhere.

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 111. A W1AW schedule is also available on request from ARRL headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of *QST* for times and dates of W1AW code proficiency runs.

SCM ELECTION RESULTS

The following were elected for two-year terms of office beginning January 1, 1980:

Uncontested:
East Bay — Robert B. Vallio, W6RGG
MI — James R. Seeley, WB8MTD

Appointments: In the West Virginia Section, Karl Thompson, K8KT, was appointed to complete the term (until September 30, 1981) of Rebecca Thompson, K8BT (resigned).

In the West Indies Section, Julio A. Negroni, KP4CV, was appointed to complete the term (until September 30, 1980) of Jose R. Lebron, KP4JL (resigned). QST

Strays

VK6 SCOUT JAMBOREE

Up to 100 VK6s are expected to be involved with the 12th Australian Jamboree, December 29 to January 7, 1980, in Perth, Western Australia. Operations will include an hf station on 20 or 15 meters, operating around the clock; an hf station on 15 or 20 meters, operating all day, beaming eastern capitals; an hf station on 40 or 80 meters, operating as required, with dipoles beaming north and south; an RTTY station; fast-scan TV on uhf; and three or more 2- and 6-meter stations.

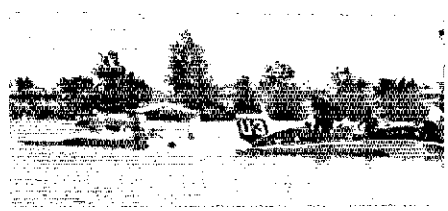
Skeds will be accepted for a particular frequency, date and time. Contact Scout Amateur Radio, VK6SH, P. O. Box 467, West Perth, Western Australia 6005. Propagation for skeds will be acknowledged by testing four and three weeks prior to the Jamboree.

10-10 CLUB NET

N3AKK will operate a cw net on Saturdays at 1600Z on or near 28,150 kHz. This net is available for Novices, or anyone desiring to qualify for 10-10 club membership.

RACES AT THE RACES

Members of the Wichita (KS) RACES provided communications for two races this past summer. In July they worked at the National unlimited-class hydroplane races at Bluestem Lake, near El Dorado, KS. In August it was cars, not boats, as the group was invited to provide backup communications for the Sports Car Club of America's national races at Lake Afton, near Wichita.



Circus-circus and the U-3 in a quiet moment. During races these boats attain speeds exceeding 200 mi/h. Wichita 2-meter RACES provided communications during the National unlimited-class hydroplane races. *(photo by Gunar Pilens)*

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

DECEMBER

1-2

ARRL 160 Meter Contest, November *QST*, page 91.

EA-DX Contest, phone, November *QST*, page 114.

Alexander Volta RTTY DX Contest, November *QST*, page 114.

North Carolina QSO Party, November *QST*, page 114.

Connecticut QSO Party, November *QST*, page 114.

5

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z, December 6. The run takes place at 9 P.M. PST on December 5. 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 self-addressed envelope will help expedite your award/endorsements.

8-9

ARRL 10-Meter Contest, November *QST*, page 91.

EA-DX Contest, cw, November *QST*, page 114.

HA-DX Contest, November *QST*, page 114.

VU2-DX Contest, November *QST*, page 114.

13

W1AW Qualifying Run, 10-40 wpm at 0300Z December 14 (10 P.M. EST December 13). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. The complete W1AW schedule of code practice and bulletins appears on page 111 of October *QST*, or send an s.a.s.e. to ARRL for a copy. Other details are the same as in the December 5 listing.

22-23

HA5-DX Contest, 24-hour period UTC on December 23. Single or multioperator; all bands/modes. Exchange signal report and ITU zone. Contacts with own continent count one point each, other continents three points except HA/HG5 count four and HA5 five points each. Multiply QSO points by sum of ITU zones for final score. Mail by January 15, 1980 to BRAL Contest Committee, Box 2, Budapest 134, Hungary.

Teenage Amateur Radio Contest, sponsored by the Twin City Teenage DX Club, 48-hour period UTC. 160 through 2 meters, cw and phone. Amateurs 21 years and younger sign/T and work anyone. Others work only those 21 and younger. Exchange signal report and age. Suggested frequencies: cw — 40 to 60 kHz from lower edge; phone — 3.975 7.275 14.275 21.375 28.575 MHz; Novice — up 10 kHz from lower edge. Count two points per QSO, except four points for DX. Double points on 40-80-160 meters. Multiply by each different prefix worked per band/mode. Single operator, multi-single and multi-multi categories. Send s.a.s.e. for results. Mail entry by February 12, 1980 to Greg Deuks, KB0CV, 1945 Ashland, St. Paul, MN 55104.

27

W1AW Qualifying Run, 10-35 wpm at 1400Z (9 A.M. EST). See December 13 for more details.

29

ARRL Midnight Special, from 0500 until 0700Z December 30 (12 P.M. EST/9 P.M. PST the evening of December 29). 40 meters only. Suggested frequencies: cw — 7060 and up; phone — 7235 and up; Novice — 7135 and up. Work stations one time only. Exchange consists of a six-digit number indicating when your amateur license expires (find it on your license). Example: 011480 for January 14, 1980. Score equals total QSOs. Standard ARRL disqualification criteria apply. Top scorers will be listed in *QST*. Send an s.a.s.e. for complete results. Send standard contest log info. Mail entries to ARRL by January 14, 1980.

31

Straight Key Night, 24-hour period UTC (from 7 P.M. EST December 31 until 7 P.M. EST January 1, 1980.) This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60-80 kHz from the lower band edge and 10 kHz from the lower edge of the Novice bands. When participating please use SKN instead of RST, preceding the three-digit report, to clue in "passers-by." Following SKN, send a list of the calls of the stations worked plus your vote for the best fist heard during that period (not necessarily one you've worked). This is not a contest; quick contest-type exchanges are discouraged. Vote too, for the most interesting QSO. Mail your report by January 10 to ARRL. See October *QST*, page 95, for a bit of flavor from the previous SKN.

JANUARY

2

West Coast Qualifying Run, 10-35 wpm at 0500Z January 3 (9 P.M. PST January 2). See December 5 listing for more details.

5-6

Zero District QSO Party, sponsored by the Mississippi Valley Radio Club from 2000Z January 5 until 0200Z January 7. Stations outside of the 0 call area work 0s only. The same station may be worked once on each band/mode. Work mobiles each time they change counties. Exchange signal report and ARRL section. Zero district stations must send county also. To score, add zero district ARRL sections worked plus zero district counties, then multiply by number of QSOs. Zeros score by adding ARRL sections, zero-district counties and DXCC countries worked and then multiplying by total QSOs. Suggested frequencies: cw — 60 kHz from lower band edge; phone — 3.900 7.270 14.300 21.370 MHz; Novice — 3725 7125 21.125 28.125. Awards. Log forms and results available for s.a.s.e. Mail entry to Mike Urmie, W0SI, 3518 W. Columbia, Davenport, IA 52804.

9

W1AW Qualifying Run, 10-35 wpm at 0300Z January 10 (10 P.M. EST January 9). See December 13 listing for more details.

12-13

ARRL VHF Sweepstakes, this issue, page 98.

ARRL CD Party, rules in Winter issue of *QCD*. Eligible Communications Department appointees and League Officials will be notified separately.

3.5-MHz YU-DX Contest, sponsored by the YU-DX Club, from 2100Z January 12 until 2100Z January 13. 80-meter cw only. Score one point for contacts with stations in your own country, two points for same continent, five for different continent and 10 points for YU stations. Multiply QSO points by number of DXCC countries plus YU call areas worked. Single and multioperator. Awards. Mail by March 15 to YU-DX Club SRJ, Box 48 11001 Belgrade, Yugoslavia.

International Island DX Contest, sponsored by the Whidbey Island DX Club, 48-hour period UTC. Phone only, cw only and mixed mode for single operator, multi-single and multi-multi stations. Single operators operate only 36 hours. Exchange signal report and serial number. DXCC countries designated as IDX Islands give island name also. Count one point for contacts in your own DXCC country, two for others. Bonus QSO points for contacts with IDX countries (s.a.s.e. to address below for IDX list and entry forms). A station may be worked only once in the contest for QSO point credit but may be worked on a new band for multiplier credit. Multipliers are DXCC countries per band. Suggested frequencies: lower 50 kHz of each band (phone and cw). Awards. Mail entries to Gary Pierson, WA7GVM, Box C, LaConner, WA 98257.

25

W1AW Qualifying Run

26-27

French Contest (REF), cw

CQ 160 Meter Contest

Classic Radio Exchange

FEBRUARY

1-10
ARRL Novice Roundup

2-3
Marconi International DX Contest, phone
South Carolina QSO Party

9-10
PAØ Contest (PACC)
Two-Land QSO Party

16-17
ARRL International DX Contest, cw

23-24
Vermont QSO Party

MARCH

1-2
ARRL DX International DX Contest, phone

*Assistant Communications Manager, ARRL

Station Activities

A-1 OPR ✗ EC ✗ DXCC ✗ RCC ✗ WAS ✗ STM ✗ OES ✗ OTS ✗ NM
SCM ✗ ARES ✗ OVS ✗ SEC ✗ OBS ✗ TCC ✗ OO ✗ NTS ✗ WAC ✗ CP ✗

CANADIAN DIVISION

ALBERTA: SCM, S. T. Jones, VE6MJ — SEC: VE6XC. Net Manager (APSN) VE6AFO. Net Manager (ACWN) VE6BBL. We extend to the family of VE6PA our deepest sympathy. He was an old timer, a fine operator, and highly respected. He passed away on September 20th. We welcome to Edmonton VE4IM. He has taken up residence and should be on the air by the time snow flies. VE6BID is back on the air from Calgary with a good signal. VE6AW is reported to be in hospital and we wish him a speedy recovery. By the time this report appears it will be very close to the festive season and I wish you all A Very Happy Christmas and A Prosperous New Year. Traffic: VE6AVZ 155, VE6BBL 40, VE6HO 47, VE6ABC 17, VE6CHK 12, VE6AAT 6, VE6QN 6, VE6CE 2, VE6JH 2, VE6WV 1.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — BCEN Assistant Net Manager, VE7COA, reports a sad experience with garbled message that was relayed four or five times. He says, group count should agree before QSL. VE7BLO has volunteered for NCS duty. He is a handicap and must write with his mouth. That is credit to take NCS duties on cw. We have a large sick parade in hospital: VE7UW VE7QC, net manager BC ARPSC net, VE7BK and there are more. We wish them all our best and get well quick. Vancouver ARC: VE7BTG, pres; VE7ARR, secy. VE7BTG reports that the instructors group on code and theory has increased to include most of BC, and very good relations and information is being gathered to improve the teaching of code and theory. Traffic: VE7COA 47, VE7FB 36, VE7BLO 7.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst/SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs: VE4s IZ NM TE VJ AGB. All events covered by Manitoba amateurs have been sent in to QST as reported. Red River flood, Marathon, Car Rally, Skylab, Winter Games, variety rides, and a few others. The Skyhook report is still being worked on. What a year we have had, and my sincere congratulations to all that made the Manitoba Amateur look good. Our SEC is busy on his new house, so please forgive him the lack of activity in the last month or so. Our slow net manager has moved to Portage and will soon be heard from again. VE4NE gone west for a month. VE4PO now a VE5AK, and VE4FR is recovering from a back injury. MEPN: QNI 902, QTC 17, sess 30. MTN: QNI 173, QTC 53, sess 29. MMN: QNI 424, QTC 32, sess 30. WRIN: QNI 127, QTC Nil, sess 5. Traffic: VE4IZ 121, VE4PG 45, VE4TE 25, VE4LB 16, VE4QJ 16, VE4AAD 11, VE4AEJ 10, VE4FK 8, VE4ACX 7, VE4HR 7, VE4JA 7, VE4AED 5, VE4LN 5, VE4AAF 4, VE4CR 4, VE4AAU 2, VE4AEA 2, VE4DP 2, VE4NM 2, VE4HK 1.

MARITIME-NFLD: SCM, Aaron D. Solomon, VE1OC — A/SCM: VO1FG. STM: VE1WF. SEC: VE1ASW. NMs VO1-JN VE1WF. Silent Keys: VE1EL VE1GU ex. VE1NQ. Hosp. VE1s OU ASW TO. 19 HARC cond. Gr. Search missing woman Bayside, Hfx. Co. VE7BTV St. Paul's Is. DX'pedition Call VE1CR/1 v. successes. New IRG. VE1AXL, ex. pres.; K1TXL, VE1BGO, vice pres.; VE1LW, secy.; VE1DQ, treas.; VE1HU VE1AXO VE1OL, dir. VE1ZS rec'd pub. Hfx. newspapers for org. EMO Gr. Search work. VE@MM mention Article "Fisheries & Oceans News" Canada for phone patch traffic. VE1s BXC BSE EI provided comm. at GRS meet Bawdon. VE1s AKK BBQ now in Chester. VE1BHD new call Fredericton. HARC started fall with Flea Market, and talk W1HDQ. New Repeaters: Nutby Mt. 147.81/.21, VE1LCA 147.84/.214. "Ham Ceilidh '80 - The Gathering of the Hams" Sydney, Cape Breton, NS Labour Day weekend '80. APN sessions 30; QNI 120, QTC 69. Traffic: VE1WF 246, VE1RI 43, VE1BKA 26, VE1CH 15, VE1QC 15, VE1BMN 8, VE1KR 8, VE1XF 8, VE1AUL 3, VE1EI 3.

ONTARIO: SCM, Larry Thivierge, VE3GT — SEC: VE3APK. STM VE3GOL. The Oakville ARC have been informed that their contribution to the ARRL/IARU 'Project Goodwill' has been used to supply a transmitter and receiver kit to 3D2UP in Suva, Fiji. At the same time the Southern Ontario Chapter of QCWA has voted a donation towards this very worth while project. Westside ARC has a new executive consisting of VE3ILE, pres.; VE3DAV, vice pres.; VE3FMD, secy.; VE3FEA, treas. In response to a request from the Prime Minister of Dominica, for amateur equipment, League Headquarters was able to ship a two-meter emergency communications package consisting of a base station, antenna and ten mobiles. The equipment was to be used in the aftermath of Hurricane Dave which caused untold destruction on the island. Welland Co. ARC now has an affiliate club, the Dunnville ARC. VE3EGO, operating from 4U1ITU has managed to contact VE3RL and other members of the Quinte ARC. The Algoma ARC in Sault Ste. Marie has appointed a committee composed of VE3s JF BPS and JIX to conduct a membership drive for their club. VE3ACY of the OVMRC has been posted to Nairobi, Kenya. Windsor ARC's October Bulletin contained an excellent article on RTTY. VE3JT has been heard working DX on 15 meter cw. Nipissing FM Assn. assisted the North Bay and District Retriever training club by providing two-meter communications during their recent trials. A new crop of towers and antennae has sprouted up around the Niagara Peninsula at the QTHs of VE3s FSF UL EQI CBG CFC AGB KYA LVN and DVI. VE3ITK enjoying his new TRS-80. VE4AGK is now VE3LVE. PRA VE3KO putting an SB-104A together in his spare time. May I take this opportunity to extend to all, a very Merry Christmas. Traffic: (Sept.) VE3GOL 341, VE3JIR 238, VE3DPO 117, VE3GT 105, VE3HGJ 95, VE3ISW 86, VE3KK 86, VE3FZG 74, VE3GFN 66, VE3SB 55, VE3JRT 49, VE3CYR 47, VE3EWD 45, VE3GNW 44, VE3EBC 40, VE3JRO 38, VE3GYD 34, VE3DVE 30, VE3ILT 29, VE3JPP 29, VE3FHZ 27, VE3IMR 25, VE3GJG 24, VE3LVE 24, VE3IFP 20, VE3BVG 18, VE3DVK 13, VE3ANJ 12, VE3AJN 11, VE3AIZ 9, VE3FPI 9, VE3BZB 8, VE3JHE 1. (Aug.) VE3AIZ 33, VE3GYD 28, VE3FPI 3, VE3JJK 2. (July) VE3JJK 4. (June) VE3JJK 8. (March) VE3JJK 221.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. WB1EZI/VE2 is back and very active as OTS. How many in our section participate in any public service related activity, including local activities such as parades, formal traffic nets or annual SET excercise? So lets have more stations involved. VE2LO/MM sur VE2RTR, a obtenu de l'aide de VE2s AJD ARX FJD lors d'une impasse serieuse sur le fleuve St-Laurent. VE2RK est encore malade de meme que VE2ALR. Traffic: (Sept) VE2EC 37, VE2FFE 27, VE2APT 15, VE2EKC 11, WB1EZI/VE2 9. (Aug) VE2EC 29, VE2APT 13.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — SEC: VE5WM, NMs VE5HG VE5DC. I regret to have to report the passing of VE5HB in Moose Jaw. He was well known and was highly respected around the province. Band condx have been improving on 75 this fall. New antennas and towers are being erected in Regina this fall due to the tornado that went through in August. VE5BCD is a new ham in Saskatoon. VE5DA moving from Regina to Weyburn. VE5LO selling his gear due to ill health. VE5RQ has a new IC22s. VE5EO has won the top fiddler in senior class. VE5RPT now has 220 in and out. VE5AAY has a new 2-mtr rig. VE5AQ and VE5IB now have computors. VE5BO is now VE4BO in Flin-Flon. VE5NJ now has a new IC211. Traffic: VE5HG 35, VE5AE 33, VE5BO 19, VE5WM 8, VE5AAT 6, VE5IM 6, VE5KS 6, VE5BBD 4, VE5OL 4, VE5RB 4, VE5QL 3, VE5CB 2, VE5JM 2, VE5MP 2, VE5GF 1, VE5TT 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STM: W3WD W3QQ. PSHR: K3JL 84, N3AKC 80. K3HBP is heading the Delaware group providing communications for the Olympic Torch Run through the 1st State. We can all help him. K3JL activated the DEPN for 2 sess during Hurricane David. New officers for DARC: WB3ENF, pres.; WB3LBM, v. pres.; AE3H, secy.; WB3GXD, treas. WA3TNP and XYL welcomed a daughter born Sept. 10. Congratulations! New EC for New Castle County is WB3FOE. KAØAMJ is a welcome addition to the Ham population of the Rehoboth area. DARC provided communications for March of Dimes Bike-a-thons in the Wilmington and Newark areas. DTN: QNI 293, QTC 41. DEPN: QNI 89, QTC 14. Traffic: W3PQ 248, N3AKC 112, W3QQ 36, W3DKX 31, N3AOA 28, WA3WIY 24, W3WD 16, WB3DUG 15, AC3T 15, K3JL 14, WA3DUM 12, WB3KYQ 12, WB3GOI 8.

EASTERN PENNSYLVANIA: SCM, Geo. S. Van Dyke, Jr., W3HK — SEC: WA3PZO. STM: K3NGN. NMs W3VA K3KW WA3WOP AG3R. Net Rpts: PFN QNI 273, QTC 406; EPA QNI 576, QTC 332; EPAEP&TN QNI 329, QTC 116; LVN QNI 14, QTC 27; LVN(2) QNI 25, QTC 7; AREC(2) QNI 13. OO repts W3CL W3GOA WA3RPG. OBS repts: WB3JZA WB3JYZ W3VA W3ID W3CL K3EBZ WA3RPG. OVS Repts: WA3BJQ W3CL N3CP W3GOA. BPL: K3NSN WA3WQP KB6FR/3 WA3ATQ. PSHR: KB6FR/3 WB3JZA WB3JYZ WB3GZV N3AIU W3DP WA3TAV K3RHI. WB3JYZ busy with marching band, tfc & DX and collecting records! WB3GZV now on 2-m. N3AIU working hard to build up LV nets, WA3RPG thanks KB6FR/3 for great assist on ampers tfc. W3VA reports all quiet. Wonder if his antenna came off! K3EIP sporting new TS520. VHF Conference a brg success, you missed a good one. N3CP needs ideas on how to get out on a 10 mtr (hidden in apartment) dipole on 80! K3AKN reports 7 are waiting results of their ham classes. Retiring changed W3BURs luck, he won a Tempo S1! W3KCM says he may have hit last FMT on nose. W3WRE reports just found key #304! W3KUA has 220 rptr going in Wilkes-Barre. Murgas ARC has class of 16 under way. WB3FYs & WB3CAI made DXCC. 5 members of MURGAS ARC now using Micro Computers! SET msgs recd fm WA3VIL W3VA KA3CHG W3VA/3 WA3CFJ KB6FR/3 K3AKN WB3JZA WB3BZV WB3JYZ. Club and rptr papers getting better all the time. WA3ATQ reports no fall this year, its winter already in the Poconos! Be good and Santa will bring all those goodies! Traffic: (Sept) K3NSN 3328, WA3WQP 1127, KB6FR/3 608, K3KW 453, WB3JZA 421, WA3ATO 364, WB3JYZ 231, W3IPX 153, W3FAF 127, K3NGN 106, N3AIU 105, WB3GZV 105, WA3CFT 104, AG3R 101, AA3B 100, WA3RPG/3 98, W3VA 85, W3DP 77, W3ADE 33, WB3CAI 28, W3ID 25, WB3GUR 23, N3CD 20, WA3VIL 13, K3EIP 12, W3RJ 11, WA3TAV 11, W3CL 10, K3RHI 10, N3CP 7, K3EBZ 6, WA3CKA 5, W3HK 5, WA3BJQ 4, K3NB 4, K3YL 4, K3AKN 2, WB3JGP 2, K3AI 1, W3BUR 1, W3CKM 1, W3EU 1, W3GMK 1, W3GOA 1, W3WRE 1. (Aug.) WB3GZV 173, W3DP 53, WA3RPG 20.

MARYLAND-DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — N3AOV beat out WB3GZU for BPL with O & D for Sept. W3ECN has a new keyer, but likes the mike better. WA3HEM announces a new YL Jr Op and all doing fine. W3CDQ keeps traveling away to ham conventions. W3WBY reports W3TFP a member of the GMRA board. WB3JRW returned his rig for repairs, but no matter got the home brew computer running! The Hagerstown 2-meter net had a special 24 hour call up with K3JLG W3FZT W3JFQ WB3GEJ and W3CWC NCS. W3ZNW busted his hand between the generator pulley and belt, word came by one finger RTTY. Hurry and heal. Congrats to W3DOI, an Advanced. WB3GZU was not too happy a tour guide to Mexico. WA3ZCE and the PGC Net meets at 0100Z Sundays on 146.28/.88. W3OYY is back running the MDC PON like old times. N3SJ is fighting a sticky relay. AA3S is looking for help with the MEPN. W3DFW is planning a trip with the RV. K3ORW found a delivery point. WB3KDQ does Sat nite chores for MDD. WØVJD/3 is at Bolling AFB. K3IU is ready for contests. W5NZ/3 renewed his 25 wpm certificate and hooked up the linear and phone patch. He is ready! W3FZV gets his report in by radio relay. The MEPN met at Gaithersburg. WB3JRW was reelected director. Dues were collected! The MDD had its picnic at W3FA. Net certificates to N3AKC W3QQ W3FA W3PQ K3IU W3FZV WØVJD/3 N3QA N3CL WB3GZU K3KU K3ORW W3ZNW AA3S K3JL WA3RAU AD3H and N3ND. Congrats to W3ADO, 90 years young. And congrats to W3AKO, 57 years with the same XYL. K3RA is coordinating the Olympic Torch Run in MDC. N3AFM has a nice 50 MHz log. W3FZT reports nice PR for the Antietam Radio Assn. earned during Hurricane David. MDD top brass N3AOV N3AKC and W3FA. No MEPN 100 percenters but others were W3ADO N3AMA WB3BFK K3OMN W3FA WB3CES and WA3FUJ. W3DFW and W3OYY continue to have large ck ins in the PON on 3905 kHz Mon - Sat at 5:15 P.M. local. Other nets next time. Traffic: (Sept) WB3GZU 398, N3AQV 287, N3SJ 119, K3ORW 117, W3FA 102, K3IU 78, WB3KDQ 72, WØVJD/3 51, AA3S 40, WB3JRW 32, W3ECN 26, W3FZV 14, N3IT 4, W3WBY3, W3ZNW 3, W5NZ/3 2. (Aug) WB3GZU 490, K3IU 66, N3IT 10, K3RKX 6, WB3FTN 1.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: WB2LCC. September was quite a month, with the SJRA hamfest turning out very nicely, and work proceeding on the plans for the Simulated Emergency Test. On this latter subject, a meeting was held in Cape May for all ECs and NMs to discuss not only SET plans, but also ARES and NTS problems in general. Quite a few people showed up and from the looks of things we'll do just fine during the SET. AA2H has been making big plans for the Boy Scouts canal cleanup, to take place in October. He expects 3000-5000 scouts and quite a role is planned for ARES and NTS. K2OIJ reports the Sandy Lane Motorcycle enduro race was quite a success, with over 300 cycles and about 25 ARES people at various checkpoints. These two activities point out the very important role of Amateur Radio in public service. Are you involved??? We wish our luck to N2ME WB2GTW WA2HGM N2RM who will be embarking in late October on a DX-pedition to 6Y5 land. We hope they are able to rack up a tremendous score to aid the FRC in attaining it's goal of #1 again. You'll be reading this in December, so happy holidays to all and to all a good night! Traffic: AA2H 162, WB2KTR 118, WA3YGZ 68, KB2EV 63, WB2LCC 43, WA2WSV 39, WA2CUW 29, WB2GTW 26, WA2ONW 26, WA2GXU 25, N2AJG 24, WA2GTJ 19, WA2OLS 14, N2AXL 13, WA2WUL 9, N2ABT 4, WB2UGA 4

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: WB2FTX. Nets: (local times)

Time	Name	When	kHz
7 A.M.	Hit & Bounce	Dy	7070
8:30	Hit & Bounce	Dy	3600
11 A.M.	Clrg. House	Dy	3925
Noon	2RN	Dy	3930
1 P.M.	Mike Farad	Dy	3925
1:30	EAN	Dy	7070
3:30	EAN	Dy	7070
4:30	2RN	Dy	3930
5 P.M.	NYPON	Dy	3913
6 P.M.	ESS	Dy	3590
6 P.M.	NYSPTEN	Dy	3925
6:30	2RN	Dy	3930
7 P.M.	NYS	Dy	3677
7:45	2RN	Dy	3690
8 P.M.	NETN	M-W-F	3732
8:30	EAN	Dy	3670
9:30	2RN	Dy	3690
10 P.M.	NYS	Dy	3677

Syracuse University repeater back on the air on 13/73. Rochester DX Assn back in business for the season. Contact W2SNI for details. KA2ATB KA2CTZ K2IAU WB2ODH & N9TE/2 all sporting rejuvenated antenna farms. K2EAW W2LU W2EBF & KB2BN have formulated a 1,100 word tower zoning ordinance for the town of Webster, which was passed by the Town Board. Copies are available from AF2K w/sase. ARATS September meeting was a tour of the world renown Calspan research facilities. WA2ZJP starting a net on 147.99/39, Sun., Tues. & Thurs. at 7:30 local time for the Harpursville area. WB2RWW back at Griffiss AFB after some temporary duty in Germany and Italy. Following stations received NYS certificates, as told by W2CS: AA2S K2DNN K2ET K2GQU K2VR N2TW N2SY W2MTA W2RUF W2SL W2TZ W2ZOJ WA2AIV WA2WLD WA2FRR WA2ICB WA2MFV WA2UAR WA2ZJP & WB2PJU/2. KB2GT did some 2-m AMTRAC mobile through WA, BC, IL, MN and MT this summer. BPL this month to K2ZWI (Univ. of Rochester ARC) and WA2SDY (Syracuse Univ. ARC), both as a result of an unannounced message booth set up in the Student Union the opening week of school. PSHR to W2ZOJ WA2MFV W2MTA N2APB WA2ZJP W2PZL and KA2BGX. Please review your method of counting your traffic! I get some very strange looking breakdowns each month (like more 'delivered' than 'received', etc.). Traffic: WA2MFV 497, K2ZWI 370, N2APB 366, WA2SDY 290, W2MTA 256, W2ZOJ 243, WB2OTC 96, W2PZL 87, WA2HSB 63, WA2ZJP 62, WA2MFU 60, WB2RWW 43, AF2K 41, KA2BGX 33, KB2GT 24, WB2OMZ 24. (Aug) K2GWN 41.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. STM: W3YQ. SEC: WA3VUP. Asst SECs WA3LJW W3JBQ. NMs W3NEM W3KUN W3MML WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	30	316	121	3585	7:00 P/D
WPAPTN	30	459	138	3983	6:30 P/D
WPA2MTN	30	514	98	146.28/88	8:00 P/D

Silent Key is K3ACF. The section's sympathies are extended to his family. New EC for Beaver County is WA3ISG and for Erie County is WB3IFD. I would like to thank K3VYY and WA3ZYO respectively the former ECs for their contribution to ARES. Beaver County's new Radio Officer is WA3ZVE and WB3CNB is deputy RO. The Northwestern Two-meter Net meets daily at 9:30 P.M. on W3MIE/R. Enjoyed meeting WPA RACES operators at the lodge at the University of Indiana of Pennsylvania at Indiana, PA. Good food was on the menu and everybody enjoyed it. I was sorry to have missed the WPA picnic at Cook Forest but due to the change in dates I had another engagement. I was told it was a success. The various clubs in the WPA Section are giving Novice classes. If you know anyone wishing to study for the test, refer him to someone running the classes. I hope all of the members in the section had a fine summer and antennas are in good order for the long winter. Traffic: W3EGJ 345, WA3PXA 281, W3SMV 214, N3FM 136, N3EE 117, W3YQ 74, N3WS 63, W3KMZ 52, K3SMB 48, W3MML 39, WA3UNX 30, WA3VRE 18, WB3KBV 15, W3EXC 14, WB3GWJ 13, W3EXG 9, WA3TO 7, WA3JBQ

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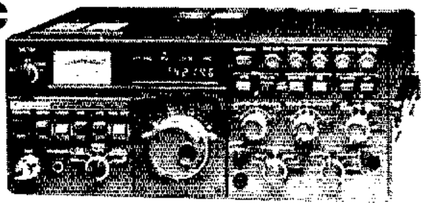

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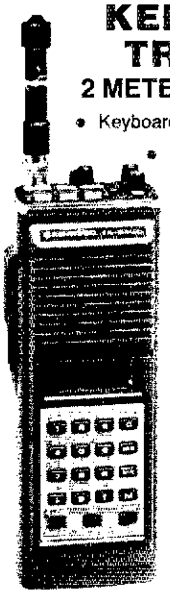

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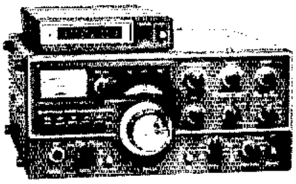

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ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU. SEC: W9AES. NMs: WA9KFK W9JSR. Cook County EC: W9HPG.

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IFN	3940	1400 Su	8	4
W9VEY Memstn		2000M	9	4

WB9YJF WD9AFF and WD9FBC were elected the officers of the Illiana Repeater System. KA9EES has upgraded to General. WD9HEQs new call is AJ9B. Twenty nine Starved Rock Radio Club members attended the annual Appreciation Dinner September 29 at Tonica, for those members and families who worked the Hamfest. WA9BFV received his DXCC #18980 certificate. W9QFO is the new North Central Phone Net Manager. New Novice in Springfield is KA9FUN. W9HPG received the coveted Infamous OLF award at the ILN get together at the Peoria Hamfest. The two day Peoria Hamfest was a very successful venture and many an eyeball QSO was held. The CAND report for September is 609 messages and Illinois representation is 100% with W9YCE W9JIJ W9NXG and W9HOT checking in. N9NA has a new home brew Quad WA9ZZG, ex W3EBD Ex W2KQW, W8SQZ W9FMP and W@CAO has returned to hamming after many years of inactivity. Our sympathy to the family and friends of WA9GLF who recently joined the ranks of the Silent Keys. The Gateway convention will be held in St. Louis on May 24 and 25. K9IZO has upgraded to Extra with a call of AI9Q. The 9RN daytime net had 60 sessions with a traffic count of 215 messages and stations W9JIJ W9YCE W9NXG W9HOT WB9EVV and WB9IFF represented the ILlinois gang. The OCWA National Convention had a FB program at the O'Hare Holiday Inn. Many famous amateurs were present. W9JIJ is the only BPL recipient for the month. Traffic: W9JIJ 555, K9PNG 215, W9HOT 169, K9BVE 163, WB9JSR 131, WA9KFK 87, K9EEA 83, W9YCE 74, K9UN 73, W9OK 71, W9KR 61, W9OBS 54, WD9BEX 49, WB9PUK 48, W9OYL 43, W9LNQ 36, W9MX 36, KA9ALR 23, WA9AQN 23, WA9JJE 21, W9PRN 20, WD9EVV 13, W9HBI 13, WD9HZF 8, WD9EBQ 2.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH. STM: W9JUJ. Net Managers: ITN W9OYY, QIN WB9UYU, ICN N9AEI September net reports. Time in UTC and freq. in kHz.

Net	Freq.	Time	QNI	QTC	Sess.
ITN	3910	1330/2230 Dy	1960	205	60
QIN	3656	1430/0100/0400 Dy	855	445	90
ICN	3708	0015 Dy	169	41	30
IPN	3910	2130 Dy	1044	108	30

VHF Nets; QNI 1113, QTC 32, three nets reporting. Ind was 100% on D9RN in Sept. W9JUJ has made BPL for 13 straight months. She says she is going for 50 in a row. Good Luck. ICN is doing quite well. This net meets daily at 3708 in the Novice/Tech portion of the band. It is a good place to get your feet wet handling traffic on cw. It's a lot of fun and those who checkin regularly find their code speed rises rather quickly. W9OYY has taken over as the manager of the Ind Traffic Net. Please support him in this endeavor. WA9ZGU is helping the Salvation Army get an amateur organization going. Anyone interested in helping should contact him in Indy. This years second SET went well despite the low turnout of amateurs. Red Cross, Salvation Army, c.d., State Police and Navy Mars were actively involved. First weekend of Oct. seems to have a lot of conflicts, perhaps some thought to moving SET back a couple of weeks is in order. Traffic: (Sept) W9JUJ 1008, W9FC 234, WB9UYU 218, W9QLW 144, WA9QCF 116, WD9GIS 115, WB9WRC 92, W9TG 84, W9RTH 83, W9XD 72, WD9GXW 67, W9EI 52, WB9VJF 40, W9HUF 39, KA9CVZ 36, W9DLF 22, W9PMT 22, WA9QKK 21, K8FZX 19, N9PS 19, N9AEI 18, W9UEM 16, W9WEI 13, W9IOH 6, K9IU 6, K9TKE 5, W9BDP 4, AJ9C 3. (Aug) W9TG 108, W9IOH 14.

WISCONSIN: SCM, Roy A. Pedersen, K@FHI — SEC: W9OAK. STM: K9UTO. NMs W9AYK W9IEM WD9EAQ W9DM K9LGU WB9ICH. BWN 3985, 1145. M-SA, BEN 3985, 1700Z dy W9IEM. WSBN 3985, 2230Z dy WB9ICH. Wnn 3725, 2300Z dy WD9EAQ. WIN-E 3662, 0000Z dy W9DM. WIN-L 3662 0300Z dy K9LGU. KA9CBN has General. Sorry to hear WB9ZRE was hospitalized for a short time, hope everything goes well for you. New Tech Baraboo, KA9DFX. Any comments on WNA bulletin please let K9ZZ know. Please fellows and gals, any tidbits or info about anything, let me know, I'm running out of things to put in this column. Northwoods traffic net had 489 checkins with 71 messages. K9ZZ has Life Membership plaque. BPL to KA9CPA. Traffic: (Sept) KA9CPA 973, W9CXY 209, W9EM 129, W9DND 122, AE9H 105, W9YCV 94, K9FHI 88, W9DM 83, W9OT 65, W9AYK 63, WD9BCM 56, WD9DHF 52, AD9X 48, W9FDY 44, WB9ICH 44, K9IGU 44, WU9ESZ 43, AG9G 36, WD9EAQ 34, K9CPM 32, N9AZI 31, K9AQ 28, WB9RRU 28, K9HDF 27, WB9JSW 25, K9JPS 24, K9AKG 23, KB9FM 23, W9GKO 23, K9UIJ 23, WB9WHO 22, K9KSA 21, WB9YPZ 21, WB9YPZ 21, W9SQJ 20, N9CP 18, N9AUG 17, W9UW 17, W9UCL 16, WB9ESM 15, K9UTO 14, KB9CT 11, WB9KPX 11, K9ANV 7, WA9WYI 6, WA9AJA 1. (Aug) WB9KPX 8, KB@CL 5.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX —

Net	Mgr.	Freq.	Time	Sess.	QNI	QTC
MSSN	WBØZBJ	3.710	5:15 P.M.	24	55	14
MSPN N	WØOPX	3.905	12:05 P.M.	27	500	53
MSPN E	KAØAIT	3.929	5:45 P.M.	30	637	140
MWX	WBØUKI	3.929	6:15 P.M.	30	266	206
MSN 1	AFØO	3.685	6:30 P.M.	30	175	94
MSN 2	KØPIZ	3.685	10:00 P.M.	30	111	72
RARESN	KØTS	146.22/.82	7:30 P.M.		89	6

We did it! The thrill that WØVB received when he worked Hawaii Oct. 6 and Alaska Oct. 8 would have meant a great deal more if it had not been coupled with the fact that has little son would have to have surgery. So congratulations to you, for being first Minnesota to work all states on two-meters with several on EME. W1MOI, Newport, NH, reports a pleasant time visiting friends in Minnesota. It was a good turn out from Minnesota to the Dakota Division Convention in Souix Falls the weekend of Oct. 5, and how nice to meet hams from the division that I did not know. Congratulations to the new Generals. Ham that is, KAØAJE WBØULU, Advanced KBØJA formerly WDØGYQ. The Minnesota section expresses sincere sympathy to AFØO and family in the

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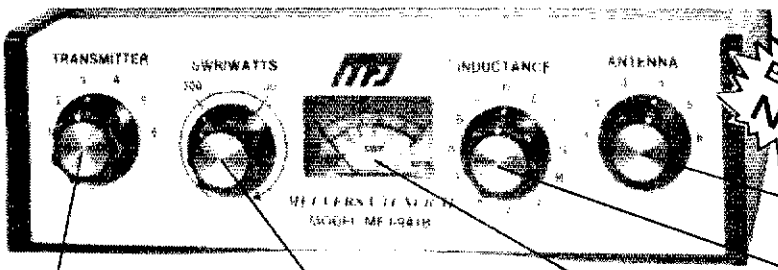

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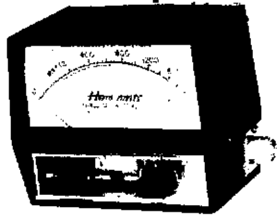

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Power Range	Frequency Bands (MHz) 2-30	25-60	100-250	200-500	400-1000
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10 watts	–	10A	10C	10D	10E
25 watts	–	25A	25C	25D	25E
50 watts	50H	50A	50C	50D	50E
100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
500 watts	500H	500A	500C	500D	500E
1000 watts	1000H	1000A	1000C	1000D	1000E
2500 watts	2500H				
5000 watts	5000H				

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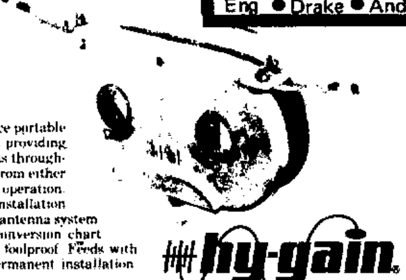

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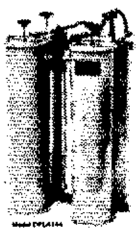

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loss of her mother. Have a happy holiday season. Traffic: WBØHOX 219, KØPIZ 183, AFØO 181, WAØTFC 172, WBØQEU 120, KAØAIT 99, WBØUKI 89, WAØYVT 66, WDØCGM 61, WAØLVG 57, WBØNZB 48, WBØZBJ 44, WØOPX 41, KØJTW 26, KØRMX 25, KAØBZP 21, NØJP 15, KØTS 12, KØCSE 7.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. OVS: WAØCLS. NM: WAØCHR. WDØGMD and NØAFP have been net controls for the DATA net and doing a good job. WBØTEE, SEC, is having an EC net on Sundays at 1800 UTC on 7240 kHz. We express our sympathy to the families of WAØREW and WØWWL who are Silent Keys. WAØQBN has left Hatton to live in Fargo and to a new job with NW Bell. WBØEHC is back in ND after a tour of duty in Twin Cities. Grand Forks Hamfest and banquet will be Nov. 10 with Dakota Division ARRL Director, KØGA, to be speaker at the banquet. YL WX Net will start Nov 1 on 3397 kHz at 1330Z daily.

Net	Freq.	Time/Day	Sess.	QNI	QNT	Mgr.
Goose River	1990.0	0900 Su	5	52	0	WØDCO
DATA	3996.5	2330/Z S-S	6	20	0	WAØCRH

Traffic: WAØRWM 75.

SOUTH DAKOTA: SCM, Lydia S. Johnson, WØKJZ — Ass't SCM: WØDVB. SEC: WAØTNM. Net Managers: WØs HOJ MZI NEQ WE WAØs TNM VRE WDØBMR. WDØGTT married WD9EQO daughter of W9CBU, and WØTLD was photographer, WDØGTU usher. The annual Black Hills ARC picnic was well attended at Roubaix Lake. WBØOQZ S.E. resigned as editor of "Feedback" as he will attend Augustana. The 1980 ARRL National Convention dates July 25-27 in Seattle, WA. Still looking for ECs for our larger cities, also OBS and OO appointees. Lawrence County C.D. Director was guest speaker for the Signal Hill ARC. PSHR was made by WDØBMR 65 and WAØTNM 94 points. Traffic: (Sept) WAØTNM 214, KØFRE 129, WAØVRE 120, WØHOJ 84, WDØBMR 79, WØDVB 68, WØMZI 32, WBØOMF 25, WØKJZ 20, WØIG 10. (Aug) WBØOMF 36.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WD5IRB. NMs: AD5D W5MYZ W5POH WA5ZWZ Nets, freq, time/day, QNI, QTC, Mgr. ARN, 3.995, 0030/dy, 1072, 103, AD5D. OZK, 3.760, 0100/dy, 127 14, W5MYZ. SCARC 28.765, 0230/Su, 0130/M, 63, 16, WD5HJC. APN, 3.937, 1200/M-Sa, 774, 40, W5POH. M-Rird, 3.928, 2230/M-F, 647, 28, WA5ZWZ. I know many AR operators were active during the emergency in LA MS AL due to the storms, but am unable to name them because I have not received any reports from them. OBs: AD5D 4, WB5WWA 3, W5UAU 2. Traffic: K5AO 61, AD5D 31, W5POH 30, W5OFU 24, W5UAU 24, WB5KUI 22, W5BLP 12, K5DW 8, WB5GQH 5, WB5WWA 4, WD5CAA 2.

LOUISIANA: SCM, S. T. "Tom" Losey Jr., K5TL — Asst SCM: K5DPG. SEC: WB5TPG. Net Mgrs: N5RB K5ARH WB5LBR WB5TPG WB5TPG new SEC. Thanks to WB5IYH for getting us a ARES program started. W5YZL and N5EK active on DRN5. SARC Hamfest changed to first week in August for 1980. LSN Net Certificates go to WD5CWK WB5NXM WB5YRY WD5EMZ WD4PPG. Congrats to all. LARC to provide commmunications for the International Rice Run, wonder if K5FNQ will be one to the participants. Acadiana DX Assn. very active. New Novice classes started by BRARC, up-grading class to begin soon. Well, SET for October has come and gone and it was no where as good as the first one. Participation on the different section nets was down to almost nothing. Guess two in one year wore us out. W5GHT, the LA Tech Amateur Radio Station, is back on the air again and active on the nets. The LAN Net needs more support from the section, if you are at 20 wpm on cw, check in and give them a hand, he needs NCS and Liason stations. Try it you'll like it

Net	Freq	Time	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. Dy	309	166	N5RB
LTN	3910 kHz	6:30 P.M. Dy	426	123	K5ARH
LSN	3703 kHz	7:30 P.M. M-F	75	16	WB5LBR
LRN	3587.5 kHz	6:30 P.M. Su	8	10	N5RB
LEN	3910 kHz	8:30 A.M. Su			WB5TPG

Traffic: N5ES 191, N5RB 173, W5YZL 158, W5GHP 145, N5EK 128, K5TL 118, WB5LBR 108, KB5AS 19, WD5CWK 16, K5DPG 16, WD5GJB 14, N5BFV 10, W5YN 4, WB5IKT 2.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. Summer doldrums in Aug. followed by Hurricane David then Hurricane Frederick up through Mississippi fed to very busy emergency activity. Commercial power off for days and Hams provided much emergency power and communications. K5MK tower and antennas downed. N5XA luckily antenna up but no power. WB5FXA along with many others very active. Jackson County ARCEN in emergency sess. 4 days continuously (Tnx WD5DCI). With all areas now recovering, we ought to be ready for SET. WB5VFS has 25 wpm sticker, congrats. CAND (W5KLV): sess 60, QTC 609. DRN5 represented 100% for MS by WD5GNR WD5BEV MSBN (K5MK), sess 30, QNI 2003, QTC 159. MTN (K5OAF): sess 30, QNI 123, QTC 61. MN (WA5OPT): sess 27, QNI 529, QTC 13. RACES (N5AMK): sess 5, QNI 231, QTC 6. JCARCEN (WD5DCI): sess 17, QNI 328, QTC 6. Traffic: N5AMK 509, W5EDT 155, WB5TRZ 147, K5OAF 88, WB5SNB 56, WA5OKI 39, N5XA 38, W5WZ 34, WB5VFS 31, W5XT 24, WB5DRP 22, K5MK 18, WA5OPT 17, WD5CSU 7, WB5UPN 7.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — SEC: WB4DYJ. Asst. SCM: WB4PRF. STM: W4ZJY. KA4GSS has been appointed OTS. Congratulations go to W5GHP for his publication of the DELTA Traffic Bulletin, all DELTA Division traffic personnel should get their info to him for publication. The Chattanooga TRI-STATE FM Assn. is commended for their activity and the very fine bulletin. The REELFOOT ARC published a very interesting bulletin. The Hiwasse Hamfest was held Sept. 22, attendence was down but had a good time, better luck next year. The RACK Club in Knoxville is making great strides in providing the area with emergency communications under the new EC W4NZW. A new repeater is being put up for their use. I want to express my thanks to WB4YPO for his service as Net Manager of the evening session of the Tenn. Phone Net. He has had to resign this position and I know his services will be missed by the entire net. He is awarded the Certificate of Merit for his untiring service. The results of the voting on whether Tenn. should join the Carolinas-Virginia Repeater Assn. were overwhelmingly in favor. The seven members of the Tenn. Repeater Advisory Committee also voted 5 to 2 in favor; based upon these results I am recommending that "The Tennessee Section join the CVRA". I urge all repeater individuals and groups join immediately in

Drake L-7 Continuous Duty 160-10* Meters 2kW Linear Amplifier

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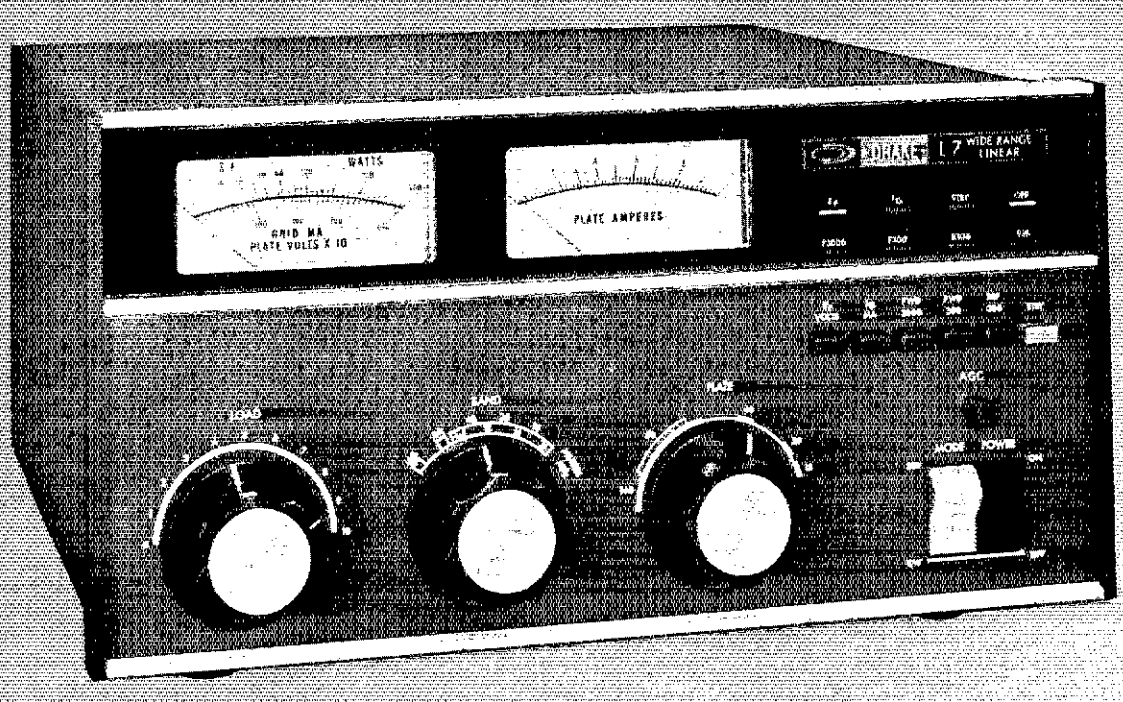

Temperature controlled design for "key-down" operation over a wide frequency range. Newly engineered for coverage of any new or expanded hf amateur bands within FCC amplifier rules. Also features wide frequency coverage for MARS, and other services authorized for this type of amplifier.

2 kW PEP, 1 kW cw, RTTY, SSTV operation—all modes, full rated input, continuous duty cycle.

160-10* meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services.

The Drake L-7 utilizes a pair of Eimac 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types. Tubes are included.

Accurate built-in rf wattmeter, with forward/reverse readings, is switch selected. Calibrated 300/3000 watt scales.

Temperature controlled two speed fan is a high volume low noise type and offers optimum cooling.

Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control.

By-pass switching is included for straight through, low power operation without having to turn off amplifier.

Bandpass tuned input circuitry for low distortion and 50 ohm input impedance.

Amplifier is comprised of two units—rf deck for desk top and separate power supply.

Operates from 120/240 V ac, 50/60 Hz primary line voltage.

DRAKE L-7 SPECIFICATIONS

Frequency Coverage*: Ham bands 160 through 15 meters. Non-amateur frequencies between 6.5 and 21.5 MHz may be covered with some modification of the input circuit.

Plate Power Input: 2000 Watts PEP on SSB/AM and 1000 Watts DC on CW, RTTY, and SSTV.

Drive Power Requirements: 100 Watts PEP on SSB and 75 Watts on CW, AM, RTTY, and SSTV.

Input Impedance: 50 Ohms. (Bandpass tuned input)

Output Impedance: Adjustable pi-network matches 50 Ohm line with SWR not to exceed 2:1.

Intermodulation Distortion Products: In excess of −33 dB.

Wattmeter Accuracy: 300 Watts forward and reflected, ± (5% of reading + 3 Watts). 3000 Watts forward, ± (5% of reading + 30 Watts).

Power Requirements: 240 Volts 50-60 Hertz 15 Amperes, or 120 Volts 50-60 Hertz 30 Amperes.

Tube Complement: Two of 3-500Z or 8802/3-500Z or 8163 or 3-400Z.

Dimensions: Amplifier 13.69"W x 6.75"H x 14.25"D (34.8 x 17.1 x 36.2 cm). **Power Supply** 6.75"W x 7.88"H x 11"D (17 x 20 x 28 cm).

Weight: Amplifier 27 lbs (12.25 kg), **Power Supply** 42.5 lbs (19.3 kg).

*Export model includes coverage of the 10-meter Ham Band.

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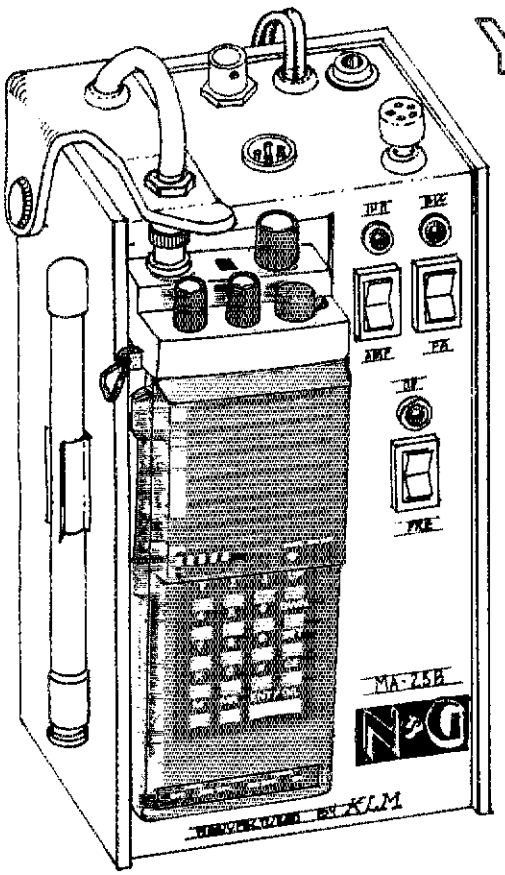

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KLM/N&G MA-25B Power Amplifier
SPECIFICATIONS

Freq. of Operation: 144-148 MHz
Power in: 3 watts
Power out: 25 watts
Preamp: 2.5 dB N.F., 11 dB gain
Mode: FM
Amps @ 13.5 VDC: 5
Audio/PA amp: 5 watts @ 8 ohms

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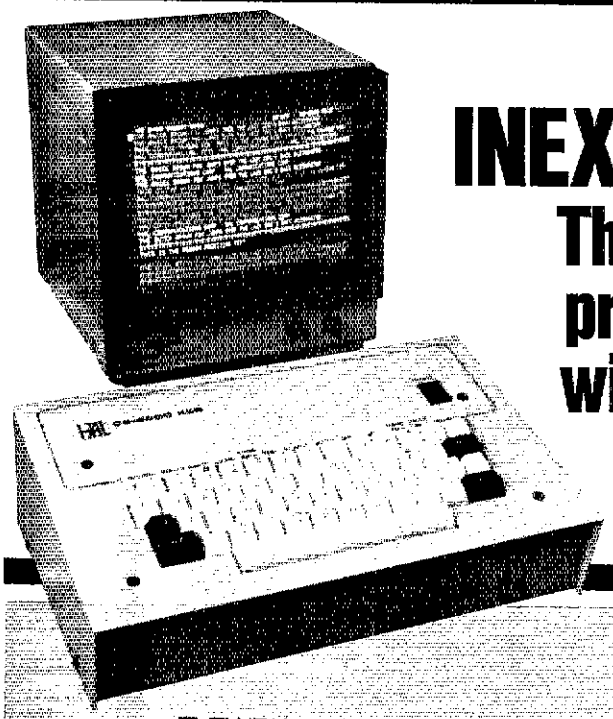

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- Integrated keyboard and video generator allows editing of transmit text
- Full 24 line by 72 characters per line display
- Bright/dim display of characters differentiates between TX and RX display
- Morse receive option may be added at any time
- Separate CW identification key for RTTY operation
- Status line on top of screen shows terminal operating conditions
- Pretype transmit message into 255 character buffer; edit before transmitting
- 2 programmable "Here Is" messages
- Word-wrap-around prevents word splitting at end of display line
- Word mode allows editing of text to be transmitted
- Quick Brown Fox and RYRY test message keys
- Small size metal cabinet gives effective RFI shielding from transmitters
- Loop compatible RTTY connections and plus or minus CW key connections
- 110 and 300 baud ASCII
- 45,50,57.74,100 baud Baudot
- 1-175 wpm Morse transmit
- 1-175 wpm optional Morse receive
- 120/240 v, 50/60 Hz power
- Internal CW side-tone
- UnShift On Space for Baudot
- Keyboard Operated Switch
- SYNC idle for RTTY
- One year warranty

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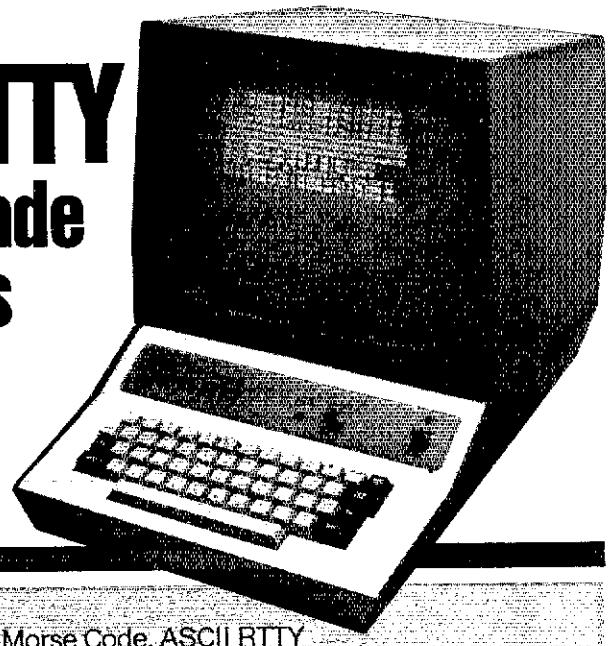

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- The HAL "original" split screen shows both RX and TX buffers or whole screen for RX
- Ten programmable "Here Is" messages can be chained from one to next
- The EAROM allows power-off storage of 2 "Here Is" messages and terminal operating conditions
- Programmable WRU answer-back and selective-call features
- Separate CW identification key for RTTY operations
- Automatic TX/RX control with KOS plus 4 keyboard controlled accessory switches
- Internal real time clock keeps 24 hour time plus date
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- New green, P31 phosphor display screen gives clear, eye-easing viewing
- On-screen status indicators give continuous display of terminal operating conditions
- Word-Wrap-Around prevents splitting of words at end of display line
- Continuous, line, and word modes offer flexibility in editing transmit text
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order to be elligible to participate in the selection of our officers. Net Reports: CW: 99 sess, 557 QNI, 247 QTC; PN: 166 sess, 6937 QNI, 727 QTC; TLC: 43 Func @ 24%, 51 QTC. Traffic: WA4CNY 542, AI4T 285, W4OGG 175, WB4BKF 144, W4ZJY 129, K4JGW 95, WB4PRF 95, WB4ZSZ 82, WA4FMR 65, K4XE 62, W4PFP 43, WD4NJR 40, WA4GLS 28, K4WOP 23, WA4BCK 20, WB4YPO 17, KB4G 15, N4BVY 11, W4YYV 11, KA4GSS 9, W4PSN 9, K4AMC 8, K4FSK 8, W4RUW 8, K4UMW 6, W4VJW 6, WA4WVW 4, K4DEC 3.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joe Miller, K4DZM — STM: K4HRF SEC: WB4ZML. NMs WA4JTE W4BEJ WA4AVV WB4NPD WA4WSM KB4OZ K4YZU. Nets reporting:

Net	QNI	QTC	Net	QNI	QTC
KTN	1189	192	CARN	232	29
KNTN	448	180	PAWN	302	25
KYN	317	153	BARES	39	9
MKPN	1016	100	KPON	60	7
KRN	375	46	5-D ARES	48	6
KSN	150	39	4-D ARES	41	5
9RN-D	9554	215	SEKEN	35	0

KB4OZ & K4DZM PSHR. K4YZU New NM of KY-RTTY Net, 3630 @ 7:30 E. Tune in and QNI. Murray State ARC handled communications for Bikeathon. Many thanks to all who participated in the SET. WA4PFR new EC for 6th Dist. Merry Xmas to all amateurs in the state. Traffic: K4YZU 260, KB4OZ 221, WA4AVV 192, K4DZM 169, WB4APC 99, WA4WSM 97, WB4NPD 74, K4HRF 61, WA4EBN 56, KA4AZT 52, W4CDA 52, K4JLX 51, WB4AUN 48, WD4COF 47, WB4ZDU 44, WB4UQI 40, W4BAZ 36, WB4ABE 31, WA4JTE 30, WA4SWF 30, W4OJN 26, WA4RCD 25, WA4AGH 23, WD4RNI 23, WD4FKZ 21, K4AVX 18, WA4OMH 17, WB4RIT 17, AI4T 16, WA4YPO 13, KA4IKH 12, W4PKX 12, KA4GFU 11, K4HOE 11, N4CGJ 10, KA4ENG 9, WA4NOH 9, WD4NYC 8, K4AML 8, W4HKT 8, WD4CJQ 7, W4IQZ 7, WD4KDG 7, WA4JAV 6, WA4NOG 2.

MICHIGAN: SCM, Stanley J. Briggs, W8MPD/K8SB — Asst SCMs: WA8DHB W8SOP. SEC: WA8EFK. STM: WB8MTD NMs: K8LNE K8KMQ WB8YDZ WA8DHB WD8BHE WD8LSV N8ABA. ECs at Large: K8RCT W8VWY.

Net	Freq.	UTC/Day	QNI	QTC	Sess	Mgr.
OMN*	3663	2300/ 0300 Dv	938	350	59	N8ABA
MiTN*	3953	0000 Dv	717	340	30	KB8AI
GLETN	3932	0200 Dv	984	203	30	WD8BSE
UPN*	3922	2200 Dv	643	142	35	WA8DHB
MACS*	3953	1600 Dv	673	138	30	K8LNE
MNN*	3722	2230 Dv	392	101	30	WD8BHE
WSSBN	3935	0000 Dv	569	38	30	WB8VAI
BR	3930	2230 M-S	430	31	25	W8HIN
ARES	3932	2230 Su	95	10	5	W8VWY
MEN	3930	1400 Su	164	3	5	W8HIN
UPARES	3922	2230 M	98	0	3	K8RCT

VHF Local Nets: 9 reports 597 26 46 WD8LSV

*NTS Section Nets. 14 members of the Kalamazoo County ARES/RACES group provided 5000 people attending Western Michigan University's Kite flying contest with communications. Event coordinated by EC K8OOB. EC at large for the UP, K8RCT, has started a UP ARES net after the UP net on Mon evenings. SEC WA8EFK reports that ARES membership in the section totals 2041. The following EC reports were received for Sept. (If your EC is not on the list, you better check with him!) WA8BAP W8GBR WB8BGY WA8OAP W8LMT W8LCU K8BGC WB8BZF WB8BNN WD8IXD WB8YIG WD8NKA K8OBZ K8UPE. The Section Communications Manager for MI starting Jan 1, 1980 will be WB8MTD. Please send all reports to him starting with the report of Dec activity. OMN OFFICERS: N8ABA, gen. manager; KB8GC, secy.; Club Elections: Cherry Land: WB8TPR, pres.; WA8EEA, vp; WD8CGA, secy.; N8AI, corr. sec; W8GLV, treas. Midland ARC: W8WOJ, pres.; WD8OMV, vice pres., W8QOI, secy.; WD8OML, treas. Motor City RC: K8SIA, pres., KB8AI, vice pres.; WD8KZX, secy.; W3GOJ, treas. OVS report from W8NOH. OBS reports KB8RS WB8DJS WA8RNB AF8V. OO reports from: K8JH W8QG K8HCT. Regular reporting to SCM is required by appointees. I am pleased to announce the following field appointments. NM for OMN. N8ABA, WD8IXZ. OTS: WD8IYA. OTS & OBS. Traffic: (Sept) WB8MTD 360, W8VPW 270, WD8KZX 261, WD8NKA 216, K8KMQ 183, WB8YRY 172, AF8V 142, WD8LRT 128, W8PDP 124, WA8DHB 121, N8ABA 112, WB8YDZ 111, WB8QYU 104, NB8IK 99, K8LNE 84, KB8GC 81, WD8EIB 79, W8MPD 77, K8RV 77, WB2LZN/8 62, WD8IXZ 61, WB8ZIY 58, N8AOA 57, WA8OAF 53, K8DTG 50, KR8AI 49, KB8GXV 46, WA8TAO/8 46, W3GQJ/8 39, WD8EGO 38, WD8BSE 37, KA8GMJ 36, WD8IBY 32, W8WOJ 31, WD8JOI 30, WB8SYA 30, W8YIO 30, WD8MJB 29, W8SOP 29, W8CUP 28, WA8PIM 27, WD8OSE 25, WD8ANB 22, W8HIN 22, KA8CGS 21, W8VIZ 21, N8ACL 19, K8UPE 19, WB8ITT 17, W8IHX 15, W8SCW 15, K8DYI 14, WB8NCD 14, KB8EQ 12, W8LDS 12, N8AG 10, W8LDS 10, K8MJK 9, W8WVL 9, WA8EXR 8, K8OCP 8, K8JED 7, W8LCU 7, WA8MAM 7, K8QBZ 7, WB8IZM 7, WB8VVF 7, K8ZJU 7, WA8GTG 6, WB8HSN 6, W0UPL/8 5, K8XE 5, WR4LB 3, WB8AFD 2, KB8BS 2, K8DD 2. (July) AF8V 92, WA8DHB 91.

OHIO: SCM, Harold C. Chapman, WB8JGW — Asst. SCMs: AF8O W8TP. SEC: K8AN. NMs AF8A K8AA7 WD8KBW WB8KWD WB8OMQ WB8YGW. Net reports

Net	QNI	QTC	Sess	Time(Local)	Freq
BN	426	204	57	6:45/10 P.M.	3.577
BNR	61	30	30	6 P.M.	3.605
ONN	83	36	27	5:30 P.M.	3.708
OSN	218	82	30	6:10 P.M.	3.577
OSSBN	2747	1115	90	10:30 A.M./4:15 & 6:45 P.M.	3.9725
06mN				9 P.M.	50.160

The second session of SET '79 is history. Without figures to back me up, it would appear that the volume of traffic was somewhat less than in past years. The number of stations capable of emergency power also appeared to be fewer. Participation was not lacking section-wide, but perhaps there was less activity on the local level than previously. Did your group have an exercise planned? If not, why not? Are you waiting for the real thing before making necessary preparations? Practice is what SET is all about; to provide the assurance that we as amateurs can provide the emergency communications for any situation that we are faced with, and which we keep telling others we can handle at anytime. Or, perhaps we have to have the real thing accompanying our SET as in the past 2 years to get us stirred up. For those clubs holding Novice and General licenses classes: please impart to the participants the importance of learning net operations and procedures. Give them the times and frequencies of the Ohio Novice

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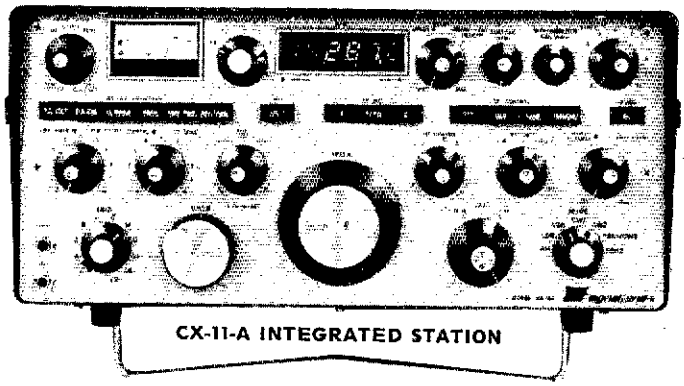

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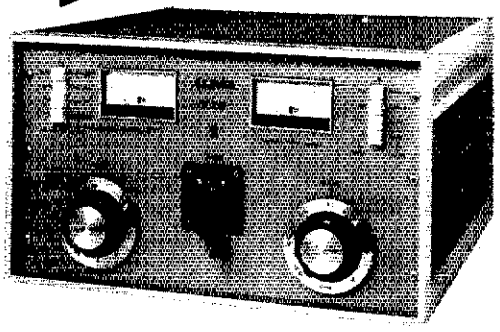

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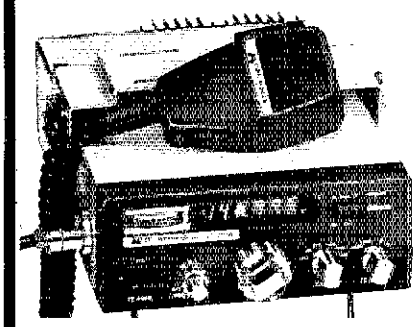

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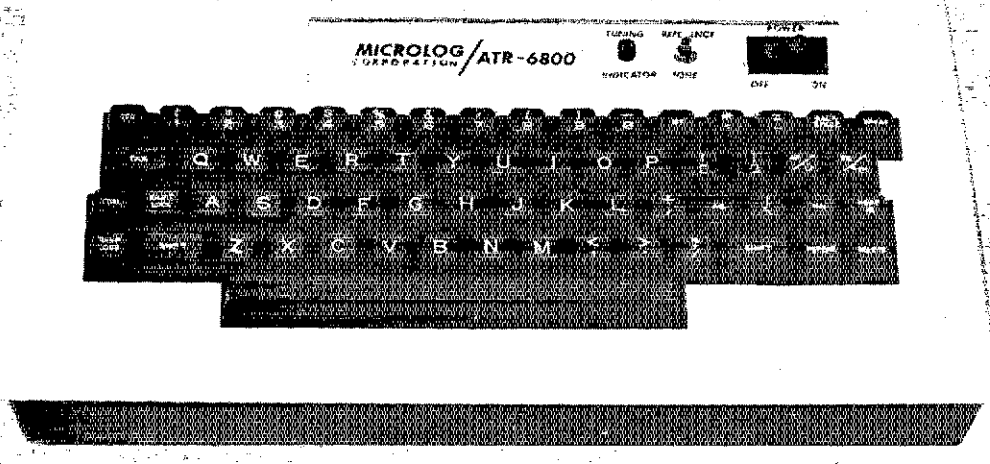

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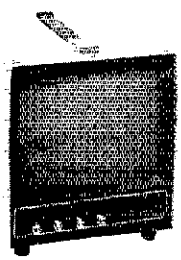

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REVOLUTIONIZES THE STATE OF THE ART

AWE AND AZDEN INTRODUCE THE BRILLIANT NEW PCS-2000

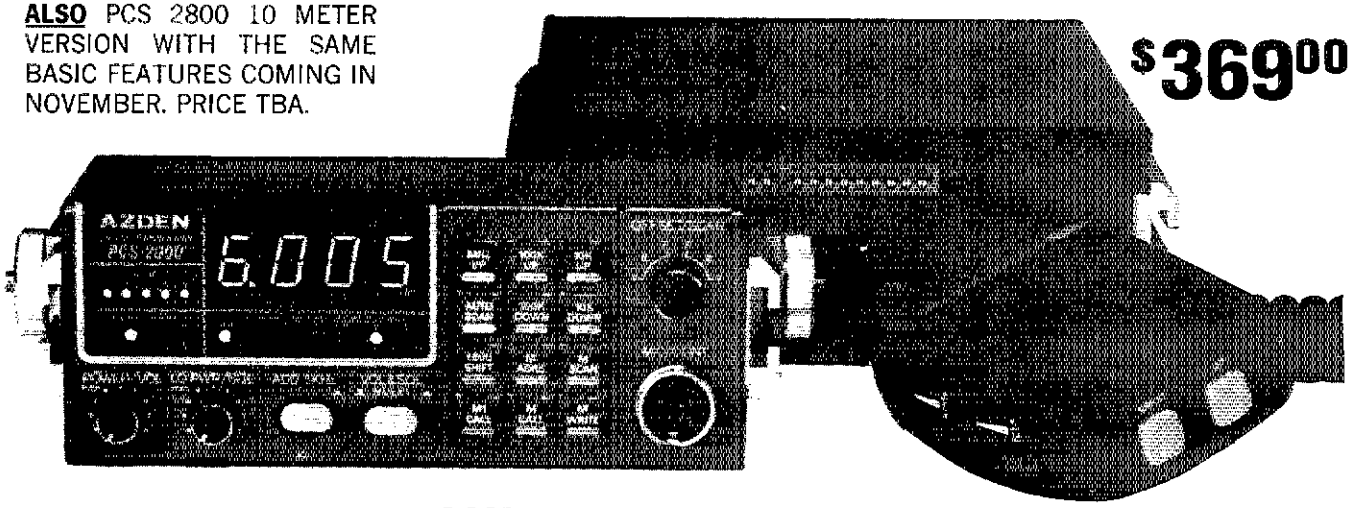
MICROCOMPUTER CONTROLLED

NEW!

2 METER FM TRANSCEIVER

NOT $550.00
INTRODUCTORY PRICE
$369.00

ALSO PCS 2800 10 METER VERSION WITH THE SAME BASIC FEATURES COMING IN NOVEMBER. PRICE TBA.



COMPARE THESE FEATURES WITH ANY UNIT AT ANY PRICE

- **FREQUENCY RANGE:** Receive and transmit: 144.00 to 147.995 MHz, 5Khz steps + MARS-CAP* and MULTIPLE OFFSET BUILT IN.
- **ALL SOLID STATE-CMOS PL DIGITAL SYNTHESIZED.**
- **SIZE:** UNBELIEVABLE! ONLY 6¾" x 2⅝" x 9¼". COMPARE!
- **MICROCOMPUTER CONTROLLED:** All scanning and frequency-control functions are performed by microcomputer.
- **DETACHABLE HEAD:** The control head may be separated from the radio for use in limited spaces and for security purposes.
- **SIX-CHANNEL MEMORY:** Each memory is re-programmable. Memory is retained even when the unit is turned off.
- **MEMORY SCAN:** The six channels may be scanned in either the "busy" or "vacant" modes for quick, easy location of an occupied or unoccupied frequency.
- **FULL-BAND SCAN:** All channels may be scanned in either "busy" or "vacant" mode. This is especially useful for locating repeater frequencies in an unfamiliar area.
- **INSTANT MEMORY-1 RECALL:** By pressing a button on the microphone or front panel, memory channel 1 may be recalled for immediate use.
- **MIC-CONTROLLED VOLUME AND SQUELCH:** Volume and squelch can be adjusted from the microphone for convenience in mobile operation.
- **ACCESSORY OFFSET:** Provides three additional offset values: +0.4 MHz, +1 MHz and +1.6 MHz. Other offsets may also be obtained.
- **25 WATTS OUTPUT:** Also 5 watts low power for short-distance communication.
- **DIGITAL S/RF METER:** LEDS indicate signal strength and power output. No more mechanical meter movements to fall apart!
- **LARGE ½-INCH LED DISPLAY:** Easy-to-read frequency display minimizes "eyes-off-the-road" time.
- **PUSHBOTTON FREQUENCY CONTROL FROM MIC OR FRONT PANEL:** Any frequency may be selected by pressing a microphone or front-panel switch.
- **SUPERIOR RECEIVER SENSITIVITY:** 0.28 uV for 20-dB quieting. The squelch sensitivity is superb, requiring less than 0.1 uV to open. The receiver audio circuits are designed and built to exacting specifications, resulting in unsurpassed received-signal intelligibility.
- **TRUE FM, NOT PHASE MODULATION:** Transmitted audio quality is optimized by the same high standard of design and construction as is found in the receiver. The microphone amplifier and compression circuits offer intelligibility second to none.
- **OTHER FEATURES:** Dynamic Microphone, built in speaker, mobile mounting bracket, external remote speaker jack (head **and** radio) and much, much more. All cords, plugs, fuses, microphone hanger, etc. included. Weight-6 lbs.
- **ACCESSORIES:** 15' REMOTE CABLE... $29.95. *MARS-CAP KIT... TBA. PCS-6R A/C POWER SUPPLY... $49.95. TOUCHTONE MIC. KIT... $39.95.

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KDK FM2016A

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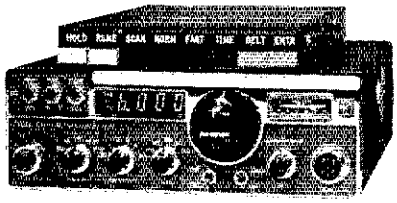

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FMMC 1* Micro phone with Built in Touch Tone Pad

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- New! Auto key up
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- Adj. level and tone balance
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- Unity 3% + C

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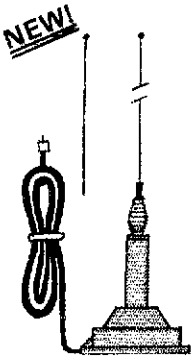

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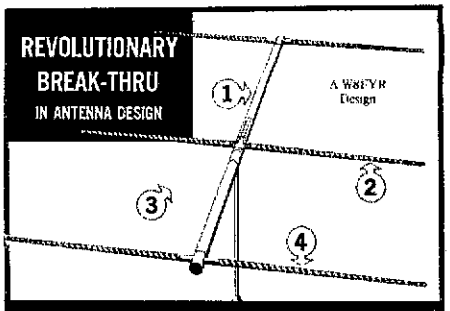
REVOLUTIONARY BREAK-THRU IN ANTENNA DESIGN



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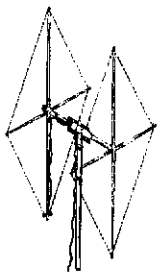

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103 80,40,20m Xcvr	$289
103A 80,40,15m Xcvr	289
AMCOMM	
S-2-25 2m FM Xcvr	$199
AMECO	
TX-62 VHF Xmtr	$ 75
621 VHF VFO	49
ATLAS	
350XL Xcvr	$699
350XL/DD6 Digital	799
350XL/DD6/305	899
350PS AC supply	149
350PS/302 Console	299
210 Xcvr	359
210X Xcvr	399
210X/NB Xcvr	439
110L Xcvr (RX+TX)	299
DMK Mobile mt	29
ATRONIX	
Code Reader	$189
CLEGG/SQUIRES-SANDERS	
22er FM series 25	$139
FM-27A 2m FM Xcvr	149
FM-27B 2m FM Xcvr	179
FM-21 220 FM Xcvr	49
011 AC supply	39
HT-146/charger	89
COLLINS	
75A-4 Rcvr (1003)	$325
75A-4 Rcvr (3880)	399
75S-1 Ham Rcvr	299
75S-3 Ham Rcvr	450
75S-3B Ham Rcvr	649
75S-3B Rcvr (round)	699
51S-1 SW Rcvr	1295
32S-1 Transmitter	299
32S-3 Transmitter	649
32S-3 Xmtr (round)	699
62S-1 VHF conv	699
312B-4 Console	199
KWM-1 20-10m Xcvr	189
516F-1 KWM-1 DC ps	69
KWM-2 Xcvr	599
312B-5 PTO console	349
351D-2 Mobile mt	75
516F-2 AC supply	149
MP-1 DC supply	89
COMDEL	
CSP-11 Speech proc	$ 69
DENTRON	
80-10AT Tuner	$ 39
160-10AT-3kw tuner	149
MT-3000A Tuner	249
160-XV 160m Xvtr	119
MLA-1200/AC ps	299
Clipperton L Amp	425
MLA-2500 Linear	569
DRAKE	
2B Ham Rcvr	$179
2AS Speaker	9
R-4 Ham Rcvr	259
R-4A Ham Rcvr	279
R-4B Ham Rcvr	329
R-4C Ham Rcvr	429
4NB Blanker	49
FL-500 Filter	35
FL-1500 Filter	35
FL-6000 Filter	35
MS-4 Speaker	19
SPR-4 SW Rcvr	349
5NB Blanker	49
SCC-4 Xtal cal	19
SC-2 2m conv	69
SC-6 6m conv	69
CPS-1 Conv ps	19
TR-4 Xcvr	389
RV-4 Remote VFO	79
TR-4C Xcvr	449
TR-4C/blanker	499
TR-4CW/RIT Xcvr	549
34PNB Blanker	69
TR-6/NB 6m Xcvr	589
2NT Transmitter	99
T-4X Transmitter	329
T-4XB Transmitter	369
T-4XC Transmitter	429
AC-3 AC supply	65
AC-4 AC supply	89
DC-3 DC supply	65
DC-4 DC supply	85
MN-4 Matcher	69
MN-4C Matcher	99
MN-2000 Matcher	175
ML-2 2m FM Xcvr	119
TR-22 2m FM Xcvr	129
TR-22C 2m FM Xcvr	149
TR-33C 2m FM Xcvr	169
AC-10 AC ps	39
AA-10 2m FM amp	39
AA-22 2m FM amp	89
EBC	
EBC-144Jr 2m FM Xcvr	$199
GALAXY/HY-GAIN	
Galaxy V Mk III Xcvr	$229
GT-550 Xcvr	279
AC-400 AC ps	75
SC-550 Speaker	19
R-530 SW Rcvr	695
AC-210 AC ps/amp	19
GONSET	
GC-105 2m AM Xcvr	$ 59
HAL	
ST-6 Demod/keyer	$239
HALLICRAFTERS	
SX-122 SW Rcvr	$225
SX-122A SW Rcvr	249
SR-400 Cyclone II	399
SR-400 Cyclone III	475
P-500AC AC ps	75
HA-1 Keyer	49
HAMMARLUND	
HK-1B Keyer	$ 29
HY-GAIN	
3750 Xcvr	$895
ITC	
Multi-2000 2m Xcvr	$289
ICOM	
IC-502 6m SSB Xcvr	$159
DV-21 2m dig VFO	129
IC-215 2m FM Xcvr	149
IC-22A 2m FM Xcvr	149
IC-230 2m FM Xcvr	199
IC-202 2m SSB Xcvr	199
IC-245/SSB 2m Xcvr	379
IC 211 2m Xcvr	529
IC-30 450 FM Xcvr	249
JOHNSON	
275w matchbox/SWR	
Kw matchbox/SWR	189
KLM	
Multi-2700 2m Xcvr	$499
PA2-140B 2m FM amp	149
PA-10-70BL 2m amp	99
KENWOOD	
TS-520 Xcvr	$499
TS-520S Xcvr	575
SP-520 Spkr	19
TS-820/dig Xcvr	750
TS-820S Xcvr	799
VFO-820 VFO	129
R-820 Ham Rcvr	788
TS-600 6m Xcvr	549
TR-7200 2m FM Xcvr	129
TR-7400A 2m FM Xcvr	289
TR-7600 2m FM Xcvr	249
TS-700A 2m Xcvr	450
VOX-3 VOX	19
MFJ	
CWF-2 CW filter	$ 19
MIDLAND	
13-510 2m FM Xcvr	$269
MIRAGE	
B-108 2m FM amp	$129
NATIONAL	
NC-300 Ham Rcvr	$129
NC-303 Ham Rcvr	179
NC-300-C6 6m conv	29
NCX-3 80-20m Xcvr	149
NCX-5 Xcvr	249
NCX-A AC supply	69
VX-501 Remote VFO	125
NYE VIKING	
SSK-1K Keyer	$ 69
PANASONIC	
RF-8000 SW Rcvr	1995
RF-2800 SW Rcvr	149
REALISTIC	
DX-160 SW Rcvr	$ 79
SP-150 Speaker	9
REGENCY	
HR-2MS 2m FM Xcvr	$129
HR-220 220 FM Xcvr	199
HR-440 450 FM Xcvr	239
P-110 AC ps	39
ROBOT	
60 Viewfinder	$129
70 Monitor	199
80 Camera	199
80A Camera	229
SBE	
SB 34 Xcvr	$199
SPECTRONICS	
DD-1T Dig (Tempo)	$ 99
DD-1K Dig (Kenwood)	99
SC-30 Counter	88
SC-250 Counter	99
STANDARD	
146A 2m FM HT	$139
14U 2m FM Xcvr	199
SWAN	
410 VFO/22 adapt	$ 89
MB-80A 80m Xcvr	189
P-1215A AC supply	49
SS-200 Xcvr	389
PS-20 AC supply	95
350 Xcvr	249
350C Xcvr	299
500 Xcvr	309
500C Xcvr	339
500CX Xcvr	389
700CX Xcvr	459
HF-700S Xcvr	499
117C AC supply	69
117XC AC supply/spkr	95
PSU-3A AC ps	129
600T Transmitter	399
600R/SS-16B Cus	399
600SP Patch	59
1200X Linear	199
Mk II Linear	695
250 6m Xcvr	199
250C 6m Xcvr	275
14A DC module	39
ST-2 Tuner	175
TPL	
502B 2m 1/40w	$ 88
TEMPO	
2020 Xcvr	$499
AC One AC ps	89
SSB One SSB adapt	139
S-1 2m FM HT	269
TEN-TEC	
570 Century 21	$249
Triton II Xcvr	388
Triton IV Xcvr	488
244 Dig display	139
252M AC supply	99
252G AC supply	99
252 AC supply	75
262G AC supply	99
WANZER	
2.4M Ant tuner	$119
WILSON	
Mk II 2m FM HT	$179
WE-800 2m FM Xcvr	349
WC-14 Charger	12
YAESU	
FT-901DE Xcvr	$799
FV-901DM VFO	289
FT-301D Xcvr	579
FT-301AD Xcvr	599
FP-301 AC ps	99
FP-301D AC ps	159
YO-301 Scope	179
FL-101 Xmtr	375
FR-101 Dig Rcvr	399
FT-7 Xcvr	379
FT-7B Xcvr	479
YC-7B Dig disp	79
FP-12 AC ps	99
FTV-650 6m Xvtr	139
FT-620B 6m Xcvr	329
FRG-7 SW Rcvr	239
FT-221R 2m Xcvr	399
FT-227R 2m FM Xcvr	249
FT-227RA 2m FM	279
CPU-2500RK 2m FM	399
FT-2 Auto 2m FM	99
200R 2m FM Xcvr	149

(1) This list was prepared from an inventory taken on the date shown left. The quantities vary. In some cases there are several of one item, others, maybe 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. But, due to the number of trades we are involved in each day, some items are in stock that are not listed. When ordering state more than one choice, if possible. (2) AES reserves the right to sell power supplies and accessories only with matching transmitters or transceivers depending on our stock situation. (3) To insure quality, our used gear is serviced after we receive your order. Please allow 5 to 10 working days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment specials, closeouts, etc. shown on this page.

The following are NEW Close-outs, Overstock merchandise, New displays, Demos, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Most Close-outs available at Milwaukee only. Terms of sale: Payment in full with order, Mastercharge, or Visa (Bankamericard); no trades.

	reg.	NOW
ALDA		
103 80-20m Xcvr	$495	349
103 80-20m Xcvr/nb/cal/mic	573	399
103A 80/40/15m Xcvr/cal	514	349
PS-115 15A power supply	84	79
ALLIANCE	reg.	NOW
HD-73 Rotor	$154	109
ATLAS	reg.	NOW
350-XL/DD6-XL Xcvr DEMO	1424	1199
DD6-XL Dig kit for 350-XL	229	199
350-PS Supply DEMO	229	199
350-PS/302 Console	458	359
DMK/XL Mobile mt	65	49
210X Xcvr	765	519
210X/NB Xcvr/blanker	810	549
215X/NB Xcvr/blanker	810	549
210XS (LE) Xcvr	765	569
210XS/NB (LE) Xcvr/blanker	810	599
215XS (LE) Xcvr	765	569
215XS/NB (LE) Xcvr/blanker	810	599
DD6-C Dig for 210X/215X	235	199
VX-5 VOX kit for 220-CS	60	49
200-PS Portable supply	105	99
220-CS/VX-5 AC ps/VOX	210	149
RX-110 Rcvr/TX-110L Xmtr	438	379
RX-110/TX-110H/PS-110H	636	549
B & W	reg.	NOW
373-6 6m coaxial filter	$ 45	19
CDI	reg.	NOW
AM filter for FT-101	$ 39	20
CES	reg.	NOW
800-YS Scanner, FT-227R	$ 99	69
CIR	reg.	NOW
Astro 200 Xcvr	$995	649
Astro 200/CW filter	1045	699
Astro 200A Xcvr	1095	699
Astro 200A/CW filter	1145	749
BPS-200 AC supply	136	108
SPR-200 Speaker	30	24
SPS-200 AC ps/speaker	165	139
SUC-200 Stn console	295	236
MIC-STA Desk mic	38	29
DENTRON	reg.	NOW
160-AT 160m ant tuner	$ 59	49
160-10AT Ant tuner	129	99
160-10AT-3Kw Ant tuner	229	149
MT-2000A Ant tuner	199	149
PS-10 VOM/wattmeter	49	39
HF 200A Xcvr DEMO	699	559
HF ACS 12v 10A supply	129	79
DRAKE	reg.	NOW
R-4C Receiver	$699	575
T-4XC Xmtr & AC-4 ps	849	699
MS-4 Speaker	33	25
7072 Hand microphone	19	9
AN-5 Shortwave ant	8	5
MN-4C Tuner	189	119
MN-7 Tuner	189	139
WH-7 Wattmeter	89	69
1525EM Encoder mic	49	39
GALAXY	reg.	NOW
R-1530 Rcvr w/spkr	1610	695
HY-GAIN	reg.	NOW
3750 Xcvr DEMO	1895	995
ICOM	reg.	NOW
IC-245 2m FM Xcvr	579	479
IC-3PA Power supply/spkr	99	59
KLM	reg.	NOW
Force 5 Xcvr/AC ps	1344	695
Multi-2000 2m Xcvr	679	479
MIDLAND	reg.	NOW
13-510A 2m FM synth Xcvr	$399	329
MOTOROLA	reg.	NOW
PK-770 PL kit	$ 29	19
NYE	reg.	NOW
250-25-3 500w tuner/relay	$212	119
250 25-4 500w tuner	202	119
REGENCY	reg.	NOW
DFS-5K Dig selector - Whamo	$199	79
EC-175 175 MHz counter	449	299
SILTRONIX	reg.	NOW
FC 1 5 KHz-40 MHz counter	$169	89
SPECTRONICS	reg.	NOW
DD-1K Kenwood display	$169	99
SC-30 30 MHz counter	169	99
SC-250 250 MHz counter	219	129
SWAN	reg.	NOW
100MX Xcvr	$699	549
WM-6200 6 & 2m wattmeter	87	59
WM-1500 Wattmeter	74	59
PS-20 AC supply	179	129
FC-76 40 MHz counter	169	89
14C DC module	119	79
TPL	reg.	NOW
802B 2m 1-4/50-80w amp	$259	149
1202 2m 5-15/80-120w amp	209	129
PS3-A12D 12v 20A supply	136	76
TEN-TEC	reg.	NOW
Omni-D Xcvr (old model)	1069	649
252M/O Power supply	139	119
262G Power supply w/VOX	139	99
252G Power supply	109	89
WILSON	reg.	NOW
1402 2m FM HT	$254	169
1402/TTP HT w/touch tone	316	209
The following model 2m HT's are without the high/low pwr. switch & batt. LED.		
Mk II HT/batt/wall cgr/TTP	337	239
Mk IV HT/batt/wall cgr/TTP	362	299
Note:High/low switch may be installed on Mk II/IV by AES for $20.00.		
System 1 5 el 20-10m beam	299	199
System 2 4 el 20-10m beam	249	179
M-320 3 el 20m beam	149	119
M-66 6 el 6m beam	104	79
M-64 4 el 6m beam	69	49
M-29 9 el 2m beam	54	39
YAESU	reg.	NOW
FT-901D Xcvr	1259	899
FT-901DE Xcvr	1259	999
FT-101FF Xcvr	759	699
SP-101B Speaker		20
YC-601B Digital display	235	199
YO-101 Monitor scope	320	279
FTV-650B 6m transverter	279	199
FTV-250 2m transverter	275	239
FR-101S Receiver	599	399
FR-101 DIG Receiver	749	499
FL-101 Transmitter	649	449
SP-401PB Speaker/patch	69	49
FT-7 20w PEP Xcvr DEMO	499	429
FT-227RA 2m FM synth Xcvr	399	329

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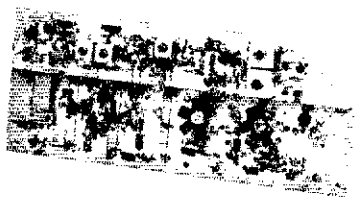
These Low Cost SSB TRANSMITTING CONVERTERS

- Let you use inexpensive recycled 10M or 2M SSB exciters on UHF & VHF!

- Linear Converters for SSB, CW, FM, etc.
- A fraction of the price of other units; no need to spend $300 - $400!
- Use with any exciter; works with input levels as low as 1 mW.
- Use low power tap on exciter or simple resistor attenuator pad (instructions included).
- Link osc with RX converter for transceive.



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NEW XV4 UHF KIT – ONLY $99.95

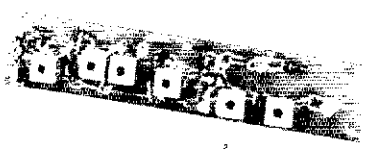
28-30 MHz in, 435-437 MHz out; 1W p.e.p. on ssb, up to 1½W on CW or FM. Has second oscillator for other ranges. Atten. supplied for 1 to 500 mW input, use external attenuator for higher levels.

Extra crystal for 432-434 MHz range..... ....$5.95

XV2 VHF KIT - ONLY $69.95

2W p.e.p. output with as little as 1 mW input. Use simple external attenuator. Many freq. ranges available.

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-4	28-30	144-146
XV2-6	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-146	50-52



XV28 2M ADAPTER KIT - $24.95

Converts any 2M exciter to provide the 10M signal required to drive above 220 or 435 MHz units.

Easy to Build FET RECEIVING CONVERTERS

Let you receive OSCAR and other exciting VHF and UHF signals on your present HF or 2M receiver

VHF KIT STILL ONLY $34.95

MODEL	RF RANGE	OUTPUT RANGE
C28	28-32 MHz	144-148 MHz
C50	50-52	28-30
C50-2	50-54	144-148
C144	144-146	28-30
C145	145-147	28-30
or	144-144.4	27-27.4 (CB)
C146	146-148	28-30
C220	220-222	28-30
C220-2	220-224	144-148
C110 (less xtal)	Any 2MHz of Aircraft Band	26-28 or 28-30

UHF KIT ONLY $34.95

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-5	435-437	28-30
C432-4	432-436	144-148
C432-9	439.25	61.25

Professional Quality VHF/UHF FM/CW EXCITERS

- Fully shielded designs
- Double tuned circuits for spurious suppression
- Easy to align with built-in test aids

T50-50	6-chan, 6M, 2W Kit.....	$49.95
T50-150	6-chan, 2M, 2W Kit.....	$49.95
T50-220	6-chan, 220 MHz, 1½W Kit	$49.95
T450	1-chan, 450 MHz, 1W Kit	$49.95

See our Complete Line of VHF & UHF Linear PA's

- Use as linear or class C PA
- For use with SSB Xmtg Converters, FM Exciters, etc.

LPA 2-15 VHF PA, 2W in/15-20W out. Solid-state t/r switching. Kit $59.95

LPA 2-45 VHF PA, 2W in/40-45W out. Can also be used with 8-10W drive. Kit $109.95

LPA 4-10 UHF PA, ½W-1W in/8-10W out. Kit $79.95

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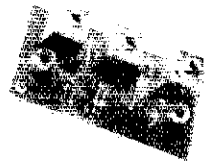

P9 Kit $12.95
P14 Wired $24.95
Specify band when ordering

- Deluxe vhf model for applications where space permits ● 1½" x 3" ● Models available to cover any 4MHz band in the 26 to 230 MHz range ● 12 Vdc ● 2 stages ● Ideal for OSCAR ● 20 dB gain

P8 Kit $10.95
Specify band when ordering

- Miniature vhf model for tight spaces–size only ½ x 2⅜
- Models available to cover any 4MHz band in the range 20 to 230 MHz ● 20 dB gain ● 12 Vdc

P15 Kit $18.95
P35 Wired $34.95

- Covers any 6 MHz band in UHF range of 380 to 520 MHz ● 20 dB gain ● 2 stages ● 12 Vdc

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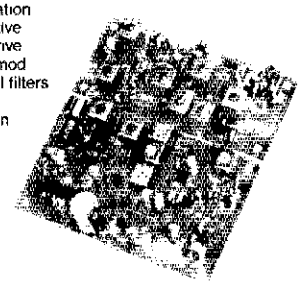

R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz..... $69.95

R75B* VHF Kit for normal nbfm service. Equivalent to most transceivers. -60dB at ± 17 kHz, -80dB at ± 25 kHz... $74.95

R75C* VHF Kit for repeater service or high rf density area. -60dB at ±14kHz, -80dB ±22kHz, -100dB ±30kHz.... $84.95

R75D* VHF Kit for split channel operation or repeater in high density area. Uses 8-pole crystal filter. -60dB at ±9 kHz, -100dB at ± 15 kHz. The ultimate receiver!.. $99.95

*Specify band: 10M, 6M, 2M, or 220 MHz. May also be used for adjacent commercial bands. Use 2M version for 137 MHz WX satellites.

R85( ) UHF FM Receiver Kits, triple conversion, include C432 UHF Front End Module. Add $20 to above prices. (Add selectivity letter to model number.)

A13-45A 6-Channel Adapter for receivers $13.95

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Net, Ohio Slow Net and Buckeye Net. Phone nets are fine and most of them do a whale of a good job, but the real disciplines are learned on the cw nets. Without discipline, no traffic net can perform as intended. Ottawa County ARES was involved in a test with Red Cross pertaining to a mock disaster at the Davis-Besse Nuclear facility. How many other groups are preparing for incidents similar to Three-Mile Island? The recently formed Tri-County Emergency Net (Clinton, Fayette Highland counties) meets at 7 P.M. Su on or about 3939 kHz. In addition to co-sponsoring the Ohio QSO Party, the Ohio Council of Amateur Radio Clubs has available many awards for working Ohio amateurs. If you are interested, forward an s.a.s.e. to Awards Custodian K8ND, Jeff Maass, 4410 Norwell Dr., Columbus, OH 43220, for a listing. Appointments: OTS W9MCH/N8BKH.

Local Nets	QNI	QTC	Sess.
BRTN	433	89	30
COARES	86	17	3
EOTN	124	58	26
TSRAC	593	523	26
VWCEN	43	0	4

Traffic: (Sept) K8AAZ 502, WB8OMQ 456, W8WPO 247, WD8JIK 331, W8PMJ 274, K8OZ 189, WB8KWD 187, K8AN 167, WA8HGH 155, W8TH 140, WB8CJU 118, W8GGX 118, WB8WTS 102, WB8UBR 95, W8QZK 92, W8MOK 79, K8FE 78, WB8MEK 78, N8VT 76, W8TP 65, WD8KBW 63, WB8SIQ 57, W8LZE 50, WB8SRC 49, N8CW 48, WB8JGW 47, WB8TRK 47, AF8A 44, WD8OZM 43, W8RG 43, K8DL 40, WD8LPP 39, WD8DIP 32, WD8JTT 32, WD8OBD 32, WD8OYK 31, WB8YTD 30, KA8BOE 29, WB8DLP 29, WD8PUH 29, W8QFM 29, WB8QHV 25, N8AKS 24, WA8MHO 24, W8WEG 24, WB8PIY 23, W8UPD 23, WB8HMI 22, N8JR 21, WB8DMF 20, WD8RNM 20, WD8QAC 19, WB8TPX 19, WD8QMP 18, AB8P 17, WB8WHF 17, WD8KFN 16, WD8OYO 15, K8CKY 14, W8MGA 14, WB8NHV 13, WA8BOV 12, WB8QHU 12, WB8WNH 11, N8AHK 10, WD8NAD 9, WD8CTX 8, WD8INK 8, WB8LWY 8, N8AUC 7, K8CYX 6, K8IOW 6, WB8VLR 6, WB8VZX 6, KA8DJZ 5, WB8INY 5, W8KN 5, WB8KKI 4, WB8NTR 4, WA8RQQ 4, W8XT 4, WB8YUS 4, N8AJD 3, W8DYF 3, WD8EKI 3, KB8KV 3, WA8TSX 3, WB8YIJ 3, W8BHL 2, W8IM 2, KB8LQ 2, WD8OTO 2, WD8RIH 2, WB8MZZ 1, WB8OXN 1 (Aug) W8PMJ 397, K8FE 115, WA8BOV 13, KA8EHA 8, W9NJP 5.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV — SEC: WB2VUK. STM: WA2SPL. ASCM: WB2VUK W2IT WB2COY WB2KDC. NM: W2CS W2WSS KB2JG WB2OOH WB2ZCM WB2EAG. Nets: NYPON 5 P.M. 3913; ESS (slow) 6 P.M. 3590; NYSPTEN 6 P.M. 3925; NYS 7 & 10 P.M. 3677; NETN (slow) 8 P.M. M/W/F 3732; CDN (Troy) 6:30 P.M. 34/94; HVN (Beacon) 7:30 P.M. M-F 37/97; SDN (White Plains) 9:30 P.M. S/T/T 66/06 M/W/F 615/015. Congrats to WB2EAG on first BOL. Congrats on upgrades, Extra, WB2LUB. WB2NEG; Adv, WA2YDG; General, WB2SMR N2AZM. New Officers for Rip Van Winkle ARS and WA2FTI N2FN WA2SPK. W2DW sez RVW 81/21 machine will be permanent for winter. Initial reports from CDN which began Sept 15 indicate a big success. Congrats fellas and keep it up. Really neat to watch all the tfc going in and out of the 2-m local nets. Congrats also to BAVTN down in NYC functioning as a section net in 2RN. Doing a bangup job filling a gap in traffic coverage we've had for many years. Along that line, ESS bulletin had a nice roster of hf stns liaison into the various 2-m local nets. PSHR: W2YJR WA2SPL WB2EAG WB2HDU WB2MCO N2BDW. BPL: WA2SPL WB2EAG AD2X. Traffic: WA2SPL 1043, WB2EAG 534, AD2X 268, K2AV 254, W2EFU 208, W2CS 192, W2YJR 128, WB2MCO 123, WA2EQW 92, WB2HDU 90, AK2P 80, W2ACQ 60, KB2KW 35, N2EF 30, N2IK 25, AA2Y 17, WB2SON 12, WB2SPK 11, WA2CJY 8, W2IQK 2.

NEW YORK CITY-LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst. SCM: Steve Bloom, WB2IDP. STM: WB2BNY. NM: WB2HIQ WB2EUF. The following are traffic nets in and around the section. Join one!

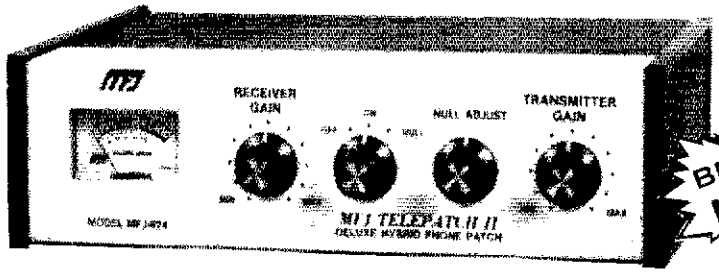
Net	Time/Day	Freq.	Mgr.
NLI*	1900 Dy	3710	WB2EUF
NCI*	2200 Dy	3830	WB2EUF
NLIPN*	1815 Dy	3928	WB2HIQ
BAVTN*	2030 M-F	147.915/315	KA2CNN
Clearinghouse	1100 Dy	3925	WB2EAG
MikeFarad	1300 M-S	3925	WA1LAD
NYSTPTEN	1800 Dy	3925	W2GLH
ESS	1800 Dy	3590	W2WSS
NETN	1930 MWF	3728	WB2EAG

Nets marked with an asterisk are NTS section nets. All times are local. PSHR this month to WA2UWA K2GCE WA2MEE KA2CNN and KA2DBW. An interesting note on the traffic statistics this month. Almost 40% of the stations reporting handled their traffic mostly or exclusively on vhf. This is a good example of the phenomenal growth of vhf traffic handling in our section. Some exemplars of vhf traffic handling in our section are KA2CNN KA2DBW WA2MEE WB2RVA WA2KXE and WB2BNA. K2LIE WB2BNY and WB2IDP who are active in the hf nets also frequent the vhf nets. Congratulations to WB2INI and WB2PJA on arrival of daughter Aileen. FCC exams at Stony Brook will be given soon. For more information contact WB2QIY. EC report received from WA2SUB. K2IZ graduated from college after a lot of hard work. All that while contending with pressures from job and family. I regret to report WB2LYH as a Silent Key. BAVTN manager, KA2CNN, upgraded to General and is getting active on the hf phone and cw nets. Official observer, N2NT, has been busy officially observing pork bellies and the like at the commodities market. OO, K2PQY, busy observing things closer to home on the amateur bands. Great South Bay Radio Club reports their repeater back on the air and they are planning new repeater with 450 input. This club is holding a Novice class. For more information contact WA2PUG. WB2HIQ up to 126 countries confirmed. BAVTN seems to have finally found a permanent home on WA2RXQ/RPT 147.315/915. This repeater has excellent coverage and they are planning to put up a satelite receiver in Manhattan. Suffolk County Radio Club had a wonderful flea market. Appointees: If you do not report every three months you will be cancelled. K2UB waiting for new Yaesu FT207R. A lot of traffic will be coming out of the Winter Olympics at Lake Placid over the next few months. A lot of it for this area. The nets could use all the help they can get in handling this traffic. Happy holidays to all of the section members! Traffic: W2GKZ 142, K2LIE 135, WA2UWA 114, WB2EUF 82, K2GCE 78, WB2IDP 78, KA2CNN 77, W2MLC 67, KA2DBW 65, WB2RVA 63, WB2KCT 46, WB2BNY 41, WB2HIQ 35, WA2KXE 25, K2UB 21, WA2MEE 16.

NEW MFJ-624 Deluxe Hybrid Phone Patch

Feature Packed: VU meter for line level and null. Has receiver gain, transmitter gain, null controls, bypass switch. Beautiful hum-free audio. RF filtered. VOX or push-to-talk. Works with any rig. Simple patch-in-patch-out installation.

Crisp, clear hum-free audio is what phone patching is all about and MFJ has it.



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PERFORMANCE: Gives you crisp clear, hum-free audio which is what phone patching is all about. Use automatic VOX or push-to-talk. RF pi-filters and PC board construction eliminates RF feedback. Works with any rig.

FEATURES: VU meter monitors telephone line level to prevent crosstalk between telephone channels. Also lets you adjust null depth for maximum isolation between receiver and transmitter.

Separate transmitter and receiver gain controls eliminate readjusting rig's controls after patching.

Null control for maximum isolation.

Function switch: OFF for normal operation. **ON** connects your rig to phone line for patching. **NULL** switches VU meter to let you adjust for maximum null.

Simple 2 cable installation (plus phone line) when rig has patch-in-patch-out jacks. Connects easily to **any** rig.

Phono jacks for patch-in-patch-out, speaker, microphone. Screw terminals for phone lines.

Eggshell white, walnut sides. 8x2x6 inches.

QUALITY: Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

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	KDK 2015R	KDK 2016A	KENWOOD TR7600 & 7625	KENWOOD TR7400A	YAESU FT227R	CLEGG FM-28 MIDLAND 13-510 13-513	ICOM IC22S
SCAN RATE	Adjustable 100kHz/sec-1mHz/sec			50kHz/sec	200kHz/sec	100kHz/sec	100kHz/sec
SWEEP WIDTH	144-148 142-149.995 or only the mHz segment you select on mHz switch.		complete band or mHz you want	complete band or mHz you want	adjustable eg. 146-148 144-146; 146-147	scans the mHz seg. selected by the mHz switch	145.35-147.99
SCAN CONTROLS	2 mini toggle switches mounted on rig-LOCK switch may be mounted on mic.		2 mini toggle switches mounted on rig.	2 mini toggle switches mounted on rig.	1 mini toggle switch mounted on mic or rig.	2 mini toggle switches mounted on rig.	1 mini toggle switch mounted on mic or rig.
PRICE PER KIT	39.95		39.95	39.95	34.95	39.95	34.95
PRICE PRE-ASSEMBLED	59.95		59.95	59.95	54.95	59.95	54.95

(Add $1.50 for Postage & Handling)

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TENNA-TAPE

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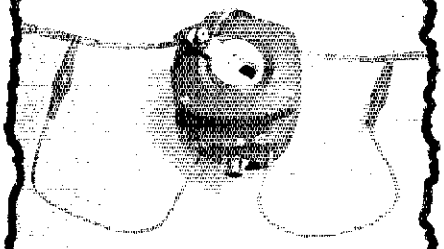

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NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MQV — SEC: WB2VUF. STM: W2XD NM: AF2L K2VX WA2OPY W2PSU WB2RMI W2TCA and W2UEZ.

Net	Mgr.	Freq	Time/Days	Sess.	QNI	QSP
NJN	AF2L	3695	7 P.M. Dy	30	505	214
NJN	AF2L	3695	10 P.M. Dy	30	340	165
NJPN	K2YX	3950	6 P.M. Dy 9 A.M. Su	35	604	282
UCEN	WB2RMI	146.085/685	Dy	30	270	107
OBTTN	WA2OPY	147.72/12	Dy	30		
NJVN	W2TCA	146.49 147.49	Dy	30	151	80
NJRTTY	W2PSU	147.51	Dy	30		
NJSN	W2UEZ	3735	6:30 P.M. Dy	30	177	38

Newsletters received from the following clubs: Sussex County ARC, Rutgers University ARC, Tri-County ARC. W2BCC spoke on "Antenna Impedance" at the 550 Club. K2ZO spoke on the "Antenna Bridge and GDO" at the BARA Club. W2NR W2TPJ and WA2MVQ OO reports list mostly chirpy signals. K2EZ reports continued work with TRS-80 and RTTY. He also lost part of his Mini-beam during Hurricane David but the spoke loss now allows a 1.5 maximum on 20! K2BYB now a Silent Key and will be missed by many. He was also a pilot. New active NJN members are: WA2PTQ WB2QMA and WA2FZT. KA2CHM and WA2SLG using new beams. New officers of Tri-County ARC: W2AMS, pres.; W2EUF, vp; WA2VMH, treas.; W2NEH, secy. and W2IHA. WB2CFB W2CHA WA2WDJ W2OJ, trustees. HARC delegates to HARC: WA2MTT and W2IHA. WA2NPP Club activity during NJ QSO party with following ops: WA2MLY W2PA WA2SOU and N2SW garnering 94,599 points. How many around remember Rutgers ARC's first call as W2IGS, then after WWII it was W2RTN in the late 50s. Members of the club while it was W2RTN were W2SWY W2VJN W2CVW and K2EFA. W5DTR/2 participated in the Raritan Ramble. N2NS and family headed down to Disney World and to see the grandparents. K2WM has a new dipole up at 50 ft. and set for the winter. WB2TOM reports the Radio Club Info Net had 31 stations report with 9 clubs checking in. WA2MVQ had a heart attack, but is now recovering. KA2CHK upgraded to General. Traffic: W2UEZ 354, WB2TOM 293, W2COB 242, WB2RMI 224, W2SQ 189, AG2R 131, AF2L 124, K2VX 114, KB2HM 95, WA2MVQ 94, WB2HSG 69, WB2RMJ/T 69, N2NS 62, WA7DPK/2 45, W2ZEP 34, WB2AIU/T 29, W5DTR/2 27, WA2OVE 26, WA2QWR 22, K2TH 22, WB2JVE 21, N2SU 13, KA2CHK 10, WA2FZJ 7, K2WM 7, W2CC 5, KA2GWP 3, KP6BC 1.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, WØLFF — SEC: WØIYW. Northeast Iowa ARA hosted a fine Iowa 75m picnic. KØJVO received the certificate of appreciation, and WØJPJ received the Baloney Award. WBØNSS back on air after tornado with a new 5wan 2 element tri-bander and Cushcraft 2-m beam. The Sioux City auto-patch machine is on 31/91. WBØZXU has added a 45 ft. dish to his antenna farm. WØSD is number 11 to get WAS on 2. WØDUN has 50 yr. pin as a Ham, also celebrating 50th wedding anniversary. WDØEIF organizing a ARES Net at Marshalltown. Yours truly had nice eyeball with Muscatine, Iowa-Illinois and Jones County Clubs. Congrats Dept: WBØSFZ for General and NØAEF for Advanced. WBØAVW for becoming the Manager of 75m Net Noon Sess., and thanks to WØWDC for a job well done. Life membership in Soo Land Assn. given to WØEON WØYOY and WAØNNC. WØEIT kept busy with FMT. WDØALY on staff of KILJ at Mt. Pleasant. Cedar Valley ARC has a sister Club in Cedartown, Ga. WBØTXL beat WBØFHI in foot race by one minute to find the fox. Point beam toward North Pole and have KOOL YULE.

Net	Freq. Time/Z	Days	QNI	QTC	Sess.	Mgr.
Iowa 75M	3970 1830	M-S	1099	52	25	WBØAVW
Iowa 75M	3970 0000	M-S	953	52	25	WØYLS
ILCN	3560 0030 0400	Dy	308	99	50	WØYLS
ICN (Aug.)	3713 0100	T-T-S	13	4	4	WBØNSS

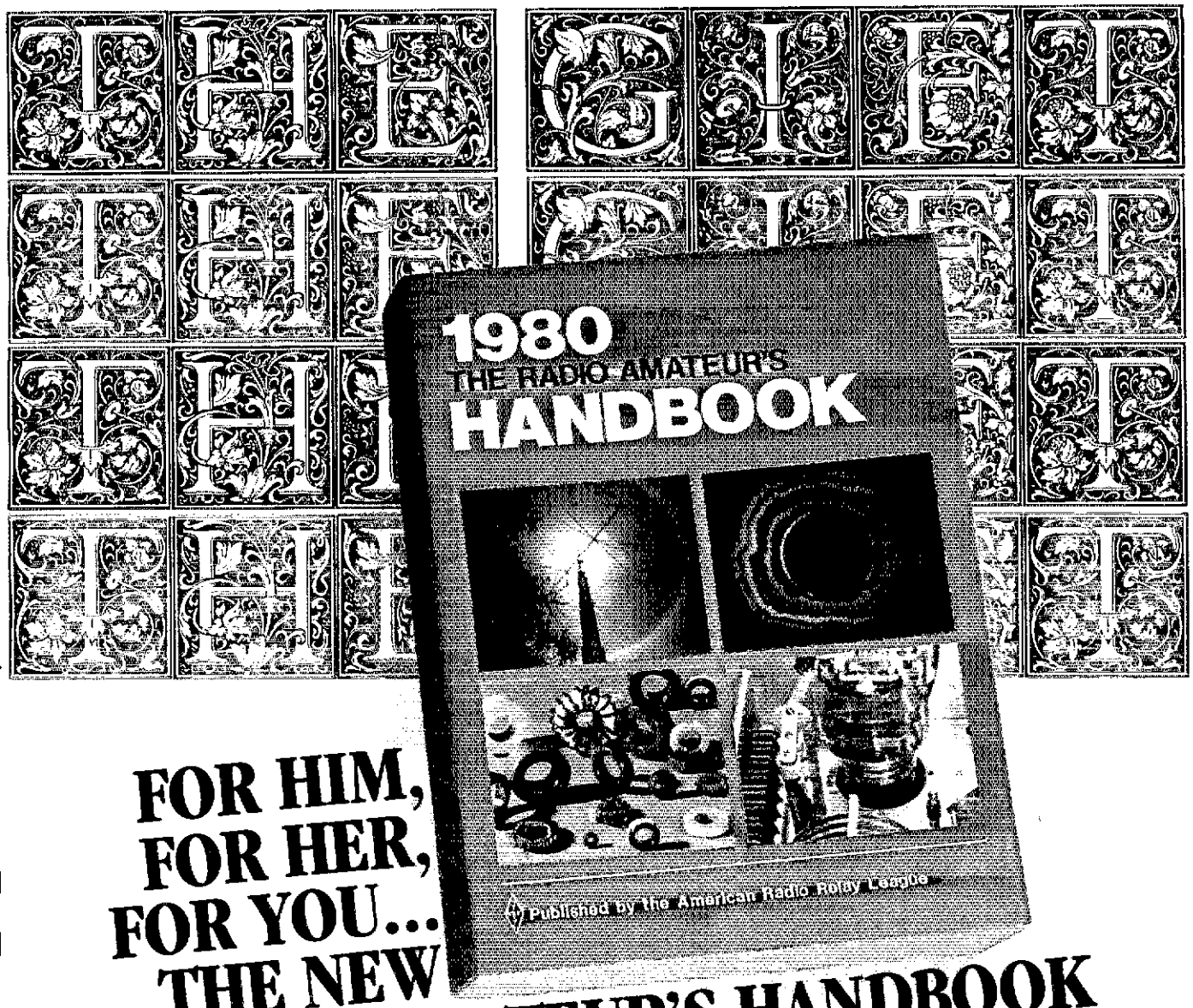
Traffic: WAØAUX 413, WØSS 180, WØYLS 130, WDØGDL 60, AEØR 49, KØGP 42, WBØUPF 39, WBØNSS 25, WØLFF 23, WBØAVW 9, KØOFI 9, KAØBYI 6 (Aug) WDØHND 2.

KANSAS: SCM, Robert M. Summers, KØXF — SEC: WØKL. As promised here is the up-date list of EC and the counties they serve. Zone 1: WBØs SZS MN NM BR DP JA. Zone 2: WØs CWJ DK GF MR MN CS. Zone 3: WØs CWJ RL PT WB LY. Zone 4A: KØs QLC SN OS JF. Zone 4B: WDØs GYX DG. Zone 5A: KØs BXF WY. Zone 5B: WØs NYG LV AT. Zone 6A: WBØJO WBØIZY. Zone 6B: WAØs LXI FR MI CF AN LN. Zone 7: WBØs YWZ GW EK CQ WO WL MG AL NO LB BB CR CK. Zone 8: KØs EMB HV BU CW. Zone 9: WBØs WVU SG SU HP. Zone 10A: WØs PSN HC RN. Zone 10B: WBØs OAO ED KW OM PR BA KM. Zone 10C: WDØs EPX RH BT PN SF. Zone 11: WAØs RXS LE NS HG GY FO CA ME. Zone 12: WØs OAG SC FI HS SW SV GT KE WH GL HM ST MT. Zone 13: WBØs SRP JW RP WS CL CD MC. Zone 14: WDØs CFZ OT LC EL SA MP. Zone 15A: KØs RXT CN SH WA BA TH LG DC SD GO. Zone 15B: KØs VBJ NT GH TR EL RO PL SM OB RS. Kansas WX Net EC is WAØLBB. If you need a map of the state showing all this info, ask your EC, SEC or SCM. Sept net activity: Net/QNI/QTC. KSBN/1035/160. KPN 250/9. QKS/354/166. QKS-SS/120/43. KWN/1073/257. CSTN/1274/66. It is with deep sorrow that we have to list KØLPE as a Silent Key. Traffic: WBØOBH 282, WØOYH 173, KØEZ 123, WDØFBP 89, WDØACG 81, WØAM, 73, WØFT 71, KØBXF 66, WØFIR 60, WØPB 31, WØCHJ 29, WØFDJ 20, WØRBO 14, NØAOL 12, WBØSZS 11, KØYTA 11, NØAOL 10, WDØCFZ 10, WØKL 7, KØFPC 6, WØRT 6, NØIN 2, KØKD 2.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst. SCM, Joe Flowers, WØOTF. SEC: WBØFKY. Novice classes are in full swing for the Ozark Amateur Radio Society, the Warrensburg Amateur Radio Club and the Heart of America Radio Club. NØAOP is sporting a new TS-180S.

Net	QNI	QTC	Net	QNI	QTC
MOSSBN	735	52	MON	218	161
NEMOE	121	0	MON2	123	69
ACE	9	0			

A total of 299 messages were handled by Amateurs at the Missouri State Fair this year. SET messages were received from these stations KØONK WBØSND KØSI WBØKUW WDØAFD WDØKZS and WDØFZJ. Congratulations to the following new licensees: Novice: KAØs DMJ PPX FPY FUJ FWF FWG FWN FWQ FWR FWX FWY FWZ FYC FYD FYF FYG FXB FXE FXF FXI FXN FXO FXR FXW FXX GBN. Tech: NØs BEX BFC KAØFXC. General: NØAGS NØBBQ NØBNH KAØGBK WBØERD. Advance: WAØZHY WBØQLI WDØCFJ. Extra: KØPYB WØQXT and



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K@RWL. Traffic: K@ONK 444, W@BMA 308, W@BV 131, W@OTF 83, WB@SND 50, WB@TNX 30, WA@EMX 15, W@VTF 14, K@RWL 9, WA@KUH 7, W@QAU 6, AG@C 2.

NEBRASKA: SCM, Rex P. Greenwell, K@KP — SEC: WA@ASM. The Pine Ridge ARC is active and holding club meetings the last Thursday of the month on the Chadron State College campus. Excitement and fun is building with PARC, including their 25th anniversary hamfest in Chadron! WB@SIP reports the UNL ARC will increase the coverage of their Lincoln repeater with a new skyhook. RTTY is also welcome on this machine. OVS, WB@OPP, has constructed a LED readout for his HW2036 and it works FB! K@TVD is a new OO in Omaha. K@JBL is the new EC in Lincoln county. Sorry to hear WD@AHV being in the hospital and unable to continue as NM; KA@BCB will replace him as the NM for the Platte Valley 2-meter net. Central ARC will elect new officers in Dec. Nets: Cornhusker QNI 776, QTC 30; Morning Phone QNI 1220, QTC 27; Nebr. Storm QNI 827, QTC 31; Pawnee QNI 123; Platte Valley QNI 62, QTC 9; PM Net QNI 95, QTC 18; QCWA QNI 57. Traffic: WA@LLQ 60, K@BHS 33, W@HOP 30, W@EUT 26, W@VYX 25, WA@QEX 23, WA@PCC 20, WB@GWR 19, W@ZNI 18, WA@DXY 9, WB@GMQ 5, WA@LOY 3.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, William J. Pace, W1ID — SEC: W1SY. STM: WB1AIU. NMs: WA1LOU K1EIR K1EIS WA1ELA WB1CPF.

Net	Freq.	Time/Days	Sess.	QNI	QTC
CN	3640	1900/2200 Dy	60	447	364
CPN	3965	1900 M-S			
		1000 Su			
RASON	13/73	2100 MWF Su			
NUTMEG	28/88	2130 Dy			
WESCON	78/18	2030 Dy	30	483	52
NENN	3720	1815 Dy			

CN Hi QNI: W1WP, WB2PJU/1

The NENN has begun publishing a newsy little net newsletter. Glad to get it! The Shoreline Amateur Club reports their repeater W1BCG/rpt undergoing final testing at club hq. KA1OB the FRI-CITY group tells us they are looking at the purchase of club windbreakers. WB1FZX addressed the CARA group as EC for the No. Fairfield County. FARA members were active traffic handlers during Hurricane David. Their news letter does a great job in covering all facets of ham interest. Notable is the DX column which announces some real goodies. W1VH active with his OO duties. N1GL of SARA (Stamford) wins Hi USA score in Bermuda contest with round trip to VP9 as prize! WB1CPF has new home-brew 2-meter beam at 50 feet! W1NJM has begun sending hi-speed code practice for the speed demons. K1JD will take over during winter when W1NJM will be in Florida. W1VS busy with winterizing antennas! New traffic buff W1CE has moved into area from Boston and should be big aid in local traffic circles. Credit must be given to WA4VCW who organized and guided the tornado effort in the Windsor/Windsor Locks area. With the aid of the 19/79 repeater crowd, this group was able to provide superb back-up communications that was not available from any other source. Done in the true spirit of ham tradition. The SARA (Southington) under the leadership of WB1AFH and WA1TQO set up a message center at the recent Southington Apple Festival. Excellent public exposure was made with about 50 messages handled thru the club station W1ECV. Shades of radio past!! There is an active Sunday group in the Southington area which runs a regular net on two-meter am of all things. W1GVT K1TQV W1FPM and W1DJC report great fun on 145.4 using mostly Goonev boxes! After many years of no club activity, the Waterbury group is discussing forming Waterbury Radio Club #4. Spark plugged by WA1LOU and N1CC. The club should be of much interest in this area where the ham population has increased tremendously in the last couple of years. Hopefully by the time this appears the club will be a reality! A new repeater group is being formed by a local group of Waterbury area hams. This organization, to be known as the Amateur Radio Educational Assn. will operate a sophisticated repeater in a Prospect location and will be micro-computer controlled with equipment designed and built by KA1DJ. Traffic: (Sept) WB1CPF 303, WB2PJU 139, W1WP 113, K1GF 119, K1XA 110, W1NJM 85, W1DFT 80, W1BDN 50, K1DM 47, WB1ESJ 36, K8AXL/BS 34, KA1CMX 29, WA1UUA 24, K1CE 23, WA1LOU 19, WB1FZX 16, WB1GIR 13, W1KV 10, W1JTD 9, W1CUH 4. (Aug) W1WP 122.

EASTERN MASSACHUSETTS: SCM: Rick Beebe, K1PAD — SEC: WA1BLG. STM: WA1TBY. EC reports received from W1BB K1FMM W1ZMO K1NLQ K1PJ W1IPZ N1NA WA1KZT W1EC W1UO N1RR W1PJ W1LE W1XA WA2GFZ WB1EZT W1BK W1IYD. OO reports rcvd from K1FB W1NF W1WLW WA1NAE W1EGE K1TBS. OVS reports received from W1JR W1GXT.

Net	Freq.	Time/Dy	QNI	QTC
EMRI	3.66	19/2300 Dy	554	379
EMRIPN	3.898	1730 Dy	423	232
EMRISS	3.715	1915 Dy	104	56
HHTN	04/64	2230 Dy	709	237
NEEPN	3.945	0830 Sn	64	13
EM2MN	90/30	2000 MWF	138	22
FM2MN	145.8	2000 TTh		

The New England Division Convention in Hartford was attended by many East Mass hams and the East Mass Public Service Award went to WB1EZT. Whitman Club has a really sharp group of CAP cadets in their Novice class. Chelmsford past president WA9NEW organized very successful Over the Horizon Radar presentation at the NE Div Convention. Massasoit Club had a talk on the Radio Shack Computer. Middlesex Club had W1RGH give a talk on the communications activities of the National Guard Capeway ARC preparing for their 1000 consecutive on the air meeting. Certificates will be issued. It will take place near the end of Jan. Contact W1IPB for details. Mitre Bedford Club had a talk on Frequency Adaptive Antenna Arrays for rejecting interferring signals. Framingham club has lost one of its founders and past president (33-34) in W1QP who became a Silent Key. The Great Ionospheric Hole Experiment went off as scheduled with W1JR helping with coordination. He is still having lots of trouble with his neighbor/antenna situation. W1LE WA1NAN W1GUE and WB1GJM worked on parade coordination in New Bedford. WB7FPY attending Tufts Dental School from Phoenix and active on HHTN. ARRL has set up a Long Range Planning Committee and is looking for our inputs. Send your comments to W4KFC. W1XA active in two marathons (just communication, no running). Rumor has it that there is a "Super" repeater under construction in Norwell. W1GXT reports an excellent aurora on Aug 29, but early in the

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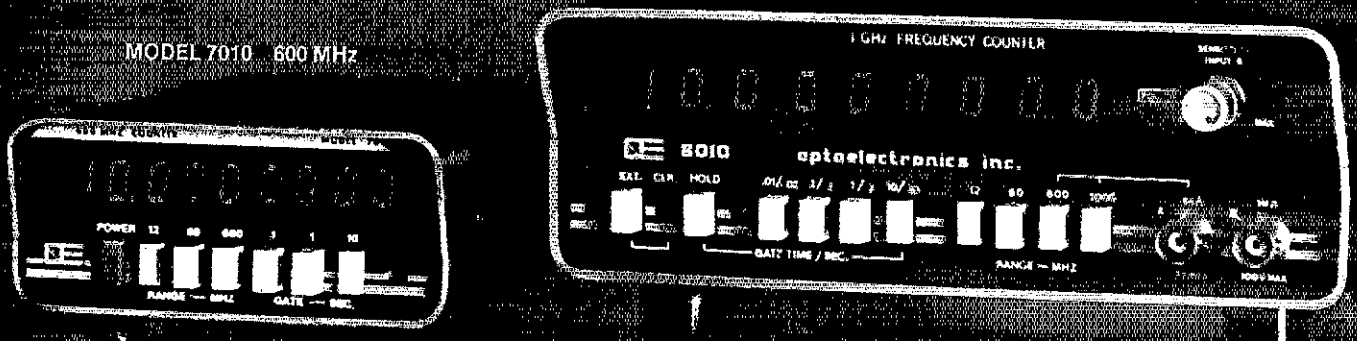

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7010 *7010.1	145.00 225.00	600 MHz	9	5-20 mV	10-30 mV	20-40 mV to 600 MHz	1-10 mV	[3] .1, 1, 10 SEC	.1Hz	1 Hz	10 Hz 600 MHz	1 PPM 0.1 PPM	10 MHz	YES OPTION $26.	YES OPTION $15.
8010 *8010.1	325.00 405.00	1 GHz	9	1-10 mV	5-20 mV	10-25 mV	1-10 mV	[8] .01-20 SEC	.1 Hz	1 Hz	10 Hz 1 GHz	1 PPM 0.1 PPM	10 MHz	YES STD	YES OPTION $39.

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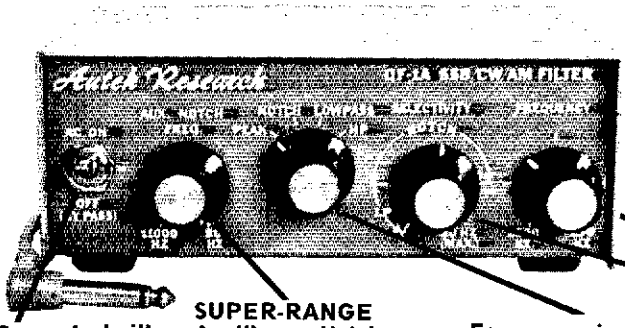

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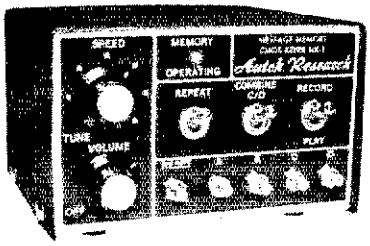

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day, so activity low. KH6JNQ reports that the New England Teleprint Net needs checkins from NH, West MA and of course VT. Tell your friends in these sections. K1PJ has installed a new Station Master at WR1AKE 825/225, try it! WA1QQV and WB1GWS active from Area 1 c.d. HQ during Hurricane David per request of c.d. Director, W1NF still in contact with W1MZ/mm in the Pacific. Traffic: (Sept) KA1CC 309, WA1TBY 308, K1GN 267, WA1VAB 256, K1BA 218, WA1ZAZ 212, K1BSD 111, WB1EMU 100, WA1LPM 94, KH6JNQ 90, WA1YWK 85, W1CZB 75, W1DMS 71, W1PEX 56, W1DMH 49, KA1BMJ 46, WB1DXR 46, W87TPY 41, W1FJI 40, N1CW 39, W1HL 39, WB1ANT 32, WB1ABM 25, KA1AHD 25, WA1QQV 25, WB1EZT 15, K1BZD 11, W1AEC 10, WB1ELU 10, WA1FNM 10, W1MJ 9, WA3TMR 9, WA1IFE 8, W1ALP 6, K1PJ 6, W1EGE 5, WB1GEX 5, K1LCQ 3, W1NF 3, WA1VMU 2, N1EE 1. (Aug) K1LCQ 25, WB1GEX 24.

MAINE: SCM, Ed Bristow, WA1MUX — WA1YUW resigned as SEC, leaving section. Tnx for fine job & good wishes. EAWA CW Net meets Mon. 6:30 P.M. 3.710 MHz. Hosstraders is back Sun. 4-6 P.M. 3.940 MHz. SARA program in Sept demonstrated construction of a printed circuit board. PSHR: WB1BYR W1RWG AF1L. SessIONS: QTC: SGN 25/1066/118; PTN 30/213/79; AEN 4/17/1; SPSN 7/38/5. SARA to have First Aid & CPR training, eveing Search & Rescue team, homebrew contest underway. Many, many more handled traffic. Your reports would be appreciated & make the record much more accurate. Traffic: (Sept) W1ISO 101, W1RWG 81, W1KX 73, WA1JZP 59, WB1GLH 53, WB1BYR 45, W1HDC 39, N5YX 29, W1GTR 28, AF1L 26, N1RP 25, K1GUP 22, W1AHM 21, WA1MUX 18, KA1EO 8, WA1YNZ 6, W1BMX 5, KA1DDJ 4. (Aug) W1ISO 116, W1HDC 62.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH/W1SWX — SEC: K1RSC. NMs: N1NH W1TN. The Interstate Repeater Society will hold its Hamfest & Auction Mar. 8, 1980. "Long Wire" will be the Port City ARC Newsletter. W1DBM gave talk on antennas at the Concord Brasspounders. OZ5VM is attending Hawthorne College. Seen on the Hyways & Byways: WA7PPP N1CB WA1YDI K1IGU & K1HDO. W1CUE is chmn of service to military families for Concord Red Cross. K1EEH is moving to Florida & K1KCD to Arizona. W1TN now CP 35. Granite State FM Net certificates to WA1PEL & K1ACL. The Keene Machine is on .975/.375. WA1NXS W1WS WA6NJS KA1CPS W1RCJ W1ZUN WB1AOU K1BH & WB1EHV dined at Pier II. WA1JSD, now XE3BR, reminds his NH friends he has not shoveled snow for 3 years. During FD, K1LIO signaled with lights to Port City Club W1WOM from CG ship in harbor. 6th annual Mt. Sunapee bike race communications provided by N1CB WA1WEY K1OJH AB1O WB1GXM WA1ZJX WB1DKX W1TPS W1RNZ & W1YT. No, N1CB did not ride a bike. It is sad to record the passing of WA1WGH. Operating from UNH is WA1YAZ. Bikini watcher K1BCS vacationed in York, ME. Very best Season's Greetings to all. Traffic: K1BCS 646, W1GUX 246, K1UQX 38, K1ACL 25, WA1PEL 8, W1BYS 3, WA1WEY 2, N1CB 1.

RHODE ISLAND: SCM, J. Titterington, W1EOF — SEC: K1DT. STM: N1RI. Al1F, ex-WA2LIK, a new resident of our state. N1DM busy with planning for AMSAT Phase IIIA scientific channel. New officers at Fidelity ARC: WB1DFA, pres.; AA1T, vice pres.; AD1P, secy/treas. Winners RI QSO Party State Champ, WA1TAQ with KA1BBY 2nd & W1GL 3rd. KA1DKL top Novice and WB1AFQ top Tech. WA1CSO takes vhf award and W1OP wins club award. An energetic, dedicated, but small group worked hard on SET weekend. WA1WKK asst. mgr., reports RIEM 2-mtr Net Totals-sessions 21, QNI 242, tfc 55. A new club is being put together in Coventry. Good luck to them. And to all of you OMs, YLs and your families, the happiest holidays ever. Let's make 1980 big! Traffic: W1EOF 44, N1RI 43, N1DM 12, AE1S 4, WA1VTZ 4.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. VT SSB Net reports new NCS: WA1QQV and KA1FJ. WBØRSD/1 has headed for CA. Bet quite a few others would like to join him! With the Oct wx bringing a few chills, more activity has been noted on the nets. I hope this will also get more news to me for this column. It has been a long dry summer for news. GMN 25/449/45; Carrier 25/411/42; VT SSB 22/410/67; VT RFD 5/90/27; VTPN 5/69/8. W1BLC in Kerbs Memorial Hosp, St. Albans, recovering from two serious operations. Info for this report MUST be in by the 5th of the month - mine goes out the 7th or 8th at very latest. Traffic: K1BQB 139, W1RNA 14.

WESTERN MASSACHUSETTS: SCM, Bill Lowe, W1TM — SEC: WA1DNB. STM: W1KK. NM: W1UD and WA1MJE. Our new SCM in Jan. 1980 will be Art Zavarella, W1KK. Considerable public service activity in Sept. Participating in the annual migratory hawk watch: WA1ABL W1BKG K1DH W1KZS WA1RFA WA1YJN. The annual Josh Billings event communicators were: WB1CSL WA1GOE W1KZS W1UZB W1YBT. Monitoring beacons in Puerto Rico during the Ionospheric Hole Experiment: K1AU W1DWA W1GG WB1HIZ K1IJV K1NM W1OA W1TM W1UKR WA1YNJ W1ZT. Met many WMass amateurs at the NE convention in Hartford. Traffic: (Sept) WA1MJE 502, W1TM 193, WB1CGK 110, W1KK 58, WB1AUV 53, WA1OPN 32, W1BVR 18, W1DOY 10, W1ZPB 9, W1ETH 8, K1BE 7, N1YY 7. (Aug) K1SSH 240, W1UD 272, K1JHC 82, WB1HIH 6.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — It is reported that KL7DR, ex KL7AH and KL7MZ have had heart attacks. We wish you all to have a speedy recovery. The Anchorage Amateur Club had its annual Flea Market with the usual success. The Eilsen Club reports that they are planning some interesting programs for their club meetings this winter. The Kodiak Club held their annual elections, I did not receive the slate of officers elected. Stations in this section handle QTC direct to the Hurricane Frederick area. The Alaska Snipers Net held 30 sessions with 685 ck ins and 81 QTC. The Alaska Pacific Net held 20 sessions with 970 ck ins and 145 QTC. There will be a TCA representative meet The Snipers Net and The Alaska Bush Net next month to handle QTC to the lower 48 on the higher freqs. Traffic: KL7P 260, KL7USA 82.

IDAHO: SCM, Lem Allen, W7JMH — Kootenai Club Members report the annual picnic and Bunny Hunt activity at the fair, participating in WIMU and Tacoma Hamfests. A real live-wire outfit. KARS!! WA7HPB KA7DDO W7GNU put new repeater on 146.37/97 in service, congrats, fellows. Also kudos go to N7AMT, new General and KA7DIS, new Tech. KA7AGR moved to Sequim, WA. WB7RNW/4 has new house in Moon Lake, FL. Early reports on the Oct SET show a decline in participation, due in part to hunting season opening on the

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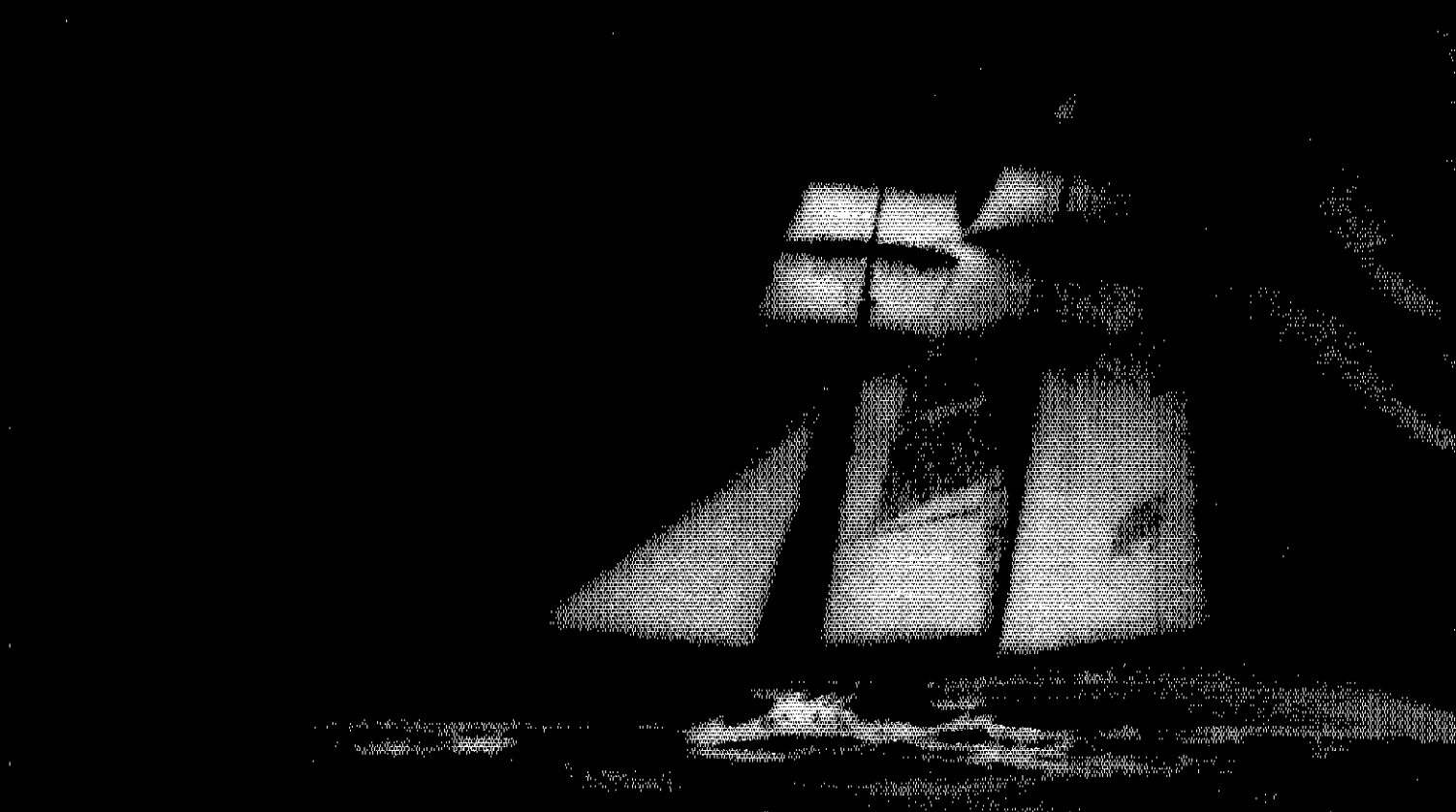

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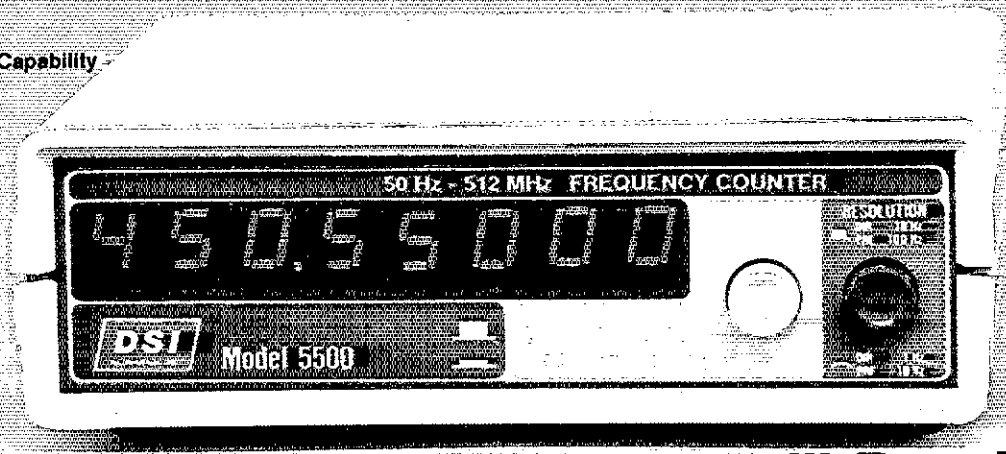

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same weekend in many places in ID. The repeaters are handling quite a bit of traffic for Hams who are out hunting. W7JMH now has Triton IV. K7QD has new 160m home brew transverter. Net reports

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935 SSB	8 P Dy	29	1104	21
CD	3990 SSB	8:10 A M-F	20	570	6
IMN	3635 CW	9 P M-F	20	179	38
Mt. Harrison	146.40/00	9 P W	4	87	5
Mini Cassia	146.94/94	8 P Su	4	10	1
Treas Val	145.44/44	9 P Su	5	189	5

The Harrison 146.40/00 repeater was alerted 9 P.M. Sept. 17 by Twin Falls search and rescue to furnish coverage in South Twin Falls county and aid the search for a lost boy. W7QZU and other amateurs helped in the search. The boy was found safe about 4 A.M. Traffic: W7GHT 262, W7JMH 51, N7APC 8.

MONTANA: SCM, Robert Leo, W7LR — Gallatin county hams in SET visited Civil Defense, Red Cross, Hospital & Sheriff to discuss and demonstrate emergency communications. Then to a W7LR pasture for an SET "Field Day" on 75 meters with emergency antenna and generator. FB. Organized by EC WB7AZJ. Glendive hams sent FB newsletter #1. Their msg: "Glendive 16-76 repeater on the air - everyone welcome." They are running a club logo contest. FB Gt Falls newsletter. Ideas from microprocessors to crystal sets (from 1931). They have Novice age 11, & General age 12 (KA7EWH & KA7EYF). W7TYN plans SEC newsletter, & has Anaconda 19/79 rptr on the air. WB7FBW issues 6 page Gallatin newsletter. N7IAK issued awards to GHRC members at Oct 4th mtg. Next FCC field exams in Billings Dec 4-6. Apply before 23 Nov. W7DB sends OBS bulletins. IMN Sept ATC 38, QNI 179. WB7UTJ reports Glendive/Sidney news, 2-mtr nets. W7IXD reports 2-mtr activity. W7IDK Havre news: 04/64 on; 19/79 on at Landusky; W7ETP new ham in Havre; KA7FFI new Novice. Traffic: (Sept) W7IXD 48, W7DB 10. (Aug) W7TGU 278.

OREGON: SCM, Dale T Justice, K7WWR — Section Nets

Net	Time(Z)/Days	Freq.	QNI	QTC	Sess.	Mgr.
AREST	0115Z Dy	3993.5				W7HLF
BSN	0145Z Dy	3908 506		26	30	WB7P-QU
JCARES		147.06	108	10	8	W7VSE
OSN	0245Z Dy	3585 106		62	30	WB7OFI
PdxAARES	0330Z Dy	147.32	542	30	27	K7WWR
WCN	0300Z Dy	3702 300		89	30	K7ZIG
1676	0300Z Dy	146.76	762	129	30	K7KVV

Western Oregon ARA is running Novice classes in North Bend. There are several classes in the Portland area Novice thru Advanced. A downtown Portland Street Fair was aided by many area amateurs for a three day event, including an unscheduled event by a supposed sniper in a hotel. The communications helped with lost and misplaced persons as well as routine items. N7AEC has his tower back up just in time for winter. Traffic: (Sept) W7VSE 610, WA7IHS 262, W7MW 92, W7LNE 30, K7WWR 28, W7LT 26, K7QPW 23, W7DAN 15, W7IWN 12, WB7OIJ 9. (Aug) W7DAN 17.

WASHINGTON: SCM, Bob Klepper, W7IEU —

Net	Time	Freq.	QNI	QTC	Sess.	Mgr.
NTN	1930Z	3970	1429	60	30	W7PFD
WARTS	0200	3970	3071	187	30	W7EQY
NWSSBN	0230	3945	643	36	30	K7AJT
WSN	0245/0545	3590	392	163	30	K7GXZ
MPRTN	0130/0615	146.92	37	23	14	W7IEU

The appointee monthly report card has been discontinued. All reports to me can be in message form and I'll be on the nets for your traffic. W7INJ and W7VOG are now Silent Keys. WA7BDD received a Public Service Award for participation in Skylab re-entry. WB7QWC worked with DES as RO during recent rail car derailment in Everett. Many thanks to other amateurs who stood by in case they would have been needed. Spokane Dial Twisters working on 1980 FD already. Have a new location and new generator. W7PBX gave interesting talk to North Seattle ARC on antennas and QRP operating. WB7BFM is now AJ7N. Mt Baker ARC happy with results of FD operation and activities. Very good article in Whatcom County S&R News about the part amateurs play in searches. Mt Baker ARC and members mentioned. W7BCS now trying out 2-meter mobile on the repeaters. Lots of good ideas brought out at the EC meeting in Tacoma. I wish more of you could have been there and so does your SEC, WA7RWK. Nice to see many of you at the Walla Walla Hamfest, nice turn out and very good weather to visit. RASC members, KB6AL WB7SWW and WB7SWU set up a station in the Mt Vernon Mall during Washington State Amateur Radio Week. More than 70 people and 2 amateurs looked at the display during the one afternoon showing. WB7POR and WB7POS are new editors of Mount Baker ARC Groundwave. The Mt Pilchuck Repeater Traffic Net (MPRTN) got off to a good start the last week of September. Anyone within hearing range is encouraged to originate traffic to be handled in or out of state. Wishing you all a Merry Christmas and a Happy New Year. Traffic: W7DZX 618, KL7JEB 285, K7GXZ 117, N7AJ 100, W7FJZ 100, WA7YCM 66, WB7WOW 58, W7IEU 55, W7LUP 54, WA7BDD 52, KA7FSP 52, W7BUN 51, W7EBU 32, W7KZ 23, N7AFZ 21, WA7PHD 20, W7LG 19, N7AFY 15, W7ZEV 14, W7APS 11, WB7CFH 10, K7FR 8, W7BCS 4, WA7EDQ 4, W7ERH 3.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: K6UWR W6ZF VE2AQV/W6. SEC: K6UWR. PSHR for SEPT: W6OA W6JXK. W6OA now has a 65 ft tower with a TA33 and a 2-meter beam. WD6BMX on OSCAR modes A, B and J, and says orbit times interfere with NCN! N6OP and K6ARE active section OOs. EBARC meeting monthly at Richmond Salvation Army Center and getting ready for antenna raising party. N6XP, first licensed in 1922, now back on air. NCCC pres WA6VEF has been traveling to clubs in EB and SCV presenting a slide show on contesting. MDARC's incredible club monthly "The Carrier" featured seven pages of pictures of members and guests enjoying themselves at their August picnic and regular club meeting. SBARA also had a picnic and hosted W6KG and W6QL of Yasme fame at their regular club meeting. SBARA congratulated WA6QBJ, and his wife on their 50th wedding anniversary. Their member, WB6KQU, now home from the hospital and on the mend. Best wishes. Traffic: W6JXK 253, W6OA 131, WB6UZX 33, N6RO 4.

PACIFIC: SCM, Pat Corrigan, KH6DD — STM: WØKON. SEC: KH6CKJ. PTN Net Mgr: KH6ST. SET was the best ever in this section. Congrats to all involved. Kauai ARC busy providing comms for various community activities. Good PR. HARC will host annual Christmas dinner Dec. 10. Big Island (Hawaii) has 40m cw net on 7125 on Wed.

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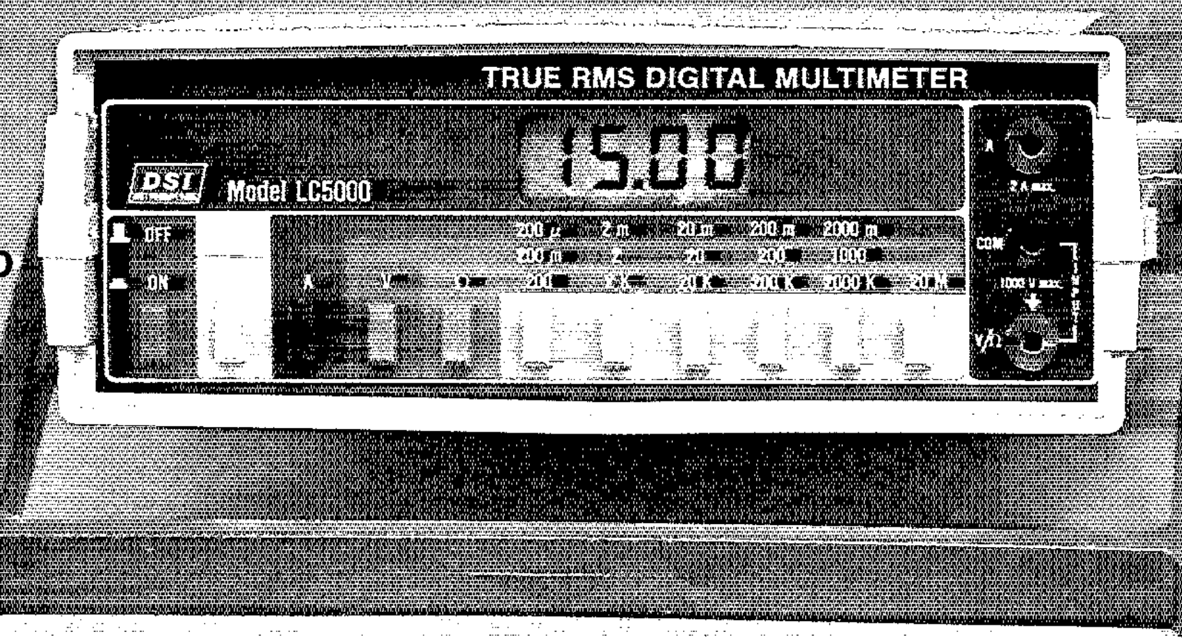

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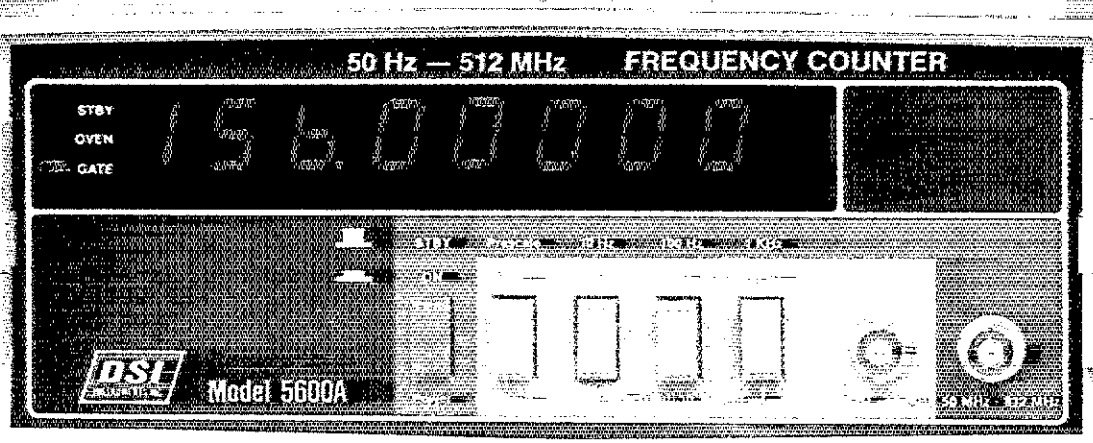

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Model	Price	Frequency Range Typ	Accuracy Over Temperature	Sensitivity Typ @ 100Hz-25MHz	Sensitivity Typ @ 50-250MHz	Sensitivity Typ @ 250-450MHz	Number of Readouts	Power Requirements	Size H W D
5600A-K	$149.95	50Hz-550MHz	Proportional Oven .2 PPM 10°-40°C	5-10MV	5-10MV	5-50MV	9	*115 VAC or 8.2-14.5 VDC	3¼" x 9½" x 9"
5600A-W	$179.95								
5500 Wired	99.95	50Hz-550MHz	TCXO 1 PPM 17°-40°C	10-15MV	10-15MV	15-50MV	8	*115 VAC or 8.2-14.5 VDC	1⅛" x 5" x 5⅛"
500HH Wired	$149.95	50Hz-550MHz	TCXO 1 PPM 17°-40°C	25MV	20MV	75MV	8	*115 VAC or 8.2-14.5 VDC or NICAD PAK	1" x 3½" x 5¾"

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AM56 Audio Multiplier .001Hz Resolution **34.95**
PA56 25dB Preamplifier with Attenuator **59.95**

nites at 6:30 P.M. local, KH6ILR planning quarterly emergency exercises for ARES members in Honolulu. KH6JHW had hands full net controlling during Typhoon at Guam at the beginning of Oct. Former SCM N7HR now active as KA2HR and has been heard on Pac. Interisland Net. Had nice letter from him who QSP's 73 to all. Traffic: (Sept) KH6H 14, KH6JJP 10, KH6B 8, KH6HIJ 6. (Aug) KH6H 8.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: W6NJU. New officers for the RAMS are: WA6UAF, pres.; WB6KJA, vice pres.; WA6PHF, secy.; W6RTK, treas.; W6FRE W6QHP and WB6FBN, dirs. WB6GFJ gave a talk on Amateur Radio to a meeting of the N. Calif. OES and also spoke to the Tahoe ARA. OZ1BOD and OZ1BNZ were the guests of both WB6YUM in Woodland and KB6GX in Sacramento for a few weeks. New upgrades include: WA6TCL, WB6TCC and KB6OI Advanced and WA6TCK and KA6AUK General. The River City ARCS are having a Novice and Advanced class at the Easter Seal Center. The North Hills RC's repeater, K6IS/R, has a new permanent home in Orangevale. The Yuba-Sutter ARES is now affiliating with RACES. Traffic: W6SX 62, W6DEF 19, W6RSP 6.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: N6KM. WA6PYN has new TS-180S. W6HQ almost flawless in EMT. FWRA active in March of Dimes hike-a-thon. SFRC in Greenpeace skate-a-thon. N6BV and N6SF hope to furnish communications for marathon swim between Cuba and Florida. HARC/FWRA picnic was a roaring success. SFRC first in its class nationwide on FD for second year in a row. W6BIP worked 211 countries during NCDXC cw marathon. N6SF bought his first new rig in 17 years. W6HLD is a Silent Key. W6BYS WB6GZT and K6SEX are conducting code and theory classes for SFRC. N6SF is new OTS. WA6ZHE active again on 2-meters. Traffic: (Sept) W6RNL 102, (Aug) WB6RTE 48.

SAN JOAQUIN VALLEY, SCM, Charles McConnel, W6DPD — SEC: WA6YAB. Asst SCMs: WA6YAK W6TRP WA6HIN. Congrats to the Stockton ARC, W6SF, for the highest FD Score among the ARRL affiliated clubs of the SJV. New officers of the QCWA Central Valley Chapter #99 are: W6UZ, pres.; W6BVM and W6MEL, vice pres.; W6BYH, secy., W6TRP, treas. AD6Q and WB6OPQ are Silent Keys. Delano Amateurs provided communications for the Delano Air Show. WB6PZW K6AYA N6OZ K6NLG and WD6AFC are ARRL Life Members. WA6QYR has a beacon on 2305 MHz in Ridgecrest. KA6GZJ and KA6FCZ are Novices. KA6GCA and KA6FRD are Techs. WA6WVG and KA6CZS are General. WA6LDJ and K6GLJ are Advanced. WD6GIY is KB6PB. WB6GIO is N6BWW. NCN for Sept: NCN 1 QNI 382, QTC 252. NCN-VHF QNI 1172, QTC 266. WA6YAB has a TR7625. WA6YAK has a Midland 13-513. WB6ITM has a TRS-80. KA6FRD has a Regency HRT-2. W6DPD has DXCC on phone. Start planning now for the 1980 Fresno Hamfest May 9-11, 1980 at the Sheraton Inn. I wish everyone a Merry Christmas and a Happy New Year. Traffic: (Sept) N6AWH 165, N6AMA 40, W6DPD 32, WA6YAB 20, WA6WDL 14, WA6JDB 9, WB6TTP 6. (Aug) WB6TTP 6, WB6WYA 4.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. Two SCV members received Certificate of Merit at Pac. Div. Convention; W6YBV for traffic and W6ASH for emergency communications CONGRATS to both for job well done! SCV was well represented at the Director's division meeting in Concord. W6ASH reports over 60 ops during SET in the SPECS Net. W6AUC rpts skeds with HI and AK, as well as busy on five nets. N6XI QRL with work, little time for on the air. W6ZRJ found time to check into NCN a few times. W6KZJ also busy on NCN. RFF visited CCRC meeting at Foothill College. SPARK nominating committee has a slate of 12 for upcoming election. New to the Mt. View area is WB9YTZ. Welcome. N6NF sent in an OO record for the past 4 months. PAARA auction was a huge success and ready for next year. W6DEF authored an article on Northern Calif Net in the PAARA-Graphs. WB6MLY active on ATV and has a source of converted uhf tuners. K6BDK organizing communications for Band Review in Santa Cruz. SCCARC thru WB6BWB took field trip to Teleprompter antenna site. K6MFV spoke before LERA ARC, topic was Antennas, the Law and Community. EC, W6WTU, is working with Sunnyvale Public Safety Dept. on the procedures and methods of coping with a major emergency. WB6KQU home from hospital. WA6QBJ and XYL celebrated 50th wedding anniversary. SBARA is planning a big Christmas Dinner. For info see WD6BZO or K4ROT. FARS guest speaker was K6GJ, it was "Accidental Scientific Discoveries." NCCC preparing for SS and ARRL DX test. New members of NCCC from SCV: WA6BZT N6ZB WB6ZYW W6OPO N6RY N6YV and K6SEM. Recent license up-grading were N6BPJ from Tech to Extra in one jump, N6DXO and N6AHH both to General. Congrats. Many new hams in SCV due to employment opportunities in the Silicon Valley. Let me hear from you. ATTN club program chairman: your SCM is available to speak to your club or organization. Traffic: W6YBV 217, W6AUC 93, W6RFF 47, W6KZJ 19, W6ZRJ 3.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — STM: N4UE. SEC: K4CJZ. Congrats to WD4PDU new Net Manager for the JFK Net; also to WD8NYN new Ass't NM for the Carolinas Morning Net. Shelby Hamfest well attended at their new location, fun time as always. W4ACY & WA4ZNA celebrating 50th wedding anniversary this month. Mecklenburg ARS operated exhibition station at annual Festival in the Park. Charlotte ARC provided communications for 7th Annual Bathtub Derby. New officers of Cary ARC include: WB4VVL, pres.; KO4T, vp; WD4MSQ, treas.; WD4CTA, secy.; WD4ODS, mailings. W4NAP RO of Rockingham Co. activated RACES unit to assist in providing communications for flood in Eden. WA4FSC reports much activity in VHF Contest in Sept. Novice classes underway in Cary (Cary ARC), Burlington(Alamance ARC) and Charlotte(Mecklenburg ARS). Azalea Coast ARC now has net nightly on 28.7 at 2100. The Barber Junction Repeater Assn commemorated the final days of operations of WR4AAA under the WR call by QSLing to those who worked the repeater while under manual control. WB4PLA is now the Chief Engineer for the 31/91 machine in Asheville. Everyone is encouraged to participate in their traffic nets during the Christmas season, see you on the air. Also remember the NC QSO Party Dec 1-3, see QST for details. Recent appointments include K4HZR(EC Columbus), & WD4CNR(EC Cherokee). WD4EPO gets BPL for second straight month, congrats. Traffic: (Sept) WD4EPO 268, WD4CNQ

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It's new! It's exciting! It's like nothing you ever read before. It's a fascinating report you can't afford to miss.

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There'll be other surprises too in Ham Radio HORIZONS for 1980 and you'll be in line for them also. New monthly columns, even a new look are among the plans we have in store for you. They all add up to a magazine you can't afford to miss.

Certainly these are features that you'll want to see — every month — fortunately we're prepared to see that you get every issue delivered right to your door. You'll get our big December 1979 issue absolutely free if you take a year (12 issue) subscription. This way you'll be first in line to receive all these exciting owners' reports as they are issued each month, plus all our other fabulous new features. No need to send any money now, we'll be glad to bill you after the first of the year.

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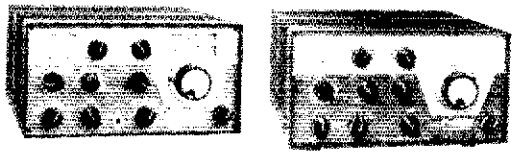

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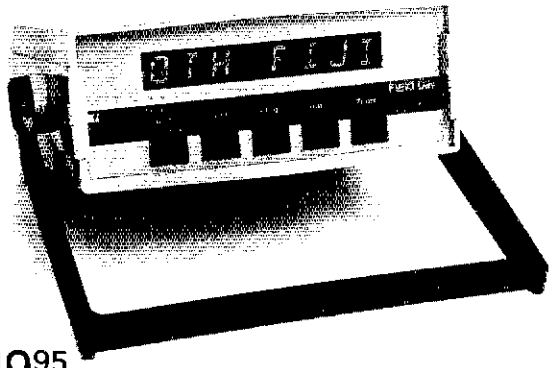

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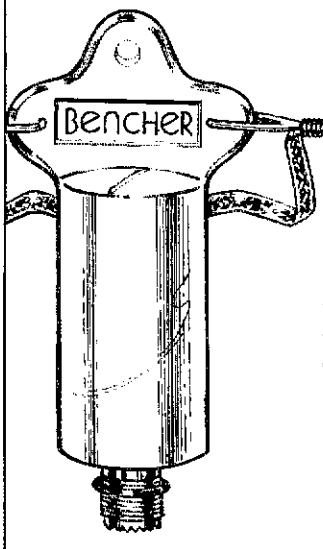

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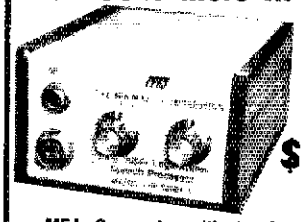

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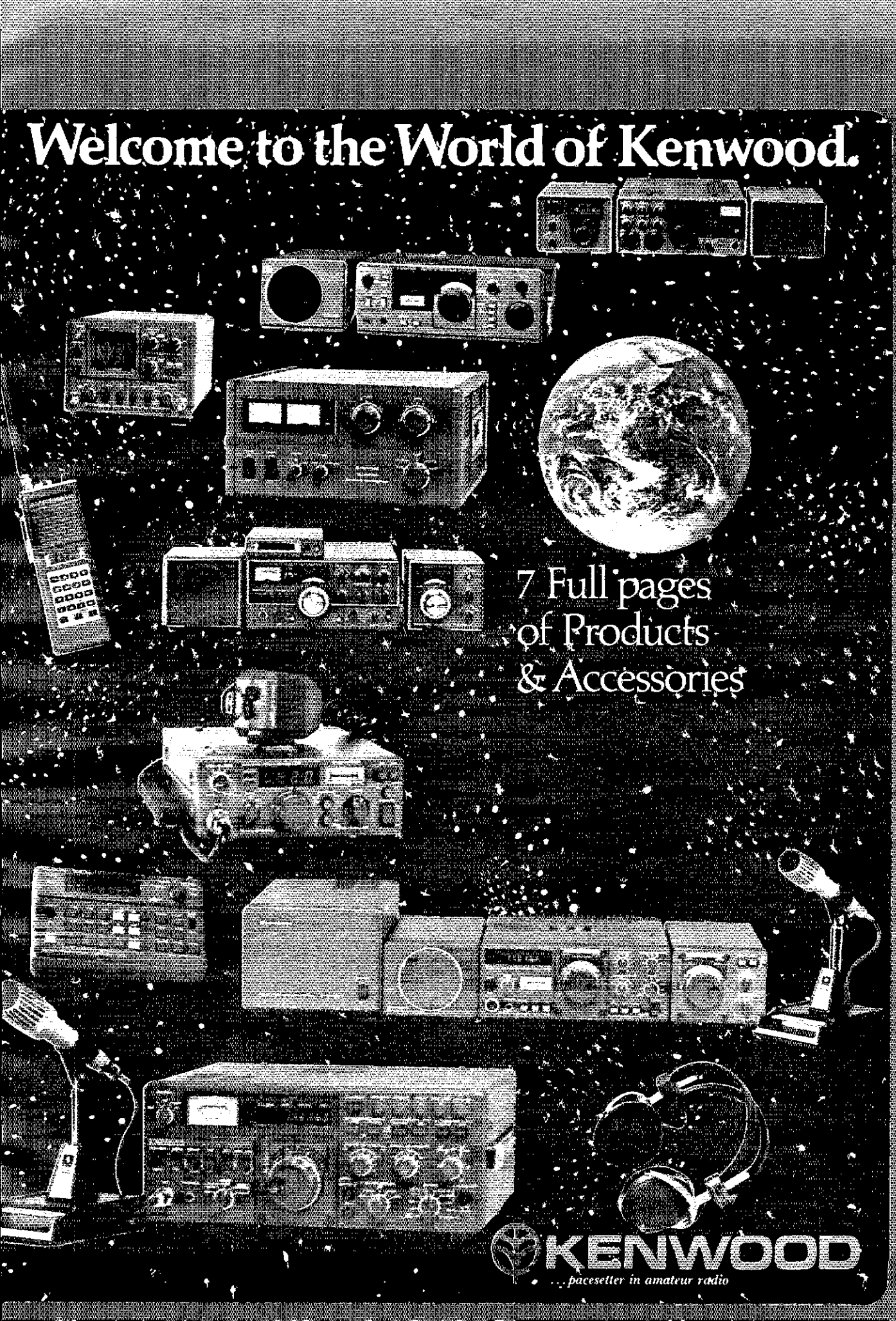

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TS-180S *with* DFC

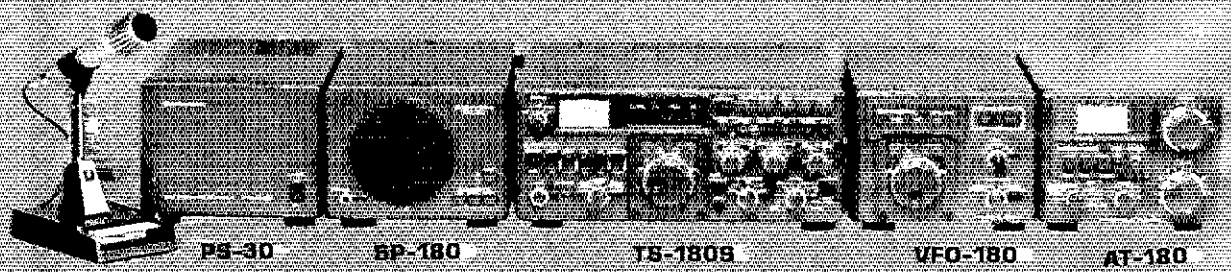
The TS-180S with DFC (Digital Frequency Control) is Kenwood's top-of-the-line all solid-state HF SSB/CW/FSK transceiver covering 160 through 10 meters, with outstanding performance and many advanced functions, including four tunable memories to provide more operating flexibility than any other rig!

TS-180S FEATURES:

- Digital Frequency Control (DFC), including four memories and digital up/down paddle-switch tuning. Memories are usable in transceiver or split modes, and can be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. (Also available without DFC.)
- All solid-state, 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters.
- Improved dynamic range, with improved circuit design and RF AGC ("RGC"), which activates as an automatic RF attenuator to prevent receiver overload.
- Adaptable to three new bands, and VFO covers more than 50 kHz and DFC 100 kHz above and below each band.
- Built-in microprocessor-controlled digital display. Shows actual frequency and switches to show the difference between the VFO and "M1" memory frequencies. Blinking decimal points indicate "out of band." (An analog monoscale dial is also included.)
- IF shift (passband dialing to eliminate QRM).
- Dual SSB filter system (second filter is optional) to provide very sharp receiver selectivity, improved S/N, and 30 dB compression with RF speech processor on transmit.
- Tunable noise blanker, to eliminate cross modulation from strong signals when noise blanker is on.
- Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).
- SSB normal/reverse switch (proper sideband is automatically selected with band switch).
- Dual RIT (VFO and memory/fix).
- Available without DFC. Digital frequency display still included, with differential function showing difference between VFO and "digital hold" frequencies.

OPTIONAL ACCESSORIES:

- DF-180 digital frequency control (for TS-180S without DFC)
- YK-88CW 500-Hz CW filter
- YK-88SSB second filter for dual-filter system



MC-50 PS-30 SP-180 TS-180S VFO-180 AT-180

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TS-120S

(MC-35S MIKE OPTIONAL)

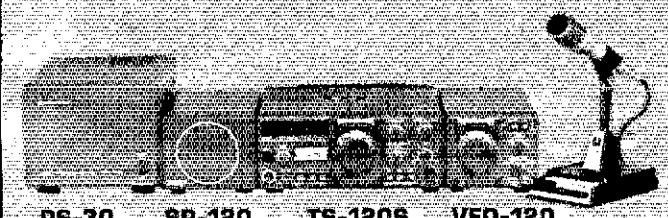
Truly a "big little rig," the TS-120S has created a new excitement in HF communications for highly versatile Amateur operation. The compact, all solid-state 80-10 meter transceiver, with up to 200 watts PEP input, requires no tuning and includes a large digital readout, making it ideal for mobile operation. IF shift and other important features make it a high-quality rig for the ham shack as well.

TS-120S FEATURES:

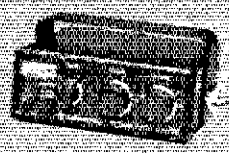
- All solid-state with wideband amplifier stages. No final dipping or loading, no transmit drive peaking, and no receive preselector tuning.
- Transceives on 80 through all of 10 meters, and receives WWV on 15 MHz.
- 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters. LSB, USB, and CW.
- Digital frequency display (standard) shows actual frequency. Backup analog subdial also included.
- IF shift (passband tuning) to eliminate QRM.
- Advanced PLL circuit, with improved stability and spurious characteristics on transmit and receive.
- Effective noise blanker.
- Built-in cooling fan, which activates automatically when final-amplifier heatsink temperature rises to 90° C.
- Protection circuit for final transistors.
- VOX.

OPTIONAL ACCESSORIES:

- YK-88CW 500-Hz filter.
- MB-100 mobile mount.



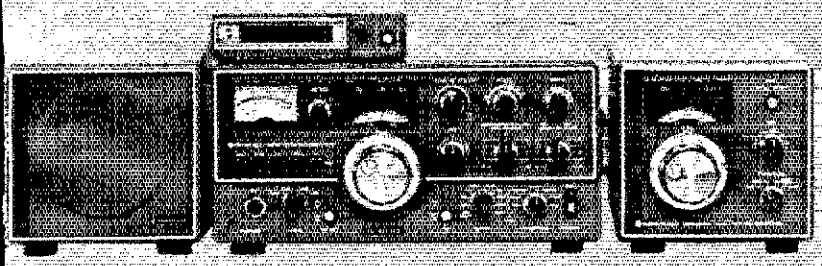
PS-30 SP-120 TS-120S VFO-120 MC-50



AT-120

AT-120 antenna tuner with mobile mounting bracket included. Features SWR meter and matches 50-ohm input to 20-300 ohms unbalanced output. Handles 150 watts (120 watts on 80 meters).

TS-520SE



SP-520 TS-520SE W/DG-5 VFO-520S

The TS-520SE is an economical version of the TS-520S, the world's most popular 160-10 meter Amateur transceiver. Now, any Amateur can afford a high-quality HF transceiver for his ham shack.

TS-520SE FEATURES:

- Covers 160-10 meters and receives WWV on 15 MHz.
- 200 W PEP input on SSB and 160 W DC on CW.
- CW WIDE/NARROW bandwidth switch, for use with the optional CW-520 500-Hz CW filter.
- Digital display with optional DG-5, showing actual frequency.
- Speech processor, effective in DX pileups.
- VOX and semi-break-in CW with sidetone.
- Built-in 25-kHz calibrator.

OPTIONAL ACCESSORIES:

- CW-520 500-Hz CW filter.
- AT-200 antenna tuner.

The TS-520S is still available, with DC (mobile) operating capability (with the optional DS-1A DC-DC converter) and transverter terminals, which were eliminated from the TS-520SE.

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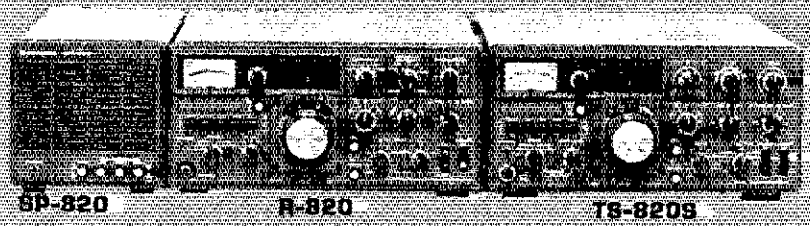
R-820/TS-820S



R-820

The R-820 is a highly sophisticated HF receiver for the Amateur who wants the highest quality with the most operating features. A combination of the R-820 and TS-820S provides the ultimate HF operating system.

R-820 FEATURES:

- Full transceive operation with TS-820S, providing full frequency control with either unit.
- Covers 160-10 meters, as well as WWV (15.0-15.5 MHz), and four shortwave broadcast bands (49, 31, 25, and 16 meters).
- Receives SSB, CW, AM, and RTTY modes.
- Double-tuned RF stages and improved dynamic range.
- IF shift (passband tuning).
- Variable bandwidth tuning (VBT).
- Very sharp, deep notch circuit in 50-kHz IF.
- Provisions for extra-sharp 455-kHz IF filters.
- Noise-blanker with variable threshold level.
- Digital frequency display, with backup analog dial.

OPTIONAL ACCESSORIES:

- YG-88C 500-Hz CW filter, for first IF.
- YG-88A 6-kHz AM filter, for first IF.
- YG-455C 500-Hz filter, for second IF.
- YG-455CN 250-Hz filter, for second IF.

TS-820S

The TS-820S is a very popular 160-10 meter SSB/CW/RTTY transceiver, preferred by DX operators and other particular Amateurs. It employs a single-conversion PLL circuit.

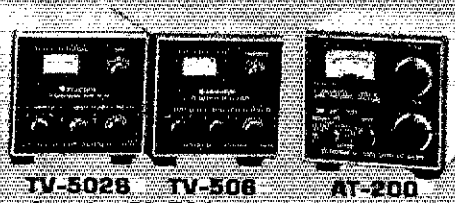
TS-820S FEATURES:

- 200 W PEP SSB/160 W DC CW/100 W DC FSK input on 160-10 meters.
- Digital frequency display, with backup monoscale analog dial.
- IF shift (receiver passband tuning) to eliminate interference.
- RF speech processor.
- Effective noise blanker.

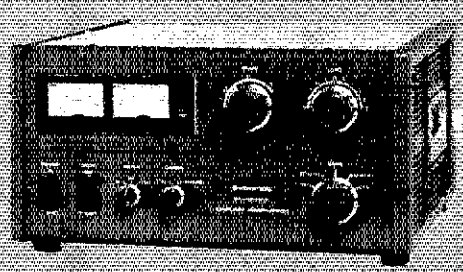
OPTIONAL ACCESSORIES:

- CW-820 (YG-88C) 500-Hz CW filter.
- DS-1A DC-DC converter.
- AT-200 antenna tuner.

ACCESSORIES FOR TS-820 AND TS-520 SERIES



AT-200 antenna tuner handles 200 W, 160-10 meters.
TV-502S 2-meter transverter covers 144-146 MHz. (Not intended for TS-520SE.)
TV-506 6-meter transverter covers 50-54 MHz. (Not intended for TS-520SE.)

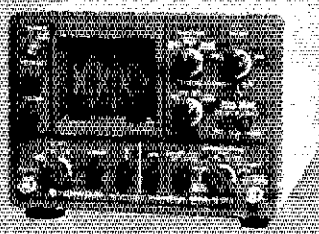


TL-922A

The TL-922A linear amplifier for all Kenwood HF equipment provides maximum legal power on the 160-15 meter Amateur bands, employing a pair of EIMAC 3-500Z high-performance transmitting tubes.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160-15 meters, with 80 W drive.
- Excellent IMD characteristics.
- Safety protection.
- Blower with automatic delay circuit.
- Variable threshold level type ALC.



SM-220

The SM-220 Station Monitor is capable of various monitoring functions, and performs as a wideband oscilloscope, and is expandable for pan-display operation.

SM-220 FEATURES:

- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- High-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Monitors received signals in IF stage.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

OPTIONAL ACCESSORIES:

- BS-8 pan-display module for TS-180S and TS-820 series.
- BS-5 pan-display module for TS-520 series.

KENWOOD ...for the discerning Amateur who demands quality.

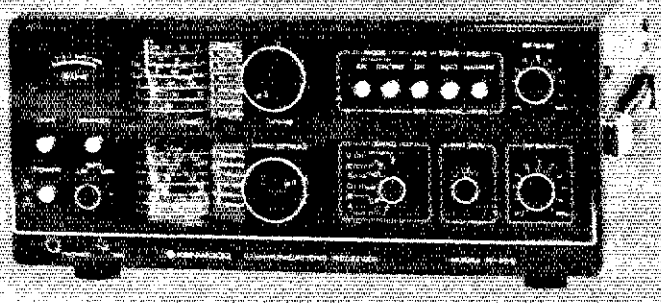
R-1000

SP-100 R-1000

The R-1000 is a highly advanced communications receiver. Up-conversion, PLL circuitry and other new technology provide optimum sensitivity, selectivity, and stability from 200 kHz to 30 MHz. Featuring easy-to-operate single-knob tuning and digital frequency display, it's perfect for listening to shortwave, medium-wave, and long-wave bands. Even SSB signals are received perfectly. Included is a quartz digital clock and timer.

R-1000 FEATURES:

- Continuous frequency coverage from 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display and illuminated analog dial.
- Quartz digital clock and ON/OFF timer.
- Multi-modes ... AM (wide and narrow), SSB (USB and LSB), and CW.
- Three IF filters ... 2.7 kHz for SSB and CW, 6.0 kHz for AM narrow, and 12 kHz for AM wide.
- Effective noise blanker.
- Built-in speaker.
- Three antenna terminals.
- RF step attenuator.
- Tone control.
- Recording terminal.
- Remote terminal, for access to timer relay ON/OFF circuit and muting circuit.
- SSB sensitivity of 0.5 μV from 2 to 30 MHz.
- More than 60 dB IF image ratio.
- More than 70 dB IF rejection.



R-300

The R-300 all-band communications receiver covers 170 kHz to 30 MHz in six bands. It's ideal for listening to foreign broadcasts and other exciting transmissions throughout a wide range of the radio spectrum.

R-300 FEATURES:

- Continuous frequency coverage from 170 kHz to 30 MHz, in six bands.
- Multi-modes ... AM, SSB, and CW.
- High sensitivity, selectivity, and image ratio.
- 500-kHz marker.
- Three-way power supply (AC/batteries/external DC), with automatic switching from AC to DC in the event of AC power failure.

KENWOOD ...for the discerning Amateur who demands quality.

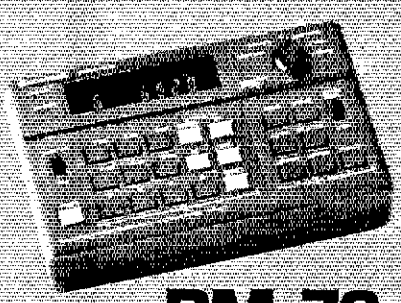
TR-7600

TR-7625

The TR-7600 and TR-7625 are Kenwood's popular synthesized 2-meter FM mobile transceivers. Combined with the RM-76 Microprocessor Control Unit, several memory and scanning capabilities are provided.

TR-7600/TR-7625 FEATURES:

- One memory channel.
- Mode switch for simplex or repeater operation. Repeater mode shifts the transmit frequency + 600 kHz or - 600 kHz or to the memory frequency.
- Full 5-kHz coverage from 144.000 to 147.995 MHz.
- Adaptable to any one MARS simplex or repeater channel between 143.7 and 148.3 (with modification kit).



RM-76

ADDED FEATURES WITH RM-76:

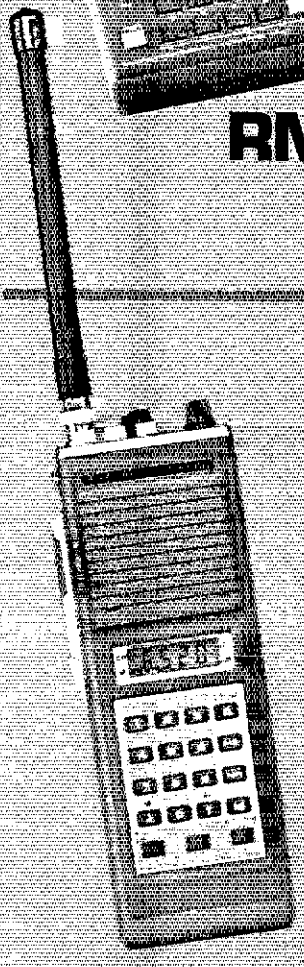
- Six memories.
- Automatic memory scan.
- Automatic scan up the band in 5-kHz steps, with selectable upper and lower frequency limits.
- Manual scan up or down the band in single or fast continuous 5-kHz steps.
- ± 1 MHz transmitter offset as well as ± 600 kHz and memory offset for repeater operation.
- MARS operation on 143.95 MHz simplex.
- Versatile digital display of transmit and receive frequencies, and operating functions.

KPS-7

The KPS-7 is a matching AC power supply for the TR-7600 and TR-7625. Output is 13.8 VDC at 7 A ICS (50% duty cycle).

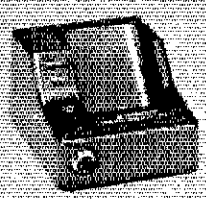
TR-2400

The TR-2400 synthesized 2-meter hand-held transceiver features a large LCD frequency readout, 10 memories, scanning, and much more.



TR-2400 FEATURES:

- Large, illuminated LCD digital frequency readout. Readable in direct sunlight, and a lamp switch makes it readable in the dark. Shows receive and transmit frequencies and memory channels, and indicates "ON AIR", memory recall, battery status, and lamp switch on.
- 10 memories, with battery backup.
- Automatic memory scan, for "busy" or "open" channels.
- Mode switch for simplex, ± 600 kHz transmit repeater offset, and memory-frequency ("M.O.") transmit repeater offset.
- REVERSE momentary switch.
- Built-in 16-button touch-tone generator.
- Keyboard selection of 5-kHz channels from 144.00 to 147.995 MHz.

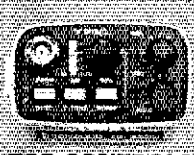


ST-1

- Up/down manual scan and repeater or simplex operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps.
- Two lock switches to prevent accidental frequency change and accidental transmission.
- Subtone switch (*subtone module not Kenwood supplied*).
- More than 1.5 W RF output.
- High-impact plastic case and zinc die-cast frame.
- BNC antenna connector.
- Standard accessories included with the TR-2400 are a flexible rubberized antenna with BNC connector, ni-cad battery pack, and AC charger.

OPTIONAL ACCESSORIES:

- Attractive leather case.
- Model ST-1 base stand, which provides 15-hour quick charge, trickle charge, and base-station operation with microphone connector and impedance-conversion circuit for using MC-30S microphone.
- Model BC-5 DC quick charger.



TOP CONTROLS

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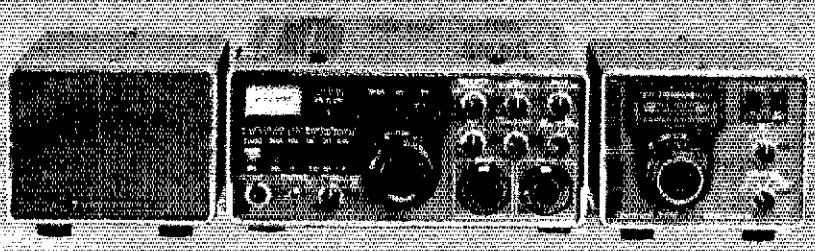
TS-700SP



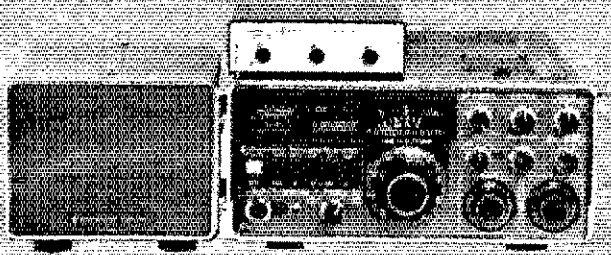
SP-70 TS-700SP VFO-700S

The TS-700SP is an all-mode (SSB, FM, CW, and AM) solid-state transceiver covering the entire 2-meter band, including repeater operation on all subbands. It's the perfect rig for the serious 2-meter Amateur.

TS-700SP FEATURES:

- All modes...SSB (USB and LSB), FM, CW, and AM.
- VFO tuning from 144 to 148 MHz in four bands.
- Seven-digit readout of receive frequency, with 100-Hz resolution. (Last digit can be eliminated automatically in the FM mode.)
- Simplex and repeater operation, including all repeater subbands. Switchable to REVERSE mode.
- Built-in receiver preamplifier.
- AC/DC capability, for fixed or mobile operation.
- 44 fixed channels with 11 crystals.
- Multifunction meter...S-meter on all receive modes, zero-center meter on FM receive, and RF transmit.
- High-low power switch (10 W/1 W).
- RIT for both VFO and fixed channels.
- Effective noise blanker.

TS-600



SP-70 TS-600 W/VOX-3

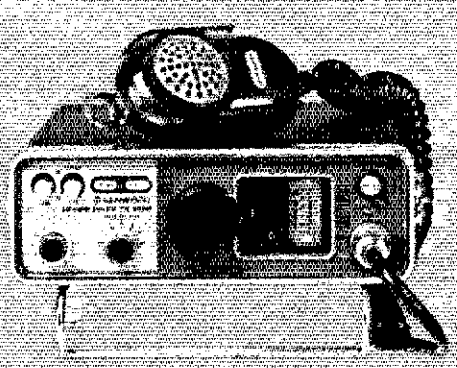
The TS-600 is an all-mode (SSB, FM, CW, and AM) solid-state transceiver covering the entire 6-meter band. It's the ideal transceiver to enjoy the many exciting propagation conditions on 6 meters.

TS-600 FEATURES:

- All modes...SSB (USB and LSB), FM, CW, and AM.
- VFO tuning from 50 to 54 MHz in four bands. Main dial graduated at 1-kHz intervals.
- AC/DC capability, for fixed or mobile operation.
- 20 fixed channels with five crystals.
- Effective noise blanker.
- 100-kHz marker.
- Multifunction meter...S-meter on all receive modes, zero-center meter on FM receive, and RF on transmit.
- RIT for both VFO and fixed channels.
- 20 W PEP input on SSB, 10 W output on CW and FM, 5 W output on AM.

OPTIONAL ACCESSORY:

- VOX-3, to provide VOX and semi-break-in CW operation.



TR-8300

The TR-8300 mobile FM transceiver operates in the 70-cm band, on 23 crystal-controlled channels (three supplied). Transmitter output is 10 watts, and a very sensitive and selective receiver is provided.

TR-8300 FEATURES:

- Covers 445.0-450.0 MHz (transmit) and 442.0-447.0 MHz (receive).
- 23 channels, three supplied (446.0 MHz simplex, 446.5 MHz simplex, and 449.10 MHz transmit/444.10 MHz receive).
- Five-section helical resonator and two-pole crystal filter in receiver IF, for improved intermodulation characteristics.
- Call channel switch, for user-desired function (such as subtone).
- High-low power switch (10 W/1 W).
- Monitor circuit, to allow listening to modulation while making frequency adjustments.

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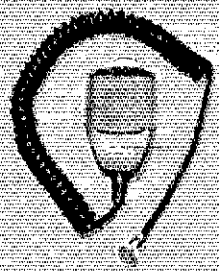
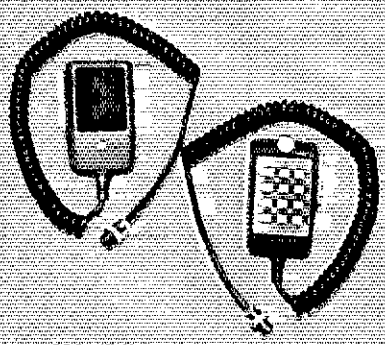
OPTIONAL ACCESSORIES

PC-1 phone patch.

MC-50 dynamic dual-impedance (50 kΩ/500Ω) desk microphone.



MC-30S (500Ω) dynamic noise-cancelling hand microphone. Also available, MC-35S (50 kΩ).

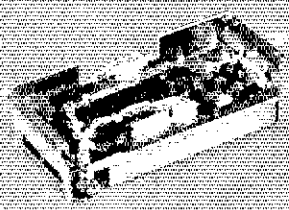


MC-45 Touch-Tone (with automatic transmit) microphone.

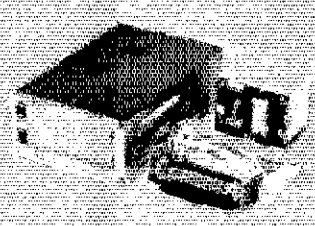
HS-5 deluxe 8Ω headphone set.

HS-4 8Ω headphone set.

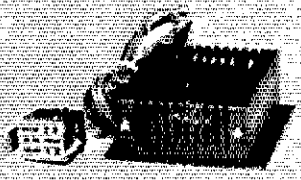
MB-10S mobile mount for TS-120S.



DF-180 digital frequency control for TS-180S without DFC.



DG-1A digital counter/display for TS-820.

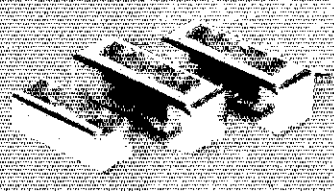


DS-1A DC-DC (mobile) converter for TS-820S/TS-520S (not for TS-520SE).

BS-8 (for TS-180S and TS-820S) and **BS-5** (for TS-520 series) SM-220 pan-display

YK-88CW 500-Hz CW filter for TS-180S/TS-120S and **YK-88SSB** IF SSB filter for TS-180S dual-filter system.

CW-820 (YG-88C) 500-Hz CW filter for TS-820S/R-820. **CW-520** 500-Hz CW filter for TS-520 series.



YG-88A 6-kHz AM filter, **YG-455C** 500-Hz CW filter and **YG-455CN** 250-Hz CW filter for R-820.

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Pro-mark KWM-380 is a complete base station in a smartly styled desktop configuration. The look is unmistakably professional.

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Microprocessor frequency control provides rate selectable tuning in 1 MHz, 1 kHz, 100 Hz or 10 Hz increments. Frequency memory provides split VFO function (half-duplex) for transmit and receiver registers.

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Specifications†

Frequency Range: Tunable in 10 Hz steps. **Receive mode** — 2.0 to 30.0 MHz, 0.5 to 2.0 MHz at reduced sensitivity. **Transmit mode** — SSB or CW 160- thru 10-meter amateur bands.

Mode: SSB (voice and RTTY, either sideband selectable), CW, or AM (receive only).

Power requirements: 105, 115, 125, 210, 220, 230, 240, 250, ±5% V ac (Internal strapping option) 50-60 Hz, 12 V to 15 V dc (Connector strapping). 120 W input in receive max. 600 W input in transmit max.

†Subject to change without notice.

Frequency accuracy: Accurate to within ±5 Hz when the 39.6 MHz oscillator and the 455.0 MHz oscillator are set within ± 3Hz. Warm-up time is 10 min.

Frequency stability: Stability is within ±150 Hz over the temperature range of 0-50°C.

TRANSMIT PERFORMANCE

Output impedance: 50 ohms nominal.

Power output: 100 W PEP nominal from 1.6-30 MHz. In CW or RTTY, there is automatic turndown to 50 W after 10 seconds, 50% duty cycle, key down 15 minutes max.

With the optional blower kit, power is 100 W average, 50% duty cycle, key down 1 hour max at 25°C, ½ hour max. at 50°C for all modes.

Unwanted signal suppression: (minimum values below)

Carrier suppression	50 dB
Undesired sideband, 1 kHz ref	55 dB
Harmonics (all)	40 dB
Mixer products	55 dB

Third order distortion: 25 dB below each tone of a two-tone test.

Audio inputs: Microphone — low impedance type. Internal strap for HI-Z. Line — 600 ohm input unbalanced impedance; level of 40 mV sufficient to produce full output.

Audio frequency response: Not more than ±3 dB variation from 300 to 2400 Hz.

RECEIVER PERFORMANCE

Antenna impedance: 50 ohms.

Sensitivity: Not more than 0.5 uV for 10 dB S+N/N at antenna input for SSB and CW, 2.0 to 30 MHz. Broadcast band attenuation is a nominal 30 dB.

I.F. and image rejection: Greater than 60 dB.

Selectivity: In operating modes of USB, LSB, CW and AM.

BW at −3 dB (min)	BW at −60 dB (max)
2.1 kHz	4.4 kHz
*1.7 kHz	3.4 kHz
*360 Hz	1.25 kHz
*140 Hz	600 Hz
*6.0 kHz	25 kHz
8 kHz	50 KHz

*optional

Audio output: Not less than 3½ W into 4 ohm load at 1 kHz, at not more than 10% total harmonic distortion. Line audio out-

Intermodulation distortion: Two equal signals spaced 20 kHz at a level of −30 dBm each will produce IMD down 30 dB min.

Size: 15.50" W (39.4 cm); 6.5" H (16.5 cm)* (w/o feet), 7.5" H (19.1 cm) (w/feet); 18.00" D (45.7 cm).

Weight: 50 lbs. (22.7 kg).

208, WB4WII 182, KB4IZ 154, W4EAT 148, AB4S 120, K4VHT 97, WD8NYN 86, WA4SRD 83, K4DHX 80, WB4VVL 73, WB4MXG 70, K4NLK 68, WD4CFZ 67, WA4WFY 62, W4PCN 59, N4UE 57, K4FTB 55, WA4IHG 53, AA4R 51, W4FMN 46, W4ACY 33, WD4FCH 29, WB4CES 27, KK4M 23, WA4CUD 21, W4HKB 17, WD4HYM 16, WA4UYS 16, WD4ABZ 14, N4BEX 12, WB4CYN 12, WD4NAO 12, WB4VQZ 8, WA4FSC 6. (Aug) WD8NYN 233, WB4VVL 72, W4HKB 30, AI4O 2.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst. SCM: WB4UDK. STM: W4ANK. SEC: WD4HBX. Congrats to all the members of the newly organized Union ARC, now an affiliated club. Many thanks to all who participated during Hurricane David & during the SET. Congrats to Spartanburg ARC for winning Field Day Champions Award. A successful hamfest at Rock Hill. Congrats to new Novices & up-grades: KA4JWC KA4JCQ KA4KXL KA4KXM KA4KXP KA4JNA WA4PUE KA4KXZ WD4EDP WD4EDN & WD4EDQ. New appointees as (DEC) District Emergency coordinator: WB4TNS K4VIA WD4DOM K4EAR WD4EDM N4BCD & WA4JYR. New appointees as (LEC) Local Emergency Coordinator: KB4CK WB4EMK & WD4OEK. Checkins/traffic Sept: SC SSBN 2292/293; Anderson 2-m Net 569/37; CMN 380/146; Lancaster Cty 2-m Net 216/22; Western SC Emergency Net 27/24; Long Mtn 2-m Net 22/14. Traffic: K4ZN 300, W4ANK 237, WD4AWN 182, K4EAR 167, W4NQL 92, W4FMZ 89, W4OCX 77, W4MTK 66, W4FVV 65, W4NTO 58, WA4SJS 55, N4BCD 49, WB4UDK 46, K4FRX 42, WB8TCT/4 35, K4VIA 32, WD4DOL 25, W4DAW 24, WD4HBX 24, KA4ASJ 20, WD4EDM 18, WA4VYS 17, AF4E 16, WB4JNE 16, WD4BUM 11, W4DRF 10, N4EE 9, WB4NBK 2, WD4FJP 1.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCM: Buddy Smith, W4YE. STM: W4SQO. SEC: N4NK. Chief OO: W4HU. Chief OVS: WA4PGI.

Net	kHz	Time-(PM)	Sess.	QTC	QNI	Mgr.
VNTN	3907	NOON	30	446	350	N4LE
VSBN	3947	6/10:15	58	722	1376	W4JK
VSN	3680	6:30	30	80	287	WA4YIU
VN	3680	7/10	60	389	721	WB4FLT

During Sept we had two floods in Virginia which proved the worth of our ARES organization. The State Office of Emergency and Energy Services (OEES) has sent a letter to all localities requesting them to cooperate fully with their ARES/RACES Emergency Coordinator. A special thanks to N4AZI for a superb job during the Sept. 21-22 flood. The Virginia Public Service Communications Foundation is now a reality. The board members are K4BKX, chmn.; W4JK, vice-chmn.; N4NK, secy-treas. Your tax deductable contributions can be sent to N4NK. Although the VPSCF is set up to assist in any legal problem with public service comm., we are presently engaged in the fight against the Quiet-Zone. The Foundation and its atty. have already met the Atty General Marshall Coleman who has promised to take action to alleviate restrictions and prevent the extension of the Q-Z to Amateur radio. W4UVA will be putting up their new 50 ft. tower. N4FM was active with the Winchester Apple Harvest Festival. K4DHB spent most of the month portable with his Argonaut. WA4EGW is making plans for the Waynesboro marathon. W4WWQ ran a phone patch for the Trans-America Balloon team. N5BA has moved back to Texas; we will all miss you. N3RC will be sailing through Oct. I am presently looking for OBSs to cover all of Virginia's repeaters. Traffic: (Sept) WB4PNY 854, KB4N 755, W4JK 701, N4NK 678, W3BBN 611, WA4LJI 607, K4BKX 541, W4SQO 371, WA4CCK 365, N4NK/4 338, K8LGA 314, W4OKN 292, WA4STO 291, K4KNP 206, WB4FLT 193, W4UQ 155, N4LE 154, KB4OG 134, W3BBQ 114, W4NWM 108, WA4YIU 97, WD4NEI 95, KF4R 95, K4JM 89, K4EJ 83, N4IF 80, AA4CK 73, N4FM 72, WB4KIT 64, WA4NTP 64, N4AZI 57, N4RF 55, N4BJX 52, K4GR 51, W4SHJ 51, K4AXF 50, W4UVA 46, WB4ODZ 43, KB4OF 43, WB4NEE 41, WD4EUV 37, W4CEU 33, WD4FTK 33, WD4RDF 32, KA4GIQ 29, WB4SHK 29, WA4WQG 28, WB4DQZ 26, WB4ZNB 26, K4DHB 24, WA4EGW 23, WB4FDT 22, WA4FDV 22, W4PRO 22, WB4RWY 22, K4VWK 21, KI4W 21, WB4ZWT 21, N9ASX 20, AB9I 20, WB4FNW 19, WA4ONR 19, N8YO 17, KA4ETG 16, WB4MAE 16, W4WWQ 16, WA4ISA 12, KØJH 12, WB4LAB 12, N4UY 12, WA4EOW 10, WA4YJF 10, W4YVG 8, WB4FWL 7, KB4OB 7, WB4UHC 7, KM4X 7, W4LXB 6, WD4RVO 6, W4DM 5, WA4QWC 5, K4ITV 4, N4OT 3, KJ4J 2, W4JUJ 2, WA4JUO 2, WD4KUK 2, W4KX 2, W4KXE 2, W4YE 2, K4BAV 1, N4BHI 1, N4DW 1, W4PXA 1. (Aug) W4SHJ 34, K4VWK 22, WD4RDF 16, W4WWQ 8.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — STM: WA8WPW. SEC: K8QEW. Net Managers: K8MHR WD8JYM WB8AKQ. SET 1979 was very successful with many groups around the state active. A very large and very successful drill was conducted by the Plateau ARA involving Fayette and Raleigh Co. hams. Communications through the 19/79 repeater were excellent, making ham radio really shine. K8CFT and WD8PCT, EC's for Fayette and Raleigh Co., were actively involved. WB8PHQ owned 13 different rigs during Sept. A record? No says WD8KKV. WA8WPW is active in Transcontinental Traffic Corp. KA8EPG is now a Silent Key. Merry Christmas to all.

Net	Freq	Time-Z	CK-In	Ttc.	Sess.
Hillbilly	14290	1700-Su	194	95	5
Novice	3730	2215-Dy			
Phone-MD	3990	1600-Dy	332	75	30
Phone	3990	2300-Dy	807	115	30
CW	3567	2300-Dy	157	55	30

Traffic: WB8AKQ 50, WA8WPW 47, K8MHR 37, N8AJC 36, WD8DHC 28, KA8ETV 27, WD8JYM 27, WD8RNR 27, WD8JYN 25, WD8LDY 22, W8HZA 20, WDRPQG 19, W8CKX 17, KA8Q 15, K8KT 14, WB8VAZ 14, W8YP 12, WD8JIK 9, K8QEW 8, WD8EAV 6, WA8LZE 5, WB8UDY 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, KØDJ — SEC: WØGOW. STM: WBØMCL. NM: ADØA WDØAIT KØCNV WØHE WØHXB WBØZQG. For those of you moving to a new address, a new ruling by FCC states that the new address should be submitted on form 610 and that a new five year term of license will be automatic. WDØDNM now working OSCAR. WØGW touring New Zealand, Australia and Fiji in Sept. Hope he brought hf gear to Fiji! STM WBØMCL reports Arapahoe Radio Net (ARN) now active Tuesday and Thursday 21.138 MHz at 8:00 local. Forty five net certificates issued by WØHE for Hi-Noon net. KØDJ had very successful fishing trip in WY and also had a good time with some of the local amateurs. WØWYX reporting increase in QRM on CARWN. This is the time of the year for longer skip on hf nets and proper measures should be taken to avoid as much QRM as possible. Net traffic: Columbine: 30 ses-

The following are excerpts from unsolicited letters and registration cards received from owners of the new TEN-TEC OMNI transceiver.

"I sold a Yaesu to buy this and am very impressed" —*WB5ULA*

"My first QSO with OMNI-A was LA1SV on CW and second was EA8SK on SSB." —*N2CC*

"Excellent rig, just as advertised." —*WB5TMD*

"Very pleased with performance. QSK feature very slick." —*WB0ELM*

"This is my 5th TEN-TEC transceiver in less than 2 years. I loved them all and still have 3." —*WB0VCA*

"Through the years I have had complete Drake and Collins stations. I tried a 544 Digital and liked it the best so decided to purchase the 546 OMNI-D Digital." —*WA4NFM*

"Your OMNI is the best rig I have had in 20 years of haming." —*K4IHI*

"As a owner of Collins rig, your OMNI-D is the best." —*K9JJL*

"I already have an OMNI-A, 544 and a TRITON IV. You may ask why I own so many TEN-TEC rigs. In case there is a great RF famine, I want to be ready!" —*WD4HCS*

"You guys really know how to turn on an old timer!" —*K8ELS*

"Best operating & most conveniences of any transceiver I've ever used." —*W6LZI*

"I like CW. Compared OMNI against IC701 (rcvr) and OMNI won hands down. XYL WD6GSB really enjoys rig on SSB. Finds rig is very stable and digital readout accurate." —*AC6B*

"Have checked it out on both modes from "top band" (160) all the way to 29 MHz. Terrific!!!!" —*W4DN*

"Works well, parts layout and design much better for any possible servicing than other ham gear. The Japanese hybrid sets can't compare to TEN-TEC for audio. Audio reports excellent without special speech processors, etc., to distort the signal." —*AG8K*

"I have been using the S-Line over 15 yrs and never thought anything could outperform it. I got the biggest surprise and THRILLED with this OMNI-D even though I have been a ham since 1936." —*KV4GD*

"This must be the greatest. I've spent enough money on final tubes to almost pay for this." —*KA4BIH*

"This transceiver was recommended to me by old time hams (Xtras) whom I have known for 40 yrs. Has excellent break-in." —*N6AVQ*

"Best package job I've ever seen! First licensed 6AAV in 1926. Now in operation—a sweetheart!" —*W7LUP*

"From a 32V2/SX115 to an OMNI is a big step!" —*K6YD*

"Receiver prominent—transmitter likewise—working comfortable—pleasing design." —*OE1FAA*

"First new rig for me in 10 years but seems to be very good." —*W5GBY*

"The best transceiver I ever used or owned." —*W3TS*

"I wouldn't swap my OMNI for anything on the market, regardless of price." —*WD0HTE*

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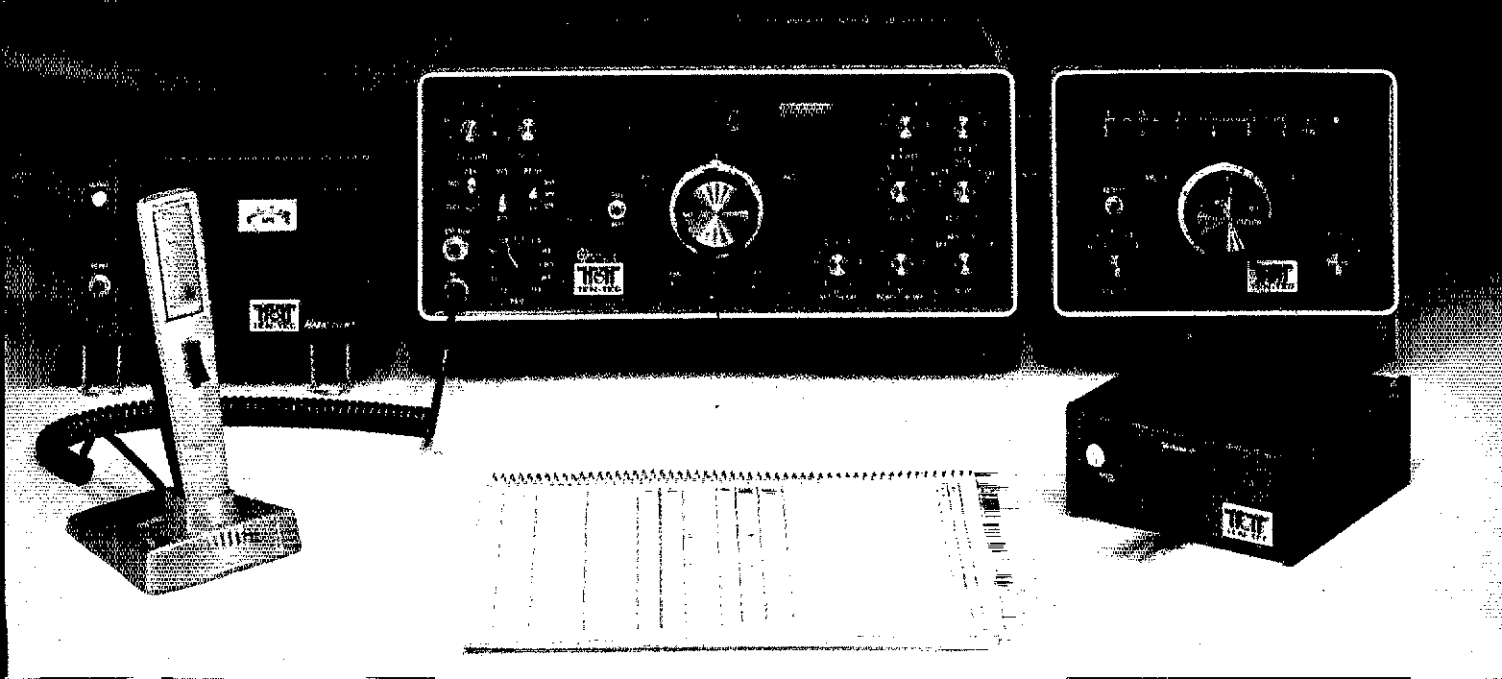

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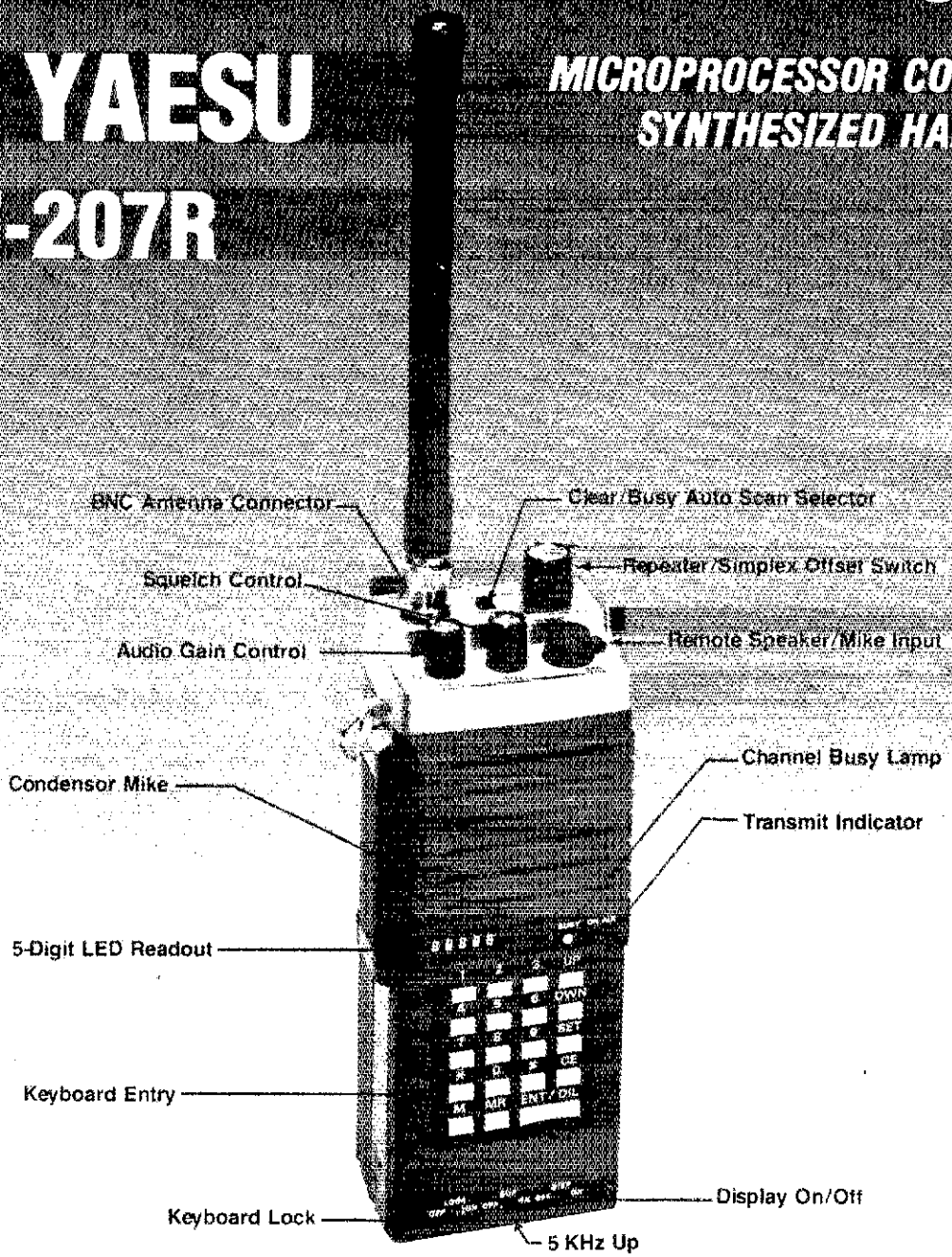

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sions, QNI 1006, QTC 108, Informals 188, QNF 1040; Hi-Noon: 29 sessions, QNI 1211, QTC 105, Informals 156, QNF 1289. Traffic: W0WYX 2865, WA0HJZ 582, AD0A 132, K0DJ 116, W0GO 67, WD0DEX 60, W0LAE 58, WB0YKH 40, W0NFW 32, W0GW 12, WD0DNM 8.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NM's WD5AHH K5KPS Southwest Net (SWN) meets daily on 3585 kHz, at 1915 local time and handled 220 msgs with 192 stations reporting in. New Mexico Roadrunner Net (MNRRN) meets daily on 3940 kHz at 1800 local and handled 308 msgs with 1151 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 130 msgs with 844 checkins. Yucca 2 mtr net handled 13 msgs with 412 checkins. Deeply regret passing of WA5LTP and W5BIH. The beautiful balloon races are underway in ABQ with many visiting hams from all over the US and some foreign countries. Good reports from the El Paso convention. QCWA had a nice dinner mtg at W5RKS's. Traffic: W5UH 283, KL7HSF 245, N5NG 213, WD5AHH 163, K5KPS 85, W5ENI 74, W5JOV 68, W5BWV 11, WA5MIY 8.

UTAH: SCM, Royce Hennignon, K7QEQ — STM: W7OCX. SEC: WB7FCB. WB7VMQ finally got a rig after 20 months as a Novice without a station. He got a new TS120S and worked 35 states, Japan, Puerto Rico, New Zealand and Canada. Then his 13 yr old son got his call KA7FSW and pretty well took over the station. WB7VMQ was a Novice two other times, KN7GGU and WN7NCZ and let both of those expire due to lack of success with cheap equipment. He now holds a Tech license and hopes to get his General in December! Traffic: K7HLR 250, WA7MEL 73, N0AHA 45, W7OCX 15, W7RO 10, W7UTM 8.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — Congratulations to new Novices KA7FPZ Basin, KA7FQF Cokeville and KA7FQL Gillette. The Casper Amateur Radio Club is the only organization that has informed me of planned participation in the upcoming SET. WB7NHR reports the Wyoming Cowboy Net held 20 sessions with 559 check-ins and 8 pieces of traffic handled. The Sheridan ARES Net reports: September, 4 sessions, 21 QNI and 0 QTC, August, 3 sessions, 21 QNI and 0 QTC, July, 3 sessions, 33 QNI and 0 QTC. Traffic: K7KSA 110, WA7GYO 68, K7TFW 14, WA7SGG 14.

SOUTHEASTERN DIVISION

ALABAMA: SCM, William E. Scates, WA4JYJ — STM: WA4JDH. The AENM is happy to have N4AWW for Net Manager for 1980. I am sure that he will do the same fine job as W4IBU has done in 1979. By the time this is in print, we should have a new SCM elected, and it will either be James Bonner, K4UMD, or Don Steenburn, WA4VLB. Alabama is lucky to have two fine gentlemen such as these running. Either way, we'll have a fine SCM. I guess everyone has heard enough about Hurricane Frederic — well, once more and for the record, ham radio in Alabama can hold its head high for a job well done. I, along with your Net Managers, felt that to run a SET so soon after would be counter productive. Thus no Alabama in SET this fall. We'll do in next fall for sure. Traffic: WA4JPH 1041, N4CCT 655, WA4VKD 526, KB4VI 157, W4CKS 99, K4AOZ 88, WN4KKN 88, KA4BUI 55, KA4EWD 43, WA4JYU 34, W4IBU 34, W4UP 31, KA4IVO 28, WB4EKJ 15, WB4TVY 8, WB4AYO 4.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4SWJ. Asst SEC: WB4HXE. STM: WA3NAZ/4. NMs: WD4ADV (ARES) K4DMK (GCN) W4GH (Ga Traffic Nets) W4HON (VHF) K4VHC (RTTY) W4WXA (GSN) WB4ZOJ (GTN) WB4ZVX (GSSBN)

Net	Freq.	Times (All EST)
GCN	3995	0700 M/S 0800 Sun
GTN	3718	1815 Dy
GSN	3595	1900 & 2200 Dy
GSSBN	3975	1930 Dy
ARES	3975	1700 Sun
GA Traffic Net	7243	1200 Dy
GA Traffic Net	3955	1830 Dy

GSSBA new officers: WB4ZVX, pres.; W4HON, vice pres.; K4VHC, secy/treas.; K4YGI WA4BZY, directors. K4ZYK, Georgia Amateur of the year. BGMRC new officers: WD4ODR, pres.; WD4HEO, vice pres.; WD4PTH, secy/treas.; WD4PAG, act mgr. Augusta reports a break even year on their Hamfest. Warner Robins first Hamfest a real success according to members of committee. Many thanks to all dedicated amateurs who handled traffic during David and Frederick. These were two good exercises. Remember our two new NTS traffic nets on 7243 and 3995. For those who work different hours, this is an opportunity to pass traffic to fit your sked. I wish to thank all who have supported us with these new nets. W4GH presented special commendation for his work with the blind and expertise traffic handling. GSSBN will continue to be on at 1930 EST by vote of the members of the annual meeting. In concluding, thanks to all who took time to make our SET a success. Also to all of you a very Merry Christmas & a Happy and Prosperous New Year and I hope Santa brings you that new rig. Hi! Traffic: (Sept) WD4ADV 384, WA3NAZ/4 240, W4WXA 210, WB4ZOJ 170, W4PIM 139, W4HON 68, W4GH 64, N4BHX 62, W4ELO 50, K4JNL 48, W4BIA 45, N4UZ 22, WD4LYV 20, WA4ZHC 12, K4PIK 9, K4WC 6, W4CMX 4. (Aug) W4AAY 4.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH — SEC: AA4FG, STM: N4WA, NM: WD4HXS WD4LUG WD4PDK. New appts: WB4IDT as OBS: K0MC as OTS. Hurricane Frederic skirted NW FL with some damage at Pensacola. Pensacola hams traveled to several south Alabama points and spent days providing emergency comm. and handling H&W traffic. Other Florida clubs, including TLH, were ready to provide assistance teams if needed. Okaloosa County opened nine shelters, all manned by amateurs. WB4UHW spent many hours at EOC Hq station. WB4VJP, A pair of simulated hurricanes, created by SECs AA4FG and AA4WC, provided the basis for the fall SET. Lots of participation at both the local and section level. WD4PDK had P/S problems, but got them fixed thanks to WA4HFG. N4ANA completed DXCC, all cw. WB4RCI recovering from heart surgery. WB4PHT, FL Sheriff's Boys Ranch, back on for SET. Jax Mayor worked closely with Duval County hams during SET. NOFARS won club competition in FL QSO Party; W4UF had top single score. WB4QVK is now KN4Y. WD4MDM now NM of WWD Net. W4MGO's weekly Key & Mike column picked up by Cape Cod paper. W4LQV new trustee of Gulf Coast ARC club station. Sorry to report N4BY a Silent Key. WB3FUJ and WA3YMV new members of Cloverleaf Farms ARC. WD4IIO, W4YRL upgraded to Extra; WA4CRI to General. Job of QFN Bulletin Editor still open as of now; contact N4WA if interested. Meanwhile, QFNS has its own newsletter, thanks to WA4PFK. Traffic: WD4HIF 696,

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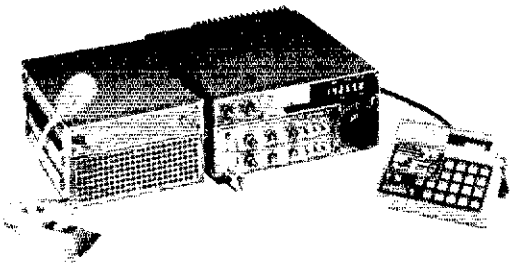

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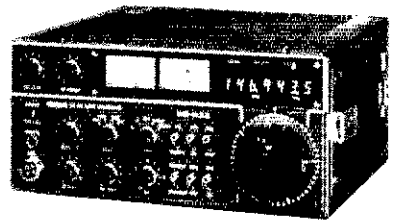

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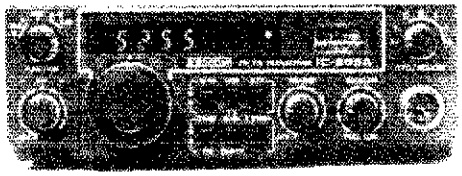

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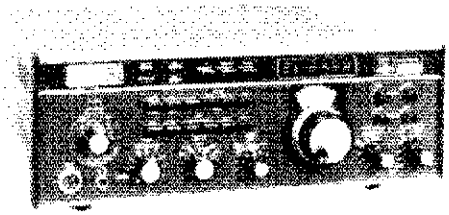

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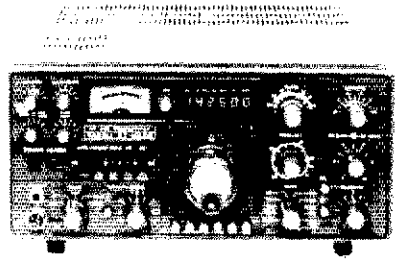

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N4WA 249, AA4FG 210, WB4TZR 173, W4FZX 148, WA4CRI 135, N4PL 125, WD4HXS 121, W4KIX 106, WD4PDK 93, WB4FJY 87, W4RH 81, W4LDM 71, WB4ADL 70, WB4DTS 70, WA4EYU 64, WB4RIS 56, K4RNS 50, W4JL 48, K4BZS 46, WD4IIO 30, N4BZH 24, K0MC 24, N4ARP 18, W4MVG 14, KF4U 6, WB4WOO 6, KB4B 5.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. New appointments: K4DYB, EC Manatee County, WB4WYG, EC Northern Brevard County. The big news of the month, of course, was the two hurricanes DAVID and FREDERIC hitting Florida in rapid succession, and the important Melbourne Hamfest wedged in between just a week after being hit hard by DAVID. It was the first good test of AA4WJ's revised frequency plan for section emergency operations using 3940 kHz night and 7272 days with Section Net Managers taking responsibility for emergency operations taking place nearest the times of their regular daily sessions. This worked quite well with managers of FPTN AFPN TPTN and FAST time-sharing the load. FMTN also operated 55.5 hours in connection with DAVID and was praised by Orlando Weather Bureau for issuing barometric pressure readings. WD4JKM reports the Dade Emergency Net operated 15.5 hours. KB4OW, EC Southern Brevard and manager Southern Brevard Emergency Net has many stories of outstanding performance and heroism by radio amateurs as DAVID smashed into Melbourne area. Our apology to KB4OW for listing his net as NBEN Northern Brevard in this column recently, rather than SBEN Southern Brevard. W4MML reports he and WB4RKY manned the Belle Glade EOC. WD4HXS reports TPTN operated 4 emergency sessions totalling 8 hours. All indications were radio amateurs did a very commendable job of communications during both hurricanes DAVID and FREDERIC. We believe part of the credit should be given to AA4WJ, as his Simulated Hurricane BILL during the January 1979 SET followed a path similar to DAVID's and was of similar strength. It was a good rehearsal for those who played SET with us in January. Could it be that the twin hurricanes JIMMY and TEDDY (simulated, of course) which struck Florida on October 6th may be a foreboding of things to come? Traffic: (Sept) W3CUL 3062, W3VR 796, W4MEE 723, K4TH 511, K4SCL 454, W4WYR 400, WA4PFK 286, WB4WYG 270, WD4COL 243, K4ZK 175, W4IRA 170, K4EUK 153, W4GPL 156, W4NFK 149, WB4SNX 146, WB4FVV 129, WB4AID 128, W4MNZ 126, KB4OW 117, WB4PIB 114, KE4O 106, WA4EIC 82, W4NTE 75, KA4FZI 69, WD4ISN 59, KA4GDV 44, WB4NJU 42, W4DVO 37, WD4CHO 36, WA4HXU 34, W4SMK 32, K8PXM 16, KA4BBA 15, WB4ZVD 15, W4MML 14, W4TJM 8, WB4GSV 6, WD4PUV 5, W4JM 2. (Aug) WB4NJU 40, W4ROA 17, KA4BBA 9.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AC7D — The Tucson Repeater Assn held their annual banquet this month and celebrated the 10th anniversary of TRA. WB7TJB, ARCA secy, reports that their Annual Yearbook is in progress. All R/Cs in AZ will be listed in this directory. This should be a most interesting publication. Date for completion is Nov '79. The AZ ARRL section welcomes K7MGA and XYL to Tucson, moved in from WA. KA7CVE recently received a beautiful gold pin from AMA in recognition of his 50 yrs in medicine. Congrats. Most RCs in AZ are in the position of installing new officers for their respective organizations. As your SCM, I would appreciate a written list of election results. It is my intent to closely coordinate with the assigned secy./pres. for info, worthy of publication in QST. (Let me know what your club is doing or plans to do in the future!) K7OXX spent five weeks in AK. He had great success fishing but had no coment re: hunting. Welcome home! Your SCM and SEC are diligently reviewing the EC/ARES program in this sect. ECs are needed in the following Ctys: Navajo, Apache, Maricopa, Gila, Greenlee, Pinal, Graham, Cochise and Yuma. If you are interested in this important ARRL program, contact your SEC, N7EH, Tucson. (Some CTY's may be combined due to population and geographical location.) The Lake Havasu City Repeater is now on 146TO1-146R61, however they are still monitoring 146T94 and 146R94 on their scanner. W7JU has been appointed Ass't to Jay Holladay, W7EJJ, Dir. SW Div. Lake Havasu RC rpts that WB7NNH and N7BL are Silent Keys. Our sincerest sympathy to the families of both. Congratulations to WA7NXL for walking off with first place in AZ during the ARRL QSO Party. (all cw)!! Sept 4-10 Net: QNI 943, QTC 207; SWN: QNI 192, QTC 220; Cactus: QNI 1089, QTC 167. Traffic: W7EP 272, K7MC 171, WA7KOE 37, K7JKM 34, K7NMQ 32, WB7NJY 20, AC7D 5, N7EH 3, WA7NXL 4, WB7QOM 4, WA7WEB 4, WB7VON 1.

LOS ANGELES: SCM, Perry Masterson, KD6C — Ben Vieckers, WB6FRM, has been appointed Assistant SCM. WA6VSE is acting SEC, K5DY is back on the air after having rig trouble for a few months. WA6LVO is acting net manager for RN6-D. W6INH has all antennas up and working now, with 261 countries confirmed. N6VI reports that his Field Day group, N6NB/6, took 1st nationwide 2A; second high overall score. Nice report. This has been another light reporting month. I have received over 50 responses from the recent ARES card mailer. Each card will be processed and answered. It will take a little time, so please be patient. 10 meters is still going great according to W6RIQ. Thanks to the clubs who sent me a copy of their bulletin this month. To all who have ARRL appointments, check your last endorsement date, if it has been over two years let me know if you desire re-endorsement or no longer desire the appointment. All traffic stations who do not have new STC certificates, they are being issued as each appointment is renewed. Endorsements are not automatic. Traffic: W6INH 146, W6OEO 125, WA6LVO 120, WB6IYD 112, K6OWA 71, KB6OT 58, N6PZ 49, W6BWG 48, WB5EKU 41, W6BRO 20, WA6OCM 20, K6CL 8.

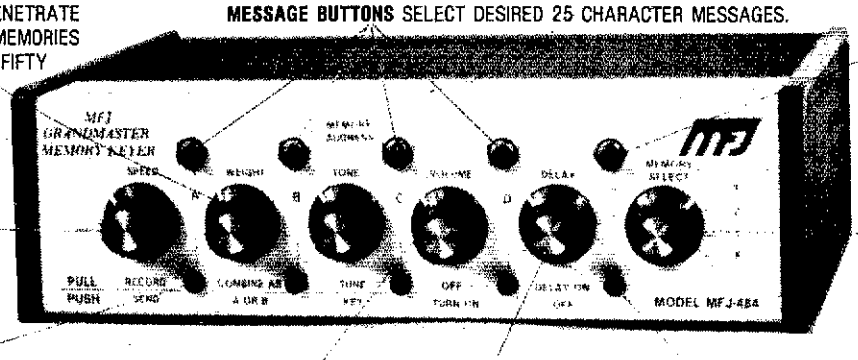
ORANGE: SCM, Roy C. Zukerman, AC6H — SEC: WA6WZO. ECs: W6DQR K6GGS W6LKN WA6MBE WB6PLZ WA6PTU W6SQE WA6TLE WA6WYP. The disasterous brush fires of September in Southern California, for the most part, skipped our section, but the users of both WR6AFV Riverside and WR6ACQ Fullerton (28/88) won praise from neighboring Ventura County for their cooperation in keeping traffic to a minimum so that WR6AOX on the same frequency could be used for Red Cross and Salvation Army communications over a wide area. VVARCs Spectrum regularly mixes technical info, club gossip/news, and food recipes for the YLs, whether licensed or not. Inclusion of ARES registration cards in the last mailing by Southwestern Division Director W6EJJ has been very

MFJ INTRODUCES THE

NEW! GRANDMASTER MEMORY KEYERS

At $139.95 this MFJ-484 GRANDMASTER

memory keyer gives you more features per dollar than any other memory keyer available — and Here's Why . . .



WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.

RESETS MEMORY IN USE TO BEGINNING.

SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION** K GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

LEDs (4) SHOW WHICH MEMORY IS IN USE AND WHEN IT ENDS.

TONE CONTROL. PULL TO TUNE.

VOLUME CONTROL. POWER ON-OFF.

DELAY REPEAT CONTROL (0 TO 2 MINUTES). **PULL** FOR AUTO REPEAT.

LED INDICATES DELAY REPEAT MODE.

NOW YOU CAN CALL CQ, SEND YOUR QTH, NAME, ETC., ALL AUTOMATICALLY.

And only MFJ offers you the MFJ-484 Grandmaster memory keyer with this much flexability at this price.

Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

A switch combines 25 character messages for up to three 50 character messages.

To record, pull out the speed control, touch a message button and send. **To playback,** push in the speed control, select your message and touch the button. That's all there is to it!

You can repeat any message continuously and even leave a pause between repeats (up to 2 minutes). **Example:** Call CQ. Pause. Listen. If no answer, it repeats CQ again. To answer simply start sending. LED indicates Delay Repeat Mode.

Instantly insert or make changes in any playing message by simply sending. Continue by touching another button.

Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

LEDs show which 25 character memory is in use and when it ends.

Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches.

PLUS A MFJ DELUXE FULL FEATURE KEYER.

Iambic operation with squeeze key. Dot-dash insertion.

Dot-dash memories, self-completing dots and dashes, jamproof spacing, instant start (except when recording).

All controls are on front panel: speed, weight, tone, volume. Smooth linear speed control, 8 to 50 WPM.

Weight control lets you adjust dot-dash-space ratio; makes your signal distinctive to penetrate QRM.

Tone control. Room filling volume. Built-in speaker.

Tune function keys transmitter for tuning.

Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 ma. max., +300 V, 100 ma. max.). CMOS ICs, MOS memories. Use 110 VAC or 12 to 15 VDC. Automatically switches to external batteries when AC power is lost.

OPTIONAL SQUEEZE KEY

for all memory keyers. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". $29.95 plus $2.00 for shipping and handling.

THIS MFJ-482 FEATURES FOUR 25 OR A 50 AND TWO 25 CHARACTER MESSAGES.

- **Speed, volume, weight, tone controls**
- **Combine memory switch**
- **Repeat, tune functions**
- **Built-in memory saver**

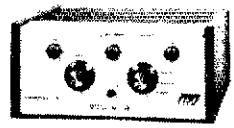
$99.95

Similar to MFJ-484 but with 1024 bits of memory, less delay repeat, single memory operating LED. Weight and tone controls adjustable from rear panel. 6x2x6 inches. 110 VAC or 12 to 15 VDC.

THIS MFJ-481 GIVES YOU TWO 50 CHARACTER MESSAGES.

- **Repeat function**
- **Tune function**
- **Built-in memory saver**

$79.95



Similar to MFJ-482 but with two 50 character messages, less weight controls. Internal tone control. Volume control is adjustable from rear panel. 5x2x6 inches. 110 VAC or 12 to 15 VDC.

For Orders Call toll-free 800-647-1800

Order any product from MFJ and try it. If not delighted, return within 30 days for a prompt refund (less shipping).

Order today. Money back if not delighted. One year unconditional guarantee. Add $2.00 shipping/handling.

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MFJ ENTERPRISES, INC. P. O. BOX 494 MISSISSIPPI STATE, MISSISSIPPI 39762

Drake R-7 Synthesized, General Coverage Receiver

Model 1240

Full general coverage recepti
0-30 MHz, with no gaps or range crystals required.

Continuous tuning all the way from vlf thru hf. Superb state-of-the-art performance on a-m, ssb, RTTY, and cw —and it transceives with the Drake TR-7.

100% solid state broadband design, fully synthesized with a permeability tuned oscillator (PTO) for smooth, continuous tuning.

Covers the complete range 0 to 30 MHz with no gaps in frequency coverage. Both digital and analog frequency readout.

Special front-end circuitry employing a high level double balanced mixer and 48 MHz "up-converted" 1st i-f for superior general coverage, image rejection and strong signal handling performance.

Complete front-end bandpass filters are included that operate from hf thru vlf. External vlf preselectors are not required.

10 dB pushbutton-controlled broadband preamp can be activated on all ranges above 1.5 MHz. Low noise design.

Various optional selectivity filters for cw, RTTY and a-m are switch-selected from the front panel. Ssb filter standard.

Special new low distortion "synchro-phase" a-m detector provides superior international shortwave broadcast reception. This new technique permits 3 kHz a-m sideband response with the use of a 4 kHz filter for better interference rejection.

Tunable i-f notch filter effectively reduces heterodyne interference from nearby stations.

The famous Drake full electronic passband tuning system is employed, permitting the passband position to be adjusted for any selectivity filter. This is a great aid in interference rejection.

Three agc time constants plus "Off" are switch-selected from the front panel.

Complete transceive/separate functions when used with the Drake TR-7 transceiver are included, along with separate R-7 R.I.T. control.

Special multi-function antenna selector/50 ohm splitter is switch-selected from the front panel, and provides simultaneous dual receive with the TR-7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selecte with this switching network.

The digital readout of the R-7 may be used as a 150 MHz counter, and is switched from the front panel. Access thru rear panel connector.

The built-in power supply operates from 100, 120, 200 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.

The R-7 includes a built-in speaker, or an external Drake MS-7 speaker may be used.

Built-in 25 kHz calibrator for calibration of analog di

Low level audio output for tape recorder.

Up to eight crystal controlled fixed channels can be selected. (With Drake Aux-7 installed.)

Optional Drake NB-7A Noise Blanker available. Provides true impulse type noise blanking performance.

DRAKE

R. L. DRAKE COMPAN

Optional accessories available

Model 1531 Drake MS-7 Speaker
Model 7021 Drake SL-300 Cw Filter, 300 Hz
Model 7022 Drake SL-500 Cw Filter, 500 Hz
Model 7023 Drake SL-1800 Ssb/RTTY Filter, 1800 Hz
Model 7024 Drake SL-6000 A-m Filter, 6.0 kHz
Model 7026 Drake SL-4000 A-m Filter, 4.0 kHz
Model 1532 Drake NB-7A Noise Blanker
Model 1536 Drake Aux-7 Range Program/Fixed-Frequency Board

DRAKE R-7 SPECIFICATIONS

Frequency Coverage, continuous tuning (With Drake DR-7 Digital R/O, General Coverage Board)
0 to 30 MHz continuous (With or without Aux-7 board) (No gaps in frequency coverage)

Frequency Coverage, continuous tuning (Without DR-7 Board installed)

0.01 to 0.5 MHz 0.5 to 1.0 MHz 1.0 to 1.5 MHz 1.5 to 2.0 MHz 2.5 to 3.0 MHz 3.5 to 4.0 MHz	Without Aux-7 Board	5.0 to 5.5 MHz 7.0 to 7.5 MHz 14.0 to 14.5 MHz 21.0 to 21.5 MHz 28.5 to 29.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux-7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux-7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux-7.

Frequency Stability: Less than 100 Hz drift after temperature stabilization including ±10% line voltage variation.

Digital Readout Accuracy: (DR-7 installed) 15 PPM ± 100 Hz

Analog Dial Accuracy: Better than ±1 kHz when calibrated to nearest calibrator marker.

Modes of Operation: Ssb, cw, RTTY, SSTV, a-m.

Sensitivity (ssb): 1.8-30 MHz Less than .20μV for 10dB S+N/N with preamp on (typically .15μV) (Noise floor typically −134 dBm) Less than .50μV for 10 dB S+N/N without preamp (typically .30μV) (Noise floor typically −128dBm). .01-1.5MHz Less than 1.0μV for 10 dB S+N/N

Sensitivity (a-m): 1.8-30MHz Less than 1.2μV for 10dB S+N/N @ 30% modulation, preamp on. Less than 2.0μV for 10 dB S+N/N @ 30% modulation, preamp off. .01-1.5 MHz Less than 4.0μV for 10 dB S+N/N @ 30% modulation.

Selectivity (2.3 kHz filter supplied): 2.3 kHz at −6 dB, 4.2 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz and 4 kHz filters are available as follows:

Ultimate Selectivity: Greater than 100 dB

Accessory Crystal Filters

SL-300 cw filter: 300 Hz @ 6 dB, 700 Hz @ 60 dB
SL-500 cw, RTTY Filter: 500 Hz @ 6 dB, 1100 Hz @ 60 dB
SL-1800 ssb/RTTY Filter: 1800 Hz @ 6 dB, 3600 Hz @ 60 dB
SL-4000 a-m Filter: 4 kHz @ 6 dB, 8 kHz @ 60 dB
SL-6000 a-m Filter: 6 kHz @ 6 dB, 12 kHz @ 60 dB

Strong Signal Handling

Two-tone dynamic range: 99 dB*	1.8-30 MHz
Third order intercept point: +20 dBm	preamp off
Two-tone dynamic range: 95 dB*	1.8-30 MHz
Third order intercept point: +10 dBm	preamp on

Blocking: >145 dB above noise floor

(at tone spacings of 100 kHz and greater)

I-f and Image Rejection: Greater than 80 dB (48.05 MHz 1st i-f) (5.645 MHz 2nd i-f) (50 kHz 3rd i-f)

Agc Performance; Less than 4 dB audio output variation for 100 dB input signal change above agc threshold. Agc threshold is typical .8μV with preamp off and .25μV with preamp on.

Attack time: 1 millisecond. Three selectable release times: Slow—2 seconds; Med—400 m sec; Fast—75 m sec. Also, "Off" position is provided.

Antenna Input Impedance: Nominal 50 ohms

Audio Output: 2.5 watts with less than 10% T.H.D. into nominal 4 ohm load.

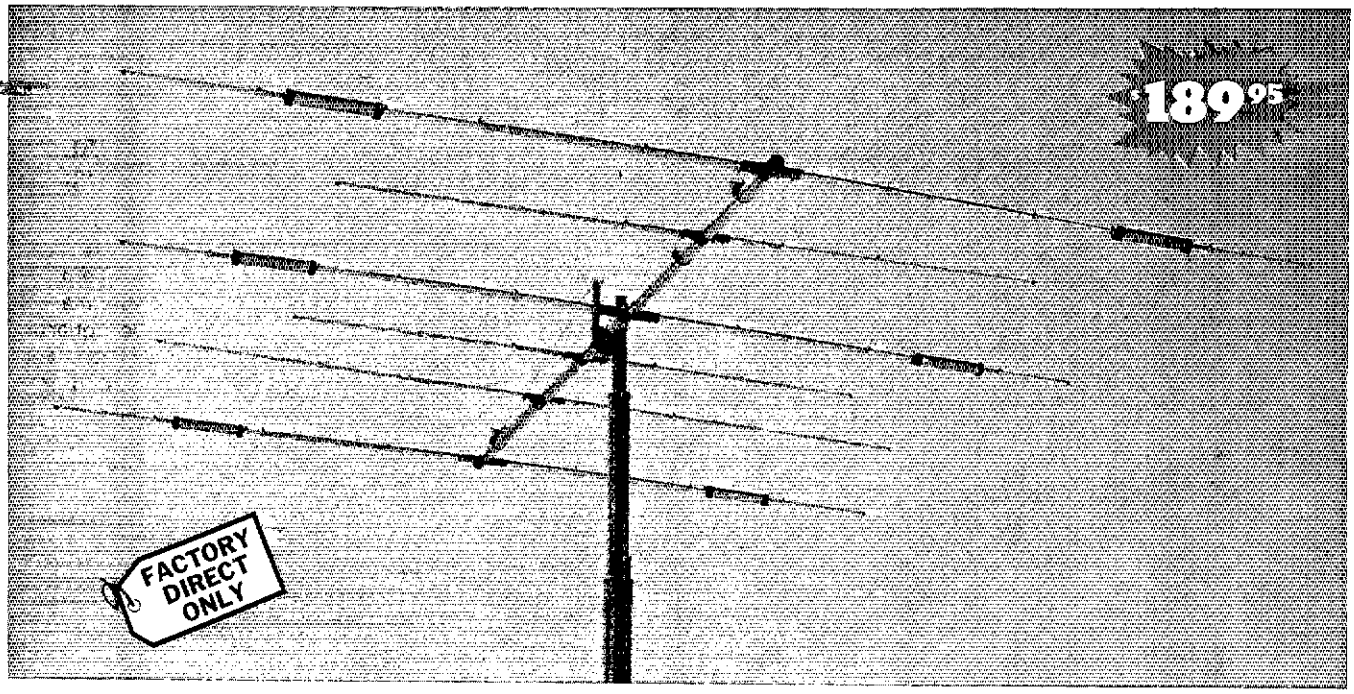
Power Requirements: 100/120/200/240 V-ac ±10%, 50/60 Hz, 60 watts or 11.0 to 16.0 V-dc (13.8 V-dc nominal), 3 amps

External Counter Mode (DR-7 installed): Readout: to 100 Hz. Accuracy: 15 PPM ±100 Hz. Maximum input frequency: 150 MHz. Input level range: 50 mV to 2 V rms.

Dimensions/Weight:

Depth— 13.0 in (33.0 cm) excluding knobs and connectors.
Width— 13.6 in (34.6 cm)
Height— 4.6 in (11.6 cm) excluding feet
Weight— 18.4 lbs (8.34 kg)

WILSON SYSTEMS, INC. presents the SYSTEM 36

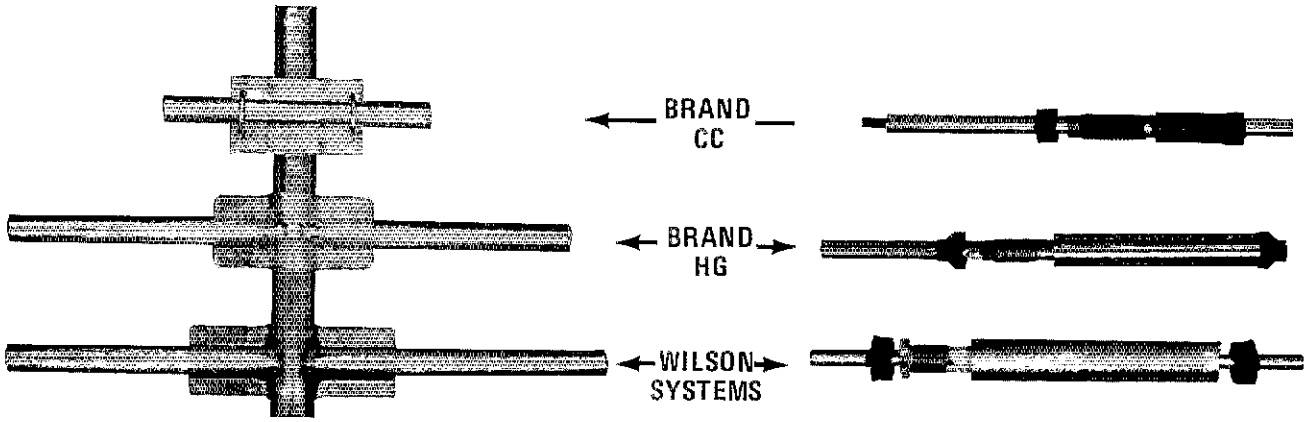


A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

SPECIFICATIONS

Band MHz 14-21-28	Boom (O.D. x Length) . . 2" x 24'2½"	Wind loading @ 80 mph . . 215 lbs.
Maximum power input . Legal limit	No. of elements. 6	Maximum wind survival . . 100 mph
Gain (dBd) . . . . . Call Factory	Longest element . . . . . 28'2½"	Feed method . . . . . Coaxial Balun
VSWR @ resonance . . . 1.3:1	Turning radius . . . . . 18'6"	Assembled weight (approx. 53 lbs.
Impedance . . . . . 50 Ω	Maximum mast diameter. 2"	Shipping weight (approx.). 62 lbs.
F/B ratio . . . . . Call Factory	Surface area . . . . . 8.6 sq. ft.	

Compare the SY-36 with others . . .



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

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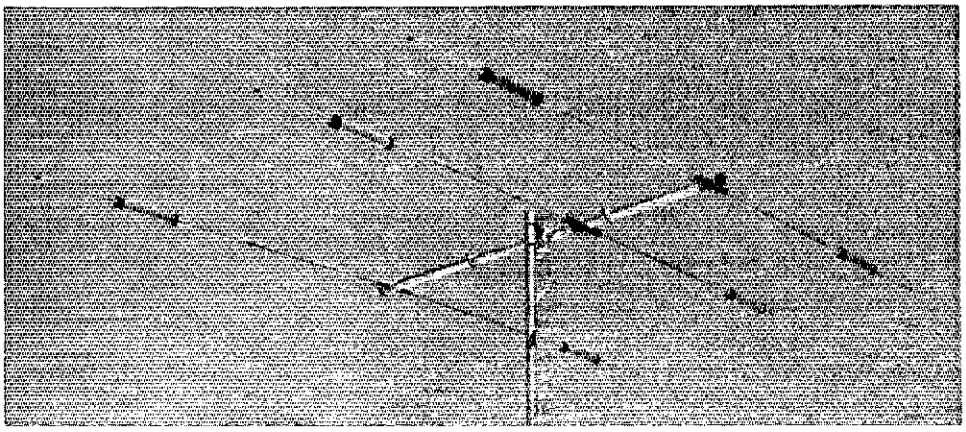
WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



$139.95

SYSTEM 33

(FORMERLY SYSTEM THREE)

FACTORY DIRECT ONLY

Capable of handling the Legal Limit, the "SYSTEM 33" is the finest compact tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excells with the "SYSTEM 33".

New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment.

Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting.

The use of large diameter High-Q traps in the "SYSTEM 33" makes it a high performing tri-bander and at a very economical price.

A complete step-by-step illustrated instruction manual guides you to easy assembly and the lighweight antenna makes installation of the "SYSTEM 33" quick and simple.

The same quality traps are used in the SY33 that are used in the SY36.

SPECIFICATIONS

Band MHz	14-21-28	**Turning radius**	15'9"
Maximum power input	Legal limit	**Maximum mast diameter**	2" O.D.
Gain (dbd)	Call Factory	**Surface area**	5.7 sq. ft.
VSWR at resonance	1.3:1	**Wind loading at 80 mph**	114 lbs.
Impedance	50 ohms	**Assembled weight (approx.)**	37 lbs.
F/B ratio	Call Factory	**Shipping weight (approx.)**	42 lbs.
Boom (O.D. x length)	2" x 14'4"	**Direct 52 ohm feed—no balun required**	
No. elements	3	**maximum wind survival**	100 mph
Longest element	27'4"		

$44.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:
Radials are required for peak operation.
(See GR-1 below).

SPECIFICATIONS:

- Self supporting—no guys required.
- Input Impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q Traps with large diamater coils
- Low Angle Radiation
- Omnidirectional performance
- Taper Swaged Aluminum Tubing
- Automatic Bandswitching
- Mast Bracket furnished
- SWR: 1.1:1 or less on all Bands

GR-1

$9.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded copper wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

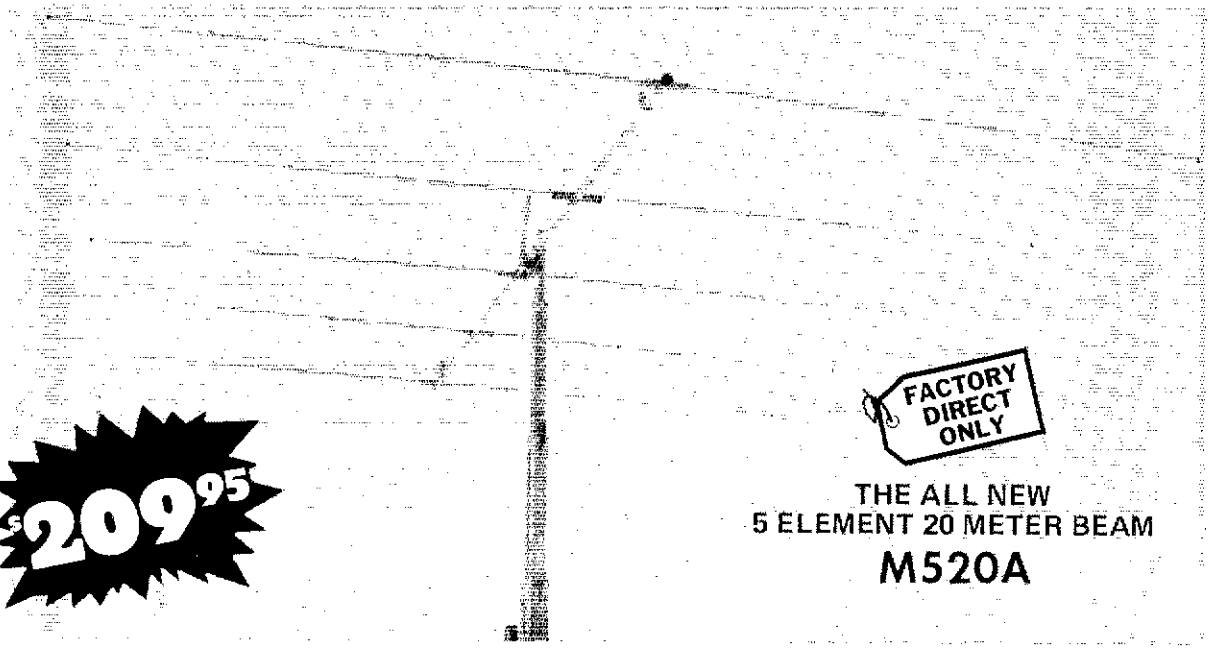
CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

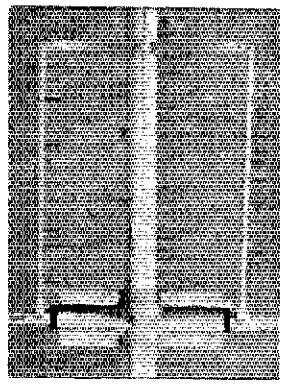
WILSON MONO-BAND BEAMS



At last, the antennas that you have been waiting for are here! The top quality, optimum spaced, and newest designed monobanders. The Wilson Systems' new Monoband beams are the latest in modern design and incorporate the latest in design principles utilizing some of the strongest materials available. Through the select use of the current production of aluminum and the new boom to element plates, the Wilson Systems' antennas will stay up when others are falling down due to heavy ice loading or strong winds. Note the following features:

1. Taper Swaged Elements — The taper swaged elements provide strength where it counts and lowers the wind loading more efficiently than the conventional method of telescoping elements of different sizes.
2. Mounting Plates — Element to Boom — The new formed aluminum plates provide the strongest method of mounting the elements to the boom that is available in the entire market today. No longer will the elements tilt out of line if a bird should land on one end of the element.
3. Mounting Plates — Boom to Mast — Rugged 1/4" thick aluminum plates are used in combination with sturdy U-bolts and saddles for superior clamping power.
4. Holes — There are no holes drilled in the elements of the Wilson HF Monobanders. The careful attention given to the design has made it possible to eliminate this requirement as the use of holes adds an unneccessary weak point to the antenna boom.

With the Wilson Beta-match method, it is a "set it and forget it" process. You can now assemble the antenna on the ground, and using the guidelines from the detailed instruction manual, adjust the tuning of the Beta-match so that it will remain set when raised to the top of the tower.



Wilson's Beta match offers maximum power transfer.

The Wilson Beta-match offers the ability to adjust the terminating impedance that is far superior to the other matching methods including the Gamma match and other Beta-matches. As this method of matching requires a balanced line it will be necessary to use a 1:1 balun, or RF choke, for the most efficient use of the HF Monobanders.

The Wilson Monobanders are the perfect answer to the Ham who wants to stack antennas for maximum utilization of space and gain. They offer the most economical method to have more antenna for less money with better gain and maximum strength. Order yours today and see why the serious DXers are running up that impressive score in contests and number of countries worked.

SPECIFICATIONS

Model	Band Mtrs	Gain dBd	F/B Ratio	Bandwidth @ Resonance 2:1 VSWR Limits	VSWR @ Resonance	Impedance	Matching	Elements	Longest Element	Boom O.D.	Boom Length	Turning Radius	Surface Area (Sq.Ft.)	Windload @ 80 mph (Lbs.)	Maximum Mast	Assembled Weight (Lbs.)
M520A	20	CALL FACTORY		500 KHz	1.1:1	50 Ω	Beta	5	36'6"	2"	34'2½"	25'1"	8.9	227	2"	68
M420A	20			500 KHz	1.1:1	50 Ω	Beta	4	36'6"	2"	26'0"	22'6"	7.6	189	2"	50
M515A	15			400 KHz	1.1:1	50 Ω	Beta	5	25'3"	2"	26'0"	17'6"	4.2	107	2"	41
M415A	15			400 KHz	1.1:1	50 Ω	Beta	4	24'2½"	2"	17'0"	14'11"	3.1	54	2"	25
M510A	10			1.5 MHz	1.1:1	50 Ω	Beta	5	18'6"	2"	26'0"	16'0"	2.8	72	2"	36
M410A	10			1.5 MHz	1.1:1	50 Ω	Beta	4	18'3"	2"	12'11"	11'3"	1.4	36	2"	20

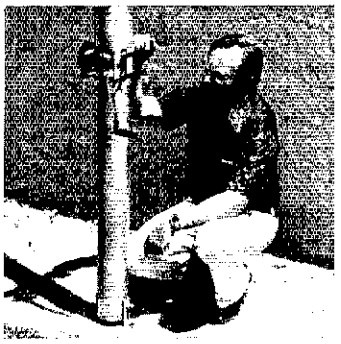
CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

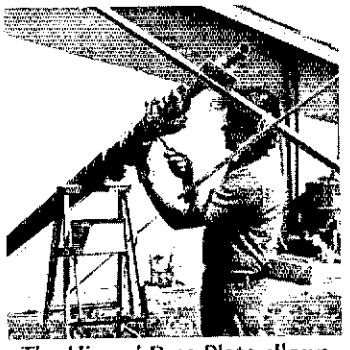
Prices and specifications subject to change without notice.

New, Improved Wilson Towers

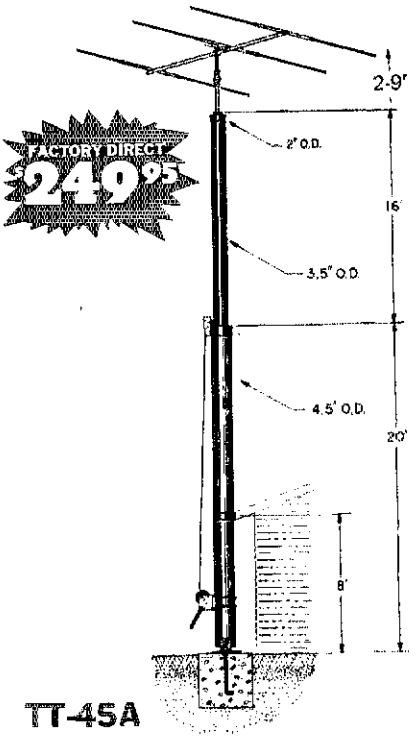


Hinged Base Plate - Concrete Pad, Heavy Duty Winch

Mounting the House Bracket



The Hinged Base Plate allows tower to be tilted over for access to antenna and rotor from the ground.

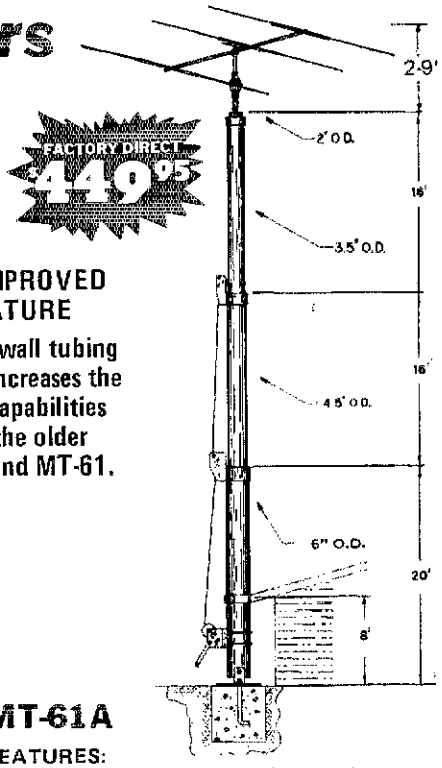


TT-45A

FEATURES:

- Maximum Height 45' (will handle 12 sq. ft. at 38') @ 50 mph
- 1200 lb. winch
- Totally freestanding with proper base
- Total Weight, 243 lbs.

The TT-45A is a freestanding tower, ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected. (Requires 12"x12"x36" of concrete.)



NEW IMPROVED FEATURE

Heavier wall tubing greatly increases the stress capabilities over the older TT-45 and MT-61.

MT-61A

FEATURES:

- Is freestanding with use of proper base
- Maximum Height is 61' (will handle 12 sq. ft. at 53') @ 50 mph
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight, 400 lbs.

Recommended base accessory: RB-61A, FB-61A.

The MT-61A is our largest and tallest freestanding tower. By using the RB-61A rotating base fixture the MT-61A is ideally suited for the SY33 or SY-36. If you plan to mount the tower to your house, caution should be taken to make certain the eave is properly reinforced to handle the tower. If not, one of the base accessory fixtures should be used. (Requires 18"x18"x48" concrete.)

GENERAL FEATURES

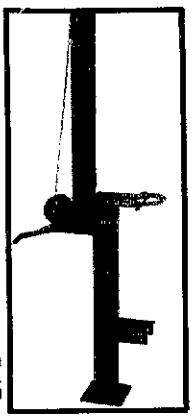
All towers use high strength heavy galvanized steel tubing that conforms to ASTM specifications for years of maintenance-free service. The large diameters provide unexcelled strength. All welding is performed with state-of-the-art equipment. Top sections are 2" O.D. for proper antenna/rotor mounting. A 10' push-up mast is included in the top section of each tower. Hinge-over base plates are standard with each tower. The high loads of today's antennas make Wilson crank-ups a logical choice.

TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower. (Requires 3'x3'x5½' of concrete.)

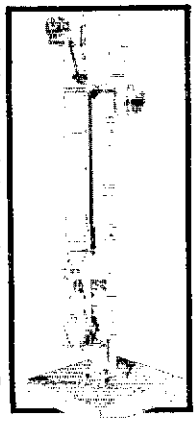
FB-45A . . . $ 99.95
FB-61A . . . 129.95



ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system. (Requires 3'x3'x6' of concrete.)

RB-45A . . . $139.95
RB-61A . . . 199.95



Tilting the tower over is a one-man task with the Wilson bases.
(Shown above is the RB-61A.)
(Rotor not included)

WSD WILSON SYSTEMS, INC.
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Las Vegas, Nevada 89103
(702) 739-7401
Toll-Free Order Number 800-634-6898

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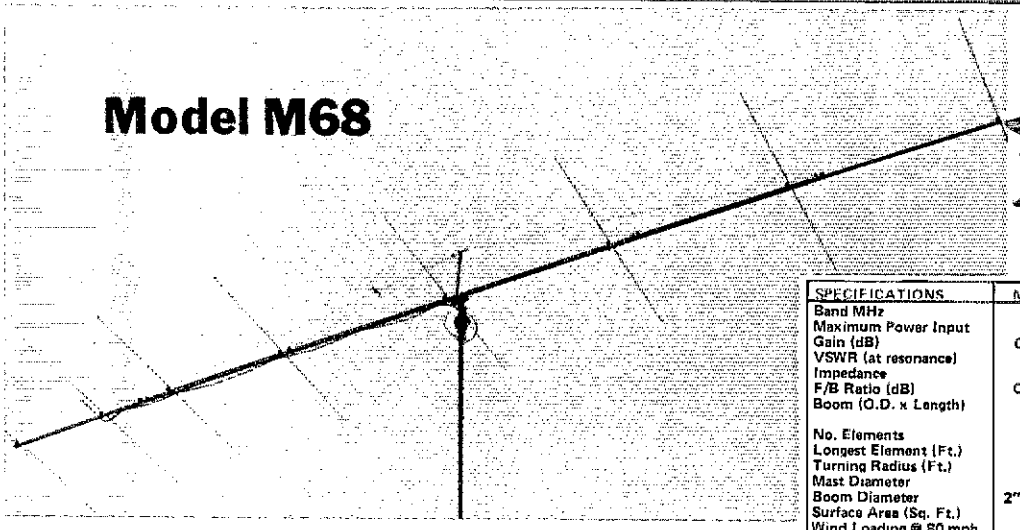
6 METER BEAMS

Model M68



As low as $27.95

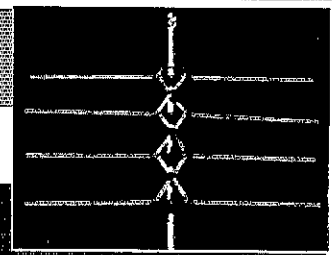
8 elements W - I - D - E spaced on a L - O - N - G 37' boom . . . for those long hauls to JA and VK land! Choose 4, 6 or 8 elements to put you in the action on six meters.

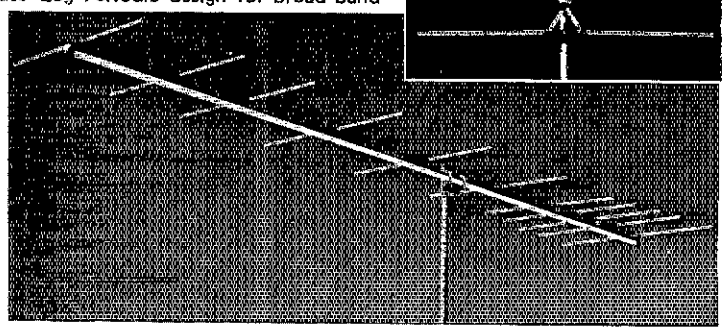
SPECIFICATIONS	MODEL M68	MODEL M66	MODEL M64
Band MHz	50	50	50
Maximum Power Input	4 Kw	4 Kw	4 Kw
Gain (dB)	Call Factory	Call Factory	Call Factory
VSWR (at resonance)	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	Call Factory	Call Factory	Call Factory
Boom (O.D. x Length)	2" to 1¼"	2" x 25'8" x 36'10"	1¼" x 11'6"
No. Elements	8	6	4
Longest Element (Ft.)	9'8"	9'8"	9'8"
Turning Radius (Ft.)	19'0"	13'10"	7'6"
Mast Diameter	2" O.D.	2" O.D.	1¼" O.D.
Boom Diameter	2" to 1¼" O.D.	2" O.D.	1¼" O.D.
Surface Area (Sq. Ft.)	5.8	4.5	1.5
Wind Loading @ 80 mph	145	112	37
Assembled wght. Approx.	34 lbs.	26 lbs.	11 lbs.
Shipping wght. Approx.	39 lbs.	31 lbs.	13 lbs.
Matching Method	Gamma	Gamma	Gamma
PRICE	$84.95	$54.95	$27.95

2 METER BEAMS

Starting at $19.95

Wilson's new 2 meter series combines the ultimate in design and quality materials. These top performing beams feature 7, 9 or 11 aluminum elements held to the heavy walled boom with the exclusive molded Lexan® boom to element mounting. The four driven elements use Log Periodic design for broad band characteristics providing full 144-148 MHz coverage with less than 1.2 to 1 VSWR across the band. Universal mounting is provided for vertical or horizontal polarization.





SPECIFICATIONS	M27	M29	M211
Band MHz	144-148 MHz	144-148 MHz	144-148 MHz
Gain (dB)	Call Factory	Call Factory	Call Factory
VSWR	Less than 1.2:1 across band	Less than 1.2:1 across band	Less than 1.2:1 across band
Impedance	50 ohms balanced	50 ohms balanced	50 ohms balanced
Number of Elements	7	9	11
Boom (O.D. x Length)	1" O.D. x 5'4"L.	1" O.D. x 10'0"L.	1½" O.D. x 12'6"
Longest Element	40"	40"	40"
Surface Area (Sq. Ft.)	.8	1.5	2.8
Assembled wght Approx.	3.5 lbs.	5 lbs.	6 lbs.
Shipping wght. Approx.	6.5 lbs.	8 lbs.	9 lbs.
Turning Radius	38"	64"	78"
PRICE	$19.95	$24.95	$29.95

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Las Vegas, NV 89103 – (702) 739-7401

FACTORY DIRECT ORDER BLANK

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WILSON SYSTEMS ANTENNAS

Qty	Model	Description	Shipping	Price
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	$139.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	189.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	44.95
	GR-1	Ground Radials for WV-1A	UPS	9.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	209.95
	M-420A	4 Elements on 20 Mtrs.	UPS	139.95
	M-515A	5 Elements on 15 Mtrs.	UPS	119.95
	M-415A	4 Elements on 15 Mtrs.	UPS	79.95
	M-510A	5 Elements on 10 Mtrs.	UPS	84.95
	M-410A	4 Elements on 10 Mtrs.	UPS	64.95
	WM-62A	Mobile Antenna: 5/8 λ on 2, 1/4 λ on 6	UPS	19.95
	M-86	8 Elements on 6 Mtrs.	UPS	84.95
	M-66A	6 Elements on 6 Mtrs.	UPS	54.95
	M-46	4 Elements on 6 Mtrs.	UPS	27.95
	M-112	11 Elements on 2 Mtrs.	UPS	29.95
	M-92	9 Elements on 2 Mtrs.	UPS	24.95
	M-72	7 Elements on 2 Mtrs.	UPS	19.95
		ACCESSORIES		
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	.12/ft.
	RG-8U	RG-8U Foam-Ultra Flexible Coaxial Cable, 38 strand center conductor, 11 guage	UPS	.21/ft.

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45A	Freestanding 45' Tubular Tower	TRUCK	$249.95
	RB-45A	Rotating Base for TT-45A w/tilt over feature	TRUCK	139.95
	FB-45A	Fixed Base for TT-45A w/tilt over feature	TRUCK	99.95
	MT-61A	Freestanding 61' Tubular Tower	TRUCK	449.95
	RB-61A	Rotating Base for MT-61A w/tilt over feature	TRUCK	199.95
	FB-61A	Fixed Base for MT-61A w/tilt over feature	TRUCK	129.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100 ft. and in 50' multiples.
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successful in getting a large number of new registrations. Beach Cities Wireless Society (K6RMJ pres) newly affiliated with ARRL meets the second Thurs. at 8 P.M. in *San Clemente at the Laguan Federal S&L* office WD6BPT, the St. Jude Hospital club station, got a real workout when the hospital lost commercial telephone service for several hours and a number of local hams were rounded up through the 19/79 Anaheim repeater to bring their handhelds and furnish essential interior communications. Another busy month monitoring band edges by OO WA6IQL. He reports he is now operational on RTTY. RATS and HFEA clubs have already had showings of W6AO's new film "The World of Amateur Radio." By the time you read this, the Division Convention will be a memory. Hope I saw you there. Traffic: WB6EIG 461, W6DXL 437, WB6QBZ 176, KA6A 51, W6NTN 43, K6WI 34, AC6H 32, K6XI 24, WA6QCA 13, W6LKN 2.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. Ass't SEC: N6RD. NM: WA6UAZ. San Diego County ECs: WB6HFE (Northern), W6INI (Central), W6OGC (Eastern) and WD6CSS (Southern). WA6JCG WB6PVE and K6SJA took part in Chula Vista Red Cross mass casualty drill. SD Chapter, QCWA officers for 1980 are: W6YYV, pres.; W6EBX, v pres.; W6OSD, secy./treas. An impressive Amateur Radio exhibit at the annual Home Show was put together by WA6LZA, complete with operating hf and 2-meter equipment. A highlight was a contact with VR6TC. The 220 Club of SD has changed meeting place to North Park Recreation Center, 4044 Idaho, on second Friday. Don't forget the Amateur Radio swapmeet on first Saturday each month at Santee Drive-in Theatre, 10990 Woodside Av, from 0700 to noon. Upgraded: WB6QEZ and KA6AGA to Advanced. SD Teleprinter Society meets fourth Tuesday at 1900 in Bonanza Restaurant, 2635 El Cajon Blvd. SD North Shores ARC meets first Tuesday, 1930, So. Clairemont Recreation Center, 3605 Clairemont Dr. Contact WA6BDW, VChmn SD Amateur Radio Council, for list of Amateur Radio licensing classes. Phone 284-5314. Traffic: (Sept) WA6UAZ 350, N6GW 219, N6AWC 156, WA6AMK 148, WB6PVH 89, N6AT 84, K6HAP 77, WB6MLB 70, WA6COE 35, WB6GMM 4, WB7SUA 4, WA6UFY 3. (Aug) WB6GMM 3. (July) WB6GMM 20.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — N6TR has moved to Simi and is a new OO appointee. W6ZRR was very active again sending 161 bulletins as an OBS. K6DZT is building a new OSCAR antenna. W6POE is new AEC for Ventura ARES. Congrats to AA6BB for graduating a new class for SMRA making his total over a hundred. He and KA6V are chasing 10 m DX with a new 5 ele beam. WD6BNN and AD6J were SBARC club winners for the All Asian DX contest and IARU Radiosport respectively. WR6AOC now on 147.345/945 and back at the Gilbralter location in SBar. WA6IJZ and N6MA have completed WAZ. N6MA visited the Iwakura ARC in Nagoya, Japan. W6RGQ is up to 265 worked. W6WBY worked WAC on 28 MHz while mobile with 30 w PEP in one day. Sorry to report the passing of WA6OGP. New Novices: KA6HUR (Burl Ives) KA6HQF KA6HEI: new Gen: N6BVR; new Extra: KF6O. Many thanks to those that responded to the recent fire emergencies in Ventura and SB counties. The ARES responded well again to serve the Red Cross and Salvation Army. That is what Amateur Radio is all about. PSHR: K6YD 90, N6YH 33, K6DZT 13, N6MA 22. Traffic: K6YD 107, N6YH 71, WB6TRP 28, N6MA 24, K6DZT 1.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — 1979 was a "banner year" for all League activities here in the Northern Texas Section; with record progress and growth in all areas of our organization! 1980 will see even more progress and improvement with the momentum of pride, dedication, and just plain hard work that amateurs here have pledged unto themselves. Through a fantastic "grass roots" group effort, you have made North Texas a better place to live, and our fraternity a greater place to belong. So, as we pause to reflect this holiday season, we can be truly thankful that we have a hobby that not only gives personal satisfaction and is richly rewarding, it also makes life just a little nicer for those we serve! So from the entire N.TX. staff; AE5C W5VMP N5WB AE5I AA5J and myself; a most joyous holiday season, and a happy and prosperous 1980! Traffic: W5TI 427, K5OUK 284, AA5J 231, WD5EUE 196, WD5HHK 139, WA5QFD 118, N5RT 112, K5MC 102, WD5IVD 100, W5HMR 93, WD5JYI 81, WB5LAT 81, WB5BKM 80, WA5INJ 74, W5VMP 65, WB5YYK 62, N5AWG 51, W5CTZ 46, AJ5F 42, WD4SIH 40, WB5JCT 36, K9MX 30, WA5EZT 26, K5PC 23, KB5DR 20, W5YK 20, KA5Q 17, WD5JDA 8, W1AEL 6, WB5DUQ 6, K2SCU/5 6, W5TAH 4, WD5GFP 2.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst SCM: Ray Miller, W5REC. SEC: WA5MLT. Lots of good comments heard on W5GM Newsletter. W5SUG reports working the cross country balloon, KØLIS. Enid Club provided communication for the Chisholm Trail Marathon. WA5FSN and others went to the Houston Con-vention. W5VXU is steady outlet for southwestern traffic. WA5OGE and 3850 RCCer's going strong at 7 A.M. on 3850. Thanks to K5OWK for fireless assistance during hurricane disasters. WA5HSU got his antenna back up and again excellent signal. WD5IFB giving us latest WARC news on OFON, 3900 and STN, 3850. WA5OUV and the OTWN got blanked out by solar flare on 19 Sept. WD5ICO has accepted appointment of EC for Pawnee County. WA5FSN WA5MLT and this station, W5REC wish to express our thanks to you for supporting Amateur Radio's many facets of interest during 1979 with special impetus on the Lawton Tornado Public Service. This season of the year brings memories of our Silent Keys — we miss them. We rejoice in our many new hams, the upgrading of many more, our pride in achievements and the growth of the OK section. Great Job! Season's Greeting to each of you! Traffic: (Sept) WB5MVR 1773, K5OWK 630, K5JGZ 379, WB5NKC 307, W5REC 274, WB5NKD 210, W5RB 132, W5BYC 64, WA5FSN 47, W5SUG 42, WA4OUV 37, WB4ELG 36, K5CAY 34, W5DRZ 32, W5UYH 30, W5VOR 26, WD5GLO 23, W5VXU 20, WD5ETB 18, K5MGD 16, WD5IFB 13, WB5AOH 11, KB5EK 7, W5HGH 7, KA5DRD 4.

SOUTHERN TEXAS: SCM, Roger Coday, N5FN — Assistant SCM: N5TC. SEC: AK5N. Net Managers at large: N5TC phone; WA5RKU cw. OOs reporting this month WB5CIT, OVS reporting this month. WB5CIT WA5QCP. EC WA5RVT reports new facilities at Brazoria County Court House worked very well during flooding emergency in late September. Summer and early fall full of real SETs. WD5KBK reports oil tank fire, refinery explosion, 3 different floods have kept Galveston County amateurs busy. 7290 traffic net has re-elected K5HZR net mgr.; WB5SDD, asst. net mgr.; W5KLV net secy.; W5TVS net treas. K5RVF reports Golden Triangle amateurs helped

with communications for Kiwanis sponsored air show Sept. 22-23, W5KLV reports 7290 traffic net held 43 sessions with 2,664 check-ins and 682 messages. KD5O (ex WD5IEB) elected Deacon for his local Baptist Church. Traffic: W5KLV 646, WB5YDD 482, N5TC 142, K5HZR 123, KA5CDX 95, WB5CIT 72, K5PE 58, AK5N 49, W5SBE 48, KA5FPD 39, WA5RVT 31, WD5KBK 25, AK5M 12, WB5EFJ 10, K5RVF 8, KD5O 4.

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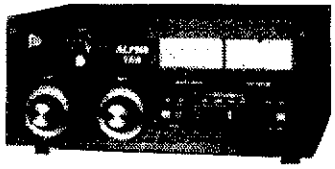

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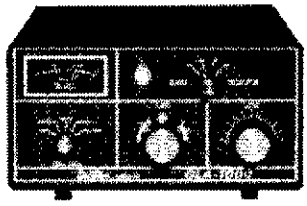

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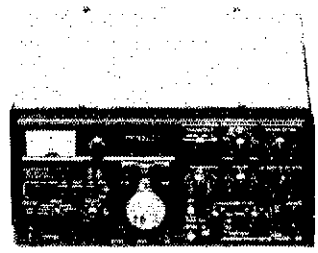

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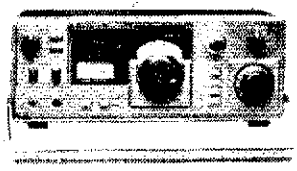

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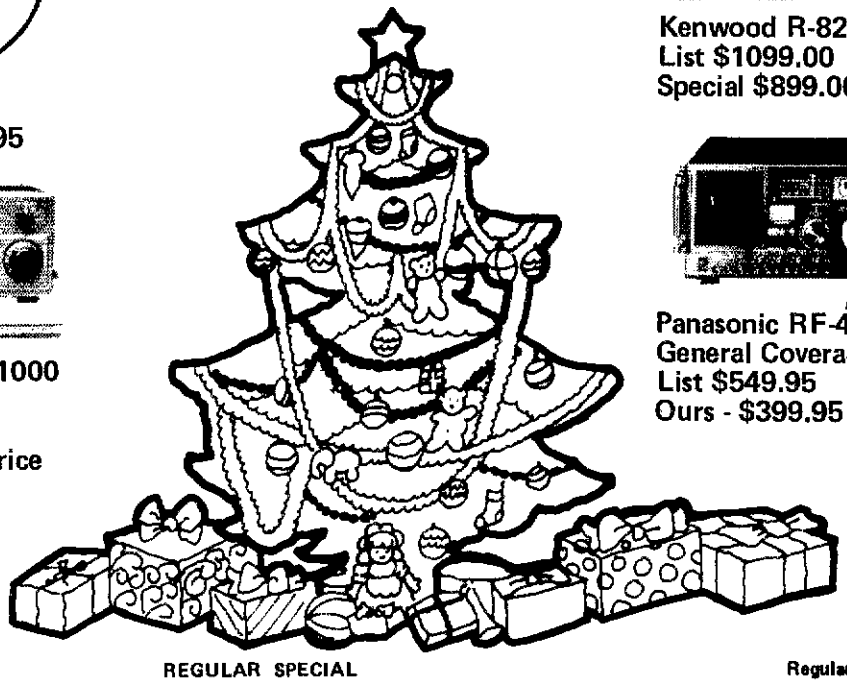

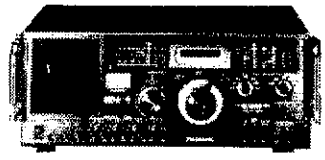

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☐	40-SEMI-CON SUPRISE, zeners, rectifiers, transistors, etc, U-test, (#2226)	1.29	80 for 1.30
☐	65-STABISTORS, axial, for regulators & computers, U-test, (#3140)	1.29	130 for 1.30
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☐	4-ROCKER SWITCHES, DPDT, solder eyelet terminals, (#3302)	1.29	8 for 1.30
☐	60-LONG LEAD DISCS, 100% prime, marked capacitors, (#5899)	1.29	120 for 1.30
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☐	1-TV/AUDIO SHIELDED CABLE, 2 cond. 15 ft. w/RCA phone plugs, (#5812)	1.29	2 for 1.30
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☐	2-GE 3W AUDIO AMP, type PA-263 IC chip, mono, (#1522)	1.29	4 for 1.30
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☐	6-POWER TAB TRIACS, 100% prime, 100V, TO-220, (#5888)	1.29	12 for 1.30
☐	6-POWER TAB SCR's, 100% prime, 100V, TO-220, (#5904)	1.29	12 for 1.30
☐	2-WATCH LCD's, 3½ digit, asst. types, size: 1" x 1½" (approx.) (#5066)	1.29	4 for 1.30
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☐	4-MOS FETS, 3N128, by Fairchild & RCA, TO-18, some duals, (#1686)	1.29	8 for 1.30
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☐	6-AC "UTILITY" OUTLETS, for 1¼" mt. ctr., solder lugs, (#3382)	1.29	12 for 1.30
☐	15-NE-2 LAMPS, neon red, for 110VAC. less resistor, (#1435)	1.29	30 for 1.30
☐	20-1N4148 SWITCHING DIODES, 4nS, 100V @ 10mA, axial 100%, (#3000)	1.29	40 for 1.30
☐	2-4 AMP SILICON BRIDGE RECTIFIER, 200V, block style, (#5928)	1.29	4 for 1.30
☐	4-VARACTOR DIODES, var. tuner capacitance, 20-50 pf. (#5887)	1.29	8 for 1.30
☐	50-PRECISION RESISTORS, ½, 1, & 2 watts, 1%, assorted types, (#363)	1.29	100 for 1.30
☐	60-CERAMIC CAPS, asst'd val. & styles, incl; tubulars, NPO's, etc., (#590)	1.29	120 for 1.30
☐	25-PLASTIC SCR's, incl; 200V, untested, high yield, TO-92, (#3192)	1.29	50 for 1.30
☐	40-MOLDED CAPACITORS, tubular, asst'd volt. to 1 mf. axial leads (#3AB642)	1.29	80 for 1.30
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☐	1-LINE CORD, 8 ft. 2 cond. 16 gauge, vinyl molded plug & grommet (#3661)	1.29	2 for 1.30
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☐	10-ZENERS, 1 watt 9.1 volts axial leads 100% (#3370A)	1.29	20 for 1.30
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☐	2-RELAYS, BABCOCK 6VDC, SPST, plastic case (#5807)	1.29	4 for 1.30
☐	1-25 AMP BRIDGE RECTIFIER, 50 volts, 100% (#5948)	1.29	2 for 1.30
☐	2-QUADRACS, 10 amp 200 PRV, TO-220 100% (#5915)	1.29	4 for 1.30
☐	60-MINI RESISTORS, 30-1/2W, 30-1/4 watt, axial, color coded, (#5922)	1.29	120 for 1.30
☐	12-SCRS-TRIAC-QUADRACS, asst. volts. TO-220 case (#2087)	1.29	24 for 1.30
☐	10-BULLPLATES, asst. resistor/capacitor networks, various styles, (#5880)	1.29	20 for 1.30
☐	2-AIR TRIMMER CAPS, alum. plates, ½" shaft, panel mt. solder lugs, (#5658)	1.29	4 for 1.30
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☐	4-12 VOLT LAMPS, w/leads, popular voltage, 100's of uses, (#5942)	1.29	8 for 1.30
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☐	20-1000 PIV GLASS AMPS, micro-mini, axial, silicon, rated @ 1A, (#5903)	1.29	40 for 1.30
☐	1-12 VCT 200 mA TRANSFORMER, 115 V prim., PC mount, (#5977)	1.29	2 for 1.30
☐	20-400 mW 15V ZENERS, micro-style, asst. epoxy & glass, 100%, axial, (#5914)	1.29	40 for 1.30
☐	100-UNMARKED CAPS, popular values, mylars & polystyrene, 100%, (#5892)	1.29	200 for 1.30
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☐	500pc-HARDWARE SURPRISE, asst screws nuts & washers, (#5891)	1.29	1000 for 1.30
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☐	200-PC BOARD PARTS, boards loaded w/100% parts, hobby bonanza, (#5946)	1.29	400 for 1.30
☐	6-RF NPN TRANSISTORS, type-2N1059, BVcbo: 40V, TO-22, 100%, (#5855)	1.29	12 for 1.30
☐	2-BRASS DOOR LOCKS, w/key, for doors windows, etc. 2-1/8" mt. ctr. (#5949)	1.29	4 for 1.30
☐	1-PUSH-PUSH CB SWITCH, DPDT, 1 x ¾ x 3/8", 100's of uses, (#3463)	1.29	2 for 1.30
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☐	50-ONE-WATT RESISTORS, popular assort, some 5%ers, 100's of uses, (#3844)	1.29	100 for 1.30
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☐	4-RIBBON CABLE CONNECTOR, single-sided, 9 contacts, PC leads, (#5967)	1.29	8 for 1.30
☐	3-"SUPER" 2N2222, NPN, ICBO:60V, Bfe:100 1W @ 2A, TO-92, 100%, (#5932)	1.29	6 for 1.30
☐	1-12 VDC MINI BLOCK RELAY, spdt, 1 x 3/4 x 5/8", 178 ohm, 1A, (#5937)	1.29	2 for 1.30
☐	10-1.5V GRAIN-o-WHEAT LAMPS, 3/16", w/10" leads, lens: RED, (#6002)	1.29	20 for 1.30
☐	10-IF-FM OP AMPS, by RCA, FM-UHF circuitry, TO-5, 10 leads, (#5951)	1.29	20 for 1.30
☐	10-NPN SWITCHING TRANSISTORS, asst'd gen. audio & switching, (#2595)	1.29	20 for 1.30
☐	1-12 VDC SOLENOID, similar to Guardian 16-P, w/plunger, ¾" stroke, (#6013)	1.29	2 for 1.30
☐	10-HUMBUCKER CONTROLS W/KNOB, for TV vertical, horiz., etc. (#5882)	1.29	20 for 1.30
☐	50-CAPACITOR SPECIAL, discs, mylars, and more, (#3775)	1.29	100 for 1.30
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☐	65-HALF WATT RESISTORS, asstd. carbons, carbo-films, various values, (#454)	1.29	130 for 1.30
☐	6-LM340T VOLTAGE REGULATORS, 5 to 24 volts, TO-220, (#5897)	1.29	12 for 1.30
☐	40-POLYSTYRENE CAPACITORS, asst'd values and voltages, (#1032)	1.29	80 for 1.30
☐	15-THERMISTORS, resistors that change with the temperature, (#2040)	1.29	30 for 1.30
☐	65-¼ WATT RESISTORS, asst'd values, metal film, marked, (#5797)	1.29	130 for 1.30
☐	1-12VDC SPDT RELAY, 180 ohm coil, 25 mA, 1x1x1¼" (#5937)	1.29	2 for 1.30
☐	15-VOLUME CONTROLS, asst. values, audio, and switch too! (#592)	1.29	30 for 1.30
☐	60-PREFORMED DISC CAPS, handy assortment of values, marked, (#1181)	1.29	120 for 1.30
☐	10-AXIAL ELECTROS, assorted values and capacitance, (#5901)	1.29	20 for 1.30
☐	60-GLASS ZENERS, 400mW, untested, better than 50% yield, (#5889)	1.29	120 for 1.30
☐	10-PC TRIMPOTS, screwdriver adjust, assorted values, (#3346)	1.29	20 for 1.30
☐	25-4" CABLE TIES, plastic, like Ty-wrap style, (#5217)	1.29	50 for 1.30
☐	5-CRYSTALS, may include; CB, ham various shapes and sizes, (#5716)	1.29	10 for 1.30
☐	40-POWER RESISTORS, assorted types, includes 2 to 10 watters, (#228)	1.29	80 for 1.30
☐	40-TWO WATT RESISTORS, carbo-films, carbons, some 5%ers, (#456)	1.29	80 for 1.30
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☐	1-WATCH GUTS, LED, who knows how good, micro-digital bonanza, (#5115)	1.29	2 for 1.30
☐	10-1000V 1A RECTIFIERS, 1N4007, epoxy case, axial leads, (#5926)	1.29	20 for 1.30
☐	3-MULTI-DIGIT LED READOUTS, bubble magnifier, 2 to 6 digits, (#3624)	1.29	10 for 1.30
☐	10-POWER TAB TRANSISTORS, NPN, plastic, TO-220, (#5629)	1.29	20 for 1.30
☐	6-PRECISION TRIM POTS, asst'd singles and multi-turns, untested, (#3389)	1.29	12 for 1.30
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☐	10-SLIDE SWITCHES, SPST, SPDT, etc. all shapes and sizes, (#5927)	1.29	20 for 1.30
☐	25-DTL's, 100% prime, asst'd flip flops, etc., marked, (#3709)	1.29	50 for 1.30
☐	4-HOBBY OPTO COUPLERS, 1500 VOLT ISOLATION, U-test, (#2629A)	1.29	8 for 1.30
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☐	5-PL-55 PHONE JACKS, standard bushing, for hams, communications, (#5868)	1.29	10 for 1.30
☐	40-RED DEVIL CAPACITORS, handy assort. of pop. values, axial leads, (#3823)	1.29	80 for 1.30
☐	50-MICAS asst. sizes-n-shapes. incl. "silvers" too! (#373)	1.29	100 for 1.30
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☐	10-MODULAR SWITCHES, Centralab "push-on" type, up to 8PDT, (#3150)	1.29	20 for 1.30
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☐	2-HEAVY DUTY LINE CORDS, 8 ft., 2 cond., 18 gauge, black insulation, (#5803)	1.29	4 for 1.30
☐	10-LED SOCKETS, "snap-in" minis, for LEDS, and transistors, too! (#5745)	1.29	20 for 1.30
☐	10-MV-54 MICRO-MINI LEDS, flat top style, diffused red lens, (#1789)	1.29	20 for 1.30
☐	30-WIRE NUTS, twist-on's, for #20-24 gauge wire, (#3724)	1.29	60 for 1.30
☐	2-ALUM. HEAT SINKS, 2¼"x3", for power tabs, innumerable uses, (#5338)	1.29	4 for 1.30
☐	1-"MICRO MINI" METER, ½" dia. 0-1 basic movement (#5858)	1.29	2 for 1.30
☐	2-DOUBLE-SIDED PC BOARDS, 3"x12" high quality G-10 glass, (#5694)	1.29	4 for 1.30
☐	60-TUBULAR CAPACITORS, asst'd 100mmf to .1mf to 600 WVDC, (#3SA219)	1.29	120 for 1.30
☐	6-MICRO MINI REED SWITCHES, 1" long, for alarms, relays, etc., (#1258)	1.29	12 for 1.30
☐	10-TANTELUM ELECTROS, asst'd mini, axial, hermetically sealed, (#5848)	1.29	20 for 1.30
☐	50-DISC TYPE CAPS, incl; NPO, hi-Q, mylar, ceramics, asst'd values, (#437)	1.29	100 for 1.30
☐	60-COILS & CHOKES, asst'd RF, OSC, IF, parasitic types, (#3SA297)	1.29	120 for 1.30
☐	6-SWITCHCRAFT PHONO JACKS, hi-Q, chasis mount, teflon base, (#5719)	1.29	12 for 1.30
☐	1-TO-3 HEAT SINK, heavy duty aluminum, prepunched for TO-3, (#4083)	1.29	2 for 1.30
☐	65-MOLEX SOCKETS, "on-a-strip", for multiple pin dips, (#1609)	1.29	130 for 1.30
☐	6-PAIRS 9V BATTERY CLIPS, w/red & black color-coded leads, (#2852)	1.29	12 for 1.30
☐	1-UHF TUNER, 3 gang, uhf TV unit, 300 ohm, pos. direct drive, (#2927)	1.29	2 for 1.30
☐	15-HUMBUCKER CONTROLS, assorted values, manufacturers dump, (#3807)	1.29	30 for 1.30
☐	30-SUBMINI IF TRANSFORMERS, slug tuned, shielded, (#3SA9)	1.29	60 for 1.30
☐	40-ADJUSTABLE FERRITE CORES, center cut for hex adjust, (#5701)	1.29	80 for 1.30
☐	3-1.5V MINI LAMPS, only 3/32" dia., draws 15mA, w/1" wire leads, (#5693)	1.29	6 for 1.30
☐	30-FT. WIRE-WRAP WIRE, 30 guage, insulated, continuous length, (#3803)	1.29	60 for 1.30
☐	4-MONO TAPE HEADS, may incl; cassette, 8-track, reel to reel too! (#5789)	1.29	8 for 1.30
☐	5-DUAL DIGIT "BUBBLE" READOUTS, HP5082 style, red, dip type (#5748)	1.29	10 for 1.30
☐	40-METAL & PLASTIC TRANSISTORS, asst'd sizes (#1965)	1.29	80 for 1.30
☐	2-HI PWR. TRANSISTORS, Motorola type, MJ3201, NPN 15W, TO-66, (#2797)	1.29	4 for 1.30
☐	60-GERM. GLASS DIODES, similar to 1N34, axial leads, untested, (#642)	1.29	120 for 1.30
☐	40-1N914 SWITCHING DIODES, silicon, 4nS, glass, untested, (#143)	1.29	80 for 1.30
☐	4-AM/FM VARIABLE COND., 2 bands, "poly-con" ¾" square, (#2924)	1.29	8 for 1.30
☐	3-MICRO SWITCHES, SPST, NO contacts, plunger style, solder tabs, (#5785)	1.29	6 for 1.30
☐	10-MULTI-GANG POTS, audio 2 gangs and up, asst'd types and values, (#5326)	1.29	20 for 1.30
☐	10-MAN-3's, 7 segment, w/bubble magnifier, 100% material, (#3842)	1.29	20 for 1.30
☐	3-PL-259 COAX PLUG, mates to SO-239, Amphenol, (#5221)	1.29	6 for 1.30
☐	1-LITE SENSITIVE UNIJUNCTION TRANSISTOR, programmable, (#5719)	1.29	2 for 1.30

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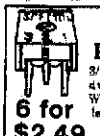

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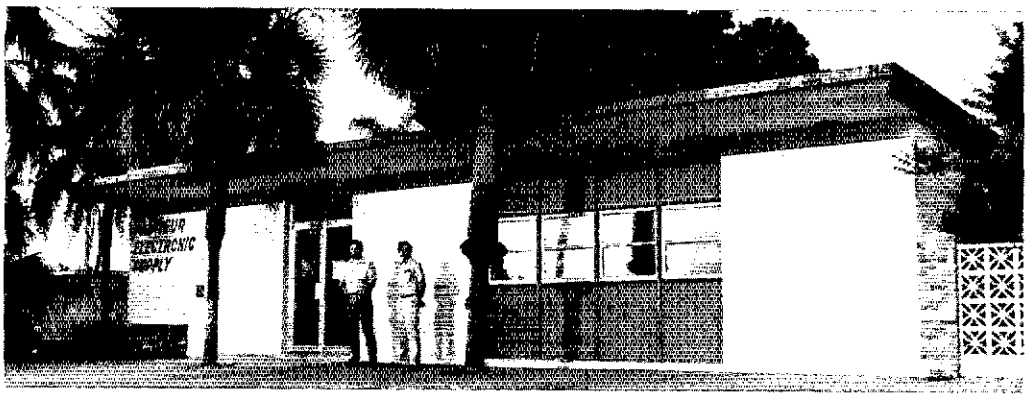

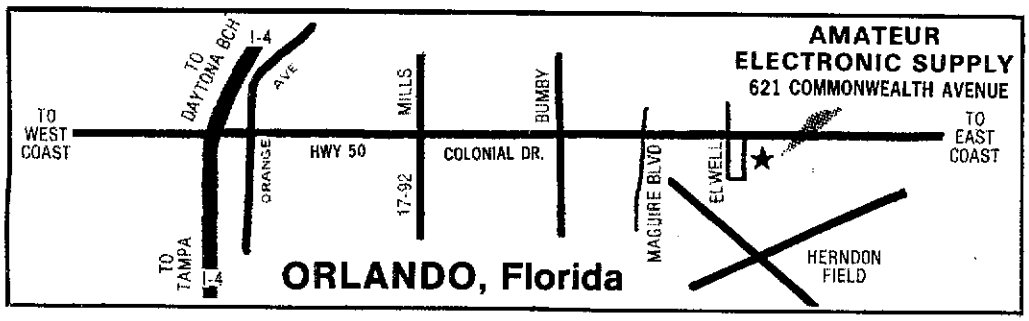

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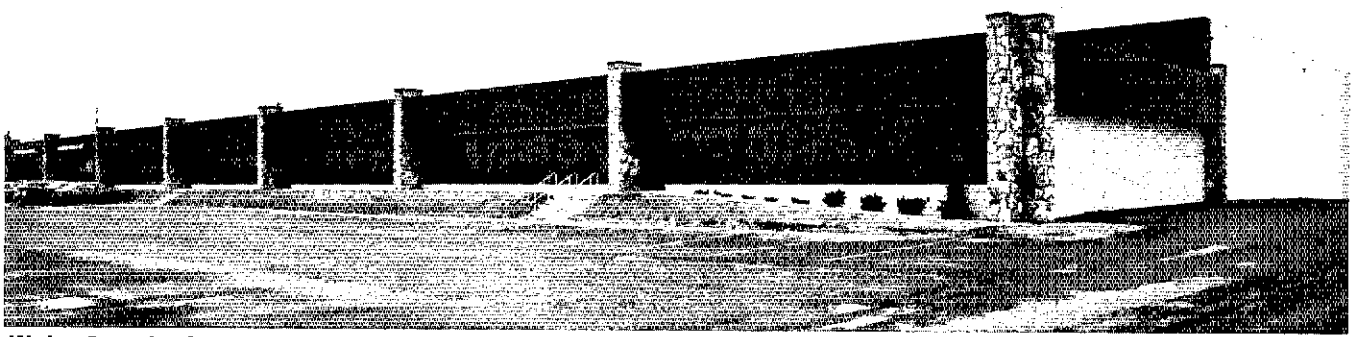

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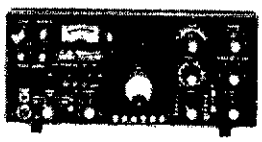

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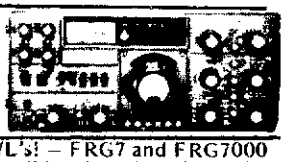

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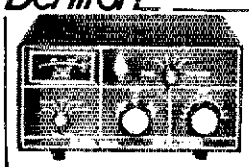

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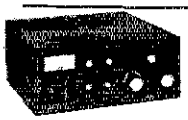

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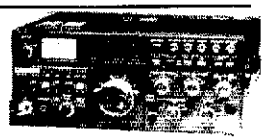

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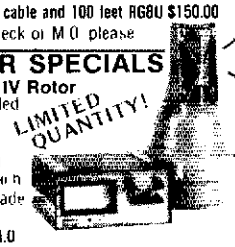

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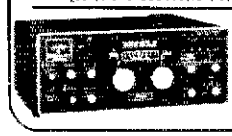

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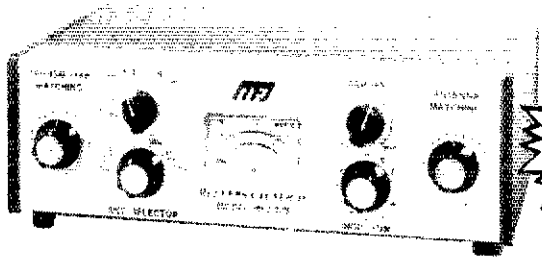

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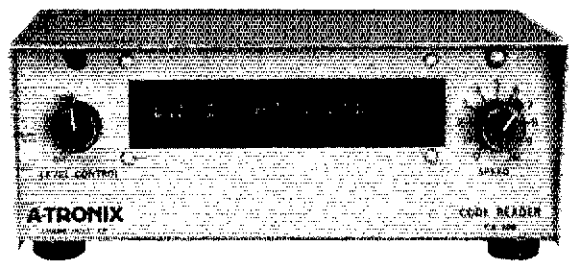

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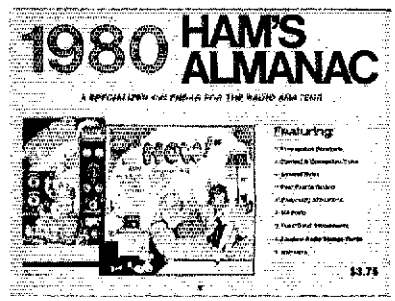

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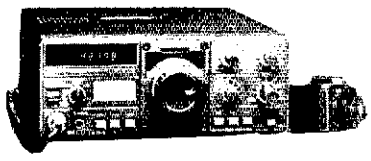

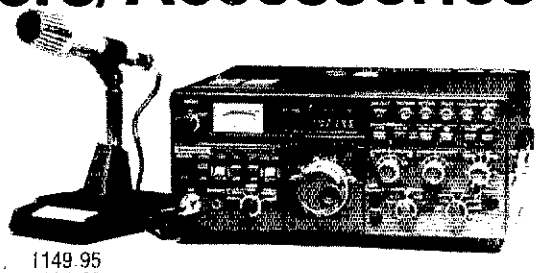

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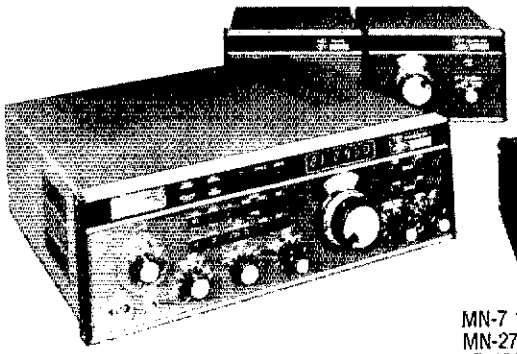

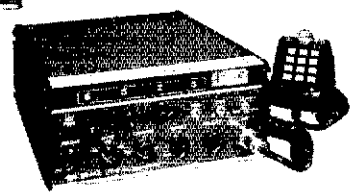

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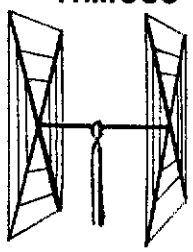

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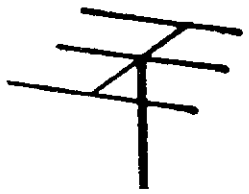

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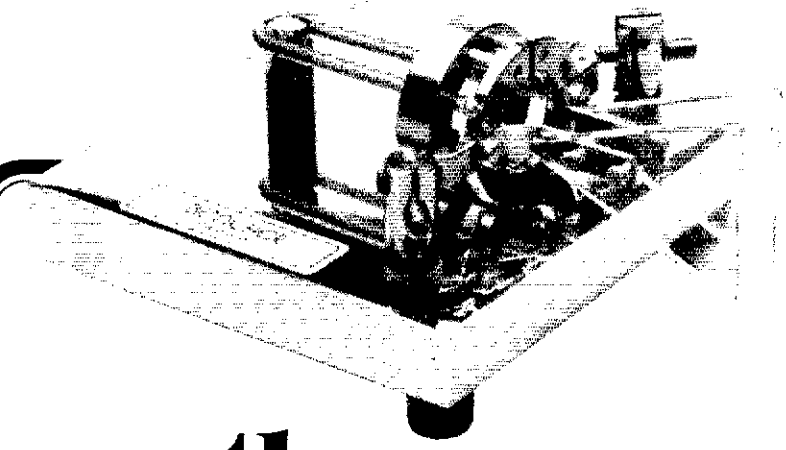

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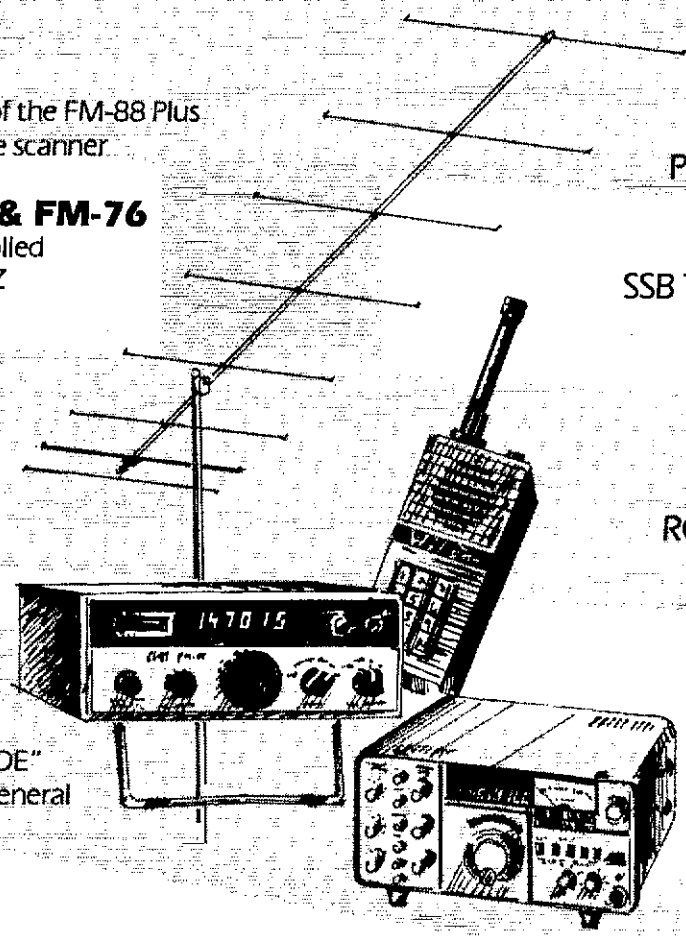

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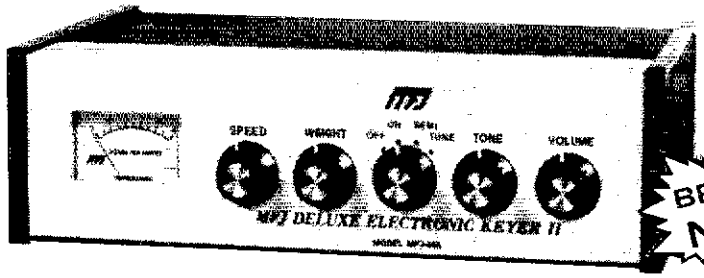

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The RFE-100 is housed in a 1.5"H x 7"W x 6"D cabinet and operated on 117220 VAC 60 Hz or 13.8 VCD, for fixed or mobile operation. The frequency displays are incandescent 7 segment display modules with a 700 ft. lambert per segment light output through a polarized filter. This display brightness is many times brighter than LED displays and allows easy reading even in high ambient light levels encountered during mobile or field operations. Installation is quite simple and is accomplished on the Drake C line, Collins S line, and the new Kenwood TS520S with no modification necessary. Just plug the RFE-100 display in. A simple installation kit is provided for the Kenwood TS520 and Drake B line. State-of-the-art is yours at reasonable cost. Price $189.95 plus $3.00 shipping. Calif. residents add 6% sales tax.

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* No Bandswitching.
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* Black or gray Cover (please specify).
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RG-8X	1 ft. .22	1 ft. .18
CUSHCRAFT ANTENNAS		
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A-147-20T	62.95	47.21
A-147-22	109.95	82.46
ARX-2	39.95	29.00
A-147-VPK	36.95	27.71
ATV-4	89.95	65.10
ATV-5	109.95	79.47
ATB-34	289.95	217.46
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MLA-2500B	999.00	824.00
Clipperton-L	699.50	577.00
GLA-1000	379.00	295.00
MT-3000A	349.00	289.00
MT-2000	199.00	168.00
AF-1	199.00	149.00
RL DRAKE		
MS-7	36.00	
SL-300	32.00	
SL-500	52.00	
1525EM	49.95	
L-7	1,099.00	
MN-7	165.00	
MN-2700	279.00	
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DL-1000	49.95	
FA-7	25.00	
TR-7 DR-7	1,395.00	
NB-7	90.00	

	List	Special
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PS-7	249.00	
PS-3	89.95	
UV-3	995.00	
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S-1T	399.00	338.00
TS-CC	16.00	14.00
TS-HA	8.00	7.00
VHF-One Plus	399.00	309.00
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IC-280	455.00	346.00
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PSU-S	179.00	147.00
1200Z	499.00	411.00
ST-3	169.00	140.00
TAYLOR		
All Mobile 2 Meter Antennas		$19.00

	List	Special
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546	1,119.00	923.00
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FT-101ZD	895.00	739.00
FT-7B	675.00	556.00
FT-202R	199.00	169.00
FT-207R	399.00	359.00
FT-225RD	895.00	739.00
FT-227RB	425.00	349.00
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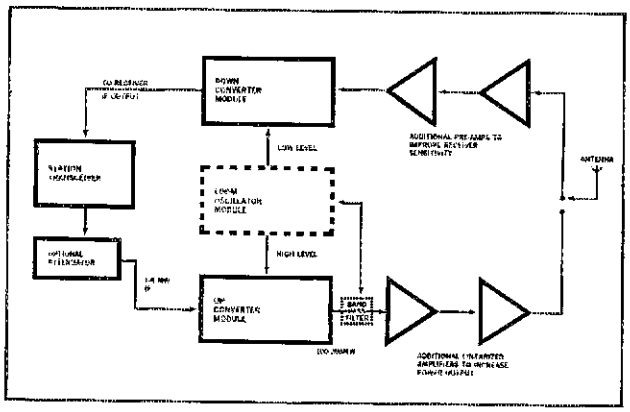
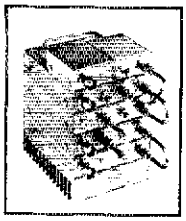
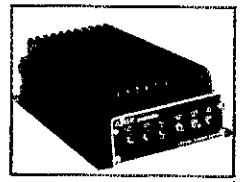


HERE AT LAST - modules for transverter system development. Lunar's line of modules allow complete system flexibility in achieving multi-band VHF/UHF state-of-the-art capability. By combining appropriate modules, EME capability is readily achieved. The 100% successful K6LEW 144 MHz DX-peditions to Delaware & West Virginia in Fall '79 attest to the module's capability. Converter NF of 1.6 dB and overall NF of 1.3 dB with preamp gave outstanding copy of EME signals using just four antennae. The basic system is the Downconverter module and the Upconverter module selected to suit your IF requirement. Adding the appropriate Local Oscillator/Filter module puts you on the desired band. Changing LO modules changes bands - thus retaining the converter modules. The basic system yields approx 6 dB DSB NF and 200 mW RF output (1-5 mW drive at IF). Adding preamps to receive side will yield desired NF, while adding power amplifiers on output will yield desired power level. Filters utilize microwave techniques, including printed capacitors. The LO modules are dual frequency with IC oscillator/multiplier stage, .001% crystals for maximum stability and dual output power levels for both low and high level mixers. The LO outputs are filtered and all non-desired signals are less than -50 dB below LO. Downconverter uses broadband DBM with an integral low noise preamp stage and bandpass filter. The Upconverter use a high level DBM and a broadband linear 30 dB gain module yielding 200 mW ***linear*** output, with 1-5 mW drive at IF required. System interconnects utilize high quality SMA-type connectors, while input/output to your system are BNC. Power amplifier modules due in early '80 boost the 200 mW to readily desired levels.



Availability listing for modules:
*1 qtr '80; **late 1 qtr '80; ***2 qtr '80
Downconverter Modules:
(specify IF) Model DC-28, DC-50*, DC-144*
Upconverter Modules:
(specify IF) Model UC-28, UC-50*, UC-144*
Local Oscillator Modules:
(specify output band/IF) Models:
LO-50/28, LO-144/28, LO-144/50*
(single freq models)
LO-144/28/2; LO-220/28/2; LO-432/28/2;
LO-144/50/2*; LO-220/50/2*; LO-220/144/2**;
LO-432/50/2**; LO-432/220/2***



Power Amplifiers Modules:
10 W PEP output from 200 mW UC module for each band — these modules due 2nd qtr '80

Attenuator:
Model AT-33; 33 dB 10W attenuator for reducing 10W rigs to 5 mW IF level.

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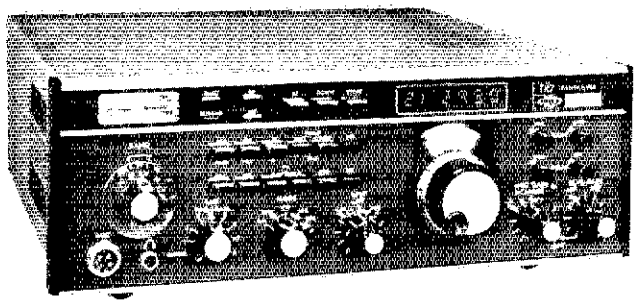

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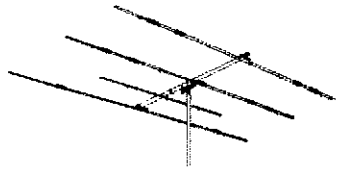

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TH3JR	3 el. 10-15-20M beam	189.95	139.95	14AVQ/WB	40-10M Trap vertical	69.95	57.00
Hy-Quad	2 el. 10-15-20M Quad	274.95	219.95	12AVQ	20-10M Trap Vertical	42.95	34.95
205BA	5 el. "Long John" 20M beam	329.95	259.95	14RMQ	Roof Mounting kit (verticals)	33.95	29.95
155BA	5 el. "Long John" 15M beam	199.95	159.95	5BDQ	80-10M Trap doublet	109.95	89.95
105BA	5 el. "Long John" 10M beam	129.95	109.95	2BDQ	80-40M Trap doublet	59.95	48.95
204BA	4 el. 20M beam	249.95	199.95	66B	6 el. 6M beam	119.95	99.95
204MK5	5 el. conversion kit	99.95	79.95	203	3 el. 2M beam	15.95	
153BA	3 el. 15M beam	89.95	79.95	205	5 el. 2M beam	21.95	
103BA	3 el. 10M beam	74.95	59.95	208	8 el. 2M beam	29.95	
402BA	2 el. 40M beam	239.95	189.95	214	14 el. 2M beam	34.95	
BN-86	Balun for beam antennas	15.95	16.95	LA-1	Deluxe lightning arrestor	59.95	49.95
TH2MK3	2 el. 10-15-20M beam	149.95	119.95	TH5DX		269.95	209.95

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		Regular	Special
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TA-36	6 el. 10, 15, 20 Mtr. beam	392.75	249.95
TA-33 Jr.	3 el. 10, 15, 20 Mtr. beam	197.00	149.95
TA-40KR	40 Mtr. Add On	119.95	89.95

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ATB-34	4 ele. 10, 15, 20 Mtr. beam	289.95	219.95	A147-11	11 ele. 146-148 Mhz. beam	36.95	30.95
ATV-4	10, 15, 20, 40 Mtr. Vertical	89.95	69.95	A147-22	22 ele. Power Pack	109.95	89.95
ATV-5	10, 15, 20, 40, 80 Mtr. Vertical	109.95	89.95	A144-10T	2 Mtr. "Twist" 10 ele.	42.95	34.95
ARX-2	2 Mtr. Ringo Ranger	39.95	32.95	A144-20T	2 Mtr. "Twist" 20 ele.	62.95	52.95
AR-6	6 Mtr. Ringo	36.95	32.95	A147-20T	2 Mtr. beam	62.95	52.95
ARX-220	220 Mhz. Ringo Ranger	39.95	32.95	A430-11	432 Mhz. 11 ele. beam	34.95	29.95
ARX-450	435 Mhz. Ringo Ranger	39.95	32.95	A432-20T	430-436 Mhz. Beam	59.95	49.95
A144-11	11 ele. 144-146 Mhz. beam	36.95	30.95				

HUSTLER

3-TBA	3 ele; 10, 15, 20 Mtr. beam	259.95	189.95
4-BTV	10-40 Mtr. Vertical	99.95	79.95
5-BTV	10-80 Mtr. Vertical	134.95	99.95
RM-75	75 Meter Resonator	16.95	14.50
RM-75S	75 Meter Super Resonator	31.95	27.50
G6-144B	2 Mtr. Base Colinear	79.95	59.95
G7-144	2 Mtr. Base Colinear	119.95	89.95

ROTORS

HAM 4 $149.95 T2X Tailtwister $199.95 Alliance HD 73 $109.95
Call for prices on rotor cable, Coax, Towers, and Accessories. All prices do not include shipping.

18HT

We carry all major brands of ham radios AT DISCOUNT PRICES

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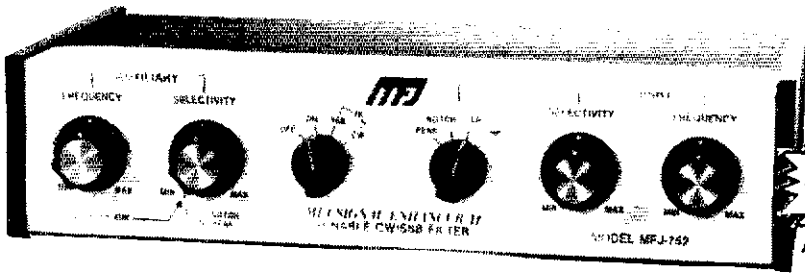
Kenwood — Yaesu — Drake — ICOM — Dentron — Ten-Tec — Swan — Tempo — Midland — E.T.O. — Wilson

NEW MFJ Dual Tunable SSB/CW filter

lets you zero in SSB/CW signal and notch out interfering signal at the same time.



Ham Radio's Most Versatile Filter

BRAND NEW

$79.95

The MFJ-752 Signal Enhancer is a dual tunable SSB/CW active filter system that gives you signal processing performance and flexibility that others can't match.

For example, you can select the optimum Primary Filter mode for an SSB signal, zero in with the frequency control and adjust the bandwidth for best response. Then with the Auxiliary Filter notch out an interfering heterodyne . . . or peak the desired signal.

For CW, peak both Primary and Auxiliary Filters for narrow bandwidth to give skirt selectivity that others can't touch. Or use Auxiliary Filter to notch out a nearby QSO.

The Primary Filter lets you peak, notch, low-pass, or highpass signals with double tuned filter for extra steep skirts. The **Auxiliary Filter** lets you notch a signal to 70 db. Or peak one with a bandwidth down to 40 Hz.

Tune both Primary and Auxiliary Filters from 300 to 3000 Hz. Vary the bandwidth from 40 Hz to almost flat. Notch depth to 70 db.

MFJ has solved problems that plague other tunable filters to give you a constant output as a bandwidth is varied. And a linear frequency control. And a notch filter that is tighter and smoother for a more effective notch.

Works with any rig. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs.

Switchable noise limiter for impulse noise; trough clipper removes background noise.

Simulated stereo feature for CW lets ears and brain reject QRM. Yet off frequency calls can be heard.

Speaker and phone jacks. Speaker is disabled by phones. OFF bypasses filter. 110 VAC or 9 to 18 VDC, 300 ma. 10x2x6 inches.

Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

The MFJ-752 carries a full one year unconditional guarantee.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for a refund (less shipping).

To order, simply call us toll free 800-647-1800 and charge it on your VISA or Master Charge or mail us a check or money order for $79.95 plus $3.00 for shipping/handling.

Don't wait any longer to use Ham Radio's most versatile filter. Order your MFJ Dual Tunable SSB/CW Filter at no obligation, today.

MFJ ENTERPRISES, INC.
P. O. BOX 494
MISSISSIPPI STATE, MS 39762
CALL TOLL FREE 800-647-1800
For technical information, order/repair status, in Miss., outside continental USA, call 601-323-5869.

Why pay retail when you can get dealer prices?

Here's a straight offer. Place your antenna and rotator order with Long Path. We'll ship your order the same day we receive it provided the items are in stock. And, you'll be quoted the lowest prices around. In fact, most of the time, we sell at the same price your local dealer buys his antennas and rotators for.

Sound too good to be true? Take a look at a few examples:

HYGAIN		CDE	
TH6 DXX	*— $219.00*	*HAM IV*	*— $141.00*
TH3 MK3	*— $153.00*	*TAILTWISTER*	*$199.00*
TH2 MK3	*— $ 99.00*		
105 BA	*— $ 86.00*	**CUSHCRAFT**	
155 BA	*— $133.00*		
205 BA	*— $219.00*	*ATB-34*	*— $217.00*
204 BA	*— $166.00*	*ATV-4*	*— $ 65.00*
402 BA	*— $159.00*	*ATV-5*	*— $ 79.00*
14AVQ/WB	*— $ 46.00*	*BOOMER*	*— $ 67.00*
18AVT/WB	*— $ 70.00*		

Convinced? All items F.O.B. Dallas. Call 8:30 to 5:00, Monday through Friday. 1-214-369-3401. Ask for Long Path Radio.

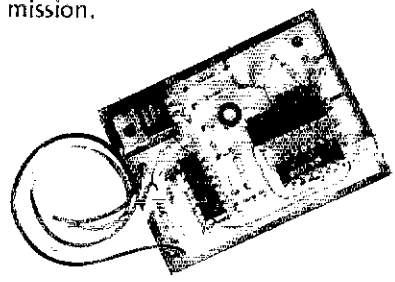
LONG PATH RADIO, INC.

P.O. Box 29682 • Dallas, Texas • 75229 • 1-214-369-3401

Cashier's Check, money order, traveler's checks accepted. C.O.D. with 25% deposit

PROUD OF YOUR CALL? . . WORRIED ABOUT THEFT?

Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

WARRANTY
Returnable for full refund within ten day trial period. One year for repair or replacement.

PRICE $39.95 Ppd
+$2.40 for CA address

Your call sign programmed at factory, please be sure to state call sign when ordering.

Inquire about commercial models.

AUTOCODE
8116 Glider Avenue, Dept. Q
Los Angeles, CA 90045
(213) 645-1892

The World's biggest SALE of Bearcat® scanners!

Communications Electronics,™ the world's largest distributor of radio scanners, celebrates the Electra introduction of four new *Bearcat* brand monitors with the world's largest scanner sale. From now, until January 31, 1980, you can save hundreds of dollars during the world's largest scanner sale!

Even the new *Bearcat* models 300, 220 and Eight Track scanners are on sale. If you've previously purchased a *Bearcat* scanner, then you *already* know you're getting all the real, live excitement that a television program or newspaper can't provide. If you don't have at least one *Bearcat* scanner, the time to buy is now!

Since **CE** distributes more scanners worldwide than *anyone* else, we can give you rock bottom prices. Our warehouse facilities are equipped to process over 1,000 *Bearcat* scanner orders per week and our order lines are always staffed 24 hours. We also export *Bearcat* scanners to more than 300 countries and military installations. Almost all items are **in stock** for **immediate shipment**, so **save now** and get a *Bearcat* scanner during the ***world's largest*** scanner sale!

NEW! Bearcat® 300

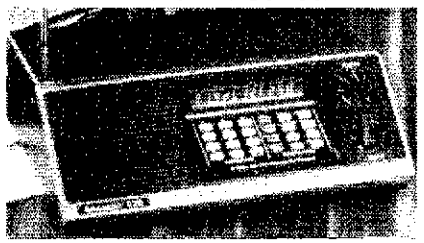
Available February - March, 1980
List price $499.95/**CE price $329.00**
7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC
Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.
The new *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. Since the *Bearcat* 300 has over 2,100 active frequencies in memory, you can touch one button and search any of many preprogrammed services such as police, fire, marine and government. Of course, you still can program your own frequencies and monitor up to 50 channels at once. Since the *Bearcat* 300 uses a bright green fluorescent digital display, it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search. Reserve your *Bearcat* 300 now for February -March, 1980 delivery.

Bearcat® 250

List price $399.95/**CE price $259.00**
50 Channels • Crystalless • Searches Stores • Recalls • Self-Destruct • Priority channel • 50 Channel • 6-Band.
Frequency range 32-60, 146-174, 420-512 MHz.
The *Bearcat* 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the *Bearcat* 250 actually stores 64 frequencies, and recalls them, one at a time, at your convenience. Automatic "count" remembers how often frequencies are activated by transmission—so you know where the action is. Decimal display shows the channel, frequency and other programmed features. The priority feature samples your programmed frequency every two seconds. Plus, a digital clock shows the time at the touch of a button. The *Bearcat* 250. Scanning like you've never seen or heard before.

NEW! 50-Channel Bearcat 300

NEW! Aircraft Bearcat 220



Aircraft Bearcat® 220

List price $399.95/**CE price $259.00**
Aircraft and public service monitor. *Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.*
The *Bearcat* 220 is one scanner which can monitor all public service bands plus the exciting AM aircraft band channels. Up to twenty frequencies may be scanned at the same time.

Not only does this new scanner feature normal search operation, where frequency limits are set and the scanner searches between your programmed parameters, it also searches marine or aircraft frequencies by pressing a single button. These frequencies are already stored in memory so no reprogramming is required. The *Bearcat* 220 also features a Priority channel, Dual scanning speeds, Patented track tuning and Direct channel access and AC/DC operation.

NEW! Bearcat® 211

List price $339.95/**CE price $229.00**
Frequency range: 32-50, 146-174, 420-512 MHz.
The *Bearcat* 211. It's an evolutionary explosion of features and function. 18-channel monitoring. With no-crystal six-band coverage. Dual scan speeds. Color-coded keyboard. Even a digital clock. All at a modest price. More scanning excitement than you bargained for.

Bearcat® 210

List price $299.95/**CE price $199.00**
10 Channels • 5 Bands • Crystalless
Frequency range: 30-50, 146-174, 420-512 MHz.
Use the simple keyboard to select the 10 channels to be scanned. Automatic search finds new frequencies. The 210 features patented selectable scan delay, push button lockout, single antenna, patented track tuning, AC/DC operation. With no crystals to buy. Ever!

NEW! Bearcat® 8 Track

List price $99.95/**CE price $79.00**
4 Channels • 2 Bands • Plays off any AC or DC Powered 8 Track Tape Player.
Frequency range: 36-44, 152-162 MHz.
The *Bearcat* 8 Track Scanner. It converts any 8 track tape player into a live-action scanning radio.

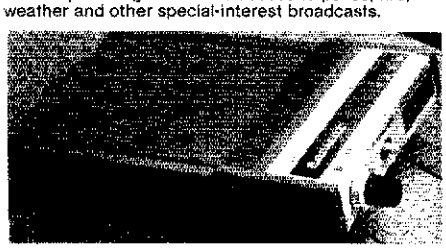
This incredibly compact 4-channel/2-band crystal scanner plugs into the tape player where an 8 track cartridge normally goes. Police, fire, emergency calls—as-it-happens scanning excitement—from an existing home entertainment center, in-car/in-boat system or portable 8 track tape player. The *Bearcat* 8 Track Scanner plugs live-action into any 8 track player. Anywhere. Crystal certificates # **A-135cc** are $4.00 each.

Bearcat® Four-Six

List price $169.95/**CE price $109.00**
The first 4 Band, 6 Channel, Hand-Held Scanner.
Frequency range: 33-47, 152-164, 450-512 MHz.
The *Bearcat* Four-Six offers "hip pocket" access to police, fire, weather and special interest public service broadcasts. Lightweight. Extremely compact. The *Bearcat* Four-Six—with its popular "rubber ducky" antenna and belt clip—provides "go anywhere/hands-off" scanning.

NEW! Aircraft and UHF Bearcat® ThinScan™

List price $149.95/**CE price $99.00**
World's smallest scanner!
The *Bearcat* ThinScan.™ High-performance scanning has never been this portable. There are **now three models** available. The **BC 2-4 L/H** receives 33-44 and 152-164 MHz. The **BC 2-4 H/U** receives 152-164 and 450-508 MHz. The new high-performance Aircraft ThinScan model **BC 2-4 AC** receives 118-136 and 450-470 MHz. Go ahead, size it up. The *Bearcat* ThinScan™ measures 2¾" across. Just 1" deep. And 5⅝" high. Four crystal-controlled channels are scanned every ½ second providing immediate access to police, fire, weather and other special-interest broadcasts.



NEW! Bearcat 8 Track scanner

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your *Bearcat* scanner, it is essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna. Order **#A63** is a ¾ inch hole mount. Order **#A64** is a ⅜ inch snap-in mount, and **#A70** is an all band base station antenna. All antennas are $25.00 and $3.00 for UPS shipping in the continental United States.

OTHER BEARCAT ACCESSORIES

SP50 AC Adapter $12.00
SP51 Battery Charger $12.00
SP55 Carrying Case for Four-Six $15.00
SP57 Carrying Case for ThinScan $15.00
SM210 Service manual for *Bearcat* 210 ..... $15.00
SM220 Service manual for *Bearcat* 220 ..... $15.00
SM250 Service manual for *Bearcat* 250 ..... $15.00
B-31.2 V AA Ni-Cad's for Four-Six (Pack of 4) $15.00
B-41.2 V AAA Ni-Cad's for ThinScan (Pack of 4).... $15.00
B-5 Replacement memory battery for Bearcat 210 .... $5.00
A-135cc Crystal certificate $4.00
Add $3.00 shipping for all accessories ordered at the same time.

TEST A BEARCAT SCANNER FREE

Test any *Bearcat* brand scanner purchased from **Communications Electronics**™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in new condition with all parts in 31 days, for a courteous and prompt refund (less shipping and handling charges).

MADE BY ELECTRA

Since all *Bearcat* scanners are products of Electra Company, a Division of Masco Corporation of Indiana, you can be assured of the finest monitor radios available in the world. With your *Bearcat* scanner, you will receive a complete set of simple operating instructions and a one-year limited warranty from Electra. If service is ever required for any *Bearcat* scanner just send your receiver to an Electra national service center.

BUY WITH CONFIDENCE

All *Bearcat* scanners are extraordinary scanning instruments. They provide virtually any scanning function that the most professional monitor could require. To ***get the fastest delivery from CE*** of any *Bearcat* scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 30 billing. All sales are subject to availability. All sales on accessories are final. Prices and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. International orders are invited with a $10.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Cashier's checks will be processed immediately and receive an order priority number. Personal checks require three weeks bank clearance.

Mail orders to: **Communications Electronics,**™ Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $5.00 per scanner for U.P.S. *ground* shipping, $9.00 for faster U.P.S. *air* shipping or $30.00 for *overnight delivery* to most major U.S.cities via Federal Express or Airborne Air Freight. If you have a Master Charge or Visa card, you may call anytime and place a credit card order. **Order toll free** 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. You may also order via TWX 810-223-2400. **Dealer inquiries invited.** All order lines at **Communications Electronics**™ are staffed 24 hours.

Since this ***multi-million dollar scanner sale*** is the world's largest, please order today at no obligation to assure a prompt order confirmation and delivery.

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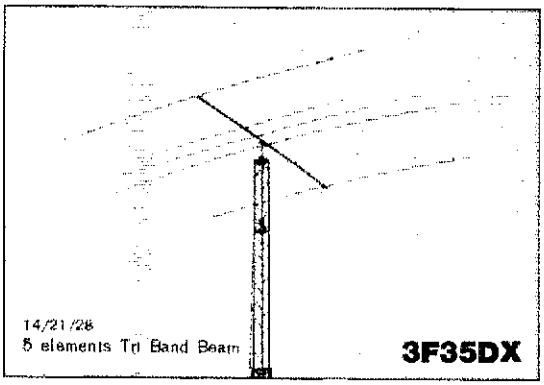
ANTENNA SYSTEMS

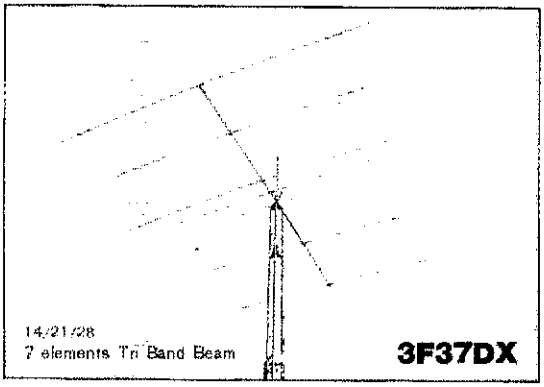
Multi Band Beam Super DX Series

These beams employ a hybrid system which is a combination of separate full-size driven elements for each individual band and Hi-Q-trap parasitic elements. These features result in high radiation-efficiency, high power-rating, and excellent VSWR over the entire bandwidth.



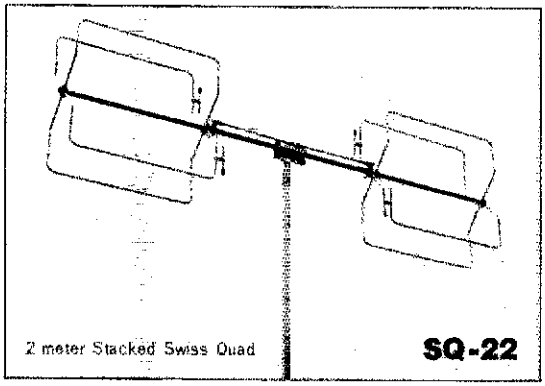
14/21/28
5 elements Tri Band Beam

3F35DX



14/21/28
7 elements Tri Band Beam

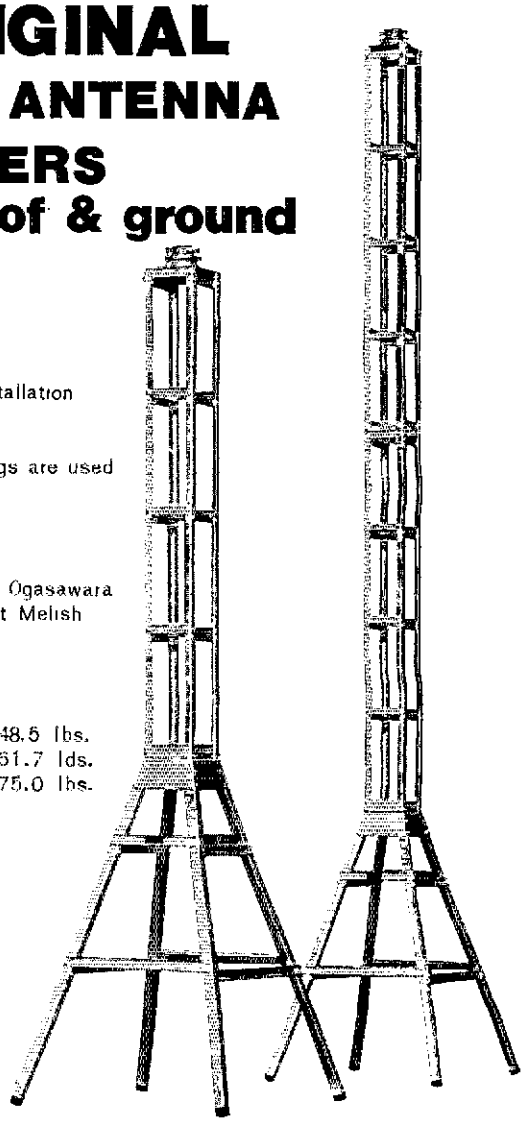
3F37DX



2 meter Stacked Swiss Quad

SQ-22

TET ORIGINAL
MODULAR ANTENNA TOWERS
Ideal for roof & ground mounts

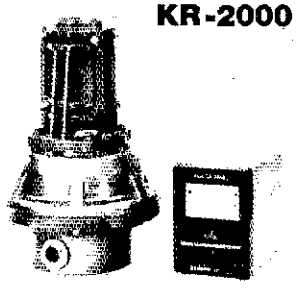


- one man assembly and installation
- Light weight
- High quality aluminum alloy
- High stability (square tubings are used as base section)

Has been used by JD1YAH at Ogasawara island and DX peditionning at Melish Reef (VK9ZR)

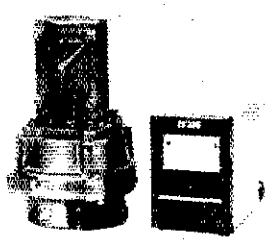
Model	TE-35A	11.6ft.	48.5 lbs.
Model	TE-55B	18.0ft.	61.7 lds.
Model	TE-750	25.0ft.	75.0 lbs.

KR-2000



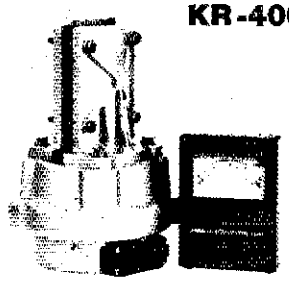
KR 2000—Designed for 360° rotation. Brake holds up to 10,000kg/cm (8680lbs/inch) torque.

KR-600



KR 600—Designed for360° rotation. Brake holds up to 4000 kg/cm (3470 lbs/inch) torque.

KR-400



KR 400—Designed for 360° rotation. Rated to support up to 200 kg or 440lbs. Read out tolerance ±5 degree max

KR-500

KR 500—Designed for 180° rotation. Brake holds up to 2000 kg/cm (1750 lbs/inch) torque.

425 Highland Parkway, Norman, Oklahoma 73069
Tel. (405) 360—6410

TET U.S.A., INC.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 70 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" × 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*.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A 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 respond appropriately to customer complaints and 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 character 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. Any currently licensed Amateur who was first licensed 25 or more years ago is eligible for membership. Members receive a membership call book and quarterly news. Write Q.C.W.A. Inc. 1409 Cooper Dr., Irving TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAO/6 Box 530, Santa Rosa CA 95402.

YAESU Equipment owners — present or prospective — join the eight-year-old, 4000-member, 45-country, international Fox-Tango Club. Members receive valuable monthly newsletter, money-saving purchasing service, technical committee consultation, free ads, FT Net, more. Back issues of newsletter available from 1972. To join, send $6 for calendar year (includes only 1979 issues of newsletter) or $1 creditable towards dues, for complete information and sample newsletter. N4ML, Box 15944 W. Palm Beach FL 33406.

ICOM-701 International User's Club is now operational. S.a.s.e. for details. N8RT, Rob Pohorence, 9600 Kickapoo Pass, Streetsboro, OH 44240.

QST and CQ 1950-1975 issues for sale. Send s.a.s.e. if ordering 73, Ham Radio, or other QST and CQ issues. One dollar minimum order and all issues cost 25c each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

INDIANA: South Bend Swap & Shop January 6, 1980 at new Century Center downtown on U.S. 31 Oneway North across from St. Joseph Bank Building. Half acre in one large room at ground level. Food, museum and Art Center in same building. Four lane highways to door from all directions. Talk-in: 52-52 & area Repeaters.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill NY 12198.

DELUXE QSLs. Samples 25c. Petty, W2HAZ, P. O. Box 5237, Trenton NJ 08638.

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.

$2.70 per 100 (1000 order). 30 original two-color styles. 125 cards minimum. We ship 2 weeks after your check clears or you may have your money back! Satisfaction guaranteed. Send 30c stamps for catalog. VP5QED Press, Box 1523-Boca Raton, FL 33432.

DISPLAY and protect your QSLs with 20 frame plastic holders. Seven for $3.00 prepaid. TEPABCO, Box 1987, Gallatin TN 37066.

FREE Samples — Stamp appreciated. Samcards. 48 Monte Carlo Dr., Pittsburgh, PA 15239.

CUSTOM printed and photo QSLs, very economical; free samples. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778, 516-744-6260.

QSLs, Catalog 45c N & S Print, P. O. Box 11184 Phoenix AZ 85061.

QSLs with class! Unbeatable quality, reasonable price. Samples, 50c refundable. QSLs Unlimited, P. O. Box 27553, Atlanta, Georgia 30327

Conley Radio Supply

for the Best Buys in Christmas Gifts

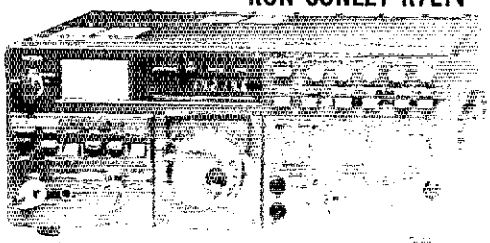
FIVE REASONS YOU SHOULD BUY FROM CONLEY RADIO SUPPLY

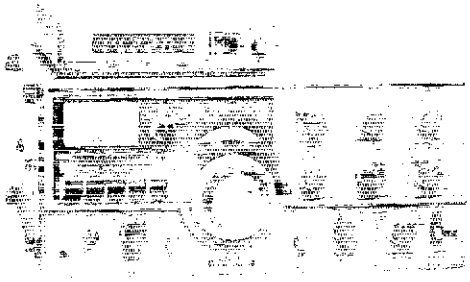
1. Large stocks for immediate shipment.
2. **No Sales Tax** in Montana. If you are buying in a state with sales tax, you are paying too much.
3. Qualified, friendly hams in the sales/service department to answer your questions or help you with an order.
4. On a cash quote, we will do our best NOT to be undersold.
5. With my own name on the door, I will personally back up any problem or question you may have.

—RON CONLEY K7LTV

CONLEY RADIO IS THE "NUMBER ONE" OUTLET IN THE NORTHWEST WITH A FULL LINE OF TOP QUALITY EQUIPMENT IN STOCK FOR IMMEDIATE SHIPMENT.

• KENWOOD TS-120S H.F. TRANSCEIVER LIST PRICE $699.95 CALL FOR QUOTE





• KENWOOD TS-180S/WITH DFC H.F. TRANSCEIVER $1149.95 CALL FOR QUOTE

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General

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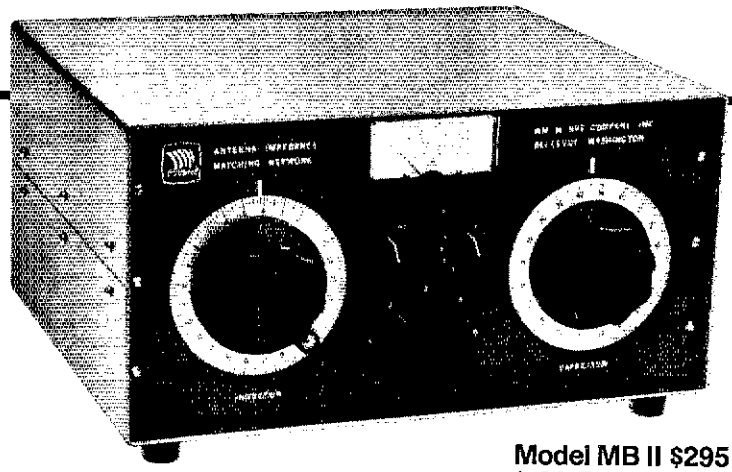
HIGH powered linears. Have two Marconi broad band amplifiers model AN/SRA-502A excess 1kW output, requires no tuning, maybe remotely located. Will crate and ship for $750. each. Have Plessey model PVT-150B ssb transmitter, 1kW output. Easily converted to high powered autotune linear. Will crate and ship for $500. Max Powell, Jr., VO1HH, P. O. Box 500, Carbonear, Nfld., Canada A0A 1T0

WANTED: Swan Model 508 external VFO and Model



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Model MB II $295
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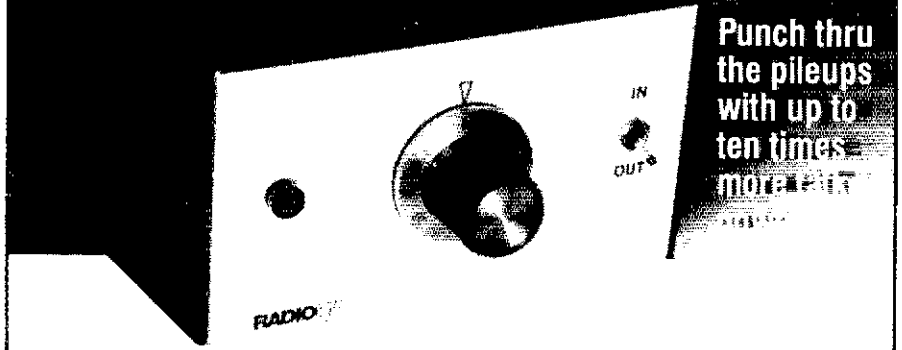
SPLIT-BAND SPEECH PROCESSOR KIT



The new DX-1 Speech Processor Kit features split-band speech processing — a new technique more effective than rf clipping that offers high performance with low distortion; described by N7WS in the September issue of *Ham Radio*. The DX-1 provides up to 15 dB increase in average talk power with shaped audio response for improved intelligibility, but maintains your natural voice quality. Installs simply between your microphone and transmitter.

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TH3MK3: 3 el. Tribander	152.00
TH3JR: Low Power Tribander	113.00
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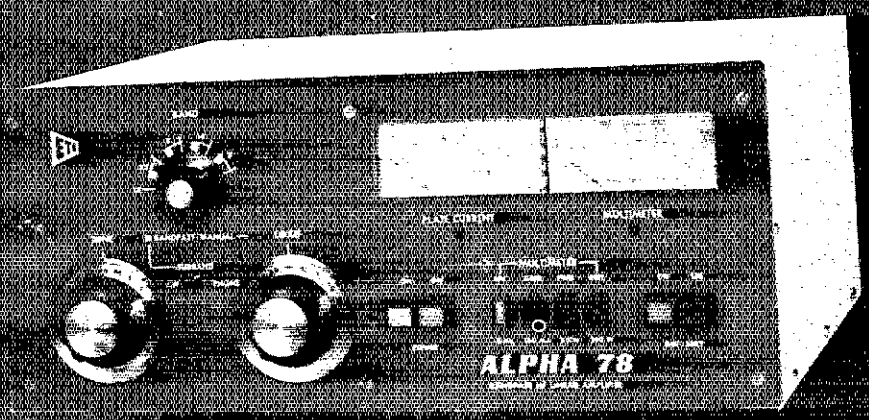

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You can work full CW break-in with the ***ALPHA 78*** (provided your exciter/transceiver's up to it!), using the same vacuum relay high speed QSK system made famous by the "Ultimate Linear" ***ALPHA 77Dx.*** And if new amateur bands are granted, you can manually tune your ***ALPHA*** to work them, too.

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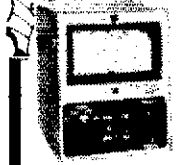
CHRISTMAS SPECIALS!



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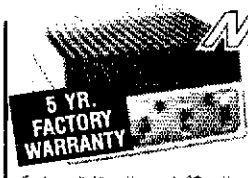

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5 YR. FACTORY WARRANTY
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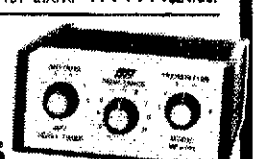

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A220-11	11-element 220-MHz beam $30
A432-11	11-element 432-MHz beam $28
A432-20T	20-element 432-MHz Twist $49
DX120	20-Element 2-mtr EME building block .$44
DXK140	Stacking kit for pair DX120 50

Alliance HD73 Rotor Special $99

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HAM 4 — (New model - 15 ft² rating)	$139
Tailtwister — (Now rated at 30 ft²)	$189
8-Conductor Rotor Cable	$0.15/ft

For a quote on your antenna system or tower needs write or call:

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Open 9 AM to 6 PM Monday thru Saturday
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FK2558	58-ft 25G foldover tower			.$660
FK2568	68-ft 25G foldover tower			.$725
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FK4558	58-ft 45G foldover tower			.$920
FK4568	68-ft 45G foldover tower			.$999

(freight paid on all foldover towers)
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Rohn 20G, 25G, 45G and 55G Prices FOB Peoria, IL. Slightly higher for local shipments. Write or call for quote on $1800 freight paid orders.

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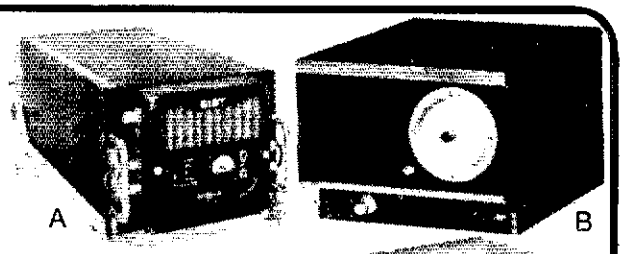

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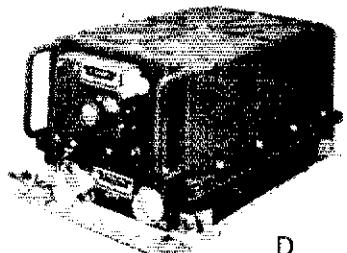

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RATIO EVALUATION SYSTEM

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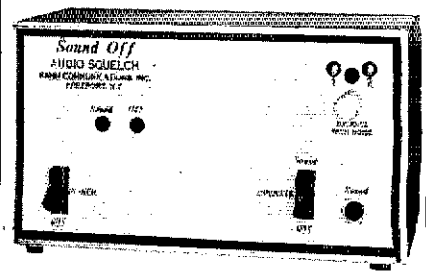

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Co-Dax Keyer	95

Central Electronics
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MM-2 Scope	69
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All Bander	69
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R4 Receiver	289
R4-B Receiver	349
R4-C Receiver	399
MS-4 Speaker	19
2NT Transmitter	125
2NT Transitter	99
TR-6	695
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SX-99 Receiver	79
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HT-37 Transmitter	159
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SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
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SX-111 Receiver	149
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Also Sixer	29
H-10 Monitor	69
VHF-1 Seneca	79
HW-12 Transmitter	75
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HW-202 2M FM Xcvr	159
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SB-102 Xcvr	369
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HA-20 6m Linear	125
SB-634 Console	175
SB-604 Spkr	29.50
SB-644 VFO	129.50
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SRC-851T	250

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500 CX Xcvr	389
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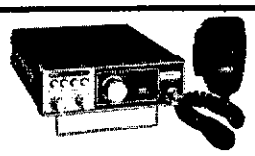
Nems Clark 1400	495
Ballantine 300H	175
PACO Scope Mod-S-50	75
Singer FM-10C	3495
Simpson 260 V.O.M.	49.50

The inventory quantities of the items shown in this list vary. There may be one or several of any item. Some items may be sold by the time you read this ad. It is also likely that we have items in stock that are not listed, as a result of the many trades we make each day. We reserve the right to sell accessories and power supplies with matching transceivers and transmitters. Please allow up to 10 working days to ship your order so that we may check and service the gear you purchase.



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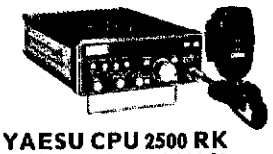
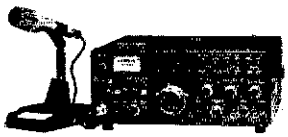
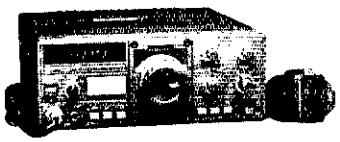
Regular $399.00
Cash (no trades) $339.15



YAESU CPU 2500 RK
(With Keyboard MIC)
Reg. $585.00
CASH (No Trades) $497.25



KENWOOD TS 180S
Retail $1,149.95
w/D.F.C.



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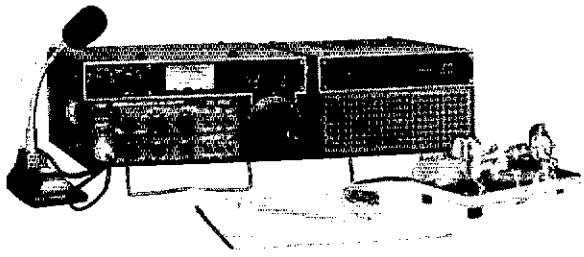

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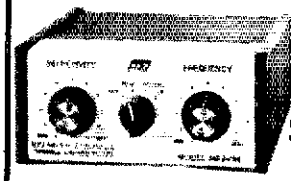

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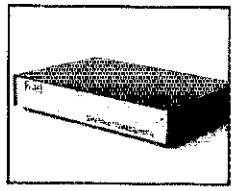
70 cm 28 MHz IF 2 dB NF
SOTA $124.95
70 cm OSCARBOX 'J'
LUNAR $124.95

Year end close out KR-500 elevation rotors $150.00



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MMW $369.95
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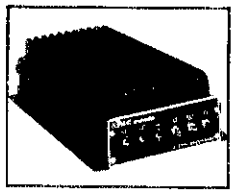

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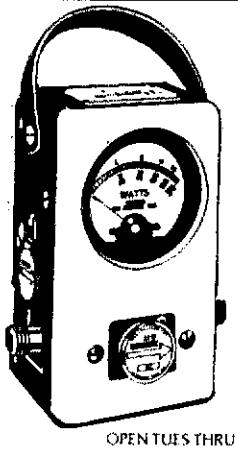

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Moory Electronics Company, P. O. Box 506, DeWitt, AR 72042, Tel: 501-946-2820.

WANTED: R390, R-390A radio receivers. New or used. Parts, manuals, etc. Trade for new amateur equipment. Communications Technology Group Inc., 448 Merrick Road, Oceanside, N.Y. 11572. 516-536-5724.

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DX? You bet! The DX Bulletin, best weekly DX info in world! Send for free sample copy: K1TN, 306 Vernon Ave., Vernon, CT 06066.

KW Rotary inductors for amplifiers and antenna tuners. Thompson Electronics, 1555 Bellefontaine, Indianapolis, IN 46202.

WANT To Buy: Technical Materiel BAC-1 and BAC-2 antenna couplers; Eimac 1000T triodes, Rohn crank-up tower mounted on trailer; Tefrex or KLM 80 meter beam, Vesto, etc., 100-300 foot tower; Collins 51J-4. Sell: Grebe Synchrophase console with built-in horn, $300.; 1939 RME-70D, $100. 75A-4, #5000, $550. HQ-120X, $75. FOB. K8CCV, 216-427-2303, 6 to 9 pm weeknights.

BATTERIES: New GE 12 V 2.5 A.h. sealed lead-acid rechargable, 3" × 4", $22. WØPOQ, 2755 Rigel Dr., Colorado Springs, CO 80906.

UHF Amplifier Kits, FM-SSB-ATV, 420-450 MHz 100 watt, solid state, $94.60 post paid. Communication Concepts, Inc., 2648 North Aragon Ave., Kettering, OH 45420.

ROHN tower — buy wholesale from worldwide distributor. 20G, $27.06/section; 25G, $37.62/section; 45G, $67.76/section. 48 ft. foldover tower, $605; 48 ft. BX freestanding, $213.40. Hill Radio, 2503 GE Road, Bloomington, IL, 61701, 309-663-2141.

DRAKE R-4/T-4X Solid-tubes replace vacuum tubes to give better performance! Pre-mixer and mixers 6EJ7/6HS6/6BE6-C plus T-4X 12BA6 $17.50 each, ppd. R-4 B/C improvement kits, $20.60, ppd Sartori Associates, W5DA, Box 2085, Richardson, TX 75080. 214-494-3093.

STANDBY Power Alternators 1,300 watts to 7,000 watts — Engine and belt drive — club discounts. Write for lit. and price list. Outdoor Outfitters, Ken N9KS Box 411 Waukesha, WI. 53187, 414-542-7772.

ICOM-701S, IC701PS, ICSM-2 mike, perfect, $1250. ICRM-2 controller $150. Astro SOC-200 Station Console as new. Has clock, identiminder, patch, speaker $200. WA6NWP, 209-642-3332.

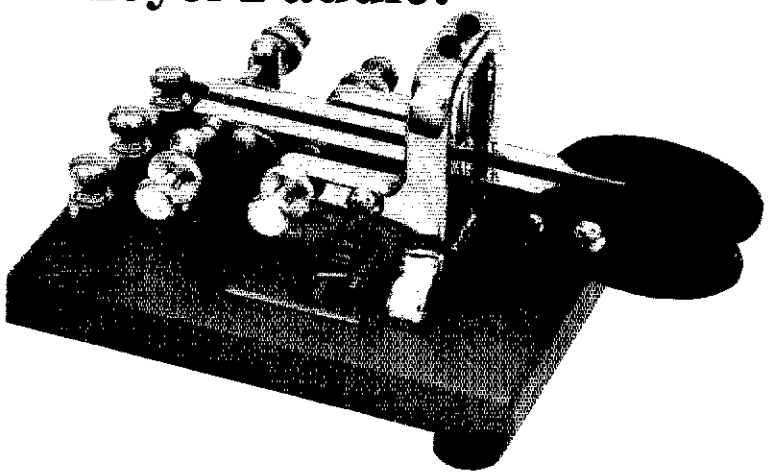
TELREX, 20M-326, 3el 26 boom, 10 dB, too heavy for tower. Minor bends, you ship. $150. Mosley; A-315 3el 15M 14' boom 10 dB. Minor repair, you ship $95. Russ Burcham, Rt. 1, Kennett, MO 63857, 314-888-3521.

Collins Bonanza: 51S1F (used in US Consulates around the world) $2200, 55G1 $325, 75S3C $995, 32S3A/516F2 $1900, 30L1 $995, 180S1 $995 312B4 $425, all R/E cables, manuals, low hours, immaculate. Winged emblems KWM-2A/516F2/rejection/Q-multiplier/DX Speech processor $795, KWM-2, rejection/Q-multiplier/PM-2 $695. 312B5 $425, cables/manuals. CP-1 $200, SM-3 $65. X455Q200 filter $175. U-ship. Thomas, W2UK, 9 Emmons Avenue, Farmingdale, NJ 07727

SALE: Heath HW 101, HP23B $300. FOB New pair 4-125A $30. New and tested 6146A's $5. 6146B's $6 EICO VTVM $25. Ed McKenzie, Box 135, Millersville, PA 17551.

HEATH HW/SB-104 Owners — Improve sensitivity, selectivity, intermodulation performance. For info sheet sent $2 and s.a.s.e. to WB4RRC, Box 461, Warner Robins, GA 31093.

The Iambic Keyer Paddle.



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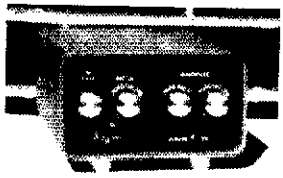

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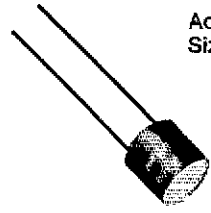

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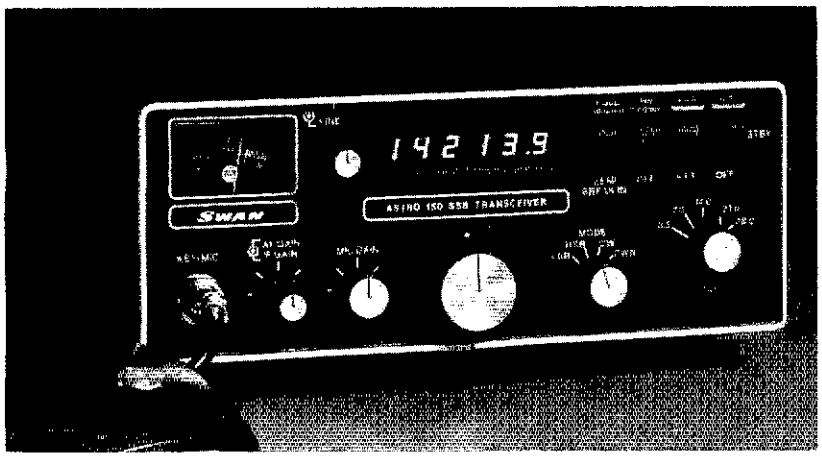

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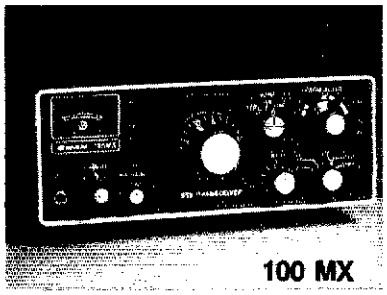
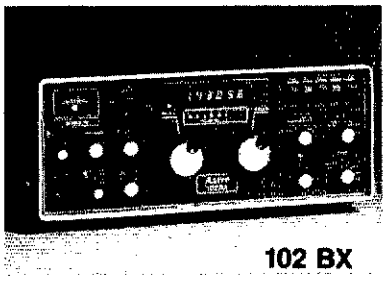


100 MX



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FOR sale: Heathkit SB-102, SB-600, HP-23, $395; SB-610, $80; SB-650, $115; SB-630 $60 excellent condition, manuals, WA1PJY 203-792-5447.

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PRINTED circuit boards for QST construction articles, Dec '78 thru Apr. 79, 1/2 price. Daniel Gravereaux N1ZZ, 602 Carter St, New Canaan, CT 06840.

STAMP poor — trade/sell mint U.S. collection for ssb xcvr. WB4PIV, Route 4 — Box 33, Liberty, KY 42539.

WANTED: scope tube 5CP1 in working condx. W4OEQ 2810 Sweetbriar Dr. Tallahassee, FL 32312.

CLEGG 22 MKII, 2m, $75 Drake TC-Z, $375, SC-2, $75 Hallicrafters HA6, $95 Microwave 144 MHz transverter, $175 Swan 250 w/117 p.s., $225 Yaesu FT-221, all mode 2m, $475 Kenwood TS-900 wips, 80-10m, $595 Needed: G28, HA410, 8875 tube. John Kakstys, W2FNT, 18 Hillcrest Ter., Linden, NJ 07036. 201-486-6917.

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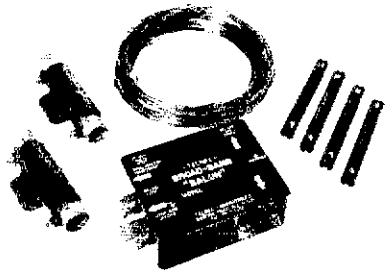

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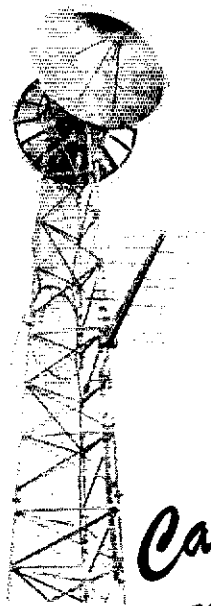

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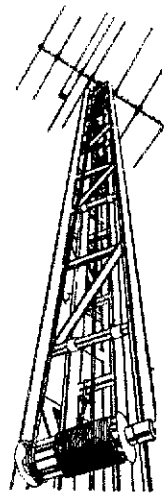

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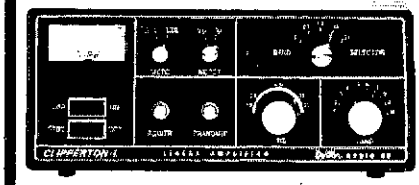

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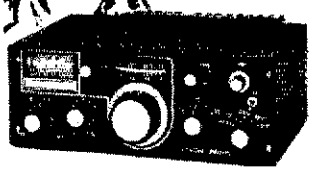

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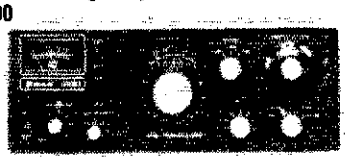

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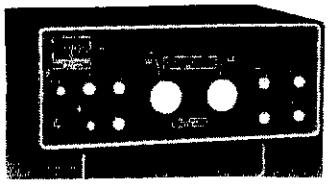

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Swan Astro 150 VRS Tuning 10-80 Mtrs. 235 Watts SSB. Fully Microprocessor Controlled frequencies. Regularly sells for **$925.00/Now $765.00.**

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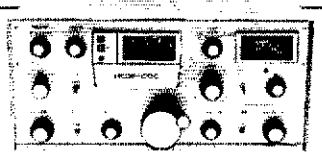
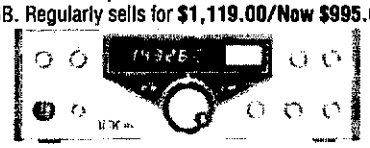


NCX 1000 Transceiver. 10-80 Mtrs. 1 kW SSB, AM, CW, RIT Control. Speech Clipper, Built-in P.S. Much more. Regularly sells for **$1,695.00/Now $1,495.00.**

Ten-Tec Omni Series B

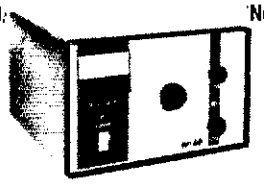
Ten-Tec D Transceiver. 160-10 Mtrs. Digital Readout. Four position CW/SSB Filter. 200 Watts SSB. Regularly sells for **$1,119.00/Now $995.00.**



Model 544 Digital Transceiver. 3.5-30 MHz. 8 pole crystal filter 200 Watts SSB. Regularly sells for **$869.00/Now $759.95.**

Century 21 Transceiver. 70 Watts CW, SSB. Digital Readout. Regularly sells for **$499.00/Now $399.00.**

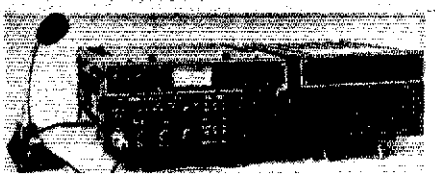
Henry 2KD-5 Linear. 80, 40, 20, 15 Mtrs. 2 kW PEP Reg. **$945.00.** **Now $895.00.**



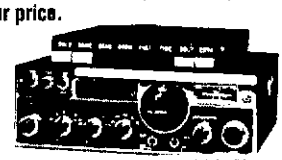
Henry 1KD-5 Linear. 1200 Watt PEP 80, 40, 20, 15 Mtrs. Reg. **$695.00/Now $649.95.**

Henry 2K4A Eimac 3-500Z. 2 kW PEP SSB. 80, 40, 20, 15 Mtrs. **$1,195.00** (Note that export models include 10 Mtrs.)

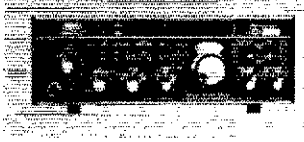
VBC Model 3000 Narrow Band Voice Modulation **$349.00.**



Icom IC701, P.S. Microphone. Reg. **$1,828.00/Call for your price.**

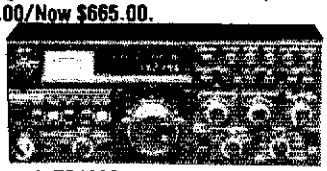


KDKFM2016A Transceiver. 1000 Channels — LED Readout. Reg. **$369.00/Now $269.95**



Drake TR7/DR7. Reg. **$1,395.00/Call for your price.**

Kenwood TS120S. 80-10 Mtrs. Digital Readout, Analog Dial, 200 Watts SSB power. Reg. **$699.00/Now $665.00.**



Kenwood TS180S with DFC. 160-10 Mtrs. 200 Watts, Digitally Tuned Memory. Regularly **$1,149.95/Now $1,092.46.**

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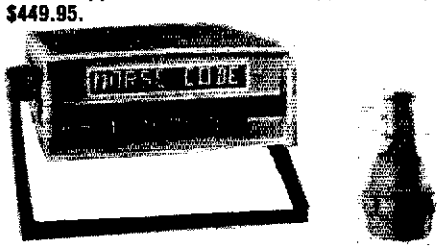

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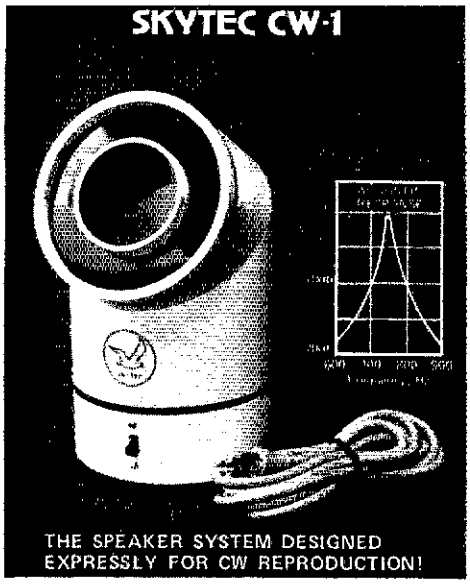

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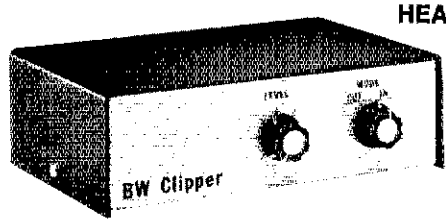

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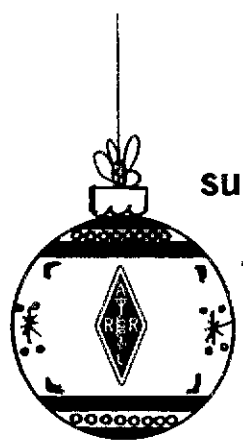

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Turn to page 137

ATLAS 210X with noise blanker and ac power console with semi-break-in and VOX. Perfect condition. Includes Ten Tec keyer. $625. firm. KA2FCU 516-371-0487.

HAVING a difficult time learning code and operating cw? These like-new visual decoders and electronic typewriter keyboard available due my friend's recent physical disability: Pickering 230-D Morse Decoder, $1500, Pickering KB-1 Electronic Keyboard Keyer, $140, (2) Atronics CR-101 Code Readers $75, Manuals/instructions. Thomas, W2UK, 9 Emmons Avenue, Farmingdale, NJ 07727.

SELL: Kenwood Twins — T-599D, R-599D, S-599. Mint Condition. AJ2M, ex-WB2MAV, Dave, 516-466-3021.

KLM-2700 2-meter multi-mode with OSCAR, VFO and synthesized 143-149 MHz, $600 or best. Mint, WB9EXI, 312-352-1557.

FLESHER TU-170 terminal unit. Mint condition $150. Godbout 12K RAM board for H8. $150. Miscellaneous RTTY, Microprocessor and rf equipment. SASE for list. W6RLL, J.W. Young, 16808 Goodvale Road, Canyon Country, CA. 91351. 805-251-2135.

WANTED — Heath receiver SB-303, kit or complete. Used or home brew linear amplifier. Gordon 3D engraving pantograph. Surplus lots engraving supplies and engraving machines. Write, give phone number. KØKJX, B-13020, St. Louis, MO. 63119.

VARIOUS Collins S-line crystals $2.50 each, Collins S-line weighted spinner knob $60.00, Collins filter F455Q23W2, 1.6 kHz $35.00, Collins CP-1 crystal pack $165.00, SBA 104-1 Heath noise blanker $20.00, Heath SB-102 dial $5.00, Skipjack keyboard $150.00, Simpson 260 (mirrored scale) w/xstr test $85.00, B & W T/R switch, model 380 $20.00, Galaxy power supply/cabinet/spkr $20.00 (needs re-wiring), Lafayette SSB-50A/10 meters $50.00. N1FB, 4 Roberts Rd., Enfield, CT. 06082 745-1029.

DRAKE T4XC, R4C, AC4, MS4, FL500, 10 mtr cw xtals, dust covers, 2 sets new spare tubes — 1 1/2 yrs. old — mint condx. $1199 J. H. Ross, K2OD, Hunter Hills-F9, Flemington, NJ 08822.

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DRAKE L4B linear — 80-10 meters, never used. $900. J. Holland, New Baltimore, MI, 48037, PH # 313-725-3606.

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COLLINS. Alpha wanted: S-Line, KWM-2, 30L-1, 75A-4. Also need Alpha linear. Vibrokeyer. W9OYH, 1605 Ridge Rd, Green Bay, WI 54304.

KENWOOD TS-520S w/t VFO-520, DG-5. K2UQC, 201-349-0938.

WANTED: Heath SB500, State Condition, Price. WB1DZT, Rt. 122, Amherst, NH 03031. 603-673-6762.

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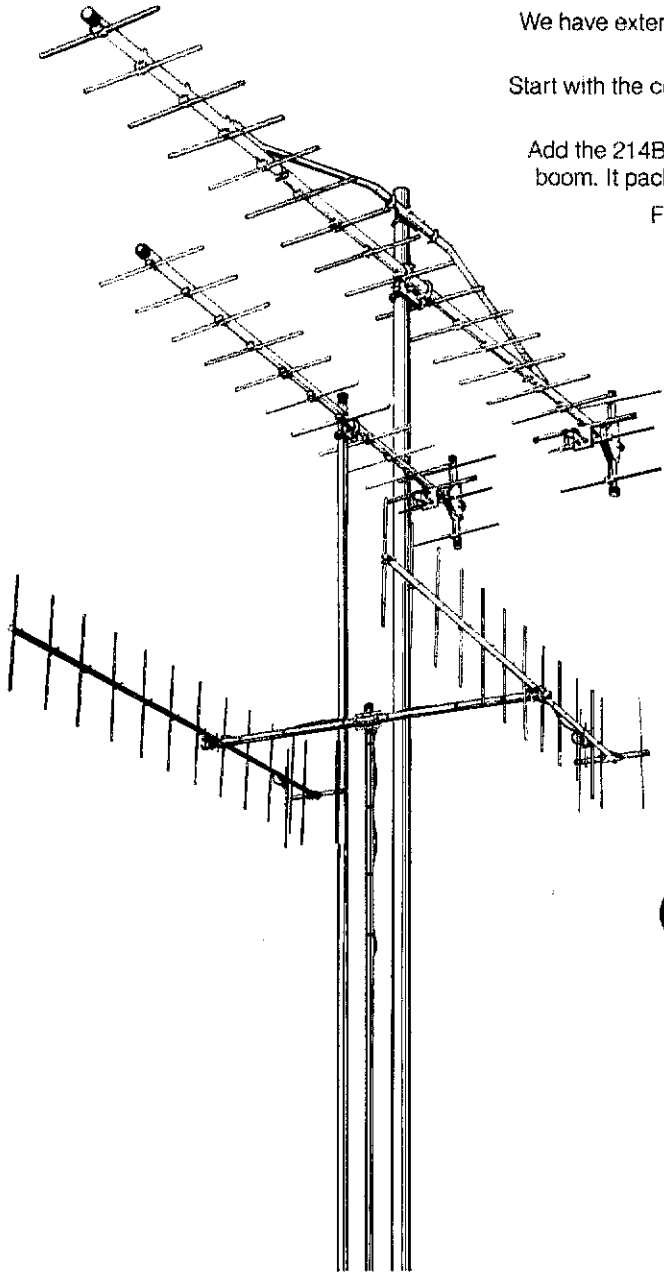
BOOMER



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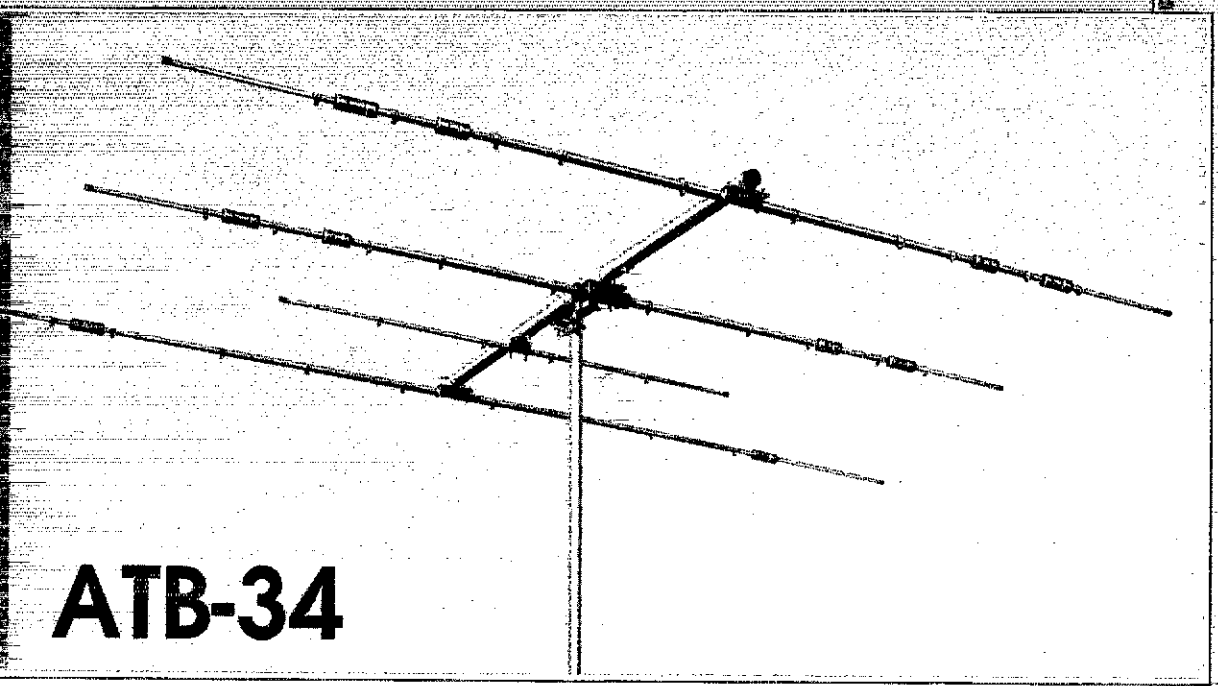

ATB-34

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SPECIFICATIONS

Gain	*
F/B Ratio Avg.	*
3dB Beam Width	62°
Nominal Impedance	50 ohms
Power Handling	2000 Watts PEP
Boom Length	48'
Longest Element	32'8"
Turning Radius	18'9"
Wind Area	5.4 Ft.²
Weight	42 lbs.
Maximum Mast O.D.	2.25"

*Antenna gain specifications cannot be published in QST. For complete information on all Cushcraft antennas see your dealer or write for a free A.R. catalog.

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ALL MODELS

Power Handling 2000 Watts. Nominal Impedance 50 ohms, Maximum Mast Size 1¾" O.D. Termination: accepts PL-259

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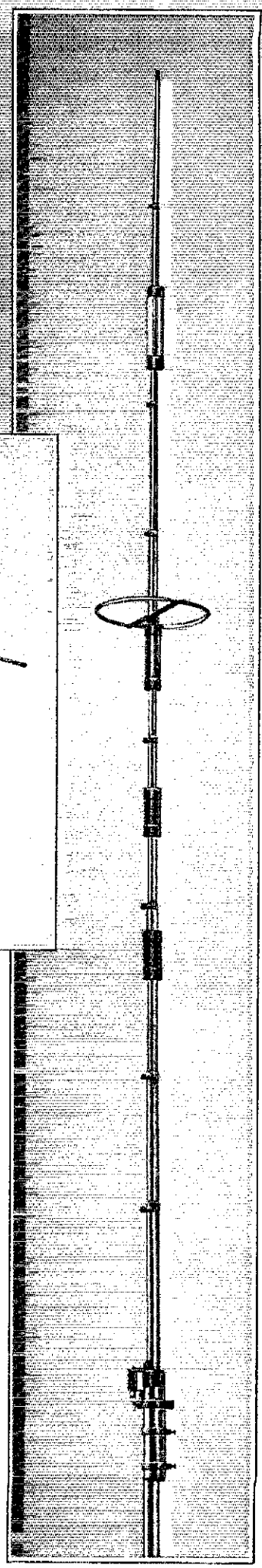

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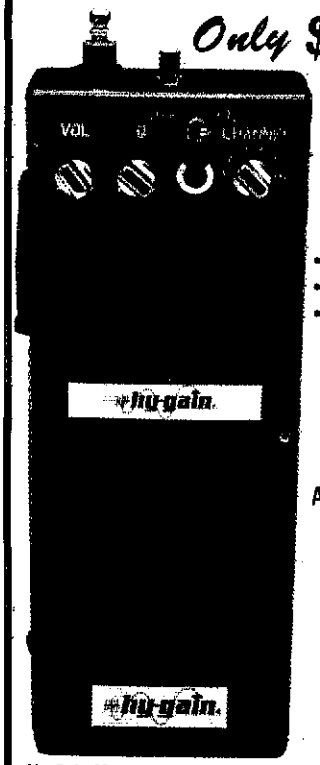

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1106 Wall charger	**9**
1107 Cigarette lighter cord	**9**
1108 External antenna adaptor	**9**
1110 Leather carrying case	**17**
1111 Carrying case	**8**
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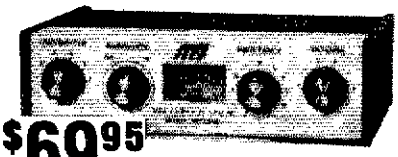

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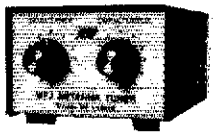

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DRAKE T4XC, $450; R-4C, $420; AC4, $90; MS-4, $20; 4-NB, $49; FL 250, 500, 1500, 6000, $35 each; FS 4, $250; DX Processor, $70; Freq. Readout, $40. ALL $1300. TR4CW, $600; 4-NB, $49; AC-4, $90; DC-4, $90. ALL $750. CM-1320S Headphone, $40. WE 800, $300; Solid State Tubes, $10. 13 Crystals, $4. WD8LPI; Address in '79 Callbook. 313-227-3493.

DRAKE R4B-$300.; Yaesu FTDX-560, $450.; Swan 350, ac/dc supplies-$350. W1HGH, 617-398-3837.

WANTED: 450-TH/450-TL tubes for collection. Paying $5. each plus shipping cost. K4VCP, Bill Collier, 705 Hugh Ave. N.E. Roanoke, VA 24019.

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HEATH SB-104A with 400 Hz cw filter, noise blanker, power supply with matching speaker, mint - $775 firm. WA3FBO — Meadville, PA. 814-724-2497.

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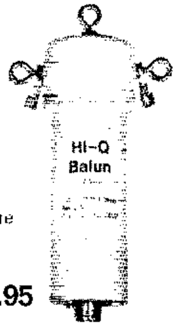

- For dipoles, yagis, inverted vees & doublets
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- For full legal power and more
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- With SO 239 connector

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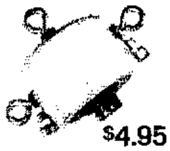

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Patent No 4,091,350

Rugged, lightweight, injection molded of top quality material with high dielectric qualities, and excellent weatherability. End insulators are constructed in a spiral unending fashion to permit winding of loading coils or partial winding for tuned traps

May be used for
- Guy wire strain insulators
- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

$4.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
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D-80	80/75	130	$28.95	$24.95
D-40	40/15	66'	25.95	21.95
D-20	20	33	24.95	20.95
D-15	15	22'	23.95	19.95
D-10	10	16	22.95	18.95
Shortened dipoles				
SD-80	80/75	90	31.95	27.95
SD-40	40	45'	28.95	24.95
Parallel dipoles				
PD-8010	80/40/20,10/15	130	34.95	35.95
PD-4010	40/20,10/15	66	33.95	29.95
PD-8040	80,40/15	130	35.95	31.95
PD-4020	40/20/15	66'	29.95	25.95
Dipole shorteners - only, same as included in SD models				
S-80	80/75			$11.95/pr
S-40	40			$10.95/pr

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center Insulator. No. 14 antenna wire, ceramic insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs

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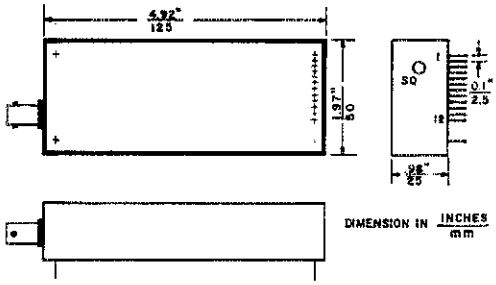

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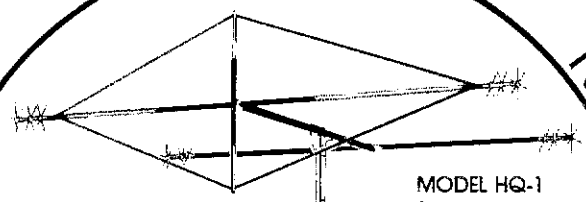

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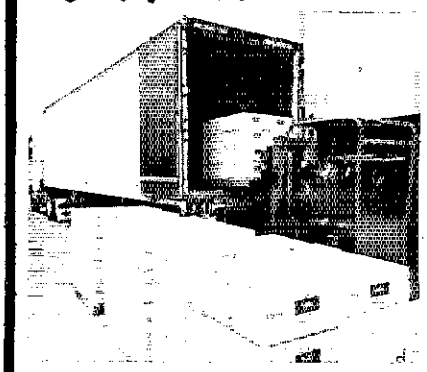

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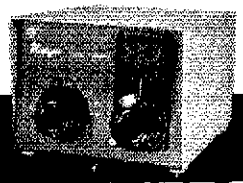

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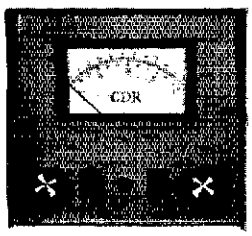

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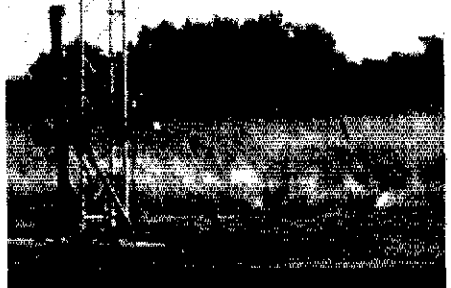

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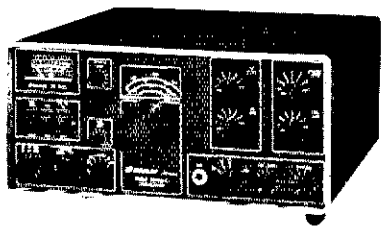

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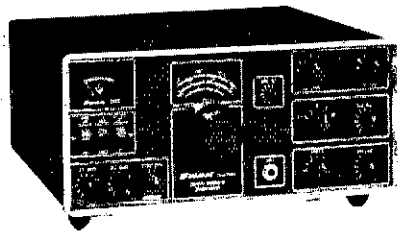

SWAN 350B 80-10m Transceiver. 300 watts PEP input on single-sideband, 200 watts DC CW. Complete with built-in 117 VAC AC power supply, 25 kHz calibrator. 80/100 Hz CW audio filter, CW sidetone. 5.5"h x 13"w x 11"d. Wt. 23 lbs. (Reg. $649.95) . . . . . **CLOSEOUT $399.**

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"SELL Heathkit ST-400 Transmitter $225. and Drake 2B receiver $155. W2INY, 206 W. 9th St. Elmira Heights, NY 14903. Call 607-732-5741."

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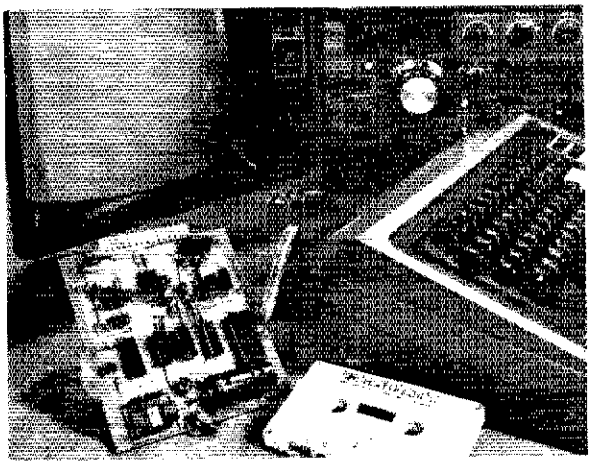

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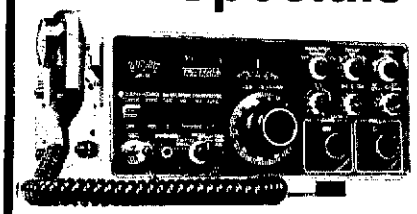

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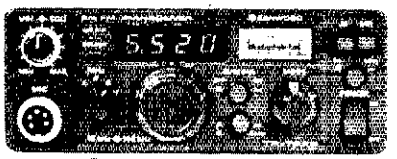

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C1320 Headphone	32.01
CM610 Headset w/mic.	36.04
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B&W COAX SWITCHES	
593 Single pole 3 position	15.70
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376 Single pole 5 position with ground	17.72
KLM ANTENNAS/AMPLIFIERS	
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WILSON CLOSE-OUTS (cash prices)	
M320 3 elements 20m monobander	100.00
M420A 4 elements 20m monobander	133.00
M27 7 elements 2m beam	17.00
AVANTI	
2m on glass antenna	Write

Hustler, Taylor, and Avanti antennas also. Write or call for a flyer. Terms: Prices do not include shipping. VISA and MasterCharge accepted. 2.5% discount for prepaid orders (certified check or money order). COD fee $2.00 per order.

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$250 or best offer. Jesse Lien, W6JMM/1, New Canaan, CT 06804. 203-972-1353.

AVANTI antennas — 2 meter 5/8 wave window mount antenna, $30 plus $2.50 shipping. K2SCX Lazarus Electronics, 2 Hunters Trail, Wading River, NY, 11792 516-929-3266.

YAESU FL2000 linear amplifier, 80 thru 10. 1200 watts PEP. Mint. $275. John, WB6WIW, 714-842-9142. U ship.

"FOR sale: MN2000, $180.; Classic .33 beam, $160. Prefer pick-up; both excellent condition — K1QEN, telephone 1-203-561-1465."

SWAN 350B cw/ssb transceiver, 80 - 10 Meters. Mint, $320. Icom-502 6 Meter transceiver. Mint $175. WB7VOO 602-298-4820.

WANTED for collection: spy radio equipment; any age or nationality. WA8UIT, P. O. Box 18161, Cleveland OH 44118.

HEATH DX-60B, xtals, mike, HR-10B, xtal cal., spkr, manuals $125. Dan, NØARB 913-381-5452.

DEMO sale: Signal/One CX-11A $5595, CX-7B, L.E.D. readout, immaculate, warranty $1495. Alpha-77 DX $3045, Alpha-76 CA $1575. Payne Radio, K4ID, 615-384-2224.

432 gear for sale: Microwave Modules MMT-432/144 transceiver $250; ARCOS 28/432 transmitting converter $200., Microwave Modules 144 MHz. converter $45., Hal 2550 keyer $50. All mint. Richard Beerman. 1323 Navajo Trail, Alabaster, AL 205-663-7755.

WANTED — Yaesu FL 2100 B or F, condition, price, etc. WB4ZPJ. Irv. Rosen 21 Abbey Lane Delray Beach, FL 33446.

KDK 2015R owners: Use memory for any odd-ball splits. Shows transmit/receive frequencies. Free details. WA2HOD 105-18 131. Richmond Hill, NY, 11419.

QUAD kits from $16.25 to $30. Send sase for information. WAC, 404 Sanders Rd., S.W., Huntsville, AL, 35802.

TEST equip.: Tek plug-ins, Ballantine, Boonton; new Measurements piston attenuator assemblies; new components; teflon sleeving, huge lot; IC-TTL databooks; some H-P, Polarad manuals; electronic welding equip, more! Low prices to clear it out! S.A.S.E. for large list. Joe Cohen, 200 Woodside Avenue, Winthrop, MA, 02152.

SELL: 10 meter converted Pace 1000-M, $150. 35 amp regulated power supply, $150. Tempo One with power supply, $475. WB2OEI, 158-20 80th Street, Howard Beach, New York 11414. 212-848-7961.

ESTATE — Signal One CX-7A. Best offer over $900. Bob, WA2NUD. 1-607-754-1525.

NATIONAL NC-300 with speaker $100, Drake TR-22C loaded $125, Regency HR-220 two crystals $100. WB2TNX. 516-249-1670. After 7 P.M.

NATIONAL NC-300, matching speaker, crystal calibrator, manual. One owner, excellent condition. $150. Pickup only, K1UKC 401-246-1943.

COLLINS 75A4 (4047), KWS1 (1319) and SC-101 Station Control, mint condition, 45 total QSO hours on equipment since new. $750 Norman W. Berg, W5CLC 8710 Claremont, N.E. Albuquerque, NM, 87112.

WANTED: equipment manufactured by Aiken Industries (A.C.L.), now Norton Communications.; RCA 7077 ceramic tubes.; TMC ssb converter; Hensley, WA5BQA, 5054 Holloway Avenue, Baton Rouge, LA, 70808."

WANTED immediately: Altec 230B broadcast console. Write or call Rex Osborne, WA8BUI, WMOV Radio, P. O. Box 647, Ravenswood, W. Va. 26164 304-273-2544.

YAESU FT301SD digital, FP301 pwr supply 10-160. cw filter. Mint cond, $675 or best offer. Must sell. KA7ADE, 208-237-6230. Will Ship.

SEASON's greetings to all from D.B. and Paul, W4UDQ and W4HHK/K4MW. ARRL, MARS, and SOWP, 1625-V 1943 — SS Samoset/KOIP. P. O. BOx 73, Collierville, TN 38017. Tel. 901-853-8205.

ICOM IC-211 2 meter multimode transceiver, 3 months old, like new $595. Icom IC-202 2 meter SSB/CW portable transceiver $165. Janel 6 meter converter $45. Janel 432 MHz 1.7 dB NF preamp $35. Regency ACT-T-16K "The Touch" synthesized programable three band scanner $195. Regency AR-2 2 meter 80 watt amplifier $70. Bob Seydler N5BMT, Rt 2 Box 2170, Boerne, Texas 78006. 512-249-2152 or 735-6191 work.

COLLINS winged emblem 75S3B, 32S3, 516F2 all like new inside and out $1295. or offer. K7HPH, 801-298-2388, 955 East 75 North, Bountiful, UT. 84010.

FOR sale: Heath SB-101, HP-23, SB-600, SB-640 remote VFO, all in mint condition with new finals, manuals and Heath mike, $425 Hammarlund HQ-170, $125. Heath DX-100, $40. Teletype 33ASR, good condition, $225. Dick Schellens, WA1BDA, 14 North Park St., Apt. 2N, Hanover, NH 03755.

ARGONAUT 509, cw filter, pwr. sply, microphone $275. I ship UPS. W7QWD, Star Route 2809, Winnemucca, NV 89445 — 702-623-2493.

HR-2B Regency 2 Meter hm 6 pairs xtals, manual, Regency ac power supply, Touch-Tone pad. Only $265. W3GFO. 813-385-0002

TEN Tec Argonaut 509, pwr supply, audio filter, $295. Ten Tec mike, $24. Dentron Jr. Monitor tuner, $47. CMOS iambic keyer, new, $35. 150w 80-20 Mtr QRP linear w/pwr supply, $75. Brown Brothers paddle, $20. Heath VF1, $25. AC1I, 1375 Stockton, Palo Alto, CA 94303, 415-858-0581.

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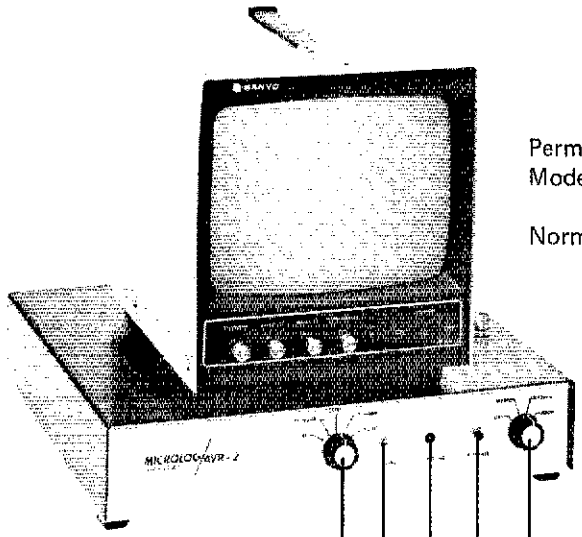

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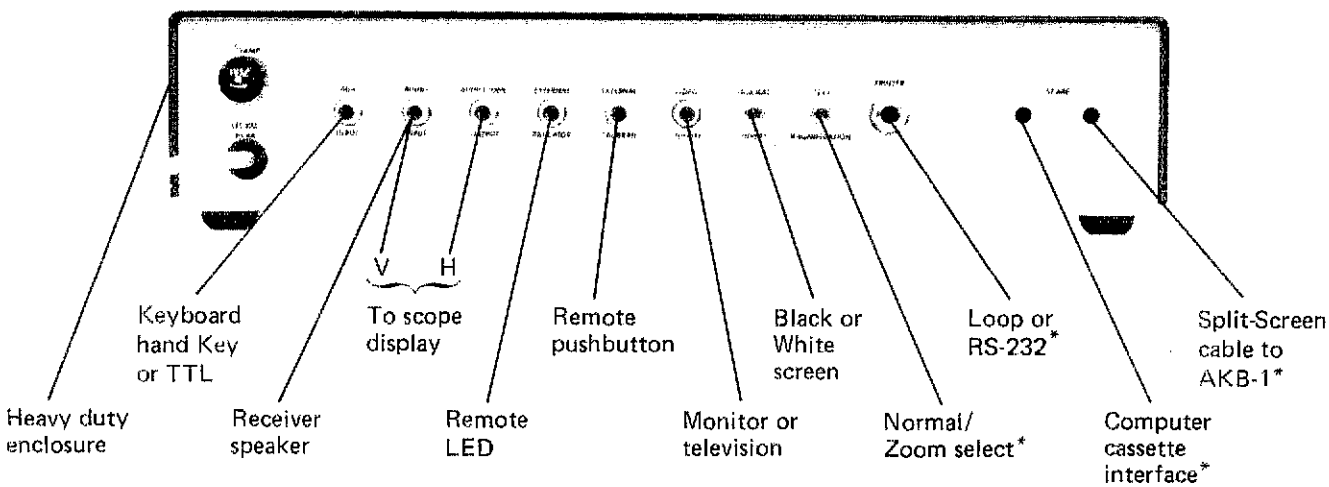

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Dear Jack:

I have operated practically every transceiver that has come on the market since 1960 and for various reasons never really was totally satisfied—that is till I purchased TEN-TEC gear. As far as I am concerned I have found the ultimate in Amateur Gear.

I am enclosing the warranty card for my new Argonaut. Fellows told me that I would not believe the performance of the Argonaut until I owned one and that is right. Right now I am mostly using it on 10 meters CW and SSB, although I have checked in to one of my nets on 3972 at 9 PM and had no trouble. The other morning I was operating SSB with it and unbeknown to me I was close to the "Breakfast Club" frequency on 75 meters when all of a sudden a fellow broke in on me and said I was too close and was QRMing the Breakfast Club. I almost fell off my chair because my wattmeter told me I was peaking 3 watts output!!! Needless to say I am very pleased with my Argonaut and that full break-in on CW.

I just cannot say enough good about your equipment. I have the KR-60 Keyer and also the CW filter so I really feel I am all set for any mode of operation. Just thank you for making such fine Amateur gear!

Rev. Paul Gates, WA8TER

***

Dear Mr. Burchfield:

I know that you have received many letters of praise over TEN-TEC equipment, but I guess you will have to read another. At the 1979 Dayton Hamvention my father and I purchased a new Century/21. It is perfect. I operate very little phone, so it was the obvious choice. It is an excellent traffic rig, and I use it on several nets regularly with 579 and 589 reports. Also, in less than two months, I have worked YO, VP9, HB9, 8J9, LZ, YU, DA, YT2, UK, G, GI, F, HA, PZ, YX, UT5, FY7, JA and 8P. Oh, another reason we got the '21 was the price: super! The antenna here is an inverted vee up thirty feet. I think I'll try a bed spring next!

Very 73 and thanks! Bill Rouse, WD8QMP, Age 15

Number 24 of a Series

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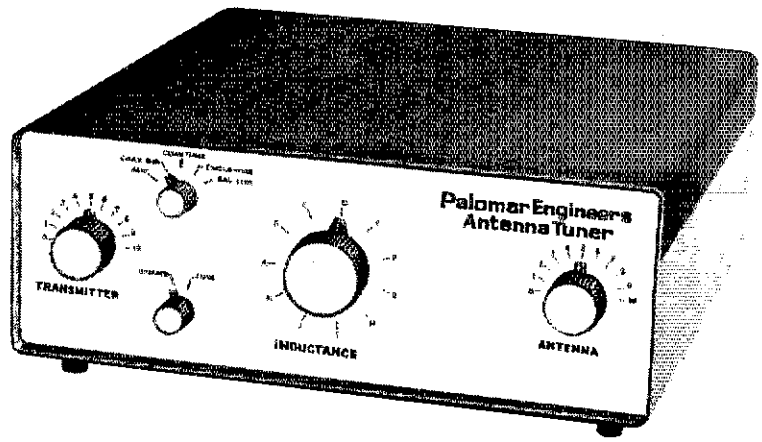
Antenna Tuner



$299.95

Here is a new tuner that puts more power into your antenna, works from 160 through 10 meters, handles full legal power and then some, and works with coax, single wire and balanced lines. And it lets you tune up without going on the air!

WE INVESTIGATED

All tuners lose some rf power. We checked several popular tuners to see where the losses are. Mostly they are in the inductance coil and the balun core.

So we switched from #12 wire for the main inductor to ¼" copper tubing. It can carry ten times the rf current. And we've moved the balun from the output, where it almost never sees its design impedance, to the input where it always does. Thus more power to your antenna.

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The biggest problem with tuners is getting them tuned up. With three knobs to tune on your transceiver and three on the tuner and ten seconds to do it (see the warning in your transceiver manual) that's 1½ seconds per knob.

We have a better way; a built-in 50-ohm noise bridge that lets you set the tuner controls without transmitting. And a switch that lets you tune your transmitter into a dummy load. So you can do the whole tuneup without going on the air. Saves that final; cuts QRM.

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SELL: Hammarlund HQ-17DAC — factory installed noise blanker, speaker, aligned, $200. HXL-1 amplifier, 80-10, $325. Heath IM-4100 frequency counter, $80. Trade Motorola 2m H23-1 ac/dc, for 6m rig — am, ssb, fm — whatever. All best offer. You ship. Rick Lochner, WD9CIV, Box 155, Idavilk, IN, 47950. 219-943-3561.

SALE — amateur and broadcast receivers. Tubes, testers, books, meters, everything. Antique/modern. New lists/30c s.a.s.e. W4BLQ, B158, Edgewater, Fl. 32032.

AZDEN $359, KDK, $295, stocked now. Moore Electronics. 214-424-2446, 2409 Grandview, Plano, TX. 75075.

"CRYSTALS: Any frequency FT-243, 40M $1.50, five or more $1.25, 80M $2.95, five — $2.50 Postage 20c per crystal. Stamp for 160M-2M listing/circuits. "Since 1933" C-W Crystals, Marshfield, MO. 65706."

FT-101EE with mobile mount. Excellent condition, tenderly cared for, $500 plus UPS. Call, W6TDZ, 707-255-8554.

3-ELEMENT Cubex quad parts: spiders, spreaders, 20 foot 3 in. boom, boom-mast connector. Used briefly $150. Deliver 150 miles. WA5ENP, 218 Karen Dr Lafayette, LA, 70503.

NATIONAL SW-3 needs 700 henry choke, original five prong tube sockets, National Dial type B, volume control dial. Replies acknowledged. W1KMN-9 Blaine Ave. Augusta, ME 04330.

FOR sale: Dentron MLA-2500 linear amplifier, 1.8-29.7 MHz. Wired for 220 Vac operation. Excellent condition. Very low time. Complete with manual. $650. firm. Morris A. Rainville, WB1CEH, 203-364-5613, Jackson Rd., Sharon, Conn. 06069.

DRAKE TR4CW, RV4C, AC4, MS4, 7075. Used 10 hrs. in original cartons UPS $695. A. Durrett, 804-633-9600, 633-6314.

TRADE mint HQ-145A, clock, speaker, for mint Drake 2B, speaker, multiplier or SMC Pentax-M 28mm f/2.8 lens. WA5ENP, 218 Karen Dr., Lafayette, LA, 70503

CENTURY 21, seven months old, $250. Jess Butler, WB7SWL, 2509-153rd. Ave. SE, Bellevue, WA 98007.

GONSET GSB-100 180W ssb xmtr $150 AA6BK, 714-968-2780.

SELL Nye Phonepatch. $22. W7EDO.

JOHNSON Invader 200, mint, $200. WA1HMR, 83 Beacon St., Framingham, MA, 01701. Tel. 617-620-0197.

HEATHKIT SB-230 1kW linear. 80m-10m. Mint condition and built by a Heath technician as a store display. $399. AIØG, 14308 Gladiola Ct., Apple Valley, MN. 55124 612-432-2022.

FOR sale: Dentron Clipperton-L linear amplifier with original warranty. Must sell because of TVI. $510. — WA2YYJ, evenings. 212-897-5260.

SELL — Hallicrafters xmtr. HT32B, Hallicrafters rcvr. SX101A. Mint. The pair, $400. ASR-28 Teletypewriter. Good condition. K1RVU, 203-442-5652.

TUBES. Selected and matched driver/finals sets for:FT101, FL101, Tempo, Drake $21. FT901, FT101Z, Kenwood Heath, Collins $19. dentron GLA $33. We carry complete replacement tube sets for most rigs. Power tubes: 572B $33. 4cx250B $33. 3-500Z $86. All tubes ppd. December equipment specials: Icom 551 $475. KDK 2016A $275. SST Ltd. 423 Cornelia Street, Boonton, NJ 07005. 201-334-1723, weekdays 9-5 EST.

WANTED — manual for HW-12. WA4GET, Frank, 107 Glen Drive Havelock, NC, 28532 919-447-8941.

COLLINS 75S-3C round 2.1 kHz. and 500 Hz filters 32S-3, 515F-2 w/spkr, winged, manuals, cables, $1,595. F.O.B. John Maver, 1049 N. Holliston Ave. Pasadena, CA. 91104. 213-798-9345 evenings.

ATLAS 210X NB, mint $460, PS-200, $70, Autek-QF-1, $44, Unique Wire Tuner $75, W1ABJ, 617-232-7080.

KENWOOD AT-200 antenna tuner, SWR/wattmeter combo. Used 3 months. Like new condition, $100. Paul, KIYOU, 413-538-7978 evenings.

SAVE even more: All new in sealed cartons, Icom specials IC-701 AC, mic $1195, IC255A $349, IC245S $499, IC211 $649. Kenwood specials TS180 w/dfc $975, TS120S $594, TS700SP $599, TR7625 $339, TR2400A $345, TL922A $999. TS520SE $549 Drake specials: TR7/DR7 $1195, PS7 $212, Yaesu specials: FT-901DM $1169, FT227RB $349. Clipperton L $499. GLA 1000 $319. Alpha amps 76A $1225, 76PA $1475, 76CA, $1636, 374A $1550, 78A $220. Telerex beams TB5EM, TB6EM and monobanders in stock. Call for quote. The Key Works, 1604 Crabb River Rd., Richmond, Texas, 77469. Mike, WB5USV, 7-10pm CDT 713-343-0487.

PRC-6 walkie-talkies, genuine G.I. 47-54 MHz fm, less battery. Good working condition. $17.50 apiece, $27.50 pair; add $2.50 shipping. Stephens, 1407 Hollyrood, Sandusky, OH 44870.

SELLING Heath SB-101 with power supply. Works fine WB1BXM 203-678-1116 (days) 203-673-1312 - evenings.

4-1000's — selling two, $99 each. One skt. and chimney $25. 100% ok. Phila. area, pick up. W3FWI, 215-649-1704 after 6pm.

ULTIMATE Transmatch. Beautifully built. Roller inductor, turns counter, Cardwell capacitors. Built in "thru line" watt meter. $85. WB6NAM, 41 Castle, San Francisco, 94133. 415-433-7519.

WANTED: Alpha 374, Alpha 76 W1ABJ 617-232-7080.

HARVEY Wells Bandmaster Deluxe 80-2 am/cw manual,

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C-6500 Closeout
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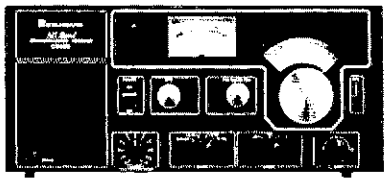

STANDARD C-6500 General Coverage Communications Receiver. All Solid-State and Synthesized. Covers .5 to 30 mHz. in 30 one mHz ranges. Modes: AM (diode detector), CW, USB and LSB (product detector). Sensitivity: .3 to 1.0 uV depending on frequency range and mode. Attenuator control to prevent overload by extreamely strong signals. Selectivity: 5.5 kHz (AM); 3 kHz (SSB & CW). Peaking preselector to manually achieve maximum sensitivity and interference rejection. Dial accuracy: within 5 kHz on all bands. Clarifier control for fine tuning varies reception ±4 kHz from dial reading. Image rejection: greater than 50 dB. Operates on 117 VAC, 12 VDC with (8) internal D cells (not supplied) or external source (less than 100 mA current drain). Automatically switches to internal or external DC in event of AC power failure. Self-contained telescoping whip antenna with rear panel connections for an external 52-75 ohm antenna. Built-in speaker and phone jack for headphones or external speaker. Separate jack for audio output to recorder. Large S meter indicates RF signal strength. External muting jack. SIZE: 13½"w x 6"h x 12½"d. WT: 14 lbs.

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MFJ-402 ECONO KEYER. $39.95. Paddle, weight, speed controls. Dot-dash memories. 8 to 50 WPM. 2x3x4 inches. Uses 9 V battery. No sidetone and jacks for external key.

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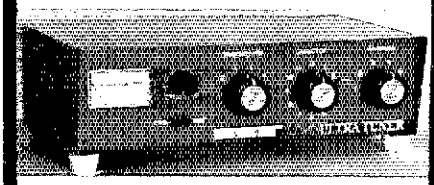

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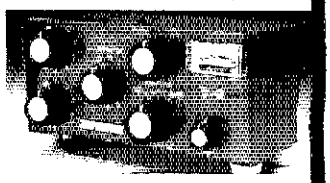

Most versatile antenna tuner available. Any antenna — coax fed or random wire (160-10m.). Front panel function switch selects between two circuits — a Pi or L network — or tuner bypass. Front panel antenna switch. Relative output meter. 200w output — will work with virtually any transceiver. 6½" X 3" X 3". Attractive bronze finished enclosure.

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SST T-1 RANDOM WIRE ANTENNA TUNER

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has your needs well in hand.

Today's Amateur demands rugged, rapid and accurate communications between Hams in the know. That's why they choose the Wilson Mark Series of hand-held radios. With exceptional qualities like these . . . why not choose the most popular radio available for yourself?

FEATURES

Advantages such as solid state circuitry, rugged Lexan® case, removable rear panel (enabling easy access to battery compartment) and compact mini-size enhance the Mark Series portable radio's versatility. In addition, Wilson carries a full line of accessories to satisfy almost any of your requirements.

SPECIFICATIONS

The Mark radios offer: • 144-148 MHz range • 6 Channel operation • Individual trimmers on TX and RX xtals • Rugged Lexan® outer case • Current drain: RX; 15 mA, TX; Mark II: 500 mA, Mark IV: 900 mA • A power saving Hi/Lo Switch • 12 KHz ceramic filter and 10.7 monolithic filter included • 10.7 MHz and 455 KHz IF • Spurious and harmonics, more than 50 dB below quieting • Uses special rechargeable Ni-Cad battery pack • LED battery condition indicator • Rubber duck and one pair Xtals 52/52 included • Weight: 19 oz. including batteries • Size: 6" x 1.770" x 2.440".

OPTIONS

Options available, include Touch Tone Pad, CTCSS, Leather Case, Chargers for Desk Top, Travel or Automobile, Speaker Mike and large capacity, small size batteries.

For more details and/or the name of your nearest dealer, contact: Consumer Products Division, Wilson Electronics Incorporated, 4288 So. Polaris Ave., P. O. Box 19000, Las Vegas, Nevada 89119. Phone 702/739-1931.

Wilson Electronics Incorporated

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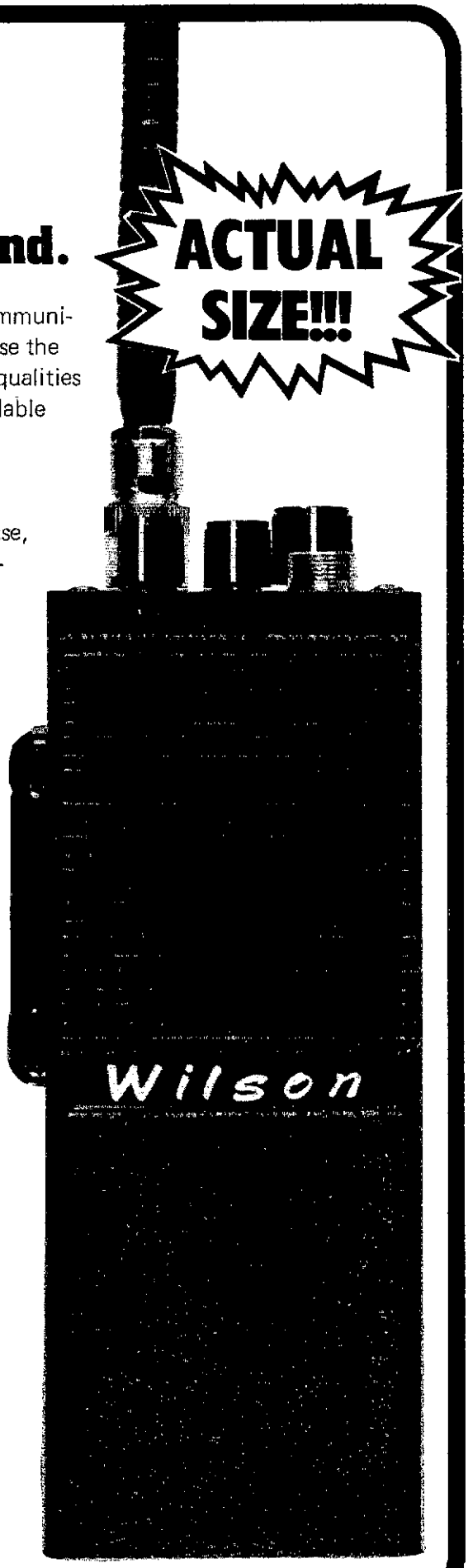

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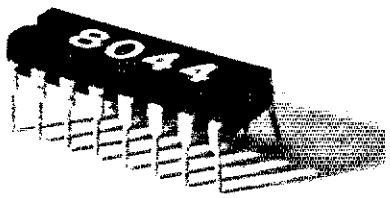
Five* new finger talkers



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* M-480: MemoryMate	124.95
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Apr '75 HR, Feb '76 QST, Radio Hdbk '75, ARRL Hdbk '77-79	
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8045: Morse Keyboard-On-A-Chip IC	59.95
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8045-2: Semi-Kit	159.95
8046: Instructokeyer-On-A-Chip IC	49.95
8046-1: Semi-Kit	79.95
8047: Message Memory-On-A-Chip IC	39.95
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(add $1.75 to kit prices for postage and handling)	
IK-440A: Instructokeyer (Mar '76 QST)	224.95

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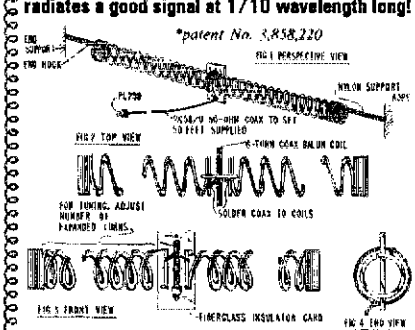

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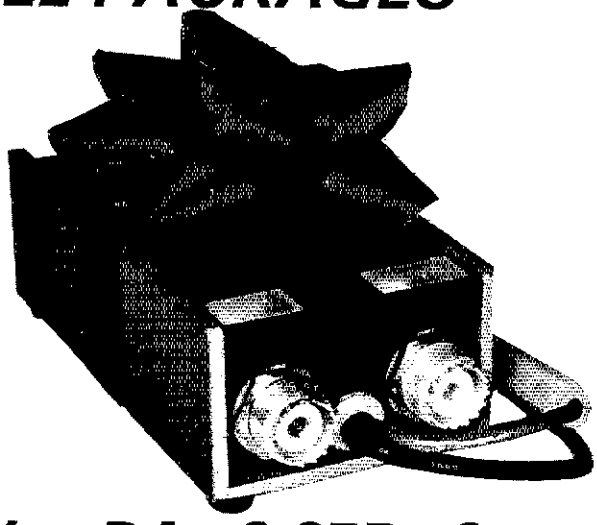

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Complete trap-dipole systems available. Write for quotes.

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vfo, power supply $100; Heath IO-10 scope $50; GR-64 .54-30 rcvr $50, Hallicrafters HT-18 xmtr/VFO 80-10 $50, Heath twoer $10. WA6IPP, 235 Alden, Redwood City, CA 94063.

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SBE-34 gud cond. $270 or trade. WA1VNO.

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SELL: Drake TR4C, AC4 supply MS speaker. Mint condition. $450. W9VCQ, 312-825-4311.

WANTED: mint Ten-Tec 405 and Alpha/Vomax. K7HI, Box 395, San Francisco, 94101.

SELL . . . Swan vertical ant 28 thru 7 MHz . . $25. cant ship W2EZM 431 Oakland, Maple Shade, N.J. 08052 609-663-8137.

NEW fall 1979 test equipment catalog available. 108 pages of quality used equipment. Write for free copy. Tucker Electronics Co., Box 401060, Garland, TX 75040.

TEKTRONIX 556 oscilloscope, dual horizontal & vertical systems, four trace, w/pair CA's $550; National NC-303 receiver, $135; Clegg FM-27B, $200. Cliff Stoll, K7TA, 316 E. Waverly, Tucson, AZ 85705 602-622-2231.

YAESU FT301D, FP301D, FV301, am, cw, and 1.8 kHz if filters, $550 N1JM, 7202 Rt. 31 East, Clay, N.Y. 13041.

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FOR sale: Kenwood 520S with cw filter, used 4 1/2 months. $595. WA2YYJ, evenings, 212-897-5260.

WANTED: Pair air system sockets, chimneys for 3-500Z H. Martin, P. O. Box 1275, Bluefield, W.Va. 24701.

WANTED: WWII radio equip. & accessories, any foreign, some U.S., especially ARB, BC474, RAX, RB, TBY. Sell/trade manuals: mil. radio, boatradio, test equip., SASE list. Miller, 11206 First, NE, Seattle WA, 98125.

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COLLINS KWM-2 with DX Engineering speech processor; Collins 30L-1 (new 811s); 516F-2 ac power supply. Package deal only $1395. Fred Liddle, W2TN, 3002 S. Parkway W., Bradenton, FL, 813-747-3976.

AN/URC4 VHF/UHF handheld fm xcvr with box of 20 xtals for commercial use. $50. URR-390A Collins VFO 200 WB8TIZ/4 John Lycan, 3 Messick Rd., Poquoson, VA, 23662.

4CX5000A, socket, fil. xf., blwr., PI-net. $325 or best. 4-1000 amp hvy dty, make offer, want: 4-1000 chimney or tubes. Bryan N6VE 714-636-9894.

WANTED: Ten-Tec 405 linear/PS, Sell: Vomax speech processor, mint, make offer. Tim Cook, Box 2012, APO NY 09127.

DRAKE 2B rcvr with 2-AQ Q-Multiplier Speaker $155. Heathkit DX-60B Transmitter with Knight VFO, $30. Bruce K2QXW Holmdel, NJ 07733 201-946-4368.

EQUIPMENT wanted: we buy late model test equipment and microwave components. Contact Tucker Electronics Company, Box 401060, Garland, Texas 75040, 214-348-8800.

TELEX CB-88N lightweight headset, 500/8Ω, glasses mount provided. Unused. $29. K1LEC, Box 73, N. Springfield, VT 05150.

FOR Sale: Heathkit HR1680, $150 — Realistic DX 160, $75 — Heathkit Novice Theory Course, $20. All in excellent condition. Will ship. Jim Constantine, KA2CMQ. Box 674 Russell, NY 13684. 315-347-2157.

QSTs 1961 to date. $40. plus shipping. Misc. parts, power transformers, linear amplifier, Mosley TA36 Antenna, s.a.s.e. state needs. W7EZ 2105 West 29th. Eugene, OR. 97405.

COLLINS: 75S3B rcvr $795., 32S3 xmtr. $695., 516F2 ac supply $140., 312B4 sta. console $149., 30L1 linear amp $550., KWM2 scvr $595., Drake W4 watt meter $60., W2TN Fred Liddle 3002 S. Parkway W, Bradenton, FL 33505 ph. 813-747-3976.

GALAXY V MK 2 with power supply and manuals. $325 plus shipping. WDØEVN 612-869-7408.

1/2" hardline — 39¢/ft. Solid copper center conductor. 50Ω, with jacket. Only 1230' and 1235' rolls left. Freight collect. Connectors available. Info. s.a.s.e. JRS Electronics, WA8OGS, P. O. Box 1893-B, Cincinnati, Ohio 45201.

DENTRON GLA-1000 linear incl. 10m and spare finals $260, Heathkit SB-201 linear incl. spare finals $340, ERC SL-56 Audio Filter $50, Eico Model 825 tube tester with adapters $40. DJ 8 GO, 914-473-4453.

A-1 condition: Drake TR-6 w/power supply, 120w output, 6m transceiver $600, Collins 32S-3 w/516F-2 power supply $600, 200 Hz filter for TS-520/S $35, call 6 to 8pm EST, Tom, K1KI, 203-673-5429.

SELL: W2AU balun $7, Dow-Key relay $5, DX-60 $45, Johnson capacitors-154-14 $10, 140-5 $5. Heathkit Signal Tracer, Model TY $10. Heathkit VTVM, Model IM-18 $25. Heathkit code oscillator, Model HD-16 $10. All manuals, no shipping. 305-499-8668.

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HEATH DX-60B, HG-10B, HR-10B with marker, $190. HW-16 with crystals, $90. KA4IFS, 800 Madison, Box 63154, Memphis, TN, 38163.

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COLLINS KWM2, 312 B-5, 516F-2, MP-1-DC supply, 351D-2 mobile mount, excellent condition $1195. WA2OVI, 516-692-9550.

SBE-144. Like new, 8 crystals $100. — 896-3549, Wilson, 02631.

DRAKE T4XC, R4B, MS4, AC4, extra xtals., original owner. Cables and manuals, local deal preferred. $850. 215-644-3285.

VHF transmitter. Fascinate your shack with a Federal Aviation type TUO Air/Ground 5-Crystal motor driven, continuous operation. Write for information. KØMWB, 1805 Oak Knoll Drive, Alexandria, MN 56308.

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Jobs for Hams

ENGINEERING: Cushcraft would like to hear from mechanical and electrical designers who would like to join us in making the finest antennas for both amateur radio and land mobile. Send your resume today to Cushcraft, P. O. Box 4680, Manchester, NH 03108.

SALES: Cushcraft is looking for experienced sales people. A thorough knowledge of amateur radio and/or land mobile plus relevant sales experience are prerequisites. Join our expanding team of antenna professionals. Cushcraft, P. O. Box 4680, Manchester, NH 03108.

"WANTED for summer of 1980: Instructors in electronics and ham radio. Must have at least a General Class F.C.C. license. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, 43 Franklin Street, Cedar Grove, N.J. 07009."

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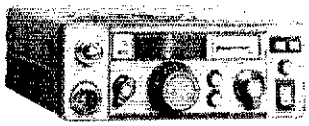

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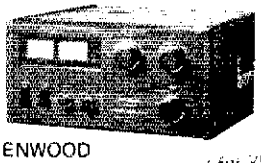

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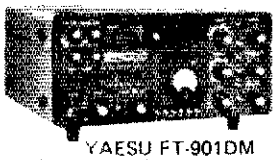

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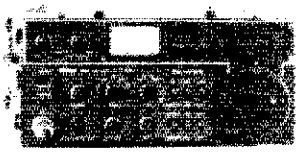

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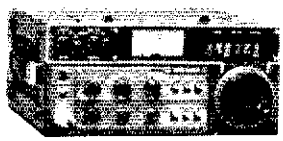

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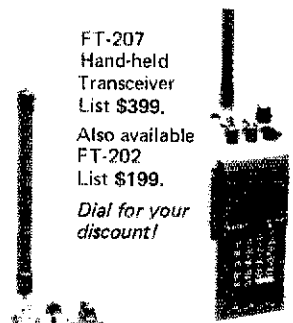

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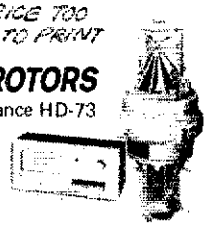

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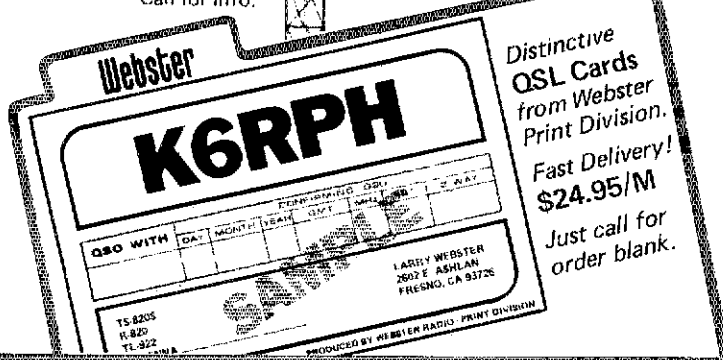

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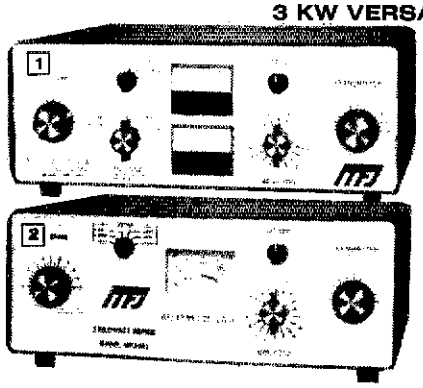
New MFJ 3 & 1.5 KW Versa Tuners

Run up to 3 KW or 1.5 KW PEP and match everything from 1.8 thru 30 MHz: coax, balanced line, random wire. Built-in balun.

3 KW VERSA TUNER IV's



1.5 KW VERSA TUNER III's

NEW MFJ KW VERSA TUNERS HAVE THESE FEATURES IN COMMON

These 6 new MFJ KW Versa Tuners let you run up to 3 KW or 1.5 KW PEP (depending on the model) and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire. Gives maximum power transfer. Harmonic attenuation reduces TVI, out of band emissions.

All metal, low profile cabinet gives RFI protection, rigid construction, sleek styling. Black. Rich anodized aluminum front panel. 5x14x14 inches. Flip down stand tilts tuner for easy viewing.

Efficient, encapsulated 4:1 ferrite balun. 250 pf, 6000 volt capacitors. 18 position dual inductor, 17 amp, 3000 V ceramic rotary switch (3 KW version). 12 position inductor, ceramic rotary switch (1.5 KW version). 2% meters. SO-239 coax connectors, ceramic feedthru for random wire and balanced line. One year limited warranty. Made in U.S.A.

3 KW VERSA TUNER IV's

[1] MFJ-984 3 KW VERSA TUNER IV

$299.95 ***EXCLUSIVE RF AMMETER insures maximum power to antenna at minimum SWR. Built-in dummy load.***

This is MFJ's best 3 KW Versa Tuner IV. The MFJ-984 Deluxe 3 KW Versa Tuner IV gives you a combination of quality, performance, and features that others can't touch at this price.

An exclusive 10 amp RF ammeter insures maximum power to antenna at minimum SWR. A separate meter gives SWR, forward, reflected power in 2 ranges (2000 and 200 watts).

Versatile antenna switch lets you select 2 coax lines thru tuner and 1 thru or direct, or random wire, balanced line or dummy load

A 200 watt 50 ohm dummy load lets you tune your exciter off air for peak performance. Efficient, encapsulated 4:1 ferrite balun.

[2] MFJ-981 3 KW VERSA TUNER IV

$199.95 ***Accurate meter gives SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. 4:1 ferrite balun.***

The MFJ-981 3 KW Versa Tuner IV is one of MFJ's most popular Versa Tuners. An accurate meter gives you SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. Encapsulated 4:1 ferrite balun.

[3] MFJ-982 3 KW VERSA TUNER IV

$199.95 ***Antenna switch lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line.***

The MFJ-982 3 KW Versa Tuner IV gives you a versatile 7 position antenna switch that lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

If you already have a SWR/wattmeter, the MFJ-982 is for you.

[4] MFJ-980 3 KW VERSA TUNER IV

$169.95 ***Heavy duty encapsulated 4:1 ferrite balun for balanced lines.***

The MFJ-980 is MFJ's lowest priced 3 KW Versa Tuner IV but has the same matching capabilities as the other 3 KW Versa Tuner IV's.

Features an efficient, encapsulated 4:1 ferrite balun for balanced lines.

1.5 KW VERSA TUNER III's

[5] MFJ-962 1.5 KW VERSA TUNER III

$169.95 ***SWR, dual range forward and reflected power meter, 6 position antenna switch, encapsulated 4:1 ferrite balun.***

The MFJ-962 1.5 KW Versa Tuner III is an exceptional value.

An accurate meter gives SWR, forward and reflected power in 2 ranges (2000 and 200 watts).

A versatile six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

Black front panel has reverse lettering.

[6] MFJ-961 1.5 KW Versa Tuner III

$149.95 ***6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.***

The MFJ-961 1.5 KW Versa Tuner III gives you a versatile six position antenna switch. It lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 ferrite balun.

If you already have a SWR/wattmeter, the MFJ-961 is for you.

Black front panel has reverse lettering.

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Why not visit your dealer today? Compare these 3 KW and 1.5 KW Versa Tuners to other tuners. You'll be convinced that its value, quality and features make it a truly outstanding value. If no dealer is available, order direct from MFJ and try it. If not delighted, return it within 30 days for a prompt refund (less shipping). Charge VISA, MC. Or mail check, money order plus $10 shipping/handling.

For technical information, order/repair status, in Mississippi, outside continental USA, call 601-323-5869.

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MFJ ENTERPRISES, INC.

P. O. BOX 494
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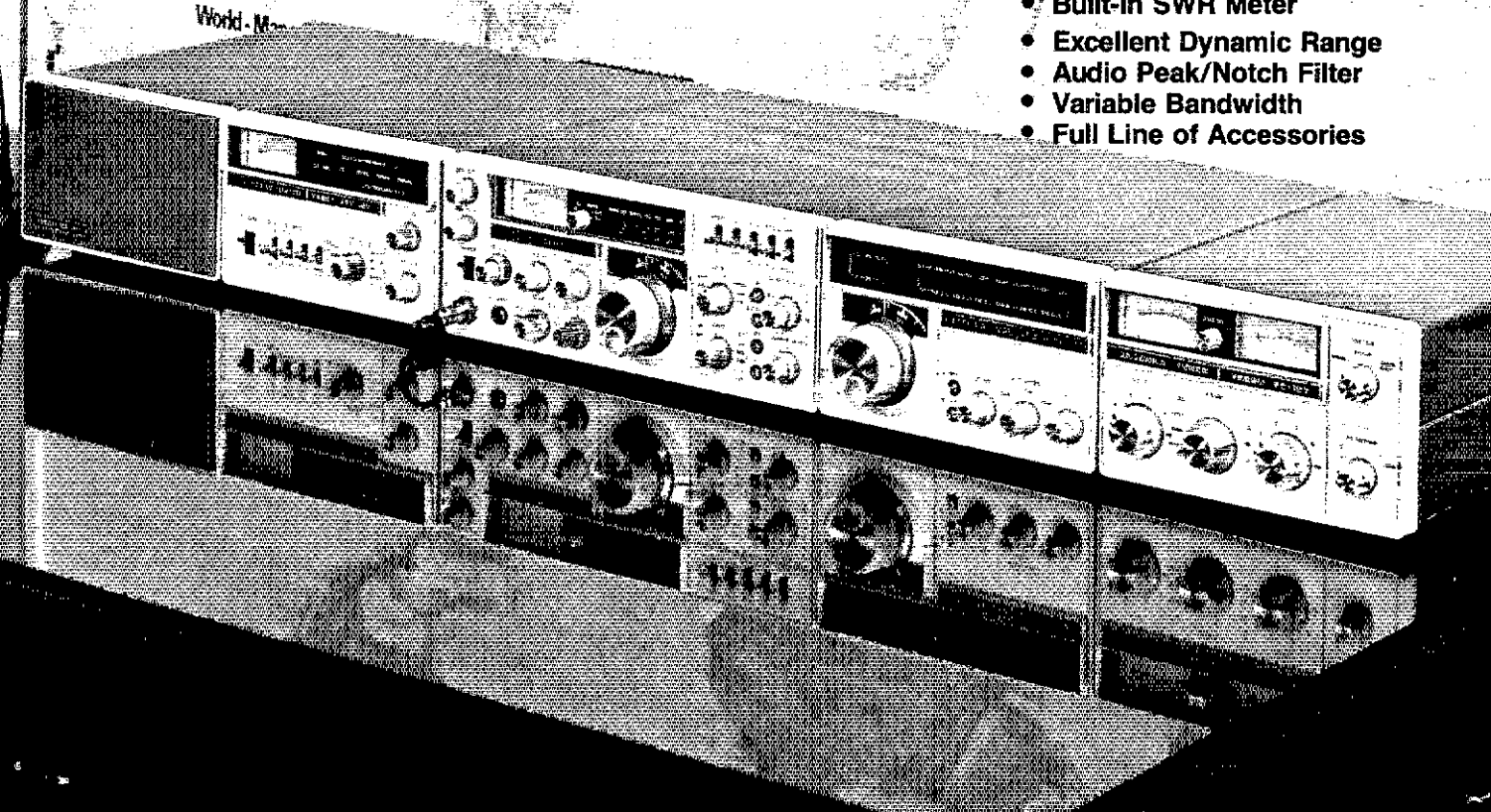
SOMETHING DIFFERENT
The FT-107 Series with "DMS"*
"It's A Cut Above The Rest"

- **Solid State**
- **240 watts DC SSB/CW**
- **160-10 meters, WWV**
  (2 auxiliary band positions are available for future expansion)
- **RF Speech Processor**
- **SSB, CW, AM, FSK**
- **Built-in SWR Meter**
- **Excellent Dynamic Range**
- **Audio Peak/Notch Filter**
- **Variable Bandwidth**
- **Full Line of Accessories**

*** OPTIONAL DIGITAL MEMORY SHIFT ("DMS")**
12 discrete memories. Stores individual frequencies or use as 12 full coverage VFOs (500 kHz each)



The FT-107 has been created as a result of a blending of technologies — computer, solid state and RF design. By careful utilization of these disciplines and the experience gained from our FT-301 series, YAESU has achieved an HF transceiver which offers unique features (e. g. "Digital Memory Shift"), efficient operation and a level of performance that has been previously unattainable.

RECEIVER:

Sensitivity: 0.25 uV for 10dB S/N, CW/SSB, FSK
1.0 uV for 10dB S/N, AM
Image Rejection: 60dB except 10 meters (50dB)
IF Rejection: 70dB
Selectivity: SSB 2.4 kHz at −6dB, 4.0 kHz at −60dB.
CW 0.6 kHz at −6dB, 1.2 kHz at −60dB.
AM 6 kHz at −6dB, 12 kHz at −60dB
Variable IF Bandwidth
20dB RF Attenuator
Peak/Notch Audio Filter
Audio Output: 3 watts (4-16 ohms)
Accessories: FV-107 VFO (standard not synthesized)
FTV-107 VHF (UHF Transverter)
FC-107 Antenna Tuner
SP-107 Matching Speaker
FP-107 AC Power Supply

TRANSMITTER

Power Input: 240 watts DC SSB/CW
80 watts DC AM/FSK
Opposite Sideband Suppression: Better than 50dB
Spurious Radiation: −50dB.
Transmitter Bandwidth 350-2700 hz (−6dB)
Transmitter: 3rd IMD −31dB neg feedback 6dB
Transmitter Stability: 30 hz after 10 min. warmup
less than 100 hz after 30 min.
Antenna Input Impedance: 50 ohms
Microphone Impedance: 500 ohms
Power Required: 13.5V DC at 20 amps
100/110/117/200/220/234V AC at 650 VA

YAESU
The radio.

And Specifications Subject To
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YAESU ELECTRONICS CORP., 15954 Downey Ave., Paramount, CA 90723 ● (213) 633-4007

TS-520SE

"Cents-ability" in a quality HF Rig!

The TS-520SE is an economical new version of the TS-520S... the world's most popular 160-10 meter Amateur transceiver. Now anyone can easily afford a high quality HF transceiver, providing 200 watts PEP input on SSB and 160 watts DC on CW!

The TS-520SE is a high-quality 160-10 meter SSB/CW transceiver intended for ham-shack use. The following changes were made to produce the new "SE" model:

- **Replaced the heater switch with a CW WIDE/NARROW bandwidth switch, for use with the optional CW-520 500-Hz CW filter. A big improvement for the CW operator!**
- **Removed DC converter terminals. Now it operates strictly on 120 VAC and is not intended for mobile use.**
- **Removed transverter terminals. Now it is strictly a 160-10 meter SSB/CW transceiver. (DG-5 Digital Display is optional).**

Ask your Authorized Kenwood Dealer about the amazing TS-520SE... and its surprisingly affordable price!

...pacesetter in amateur radio

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220