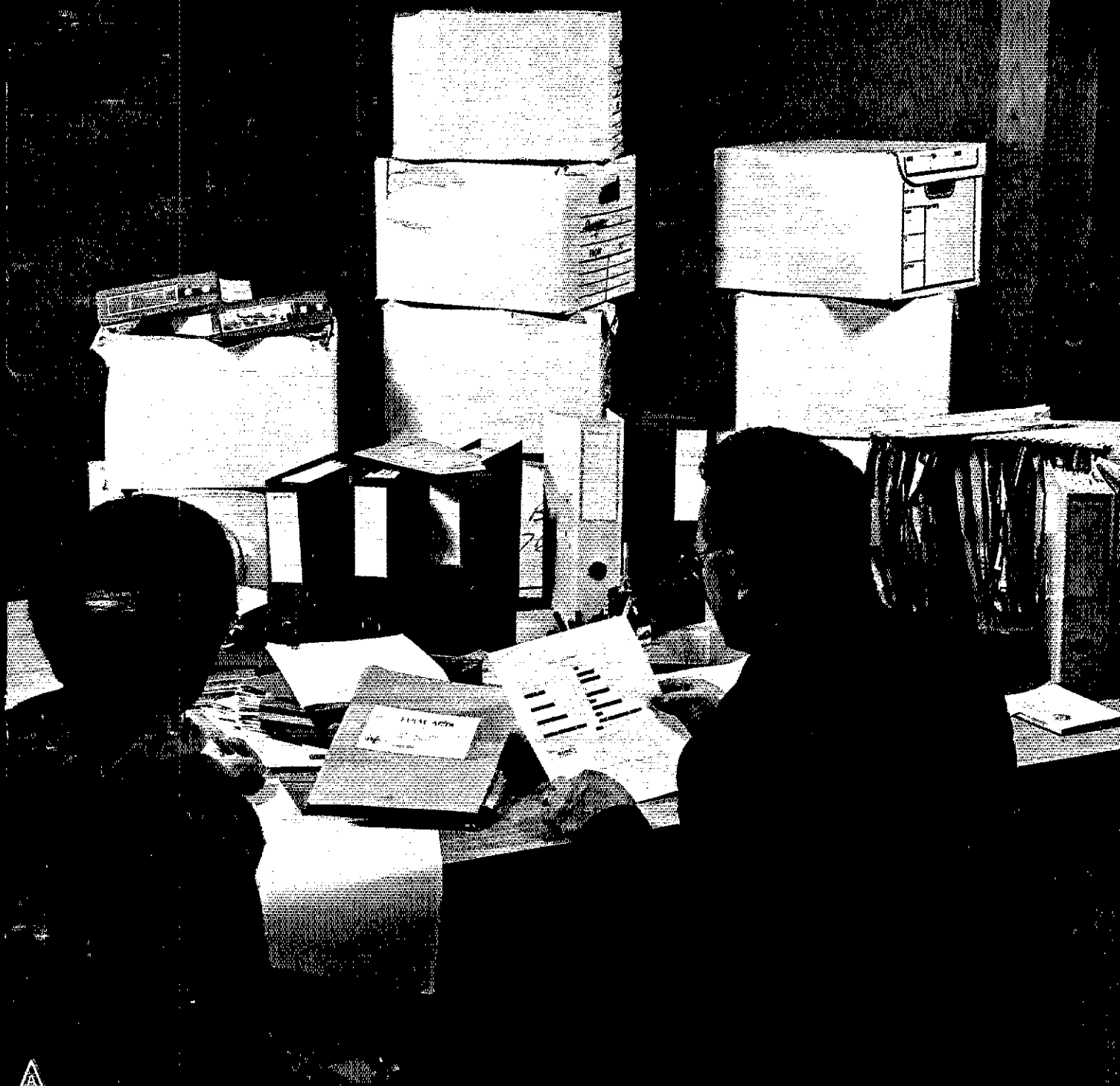
February 1980 $2.50

QST

devoted entirely to Amateur Radio



WARC 79 from start to finish

tempo...

the first in synthesized portables gives you the broadest choice at the lowest price

Shown with optional touch tone pad

...the new S-5

* The only synthesized hand-held offering 5 watt output. (Switchable for 1 or 5 watt operation)
* The same dependability as the time proven S-1 Circuitry that has been proven in more than a million hours of operation.
* Heavy duty battery pack.
* External microphone capability.
* The S-5's exciting low price...only $349.00
* With touch tone pad $399.00

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
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mmx 170 mm (1.6" x 2.5" x 6.7")
Weight:	17 oz
Sensitivity:	Better than 5 microvolts nominal for 20 db

SUPPLIED ACCESSORIES
Telescoping whip antenna, ni-cad battery pack, charger.

OPTIONAL ACCESSORIES
12 Button touch tone pad (not installed): $39 • 16 Button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Rubber flex antenna: $8 • Leathe holster: $16 • Cigarette lighter plug mobil charging unit: $6 • Matching 30 watt output 13.8 VDC power amplifier (S30): $89 • Matching 80 watt output power amplifier (S80): $149

The new improved Tempo S-1

- The first and most thoroughly field tested hand-held synthesized radio available. 800 channels in the palm of your hand.
- Simple to operate. (You don't need a degree in computer programming)
- Heavy duty battery pack allows more operating time between charges.
- External microphone capability
- The lowest price ever...$299.00
- *The S-1T (With touch tone pad installed)...$339.00*

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) provides excellent mobile communications 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.

The Tempo S-2

Tempo is first again. This time with a superior quality synthesized 220 MHz ha held transceiver. With an S-2 in your car or pocket you can use 220 MHz repeate throughout the U.S. It offers all the advanced engineering, premium quali components and exciting features of the S-1. The S-2 offers 1000 channels in extremely lightweight but rugged case.

If you're not on 220 this is the perfect way to get started. With the addition of the 25 (25W output) or S-75 (75W output) Tempo solid state amplifier it becomes powerful mobile or base station. If you have a 220 MHz rig, the S-2 will a tremendous versatility. Its low price includes an external microphone capabili heavy duty ni-cad battery pack, charger, and telescoping whip antenna.
Price...$349.00 With touch tone pad...$399.

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal. . . give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

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ASR Operation (Compose your transmission *WHILE* receiving)

- 150-line Receiver Buffer
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- Morse, Baudot, or ASCII Operation
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- 110-9600 baud ASCII
- 60-130 WPM Baudot
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Write or call for the DS3100 ASR specifications and see how *YOU* have helped design the new standard in amateur radio terminals.

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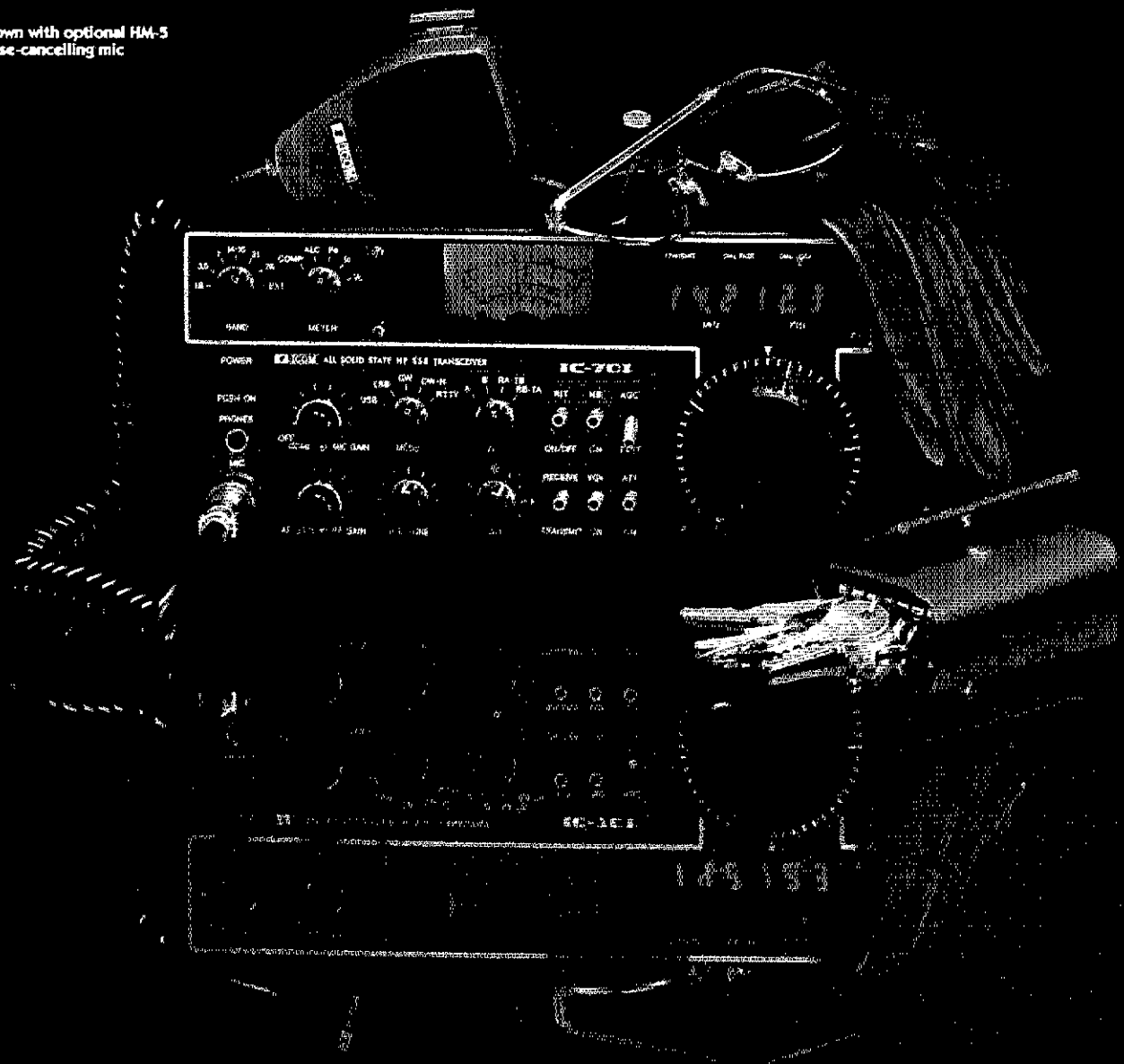

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When you're ready for the maximum in mobile HF, you're ready for the IC-701.

For full-feature, full-band, full-power mobile HF, ICOM's top-quality **IC-701** outshines them all. With fixed-station type flexibilities, full band coverage from 160 M to 10 M, and a full 200 watts input, the **IC-701** fits your mobile HF aspirations like a fine glove.

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Phone (214) 620-2780

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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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February 1980
Volume LXIV Number 2

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THE COVER

WARC-79, from start to finish, was a mountain of paper work, all finally condensed into the "final acts." See pages 52-71.

Contents

The Little Amplifier With The Big Reputation

In January 1979 the GLA 1000 was introduced. It was a unique linear design; tested not only in the lab but in ham stations across the country.

January 1980 . . . DenTron proudly introduces the new GLA 1000B. Our new improved GLA is built on a design whose strength and durability made it justly famous.

Because you asked for it, the GLA 1000B is bursting with exciting new features. We've added tuned input for solid state radios; front panel antenna switching for dummy load tune up; a technical design change providing longer tube life.

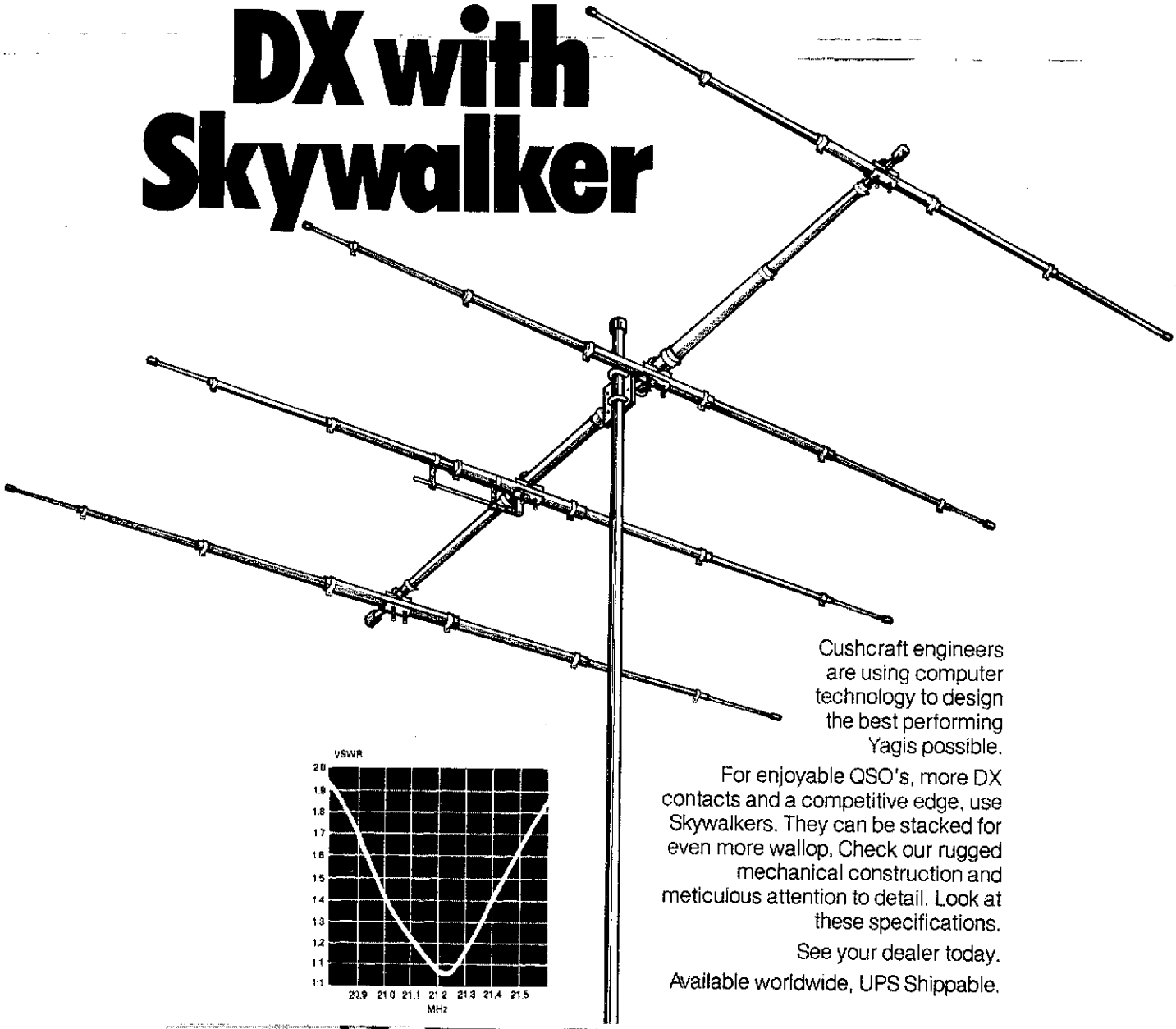
We think you'll agree, however, one of the most exciting features is the price. At $299.50 can you afford not to be heard?

$299.50 sugg. retail
FCC type accepted

DenTron Radio Co., Inc.

2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216) 425-3173

Work Real DX with Skywalker

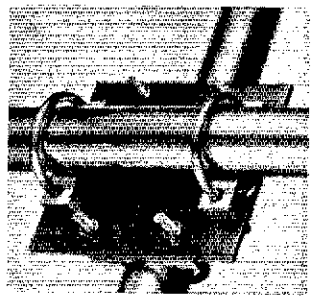


Cushcraft engineers are using computer technology to design the best performing Yagis possible.

For enjoyable QSO's, more DX contacts and a competitive edge, use Skywalkers. They can be stacked for even more wallop. Check our rugged mechanical construction and meticulous attention to detail. Look at these specifications.

See your dealer today.

Available worldwide, UPS Shippable.



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

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Cushcraft antennas are used by The Official 1980 Olympic Amateur Radio Networks.

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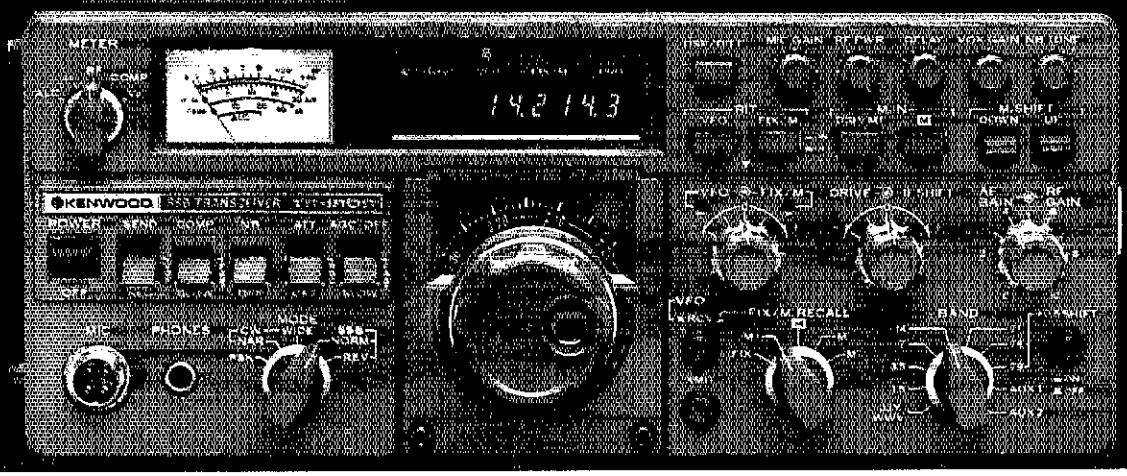


Maximum convenience with optimum features

TS-180S

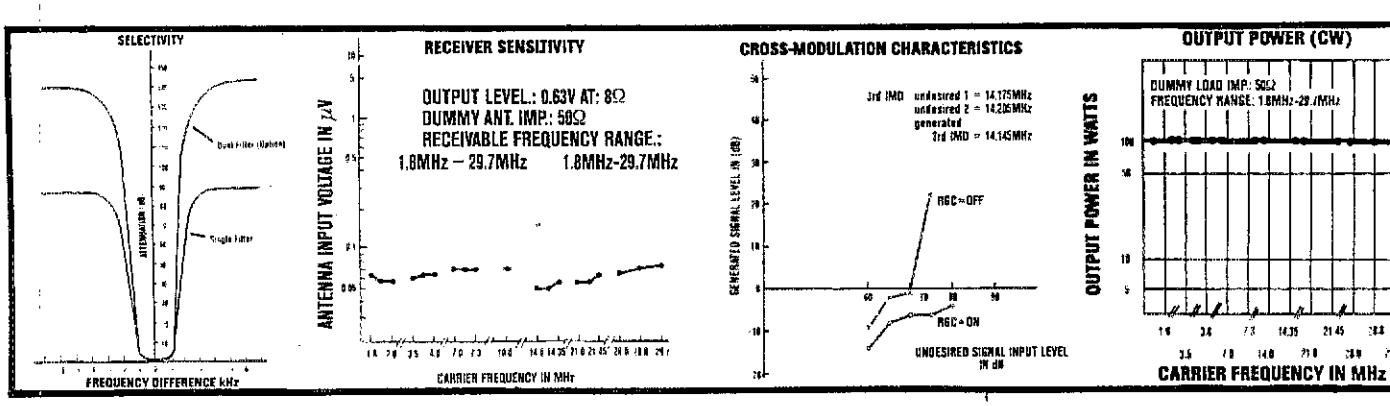
The TS-180S is Kenwood's top-of-the-line all solid-state HF SSB/CW/FSK transceiver. New circuit-design technology has been incorporated throughout the transceiver, resulting in optimum receiver and transmitter performance, as well as advanced operating features that every DXer, contest operator, and all Amateurs would desire for maximum efficiency and flexibility.

TS-180S FEATURES:

- Digital Frequency Control (DFC), including four memories and manual scanning. Memories are usable in transmit and/or receive modes. Memory-shift paddle switches allow any of the memory frequencies to be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. It's almost like having four remote VFOs!
- All solid-state...including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate!
- High power...200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters (entire band provided). Also covers more than 50 kHz (100 kHz with DFC) above and below each band (MARS, etc.), and receives WWV on 10 MHz.
- Adaptable to all three new bands.
- Improved dynamic range.
- Dual SSB filter (optional), with very steep shape factor to reduce out-of-passband noise on receive and to improve operation of RF speech processor on transmit.
- Single-conversion system with highly advanced PLL circuit, using only one crystal with improved stability and spurious characteristics.
- Built-in microprocessor-controlled large digital display. Shows actual VFO frequency and difference between VFO and "M1" memory frequency. Blinking decimal points indicate "out of band." Monoscale dial, too.
- IF shift. Kenwood's famous passband tuning that reduces QRM.
- Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).
- Automatic selection of upper and lower sideband (SSB NORM/SSB REV switch).
- Tunable noise blanker (adjustable noise-sampling frequency).
- RF AGC ("RGC"), which activates automatically to prevent overload from strong, lo signals.
- AGC (selectable fast/slow/off).
- Dual RIT (VFO and memory/fix).
- Three operating modes: SSB, CW, and F
- Improved RF speech processor.
- 13.8 VDC operation.
- Also available is the TS-180S without DI which still shows VFO frequency and diff ence between VFO and "hold" frequenc on the digital display.
- Full line of matching accessories, includ PS-30 base-station power supply, SP-180 ternal speaker with selectable audio filte VFO-180 remote VFO, AT-180 antenna tun SWR and power meter, DF-180 digital frequer control, YK-88 CW filter, and YK-88 SSB fi

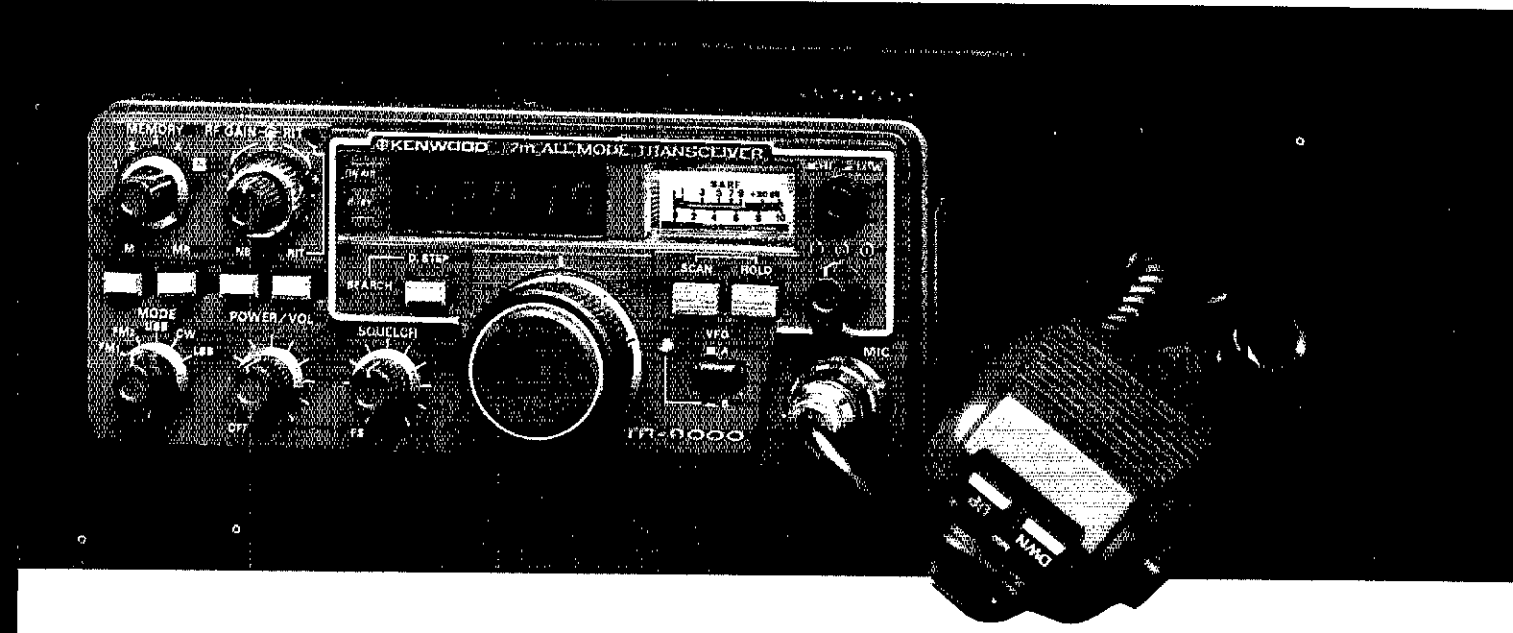
All of these advanced features can be yours and at an attractive price! Visit your local Aut rized Kenwood Dealer and inquire about exciting TS-180S with DFC!

NOTE: *Price, specifications subject to chang without notice and obligation.*



TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220

New 2-meter direction.



A compact transceiver with FM/SSB/CW plus...

TR-9000

Kenwood's done it again! Now, it's the exciting TR-9000 2-meter all-mode transceiver...complete with a host of new features. Combining the convenience of FM with long-distance SSB and CW in a very compact, very affordable package, the TR-9000 is the answer for any serious Amateur Operator! Versatile? You bet! Because of its compactness, the TR-9000 is ideal for mobile installation. Add on its fixed-station accessories and it becomes the obvious choice for your ham shack!

TR-9000 FEATURES:

- FM, USB, LSB, and CW...all popular modes
- Compact size...only 6 11/16 inches wide X 2 21/32 inches high X 9 7/32 inches deep
- Digital dual VFOs...with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz, convenient for each mode of operation
- Digital frequency display...five, four or three digits, depending on selected tuning step
- Extended frequency coverage...143.9000 – 148.9999 MHz
- Five memories:
  M1 – M4...for simplex or ± 600 kHz repeater offset
  M5...for nonstandard offset (memorizes transmit and receive frequency independently)
- Scan of entire band...automatic busy stop and free scan
- SSB/CW search...sweeps over selectable 9.9-kHz bandwidth segments, for easy monitoring
- UP/DOWN microphone (standard)..."beep" sounds with each frequency step
- Noise blanker...eliminates pulse-type noise on SSB and CW
- Low-noise, dual-gate MOSFET and two-stage monolithic crystal filter for improved receiver front-end characteristics
- RIT (receiver incremental tuning) for SSB and CW...effective even on memory channels
- RF gain control
- CW sidetone
- Automatic selection of AGC time constant with MODE switch (slow for SSB and fast for CW)
- Improved power module for reliable and stable linear RF output
- Selectable power outputs...10 W (HI)/1 W (LOW)
- Mobile mounting bracket...easy to mount, with quick-release levers
- LED indicators...ON AIR, BUSY, and VFO
- Accessory terminals on rear panel. KEY, BACKUP DC, STBY, EXT SP, DC, TONE INPUT, and ANT

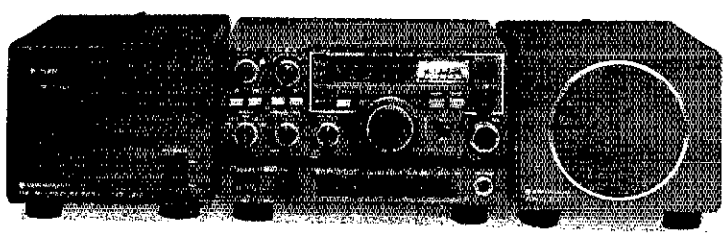
See your Authorized Kenwood Dealer now for details on the TR-9000... the new direction in 2-meter all-mode transceivers!

NOTE: *Price, specifications subject to change without notice and obligation.*

Subject to FCC Approval

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- PS-20 power supply
- SP-120 external speaker
- BO-9 System Base...with power switch, SEND/RECEIVE switch for CW operation, backup power supply for memory retention (BC-1 backup power adaptor may also be used for this application), and headphone jack



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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Spectrum Management

Elsewhere in this issue you will find a rather complete story on WARC-79 — the preparation, the participation, the results. Although Amateur Radio's place in the spectrum is pretty well assured for the next 20 years or so, WARC-79 was a clear demonstration of the need for a great deal of first-rate frequency management by *all* of those who use the spectrum. As amateurs, we have been allocated certain slices of that spectrum, and it's up to us to so manage these bands that we make the best use of them, for our benefit and for the benefit of others. In carrying out this management of our resources, there are many factors to consider. The sharing with other services, the suballocation of the bands by mode, the communications discipline that we impose on ourselves — these are some of the thoughts that come to mind.

RTTY, cw, ssb, nbvm, ASCII, SSTV, fm, a-m — all of these modes, and perhaps more, have their champions among the amateur fraternity. Although in most of the world the division between, for instance, phone and cw is voluntary and is generally established by IARU Regional band plans, in the United States and Canada our band suballocations are part of the amateur regulations promulgated by FCC and DOC. The existing suballocations were established a number of years ago, and it would be well now to consider whether growth in the technology and the amateur population warrants some changes. It would be particularly appropriate to give some thought to the new band at 10,100-10,150 kHz. How do you think that band ought to be allocated? All cw? All phone? 50-50 split? Restricted to any class of license? That band, if all goes according to plan, should be available for our use in January, 1982. That's less than two years away, and it doesn't leave very much time really for you to register your thoughts, for the League to file a petition with FCC, and for the Commission to go through the formality of rule making; nor does it leave much time for a similar decision process in Canada.

There are a number of other aspects of frequency management that also need to be considered by all of us. For example, is it very smart to engage in cross-town QSOs on 20 meters, when your signal is being propagated worldwide? Especially when you're running a kilowatt? Especially when other amateurs are trying to use the frequency for long-distance communications? In other words, we need to improve our "smarts" in the way we use our bands.

One of the things that the IARU team in Geneva dreaded was the possibility that some unfriendly delegate might challenge the need of the amateur service for additional frequency bands based on a monitoring of what was going on in the existing bands. It never happened, but wouldn't it have been dreadful if some delegate had listened to some of the shenanigans that took place on 20 meters during Hurricane David? How many new frequencies do you think we'd have gotten if someone at WARC-79 had ever played a tape of that garbage? And what about the deliberate interference that is taking place on repeaters? Must we continue to put up with this vandalism? Many of us would like the FCC to solve this problem, but the trouble is that although the Commission has some excellent and modern monitoring stations, and although it has some highly qualified engineers working at those stations, their workload may be too heavy to spend as much time on our problems as we would like. So, let's do some of our own frequency management and maintenance of discipline. We're not suggesting that a vigilante corps be formed, complete with lynching ropes, but a little social pressure might be in order. First, however, we amateurs have got to identify the bad actors. It used to be a game, just for fun, to have hidden transmitter hunts. Couldn't we now make it a game with a purpose?

Amateur Radio worldwide continues to grow. With growth comes a host of problems, not the least of which is a higher level of interference both because of crowding and because of deteriorating standards. History has shown us that the technology generally evolves to make it possible to put more stations into a given hunk of spectrum. The rest of the problem will have to be solved by good management of the frequency resources that have been allocated to us — intelligent suballocations, intelligent operating techniques, and a maintenance of discipline. The technical advances, the good suballocations — these can be achieved by fairly straightforward technical and operational analysis. But to rid our bands of the malicious and deliberate interference by fellow amateurs — this may be the most difficult problem we have. And yet, if we don't solve it, the result is chaos. — *Richard L. Baldwin, W1RU*

League Lines...

Automatic reciprocity between Canada and the U.S. Effective January 21, 1980, Canadian-licensed radio amateurs may operate their stations in the U.S. without having to obtain a written permit from FCC. Also, U.S.-licensed radio amateurs are allowed to operate their stations in Canada without having to obtain a written permit from DOC. All other regulations with respect to reciprocity between the U.S. and Canada remain in effect. Deletion of the written-permit requirement is the only change.

New Amateur Radio exams! FCC has released new syllabi for new Novice, Technician/General, Advanced and Amateur Extra Class written exams. QST will publish the new syllabi next month. FCC plans to introduce new exams for all classes of Amateur Radio license which will be taken from, and correspond precisely to, these new syllabi. Implementation date of the new exams is not known at this time; however, the Commission staff plans to release a public notice in advance, giving the exact date the new exams will be used. Watch QST for further developments.

Trouble ahead for FCC's volunteer examiner program. At an open meeting, the FCC's general counsel stated that in his judgement the present method of conducting Novice examinations by volunteer examiners was illegal. In response, the chief of the Private Radio Bureau, Carlos Roberts, said that his Bureau realized that a problem existed and would seek a solution. However, the status quo must continue for now. It appears that this legal opinion may have a significant impact on the Novice licensing program in the not-too-distant future.

Availability of license. The original operator license no longer has to be in the personal possession of the operator when operating an Amateur Radio station. Now a photocopy will suffice. FCC has changed § 97.82 of the Amateur Rules to allow a photocopy of the license to meet this "availability of license" requirement.

Our request for comments on possible Field Day rules changes resulted in an unexpected deluge of letters. The overwhelming sentiment was for no major changes, though a limit on set-up time was often mentioned. A few minor changes will be detailed in March QST, with complete rules in May QST.

The "brief delay" referred to in the next to last paragraph of February 1979 "League Lines" is now over and the control IC and the filters necessary to build narrow-band voice modulation (nbvm) units are now available from the manufacturers. Information may be obtained from VBC Inc., P. O. Box 1289, San Mateo, CA 94401.

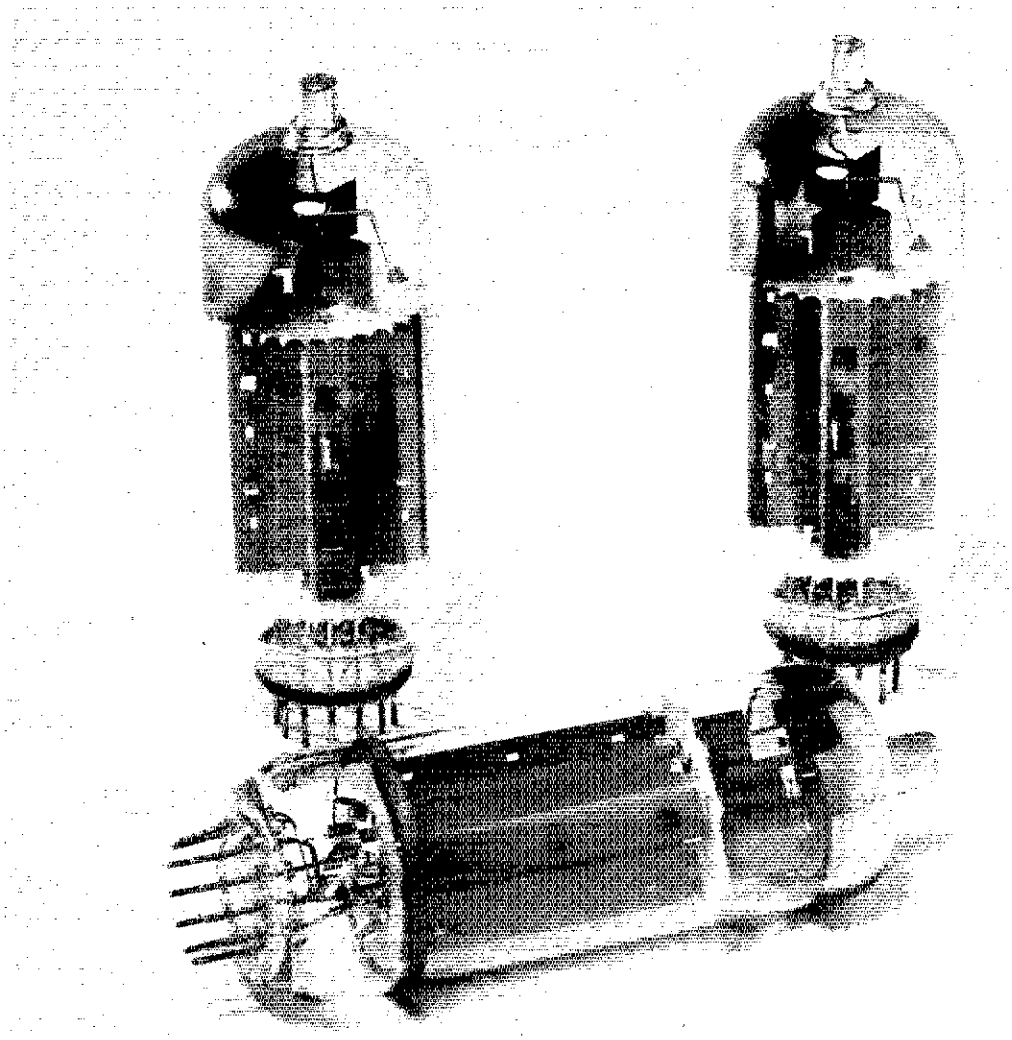
The deadline for responding to the federal Department of Communications (DOC) discussion paper entitled The Utilization of the Radio Spectrum in the Range 0.890-10.68 GHz has been extended to March 1, 1980. The paper, a major review of these bands, invites comments and submissions as part of a three-stage process leading towards an overall policy for their use in Canada. Submissions should be mailed to the Director-General, National Telecommunications Branch, Department of Communications, 300 Slater St., Ottawa, ON K1A 0C8.

The ARRL hq. Technical Department is temporarily unable to accept technical information service (TIS) phone calls. Answers to TIS letters will be very slow until staff vacancies are filled. Openings still exist for technical editors and lab technicians. Please contact W1FB or K1TD at Hq. if interested.

New SSB-only CB? FCC has directed its staff to begin drafting a proposal creating a new SSB-only CB radio service between 27.41 and 27.54 MHz. It also directed that the proposal explore allowing longer-distance contacts than those permitted in the CB Radio Service, allowing VFOs and requiring users to pass a non-technical test. Some FCC observers expect that it may take up to one year for the proposal to be released. Watch QST for further developments.

ARRL hq. Club and Training Department and Membership Services Department are looking for persons to fill staff vacancies. If you are interested in employment at ARRL hq., send us a resume including details of your Amateur Radio experience.

Some Thoughts About TV Sweep Tubes



There's nothing wrong with using TV sweep tubes as rf power amplifiers. Here are some observations.

By Doug DeMaw,* W1FB

A stigma seems to have developed concerning the use of horizontal-output tubes (sweep tubes) in amateur transmitters. Some operators fear them because of their thermal fragility and others claim they're no good as linear amplifiers for ssb operation. Sure, there's a bit of truth connected with both concerns, but there are some good features too!

In many parts of the world it is easier to purchase TV sweep tubes locally than it is to find a 6146B. Surely this is a plus feature. Also, a number of sweep tubes cost less than 6146s do.

In simple terms, the thermal-fragility problem can be explained by stating that the key-down (continuous-carrier mode) is limited to short periods compared to that of 6146s. Too long a period (generally in excess of 30 to 45 seconds) will cause excessive tube heating and subsequent damage or failure. The reason for this limitation is that sweep tubes are designed for high peak currents of short duration (pulse service), but not for high levels of

*Senior Technical Editor, ARRL

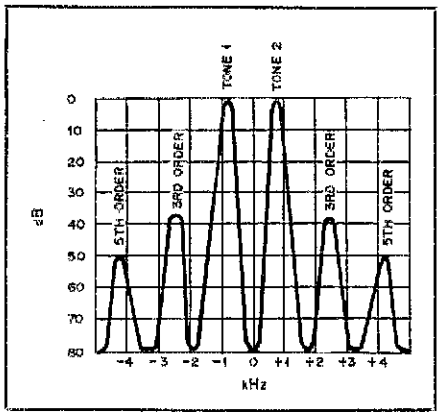


Fig. 1 — A classic spectrum display of what would be seen at the transmitter output during a two-tone IMD test. The maximum power output is represented by the peaks labeled tone 1 and tone 2. The 3rd- and 5th-order distortion products are displayed to the left and right of the desired signal. The 3rd-order products are 39 dB below full power and the 5th-order products are 50 dB below full output. Ideally, there would be no IMD products showing, and there would be some noise appearing as "grass" near the baseline of the spectral display. The higher the level of the 3rd- and 5th-order products, the lower the quality of the ssb signal.

Table 1

Some Sweep-Tube Parameters

Type	C (Input) (pF)	Input Resonant Frequency (MHz)	C (Output) (pF)	Output Resonant Frequency (MHz)	Probable*** Upper Frequency Limit of Operation (MHz)
6GJ5	19.1	190	10.0	190	150
6HF5*	25.5	86	16.3	141	60
6HF5**	26.7	100	16.3	141	75
6JB6	19.1	190	10.5	200	145
6JE6	24.3	82	14.5	152	60
6JM6	17.2	200	10.3	194	150
6JG6	22.9	187	14.7	226	150

*One grid connection.
**Two grid connections.
***75 percent of self-resonant frequency.
Data courtesy of Sylvania

continuous current. They are entirely suitable, however, for ICAS (intermittent commercial and amateur service) operation.

In linear-mode service, they do not yield the IMD (intermodulation distortion) quality which is typical of 6146 tubes at full rated power, respectively. In a properly designed and operated amplifier, however, it is possible to obtain sweep-tube linearity which nearly approaches that of the 6146 tube. For example, the Yaesu FT-101E which was reviewed in September 1976 *QST* exhibited 3rd-order distortion products which were 34 dB down from full output. The '101 uses sweep tubes in the PA. The Kenwood TS-820, which contains 6146Bs in the PA, was reviewed in the same issue. The 3rd-order products from the '820 were 39 dB below full power.

The worst-case IMD observed in the ARRL lab from a rig which utilized sweep tubes was −27 dB. The ARRL technical staff feels that an acceptable level for 3rd- and 5th-order distortion products (see Fig. 1) is 30 dB or greater below full power. Therefore, the FT-101E and TS-820 units are considered above average in terms of IMD.

The now-defunct Galaxy Company once marketed a 2-kW PEP linear amplifier (model 2000 +) which contained 10 sweep tubes in parallel. The amplifier operated Class AB1 and was grid-driven across a 50-ohm noninductive power resistor. The measured 3rd- and 5th-order distortion products were 31 dB below full amplifier power output.

Another example of acceptable performance was seen when a linear amplifier built by the author was tested by means of a spectrum analyzer. The circuit contained four 6KD6 sweep tubes in parallel, cathode driven and in Class AB1. The IMD products were observed at −30 dB or better. Peak output power was 800 W.[1]

Operating Frequency

Generally speaking, TV sweep tubes are able to give acceptable performance up to 30 MHz. The 6146B, on the other hand, is good well into the vhf region.

The useful upper frequency limits of sweep tubes are determined by the internal lead lengths, the input capacitance and the output capacitance. Since these tubes were designed for low-frequency TV service (15.750 kHz), the manufacturers are not concerned with the aforementioned "problem causers." The high terminal capacitances of the tubes tend to shunt the rf currents to ground. This malady becomes more pronounced as the operating frequency is increased. The high-input C makes the tube hard to drive and presents impedance-matching problems. The high-output C can cause excessive currents inside the tube, causing gradual performance degradation or complete failure. Therefore, it is prudent to choose sweep tubes with short internal leads and minimum terminal capacitance. The effect of long internal leads is one of the lead inductance resonating with the internal capacitance at some specified high frequency. This condition can cause stray rf currents to be high, ultimately harming the tube. Vhf parasitic oscillation is enhanced greatly if the tube chosen has input and output self-resonant frequencies which are close in frequency. Table 1 shows how various popular sweep tubes compare in this respect. Parasitic chokes of the type shown in Fig. 2 (Z1) can be installed to prevent parasitics.

The writer made but one attempt to use a sweep tube at vhf. A 6JB6 was hooked up for grounded-grid operation and driven from a 5-W exciter. An output of 25 watts was obtained, but the tube efficiency was rather dismal — roughly 30 percent after considerable optimizing. The tank circuit was designed to absorb the tube output capacitance (Fig. 3). The 19 pF of input C presented no special problems.

The Problems of Parallel Use

No matter what tube a builder may choose for the amplifier, paralleling two or more such tubes creates design problems. A matter of special concern is the current drawn by each tube in the string. Dynamic balance is essential to ensure that no single tube in the combination "hogs" the plate current. If, for example, six 6HF5s were connected in parallel, and the g_m (transconductance) of one was substantially higher than the rest, the one with the high g_m would probably be driven well beyond its safe dissipation rating. The result would be disastrous as you sat and watched the anode turn red, just before the glass envelope melted or cracked! Sweep tubes are especially prone to this ailment because of their high g_m ratings: The 6KD6, for one, has a transconductance of 14,000 micromhos!

A not-so-practical solution to the problem of current sharing is to install a matched set of tubes. For the amateur this is not good news, as *many* tubes would be necessary in order to grade them out for the matched set required in the amplifier.

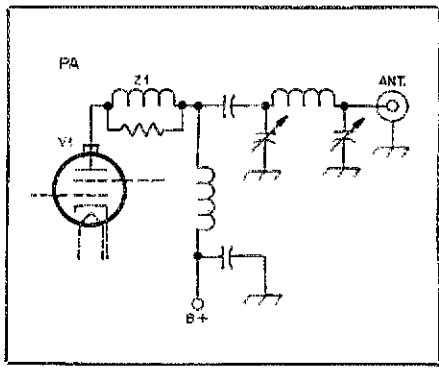


Fig. 2 — Schematic illustration of an amplifier which contains a parasitic suppressor (Z1). This component can be fashioned from a 100-Ω, 2-watt composition resistor. The coil is wound over the resistor body and made common to the resistor pigtails. Eight turns of no. 20 enameled wire are suitable for the coil.

[1]Notes appear on page 15.

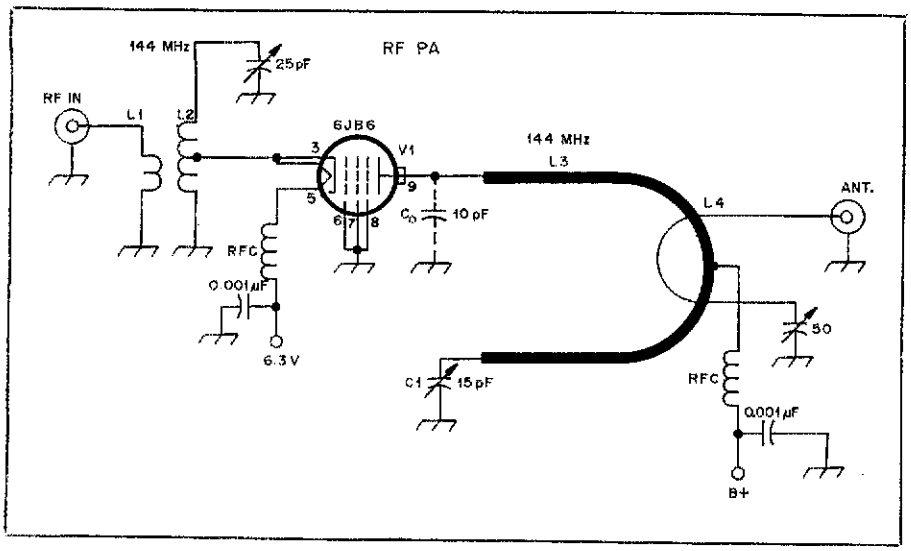


Fig. 3 — Circuit of an experimental 144-MHz grounded-grid amplifier which used a 6JB6 sweep tube (see text). C_o is the tube output C. L3 is dimensioned so that resonance occurs when C1 is set at 10 pF.

A simple method for balancing the tubes was worked out by the author (note 1). The scheme is shown in Fig. 4. With full drive to the amplifier, the bias-adjust control for each tube is tweaked for equal plate currents. The resting plate currents may be unequal as a result, but they will not be too low to affect linearity of the amplifier. Although separate meters are shown for each tube in Fig. 4, they aren't necessary. A single 0-1 ampere meter can be employed to meter all four tubes at one time. Tube balance can be measured by installing a 10-ohm, 1-watt resistor in series with each cathode lead. R1 through R4 are then adjusted to obtain equal voltages across the 10-ohm resistors at peak drive. When choosing sweep tubes for grounded-grid service (Fig. 4), it is mandatory to select the types which have the beam-forming plates brought out to a separate base pin. This connection should be returned to rf ground along with the

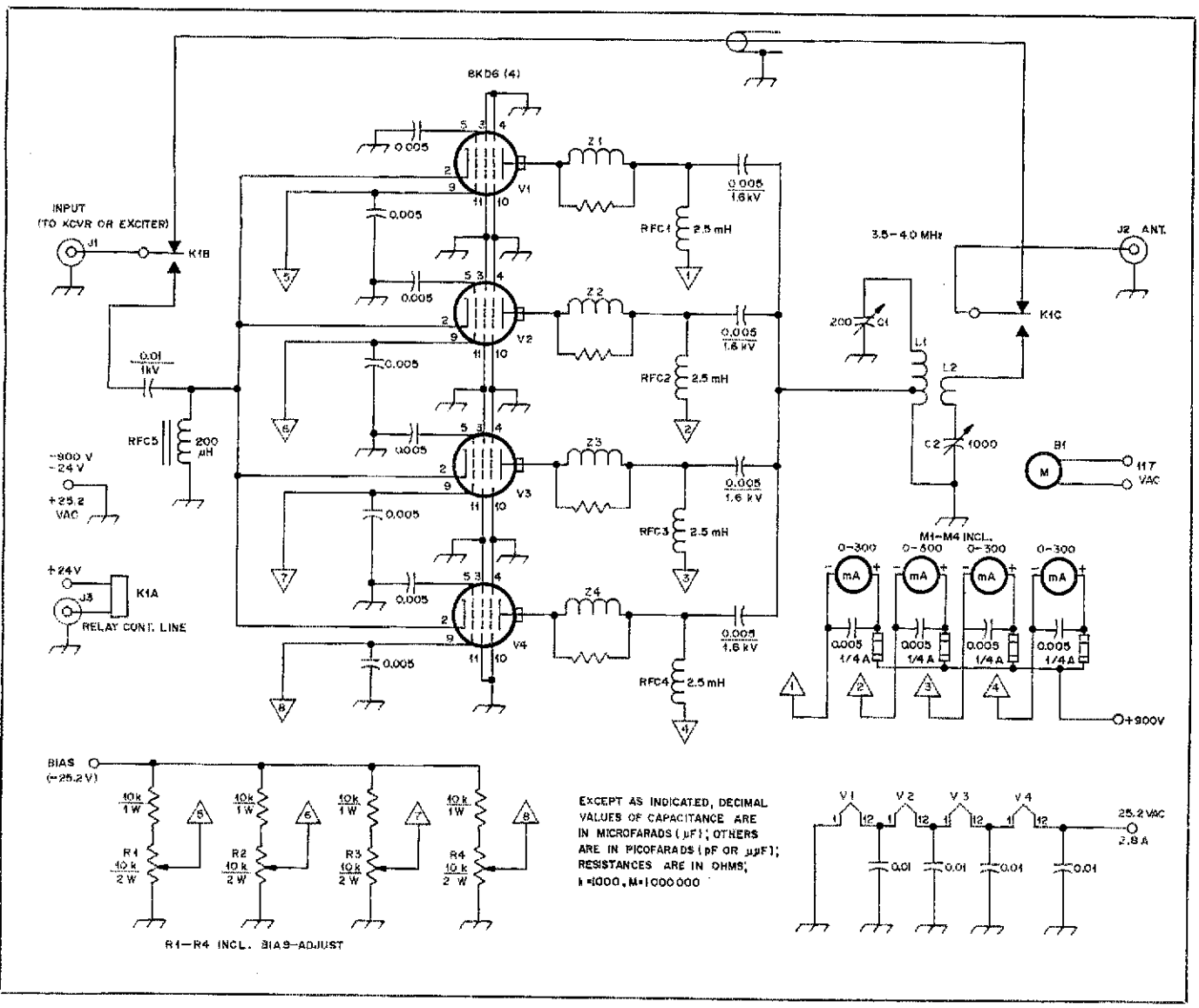


Fig. 4 — A grounded-grid sweep-tube linear amplifier which contains four 6KD6 tubes. Dynamic balance is ensured by means of R1 through R4. These controls are set to provide equal plate currents for the four tubes at peak drive periods (see text and note 1). This circuit originally appeared in July 1968 *QST*, page 31.

control and screen grids. Some sweep tubes have their beam-forming plates connected to the cathode *inside* the tube. In grounded-grid service, this will lead to amplifier self-oscillation, especially as the operating frequency is increased.

Another complication which results from paralleling several tubes is a marked increase in the combined input and output capacitance. Needless to say, as either of these values become elevated, the greater the unwanted rf-shunting effect discussed earlier. Severe limitations can be imposed on the upper frequency range of the amplifier. For example, the 6KD6 tube has a rated input C of 40 pF and an output C of 16 pF. Six of these tubes in parallel would yield 240 and 64 pF, respectively. The output capacitance could be absorbed in the plate-tank circuit, but the input capacitance would have to be dealt with by means of matching networks similar to those used with rf power transistors. In fact, the plate impedance of several sweep tubes in parallel becomes pretty low, causing the designer to move in the direction of transistor matching networks. A six-tube Class B amplifier (sweep tube) might develop 1 ampere of plate current at peak drive. If the plate voltage were 900 — a typical value for amateur service — the plate impedance would be approximately 572 ohms, as derived from

$$R_L = \frac{E_p}{1.57 \times A}$$

where

E_p is the plate voltage,

R_L is the plate impedance in ohms and

A is the plate current in amperes.

In basic terms, the low-impedance and high-output C makes conventional tank circuits impractical at frequencies above 40 meters. If a pi network with a loaded *Q* of, say, 12 were desired, the resultant values of C and L would become quite impractical at the upper end of the hf spectrum. For this reason, transistor types of networks become more desirable.[2]

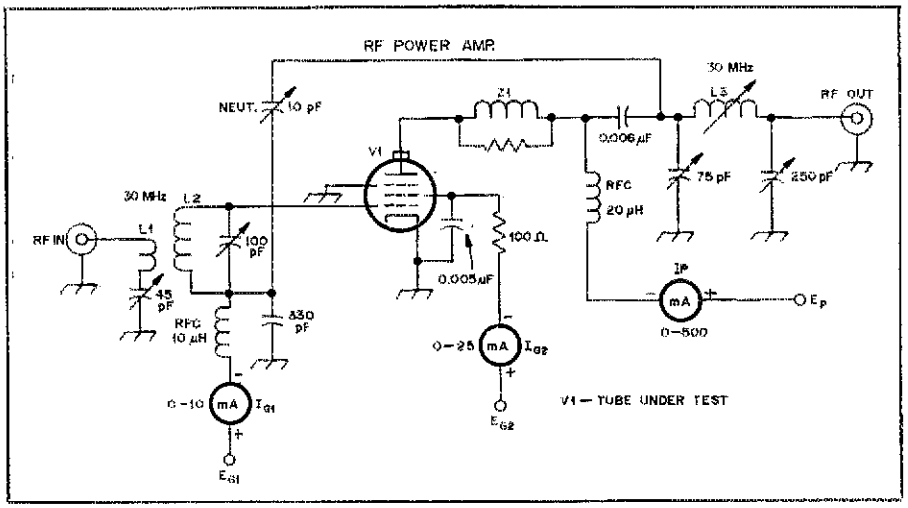


Fig. 5 — Schematic diagram of the 30-MHz test circuit used by Sylvania to collect rf operating data for six common TV sweep tubes. Z1 is similar to that of Fig. 2. L2 and L3 are chosen to provide a high operating tank *Q*.

Operating Parameters

In 1964, Sylvania Electric Products Inc. took the trouble to test their sweep tubes for rf service up to 30 MHz. Data were compiled for Class C and Class AB1 operation for six popular tubes. Tables 2 and 3 contain the information as it was presented in *Sylvania Industrial News* for November and December 1964. Table 1 was published by Sylvania at the same time. These are probably the only meaningful rf data developed for deflection tubes.

It was mentioned earlier that a plate voltage of 900 was typical for sweep tubes in amateur service.[3] That statement should be clarified by saying that 900 is more typical in homemade linear amplifiers than it is in commercial equipment. Tables 2 and 3 specify 500 volts as

Table 2

Class C Operation ICAS — 30 MHz

Type	(1) E_{G1} V dc	(1) E_{G2} V dc	(1) E_p V dc	Peak E_{G1} V rf	(1) I_{G1} mA dc	I_{G2} mA dc	I_p mA dc	Grid 1 Driving Power (Approx.) Watts	Grid 2 Dissipation Watts	Plate Input Power Watts	RF Power Output Watts	Efficiency (%)	Plate Dissipation Watts	(2) Circuit Loss Watts
6GJ5	−75	200	500	61	5.0	14.9	180	0.43	2.99	90.0	62.7	69.5	22.0	5.3
6HF5	−85	140	500	67	8.0	12.5	232	0.76	1.75	116.0	77.0	66.0	35.0	4.0
6JB6	−75	200	500	61	5.0	13.3	180	0.43	2.66	90.0	62.7	69.5	22.0	5.3
6JE6	−85	125	500	72	8.0	17.2	222	0.82	2.15	111.0	76.3	69.0	30.0	4.7
6JM6	−75	200	500	57	4.0	13.7	180	0.32	2.72	90.0	61.1	67.9	22.0	6.9
6JG6	−80	150	450	67	8.0	20.0	202	0.75	3.0	91.0	63.0	69.3	21.0	7.0

(1) Selected as optimum operating conditions.
(2) Calculated power lost in tank circuit.

Courtesy of Sylvania

Table 3

Class AB1 Operation ICAS — 30 MHz

Type	(1) E_{G1} V dc	(2) E_{G2} V dc	(2) E_p V dc	(1) I_p 0 Signal mA dc	I_{G2} mA dc	I_p mA dc	Plate Power 0 Signal Watts	Grid 2 Dissipation Watts	Plate Input Power Watts	RF Power Output Watts	Peak Envelope Power (PEP) Watts	Efficiency (%)	Plate Dissipation Watts	(3) Circuit Loss Watts
6GJ5	−43	200	500	30	3.8	85	15	0.76	42.5	17.5	35.0	41.5	22.0	3.0
6HF5	−46	140	500	40	4.5	133	20	0.63	66.5	28.8	57.6	43.0	35.0	2.7
6JB6	−42	200	500	30	4.2	85	15	0.84	42.5	17.5	35.0	41.5	22.0	3.0
6JE6	−44	125	500	40	3.9	110	20	0.49	55.0	23.4	46.8	42.6	30.0	2.6
6JM6	−42	200	500	30	4.4	85	15	0.88	42.5	18.3	36.6	43.1	22.0	2.2
6JG6	−35	150	450	30	4.5	98	13.5	0.67	44.0	18.9	37.8	43.0	21.0	4.1

(1) E_{G1} adjusted to indicated I_p (zero signal).
(2) Optimum conditions for providing best linearity and efficiency.
(3) Calculated power loss in tank circuit.

Courtesy of Sylvania

the upper limit, but some transceiver manufacturers use up to 650 volts. Most sweep tubes have sufficient internal-element spacings and insulation to take up to 1000 volts. The test circuit used by Sylvania is given in Fig. 5.

Closing Comments

Are sweep tubes suitable for amateur service? Tables 1, 2 and 3 offer hard proof that they can be used advantageously. They seem to be especially suited to Class C service in terms of efficiency. The cw operator should find them excellent for the purpose.

Practical experience has proved that these tubes can be pushed in excess of their ratings at low duty cycles. Remember the days when some of us ran our Class C 807s or 1625s with 1000 plate volts and higher-than-rated plate current? Rule number 1 was "don't hold the key down for more than a few seconds." If this rule were observed, many hours of operation at elevated power output could be had, but the longevity of the tubes was shortened as a tradeoff. If the reader wishes to "push" some sweep tubes (although it is not recommended), he or she should be prepared to replace them more frequently than if they are held within the prescribed ratings. QST

Notes

[1]DeMaw, "Some Ground Rules for Sweep-Tube Linear-Amplifier Design," *QST*, July 1968, p. 30.
[2]DeMaw and Hayward, *Solid State Design for the Radio Amateur*, chapter 4, ARRL, 1977.
[3]DeMaw, "A Husky Power Supply for Sweep Tube Amplifiers," *QST*, December 1969.

Strays

ABOUT PROJECT GOODWILL . . .

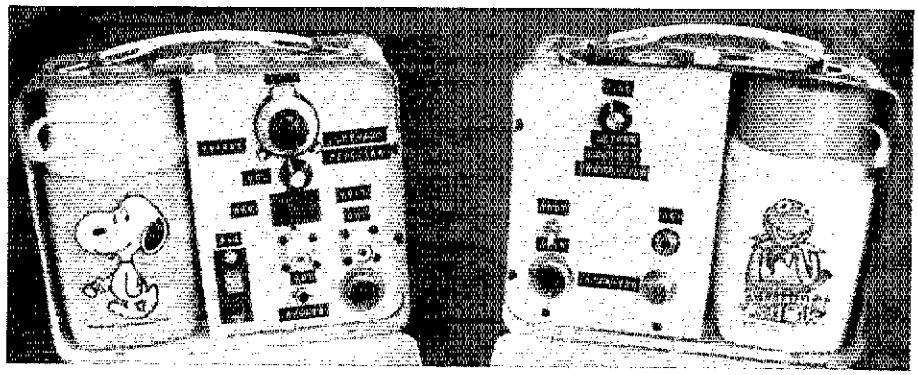
☐ No, it's *not* dead! The project was put on ice while the staff was at WARC-79, but it is now back in full swing, and we're slowly but surely matching a backlog of generous donors to recipients in developing countries. We apologize for this inevitable delay, but want to assure those clubs and individuals who have been patiently awaiting some word from Hq. that your money is safe, and you will soon be matched.

The success of the project was evident in Geneva during WARC, with favorable remarks being received from a number of developing countries' administrations. In addition, several kits were distributed on site in Geneva to delegates who expressed a genuine interest in promoting the Amateur Service in their countries.

Watch *QST* for periodic updates on the project. And thanks!

DO YOU SEND QSL CARDS TO BOX 88?

☐ Walt Brown, KAØDMB, Omaha, NE, recently worked his first Russian station, a UA3 near Moscow. Walt sent a QSL direct, with an IRC to guarantee a prompt return. Not only did Walt get a return, but the Russian ham enclosed a very nice two-page letter. The letter described his homemade equipment, some personal information and Amateur Radio experience. In addition, the Russian ham asked that the following information, concerning QSL procedures, be passed on: (1) Please do not use call signs on envelopes. (2) Only QSL cards, and not enclosures such as IRCs, should be sent via the QSL bureau address, Box 88 in Moscow. — *Dick Jugel, KØDG, Omaha, NE*



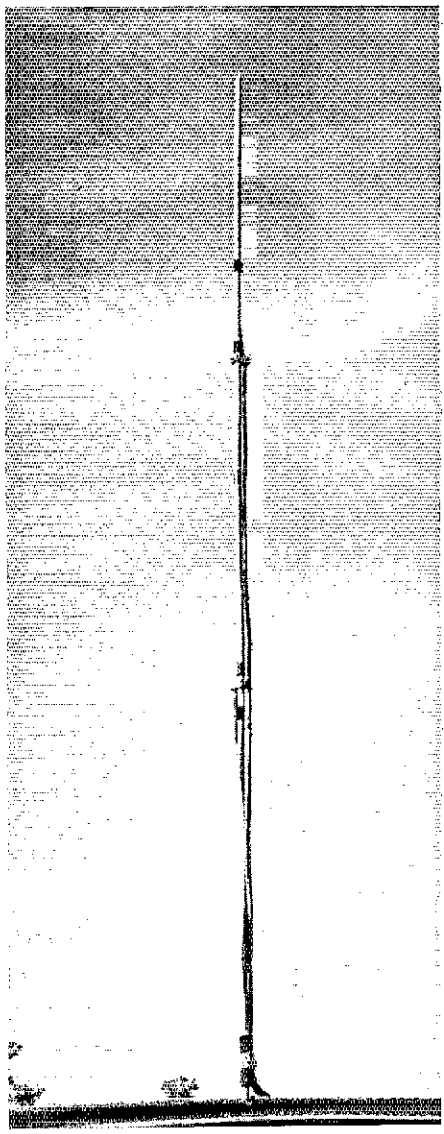
This novel job of packaging the Herring-Aid Five receiver (July 1976 *QST*) in the Charlie Brown lunchbox and the Tuna-Tin 2 transmitter (May 1976 *QST*), CB Slider (March 1977 *QST*) and Codzila 1 (February 1977 *QST*) in the Muppet Show lunchbox was done by Bill Barfield, WB5PRR, Satartia, MS. Bill built the panels with sheet metal. Since the thermos bottles still fit in the units, carrying liquid refreshment is easy.

Radio direction finding is very popular in the People's Republic of China. This picture was taken by a reporter from the Chinese Sports Illustrated News Agency at a direction-finding contest. Although the equipment is made in China, details on construction, frequencies, call signs and modulation are as rare as a BY QSL. *(photo courtesy HB9AQZ)*

A VHF-UHF 3-Band Mobile Antenna

Three bands — 144, 220 and 440 — on one stick sound interesting? This antenna might allow you to condense that stainless-steel and plastic jungle atop your auto onto a single pole.

By J. L. Harris,* WD4KGD



The three-band antenna system mounted atop a pickup truck. *(photo by WD4FNS)*

In looking for a mobile antenna system for my Drake UV-3, I rejected the notion of one broadband antenna such as the discone because of band-switching problems not to mention its somewhat busy appearance. I also rejected the idea of three separate whips which I felt would give the relatively small roof area of my pickup truck a cluttered look. Three separate antennas confined to so small a space would also cast "shadows" on the vertical patterns of one another. In order to take full advantage of the three antenna terminals on the UV-3, I needed three separate antennas, but I wanted an omnidirectional pattern with no "holes."

The solution I chose was to use three stub-fed verticals on one whip. The stub-fed vertical, or J antenna, consists of a basic half-wave radiator end fed through a quarter-wave stub. This stub serves as an impedance transformer. It transforms the high impedance of the half-wave radiator to that of the low-impedance coaxial line. Few antennas lend themselves to omnidirectional patterns and ease of matching to coaxial line as well as the stub-fed vertical.

Construction

My approach is cheap, novel and effective and uses only four basic parts except for the coaxial lines: the whip and three easily fabricated blocks. These materials are available at most hardware or hobby stores. The whip is one piece of 3/8-inch (9.5-mm) aluminum tubing 60 inches (152 mm) in length. Be sure that the piece you select is straight and free of nicks or dents.

Overall construction is shown in Fig. 1. The three stub blocks are made from 3/8-inch (9.5-mm) aluminum stock. Refer to Fig. 2 and saw three blocks 3/8 × 5/8 × 1-1/8 inches (9.5 × 15.9 × 28.6 mm). Drill a 3/8-inch (9.5-mm) hole as shown so that the piece will slip over the mast. Tap a no. 6-32 hole into the 3/8-inch (9.5-mm) hole just drilled for a setscrew to hold the block in place. The third hole is used to connect the braid of the coaxial cable to the mast. It is at this point where the quarter-wave stub begins and the feed line ends. For RG-58/U and similar size cable use a 13/64-inch (5.2-mm) drill and tap the hole with 1/4-20 thread. For RG-8/U, use a 25/64-inch (9.9-mm) or "X" drill and tap with 7/16-20 thread. Prepare the coaxial cables by separating the center conductors from the remainder of the cable to the lengths given in Fig. 1. Cut off all but 3/8 inch (9.5 mm) of the braid and fold this back over the jacket. These sections can be threaded into the tapped holes. The blocks can then be mounted to the whip as in Fig. 1.

Matching

As mentioned earlier, the quarter-wave stub is an impedance transformer. The spacing between the coaxial cable center conductor and the whip (dimension "A" in Fig. 1) determines the impedance of this section and consequently the match to 50-ohm line. Using an SWR indicator, determine the optimum spacing "A." This dimension can vary greatly depending on the size of the cable and its dielectric material. Once I determined the correct spacing, I stood off the center conductor from the main support with small styrofoam blocks. Electrical tape was used to hold the quarter-wave section and styrofoam block to the main support.

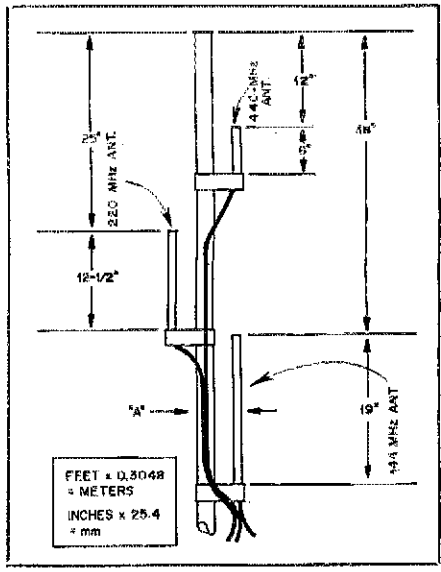


Fig. 1 — Construction dimensions of the three-band antenna. Cables should be routed and taped as shown.

*Rte. 5, Box 39, Henderson, NC 27536

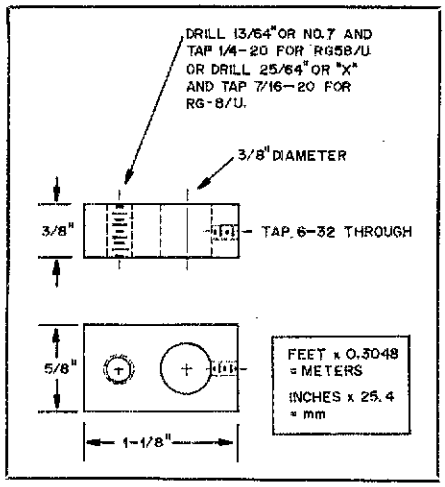


Fig. 2 — Detail drawing of the stub blocks used to connect and support and the quarter-wave sections.

The cables from the 440- and 220-MHz antennas should be routed as shown in Fig. 1 on opposite sides of the main support and away from other stubs.

The assembly is finished by taping all cables in place and coating the stub blocks with clear acrylic spray to prevent moisture from entering the cables. Although this antenna system is intended for mobile use and is constructed for this purpose, it should not be overlooked as a base station system. Just add 6-meters and you've got a 4-band array! E-plane patterns for the three bands are shown in Fig. 3.

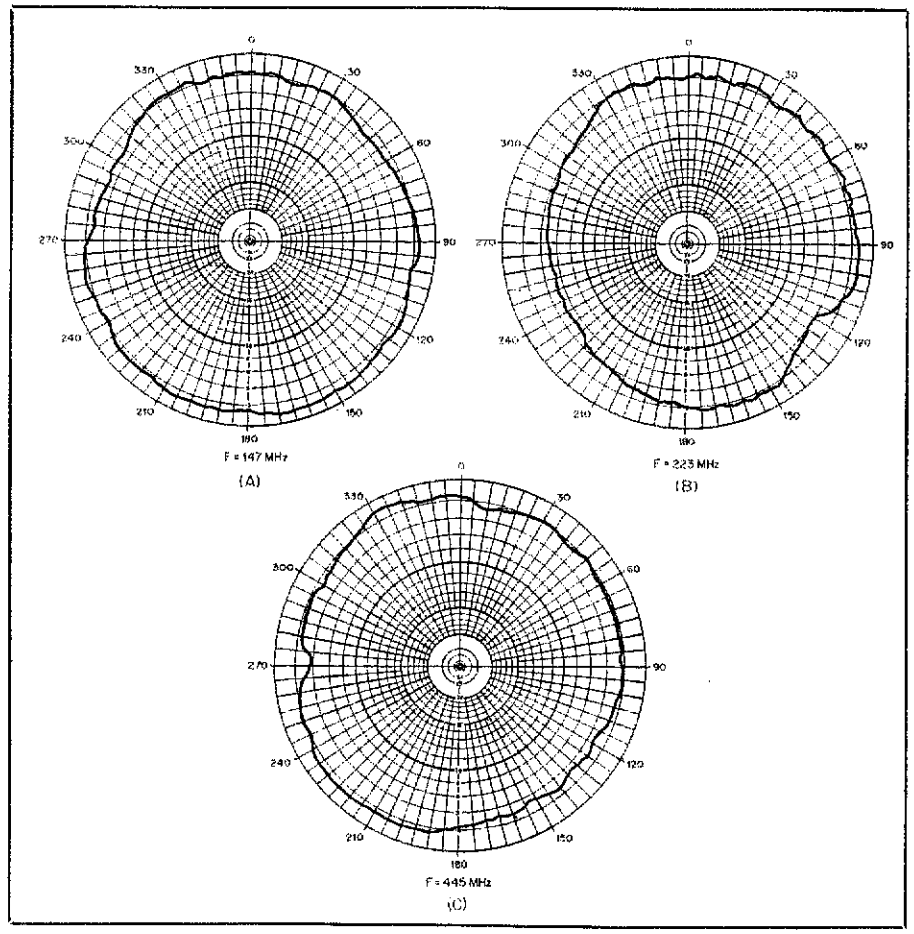


Fig. 3 — E-plane patterns for the three-band antenna. The patterns at A, B and C, respectively, are measured responses for 147, 223 and 445 MHz.

Feedback

☐ An omission occurred in "The Microprocessor and Slow-Scan Television," January 1980 *QST*, page 40, Fig. 8A. The box to the right of the "End of Line?" triangle should read "Erase to *End of Line*."

☐ The input intercept figures for the Drake R-7 receiver, "Product Review," January 1980 *QST*, page 49, were reversed. The corrected text should read: "These numbers equate to a 3rd-order input intercept of +17 dBm on 80 meters with the preamp turned off and −2.5 dBm with the preamp turned on."

☐ The diagram for W6HPH's two-element, 144-MHz antenna that appeared in "Hints and Kinks," October 1979, *QST*, should have indicated the part for mounting the BNC fitting as a brass bracket.

☐ Two SSTV frequencies were left off "The Considerate Operator's Frequency Guide," January *QST*, page 91. Both 7171 kHz and 21.340 MHz are generally recognized SSTV frequencies. Others are 3845 kHz, and 14.23 and 28.68 MHz.

☐ The list labeled "6-Meter Radio Control Channels" ("FM/RPT," December 1979 *QST*, page 77) is actually a list of "guard" channels which could be allocated for repeater use in the event that additional repeater frequencies are needed. It is suggested that frequency coordinators do not assign these channels. Actual R/C channels are 53.1, 53.2, 53.3, 53.4, 53.5, 53.6, 53.7 and 53.8 MHz.

☐ The accident involving two Union Pacific Railroad employees ("Stray," January *QST*, page 41), did not occur, according to John Champa, K8OCL, an ARRL technical advisor on safety matters from Columbus, OH. His information was corroborated by a Union Pacific spokesperson. Although butane can be considered dangerous if it is mishandled, Champa reports, it is not nearly as explosive as three sticks of dynamite. The "Stray" item was parapharased from a club newsletter, which had published an account of the supposed incident.

Strays

CALLING PROFESSIONAL STUDENTS

☐ If you have received your acceptance letter from, or are now attending medical, dental, osteopathy, nursing, veterinary or other health-related professional school, you are eligible to join the Medical Amateur Radio Council, Ltd. (MARCO). This group of ham/health professionals meets regularly, on-the-air, to exchange medical and electronic data. Further information and applications from Milt Lowery, N5BLU, Baylor College of Dentistry, 3302 Gaston Ave., Dallas, TX 75246.

QST Congratulates . . .

☐ Jack Boyce, WDØGMR, Kansas City, MO, who put the Kansas City Emergency Preparedness Office's radio equipment which had been unused and in storage for several years, back on the air. The four or five afternoons of work, a major donation from any volunteer, is even more significant because Jack is legally blind.

An Automatic CW Identifier

Need a simple, reliable station identifier to prevent breaking the 10-minute rule? Here's one that meets all major requirements.

By Earl R. Savage,* K4SDS

With each advance in the state of the cw art, staying legal with i-ds becomes more difficult. First there was semi-break-in and then *real* break-in. The straight key was followed by the bug, the electronic keyer and now the Morse keyboard. Soon it will be computerized voice-to-Morse conversion by means of the microprocessor. With all this, sharp filters and stable rigs, cw ragchewing is more like an eyeball QSO than phone can ever be.

Yet each advance makes one problem worse: It gets harder and harder to remember to identify every 10 minutes. One day the microprocessor will take care of such chores, but in the meantime, almost everything has been tried, from flashing lights and ringing bells on up.

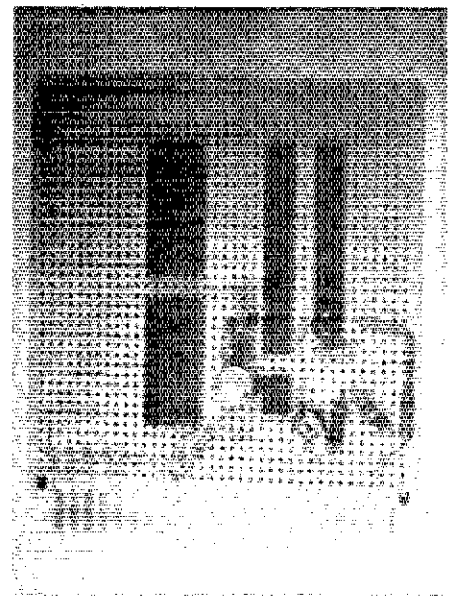
Do you remember the revolving disc and the cam-actuated switch? How about the keying relay driven by an audio-tape loop? Or the photocell and the perforated disc? More recently the ROM has entered the picture with complex programming problems.

What we need is a simple, reliable automatic identifier. Here is one that you will want in your shack. All the major requirements are met: (1) fully automatic operation; (2) manual operation as desired; (3) ease of programming; (4) quick reprogramming as desired; (5) dependability; and (6) use of common, low-cost components.

The AUTO-ID'ER keys your call sign automatically every 10 minutes. If you start it manually before the set interval, it keys your call sign and resets for a new 10-minute interval. As a bonus, you can disable the timer and reprogram for your standard contest response. Other uses will present themselves. All this for a "new-parts cost" of only $10 plus a modest amount for the power supply and cabinet.

How It Works

A block diagram of the AUTO-ID'ER is shown in Fig. 1. U1 is an adjustable timer provided with a manual override switch. The timer sends a pulse every 10 minutes to an R-S flip-flop which enables the key clock, U3. Both U1 and U3 are 555 ICs, the functions of which can be combined by using one 556 if desired.



The AUTO-ID'ER constructed on a universal pc board and ready to be plugged into the author's keyboard.

The clock pulses the counters at an adjustable rate, which establishes the keying speed. Counter U4 addresses all memory ICs in parallel. Though only two are shown, you can have as many memories as needed. You will be pleasantly surprised later to see that the memories are inexpensive data selectors.

Two functions are performed by the second counter, U5. It addresses the memory selector and also feeds a "stop and reset" pulse to the control flip-flop. The memory-select IC, U8, sequentially feeds the outputs of the memories to the keying interface which you select to match the characteristics of your transceiver/transmitter.

Programming

Use of type 74150 multiplexers (1-of-16 data selectors) for memories is the key to the simplicity and low cost of the AUTO-ID'ER. It is necessary to understand how they operate in order to program them properly.

A 74150 has 16 input lines, each of which may be high or low. When one of the 16 lines is addressed, the *complement* of the information on that line appears at the output. If each input line is considered one Morse *bit*, 16 bits can be wired in. Thus, when sequentially addressed 0-15, these 16 bits appear *serially* at the output. If a transmitter is keyed with the serial bits shown in Fig. 2, the resulting signal is a dah and 2 dits. Of course, this is the letter D and the bits can be programmed to produce any letter or letters. Bits are recorded by these simple rules:

1) A dit is two bits — 1Ø (a high followed by a low).
2) A dah is four bits — 111Ø.
3) A letter space is two bits — ØØ.
4) A word space is four bits — ØØØØ.

Following these rules, DE is recorded as 111Ø1Ø1ØØØ1Ø. That is 12 bits — three-fourths of the 74150 capacity. But we can do better than that.

In order to increase the storage capacity of each 74150, we will use a technique called "folding." If we run through the 0-15 addresses twice and fold the inputs, the capacity will double — giving 32 bits! Here is how to fold a data selector (DS).

For purposes of illustration, we'll use a 1-of-4 DS. The sample DS will be programmed with the help of Table 1. At this point we won't be concerned with Morse output but with the four possible combinations.

Since we are going to address the DS twice, we'll start at pass no. 1, input no. 1. We'll progress to inputs no. 2, no. 3 and no. 4, and write in the first four bits: Ø11Ø. (Note: The first bit is always Ø.) For the

*Box 351, New Castle, VA 24127

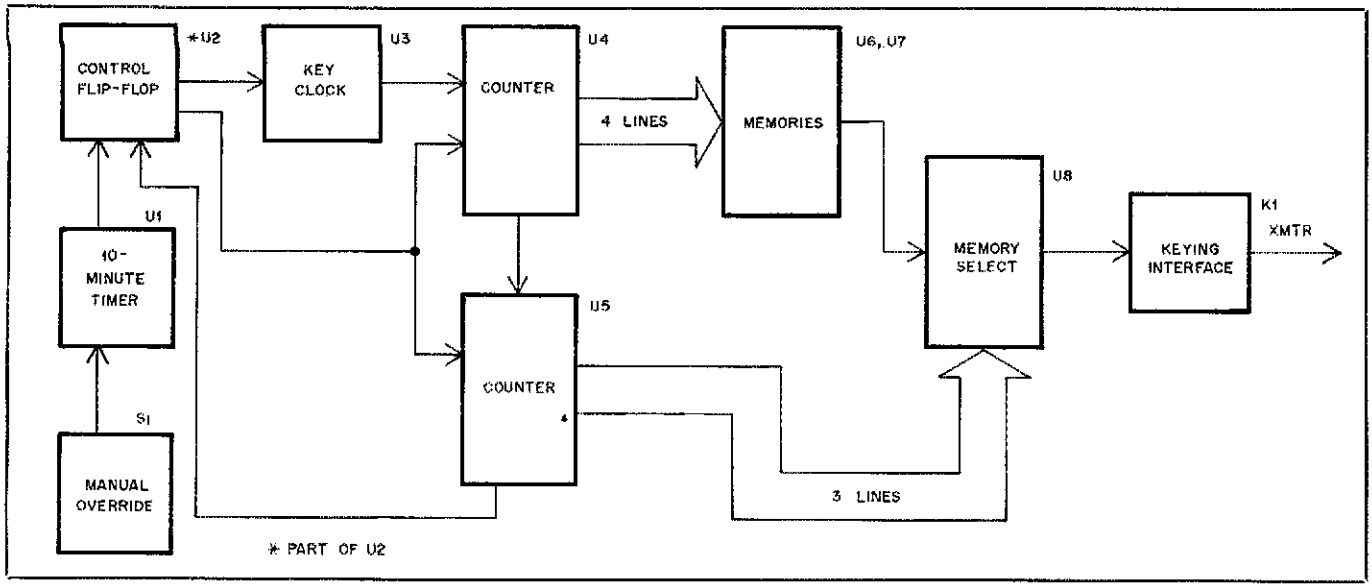


Fig. 1 — A block diagram of the AUTO-ID'ER.

second pass, we'll write in ∅1∅1.

Now, observe that input no. 1 is required to put out ∅∅ on the two successive passes. *Remembering that the output will be the complement,* we'll wire the input to 1 (+5 V or high). Input no. 2 will be wired to ∅ (ground or low) since it is connected to output 11.

Input no. 3 is different. It must be 1 on the first pass and ∅ on the second. Therefore, we must wire it to a line which will change from 0 to 1 between passes 1 and 2. We'll call this line A. Likewise, input no. 4 goes to a line which changes from 1 to ∅, which we'll call line B.

But where do these lines A and B come from? They originate at the *third* address line (see Fig. 3). You will perceive that the output of the counter (4) will be on ∅ on counts 0-3 and 1 on counts 4-7. Therefore, we'll call it line A. By the same token, when line A is inverted, it becomes line B. Thus, we have folded a 4-input DS into an 8-input DS.

Exactly the same procedure is used to fold a 16-input 74150 into a 32-input DS. Of course, there are four address lines so the fifth counter line becomes the A and B lines. As a further example, Table 2 shows how my call sign is folded into two 74150s. If you still have difficulty with the folding technique, see pages 140-144 of Don Lancaster's *TTL Cookbook.*[1] The process is not as complex as it may first appear.[2]

When your first 74150 is full, continue to the second and so on until your message is complete. If you get to the end of a DS memory and need just a very few bits to complete your message, you can steal a few rather than add another DS. If you are on your toes, you caught the fact that I cheated on Table 2. I broke the rules and simply left out two ∅ bits which kept me from needing another 74150 (and it takes a *very* sharp ear to detect it on the air).

You may be able to use this technique to save a little money, space and wiring time. If not, and you have unused bits remaining, be sure to fill them with ∅s.

Typical call signs will require three or four 74150 data selectors. Put in as many as you need. Connect all address and power pins in parallel. Output pins (no. 10) are connected sequentially to the 74151 DS as indicated. Unused 74151 input pins are grounded.

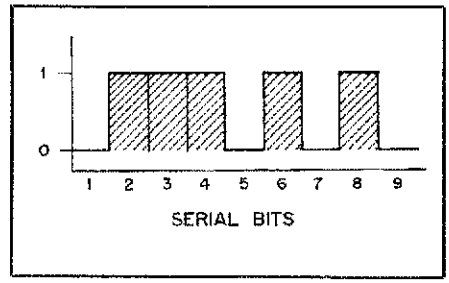


Fig. 2 — This keying sample is typical of the patterns produced by the AUTO-ID'ER.

Table 1

Sample Programming

Address	*Input*	*Pass 1*	*Pass 2*	*Wire to*
00	1	0	0	1*
01	2	1	1	0*
10	3	1	0	A
11	4	0	1	B

*1 = +5 volts; 0 = ground

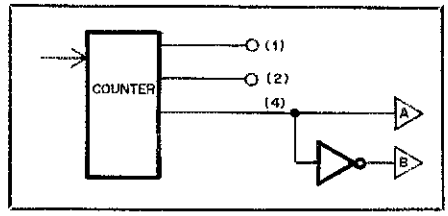


Fig. 3 — Origin of lines A and B in the AUTO-ID'ER.

The Circuit

The schematic diagram of the timing and counting subcircuit is given in Fig. 4. Components of the timer (U1) have been chosen to provide a range of about 7.5 to 11 minutes. This is determined by R1, R2 and C1, any or all of which may be changed to alter the range covered.

Not only is the value of C1 important, the quality is important also; the same applies to C2. Both capacitors should have low leakage. Excessive leakage will extend the timing period and require more series resistance. Because of the long timing period of U1, a capacitor with high leakage could prevent it from timing out at all. (If yours does not time out, you should check the operation and your wiring by substituting a smaller capacitor. This check should be made before going out to buy a better-quality capacitor.)

The components associated with U3 establish the speed of the keying clock (the actual speed is halved by the first stage of the counter). As shown, the range is from about 10 to 70 words per minute.

The stop-and-reset line from U5 to the flip-flop (two 7400 gates) must be inverted; this is done with another 7400 gate. The point of attachment to U5 will depend upon how many memories you need to contain your call sign. Connected as shown, the AUTO-ID'ER stops at the end of the fourth memory. You may have to make an adjustment here. If so, consider the 32 BCD line as 1 for memory count; the 64 line as 2; and the 128 line as 4. An AND gate will be required if the number of memories exceeds 4.

Fig. 5 provides the schematic diagram

[1]Notes appear on page 21.

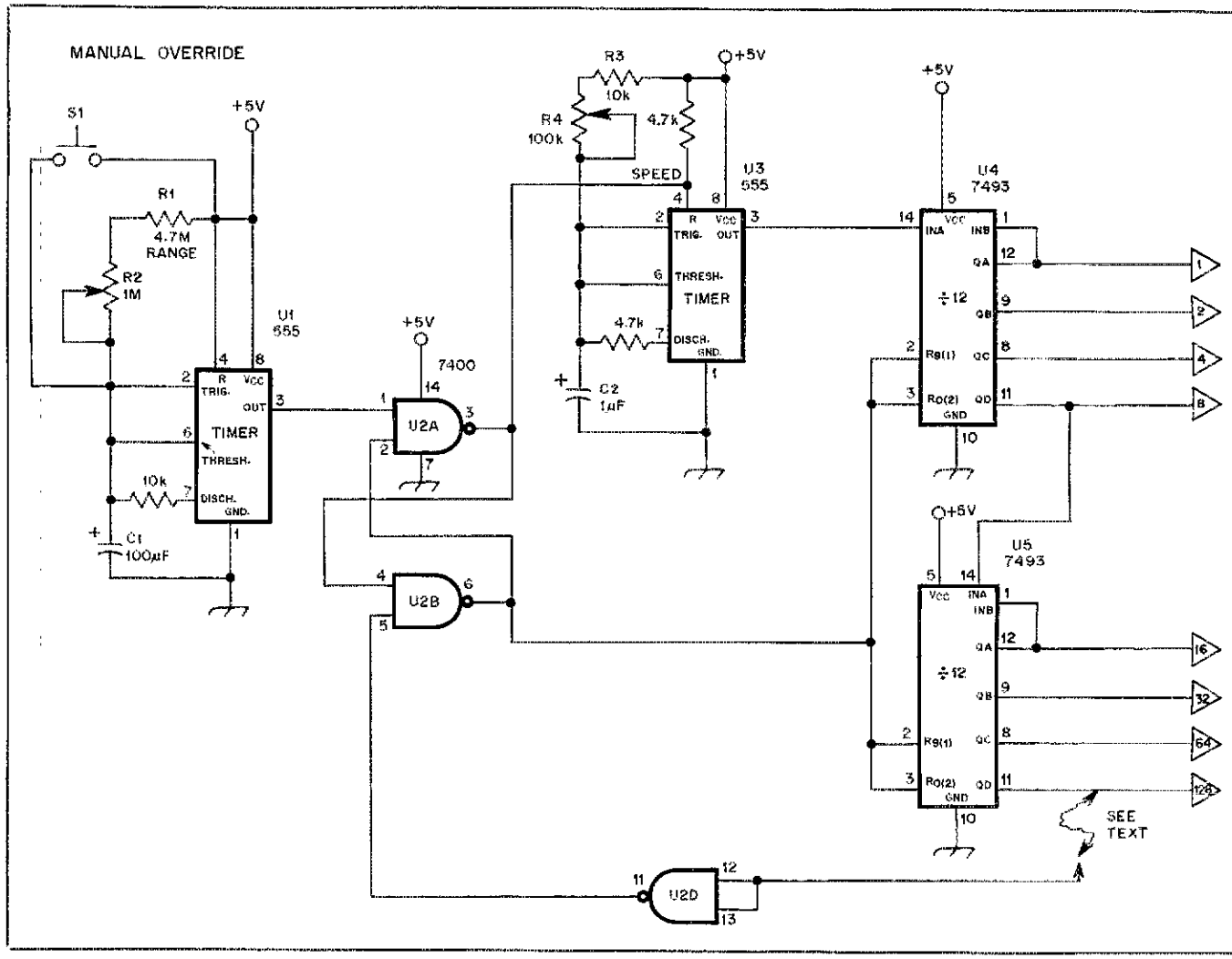


Fig. 4 — AUTO-ID'ER timing and counting subcircuit. Resistance values are in ohms.

for the program subcircuit of the AUTO-ID'ER. The input lines of U6 are numbered in the order of their selection. Programming is accomplished by connecting these lines to 1, ϕ, A or B, as explained earlier. The origin of lines A and B is also shown.

U8, a 74151 1-of-8 DS, supplies the ew pulses for keying the interface. Output pin 5 does *not* give the complement of the input.

No power supply is illustrated because you must be as tired of seeing them as I am. The AUTO-ID'ER requires a regulated power source that furnishes 5 volts at 300 mA or more. Any standard circuit should suffice.

Keying Interface

You must choose and build the keying interface suitable for your transceiver/transmitter. Three choices are given in Fig. 6. Of course, you may build two or all three of them for maximum versatility. If your rig has unusually high voltage or current on the key line, be sure the keying transistor/relay you select can handle it. The ones in Fig. 6 are suitable for most rigs.

Table 2

Completed Programming Chart for DE K4SDS. See text.

			First Memory			*Second Memory*		
Pin	*Address*	*Input*	*Pass 1*	*Pass 2*	*Wire to*	*Pass 1*	*Pass 2*	*Wire to*
8	0000	1	0*	1	B	0	0	1
7	0001	2	1	1	0	1	1	0
6	0010	3	1	0	A	0	1	B
5	0011	4	1	1	0	1	1	0
4	0100	5	0	0	1	1	0	A
3	0101	6	1	1	0	1	1	0
2	0110	7	0	1	B	0	0	1
1	0111	8	1	1	0	0	1	B
23	1000	9	0	0	1	0	0	1
22	1001	10	0	0	1	1	0	A
21	1010	11	1	0	A	0	0	1
20	1011	12	0	1	B	1	1	0
19	1100	13	0	0	1	0	0	1
18	1101	14	0	1	B	1	1	0
17	1110	15	0	0	1	0	0	1
16	1111	16	1	1	0	0	1	B

*Always 0

Construction

Layout of the AUTO-ID'ER is not critical. You may use any of the common building techniques. With reasonably compact construction, the AUTO-ID'ER will fit into an 80 × 100 × 60-mm (3 × 4 × 2-1/2-inch) cabinet and leave space for a power supply.

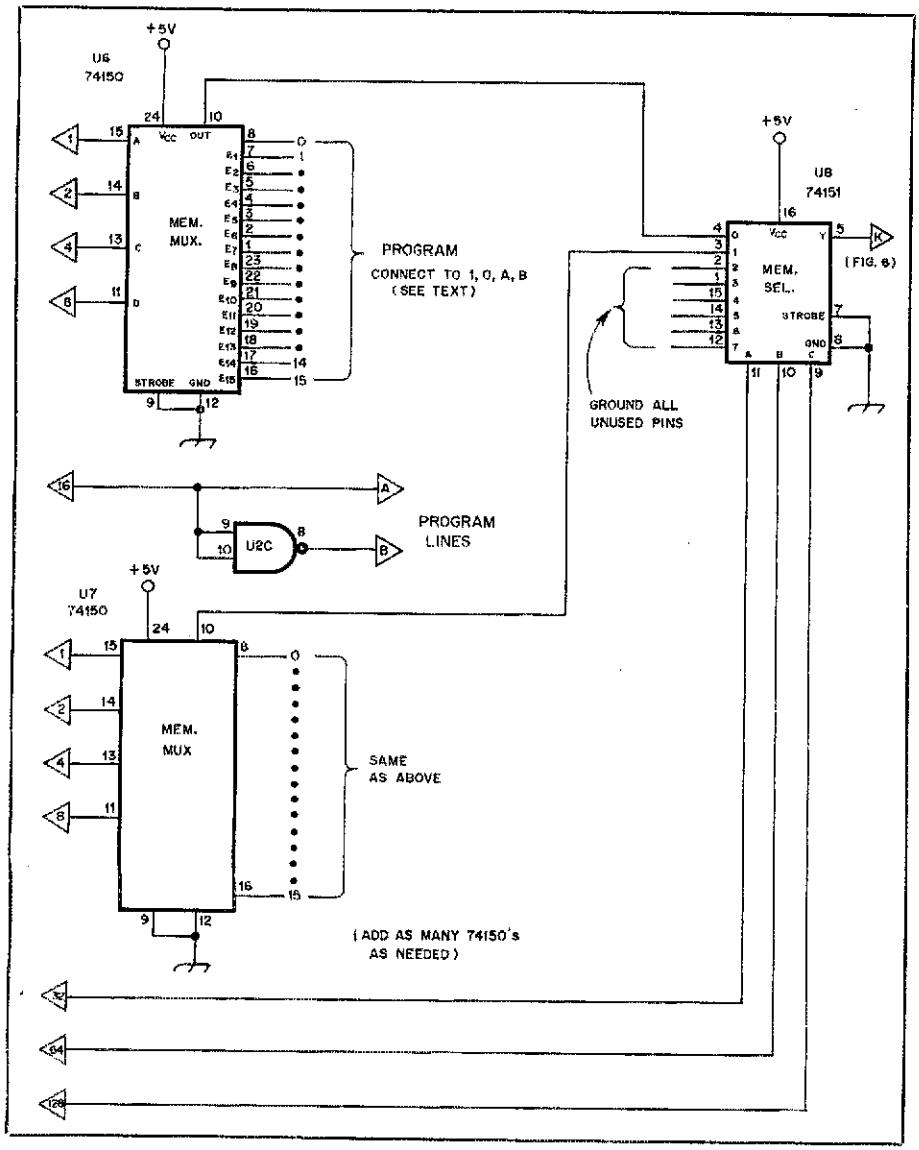


Fig. 6 — Keying interface subcircuits for use with the AUTO-ID'ER. The circuit at A is for negative (grid-block) keying, and that at B for positive keying. The relay keying at C may be used for either positive or negative keying. Resistance values are in ohms; k = 1000. Transistors are Radio Shack components or equiv.

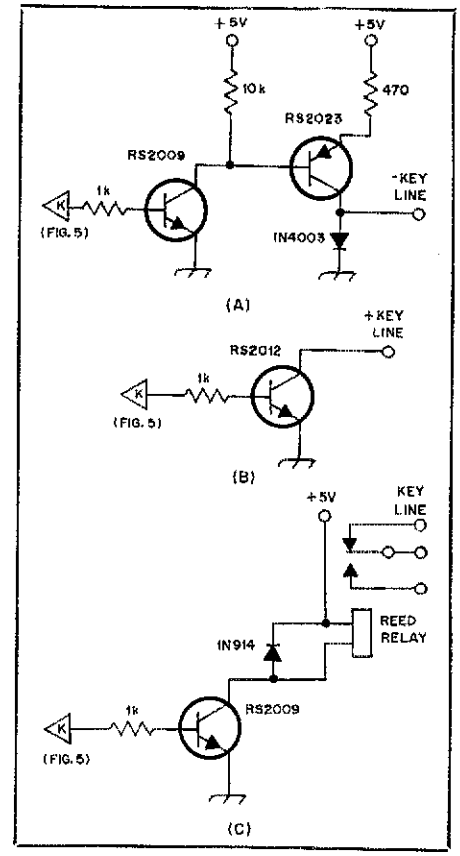


Fig. 5 — Program subcircuit for the AUTO-ID'ER.

The prototype in the photo first was constructed on a Radio Shack universal pc board (no. 276-154). This board was modified slightly to increase the capacity for the large 24-pin 74150s. Though only two of these DS memories will hold my call, there is obviously space for two more, enough to hold almost any i-d.

A modification of the board was made by dividing two rows of the multiple-hole solder pads. I used a Radio Shack no. 64-2178 cordless drill/saw as shown in Fig. 7 but the job can be done with a sharp knife, a steady hand and patience. Using this type of plug-in board with matching connector is an excellent way to add the AUTO-ID'ER to an existing piece of equipment.

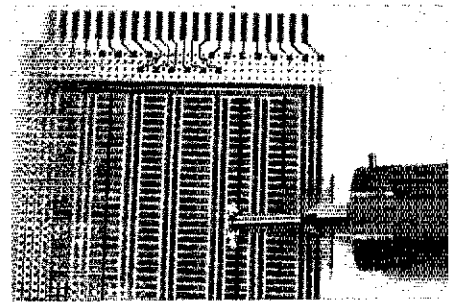


Fig. 7 — Modifications being made to the universal board to accommodate the 24-pin data selector memories.

Operation

Operation of the AUTO-ID'ER is simplicity itself. With the keying interface connected in parallel with your regular keying device, the unit begins operating as soon as power is applied. Ten minutes later it sounds off, unless you kick it off manually first.

There are two points you may wish to consider. The first is that you should not cut the 10-minute limit too fine. It may be advantageous to set U1 for 9 or 9-1/2 minutes. Note that the interval after a manual trigger is a little longer than after an automatic trigger.

The second point is that on occasion the AUTO-ID'ER will sound off while you are sending. That leads to a resulting mixture of garbled cw, so you'll just have to stop sending and push the manual switch for another i-d. You can avoid this annoyance if you have some space (bits) left in the last 74150. In this case, move your i-d down and place a signal in front of it. On hearing the signal, you stop sending and let the AUTO-ID'ER take over. Another alternative is to add a circuit that will disable the clock of your keyer or keyboard when the i-d begins.

Summary

Your efforts in building the AUTO-ID'ER will be repaid many times over. When the accessory is up and running, you won't have to keep one eye on the clock as you ragchew. It is a relief to be free of that chore.

Whenever you tap switch S1 your i-d is keyed and the unit resets for a new 10-minute interval from that point. If you keep ahead of it, fine. If not, don't worry — the AUTO-ID'ER will do it for you and keep your operation legal. QST

Notes

[1]Lancaster, *TTL Cookbook*, Howard Sams and Co., Inc., Indianapolis, IN 46268.

[2]Still have problems? Send your call with $1 and an s.a.s.e. to the author for personalized coding instructions.

● *Basic Amateur Radio*

Matching the Transmitter to the Load

Most ham shacks contain a Transmatch, but do you need one? Under some conditions, "yes." Here's the rundown.

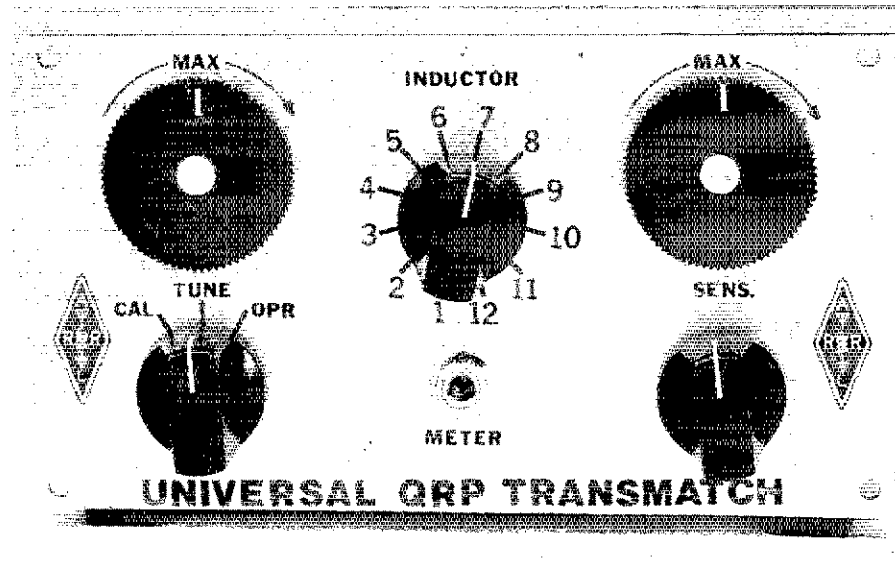
By Doug DeMaw,* W1FB and Bob Shriner,** WAØUZO

"My antenna won't load up properly because the feed line doesn't match the antenna impedance. Will a Transmatch cure the problem?" That's a commonly asked question among inexperienced amateurs. The answer is "no!" The exception would be if the Transmatch were installed at the antenna feed point. But, Transmatches are normally used at the transmitter end of the transmission line. So, the device will only "fool" the transmitter into "thinking" it has a proper load to look into. The mismatch condition at the feed point will remain the same.

So, why even use a Transmatch (transmitter to transmission line matcher)? Well, presenting a flat load (no reactance) to the transmitter has its advantages. First, the transmitter output tank circuit can be tuned normally if it looks into 50 ohms (most modern transmitters have a 50-ohm output characteristic). Second, a proper load will enable the transmitter to develop its full rated power output. This is especially true if a solid-state transmitter with an SWR shut-down circuit is used. The higher the SWR (standing-wave ratio) the lower the transmitter output power with most rigs of that type. A correct load for the transmitter will also help prevent arcing of the PA tank variable capacitors and switches.

There remain two more advantages which justify a Transmatch. If the unit is capable of functioning as a high-Q bandpass network when adjusted to match the load, a reasonable amount of harmonic attenuation can result. Some circuits offer as much as 30 dB of harmonic attenuation. This, of course, aids spectral purity and reduces TVI. The other benefit can be seen in the case of a narrow-band antenna (75/80-meter dipole, for example) where without a Transmatch the system works nicely over a narrow portion of, say, 80 meters. But, when the antenna is used for ssb work on 75 meters the SWR is sky high. The Transmatch will again "fool" the transmitter and provide a 50-ohm load anywhere in the 75/80-meter range. The SWR which still exists beyond the Transmatch is normally of little consequence (minimum power loss) from 160 through 20 meters if the feed line is not unusually long (more than 100 feet, or 30.5 meters) and if it is of good quality and size, such as RG-8/U or RG-11/U. The losses are greater in the smaller-diameter coaxial cables.

Transmatches are known by other names, such as "antenna couplers" and "antenna tuners." Technically speaking, either name is inappropriate unless the network is used at the antenna feed point,



Front-panel view of the QRP Transmatch with SWR indicator. Low-cost pc-board construction is used throughout.

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or if it is actually used to tune the overall antenna system to resonance at the operating frequency. Some hams even call them "Matchboxes," which is a name borrowed from the commercial product of the same name that was manufactured by the E. F. Johnson Co. (see Fig. 1). But, in essence, all such devices contain capacitors and inductors, which when adjusted properly will match one impedance to another.

When Isn't a Transmatch Needed?

It would be rather pointless to install a Transmatch in the antenna line if the SWR was 2:1 or less. All you would add would be another gadget to tune as you changed bands. A dreadful misconception prevails whereby some amateurs become distraught if the SWR indicator shows anything greater than a ratio of 1.3:1; they believe that their signal suffers immeasurably if the slightest amount of reflected power is observed. Balderdash! Very little (if any) difference will be noted in the hf bands between a 2:1 and a 1:1 SWR condition. Honest on-the-air checks with other amateurs will prove this to be true.

What is being said here is that if you're using a coax-fed dipole, vertical antenna or beam, and if the SWR is less than 2:1 in the desired operating range of the band, don't waste money and space on a Transmatch. But, if you plan to use an end-fed wire antenna, or operate over all of one of the lower bands with a frequency-restricted coax-fed antenna, then a Transmatch will be quite beneficial. If the system SWR is greater than 2:1 at the frequency for which the antenna has been cut, then you'd better plan to correct the problem *at the feed point*. That's where the action really is! *The ARRL Antenna Book*[1] is recommended as a source of information on antenna theory, matching methods and practical examples.

Design Considerations

You will find some discussion about the fine points of Transmatch design in the "Product Review" column in an upcoming issue of *QST* (Murch Transmatch). There are some major design considerations which a builder must observe if good performance is to be had.

1) Ensure a wide range of variable inductance.

2) Provide a wide range of variable capacitance.

3) Employ coils and capacitors which can stand up under the planned power level without arcing or overheating.

4) Keep all rf leads as short as possible.

In addition, it is wise to select variable capacitors which have the lowest possible *minimum* capacitance. This will extend the impedance-matching range considerably at the higher frequencies, such as 15 and 10 meters.

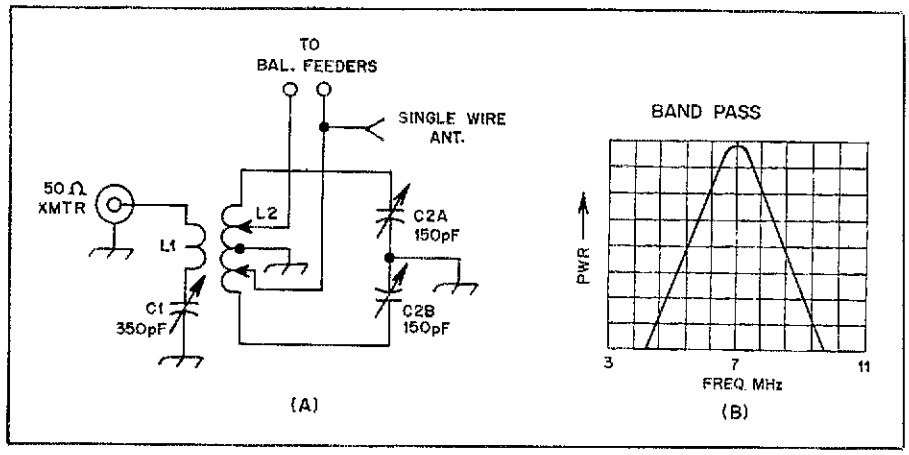

Fig. 1 — Bandpass type of Transmatch network which is suitable for use between coax and balanced feeders.

Common Transmatch Circuits

A bandpass type of Transmatch circuit is shown in Fig. 1A. The link (L1) must be capable of forming a resonant circuit with C1 at the operating frequency. Inductance L2 and capacitance C2 must also tune to resonance at the chosen operating frequency. The two taps (arrows) on L2 are moved in from the outer ends of the coil by equal numbers of turns until the balanced feeders are matched to the 50-ohm transmitter impedance. You will note that in addition to an impedance match there has been a transformation from an unbalanced condition (transmitter output) to a balanced condition (balanced feeders). A single-wire, end-fed antenna can be matched to the transmitter by connecting it to one of the coil taps as shown. A bandpass type of response will result if the Transmatch loaded Q is reasonably high. This is shown at B of Fig. 1. Frequencies *above* and *below* the operating frequency are attenuated. This is desirable in terms of TVI reduction and harmonic attenuation in general.

The popular T-matching network found in most of today's commercial and homemade Transmatches is seen in Fig. 2A. A variation of this circuit contains a dual-section variable capacitor at C1. The section which is not shown would be connected between J1 and ground. In practice, there is no difference in the matching range and performance of the network when a single-section variable capacitor is used at C1.

Fig. 2B shows two possible response curves. The solid curve illustrates a bandpass type of condition. The dotted curve indicates a high-pass response (no significant harmonic attenuation). The response obtained will depend upon the impedance-transformation ratio being dealt with, plus the final inductance-capacitance ratio of C1, C2 and L1 during a matched condition. An in-depth technical explanation of this phenomenon is well beyond the intent of this article. The user of this type of circuit should never assume that a T-network Transmatch will offer harmonic attenuation, however. If a rule of thumb is to be

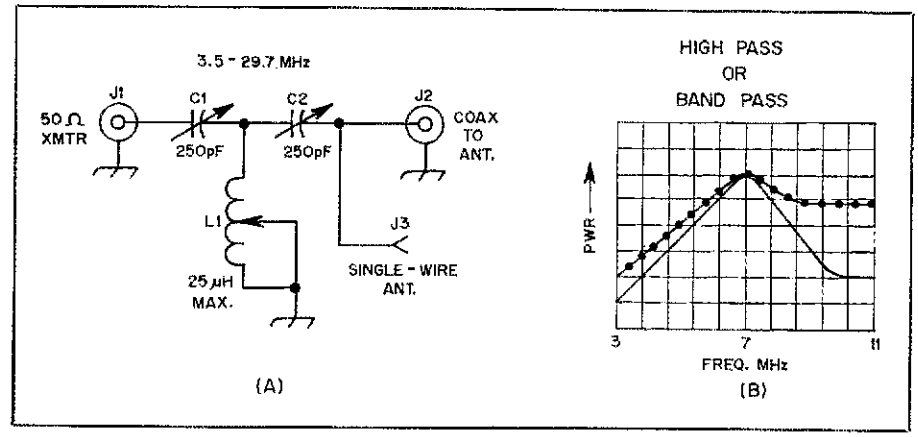

Fig. 2 — Basic circuit of the so-called "Ultimate Transmatch" (T-network) is shown at A. The curves at B illustrate two kinds of response (high pass and bandpass) which can result under different load and tuning conditions.

[1]Notes appear on page 26.

offered here, we might say, "use the maximum amount of capacitance at C2 which will result in an SWR of 1:1 through adjustment of C1 and L1." Laboratory tests at ARRL showed that minimum power loss (insertion loss) through the Transmatch will result when C2 is set for the greatest practical amount of capacitance. Our workshop project for this Basic Radio installment contains the circuit of Fig. 2A. The most outstanding feature of this type of network is its very broad range of impedance-matching capability. Although a tapped inductor can be used at L1, a rotary inductor will provide the greatest flexibility in matching a wide range of load impedances at J2.

An excellent matching network for harmonic attenuation is the low-pass type. This is known also as a pi network. The basic circuit is shown in Fig. 3A. The type of response from this network is shown at B of Fig. 3. The major limitation of this style of Transmatch is its matching range. In order for the circuit in Fig. 3A to match loads from 50 to 2000 ohms, for example, C1 would require a maximum capacitance of 4500 pF and C2 would require 9000 pF of capacitance. L1 would require a maximum inductance of 10 μH and a minimum inductance of 0.4 μH. These values are based on a loaded Q of 10 at 3.5 MHz. The maximum capacitance values would be used when matching 50 ohms to 50 ohms with L1 set at 0.4 μH. A 2000-ohm load at J2 or J3 would require roughly 1100 pF at C1, 227 pF at C2 and 10 μH at L1. What's the point of explaining all of this? Well, it was done only to illustrate the lack of practical component values for wide-range (3.5 to 29.7 MHz) frequency use when a host of impedances needs to be matched to 50 ohms, while maintaining a loaded Q (quality factor) of 10. Greater network flexibility could be realized with the specified L and C values, however, by allowing the Q to vary all over the ball park as the L and C values were juggled simply to obtain a matched condition. In a real-life situation, this is how most Transmatches are operated. Since the exact network Q is seldom known for a given matched condition, the level of harmonic attenuation is similarly unknown. Therefore, it is best to regard a Transmatch purely as a *matching device*. Whatever harmonic reduction that will result can be regarded as a bonus.

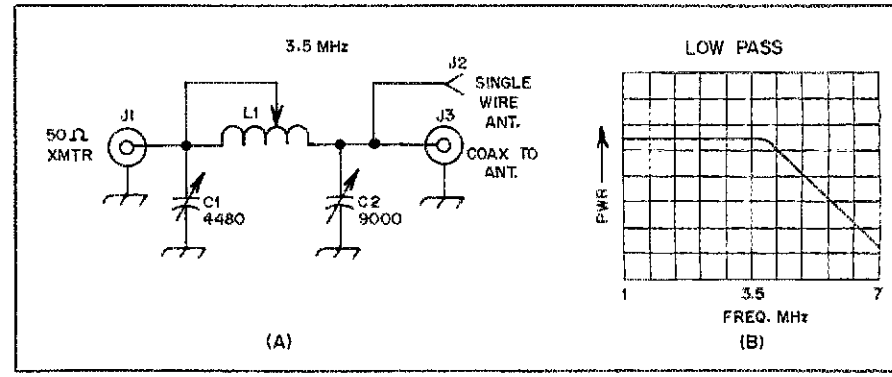

Fig. 3 — A pi-network (low-pass) type of matching network. This circuit has limited matching range (see text) but is excellent for harmonic attenuation.

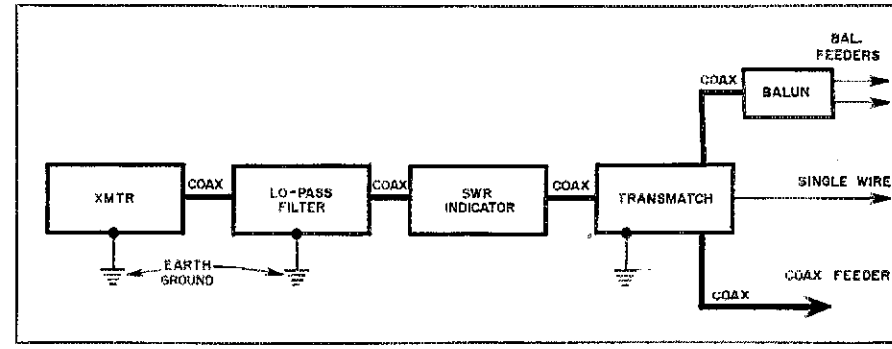

Fig. 4 — Block diagram of a typical setup in which a Transmatch and balun transformer would be used.

Practical Use of a Transmatch

In order to adjust a Transmatch easily it is necessary to use an SWR indicator with it. This will tell the operator when the network is tuned for minimum reflected power from the load. Some Transmatches have a built-in SWR indicator. Others do not.

Fig. 4 shows a recommended setup for using a Transmatch. A low-pass TVI filter is placed in the line immediately at the transmitter output. A quality earth ground is connected to the frame of the transmitter, the case of the low-pass filter and the chassis of the Transmatch, as shown. Coaxial cable (50 ohms) is used between the transmitter and the Transmatch. The SWR indicator (sometimes called a bridge) is always used *before* the Transmatch, as illustrated. If we were to locate it after the Transmatch we would never be able to adjust the Transmatch accurately. At best, we would be tuning the matching network for maximum power to the antenna (which should coincide closely with minimum reflected power in most instances). This assumes that coax feed to the antenna was being used and that the antenna SWR was reasonably low.

What About Baluns?

First of all, let's pronounce this popular word correctly. It is a "bal-un" (*bal*anced to *un*balanced transformer). It is not a "bal-oon" or a "bay-lun," as many amateurs pronounce it. Its function is clearly defined by its name: It converts an unbalanced condition (coax) to a balanced one (balanced feeders). Although the typical balun has a 4:1 impedance-transformation ratio (e.g., 200 ohms balanced to 50 ohms unbalanced), a balun can be built to handle almost any reasonable transformation ratio. The *transmission-line* type of transformer of Fig. 5A shows a 4:1 transformation. But, the broadband *conventional transformer* of Fig. 5B can be made to handle a wide range of transformations. The circuit at B is indeed a balun because of its function. Transformers of the type shown at A and B of Fig. 5 are used frequently in solid-state transmitters to provide an

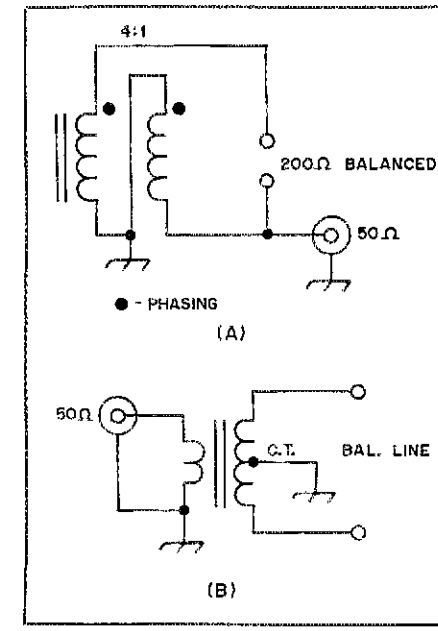

Fig. 5 — The circuit at A is for a transmission-line type of balun (4:1 ratio). A conventional balun transformer is shown at B.

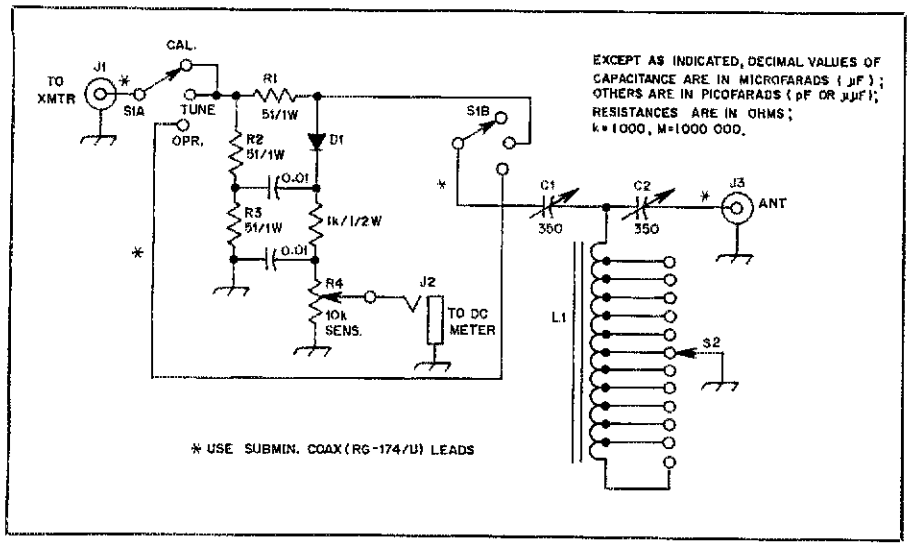

Fig. 6 — Schematic diagram of the QRP Transmatch/SWR indicator. Fixed-value capacitors are disc ceramic. Resistors are composition types except for R1, which is a carbon type of control.

C1, C2 — Miniature transistor radio 350-pF variable. Set trimmers on variable capacitors for minimum C, if trimmers are included as part of the unit.

D1 — High-frequency, small-signal diode. 1N34A, 1N914 or equiv.

J1, J3 — Phono jack, single-hole mount.

J2 — Miniature 2-circuit phone jack.

L1 — 44 turns no. 24 enam. wire spaced evenly over an Amidon T106-2 toroid core (26 μH). Tap at 8, 12, 15, 19, 23, 26, 28, 32, 35, 38 and 41 turns from C1-C2 end. (See text.)

R1, R2, R3 — See text.

R4 — 10,000-Ω control, linear taper.

S1 — Two-pole, 3-position rotary wafer switch. Three-pole switch with unused lugs shown in photograph.

S2 — Single-pole, 12-position rotary wafer switch.

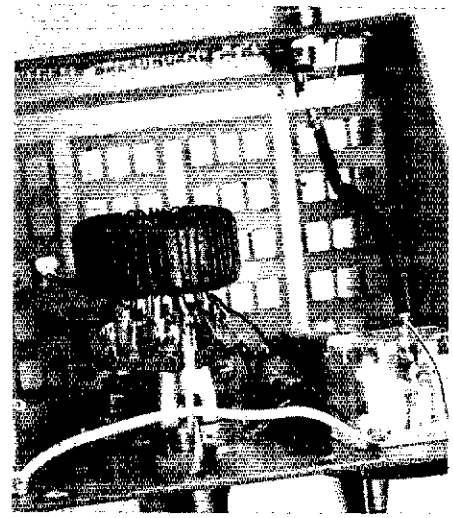

Fig. 7 — Close-up view of the tapped toroid and S2.

impedance match between a single-ended transistor driver and the bases of a push-pull amplifier.

Many commercial Transmatches contain high-power toroidal baluns. These are used when balanced line is employed to feed an antenna. A good example would be the use of 300-ohm twin-lead to feed a folded-dipole antenna, or open-wire feeders for use with a center-fed Zepp antenna.

Since a balun is a broadband type of transformer, it isn't too effective as an rf transformer at load levels above, say, 600 ohms. These devices work best at low impedance levels. This is because at higher impedance levels the inherent built-in reactances (unwanted) affect the phase balance of the transformer, and this becomes more significant as the operating frequency is increased. Additionally, much higher rf voltages are developed at high impedances than at low impedances, and this can cause arcing between the balun turns or between the turns and the toroid core. Many baluns have been destroyed quickly by amateurs who tried to match the output of a high-power rig to a high-impedance load. A charred and very hot toroid core resulted!

When a balun is used in a sensible manner, a shown in Fig. 4, it will add flexibility to the ham station. A typical case was tried and proven at KA1BUQ when an 80-meter "inverted-V" antenna was fed with 300-ohm TV line, routed through a 4:1 toroidal balun and into a homemade Transmatch. All-band (3.5 to 29.7 MHz) operation with an FT-101E transceiver proved effective. An SWR of 1:1 was obtained readily on each band, and good signal reports were received. The Transmatch of Fig. 1 (without a balun) would have worked nicely, too.

This Month's Project

We shall build a simple SWR indicator/Transmatch for the QRP rig described in Basic Radio earlier (December 1979 *QST*).[1] It can be used with other QRP rigs such as the Ten-Tec Argonaut or Heath HW-7 and HW-8 series. In fact, it is suitable for any rig with up to 10 watts of rf output power.

The circuit for our project is shown in Fig. 6. A resistive bridge (R1, R2 and R3) is used to indicate a null when minimum reflected power from the load is realized. The Transmatch becomes the fourth resistance in the balanced bridge. Thus when it presents a 50-ohm characteristic to the bridge circuit, the bridge is nulled. This will be indicated by no needle deflection on the dc meter which is connected to J2. If 51-ohm, 5-percent resistors are used, the bridge will be quite accurate for 50-ohm work. The builder can employ 47- or 56-ohm, 10-percent resistors at R1, R2 and R3, however. The end result will be plenty good enough for any antenna-matching situation. The important thing is that *all three* resistors are of the same ohmic value. In other words, don't mix 47- and 56-ohm resistors.

The SWR bridge is followed by a T-network Transmatch. C1 and C2 are miniature transistor-radio tuning capacitors. L1 is a tapped toroidal inductor. With the taps at the turns specified in Fig. 6, there will be inductance increments of 1, 2, 3, 5, 7, 9, 11, 14, 17, 20, 23 and 26 μH. This should be ample for most matching problems encountered from 3.5 to 29.7 MHz. If a perfect null isn't attainable, don't worry.

Construction

We will follow the same format used in the last several Basic Radio projects, using the Universal Breadboard described in *QST* for September 1979. Once more the panel and the side brackets can be fashioned from pieces of double-sided (copper on both sides) pc board material.

A parts-placement guide is hardly necessary for this project because only three of the isolated pads on the breadboard foundation are used. They serve only as tie points for some of the parts. You may use any pad you desire for these terminals, but pick pads that are close to the related circuitry (keep the leads short).

The shield braids of the miniature coax cable leads should be grounded at both ends. The coax is used between J1 and S1A, from S1B to R1/R2 and between C2 and J3.

When winding the toroid coil, L1, be sure that the insulation is not ruptured so that any two turns short together. This would lead to a shorted-turn condition, thereby destroying the Q of the network.

There are two ways to place the taps on L1. A small loop can be made in the wire as the core is being wound — arranging it so that each loop occurs where the tap point belongs. A couple of twists in the

wire at each loop will keep tension on the main winding. After the total winding (with all 11 tap loops formed) is finished, scrape the insulation off each loop by means of a knife blade. The bare loops can then be soldered to the lugs on S2 of Fig. 6.

Author Shriner used a different technique in establishing the tap points. The toroid was wound with the specified number of turns. Next, insulation was scraped *carefully* (and tediously) off each turn where a tap was required. Short wire leads were then soldered to the bare spots on the coil turns to permit connection to the lugs of S2. A close-up view of L1 prepared in this manner is shown in Fig. 7. Once the Transmatch is built (Fig. 8) and checked out it would be a good idea to coat the toroid winding with Polystyrene Q Dope or some similar low-loss coil dopant. If difficulty is experienced in obtaining a matched condition at 21 or 28 MHz, reduce the first tap on L1 from 8 to 4 turns or less.

Transmatch Adjustment and Use

The meter from the "RF Sniffer" can be plugged into J2 of Fig. 6 for use with this unit.[3] Alternatively, any 50- or 100-μA instrument can be used as an indicator. Even your VOM can be connected at J2 for a readout instrument.

Connect the SWR indicator/Transmatch between your transmitter and the antenna. Place S1 in the calibrate position (CAL). Set R4 for minimum sensitivity (counter-clockwise). Key the transmitter and adjust R4 for a full-scale reading on the meter. Now, switch S1 to the tune mode. Adjust C1, L1 and C2 for a zero meter reading (null). It may take several repeats of the control adjustments before the null is reached. Once that has been achieved, place S1 in the operate position and you're ready to chase DX! It's a good idea to log the settings of the three controls (in terms of "o'clock" readings) to save time when changing bands later and readjusting the Transmatch. Don't forget that you have a built-in dummy load when you operate your transmitter into the SWR indicator while S1 of Fig. 6 is at the CAL position. If the transmitter delivers more than 4 or 5 watts, it would be wise to use 2-watt resistors at R1, R2 and R3 of Fig. 6.

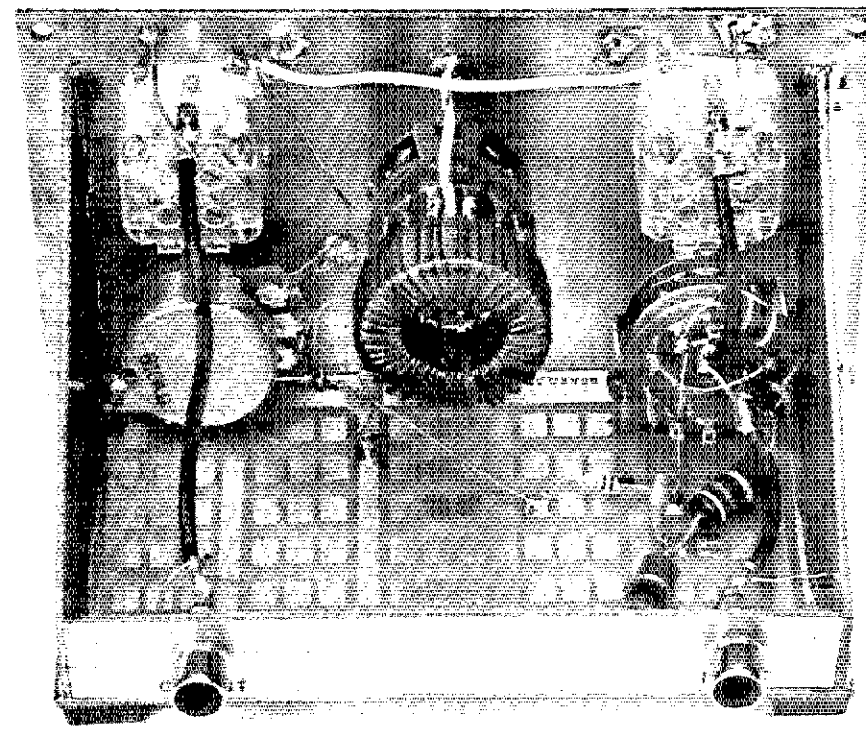

Fig. 8 — Interior view of the Transmatch. J1 and J3 are mounted on a rear apron made from a section of pc board.

Closing Remarks

There are situations with any type of Transmatch in which it may not be possible to obtain an SWR of 1:1 with a given transmitter. The usual cause is a particularly high level of harmonic energy at the transmitter output (faulty design or tuning). When looking into a resonant load such as an antenna, the harmonic energy will be rejected by the antenna and will show up as reflected power. This can cause misleading results when trying to match an antenna at the desired operating frequency. If this happens to you, better check your rig for harmonics! This condition will not be observed if the transmitter is operated directly into a resistive dummy load, as the load will accept any frequency you supply to it.

Don't attempt to substitute an unknown toroid core for the one we have specified. The core has been chosen for the operating frequency, power level mentioned and inductance called for in the design (26 μH). The wrong core can render the Transmatch useless.

Now the question of the day: Do you really need a Transmatch? If so, warm up that soldering iron and go to work! QST

Notes

[1]Available from ARRL or your local dealer; $5.

[2]Circuit boards, negatives and complete parts kits for this project are available from Circuit Board Specialists, Box 969, Pueblo, CO 81002.

[3]*QST* October 1979, p. 15.

Strays

HELP PUT SOLAR POWER ON A FIRE TOWER

☐ Charlie Colin, KA6FVN, works for the U.S. Forest Service in California. Both his isolated work location, a fire lookout tower, and his nearby home are without electricity. Charlie wants advice on building a solar panel and regulator circuit (August 1977 *QST*, page 24) and is looking for a pen-pal Elmer. Contact Charlie via 611 Hilmar St., Santa Clara, CA 95050.

I would like to get in touch with . . .

☐ the eight stations that contacted the Musk Ox Expedition at the North Pole in 1955. Log misplaced in moving. Please write Vandergrift, 2308 Zinnia Ct., Lilleen, TX 76541.

RAIN IN MASSACHUSETTS

☐ The Radio Amateur's Interstate weather Net — RAIN — now meets nightly on the Marlboro, MA, 01/61 repeater. If you can reach this machine, we'd appreciate your participation. — *Robert DeMatta, N1AMF*

Medium-Scan-Television Update

MSTV — a mode that adds motion to SSTV images.

By Don C. Miller,* W9NTP

During the last one-and-one-half years several developers of slow-scan television have been working on a new type of television called medium-scan television, or MSTV. MSTV will add motion to the SSTV image. This series of experiments was discussed in October 1978 *QST*.[1] The article mentioned that the Special Temporary Authorization (STA) permit from the FCC is valid until July 1980. During this past period of time several tests have been conducted and several conclusions made. This update provides the latest information for those who are interested in the tests. This article cannot include all the details of the equipment, so anyone not on the current MSTV mailing list should send a large manila, stamped, return envelope to W9NTP to keep up on the current status.

Equipment has been constructed for demonstration purposes and displayed at many hamfests and conventions across the country. Observations of many viewers and the restrictions of bandwidth on resolution have led the developers to specify a set of standards for the rest of the test period. These standards are given in Table 1.

A beacon is currently operating from Indiana on 29.150 MHz. This beacon operates on Saturday of each week, transmitting the first 10 minutes of each hour, starting when the 10-meter band opens. Several messages and tests are being transmitted. A voice-recorded message gives the present status of MSTV each week. In addition, approximately one-half of the time period is devoted to the transmission of a test image at the standard specifications of Table 1. If the beacon operator, W9NTP, is home, a call-in standby period will immediately follow the transmission of the recorded voice and test image.

How Is MSTV Received?

In order to receive the image it will be necessary to have a wide-band (36 kHz) 10-meter receiver on 29.150 MHz. In the United States there are old two-way fm receivers available very cheap but the writer has not found any type that is recommended. The development of a new economical receiver is being attempted in a short time period by one commercial company. Science Workshop[2] is currently developing a small receiver that will be crystal controlled and will have a discriminator and sufficient bandwidth to receive the low-frequency video. In addition the writer is working with a GLB[3] front end that may convert into many of the repeater kits that use 10.7-MHz i-f strips for 2-meter repeaters. If anyone would like to work in this area to speed up the development of MSTV it would be greatly appreciated.

Table 1
Medium-Scan-Television Standards

These standards are being used for 10-meter transmissions during current experimentation under Special Temporary Authorization of the FCC. (See text.)

Frame rate	2 frames/s
Line rate	256 lines/s
Horizontal line resolution	128 pixels
Vertical line resolution	128 lines
Horizontal sync pulse width	0.5 ms
Vertical sync pulse width	3.9 ms
Base video bandwidth	16 kHz
Type of modulation	Narrow-band fm
Rf bandwidth	36 kHz

There are several approaches to receiving the MSTV image. The most attractive one at the moment from economic and simplicity viewpoints is to use S-100 memory computer boards. This will require two memory boards and a video interface board. The computer memory boards are standard but the video interface board is unique. The design will be furnished to anyone wishing to build the MSTV system.

Another approach which is very attractive is to use a Robot 400 monitor with two memories. The added second memory board can be purchased at cost from the writer. This makes the Robot 400 useful for color SSTV and for graphic applications as well as for MSTV experiments. The problem of using the Robot 400 is the requirement of slow readout of the dynamic memories which must be refreshed at a faster rate than the MSTV pixel rate. For this reason it is required to have an external static buffer memory to do the actual data rate conversion. The S-100 memory board can be used here also. Only part of the 8-K memory is used in this application.

The third approach is to use a converted SSTV P7 monitor. The deflection circuits are triggered directly with the recovered horizontal and vertical pulses. Very little actual conversion is required from the SSTV mode. The image viewed is quite good and will permit anyone to take part in the reception experiments without much expense or development time.

Since only the individuals listed on the original STA are allowed to transmit during this phase, all other participants should apply their efforts to the reception of the image. There are many unknown factors in the reception of wide-band signals on an unpredictable band like 10 meters. Selective fading could easily tear the signal apart so that it would be impossible to synchronize the image. It is therefore recommended that the reader build some kind of a receiver that can receive the video and then apply the output to a P7 monitor or a digital scan converter as mentioned above. Those of you who may be too young in SSTV to know about the development of SSTV in the 60s will be able to experience some of the excitement of developing a new mode that was experienced by SSTV and ssb experimenters earlier.

After this initial phase of getting the first picture across the Atlantic Ocean has passed, the experiments will include computer processing of digital pictures to enhance and to simplify the data to do bandwidth reduction. Bob Suding, WØLMD,[4] has experimented with the transmission of digital slow-scan data and has had very good results. He believes that eventually a moving image can be transmitted with computer processing at normal TV rates in a bandwidth as low as 36 kHz. This must wait for the future. Let us try to keep the experiments going at a fast pace and record as much data as possible so that when we submit our STA report to the FCC next July we can show the inventiveness of radio amateurs. Thus, they will continue the STA and include more names to complete the development of medium-scan television to a successful new mode of operation for the radio amateur. QST

*Box 95, Waldron, IN 46182

Notes

[1] Miller, "Medium-Scan Television — A New Amateur Frontier," *QST*, October 1978, p. 30.
[2] Box 393, Bethpage, NY 11714.
[3] 1952 Clinton St., Buffalo, NY 14206.
[4] The new address of Dr. Robert Suding, WØLMD, is 1161 Reston Ave., Herndon, VA 22070.

A Microprocessor-Based Audible Clock

An audible clock has many applications in Amateur Radio. Use this information to get started with one.

By Dr. William S. Wagner,* AA4WW

An earlier issue of *QST* presented a "talking" voltmeter, one that could be programmed either to beep or to send Morse code for a measured potential.[1] A 6800 microprocessor-based microcomputer, appropriate interfacing, and a software package can also make an audible 12-hour clock. For example, a time of 02:41 would be sounded audibly as dah (pause) dit dit (longer pause) dit dit dit dit (pause) dit. A time of 12:09 would be dit (pause) dit dit (longer pause) dah (pause) nine dits, etc. The clock gives a reading once every 20 seconds, or three times a minute. This gives ample time to output the audible tones. Some other interval could be selected if desired, however, — 10 seconds or 30 seconds, for example. The length of the tones and the pauses are all software controlled. The clock can be set to any desired starting time by storing minutes at address 0001 and hours at address 0002.

A suitable interface circuit is shown in Fig. 1, and a software package in Table 1. As shown, a pulse with a 20-second period is necessary in order to drive the hardware interrupt of the microprocessor. The 60-Hz line is used to develop this pulse so that it has good accuracy. If the microcomputer oscillator clock is crystal controlled, however, then good accuracy could also be achieved by dividing it down to get the desired 20-second pulse.

With appropriate changes to the program and to the interface circuit, the technique illustrated here could be used for many amateur applications. One which comes to mind is a repeater clock to send the time in Morse code during identification. Another is to modulate beacon transmitters, enabling those who may be audio-recording received signals to detect the exact time of a band opening upon playback. The application is up to you.

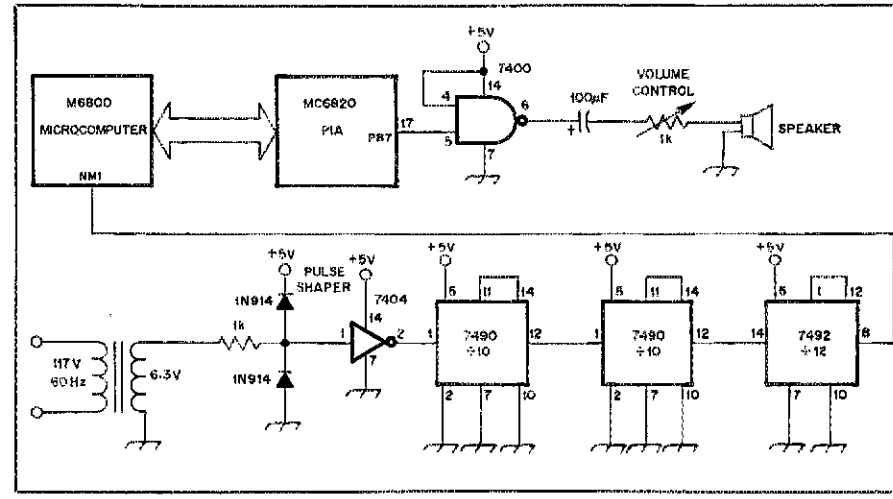

Fig. 1 — Interface circuit for the audible clock. The 60-Hz line frequency provides the frequency (time) reference. The divider chain provides an interrupt signal every 20 seconds to the microcomputer.

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[1]Wagner, "An Audible Digital Voltmeter," August 1979 *QST*, p. 32, and Hall, "Additional Notes on the Audible Voltmeter," p. 34 of the same *QST* issue.

Table 1

Program Listing for the Audible Clock

Address	Op Code	Label	Mnemonic/Operand	Comment
0000		SECONDS		RESERVED FOR SECONDS
0001		MINUTES		RESERVED FOR MINUTES
0002		HOURS		RESERVED FOR HOURS
0003	CE FF04	INITIALIZE	LDX FF04	B SIDE OF PIA IS OUTPUT
0006	FF 8002		STX 8002	
0009	3E	WAIT	WAI	WAIT FOR INTERRUPT
000A	20 F1		BRA F1	
00FD	7E 01A0	NMI VECTOR	JMP 01A0	GO TO CLOCK PROGRAM
Clock Program				
01A0	CE 0000	CLOCK	LDX 0000	
01A3	C6 03		LDAB 03	NUMBER OF READS PER MINUTE
01A5	0D		SEC	
01A6	8D 0E		BSR 0E	INCREMENT 20-SECOND INTERVAL
01A8	C6 60		LDAB 60	COMPARE MINUTES TO 60
01AA	8D 0A		BSR 0A	INCREMENT MINUTES
01AC	C6 13		LDAB 13	COMPARE HOURS TO 13
01AE	8D 06		BSR 06	INCREMENT HOURS
01B0	8D 15		BSR 15	GO TO OUTPUT (MINUTES)
01B2	8D 13		BSR 13	GO TO OUTPUT (HOURS)
01B4	09		DEX	
01B5	3B		RTI	GO BACK TO WAIT AGAIN
01B6	A6 00	INCREMENT	LDAA 00, X	LOAD TIME
01B8	89 00		ADCA 00	
01BA	19		DAA	ADJUST TO BCD
01BB	11		CBA	TIME TO CLEAR?
01BC	25 01		BCS 01	NO
01BE	4F		CLRA	YES
01BF	A7 00		STAA 00,X	STORE TIME
01C1	08		INX	POINT AT TIME
01C2	07		TPA	
01C3	88 01		EORA 01	
01C5	06		TAP	
01C6	39		RTS	
01C7	09	OUTPUT	DEX	POINT X AT BYTE
01C8	9F 10		STS 10	
01CA	96 02		LDAA 02	WHATS IN HOURS?
01CC	27 05		BEQ 05	IF IT'S ZERO
01CE	A6 00		LDAA 00,X	LOAD A WITH MINUTES (HOURS)
01D0	7E 0020		JMP 0020	GO TO AUDIO PROGRAM
01D3	7C 0002	ADJUST	INC 0002	MAKE IT ONE
01D6	20 F6		BRA F6	RESUME
Audio Program				
0020	FF 0015		STX 0015	
0023	8E 00C0		LDS 00C0	
0026				
.	.		.	
.	.		.	
.	.		.	
0060				
0062	27 41		BEQ 41	
0064				
.	.		.	
.	.		.	
.	.		.	
009F				
00A0	9E 10		LDS 10	
00A2	DE 15		LDX 15	
00A4	39		RTS	
00A5	7E 0140		JMP 0140	

Note: Addresses 0026 through 0061, addresses 0064 through 009F, 0100 subroutine for dit tone, and 015B subroutines for dah tones are the same as for the audible voltmeter. See page 33 of August 1979 *QST*.

Strays

CAN YOU HELP A DEAF HAM?

☐ For many years the deaf have been able to communicate by means of modified Teletypes which contain a special telephone adaptor. The adaptor permits the deaf to dial and receive the transmit messages over ordinary telephone lines.

The Teletype for the deaf (TTD) does not match the commercial or amateur networks. TTD uses a 5-level, 45.5-baud Baudot code. The mark is 1400 Hz, space is 1800 Hz with a mark hold (no tone in the holding position).

Does anyone know of a transverter to allow use of TTD in Amateur Radio? Can any of our inventive and experimenting hams come up with a simple piece of equipment to enable the hams and the deaf network to contact each other? Leonard Frank, K2TLW, 28-16 203rd St., Bayside, NY 11360, would like any available information or ideas.

Bug Box QSK

Build this simple and effective cw break-in system and enjoy the luxury of true QSK.

By David P. Shafer, W4AX

An earlier article of mine described a break-in system for cw operation that eliminates backwave and hash from the transmitter.[1] Grid-block bias was applied to the first mixer tube to eliminate backwave. A relay, activated by the key, controlled the screen-grid voltage supplied to the PA tubes to eliminate hash. Automatic break-in (QSK) was provided by a T-R switch.

That method was satisfactory, with one important exception common to systems in which the antenna is tied directly to the transmitter pi network. Suck-out, or the reduction of received levels, may occur because of energy absorption by the pi network. The degree of such attenuation depends on the configuration of station components and the band in use. Many excellent circuits using T-R switches were examined but all appear to have this common deficiency. In some cases TVI may be caused by signal clipping in the T-R switch.

It was therefore decided to devise a system for complete isolation of the receiver in QSK operation. Several methods described in numerous articles or found in manufactured ham gear were considered. In some transmitters, for example, transfer of the antenna for break-in operation is accomplished by means of the VOX relay. This often results in clipping of the first transmitted dit or dah. It usually becomes objectionable at about 20 wpm. In addition, the clacking of the relay may be annoying. If the VOX time-constant potentiometer is adjusted to delay the release of the relay for an appreciable interval, so as to avoid "crowding" the operator, true QSK is not realized.

The basic QSK circuit by VE3AU[2] appeared to be the most promising because of its simplicity and fail-safe feature. A modified version of this circuit has been in use with complete satisfaction for many years. The W4AX Bug Box was designed primarily for cw QSK operation. It is not intended to provide instantaneous QSK in ssb operation, nor does it control the shape of the rf envelope, dit speed or pulse length. These are functions of transmitter and keyer adjustments. The basic Bug Box circuitry consists of a single transistor which controls a vacuum relay. No changes in the transmitter, amplifier or receiver are necessary.

Theory of Operation

Refer to Fig. 1. For cw operation, S2 is thrown to the cw position. The key (hand, electronic or keyboard) should apply chassis ground potential at J5 or J6 when closed. This turns on transistor Q1, connecting negative potential to the vacuum relay K1. The initial surge of current through the 50-μF capacitor momentarily short-circuits the 220-ohm resistor, thus raising the voltage applied to relay K1 to a value somewhat higher than the nominal 26 volts. The armature movement of K1 from its normally open to normally closed contact is almost instantaneous. Ground potential is also applied through D4, the two rf chokes and the relay common and normally open contacts to J4 and on to key the transmitter. This starts the generation of rf. Note that the transmitter cannot be keyed until after the rf path from J2 to J1 has been completed. This fail-safe feature is desirable because it insures cold switching.

Opening the key simultaneously interrupts the dc paths to both Q1 and the transmitter. However, it is imperative that K1 remain operated until after the rf envelope has completely disappeared. This is accomplished by the network consisting of R2, C6 or C7, and D3 shunting the relay coil. While the key remains closed, the FAST or SLOW capacitor is in a charged condition and no current flows through D3 or its shunt resistor. At the instant of "break" (opening of the key), the energy stored in the capacitor discharges through D5. The duration of this "slugging" current depends almost entirely on the value of capacitance and the impedance of the coil. In the FAST position of S3, the relay will release in approximately 8 ms; in the SLOW position, about 48 ms.

During the "space" interval (between individual dits and dahs) the network is at zero potential. At the instant of "make," a surge of current flows through K1. Only a small charging current flows into the FAST or SLOW capacitor through the 100-ohm resistor and continues for a few ms while K1 is in an operated condition. Thus, the charging current cannot effectively lower the initial peak voltage applied to the relay. In other words, the timing network cannot "rob" the relay at the instant of "make."

The values in the network are chosen to insure cold switching at any keying rate. In both FAST and SLOW QSK, the relay must remain operated after each dit until well after rf has ceased. This interval is independent of the keying rate. For FAST QSK, the relay will release after each dit, at any speed up to about 50 wpm. This gives instantaneous break-in, provided the receiver age is deactivated. In SLOW QSK, the relay will "hold over" between dits at speeds over approximately 10 wpm. This optional feature is built in to avoid unnecessary switching of the antenna back and forth to the receiver while the receiver is still muted by its age, if used. In short, SLOW QSK provides break-in between words rather than individual dits.

While the relay remains on its normally open contact following the instant at which the key is opened, there is a path from J4 to J1 through 470 kΩ shunting the 0.06-μF capacitor. The resulting key-line

[1]Notes appear on page 32.

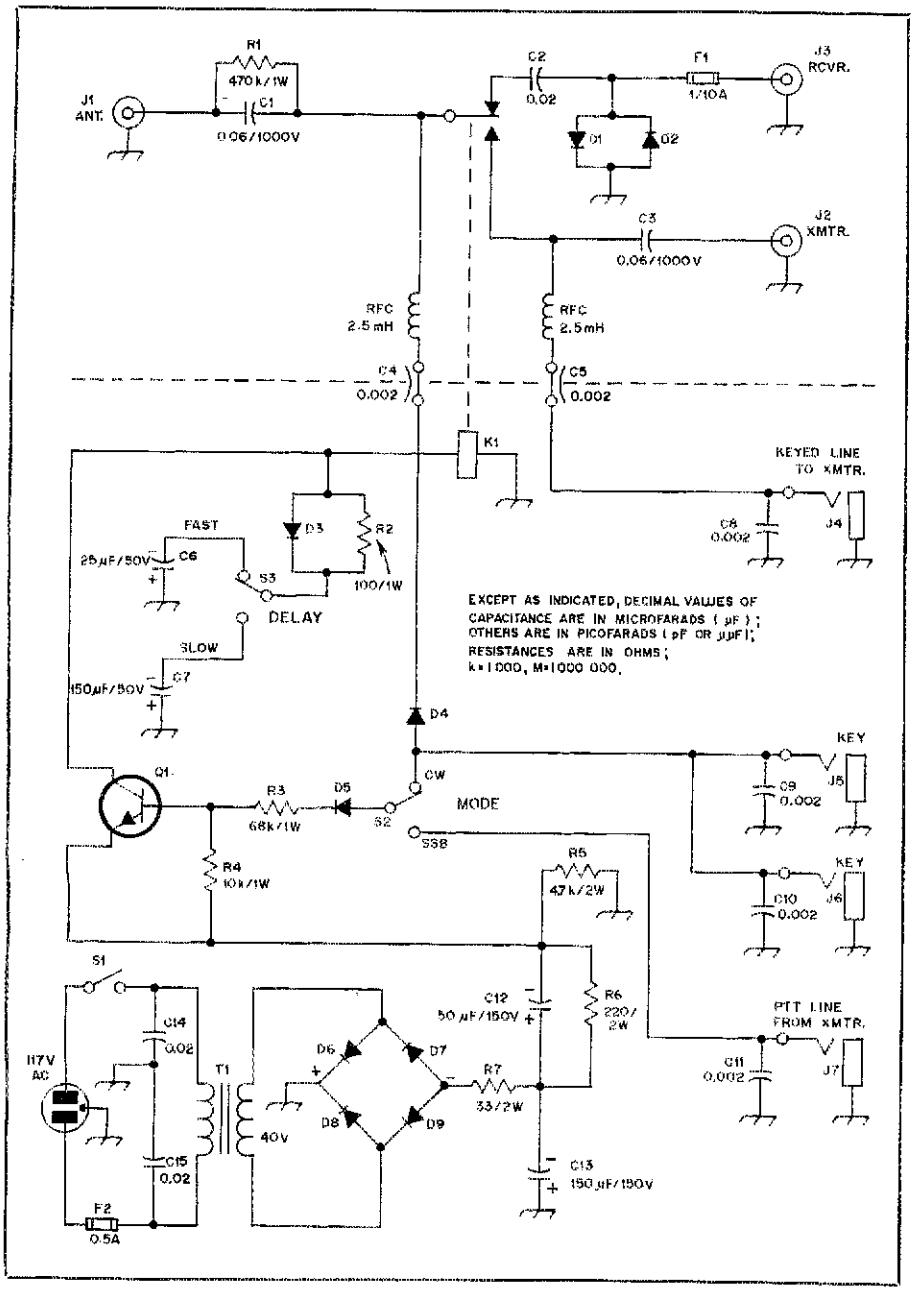


Fig. 1 — Circuit of the W4AX Bug Box. Capacitances are in µF and are disc ceramic except for those with polarity indicated, which are electrolytic, and those listed below. Resistances are in ohms (k = 1000), and are 1/2-watt carbon unless indicated otherwise.
C3, C4 — 0.002-µF feedthrough.
D1, D2 — 1N34A or equivalent.
D3-D9, incl. — 1A, 200 PIV, RCA SK3030 or equiv.
K1 — Vacuum relay (Kilovac HC1 or Jennings RJ1-A).
Q1 — Silicon npn gen. purpose transistor, 10 watts, 3.5 A (2N5784 or equiv.).
T1 — 117-volt primary, 40-volt 0.3 A secondary, Thordarson 23V117 or equiv.

current is only a fraction of a milliampere and produces no tail on the rf envelope. The resistor is used to dissipate any residual charge on the capacitor and antenna system which would be transferred to the receiver when the relay returns to its normally closed contact.

For ssb operation S2 is thrown to the ssb position. When transmission is to begin, ground potential is applied by the transmitter PTT line to J7 and turns on Q1. This operates the relay as in QSK operation. When the PTT button is released, K1 transfers the antenna to the receiver. As in cw operation no clipping of the rf envelope can occur even if the PTT line is opened while talking. The relay timing network is common to both modes.

Choice of Components

The fuse and parallel, reverse-connected diodes D1 and D2 protect the receiver against possible high-level surges from such sources as lightning. The writer blew the fuse on one occasion while testing a second antenna without disconnecting the one in normal use. The strong rf level might have damaged the receiver had it not been for the built-in protection. The 0.02-µF capacitor simply isolates dc from the receiver.

The Bug Box is very quiet in operation. The slight click of the relay, caused by the snappy transition on "make," can be heard at the operating position but not outside the room even in the wee hours of night. Relay operation can be made virtually noiseless if C12 is reduced to approximately 15 µF. The higher value is recommended, however, in order to prevent a shortening of each rf bit reaching the antenna. At low keying speeds, the difference can hardly be detected on a monitor scope. At speeds of 35 wpm or more, this "spacing bias" would be about 5 percent: not objectionable but less than the ideal 50 percent dot weight in the transmitted rf envelope. With the 50-µF capacitor, the spacing bias can hardly be detected at any speed.

Although the 0.06-µF capacitors connected to J1 and J2 are rated at 1 kilovolt, they are conservatively operated and will handle the legal limit. The author uses three 0.02-µF disc ceramic capacitors in parallel in each location.

Any one of several npn transistors similar to the RCA 2N5784, conservatively rated, may be used. The 2N3053 and 2N5321 are good substitutes. Ripple from the power supply is not a problem even with a smaller filtering capacitor; 100 µF is entirely satisfactory but 150 µF is recommended.

The retail price of the Kilovac[3] HC1 or Jennings[4] RJ1 vacuum relay is in the $60 range, depending on quantity. This is a bit steep, but well worth the investment. The coil resistance of both relays is 335 ohms and the nominal operating potential is 26 V. Cheaper reed type relays are available, but seem somewhat prone to sticking of the reed on one of the contacts or hanging up in midposition.

Shielding

The rf-circuit components should be shielded from the dc components. This prevents erratic switching by the transistor caused by exposure to high-level stray rf. The writer uses the Bud C-1796 utility cabinet with a built-in shelf. The relay is mounted in a hole cut in this shelf. J1 and J2 are type SO-239 connectors. J3 is a phono jack. These are mounted on the rear face behind the smaller section containing the rf components. J4 through J7 are located in a row behind the larger compartment housing the dc circuitry. Two key jacks, J5 and J6, are provided so that either a straight key or electronic keyer can be used at will. The switches and pilot lamp are mounted on the front face of the box. C8 through C11 are rf bypass capacitors. The chassis should, of course, be connected to a good ground for safety.

Gain Control

In QSK operation, it is desirable to

monitor the transmitted frequency rather than use a sidetone. This and other advantages of break-in operation are covered in another article.[3] Since the audio level of transmitted signals is usually higher than that for received signals, blasting must be prevented. There are several methods of doing this. For example, a second relay, controlled simultaneously with the antenna relay by the key, applies a partial ground to the receiver muting circuit to increase the agc bias. The degree of muting depends on the amount of resistance used for this purpose. Unpleasant popping may occur in this method however, but can be reduced (if not entirely eliminated) by proper timing of the auxiliary relay and smoothing the change in agc bias by a combination of capacitance and resistance.

A simpler and more effective way is to use a clipper on the receiver output — unless, of course, the receiver is equipped with a built-in limiter stage which would make this unnecessary. With the clipper, there is no popping whatsoever. The Bug Box remains as described and no changes in the receiver are made. Two 1-A, 200-PIV silicon diodes are connected back-to-back and bridged across the receiver output. The audio signal then passes through a 1-kΩ potentiometer to the speaker or headphones. Strong local and incoming signals are equalized in level by the diodes at a higher forward-current voltage threshold than is the case with germanium diodes. It is for this reason that the potentiometer is connected to attenuate the audio signal, after clipping, to a comfortable listening level. At W4AX, the clipper and an MFJ CWF-2 selective filter are housed in a small box (Bud CU-234) fastened to the receiver chassis.

Summary

The Bug Box provides quiet and reliable cold-switching QSK at full power, on all bands and at any keying rate. The addition of an audio clipper eliminates blasting and assures comfortable cw break-in operation with headphones or speaker. PTT is provided for ssb operation. Modification of other gear is unnecessary.

The writer is indebted to the many amateurs who have contributed helpful comments and suggestions during the development of this system. Several of them, here and abroad, are using the Bug Box. QST

[Editor's Note: Shortly after accepting Mr. Shafer's article for publication, we were saddened to learn of his passing.]

Notes

[1] Shafer, "Cleaner Break-In With the 32S-3," *QST*, November 1964.
[2] "A New High-Power Keyed Antenna Relay," *QST*, August 1967.
[3] Kilovac Corp., P. O. Box 4422, Santa Barbara, CA 93103.
[4] ITT, Jennings Div., P. O. Box 1278, San Jose, CA 95108.
[5] Shafer, "Why QSK?," *QST*, February 1979.

ARRL International DX Contest Awards Program

The 1980 ARRL International DX Contest will feature a wide variety of plaques to be awarded to single and multioperator stations. The response to our inquiries for club and individual donors has been overwhelming and only a few were still unfilled at this writing. Many thanks to those who have expressed their support of the ARRL contest program! Are you interested in sponsoring one of the few remaining plaques or do you have a special one you'd like to sponsor? Contact the Contest Branch at ARRL hq. The ones already sponsored are listed in the tables that follow.

W/VE Phone

Single Operator

All Bands	Frankford Radio Club
3.5 MHz	Gary Firtick, K1EB/W1EBC
14 MHz	Richard Loehning, N9ACP, and Mark Michel, W9OP
21 MHz	Hamfesters Radio Club
28 MHz	Roy and Kathryn Tucker, N6TK/AA6TK
QRP	Rockford Amateur Radio Assn.

Multiop-Single transmitter
Mad River Radio Club

Multiop-Multi transmitter
Buffalo Area DX Club

W/VE CW

Single Operator

All Bands	Frankford Radio Club
1.8 MHz	W1TX Roy Fosberg Memorial — Connecticut Wireless Assn.
3.5 MHz	Northern Illinois DX Assn.
7 MHz	Ellis — Doucett Memorial
14 MHz	Neenah-Menasha ARC
21 MHz	Willamette Valley DX Club
28 MHz	Stan Kugler, W1XK

Multiop-Single transmitter
Mad River Radio Club

Multiop-Multi transmitter
North Florida AR Society — W4IZ (Hollis Graves Memorial)

DX Phone

Single Operator

World	North Jersey DX Assn
Africa	William Shepherd, K3WS
Asia	Lafayette ARC and Acadiana DX Assn.
Europe	Ron Nevers, K1VTM
North America	Chod Harris, VP2ML
Oceania	Ray Stone, W5RBO
South America	Roy and Kathryn Tucker, N6TK/AA6TK
1.8 MHz	Arkansas DX Assn.
3.5 MHz	Robert Peterson, W3YY
14 MHz	Armond Noble, N6WR
21 MHz	Worldradio, Inc.
28 MHz	Mike Badalato, W5MYA

Multiop-Single transmitter

World	Delta DX Assn.
Africa	Indy DXers
Asia	Kansas City DX Club
Europe	Roger DeBusk, K8LSG, Memorial
North America	Lynn and Rosie Lamb, W4NL/KA4S
South America	Liga Colombiana de Radio-aficionados

Multiop-Multi transmitter

World	Gloucester County ARC of Southern New Jersey
Asia	Mike Badalato, W5MYA
North America	Southeastern DX Club

DX CW

Single Operator

World	North Jersey DX Assn.
Africa	San Diego DX Club
Asia	Sonoma County Radio Amateurs
Europe	Clarke Greene, K1JX
North America	Pete Grillo, W6RTT
Oceania	Ray Stone, W5RBO
South America	Alamo DX Amigos — San Antonio, Texas
1.8 MHz	Arkansas DX Assn.
7 MHz	Art Boyars, K3KU
14 MHz	Bencher, Inc.
21 MHz	John Minke; N6JM

Multioperator-Single transmitter

World	Texas DX Society
Europe	South Florida DX Assn.
North America	The K5RC Multiop Crew
South America	Mike Badalato, W5MYA

Multioperator-Multi transmitter
World — QRZ DX

Special

Single Operator

Scandanavia (Highest score)	John Lindholm, W1XX
Rhodesia (phone)	DX Assn. of Connecticut
W/VE Low Power (combined)	Ken Bolin, W1NG
World (combined)	Yankee Clipper Contest Club
Israel (cw)	Martin Harstein, N6WW
Israel (phone)	Martin Harstein, N6WW
West Coast Big Gun (14 MHz phone USA)	Larry Pace, N7DD

Multioperator

Caribbean (phone)	Joe Johnson, W5QBM Memorial

Club Competition Gavels

Unlimited: 50 or more entries	ARRL
Medium: 11-49 entries	ARRL
Local: 3-10 entries	ARRL

After we read the revised rules for the ARRL DX Contest in December *QST*, a couple of the rules were apparently not specific enough. QRP may be defined as 5 watts dc output or 10 watts dc input, as long as you can accurately measure it. QSOs with your own country count for multiplier credit only. W/VE and VE/W QSOs count for multiplier only. — *Tom Frenaye, K1KI*

A Cheapy-Charger for NiCad Batteries

Need a power supply for that portable gear? Use NiCad batteries and this simple, effective charger.

By Hans Schroeder,* AE9G

Have you found yourself avoiding NiCad batteries as a power supply for your portable equipment because of the charger hassle? I almost did. I had decided against using nickel-cadmium cells for portable operation of my QRP rig because buying and taking along a special charger was not attractive. But then I found a booklet with design information published by General Electric for use with their products.[1] I think the data is not strictly limited to GE cells, but can be applied as well to anonymous NiCad cells like those frequently advertised in surplus equipment flyers. My own charger turned out to be very simple, and some of the design information ought to be useful to fellow builders.

NiCad Characteristics

Sealed nickel-cadmium cells are a closed chemical system requiring no replenishment of any sort during their life, which should be at least 1000 charge-discharge cycles. What is harmful to the cells is too deep a discharge, especially reverse-charging, or excessive overcharge. Reverse charging happens easily in a series string of cells. When a series string is completely discharged not all the cells reach their end point simultaneously. The cell which reaches zero charge first will be reverse-charged by the continuing current flow caused by the cells which still have potential. Reverse charging causes hydrogen to be developed which is not reabsorbed but lost to the chemical cycle. If enough pressure builds up, the hydrogen will escape through the pressure-relief vent.

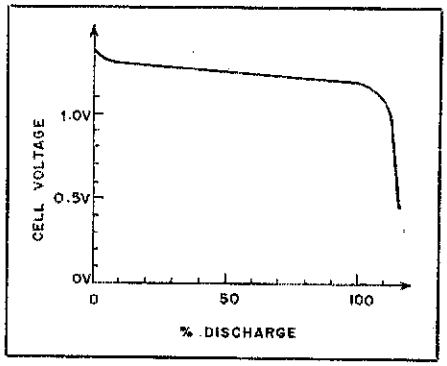


Fig. 1 — Typical nickel-cadmium-cell discharge characteristics.

The normal discharge characteristic of the NiCad cell is shown in Fig. 1. Ordinary cells — those which are not intended for high discharge-rate applications — are rated on a one-hour basis. That means that a size D cell which is marked 1.2 ampere-hours (such as the GE type GC-3) is able to supply 1.2 A for one hour. Charging currents are then specified as percentages of this one-hour current. For example, a trickle charge should be 2 percent of that one-hour current, or less. That current is intended to sustain the charged state of the cell, but is not adequate to charge a cell which has been discharged.

More commonly used is the normal, so-called "overnight" charging rate. This should use a current about 10 percent of the one-hour current. Besides charging the cell in a reasonable length of time (about 14 hours from total discharge), it is a rate at which the cell can be overcharged for some time without harm.

The limiting factor in overcharging is the rate at which the chemical system can reabsorb the oxygen which is developed when a charged cell continues to be charged. If the overcharge current is too high, oxygen is developed more rapidly than it can be absorbed. Excessive pressure develops, and this pressure bleeds off through the cell vents, with the resulting loss of oxygen to the chemical cycle. In addition there is an undesirable heat buildup. None of these effects occurs at the 10-percent rate.

Unknown Cells

If a cell is labeled with its capacity in ampere-hours it is an easy matter to use it in accordance with this information. If it is unlabeled, it is possible to charge the cell at a conservative rate for perhaps 20 to 30 hours to achieve full charge without risk of damage, and then experiment to find the one-hour current. After the one-hour current has been found the cell is in effect calibrated, and the proper 10 percent current for charging can be determined.

Table 1 lists suggested charging currents for common cell sizes. For odd cell sizes interpolate between given values on the basis of the volume of the unknown cell.

The Cheapy-Charger

According to these requirements a constant-current source delivering the desired current is needed. A bridge rectifier connected to the 117-volt power line with a suitable series dropping resistor could do a good job of that, but the

*2400 E. Bradford Ave., #706, Milwaukee, WI 53211

[1] *Nickel-Cadmium Battery Application Engineering Handbook*, 2nd Ed., 1975, General Electric Co., $5.

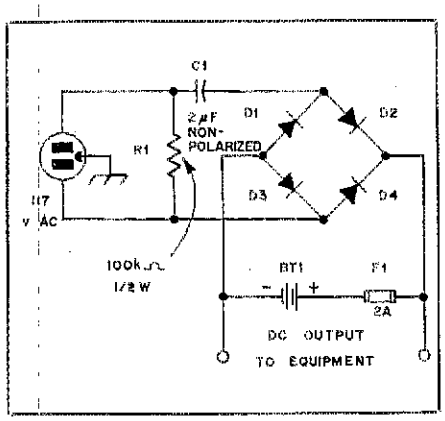


Fig. 2 — The circuit diagram of the AE9G NiCad supply and charger.
BT1 — 10 size-D NiCad cells in series.
C1 — Nonpolarized, approximately 2 μF, 200 V (see text).
D1-D4, incl. — 200 PRV general-purpose silicon diodes, 1N4003 or equiv.

resistor would have to dissipate a substantial amount of power. A much better choice is to use a "dropping capacitor" as suggested in the GE booklet. The circuit of such a charger is shown in Fig. 2.

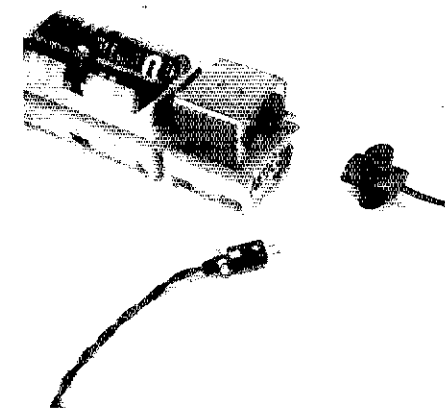
The circuit is simple enough that it is likely to be a 100 percent junk-box project. In my case it almost was — except for the Jones plug used for the dc output connection. The photo shows the charger with a 10-cell battery. To use the battery, plug in the dc cable; to charge, unplug the dc cable and plug in the ac cord.

A few comments on the circuit components: The bridge-rectifier diodes must be able to handle line voltage; current is unlikely to be a limitation. The function of the resistor is to remove any residual charge which might remain on the capacitor and then appear as a voltage between the two ac prongs. Anything between 100 kΩ and 1 MΩ will do. The capacitor value must be determined empirically. As a starting point, use 1 μF per each 40 mA of charging current desired. The value of capacitance used in this charger for a battery pack consisting of 10 size-D NiCad cells is 2.4 μF, which results in a charging current of 90 mA. With no cells being charged the short-circuit current is 95 mA, showing good current regulation.

Safety Considerations

The observant reader will have noticed that when the charger is in use there is no isolation from the power line. I do not find this to be a problem since no point carrying line voltage is exposed. [It would be desirable to use a 3-wire grounding ac plug and cord and connect the green ground wire to the chassis of the charger, as shown in the diagram. — Ed.]

If one of the cells is removed, full-wave rectified ac can be found between the open points, but that is a somewhat artificial situation. In general, any hazard points are about as accessible as the terminals in an ac wall outlet.



The supply/charger in completed form. The charger components are enclosed in the small aluminum box.

It is possible to operate some pieces of equipment (those not sensitive to a little 120-Hz hum on the dc, such as a keyer) from the battery pack while it is being charged. But in that case an isolation transformer should be connected between the power line and the charger. In most cases, though, the 120-Hz ripple caused by the charging current together with the internal resistance of the cells prevents using the dc output while the pack is being charged. The best solution is to build another battery pack, and *charge — cheap!*

Strays

SOLAR-ELECTRIC POWER ADVANCES

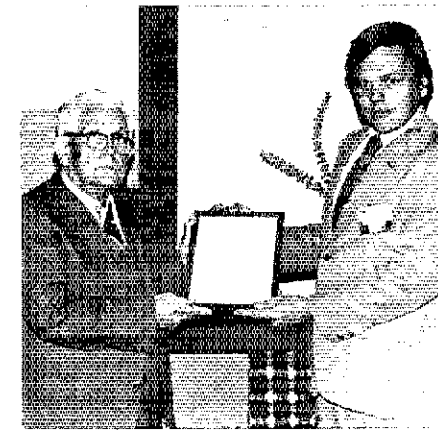
On August 29, 1979, radio station WBNO (a-m) in Bryan, OH, became the first commercial radio station to obtain power from the sun via photovoltaic solar cells. The energy collector consists of 33,600 individual solar cells providing 15 kW of peak-power capability.

WBNO is a daytime a-m station of the low-power class. The solar-array composite system furnishes 70 to 90 percent of the total energy needed annually by the transmitter, according to an article in the November 1979 *Broadcast Engineering*, page 36. The remainder of the station power is supplied by the commercial mains.

The solar array consists of 100 4- × 8-foot (1.2- × 2.4-m) racks of cells which occupy, collectively, a third of an acre. Nominal output voltage on the service bus is 128 dc. A bank of storage batteries serves as the buffer between the solar array and the station equipment. A capacity of 40 kWh is used. This requires 60 each, 310-Ah batteries, with a combined weight of 2 tons!

This experimental station was sponsored by the U.S. Department of Energy. Project management was by MIT Lincoln Laboratory. Dc-to-dc converters are used between the 128-volt bus and equipment which requires higher operating potentials.

This certainly appears to be a proper move toward energy conservation. Many low-power amateur repeaters could be powered economically by means of solar energy, although projects such as that of WBNO are still quite costly. Unit cost for solar-electric panels should decline as the consumer demand increases. Who knows how long it will be before amateurs can power their 1-kW stations from converted sun energy? How about it, you W6s and Florida W4s? — *Doug DeMaw, W1FB*



Walter G. Marburger, W8CVQ (left), received the ARRL Certificate of Merit for over five decades of activity on the vhf bands. The presentation was made at the 26th annual vhf conference, held at Western Michigan University. Representing the ARRL was the Michigan SCM W8MPD (right), who was one of Professor Marburger's electronics students at Western 23 years ago. *(photo courtesy W8MPD)*

Zapping Life Back into a Nickel-Cadmium Cell

Don't blame your charger because your batteries aren't up to snuff. Give your NiCads the zap treatment!

By George P. Schleicher,* W9NLT

The rechargeable battery has gained great popularity in recent years. Portable radios, pocket calculators, photographic flash attachments, and so on, are economically more attractive than if they had been equipped with "throw-away" batteries. Most of these low-power devices use the spill-proof nickel-cadmium (NiCad) cell which is now widely available. For some devices, the battery is specially constructed with welded connections between the cells. Some have an assembly of three or more cells encased in a molded phenolic housing for ease in handling.

Two sizes of NiCad cells are the most common: the AA and the sub-C sizes. Rechargeable cells are also available in the C and D sizes. Usually both the C- and D-size cells are rated at 1.0 to 1.2 ampere-hours. That is because under the glossy plastic C- or D-size exterior lies a standard sub-C NiCad cell.

A fully charged NiCad cell will have a potential of 1.25 volts. A cell is rated at the maximum current it can deliver for one hour when fully charged. At the end of that time the cell voltage should not have dropped to less than 1.0. A cell that has been discharged to that point should be recharged. Most manufacturers recommend that the charging current be one-tenth of the ampere-hour rating. Charging time would be about 10 hours but for the fact that the charging operation is only approximately 66 percent efficient. Thus a 15-hour charging time is often recommended.

Sometimes, when a NiCad-cell-powered device has not been used for a long period of time, the battery may appear to be dead. Yet, after the batteries are recharged, the device still performs poorly. If the battery voltage is checked it may be low, usually by the voltage of one cell. Can the dead cell be restored? Often yes, if the right technique is used. What has happened is that one cell has become so discharged that its terminal voltage has dropped to zero. Then the other cells in the string force current through the dead cell, tending to reverse-charge it. After a charge, the other cells are brought up to normal terminal voltage but the cell that was reverse-charged may remain at zero terminal voltage. Attempting to use the device will cause further deterioration of the bad cell. Attempts to charge the bad cell at a normal rate usually prove unproductive.

Restoring the Cell

The cure involves testing each cell in the battery to identify the one that has lost its output voltage and applying a short-duration, high-current charge to *only* that cell. The charging current will be heavy — 20 or more times the normal charging current — but only for a few seconds. It is best to have a continuously adjustable low-voltage power supply for this operation. It is also important that both the cell voltage and the charging current be monitored constantly during the zapping. The charging setup is shown in Fig. 1.

The operation involves connecting the charging circuit to the defective cell (power supply negative terminal to cell negative terminal) and increasing the voltage slowly until a maximum allowable current is reached: Use an upper limit of 1-1/2 to 2 A for a size-AA cell and 3 to 3-1/2 A for a larger cell. As the charging current is increased toward the maximum value, a close watch should be kept on the voltage measured across the cell. After about 10 seconds of heavy charge, voltage should appear across the cell and rise rapidly to between 1.0 and 1.3 volts. This rise should occur in only two or three seconds. The charging current should be reduced as rapidly as the cell voltage rises; it should be reduced to the normal charge rate (150 mA for most cells) by the time that the cell voltage rises to 1.4.

That's all there is to it — except that after a terminal voltage of 1.0 or more has been restored to the low cell, all of the cells in the battery should be discharged to 1.0 volt per cell. Then the battery should be given a full charge under the conditions recommended by the manufacturer of the battery or the battery charger. NiCads will be most reliable and deliver full rated power if they are discharged and fully recharged at least once every month. QST

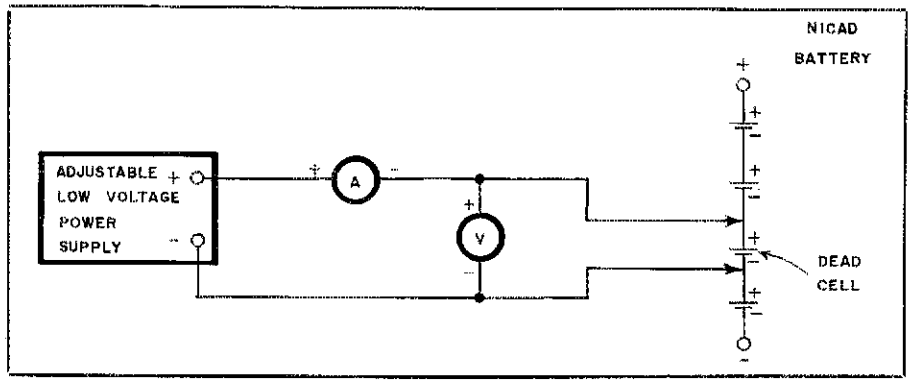


Fig. 1 — The NiCad Zapper is a power supply with charging-current and cell-voltage metering.

*1535 Darmouth Ln., Deerfield, IL 60015

A Versatile Timer Circuit

Need an i-d reminder or a repeater time-out warning device? Then stop, look and read about KA6A's circuit. Included are manual- and automatic-triggering schemes.

By J. J. Coleman,* KA6A

This article describes a four-part versatile timer circuit that is suitable for application as an i-d reminder or for repeater timeout warning. Several different triggering schemes, both manual and automatic, are described, along with explained variations. As you continue reading the following paragraphs you'll also find a description of general timer applications of the ubiquitous 555-timer integrated circuit. Additionally there are included some other logic and rf circuits. Suggestions are offered for those who enjoy experimenting with modifications, while those amateurs who merely want to build the circuit will find the necessary basic data for that purpose. Finally, enough information is offered about all four parts of the circuit so that any individual part may be used for other applications.

Timer and Oscillator Circuits

Appropriately enough, we begin at the end and work forward. Let's consider then how useful it can be to have an i-d reminder. If you work the hf bands, your imagination does not have to be stretched in order to agree that such a reminder is indeed practical, particularly if you are an ardent ragchewer. After all, the Amateur Radio regulations are specific about the station identification.

In general, an i-d reminder circuit would emit a brief tone or turn on an LED to remind the operator to identify before the 10-minute limit is reached. Amateurs who operate through vhf repeaters equipped with timers can benefit from a circuit that emits a short tone, warning that the carrier is about to drop. In both cases, an audio oscillator is a necessary requirement. Fig. 1 shows a 555-timer chip (U1) functioning as an audio oscillator. Actually, the correct description is an astable multivibrator configuration. In simple terms, the output at pin 3 turns on (+V) and off (0) continuously at a rate determined by the 1-kΩ and 180-kΩ resistors in conjunction with the 0.01-μF capacitor. If resistance R_C is much greater than R_B, the

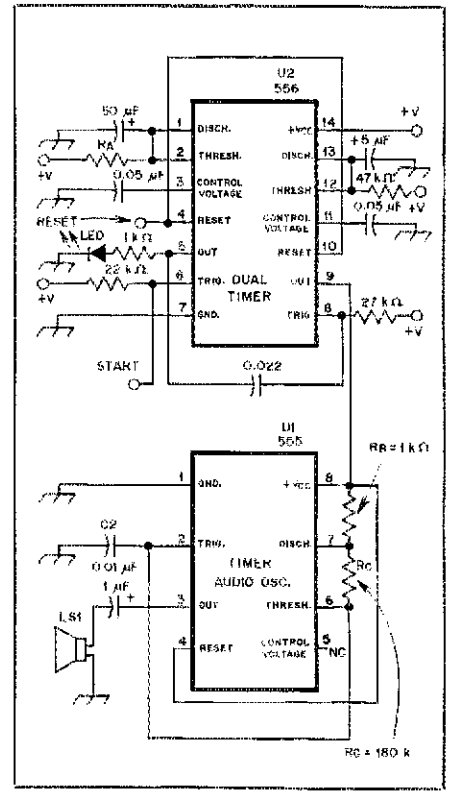


Fig. 1 — Oscillator (U1) and dual timer (U2). The timer interval is determined by the 50 μF capacitor and resistance R.

frequency is given by the formula $f = 1.6/(R_C \times C_2)$ where the resistance is in megohms and the capacitance is in microfarads. In Fig. 1, the frequency is about 900 Hz for values of 180 kΩ and 0.01 μF.

The audio-frequency square wave of the oscillator is used to drive a speaker. The resultant tone is somewhat harder than that of a sine wave, yet it is not unpleasant. There are no audible chirps or clicks produced by this oscillator. With a potential ranging from 5-16 V on pin 8 of the IC (U1) the oscillator will provide enough power to drive most small speakers with sufficient volume. Additional amplification is not necessary. Sidetone and code-practice oscillators can also be fashioned from this single IC.

U2 in Fig. 1 is a dual timer.[1] Except for common +V and ground, this type 556 contains two independent timer circuits. The left side of the chip (U2A) is used as an interval timer which measures, for example, the 30 or 60 seconds for repeater warning or the slightly less than 10 minutes for an i-d reminder. The right side (U2B) of the timer chip is turned on when U2A has completed the timing interval and determines the length of time the oscillator (U1) is on.

The values of components at pins 1 and 2 of U2A (pins 12 and 13 for U2B) determine the time interval. The formula is approximately $T_{sec} = 1.25 \times R \times C$ where resistance is in megohms and capacitance is in microfarads. In Fig. 1, R_A is not specified. A potentiometer, a single resistor or several resistances mounted on a ganged switch may be used for R. As an example, with a 100-μF capacitor and a 5-MΩ potentiometer, all times from 0 to 10.4 minutes are possible. Timer U2B with a 47-kΩ resistor and a 5-μF capacitor allows the oscillator to be on for 0.3 second.

Pin 3 (11) should be tied to ground with a capacitor. A typical value is 0.05 μF but other values will work as well. Pin 4 (10) is the reset pin which must be kept at +V in order for the timer to count an interval. This pin is brought to ground momentarily or indefinitely to stop the timer in midinterval.

Pin 5 (9) is the output pin. During the interval it is at +V potential but otherwise this pin is at zero voltage. The output of U2A is used to start U2B in addition to driving an optional LED for indicating that the timer is working. While timing its interval, U2B supplies voltage to the oscillator directly. An LED and a resistor could be put on this pin for use as a silent optical indicator.

Pin 6 (8) is the start pin. This pin is normally held high (+V) until a trigger momentarily drops the voltage level to ground potential. Once the timer is started, it will continue until it reaches the time specified by the RC combination or until it is reset. The trigger for U2B comes at the end of the

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[1]Notes appear on page 37.

U2A timer interval. At this point, the U2A output goes low, and, through the 0.022-μF capacitor, momentarily drives the U2B start to zero. Other values of capacitance can be used for this connection. The circuit of Fig. 1 can be made from two 555s rather than one 556. Pins 1, 2, 3, 4, 5, 6, 7 and 14 on the 556 correspond to 7, 6, 5, 4, 3, 2, 1 and 8 on the 555 single timer IC respectively.[1,2]

Triggering the Timer

Now, we turn our attention to triggering techniques. It is necessary to develop a way to start timer U2A. Also, some way of allowing for the silent reset of both timers must be designed. For a ten-minute i-d reminder, a simple switch arrangement that starts the timer in one position and then resets in the other position will perform satisfactorily. For repeater timeout warning, it is possible to make use of the fact that many microphones have one connection that is grounded for transmit. The connection is part of the push-to-talk switch. The timer circuitry can be added to that connection for automatic operation. Finally, some form of rf actuation may be arranged for automatic RTTY or fm-timer triggering.

Fig. 2 shows a triggering scheme that offers many possibilities. The START pin of the timer is connected through a capacitor to a switch and to a switching transistor (Q1). The collector voltage of Q1 is normally high (+V). If the switch is closed or Q1 is driven into saturation, two things happen. First, the START pin of U2A goes momentarily low and starts the timing interval. Second, transistor Q2, which is normally low (0.1 V) goes high (+V). This allows the timer to function, since the reset voltages of both U2A and U2B will be high as required. The timer will go through the complete cycle unless the switch is opened or the drive on Q1 is removed. Then Q2 will again saturate bringing both pins 4 and 10 low. This stops the timer silently, since pin 10 is the reset for the driver (U2B) of the oscillator.

For manual switching or a microphone connection, transistor Q1 and the Zener diode are not necessary. The Zener diode provides protection of the transistor from overvoltage on the emitter-base junction. There is a measure of freedom in the selection of resistance and capacitance values. The values indicated on the drawing are not necessarily critical. Furthermore, other transistors may be substituted for the 2N2222A. The Zener-diode voltage, however, must not exceed the maximum rating of the transistor and may be as small as 1 volt.

For direct rf triggering, a source of rf-dependent dc current is necessary to saturate Q1. Two possible sources are shown in Fig. 3A as part of a Monimatch type of SWR indicator.[3] It is also possible to steal current from a commercial SWR bridge such as the Swan SWR-3, which has a circuit similar to Fig. 3A. Caution is in order for use of this circuit at frequencies higher than 30 MHz. [Editor's Note: The Monimatch is a frequency-sensitive device and is normally built for use between 1.8 MHz and 30 MHz.]

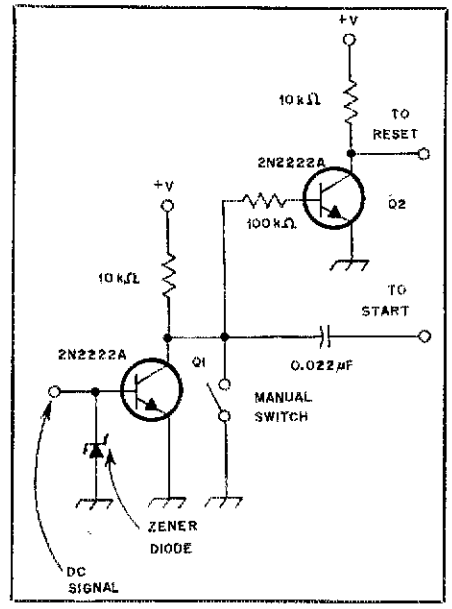


Fig. 2 — Triggering and reset diagrams for the timing circuit of Fig. 1.

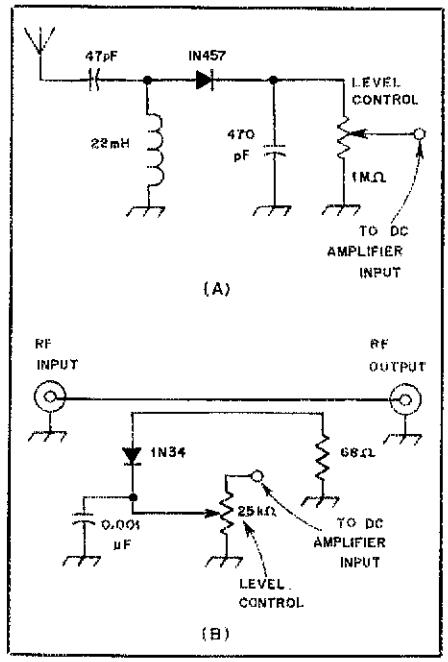


Fig. 3 — Direct (A) and indirect (B) schemes for obtaining an rf-dependent direct current.

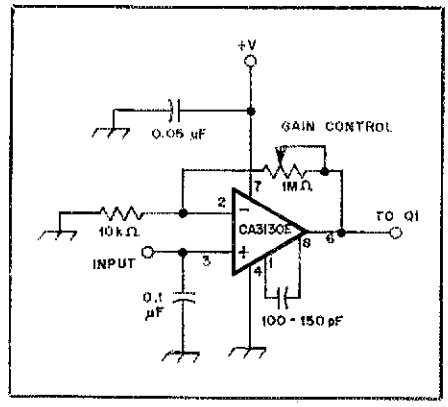


Fig. 4 — Dc amplifier used to obtain sufficient drive for the triggering circuit of Fig. 2.

An alternative scheme requiring no direct transmitter connection is a variation of a field-strength meter circuit such as shown in Fig. 3B. Circuits for field-strength meters abound.[4] Of course a commercial circuit could be used. This circuit worked nicely with just a few inches of wire wrapped around the antenna coaxial feed line for a 2-meter installation. As before, component values are not very critical. Substitutions are possible.

Both the circuits of Fig. 3 require some dc amplification for low rf power levels. A circuit was designed to provide this amplification (Fig. 4).[5,6] The IC is a single-supply op-amp biased to give a noninverting gain of from 0 to 100. The 0.05- and 0.1-μF capacitors bypass rf to ground. The same amplifier configuration has been used to extend the range of several commercial Monimatch-type devices for QRP use.

The final circuit, presently in use by blind amateur WD6EBW, uses the field-strength detector, dc amplifier, transistor switching and a fixed timer duration of about 50 seconds. This has proved to be plenty of time for most 2-meter repeater transmissions. To tune-up the sensitivity controls on the dc amplifier (Fig. 4) and the field-strength detector (Fig. 3), the potentiometers are adjusted alternately in small increments until the LED lights up on transmission. The LED indicates that the timer is indeed working. Adjustments are made first by a sighted amateur. These should then be left alone. The circuit is sensitive to as little as 0.5 W at 147 MHz. The power supply can be a 9-V battery or a 12-V dc supply. The circuit draws only 20 mA (less without the LED).

Finding Parts

One final note about parts. The circuits described here are quite forgiving with the result that many substitutions are possible. If it is necessary to buy parts, I recommend buying twice the amount necessary. The extra components are useful for developing a junk box. Many of the parts suggested for these circuits are available from Jim-pak,[7] a firm that manufactures a line of hobbyist supplies, sold at reasonable prices.

I trust one or all of these circuits will appeal to you. Possibly, by adding one additional box to your shack, your operations on the hf bands will remain legal. With one of these aids, you can also avoid out-talking your local repeater timer. QST

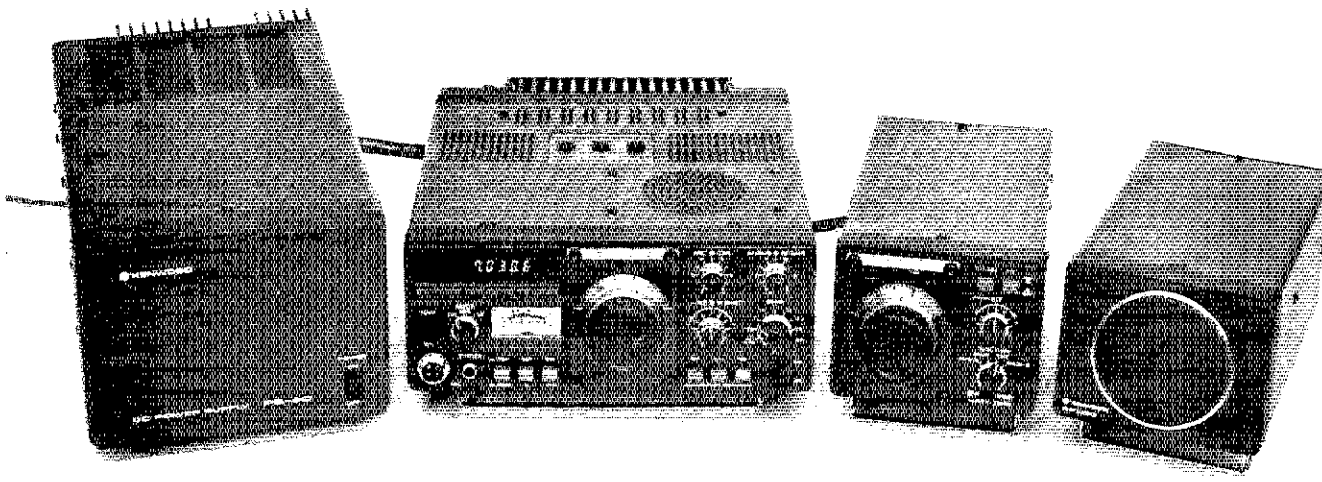
Notes

[1]Keeler, "555 Basics and More," *73 Magazine*, November, 1978.
[2]Jung, *555 Timer Cookbook*, Howard Sams and Co.
[3]*The Radio Amateur's Handbook*, forty-ninth edition, ARRL, 1972, p. 574.
[4]Elementary Electronics, *1979 99 IC Projects*, Davis Publications, Inc.
[5]Riley, "An IC Audio Tune-Up Device for the Blind Amateur," June 1972 *QST* and Riley's personal communication with G. C. Bush, AA6RB.
[6]Jung, *IC Op-Amp Cookbook*, Howard Sams and Co.
[7]Jim-pak, 1021 Howard St., San Carlos, CA 94070.

Product Review

Conducted By Paul K. Pagel,* N1FB

The Trio-Kenwood TS-120S HF SSB Transceiver



The Kenwood TS-120S ssb/cw five-band transceiver is shown here with the matching PS-30 power supply, VFO-120 remote VFO and SP-120 external speaker. The combination makes a compact, flexible station whether mobile, portable or fixed.

Kenwood has welcomed another member (baby brother to the TS-820S), the TS-120S, to the ever-growing family. It's easy to see the Kenwood folks had mobile operation in mind when they designed the TS-120S. The size, weight and operating voltage required for the '120 make it ideal for use in land, air and maritime mobile service. Portable and fixed-station operation are readily achieved with an ac-operated supply. Weighing in at a mere 12.3 lbs (5.6 kg), the transceiver proper may be carried as hand baggage aboard an aircraft while the power supply is sent along with the luggage. Or, that added weight may be left behind and the rig operated from any 13.8-V dc source capable of supplying approximately 20 A of peak current.

The matching PS-30 power supply is hefty. In addition to supplying the required voltage and current demands of the '120S, a terminal block at the rear of the unit provides a source of 13.8 V dc at 5 A for powering other units. For example, a 144-MHz or 220-MHz transceiver might be powered from that source. Thus, only one supply would be needed for both hf and vhf/uhf capability.

The '120 has both analog and digital readout, RIT, i-f shift, built-in VOX, 25-kHz calibrator, provisions for crystal control, an internal speaker (with provisions for an external speaker), and a noise blanker designed to eliminate ignition-type noises. Additionally, the design of the '120 is of the "no-tune" variety — set the band switch and operate! How simple can you get?

This rig is broadbanded from 3.5 MHz to 30 MHz. The power output of the transceiver is so constant from one end of a chosen band to the other, it appears as though you're looking at the output of a battery! The measured output power is in excess of 100 watts from 80 through 15 meters. It provides 85 watts across the whole 10-meter band.

With the optional VFO 120 (note the VFO 520 or VFO 820 cannot be used), cross-frequency flexibility is optimum. The remote VFO also has receiver incremental tuning (RIT) and a "T-F" function. The T-F function allows the operator to check the *transmit* frequency for occupancy while in the receive mode and operating "split" cross-frequency. This is done by simply pushing the T-F button; it requires no receiver tuning. Both the main and remote VFOs are gear-driven from the main tuning knobs: No backlash was noted during use. Obviously, the digital display is the primary method of frequency readout. The analog dial may be used as an alternative, but is not as accurate. While the knob skirt has 1-kHz markings which track fairly well, the analog frequency dial (graduated in 10-kHz increments) on both the transceiver and the remote VFO was found to differ by approximately 3.5 kHz from the digital display.

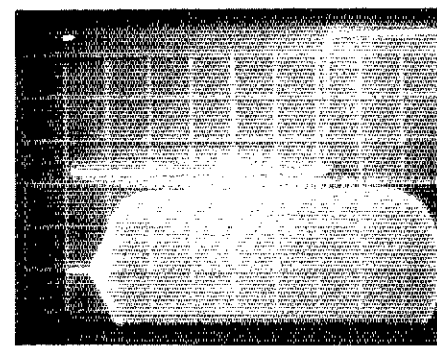


Fig. 1 — The keyed cw waveform of the Kenwood TS-120S. The test was performed on 80 meters. Horizontal divisions are each 5 milliseconds. The upper waveform displays the actual key-down time. Roughly seven (7) ms after key-up, the wave starts to decay. With such smoothly rounded leading and trailing edges, no clicks will be generated. The weighting is "heavy," however, because of the time lag between key-up and the decay of the wave.

The transceiver will tune approximately 60 to 70 kHz outside of each 500-kHz range. This may prove of some worth to MARS operators. Depending on the band in use, the digital display will indicate the frequency of either the high or low end of the tuning range normally, but the opposite end will be awkward digits once the 500-kHz edge is passed. For example, on the 7-MHz band, the upper limit is displayed as 7.562.7 while the lower limit (below the band edge of 7.0000 MHz) appears as 929.2. On 28.5 MHz, the upper limit (past the correctly displayed 28.9000 MHz) will show as 062.7 while the lower limit is displayed as 28.429.1. The analog dial scale is blank beyond the 0 and 500 marks, but the knob skirt markings may be used, and "mental mathematics" performed to ascertain the frequency. The transceiver will function in both receive and transmit over the entire range. With the band switch at the WWV/JJY position, transmission is inhibited, but the receiver is operable for 15-MHz WWV reception.

While operating ssb, nice sharp peaks were noted on the monitor 'scope. The audio quality reports received were excellent, even when using a relatively inexpensive microphone. There is no speech-processing unit built into the '120S.

Some transceivers are designed for ssb

*Assistant Technical Editor, ARRL

operation and leave cw as a kind of afterthought. It was difficult to argue against the performance of the TS-120S. The only item we felt was missing was full break-in (QSK) operation as opposed to the "semi-break-in" incorporated into this and most other transceivers. While running "full-bore" cw on 40 meters, the '120S proved itself a pleasure to operate. VOX keying was quick and reliable (unlike some others) and the clicking of the T-R relay was found to be not unduly loud. When wearing headphones, the operator may be totally unaware of the relay noise. If manual switching is desired, the conveniently located (for right-handed operators) send-receive switch may be used. It is off to the left side of the transceiver and clear of other controls. PTT is, of course, available.

The key jack presents +9 V to the key, so if a transistor-output keyer is used, ensure that the proper polarity is available. The keyed waveshape is shown in Fig. 1. The 'scope presentation of the transceiver output shows smoothly rounded leading and trailing edges. It was not possible to make the keying too "hard" even when attempting to over-drive the rig. The weighting is a bit heavy, however.

The cw monitor note (800 Hz) reflects the "heaviness" of the keying; if high-speed cw is used, the note might tend to sound somewhat "mushy" above 40 wpm. The sidetone volume is adjustable by means of an internally located pot; the cover must be removed from the transceiver for access to this control. No trace of hum could be found on the signal and the dynamic regulation of the power supply was such that no dips or overshoots were noted on the waveform.

Although there is no age-selection switch on the '120, Kenwood remembered the cw operator once again. When the mode switch is changed from ssb to cw, the age action of the TS-120S is altered. A faster age time constant is employed on cw, while the desired slower action will be noted on ssb.

While certainly the IF SHIFT feature is an asset to ssb operation, coupled with the optional 500-Hz cw filter (YK-88C) and RIT, it is a most effective means of reducing QRM while on cw. This function is a welcome carry-over from the TS-820S and the R-820, both reviewed earlier in *QST*.[1,2] Installation of the cw filter takes less than 15 minutes. The filter is simply soldered to the pc board in the allotted space and a jumper plug (for diode switching of the filters) is moved to an adjacent socket. The addition of the cw filter may be desired if cw operation of any magnitude is planned.

The rear panel of the '120S supports the antenna connector, key jack, external-speaker jack, power connector, a hefty grounding terminal and two DIN connectors. One of the DIN connectors is used for cabling of the remote VFO (optional) while the other is a remote jack for use in connecting a linear amplifier or other equipment. A good portion of the rear panel is occupied by a heat sink and pluggable cooling fan, both used to allow the final amplifier transistors to "breathe" properly. The fan is notably quiet and operates only when the heat-sink temperature reaches a specific level. After an hour-long cw QSO at full output, the heat sink was warm to the touch. The heat sink at the rear of the PS-30 power supply was somewhat warmer than that of the transceiver, but not hot enough to cause injury if contacted inadvertently. Both heat sinks should be kept free of surrounding objects, however, to allow for good ventilation during operation. If for some reason the TS-120S heat-sink temperature should rise abnormally, protection circuitry incorporated in the rig will return it automatically to the receive mode until it has cooled properly. The final amplifier transistors are further protected against high VSWR levels. If the VSWR should climb too high, the output power of the transmitter is lowered by reducing drive to the final amplifiers. The owner's manual recommends the VSWR be below 1.5:1 and that a Transmatch be used for impedance matching between the transceiver and antenna when greater mismatches are encountered.

[1]DeMaw, "Product Review," *QST*, September 1976.
[2]Rusgrove, "Product Review," *QST*, July 1979.

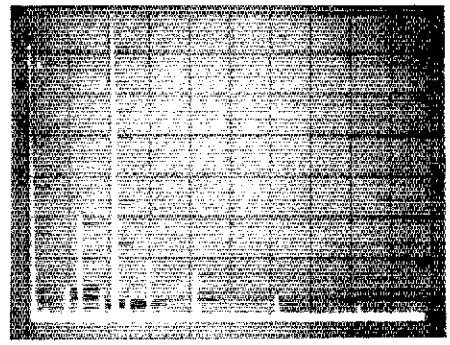


Fig. 2 — A spectral photograph of the transmitter output of the TS-120S operating on 21 MHz at rated cw input power. The vertical divisions are each 10 dB. The horizontal divisions are each 10 MHz. The synthesizer spur at approximately 10.5 MHz is down approximately 49 dB. Other spurs are at least 60 dB down. The TS-120S meets the present FCC requirements for spectral purity.

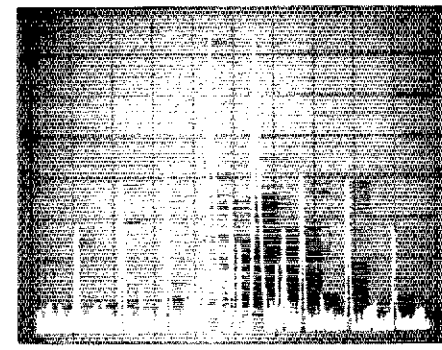


Fig. 3 — This photo represents full-power, 7-MHz, two-tone testing of the TS-120S. Each vertical division is 10 dB. The horizontal divisions are 1 kHz each. Third-order products are approximately 36 dB down from the full PEP output level. All measurements were taken in the ARRL lab.

The Receiver Circuit

The receiver section of the '120S employs a single-conversion scheme with an i-f of 8.83 MHz. Signals arriving at the antenna are met by an i-f trap then impedance-matched by a wide-band transformer for application to a bandpass filter. This filter is common to both reception and transmission. No preselector peaking is required. From here, the signal is fed to two MOSFET rf amplifiers, providing approximately 20 dB of amplification. At the

TS-120S Manufacturer's Claimed Specifications

Frequency range: 80-meter band — 3.50-4.00 MHz.
40-meter band — 7.00-7.30 MHz.
20-meter band — 14.00-14.35 MHz.
15-meter band — 21.00-21.45 MHz.
10-meter band — 28.00-29.70 MHz.
WWV — 15.0 MHz.
Mode: Ssb/cw.
Grounding: Negative ground only.
Power requirements: Receive — 0.7 A 13.8 V dc; Transmit — 18 A 13.8 V dc.
Final power input: 80- to 15-m band — 200 W PEP for ssb operation.
160 W dc for cw operation.
10-m band — 160 W PEP for ssb operation.
140 W dc for cw operation.
Audio input impedance: 500 Ω — 50 kΩ.
Audio output impedance: 4 Ω — 16 Ω.
Audio output: More than 1.5 watts (with less than 10% distortion) into an 8-ohm load.
Rf output impedance: 50 Ω.
Frequency stability: within 100 Hz during any 30-minute period after warmup.
Within ± 1 kHz during the first hour after 1 minute of warmup.
Carrier suppression: Carrier better than 40 dB down from the output signal.
Sideband suppression: Unwanted sideband is better than 50 dB down from the output signal.
Spurious radiation: Better than 40 dB down from output signal.
Harmonic radiation: Better than 40 dB down from output signal.
Image ratio: Image frequency better than 50 dB down from the output signal.
I-f rejection: I-f frequency is 70 dB or more down from output signal.
Receiver sensitivity: 0.25 μV at 10 dB S + N/N or better.
Receiver selectivity: Ssb — 2.4 kHz (−6 dB) 4.2 kHz (−60 dB). *Cw 0.5 kHz (−6 dB) 1.5 kHz (−60 dB).
Semiconductors: IC — 26. FET — 16. Transistor — 90. Diode — 142.
Dimensions (WHD): 9-1/2 × 3-3/4 × 11-9/16 inch (241 × 94 × 293 mm).
Weight: 12.3 lbs (5.6 kg).
Color: Gold-brown.
Price class: $700.
Manufacturer: Trio-Kenwood Communications, Inc. 1111 West Walnut, Compton, CA 90220.
*Optional cw filter installed.

mixer, the signals meet the VCO output from the PLL and are converted to the i-f. Ceramic filters, noise blanker, crystal filter and three stages of i-f amplification are next in the path of the signal. A diode-ring demodulator and successive audio amplifiers are the last steps taken before the signal is heard in the speaker/headphones.

The Transmitter Circuit

Both high- and low-impedance microphones may be used with the TS-120S. The mic gain control is simply adjusted to a higher level when low-impedance microphones are used. After amplification the audio is passed to the balanced modulator. The resulting double-sideband signal at the i-f (8.83 MHz) is filtered to remove the unwanted sideband. After further amplification the signal is fed to a MOSFET balanced mixer, combined with the VCO output and converted to the final transmitted frequency. The BPF (bandpass filter) removes spurious signal components and the "scrubbed" signal is amplified in three stages in the wideband amplifier. The driver and push-pull final amplifiers then pass the signal through an rf filter and on to the antenna.

Some Notes

A few typographical and transliteration errors were found in the text of the owner's manual. It reminded the reviewer of the earlier years when imported amateur equipment was just making headway. From an operational point of view, the manual covers all areas well. Unfortunately, the only page devoted to troubleshooting is aimed solely at *operational* failures, not those caused by defective components. A comprehensive service manual is available from Kenwood, and would be a worthwhile investment, however.

With a dummy load connected to the transceiver, spurious responses ("birdies") were found in the receiver every 100 kHz across each band and a couple of other spots on the dial. Most of them were very low level responses (the strongest ones being at the extreme ends of the bands); in no case did any of them cause the S meter to deflect. In fact, with an antenna connected, the atmospheric and band noises coupled with the incoming signals masked all but a few. The responses would probably not be noticeable under most circumstances and should not cause any difficulty in reception.

While the 120 was being used at one location only two blocks away from WIAW, receiver overloading was experienced from the strong signal of that station. There is no front-end attenuator provided on the transceiver, which might have offered some assistance under these strong-signal conditions. In a suburban environment away from such strong local signals, no problems with receiver overloading were encountered. The receiver was checked in the ARRL lab and the following figures were obtained: noise floor −139 dBm, blocking dynamic range 108 dB, IMD dynamic range 75 dB. These figures develop an input intercept figure of −26.5 dBm. These are worst-case numbers developed on 80 meters using the optional 500-Hz cw filter. Noise-blanker operation did not degrade these figures. Transmitter tests performed in the ARRL lab with a spectrum analyzer resulted in the displays shown in the accompanying photographs. See Figs. 2 and 3. — *Paul K. Pagel, N1FB*

HEATH HM-2140 DUAL HF WATTMETER

If you are a post-holiday shopper looking to spend the contents of that modest cash kitty your YL gave you as a Yuletide gift, either the Heath HM-2140 or the HM-2141 dual-meter wattmeter is worth your consideration. The principal difference between these two instruments is that the -2140 monitors forward and reflected power over the range of 1.8 to 30 MHz, while the -2141 is designed for the range of 50 to 175 MHz.

Being interested mainly in the lower-frequency amateur bands, I chose to construct the HM-2140 wattmeter. I've not been disappointed.

As shown in the accompanying photograph, Heath has packaged the HM-2140 in an attractive metal enclosure, with two large, rectangular panel meters that provide good visibility. These are used to monitor forward and reflected power besides displaying the VSWR measurement. Additionally, provision is made for reading either PEP or average power. Let this desk-top instrument rest beside your other equipment and you'll notice how it catches the eye of visiting amateurs.

Although Heath engineers have designed the HM-2140 for use in the Amateur Radio bands, it can be employed for other services which operate between 1.8 and 30 MHz. No additional plug-in modules are required to obtain full use of this device within this frequency range.

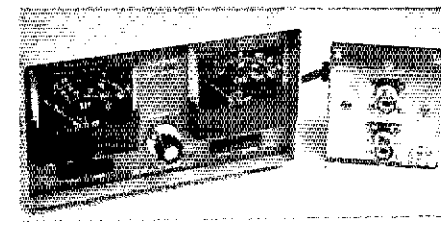
The HM-2140 meets the needs of the operator who is satisfied with low power, or the one who insists on operating transmitting gear full bore at the top legal power limit. Two meter scales are furnished for forward-power indication. The lower scale covers up to 200 watts PEP; the upper range is for power up to 2000 watts PEP. Push-button switching is provided for accommodating either low or high power. There are three scales on the meter: the low range, PEP up to 50 watts; the high range, up to 500 watts reflected PEP; and VSWR covering from 1:1 to 3:1. Push-button switching provides convenient changeover for measuring average or peak-envelope power. The circuit is designed to work into a 50-ohm line.

Because this Heath instrument contains an integrated circuit, a small amount of power is required for its operation. This may be provided by an internally mounted 9-V battery or an external Heath GRA-43-1 converter supply. This optional ac power source may be ordered separately. An LM-324 quad operational amplifier IC serves as an integral part of the peak envelope power-indicating circuit. This has a low supply-current drain (800 μA). Frequent replacement of the battery should not be necessary. Condition of the battery may be checked readily by the metering circuit.

About the Circuit

There are two main areas in the PEP-indicating circuit. The first is a peak detector with gain and the second is a unity-gain buffer network with an offset adjustment. This arrangement preserves the calibration of the rf sensor and contributes to reliable adjustment of the meter.

A practical feature of the HM-2140 that I like is the remote sensing unit. This part of the wattmeter is connected in series with the antenna transmission line for sampling the rf fed to the antenna system. The sensor is connected to the wattmeter by means of a flexible umbilical cable that avoids connecting clumsy coaxial cables directly to the wattmeter. Use of the sensor at a remote position, however, is optional, for the HM-2140 is so designed that the sensor can be placed inside the wattmeter enclosure if the operator so desires. This part of the HM-2140, incidentally, is factory wired and calibrated. Instructions stipulate that the sensor is not to be adjusted. Doing so or otherwise tampering with the sensor can void the warranty.



There is no sacrifice of portability with this new Heath HM-2140 dual wattmeter. The net weight is 4 pounds (1.82 kg). Overall dimensions (HWD) are 4-1/8 × 7-1/2 × 6-3/8 inches (inches × 25.4 = mm). Heath has priced the HM-2140 in the $70 class. It may be purchased from the Heath Company, Benton Harbor, MI 49022, or from Heathkit retail stores.

Comments

Constructing the HM-2140 provided me with two evenings of enjoyment. The carefully planned instructions were thorough, with a well-arranged order of assembly. I liked the workmanship of the Heath circuit board, which contributed to the delight of assembling the wattmeter.

Gratified that the unit passed the initial "smoke test," I proceeded to give it two weeks of on-the-air testing, followed by laboratory testing with a Bird wattmeter. For checking the low-power range, a steady 50-watt signal was fed through the HM-2140 into a 50-ohm dummy load. Band-by-band behavior was observed from 160 through 10 meters. The major scale markings of the Heath wattmeter coincided with the Bird meter indications in each case. A slight difference could be noted for the in-between indications, yet these are within the manufacturer's tolerance ratings.

To note how the HM-2140 behaved where excessive reactance is involved, a deliberately *large* amount was introduced while operating on 10 meters. This caused the reflected power calibration potentiometer in the sensor to heat, apparently as the result of an unwanted resonance that developed in conjunction with an internal ferrite bead. This is not viewed as a fault of the device, however.

The final test involved a high-power run while using a linear amplifier. The HM-2140 performed equally well at this power level.

Readers who are unfamiliar with in-line rf power metering will benefit by reading Doug DeMaw's discussion of practical considerations for this type of instrumentation. His article appeared in December 1969 *QST*. He explains the design philosophy of such circuitry including the basic Bruene configuration. The latter was introduced in April 1959 *QST*. The HM-2140 is based on these principles. Additional information may be found in *The ARRL Antenna Anthology* published in 1978. — *Stu Leland, W1JEC*

THE BRODER LOGIC TRAINER MODEL 100

". . . with no previous logic experience [students] may achieve a very high level of competency in minimum time. . . ." I'm the ideal reviewer, then, because I know nothing about logic circuitry but am anxious to learn. That was my first reaction to this training device. My second reaction was, "What a *neat* gadget!" It is fun to play with and that is the first sign of a good learning device — it piques the old curiosity.

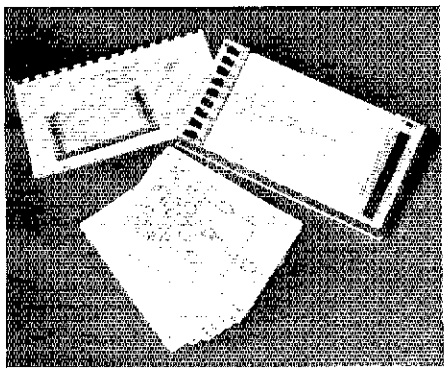
The Broder Logic Trainer is housed in a small box with eight on/off switches on the left and 20 LCD display bars to the right. A set of cards fits into the space between. Each card has a circuit printed on it. The student determines the on/off state necessary at the input to work the problem correctly. If the student is right, an LCD display bar appears at the output (see the photo).

The Broder Logic Trainer also comes with a manual that provides a learning text and answers to the program cards. The text and cards cover gates and sequential logic, including flip-flops, counters and shift registers. The text has additional short sections and a few problem cards on binary adding, Boolean algebra, logic component voltage, logic families, noice immunity, troubleshooting, clock frequency, switch circuit problems, Venn diagrams and symbolic logic.

How well does it work? In going through the manual I found I had no problem with the section on gates, which comprises about one half (20) of the cards. The text is clear and with a little practice, the correct display bars appeared at the output.

Sequential logic was a different story, however. The explanations in the text were not adequate for this reviewer's understanding. At this point, I began using a large classroom text as my main source of information and the manual and cards as a supplement. This worked fine. Again I began to see LCD displays in the right places.

The hands-on approach of this gadget is a great idea. I found that I learned rapidly and retained the knowledge longer when I had the immediate feedback of the LCD display to confirm that I'd worked the problem correctly. Perhaps someone who has a little background in logic — say, home computers or the like — would not have needed another text. I found that I did. While this doesn't in any way make the Broder Logic Trainer a less-useful device, it is probably not a complete course for the inexperienced. It is, however, an excellent workbook and supplement to any logic course. It would be of great help to anyone undertaking home study or attending a course that has no lab time available. It's definitely an enjoyable and effective way to learn. The Broder Logic Trainer, Model 100. L. J. Broder Enterprises, Inc., 3192 Darvany Dr., Dallas, TX 75220. Price: $69.95 with manual and 9-V battery. — *Jeanette M. S. Zaimes, ABIP*



The Broder Logic Trainer in action. In this photograph, a total of three bars may be seen on the LCD display. As explained in the instruction manual, only the bar pointed to by the problem output (the uppermost in this picture) is significant. The other bars are disregarded.

New Books

☐ *Morse, Marconi and You*, by Irwin Math. Published by Charles Scribner's Sons, New York, NY. Hard cover, 7-3/4 × 9-1/4 inches, 80 pages, $8.95.

The idea behind this book is excellent: to take the reader through the fundamentals of electricity and radio electronics theory by providing easy-to-understand projects accompanied by clear, elementary text. Despite its small size and a sprinkling of errors, the book hits its mark.

After disposing of communications before radio in three pages, the author delves into the fundamentals of electricity. The first construction project is a simple flashlight circuit. From here, the reader is led through other projects, culminating in a "versatile shortwave receiver." Although it doesn't seem likely that a youngster who knew little about radio electronics when beginning this book could successfully build this sophisticated project without assistance, that may not be a serious drawback. First of all, a careful reading of the six-page chapter provides a solid introduction to the principles of a regenerative receiver. Secondly, it certainly doesn't hurt to encourage a beginner to seek help from more-experienced friends or relatives.

The building projects between the simple flashlight and the receiver are often useful and always educational. They include an electromagnet, telegraph set, telephone and the author's specialty — a light-beam communications system. This project will be a bit too much to chew on for most youngsters, but will make absorbing reading for everyone unfamiliar with communication via light waves.

The author, WA2NDM, is well versed in Amateur Radio, having written a column in *CQ* for several years. While he devotes only a couple of pages to Amateur Radio *per se*, Math's book is a decent introduction to the hobby. The progression of projects, from a telegraph key to the shortwave receiver, gives the reader a solid foundation on which to expand his or her knowledge of radio.

There are a few problems that detract from the book's effectiveness. There is no explanation of the difference between ac and dc, for example. Theory explanations are purposely brief, but a single sentence would have sufficed. The table of international Morse code characters has three flaws: It is written in the now less-accepted dot-dash form and both the U and the W are represented as two dots and a dash. In addition, it omits the useful double dash in favor of the seldom-used comma. Both ARRL and *Ham Radio Horizons* are victimized by careless errors: The author suggests writing to the "Amateur" Radio Relay League for information on a Novice course, and *Ham Radio Horizons* is said to be published in "Greenvale," NH.

A redeeming feature is the artwork — 77 figures, many of which show pictorial representations of circuit components. The large number of figures also makes the book's relatively hefty price tag a bit easier to bear.

Aimed at youngsters and others who have yet to develop a serious interest in electronics, this small book will provide many hours of enjoyment. The author feels that hands-on experience is preferable to detailed explanations of electronic principles. He may just have a point! — *Joel P. Kleinman, WA1ZUY*

☐ *Man-Made Radio Noise*, by Edward N. Skomal. Published by Van Nostrand Reinhold, a division of Litton Educational Publishing, Inc., New York, NY. Hard cover, 6 × 9 inches, 342 pages plus index, 148 illustrations, $19.95.

Man-made radio noise, so familiar to radio amateurs, is a form of pollution that affects services beyond our treasured hobby. Fortunately, more and more attention is being devoted to the noise problem. In-depth studies are being conducted in a continuing effort to better understand the nature of such interference with the hope that someday much of it can be eliminated. *QST* readers who wish to sample current thinking about radio noise will do well to examine Edward N. Skomal's recent book. The author has been studying natural and man-made noise since 1964. His investigations include experimental studies, theoretical developments of generation and propagation processes and the evaluation of noise as it affects radio communication. He is indeed well qualified. His credits include membership in the IEEE, the International Union of Radio Scientists and the American Physical Society. Additionally, he has served on an advisory committee to the Office of the President on national telecommunications planning. Currently he works for the Aerospace Corporation in El Segundo, CA.

Man-Made Radio Noise contains information for both the engineering and nonengineering reader. After explaining basic terms and defining the difference between manmade and naturally occurring noise, the author deals with other forms, including automotive ignition noise, and how separate sources produce interference that combines into a composite pattern found in most urban areas. Mr. Skomal provides sufficient information so that predictions of average power, quasi-peak and peak-noise field intensity can be confidently made.

The book contains chapters on electric power generation and transmission line noise, interference caused by industrial, scientific, medical, consumer and transportation equipment. The author even delves into elevated and airborne incidental noise. The latter sections are based on data gathered at heights up to 26,000 feet over major cities on three continents.

There is a broad scope of information in *Man-Made Radio Noise*. It is not a "nuts and bolts" hands-on treatment of cures for interference. Rather, it is more theoretical. If you like the challenge of calculus to enrich your understanding, Mr. Skomal has included a liberal amount to tease your brain. Look this book over the next time you are in your favorite book store or public library. — *Stu Leland, W1JEC* QST

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

CAPACITANCE- AND INDUCTANCE-MEASURING DEVICES

The capacitance bridge and the gadget I made for measuring inductances have been most useful. The latter isn't a true bridge, but it operates on the principle that at resonance the voltage comes to a peak across either L or C in a series circuit. Diagrams for both of these devices are shown on these pages.

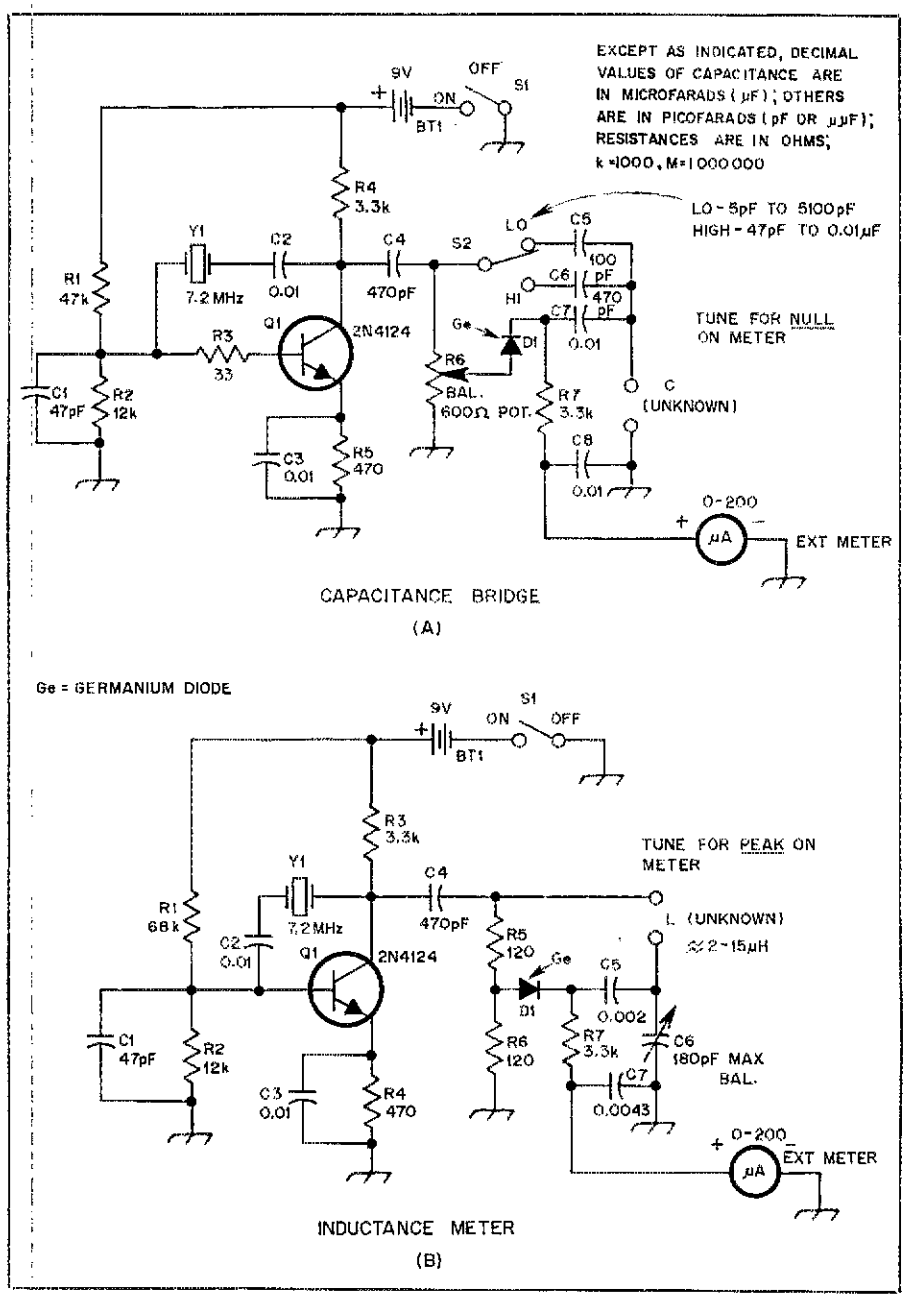
There is nothing critical about parts values in either circuit. In the capacitance bridge, the 100-pF capacitor standard gives a midscale reading of 100 pF in the LO position of the range switch. In the HI position, the 470-pF standard gives a midscale reading of 470 pF. Theoretically, this should have been 1000 pF, but I was unable to get solid dips on the meter with such a large capacitance while using the HI range. I dropped the value to 470 pF as a practical measure.

The value of the variable capacitor that is part of the movable arm of the inductance meter must be such that resonance with an unknown inductance can be attained at 7.2 MHz, the frequency of the internal generator. Other crystal frequencies may be used or you may obtain a signal from a dip oscillator.

Calibration of the capacitance-bridge dial is in both pF and μF with known values being placed in the unknown leg for calibration purposes. The dial of the inductance-measuring gadget is calibrated in μH, again using known values of small inductances such as rf chokes as standards. Only the resistance or impedance bridge for measuring antenna impedance (not included here) is calibrated in ohms.

The circles of aluminum, cutouts made from small speaker cutouts, are useful as instrument dials. I use them on my capacitance bridge, the inductance meter and the resistance bridge I constructed for measuring feed-point impedances of antennas. I cover these cutouts with white card stock on which I mark the calibrations. A coating of Q-Dope protects the pencil markings from smearing. A soft pencil, such as used for machine scoring of tests, is excellent for marking the dials. A dab of epoxy cement will secure the dials to the shafts. Fine tuning adjustments are made easily by placing a finger on the dial edge. — *J. Frank Brumbaugh, Sarasota, FL*

*Assistant Technical Editor, *QST*



These diagrams are for a capacitance bridge (A) and an inductance meter (B) for measuring unknown component values. Capacitances are shown in pF and μF. Inductance values are in μH. Fixed resistances are 1/4 watt. The following parts apply to both diagrams except S2 which is part of the capacitance bridge only.

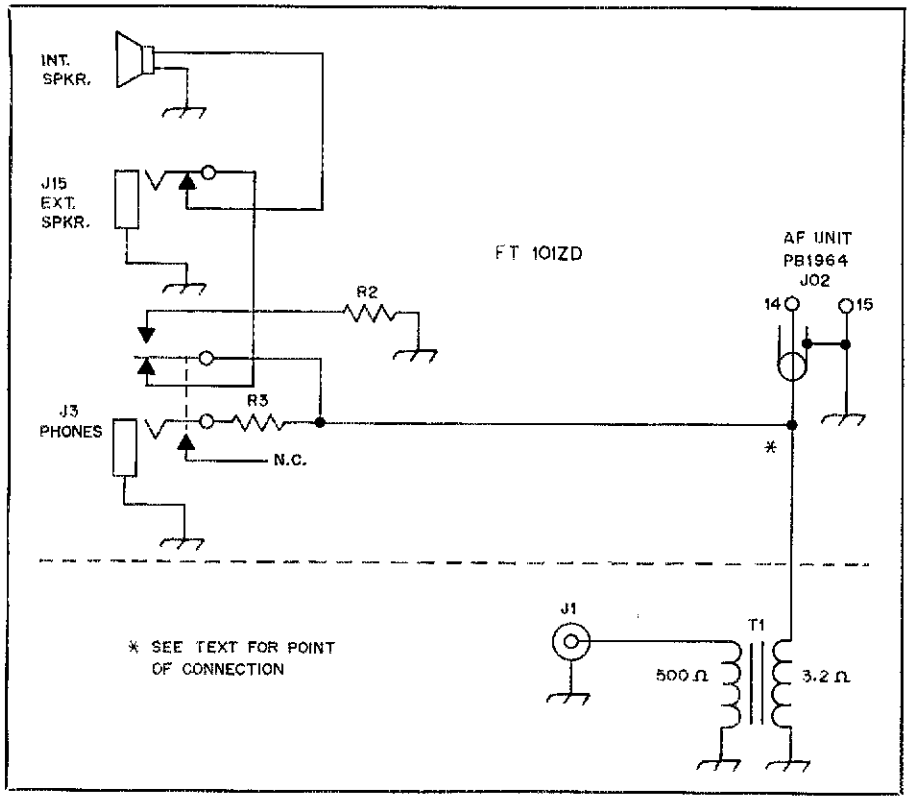
BT1 — 9-V transistor-radio battery.
D1 — Germanium diode, 1N34A or equiv.
M1 — 0-200 dc microammeter.
S1 — Spst switch.
S2 — Spdt switch.
Y1 — 7.2-MHz crystal.

A 500-OHM AUDIO OUTPUT FOR THE FT-101ZD

Owners of the Yaesu FT-101ZD who wish to operate RTTY are at a loss for a 500-ohm audio source. The FT-101ZD has a low-impedance (4 to 16 ohms) audio output only. Attempting to derive audio in parallel with the external speaker jack is awkward. Without the benefit of impedance matching this method requires too high an output level. The raucous sound of an RTTY signal echoing through the shack (and the house) can soon make one unwelcome in one's own home! If the external speaker is disconnected, one cannot hear the signal as he zeros in. The circuit in the accompanying drawing may be added to the '101ZD unobtrusively and provide the needed 500-ohm source without external hook-ups and their inherent shortcomings.

There's a reason for tapping the audio line as shown: If the headphones or an external speaker are plugged into their respective jacks, the audio output at J1 remains uninterrupted. This may be desirable if one does any RTTY work at the wee hours and wishes to remain on good terms with other members of the family.

Two simple additions are required: a single-hole mount phono jack and a 3.2- to 500-ohm miniature audio transformer. The phono jack is mounted on the rear panel at the outside edge of the chassis adjacent to the external-speaker jack. The miniature audio transformer is secured to the transceiver chassis by soldering the pc mounting tabs to the left-hand wall



In N1FB's 500-ohm audio-output modification, components above the dotted line are part of the FT-101ZD transceiver. The added components are J1 and T1. J1 is a single-hole-mount phono connector. T1 is a miniature 3.2- to 500-ohm audio transformer.

beneath the chassis as viewed from the front panel with the transceiver inverted. There are two unused holes in the wall and one of these is used to mount a small three-lug terminal strip with 4-40 (M3) hardware. The transformer is placed between the terminal strip and the nearby voltage regulator. Clean the mounting tabs of the transformer and the chassis with an abrasive (sandpaper or emery cloth) and use a high-wattage soldering iron to ensure a well-soldered joint. Shielded wire is run from the 3.2-ohm primary connections to the audio-output connections available at the terminal strip mounted on the same chassis wall near the MIC and PHONES jacks. (A yellow, shielded cable connects the af board output from JO2 to this terminal strip.) A single-conductor wire is then connected between the 500-ohm secondary and the phono jack on the rear panel.

The 500-ohm audio source may now be permanently connected to the RTTY system. Audio output levels will be compatible with those needed for speaker or headphone reception; the use of either of these will not affect the 500-ohm output. — *Paul K. Pagel, N1FB*

LONGER LIFE FOR FRONT-PANEL LIGHTING

I seem to have had more than my share of problems with front-panel illumination on my 2-meter and 450-MHz fm rigs as the lamps were popping like corn over a hot fire (yes, my power-supply voltages are correct!).

Some lamps are mostly for show. Others, like the channel-number light on the Kenwood TR-8300, are essential. Furthermore, to replace the lights in my Tempo VHF/ONE required major disassembly of the radio. On top of all this, replacements for some of the lamps are not easy to find. Clearly, something needed to be done.

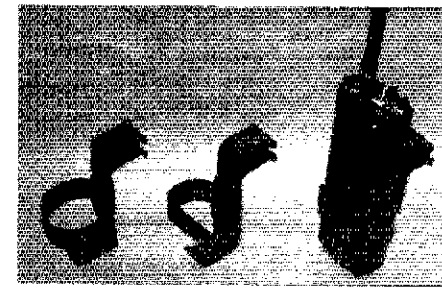
My solution to the problem is to reduce the voltage across the lamps by means of a dropping resistor. Nothing will guarantee infinite life for the lamps, but so far I have found that reducing the lamp potential to about 8-V dc has made a tremendous improvement.

Selecting the proper resistors involves an exercise in Ohm's Law plus a little experimenting. The resistor should allow about 8 volts across the lamp. Be sure that the resistor power rating is adequate. A good rule of thumb is to select a resistor with a power rating of two times the power actually dissipated in the resistor. Finding a place to mount the resistor is left to the reader.

So far, I have lost no lamps during operation at reduced voltage. All have adequate brightness. This is a welcome change, since Murphy's Law says that lamp failure will happen both often and during a trip far from a radio store. — *Roy Hejhall, K7QWR, ARRL Technical Advisor, Phoenix, AZ. From the Arizona Repeater Association publication* The Squelch Tail.

RELAY CHATTER

Chatter from an antenna relay can be rectified by inserting a diode and a series resistor in one leg of the coil circuit to reduce the voltage by 25 percent. This applies to ac-operated relays. Make sure that the diode will handle both the voltage and the current drawn by the relay. If chatter is still present, place an 8-μF capacitor across the relay coil. — *Louis A. Gerbert, W8NOH, Grand Rapids, MI*



Reshaped automobile beverage holders provide a good means for keeping a hand-held radio accessible in a car.

MOBILE HOLDER FOR HAND-HELD RADIO

Ever been bothered while operating mobile with a hand-held transceiver that refuses to stay put on the car seat or dash? A simple solution consists of an automobile beverage holder that can be converted to hold a hand-held set. The holder keeps the hand-held readily accessible without the need for any permanent installation.

The secret of the conversion lies in reshaping the beverage holder while using controlled heat from an infrared lamp to gradually soften the plastic ring of the holder. When heat is applied and the plastic becomes pliable, a piece of scrap wood, the approximate width and depth of the transceiver, can be inserted gradually through the ring opening. With the aid of a towel or soft cloth, the warm plastic can then be shaped to the wooden form, alternating between heating and shaping. The plastic should be held in place for one to two minutes until it cools sufficiently to retain the new shape. When the plastic is cool, the radio can be checked for a snug fit in the holder. If this is done slowly, avoiding overheating, the plastic can be shaped without difficulty.

One refinement is to bend the edge of the holder base in an upright direction. This prevents any significant vibration to the transceiver when the vehicle is moving. — *Allan Hale, WA9IRS/WB8UZG, Cincinnati, OH*

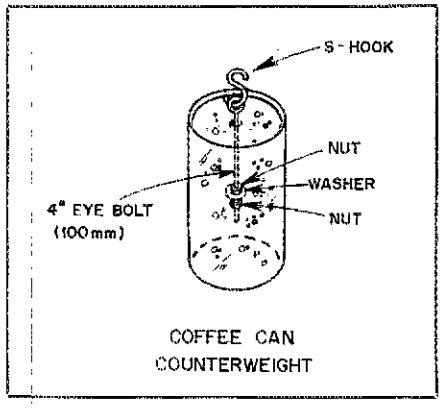
AIDS FOR CIRCUIT-BOARD MAKING

Readers of Doug DeMaw's article on making circuit boards that appeared in September 1979 *QST* may benefit from this information. One tool that was not mentioned in the article, but is useful for fabricating pads, is a metal punch kit. Such punch kits as Whitney-Jensen punch set No. 5 Jr. come with seven punches and dies. With these, one can easily make pads of various sizes up to 1/4 inch (6 mm) in diameter. A punch kit can be purchased for about $20.

Also, 3- to 5-minute drying epoxy cements are available at hardware stores. Use of these eliminates waiting overnight for drying. — *John J. Schultz, W4FA, Voice of America, APO New York*

COFFEE-CAN COUNTERWEIGHT

A simple counterweight for an end-fed wire or dipole antenna can easily be made by filling a two-pound coffee can with Sacrete (premixed



A coffee-can antenna counterweight suggested by W2EPN. The can, a two-pound size, will hold approximately 10 pounds of concrete.

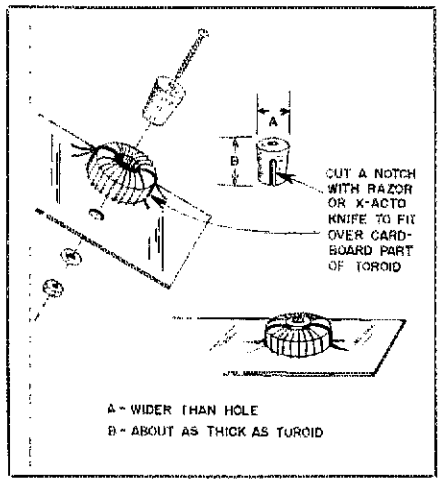
cement). An eye bolt is pushed down into the concrete while it is soft and kept in position by passing a rod (or stick) through the eye, allowing the rod to rest on the edge of the can while the concrete hardens. For convenience in removing the weight to lower the antenna, an S-hook may be used as shown in the sketch.

A two-pound coffee can filled with concrete weighs approximately 10 pounds. This has proven sufficient for the purpose. It is also more practical and attractive than using bricks to keep an antenna taut. — *Roy Foody, W2EPN, Bayport, NY*

CORKS FOR TOROID MOUNTING

Recently I tried mounting some toroids on the circuit board of my RTTY converter. Although I had some plastic inserts, there were not enough. A package of assorted corks, bought at a hardware store, provided a solution to the problem.

To use this method of mounting, find corks a bit wider than the hole in the toroid. Drill a 1/8-inch (3-mm) hole in the middle of the cork, cut a notch on each side to fit the dividers of the toroid (if present) and insert a no. 40 screw with washer. The screw should be long enough to pass through the cork and circuit board. The cork seems to be an excellent mount. It does not damage the wires, provides a snug fit, grips well and is inexpensive. — *Raymond B. Bass, W7YKN, Reno, NV*



W7YKN suggests this method of using corks for mounting toroids. Dimension A should be wider than the opening in the toroid. Dimension B should be the same as the thickness of the toroid.

COMMENTS ON SB-220 MODIFICATION

Referring to the "Hints and Kinks" item, "On Upgrading Your SB-220 Linear Amplifier" (November 1979 *QST*), W3OJB writes that the circuit shown can provide excessive voltage across the time-delay relay coil, K1. He suggests a better approach is to wire the B lead of the relay coil to point D, which is the midpoint of the high-voltage primaries. Doing so will provide a more constant voltage, unaffected by the surge-resistor function in the filament-transformer primaries.

W8JTD agrees that this change is desirable. Accordingly, he suggests deleting steps 3 and 4 on page 56 of November *QST*, substituting the following new steps. First, twist together, solder and tape the ends of the leads mentioned in steps 1 and 2. Then solder a lead to relay-coil terminal B. Connect the free end to terminals 2 and 3 of amplifier terminal strip AE (these terminals are strapped together for 230-volt operation).

While the relays in the SB-220s at both W8JTD and WØPT, wired according to the November "Hints and Kinks" diagram, continue to perform flawlessly, W8JTD attributes this performance to the tolerance of the relays used at both stations. He does recommend, however, that the above modification be made, especially where relays of marginal quality are used. The diagram should be modified to show these changes for the sake of future reference. — *Stu Leland, W1JEC*

INEXPENSIVE NAMEPLATES

For identification at hamfests and conventions, attractive homemade nameplates, such as those shown in the accompanying photograph, can be fabricated at a fraction of the cost of engraved Bakelite plates. Obtain a small amount of 1/16-inch model airplane plywood from a hobby store. It is generally sold in pieces 4 × 10 inches (inches × 25.4 = mm). With a fine saw or sharp knife cut this into strips 3/4 × 3 inches.

Sandpaper the wood smooth. Use Stik-On letters, available at many stationery stores, to spell out your name or call sign. No glue is necessary to secure them to the wood. With a small brush apply a coating of varnish to the surface of the wood. When dry, cement a metal pin-back to the side of the wood without the letters.

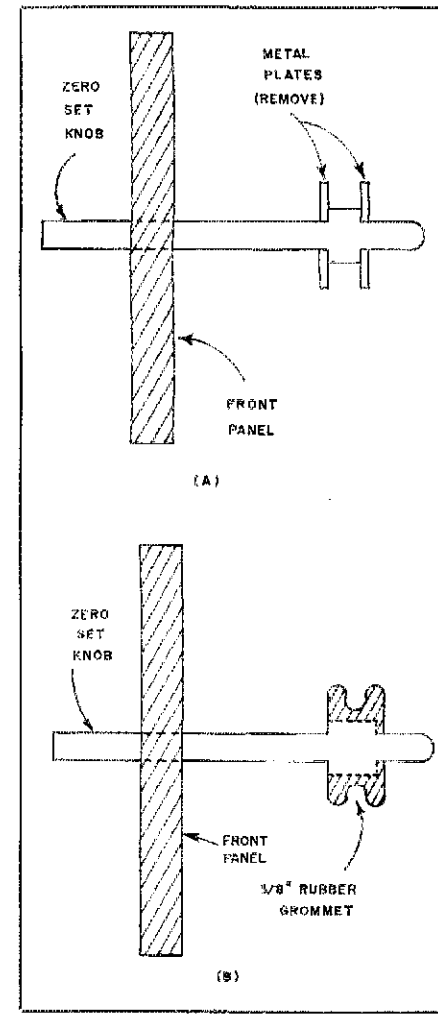
Small strips of thin white or colored plastic can be used instead of wood. Half-inch letters are appropriate. They are available in many sizes and colors from hobby stores as are the pin-backs.

An inexpensive nameplate made from hobby materials.

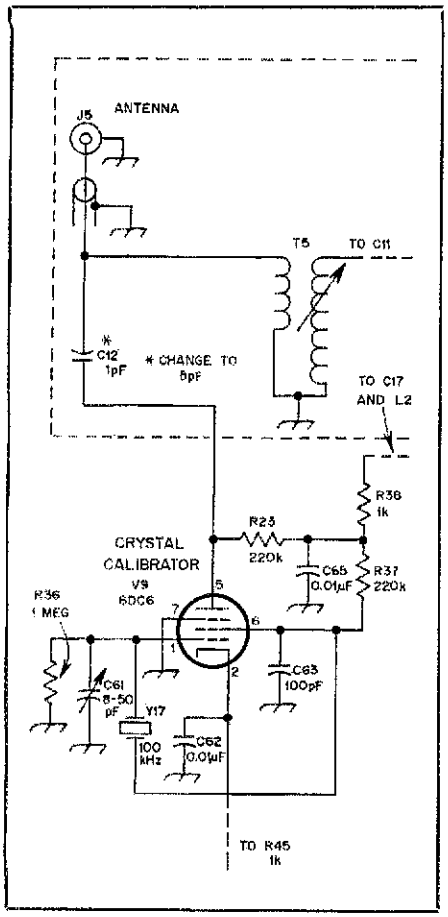
Desk nameplates are made in a similar manner, but the wood should be 3/16- × 1-1/4-inch pine. It is sold at lumber yards. Letter size should be 1 inch. A small block of wood glued to the back of the desk plate will hold it upright. — *Hyman Wallin, Silver Spring, MD*

ZERO-SET DIAL MODIFICATION FOR THE "SB" SERIES

One problem with the Heath "SB" series is that the zero-set dials on the SB-102, -303 and -401 occasionally become inoperative following breakage of the zero-set drive pulley. After replacing three of these pulleys I decided to fix the problem for good. One way to remedy it with minimal cost is to replace the two metal plates on the pulley with a 3/8-inch (10-mm) rubber grommet. The plates can be removed easily with pliers. The rubber grommet will not slip on the dial, nor will it damage the edge of the dial as did the old metal pulley. The rubber grommet should be glued to the old shaft so that it doesn't fall off or slip after prolonged use. Super Glue works very well for this purpose. This modification restores the zero set to perfect working condition. — *Gary M. Kalata, WA2RFK, Cherry Hill, NJ*



Damaged zero-set drive pulleys on the Heath SB-102, SB-303 and SB-401 series may be repaired with the aid of a rubber grommet. See text for WA2RFK's explanation.



N1FB suggests the above modification for increasing the calibrator injection level of the Collins 75S series receivers. Resistance values are in ohms.

INCREASING THE 75S-( ) CALIBRATOR INJECTION LEVEL

The amplitude of the Collins 75S-( ) receiver crystal calibrator is generally adequate up to the 10-meter band. There, especially at the high end of the band, the signal level is much lower. This level may be increased by changing the value of the coupling capacitor, C12, which normally has a value of only 1 pF. Substituting a 5-pF capacitor (or larger, depending upon the level desired) will result in an increase of 4 to 5 S-units which should be sufficient for most applications.

To replace C12, the rear-most shield can, which covers the rf amplifier input switching wafer of the bandswitch (S4), must be removed. The fiber shaft which couples the different switch sections must be removed first; it was decided to move the shaft toward the *front* of the receiver rather than out through the rear chassis hole provided. The band-switch index may simply be moved to one side once the shaft coupler is loosened and the mounting nut and washer removed. This avoids having to pull the fiber shaft through three wafer sections; only one section need be involved. Caution must be observed to prevent misalignment of the vacated wafer, but providing that no rotary motion is applied to the shaft, the wafer will remain in position. Next, the two nuts and washers securing the shield can are loosened and the shield removed. The capacitor is then replaced with the new unit and the process reversed. To ease reassembly, a small dab of silicone grease may be placed at the end of the fiber shaft to permit a smoother reentry into the wafer hole.

Check the calibrator signal at all positions of the band switch. If at any position you cannot get an S-meter reading, it may indicate a slight misalignment of the two shafts at the coupler. Simply loosen the set screws and adjust slightly. — *Paul K. Pagel, N1FB*

ANTENNA CORROSION REMOVER

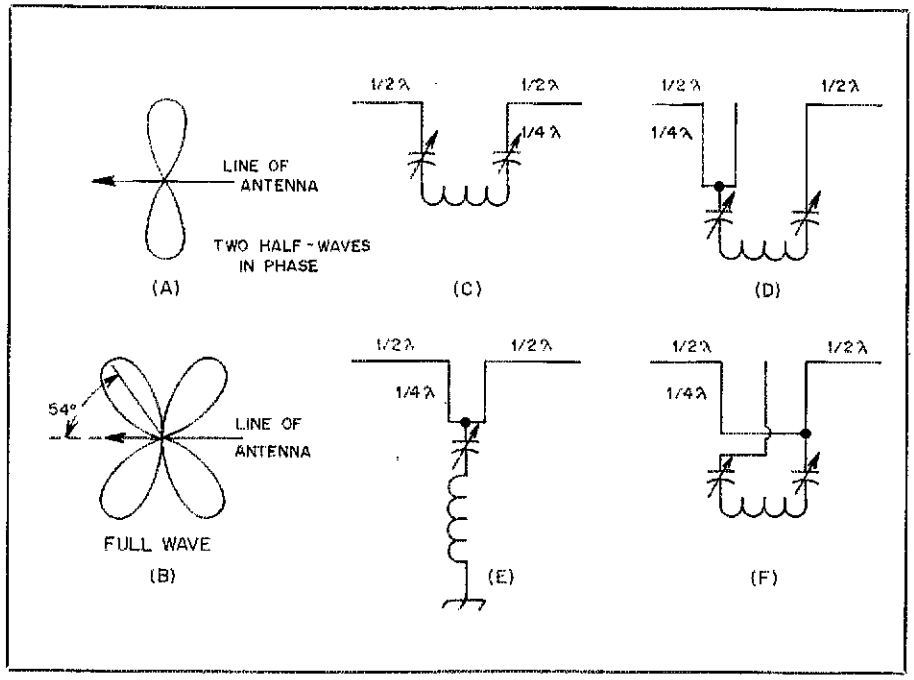
After several years of service, particularly in metropolitan locations, antennas and other exposed aluminum parts often corrode or oxidize to the extent that the electrical characteristics are impaired. One measure which can restore such parts is to apply one of the commercially available aluminum cleaners such as Duro Aluminum Jelly or Burnside Aluminum Brightener. After the metal has been cleaned, it should be thoroughly washed to remove any residual cleaner, dried and coated with an anti-corrosion or anti-rust film spray or sealed with lacquer. Care should be taken when cleaning coil assemblies or where sleeve sections connect to maintain continuity. Aluminum cleaners should not be used on anodized aluminum parts. These are easily cleaned with household aluminum polish. — *Allan Hale, WA9IRS/WB8UZG, Cincinnati, OH*

THE OLD TIMER'S NOTEBOOK: CHANGING ANTENNA DIRECTIONAL CHARACTERISTICS

It is not generally realized that some change in the directional properties of a center-fed full-wave antenna can be brought about by changing the feed method. Quoting from a letter from Edward W. Sanders, W3AKU: "In *QST* several articles have appeared in which mention has been made of the use of an antenna system having two half waves in phase on the flat-top. Such a situation results in an antenna directional at right angles to the axis of the flat-top and is accomplished by the use of a full-wave flat-top with an odd quarter-wave feeder connected to the center. If we increase the length of the feeder one quarter wavelength by means of loading coils or by switching-in the appropriate length of wire, we will have two half waves on the flat-top, but they will be out of phase, corresponding to an end-fed full-wave antenna. This system will produce a four-lobed characteristic as shown at B in the accompanying drawing."

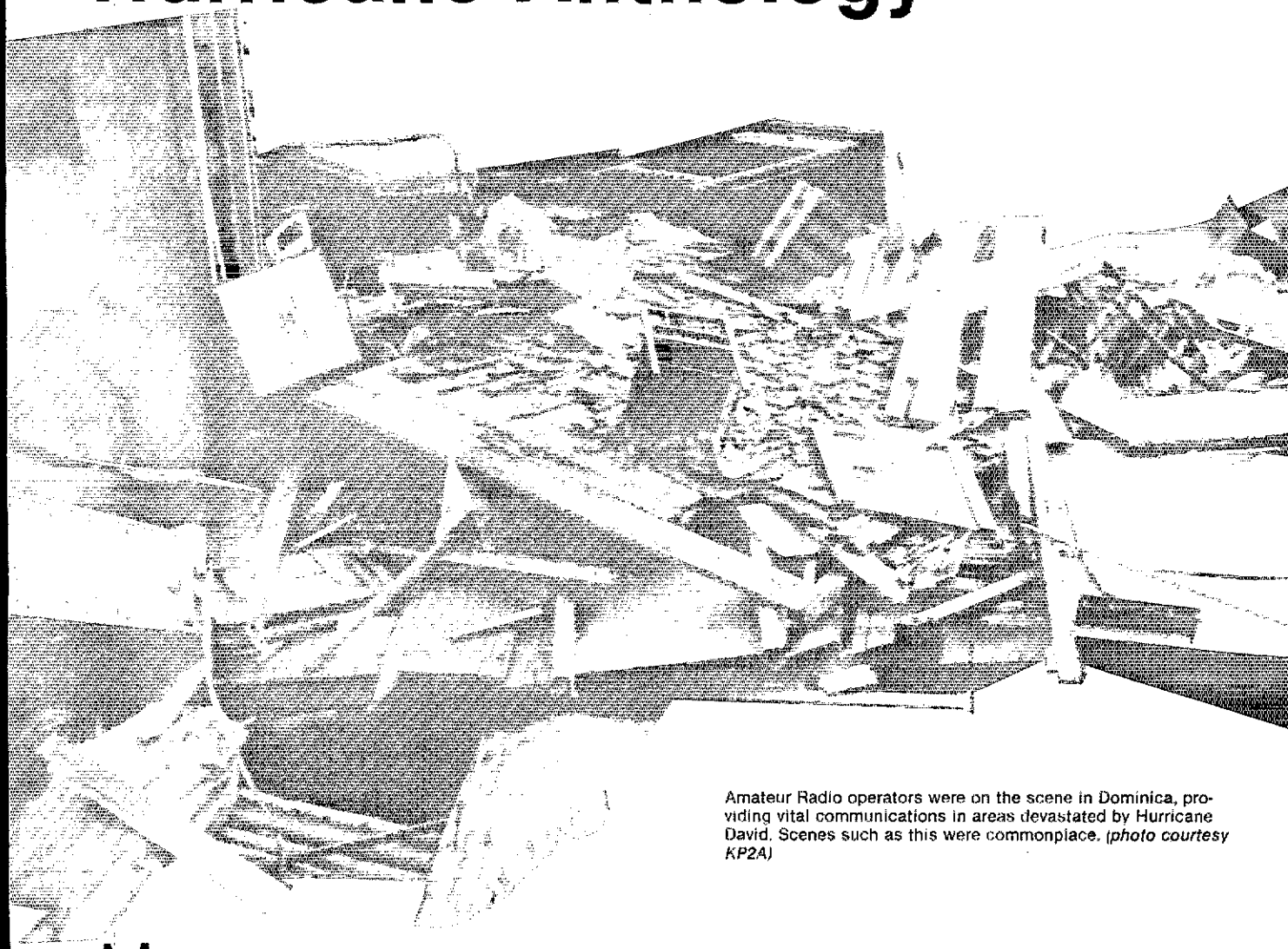
The reversal of phase in one half-wavelength section of the antenna can be brought about in a number of ways. A section of wire measuring a half wavelength can be inserted in *one* feeder, or a loading coil having the same equivalent length can be substituted for the half-wavelength section. A third method is shown in the lower center of the drawing (E). In this case the two quarter-wavelength feeders are simply connected together and the whole system worked against ground. A short ground lead is necessary in this case. In all three of these methods the feeders are no longer nonradiating but become part of the antenna.

To have the feeders nonradiating with either method of antenna phasing, it is necessary to use a third feeder wire which can be connected appropriately to the other two (see drawing) The two right-hand feeder arrangements, D and F, illustrate the method of connection. D provides two half wavelengths in phase and a signal pattern as indicated at A. Configuration F puts the two half-wavelength sections out of phase giving the directional characteristic of pattern B. This corresponds to feeding the two half-wavelength antennas from a Zepp feeder and with the currents in each horizontal element being out of phase. The directional characteristic in this case corresponds to B. The change can be made quite simply and quickly by installing a switch to shift one of the active feeders from one side of the coupling apparatus to the other. — *Hints and Kinks for the Radio Amateur (1945)* QST



Feeder changing methods for altering the directional pattern of an antenna. Configurations C and D will give a pattern similar to A. E and F render a cloverleaf pattern shown at B.

Hurricane Anthology



Amateur Radio operators were on the scene in Dominica, providing vital communications in areas devastated by Hurricane David. Scenes such as this were commonplace. *(photo courtesy KP2A)*

Many reports were filed documenting the service performed by Amateur Radio operators during the Hurricane David and Frederick emergencies. It was a worldwide effort in the true tradition of the Amateur Service. Space limitations prevent us from using all the reports. What follows are the more significant contributions, starting with a chronicle from the pen of W4PPC.

Hurricane Traffic Net

By George Naftzinger,* W4PPC

It is extremely difficult to encapsulate an operation of the magnitude of what was known as the Hurricane Traffic Net — difficult because of the number of stations involved, the geographic scope and the total hours of operation. Proper individual credit can never be afforded in the measure commensurate with the help given. Many hams spent untold hours just "riding along," in case they were needed. They cleared the frequency, gently urging those not concerned with, or knowledgeable about, the operation to QSY. They were valuable in our need for relays. Many other hams spent an equal time in "quiet operation," waiting to receive answers to traffic sent or just listening. At any given time, I would suppose, there were hundreds of amateurs standing by on 14,303 MHz. Many were experienced net control stations (NCSs) with the independent Intercontinental Amateur Traffic Net and the Maritime Mobile Service Net.

*11260 S.W. 176th St., Miami, FL 33157

Notes from the Log

I cannot "box score" the cooperation of everyone concerned, so the next best thing is let my log book stand as a tribute to all those hams who made this a highly successful public service exercise:

Frequency: 14,303 MHz (+ or − QRM)

Number of Days Involved: 30 (August 30 to September 28, 1979)

Total Time as NCS: 180 hours and 52 minutes

Longest Day as NCS: September 10 (13 hours and 10 minutes continuous)

Alternate NCSs: At least a dozen. (Propagation at night was erratic and the net was kept on as long as needed.)

Wed., Aug. 29 — Hurricane David ravaged the commonwealth of Dominica during the early evening hours.

Thurs., Aug. 30 — Traffic began to build up early at 14,325 on the Hurricane Information Net and at 14,313 on the Intercon Net. In quick "on the air" consultation with some fellow NCSs, it was agreed that a separate frequency would be selected to handle hurricane-related traffic. After trying two others, we settled near 14,303. One of our initial contacts

was Fred White, J7DAY, on Dominica. He was providing the only means of communication out of or into the island. He was using a long-wire antenna and runing 100 watts from the police station in the capital, Roseau. The Prime Minister of Dominica was on Fred's rig trying to talk to Washington. He was heard here in Miami, but not at the State Department ham station. A relay was made of all information, request for assistance and assessment of damages. Thus the Hurricane Traffic Net was born.

Early in the operation, unintentional and, I'm sorry to say, intentional interference was a problem. Also, my telephone rang continually with newspaper, television, radio and wire service reporters wanting any scrap of information they could get from the affected area. Amateur Radio was the only working form of communication there.

Hurricane David intensified and swept across the Caribbean, passing south of Puerto Rico. The International, American and Canadian Red Cross were now using the net with considerable traffic. Relief-coordination messages, along with health and welfare (H & W) requests, were passed to Dominica in increasing numbers.

Fri., Aug. 31 — Early in the day Hurricane David was still heading Northwest. But, as the day wore on, David took a sudden shift to the North. The Dominican Republic lay directly in its path. Late in the day, David scored a direct hit on San Cristobal and by nightfall, Miami time, passed straight through Santo Domingo. I talked with two HI8s during the height of the storm, as the net stood by to hear their reports.

Sat., Sept. 1 — An eventful day! Two good things happened: We got clearance for third-party traffic to Dominica via info from W1AW, and Evelyn Gauzens, W4WYR, joined me on the net. She also was located in Miami and is an experienced traffic handler. This was overshadowed, however, by the realization that today was the start of the three-day Labor Day holiday and the QRM became horrendous. W4WYR and I quickly established an "odd-ball" simplex pipeline frequency for 2-meter coordination contact. Evelyn helped to channel the tremendous load of H & W traffic prompted by the holiday crowd on 20 meters. She operated with the net in this role for the remainder of the month.

Meanwhile, Hurricane David had cleared the north coast of the Dominican Republic after ravishing that country. Tropical Storm Frederick had appeared and was tracking across the Atlantic east of the Windward Islands on a route almost identical to that taken earlier by David. If that was not bad enough, behind us, to the west, Tropical Storm Elana had formed in the Gulf of Mexico.

At 6 P.M. W4WYR and I developed additional concerns as we handled the influx of traffic moving between North and South America into Dominica and the Dominican Republic: South Florida had been placed under a hurricane watch. For us it was an event of some importance, the first hurricane alert here in 13 years. In addition to our net commitment, we now had to "batten down the hatches" at home.

Sun., Sept. 2 — I missed much of the net on this date, but Evelyn filled in. My neighbor helped me cut down a 50-foot tree alongside the house, just outside the shack. There were storm shutters to put up, lawn furniture to put away, batteries and lamp oil to buy, extra water to store, extra ice to freeze and a hundred other sundry chores. The National Hurricane Center was plotting David on a head-on course toward Miami.

I took down my 2 meter and TV antennas, but elected to keep my low-band vertical standing to enable a quick return to the air. We were now under a hurricane warning. David was expected to move into Miami early Monday morning.

Mon., Sept. 3 — "Oh, say can you see by the dawn's early light, that beautiful vertical, is it standing upright?" Everything was okay! In the predawn hours David stalled and began to turn more to the north, just off the Miami coastline. At 6 A.M. the Hurricane Center said Miami was spared: David was heading north. My station, as Hurricane Traffic Net Control, was back on the air. Traffic, including South Florida inquiries, flowed unabated.

HI8XDJ and her crew in Santo Domingo handled most of the Dominican Republic H & W. J7DAY was joined by J7DAD in Roseau. W4WYR was now spreading her time between our net on 20 meters and Florida nets on 40 and 80.

Tues., Sept. 4 — KP2A arrived on the scene in Roseau to assist the overworked ops there. John Ackley, accompanied by his wife, Carol, brought his gear to Dominica. They set up operation at the Red Cross location. As we established our first contact with him, we discovered that John, Carol and I were all celebrating birthdays on September 4. John was our mainstay, operating there under various calls until it was determined that he should be J73A.

Wed., Sept. 5 — With Labor Day behind us, the frequency was considerably easier to maintain. Numerous phone patches to Red Cross and Catholic Relief were handled and future schedules established. By now the net was operating efficiently and settling into a good routine. Hundreds of messages were passed during this first week of operation. David had moved north along the Florida and Georgia coasts into South Carolina during the past two days and was downgraded to tropical storm status over Virginia.

Thurs., Sept. 6 — W1AW checked into the net and made available a 10-watt, 2-meter repeater with emergency power and 10 portable, 2-meter transceivers. In consultation with those in the affected areas, it was determined that this equipment should go to Dominica. It was being lent through ARRL/IARU hq. and was to be returned after other telecommunication could be restored.

During this day, Tropical Storm Frederick dumped an additional 15 inches of cruel new rain on the already beleaguered victims of David's wrath in the Dominican Republic. It compounded an already serious problem.

Sept. 7 to 12 — During these six days, the Hurricane Traffic Net operated routinely, passing considerable relief and H & W traffic. All hands put in long hours of operation.

Meanwhile, a hurricane named Frederick was churning in the Gulf of Mexico and by the 13th was headed directly toward the Alabama-Florida coast. We kept a nervous eye on the Gulf as "Fred" progressed. By 7:30 P.M., the traffic net was closed for the night and we monitored Frederick's passage as it slammed into Mobile. Duke Dent, AF4R, went to the National Hurricane Center in Miami and relayed, via 2 meters, the latest information, while working in close contact with Dr. Neil Frank, the center director.

Thurs., Sept. 13 — An important date in our chronology of events on the Hurricane Traffic Net. We were faced with another devastated area, this time stateside. Without commercial telecommunications, the anticipated traffic load loomed large. At the suggestion of the Communications Department at ARRL hq., we were joined by representatives of the National Traffic System (NTS). (The Hurricane Traffic Net, during its entire operation, acted as an informal traffic net, but under strict net discipline.) Eastern Area Net Manager WB4PNY checked in from Richmond, VA. She was followed rapidly by other veteran traffic handlers. In all we had nearly three dozen seasoned NTS operators check in over the next few days. VE3GOL, an outstanding traffic expert in Ontario, had joined the net earlier for anything going into Canada.

With just a few stations on the air in Mobile, we were faced with a problem of getting traffic into the area. The solution was obvious. The NTS stations, wherever they were located, took the informal H & W messages, put them in formal form and entered them into the system.

Sept., 14 to 16 — By the time weekend traffic hit a peak, we had the operation down pat. The NTS stations quickly adapted to the procedures that had been worked out. The load of traffic into Alabama was added to the already heavy schedule of information being passed to and from Dominica and Dominican Republic.

An interesting thing happened as the net worked in closer liaison with the NTS stations. More and more operators were prompted to check in with messages properly framed in the standard ARRL format and numbered one, two or three. We did not require or request it, but stations never before exposed to traffic handling presumably must have been impressed with the great cooperation and the efficient operating demonstrated by the NTS hams. (Net Control took this opportunity to invite stations to ask their SCMs how to become net members within the system. I also answered a few questions on the subject on the net.)

Sept. 16 to conclusion — One aspect concerning the net should be emphasized here: the operating schedule. At no time during the 30 days did we just stay on the air and occupy the frequency. It was decided at the outset to stay on only as long as we had traffic. We established a morning, noon and evening time to convene. Sometimes we would operate straight through to handle a heavy traffic load. At other times, with lighter traffic, we would shut down quickly. The point is, we did our best not to tie up a frequency and to demonstrate our willingness to share. We had a good reason to operate as we did and attempted, by reasonable operating practices, to show our goodwill to fellow amateurs. Unfortunately that was not always reciprocated.

With diminishing need, the net continued operation through September 28 and went QRT at 9:06 A.M. EDT that date. Many interesting and exciting things took place during the 30 days that we functioned and many friendships developed.

We Are the Communicators

The day after Frederick struck Mobile, a U.S. Navy vessel was going to make port there, when for some unknown reason every form of communication on board malfunctioned. The captain ordered one of the crew, an amateur, to see if he could make contact with someone on his ham gear and find out the conditions in Mobile Bay. The ham checked in with an emergency call on the net. We handled him immediately. With the help of Coast Guard personnel, who contacted the Navy, we advised him to "stand clear of Mobile; cannot guarantee condition of navigational aids." In helping him the net probably saved quite a few taxpayers' dollars.

My "world famous" 40-through-10 trap vertical antenna scored another point for those of this polarized persuasion. even the W1AW operator doubted what I was using. The secret is the grounding. I think that's the secret of success for any ham — how well he is grounded in his hobby.

For this operator, the net was a dream of service rendered by ham radio, that began when I was a young Novice, over a quarter of a century ago, in Reading, PA. My older "Elmers" taught me not only the necessary technical know-how and code, but good operating habits and proper discipline. Even though many of them are now silent keys, I hope they know I tried to bring a traditional honor to their tutelage. Good operating habits do rub off and I think the Hurricane Traffic Net participants helped to demonstrate the highest traditions of Amateur Radio.

As I wrote earlier, there were hundreds of stations involved in the operation of the net, some transmitting often, some only occasionally, some very little and some not at all. I view the net as a jigsaw puzzle, with each station but a single piece of the entire picture. All of them fitting into their proper place produces another illustration of the great service that is freely given by the worldwide community of amateur operators.

When all else fails we are the communicators. My thanks to you all!

A Quick Trip

By Bob Denniston,* WØDX/VP2VI

Hurricane David, one of the worst of this century, passed through Dominica, leaving devastation in its wake and wrecking homes and roads, telephone and power lines. After the hurricane, Fred White, J7DAY, was the only means of communications with the outside world. He had been operating continuously for 48 hours when I asked him if I could be of assistance. A message came back from the Prime Minister asking me to come immediately. My son, Matt, and I packed our amateur station and a food supply and headed for the airport.

As our flight circled Dominica, we could see that all the banana trees were flat on the ground and most of the coconut palms were broken off. This was what was left of Dominica's main source of income.

This station, operated by Fred White, J7DAY, provided communications from the Rouseau, Dominica police station. *(photo courtesy WØDX)*

The road from the airport to Roseau, 35 miles away, was blocked by fallen trees and landslides. We traveled as far as we could by truck and then hiked the rest of the way. Eventually we made our way to the police station in Roseau where J7DAY was set up.

The police station, a three-story, reinforced concrete building was still in good condition. Since it was about the only building left standing, government officials used it as their headquarters. With my arrival, Fred, J7DAY, was able to get his first night's sleep in a long time.

The next day, signing WØDX/J7, I went on the air. Frequencies used were 3808 and 7213 kHz, the Antilles Emergency and Weather Net, a network of stations in the Caribbean which meets twice daily and has tracked hurricanes for more than 20 years. Frequencies normally used by the Barbados Net, 3505 and 7185 kHz, were also active.

The operation continued for seven days more. Over 3000 messages were handled, most of which were to and from government officials of various countries. The largest volume of traffic was to and from the U.S. Embassy in Barbados, which organized a large relief effort.

Two other radio amateurs, 8P6GB/J7 and KP2A/J7, brought their stations to Dominica, set them up at Red Cross headquarters and handled thousands of H & W messages. KP2As story follows.

*Smugglers Cove Hotel, Box 4 — West End, Tortola, BVI, LI

Dominica Demolished

By John Ackley,* KP2A

Hurricane David hit Dominica on Wednesday, August 29, with sustained winds of 150 mi/h and higher gusts, to which only twisted girders could testify. Although most of the houses lost their roofs and many were destroyed (60,000 people of a nation of 85,000 were made homeless), only 40 deaths and fewer than 2000 injuries were attributed to the disaster. All electricity, telephones and water supplies were destroyed. All overseas communication was out except for J7DAY.

I was in contact with Fred during and after the hurricane. He described how his antennas were blown down, but we were still able to communicate even though his wires lay in the bushes. Then his home was destroyed. He relocated in the basement of the house next door.

It was awesome to hear Fred describe the effects of the hurricane as it struck. It made all in contact with him feel so helpless. He kept saying over and over again that everything around him, as far as he could see from his location on Kings Hill overlooking Roseau, was flat. He sent a message to his government, by way of an amateur operator on Montserrat, to a broadcast station in Montserrat and then back to Dominica, stating that he was alive and well and was on the air with emergency power. Within hours, he was relocated to the disaster headquarters located at police headquarters. For many hours, Fred was the only means of communications for relief operations. During this period I asked Fred how I might help. He immediately gave the microphone to the Prime Minister, who indicated that all sorts of help was needed, including communications. I started packing immediately and got to Dominica as soon as possible, but found that WØDX had beaten me there by about 24 hours by walking part way through the jungle of fallen trees.

I finally succeeded in getting into town.

*Box 10245, Charlotte Amalie, VI 00801

KP2A operated J73A from Dominican Red Cross hq. He was assisted by J7DAJ and W4UG. *(photo courtesy KP2A)*

Fred was still engaged in governmental communications and Bob was handling mostly communications regarding coordination of a massive U.S. relief operation, so I set up at Red Cross headquarters and handled relief coordination and H & W traffic. The trunk of a palm tree that was still standing nearby served as a support for a long-wire antenna.

The operation soon settled into a routine. Every two hours, we would check into the Hurricane Traffic Net operated by W4PPC on 14,303 MHz. Between this schedule, we would operate 40 or 80 for traffic within the Caribbean. Stanley, VP2ABC, set up his rig in a number of different villages on the island and was able to answer many H & W inquiries. He used the calls VP2ABC/J7 and J73S. Charles, 8P6GB, set up in the Goodwill section of Roseau and handled a steady stream of H & W inquiries from neighboring islands. W4UY came down from Miami to give me a few days of much appreciated rest. IARU/ARRL lent Dominica a 2-meter repeater and a number of 2-meter transceivers which were put to immediate use at such locations as police headquarters, Red Cross headquarters, the hospital, the island's broadcasting station, the port, and so on. Since the telephone lines had been destroyed, this equipment was very useful. The people and government of Dominica are well aware and appreciative of the international Amateur Radio benefits on their behalf.

During the hectic flow of traffic, members of Dominica's Radio Club decided that KP2A/J7D was a little awkward and the call J7A was assigned. Additional confusion resulted, however, so the call was quickly changed to J73A. On September 21, WA5UDQ, J7DD (W2BP) and J7DAJ took over the operation at the Red Cross and things started to wind down.

An interesting observation is that amateurs in countries that do not permit third-party traffic were not prepared to handle message traffic. It was a new experience for them, but they learned very quickly on the job. I feel, therefore, that permitting third-party traffic is in a nation's self interest, in order to have hams ready to handle emergency situations.

The Canadian Scene

By Noreen Nimmons,* VE3GOL

*114 Babcombe Dr., Thornhill, ON L3T 1N1

At 3:40 P.M. on Friday, September 7, I received a call from Ontario's section emergency coordinator, VE3APK. The Canadian Red Cross had just contacted him asking for help in clearing a large volume of H & W inquiries to Dominica. We linked into the Hurricane Traffic Net. The following morning, three members of the Red Cross staff joined the SEC at his Oakville, ON, QTH. On advice from J73A, the master list of these first messages was sent by Telex; incoming replies were to be received by Amateur Radio. I alerted our SCM, VE3GT, who soon advised that the Department of Communications had given special clearance for Canadians to handle third-party traffic with Dominica; I placed

bulletins to this effect on our nets.

VE3APK and I worked out a system for covering the H & W circuit continuously. VE3APK and his wife, Doreen, had a copy of the Red Cross message master list; we maintained direct contact with each other and with Red Cross staff. Doreen telephoned me when new messages came from the Red Cross. She taped all daytime transmissions for VE3APK's information, later transcribing data which has proven to be very comprehensive.

VE3AML gave us early assistance, along with VE3AUM, who acted as NCS on the 20-meter net, allowing time for W4PPC to oil his cast-iron throat. Members of the Oakville ARC, specifically VE3FZG, continued to assist us with sked assignments.

To avoid confusion on message replies to Canadian Red Cross, we established specific "Canadian Red Cross receive stations" and advised W4PPC accordingly. Our section-net operators were also advised of this liaison and of the format being used. This became significant when Hurricane Frederick compounded traffic. I handled the original urgent request for typhoid vaccine and it was rewarding for me to be able to notify J73A that a doctor from the World Health Organization was en route to Dominica.

The early days of net operation were hectic. I was very impressed with the discipline and assistance given to the NCS by the operators on the circuit. This was especially important during the daily phone patches from Dominican officials to the Department of State and the International League of Red Cross Societies. When Hurricane Frederick touched down, the net began doing double duty.

We are indebted to all the operators on the net for providing the communications which at this writing has given us an 85 percent return on messages originating from the Canadian Red Cross.

Service to the Community

By Jose M. Barcelo,* HI7UP/W2

The devastation caused by Hurricane David in the Dominican Republic, which left the country without communications for many days, is well known to all. Uncertainty and anguish ensued for residents of this beautiful island. Also, relatives in the United States were desperate to ascertain the fate of their families. For the first three days, there was no way at all to get through, except by ham radio.

Reciprocal-operating HIs in this country established an emergency net the night the hurricane hit. Traffic was passed to HI8AVC/mobile. He did a heroic job, putting himself and his station at the full disposal of the community. He tried personally to contact each residence throughout the island to deliver the inquiries and send messages in reply. By the end of the week, ABROAD (Amateur Bilingual Radio Organization and DX) had opened a net on 20 meters. Among the check ins were HI8DC, the official civil defense station, and HI8EN, the Army headquarters station. Thereafter, traffic was dispatched concerning shipments of food and medical supplies into Santo Domingo.

On September 8 and 9, ABROAD organized a sidewalk message service at 103rd Street and 39th Avenue in Queens, New York City. Local residents filed an enormous amount of H & W inquiries, which were then sent to HI8LMG, HI8MFP and other Dominican stations.

The Amateur Bilingual Radio Organization and DX (ABROAD) handled health and welfare traffic from the sidewalks of New York. Operating the rig is HI8VAC/W2, standing in back of him is HI7UP/W2, to his right is HI8CC/W2, holding the clipboard is HK3DFO/W2, next to him is HI3LG/W2 and waving is HI8LMD. *(photo courtesy HI7UP/W2)*

*P. O. Box 13, Flushing, NY 11352

Alabama Emergency Net M Report

By Hubert Wheeler,* W4IBU

The fat was in the fire when I arrived home Wednesday afternoon, September 12. Before the trouble was over, there was not one acre of Alabama that had not been affected by Hurricane Frederick. The disastrously affected acres lie in Mobile and Baldwin Counties where the damage to life and property cannot be estimated.

As manager of Alabama Emergency Net M, I called the net into emergency session at about 4 P.M. and it remained in continuous session for four days and nights. The net later tapered off into sessions lasting 18 hours daily.

On Wednesday, before the landfall, the net was in communications with Mobile and its neighboring cities. One by one these stations went off the air as they lost their antennas and/or commercial power. It was about 10 P.M. that we lost contact with the last station in Mobile.

By the next morning, help from the surrounding towns began to arrive: rigs, antennas, portable generators and the like. The first priority was the establishment of links between the Emergency Operations Centers which had no other form of communication. During those first two days after the storm, the net handled only emergency traffic. Gradually, as more stations became established, priority traffic from the disaster zone was handled. It is impossible to determine the number of messages handled by the amateurs, but they number in the hundreds.

*2100 Buckingham Dr., Huntsville, AL 35803

Northern Florida Report

By Fred Marchman,* AA4FG

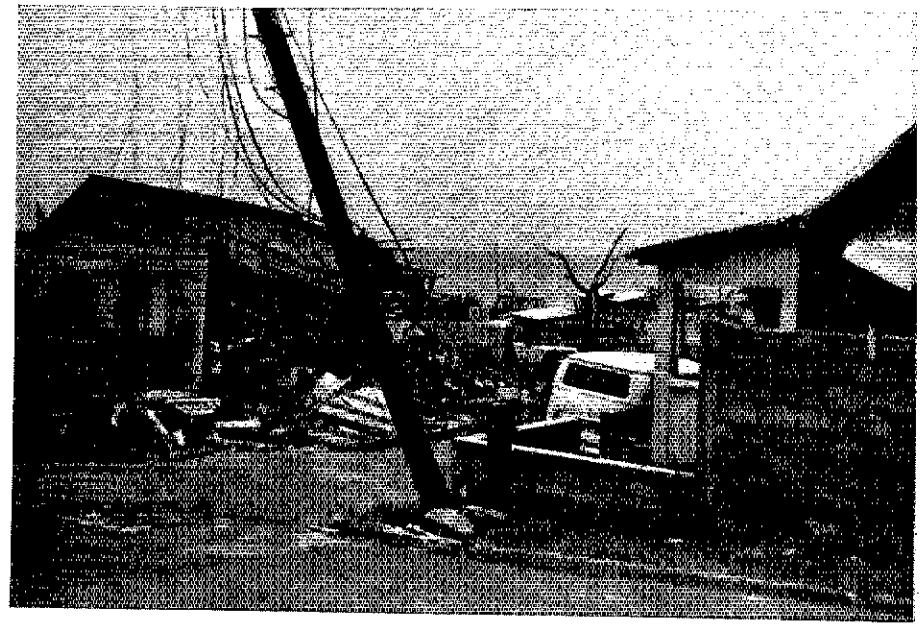
Northern Florida amateurs responded with a high degree of effectiveness to the need for emergency communications resulting from the one-two punches delivered by Hurricanes David and Frederick. David's course along the east coast of Florida spared the counties of Volusia, Flagler, St. Johns, Duval and Nassau from extensive damage. Amateurs in those counties agree that David was an educational hurricane and have since been at work incorporating the lessons learned into revised plans and procedures.

Frederick, however, dealt a severe blow to Escambia, the westernmost of the Florida-panhandle counties. The Northern Florida Phone Net (NFPN) at 3950 kHz went into extended session at 1200Z, September 13, with the All Florida Phone Net (AFPN) on 7272 kHz taking over at 1400Z. The Tropical Phone Traffic Net (TPTN) picked up the operation at 2000Z. These NTS section nets went into successive emergency sessions beginning at 2300Z, September 13 until 2100Z September 14, when the traffic load was reduced to the point that it could be handled by regular net sessions.

All Florida traffic offered to these nets was handled smoothly and promptly, primarily because contact was maintained with all the affected western Florida counties throughout the storm. Two-meter links played an important part in the distribution and delivery of traffic throughout the emergency. The extent and details of amateur operations during Frederick are reflected in the reports of the various county emergency coordinators. This radiogram was from Escambia County EC WA2GIN/4:

"TO AA4FG
SEC NORTHERN FLORIDA
NEW PORT RICHEY, FL 33552
813-849-1224
HURRICANE FREDERICK INTERIM REPORT
X 66 AMATEURS MANNED 8 SHELTERS, CIVIL DEFENSE EOC, AMERICAN RED CROSS, FLORIDA HIGHWAY PATROL, NATIONAL WEATHER SERVICE AND NAVY MARS X ARES SUPPORTED 3 COUNTY AND 4 CITY CIVIL DEFENSE ORGANIZATIONS/ AMERICAN RED CROSS/ SALVATION ARMY/ NATIONAL GUARD AND ESCAMBIA SEARCH AND RESCUE X ESCAMBIA COUNTY PROVIDED EMERGENCY COMMUNICATIONS ASSISTANCE TEAMS TO FAIRHOPE, FOLEY, ROBERTSDALE, GULF SHORES AND SILVER HILLS, ALABAMA X HANDLED HUNDREDS OF OFFICIAL AND HEALTH AND WELFARE MESSAGES AROUND THE CLOCK X SUPPORT TO BALDWIN COUNTY, ALABAMA CONTINUES 73 JIM WA2GIN/4 EC ESCAMBIA COUNTY"

To the Northern Florida amateurs, a hearty "Well done"!



More devastation in Dominica. *(photo courtesy WØDX)*

*901 E. Missouri Ave., New Port Richey, FL 33552

RTTY Linkup

By Quentin E. Nelson,* WA4BZY

For the past three years, RTTY has served very well in providing communications support to the Salvation Army. In 1976, I became very active in RTTY, working with the Salvation Army in providing communications to and from Guatemala (see "Terremoto Ayuda," June 1976 *QST*). My station handled 1608 H & W messages from all over the world. After this experience I felt the need to put together an emergency package that could be activated on a moment's notice. On Thursday, September 13, the Salvation Army in Atlanta asked us to place it in operation. This was the day after Hurricane Frederick hit Mobile. The Alabama Net on 3965 kHz had all it could handle without H & W traffic. WA4BZY and WA4EPK went to Mobile and set up the RTTY station at the battered Salvation Army building. Back in Covington, GA, six amateurs manned WA4BZY's home station, while a team of Salvation Army cadets answered the telephone and took H & W inquiries as well as priority messages from Salvation Army officials in Atlanta to counterparts in Mobile. This helped tremendously in getting food, clothing and vital materials into the hurricane area. Once the circuit was established between the two stations, 968 H & W messages were handled. Success rate was 100 %! An emergency generator, part of the RTTY package, along with antennas cut for 3610, 7090 and 14,090 kHz, were used in Mobile. ARRL format was used in the handling of all the traffic. I wish to thank all amateurs who assisted with this special RTTY hotline. This portable RTTY station is now installed at the Salvation Army headquarters in Atlanta, where it is tested on a weekly basis to ensure that it is operational and ready to go when an emergency exists. QST

*3531 Oregon Trail, Decatur, GA 30032

A Chance Occurrence

On August 30, as David made its destructive way through the Caribbean, I had just completed a 10-meter cw QSO with WA4FAR in Florida. While I was filling out my log book, I heard a faint signal calling me. I copied the call as NP4AB. When I answered the call, he asked if I could handle a message for him to Lansing, IL. He had been reading the mail of the previous QSO and knew I was located in that state. I told him I would try, but conditions weren't the best and his RST was 369 with QSB.

The message was that the worst of the hurricane was over and the boat was in a safe place. He said the boat was off St. Croix in a lagoon and all was well. He wanted me to call his mother and deliver this message. He thanked me and said he had to QRT as he was on battery power and wanted to conserve it. When I delivered the message his mother was very relieved.

Being a Novice and considering our limitations, I feel that we can be of service to the public and take our place with amateurs throughout the world. Handling this message — being able to help someone in need — made me proud to be an Amateur Radio operator. — *Terry England, KA9DGS, Danville, IL*

The Geneva Story

Take 16 years for preparations, add hundreds of volunteers working toward a common goal, mix with some strong support from influential governments, and what do you have? Three new ham bands!

By Richard L. Baldwin,* W1RU and David Sumner,** K1ZZ

It's over! The years of preparation, the 11 weeks of meetings, the countless hours of studying proposals, the agonizing over the possible outcome — all this came to an end on the evening of December 4, 1979, with the adoption by the World Administrative Radio Conference (WARC-79) of a new international Table of Frequency Allocations for the users of the radio spectrum. For the first time in 20 years, the nations of the world met to consider comprehensive changes in the Table and in other important parts of the Radio Regulations of the International Telecommunication Union (ITU). The needs of radio amateurs were weighed against the needs of all the other occupants and prospective occupants of the spectrum. Would we measure up? Would the world agree that our contributions justify continued access to a crowded and finite radio spectrum, in the face of compelling demands from other important users? The question had confronted us for years. On the evening of December 4 we could relax, because we finally knew the answer: Yes!

WARC-79 was a major challenge for the Amateur Radio community. The Conference had the power to make sweeping changes in the privileges we enjoy as radio amateurs, even to the extent of doing away with them altogether. But we were well prepared for this challenge. Ever since the last general WARC, in 1959, we had known that another was coming. Under the banner of the International Amateur Radio Union (IARU), a worldwide cooperative effort was organized with a twofold mission: to have agreement on common allocations objectives for Amateur Radio, and to get maximum support for these objectives from the countries to be represented at WARC-79. In general terms, the objectives were:

- Retention of present allocations
- Three new hf bands, near 10, 18 and 24 MHz, for flexibility in adjusting to propagation changes and to accommodate more amateur stations
- New amateur-satellite bands between 1 and 10 GHz
- Exclusive allocations in some shared bands, and expansion of some present bands.

How did we do? Look at Table 1, and judge for yourself. All we can say is, considering the pressures on the spectrum from a number of directions, we are *very* proud of the results of this international team effort.

The Early Bird . . .

While the opening date for the Conference was September 27, 1979, our story begins long before that. As early as 1963, ARRL/IARU President Herbert Hoover, Jr., W6ZH, recognized that preparations had to begin for the next WARC. (W6ZH is now held by Mr. Hoover's son, ex-W6APW.) Work already was underway in Europe to strengthen the IARU in Region 1;[1] similar efforts were encouraged in Regions 2 and 3. Under Mr. Hoover's direction a program was launched to develop Amateur Radio in the new nations of Africa. An image of the radio amateur as a technically competent operator, anxious to improve his skills and to perform public service, was conveyed to key public officials. These efforts continued under Mr. Hoover's successor, Robert W. Denniston, WØDX. The Intruder Watch was created, to document the interference from nonamateur stations suffered by amateurs in their exclusive bands. Bob also developed a personal rapport with a number of amateurs outside North America who were destined to play important roles in the IARU. (Bob is now VP2VI, and continues his participation in IARU activities as president of the British Virgin Islands Radio League.)

IARU preparations assumed a new dimension in 1974, when Noel B. Eaton, VE3CJ, became president of the Union. Noel is the first IARU president from outside the U.S. Under his leadership, the three regional organizations assumed a greater importance in the functioning of the Union; extensive travel was undertaken by several headquarters representatives, to improve the liaison between headquarters and the member-societies and to bolster the societies' efforts to influence their governments; and an International Working Group was established in 1976 to advise on WARC preparations, with members from all three regions. This group became the nucleus of the IARU Team which went to Geneva in 1979.[2]

Support from the United States

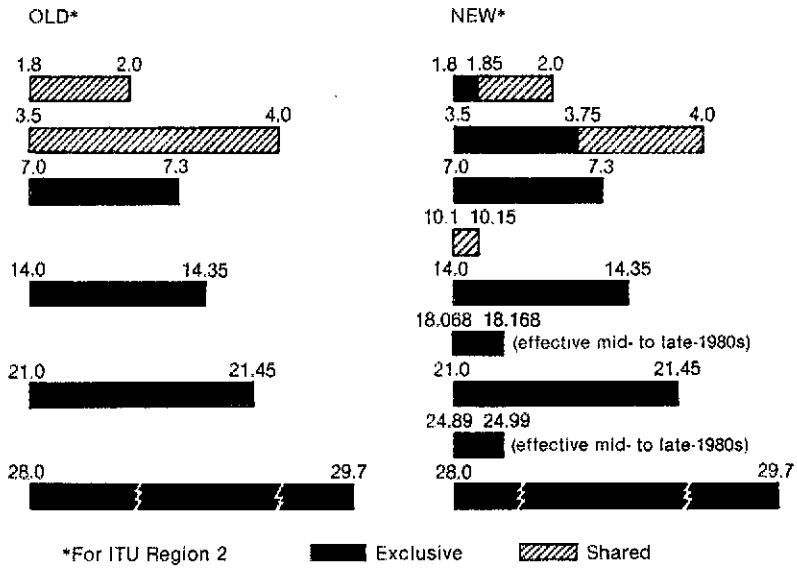
As far as we know, the U.S. government was the first to begin formal preparations for WARC-79. Those responsible for U.S. preparations felt it was important to involve the users of the radio spectrum, as well as the general public, as much as possible in the preparatory process. For the amateur service, as for the other radio services, things began in 1973 with the formation of a working group, under the Executive Office of the President, whose job it was to define the spectrum requirements of the service for the remainder of this century. The amateur service study group consisted of three FCC employees and one ARRL staffer: W3OKN, W4BW, N4FK and W1RU. Their report identified the desirability of new bands near 10, 18 and 24 MHz.[3] Relying on computer analyses of propagation over different paths under varying conditions, the report clearly showed that amateur communication could be made much more reliable through the addition of these new bands. The ability of amateurs to provide emergency communications would thereby be greatly enhanced. The report also demonstrated that the worldwide amateur population would continue to grow, and that additional spectrum was needed to ease overcrowding in a service which already had provided a good example to others by adopting spectrum-conserving modes such as single-sideband.

*General Manager, ARRL
**Assistant General Manager, ARRL

[1]Notes appear on page 61.

Table 1
How did Amateur Radio fare in Geneva at WARC-79? Judge for yourself. (Unless otherwise stated, changes should be effective January 1, 1982.)

Bands Below 30 MHz



*For ITU Region 2 — Exclusive — Shared

Summary of losses

NONE!

Summary of gains

- Three new bands, spaced between present bands to give us greater ability to adjust to changes in propagation
- Exclusive use of parts of the 1.8- and 3.5-MHz bands, which are now shared
- 250 kHz more spectrum for amateur use
- 500 kHz more exclusive spectrum

Bands Above 30 MHz

Summary of losses**

- 1215-1240 MHz withdrawn to protect new radionavigation-satellite system
- Some additional sharing of certain bands above 220 MHz

**For the USA

Summary of gains**

- New satellite bands at:
  - 1260-1270 MHz (uplink only)
  - 2400-2450 MHz
  - 3400-3410 MHz
  - 5650-5670 MHz (downlink only)
  - 5830-5850 MHz (uplink only)
  - 10.45-10.5 GHz
- New secondary amateur allocation at 902-928 MHz
- New amateur and amateur-satellite bands totalling 4,700 MHz exclusive and 17,040 MHz shared above 40 GHz

Even then, there was no guarantee that the U.S. would propose new high-frequency bands for amateurs. In fact, it was not until the spring of 1978 that three new bands of 100-kHz each found their way into the draft U.S. proposals.[4] Hundreds of individual amateurs and local radio clubs took part in the battle to win U.S. support by joining the League in filing comments in response to three FCC Notices of Inquiry.[5]

Several dozen prominent amateurs participated even more directly. In early 1975, the FCC created a series of advisory committees for the radio services it regulates. The advisory committees were responsible for providing information on the future spectrum requirements of their respective services. The FCC Advisory Committee for Amateur Radio (ACAR), first under the chairmanship of W4BW, followed by W3BE, was one of the largest and most active; its membership list read almost like a "Who's Who" of Amateur Radio. Some members travelled thousands of miles at their own expense to participate; others, unable to do so on a regular basis, made contributions to the work of the committee by mail. The ACAR report to the Commission, rendered in 1976, strongly endorsed the concept of the new bands and provided an expanded justification for them, as well as for retention of our other bands and the allocation of new microwave bands for amateur satellites. The League printed hundreds of copies of the ACAR report and distributed them widely, both here and abroad.

Support from the defense community also was essential if we were to get new bands. Military support for Amateur Radio is based upon the recognition that amateur operators are a pool of expertise which can be tapped in time of national emergency, and upon the fact that in such an emergency the amateur bands can be cleared for military use without disrupting other communications services. While no one factor can be singled out as the most important in the quest for new bands, our hopes were raised considerably when we knew the Army, Navy, and Air Force would be in our corner.

Another milestone in our domestic preparations was the retaining by the League, in 1974, of Merle Glunt, W3OKN, as a consultant on conference preparation. Merle came to the League after three decades of government experience in spectrum management, most recently as assistant chief engineer of the FCC. Merle became a familiar face at WARC preparatory meetings in Washington, attending scores of them on behalf of the League. This, coupled with his long experience in government service, earned him a place on the U.S. delegation to WARC-79.

Canada — An Early Supporter

The first formal recognition by a government of the need for new ham bands, by their inclusion in draft proposals for the Conference, came not from the U.S. but from Canada. In February 1977, the Canadian First Draft Proposals were released. Included were three new bands of at least 300 kHz near 10, 18, and 24 MHz.[6] While some other aspects of the Canadian proposals were not as favorable, and while subsequent Draft Proposals did not go quite as far in advocating new bands, we were able to count on Canada as a strong supporter of Amateur Radio throughout subsequent preparations and during the Conference itself. The naming of J. C. R. "Bud" Punchard, VE3UD, to its delegation underscored Canada's commitment to the amateur service. There were several other amateurs on the Canadian delegation as well. During WARC-79 you could easily pick out the Geneva hotel which housed the Canadians: It was the one with the tri-band beam on the roof!

Worldwide Agreement

Amateur Radio is so diverse, it brings to mind the old story about the blind men and the elephant. Each one feels a different part of the beast, and so has a different idea of what an elephant is like. We

K1ZZ with Victor Panton of Jamaica; Ron Case, 8R1M, of Guyana; and Philip Cross and Dr. Frank Subaran of Jamaica.

amateurs have different operating interests, use a variety of modes of emission and are equipped to operate in frequency bands ranging from medium frequencies into the microwaves. In addition, the circumstances facing radio amateurs vary tremendously from one part of the world to another. We are subject to varying national regulations, face government attitudes which range from active encouragement to outright hostility, and exist within a whole spectrum of economic, social and cultural environments.

But intercommunication is what Amateur Radio is all about; to hams, "international goodwill" is a lot more than an empty slogan. Beginning in 1974, WARC-79 began to be discussed in earnest among the member-societies of the International Amateur Radio Union. Representatives of IARU headquarters tested the idea of new ham bands with dozens of knowledgeable people overseas. Was it realistic? Could we expect to win government support? What arguments would be the most effective? The answers varied greatly. Many member-societies were confident of government support for the present bands, but had mixed feelings about our chances for new bands. Some gave assurances that everything amateurs wanted would be supported, though this was rather unrealistic in view of the pressures from other services. Some were quite pessimistic, but promised to do their best in presenting the case for Amateur Radio to their governments.

Formal adoption of the WARC objectives for Amateur Radio came at a series of meetings of the IARU Regional Divisions in 1975 and 1976. The IARU Region 3 Association led off in March 1975 by adopting objectives which essentially mirrored those of the four-man U.S. study group. A month later the Region 1 Division adopted very similar objectives, the major difference being that below 10 MHz they were somewhat more modest in recognition of the greater difficulties faced by amateurs in Region 1. Region 2 followed in April 1976, endorsing the objectives previously adopted by Region 3.

WARC-79 was the first conference for which the world's amateurs adopted a common position in this way. The importance of this method of approach probably cannot be overemphasized. In previous conferences, Amateur Radio had enjoyed the support of a relatively small group of influential nations, and that was all that was required. This time around it was obvious that this would *not* be enough, and that broad support from all corners of the world would be needed. In seeking this support from their governments, our sister societies in other countries could argue that their position was the same as that adopted by an international organization with a long history of ITU recognition. Also, because we started so early and disseminated so much information on the subject of WARC, when they approached their governments our representatives often were the first and the best-informed of the representatives of the various radio services to do so.

Another important role of the IARU in conference preparation was as a clearinghouse for information and ideas. Through an occasional "WARC Newsletter," as well as other media, member-societies were able to keep one another well informed on the progress of their work.

In short, the WARC effort on behalf of Amateur Radio was a team effort, involving hundreds of people in scores of countries, carried out under the banner of the IARU. Whatever differences we may have had were put aside for the duration while the more important, common objective was sought. For those of us who were able to experience the teamwork firsthand, it was unforgettable and exhilarating.

The IARU Geneva Team

In conjunction with the Region 2 Conference in April 1976, IARU President Eaton had convened a meeting with representatives of the three regional organizations and several national amateur societies. One idea to emerge from this meeting was that there was a need for a worldwide IARU working group, responsible directly to the president, to assist in guiding the preparatory work. This working group met several times over the following two years. One of the important products of the group was a model position paper in English, French and Spanish which national societies could use as a basis for their own formal submissions to their governments. Another was a four-page paper, "The Case for Amateur Radio," which was widely distributed in English, French, Spanish and Arabic.

As time went on, the working group became the nucleus for the team of observers which would represent the IARU in Geneva during WARC-79. Some members were able to gain appointments to their own national delegations, which gave them direct access to their delegations and was, therefore, preferable to observer status. (For decades, the ITU has recognized the IARU as the international organization representing Amateur Radio, and the IARU is regularly admitted to ITU conferences as an observer. However, it is only national delegations which can vote at such conferences — one country, one vote.) The official role of the IARU observers was to provide the Conference with a source of expertise on matters affecting the amateur and amateur-satellite services. Of course, having access to conference meetings (which are closed to the general public) also provides an opportunity for informal discussions with delegates, and in particular to provide information and assistance to our friends on national delegations.

In "WARC Countdown" for September and October 1979, you were introduced to the members of the IARU Team. They were IARU President Noel B. Eaton, VE3CJ; Vice President Victor C. Clark, W4KFC, who is also president of IARU Region 2; Secretary Richard L. Baldwin, W1RU; Thomas R. Clarkson, ZL2AZ; C. Eric Godsmark, G5CO; Bruce Alan Johnson, WA6IDN; Shigetake Morimoto, JA1NET; Wojciech Nietyksza, SP5FM; David H. Rankin, 9V1RH/VK3QV; Pedro Seidemann, YV5BPG; Alberto Shaio, HK3DEU; Carl L. Smith, WØBWJ; R. F. Stevens, G2BVN; and David Sumner, K1ZZ. Just as much a part of the team were the members of the national delegations who were there specifically to represent Amateur Radio in their countries:

Jaffar Amour, 7X2AJ, Algeria
Alfred Mueller, DL1FL, Federal Republic of Germany
Michael Owen, VK3KI, Australia
Dr. David A. Wardlaw, VK3ADW, Australia
Hugo Coscio, CP5EC, Bolivia
J. C. R. (Bud) Punchard, VE3UD, Canada
E. Merle Glunt, W3OKN, U.S.A.
H. Walcott-Benjamin, EL2BA, Liberia
O. B. Ajayi, 5NØOBA, Nigeria
Pablo Mooser-Mueller, XE1SR, Mexico
Fabian Zarrabe, YN1FI, Nicaragua
Lars Heyerdahl, LA6A, Norway
Stein Barlaug, LA4ND, Norway
J. F. C. (Fred) Johnson, ZL2AMJ,

New Zealand
Nicolas D'Anello, HP1ND, Panama
Jose J. Tupaz, Jr., DU1JJT, Philippines
Manuel C. Tupaz, DU1MCT, Philippines
Ruben L. Marcelo, DU1RLM, Philippines
R. F. Stevens, G2BVN, United Kingdom
Col. Kamchai Chotikul, HS1WR, Thailand
Mirko Mandrino, YU1NQM, Yugoslavia

Their presence in Geneva is testimony to the effectiveness of their national Amateur Radio organizations, and to the importance attached to our service by their governments. Of course, the presence of an amateur on a delegation did not mean automatic support for amateur proposals, but at least it provided a point of contact and a pro-amateur voice at delegation meetings.

In addition to those listed above, there were more than 100 other radio amateurs in Geneva as members of national delegations. (In all, about 7% of the delegates were licensed amateurs.) Their primary responsibilities were in other fields, but many of them were willing to provide some assistance on amateur matters as their other obligations permitted. The same was true for a number of non-amateurs as well; when an amateur matter was at hand they would offer to speak up on our behalf or to intercede with delegations to which we did not have direct access. While these contributions cannot be individually recognized here, they are hereby acknowledged with sincere thanks on behalf of the entire Amateur Radio community.

Geneva At Last

Much of the important work was done in the years and months prior to the Conference, in national capitals all over the world, as radio amateurs presented our case to their government authorities. The Conference itself was simply the climax of this effort. WARC-79 was scheduled to open on September 24 and to conclude its work by the end of November. The members of the IARU Team began to gather in Geneva in mid-September. This was the first time some of us had had a chance to meet, and there were a number of matters of team organization and strategy which had to be discussed prior to the opening of the Conference. Team members also were able to attend TELECOM-79, a week-long telecommunications exposition which included an excellent display of the different facets of Amateur Radio. A reception sponsored by the Deutscher Amateur Radio Club, the IARU member-society for the Federal Republic of Germany, was held on September 22 for Conference attendees who arrived early.

The Conference itself got off to a somewhat slow start. Usually, the heads of delegations get together the day before the opening of an ITU conference and agree, by consensus, on a conference chairman. This time, consensus was not easy to reach. There were several candidates, none of whom was fully acceptable to all delegations. After a three-day delay in the opening of the Conference, the delegation heads agreed to the selection of Mr. Roberto J. P. Severini of Argentina. It is worth noting that, while not presently licensed, Mr. Severini was LU5BQ in the late 1940s and early 1950s and told us that he had worked about 85 countries on 28 MHz while he was on the air. About midway through the Conference, he visited the OSCAR satellite station at 4U1ITU and had an opportunity to see how Amateur Radio had developed in the last 25 years.

Once the initial delay was past, the Conference got right down to business. The opening Plenary Meeting took place on the afternoon of September 27. Here, the committee structure was adopted, committee chairmen were named, and among other actions, international organizations such as the IARU were formally invited to participate as observers. There was a bit of political rhetoric, but this did not set the tone for the weeks of committee meetings that followed. The discussions in the committee and working-group meetings dealt almost entirely with technical issues.

Committees and Working Groups

WARC-79 had almost 14,000 proposals to consider, ranging from minor editorial matters to major changes in the philosophy of spectrum allocation. Most of the proposals dealt with frequency allocations, and so were assigned to Committee 5, whose chairman was Mr. M. Harbi of Algeria. However, Committees 4, 6 and 7 also had to deal with proposals of concern to amateurs. Committee 4, chaired by Mr. N. Morishima of Japan, considered a wide range of technical regulations including the spurious-emissions standards for transmitters. (The previous standards, adopted in 1959, are the basis for the values found in Section 97.73 of the FCC Rules.) Committee 6, chaired by Dr. Miroslav Joachim, OK1WI, of Czechoslovakia, dealt with regulatory procedures such as the notification requirements for amateur satellite systems. (The U.S. had proposed an easing of these notification requirements, to recognize that it was impractical to notify the location and technical characteristics of every amateur station transmitting through a satellite.) Committee 7, under Mr. P. O. Okundi of Kenya, examined proposals to modify Article 41 (new number N30) of the Radio Regulations, which sets forth the general regulations for the amateur and amateur-satellite services: the Morse code requirement, the prohibition on international third-party traffic, etc. Of course, in each case the amateur-related matters were just a small portion of the committee's workload.

Committees 4, 5 and 6 immediately established working groups to deal with their assigned proposals in smaller batches. This was necessary to permit work to be done in parallel, so the Conference could be completed on time. There was some resistance to the formation of numerous working groups, primarily by the smaller delegations who felt they did not have the manpower to cover several simultaneous meetings. Committee 5 at first tried to proceed with only five working groups, but had to split one of them in half when it became apparent that its workload was simply too great. Even then, the Steering Committee tried to avoid scheduling simultaneous meetings of a committee's working groups, to permit the greatest possible participation by the smaller delegations. This meant that the Conference moved rather slowly at first, but the pace quickened considerably toward the end because agreements reached at the working group and committee levels generally were not readdressed at the plenary level.

Because so much work was done in parallel, a chronological account would be practically indecipherable. Instead, we will take you band by band through the amateur spectrum. This was *not* how the bands were examined in Geneva. In fact, discussions of particular portions of the spectrum stretched over periods as long as nine weeks from the first consideration in a working group to final adoption at a Plenary Meeting. Major changes could have been made at any time, so reports from Geneva during the course of the Conference had to be somewhat sketchy.

Below 4 MHz (Working Group 5BA)

The chairman of WG5BA was Mr. Leopoldo Cook, YV5FJL, of Venezuela. There was little support for a low-frequency amateur band in the vicinity of 190 kHz in view of the continuing requirements of other services, so the matter was dropped. The working group did give detailed consideration to the amateur bands at 1.8 and 3.5 MHz.

1.8 MHz

There was some sentiment for a uniform, worldwide, exclusive amateur allocation at 1.8 MHz, but the existing operations of other services made this impossible to realize. Most of the discussion dealt with Region 1, where there is no amateur band at all in the Table of Frequency Allocations adopted in 1959. (Exceptionally, amateurs in about a dozen countries in Region 1 have been permitted to operate at power levels of 10 watts or

less, as long as they do not cause harmful interference to other services.) The 1.8-1.81 MHz segment was sought for low-power, narrow-bandwidth radiolocation systems in Region 1, and so could not be included in an exclusive amateur segment; however, agreement was reached on 1.81-1.85 MHz as exclusively amateur in Region 1, with exceptions to take care of differing needs in specific countries. The major problem amateurs will face in this new band is that certain maritime mobile operations in Western Europe will continue in the 1.81-1.83 MHz segment, which will limit amateur operations there; on the other hand, the existing footnote provisions have been extended to several more countries, thus making a wider band available.[3]

In Region 2, a 50-kHz exclusive segment at 1.8-1.85 MHz encountered little opposition. The major threat was a U.S. proposal to expand the Standard A-M Broadcasting Band to 1860 kHz, but this was carried only to 1705 kHz. Sharing continues in the segment 1.85-2.0 MHz, though this part of the band is subject to national regulations which may limit amateur access only to certain portions to protect the services with which it is shared. Good news for amateurs is that Loran operations in Region 2 must cease by December 31, 1982. Soon it should be possible for many of the present restrictions on U.S. and Canadian amateur operations to be removed.

In Region 3, while there was support for an exclusive 25-kHz amateur segment, there was not enough to win such a segment without the loss of sharing privileges in the rest of the 1.8-2.0 MHz band. Therefore, it was felt best to maintain the *status quo*, where administrations in Region 3 can make as much as 200 kHz available to amateurs.

3.5 MHz

At 3.5 MHz, the situation in Region 1 was similar to that at 1.8 MHz in Region 3: there was some support for a narrow, exclusive amateur segment, but some countries would agree to this only if the wider, shared band were cut back. The *status quo* was the better alternative, and was maintained in both Regions 1 and 3. We were able to do better in Region 2, where there was quite a bit of support for a sizeable exclusive segment. There was some feeling that the present shared band should be divided between the services which now share it; this was resolved by a footnote which accomplishes this on a country-by-country basis, mostly in southern South America and mostly in countries which already had such restrictions in their national regulations.

One proposal from Canada gave us a great deal of concern, and could have caused serious problems if it had not been modified. The Canadian proposal was for the top 100 kHz of the band, 3.9-4.0 MHz, to be reallocated to broadcasting. This would be consistent with how the band is allocated in Regions 1 and 3, but not with the needs of most countries in Region 2; therefore, the proposal encountered considerable opposition. Canada's stated requirement was for a broadcasting service to reach its sparsely populated northern reaches, so language eventually was worked out for a footnote which permits such a service in the band 3.95-4.0 MHz subject to there being no harmful interference to other services, including amateur. It remains to be seen how a broadcasting service can operate here without causing interference, but that is the requirement which is clearly stated in the Radio Regulations. We particularly owe our thanks to the delegation of Venezuela for insisting on protective wording in this footnote.

4 to 27.5 MHz (Working Group 5BB)

Working Group 5BB did not begin work until October 16, after it became apparent that all of the spectrum below 27.5 MHz could not be reviewed effectively in a single group. Thus the chairman, Peter Barnes, VK3GH, of Australia, found himself assigned the most difficult part of the spectrum and the least amount of time. The reason this part of the spectrum was so difficult was that propagation here is generally of a worldwide nature. Elsewhere, conflicting requirements could be resolved on a regional basis or through complex sharing arrangements, even when satellites were involved. In the high-frequency bands, however, the same flexibility does not exist. This is especially true of bands which are the subject of intra-service planning, where specific channel allotments are made to specific countries. At hf, exclusive allocations must be the rule and sharing, the exception.

Entering the Conference, the fixed service enjoyed allocations covering 62% of the hf spectrum, 70% of it on an exclusive basis. For about 40 years, the hf fixed service carried many of the world's intercontinental telecommunications circuits; however, the expansion of the undersea cable network and the spread of communications satellite technology has caused virtually all of this traffic to be shifted from hf. Therefore, there was widespread feeling that present fixed service allocations could be reduced to accommodate the growth of other services, particularly maritime mobile, broadcasting and amateur.

This feeling was widespread, but was by no means unanimously held. Military communicators tended to favor retention of the fixed service bands because military requirements generally are satisfied in these bands. Developing countries were extremely reluctant to surrender fixed service bands which were useful for communication within a country, because they felt their internal communications needs would continue to be met by hf radio in the coming decades. The USSR and its allies opposed nearly all changes, apparently being quite content with the existing situation at hf. No solution was going to be found which would satisfy everyone's stated needs.

Faced with this situation, Working Group 5BB first agreed to leave alone the existing narrow, exclusive bands for which few proposals had been made: aeronautical mobile, standard time and frequency (WWV, etc.), and the like. Then the chairman began to "test" the various other proposals for support, without actually conducting a formal vote. Proposals to reallocate fixed service spectrum to other services were the most common, and usually involved one end of an existing fixed service band. For a given band, the proposal for the greatest change was considered first, working down through the more moderate proposals until it was clear that a substantial majority favored a particular change. If no change was favored by a substantial majority, then the *status quo* was maintained.

New Bands

The first new amateur band to be tested was at 18 MHz, on October 31. A 200-kHz-wide band was favored by 22 countries, led by Syria, but opposed by 50 others. There was much more support for a 100-kHz bandwidth: 53 supported this, and 26 were opposed. Thus, because 18.068 MHz was an existing band edge for the fixed service, it tentatively became the lower edge of a new amateur band extending 100 kHz into the old fixed service band. This new band and the other 5BB actions described below subsequently were approved at Committee 5 and the Plenary.

Our next test came on November 1 at 10 MHz, which was generally regarded as our most-needed new allocation. However, opposition here was very strong. The lower fixed-service bands were the most strongly defended, and it was extremely difficult for other services to gain majority support for expansion below 12 MHz. The first test, for a 200-kHz exclusive allocation, failed by a margin of 55 to 24. Six other combinations of bandwidth and sharing arrangements were tried before the opposition relented, and it was by a margin of 47 to 26 that the working group endorsed a 50-kHz shared band, 10.1-10.15 MHz, with the amateur service secondary and the fixed service primary. Some leading opponents abstained, which helped make the difference, but it was the tenacity of delegations such as Jordan which saved the day. A later effort, on November 10, to expand the band to 100 kHz failed to win majority support.

What secondary status means is that amateurs cannot cause harmful interference to the fixed service in this band,

and must accept any interference caused them by this service. No doubt many countries which support Amateur Radio will move their fixed service stations out of this band; however, others may choose not to permit their amateurs to operate here at all. Regardless, access to the band will be a valuable addition to amateur privileges and will permit us to bridge the gap between 7 and 14 MHz, thus enhancing our ability to provide communications in the event of natural disasters.

A test of proposals to extend the 21-MHz band downward by 50 kHz came right on the heels of the test of the 10-MHz band and received very little support, probably because it was not regarded as being nearly as important to amateurs as the very controversial band which had just been discussed. However, our disappointment must be tempered by the realization that there were no proposals to *reduce* the size of this band, which was quite a victory in itself.

Our third new band came up the following day, November 2. A 200-kHz band proposed by Australia and New Zealand failed, 38 to 31, but a proposal by Botswana for the band 24.89-24.99 MHz succeeded by the margin of 43 to 28.

The most serious threat to the usefulness of the 14-MHz band came from a proposal for a broadcasting band just below the band, at 13.8-14.0 MHz. The willingness of hf broadcasters to confine their operations to designated bands is somewhat less than complete, so a broadcasting band right next to an amateur band was very undesirable. Fortunately, the band eventually agreed to was 13.6-13.8 MHz, which gives us some measure of protection. Another important battle at 14 MHz involved the existing footnote which permits the fixed service in the USSR to operate in the segment 14.25-14.35 MHz. This footnote orginally was agreed to, many years ago, in recognition of the massive land area of the USSR; however, this time around a number of other countries with smaller land areas wanted to be added to the footnote. There was a lot of opposition to adding these new countries, and eventually a compromise was reached wherein four new countries were added but a power limit of 250 watts was placed on the fixed service stations, including those in the USSR. There was no consideration of proposals to reduce the size of the 14-MHz amateur band.

Showdown at 7 MHz

In this discussion of the bands between 4 and 27.5 MHz we have saved the most exciting for last: the 7-MHz band. Back in 1927, at the Washington Conference, amateurs were given a worldwide allocation of 300 kHz. In Region 2 we have managed to retain the band, but in Regions 1 and 3 it has been cut back at every subsequent conference. In 1959, only a major effort led by the U.S. kept us from losing the top 200 kHz in Region 2 as well. Many of the proposals for WARC-79 advocated separate worldwide, exclusive allocations at 7 MHz for the amateur and broadcasting services, on the grounds that the present sharing of 7.1-7.3 MHz on a regional basis is undesirable.

Amateurs would readily agree that this sharing is undesirable, because we are the ones who suffer all the interference. But there is something much worse than an undesirable sharing situation, and that is to have no access to the band at all. This is what some countries outside Region 2 proposed as a "solution" to the problem: to exclude amateurs in Region 2 from the 7.1-7.3 MHz segment! In fact, an analysis of the pre-Conference proposals might have led to the conclusion that this was probably going to happen, because there was a great deal of sentiment against the *status quo*.[3] Many of the proposed changes involved a reduction in the adjacent fixed-service bands, which was very unpopular in some quarters.

The 7-MHz band was first discussed on October 23, early in the work of Working Group 5BB. Because of the volume of proposals facing the group and the number of delegations who wished to speak, not everyone received the floor who wanted it. From this initial discussion a "compromise" built around a Botswana proposal emerged: worldwide allocations of 7.0-7.15 MHz for amateurs, and 7.15-7.4 MHz for broadcasting. There were several problems with this. First, as far as Region 2 amateurs were concerned it was no compromise at all, but a severe setback. Second, while it appeared that amateurs outside Region 2 would benefit from this arrangement, the expansion of the worldwide amateur band depended upon the elimination of the fixed service from 7.3-7.4 MHz, which we did not believe was likely to survive further Conference consideration. Proposals to extend the amateur band below 7.0 MHz had run into considerable opposition, indicating the strength of the fixed service in that part of the spectrum. Finally, in view of the demonstrated irresponsibility of some hf broadcasters, the reallocation of 7.1-7.15 MHz from broadcasting to amateur was not likely to lead to the elimination of broadcasting from that segment.

Alternative proposals were circulating calling for 200-kHz bandwidth for the amateur service, worldwide. There was some sentiment for this approach among the amateurs in Geneva, especially among those representing countries outside Region 2, but this compromise was even less likely to be acceptable to the fixed and broadcasting interests.

Prior to the opening of the Conference the IARU Team had agreed that a wider worldwide band should be sought, but not at the expense of the existing 300-kHz bandwidth in Region 2. Now it was apparent that out best hope, unfortunately but not unexpectedly, was for maintenance of the *status quo*. We could not count on support for this from outside Region 2, even from countries which were strong allies on other issues. So we were faced with a difficult problem, because on any vote the Region 2 countries would simply be outvoted. (Of the ITU member-countries, 99 are in Region 1, 28 in Region 2, and 27 in Region 3.)

Fortunately, the mood of the Conference was to avoid formal votes as much as possible. The objective was a solution which was acceptable to all, not a solution which had to be imposed upon an unwilling minority. When the 7-MHz band was next discussed in 5BB, on October 26, Colombia argued that 150 kHz was not adequate for amateurs in Region 2 and was immediately supported by the U.S. and Venezuela. After some further discussion which made it clear that a wider amateur band was not supported in Regions 1 and 3, the chairman concluded that the *status quo* at 7.0-7.3 MHz, with broadcasting possibly expanded into 7.3-7.4 MHz worldwide, had the most support. However, in one of the most hard-fought battles of the Conference, broadcasting subsequently failed in its bid to gain access to 7.3-7.4 MHz. (Perhaps we should say, "legitimize its access," because of the large amount of out-of-band broadcasting which already takes place in that segment.)

Having not achieved a worldwide broadcasting band at 7 MHz at the working group level, some delegations were not about to give up. On November 23, the report of 5BB was considered in Committee 5. The United Kingdom, a firm supporter of Amateur Radio on most issues, formally proposed that 7.1-7.3 MHz be made a worldwide broadcasting band, and was supported by Switzerland and Nigeria. The U.S. and Brazil spoke in opposition, but the chairman of Committee 5, Mr. Harbi, had no choice but to submit the proposal to a vote. The result was 42 in favor of the United Kingdom proposal, 32 opposed and 33 abstentions.

Immediately a whole host of Region 2 countries asked for the floor. The U.S. said the decision was unsatisfactory, and requested that a footnote be included which would make 7.1-7.3 MHz an amateur allocation in the U.S. The U.S. requested other Region 2 countries to join this footnote. *Every Region 2 country present in the room asked to be included in the footnote!* It was the dramatic high point of the Conference. An entire Region was united against an action which had been taken by majority decision, but which had practically no effect outside that Region! The chairman announced a coffee break; an excited buzz of voices broke out through the huge meeting hall.

Thus, when the meeting resumed, Mr. Harbi was faced with a serious dilemma. The U.S. spokesman observed that, if allowed to stand, the decision just taken "... would shake the very foundations on which the ITU was built." However, Pakistan and Iran refused to accept any action which would reverse the decision. The meeting was adjourned without resolving the problem.

That evening and the following morning saw a great deal of discussion of how to resolve the stalemate. The goodwill of the United Kingdom delegation, which was aghast at what it had stirred up, permitted a compromise to be put together. Brazil, the U.S., the United Kingdom, Botswana, Tanzania and Mexico submitted a document proposing that the amateur allocation 7.1-7.3 MHz be restored in Region 2, with the following footnote: "The use of the band 7,100-7,300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3." The reason for the footnote was to permit a future planning conference to plan the use of the band by broadcasting *within Regions 1 and 3* (and not for broadcasting to Region 2) without having to build protection for amateurs into that plan. In other words, if a broadcasting station located outside Region 2 directs its programs to an audience which is also outside Region 2 we have no basis for a complaint of interference. However, if the broadcast is intended for an audience in Region 2, then we have every right to complain. On paper, this amounts to an easing of a requirement that broadcasters avoid interfering with amateurs in Region 2; as a practical matter, that requirement has not been observed because it was not realistic. As you will see, we later gained a couple of related concessions at 7 MHz which even promise to improve our situation somewhat.

Getting back to our story, the compromise proposal was considered in Committee 5 on November 24, and was adopted by the overwhelming margin of 53 to 9, with 19 abstentions. And thus it remained; much to our relief, the issue was not raised in the Plenary Meetings.

Good Friends, and Others

As you can see from the preceding description of the 7-MHz battle and from what happened at 1.8 and 3.5 MHz, Amateur Radio enjoyed solid support in North and South America. At one time or another, just about every Region 2 country took the floor to promote or defend our interests. Other outstanding supporters on the tough hf issues included Australia, New Zealand, Papua New Guinea and The Philippines from Region 3, and Botswana, Jordan, Norway, Syria, the United Kingdom and Yugoslavia from Region 1. We had many other supporters, but these are the ones who come to mind as being both consistent and vocal.

A great disappointment was the lack of support, and outright opposition on many issues, from Japan. As far as we were able to determine during the conference, the Japanese delegation of about 50 people included no radio amateurs at all. The country with the largest amateur population, and the one which is the largest manufacturer of Amateur Radio equipment, should have been a major supporter. Instead, we encountered opposition even on issues where Japan appeared to have no direct national interest.

27.5 to 960 MHz (Working Group 5C)

The Chairman of Working Group 5C was Mr. Klaus Olms of the Federal Republic of Germany. Mr. Olms quickly won praise for the businesslike way he organized the work of the group, and the evenhandedness with which he conducted its meetings.

The 28-MHz band was discussed at the very first meeting of 5C, on October 3. The only proposal for change was made by China, which sought a secondary allocation for the mobile service. It turned out that this proposal was intended to accommodate an existing use of the band in China, where low-powered mobile stations had been in operation prior to China's rejoining the ITU a few years ago. Norway and several other countries spoke against the proposal, on the grounds that the exclusivity of the band should be maintained and that China's operations could continue on a national basis, even without a Table allocation, as long as harmful interference was not caused to the amateur and amateur-satellite services. The chairman noted this opposition and asked China to reconsider. When China announced toward the end of the meeting that it was willing to accept the will of the majority and withdraw its proposal, spontaneous loud applause broke out in the meeting room.

More difficult issues lay ahead, as Working Group 5C worked its way up through the spectrum. The 50-MHz band was maintained as exclusively amateur in Region 2 without discussion, but several countries in Region 3 were eager to use the band for fixed, mobile, and broadcasting services similar to its present use in Region 1. They were accommodated in new and modified footnotes. Considerable effort was invested in a possible 50-MHz allocation in Region 1 (in addition to the present footnote for southern Africa), to no avail. In particular Norway went to great lengths in pressing for the Conference to go on record as favoring some accommodation of the amateur service if or when television broadcasting in the band is discontinued. The United Kingdom and Yugoslavia favored some form of narrow, secondary allocation. Both approaches had their supporters, but in the end we were caught between the broadcasting and the mobile interests, who were having their own tug-of-war in that part of the spectrum and who were reluctant to complicate matters still further by consideration of the amateur issue. There is still the possibility that individual administrations in Region 1 will permit amateurs to operate under carefully controlled conditions, as long as harmful interference is not caused to other services.

The 144-MHz band also had its problems. There was no opposition to continuing the 144-146 MHz allocation as exclusively amateur, with the exception of a couple of troublesome footnotes. When you examine the Table, you will see a footnote which permits Singapore to operate existing fixed and mobile systems in 144-145 MHz for a finite period of time. This started out as a proposal for an additional allocation to fixed and mobile at 144-146 MHz, without a time limit, which several other countries also desired to join. Fortunately, there was considerable opposition to such a footnote, based in part upon the potential for interference to amateur satellites. The Singapore footnote which finally emerged was the result of intensive negotiation and compromise.

The 146-148 MHz segment, which is not available to amateurs in Region 1 and also is not available for amateur satellites, came under heavy pressure in Region 3. The end result was a shared allocation to the amateur, fixed and mobile services, all on a primary basis. It will be up to each administration in Region 3 to decide the extent of amateur privileges in their country.

The 220-MHz band, which always seems to be the subject of so much discussion domestically, was settled in a matter of moments. You can see the results in the Table: fixed, mobile, and amateur primary, and radiolocation secondary, in Region 2. There was no support for a U.S. proposal to downgrade the amateur service to secondary status and to create a worldwide maritime mobile band here.

New Zealand has an interesting allocation for the amateur service on a secondary basis at 610-620 MHz. The main use envisioned for this band is for amateur television repeater outputs.

In Region 2, amateurs picked up 902-928 MHz on a secondary basis, shared with several other services. At least in the U.S. and Canada, this part of the spectrum is now the subject of intensive planning and it is not at all clear what form the domestic amateur allocation may take. This will be the subject of future FCC rulemaking.

Tough Going at 420 MHz

Along with 7 MHz, the 420-450 MHz band was the most vulnerable of the amateur allocations.[1] This chunk of spectrum is highly prized for a variety of uses:

military and navigational radars, land mobile systems, space telecommand functions, low-capacity point-to-point links, and even for medical equipment used in cancer research. It seemed as if every administration had a slightly different idea of how to use the band, and what resulted was a tremendous array of footnotes which recognize just about all of these different ideas.

In Region 1 the amateur band already was limited to 430-440 MHz, but was on a primary basis shared with radiolocation (radar). This was maintained, but other services (mostly fixed and mobile) were added by footnote in literally dozens of countries. In Regions 2 and 3, the amateur service lost access to the 420-430 and 440-450 MHz segments, being replaced by the fixed and mobile services. This brings the band edges into line with those in Region 1. However, Australia, the U.S., Jamaica and the Philippines kept the amateur service in both segments by footnote, and Canada, New Zealand and Papua New Guinea maintained the 440-450 MHz segment in their countries. Seven countries in Region 2 upgraded our status to primary in the remaining 430-440 MHz segment. On the other hand, a number of other countries, mostly in Region 3, added fixed and mobile by footnote.

On a brighter note, we were able to gain some recognition for the needs of the amateur-satellite service at 435-438 MHz. This segment has been available for use by amateur satellites since 1973, on the basis that harmful interference is not to be caused to other services operating in accordance with the Table and that protection from interference cannot be claimed. When the only other occupant of the band is radiolocation, these conditions do not cause much problem; however, with the addition of new services which use narrowband emissions and power levels similar to those of amateur-satellite earth stations, the picture changes somewhat. New Zealand led an effort to modify the various footnotes to leave the segment 435-438 MHz free of fixed and mobile stations, but this was defeated and a compromise proposal by India, to exclude the mobile service but not the fixed service, was adopted instead.

It is difficult to say what all of this portends for the U.S. amateur. Several months ago, Canada had announced its intention to withdraw 420-430 MHz from the amateur service to permit its use by fixed and mobile stations in that country. As a result of the Conference's actions, if these operations cause interference to the amateur service in the U.S. we will have no basis for complaint, and we will have to avoid causing interference in return. Because the fixed and mobile services are listed in the Table as primary in Region 2 in both segments, 420-430 and 440-450 MHz, we can anticipate some heavy pressure by land mobile interests to open these segments for their use. The major question will be compatibility with continuing requirements for military radars. Amateurs have a long record of successful sharing with radiolocation in this and higher bands; the land mobile service does not.

Working Group 5D (960 MHz to 40 GHz)

Of all the working group chairmen, Dr. B. S. Rao of India found himself faced with the most proposals to be considered. To handle the workload the meetings of Working Group 5D ran morning and afternoon for seven weeks straight, with few breaks. The major issue for amateurs was the need for new amateur-satellite allocations in the bands between approximately 1 and 10 GHz. Our requirement, as defined in cooperation with the Radio Amateur Satellite Corporation (AMSAT), was for amateur satellite access to portions of each of the presently allocated amateur microwave bands. Operation on a noninterference basis, similar to the conditions previously imposed at 435-438 MHz, was satisfactory. In fact, it was preferable to sharing with another service on an equal basis, because such a sharing arrangement inevitably would have led to the imposition of strict protection criteria which would be difficult or impossible to meet.

We were able to obtain amateur-satellite allocations totalling just about twice the bandwidth originally sought. In some bands there were objections to the specific segments originally proposed, but in each case it was possible to resolve the objection by shifting to a segment in another part of the band. It was not possible to resolve a U.S. objection to transmissions from space, i.e., downlink transmissions, in the 1260-1270 MHz segment. The U.S. had a similar objection at 5650-5670 MHz, but thanks to Norway it was possible to obtain a second amateur-satellite segment at 5830-5850 MHz where there was no such problem. Ironically, the USSR could not agree to *uplink* transmissions at this end of the band, so that segment is for downlink only.

Examination of the Table will show that we have several new sharing partners in our bands between 960 MHz and 40 GHz. However, the only outright loss of spectrum was at 1215-1240 MHz, where amateurs are being excluded to provide protection for a new radionavigation-satellite system. This was aired during the domestic preparations and was part of the U.S. and other proposals, so it came as no surprise. We were able to maintain the 1240-1260 MHz allocation despite the introduction, on the insistence of the USSR, of the radionavigation-satellite service in this segment as well.

At the plenary level there was a last-minute flurry of activity on the question of 10.0-10.5 GHz. In Working Group 5D, dozens of countries had requested that their names be included in a footnote adding the fixed and mobile services to this band. In Committee 5, the United Kingdom proposed limiting the footnote to 10.0-10.45 GHz to provide some protection to the amateur-satellite service. This was not acceptable to a few countries, though the U.K. effort did succeed in greatly reducing the number of countries listed in the footnote for that segment. However, in Plenary, another dozen or so countries were added to the 10.0-10.45 GHz footnote, and Iraq noted that with so many countries listed it seemed more logical to include fixed and mobile in the body of the Table itself. Canada pointed out that there were few Region 2 countries listed in the footnote, so the change was limited to Regions 1 and 3.

Above 40 GHz (Working Group 5E)

In general, the working groups of Committee 5 had to take existing operations into account when making allocations changes. This was much less of a problem for the chairman of Working Group 5E, Dr. A. W. Adey of Canada. While some allocations above 40 GHz already existed for space services, most of the activity in this part of the spectrum has been experimental in nature and it is virgin territory as far as terrestrial allocations are concerned.

Thanks to strong support from New Zealand and others, the amateur and amateur-satellite services fared very well here. Exclusive bands, generally adjacent to wider, shared bands, were made available at intervals throughout the allocated spectrum. It is very satisfying to know that the telecommunications community believes there is a place for Amateur Radio at this frontier of technology, and that this has led to adequate allocations for experimentation by individual amateurs. In effect, WARC-79 has issued us a challenge. Will we accept the challenge, or let these new bands lie fallow? That's up to us to decide, but if we do the latter we have no one to blame but ourselves if we eventually lose them.

Resolution 10

For the last 20 years, the Radio Regulations have included an often-neglected resolution which defined the relative rights of the amateur and broadcasting services at 7 MHz. You can find it in Appendix 2 to Part 97 of the FCC Rules. When the new footnote mentioned earlier was added to the band 7.1-7.3 MHz, some delegations felt there was no longer a need for Resolution 10 because the footnote was a substitute for at least part of it. However, others felt that the resolution should be modified and retained.

When the matter was first discussed in Committee 5, several of the old provisions were stricken and the remaining text was

modified to read as follows:

Relating to the Use of the Frequency Band 7000-7100 kHz

The World Administrative Radio Conference, Geneva, 1979,

considering

a) that the sharing of frequency bands by amateur and broadcasting stations is undesirable and should be avoided;

b) that it is desirable to have worldwide exclusive allocations for these services in Band 7 [3-30 MHz];

c) that the band 7000-7100 kHz is allocated on a worldwide basis exclusively to the amateur service;

resolves

that the broadcasting service shall be prohibited from the band 7000-7100 kHz and that broadcasting stations operating on frequencies in this band shall cease such operation.

As modified, the resolution provides strong support for amateurs in their battle to rid the band of intruders. However, it did not have unanimous backing by any means; in fact, a proposal in Committee 5 to suppress the modified resolution failed on a tie vote! Several countries which were generally supportive of the amateur service were opposed to the resolution, because they feared that broadcasters would try and use it to legitimize their out-of-band operations in other parts of the spectrum. Sweden raised this very point in one of the last Plenary Meetings (at 12:30 A.M. on the morning of December 2, to be precise!). Fortunately, Poland spoke in strong support of the resolution and was joined by Venezuela and Brazil. When the Swedish proposal to suppress the resolution was put to a vote, it failed by one vote: 37 in favor, 38 opposed, with 14 abstentions.

One important change in the resolution is that in the "resolves" portion the word "should" has been replaced with "shall" in two places. This strengthens the obligation of administrations to observe the conditions set forth in the resolution. The broadcasting stations who operate in the 7.0-7.1 MHz band are not likely to cease operation immediately, but the resolution does give us a new tool to use in trying to get them out of our worldwide, exclusive band.

Disaster Communications in Amateur Bands

Several administrations made proposals to designate 10-kHz segments of the amateur hf bands for priority use by stations operating at the scene of a natural disaster. The proposals gave us some concern, because the stations which were envisioned were not necessarily amateur stations. While the use of the amateur bands for emergency communications should not be limited strictly to amateurs, the IARU and its member-societies believe that the best approach is to use existing amateur facilities wherever possible. Amateurs already have organized a large number of emergency communications networks which use frequencies throughout the amateur bands; the proposals would not have provided additional protection for these networks, and might have resulted in a *de facto* reallocation of the designated segments for nonamateur use in some countries. At the same time, it seemed desirable to support the spirit of the proposals and to call attention to the role which the amateur service can play in natural disasters.

When the proposals came up for discussion, a sub-working group was created to draft a resolution to cover the subject. The IARU was invited to participate in the work of the group. The result, Resolution BN, appears on page 70. Needless to say, if you encounter a station engaged in disaster communications in an amateur band you should avoid any possibility of causing interference to that station. This has always been the case, as a matter of common sense, and is not spelled out in the resolution for that very reason. When disaster communications are in progress, most amateurs use a very simple rule to govern their transmitting: When in doubt, don't.

Article N30/41

As noted last month and in the November editorial, the only major change to the international regulations which govern the amateur service was the lowering of the lowest frequency for which a code-free amateur license is possible from 144 to 30 MHz. The only amateur band thus affected is 50 MHz. Worldwide there was a common fear that if the code requirement were eliminated entirely, administrations would be put under great pressure to license CB-type operators in the amateur service. Unless a lot more hf spectrum is found for the amateur service, the interference caused by a large influx of untrained or semi-trained operators would make it impossible for amateurs to continue to provide their traditional public-service communications. Fortunately, the majority of administrations saw the wisdom in maintaining the existing requirement below 30 MHz and in not changing the basic character of the amateur service.

Amateur, or Radio Amateur?

Sometimes the work of the different committees overlapped to some extent. Early in the Conference, Committee 7 examined Article N30/41 and tentatively adopted proposals to change "amateur" to "radio amateur" wherever it appeared. However, when Committee 5 reviewed the definition of "amateur service," it decided *not* to change the name of the service to "radio amateur service." (The only substantive change in the definition was to add the word "radiocommunication" to bring the definition into line with the other definitions of radio services.) Therefore, Committee 7 had no choice but to go back and change its earlier decision, because the decision of Committee 5 took precedence. The change to "radio amateur service" was desired by a group of Spanish-speaking administrations who preferred the term "radioaficionado" to "aficionado."

Spurious Emissions

Committee 4 adopted new standards for spurious emissions from transmitters operating between 235 MHz and 17.7 GHz. New transmitters installed after January 1, 1985 (and all transmitters in operation after January 1, 1994) will be required to have their spurious emissions suppressed as follows:

235 to 960 MHz

• mean power above 25 watts	60 decibels or 20 milliwatts
• mean power 25 watts or less	40 decibels or 25 microwatts

960 MHz to 17.7 GHz

• mean power above 10 watts	50 decibels or 100 milliwatts
• mean power 10 watts or less	100 microwatts

Where the limit is expressed in decibels of suppression as well as in milliwatts or microwatts, the transmitter must comply with the more stringent of the two. For example, under these new standards a transmitter providing 10 watts of output at 432 MHz may have no more than 25 microwatts in a spurious emission, which is about 56 dB of suppression.[11] We can expect to see these new standards incorporated into the FCC Rules sometime in the next few years.

Satellite Notification

The ITU Radio Regulations set out some rather complex and detailed procedures to be followed by administrations which intend to authorize the operation of space services. The amateur-satellite service is not exempt from those procedures; however, the nature of the amateur-satellite service makes it impossible to comply with the letter of the regulations. Amateur stations throughout the world have free access to amateur satellites, and the sponsors of a satellite have no way (and no particular reason or desire) to determine the identity of each and every amateur station which uses the satellite. Thus it is impossible to provide details on the location, equipment, antennas, etc., of every "amateur earth station." The U.S. proposed a resolution to eliminate those notification requirements which could not reasonably be met for the amateur-satellite service. The U.S. proposal ran into problems because some delegations felt it was vaguely worded, but Australia picked up the ball and managed to ease a modified version (Resolution BV) through Committee 6.

Implementation

Of course, the new Radio Regulations do not take effect immediately. There has

to be some time for them to be studied, for national regulations to be brought into conformity, and for changes in some present operations to be planned. Also, because the Radio Regulations have the force of a treaty, in most countries there must be high-level government approval (in the U.S., Senate ratification) of the Conference agreements.

The date selected for the coming into force of the new Radio Regulations is January 1, 1982. Some allocations changes, such as the new 10-MHz band, will be effective on that date (subject to adoption of the necessary changes in national regulations). However, transition procedures apply in some cases, such as our new bands at 18 and 25 MHz. Here, a long series of other actions must be completed before amateurs will get their new, exclusive allocations. First, the hundreds of thousands of entries in the ITU's International Frequency List will be reviewed to eliminate "dead wood" in the high-frequency fixed service bands — that is, frequency assignments to stations which are no longer in operation or which serve only a backup function. These assignments will be deleted or reclassified, and new assignments will be sought for the fixed service stations which must move out of bands which have been reallocated to other services. This process, including the notification to administrations of their new frequency assignments, is to be completed by July 1, 1984. Then, administrations will have five years in which to make the frequency changes. There are a number of reasons for them to make the changes as quickly as possible, so it is conceivable that the whole process may be completed well before 1989; time will tell.

Several specialized ITU conferences are likely to be scheduled in the coming years. One that will be of particular interest is a High-Frequency Broadcasting Conference which will try to plan the use of the hf broadcasting bands to reduce interference and to provide more equitable access. This conference will have no authority to change the allocations which were agreed to at WARC-79, but the outcome could still have an impact on the other users of the hf spectrum, including amateurs. If the problems of excessive power and bandwidth, redundant transmissions in the same band, and other inefficiencies in the hf broadcasting service can be solved, then it should be possible to reduce the chaos which results from out-of-band broadcasting. If the conference does not properly address these problems, then the orderly allocations defined in the Radio Regulations will continue to be something of a myth.

Social Notes

Delegate or observer, the amount of personal rapport which you establish with the other Conference attendees will have a lot to do with how effective you are. Over the years, a reception hosted by the IARU has become something of a tradition at ITU conferences and seminars. This time there were so many people we wanted to invite that we had to schedule the reception in two parts, on the evenings of October 2 and 4. In all, about 400 delegates (including the heads of most delegations) attended the IARU functions. A third, somewhat smaller, IARU reception was held toward the end of the conference to thank those amateurs and others who had been particularly helpful. We also held a weekly "open house" at the IARU office, located just across from the conference center, and encouraged amateurs to stop by for informal discussions. These IARU-sponsored affairs were supplemented by the DARC reception mentioned earlier, which was hosted by its president, Philipp Lessig, DK3LP, and by a Japan Amateur Radio League reception on October 30, hosted by the JARL president, Shozo Hara, JA1AN.

Every delegate who registered for the opening of the Conference received a special pocket calendar, specially designed for WARC-79, courtesy of the IARU. Hundreds of IARU pins and pens, OSCAR satellite pins, promotional booklets and other paraphernalia were distributed to delegates. USKA, the national amateur society of Switzerland, distributed first-day covers showing the very attractive Amateur Radio stamp which was issued in September in honor of USKA's 50th anniversary. Publications of the ARRL and the Radio Society of Great Britain were supplied to delegates who had questions about Amateur Radio, and good homes were found for several 14-MHz Project Goodwill rigs. None of this was likely to change anyone's vote on a particular issue, of course, nor was it intended to do so; the objective was to provide some visibility for the amateur service and a greater understanding of the value of the service.

CB

One question which is sometimes asked is whether the Conference had any effect on CB. CB is not an internationally recognized radio service, and is not mentioned anywhere in the Radio Regulations. Domestically, it is regarded as a part of the mobile service for allocations purposes.

There were a couple of proposals to give CB some international recognition, but they got nowhere. Italy had proposed a definition for a "Non-Professional Personal Service" with an allocation of 26.96-27.28 MHz, but this was given an unsympathetic reception. The Federal Republic of Germany hoped to have 928-930 MHz designated for short-range, low-power mobile communication, but this ran into considerable opposition from countries which had other ideas for that part of the spectrum. A nonbinding recommendation was proposed which would have asked administrations to consider using a small portion of the 862-960 MHz band for this purpose, but after lengthy discussions in Working Group 5C there was no agreement even to this. A footnote along the same lines, but limited to specific countries (mostly in Western Europe), also failed. Several African countries were particularly adamant in their opposition.

The end result: In the entire Radio Regulations you will not find a single reference to anything faintly resembling CB.

WARC-79 in Retrospect

WARC-79 is now history. Those of us who have labored on this project for as long as 16 years, volunteers and full-time staff alike, can begin to focus on other things. But there will be other WARCs, other challenges, and we have to be ready for them.

The basic approach which was used in preparing Amateur Radio for WARC-79 has proved to be correct. There are some changes in detail which might be made if we had it to do over again, but our basic strategies and method of organization were sound. Here, "we" certainly does not mean your co-authors; it means the hundreds of people the world over who have involved themselves as volunteers in IARU affairs over the past several years. *They* are the people to whom you owe your thanks. *They* are the ones who chose not to sit on the sidelines and say, "Somebody should be doing something about WARC." They went ahead and *did* something. They did it as part of an international team. They did it because they enjoy Amateur Radio, and believe it has something to offer the world.

If they hadn't, come January 1, 1982 you might have been the owner of a lot of useless radio gear. If you find yourself in a position to help out for some future WARC, or to work for Amateur Radio in some other capacity, you might remember that.

Notes

[1]Region 1 is Europe, Africa, the Middle East and the USSR; Region 2, the Americas including Hawaii; Region 3, the rest of the world.

[2]"WARC Countdown," *QST*, September 1979, p. 66, and October 1979, p. 68.

[3]"It Seems to Us," *QST*, December 1974, p. 9.

[4]Sumner, "Last Call for Comments on FCC WARC Proposals," *QST*, June 1978, p. 52.

[5]Anyone who is interested in the details of the U.S. preparations should check the references listed under "World Administrative Radio Conference" in the annual index in the December issues of *QST*, 1976 through 1978.

[6]Sumner, "First Canadian WARC Proposals List New Ham Bands," *QST*, June 1977, p. 64.

[7]The Committee structure is shown in "WARC Countdown," *QST*, December 1979, p. 73.

[8]For details on this and other new allocations, see the complete Table of Frequency Allocations for the amateur and amateur-satellite services in the appendix which follows this article.

[9]"WARC Countdown," *QST*, July 1979, p. 54.

[10]"WARC Countdown," *QST*, August 1979, p. 64.

[11]For more information, see Rusgrove, "Spectrum Analysis — One Picture's Worth a . . .", *QST*, August 1979, p. 15.

Extracts from the International Radio Regulations for the Amateur and Amateur-Satellite Services

Definitions

3044 78 3.34 *Amateur Service:* A *radiocommunication service* for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

3108 84ATA 3.35 *Amateur-Satellite Service:* A *radiocommunication service* using *space stations* on earth *satellites* for the same purposes as those of the *amateur service.*

Categories of Services and Allocations

3427 ***Primary, Permitted and Secondary Services***

3428 137 Where, in a box of the Table in Section IV of this Article, a band is indicated as allocated to more than one service, either on a worldwide or Regional basis, such services are listed in the following order:

a) services, the names of which are printed in "capitals" (example: FIXED); these are called "primary" services;

b) services, the names of which are printed in capitals between oblique strokes (example: /RADIOLOCATION/); these are called "permitted" services (see No. 3429/138);

c) services, the names of which are printed in "normal characters" (example: Mobile); these are called "secondary" services (see No. 3430/139).

Additional remarks shall be printed in normal characters (example: MOBILE except aeronautical mobile).

3429 138 Permitted and primary services have equal rights, except that, in the preparation of frequency plans, the primary service, as compared with the permitted service, shall have prior choice of frequencies.

3430 139 Stations of a secondary service:

a) shall not cause harmful interference to stations of primary or permitted services to which frequencies are already assigned or to which frequencies may be assigned at a later date;

b) cannot claim protection from harmful interference from stations of a primary or permitted service to which frequencies are already assigned or may be assigned at a later date;

c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

The IARU Team of observers to WARC-79. Front row: JA1NET, WA6IDN, 9V1RH, HK3DEU, SP5FM, W1RU; rear: VE3CJ, K1ZZ, G5CO, WØBWJ, ZL2AZ, W4KFC. Absent from photo: G2BVN, YV5BPG.

3431 140 Where a band is indicated in a footnote of the Table as allocated to a service "on a secondary basis" in an area smaller than a Region, or in a particular country, this is a secondary service (see No. 3430/139).

3432 141 Where a band is indicated in a footnote of the Table as allocated to a service "on a primary basis", or "on a permitted basis" in an area smaller than a Region, or in a particular country, this is a primary service or a permitted service only in that area or country (see No. 3429/138).

3433 ***Additional Allocations***

3434 142 Where a band is indicated in a footnote of the Table as "also allocated" to a service in an area smaller than a Region, or in a particular country, this is an "additional" allocation, i.e. an allocation which is added in this area or in this country to the service or services which are indicated in the Table (see No. 3435/143).

3435 143 If the footnote does not include any restriction on the service or services concerned apart from the restriction to operate only in a particular area or country, stations of this service or these services shall have equality of right to operate with stations of the other primary service or services indicated in the Table.

Thormod (Tom) Boe, LA7OF, with Alfred Mueller, DL1FL. Tom was the spokesman for Norway in Committee 5 and was responsible for much of the support which Amateur Radio received from Norway.

3436 144 If restrictions are imposed on an additional allocation in addition to the restriction to operate only in a particular area or country, this is indicated in the footnote of the Table.

3437 *Alternative Allocations*

3438 145 Where a band is indicated in a footnote of the Table as "allocated" to one or more services in an area smaller than a Region, or in a particular country, this is an "alternative" allocation, i.e. an allocation which replaces, in this area or in this country, the allocation indicated in the Table (see No. 3439/146).

3439 146 If the footnote does not include any restriction on stations of the service or services concerned, apart from the restriction to operate only in a particular area or country, these stations of such a service or services shall have an equality of right to operate with stations of the primary service or services, indicated in the Table, to which the band is allocated in other areas or countries.

3440 147 If restrictions are imposed on stations of a service to which an alternative allocation is made, in addition to the restriction to operate only in a particular country or area, this is indicated in the footnote.

3441 *Miscellaneous Provisions*

3442 148 Where it is indicated in these Regulations that a service may operate in a specific frequency band subject to not causing harmful interference, this means also that this service cannot claim protection from harmful interference caused by other services to which the band is allocated under Chapter NIII/II of these Regulations.

3443 149 Except if otherwise specified in a footnote, the term "fixed service", where appearing in Section IV of this Article, does not include systems using ionospheric scatter propagation.

Description of the Table of Frequency Allocations

3444 150 The heading of the Table in Section IV of this Article includes three columns, each of which corresponds to one of the Regions (see No. 3415/125). Where an allocation occupies the whole of the width of the Table or only one or two of the three columns, this is a world-wide allocation or a Regional allocation, respectively.

3445 151 The frequency band referred to in each allocation is indicated in the left-hand top corner of the part of the Table concerned.

3446 152 Within each of the categories specified in No. 3428/137, services are listed in alphabetical order according to the French language. The order of listing does not indicate relative priority within each category.

3446A In the case where there is a parenthetical addition to an allocation in the Table, that service allocation is restricted to the type of operation so indicated.

3447 153 The footnote references which appear in the Table below the allocated service or services apply to the whole of the allocation concerned.

3448 154 The footnote references which appear to the right of the name of a service are applicable only to that particular service.

3449 155 In certain cases, the names of countries appearing in the footnotes have been simplified in order to shorten the text.

Table of Frequency Allocations

kHz

Region 1	*Region 2*	*Region 3*
1800 - 1810 RADIOLOCATION 3490A 3485B 3490B	1800 - 1850 AMATEUR	1800 - 2000 AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation
1810 - 1850 AMATEUR 3492C 3492D 3492E 3492F	3492/198	
1850 - 2000 FIXED MOBILE except aeronautical mobile 3488/194 3490/195A 3499/205	1850 - 2000 AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION 3492/198 3492A	3492/198

3488 194 In the Federal Republic of Germany, Denmark, Finland, Hungary, Ireland, Israel, Jordan, Malta, Norway, Poland, the German Democratic Republic, the United Kingdom, Sweden, Czechoslovakia and the U.S.S.R., administrations may allocate up to 200 kHz to their amateur service in the bands 1715 - 1800 kHz and 1850 - 2000 kHz. However, when allocating the bands within this range to their amateur service, administrations

shall, after prior consultation with administrations of neighbouring countries, take such steps as may be necessary to prevent harmful interference from their amateur service to the fixed and mobile services of other countries. The mean power of any amateur station shall not exceed 10 watts.

3490 195A Some countries of Region 1 use radiodetermination systems in the bands 1606.5 - 1625 kHz, 1635 - 1800 kHz, 1850 - 2160 kHz, 2194 - 2300 kHz 2502 - 2850 kHz and 3500 - 3800 kHz. The establishment and operation of such systems are subject to agreement obtained under the procedure set forth in Article N13A. The radiated mean power of these stations shall not exceed 50 watts.

3492 198 In Region 2, Loran stations operating in the band 1800 - 2000 kHz shall cease operation by 31 December 1982. In Region 3, the Loran system operates either on 1850 kHz or 1950 kHz, the bands occupied being 1825 - 1875 kHz and 1925 - 1975 kHz respectively. Other services to which the band 1800-2000 kHz is allocated may use any frequency therein on condition that no harmful interference is caused to the Loran system operating on 1850 or 1950 kHz.

3492A Alternative allocation : in Argentina, Bolivia, Chile, Mexico, Paraguay, Peru, Uruguay and Venezuela, the band 1850 - 2000 kHz is allocated to the fixed, mobile except aeronautical mobile, radiolocation and radionavigation services on a primary basis.

3492C In Region 1, the use of the band 1810 - 1850 kHz by the amateur service is subject to the condition that satisfactory replacement assignments have been found and implemented in accordance with Resolution BR for frequencies to all existing stations of the fixed and mobile, except aeronautical mobile, services operating in this band (except for the stations of the countries listed in Nos. 3492D, 3492E and 3492F). On completion of satisfactory transfer, the authorization to use the band 1810-1830 kHz by the amateur service in countries whose territories are totally or partially located north of 40° N shall be given only after consultation with the countries mentioned in Nos. 3492D and 3492E to define the necessary steps to be taken to prevent harmful interference between amateur stations and stations of other services operating in accordance with Nos. 3492D and 3492E.

3492D Alternative allocation : in the Federal Republic of Germany, Angola, Austria, Belgium, Bulgaria, Cameroon, Congo, Denmark, Egypt, Spain, Ethiopia, France, Greece, Italy, Lebanon, Luxembourg, Malawi, the Netherlands, Portugal, Syria, the German Democratic Republic, Somalia, Tanzania, Tunisia, Turkey and the U.S.S.R., the band 1810 - 1830 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

3492E Additional allocations : in Saudi Arabia, Iraq, Israel, Libya, Poland, Roumania, Chad, Czechoslovakia, Togo and Yugoslavia, the band 1810 - 1830 kHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

3492F Alternative allocations : in Burundi and Lesotho, the band 1810-1850 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

Region 1	*Region 2*	*Region 3*
3500 - 3800 AMATEUR 3499A FIXED MOBILE except aeronautical mobile 3490/195A	3500 - 3750 AMATEUR 3499A 3500B 3500D	3500 - 3900 AMATEUR 3499A FIXED MOBILE
3800 - 3900 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	3750 - 4000 AMATEUR 3499A FIXED MOBILE except aeronautical mobile (R)	
3900 - 3950 AERONAUTICAL MOBILE (OR) 3501A		3900 - 3950 AERONAUTICAL MOBILE BROADCASTING
3950 - 4000 FIXED BROADCASTING	3500C 3500D 3502A 3502AA	3950 - 4000 FIXED BROADCASTING 3502B

3499A For the use of the bands allocated to the amateur service at 3.5 MHz, 7.0 MHz, 10.1 MHz, 14.0 MHz, 18.068 MHz, 21.0 MHz, 24.89 MHz and 144 MHz in the event of natural disasters, see Resolution BN.

3500B Additional allocation : in Honduras, Mexico, Peru and Venezuela, the band 3500-3750 kHz is also allocated to the fixed and mobile services on a primary basis.

3500C Alternative allocation : in Argentina, Boliva, Chile, Ecuador, Paraguay, Peru and Uruguay, the band 3750 - 4000 kHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

3500D Additional allocation : in Brazil, the band 3700 - 4000 kHz is also allocated to the radiolocation service on a primary basis.

3502A Additional allocation : in Canada, the band 3950 - 4000 kHz is also allocated to the broadcasting service on a primary basis. The power of broadcasting stations operating in this band shall not exceed that necessary for a national service within the frontier of this country and shall not cause harmful interference to other services operating in accordance with the Table.

3502AA Additional allocation : in Greenland, the band 3950 - 4000 kHz is also allocated to the broadcasting service on a primary basis. The power of the broadcasting stations operating in this band shall not exceed that necessary for a national service and shall in no case exceed 5 kilowatts.

Region 1	*Region 2*	*Region 3*
7000 - 7100	AMATEUR 3499A AMATEUR-SATELLITE 3508BA 3508C	
7100 - 7300 BROADCASTING	7100 - 7300 AMATEUR 3499A 3508D	7100 - 7300 BROADCASTING

3508BA Additional allocation : in Angola, Iraq, Kenya, Rwanda, Somalia and Togo, the band 7000 - 7050 kHz is also allocated to the fixed service on a primary basis.

3508C Alternative allocation : in Egypt, Ethiopia, Guinea, Libya, Madagascar, Malawi and Tanzania, the band 7000 - 7050 kHz is allocated to the fixed service on a primary basis.

3508D The use of the band 7100 - 7300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3.

kHz	
10,100 - 10, 150	FIXED Amateur 3499A

14,000 - 14,250	AMATEUR 3499A AMATEUR-SATELLITE
14,250 - 14,350	AMATEUR 3499A 3514/218

3514 218 Additional allocation : in Afghanistan, China, Ivory Coast, Iran and the U.S.S.R., the band 14,250 - 14,350 kHz is also allocated to the fixed service on a primary basis. Stations of the fixed service shall not use a radiated power exceeding 24 dBw.

18,068 - 18,168	AMATEUR 3499A AMATEUR-SATELLITE 3515B 3515C

3515B The band 18,068 - 18,168 kHz is allocated to the fixed service on a primary basis subject to the procedure described in Resolution CV. The use of this band by the amateur and amateur-satellite services shall be subject to the completion of satisfactory transfer of all assignments to stations in the fixed service operating in this band and recorded in the Master Register, in accordance with the procedure described in Resolution CV.

3515C Additional allocation : in the U.S.S.R., the band 18,068 - 18,168 kHz is also allocated to the fixed service on a primary basis for use within the boundary of the U.S.S.R., with a peak envelope power not exceeding 1 kW.

21,000 - 21,450	AMATEUR 3499A AMATEUR-SATELLITE

24,890 - 24,990	AMATEUR 3499A AMATEUR-SATELLITE 3518A 3518B

VE3CJ with Dr. John deMercado, VE3LBA, of the Canadian delegation.

3518A Additional allocation : in Kenya, the band 23,600 - 24,900 kHz is also allocated to the meteorological aids service (radiosondes) on a primary basis.

3518B The band 24,890 - 24,990 kHz is allocated to the fixed and land mobile services on a primary basis subject to the procedure described in Resolution CV. The use of this band by the amateur and amateur-satellite services shall be subject to the completion of the satisfactory transfer of all assignments to fixed and land mobile stations operating in this band and recorded in the Master Register, in accordance with the procedure described in Resolution CV.

MHz	
28 - 29.7	AMATEUR AMATEUR-SATELLITE

Region 1	*Region 2*	*Region 3*
47 - 68 BROADCASTING 3541B (and others)	50 - 54 AMATEUR 3543A 3543B 3542/244 3545/247	

3542 244 Alternative allocation : in New Zealand, the band 50 - 51 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis;

Norbert Gabriel, DJ7ZY, of the delegation of the Federal Republic of Germany.

the band 53 - 54 MHz is allocated to the fixed and mobile services on a primary basis.

3543B Alternative allocation : in Afghanistan, Bangladesh, Brunei, India, Indonesia, Iran, Malaysia, Pakistan, Singapore and Thailand, the band 50 - 54 Mhz is allocated to the fixed, mobile and broadcasting services on a primary basis.

3543A Additional allocation : in Australia, China and the Democratic People's Republic of Korea, the band 50-54 MHz is also allocated to the broadcasting service on a primary basis.

3541B Alternative allocation : in Botswana, Burundi, Lesotho, Malawi, Namibia, Rwanda, South Africa, Swaziland, Zaire, Zambia and Zimbabwe, the band 50 - 54 MHz is allocated to the amateur service on a primary basis.

3545 247 Additional allocation : in New Zealand the band 51-53 MHz is also allocated to the fixed and mobile services on a primary basis.

MHz		
Region 1	*Region 2*	*Region 3*
144 - 146	AMATEUR 3499A AMATEUR-SATELLITE 3584AA 3589A	
	146 - 148 AMATEUR 3598A	146 - 148 AMATEUR FIXED MOBILE 3598A

3589A Additional allocation : in Singapore, the band 144 - 145 MHz is also allocated to the fixed and mobile services on a primary basis. Such use is limited to systems in operation on or before 1 January 1980, which in any case shall cease by 31 December 1995.

3584AA Additional allocation: in China, the band 144 - 146 MHz is also allocated to the aeronautical mobile (OR) service on a secondary basis.

3598A Alternative allocation : in Afghanistan, Bangladesh, Cuba, Guyana and India, the band 146 - 148 MHz is allocated to the fixed and mobile services on a primary basis.

Region 2
220 - 225 AMATEUR FIXED MOBILE Radiolocation 3608AA

3608AA In Region 2, the band 216 - 225 Mhz is also allocated to the radiolocation service on a primary basis until 1 January 1990. On and after 1 January 1990, no new stations in that service may be authorized. Stations authorized prior to 1 January 1990 may continue to operate on a secondary basis.

Region 1	*Region 2*	*Region 3*
420 - 430	FIXED MOBILE except aeronautical mobile Radiolocation 3640/319 3640A 3636/318	
430 - 440 AMATEUR RADIOLOCATION 3636/318 3646/322 3646A 3646B 3646D 3643/320 3646C 3645A 3645/321 3642/319B 3644/320A 3646E	430 - 440 RADIOLOCATION Amateur 3636/318 3643/320 3640B 3646C 3642/319B 3644/320A	
440 - 450	FIXED MOBILE except aeronautical mobile Radiolocation 3640A 3640/319 3636/318 3640C 3640D 3641/319A	

3640A Additional allocation : in Australia, the United States, Jamaica and the Philippines, the bands 420 - 430 MHz and 440 - 450 MHz are also allocated to the amateur service on a secondary basis.

3640 319 Different category of service : in Australia, the United States, India, Japan and the United Kingdom, the allocation of the bands 420 - 430 MHz and 440 - 450 MHz to the radiolocation service is on a primary basis (see No. 3432/141).

3636 318 Additional allocation : in China, India, the German Democratic Republic, the United Kingdom and the U.S.S.R., the band 420 - 460 MHz is also allocated to the aeronautical radionavigation service (radio altimeters) on a secondary basis.

3646 322 Alternative allocation : in Denmark, Norway and Sweden, the bands 430 - 432 MHz and 438 - 440 MHz are allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

Our "home away from home" for 11 weeks in Geneva. The ITU building on the left houses the International Amateur Radio Club, 4U1ITU, which you could probably guess from the tribander on the roof. The building in the center was the location of the IARU office. The conference center itself is on the right.

3646A Different category of service : in Denmark, Libya, Norway and Sweden, the allocation of the bands 430 - 432 MHz and 438 - 440 MHz to the radiolocation service is on a secondary basis (see No. 3431/140).

3646B Additional allocation : in Finland, Libya and Yugoslavia the bands 430 - 432 MHz and 438 - 440 MHz are also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

3646D Different category of service : in France, the allocation of the band 430 - 434 MHz to the amateur service is on a secondary basis (see No. 3431/140).

3643 320 Additional allocation : in Afghanistan, Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei, Burundi, Egypt, the United Arab Emirates, Ecuador, Spain, Ethiopia, Greece, Guinea, India, Indonesia, Iran, Iraq, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Liechtenstein, Libya, Malaysia, Malta, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syria, Singapore, Somalia, Switzerland, Tanzania, Thailand and Togo, the band 430 - 440 MHz is also allocated to the fixed service on a primary basis and the bands 430 - 435 MHz and 438 - 440 MHz are also allocated to the mobile, except aeronautical mobile, service on a primary basis.

3640B Different category of service : in Argentina, Colombia, Costa Rica, Cuba, Honduras, Panama and Venezuela, the allocation of the band 430 - 440 MHz to the amateur service is on a primary basis (see No. 3432/141).

3646C Additional allocation : in Angola, Bulgaria, Cameroon, Congo, Gabon, Hungary, Mali, Mongolia, Niger, Poland, the German Democratic Republic, Roumania, Rwanda, Chad, Czechoslovakia and the U.S.S.R., the band 430 - 440 MHz is also allocated to the fixed service on a primary basis.

3645A In Region 1, except in the countries mentioned in No. 3645/321, the band 433.05 - 434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. The use of this frequency band for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunications services might be affected. In applying this provision, administrations shall have due regard to the latest relevant CCIR Recommendations.

3645 321 In the Federal Republic of Germany, Austria, Liechtenstein, Portugal, Switzerland and Yugoslavia, the band 433.05 - 434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services of these countries operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 5002A.

3642 319B Additional allocation : in Brazil, France and the French Overseas Departments in Region 2, and India, the band 433.75 - 434.25 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis until 1 January 1990, subject to agreement obtained under the procedure set forth in Article N13A. After 1 January 1990, the band 433.75 - 434.25 MHz will be allocated in the same countries to the same service on a secondary basis.

3644 320A In the bands 435 - 438 MHz, 1260 - 1270 MHz, 2400 - 2450 MHz, 3400 - 3410 MHz (in Regions 2 and 3 only), 5650 - 5670 MHz the amateur-satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table (see No. 3442/148). Administrations authorizing such use shall ensure that any harmful interference caused by emissions from a station in the amateur-satellite service is immediately eliminated in accordance with the provisions of No. 6362/1567A. The use of the bands 1260 - 1270 MHz and 5650 - 5670 MHz by the amateur-satellite service is limited to the Earth-to-space direction.

3646E Additional allocation : in Austria, the band 438 - 440 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

3640C Additional allocation : in Canada, New Zealand and Papua New Guinea, the band 440 - 450 MHz is also allocated to the amateur service on a secondary basis.

3640D Different category of service : in Canada, the allocation of the band 440 - 450 MHz to the radiolocation service is on a primary basis (see No. 3422/141).

3641 319A Subject to agreement obtained under the procedure set forth in Article N13A, the band 449.75 - 450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space).

MHz

Region 3
610 - 890
FIXED
MOBILE
BROADCASTING
3657A (and others)

3657A Additional allocation : in New Zealand, the band 610 - 620 MHz is also allocated to the amateur service on a secondary basis.

MHz

Region 2
902 - 928
FIXED Amateur Mobile except aeronautical mobile Radiolocation
3669A 3670/340

3669A Different category of service : in the United States, the allocation of the band 890 - 942 MHz to the radiolocation service is on a primary basis (see No. 3432/141) and subject to agreement obtained under the procedure set forth in Article N13A.

3670 340 In Region 2, the band 902 - 928 MHz (centre frequency 915 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 5002A.

1215 - 1240	RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) 3673/343 3674/344 3673A 3675A
1240 - 1260	RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) Amateur 3673/343 3674/344 3673A 3675A 3675B
1260 - 1300	RADIOLOCATION Amateur 3644/320A 3673/343 3674/344 3675A 3675B

3673A Use of the radionavigation-satellite service in the band 1215 - 1260 MHz shall be subject to the condition that no harmful interference is caused to the radionavigation service authorized under footnote 3673/343.

3675A In the bands 1215 - 1300 MHz, 3100 - 3300 MHz, 5250 - 5350 MHz, 8550 - 8650 MHz, 9500 - 9800 MHz and 13.4 - 14.0 GHz, radiolocation stations installed on spacecraft may also be employed for the earth exploration-satellite and space research services on a secondary basis.

3674 344 Additional allocation : in Afghanistan, Angola, Saudi Arabia, Bahrain, Bangladesh, Cameroon, China, the United Arab Emirates, Ethiopia, Guinea, Guyana, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Libya, Malawi, Morocco, Mozambique, Nepal, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syria, Somalia, Sudan, Sri Lanka, Chad, Thailand, Togo and Yemen (P.D.R. of), the band 1215 - 1300 MHz is also allocated to the fixed and mobile services on a primary basis.

3673 343 Additional allocation : in Algeria, the Federal Republic of Germany, Austria, Bahrain, Belgium, Benin, Burundi, Cameroon, China, Denmark, the United Arab Emirates, France, Greece, India, Iran, Iraq, Kenya, Liechtenstein, Luxembourg, Mali, Mauritania, Norway, Oman, Pakistan, the Netherlands, Portugal, Qatar, Senegal, Somalia, Sudan, Sri Lanka, Sweden, Switzerland, Tanzania, Turkey and Yugoslavia, the band 1215 - 1300 MHz is also allocated to the radionavigation service on a primary basis.

3675B Additional allocation : in Canada and the United States the bands 1240 - 1300 MHz and 1350 - 1370 MHz are also allocated to the aeronautical radionavigation service on a primary basis.

Region 1	Region 2	Region 3
2300 - 2450	2300 - 2450	
FIXED Amateur Mobile Radiolocation	FIXED MOBILE RADIOLOCATION Amateur	
3644/320A 3709/357	3644/320A 3680A 3709/357	

3680A In Australia, the United States and Papua New Guinea, the use of the band 2310 - 2390 MHz by the aeronautical mobile service for telemetry has priority over other uses by the mobile services.

3709 357 The band 2400 - 2500 MHz (centre frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. Radio services operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 5002A.

Region 1	Region 2	Region 3
3300 - 3400	3300 - 3400	3300 - 3400
RADIOLOCATION	RADIOLOCATION Amateur Fixed Mobile	RADIOLOCATION Amateur
3739/376 3733/370 3732A	3733/370 3732A	3732A 3739/376
3400 - 3600	3400 - 3500	
FIXED FIXED-SATELLITE (space-to-Earth) Mobile Radiolocation	FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile Radiolocation 3736A	
3738/375 (and others)	3644/320A 3739A	

3739 376 Additional allocation : in Afghanistan, Saudi Arabia, Bahrain, Bangladesh, China, Congo, the United Arab Emirates, India, Indonesia, Iran, Iraq, Israel, Japan, Kuwait, Lebanon, Libya, Malaysia, Oman, Pakistan, Qatar, Syria, Singapore, Sri Lanka and Thailand, the band 3300 - 3400 MHz is also allocated to the fixed and mobile services on a primary basis. The countries bordering the Mediterranean shall not claim protection for their fixed and mobile services from the radiolocation service.

3733 370 Additional allocation : in Austria, Bulgaria, Cuba, Hungary, Mongolia, Poland, the German Democratic Republic, Roumania, Czechoslovakia and the U.S.S.R., the band

Fred Johnson, ZL2AMJ, and David Wardlaw, VK3ADW. New Zealand and Australia were among Amateur Radio's strongest supporters, a fact which is due in large measure to the work of the New Zealand Association of Radio Transmitters and the Wireless Institute of Australia.

3300 - 3400 MHz is also allocated to the radionavigation service on a primary basis.

3732A In making assignments to stations of other services, administrations are urged to take all practicable steps to protect the spectral line observations of the radio astronomy service from harmful interference in the bands 3260 - 3267 MHz, 3332 - 3339 MHz, 3345.8 - 3352.5 MHz and 4825 - 4835 MHz. Emissions from space or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 3280/116 and 3281/116A and Article N33A).

3736A In Regions 2 and 3, in the band 3400 - 3600 MHz the radiolocation service is allocated on a primary basis. However, all administrations operating radiolocation systems in this band are urged to cease operations by 1985. Thereafter, administrations shall take all practicable steps to protect the fixed-satellite service and coordination requirements shall not be imposed on the fixed-satellite service.

3738 375 Additional allocation : in the Federal Republic of Germany, Israel, Nigeria and the United Kingdom the band 3400 - 3475 MHz is also allocated to the amateur service on a secondary basis.

3739A Different category of service : in Indonesia, Japan, Pakistan and Thailand the allocation of the band 3400 - 3500 MHz to the mobile, except aeronautical mobile, service is on a primary basis (see No. 3432/141).

Region 1	*Region 2*	*Region 3*
5650 - 5725	RADIOLOCATION Amateur Space Research (deep space) 3757/389 3755A 3644/320A 3758/389A 3758A	
5725 - 5850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 3756/388 3760/391 3755A 3758A 3757/389 3761C	5725 - 5850 RADIOLOCATION Amateur 3757/389 3760/391 3758A 3761C	
5850 - 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 3760/391	5850 - 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 3760/391	5850 - 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 3760/391

3757 389 Additional allocation : in Afghanistan, Saudi Arabia, Bahrain, Bangladesh, Cameroon, Central African Republic, China, Congo, Korea (Republic of), Egypt, the United Arab Emirates, Gabon, Guinea, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Libya, Madagascar, Malaysia, Malawi, Malta, Niger, Nigeria, Pakistan, the Phillippines, Qatar, Syria, Singapore, Sri Lanka, Tanzania, Chad, Thailand and Yemen (P.D.R. of) the band 5650 - 5850 MHz is also allocated to the fixed and mobile services on a primary basis.

3758 389A Different category of service : in Bulgaria, Cuba, Hungary, Mongolia, Poland, the German Democratic Republic, Czechoslovakia and the U.S.S.R., the allocation of the band 5670 - 5725 MHz to the space research service is on a primary basis (see No. 3432/141).

3758A Additional allocation : in Bulgaria, Cuba, Hungary, Mongolia, Poland, the German Democratic Republic, Czechoslovakia and the U.S.S.R., the band 5670 - 5850 MHz is also allocated to the fixed service on a primary basis.

3760 391 The band 5725 - 5875 MHz (centre frequency 5800 MHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 5002A.

3756 388 Additional allocation : in the Federal Republic of Germany, the band 5755 - 5850 MHz is also allocated to the fixed service on a primary basis.

3761C The band 5830 - 5850 MHz is also allocated to the amateur-satellite service (space-to-Earth) on a secondary basis.

GHz

Region 1	*Region 2*	*Region 3*
10 - 10.45 FIXED MOBILE RADIOLOCATION Amateur 3779/401A	10 - 10.45 RADIOLOCATION Amateur 3779/401A 3780/402	10 - 10.45 FIXED MOBILE RADIOLOCATION Amateur 3779/401A
10.45 - 10.5	RADIOLOCATION Amateur Amateur-Satellite 3780A	

3779/401A The band 9975 - 10,025 MHz is also allocated to the meteorological-satellite service on a secondary basis for use by weather radars.

Stein Barlaug, LA4ND, of the Norsk Radio Relae Liga and the Norwegian delegation.

3780 402 Additional allocation : in Costa Rica, Ecuador, Guatemala, and Honduras, the band 10 - 10.45 GHz is also allocated to the fixed and mobile services on a primary basis.

3780A Additional allocation : in the Federal Republic of Germany, Angola, China, Ecuador, Spain, Japan, Kenya, Morocco, Nigeria, Sweden, Tanzania and Thailand, the band 10.45 - 10.5 GHz is also allocated to the fixed and mobile services on a primary basis.

GHz

24 - 24.05	AMATEUR AMATEUR-SATELLITE 3803/410C
24.05 - 24.25	RADIOLOCATION Amateur Earth Exploration-Satellite (active) 3803/410C

3803 410C The band 24 - 24.25 GHz (centre frequency 24.125 GHz) is designated for industrial, scientific and medical (ISM) applications. Radiocommunication services operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 5002A.

47 - 47.2	AMATEUR AMATEUR-SATELLITE
75.5 - 76	AMATEUR AMATEUR-SATELLITE
76 - 81	RADIOLOCATION Amateur Amateur-satellite 3815E

3815E In the band 78 - 79 GHz radars located on space stations may be operated on a primary basis in the earth exploration-satellite service and in the space research service.

116 - 126	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE 3815BA SPACE RESEARCH (passive) 3679A 3816A 3816B

3816B The band 119.98 - 120.02 GHz is also allocated to the amateur service on a secondary basis.

142 - 144	AMATEUR AMATEUR-SATELLITE
144 - 149	RADIOLOCATION Amateur Amateur-satellite 3816C

3816C The bands 140.69 - 140.98 GHz, 144.68 - 144.98 GHz, 145.45 - 145.75 GHz and 146.82 - 147.12 GHz are also allocated to the radio astronomy service on a primary basis for spectral line observations. In making assignments to stations of other services to which the bands are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from space or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 3280/116 and 3281/116A and Article N33A).

241 - 248	RADIOLOCATION Amateur Amateur-Satellite 3816H
248 - 250	AMATEUR AMATEUR-SATELLITE

3816H The band 244 - 246 GHz (centre frequency 245 GHz) is designated for industrial, scientific and medical (ISM) applications. The use of this frequency band for ISM applications shall be subject to special authorization by the administration concerned in agreement with other administrations whose radiocommunication services might be affected. In applying this provision administrations shall have due regard to the latest CCIR Recommendations.

ARTICLE N30/41

Amateur Service and Amateur-Satellite Service

Section I. Amateur Service

6354 1560 § 1. Radiocommunications between amateur stations of different countries shall be forbidden if the administration of one of the countries concerned has notified that it objects to such radiocommunications.

6355 1561 § 2. (1) When transmissions between amateur stations of different countries are permitted, they shall be made in plain language and shall be limited to messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified.

6355A (1A) It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties.

6356 1562 (2) The preceding provisions may be modified by special arrangements between the administrations of the countries concerned.

6357 1563 § 3. (1) Any person seeking a license to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz.

6358 1564 (2) Administrations shall take such measures as they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station.

6359 1565 § 4. The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which these stations are to operate.

6360 1566 § 5. (1) All the general rules of the Convention and of these Regulations shall apply to amateur stations. In particular, the emitted frequency shall be as stable and as free from spurious emissions as the state of technical development for such stations permits.

6361 1567 (2) During the course of their transmissions, amateur stations shall transmit their call sign at short intervals.

Section II. Amateur-Satellite Service

6361A § 5A. The provisions of Section I of this Article shall apply equally, as appropriate, to the amateur-satellite service.

6362 1567A Spa2 § 6. Space stations in the amateur-satellite service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article N20/15. Administrations authorizing such space stations shall inform the IFRB and shall ensure that sufficient earth command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing administration (see No. 6105/470V).

RESOLUTION BN

Relating to the International Use of Radiocommunications, in the Event of Natural Disasters, in Frequency Bands Allocated to the Amateur Service

The World Administrative Radio Conference, Geneva, 1979,

considering

a) that in the event of natural disaster normal communication systems are frequently overloaded, damaged, or completely disrupted;

b) that rapid establishment of communication is essential to facilitate worldwide relief actions;

c) that the amateur bands are not bound by international plans or notification procedures, and are therefore well adapted for short-term use in emergency cases;

d) that international disaster communications would be facilitated by temporary use of certain frequency bands allocated to the amateur service;

e) that under those circumstances the stations of the amateur service, because of their widespread distribution and their demonstrated capacity in such cases, can assist in meeting essential communication needs;

f) the existence of national and regional amateur emergency networks using frequencies throughout the bands allocated to the amateur service;

g) that in the event of a natural disaster, direct communications between amateur stations and other stations might enable vital communications to be carried out until normal communications are restored;

recognizing

that the rights and responsibilities for communications in the event of a natural disaster rest with the administrations involved;

resolves

1. that the bands allocated to the amateur service which are specified in No. 3499A may be used by administrations to meet the needs of international disaster communications;

2. that such use of these bands shall be only for communications in relation to relief operations in connection with natural disasters;

3. that the use of specified bands allocated to the amateur service by non-amateur stations for disaster communications shall be limited to the duration of the emergency and to the specific geographical areas as defined by the responsible authority of the affected country;

4. that disaster communications shall take place within the disaster area and between the disaster area and the permanent headquarters of the organization providing relief;

5. that such communications shall be carried out only with the consent of the administration of the country in which the disaster has occurred;

6. that relief communications provided from outside the country in which the disaster has occurred shall not replace existing national or international amateur emergency networks;

7. that close cooperation is desirable between amateur stations and the stations of other radio services which may find it necessary to use amateur frequencies in disaster communications;

8. that such international relief communications shall avoid, as far as practicable, interference to the amateur service networks;

invites administrations

1. to provide for the needs of international disaster communications;

2. to provide for the needs of emergency communications within their national regulations.

The Decade Ends

As we enter the 80s, let's take a few minutes to review the Amateur Radio highlights of 1979.

By Dave Bristol,* KA2BNV

The past year was a busy one for Amateur Radio. Final preparations for WARC-79, the conference itself in Geneva and the results — as reported elsewhere in this issue — were the year's highpoints. There was a great deal of other news as well, however.

WARC-79 and Project Goodwill Make Friends for Amateur Radio Worldwide

Amateurs throughout the world contributed to advances in our fascinating hobby. In final preparation for the World Administrative Radio Conference (WARC-79), members of the International Amateur Radio Union (IARU) Geneva WARC team met with national administrations on six continents. The team devoted countless hours to visiting with and assisting member-societies of the IARU. Many of the developing nations' representatives asked for and received assistance in understanding some of the intricacies of WARC.

The genuine interest and generosity of the amateur community was directly responsible for Project Goodwill, one of the most successful programs in recent memory. Through Project Goodwill 20-meter transmitter and receiver kits are being sent throughout the world.

Voluntary contributions amounting to over $41,000 made it possible for the IARU WARC team to pursue various tasks including visiting African nations and assisting the administrations of Tanzania, Sudan, Botswana, Seychelles, Lesotho and Yemen in setting up economical training programs in Amateur Radio. Chinese officials attending the International Telecommunication Union (ITU) Region III seminar in Sydney, Australia, were very enthusiastic about the technical training potential of Amateur Radio.

*Editorial Assistant, *QST*

Year after year, Field Day is one of the most popular Amateur Radio activities. This year was no exception. *(photo by N. A. Kirkland, Jr.)*

Fifteen years of preparation came to a climax with the opening of WARC-79 in Geneva in September. The amateur community and the IARU WARC team concluded a tremendous effort to be sure that nothing was overlooked in preparation for WARC-79. The results speak for themselves.

One of the most hotly contested rule change proposals was the U.S. proposal to permit the dropping of the Morse code requirement below 144 MHz. This proposal, fortunately, was unpopular both with amateurs and with many of the WARC delegations. On October 6, a WARC committee rejected the proposal.

League members were kept up to date on WARC preparations and proceedings through the *QST* column, "WARC Countdown," introduced in June 1979 *QST*. WARC information was also passed along through "League Lines," editorials, W1AW bulletins and via *HR Report*.

Increased Participation in Activities

ARRL-sponsored contests were extremely popular during 1979. Nearly all contests, particularly those in the vhf and uhf ranges, showed increases in participation. Sunspot activity contributed to excellent propagation for most events. Two short contests, the 40- and 80-meter Midnight Specials (two hours long) proved to be very popular, as did the big three — Field Day, November Sweepstakes and the DX Competition.

The OSCAR education program continued its role as a useful and valuable educational tool by introducing several hundred educators and their students to satellite communications via OSCARs 7 and 8. Furthermore, the Radio Amateur Satellite Corporation (AMSAT), realizing the tremendous potential of satellite education, has set aside four kHz of the soon-to-be-launched AMSAT-OSCAR Phase III satellite for strictly educational uses. Teachers throughout the U.S., Canada and around the world have begun gearing up for this project.

This year has also shown that there is a bright, active future for other satellite programs. Future projects include the University of Surrey UOSAT beacon and experiment satellite, a French college-level educational satellite, Rensselaer Polytechnic Institute's orbiting telescope which will send information on Amateur Radio frequencies, AMSAT-OSCAR Phase III A and Phase III B satellites and expanded uhf satellite allocations provided for at WARC-79.

Other Milestones Reached

The League's Club and Training Department introduced a new Advanced

and Extra Class instructor-student guide to aid the many volunteer instructors. One, Sam May, AD7F, of Port Falls, ID, was the winner of the first Instructor of the Year Award (February 1979 *QST*, page 52.) *QST* also saw the beginning of a new column, "In Training." The first ARRL Affiliated clubs were recognized in December *QST*.

March *QST* brought forth a new column, covering the world above one gigahertz — "The New Frontier" — to readers. The latest exciting developments in the field of amateur microwave activity including the equipment, achievements and plans are presented by the column's conductor, Bob Cooper, W5KHT.

With wartime surpluses depleted, inflation finally caught up with the ARRL budget. After several hours of debate and extensive review of budget material, the Board of Directors came to the conclusion that an increase in dues was necessary if the League were to continue to meet the challenges of WARC-79, the training program, inflation and, especially, the challenges of 1980 and beyond. Effective April 1, dues were increased to $18 per year in the U.S.

The "Russian Woodpecker" continued to hamper operation on amateur frequencies. Senator Goldwater, K7UGA (R-AZ), brought the problem that this signal is causing to the attention of his colleagues in Congress and has entered an item concerning the Soviet interference into the *Congressional Record* of October 4, 1979. ARRL President Dannals sent a letter to President Carter, informing him of the Soviet interference problem.

A number of amateurs were at the forefront of propagation studies related to the solar eclipse on February 26. Hams were also actively involved with the "Great Ionospheric-Hole Experiment" following the September launch of an Atlas-Centaur rocket.

Familiar names in the public service area include hurricanes David and Frederic, Three Mile Island and the locations of the many fires, storms, floods, chemical spills, boating and vehicle accidents, search and rescue activities and other emergencies that amateurs were involved in.

ARRL hq. hosted the first nationwide National Traffic System (NTS) meeting in November. December *QST* announced new ARRL radiograms. In other public service-related activities, an AMSAT-OSCAR Phase III NTS channel was designated and the Simulated Emergency Test (SET) was returned to October.

Full ARRL members in the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions had the opportunity to select directors and vice directors to represent members and their ideas about how their League should be run. Results of these elections were announced in this month's and last month's "Happenings" columns.

One of the most outstanding technical and operating milestones of the decade occurred when Mike Vestal, WØYZS, completed the first-ever 432-MHz WAS. His feat was outlined in October 1979 *QST*, page 46. Congratulations to Mike and his moonbounce partner, Tom Bishop, KØTLM.

New publications or revisions added to the ARRL library were two printings of *The Radio Amateur's License Manual*, *The ARRL Novice* and *Technician-General Q & A Books*, and Volume 1, *Weekend Projects for the Radio Amateur*. The 1980 edition of *The Radio Amateur's Handbook* includes sections on Specialized Communications Systems and Vacuum Tubes and Semiconductors.

Rewrite of the Communications Act

Congressional hearings on proposed amendments to the Communications Act of 1934 continued during the year, and the League was there each time to present testimony in support of Amateur Radio. In the House of Representatives, H.R. 3333 was introduced by Representative Van Deerlin (D-CA). The proposal was a major top-to-bottom rewrite of the 1934 Act. Representative Van Deerlin has withdrawn this bill because it was the consensus of the House Communications Subcommittee that the bill attempted to accomplish too much in too short a time.

On the Senate side two bills were introduced: Senator Hollings (D-SC) introduced S.611 and Senator Goldwater introduced S.622. These bills were not as encompassing as the House bill; they propose only a few specific amendments to the Communications Act of 1934.

During June the league presented testimony on each of these bills to the Communications Subcommittees of the House and Senate. Although the Van Deerlin bill has been withdrawn, Senator Goldwater has circulated revised versions of S.622 and we are pleased to report that many of the League's recommendations appear in it.

FCC Activities

The FCC issued a Notice of Inquiry into the subject of radio frequency interference (RFI). The Commission solicited comments from consumers, equipment manufacturers, service technicians, government agencies, economists, engineers, licensees and all other interested parties. We are anxiously awaiting definitive word on the Commission's findings.

Amateurs in the National Radio Quiet Zone, located on the border of Virginia and West Virginia, are looking forward to a decision on an FCC Notice of Proposed Rulemaking (NPRM). Under the proposed rule, any Amateur Radio station licensee proposing to install a new amateur station in repeater operation or to modify an existing station in repeater operation within the quiet zone would have to notify the director of the National Radio Observatory in Green Bank, WV (January 1979 *QST*, page 62).

In a separate but related docket, changes in the amateur rules were proposed which would establish criteria to ensure interference protection for FCC monitoring stations from Amateur Radio stations (February 1979 *QST*, page 62).

News from Canada

Early in the year the CRRL announced that proceedings had been launched for the formal federal incorporation of the Canadian Radio Relay League. Later in the year the ARRL Board of Directors officially sanctioned the federal incorporation of the CRRL as a self-governing division of the ARRL. Other Canadian news included announcements that the Canadian WARC delegation would include amateurs, that the WARC position had been finalized and that the Canadian Tariff Board had recommended that certain amateur gear be exempted from customs entry duties.

Committees are Formed

Amateur Radio will play a part in the Olympic Games. The League was approached by the Winter Olympic Games committee and asked to provide a team of amateurs to be the sole means of communications for the convoy that will accompany the 52 Olympic torch runners from Yorktown, VA, to the Olympic site in Lake Placid, NY. Preparations have been completed and the SCMs of the six states through which the torch will pass have selected amateurs to provide the necessary communications services.

A Public Relations Advisory Committee was formed to provide information to the Board of Directors and a common meeting ground for ideas and discussions relating to the most appropriate way of projecting the image of Amateur Radio. Dee Logan, W1HEO, is chairman.

The Long-Range Planning committee, with Vic Clark, W4KFC, as chairman, is responsible for recommending steps necessary to preserve and improve Amateur Radio in the years ahead.

The ARRL Advisory Committee on Biological Radiation (rf) Hazards, under the direction of Ray Wangler, W5EDZ, has prepared comments on the biological effects of rf radiation on individuals. The committee's ongoing task is to develop information on the political, social and technical environmental trends in the area of biological effects of rf radiation.

What Does the Future Hold?

What's in store for us in the 80s? The possibilities are limited only by the resourcefulness and imagination of the many dedicated and talented hams, all over the world. QST

International News

Conducted By Bruce Alan Johnson,* WA6IDN

What About the International Future of Amateur Radio?

With just under 10 percent of the delegates to the 1979 World Administrative Radio Conference (WARC-79) in Geneva being licensed radio amateurs, it would make good sense to capitalize on this assemblage, wouldn't it? IARU President Noel B. Eaton, VE3CJ, thought so, and he convened there on 7 November a meeting of licensed delegates who were officers of their national societies or had held some post (and hence proved genuine interest) in the IARU or their local bodies.

For newcomers to the international scene in Amateur Radio, the IARU is the International Amateur Radio Union, a half-century-old federation of national Amateur Radio societies in nearly 110 countries. Headquartered and co-located with ARRL hq. in Newington, CT, the IARU has as its goal the protection and worldwide promotion of the Amateur Radio Service — including, of course, representing our interests at WARCs.

Thirteen countries were represented by the 19 delegates who attended the special meeting called by President Eaton to discuss the problems and future of the IARU (and hence of Amateur Radio itself around the world). IARU hq. and two of the IARU region secretariats were also represented.

This was an informal meeting, to be sure. We were assembled to identify any problems which we all foresaw confronting either the Amateur Service or the IARU in the years before the next WARC, and to discuss any changes which might benefit the service — whether in the IARU constitution or its general structure.

As in any such meeting, the conclusions reached were general in nature, but I think it is safe to say that all agreed that a healthy, vigorous future for Amateur Radio around the globe depends largely on increasing the emphasis on IARU activities in the years ahead, both at Hq. and on regional levels. It was clear to all present that Amateur Radio had through the IARU earned a considerably elevated reputation in recent years, and that indeed this enhanced position was a significant factor in the great success enjoyed by amateurs at WARC-79.

"Out of every meeting comes yet another," Winston Churchill is reputed to have once said. Ours was no exception to this terse observation, and indeed we did form an ad-hoc group of seven amateurs to study further for the president just how we might go about setting up a workable committee to further both the study of problems and the identification of solutions. In other words, we (DL1FL, K1ZZ, SP5FM, 9V1RH, YV5BPG, ZL2AZ and WA6IDN) were tasked with producing a suggested timetable and outline for the president's IARU long-range planning group.

The principal challenge facing one in such a task is the selection of the nine members which will compose the group — no small job when one considers that there are three regions and nearly 110 member-societies. But a white paper was drafted, a budget submitted, and timetable approved for submission to IARU President Eaton, who in turn will name the members of this vitally important committee in February 1980.

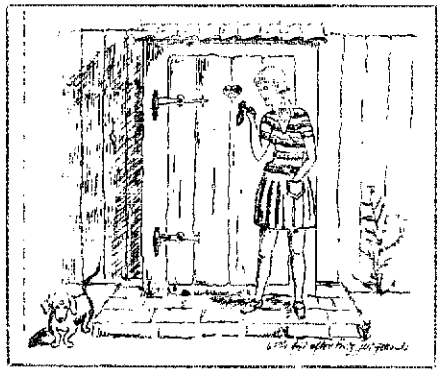
Have you ever stopped to consider just how diverse are the problems facing Amateur Radio from country to country? This diversity was very evident during the 154-nation WARC, and we are of the opinion that these many differences point at the same time towards the common strengths enjoyed by the IARU member-societies everywhere.

The IARU group. Standing, left to right: LA4ND, WØBWJ, 5NØOBA, G5CO, OH2KH, WA6IDN, W4KFC, YU1NQM, I1ZCT, DK3LP, K1ZZ, ZL2AZ, VK3ADW, 9V1RH. Seated, EL2BA, G2BVN, SP5FM, VE3CJ and W3JPT.

*International Services Officer, ARRL

SO, YOU LIKE THE CARTOONS

We've been very pleased — and surprised — by the number of communications received from *QST* readers following the publication of some Amateur Radio cartoons from the Finnish journal. In response to your support, then, we offer herewith a cartoon from the journal *OZ* of the Eksperimenterende Danske Radioamatorer in Denmark. *OZ* is — quite understandably — as popular with Danish amateurs as *QST* is with North American amateurs!



"Herr Frederiksen! I'm sorry to bother you, but will you be finished soon?" "Have patience, Mrs. Hansen: You know very well that *OZ* arrived today!"

A FAREWELL AND A THANK YOU

The thanks certainly come first — to the countless radio amateurs who have in the past few years given so much of their time and talents to aid the ARRL and the IARU in preparing for WARC-79. I have immensely enjoyed being a member of a splendid team of amateurs who aggressively defended Amateur Radio's interests in Geneva. And I certainly do not hesitate to say that I will never forget the thrill of serving in a small way both the League and the Union in their international needs.

These past few years were among the most exciting in Amateur Radio's history, and I am humbly grateful to have been able to play a role, however small. While so doing, I have met many amateurs whose sacrifices for Amateur Radio regretfully remain unsung in the pages of *QST* and other amateur magazines. This is unavoidable, of course, for many of them wish it to be this way. They're all over the world, these forward-looking men and women who are today's Maxims and DeSotos and Tuskas of Amateur Radio.

This will be my last column in *QST*, but I know it will soon be resumed under the pen of an able amateur who will carry on the international work. My deepest thanks again to all who extended a helping hand to the international desk in Newington, and to those of you who helped to prove to the world that Amateur Radio is a thriving international resource of technological aid and goodwill towards all. QST

Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

Mississauga . . . Your League Was There!

It is not often that a formal report on a situation is an interesting, as well as informative, narrative; however, in this case, we are sure that the following report by Ontario Assistant SCM and STM Noreen Nimmons, VE3GOL, more than fills this bill!

"Arriving back from Newington, November 11, I found the city of Toronto well into the mass evacuation of 200,000 residents from Mississauga. SEC Chuck Powers, VE3APK, Metro EC Mike Goldstein, VE3GFN and other ECs were fully in action — the Red Cross headquarters having activated their services. All commercial phone lines were overloaded and remained so for the duration of the crisis. The crash site, *all* evacuation centres and Red Cross headquarters immediately received Amateur Radio communications and we provided the link between their headquarters and personnel. In some cases, the St. John Ambulance and Salvation Army staffs were included. In many cases our link also included the Peel regional police. We were the only communications link into and out of the evacuated area for over 80 hours. Evacuation occurred in two phases — 100,000 people per phase. *Many* hams were involved through clubs and some set up repeater or hf calling frequencies, but due to the previous work which the SEC and I had done with the Canadian Red Cross, we were officially called upon by them to provide the official communications. From that point forward, we received tremendous cooperation from the other groups and clubs, who then pooled into our ARRL ARES operation. I contacted our SCM (295 miles away) to advise him of the situation and to receive his authority on our efforts. I sent a QNC to alert the Section and Region nets for possible overload. A Net Manager from each kept a sked with me in order to stay on top of this aspect; however, the entire operation was contained locally. Thankfully, there was no loss of life, no aftermath or follow-up W or DWI traffic. I presume those 200,000 people all overloaded the phone system again! At 7 A.M. on Monday the 12th, another operator was sent to my QTH. We monitored two vhf rigs and one hf, receiving messages and acting as liaison. On Tuesday and Wednesday, I acted as NCS for the prime repeater, with relief NCSs taking over while I received a few hours sleep. This is what we all did . . . no one person operated continuously for 80 hours plus. The net was run formally and new operators (some just having received their licenses) quickly caught on to required net discipline. Experienced ARPSC members with NTS stripes were my pride and joy! Message formality was maintained except that preambles were dispensed with — one simply does not have the time. Operators logged time and date, from whom received/sent. All texts were formal and all signed by officials (we only acted as radio officers). Prime net frequency handled emergency and priority traffic only; others were used for the balance of messages, depending on their individual importance. *Careful logging by NCS ensured knowing where everybody was.* Needless to say, my experience on NTS (National Traffic System) proved an invaluable asset to me. Bulletins were transmitted on the prime net frequency and the rest is history. I can safely say that not one of the operators looked for gold stars. It didn't really matter what your name, call or affiliation was . . . it did matter that we had frequencies to operate on . . . were licensed Radio Amateurs, were there when called and simply hung in there until the job was done. There are a lot of heroes . . . and that includes the hundreds of hams who listened but never once interfered with the nets or overall communications."

In conclusion, the following Radiogram was dispatched to the League Ontario Division Section Emergency Coordinator, VE3APK: To all Ontario Amateurs and participants — Mississauga Evacuation Crisis: Ontario Division Red Cross wishes to extend their sincere appreciation and admiration for the support given to the society during the Mississauga evacuation crisis. The high degree of dedication and professional skill evidenced by all personnel of ARRL Ontario Section is deserving of the highest praise. As of 2359 EST the operation requiring the services of ARRL Ontario Section is ended. (Signed) Brigadier General J. B. Westhead — MBE, ED, CD, Chairman-Emergency Services; Ken McBride — Director Emergency Services; Millie Blair — Assistant Director Emergency Services, Canadian Red Cross-Ontario Division.

Hopefully there shall soon be a feature *QST* article dealing in depth with the Mississauga Emergency operations; however, at this point in time, the above brief narrative fully illustrates the complete worth of emergency preparedness and the training of the League's ARPSC and NTS organizations and members thereof.

The Canadian Radio Relay League salutes all the participants . . . on a job exceedingly well done.

NOEL J. EATON HONORED

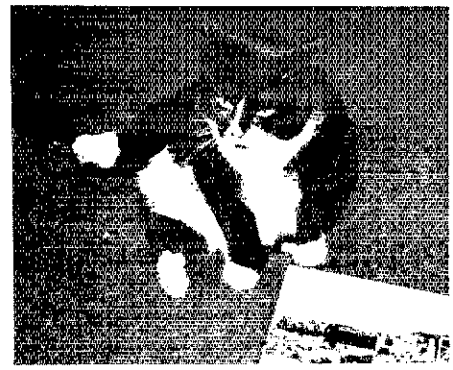
At the end of the year, the Board of Directors of the CRRL unanimously and *enthusiastically* elected ARRL Vice President and IARU President Noel J. Eaton, VE3CJ, as the first Honorary Vice President of the Canadian Radio Relay League, Inc. As indicated to Noel, "This is but a small token from our organization of the esteem in which you are held and for your long-term service as the ARRL Canadian Division Director (14 years) and to the Amateurs of Canada in general . . . not to mention the global Amateur community."

DOC AMATEUR NEWS

There shall soon be automatic "no permit" reciprocal amateur licensing between the amateurs of the United States and Canada. The CRRL in Canada and the ARRL in the States have both been aggressively pursuing such action for the past several years. On December 4, 1979, the FCC voted to amend the U.S. amateur rules to delete the permit requirement for Canadian amateurs wishing to operate in the U.S., on the understanding that the DOC was prepared to do the same. DOC has advised the League that they have taken the necessary action with External Affairs to officially reciprocate.

Effective October 19, an agreement has been signed between Canada and Jamaica, permitting amateur stations to pass traffic on behalf of third parties.

The Department is currently reviewing the matter of special call-sign prefixes for use at stations to signify special occasions and events. The CRRL shall be making known to the Department their recommendations in due course and the text of this recommendation will be published on this page next month.



On this page, last month, we revealed the basic reason for much of the inefficiency at CRRL headquarters. You can now see pictured the extremely sad result . . . "Ms. CQ" caught seriously comtemplating assigning *QST* for active duty in her sandbox!

POTPOURRI

☐ CRRL Director Tom Atkins, VE3CDM, has been named chairman of a special Ad-Hoc Committee to study a proposed Novice license for Canada and to make recommendations to the CRRL Board.

☐ Bill Champagne, VY1AU, has been appointed the League QSL Bureau manager for the Yukon. His address: Yukon Amateur Radio Association, P. O. Box 4597, Whitehorse, Yukon, Y1A 2R8.

☐ CRRL Western Director George Spencer has moved to Edmonton from Winnipeg and sports the new call of VE6XN. His address: Box 5301, Station E, Edmonton, AB, T5P 4C5. QST

*President, CRRL

The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr.,* W5KHT

The World of Gunn Diodes

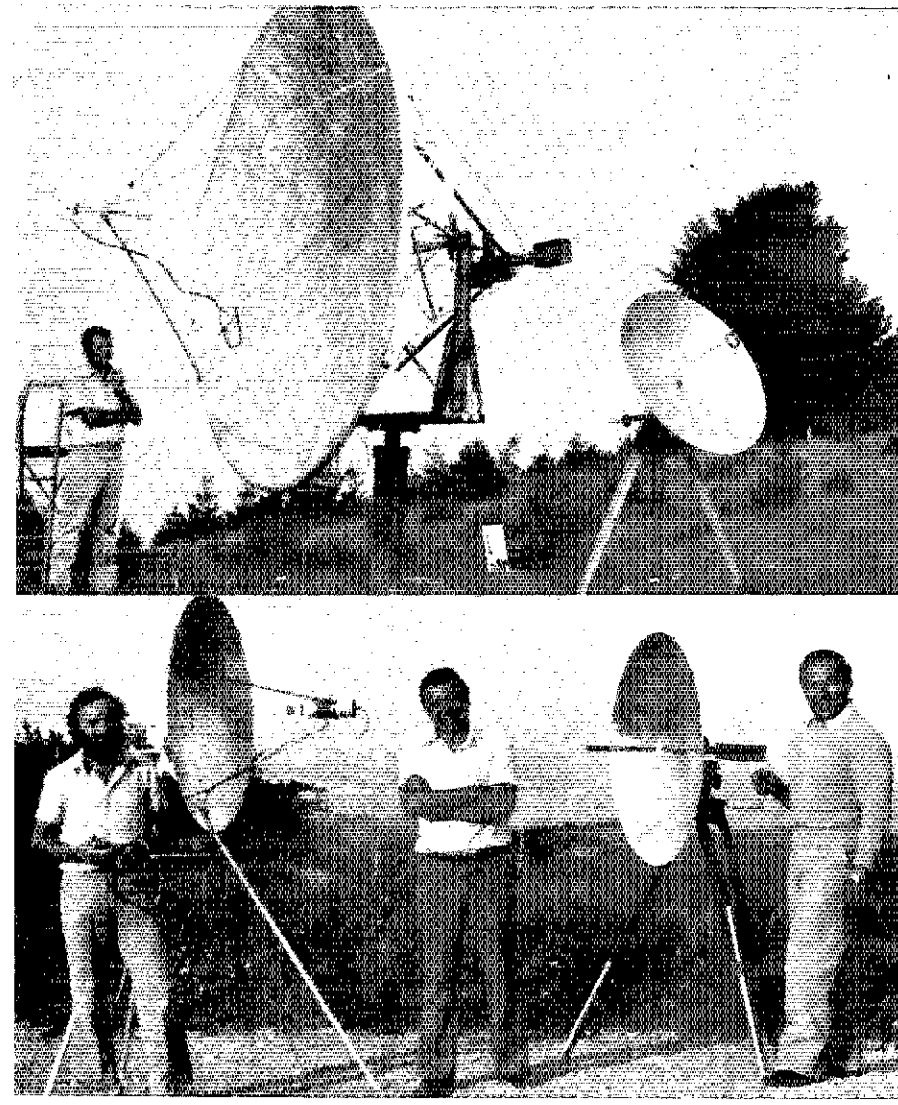
Record amateur achievements in the middle and upper GHz range are happening at a dazzling pace and not surprisingly much of the work is being done with Gunn-diode transceiver devices. Challenged by the apparent European lead with 10 GHz, WA1KPS and W2NSD/1 set out to establish some American goals to shoot at. Working over a period of several months, with W2NSD/1 holding down a mountaintop in New Hampshire, the duo has managed to establish 10 GHz-to-10 GHz amateur two-way QSOs over distances out to 106 miles and totaling seven different states worked from New Hampshire. None of the contacts was shorter than 50 miles and only the longest (NH to NY) required a parabolic antenna. The other contacts were made with Gunnplexers and the "standard" 17-dB-gain horn antenna. It may be some time before 10-GHz activity rises to a level where "States Worked" boxes are a feature of reporting, but for now W2NSD/1 appears to have it all to himself, with seven worked!

Meanwhile, back across the pond, HB9MDN/p and HB7AKR/p have established what is believed to be an amateur 24-GHz record utilizing (you guessed it) 10-mW-output Gunn oscillator devices. With 1-meter parabolic antennas on both ends and 30-MHz i-f ranges, the pair managed to cover a 177-km (109.99-mile) path at our highest presently assigned amateur band (the previous record was held by a pair of G stations at 150 km).

I4BER, meanwhile, has put his Microwave Associates Gunnplexer package to a new test: measurement of the noise sources of space. Using a 3-meter (10-foot) parabolic (see photo) Tomassetti has been able to detect large background-noise levels from our sun and even from the 200-kelvin (computed) noise source offered by the moon's surface! I4BER notes that the sun's noise is perfectly audible to the ear on a 1-meter dish driving a Gunnplexer with a 30-MHz i-f (1-MHz wide). The i-f amplifier operates nonsaturated. It is worth noting that the moon, as a noise source, is calculated to be six times below the 7-dB, 10-GHz receiving system noise figure. Chart recordings provided by I4BER indicate such a pronounced visual peak in "moon noise" that one is moved to suggest a very practical application of this measurement would be the installation of a 10-GHz Gunnplexer receiving system on 144, 220, 432 (etc.) moonbounce-antenna arrays. By precisely aligning the vhf array on the moon, in conjunction with the 10-GHz receiving system (which reads out the peak or center of the moon's surface), precise tracking of the moon would result, assuring peak vhf-array alignment at all times. I4BER, using his 3-meter parabolic and 7-dB NF Gunnplexer receiving system has also located galactic noise sources such as Cassiopea, Orion and others.

A previous column (June 1979, page 63) described pioneering work done by Robert M. Richardson, W4UCH/2, at Lake Chautauqua, NY. Richardson appeared at the Dayton Hamfest last April demonstrating his Gunnplexer video (plus subcarrier audio) system. What virtually nobody knew at the time is that the video and audio witnessed there was being produced by possibly the simplest video microwave circuit yet devised. Richardson creates a 4.5-MHz carrier for fm modulating with his audio source and mixes that with a baseband video signal. The two are then applied to the Gunnplexer directly. The receive Gunnplexer is adjusted so that its local oscillator is offset from the transmitter oscillator by 55.25 MHz. This i-f signal is fed directly into a standard NTSC television receiver. FM video into an a-m television receiver?

Yes. With no visible degradation of even color transmissions! To top that off, Richardson has stacked Gunnplexer transmitters on various frequencies so that the receiver i-f produces standard American TV channels. He has run up to seven TV channels (using NTSC channels 2, 4, 6 and 7, 9, 11 and 13) into a single GPX receiver utilizing 25-inch "snowsled" parabolic antennas over distances of several miles. Intriguing? We'll look further into this in our next column. QST



The top photo shows I4BER with his 3-meter and 1-meter Gunnplexer systems. The 3-meter system can detect the moon as a 200-kelvin noise source! In the lower photo I4BER is shown with I4CHY (left) and I4FZD (right). These 10-GHz enthusiasts from Italy combined talents to establish new world records this summer. *(photos courtesy I4BER)*

*Rte. 5, Box 364, Guthrie, OK 73044

Correspondence

Conducted By Perry F. Williams,* W1UED

FALSE ECONOMY

☐ Here's the gist of a letter I've sent to K7UGA and other senators:

I have just received notification from the FCC Engineer in Charge, Atlanta, Georgia, that FCC will no longer be able to attend hamfests to give Amateur Radio examinations.

Energy conservation is a very high priority item and the Government should be a leader in this effort. The action taken by FCC does not aid conservation. The Atlanta office usually sends three people to the Birminghamfest to administer the test. In excess of 400 people take the exams. How can the travel of 400 people to Atlanta from Birmingham consume less energy than the travel of three from Atlanta to Birmingham?

I urge you to encourage the Commission to reconsider their position, making a real contribution to energy conservation in the total picture, and also providing a popular and useful service to the people who pay the taxes which Congress doles out to FCC! — *William E. Dobbins, WA4DGI, President, Birmingham ARC, Birmingham, AL*

"SPECIAL TECHNIQUES" RETURNS

☐ Thanks to the many members who registered, with ARRL hq., their interest in specialized communications, material on radioteletype, fast- and slow-scan television, and OSCAR satellites and on vacuum tubes has been restored to the Handbook. Let us who are interested and knowledgable in these modes *supply* updated information to Hq., on a continuing basis, for publication. It is very easy to gripe about non-representation, but it seems even harder to get input from the membership.

There are also some very fine publications available which deal with these specialties:

RTTY Journal, c/o Mike Stone, WB0QCD, P. O. Box H, Lowden, IA 52255. Ten times per year. Columns on DX, vhf, manufacturer reviews, schematics, for-sale items and feature articles. $5 per year.

AS — Amateur Television Magazine, published bi-monthly by Henry Ruh, KB9FO, P. O. Box 1347, Bloomington, IN 47402. Fast-, medium-, slow-scan and satellite TV are all covered, including articles by such experts as W9NTP. $6.50 per year.

AMSAT-OSCAR Newsletters, published by the Radio Amateur Satellite Corporation (AMSAT), P. O. Box 27, Washington, DC 20044. What's happening on orbital satellites used for communications by hams; what's in the works for the future. Membership at $10 per year includes quarterly newsletter. — *Mike Stone, WB0QCD, Lowden, IA*

NOT FREE?

☐ The "New Frontier" column entitled, "All Airwaves are Not Free," in the October issue of *QST*, brings up the serious controversy between radio law and citizen's rights. Apparently Section 605 of the Communications Act was bent toward commercialism.

Reception must remain uncompromised. I am appalled to think that a citizen could be arrested and fined or jailed for receiving transmissions which are broadcast through his own private property. Compromise of the right to receive opens the door to all forms of censorship, greed and tyranny. By any reasonable sense of ethics, this interpretation of Section 605 is out of line — the airwaves are not for sale! — *Carl B. Rayman, WA0RLY, Austin, MN*

☐ Amateurs, beware! Your rights are under attack by the commercial world. The article on page 79, October *QST*, would have you believe it's criminal to tune in on certain signals. The main thrust for this ridiculous assertion is the Privacy clause which states you cannot "benefit" from such reception. "Benefit" in legal terms means accepting tangible assets like money. I feel I'm free to tune across the spectrum in my home. If a 2.15-GHz signal invades my privacy, I'll turn it on or off without asking permission. — *Larry Simonton, KA2Z, Cherry Hill, NJ*

NOT PUBLIC?

☐ I find FCC's recent ruling as related in "Author Denied Amateur Radio Tapes" ("Happenings," November *QST* page 79) both disturbing and puzzling.

First, it disturbs me that a subject of legitimate interest and research should be thwarted, simply because a bureaucrat so rules. All the balderdash about Section 605 of the Communications Act of 1934 is but a smokescreen; the final provisio of that paragraph should lay the matter to rest:

"Provided, that this section shall not apply to . . . any radio communication broadcast, or transmitted by amateurs or others for the use of the general public, or relating to ships in distress."

Second, I'm puzzled at the Commission's consideration of the nature of amateur communications. If, as quoted in "Happenings," our QSOs are of a private nature, not to be divulged (". . . divulgence by anyone who might happen to intercept them should be prohibited . . ."), then this may mean ultimately that one amateur may not discuss what he overheard down the band or even relay message traffic. And what of this opinion in light of the exemption of the final statement of Section 605, above? — *Lawrence F. O'Toole, K3LBP, Mt. Pleasant, PA*

BOILED HAM, SOMEWHAT RYE!

☐ In reference to the Operating News lead, "The Price of Boiled Ham," in September *QST* (page 105), consider yourself tarred and feathered! For your lack of objectivity.

For years we've been listening to the complaints of the noncontesting types with nary a word of reply. We've just had to grin and bear it. Now I feel I've got to speak out.

Tell me why it is that the non-contest types don't seem to realize that there is often plenty of vacant spectrum up the band 50 kHz or so? Do they really get their thrills from uttering "The frequency is occupied," every third sentence? Are they running crystal control or did their VFO gears get stuck? Don't they know you can't buy and own a frequency? Do they still know how to send cw when there's a tone contest on?

Yes, your article was half-baked, you need to be more objective and give the other point of view. — *John L. Barber, (call withheld on request), McKinney, TX*

☐ I got a great kick out of your "Boiled Ham." I'm afraid I'll have to admit being a "baked ham" and not the other kind. Reckon "boiled" is quite apropos. Seems to me with the possibility of additional frequencies after WARC we could make available a contesters' band!

When I listen and find a contest on, I just shut down and forget it. What is proved, anyway, with all these contests cluttering up the bands? QRP contests might be okay, but these "magnum boomer" types leave me cold. Naturally, any guy with lots of bucks can acquire anything that's available and dominate the frequencies much to the disgust of the little guys.

Where do good operating habits come in when the count mania is going full blast? Just a tiny bit below the band edge to attain advantage, or juicing up the input so flourescent lights come on sans switch. Or other infractions in the heat of battle — these should be encouraged? — *Ivor Paulsen, W1OL, Woburn, MA*

☐ Although you admit to being biased, your objective treatment was excellent. Congratulations on a nice article!

Since you asked for comments, my middle-of-the-road attitude has me agreeing with both sides in part. I think contests have a real place, for training value, and to populate a band that needs it, such as 160, 70 cm, 23 cm and so on.

Although I have never officially entered a contest for score, due to limited time, I do enjoy giving contacts to any station active in them. Moderation and respect for the others on the air is the important thing to me. — *Dale N. Diehl, K5WUF, Oklahoma, OK*

MONEY AND PRAYERS?

☐ For the past few years we've had our choice of whom to listen to and believe — the unnamed pessimists advising we sell our amateur equipment while it still had a market, or ARRL promising nothing other than to spend our money as fast as possible and to pray. Either the money was spent wisely or the prayers were properly directed. I care not which. My thanks to all the IARU and League workers for a job well done. — *Dave Heller, K3TX/W5NEJ (ex-K3HNP), Morrisville, PA*

[Editor's Note: K3TX is referring to the favorable outcome for amateurs, of the World Administrative Radio Conference. See the report on pages 52-71 of this issue.]

*Manager, Membership Services Dept., ARRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Licensing, Exams — and the Gettysburg Address

It seems that you need a license for just about everything these days. Our illustrious hobby is certainly no exception. The Amateur Radio license is the instrument by which the FCC authorizes the use of the amateur bands by hams in this country. You know this of course, but before turning the page to check National Traffic System statistics, take a look at some of the recent FCC action concerning licensing. It might just save you some unnecessary waiting the next time you ship your paperwork off to Gettysburg!

Q. I've recently moved. How do I notify the FCC?

A. A letter notifying the Commission of a change of address is no longer sufficient. The FCC has recently ordered that all modifications must be submitted on a Form 610. When processing the 610, the FCC will also automatically renew your license. There seems to be some confusion over the difference between the mailing address and the station location. They do not have to be the same. If both are the same, you must still fill in boxes 4 and 5 on the 610. Remember that the station location must be a geographically identifiable spot, not a box number (97.43). The *mailing address* is the one to which the FCC will send official mail (97.42). It is also the one listed in the *Callbook*. The *station location* is where you will be setting up your fixed station.

Q. I've heard that you no longer need to have the original license in your possession when operating. Is this true?

A. Recently, the FCC has relaxed its requirement that the original operator license be in possession of the control operator of an amateur station. A photocopy is now sufficient (97.82 modification).

Q. When should I apply for renewal?

A. Normally, you should submit an application for renewal, on a Form 610, about 90 days before the expiration date of the license. Doing so means that you will be able to operate beyond the expiration date and until the new ticket arrives. Renewal can be applied for at any time during the term of the license. There is one special case, however: If you are an Advanced class licensee wishing a Group B call, you should apply 60 days in advance only.

Q. I checked the expiration date and found that my license expired last June! Is there any possibility of renewing it?

A. You're in luck. There is a grace period of five years under which you may still renew your expired license (97.13[d]). If you renew within one year following expiration, you will retain your call; after this period, the FCC will issue your station a new call sign. If your license has expired beyond the five-year period, you will have to be reexamined for a new one. Remember that during these periods of grace, your license is not valid and you will not be permitted to operate until your new ticket arrives. Don't forget to date and sign the 610, and attach a photocopy of the original license (97.13).

Q. Can you recite the Gettysburg address?

A. All applications for license renewal or modification should be sent to: Federal Communications Commission, Box 1020, Gettysburg, PA 17325.

Q. I was licensed before 1925 and have been an amateur for over 60 years. Can I receive credit for the Extra Class elements?

A. Not any more. At the present time, no examination credit will be given on the basis of holding or having held any amateur or commercial license, except by the provisions described below (97.25).

Q. Are there any cases where exam credit will be given?

A. Yes. Amateur code credit certificates are being issued by the FCC to applicants who successfully complete the code exams and fail the associated written element. The certificate is good for one year (97.25[b]). Also, an applicant will be given credit for the 5-wpm or 13-wpm code elements if, within five years prior to the receipt of his application by the Commission, he/she held a commercial radio*telegraph* license or permit issued by the FCC (97.25[c]). Code credit for 20 wpm will be given to an Amateur Extra Class applicant if he/she so requests and submits evidence of having held the Amateur Extra first-class license, having continuously held its successor license. Twenty-wpm code credit is also given to Extra Class applicants who hold valid first class commercial radio*telegraph* licenses or permits issued by the FCC containing an aircraft radio*telegraph* endorsement (97.25[d]). In other words, you need a pretty high-falutin' ticket to get any credit!

Q. I am disabled and unable to travel. How can I take the General exam?

A. In cases such as this, a Commission examiner may conduct the exam, or appoint a volunteer examiner to conduct the exam at a location other than an FCC exam point. The back of the applicant's Form 610 should be filled in by a physician certifying that the applicant is unable to appear at a regular exam point because of a protracted disability preventing travel (97.27).

Q. Is it possible to take my examination for General at our upcoming convention?

A. The FCC has recently announced that because of budget cutbacks it will no longer be able to conduct exams by special arrangement at hamfests or conventions. The Commission will honor all previously made commitments, but will make no further arrangements. This action does not affect regularly scheduled quarterly or semiannual exams given at field examination sites.

Q. Does the exam have to be completed in writing? I am blind, and would not be able to read or write the exam.

A. Blindness or other disability sometimes makes it impossible to write out the examination in longhand. In these cases, the FCC permits the blind or disabled applicant to typewrite or dictate the code test and examination answers. The witness or examiner must certify that the exam comprises solely the applicant's effort or dictation, and that no outside assistance was received. Braille exam papers are also available to blind applicants by advance arrangement with the District Engineer-in-Charge.

Q. I am a U.S. citizen working temporarily outside of the United States. How can I be examined for an operator license?

A. You may be examined, for a Novice class license only, by a volunteer examiner. On the application, the examiner is required to explain why his mailing address is different from the one in FCC files before the Commission can mail the written exam. Higher class license exams are available on a walk-in basis, twice a year, in England and West Germany.

Q. What is a reciprocal operating permit?

A. A reciprocal operating permit is the instrument by which a foreign government authorizes Amateur Radio operation by visiting hams. The U.S. has entered into such agreements with a number of countries around the world. These agreements also allow foreign hams to operate in the U.S. Information on specific countries can be obtained from the Membership Services Department, ARRL, Newington, CT 06111.

Q. Does this mean that to operate in Canada, I must first apply for a permit?

A. Not any more; Canada is now an exception. Canadian amateur operators visiting the United States and U.S. hams visiting Canada no longer need a permit prior to operating within the country they are visiting. Otherwise, the existing agreement is still in effect. Visiting amateurs must operate within the restrictions of their home country license and also within the restrictions of their host country's rules and regulations. Since there are no licenses in Canada equivalent to the Technician and Novice licenses here, these licensees are still not permitted to operate in Canada. You should carry your original license with you to facilitate customs checks.

Q. When identifying my station, am I also required to give the other person's call?

A. It is not necessary to send the other person's call when you i-d. There is one exception: At the end of your contact, when signing off, you must give the other person's call in addition to your own: "W1JKS from WB1ACZ clear," for example (97.84[a]). It is a common misconception that you must send the other person's call every time you send yours.

[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 FCC's Personal Radio Branch. Numbers in parentheses refer to specific sections of the FCC rules.]

*Membership Services Assistant, ARRL

YL News and Views

Conducted By Jean Peacor,* K1IJV

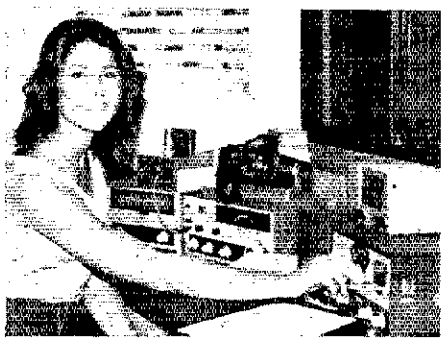
Making It Happen

Heard the one about the three kinds of people in the world? There are those who makes things happen, those who watch it happen, and those who sit back and say "what happened?" Radio amateurs abound who fall into the first category.

Whoever said "Youth is wasted on the young," hadn't met many of the young radio amateurs we are fortunate enough to have in our ranks. They're making things happen. In today's world, the opportunities are there. Richer are those who take advantage of them.

To quote Fred Marchman, AA4FG: "If you've lost faith in the younger generation, you need to talk with Sherrie!" To quote James Roberts, KO4R: "Jonelle has made history at our school and probably in the nation as well." Sherrie and Jonelle are but two of the many YLs making things happen.

Sherrie Hobbick, WD4IXV, is the newest "General" in the 160-member Gulf Coast Amateur Radio Club of New Port Richey, FL.



Newest "General," Sherrie, WD4IXV

First licensed as Technician in 1978 after attending club-sponsored classes, Sherrie's extremely busy school schedule delayed her preparation for upgrading. Everything came together at the Melbourne Hamfest in September just a few days following her 16th birthday. She'll soon have a new 1 × 3 call.

A new ssb station is in the offing and Sherrie's looking forward to joining FL NTS Section nets. Her activity in public service and ARES work has been her chief interest. She has participated in walkathons, both by walking the route and by furnishing communications en route. She is NCS on the West Pasco ARES Net and a member of the GCARC Repeater Team.

In addition, Sherrie's school activities make her one of the "making things happen" people. A "straight A" student, she is a member of the National Honor Society, Spanish Honor Society and the Conservation Club. She is a varsity cheerleader and plays piccolo and flute in the school band. The New Port Richey club is proud to have Sherrie as a new member and, as a result, they are out recruiting teenagers for their classes.

A History-Making Ham

Jonelle Lewis, KB4RS, had the distinction of being the subject of a *Daily News* article in Franklin, GA, at age 19. Its caption was "Franklin Student, 19, Makes History at Tech."

Talk about making things happen! Jonelle is the first YL to graduate from Troup County Technical-Vocational School as a top student in its electronics program.

The school's communications phase of her training prompted Jonelle to become a licensed

Making history, Jonelle, KB4RS

radio amateur. Within a 10-day period, she went from no license at all to an Advanced ticket. No small feat. Prior to that, she had obtained the Radar-Endorsed First Class Radio Telephone License from the FCC.

Jonelle is the only licensed amateur in her family. But, she credits her interest in electronics to her father who brought home fascinating books while attending electronics courses at Troup Tech. At that time, she was a high school freshman. Two years later she transferred to Troup Tech in her junior year to pursue the interest her father's studies had sparked.

Her knowledge of transmitters, receivers, computers and radar qualifies Jonelle for many things. She has begun her career as a medical technician in one of Georgia's hospitals where you can be sure she will continue to make things happen.

Our hats are off to Sherrie and Jonelle and to all the youth in Amateur Radio. They're making it happen.

QCWW CHARTER MEMBERSHIP

Last month's column featured news of the newly formed QCWW Chapter. Charter membership is being held open until just before the annual QCWA QSO parties held in February and March 1980. It is hoped to have a large membership by that time and to offer a special certificate for "Worked 20 QCWW Members."

YLRL CERTIFICATE RULES

(Repeater contacts are not valid on any YLRL certificates.)

YL Century Certificate Rules — YLCC

Custodian: Onie Woodward, W1ZEN, 14 Emmett St., Marlboro, MA 01752.

1) Two-way communication must be established on authorized amateur bands with stations, mobile or fixed, operated by 100 different licensed women amateurs. Any and all amateur bands may be used.

2) All contacts must be made from the same locations. Within a given community, one location may be defined as from places no two of which are more than 25 miles apart.

3) Contacts may be made over any period of years, provided only that all contacts are from the same location.

4) Contacts with YLs anywhere in the world are recognized, provided only that confirmations clearly indicate the stations were operated by duly licensed women Amateur Radio operators.

5) One hundred QSL cards, or other written communications, from the stations worked confirming the necessary two-way contacts, accompanied by a list of claimed contacts, including the full name of the operator, alphabetically arranged (last name first), the call letters, and date of each contact, must be submitted by the applicant directly to the YLCC custodian. Sufficient postage must be sent with the confirmations to finance their return by first-class mail. The YLRL will not be responsible for any loss or damage to same.

6) Endorsements: Confirmations of contacts accompanied by alphabetical list, as described above, from stations operated by additional YLs may be submitted for credit each time 50 additional confirmations are available. Endorsements will be made to the original certificate as application is approved. Gold stickers will be awarded to applicants who have worked their additional contacts from the same location (or within a 25-mile radius). Silver stickers will be awarded, provided only that the holder of the certificate, in moving, retains the same call letters that appear on the original certificate.

7) Decisions of the YLCC custodian regarding interpretations of these rules as here stated or later amended shall be final. All inquiries regarding cards, applications or the certificate should be addressed to her.

OKLAHOMA'S FAMILY OF 10

Can you top this? Many families have 10 members, but how many have 10 who are all members of the ham fraternity? What's more, one is also another "leading lady."

Herman, N5KK (Extra), and Mary Lou Foster, WD5GIF (Advanced), have six children. Four of the six are hams married to hams.

Their son Larry, WB5SVV (Advanced), married Suzanne, WD5CSQ (Technician). Garry, WB5THA (Advanced), married Anita, WD5CSR (Technician). Jerry, N5KZ (Extra), married Lois, WD5JNF (Novice) and daughter Pam, N5KW (Extra), married Sam Whitely, K5SW (Extra). That makes four Extra Class, three Advanced, two Technician and one Novice which equals 10!

Pam "scored another mark for women everywhere, according to the *Muskogee Daily Phoenix & Times-Democrat*, by being elected president of the Muskogee Amateur Radio Club. She's the first woman president of the club since its beginning (about 20 years ago). Congratulations to another "leading lady" and to the family that may just be the record-breaker.

Family hamfest (seated l. to r.): WB5SVV, WD5GIF, N5KK, WB5THA, WD5CSR; (standing l. to r.): WD5CSQ, WD5JNF, N5KZ, N5KW, K5SW.

*Country Club Dr., Monson, MA 01057

Happenings

Conducted By W. Dale Clift,* WA3NLO

FCC Proposes Formal Rules for the Amateur Satellite Service

The Federal Communications Commission has proposed to add a new Subpart H, *Amateur-Satellite Service*, to Part 97 of the Rules. The Notice of Proposed Rule Making (NPRM) in Docket 19852, would first of all make the Rules for the Amateur Radio Service apply to the Amateur Satellite Service, except in those instances specifically covered by the proposed subpart. Generally, all amateur stations and Amateur Radio operators would be authorized to operate in the Amateur-Satellite Service to the extent of the privileges authorized by their Amateur Radio licenses, without any additional authorization by the Commission. However, actual licensing of the space stations would be limited to holders of the Amateur Extra Class operator license.

The NPRM also suggests that any Amateur Radio operator possessing an operator license with the requisite frequency privileges for controlling the space station could be designated by the space station licensee to conduct telecommand operations. Furthermore, the licensee of the space radio station could authorize Amateur Radio stations in other countries to conduct telecommand operations, subject to the regulations of the licensing authority in the other country.

The proposed Subpart H would define new terms, including space, earth and telecommand operations, and would also impose a special requirement that the space station be capable of being turned off by a number of "sufficient Amateur Radio stations licensed by the Commission capable of telecommand operation to effect the cessation of space operation, whenever such is ordered by the Commission." The proposed rules would also list the frequency bands and contain special provisions exempting space stations from the identification requirements of Section 97.87 of the Rules. Special provisions would also permit telecommand operation to be in special codes intended to obscure the meaning of the command messages and exempt telecommand stations from station-identification requirements.

The Notice also proposes rules for the international advance publication of the space stations's operations and international frequency coordination. The proposed Subpart H would also create detailed FCC notification requirements for "pre-space," "in-space," and "post-space" operation.

The Commission invites all interested persons to file comments. Formal participants should file an original and five copies of their comments with the Secretary, FCC, Washington, DC 20554, on or before February 5, 1980. Reply comments are due on or before March 6, 1980. For further information, contact Roy C. Howell, Rules Division, Private Radio Bureau, Federal Communications Commission, Washington, DC 20554. Tel. 202-254-6884.

ARRL ELECTIONS RESULTS

Last month, the results of the ARRL director elections in the Canadian and Great Lakes Divisions were omitted because balloting was still in progress. (See January 1980 *QST*, page 69.) The Committee of Tellers has tabulated the votes in these divisions and declared the following results:

Canadian Division

Mitchell A. Powell, VE3OT, has won the election with 1636 votes. William W. Loucks, VE3AR, the only other eligible candidate, got 856 votes. Mitch, who lives in London, ON, is teaching master at Fanshawe College of Applied Arts and Technology. An assistant director of the ARRL Canadian Division in 1979, Mitch is also a past president of the London Amateur Radio Club, Inc., a director and past president of the Ottawa Valley Mobile Radio Club, and trustee of VE3LFC, the Fanshawe College ARC station. He is also active in QCWA, the Radio Society of Ontario, and the Canadian Amateur Radio Federation. He holds the Amateur Advanced license, and has a 40-wpm code-proficiency certificate. First licensed as VE1WN in 1949, Mitch is a life member of ARRL.

Great Lakes Division

Leonard M. Nathanson, W8RC, became the new director for the Great Lakes Division when he won 2149 votes. His closest contender, John E. Stringer, W8AJW, received 1533 votes, while David E. Heil, K8MN, trailed with 922 votes. Leonard, an attorney living in Southfield, MI was formerly an electrical engineer. He held the offices of president and director in both the Detroit Amateur Radio Association and the Oak Park Amateur Radio Club. He is also past trustee of W8MB, past editor of the Michigan *QMN Bulletin*, and past president of the Detroit Area Amateur Radio Council. Leonard also counts Amateur Radio instruction, ORS, Army MARS, and EC of Wayne County as some of his present and past interests and pursuits. Holder of the Extra Class license, Leonard was first licensed in 1948 as W8DQL. He is a life member of both QCWA and ARRL.

FCC WILL CONTINUE TYPE ACCEPTING BROAD-BAND AMPLIFIERS

On April 28, 1978, the Commission banned the manufacture and marketing of any external radio-frequency power amplifier or amplifier kit which is capable of operation on any frequency or frequencies below 144 MHz unless a grant of type acceptance[1] has been issued for that model amplifier. Following the introduction of this type-acceptance program, a new design of external radio-frequency power amplifier has been introduced to the amateur market. These amplifiers operate with a broad-band capability. While the amplifiers can comply with the necessary technical standards when operated in accordance with their instructions, they are also capable of causing interference problems when operated incorrectly. These units are capable of being used at full output power when operated at a lower frequency than that indicated on the band-selector switch. Under these improper operating conditions, the level of generated spurious and harmonic emissions exceeds that required by the emission limitations contained in Section 97.73 of the regulations. Such excessive emissions can cause interference to other operators in the Amateur Radio Service as well as to services adjacent to the amateur frequencies.

This possibility of creating additional interference has caused some concern over the acceptability of such equipment for receiving a grant of type acceptance. However, it was determined that any immediate denial of type acceptance for the broad-band amplifiers would be an unwarranted burden upon the manufacturers of this type of equipment. Therefore, to allow sufficient time to develop alternatives to the present equipment designs, this Public Notice is being used to alert external-amplifier manufacturers of the interpretation cited below. These criteria will be used when evaluating the amplifiers for the purpose of type acceptance. All applications received on or after July 1, 1980, will be evaluated in accordance with this new requirement. Amplifier models type accepted prior to this date are not subject to this requirement and their type acceptance will not be affected.

Effective July 1, 1980, any external radio-frequency power amplifier or amplifier kit submitted for a grant of type acceptance for the Amateur Radio Service must be capable of

*Deputy Manager, Membership Services, ARRL.

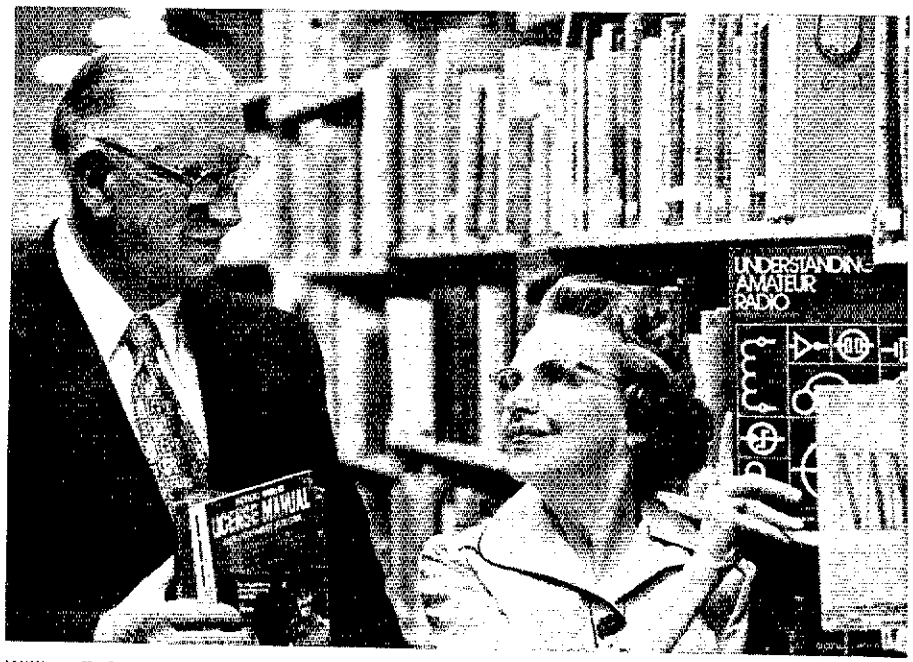
[1]Editor's Note: Type acceptance is an equipment authorization issued by the Commission for equipment to be used pursuant to a station authorization. Type acceptance is based on representations and test data submitted by the applicant.

complying with the emission limitations contained in Section 97.73 of the regulations for any amateur frequency on which the amplifier is capable of operation. This requirement must be met regardless of the position of the amplifier's band-selector switch or the frequency (amateur) of the signal driving the amplifier. The amplifier shall be deemed to be capable of operation whenever its output signal at the fundamental frequency can be adjusted to a level equal to or higher than one-tenth of the designed output power of the amplifier. Conversely, if the output signal at the fundamental frequency can not be adjusted to a power level equal to or greater than one-tenth of the designed output-power level of the amplifier, the amplifier shall be considered to be not capable of operation on that frequency.

A brief explanation of the above requires a look at the characteristics of the designs used in the majority of tuned-circuit amplifiers. With those amplifiers, should the band-selector switch be placed in the wrong position, assuming the amplifier will still function, the operator is immediately aware of the error because of excessive current being supplied to the final stage, tuning problems, and a reduction in output power. In respect to the broadband amplifiers, these error indications are not present to alert the operator of the situation.

External amplifiers in the Amateur Radio Service are permitted a maximum gain of 13 decibels. Therefore, if the amplifier's output signal is required to be reduced at least 10 decibels when operated with high spurious-emission levels, an effective gain of 3 decibels or less will occur. Such a reduction in output power should be apparent to the operator, alerting him or her to adjust the amplifier correctly.

Any questions regarding this material should be directed to Mr. John Reed at Room 7202, FCC, Washington, D.C. 20554, Tel. 202-632-7040. — *FCC Public Notice*



William E. Symons, K4IH, left, president of the Blue Ridge Chapter of the Quarter Century Wireless Association, presents a number of ARRL publications to Elizabeth Marchall, librarian at the Henderson County (NC) Public Library. If your club would like to donate League publications to a local library, contact Hq. for information on purchasing 19 publications at a special reduced rate of $55.

UPDATE ON 10-METER AMPLIFIER BAN LAWSUIT

ARRL General Counsel Robert M. Booth, Jr., W3PS, has delivered oral argument before the U.S. Court of Appeals for the District of Columbia Circuit in the League's continuing legal battle against FCC's March 1978 decision to ban the commercial manufacture and sale of radio-frequency power amplifiers capable of operation between 24 and 35 MHz. (See May 1978 *QST*, page 46.) The ban applies to commercial amplifiers for use on the amateur 10-meter band. After exhausting all FCC procedural means to reverse the decision, the ARRL Board of Directors decided in November 1978 to press for relief in federal court. The Appeals Court case number is 78-1853.

Emphasizing the points made in the League's written brief, Mr. Booth stated that the 24- to 35-MHz restriction was not lawfully adopted because of both (1) lack of notice as required by Section 4 of the Administrative Procedure Act, and (2) such a requirement or restriction was not suggested or proposed in any comment filed in response to the Notice of Proposed Rule Making.

Mr. Booth also contended that the Commission violated Section 302 of the Communications Act, which requires that any regulations governing the interference potential of devices be "reasonable." He referred to two provisions for type-acceptance of amplifiers which already ensure that linear amplifiers designed and built for the Amateur Radio Service cannot be used by a CB station (FCC's reason for adopting the ban). They are: (1) the requirement that the input or driving of linear amplifiers be at least 50 watts, thereby making them inoperative with a 4-watt CB transmitter or transceiver, and (2) the prohibition against use of an internal circuit to automatically switch the antenna from the output of the amplifier to the CB receiver. Amateurs seldom employ such circuitry; switching is accomplished by relays actuated by the operator. "If these two provisions will prevent illegal use of linear amplifiers by CB stations, why, then, is the 24- to 35-MHz frequency restriction necessary?" asked Mr. Booth. The court's decision is expected in two or three months.

THIRD-PARTY TRAFFIC MUST BE LOGGED

The FCC has dismissed a petition, RM-2481, seeking the deletion of Section 97.103(b)(2) of the Amateur Rules, which requires amateurs to note in their station logs all third-party traffic sent or received, including the names of the third parties and a brief description of the traffic content. The petition for deletion of this requirement had been filed by Louis Huber, W7UU. Mr. Huber stated that he felt this requirement contradicted the Secrecy Provisions of Section 605 of the Communications Act of 1934, as amended.

In its Order dismissing the petition, the Commission held that the required log entry was not improper divulgence of radio communication; rather, the Commission is a "lawful authority" to which amateurs may disclose the existence and content of communications without violating the Act.

ARRL ADVISORY COMMITTEES

ARRL President Dannals, W2HD, has announced the names of the members of the ARRL Advisory Committees effective January 1980. These committees prepare recommendations within their specialty areas to the ARRL Board of Directors and/or Hq. staff. These recommendations are based upon consultation with segments of the membership and studies conducted by the committees. (* denotes committee chairman.)

Contest Advisory Committee: Bill Myers, K1GQ; Lew Thompkins, N2LT; Bill Olson, W3HQT; Howard Hoyt, K4PQL; Thomas Morrison, K5TM; Alan Brubaker, K6XO; Frederick Niswander, K7GM; James Stahl,* K8MR; Howard Huntington, K9KM; Edward Gray, WØSD; and Henry Thel, VE7WJ. Board liaison is Tod Olson, KØTO; and Hq. liaison is Tom Frenaye, K1KI.

DX Advisory Committee: Anthony Berg, W1OT; David Beckwith, W2QM; James Douglas, W3ZN; John Kanode, N4MM; Sanford Hutson,* K5YY; James Rafferty; N6RJ; Robert Hudson, K7LAY; Daryl Kiebler, WB8EUN; Norman Meyers, N9MM; James Spencer, WØSR; and Harold Parsons, VE3QA. Board liaison is Gay Milius, W4UG; and Hq. liaison is Donald B. Search, W3AZD.

Emergency Communications Advisory Committee: Frank Jasinski, W1XA; Paul Vydareny, WB2VUK; Bob Josuweit, WA3PZO; Bill Farone,* N4NK; Bob Schmidt, W5GHP; Ed Gribi, WB6IZF; and W. D. Bemmels, WØKL. Appointments are still open for W7, W8, W9 and VE representatives. Board liaison is Max Arnold, W4WHN; and Hq. liaison is Bob Halprin, K1XA.

Bill J. Wheeler, KØDEW, of Lebanon, MO, was named "Midwest Amateur of the Year" at the ARRL Midwest Division Convention, Cedar Rapids, IA.

One good program to generate publicity for Amateur Radio is declaration of Amateur Radio Week in a city, county or state/province. Sometimes, such a Week is observed in tandem with a local event, such as a hamfest. The preferred national date, if it doesn't conflict with a special local event, is the June week ending with Field Day — for 1980, June 22-28. Last year's Amateur Radio Week in New Hampshire resulted in this photo, more imaginative than most. Foreground: Governor Hugh Gallen. Left to right: N1AIX, K1RA, W1NH (SCM NH), W1JY and W1OMZ. Added note: the first two and last of the above are state legislators. *(photo courtesy W1NH)*

Public Relations Advisory Committee: Dee Logan,* W1HEO; Stephen Mendelsohn, WA2DHF; John Rouse, KA3DBN; Gray Berry, W4MGO; J. A. (Doc) Gmelin, W6ZRJ; John R. Brown, W7CKZ; James Apsey, K8JA; Michele Bartlett, N1AGD/9; Thomas Atkins, VE3CDM. Appointments are still open for W5 and WØ representatives. Board liaison is Stan Zak, K2SJO; and Hq. liaison, Perry F. Williams, W1UED.

VHF Repeater Advisory Committee: Lewis Collins, W1GXT; Charles Harrison,* K2MZ; Thomas Carpenter, W3YVV; Charles Durst, WA4WTX; Eilene Spiegel, WA5WDW; Gordon Schlesinger, WA6LBV; Clay Freinwald, K7CR; John Weeks, K8RT; Jack Forbing, K9LSB; Whitman Brown, WBØCJX; and Ronald MacKay, VE1AIC. Board liaison is Carl Smith, WØBWJ; and Hq. liaison is Harold Steinman, K1FHN.

VHF/UHF Advisory Committee: Joe Reisert, W1JR; Richard Knadle, Jr., K2RIW; Anthony Souza, W3HMU; Russell Wicker,* W4WD; Roy Albright, N5RA; Louis Anciaux, WB6NMT; Randall Stegemeyer, W7HR; Ted Hartson, WA8ULG; Malcom Bibby, GW3NJY/W9; Clair Robinson, KØCJ; and J. Leslie Weir, VE3AIB. Board liaison is Jay Holladay, W6FIJ; and Hq. liaison is Bernard Glassmeyer, W9KDR.

LICENSE PLATE BILL FILED IN MASSACHUSETTS

Under present Massachusetts motor vehicle laws, amateur license plates can be issued for a relatively small variety of vehicles — mainly passenger cars. On December 5, 1979, Senator Carol Amick from Bedford filed a bill that would extend the availability of ham plates to privately owned emergency vehicles; this means vehicles with emergency uses, such as pickup trucks, vans and Jeeps.

The bill was suggested by ABIZ, who pointed out that when ham communication is needed during an emergency such as the Amato search last year, it is often useful to bring in vehicles that can operate away from paved roads. Ham plates on such vehicles are an aid to identifying vehicles that should be passed through check points. Senator Amick queried the Registrar of Motor Vehicles and was told that the Registry had no objection to issuing amateur plates to such vehicles, but was not allowed to at present.

While there is no opposition to the bill, the legislature has a large amount of work each year; thus the bill could end up being overlooked. It is suggested that Massachusetts hams write to their legislators asking them to support the change. Letters can also be sent to Senator Amick at the State House. — *John Carroll, ABIZ*

STAFF NOTES

A hearty "welcome aboard" to John Pelham, W1JA, an assistant technical editor in the Technical Department. John will be primarily concerned with editing *QST* technical articles. He comes to us from WEDH-TV, Hartford, where he was a broadcast engineer for six years. Born and raised in Bridgeport, CT, John moved to Newington in 1978, and had to travel all the way across town for his interview! An avid photographer, John also enjoys hi-fi and lifting weights (Viking I transmitters, no doubt!). He received his Associate's degree in Electrical Engineering from Norwalk State Technical College in 1974. First licensed in 1968 as WA1JMO, John earned his Extra Class in 1973 and received W1JA in 1977. Active on hf and vhf, he enjoys chasing DX, general cw operating, and an occasional taste of traffic handling. — *Rick Palm, K1CE*

John C. Pelham, W1JA

Conducted By Stan Horzepa,* WA1LOU

ASCII/RPT

ASCII no longer belongs in the category of things to come; ASCII is here. The FCC finally gave their approval and soon they will release the operating standards for ASCII Amateur Radio communications. Anxiously, we wait.

ASCII will be the fastest nonvoice mode of communications in ham radio. More efficient communications will be achieved. At today's speeds, one QSO may take place in x amount of time on a particular frequency; at higher ASCII speeds, more than one QSO may take place in the same (x) amount of time on that frequency; thus, our frequency space will be utilized more efficiently. In our congested bands, this is desirable; however, there is a problem: At higher speeds, more information can be lost because of interference than would be lost at slower speeds.

Currently, the most popular RTTY operating speed is 60 wpm, which is equivalent to 300 characters per second (cps). At that speed, a two-second static crash can wipe out 10 characters. At 110 wpm (550 cps; the slowest speed that the FCC will probably decree), ASCII will be nearly twice as fast as the popular RTTY speed and twice as much information can be lost. A two-second static crash would wipe out 19 characters, nearly one-fourth of this sentence.

For ASCII communications, a transmission medium that is the least susceptible to interference is desirable. Frequency modulation via repeaters fulfills this need. Contrasted with cw, RTTY and ssb, fm is noise-free. Unintentional adjacent frequency interference is minimal. Via repeaters, there are additional advantages. As we all know, longer distances can be spanned with repeaters than by direct means. Also, many repeaters are already tied into microprocessors. Imaginations will run wild coming up with new applications for microprocessed repeaters that relay ASCII-encoded information.

Using ASCII on repeaters will permit repeaters to operate on one frequency rather than the two (input and output) that are now required. Both transmission and reception can be accomplished on the same frequency.

One-channel repeater operation is achieved by the use of a microprocessor at the repeater site. A station sends an ASCII-encoded message at high speed on the repeater frequency. The repeater receives the message and rather than retransmitting it instantaneously, the message is stored in the microprocessor's memory. When the station has completed sending the message, the microprocessor shuts off the repeater's receiver, turns on the transmitter and begins sending the stored message on the same frequency. At high speeds, the messages are received and sent so quickly that the time delay involved in completing the receive/retransmit cycle is short and not a deterrent to meaningful conversation.

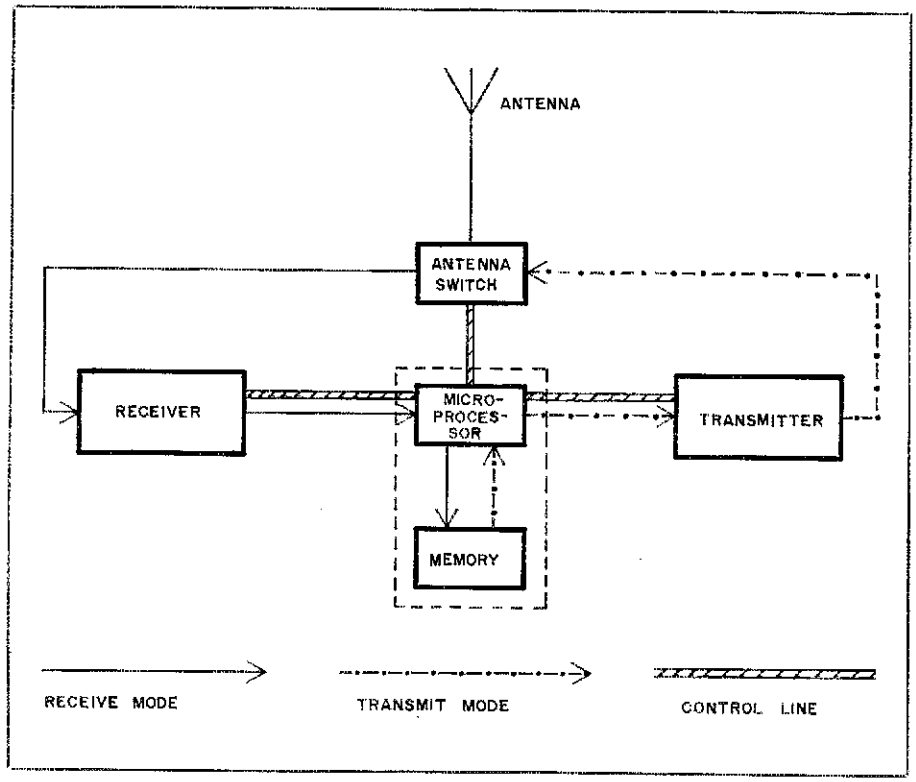
Similar systems are already successfully in operation in the commercial field. Packet radio (small hand-held transceivers attached to or built into computer terminals for the purpose of transmitting and receiving short bursts [packets] of data) data communications use similar repeater systems. One-channel repeater systems can presently be used with RTTY. At the relatively slow RTTY speeds, the receive/retransmit cycle time delay would be too long to permit interactive conversation, although, it would be perfectly acceptable for the simple transfer of information beyond a QSO, however.

The time delay could be further shortened by limiting each transmission to a short period of time. (Please note that throughout this proposal, the assumption has been that each transmitted message is assembled before actual transmission and not simply typed into an ASCII-encoder as it goes over the air, otherwise the advantage of high-speed information transfer would be lost.)

Besides the economy of frequency space, there could also be an economization of repeater hardware in a one-channel repeater system. The cost of adding a microprocessor to a repeater is offset by the elimination of a carrier-operated-relay (COR) circuit and a duplexer or the second antenna and transmission line. Split repeater sites could be eliminated. And repeater desense would vanish!

With ASCII privileges upon us, we are on the verge of a new epoch in ham radio and now is the time to sit down, massage our brains, push our pencils and get this epoch off the ground. 902 MHz, here we come!

*72 Stiles St., Waterbury, CT 06706



A one-channel repeater system proposed for ASCII communications consists of five primary parts. Gone are the COR and duplexer or dual-antenna systems. A microprocessor and antenna switch have taken their place to permit reception and transmission on the same frequency.

A Brief Explanation

ASCII stands for American National Standard Code for Information Interchange. It is a binary code in which each character consists of a string of eight zeros or ones; 10100110, for example. This "8-level" code has been widely accepted as the standard for data transfer within and among computers. Until the FCC ruled that amateurs could use ASCII, amateur radioteleprinter operations were restricted to the more limited 5-level code called the Baudot Teletype code (see "ASCII — at Last," December 1979 *QST*, page 9). — *Hal Steinman, K1FHN*

IMMORTALITY ACHIEVED!

Yes, it's true. Immortality can now be achieved . . . right here in the pages of *QST*. Simply send (to the address below) a good photograph of a unique or interesting aspect of your repeater along with an explanation of what the photo is all about, and, *voila*, your repeater will appear in a future installment of this column.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1DUN, Norman E. Jetts, Alton, NH
W1HDE, Arthur C. McLean, Nashua, NH
W1JOU, Walter W. Smith, Contoocook, NH
W1KYE, Gennaro De Simone, East Billerica, MA
WA1NFK, Charles G. Talbott, Jr., New Canaan, CT
W1QP, Dr. Carlton R. Crosby, Chatham, MA
WA1RER, Stanley O. Chandler, S. Windham, ME
W1TDJ, William Wheeler, Concord, NH
W2CO, Walter A. Cobb, Caldwell, NJ
WB2DJC, Evan M. Davidson, Brick Town, NJ
K2DPW, Marvin L. Vinkey, Williamson, NY
WA2DSR, Harold Gunn, Selden, NY
K2OK, George A. Rhoades, Brick Town, NJ
K3ACE, Alfred C. Gates, Corry, PA
W3AO, Edna M. Davis, Croydon, PA
W3AQE, Donald Kinnier, Rydal Park, PA
WA3ELL, Michael L. Ewart, Baltimore, MD
K3GYZ, Alvin E. Cole, Wellsboro, PA
K3KME, George A. Wragg, West Palm Beach, FL
K3LOE, John M. Thot, Woodlawn, MD
K3YBN, William B. Cole, Pasadena, MD
KA4ADQ, Walter Washington, Jr., Little Rock, AR
W4BFM, Charles E. Uptam, Decatur, AL
W4GHR, John W. Soehl, Sarasota, FL
*KB4IF, Duane L. Walters, Albany, GA
W4ILQ, James H. Austin, Taylors, SC
WD4NWF, Robert W. Taylor, Orlando, FL
W4OX, Wallace E. Spedding, Doraville, GA
WA4WJB, Claude V. Timberlake, Alexandria, VA
K4WN, Richard M. Baldwin, Louisville, KY
N5AEK, Charles R. Harris, Houston, TX
WD5AFY, Grady Y. Jackson, Jr., Shreveport, LA
ex-W5ASU, Derden Matthews, Athens, TX
W5DGG, George B. Lambert, Wichita, TX
WB5GYA, John McCord, San Antonio, TX
W5HRZ, Robert H. McAfee, Rogers, AR
W5OAT, Lloyd L. Johnson, Mabank, TX
W5SF, Albert B. Rose, San Antonio, TX
WA5VIM, Lois H. Mooly, White Hall, AR
W5VLV, Steve S. Setar, Austin, TX
N6BPX, Bonnie B. Smith, Fresno, CA
W6DOU, Paul L. Lemon, Santa Rosa, CA
W6HHE, Norbert H. Soares, Santa Paula, CA
W6HLD, Allan D. Brodnax, San Rafael, CA
K6KT, Wallace E. Francisco, Los Angeles, CA
WA6OGP, Jesse B. Isenagle, Port Hueneme, CA
WB6OPQ, Harry R. Robison, Stockton, CA
K6PB, Lauriston C. Marshall, Gualala, CA
W6QS, Frederick A. Gwynn, Palo Altos, CA
K6TLU, John D. Iglinsky, Wilmington, CA
K6YT, Walter W. Wallace, Oceanside, CA
W7DVJ, Paul A. McKesson, Las Vegas, NV
W7FTF, Chris B. Linschoten, Salt Lake City, UT
WD8CLT, Cynthia R. Siebel, Parkersburg, WV
WD8DOC, Clifford G. Poole, Brunswick, OH
W8DQP, Dr. Clarence Schweigert, Detroit, MI
W8EIR, Howard P. Estes, Chelsea, MI
WA8ENA, Harry L. Welch, Brooklyn, MI
KA8EPG, William K. Baldwin, Winfield, WV
(W8ETW, Clifton T. Falls, Walbridge, OH
N8HI, John C. Widman, Traverse City, MI
WB8ISQ, Norma C. Belland, Rapid River, MI
WD8IER, Henry C. Leis, Jr., Saginaw, MI
W8NPV, Lawrence W. Nollenberger, Newark, OH
K8OAB, Roger H. Remaklus, Dundee, MI
WA8RKM, James E. Oldaker, Huntington, WV
WD8RTT, John H. Kagay, Ann Arbor, MI
WA8SSJ, Howard A. Schaefer, Lancaster, OH
W9GXH, Anthony Dambrauskas, Berwyn, IL
W9IYD, Robert J. Rupp, Waukegan, IL
W9PME, Robert S. Downer, South Bend, IN
W9QIQ, Wayne Lappincott, Milton, WI
K9RML, Carl L. Baldwin, Clermont, FL
WØAUL, Robert M. Evans, Des Moines, IA
KAØDDA, William S. Hanson, Duluth, MN
KØGHH, Curtis Kluger, Swea City, IA
WØJFR, James H. Quigley, Falls City, NE
KØLPE, Joseph E. Hoover, Concordia, KS
WØNHJ, William E. Christy, Richmond Heights, MO
KØQKN, Carl O. Nash, Luverne, MN
KØRAR, David W. Laux, Goodman, MO
WØVEA, Dayton L. Phiter, North Platte, NE
VE1ARH, Lloyd E. A. Hamm, Halifax, NS
VE1CT, John Henry Thoms, Dartmouth, NS
VE1GU, Alex A. Wilson, St. John, NB
ex-VE1LU, John Stanley Beazley, Dartmouth, NS
VE2BR, George Brewer, Lachute, NS

*Life Member, ARRL

Hamfest Calendar

Colorado: The Grand Mesa Repeater Society will sponsor the first annual Western Slope Swapfest on Saturday, February 9, from 10 to 4, at the Lincoln Park Barn, Grand Junction. Talk-in on 22/82. Advance table reservations $2 per table. For reservations and info write Larry Brooks, WBØECV, 3185 Bunting Ave., Grand Junction, CO 81501.

***Delaware:** The Delaware Valley Amateur Radio Society will host the Winter Fest and Computer Show on Sunday, March 2, from 10 to 4:30, at the Christiana Memorial Hall, Route 273 and Old Baltimore Pike, Christiana. Talk-in on 52, 35/95 and 223.36/224.96. Frostbite tailgate section available. Tables, food and free parking available. For advance tickets and info write DVARS, P. O. Box 426, New Castle, DE 19720.

Iowa: The Davenport Radio Amateur Club Hamfest will be held Sunday, February 24, from 8 to 4, at the Davenport Masonic Temple, located at 7th Street and Brady (Hwy. 61). Tickets $2 advance, $3 at the door. Tables $3, plus $2 for ac hook-up, if desired. Talk-in on DRAC (WØBXR) repeater, 28/88. For tickets, write to Clarence Wilson, WAØOEW, 1357 W. 36th St., Davenport, IA 52806.

***Illinois:** The Sterling-Rock Falls ARS will sponsor Hamfest-80 at the Sterling High School fieldhouse on Sunday, March 9. Advance tickets $1.50, $2 at the door. Large indoor flea market for radio and electronic items only. Tables available at the door only, on a first-come basis, $3. Free parking with RV area. Prizes. Two shopping centers and theaters nearby. For tickets, write Don Van Sant, WA9PBS, 1104 5th Ave., Rock Falls, IL 61701. Please make checks payable to Sterling-Rock Falls ARS. Talk-in on WR9AER 25/85.

Indiana: The LaPorte Winter Hamfest will be held Sunday, February 24, in the LaPorte Civic Auditorium beginning at 8 A.M. Plenty of free tables. Coffee and hot food available. Tickets $2.50 at the gate, $2 advance. Hotel, restaurants and gas available. Talk-in on 52. Info, reservations and advance tickets from LPARC, P. O. Box 30, LaPorte, IN 46350.

***Kentucky:** The Mammoth Cave ARC will sponsor the annual Glasgow Swapfest at the Glasgow Flea Market building, 2 miles south of Glasgow on Hwy. 31E, on February 23, from 8 to 5 CST. Large heated building. One free space with table and chairs for each exhibitor, other spaces $3 each. Prizes, free coffee and free parking. Talk-in on 34/94. Info from WA4JZO, 121 Adairland Ct., Glasgow, KY 42141.

Massachusetts: The Algonquin ARC will sponsor their third annual Ham Radio Flea Market on Sunday, February 24, at the Marlboro Jr. High School cafetorium, just off Rte. 85 North. Admission 50 cents. Tables $5 in advance, $7.50 at the door, if available. Food available. Talk-in on 01/61 and 52. Will be held rain, shine or blizzard. For info or reservations contact Charles D. McCarthy, WIBK, 128 Forest Ave., Hudson, MA 01749, Tel. 617-562-5622.

Massachusetts: The University of Lowell Wireless Society will hold its annual Auction and Flea Market on Friday, March 7, in Cumnock Hall, University Ave., Lowell. Doors open at 6 P.M., auction at 7:30. Advance table reservations $5, $7.50 at the door, if available. For table reservations, info and directions contact University of Lowell Wireless Society, Box 133, Student Information Center, University of Lowell, Lowell, MA 01854.

Michigan: The Traverse City Swap 'n' Shop will be held Saturday, February 9, from 10 to 4. Talk-in on 25/85 and 52. Prizes. For more details contact Jim Fenton, W8LVZ, 11476 Cedar Run Rd., Traverse City, MI 49684, Tel. 616-275-7597.

Michigan: The Livonia ARC presents its 10th Anniversary Swap 'n' Shop on Sunday, February 17, from 8 to 4, at Churchill High School, Livonia. Plenty of tables, prizes, refreshments and free parking. Talk-in on club station K8UNS on 52. Reserved table space (12-foot minimum) available. For further info send s.a.s.e. to Neil Coffin, WA8GWL, Livonia ARC, P. O. Box 2111, Livonia, MI 48150.

New Hampshire: The Interstate Repeater Society will hold its annual Auctionfest at the Sheraton Wayfarer Convention Center in Manchester on Saturday, March 8, at 7 A.M. Auction starts at 10. Prizes and refreshments. Admission 50 cents for adults, children under 15 free. Talk-in on 25/85 and 52. For more info send s.a.s.e. to IRS Auctionfest, P. O. Box 94, Nashua, NH 03061, or call Gary Delong, KA1BCA, at 603-434-5872.

New Jersey: The Splitrock ARA Auction will be held Thursday, February 28, at 8 P.M. at De Maio's Supper Club, Route 287, Hannover. Talk-in on WR2ADB, 38/98 and 52. For further info contact Splitrock ARA, P. O. Box 3, Whippany, NJ 07981, Attn: Auction Committee.

North Carolina: The Briarpatch ARC will hold its annual Hamfest on Sunday, February 24, from 8 to 3 at the National Guard Armory, in Elkin, NC. Talk-in on 22/82, 69/09 and 52. Food and prizes. For details write Phil Berry, N4AKZ, Rte. 1, Box 143, Woodlawn, VA 24381.

***Ohio:** The Mansfield Mid-Winter Hamfest/Auction will be held Sunday, February 10, at the Richland County Fairgrounds, Mansfield. Prizes, flea market, auction. Large heated buildings. Doors open to public at 8 A.M. Talk-in on 34/94. Tickets $1.50 advance, $2 at the door. For info or advanced tickets contact Harry Frietchen, K8HF, 120 Homewood, Mansfield, OH 44906, Tel. 419-529-2801 or 524-1441.

***Ohio:** The Cuyahoga Falls ARC's 26th annual Electronic Equipment Auction/Flea Market will be held Sunday, February 24, 8:30 to 4, at North High School, Akron. Tickets $2. Bring tables, or some available for $2 each. Refreshments and prizes. Easy access from Tallmadge Avenue off-ramp, North Expressway (Rte. 8). Connections to major interstates and Ohio Turnpike. Talk-in on 04/64 and 52. Details from CFARC, P. O. Box 6, Cuyahoga Falls OH 44221, or call K8JSL at 216-923-3830.

Virginia: The Vienna Wireless Society will hold its annual Winterfest Sunday, February 24, at the Vienna Community Center. Indoor tables $2 to $5, depending on quantity. Sales, prizes and food. Outdoor tailgating $1. Open at 6:30 for vendors, 8 for others. Prizes. Admission $3, preteens with parents free.

Wisconsin: The Wild Rivers ARC will hold a mid-winter Swapfest at Minong village hall on Sunday, February 17, from 10 to 3. Admission $3, Tables free. Talk-in on 28/88 and 52. For info contact Roger Doehr, W9DLY, Route 5, Box 452, Hayward, WI 54843.

Coming Conventions

March 22-23
Roanoke Division, Charlotte, NC

March 28-29
Great Lakes Division, Muskegon, MI

April 18-20
Missouri State, Kansas City, MO

May 16-18
New York State, Rochester, NY

May 24-25
Midwest/Central Division, St. Louis, MO

May 31-June 1
Kansas State, Salina, KS

June 7-8
Delta Division, Senatobia, MS

June 7-8
West Gulf Division, Dallas, TX

June 21-22
Georgia State, Atlanta, GA

ARRL NATIONAL CONVENTIONS

July 25-27, 1980
Seattle, WA

March 13-15, 1981
Orlando, FL

*ARRL Hamfest

How's DX?

Conducted By Clarke Greene,* K1JX

Novice DXCC? WB3JRU is On His Way

"Thanks for the report, Ahmad. We're running a kilowatt here to five elements at 85 feet. Say, have you heard anything about that trip to Heard island? That's one of the four I need, to have them all. The grapevine has them leaving next Tuesday . . ."

The above seems typical of the conversations many of us hear on the DX bands. Everyone, it seems, has a giant tower, fortified with monobanders, on their hilltop. Perhaps worse, everyone needs only a few exotic confirmations to make the DXCC Honor Roll.

Fortunately, or maybe unfortunately, you only hear about *these* guys, who are, in reality, the exceptional DXers. This month we'll talk about another exception; the other extreme.

Bernie, WB3JRU, has been a ham for about two years. A Novice at that. When he first became active, he started chasing states, just like a lot of newcomers. As he kept looking for just a few states to complete WAS, that got to be kind of boring. So, one Saturday he looked around the Novice band and found a KZ5 on phone who actually came back to his cw call. On the same day, he worked a VE7 in the same fashion. That started him off. We asked Bernie to share some of the experience he's gained in his 20 months of DXing in the Novice band.

How's DX?: How many countries are you up to now?

WB3JRU: The last one I worked was no. 135. I still need a couple of cards to get the 100 for DXCC, but a lot of them are probably coming through the bureau.

How's DX?: That's pretty good. What do you have for a station?

WB3JRU: My dad's a ham too and we share the station. We've got a Ten-Tec Triton IV. For antennas we've got a three-element tribander and some dipoles.

How's DX?: How high is the beam?

WB3JRU: It's mounted on our roof. Our house is only one story tall so the beam is only about 20 feet up. Same with the dipoles.

How's DX?: So a super station isn't required to work DX in the Novice band?

WB3JRU: No, not at all. Out of those countries, there were probably only three or four times when I had to work through a pile up. Pile ups are really rare. Usually when a DX station shows up, nobody calls him! So by listening a lot you can catch a lot of DX just about begging for contacts.

I also called CQ DX a lot. Since not many Novices seem to be seriously interested in DXing, there aren't too many stations in the Novice band who are looking for foreign stations to call them.

How's DX?: Maybe a lot of these DX stations move higher in the band to avoid the QRM.

WB3JRU: Could be. In the last CQ World Wide Contest I worked a CN8 in the Novice band after two of the big guns worked him. It wasn't one I needed though.

How's DX?: Are DX contests productive in the Novice bands? I mean is there a lot to work?

WB3JRU: Sure. In that CQ contest I made over a hundred contacts. Lots of stations, especially the Europeans were all over the place. A friend of mine had even more contacts but I beat him in zones and countries. Right at the end of the contest I worked P29NDX on ten meters. They have a Novice band in Australia too.

There are a whole lot of stations that are on for the Novice Roundup. You have to tell them you're in a contest and ask for a contest report, but they're always happy to give one. I worked a lot of Europeans that way.

How's DX?: You said that there aren't too many real active DXers in the Novice band. What do you mean?

WB3JRU: There are a lot of guys DXing, but not *that* many. Really, the competition isn't nearly as bad as in the General or Extra Class bands. We have a few Novice DXers in this area. We even have a telephone alerting system in the area. If anyone hears a country one of the other guys needs, he calls him on the phone. I'm in charge of that.

How's DX?: For most DX clubs, the alert system is really put to use when a DXpedition comes on the air. Do many DXpeditions try to work Novices?

WB3JRU: No. ZL1ADI always makes time to work Novices when he goes somewhere, but most don't.

How's DX?: Maybe they aren't familiar with where Novices can operate or they don't know Novices are interested.

Karnik, VU2CK, and his daughter Alka, VU2ALK, visited the United States recently. Here they are at the station of W2JB. VU2CK recently retired from Indian Airlines, while his daughter is a nuclear physicist at Delhi University. (*photo courtesy W2JB*)

WB3JRU: I don't know about that. I've written a couple of guys who were going on expeditions asking for a sked or a time when they'd be in the Novice bands. I even volunteered to be QSL Manager for their whole trip. They didn't even answer. You know, if these expeditions only spent an hour or two in the Novice bands, all the Novices and Technicians who are interested could work them. Some of these countries won't be on again for several years, so the guys who are just starting now will need these countries for years and years.

How's DX?: Which bands do you think are the best?

WB3JRU: I really like 10 meters. With conditions as good as they are, you can really work a lot on 10. Fifteen is good too, but 10 seems a little better, for me. A lot of times, I try to work guys who are on phone. There are a lot of DX stations operating phone in the Novice band, and most will answer a cw call. Some have made a big deal about not answering but most guys are willing. I worked a lot of stations that way, including such places as Egypt and Syria.

I haven't worked too much on 40 or 80. ON4UN listened up in the Novice band for me one night and I worked him on 40. On 80 I haven't worked outside North America, but I did work Alaska and VE1AI/1 on Sable Island. Oh, yeah, I've worked a lot of Caribbean and South American stations on 40.

How's DX?: How about operating techniques? Do you do anything special?

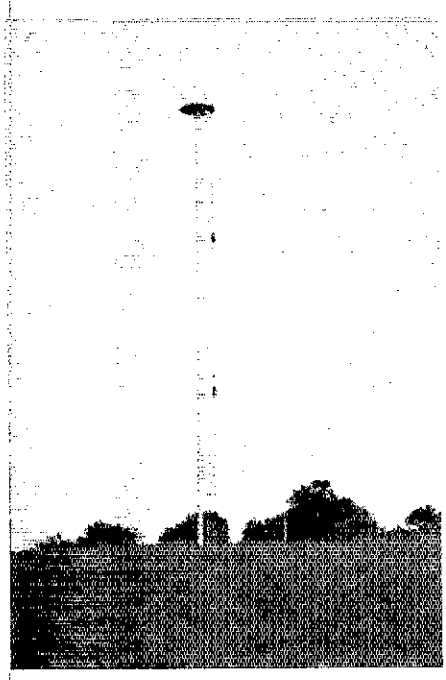
WB3JRU: Well, I've listened a *lot*. I like to SWL on all the bands, even 20 where I can't transmit. On 80 I've heard lots of DX. One morning, a VØY was coming through so I called one of the local DXers who went down and worked him. I think listening helps a lot. It's really interesting, and I think it gives me an idea when and where the bands are open to.

The big thing I do, that is different from a lot of Novices, is to keep the calls short. I was in a pile up once and the Novice who got through to the DX was in California. When it was his turn to transmit, he sent the report three times, his name three times and the QTH three times. The third time he spelled out California, I dropped my call once. I was the next guy the DX station worked.

Usually the DX station will come back to the first guy he can identify. A bunch of short calls always seems to work better than a long one. The other day one of my friends worked an EA9 and called me on the phone. While they were still working each other I found them and waited. My friend signed in a hurry so I could work the new country. We worked just before the band dropped out.

How's DX?: One last thing. Do you find being at home late in the afternoon helps? Being a high school student you can be on the air when other people can't.

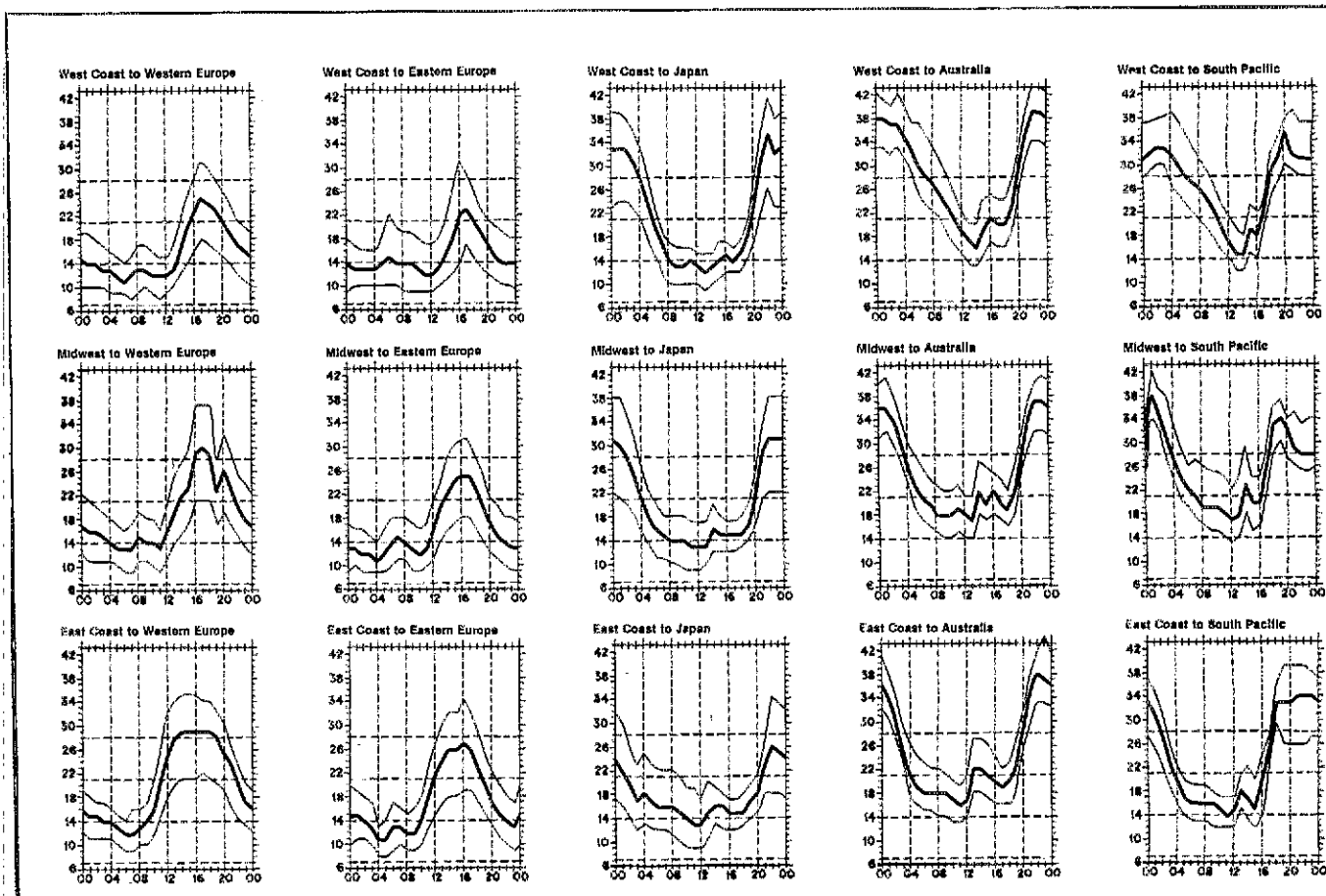
*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770



Field Day, Swiss style. The photos are of the HB7BBM/p operation during the Swiss National Field Day. The middle photo shows HB9BBM on the left of HB9MQ. At the right HB9MQ relaxes at his home station. *(photos courtesy of W4MGN)*

WB3JRU: No, I don't think it helps much. I've found the best time to be on is early in the morning, like before school, and early in the evening. Even on weekends that's true. I don't know whether it's propagation or if that's when the DX is active, but those are the best times.

Bernie offers some good advice for anyone just getting going, not just Novices. All you more experienced ops, remember this; the Novices of this year are the guys in next year's pile-ups. Isn't it worthwhile to encourage good operating skills in these new operators? Maybe some of the clutter heard on the bands might get reduced to only a dull roar.



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

Roger Western, EP2IA, was one of the most active amateurs from Iran in recent years. Here he is at his now-dismantled Tehran station, where he made 22,000 QSOs in 18 months. You can work Roger now back at his home call G3SXW.

DX CLUB NOTES

Two DX Clubs were inadvertently left off the list published in the December *QST*. The list was provided by the Club and Training Department at ARRL headquarters and included all the clubs who had current yearly club reports on file and were thus known to be active. If you club wasn't listed, an error of omission could well have been made; but more likely, it meant that your club officers hadn't kept ARRL headquarters up to date with the requested paperwork. Here are the DX clubs that weren't listed in December's column:

The Dauberville DX Club, P. O. Box 73, Dauberville, PA 19597.

The Kansas City DX Club, c/o Stu Conrad, 9100 Nall, Overland Park, KS 66207.

The following is an address change from that listed in December's Long Island DX Association, P. O. Box 173, Huntington, NY 11743.

QSL Corner

Administered By Joan Becker

In the past few months, we have listed and informed you of the workings of the Incoming or Domestic Bureaus and how they function. For those of you who are not familiar with the workings of the ARRL Outgoing Overseas QSL Service, any ARRL member can utilize this outgoing service by observing these criteria:

1) Sort QSLs alphabetically by call-sign prefix — (A4, AP, CE, F, G, GI, JA, VK1, 3D2, etc.).

2) Enclose the address label from the brown wrapper of your *current QST*.

3) Enclose the proper fee for the QSLs being forwarded ($1 per pound or portion of a pound). For example, one pound equals 155 to 175 cards — the fee would be $1; for one-and-a-half pounds, $2; for two pounds, $2.

CORRECTION

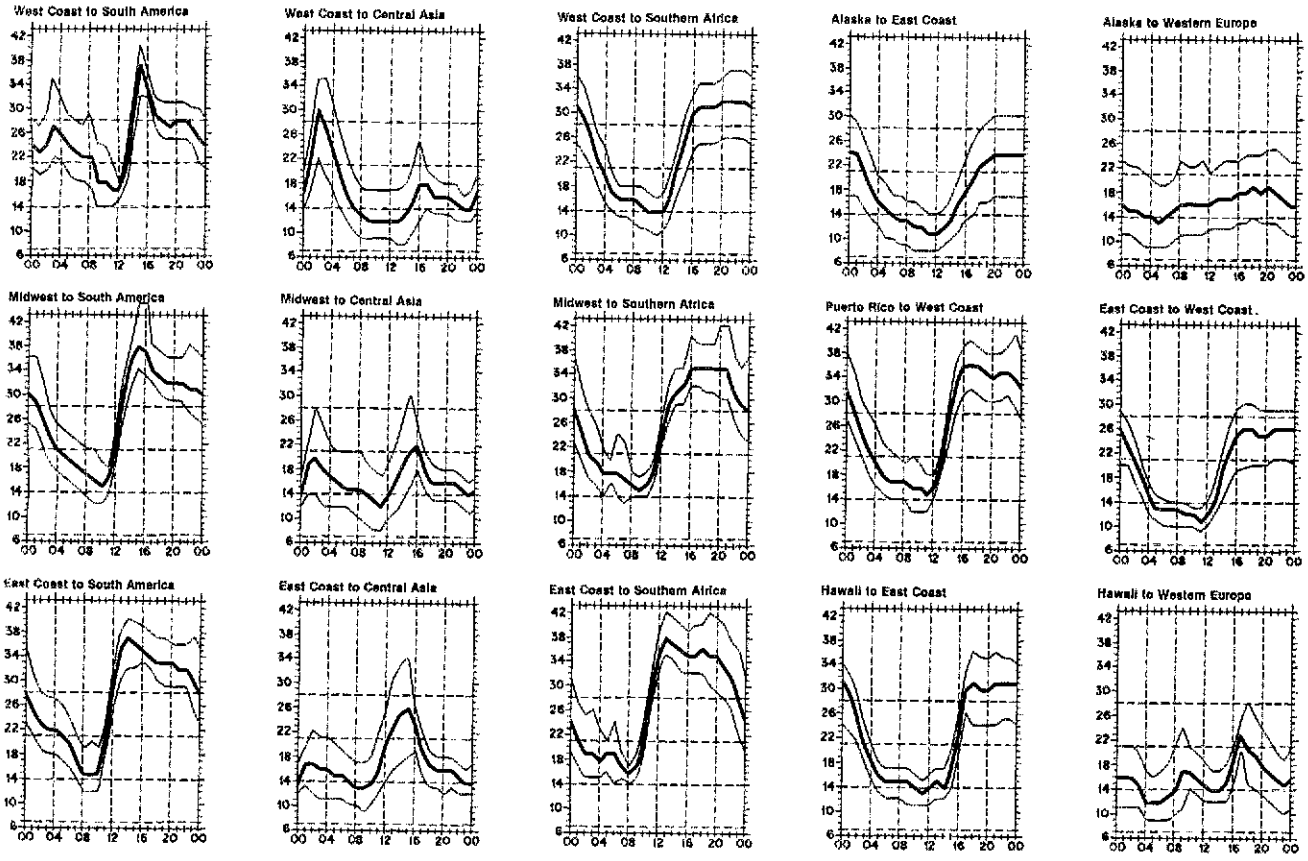
Palmyra (K6LPO/KH5) QSLs should go to WA6YQW, *not* WA6YQF, as printed in January "QSL Corner."

DX QSL MANAGER VOLUNTEERS

KA4AUR
WB5MJK
K4BUE

The following information is for those who would like to QSL direct. As always no guarantee is made for accuracy, as these are printed as we receive them.

A35QF/ZK2PE (K9LSA)
A4XHJ (DK4MS)
FK8CW (K2IJL)
F0FEM (WB2ZEW)
HK0BXK (WB4QFH)
HT1AR (K7UU)
KG6SW (W7OM)
K9EJ/8R1 (K1RH)
JY4MB (WA4HNL)
PR8ZPJ (W7BUN)
TG0AA Nov. 24-25, 1979, via W1XX (see below)
TG0AA Nov. 16-19, 1979, via CRAG, Box 115, Guatemala City, Guatemala, Central America
W1XX/TG via above address
TN8BL (VE3HGW)
TU4AUQ (F6FPF)
VP1JEC (W4BSO)
VP1RX (W4SME)
VP2EAI (WA7IRD)
VP2MEX (I3SUE)
VQ9PC (K9KER)
VS6DD (N6ADD)
VP5MRX (K8MR)
W1XX/OH0 via John Lindholm, W1XX, 567 Broadview Terrace, Hartford, CT 06106
W5ZPA (W5RV)
XT2AW (KN1DPS)
YV5AMU (K4BUE)
ZD7HH (W4FRM)
ZD8AI (N3WM)
ZK1AM (W0WP)
ZK1MB (ZL1ADI)
3B9RS (DJ6Q)
7P8BL (K5PME)
7X2BK (WA3HUP)
7Z2AP (I8YCP)
8P6ML (AF1B)
9Q5GS (DK4MS)



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 February 15 to March 15, 1980, assume a sunspot number of 159, which corresponds to a 2800-MHz solar flux of 202.

DX Century Club Awards

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. There are now 319 countries on the list, and the DXCC Honor Roll (published in the March and September issues) highlights those ops who are within 10 countries of that figure. Each DXCC certificate may be endorsed for additional countries over 100 — in increments of 20 up through 240, increments of 10 through 300 and increments of 5 over 300. This listing contains the call signs and exact country-totals of amateurs who've joined the DXCC or increased their country-totals during the period from October 1, 1977 through September 30, 1979. Think you may be ready for DXCC? Write Headquarters for details.

Cw annual listing will appear in February 1980 QST.

CW

302 W9KNI
301 K6GA
298 K9MM
293 N4WW
291 K7TQC N4HJ
285 ON5NT
284 W8AH W9ZM
282 DL6EN
281 K2FL
280 JA1JRK F3FN W6PT
279 K8MFO
277 W3KT
274 SM5BHW W9DWQ
272 K4PI
267 JA8JL K4IEX K4XO
265 WØWP
262 JH1VRQ
261 JA1EMX
259 OZ1VY
257 IF1PJK
256 DJ2BW DL8AN
255 JA1IBX K5UR
254 K6JG
252 W3GRS
251 K9AJ
250 F3AT JA1BWA OZ1LO YU2RTW
247 K5LM
246 SMØGMG
244 WØSR
243 K8DYZ WB6ZUC
242 JA2AAQ JA8ZO
240 DL7AA KE4I W1JR W1NG W2NC W8RT WØBW WA6TLA
239 W8UVZ
238 W4LVM
236 W6ZCG
234 JH7BRG
233 DL1PM K6DT N4OW
231 N4WX NØRR
230 DL1HH JA1HN
229 JA1GTF
227 W1GL
225 W1AB W9GW
224 K2UO K7ZR OZ7BW W9SFR WB8JEY
223 K9RL W9TY
222 HB9HT K9GN N1AC N5JR OZ3Y
221 I8OBG K8WW WB8OBA
220 AE6U K6CBL N4MM OH2BN SMØAJU W4BV W6BS W8OA
219 K6AC W7LR
217 JA8AA K6XP K8CW PY2ELV
216 W4KN
214 N6JV
212 K2IJ
211 OE1ZGA
209 K5OR KØKES
208 WB6RSE
207 AA4M I5XIM
206 N4SV W1BB W1YY W6TFO
205 JA1QXY JAØCUV K5VT WB9SLV
204 JA2BP K7UR WØBN
203 JA2EIV JA8CFR K2SHZ SM5AKT W6HGQ
202 W1YN W6JO W6UY N7UT
201 JA7JAA N7MW W4WJ
200 F6DCQ JH7LMZ K4FJ K4NV K5RW K5TSQ K8LJG N4RR SMØCCE JE3BX W4NBP WA4DAN
199 N2CW SVØAA
198 K8YK
196 N4HI
195 W7SM
194 N3ED
193 DK8NG
192 W2LZX W7WN W8BZW
191 K8ZH
190 K2BZT
189 K5ETA
188 JA1KF K1SA W4JFE
187 N4NX
186 I3HDH PY5WO W2MIG
185 W3AP
184 K4UEE N8JW SMØCCM
183 N6DS W2MD
182 AB4H AC1O K4SE W2OB
181 DL3BK K9OXY W3ODJ
180 AD1C DJ7CX DL1ES JA2INS K6KII KØLST N2AC N2JA N8BM VE7CNE WØCAW WØOQK WB4OSN
176 JR1URH K1RH OK3EA
175 K2LX PY2RG W5FL W8JW
172 DJ5DA N4DW
170 I1GXR
169 W8GKM
167 JA5GAX W6UR WB7ASF
166 JA8AJS K6RLY W2RS
165 FG7XA WA4VMZ
164 CX4LO D4CBS N9MM W4BQY
163 JI1VLV N3RL SM6CRH W2PV
162 K2SX K9QVB WB2KXO
161 DL1EV N6MU SM6AYM
160 OK5AD K1TO K9WA KD4Z KL7H N4OT N4SX W2TO W4WXZ W7KVV WA2JOC WA4JTI WB5UWF
159 HP1AC KH6HC
158 EA2CP I3BLF K9ZO KN4B W3GL
157 G4BUE PY2BW
155 IT9GLJ W6OKX WØVX
154 K3IE K5MK YV4BK
153 K2KA K5KLA W1EWO
152 JA2ETO W4AX W4OUN
151 DF4GV IØWLS JHØCAZ K5ZD N5DX OK3JW
150 KØRP N6IM OH2BDA W5SVZ W8YQ
149 JA1KJW K1UO K8FU SMØDJZ
148 JA1OEH K4SB VE3AKG
147 K3NR N4VA WA9ITB
146 JA7HMZ N8II
145 DK3ES K3EQ W1WA W8DA J9FD WA2ORX
144 W9HR WA3GJZ ZP5AO
143 AB4Z AC4GRW DL7DX K4HRG W2QL WA4MCH
142 G4FAM K4EFZ KB8KW OK1MP PAØTA SM6CMU
141 DK5AD/W3 JA1SGU KØDEQ NØHY W3KFQ W9AG W9VJW
140 AC6MUR DJ2AA DL1QT HB9ALO I8AYS JA1GLT JA7BMR JA7JT NØRF K8SW K9BK W2PQZ W3IVB W7EEJ W9DH W9IT W9RW WØAP WA5YMW WA6TYQ
139 PT2OFR SM6FKF W1WLW
138 I1SBU JA2DMO JA8CNL SM5AQD VE2EGC YB7AAU
137 DJ3OE SMØGMZ
136 K6WD VE3DGI
135 DL1BS JA1ENA JF1KKV K5GO K8HV K8IP
134 K2TV N5RF WØNB
133 DF3FI N2KJ W7IIT
132 IØDYB JA2KVD
131 JA1IDY K3QIA OH3NY
130 JA1PIG/PZ JR3PYW K3VDU N4IB N6VR N9RR WA7ZLC
129 K1WB
128 I3MLO I3MQ JA1INV N4PY VE1AJP VE1BDT W2TE WB3JUK
127 I5IZ K9CW LU8ADK N4CQ WB9KBV WBØYUI
126 HI8MOG JF1DSN W3JF WA5TTX WBØTTL
125 AA1K DL9TJ N2UN N6PV VE6AYI W9OW WA2AUB WA5VUW
124 DL6MK JA7JWF N1HW VE3IHF WØIUB WB2FFY
123 AA4NA DK7RW HI8LC K9IW K9LV N9NS WA8OEC
122 DK6IS GM3LYY HB9BIF JF1VSA JI1WHM K6RK KL7AF N1RI N5RR W5TVX W7OK
121 HK3YH K5OA LA9CJ N4YM OZ1DYD K3KA W5OB W6TOR W8DCH
120 EA6FD K2NJ K3TZV K4IYS K9CT N4OI N6FI N7RO N9KW PT7AC W1OPJ W2LMO W2SGC W4LOO WA4OMQ WB4RUA
119 DK8SL JA6OKK K8VM N4GG 5Z4CW
118 W4JD WB4UME YU1NZW
117 K2QF N4QS PT7VJZ
116 DL3CW DK7SU JA7GLB 5T5CJ
115 AB9E W1FZ W2WZ
114 JA7AMA KL7PI OZ1AC
113 DK7XX DL7BQ JA4CTL JA7ARH N9WA OZ1CTK PJ2VD W1RJU
112 OF3KT DL6VW K1TG OH1FM W1XS
111 I4CJW K5EOA W4DGJ W6RU WDØFZJ ZE4JS
110 ACØS DK6AS DK6CS GM3YOR GW3INW JA1FIJ JA2RJC JA3CSZ JF3LBD JH2CJW JJ1BBQ JR1FVW K3GJ K9EVB LZ2DR N8MC OH8PF SM7CZC W3FLA W5LFS W7DPW W8TWA WA2EYA WB3FIZ 9H1ED
109 AA7C AC2U AF8Y AG4S EA8NU JA1DFQ JA3CHO JR1IOS N8SI W9WI WA2CDD WA2YSA WD8DZO
108 DL7AR JA1JKG JA5SIX JA6PWN JJ1WWG K2PX K2YGM K3UA K4JYS K6OC N4MT W1NHJ W1RED W4HAL WB3CQM WD4IHV 9H1FN
107 DK5VO HB9BNV JA8MHG K9MFI N2FF N4TJ N6MU W6HOL YV1OB
106 AA4CK DF3FJ EP2LA JA7WMO JH6HYC N5TC N9ER ON4JV W3KV
105 AA4US AF6D CX7BBB DF4OW DK5PR HM2JN JA3BAG JA3GM K4AIZ K7CU K8AV K9MK N6JM N6ND N6UC OH2PQ OH6JW W1HX W2ZZ W8GMH W9VA WØSA WA8MOA WB3AXN WB4TUY WBØRRX 4Z4MB
104 DL3IA DL7WL JA1KQX JA3HCN JA4GAS JA6MPJ JA8TRT K4OAH K9UWA KØSVX OH1EH PY2CYE SM5VB VE2AH VE2WA W1IQ W1ZR W3HAZ W4MPY W8AN W8CD WD9IIC 9M2FK
103 AB1V DF2KV DJ4XA DJØGD DL3NU EP7VW F9XL J7DD JA2TK JA3ARM JF1ABD JH2XHH K3SWZ K5EJO K5OGX K5XE N1ZT NØOA PAØUGB W3RO W6RZ W7IGE W9PN WA1CCR
102 AB5J ABØX AD1Q AG5G DJ4EY DK6NG I4HNI I5EPM JA6GDG K6CR KZ5EK N8RF OH1LA HB9WL VE3CXL VE7DLM W1LOO W1WKP W2SFC W3AX W6IA WØJF WØMB WØSI WA1SWV WB2MVS WD8MAS
101 EA5GR HB9BBB JA1BGS JA1ILN JA7EWS JH3JEX JH3KAI JH6XOD JR3ODV K2JT K5KX K5NW K5WG K8HF K9KA KL7HMO N1YL N3NN N6HI NØJC OA8V VE7ECP W1JZ W3FAF W3OGY W4DZZ W6GLM W5PYV W6QL W6SMD W6SZN W7XN W9NO WØUZ WA1FCN WA2NP WB5PL YU1AG YV1TO
100 AA4AK AC4TV AD1E DJ7RJ DK9MB CP2EA HA8UB I5IRM I5SMX JA2IDN JH2JBT K1AO K1CBR K1MEM K1WJ K1XA K2PF K2QD K5BDX K8YYQ K9UIY LA2BG LU1BA N2HA N4EY N7CW N7MG OE1KJ OE1TK OE3EV OK1DK OZ8AE P29JS PY2KN VE6AJ VE7GU W1GG W3YY W4OQ W5AS W6ID W6KG W7UV W8NP WA4LC WB6PC WB7AF WB8ZF WBØON ZS3BT

DXCC Notes

The October credits for DXCC will be in March 1980 *QST* because the annual listing was larger than expected and had to be split between the January and February issues.

Kiribati (T3)

The country status of what was formerly known as the Gilbert and Ocean Is. (VR1) Br. Phoenix Is. (VR1) and the Line Is. (VR3) has not changed for DXCC credit. They still fulfill the requirements for separate county status as far as the Countries List Criteria are concerned. There will be no deletions or additions to the ARRL DXCC list because of this governmental and prefix change.

By a majority vote of the DXAC and the approval of the Communications Manager, Kiribati (T3) will be listed on the next revision of the ARRL DXCC list as follows.

VR1, T3K — W. Kiribati (Gilbert & Ocean Is.)
VR1, T3P — Cent. Kiribati (Br. Phoenix Is.)
VR3, T3L — E. Kiribati (Line Is.)

Strays

A FUN DXPEDITION

☐ A group of San Antonio-area amateurs will be on the air from 1800 UTC Saturday, April 19, until 1800 UTC Sunday, April 20, from Langtry, TX, home of the infamous Judge Roy Bean, "The Law West of the Pecos." The DXpedition will use the call sign W5TEX and will operate 7235 kHz ssb, 14,285 kHz ssb, 21,110 kHz cw and 21,360 kHz ssb, plus or minus 5 kHz. Specially printed certificates will be sent to those sending QSL cards and an s.a.s.e. or IRCs to: Law West of the Pecos DXpedition, 2618 Rigsby Ave., San Antonio, TX 78222. —*Fred Bonavita, W5QJM, Austin, TX*

MAKE YOUR SUMMER VACATION PLANS EARLY

☐ Eksperimenterende Danske Radioamatorer (EDR), Copenhagen, Denmark invites you and your family to spend the week of July 19-26 at the Copenhagen Ham Meeting 1980. For further information write to EDR, Copenhagen Ham Meeting 1980, P. O. Box 96, DK 1004 Copenhagen K, Denmark.

A FIRST?

☐ Last fall, W7JWR, who was on a motorcycle on State Highway 86 in Arizona and KB9DU/M, who was on a farm tractor in Illinois, had a 10-meter ssb QSO. Both hams were using converted CB transceivers. — *Gordon M. Dunning, W7JWR, Green Valley, AZ*

KM6BI AND WD8KLN/KH6 QSL INFORMATION

☐ Michael Daugherty, KA3BKZ, has all the logs for KM6BI, Midway Island, from June 1978. He also has the logs for his old call, WD8KLN/KH6 and will still send QSL cards. Contact Mike at Box 33, Dowell Rd., Dowell, MD 20629.

QST congratulates . . .

☐ Don Alexander, W8LK, of Dayton, OH, who received the 60-year certificate at a recent QCWA dinner. Don began his amateur activities as radio 1BK in 1919, in Bangor, ME. He has operated continuously since that time as 1BK, W8DMN and W8LK. During the war years his operation was as part of the War Emergency Radio Service (WERS) 2-1/2-meter defense system in Dayton.

☐ Shawn R. O'Donnell, K3HI, who has won an International Brotherhood of Teamsters scholarship. Shawn was first in his class of 840 at the Shaler Area High School, Pittsburgh, PA. He is very active on western PA section nets. We wish him continued success at the Massachusetts Institute of Technology, where he is studying electronics.

☐ Marlin E. Sipe, Jr., WB3IJZ, of Mt. Wolf, PA, recipient of a Bell and Howell Corporation four-year scholarship for a bachelor's degree in Electronics Engineering Technology.

I would like to get in touch with . . .

☐ amateurs anywhere in the world who are members of Rotary International. W. E. Medcalf, W5SKX, Star Route 1, Box 126AA, Deming, NM 88030.

☐ Amateur Radio operators along the West Coast of North America, preferably those who live in AK, Canada, WA, OR and CA, within 100 miles of the San Andreas fault, who would be interested in participating in an earthquake-prediction project. Send s.a.s.e. to Lawrence L. Cotariu, KA6GVI, 8041 N. Hamlin, Skokie, IL 60076.

☐ hams in the Northeast who were radio operators with the Seventh Fleet in WW II. Contact Paul Murray, WA1MIS, 11 Carriage Dr., Huntington, CT 06484.

☐ former Civilian Conservation Corps members. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

☐ amateurs who are alumni, friends or partners of Oral Roberts University. Contact Amateur Radio Outreach Club, O.R.U., Box 2564, Tulsa, OK 74171.

☐ teenage hams interested in coordinating an after-school traffic-handling net on 10-meter phone. Contact Rick Dexter, WD5ICZ, 7007 Shearwater Dr., San Jose, CA 95120.

Club Notes

After reading local club bulletin upon club bulletin which mention railroading members into offices, seeing Philmont Mobile Radio Club's (PA) newsletter, *The Blurb*, was refreshing. Nominees are presented at the November meeting. From then until election time, Philmonters campaign — "a fun time," they call it. "Over the years," writes W3AWG, "electioneering has been hot and heavy. One candidate livened things up on election night with a four-piece band, complete with drummer. A recent candidate brought his own fiddler! On election night the candidates bring their campaigns to a conclusion with a final speech."

You say, "Why isn't my club like that?" I say, "It's all in your attitude." It would probably take one candidate one time to put on a real campaign in your club, complete with sideshow, to get everyone else to do the same thing the next year. Philmonters consider it an honor to be elected to office. If those that ask "Why aren't our members like that?" would loudly proclaim upon getting elected that it is an honor, and act that way throughout their year of office, it might rub off!

It seems that every other month we run a tidbit on a new twist for fox hunting. Here is another that Cedar Valley (IA) Amateur Radio Club tried. The fox used random transmissions rather than requested ones. Two transmissions every five minutes were 30 seconds in length. This forced hunters to be alert for taking bearings, and worked quite well.

Sturdy Memorial Hospital in Massachusetts recently finished its new emergency wing. The Sturdy Memorial Amateur Radio Club commemorated the opening with an 18-hour demonstration of its emergency communications capabilities. The club presented a plaque to the hospital pointing out the contribution of Amateur Radio to the hospital's emergency preparedness. A local newspaper ran quite a spread covering the event. Below is their good-looking QSL card.

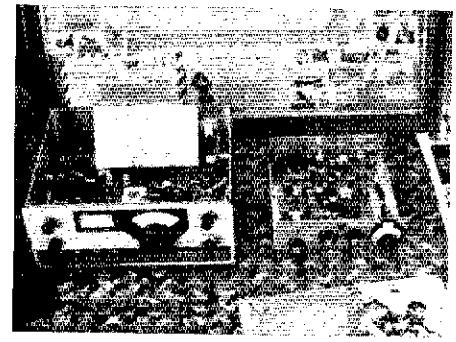
N4NK, Section Emergency Coordinator of Virginia, knows how to liven up meetings. His idea is to hold a mock ew traffic net. For the meeting's program, he suggests, have everyone bring a code-practice oscillator. Assign someone as net control station who knows how to be an NCS. Radiograms written up prior to the meeting are sent from member to member, following National Traffic System procedures. Charts on how to do this can be in ready view. This is an excellent and enjoyable instructional program. We have all heard the cry for better operators and public service training — well, clubs, here is the way to start.

Clubs also lament the proliferation of "appliance operators" and "nonbuilders." Winnipeg (MB) Amateur Radio Association does something about it. They offer a $150 prize for the best project at their "Home Brew Night." Quite an incentive!

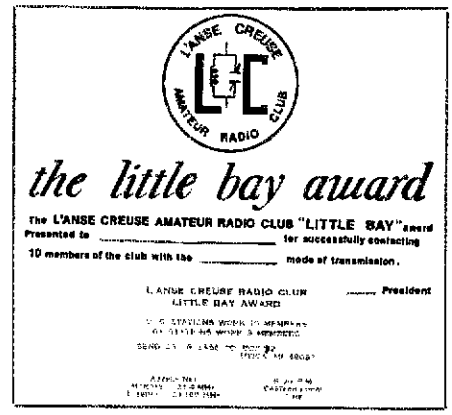
Two points to ponder for future hamfest planning. Virginia Amateur Radio Association members take a vote as to how many wish to attend area hamfests. If enough want to go, a bus is hired. Great for the gas shortage. Clearwater (FL) Amateur Radio Society gives several extra raffle tickets to those amateurs who purchase entry tickets in advance. This helps advance ticket sales and gives the club a little better idea of what to expect for attendance.

A safe deposit box was found to be a good idea by Baltimore (MD) Amateur Radio Club members. The contents? A copy of the club station and club repeater licenses, a list of all club equipment and who is custodian for each piece, a list of all equipment the club is using which it does *not* own and whose it is, contracts in which the club is a party, insurance policies, and more.

A gin pole, climbing belt, 150 feet of rope and two safety helmets are part of a package owned by Radio Club of Tacoma (WA). Members can put down a deposit in order to borrow them. It's just another nice benefit of belonging to the club. — *Rosalie White, WA1STO* QST



So many nonhams think that Amateur Radio is a terribly expensive hobby. Manchester (CT) Radio Club put on an excellent exhibit that proved this isn't necessarily so. *(photo by WB1ARX)*



L'Anse Creuse (MI) Radio Club's "Worked 10 Members" award — a smart, simple certificate.

Strays

QST congratulates . . .

☐ Hyannis, MA, radio station WQRC, one of 25 stations and radio networks in the country to have won an award in the 1979 Armstrong Awards competition. WQRC's winning entry, entitled "From Cape Cod To Cornwall," reflected the station's day-long, live coverage of the Marconi 75th anniversary special-event Amateur Radio station, KM1CC. — *from the Sunday Cape Cod* Times

☐ Reinaldo "Ray" Alea, KA8BAC, of Dayton, OH, winner of the Rookie Award sponsored by the Eastern North Carolina DX Club. This award was given for being the top-scoring newcomer (General or above for less than one year) in the 1979 ARRL International DX Competition.

I would like to get in touch with . . .

☐ anyone who has schematics for a simple, low-cost 2-meter synthesizer to fit on a crystal-controlled rig. Lee Groce, N4AAD, P. O. Box 213, Yadkinville, NC 20755.

☐ anyone using the Heath H8 and H9 computers in conjunction with ham radio, including RTTY. Contact Bob Sloat, K4VGN, P. O. Box 05-37, Tice, FL 33095.

50 Years Ago

February 1930

☐ Hoffman and Mix, of Burgess Battery, use a combination of belts and pulleys on tuning condensers and a variometer to attain 13,000 kc. of coverage without changing coils. A peaked audio circuit adds selectivity.

☐ The Department of Commerce reports a drop of 99 in the amateur population during the past year, to a total of 16,829.

☐ The Editor says most hams complaining about heavy QRM in the new, smaller bands haven't adopted recommendations of the Technical Development Program, particularly stability in transmitters and selectivity in receivers.

☐ The list of Silent Keys adds the name of Clyde Darr, W8ZZ, a prominent amateur in many fields but perhaps best known to most of us as the artist behind numerous *QST* covers.

☐ Voltage regulation on power lines is not the best, a problem W2BVA suggests can be solved with the addition of a toy (train) transformer in a sort of autotransformer hookup.

☐ W9FZN says if you want to stick to one frequency, in addition to stability in the transmitter you must achieve it also in the antenna, such as using a vertical brass pipe embedded in concrete.

☐ An extremely neat and effective station, W1KH (George W. Bailey), is cited as an example of good 1929 design and construction to cope with present crowded band conditions.

☐ Grammer hits a three-bagger this issue: a power supply for a small rig, tables and graphs for winding coils on tube bases, and a critique of our present methods of construction and use of monitors.

☐ Increasing 'phone interest prompts E. H. Spitzer of G.E. to provide suggested tube combinations and operating characteristics for power ranging from the 210 to the 204-A.

☐ W9DUH reports on a compact and flexible tube and set tester especially useful for the newer tube types.

25 Years Ago

February 1955

☐ W6JXM has combined one-antenna keying, monitoring and a break-in system into a single control unit — for the c.w. man, of course.

☐ Most 2-meter converters output on bands where the 75A receivers do not have adequate spectrum coverage, so W8NOH built one to feed into the 26-30 Mc. segment.

☐ W6CAB uses a double conversion system and a dual filter to achieve continuously variable selectivity — from wide skirts to almost vertical sides.

☐ W5SQT uses remote control to avoid r.f. feedback from his end-fed antenna, and provides us with data on resultant bandwidths.

☐ CGS Laboratories have built a unit to play out incoming code signals on a teleprinter, at speeds up to 70 w.p.m.

☐ With always an eye on the Novice's pocketbook, W1ICP shows a multipurpose field-strength meter using a baking pan for the chassis.

☐ Working a mobile converter into the car receiver doesn't provide much selectivity, a problem W6MHP solves by adding a bandpass filter around 1500 kc. between the two units.

☐ The Editor warns us not to believe rumors that FCC isn't monitoring our activities; a number of citations and license suspensions occur with regularity, even though there hasn't been much publicity recently.

☐ W9LI achieves 7- and 14-Mc. directivity with two vertical elements by appropriate switched phasing.

☐ W2IOK's two-stage unit for 10, 15 and 20 meters is meant as a driver, but will put out 25 watts on its own if you choose.

☐ W2RIX tries to appease the XYL by putting at least the speaker portion of the ham installation into an attractive corner cabinet enclosure.

☐ The single-copy price of *QST* has been raised to 50 cents, but the dues remain at $4 per year. — *W1RW* QST

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

A New Facility for VHF Coordination

The value of hf nets for coordinating vhf/uhf activities has been demonstrated over the years. The Sunday evening (0230 UTC Monday) Central States Net held on about 3818 kHz is a prime example. This net is instrumental in establishing numerous meteor scatter (m.s.) and earth-moon-earth (EME) skeds as well as passing general operating information on the bands above 50 MHz. The 14,345 kHz moonbounce nets held each Saturday and Sunday beginning at 1600 UTC provide worldwide liaison for 2-meter and 70-cm EME activities. For the 6-meter enthusiast, the around-the-clock gathering on 28,885 kHz enables up to the second coordination of 50-MHz operation during this period of high solar activity. It is difficult to assess how many "once in a lifetime" contacts have resulted from use of this facility, but it is certain that they are numerous indeed. The various AMSAT nets held in this country and other parts of the world have demonstrated their usefulness in disseminating news and information on amateur satellite operation.

Yes, these hf nets have been very useful; nevertheless, they often fall short of furnishing the type of communication needed — for the usual reasons we find hf operation less than 100 percent useful and enjoyable. Variable propagation conditions and QRM, some of it intentional and malicious, all too often result in loss of information or, at least, require extra time for repeats.

Soon, however, we will have a new communications facility we can count on for many hours each day. And, it will be available on our own vhf/uhf bands where — initially at least — we will be the principal users. By now, I am sure you have guessed that this new facility is the AMSAT Phase III satellite, to be known as AMSAT-OSCAR 9 once successfully in orbit. Yes, I said soon. As of early December, when this is being written, the scheduled launch date for the European Space Agency's second engineering test flight of its Ariane launch vehicle is May 30. From Kourou, French Guiana, QTH of the FY7THF beacon so well-known to 6-meter devotees, the rocket will put the newest OSCAR, along with the primary payload Firewheel, into a transfer orbit. Approximately one month later an onboard solid-propellant motor will lift our new space wonder to its intended orbit. Soon after achieving that orbit which swings high over the northern hemisphere, the satellite will be turned over to general amateur use.

How can we make use of this new facility to promote other types of vhf activity? In the same way we now use the hf bands. In order to gain an understanding of how OSCAR 9 will operate, readers are referred to the informative series of articles by Steve Place, WB1EYI, which began in December *QST*. Note that Steve goes into some detail describing the Special Service Channels (SSCs) being proposed for the two ends of OSCAR 9's passband. I wish to draw on that concept in setting forth a proposal for a dedicated spot in the OSCAR 9 passband where vhfers can meet and discuss their activities. From Steve's first article you can see that at the high end of the downlink passband is the engineering beacon with three SSCs just below it. I propose that we use the channel immediately below the suggested AMSAT Coordination and Net Frequency (ACNF) on which to exchange vhf/uhf news and information. Scheduling of the channel can probably best be done in a manner similar to that proposed for the SSCs, with a volunteer responsible for designating which group has the use of it at any particular time. In this way, all interest groups will have a chance with ample time left for general open use. Thus, if W1JR wishes to set up a 70-cm EME sked with JA1VDV, he need only get on the right uplink frequency to come down on the "vhf channel" at a time that the satellite is in view of both New England and Japan. This will be quite a few hours per orbit, and, if a scheduled net is not in progress, a call can be made. If we learn to take maximum advantage of this new communications resource and monitor the channel, much as we do our local repeater, Joe's chance of raising Aki will be quite good.

I know it sounds futuristic, but it is just around the corner. OSCAR 9 will serve us to the extent that we develop means of using it properly. Scheduling of organized nets will be a must and someone to handle this task will be needed. Do I hear any takers? We will have to get used to monitoring the channel while working around the shack, making necessary corrections for Doppler and adjusting antenna pointing from time to time. Maybe those with computers can train their machines to accomplish these menial chores for them. In any case, because of the nature of the orbit, these corrections will be needed much less frequently than we are accustomed to with earlier OSCARs.

There's a great new day dawning for Amateur Radio. Those of us who call the world above 50 MHz home stand to benefit as much as any group in the hobby. It's up to us to take full advantage of the new facility. CU on the vhf channel!

EME ANNALS UPDATE

Many have asked when I am going to publish another EME Annals box update. The plan is to do this sometime during the next few months, but I must receive up-to-date information from moonbounce(rs if the box is to be representative of the status of the mode throughout the world. Please list all stations worked via EME and present a summary of the total number of U.S. states and DXCC countries contacted via the moon. The regular form used for reporting for the other standings boxes can be used. If you need some, send along an s.a.s.e. and I'll provide them right away.

ON THE BANDS

6 Meters — The 6-meter band continued its fine performance between mid November and mid December. Crossband 6-to-10 contacts have been a common occurence almost every morning. Numerous QSOs have taken place between Europeans operating on 10- and 6-meter stations in all parts of the country, including the West Coast. A number of 6s, including W6XJ, WA6HXM, W6ABN and K6GMV and several Pacific Northwest stations have even worked EI2W both ways on 6. In fact, Harry has worked many stations in all U.S. call areas, much of Canada and the Caribbean. He really shocked the San Antonio SMIRK Net the morning of December 8 when he broke into the roundtable just as K5ZMS was reading to the group a speech on international friendship through Amateur Radio which EI2W had delivered eighteen years ago. The other European capable of 50-MHz operation ZB2BL, has also been on quite a bit. The QSLs are beginning to arrive at the QTH of W2UTH. It looks as if Hank and daughter Karen, WD2AKA, will be busy answering them. Incidentally, W2UTH is a member of a very unusual team. Both he and XYL Harriet, K2KEP, have earned WAS and WAC awards on 6 meters. There are a number of other husband-and-wife teams active on the band as well. W5EF and K5EF recently submitted cards for their WASs. W7KMA tells of the somewhat unusual work that he and his spouse, WB7TOV, have been doing. On November 16 they both worked the husband-and-wife team of JA8QX and JA8EJH. The very next afternoon they hooked up with AL7C and KL7HMH, also a husband & wife combination. Tom and Nora run less than 10 watts. It was enough to enable them to join the lucky far-westerners who have worked EI2W. W7KMA has also amassed cards from all 50 states and is one of a large horde who have recently applied for 50-MHz WAS. The supurb conditions have enabled a great deal of excellent low-power work. One story, of many, is from WA9CUH who tells of contacting three Gs via crossband while using a barefoot IC-502 into a 5-element beam. He got 5 × 9 reports from two of them. But perhaps the most unusual of these QRP tales comes from WD4MBK. Charles recounts the work that he and the others at W4ALC have been doing with their new IC-551. When they found that they were still receiving S9 reports from the West Coast, even with the output power turned down to 100 milliwatts, they went to the EE lab and got an attenuator. Using 30 dB of attenuation, to reduce their output power to 50 microwatts, they still managed to work K6PXT. Incidentally, the 30 dB of attenuation was also in the receive circuit, bringing K6PXT's signal down to S9. Charles says that now he is prepared to reduce the output power to 100 nanowatts.

Unfortunately, amateur signals from Europe are very few and crossband must suffice for most contacts into that part of the world. It's fortunate, however, that there is so much crossband activity, because the video signals from Europe have been absolutely overpowering some mornings, making it difficult to hear amateur signals. I have heard the TV buzz all the way up to S7 5, even on the rig in the car.

Europe has not been the only fare available. There have been a few good openings to the northern part of South America. Contacts with stations such as YV6ASU, PY7AS, FY0FL, JA1PIG/PZ, FI2NA, FI2HL, HC1JX, HP2XPW, HP2XRK, HH2MC and HH2HA have been reported from various parts of the country. Almost daily openings to the KL7s have taken place. Even the Pacific has been worked from

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.

One of Australia's outstanding vhf operators, VK3OT. If 52 MHz opens to VK3, you can bet that Steve will be there with one of the better signals.

the Midwest and the East Coast. Around November 19 was apparently the best period for this kind of work. Both K3MWV and W3OTC report working KG6DX and KG6JIQ with good signals on the 19th. A few days earlier, this conductor and many others snagged KG6DX and KX6PF. Still no JAs here in the Washington area, however, although K3MWV, near Philadelphia worked two of them on November 7th. But, if JAs have been scarce here, they have been in abundance elsewhere. K7ICW notes in his OVS report that his son N7AKB worked all JA call areas during one two-hour stretch, November 16. N6CT's log shows several days in which Bruce QSOed several pages of JAs. N7DB says that he has over 600 JA contacts in his log so far this fall while WA7RTA has snagged over 1000. But probably some of the most outstanding contacts made so far this fall were completed November 17 when VE1ASJ hooked up with ZL1AVZ and ZL1AUM. K1TOL also worked ZL1AUM. These contacts took place on about 50.105 with the ZLs taking advantage of their new privilege — working the low end of the band before TV hours. Others who may get low-end privileges are those on Cyprus. In a letter to W2UTH, 5B4AZ says that they may get a spot frequency at 50.110 in addition to the one they already have at 50.5. W2UTH also calls attention to the fact that many 6-meter operators may not be accustomed to working DX and therefore may not be acquainted with the ARRL DX QSL bureaus. It's quite possible that the cards they have given up hope of getting are sitting at their bureau waiting to be claimed. Those not familiar with the QSL bureau system should check December 1979 *QST* for information on how to get any cards due them.

The super conditions have permitted many unusual and interesting contacts in addition to much QRP work. One example is the FAX schedules K7OFT has been holding with WB2IBF and WA2QQR on 50.25. All are using Western Union DeskFax units. Since FAX is not permitted on the hf bands, this work represents a DX record for the mode. This conductor formed one end of another interesting contact which may also represent a first. On December 8, I worked K6MYC via narrow-band voice modulation (nbvm). As far as I know, this was the first time that this mode has been used for a transcontinental 6-meter QSO.

News of those ionosphere heating experiments keep cropping up from time to time. W7CI, near Phoenix, reports that he and K1SC/7 worked several 50-MHz stations the evening of October 12. Signals were quite fluttery and beam headings indicated that the scattering area was in the vicinity of Platteville, CO.

2 Meters — Not all of the exciting news concerns 6 meters. There is plenty of tight left in the old 2-meter band, too, especially for those with EME capability. WAC is now achievable and, in fact, has been accomplished. It should not come as too much of a surprise that K1WHS is the first to pull it off. On November 28, Dave completed a contact with ZS6TS in Johannesburg, South Africa, in conjunction with ZS6ASO. ZS6TS has been constructing a four-Yagi array along with the other necessary gear to become operational on moonbounce. They must have done a good job, as K1WHS reports that signals were very good. Now that the ice has been broken, I am sure that there will be many others earning WAC on 2 meters, an award in which 70 cm has lead the way, thanks to the activity of ZL5U.

Whatever the inverse of "It's an ill wind that doesn't blow someone some good," K1FO comments that the super conditions we have been experiencing on 6 meters have, at times, resulted in very poor 2-meter EME results. Steve notes that, particularly during early November, it was almost impossible to work 2-meter EME because of weak signals and extreme Faraday rotation. He had just replaced his four 16-element F9FT array, complete with water in the phasing lines, with a like number of 19-element Boomers and new phasing lines, only to find that he couldn't work anyone. After contenting himself with 6-meter DX for a couple of weeks, he found that the new array worked well after all, producing contacts with N7NW, W5FF, W5LUU, W7UBI, WBØQMN and W7JF. The last three, ID, CQ and MT, represented new states, bringing K1FO's total to 46.

Talk about quick break-in! A letter from GW4CQT to WAØLPK/KL7 recounts the situation during their EME sked in which Dave certainly went out of his way to complete the contact. GW4CQT admits being "a little slow in responding" and then goes on to tell the story. It seems that, just at the beginning of the schedule, his coax caught fire about three feet below the antenna. Since he had a receive preamp mounted at the antenna, his hearing capability was unimpaired by the conflagration. Luckily also, he had a spare coax going up to the antenna. You guessed it. The schedule progressed with Dave climbing 40 feet of tower to accomplish each transmit-receive changeover, but the contact was successful nevertheless. That's what I call dedication!

Another resident of the British Isles reports that he is operational on 2-meter EME with a kW and four 16-element F9FTs. G5CSZ, whose stateside call is W4FAY, is the first American holding a reciprocal British license to receive a high-power permit. So far he has worked 33 stations in seven countries and 21 U.S. states. Hoppy notes that he has trouble QSLing because so many do not know his address. Cards may be sent to the *Callbook* QTH of W4FAY or to W. Hopkins, Menwith Hill Station, Box 502, APO New York, NY 09210.

After a seven-year absence, during which family affairs prevented much involvement in Amateur Radio, VE7BQH is back on moonbounce. Lionel expresses amazement at the growth of EME since he was last on. He notes that, when he was last active, there were about five active 2-meter moonbouncers and that all contacts resulted from schedules. But now, by his count, there are some 55 stations and contacts can be obtained from CQs. He terms it "an enjoyable shock." Another EMer who hasn't been inactive as long as seven years is also about to get back on after a lapse of several months, this time from his new QTH in MT. It's certain that what WA1JXN did to put VT on the 2-meter-EME map, he will do for MT. His mailing address is P. O. Box 243, Frenchtown, MT 59834.

How many have problems with desensitization from strong, nearby repeaters and stations operating tm? WB2WIK is one who does. Steve says that his QTH is line-of-sight to three repeaters and when one keys up, it drastically reduces what he can hear at 144. He wonders what others have done to solve this problem, possibly including the use of low-loss filters. This conductor would also be interested and will pass on any worthwhile suggestions.

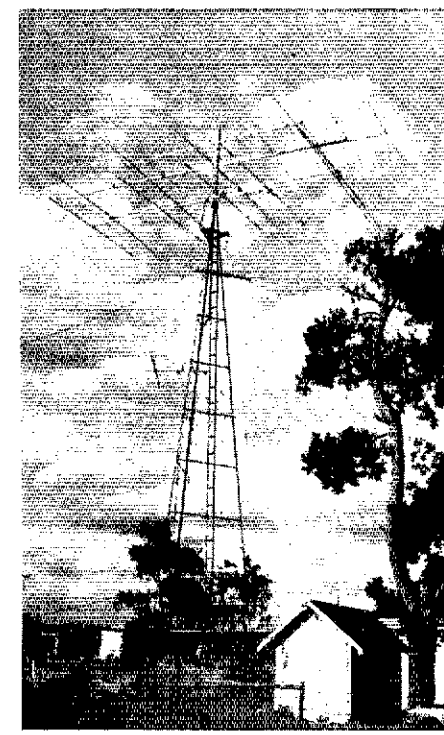
A newcomer to 2 meters, and one who has done very well since getting on the band last August, is WA3WUL, DE. Bruce now proudly boasts 24 states, the latest being WA4LYS, FL, worked on tropo November 28. That is certainly an unusual contact for late fall. The rig at WA3WUL consists of an IC-502 driving a 150-watt, solid-state amplifier which feeds an 11-element Cushcraft at 42 feet. Bruce's success is all the more notable when one learns that his location is far from ideal for vhf work. In fact, he put off 2-meter operation for a number of years because he did not believe that he could get out on the band!

K5VNV, near Houston, reports that he is operating an attended beacon at nights and on weekends. The frequency is 144.444 and it transmits with Morse-keyed mew with a 444-Hz tone. Power is 70 watts to an omnidirectional antenna. Reception reports to K5VNV at his *Callbook* address are solicited.

23-Cm Standings

Figures are states, U.S. call areas (plus VE and XE call areas, plus other DXCC countries not located within the borders of the above) and best DX in miles

K1PXF	13	5	448	W5LDV	2	2	838
W1JR	10	4	475	WB5LUA	2	1	372
K1FO	10	4	405	W5HN	1	1	360
W1XP	7	3	300	K5PUF	1	1	290
W1QXX	6	3	260	W5HPT	1	1	257
K2UYH	18	6	520	WA5HNK	1	1	250
WA2LTM	17	6	770	K6ZMW	2	2	250
W2VC	13	5	537	N6NB/6	2	2	250
K2JNG	10	4	305	W6OCU	2	2	200
W2DWJ	10	4	200	N6CA	1	1	120
K2YCO	8	5	570	N6TX	1	1	112
WA2VTR	6	4	320	N6CA/7	1	1	220
K2FVJ	5	3	247	K8WW	6	4	448
WA2EUS	4	5	320	W8YIO	5	4	551
K2OVS	3	2	135	WB8PAT	3	3	405
W3HMU	11	5	300	W9HUV	5	3	525
K3IUV	9	4	290	W9UIY	5	3	300
WA3JUF	7	4	300	W9WGD	3	3	770
K4QIF	15	6	785	WB9SNR	3	2	325
K4NTD	3	2	847	W9JTP	3	2	165
W4VHH	2	1	350	WØZJY	3	1	170
W4LDV	1	1	290	VE3HW	1	1	260
K5LLL	2	2	847				

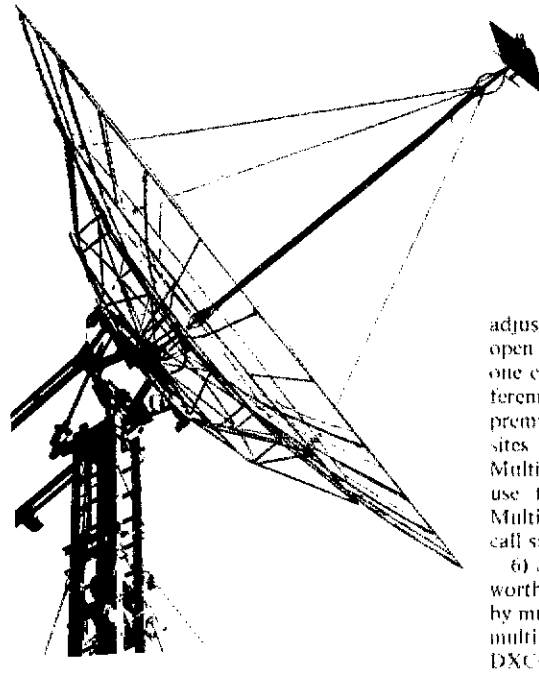


The antenna farm at VK3OT. A four-element monobander serves on 20 meters along with interlaced 15- and 10-meter arrays. An eight-element, 37-foot Yagi is used on 6 meters and a 13-element job on the 2-meter band.

70 Cm and Down — In his *432-EME Newsletter* for December, K2UYH notes that conditions were exceptionally good the weekend of November 2 and 3. Al even likened the sound of the band to an early OSCAR 7 Mode B pass! Observe that this period is very close to that cited in the 2-meter section by K1FO when 2-meter conditions appeared poor. The *Newsletter* also reports the reactivation of VE7BBG. Al notes that Cor's ssb signal off the moon is superior to that of most other stations running higher power and larger antennas. VE7BBG is sporting a new GaAs FET preamp which appears to be doing well for him. Another project at VE7BBG is 23-cm-EME capability. Cor now has 400 watts output and expects to increase that soon with a higher voltage power supply. He is consistently hearing his own echoes. A potential 23-cm station is SM6FRR who will use a 6-meter dish as soon as a 9-meter dish is completed for use on 70 cm. VK5MC has received a renewal of his high-power permit and is active on 2 meters, 70 cm and soon 23 cm. With so much happening on 23 cm, it appears that K2UYH may have to change the name of his newsletter. In 70-cm terrestrial news, K2UYH informs me that he believes that WA2LTM now holds the overland tropo record on that band. Doug's 1335-mile contact with WB5LUA, during the September contest, is what did the trick.

WA6EXV's OVS report tells of the monitoring he has been doing of the 2304.192-MHz remote transmitter, W6IFE, which the San Bernardino Microwave Society has installed on Heaps Peak (117° 8.5' West, 34° 34' North.) Chuck says that the signal varies as much as 12 dB over the 103-mile, below line-of-sight path. The transmitter runs 2 watts to a five-element vertical collinear antenna. Transmission is Morse with fm tone modulation with a deviation of about 5 kHz. Hours of operation for W6IFE are 1900 to 2200 PST each evening.

Rules, 3rd ARRL International EME Competition



This 30-foot-diameter dish was used by JA6CZD in the 1979 ARRL International EME Competition on 432 MHz. Soichiro made 23 QSOs and 17 multipliers for a score of 35,700 points.

Last year's EME Competition brought out a good number of newcomers, with an increase of 10 percent over the year before. Declinations will be higher this year. This should allow those in the Northern Hemisphere to clear the treetops with greater ease and allow for longer EME windows.

Rules

1) *Eligibility:* Amateurs worldwide are invited to participate.

2) *Object:* Two-way communication via the earth-moon-earth path on any authorized amateur frequency above 50 MHz.

3) *Time:* All contacts must be made during the contest period starting at 0001 UTC on April 19 and ending at 2359 UTC on April 20 resuming at 0001 UTC on May 17 and ending at 2359 UTC on May 18. Entrants may operate as much of this 96-hour period as they wish.

4) *QSOs:* For a valid contact to occur, each station must send and receive both call signs and a signal report in any mutually understood format, plus a complete acknowledgement of the calls and report. Partial or incomplete QSOs do not count. Contacts may be made on cw or ssb. However, no station may claim credit for any repeat QSO with the same station on the same band, even if the second contact occurs on a different mode or a different weekend during the contest. If partial or incomplete QSOs are made, indicate them in your log.

No station — single or multioperator — may radiate more than one signal per band at any time during the contest.

Fixed or portable operation is permitted. Stations outside their licensed call area *must* sign portable, identifying the call area of the operating site.

A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently under any other call sign during the contest, even if more than one call is assigned to one location by the licensing authority. The intent of this rule is to recognize the difficulty of achieving EME capability and to prevent any entrant from gaining an unfair advantage by working the same station more than once for credit.

Stations using equipment that is not amateur (such as a dish antenna or lab equipment owned by an institution or a government agency) will have their scores listed separately.

There is no specified minimum terrestrial distance for contacts, but all communications must be copied over the moonbounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be. You *must* hear the other station's call, report and acknowledgement via moon echoes.

5) *Entry Classifications:* Entries will be classified as single operator where all operating, equipment adjusting, and antenna alignment during the contest period are performed by *one* person.

The multioperator class includes those stations where two or more persons operate, adjust equipment or align antennas. It is also open to teams of neighboring amateurs within one call area, but with EME facilities for different bands set up on different team members' premises, as long as no two of the operating sites are more than 50 km (30 miles) apart. Multioperator neighborhood groups can not use the same call signs at each location. Multioperator listings in the results will list all call signs.

6) *Scoring:* Each completed EME contact is worth 100 points. The final score is determined by multiplying the number of QSO points by a multiplier consisting of the total number of DXCC countries and U.S. and Canadian call areas worked via EME on each band. Example: PA0SSB works 15 stations in four U.S. and Canadian call areas and three other DXCC countries on 144 MHz plus three stations in two U.S. call areas on 1296 MHz. He has 18 QSOs (times 100) for 1800 QSO points, times a multiplier of nine (seven on 144 MHz and two on 220 MHz), for a total score of 16,200 points. Contacts with KH6, KL7 and so on, carry multiplier credit as DXCC countries but not as "call areas." No contact may be counted for more than one multiplier.

7) *Reporting:* Entries must be postmarked no later than June 2, 1980 (two weeks after the contest) and must set forth the call sign, report and time of completion for each contact claimed. Entries received after mid-July may not make *QST* listings. An accompanying summary sheet must list the total number of QSOs on each band, multipliers on each band and final score. Please send along any details of your transmitter, receiver and antenna used on each band, with a picture if possible.

8) *Awards:* The high-scoring single- and multioperator stations in each U.S. and Canadian call area and each DXCC country will receive a certificate. In addition, each station that successfully completes at least one moonbounce contact during the contest period will receive a certificate commemorating his achievement.

9) *Information on disqualification criteria is on page 90 of January 1980* QST.

Public Service

Conducted By Robert J. Halprin,* K1XA

From the Mailpouch

Recent topics in this department have caused a considerable influx of mail. The following is a representative sample:

"I liked your comments in the November *QST* re the operations of W4PPC and the Hurricane Net. You touched upon a number of good points, but I still feel something was overlooked. Some of this has been on my mind for quite a while . . .

"1979 has given amateurs the chance to utilize our unique service in both overseas and domestic emergency relief operations. The two hurricanes, which devastated major population centers of the Caribbean and parts of the U.S. mainland, provided a situation in which our systems should have been able to function. During these emergencies we may have convinced ourselves that we were indeed doing a fine job. In retrospect, however, I think we are beginning to realize that there still are many problems that need to be addressed.

"One point which you touched upon was the nonintegration of NTS with those stations providing direct communication into the affected areas. Eventually there was a degree of formalized traffic handling, but it should and could have been there from the start. Every ham should at least be able to pass a piece of traffic in the standard format. It is part of public service, which remains one of the pillars that supports the continued existence of Amateur Radio. If a ham can comprehend a schematic of a complex circuit, he should also be able to learn to recognize and formulate a message properly.

"Another point is traffic into the affected area. Health and welfare (H & W) inquiries into an area should be banned, if not at least discouraged, for a period of time after the storm, or whatever, has subsided. Stations that can come on-the-air from the affected area cannot be expected to deliver H & W inquiries just a few hours after a calamity. With telephone service, commercial power gone and debris and curfews curtailing travel, one cannot expect a ham to be able to venture far from shelter. H & W traffic should be encouraged *out of* the disaster zone. This is where organized teams of hams can really perform. Setting up in community shelters and such, amateurs can readily solicit H & W advisory messages and pass them into NTS with ease and dispatch. Incoming H & W inquiries are often a waste of time since most people are no longer in their homes. Encouraging outgoing messages makes much more sense than accepting messages into the affected areas.

"This leads me to a parallel, yet somewhat different, area. I would really like to know how many, if any, of those big Field Day stations we read about in *QST* got together in some of the affected areas of the country to really do what it is purported they're preparing for in their annual summer event. I may be presumptuous, but the answer is probably too damn few. This, to me, glaringly points out one of the biggest farces conducted by the League. If anyone can seriously believe that Field Day is still a preparatory run for a real emergency, he is looking through the wrong end of the telescope. Let's face facts. If we all had four or five months advance notice of the next emergency in our area, we sure could get prepared. Field Day is no longer a sample of our ability to respond to an emergency. It has become a contest, nothing more. That's okay too. Let's just face up to that and quit selling it as something a lot more noble and serious. There's nothing wrong with going out into the cow pastures, campsites and shopping malls of America and making ham radio visible to the public. What is wrong is to let people believe that this same kind of effort could be expected during an emergency. We're kidding them and ourselves.

"Our other attempt at getting prepared for emergencies — SET — also shows signs of declining quality. Scenarios involving chasing King Kong or involvement in subduing a terrorist attach are a far cry from reality. While they demonstrate active imaginations on the part of the authors, they seem to give an air of frivolity to the exercise. Do any of us really think we as hams, only as hams, stand a chance of rendering vital assistance to a police agency involved in a terrorist situation?

"SET also lacks the main criteria by which emergency response can truly be measured. It lacks the element of surprise. SET scenarios should be realistic and focused on situations unique to the particular district. SCMs and SECs should devise these problems and spring them upon their respective districts . . . The element of surprise, or at least short term advance notice, injects a sense of urgency into the exercise that really is missing when a person or group has even a week or two to prepare.

"I realize I've offered a lot of criticism and only a little bit of new ideas, but perhaps it will stimulate comment . . . anyway, my thanks to you for reading these ramblings and a thank you from one of us out here to all of you who really believe that ham radio is worth working, and working hard, for."

Then there was this, referencing the same column: "I don't believe Mr. Halprin monitored very long, as his comments on the net on 14,325 kHz were uncalled for . . . I monitored both 14,325 and 14,303 and found them both quite interesting and informative . . . I most wholeheartedly agree that one should not transmit unless he has something to contribute. I was silent for the entire length of the hurricane emergency as I had no reason to talk, not even telling the QRMers to be quiet.

"So I think in this instance, Mr. Halprin, you did not have anything to contribute, so you would have been better off to remain silent." (WBØZJF)

Dave Manescu, W6CCM, filed these comments on behalf of the County Hunters:

"County Hunters serve many purposes . . . We congregate some 200 stations at one particular frequency for the purpose of working all counties in the USA . . . our primary purpose is not to work the counties however; it is to have a frequency available for low power or mobile stations to get instant recognition in case of emergency. In the 10 years that I have been involved with the net, we have handled many situations of an emergency nature. We do not handle routine traffic on the net, but allow stations that have traffic an opportunity to contact their stations and then QSY. We do stop all county hunting in the event of a real emergency!

"Our net membership comprises people from all walks of life; doctors, lawyers, professors, policemen, firemen and so forth. Our members hold A1-Op., BPL, PRA and other positions of importance in the Amateur Radio fraternity. Looking over the list of SCMs, you will discover that a great many of them are also County Hunters. Most of us are members of ARES, RACES, MARS, NTS and the like, but we seem to find that the personal friendships developed in County Hunting are more rewarding than handling routine traffic . . . Our net serves a purpose and if you'd listen in once in a while, I feel sure you would be able to pick up some good operating procedures for use by NTS stations."

AMATEUR RADIO SIGNS

About three years ago, our club, the Douglas County Amateur Radio Club, became more heavily involved in local 2-meter public service work. Since that time, I feel we have become a really excellent example of how Amateur Radio can serve a community. At the time we first got started, however, we were barely known for our efforts and were often mistaken for another radio group that was gaining notoriety.

I was then Information Manager for the club and got interested in finding a way to make our mobile units stick out during public service work. At that time, I came up with a series of homebrew signs that attached to the units with a strip of magnetic tape running around the edge. They read "AMATEUR RADIO PUBLIC SERVICE" in bold letters and were a fantastic boost for our publicity. They have helped identify us during emergencies and make law enforcement officials aware of our presence. Since that time, I have become more and more sold on what the signs have done for our club. We have arranged with a commercial manufacturer to make professional quality, entirely magnetic and completely weatherproof signs. — *Rick Link, WBØKDE*

*Assistant Communications Manager, ARRL

LETTER FROM ARGENTINA

The ARRL performs an extremely vital function within the USA in training amateurs to handle emergencies. In my opinion, the service rendered by amateurs in emergencies, more than any other service provided by hams, has won government support for Amateur Radio. In light of the great importance that emergency preparedness deserves, it's a shame that many don't take time to prepare themselves.

I would like to cite an experience which left me wondering just how many of our fellow hams really know how to handle an emergency situation effectively. This incident took place several months ago but the more I think about it, the more I believe that it should not go unreported.

I was asked to handle some traffic that had to do with a medical emergency. A life and death situation was involved but we were working against a time factor that was not so critical, thus I gave the traffic a priority precedence.

After searching 15 meters for over two hours, trying to find someone to handle my traffic, I was rather shocked at the behavior of some of my fellow stateside amateurs. After breaking and stating that I had priority traffic and then being asked to standby, I spent countless minutes, on more than one occasion, listening to the stations return to insignificant rapchew. On one occasion, a discussion was starting on the subject of "should the frequency be surrendered to a station with priority medical traffic or not."

Such unpreparedness is really inexcusable. It only requires that a few basic rules be learned. One of the first things everyone ought to know is that there is an order by which we should proceed: 1) Emergency traffic, 2) Priority traffic, 3) Welfare traffic, 4) Routine traffic and then general conversation. Secondly, in an emergency situation, help if you can; if you can't, clear the frequency.

I spent many years in Amateur Radio believing that no one would have to be taught anything so basic, but it appears that I was mistaken. One doesn't need extensive experience to handle a priority traffic situation if he or she realizes the importance of following basic procedure. After finding general incompetence among several "old timers" I was finally directed by an 18-year-old to a frequency where I could handle the message, and there, a 14-year-old ran the patch for me. I don't believe that either of them had been licensed long because they held WD prefixed 2X3 call signs. Let that be a rebuttal to those who insist on saying "kids are kids."

I wholeheartedly support the League's emergency preparedness programs. I am very impressed by them but I also realize that programs are completely useless, unless the amateur community takes heed.

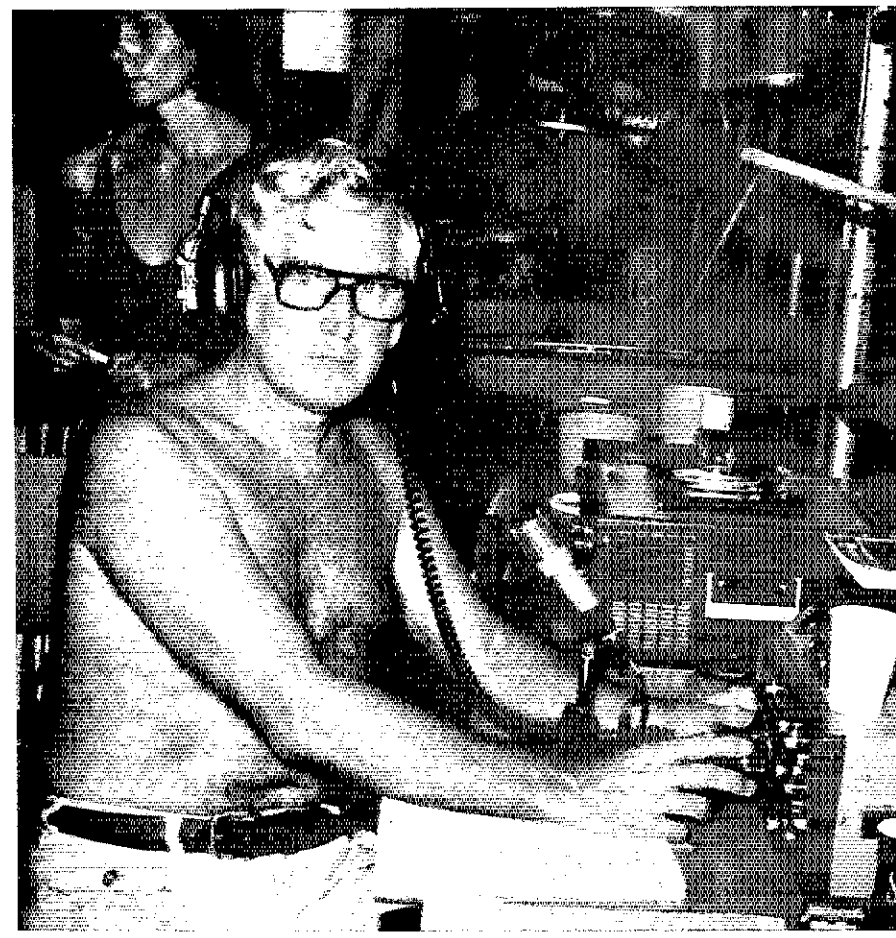
There's simply no excuse for incompetence. I am thankful that there are many who do know what they are doing, that there are several among us who do justify our existence. In subsequent attempts to handle traffic related to this incident, I found exceptional response from several radio amateurs, both young and old. My pride was restored. Nevertheless, I came to realize that having a percentage, even a very high percentage, of hams ready to handle an emergency situation, will not always be sufficient. Emergencies are never preplanned and thus we never know who will be there when the time comes to help out. We must all be ready! — *Scott Parker, WA7VYJ/LU*

NATIONAL WEATHER ASSOCIATION AWARD

R. B. "Pat" Shreve, W8GRG, of Shaker Heights, Ohio, has been selected by the National Weather Association to receive its 1979 award for the outstanding contribution to operational meteorology by an individual, not a part of the meteorological community. Pat was nominated for his work in organizing the SKYWARN program and the design, construction and installation of a SKYWARN radio station at the National Weather Service (NWS) office in Cleveland. The unit includes provisions that allow it to be turned on remotely by Amateur Radio SKYWARN volunteers to alert NWS personnel of incoming severe weather reports. It also contains a complete 2-meter transmitter and receiver for use by amateurs who man the NWS office when weather conditions warrant.

Pat was nominated for the award by George Hinds, WB8JYR, president of the Lake Erie Radio Association, with supporting documentation from NWS officials. The award, an engraved plaque, was received on behalf of W8GRG by WØWYX and KØZSQ at the NWS annual banquet in Denver.

This marks the second consecutive year that an Amateur Radio operator has won this NWA award. An announcement of the NWA 1980 awards program will be made in early summer. Our congratulations to W8GRG. — *Bruce Eggers, WA9NEW*



John Ackley, KP2A, at the controls of J73A during the Hurricane emergency. See his report in "Hurricane Anthology," elsewhere in this issue. In the background is his wife, Carole, who accompanied him to Dominica.

[] ARRL Section Emergency Coordinator Reports. For November, 30 SEC reports were received, denoting a total ARES membership of 15,195. This is a 9 percent decrease as compared with reports received last November (33) and a .67 percent decrease in ARES membership (15,297). Sections reporting were Alta, Ariz, Ark, Del, Ind, Iowa, Kans, Me, Marc/NH, Mich, Mo, NFla, NNJ, NTex, Ohio, Okla, Org, SV, SDgo, SJV, SBar, SCV, SFla, SNJ, Va, Wash, WVa, WMass, WPa, Wisc.

COMMUNICATIONS SERVICE OF THE MONTH

Cheyenne, WY — November 20. A severe blizzard hit southeast Wyoming and north-central Colorado two days before Thanksgiving. Major highways in Wyoming were closed for over a week. Seventy people were rescued from a nine-mile stretch of Interstate 25, just south of Cheyenne, by the Wyoming National Guard. Most were stranded for over eight hours. Local authorities insisted that nobody was in this area, but local hams had radio contact with two stranded amateurs and finally convinced the National Guard that there were people out there. Rescue activities were coordinated with the Northern Colorado ARES through WRØADD, the Fort Collins, CO, repeater. The following night, 2-meter operators were requested for emergency ambulance runs to rural areas. On Thanksgiving night, the state EOC requested 2-meter equipment and operators to accompany the National Guard to Wheatland to take food and blankets to the many travelers who were stranded there. The 70-mile trip took 5-1/2 hours even with a 22-ton snowplow to lead the way. Fifty stranded people plus a four-mile caravan of vehicles were picked up along the way. These people had tried to get out of Wheatland even though the Interstate was officially closed. The highway would drift shut within minutes after being plowed. The Laramie Peak repeater, WR7AHT, was used for this operation. The day after Thanksgiving, medical supplies were airlifted to the Wheatland area. A 2-meter link was established between the state EOC and the sheriff's office in Wheatland. Amateurs were accompanying National Guard snow-removal crews in the rural areas through December 2. WR7ADP, the Sherman Hill repeater, was used for this activity. We were extremely fortunate to have no fatalities because of the blizzard. (WB7UFP, EC Laramie Co.)

REPEATER LOG

According to reports received between November 20 and December 20, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Chemical Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Miscellaneous	Total
WR3AGI						1		1
WR3AKR				1		1		2
WA3AOP						1		1
WR4ACY				22			1	23
K4SCL				1				1
K4VYN		1						1
WR5ABA				2				2
WR5ABE				2				2
WR5ABI		1		3				4
WR5ABY		2		11				13
WR5AIB		1						1
WR5APK				6				6
WR5APN				1				1
N5DD				1				1
WA6WTT				4				4
WR7AGX			1	2	1	1		5
WR7ANE		1						1
K7GC		1						1
W7WGW			1	1	1		2	5
WR8AJL						1		1
WR8ARB			1					1
WØCBL							1	1
TOTAL	0	7	3	97	2	5	4	78

NATIONAL TRAFFIC SYSTEM

Welcome to N4MD, new manager of RN5-b, assuming the reigns from WA5IQU. The 1700Z session of 2RN now meets on 40 meters on 7235 kHz. DPAN certificates went to W7AK NØAHA N6ANL VE7DKY W6DXL WØEJD N6GW WA7IHS KL7JFB WA6LVO WBØMTA K6OWA WAØOYI WB6PVH W7TGU WA6UAZ W7VXF. DEAN certificate to K3ORW.

November Reports

Area Nets

1	2	3	4	5	6	7
EAN	90	3789	42.1	1.225	93.5	
CAN	90	1959	21.8	637	100.0	
PAN	58	2045	35.3	729	99.2	

Region Nets

1RN	105	1047	9.9	539	84.2	96.7
2RN	125	1164	9.3	554	94.7	97.8
3RN*	30	277	9.2	602	98.9	97.8
4RN	120	1968	16.4	657	83.2	98.9
RN5*	60	813	13.6	535	93.9	100.0
RN6	124	1363	10.9	362	87.0	93.3
RN7	120	1421	11.8	841	99.2	93.3
8RN*	60	569	9.5	540	96.0	97.8
9RN	150	1145	7.6	333	94.0	100.0
TRN	90	615	6.8	287	76.9	100.0
ECN	60	297	4.9	479	85.5	72.2
TWN	89	675	7.6	332	87.1	91.7

TCC

TCC Eastern	183[1]	1092	
TCC Central	196[1]	1102	
TCC Pacific	112[1]	922	
Sections[2]	6079	28,505	4.7
Summary	7450	50,768	6.8
Record	6563	49,866	18.4

*incomplete report

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (200): ASN (AK), AENB AENJ AENM AENS (AL), ARN OZK (AR), HARC (AZ), NCN-1 NCN/VHF NCTN SBARESN SCN SVN/VHF (CA), CN CWN HNN (CO/WY), CN CPN NVTN RASON WESCON (CT), DEPN DTN (DE), AFPN DEN FAST FMTN FPON FPTN GN MEN NFPN PBTN PEN QFN QFNS SBEN SPARC SWFTN TPTN (FL), CGVHFN GSN GSSBN GTN MAEN (GA), I75MN IACN (IA), IMN MTN (ID/MT) ILN ILPN (IL), ICN ITN QIN (IN), KPN KSBN QKS (KS), 4DARES 5ARES 6ARES KNTN KRN KRTN KTN KYN (KY), LAN LRN LSN LTN (LA), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MN WMN WMPN APN (MAR/NF), MEPN MNN MTN WRIN (MB), MDD MEPN (MDC), AEN SGN SPSN (ME), MACS MITN MNN OMN UPN (MI) MSN MSPN MSSN (MN) ACE MEOW NEMOE (MO), MTN (MS), CNGTN JFK NCSSBN THEN (NC), CMN (NC/SC), WNN (NE), GSFM NHN (NH), JSARS MCN NJN NJPN NJSN NJVN OBTTN SPARTN UCETN (NJ), NMRR SWN (NM) BAVTN CDN NLI NLIPN NLIVHF NYPON NYS OCTEN STAR WDN (NY), OE E BN BNR ONN OSN OSSBN (OH), NWOSN OAN OFON OLZ ONON OPEN OTWN STN (OK), CMN LN ODN OLN OPN OSN (ON), 16/76 BSN OAREST OSN PDXAARES (OR), EPA EPAEPTN PTTN WPA WPATMTN WPPTN (PA), WOV/UHF (PQ), CNN SCSSBN (SC), NJO SDN SDSSEN SDWXN TSEWN (SD), RARA2M SATN SPN (SK), MCRN METEN TN TNN TPN WTVHFN (TN), DFW TEX TTN (TX), BUN UCN (UT), VN VNTN VSBN VSN (VA), WARTSN WSN (WA), BEN BWN NWTN WEXP WIN WSBN (WI), BDTN WVMDN WVN WVNN WVPN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
TCC Eastern	193	94.8	2916	1092
TCC Central	210	93.3	2020	1102
TCC Pacific	120	93.3	1844	922
Summary	523	93.8	6780	3116

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November): Eastern Area (N2YL/K3KW, Directors) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH XA, W2s CS CQB EFU FR GKZ MTA RO ZOJ, K2NY, N2TL, WA2s ICB SPL, W3s FAF PQ, WA3WQP, K3s KW NGN, W4s JK MEE SQQ UQ, WA4CCK, WB4PNY, K4s BKX KNP, N4s KB NK, KB6FR/3, W8s PMJ VPW, WA8WPW, WB8WTS, K8s AAZ KMQ, VE3s GOL SB. Central Area (W5GHP/W9JUJ, Directors) — W4ZJY, WD4HIF, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ RKU, WB5s NKD OXE, YDD, WD5HHK, K5s GM MC, N5s RB 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, K5MAT, N6s GW PZ, W6s EOT OA SX VZT ZRJ, WB6PVH, W7s AK DZX EP GHT LYA VSE, K7s HLR KSA MC, WA7GYO, ADØA, KØs BN DJ, WØFG, VE7ZK.

Independent Nets (November 1979)

	2	3	4
Amateur Radio Telegraph Society	30	2285	408
Central Gulf Coast Hurricane	30	188	2380
Clearing House	29	306	504
Early Bird	30	800	379
Empire Slow Speed	30	109	345
Hit and Bounce	30	386	522
IMRA	26	363	1030
Mission Trail	30	263	1383
North American SSB	26	307	289
North American Traffic and Awards	25	31	496
Washington Region PON	17	24	343
West Coast Slow Speed	30	148	324
20-Meter ISSB	26	316	425
75-Meter ISSB	30	866	1240
7290 Traffic	46	567	2606

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll November 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.

323
KA9CPA
179
K4TH
176
W2ZOJ
159
WD4COL
152
WB3GZU
WA4CNY
150
WA4PFK
148
WB2MCO
145
WD8LRT
136
K2GCE
133
VE3GOL
128
W4OGG
KØPIZ
125
WD4HIF
123
WA2SPL
N2YL
121
WA3PXA
120
W2RQ
N8CW
WD8KZX
119
N5AWG
118
WB8YRY
117
KA1CC
W1GUY
N4CCT
W9KLV
116
WA3WQP
114
K1BA
AA2H
113
WØOYH
112
K4BKX
N4NK
VE3JIR
111
WA2UWA
WA3NAZ/4
WB5NKC
K5TL
109
WA5RVT
N6AWH
108
W2UEZ
K2VX
KB4N
K4SCL
AF4T
KL7HSF
VE5AE
107
W5DTR
AFØO
VE3JRT
106
WA2ZJP
KL7JEB
VE5HG
105
K4DZM
KR4AZ
KB8OZ
104
WA2MFV
W7VSE
103
WB1CPF
WB2TOM
WB3JZA
WB5NKD
K7GXZ
WB7WOW
102
W1TN
WB2EAG
W4CKS
W7GHT
W9JUJ
100
WA1TBY
WB2HDU
WA4JDH
WB5YDD
WB6PVH
AF8V
99
W2CS
AF2L
WBGGX
98
AG9H
97
AG2R
WB4FVV
W6OA
96
N5TG
WD8NYN
95
AA3S
W4NWM
N9AUG
94
WB3JYZ
WD4AWN
WB5LAT
AK5N
KB8GC
VE1WF
93
K1BSO
N2CR
WB2OTC
W5HMR
WB8MTD
WBØZBJ
92
WA4STO
WB5MMI
N8ABA
91
WA2EQW
WB2PJU
WB5LBR
K5OWK
90
WA4CCK
K4GCN
WA4YIU
WD5EUE
AE5I
WB7OFI
VE3DPO
89
WB1DXR
W1RWG
W2YJR
KA4FZI
WD4RNI
WB5TPG
K7ZIG
WAØTNM
88
K4XE
WA7IHS
87
W2SQ
N3AKC
86
WB1ANT
WB5JYI
85
W2MTA
WB3JRW
K4EV
W4JK
WD4LUG
AA5J
WB8SYA
84
W3DP
K3ORW
N4LE
83
K4JGW
W5VMP
W7EP
82
W4ZJY
WD5CWK
WØFT
81
N1AMF
W3AIU
W5JOV
N6WP
80
W1EOF
W8IHX
W8VPW
KØEZ
79
WA5RKU
78
N4WA
77
KB4OW
WB4ZDU
WB8YDZ
WB9JSR
76
KB2HM
W4ANK
75
K3JL
KM4G
KK4M
WB7TOF
WD9BCM
74
KA2CNN
WA2OVE
W4FMN
WB5CIT
AJ5F
WA8GMT
W9HOT
73
WA2MVQ
WDØBMR
72
WØOTF
VE3GT
VE5KS
71
WB1BYR
WA2CUW
WA5QFD
70
WA1VAB
W2TCA
WD5IVD
N7AFZ
69
K7JV
W9JIJ
VE3KK
68
WA4EYU
KB4OG
N5RB
K6YD
67
AF1L
WA1LOU
W1TM
KB2GT
W3BBQ
WB4ZOJ
66
W4NQL
W6JXK
KB6OT
W9XD
VE3APK
65
WB1FZX
WB2ZCM
KA8CDX
WB8SIO
WBØHOX
64
WB5EKU
W5SPE
KB6FC
W7LNE
WBØSND
63
W3BBN
WD4PDK
K4VHT
WB8WIS
KAØAIT
62
K3RHI
WD4LYV
WA6LVO
61
KA2BGX/N
W2XD
WD4CNQ
W4HON
WAØTFC
60
KH6JNQ/1
WD8KBW
K9UN
57
N2BDW/T
55
KA8GMJ/T
53
KA2DBW/T
K4HBI/T
50
WD4CFZ/T
WD8BHE/N
48
WA2MEE/T
47
WA1ZLQ/T
WB2RMJ/T
46
WD4JJK/N
42
WA2HEB/T
41
N2BGR/T
WB7CFH/T

Brass Pounders League November 1979

BPL Medallion (see April 1979 *QST*, page 77) has been awarded to the following amateur since last month's listing: KB6FR/3.

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	774	1050	1363	197	3384
WØWYX	55	1250	307	942	2554
WA4JDH	4	598	596	4	1202
KA9CPA	28	725	135	281	1169
WAØHJZ	22	673	30	412	1137
KB6FR/3	184	397	332	72	985
WA3WQP	3	500	454	27	984
K1BCS	163	290	406	55	914
WAØRWM	44	456	16	256	772
KB4N	1	367	387	12	767
WD4HIF	19	340	343	45	747
W4MEE	4	374	348	18	744
W7VSE	3	366	355	6	730
W9JUJ	2	366	336	1	705
WB4PNY	1	348	304	11	664
WB3GZU	89	238	274	60	661
WØBMA	164	157	268	53	642
AA4FG	223	81	297	26	627
W7DZX	19	295	303	2	619
W5KLV	9	324	239	45	617
W5TI	11	333	256	15	615
W9JIJ	45	285	270	15	615
WB8KWD	2	289	304	4	599
KL7JEB	31	248	273	32	584
WAJK	0	301	270	2	573
K4TH	17	258	194	95	564
WA1TBY	39	241	264	16	560
K8AAZ	7	289	236	20	552
WA8WPW	2	252	276	4	534
W3VR/4	249	99	176	9	533
WA4CNY	30	225	221	49	525
K4SCL	2	267	248	7	524
KØONK	1	395	100	21	517
WAØAUX	28	248	239	0	515
WB6PVH	4	247	237	25	513
W2RQ	2	281	201	19	503
WØWYX (Oct.)	57	1138	491	647	2333
WA2SPL (Oct.)	1	466	479	32	978
W7VSE (Oct.)	11	453	412	25	901
WBØMTA (Oct.)	45	137	319	5	506
Multioperator stations					
K3NGN	100	2000	2000	230	4330

BPL for 100 or more originations plus deliveries:

WA3ATQ	278	WB2OTC	106
N3AOV	183	WD4EPO	103
WB3KDQ	137	W2ZOJ	101
N4BBY	123	WA4CRI	101
K5OWK	119	W4LX	101
W7LUP	111	WB5YDD (Sept.)	140

Multioperator station:

WD4IIO	218

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted by John F. Lindholm,* W1XX

Official Observer Program

He tried to make some sense from the cw gibberish being sent, but it came out "wouff hong." He decried the "rotten QRM." The author is "The Old Man," byline of none other than Hiram Percy Maxim, first president and co-founder of the American Radio Relay League. The time is January 1917.

It's six-plus decades later, but things haven't changed much, have they? Sure, the technology is there but the rig is still controlled by the nut behind the knob.

To inform those amateurs who have rotten operating habits (especially violations of operating privileges) or rotten signals (not from the Land of OZ), the League has successfully sponsored the Official Observer program for over 50 years. Last year more than 5000 observations were made to alert fellow amateurs of a potential violation prior to possible receipt of a more serious notification by FCC or DOC (Canada). Amateur Radio has a long-standing tradition as a self-policing service. Although we tend to shy away from that word nowadays, we can indeed swell up with pride because of that self-made image that has been carefully nurtured. And hundreds of volunteer Official Observers (OO) have played a significant role.

But can we let down our guard? The same technical/operating maladies that plagued the spark-gap generation pester us today. How many more amateurs do we have today as compared to Maxim's day? How much more spectrum to manage? How much greater technical know-how to properly harness? With the dawn of new amateur bands on 10, 18 and 24 MHz, what greater challenge lies before us? The responsibility to keep our own house in order is indeed far greater today than at any time in history.

For the perpetrators of malicious interference, we are in need of an ARRL-sponsored, clearing-house reporting procedure. We need a coordinated effort regionally, encompassing the expert dual efforts of both legal advice and technical direction-finding (DFing) techniques in concert with the enforcement arm of our licensing authority. We need to know what to do when so confronted by malicious interference on the air . . . a well-defined procedure . . . reminiscent of the TVI Committee of yesteryear, an activity in which the League was prominent.

The Official Observer program is aimed at helping those who want to be helped. Those of the malicious interference ilk do not. We occasionally receive a letter from some irate amateur because "I wasn't on the air at the time reported," or "My rig is store-bought and three QSOs said my signal was FB." Or a host of other reasons which may be entirely valid. The point is that the observer is simply that — an observer, not a judge. His observations are of the scientific objective variety. Opinionated comments of condemnation are not condoned. Occasionally, someone takes receipt of such an OO notice as a personal affront to his integrity. That is not the intent. The OO is not an ugly troll residing beneath a bridge.

You will find that the OOs are really a friendly lot. They don't seek grief. It takes a special kind of dedicated person to forsake working DX or county-hunting to assist his fellow amateur by reporting harmonics, overdeviation, or improper i-d. All OO notices conclude with: "This observer thanks you for your courtesy and cooperation in improving the Amateur Radio Service."

When the Communications Department was restructured a couple of years ago, the number of observer classes was reduced from 5(!) to 3. Being proponents of the concept that an effective program should be as simple as possible, and the more simple the better the chances of being effective, we have streamlined the program further by eliminating the concept of classes altogether. Previously, Class I observers met more strict standards of frequency measurement than Class II; and Class III observers were limited to vhf observing. We think this concept is un-American; and Technician class licensees need not be designated "third class" status. The criteria now require that an observer meet rigid frequency measuring standards at least once per year to qualify for reporting "measured" frequencies. All other OOs must indicate frequency as an approximation.

The OO roster is never full and qualified seekers of the appointment are solicited. As with other ARRL appointments, your Section Communications Manager is your "boss," and he/she is the person to contact for further information. See page 8 of any *QST*. We do not seek the frustrated policeman-types. Nor do we solicit vigilantes with chain in hand. Mature, qualified, even-keeled amateurs (with at least four years' experience as an amateur) who genuinely will devote part of their operating time to monitoring the bands are indeed enlisted. OOs have maintained a high tradition of excellence and we seek only the very best. Perhaps you'd like to apply?

Meanwhile, let's give the Wouff Hong a well-deserved vacation from its merciless acts of reform.

FREQUENCY MEASURING TEST

The November 3 FMT almost started late because of a blown fuse at W1AW. The transmitter went on the air in accordance with the schedule, but the equipment was not warmed up adequately to ensure frequency stability. As a consequence, the 20-meter run was transmitted with a frequency drift of 40 Hz. The usual practice is to have the related equipment warmed up and ready to go for 24 hours prior to the start of the FMT run. Hence the decision to discount the early 20-meter run. The umpire's official early readings were 7074.191 and 3542.410 kHz. Late runs: 14,080.405, 7062.363 and 3535.260 kHz.

Measurements numbering 1170 were reported taken by 74 participants; 61 measured within 100 Hz of the umpire. They are listed as follows with average error preceding their calls: (0 Hz) K4BE WA4AXA W4IBU W5IJW WA5NOM W5ZTN W6RQ W8CUJ W8NWU W8OK WØKL WØUSL, (1) AG1R K1BC W1BGW W1JH W3BFF W4NTO W5FMO WA6IQL W6CBX W6CDF WB6LCI K6MZN W6OQI K7HZ/6 W7ANF W7KR W9LI KØMOZ, (2) K2RG K2SM WB4PMG, (3) N5BQK KØBRS, (6) K4ZN, (7) W2ND AJ7Q, (8) W4HU, (10) K5FSA, (11) N4CDE N6YD, (13) N1QY, (15) WB1CZE, (16) N5DZ, (19) WA9PVS, (26) W8ZRL, (28) VE3FCU, (30) W4QN, (35) K6RB, (36) K8EF, (37) W1UJ, (38) W3FYK, (53) KH6CZ, (64) W8HZA, (65) W4AWS, (73) W4UCL, (79) W6SSB, (82) W3ADE, (90) VE6MJ and (91) N6MJ. All entries measuring over 100 Hz have been notified.

Excerpts

I used a Collins 75 S-3 in conjunction with a home-constructed counter (Ken Macleish, W1EO, *QST*, October 1970). Counter is used in signal mode, readout directly in frequency (WB6LCI). I always enjoy this activity and do not understand why so few participate (W4QN). My first experience in frequency measuring indicates that I have a lot to learn, particularly in single-signal reception in the addition to the art of precise measurement (K6RB).

The next scheduled FMT will be on February 9 (local time). Consult the January "Contest Corral" column for complete details. — *Jeannie DeMaw, W1CKK*

SCM ELECTION NOTICE

To all ARRL members in the Wisconsin, Illinois, Northern Florida, Manitoba, Santa Clara Valley, Indiana, Vermont, Maine and Oregon sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

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

(Place and date)

Communications Manager, ARRL
225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . ZIP . . .)

SCM candidates must have been members of the League for a continuous term of at least two years and licensed amateurs of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 7, 1980.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on April 1, 1980, returns counted May 20, 1980, and SCMs elected as a result of the above procedures will take office July 1, 1980.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning July 1, 1980.

If no petitions are received for a section by the specified closing date, such section will be resolicited in July *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

*Communications Manager, ARRL.

You are urged to take the initiative and file a nominating petition immediately.
John F. Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING SOLICITATION

Since no petitions were received for the Santa Barbara section as a result of notices in the July and August *QST*, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate.

SCM ELECTION RESULTS

The following were elected for two-year terms of office beginning April 1, 1980:

Uncontested:

E. New York — Guy L. Olinger, K2AV
Maritime/Nfld. — Donald R. Welling, VE1WF

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 111. A W1AW schedule also is 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.

Strays

Nico Gurfield, KA6FJT (right), and Dave Ross, WD6FLP, both relative newcomers to ham radio, are greeted by John Griggs, W6KW, retired SW division director at the recent SW division ARRL HamCON. Nico and Dave were featured in the "World of Amateur Radio" film. *(photo by K6PGX)*

A real-live RST attended the 1979 Shelby, NC, hamfest. Shown (left to right) are Bill Paris, AA4*R*; Ron Bailey, AA4*S* and Tony McDowell, AA4*T*.

	OSCAR 7			OSCAR 8			
DATE (UTC)	*Orbit No.*	*Time UTC HR MN*	*Eqx W. Long. Degrees*	*Orbit No.*	*Mode*	*Time UTC HR MN*	*Eqx W. Long. Degrees*
1 Feb.	23,845	01:19	87.9	9728	AJ	01:28	71.7
2 Feb.	23,857	00:18	72.8	9742	J	01:33	72.4
3 Feb.	23,870	01:12	86.4	9756	J	01:38	73.6
4 Feb.	23,882	00:12	71.2	9770	A	01:43	74.9
5 Feb.	23,895	01:06	84.8	9783	AJ	00:04	50.4
6 Feb.	23,907	00:05	69.7	9797	X	00:09	51.6
7 Feb.	23,920	00:59	83.2	9811	A	00:14	52.9
8 Feb.	23,933	01:54	96.8	9825	AJ	00:19	54.2
9 Feb.	23,945	00:53	81.7	9839	J	00:24	55.4
10 Feb.	23,958	01:48	95.3	9853	J	00:29	56.7
11 Feb.	23,970	00:47	80.1	9867	A	00:34	58.0
12 Feb.	23,983	01:41	93.7	9881	AJ	00:39	59.2
13 Feb.	23,995	00:40	78.6	9895	X	00:44	60.5
14 Feb.	24,008	01:35	92.1	9909	A	00:49	61.8
15 Feb.	24,020	00:34	77.0	9923	AJ	00:54	63.0
16 Feb.	24,033	01:28	90.6	9937	J	00:59	64.3
17 Feb.	24,045	00:28	75.4	9951	J	01:04	65.6
18 Feb.	24,058	01:22	89.0	9965	A	01:09	66.8
19 Feb.	24,070	00:21	73.9	9979	AJ	01:14	68.1
20 Feb.	24,083	01:15	87.5	9993	X	01:19	69.4
21 Feb.	24,095	00:15	72.3	10007	A	01:24	70.6
22 Feb.	24,108	01:09	85.9	10021	AJ	01:29	71.9
23 Feb.	24,120	00:08	70.8	10035	J	01:34	73.2
24 Feb.	24,133	01:03	84.3	10049	J	01:39	74.4
25 Feb.	24,145	00:02	69.2	10062	A	00:01	49.9
26 Feb.	24,158	00:56	82.8	10076	AJ	00:06	51.1
27 Feb.	24,171	01:51	96.4	10090	X	00:16	53.7
28 Feb.	24,183	00:50	81.2	10104	A	00:16	53.7
29 Feb.	24,196	01:44	94.8	10118	AJ	00:21	54.9
1 Mar.	24,208	00:43	79.7	10132	J	00:26	56.2
2 Mar.	24,221	01:38	93.3	10146	J	00:31	57.5
3 Mar.	24,233	00:37	78.1	10160	A	00:35	58.7
4 Mar.	24,246	01:31	91.7	10174	AJ	00:40	60.0
5 Mar.	24,258	00:31	76.5	10188	X	00:45	61.3
6 Mar.	24,271	01:25	90.1	10202	A	00:50	62.5
7 Mar.	24,283	00:24	75.0	10216	AJ	00:55	63.8

Orbit predictions by Dr. Tom Clark, W3IWI, AMSAT, Box 27, Washington, DC 20044. 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).

Soviet RS data have been discontinued.

O 7 progresses an average of 28.737244° W. per orbit in a period of 114.945677 minutes. O 8 progresses an average of 25.807467° W. in a period of 103.225427 minutes.

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

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7

Mode A — x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B — x = uplink frequency − 578.100 MHz ± Doppler shift

OSCAR 8

Mode A — x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J — x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband.

Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

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.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

FEBRUARY

1-10

ARRL Novice Roundup, January *QST*, page 88.

2-3

Marconi International DX Contest, phone, January *QST*, page 95.

CWSP International DX Competition, January *QST*, page 95.

South Carolina QSO Party, January *QST*, page 95.

New Hampshire QSO Party, January *QST*, page 95.

North American Sprint, sponsored by the National Contest Journal, from 0100Z until 0500Z February 3. Single operator, cw, 80-40-20 meters only. Suggested frequencies: 3530-3550, 7030-7050, 14,030-14,050. Stations outside of North America work NA stations only. Stations may be worked once per band. Exchange his call, your call, serial number, your name, state (or VE province) or country. Proper logging requires the time for each QSO. Serial numbers start with 001 and must be consecutive. An operator may only use one call sign during the contest. Multiply total valid QSOs by the sum of states, VE provinces and other North American countries to get final score. USA and Canada don't count as countries. KH6 not counted as state or country. VE multipliers are Maritime (VE1, VO1, VO2) and VE2 through VE8. Non-North American countries do not count as multipliers. Special QSY rule: If any station solicits a call by sending CQ, QRZ?, QRZ, etc., he is permitted to work only one station in response to that solicitation. He must then move at least 1 kHz before working another station, or at least 5 kHz before soliciting other calls. Team competition: Each team has a maximum of 10 members. To qualify as a team, the name, call sign of each operator, and call sign of the station operated should the operator be a guest at a station other than his own, must be registered with N6SF. The team information may be contained in a letter, which must be received before the start of the Sprint, or be contained in a Western Union Mailgram dated at least 24 hours before the start of the Sprint. No distance/meeting requirements for a team entry. Disqualifications may be made for illegibility, incorrectness, or illegal or unethical operation. Awards. Entries should be mailed in time to reach N6SF no later than March 3. A complete entry consists of a summary sheet showing name, address, score computation, etc., and a log (including dupes marked as such) with new multipliers numbered. Separate dupe sheets for each band. Send to Rusty Epps, N6SF, 235 Montgomery St., Suite 2600, San Francisco, CA 94104.

6

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z February 7 (9 P.M. PST February 6). Frequencies are approximately 3590/7090 kHz. Underline 1 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.

9

ARRL Frequency Measuring Test, January *QST*, page 95.

9-10

PACC Contest, January *QST*, page 96.

Two-land QSO Party, January *QST*, page 96.

12

W1AW Qualifying Run, 10-35 wpm at 0300Z on February 13 (10 P.M. EST February 12). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. The complete W1AW code practice and bulletin schedule 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 the February 6 listing.

16-17

ARRL International DX Contest, cw, revised rules appeared in December *QST*, page 94.

YL-OM Contest, phone, sponsored by the Young Ladies Radio League, from 1800Z February 16 until 1800Z February 17 (cw contest March 8-9). YLs work OMs, and vice versa. Exchange signal report, serial number and ARRL section or DXCC country. Score 1 point for each YL/OM contact. Multiply number of contacts by number of different ARRL sections (KH6, KP4, etc., count as DX) plus DXCC countries. Multiply that total by 1.25 if dc input power is 150 watts or less (300 w PEP on phone) for final score. Log should say whether you are a YL or OM. Awards. Mail entry by March 21 to YLRL Vice President (one O'Donnell, WA2DMK, Newcomb, NY 12852.

23

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST). See February 12 listing for more details.

23-24

French Contest, phone, January *QST*, page 96.

Vermont QSO Party, sponsored by the Central Vermont Amateur Radio Club, from 2100Z February 23 until 0100Z February 25. Exchange signal report, serial number and county (VT only)/ARRL section. VT stations count 1 point per QSO and multiply by the number of ARRL sections plus DXCC countries worked. Others count 3 points per QSO and multiply by sum of VT counties worked on all bands. Suggested frequencies: cw — 3.685 7.060 14.060 21.060 28.100 144.1 MHz; Phone — 3.932 3.909 7.265 7.290 14.290 14.325 21.375 28.600 50.260 50.360 145.8 MHz. Send s.a.s.e. for results. Awards, "Worked VT" Award for working 13 of the 14 counties. Mail entry by March 31 to Gerald Benedict, WIBD, 23 Foster St., Montpelier, VT 05602.

40-Meter Contest, sponsored by the FAROUT Amateur Radio Club. Starts 1700Z February 23, ends 2300Z February 24. Open to all amateurs. Work each station once on cw and once on phone. Exchange RS(T), serial number, and ARRL section or country. Operate no more than 24 hours. Scoring: Count 5 points for each FAROUT club member worked; all others count 1 point. Multiply total QSO points times multiplier for final score. Awards. Logs and dupe sheets must be mailed by March 31 to Charles Berry, WD8NVY, 1982 Lynnpark Ave., Dayton, OH 45439.

MARCH

1-2

ARRL International DX Contest, phone, December *QST*, page 94.

6

West Coast Qualifying Run, 10-35 wpm at 0500Z March 7 (9 P.M. PST March 6). See February 6 listing for more details.

8-9

YL-OM Contest, cw, see February 16-17 listing.

Virginia QSO Party, sponsored by the Sterling Park ARC, from 1800Z March 8 until 0200Z March 10. 160-10 meters. Exchange signal report, serial number and county (VA only), state, province or country. Count 1 point per QSO. VA stations multiply by total number of VA counties, states, provinces and countries worked. Others multiply by number of VA counties worked (max. 98). Suggested frequencies: cw — 60 kHz from the low end and Novice bands; phone — 3.930 7.230 14.285 21.375 28.575 MHz. Awards. Send s.a.s.e. for results. Logs must be received by April 15. Send to Virginia QSO Party, P. O. Box 599, Sterling, VA 22170.

12

W1AW Qualifying Run, 10-35 wpm at 0300Z on March 13 (10 P.M. EST March 12). See February 12 listing for more details.

15-16

Bermuda Contest

Marconi International DX Contest, cw, January *QST*, page 95.

All Asia Contest, phone

22-23

BARTG Spring RTTY Contest

Tennessee QSO Party

24

W1AW Qualifying Run

29-30

CQ WPX Contest, phone

YL ISSB QSO Party

Wisconsin QSO Party

APRIL

5-6

ARRL Open CD Party

QRP ARC QSO Party

12-13

ARRL EME Contest — I

26-27

Trophy H. M. The King of Spain (EA)

Helvetia Contest (HB9)

MAY

17-18

ARRL EME Contest — II

JUNE

14-15

ARRL VHF Contest

28-29

ARRL Field Day

* Asst. Communications Manager, ARRL

Section 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 — SE & Asst SCM Roy Ellis, VE6XC. Net Mgr: (APSN) VE6AFO. Net Mgr: (ACWN) VE6BBL. The Northern Alberta Radio Club have amateur classes well underway with an enrollment of over thirty members. A computer group has been formed within the NARC and interested amateurs should contact this group thru the club. I am sorry to report the passing of VE6AFW. His cheery voice will be missed by all who knew him. As I expect to be away for several months, my duties as your SCM will be carried out by Assistant SCM, Roy Ellis, VE6XC. Your cooperation will be very much appreciated. Traffic: VE6JB 154, VE6CHK 99, VE6BBL 66, VE6ABC 22, VE6QN 15, VE6XC 14, VE6YW 9, VE6CEY 8, VE6AMM 6, VE6NF 6, VE6JT 4, VE6CE 4, VE6AAT 4, VE6CFQ 2, VE6CO 2, VE6MJ 6, VE6TE 1.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — BC Phone Net 3755 kHz averaging 134 per night. VE7OC, NM, and VE7DOF, asst NM, should be pleased with the activity on net. BCEN 3650 kHz tries to keep net speed down to 15 wpm which has shown an increase of checkins, but traffic is lacking. Well, we seem to have a rash of broken limbs in our ranks, VE7UU VE7DGB, who is 80 years young and VE7DAR's XYL, VE7CAM in Halifax teaching. Vancouver Senior Citizens ARC supplied communication from six curling rinks for seven days in two seven hour shifts for the BC Bonspiel. Thanks to BCFM Assn. VE7RAG repeater on two. VE7CIL set it all up. Traffic: VE7ZK 80, VE7CQA 77, VE7FB 24, VE7BLO 8.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR, STM: VE4RO. NMs: VE4s VJ TE NM IZ AGB. Activity increasing and checkins good on all nets. SET was operated as a practice session this year due to the holiday. Results were gratifying dispite the long weekend. Hopefully some other arrangement can be found so we can operate an efficient SET in October next year. Merry Christmas and a Happy New Year to all. MEPN: QNI 1243, QTC 36, 30 sess; MTN: QNI 240, QTC 56, sess 30; MMN: QNI 478, QTC 30, sess 30; WRIN: QNI 104, QTC nil, 4 sess. Traffic: VE4RO 92, VE4PG 69, VE4QJ 29, VE4AEJ 26, VE4TE 25, VE4LU 17, VE4JA 13, VE4HR 12, VE4JI 10, VE4ID 9, VE4ADS 8, VE4FK 8, VE4LB 7, VE4CR 6, VE4NM 6, VE4LN 5, VE4AAD 4, VE4NE 4, VE4ACX 3, VE4AAU 2, VE4EN 2, VE4HK 2, VE4MP 2, VE4AAE 1, VE4DP 1.

Maritime-Nfld: SCM, Aaron D. Solomon, VE10C — AJSCM: VO1FG. STM: VE1WF; SEC: VE1ASW. NMs VO1JN VE1WF. Silent Keys: VE1CT VE1GY VE1KA VE1LX. Condolences Your SCM thanks all those who supported him in the recent election for Vice-Dir. Can. Div ARRL. VE1ASJ has worked 2-ZL stations on 6 meters. New LGARC officers: VE1EE, pres.; VE1VW, vice pres.; VE1IZ, treas. DX-ped. Sable Is. incl. VE1s AMC AMZ AWS AI MX made 7-K contacts & many 6 meter cross-band contacts. SARC: VE1GH, pres.; VE1WI VE1XQ, vice pres; VE1BVD, secy.; VE1ABM, treas. 19 SARC mem. are reg. & equip for gr. search rescue. 14 SARC mem. provided comm. for Ghost Patrol. SONRA: VO1FX, pres.; VO1IM, vice pres.; VO1MG, secy.; VO1CR, treas. VO1AA opr. Signal Hill made 650 contacts 24 hrs. Coast Guard Aux. Comm. Gr. being formed for Nfld /Lab. HUMBARS: VO1AE, pres.; VO1DO, vice pres.; VO1DX, secy.; VO1LX, treas. VO1GP rec'd Campbell Award from Corner Brook ARC. Your SCM wishes all Amateurs a very Happy New Year. APN: Sessions 30, QNI 142, QTC 112/105. Traffic: VE1WF 324, VE1LCR/RO 78, VE1CF 28, VE1BMN 24, VE1OG 16, VE1BXA 14, VE1XF 12, VE1AUL 10, VE1KR 8, VE1ASW 4

ONTARIO: SCM, Larry Thwierge, VE3GT — SEC: VE3APK. STM: VE3GOL. NMs VE3s AJN GFN EWD GJG IFP ISW. During the recent Mississauga emergency, Amateur Radio has again proven that it is a tremendous resource of emergency communications. From the time the Amateur Radio Emergency Service was alerted, until all stations were secured, amateurs provided the communications back bone on vhf, using local 2-meter repeaters as well as simplex frequencies during the massive evacuation of Mississauga and surrounding areas. Many amateurs manned their posts for up to three days. Red Cross and civic officials were very impressed with the professionalism demonstrated by amateur operators in this public service effort. Congratulations to all of you for a job well done. VE3FYW has a slide presentation labelled, "In the beginning" and several clubs have already taken advantage of his historical reminiscence. Peterboro ARC, with much solid experience, hoping to provide communications for the water events during the 1980 Summer Games held there. VE3CO indicates there are 386 licensed White Caners in Canada and, incidentally, congratulations are in order to Bill, he celebrated his 60th year as a League member last month. The Ont. Trilliums, who manage the VE3QSL Bureau, celebrating their 15th anniversary on May 24th at the Prince Hotel in Don Mills. Sudbury repeater VE3SRS on 146.46/06 MHz now has the call VE3NRB. Upgrades to Advanced are VE3AXA and VE3KTE. VE3SIS is a new repeater in Toronto operating on 52.23 MHz input and output on 53.23 MHz. It is located at Yonge and Steeles and is sponsored by the Six Metre ARC who otherwise are the six metre FD group at the Canadian champion VE3NAR/3 Nortown ARC. New calls are VE3s LQA LWM and LWK. New Emergency Coordinators are: VE3XB, North Halton and Brampton and VE3IFP, Walden. After 27 years as an amateur, VE3DPO has joined the gang on ssb. Regretfully I report that VE3DOB became a Silent Key. The following clubs held very successful annual banquets: Ottawa Valley ARC, Kitchener-Waterloo ARC and Windsor ARC. VE3FPI and VE3GNW on RTTY now. Traffic: VE3GOL 358, VE3JIR 329, VE3KK 169, VE3JRT 166, VE3DPO 162, VE3CYR 125, VE3GT 121, VE3ISW 111, VE3SB 71, VE3GJG 70, VE3APK 68, VE3HCS 63, VE3GFN 62, VE3HGJ 56, VE3EWD 51, VE3JPP 50, VE3ILT 49, VE3JRO 44, VE3IFP 42, VE3AJN 35, VE3GYD 34, VE3DUK 33, VE3JJK 31, VE3FGU 29, VE3ANJ 26, VE3COWA 22, VE3AWE 21, VE3BVG 19, VE3IMR 18, VE3GNW 14, VE3FHZ 13, VE3DVE 10, VE3KXB 9, VE3FPI 8, VE3JHE 8.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. New appointees: VE2BDM as 00, VE2BZL as OTS. Congratulations to VE2QO on obtaining the first Canadian DXCC-RTTY certificate and number 12 worldwide. The RAQI Administration office is now located at 8045 de Normanville, Suite 12, Montreal. The telephone number is (514) 726-2119. The mailing address is 1514 Jarry St. E., Box 88 Montreal H2E 2Z7. Felicitations a VE2EAR (16 ans) pour avoir attent son 100 eme pays confirmes, DXCC. Traffic: (Nov.) VE2FFE 35, VE2EC 27, VE2APT 10, VE2EKC 7, VE2BDM 6. (Oct) VE2APT 30.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — SEC: VE5WM. NMs: VE5DC VE5HG. With the cold upon us now, a sharp ear is now on the repeaters in case anyone runs into trouble. Lucky Lake repeater is now underground. Due to an ice storm the 150 ft tower came down and since then it has been rebuilt to 70 ft, also it has a second windcharger for backup power. The Battleford repeater is up again and is working well. A new repeater coming up is one at Weyburn 146.10-146.70. VE5XC is heard back on the air checking into tenth region. VE5DR has headed south for the winter. VE5DR has headed south for the winter. VE5HG is busy with repeater repairs. There is an increasing interest in Sask on 160 meters. SATN: 445 QNI, 40 QTC. SPN: 1287 QNI, 59 QTC; Regina 2-M Net: 366 QNI, 9 QTC. Traffic: (Nov) VE5AE 74, VE5HG 39, VE5WM 25, VE5XC 16, VE5XS 7, VE5AAT 6, VE5ACM 4, VE5EO 4, VE5MP 2. (Oct) VE5AE 81, VE5WM 55, VE5QI 49, VE5HG 37, VE5OOY 16, VE5NJ 14, VE5TT 10, VE5AAI 6, VE5DR 6, VE5OL 5, VE5LN 4, VE5UX 4, VE5AAT 3, VE5XY 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STM: W3WD W3QQ. PSHR: N3AKC 87, K3JL 75. WA3HDS and family hosted the 1st State ARC at a most enjoyable Christmas covered dish dinner. Congratulations to WA3QLS on receiving his Private Pilot's license. WB3JUZ gave the DARC an excellent program on "Transmitter Hunting." Tnx to WB3LMB for superior art work on the DARC Club Bulletin and for his "T" shirt and jacket designs. Hams with 4WD vehicles please register with New Castle Co. EC, WB3FOE. WA3WIY/WB3DUG and W3WD are using new rigs on the DE nets. Nov. Tfc. DTN: QNI 315, tfc 57 DEPN: QNI 69, tfc 18. Traffic: W3PQ 159, N3AKC 73, W3QQ 68, W3DKX 42, K3JL 38, WA3WIY 38, WB3DUG 29, W3WD 21, WB3GOI 19.

EASTERN PENNSYLVANIA: SCM, G. S. Van Dyke, Jr., W3HK — SEC: WA3PZO. NMs: K3NGN W3VA WA3WOP AG3R. STM: K3NGN. Net Reports: EPAEP&TN QNI 364, QTC 133; EPA QNI 370, QTC 277; PTTN QNI 300, QTC 121; PFN QNI 348, QTC 354; LVN QNI 12, QTC 24; AREC(2) QNI 14; LVN(2) QNI 30, QTC 9. OBS repts: N3AIU WB3JZA WB3JYZ W3VA W3ID W3CL K3EBZ. OVS repts: WB3AZE W3GOA WA3BJO N3CP W3CL K3RHI K3YD. OO repts: K3NSN W3GOA. PSHR: WB3JZA WB3JYZ N3AIU W3DP K3RHI. BPL: K3NSN KB6FR/3 WA3WQP WA3ATQ. W3CUL/4 reads our dope sheet, homesick? K3KW has had to drop the EPA NM slot due to TCC assignments. We wish him well in the TCC job and thank him for a job well done in EPA NM. K3NGN will fill in as NM for EPA. WA3PZO is working with the Olympic Torch Run and things are shaping up nicely. K3NG back on FCC TVI work! WA3ATQ says spring is next. Her OM is an undercover man, his art is in the garage! WB3JYZ now big "E," also looking for Utah for WAS. W3VA working some DX. WA3VIL says 2-m is fun, even has XYL interested! WB3JYZ now bit "E." WB3JZA now AJ3R. K3EBZ now General. W3WRE still silent on air but not at banquets! WB3HUX now big "G." KA3CSN new Tech. W3DZH is ahead of Santa, sporting a new TR7. W3KUA reports 220 MHz activity up at Wilkes-Barre. Club papers not only look good, they have real good information in them! If enthusiasm means anything, the Pack Rats and Frankford Radio Club will be able to do their thing again this year! 73 and Happy New Year. Traffic: K3NGN 4330, KB6FR/3 985, WA3WOP 984, WA3ATQ 490, WB3JZA 402, K3KW 248, WA3CFJ 233, K3NGN 151, W3IPX 150, AG3R 127, N3CD 122, WB3JYZ 120, N3AIU 106, W3DP 95, W3VA 91, W3FAF 78, WB3GZV 50, WB3GUR 49, WB3FEH 42, K3EIP 35, AA3B 33, WA3VIL 27, W3ID 26, W3ADE 21, W3AVJ 20, KA3BEH 18, WB3CAI 18, W3CL 12, N3CP 12, KA3CHG 11, K3RHI 8, AA3C 7, K3EBZ 7, K3AKN 4, W3HK 3, WA3BJQ 2, K3AI 1, W3EU 1, WB3FPL 1, W3GMK 1, W3GOA 1, W3WRE 1, K3YD 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — Tnx to minutes and bulletins from the Anne Arundel Radio Club, So. Md. ARC and the FAR for November inputs. W3ECN may be a weekender, but he is busy with a new ATV camera an code practice. W3EOV is still looking for graphology experts. W3CDQ contested in the YLAP do. K3RXK had fun in the SS both Modes. W3ZNW can now write with right hand. WB3JRW was doing a little deer hunting. N3AQV likewise, but he operated portable! W3OYY lives in deer country. KB3AP got involved in some emergency communications. W0VJD/3 has been doing yoeman service in the DC area. W3FZV has worked all JA districts. WB3KDQ N3AQV teamed up and share BPL honors with WB3GZU this month. K3MR handles traffic in Balto. and W3MR is an OO in SS. WB3CES K3CRW and N3SJ have limited delivery areas, but they shr up the nets. AA3S has a full time job keeping the MEPN perking. N3QA is located right across the bay in Kent County. W3DFW is almost, but not quite, the youngest man in the WR PON. N3AFM has a ball with the 6 meter openings. W3WBY has retired. WB3KYL is doing inside work as an electrician. W5NZ/3 finds work interfers with his hamming. WB3FAF has the MARC bulletin sked at 8 P.M. local on their repeater. W3FZT sadly reports W3BNC and W3NG are Silent Keys. W3GRF is a new OTS. With the nets: Net/Manager Sessions/Traffic/QNI average. MDC PON/W3OYY 4/9/25 WR PON/W3DFW 17/24/20. Washington County/W3FZT 4/4/23. MEPN/AA3S 31 170/23.5. Toppers N3AMA WB3BFK. Others W3ADQ N3AGM WA3IHW K3OMN and WA2YFM. Point winners were AA3S/78, K3ORW/56, WB3GZU/40, WA3FUJ/45, and K3YUC/40. MDD/W3PQ meets 7 and 9 P.M. local on 3643 daily. Traffic: WB3GZU 661, N3AQV 481, WB3KDQ 322, W0VJD/3 195, K3ORW 175, W3FA 125, WB3JRW 110, AA3S 88, W3EOV 62, N3SJ 47, N3QA 32, W3ECN 22, W3FZV 22, WB3KYL 22, KB3AP 14, K3RXK 13, K3MR 4, WB3CES 2, W5NZ/3 2, W3ZNW 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: WB2LCC. Two EC positions were opened up this month with the resignations of K2IB, as Ocean County EC and K2OG, as Cumberland County EC. I wish to thank them for their hard work and wish them the best in the future. As there are currently no applications on file for the job of EC, I would like to request all interested persons in either of these counties to contact W2HOB, our SEC, or myself for complete information. The job of EC is a toudh one, requiring coordination of all emergency communications and ARES activities within the county, but there is a lot of room in which to excel and it sure pays off in knowing you are doing your best to serve the public and ham radio. More progress is being made every day on our section RTTY repeater to be located on the Channel 23 TV tower in Waterford Works, Camden County. Our section RTTY Coordinator is WA2KNZ and he reports that by the time you read this we will be on the air or almost there. Are you crystalled up for it? The frequency is 147.945/345, and it's primary purpose is emergency communications and the like. Why not fire up your old RTTY klunker and join the fun. We still lack RTTY equipped stations in several counties so there is plenty of room. Until next month, RYRYRYRYRYRYRYRYRY! Traffic: AA2H 191, KB2EV 121, N2AFN 114, WA2CUW 94, WB2LCC 67, WA2GXU 63, N2AJG 48, N2ALS 42, WA4JRP 36, WA2HEB 35, WA2ONW 32, WA2WUL 20, K2UL 18, WB2GTW 17, KC2J 12, W4NLC 12, WA2TWK 11, N2AXL 10, WB2GFM 7, WD2AHO 6, WA2GTJ 4.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: WB2FTX. BPL to W2ZOJ WA2ZJP and WB2OTC. PSHR to W2ZOJ WA2MFV WB2OTC W2MTA KB2GT KA2BGX. Oct. PSHR to W2MTA KB2GT KA2DFM. WA2MFU made BPL in Aug., but was left off the listing in Nov. OST. Sorely needed Central NY Traffic Net started Dec. 17 on 147.90/.30 (WR2AOC) repeater which is located at the Onondaga Community College campus, 9:30 P.M. (local), every day. W2WSS reports ESS activity up for Nov, both ONI and ttc. Still sending the wrong messages? Get a copy of ARRL form CD-3 or check out Dec. OST for the new numbered radiograms that went into effect 1/1/80. WB2OJX celebrated his update to Extra with a new call and is now KC2P. His junior op has a new Novice ticket, KA2GMC. All hams residing in St. Lawrence County can get a special QSL commemorating the 1980 Olympics. Contact WB2NAO for details. WA2CBU and AF2K again spent a week in Gibralter in Nov. and QSLs for contacts with ZB2EM or ZB2EN go via AF2K. WB2RWW is the new secretary of the Griffiss AFB ARC, and is now up to 108 countries on QRP. K2OS now has 52 elements cooking on two-meters, and his father has a new monobander up on 10. Traffic: (Nov) WA2ELD 451, W2ZOJ 399, WB2OTC 266, WA2MFV 226, WA2HSB 221, W2RUF 208, W2MTA 189, WA2ZJP 173, KA2BGX 136, WB2RWW 108, W2PZL 101, KA2CTU 86, K2GWN 82, WA2KOJ 69, KB2GT 52, WA2MFU 45, WA2AFE 42, W2IMO 42, WB2OMZ 31, WB2OWO 19, N2ALB 16, K2VR 11, W2FR 10, WB2NAO 4. (Oct) WA2ELD 300, W2MTA 298, KA2DFM 101, WA2KOJ 84, K2GWN 74, KB2GT 60, WB2OMZ 57. (Sept.) WA2ELD 329. (Aug) WA2ELD 366. (July) WA2ELD 293.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. STM: W3YQ. SEC: WA3VUP. Ass't SECs: WA3LJW WA3JBQ. NMs W3NEM W3KUN W3MML WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	30	349	152	3585	7:00 P/D
WPAPTN	30	661	179	3983	6:15 P/D
WPARACES	3990.5	9:00 A/Su: P	TTN	3610	6:30 P/D

The NWPA2MTN had 26 sess, QNI 161, QTC 6. The Radio Officer for Beaver County is WA3JZE, inv error. New Novice is KA3EGE, new Generals are KA3BTH & KA3CEO. WB3AMR has moved up to Extra. Congratulations to all. the Radio Amateurs of Corry new officers for 1980 are W3KJE, pres.; WB3BNH, vice pres; WA3WPV, secy.; WA3SJM, treas. The Irwin ARA new officers, are WB3EKB, pres.; K3KSY, vice pres.; WA3ZBJ, secy.; WB3BRD, treas.; WB3EVZ, comm. dir. W3ATQ is retiring and moving to Williamsburg, VA. We wish you a very long and happy one. WB3GPF has moved to CT. The Irwin ARA Bull-Sheet insinuates he'll be sorry. KA2DLJ is leaving the Indiana County area to be chaplain at a VA Hospital in Michigan. Godspeed and our best wishes in your new ministry. If I may have been a little hard to contact the last month please bare with me as my XYL had a major lung operation and it was very trying for a while, but she is doing fine now. Tnx to all for the well wishes. Traffic: (Nov) W3EGJ 272, WA3PXA 254, W3SMV 244, W3NEM 198, N3FM 130, W3YQ 121, WA3VUP 90, WB3JDI 80, W3KMZ 60, W3MML 60, W3UHL 53, KB3DT 41, WB3HUJ 40, K3SMB 37, N3WS 36, W3KUN 35, W3RUL 26, W3EXC 24, WA3VRE 24, N3KB 22, N3AZH 19, WB3GWJ 14, W3AS 12, W3SN 11, AB3X 10, AF3B 9, K3ISO 9, W3TTN 9, WA3JBQ 8, K3VQV 8, WA3TQ 6, WB3KBV 6, WB3IFD 5, WA8PAV/3 5, WB3BOB 3, K3UA 3, W3LOD 1. (Oct) W3NEM 160, WB3IFD 20, WB8PAV/3 18, N3WS 16, (Sept) W3UHL 56, WA3JDI 34, W3TDW 18, KB3DT 7.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU. SEC: W9AES. NMs WA9KFK and WB9JSR. Cook County EC: W9HPG

Net	Freq.	Times/Days	Tfc.	Sess.
ILN	3690	0030/0400 Dy	341	60
ILL Phone	3915	2245 Dy	228	30
NCPN	3915	1300/1800 Dy	192	52
IEN	3940	1400 Su	—	—
W9VEY Mem				
Stn	144 MHz —		7	4

WD9FPR is now a General. W0RJW/9 has a new Drake C Line. W9HOT reports that the 9RN daytime net during 90 sessions passed a total traffic count of 412 and that IL

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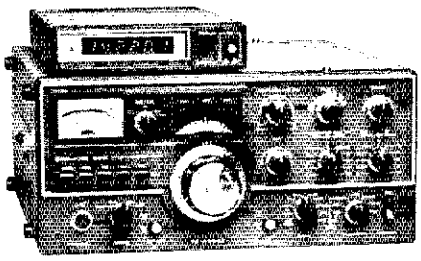

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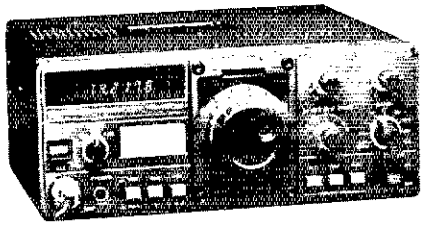

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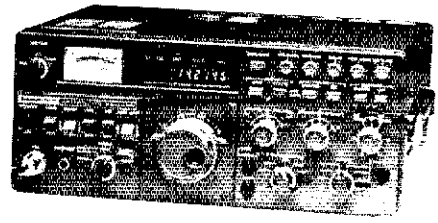

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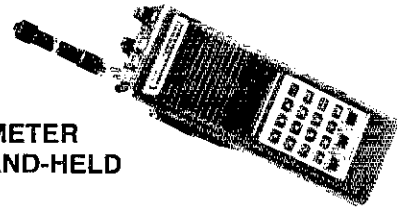

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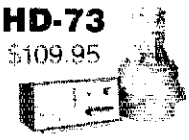

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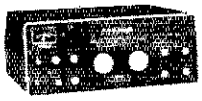

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had a 100% daily check-in with W9JIJ W9NXG W9YCE W9HOT WB9WGD WD9EVV and WB9QMO checking into the net. WB9RFT's new QTH will be San Diego. W9OUW has a new Butternut vertical with 24 verticals to bring in the tough ones. WB9CJR has upgraded to General. WD9CMB WB9PBR KA9DNQ WB9MMM WD9FVF WD9FVH N9NUN and WB9SFT are the new officers of the Rockford Amateur Radio Association. The League's Executive Committee granted ARRL Club affiliation to Southern Illinois Amateur Radio Society and declared them a duly affiliated station. W9PRN will speak at the Moultrie Amateur Radio Klub annual dinner on December 1st in Mattoon. Our sympathy to the family and friends of K9BOV who recently passed away and joined the ranks of Silent Keys. We also pass along our sympathies to WD9DEA on the loss of his father-in-law. The CAND net had a total of 727 messages during 60 sessions and W9JIJ W9NXG WB9WGD W9HOT and W9YCE helping to make the Illinois participation 100%. W9JIJ is the only BPL recipient for the month. Traffic: W9JIJ 615, W9NXG 385, W9HOT 204, WB9JSR 165, WB9WGD 163, WB9EVV 119, W9OK 99, WA9KFK 85, K9UN 67, KA9DTE 60, W9LTU 60, WØRJW/9 52, W9YCE 50, WD9BEX 49, N9MX 48, KA9ALH 42, W4IZI/9 30, WA9JJE 30, W9LNQ 24, K9PNG 23, W9PRN 20, W9KR 19, WD9HZF 18, WB9YJF 18, WB9SGK 9, WB9PTP 2, AA9R 2.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH. STM: W9JUJ. Net Managers: ITN W9QYY, QIN WB9UYU, ICN N9AEI. November net reports.

Net	Freq	Time	QNI	QTC	Sess.
ITN	3910	1330/2300 Dy	2107	272	60
QIN	3656	1430/0100/0400 Dy	787	405	90
ICN	3708	0015 Dy	110	33	29
IPN	3910	2130 Dy	1134	232	30
VHF Nets (October)(9 nets)			2605	136	

There are 47 VHF nets, 8 nets meet daily.

Net	Freq.	Day	Time	Net Mgr.
FWA6MN	50.50	M-F	7:00 P.M.	W9PMT
IMO	146.28/88	M-F	6:30 P.M.	WB9RIT
SCAN	146.19/79	Wed	8:30 P.M.	N9AZO
SEIN	146.25/85	Wed	7:30 P.M.	K9TE
CCARES	147.3	Thu	8:00 P.M.	WB9WWB
LVARCN	146.31/91	Fri	9:00 P.M.	WD9EWD
DCEN	147.96/36	Sun	6:00 P.M.	WD9CBV
DCARES	147.195/795	Th	8:30 P.M.	N9AHP
EIARES	146.745/145	Wed	7:00 P.M.	WB9SBI
FCARES	146.805/205	Th	7:00 P.M.	WB9RLE
SARES	147.84/24	Tue	8:00 P.M.	WA9HZY
HCARES	146.94	Tue	7:30 P.M.	W9TIZ
HCN	147.75/15	Mon	8:00 P.M.	WB9AWW
KARC	146.52	Mon	9:15 P.M.	WA9SCY
HCEN	146.31/91	Thu	9:15 P.M.	WB9UEI
KARES	146.31/91	M-F	11:00 A.M.	WB9MIK
JCARES	145.44 AM	M/Th	7:00 P.M.	WA9KWH

To be continued. Complete list to be in Bison. Silent Keys W9FMJ and K9RWQ. Our thanks to WA9OHX. Traffic: (Nov) W9JIJ 705, WB9UYU 285, WD9CIS 254, W9FC 247, W9DLF 160, W9OLW 137, W9EI 84, W9XD 63, WD9GXW 57, N9AEI 46, W9TG 45, K9WWJ 43, W9PMT 41, W9WEI 39, WB9VJE 36, W9UEM 35, WA9GJZ 34, WA9OHX 32, W9HUF 29, W9IOH 26, WD9CFZ 20, K9CGS 15, W9RTH 15, K9DIY 14, K9KTB 14, WA9OKK 14, KA9CVZ 10, W9DZC 7, N9PS 4, K9TKE 4, W9BDP 1. (Oct) W9TG 210, W9QLW 166, WD9GXW 57, W9PMT 34.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI - SEC: W9OAK. NMs: W9AYK W9IEM WB9ICH WD9EAQ K9LGU W9DM. STM: K9UTQ. KA9FXG KA9FVL have Novice. KA9EEW KA9AGJ have Gen. N9JW and WB9WWE are back in Stevens Point. The third week of September has been designated as "Wonderful Wisconsin Week" and signed into law by Gov. Dreyfus. Don't forget 26th National ARRL Convention will be held July 25-27, 1980 in Seattle, WA. Dane county 2-meter net had 64 QNI no QTC. New frequency is contemplated. WD9CPY is new General and is located in Delavan. BPL to KA9CPA. NWTN had 492 QNI, 65 QTC in 1209 minutes. Are you a member of the MARS system? This helps to get traffic passed through WI, besides it's good training. Officers for WNA: K9LGU, chmn.; W9AYK, secy.; WB9ICH, treas. K9UTQ, training officer. WB9QAE has General. Hamtrix had good article on conventions. Green Bay 2-meter net had 40 checkins, 8 messages in 30 minutes. I hope your club is prospering well, and you get many new members and have lots of fun. K9EF/HI8 will be on and off during the winter, watch for him, may also be /8HI. Traffic: (Nov) KA9CPA 1169, WB9YPY 157, AE9H 146, W9DND 148, N9AUG 142, W9IEM 130, WD9DHF 114, K9FHI 99, W9YCV 93, W9DM 75, WD9ESZ 60, WD9BCM 58, K9LGU 58, WB9ICH 50, K9AKG 48, WB9ESM 45, AD9X 44, N9CP 40, AG9G 40, WB9RRU 36, WB9WHQ 36, K9HDF 33, W9SFL 33, W9FDY 32, W9YYL 31, K9AQ 30, K9KSA 27, K9CPM 25, WB9JSW 23, WB9TOW 22, K9UU 22, K9VSY 22, WB9YPZ 22, K9JPS 21, W9GKO 20, KB9CV 19, WB9PAW 16, WA9LDX 15, W9UW 15, KB9FM 10, AF9F 10, WA9WYI 9, WD9AJA 6, K9ANV 5, WA9WYS 3. (Oct) K9JPS 36, WA9WYI 3 (Sept) WB9YPY 164.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — STM: AFØO. SEC: WAØOIT.

Net	Time	Freq.	Mgr.	QNI	QTC	Sess.
MSPN N	1800Z	3.945	WAØAIN	494	48	28
MSSN	2315Z	3.710	WBØZBJ	115	22	29
MSPN E	2345Z	3.929	KAØAIT	797	208	30
WX NET	0015Z	3.929	WBØUKI	428	294	30
MSN 1	0030Z	3.685	AFØO	321	102	30
MSN 2	0400Z	3.685	KØPIZ	145	79	30
RARESN	0130Z Su	146.22/82	KØTS	83	15	4
SCRC	0300Z Su		KAØAIT	60	15	4

Upgrades this month are: General to Advance NØASO, Tech to Advance KBØJT, previous call KAØCME, Novice to Tech NØBJR and KAØCRX. Congratulations and many years of happy hamming. Hear Ye! Hear Ye! Save July 13th and go to Hibbing for a FIRST! A big hamfest is scheduled at the fairgrounds and will be a joint effort by several towns in the Mesabi Iron Range. More information on this later. WDØFSL, EC of Carlton County, lets us know that Moose Lake ARC has 2-meters. Will let you know when it comes on the air. Word comes from WØVB that 6 meters is keeping everyone hopping, just look at this: completion of WAS were WØRGU KØSE WBØCOR KØCJ WØJE. 6 Meter WAC WBØCOR, just got EI2W - had Africa from years back. Minnesota 6 meter hams have worked the following this month: Alaska, Guam, Hawaii, Puerto Rico, Costa Rica, California, Japan, Marshall Islands, Virgin Islands, Ireland, Europe cross-band 6 - 10 meters. Three Rochester hams, WBØUIP KØSE and WØVB, worked 110 Japanese stations on 6 meters within

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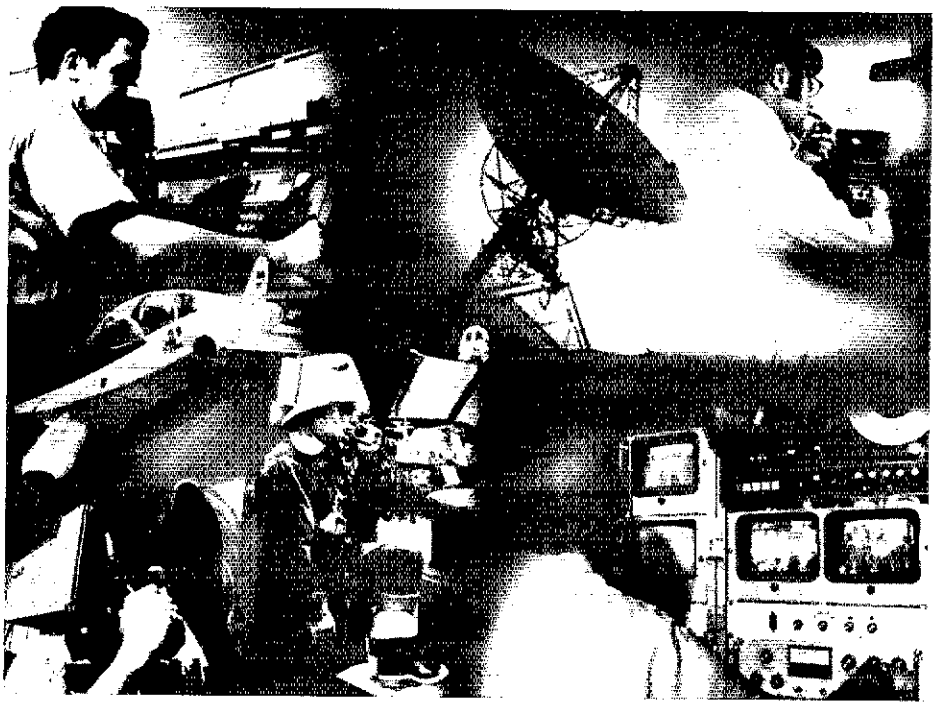

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an hour, most on cw. WØVB worked 22 Japanese stations using only 10 watts of cw and a 4 element beam. We've had some busy hams around here. With Valentine's Day upon us, I wonder how often Cupid has worked via the amateur airways? Traffic: WBØHOX 316, AFØO 316, WAØTFC 289, KØPIZ 194, WAØYVT 143, WDØFFE 137, WBØQEU 107, WØHZU 90, KAØAIT 81, WDØCGM 79, WBØUKI 75, KØCSF 52, WAØAIM 51, WBØNZB 50, WBØZBJ 48, WBØLRK 36, WAØLVG 36, KAØBZP 32, KØJTW 24, WØDUW 23, KØTS 18, KØRMX 16, NØJP 12, KØFTB 8, WDØGPX 4, KØFLT 4.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØPWM — SEC: WBØTEE. OBS: WØDM. NM: WAØCRH. The Fort Ansual Hamfest had a very good attendence and at the banquet, KØGA, District Director, gave a very information talk to enlighten us more. Hettinger and Minot Radio Clubs exhibit Amateur Radio at their Malls with good interest and response sending messages. WBØWAI is now AEØE of Dickinson. Goose River 2-Meter Net is Tues at 0300 UTC on 31-91. Fargo 2-Meter Net on Sun at 0300 UTC on 16-76. Minn-Dak Sunflower Net at 0100 UTC Sun on 26.865 MHz. There is also a nice certificate to receive to check-in. WDØDFT has a new multibanner antenna and getting DX repts. WDØCLB EC McHenry Co, helped patrol the streets in Deering on Halloween to keep them safe for the youngsters. Congrats to WBØSHD and XYL on their new harmonic.

Net	kHz	CST/Days	Sess.	QNI	QTC	Mgr.
Goose River	1990.0	0900 Sun	4	47	0	WØCDO
DATA	3996.5	1830 Dy	26	278	30	WAØCRH
YL WX	3996.5	0730 Dy	30	610	601	WAØRWM

Traffic: WAØRWM 772, WØCDO 69, NØAFP 52, WAØCRH 31, WDØGMD 18, WØDM 10.

SOUTH DAKOTA: SCM, Lydia S. Johnson, WØKJZ — Asst SCM: WØDVB. SEC: WAØTNM. NMs: WØs HOJ MZI NEQ WE WAØs TNM VRE WDØBMR. PSHR earned by WAØTNM 89 points and WDØBMR 73. Hot Springs Radio Club classes graduated nine Novices as listed: KAØs FNF FNG FNH FPR FPS FST FTB FUH FUI. EC, WØHOJ, reports results of their club officers as KØOR, pres.; KAØFPR, secy-treas. Lawrence-Harding Co. c.d. meets Sun. 8 A.M. MST on 3960 for checkins followed by code practice at 5-10-15-20-25 wpm with KØAS keying. WBØJEK, student Univ. NM, can be heard operating W5GB. KAØDDS got his 20 wpm ARRL award. EC, WAØBWF, held SET late in the month with 28 active participants and total 38 points. WØSD received DXCC Honor Roll Mixed Mode and two-meter WAS Award # 11. Traffic: (Nov) KØFRE 149, WAØTNM 140, WØDVB 133, WAØUEN 128, WØHOJ 115, WDØBMR 87, WAØVRE 86, KØAS 38, WBØOMF 37, WBØEVQ 18, WØKJZ 18, WDØGVZ 17, WØIG 5. (Oct) WAØTNM 133, WBØEVQ 11.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WD5IRB. NMs: AD5D W5MTZ W5POH WA5ZWZ. Nets, freq, time/day, QNI, QTC, mgr. ARN, 3.995, 0030/Dy, 1363, 65, AD5D. OZK, 3.760, 0100/Dy, 196, 37, W5MTZ. SCARC, 28.765, 0230/M-T, 76, 13, WD5HJC. APN, 3.937, 1200/M-S, 889, 42, W5POH. M-Bird, 3.928, 2230/M-F, 887, 44, WA5ZWZ. W5YDP as EC. WB5WWA as OBS. AD5D reports All States Net on 3.995 at 0500 Sat. The SEC & SCM visited the Hot Springs ARC Nov. 13th. The CAREN will hold their Xmas party Dec. 14th. The OZARC will hold their Xmas party Dec. 20th. Another repeater in Little Rock area 147.90/147.30. CAREN members holding Novice class at UALR with about 25 students. Caren members planning Tech and Gen class to start at UALR latter part of Jan. CAREN 10 meter net 1.30 on 28.66 every Thur except 1st Thur of month. OBs WB5WWA 2, AD5D 2, W5UAU 2. Traffic: K5AO 44, AD5D 33, WD5IRB 32, W5BLP 22, W5OFU 20, W5UAU 19, WB4WWA 8, WB5GOH 4, WB5KUI 2.

LOUISIANA: SCM, S. T. "Tom" Losey, Jr., K5TL — Asst. SCM: K5DPG. SEC: WB5TPG. NMs: N5RB K5TL WB5LBR WB5TPG WB5USS. K5BLV W5YZL and N5EK all active on ORN5. WB5HVS new pres. of MTA ARC. WA5LHL reports nice news article in Lake Charles Newspaper on Amateur Radio. Lots of activity coming out of that part of the state now. New Officers for BRARC: WB5RYO, pres; KB5AQ, vice-pres; N5ADF, secy; WB5RYC, treas. New Officers for SARA: K5YLH, pres., K5TNP, vice pres.; N5ATK secy; WD5HMN, treas. Congrats to K5DPG on his election as Vice Director of the Delta Division. He is a good man and will be an asset to the division and the section. The LEN NET has changed time and location. It is now on 3910 kHz at 8:00 P.M. on Sun and needs your support. WB5TPG, SEC, advices the Net is growing. Emergency preparedness for hams is most important. QNI this net and find out what advance planning is being done so our section will be prepared when the time comes. N5BFV active on LAN and new RN5 Rep, keep up the good work. Whatever happened to WB5OOM?

Net	Freq.	Time	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. D	367	169	N5RB
LTN	3910 kHz	6:30 P.M. D	660	144	K5TL
LSN	3703 kHz	7:30 P.M. M-F	108	28	WB5LBR
LRN	3587.5 kHz	6:30 P.M. SUN	6	9	N5RB
LEN	3910 kHz	8:00 P.M. SUN			WB5TPG
RACES	3910 kHz	8:45 P.M. SUN			WB5USS

Traffic: K5TL 203, W5GHP 179, N5RB 172, WB5LBR 96, N5ES 93, K5BLV 79, WB5TPG 38, W5YZL 36, W5VMY 32, WD5CWK 26, W5MI 17, N5BFV 15, N5EK 10, WD5GJR 8, KB5AS 7, K5BCN 6, WB5ILX 5, WA4NUW/5 5, KA5EDB 4.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. Christmas is almost upon us and by the time you read this it will be history. Most clubs are planning some type of get together and I would like to take time to wish you all a Merry Christmas and Happy New Year. The beginning of the year will bring elections of club officers so please support your club. WARC has turned out well for us and we all owe ARRL and many individuals a hearty thanks for a job well done. Notes from K5OAF and WB5FHA both begging for more support on the MTN (3665 kHz daily). We all can work cw if we just will! Let's support these guys & our net!! CGCHN (K5UPN) sess 30, QNI 2380, QTC 188. MSBN (K5MK) sess 30, QNI 2107, QTC 193. MTN (K5OAF) sess 30, QNI 137, QTC 57. MN (WA5OPT) sess 30, QNI 542, QTC 19. RACES (N5AMK) sess 4, QNI 189, QTC 3.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — Asst SCM: WB4PRF. SEC: WB4KYJ. STM: W4ZJY. Phone Nets report 199 sessions, QNI 6994, QTC 661. CW Nets report 78 sessions, QNI 466, QTC 238. CW Net Honor Roll: WB4ZSZ K4XE AF4T W4ZJY and K4WOP. KA4HAM and K4VM have been appointed NMs. Net certificate has been awarded to WD9CSZ. Since this is the last SCM report for me, I want to take this opportunity to say thanks for all your support during my tenure. I am asking

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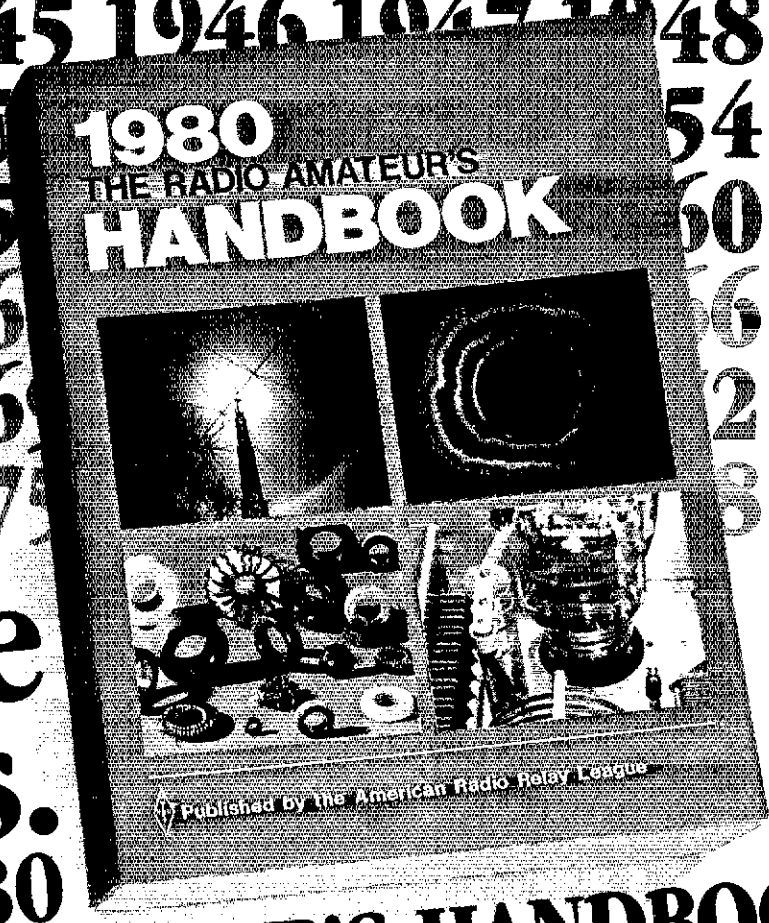

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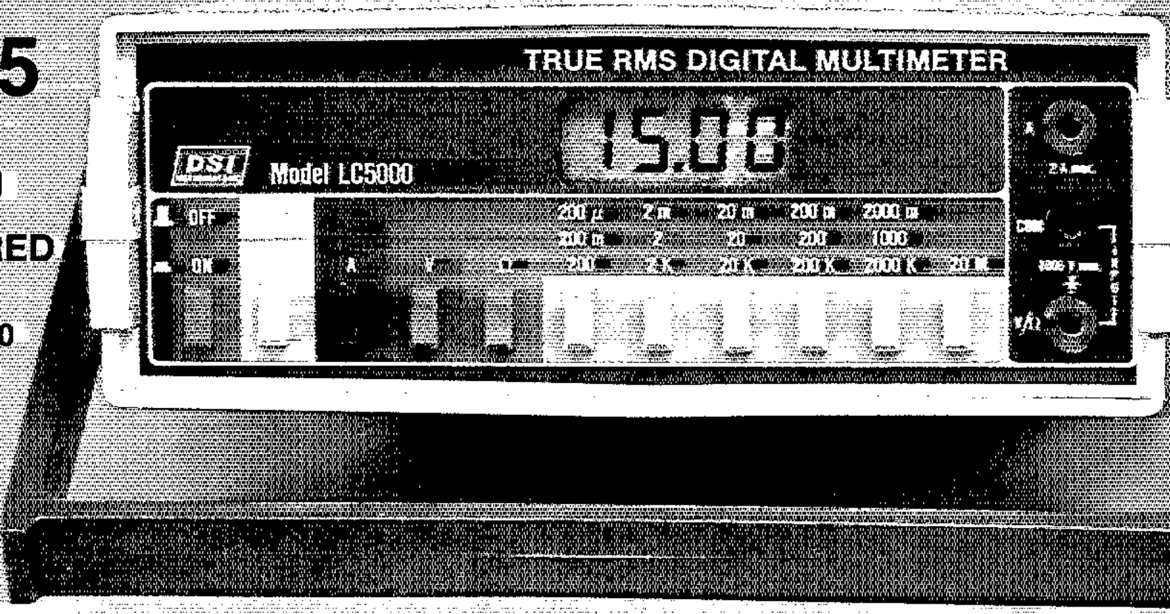

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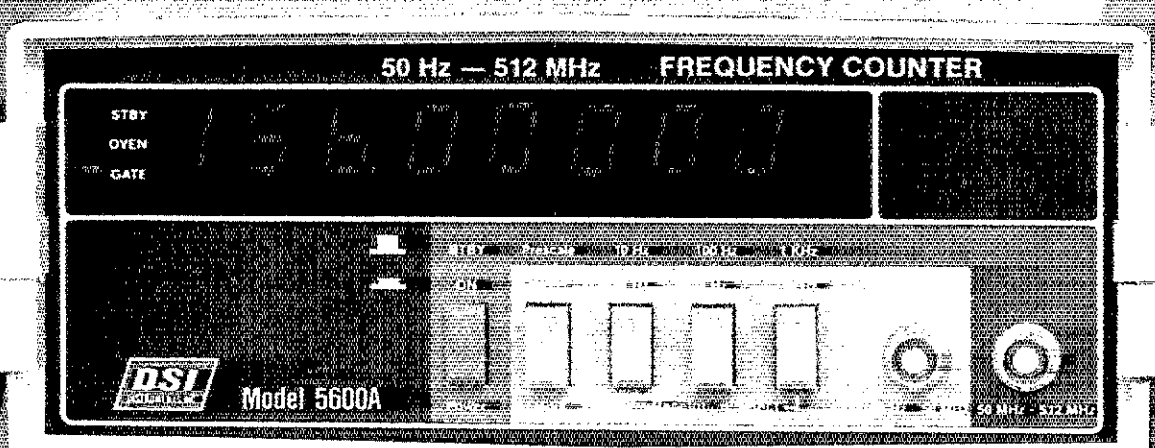

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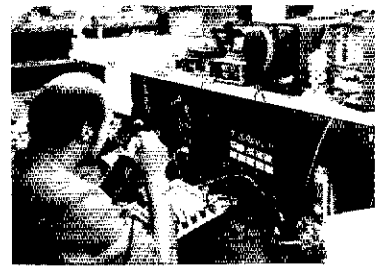

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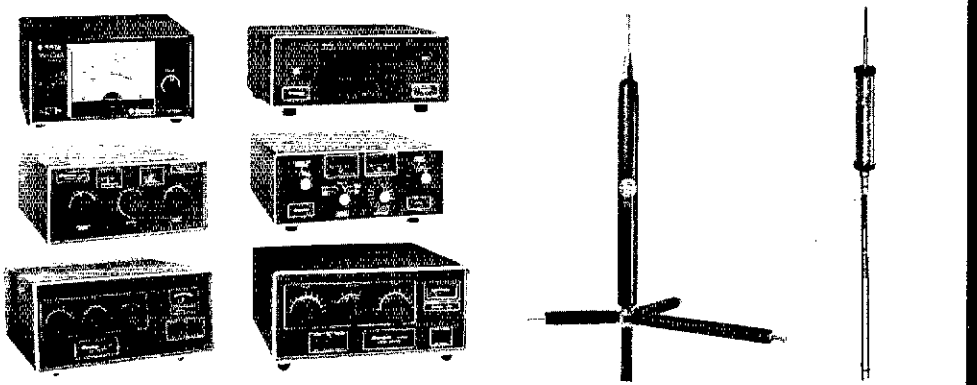

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that you give Earl your continued support that you have given me. It has been a pleasure for me to have worked so closely with you and to get acquainted with so many of you. I want to say a special thanks to all those who have served during my tenure in the appointed positions because your assistance has been invaluable during the past eight years. Just remember that I am still available to assist anyone in the enhancement of Amateur Radio in this area. Call on me at any time. Traffic: WA4CNY 525, W4OGG 274, AF4T 223, W4ZJY 195, WD4SIG 124, WB4BKF 115, W4MRD 82, K4JGW 80, WD4NJR 74, WA4FMR 64, K4XE 63, WB4YPO 58, KD4C 54, WB4ZSZ 47, WB4PRF 36, WA4GLS 22, K4AMC 21, K4VM 18, W4TYV 15, W4WVW 11, K4UMW 10, W4EWR 6, KA4GSS 6, W4EBT 4, W4PSN 4, W4VJW 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joe Miller, K4DZM — STM: K4HRF. SEC: WB4ZML. NMs: K4YZU KS4V KB4OZ WA4WSM W4BEJ WA4JTE WA4AVV. Nets reporting:

Net	QNI	QTC	Net	QNI	QTC
KSN	186	57	4-ARES	18	3
KYN	293	132	5-ARES	66	3
KNTN	428	259	CARN	185	31
KRTN	119	33	PAWN	277	24
KRN	515	44	BARES	81	37
MKPN	1066	155	AATN	53	4
KTN	1489	214	SEKEN	126	—
KPON	55	3	D-9RN	90%	412
6-ARES	140	16	D-CAN	100%	727

PSHR: WB4ZDU WD4RNI KB4OZ K4DZM, K4HRF new pres. of RCARA in Ashland area. AB4Y back on RTTY. Repeater in Livingston Cty., 147.915/315 working very well. WB4YAB reports KH6 & KL7 openings on 6 meters. KYN's Xmas party generated lots of traffic. WD8RNR WD4RWU new OVSs. Tri-State Two-Meter Net going great QNI 220, QTC 29. Training sess nightly on .13/73. Louisa, KY. Traffic: KB4OZ 261, WD4RNI 198, WB4ZDU 180, WD8RNR 166, K4DZM 146, WA4WSM 136, WA4EBN 128, WA4AVV 111, K4YZU 106, KS4V 85, WD4KDG 80, WB4UOI 77, WB4ABE 75, WD4COF 53, WA4SWF 54, K4HDE 51, WA4AGH 48, KA4AZT 48, K4JLX 48, WB4APC 47, K4HRF 45, W4CDA 37, WA4JTE 37, KA4IKH 36, N4AOF 35, WB4AUN 31, W4OJN 28, WB4ILF 24, WA4OMH 24, W4PKX 22, N4CCJ 18, KA4GFU 18, KB4YH 17, WA4YPO 17, W4HKT 16, W4BAZ 15, WD4LXX 14, WA4GAL 13, WD4CJQ 10, K4MHL 10, K4AVX 9, K4AML 8, WA4NOG 7, WD4BSC 5, WA4IGD 1, KS4W 1.

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.
QMN*	3663	2300/0300 Dy	1311	433	90	N8ABA
MiTN*	3953	0000 Dy	633	279	30	KB8AI
GLETN	3932	0200 Dy	1186	239	30	WD8BSE
MACS*	3953	1600 Dy	767	144	30	K8LNE
MNN*	3722	2230 Dy	425	109	30	WD8BHE
UPN*	3922	2230 Dy	778	100	34	WA8DHB
WSSBN	3935	0000 Dy	637	37	28	WB8VAI
SR	3930	2230 M-S	383	31	23	W8HIN
MiARES	3932	2232 Su	70	12	4	W8VWY
MEN	3930	1400 Su	164	3	4	W8HIN

*NTS Section Net. WB8FLK, EC for liaison to National Weather Service in South Eastern MI has completed the emergency communications plan for procedures to provide communicaitons between the Metro-airport weather station and the e.d. offices in the 8 counties in South Eastern MI. The main link is on 220 MHz. For more info contact WB8FLK. QO report from K8JH. OBS reports from WB8DJS WD8IYA K8NKB AF8V AF8D. This is the final Section Activity column for me as Michigan SCM. The last two years have seen several outstanding achievements in Michigan. The ARES now stands at an all time record of membership and activity. More counties than ever before have ECs. The Michigan Traffic Net was started and now is a major service in the National Traffic System. Traffic training seminars have been conducted on the air and its results of smoother traffic work can be observed on the section nets. Two ARPSC workshops have been held each year with one each year in the U.P. The longstanding U.P. Net became an NTS net with regular liaison with the QMN and the MiTN. The Michigan Novice Net continued a steady growth in participation and traffic. I want to thank all of the dedicated amateurs in Michigan who worked to produce these achievements. Traffic: (Nov) WD8KZX 438, W8VPW 391, WB8MTD 387, AF8V 241, K8KMQ 212, N8BIK 184, WD8LRT 181, WB8YRY 161, K8DTG 156, K8RV 144, N8ABA 126, KB8GC 118, WA8PIM 89, WA8DHB 81, W8MPD 78, KB8MX 73, W8CUP 72, WA0TAQ/8 67, WB8ZNS 67, WB8ITT 65, W8IHX 53, WD8GHE 50, WB8QYU 48, W8YIO 48, W8HIN 47, WB8YDZ 45, K8LNE 44, WD8NKA 44, WB8SYA 44, W3GQJ/8 41, WB8ZIY 39, WD8EGO 38, W8WOJ 38, WD8EIB 36, WB8DJS 32, WB8VAI 32, KA8CPS 30, K8GXV 27, K8JED 27, W8TBP 27, WD8IBY 26, WD8IXZ 26, N8ACL 25, AC8F 24, W8SOP 21, W8PBO 20, W8UM 19, WD8ROK 18, KA8GMJ 17, WA8QAF 17, K8ZJU 17, WD8MJB 16, KB8GT 12, W8VIZ 12, WB2LZN/8 10, W8LDS 9, W8QFQ 9, KB8EQ 8, WA8GTG 8, W8WVL 8, WA8EOW 6, W8SCW 6, K8CIP 5, W8FZL 5, WB8HSN 5, W8JUP 5, W8NI 5, K8OCP 5, WB8AFO 4, K8DYI 4, WD8JQL 4, K8QBZ 4, W8ZUL 4, WA8FJF 3, KB8FK 3, W8QOM 3, W8LOU 2, WD8ORQ 2, WA8VBZ 2, W8BEZ 1, WD8JKQ 1. (Oct) WB8QYU 209, WA8EFK 142.

OHIO: SCM, Harold C. Chapman, WB8JGW — Asst. SCMs: AF8O W8TP. SEC: K8AN NMs AF8A K8AAZ WD8KBW WB8KWD WB8OMQ WB8YGW. Net reports.

Net	QNI	QTC	Sess.	Time (Local)	Freq
BN	552	340	59	6:45/10 P.M.	3.577
8NR	119	28	30	6 P.M.	3.605
ONN	108	26	28	6:30 P.M.	3.708
OSN	239	119	30	6:10 P.M.	3.577
OSSBN	2692	828	90	10:30 A.M./ 4:15 & 8:45 P.M.	3.9725
O6mN	329	42	29	9 P.M.	50.160

Your SCM is a continual grumbler! He's never happy! He continues to expect Ohio to be the top section! With the personnel we have and the National Traffic System outlets we have (phone cw and RTTY) there is no reason we can't be; IF ALL stations handling even one piece of formal traffic would report it monthly to the SCM. Don't get the idea that light activity reports don't count, they are probably the most important because they are the most numerous. We aren't all in a position to handle 100 or more per month. Warren, Wonster, Youngstown areas still not visibly represented on section nets. With the ham population in those areas, it would seem we could expect some kind of representation. Enough grumbling! Congrats to W8GRG named "Civilian of the Year" for his contributions to the meteorological profession with the

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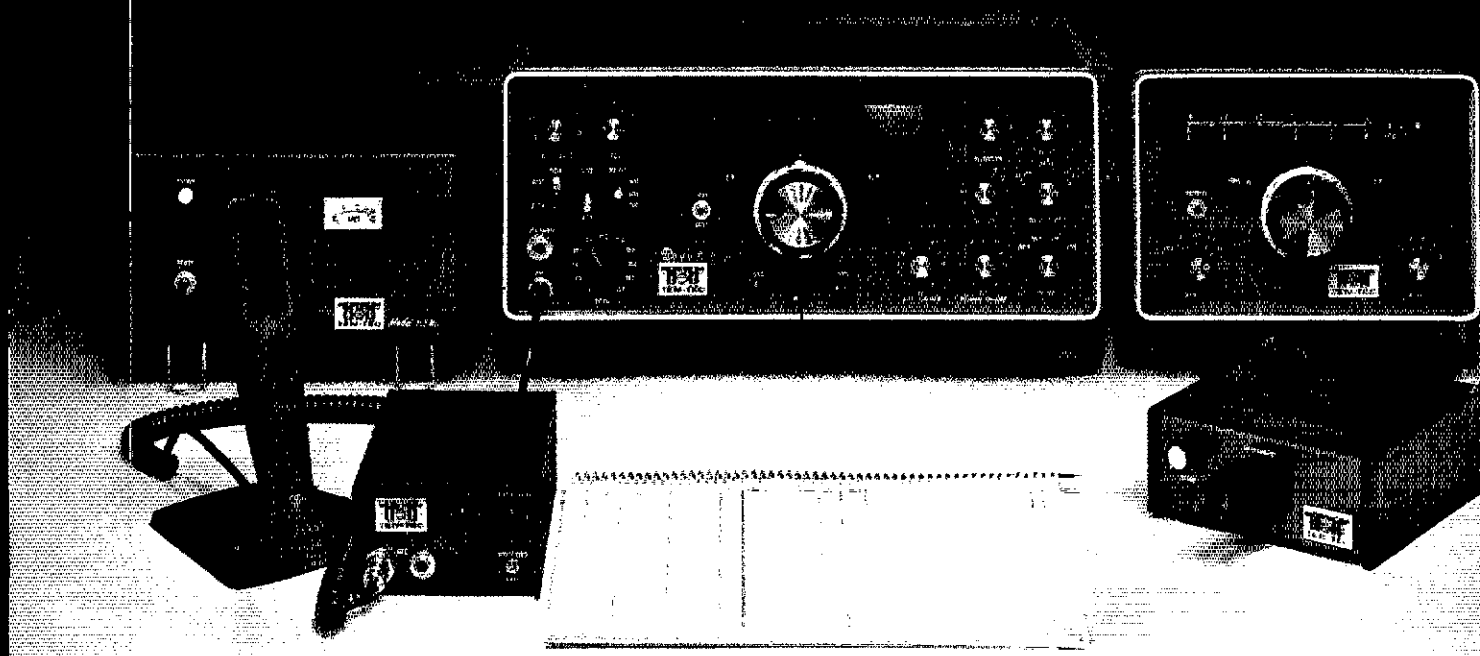

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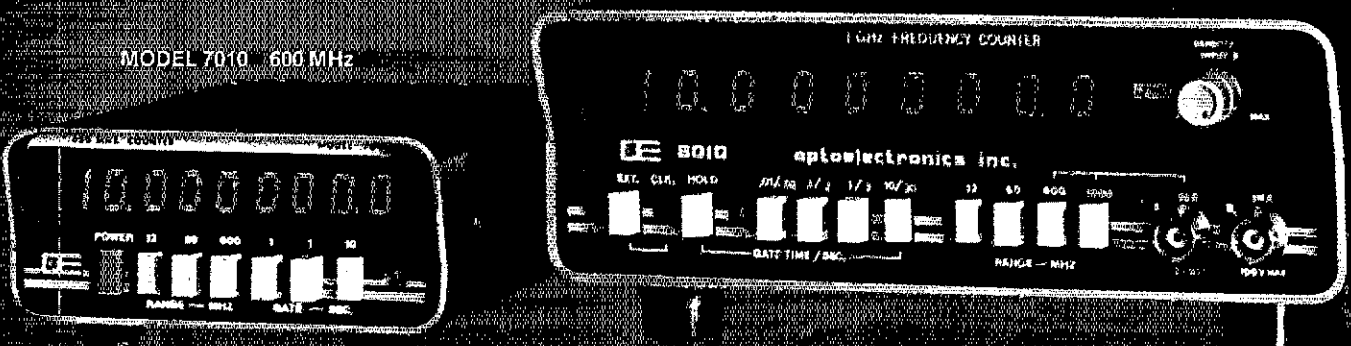

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8010 *8010.1	325.00 405.00	1 GHz	9	1-10 mV	5-20 mV	10-25 mV	1-10 mV	1|.01-20 SEC	.1 Hz	1 Hz	10 Hz 1 GHz	1 PPM 0.1 PPM	10 MHz	YES STD	YES OPTIO $39.

* Has precision 0.1 PPM TCXO time base.

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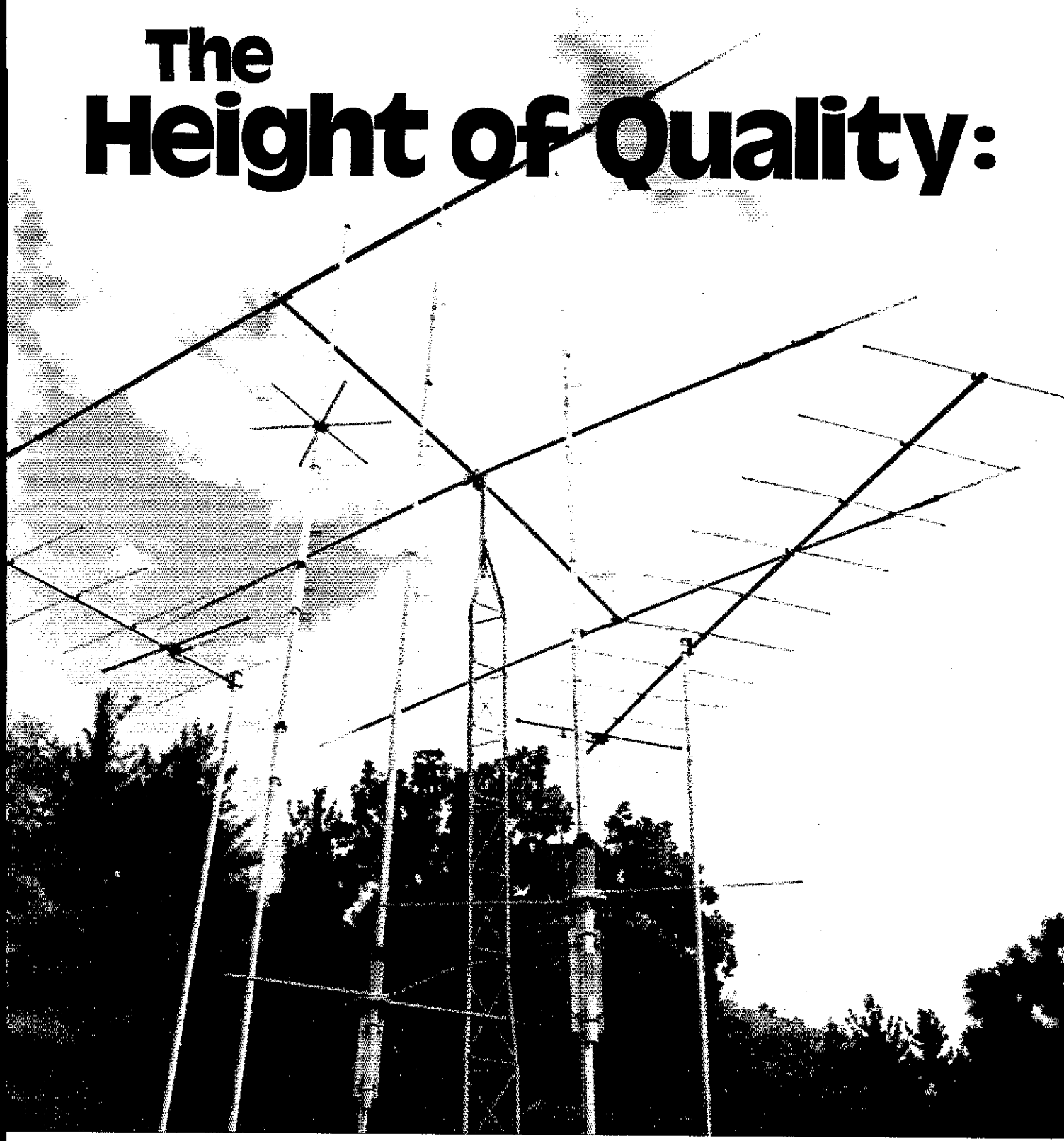

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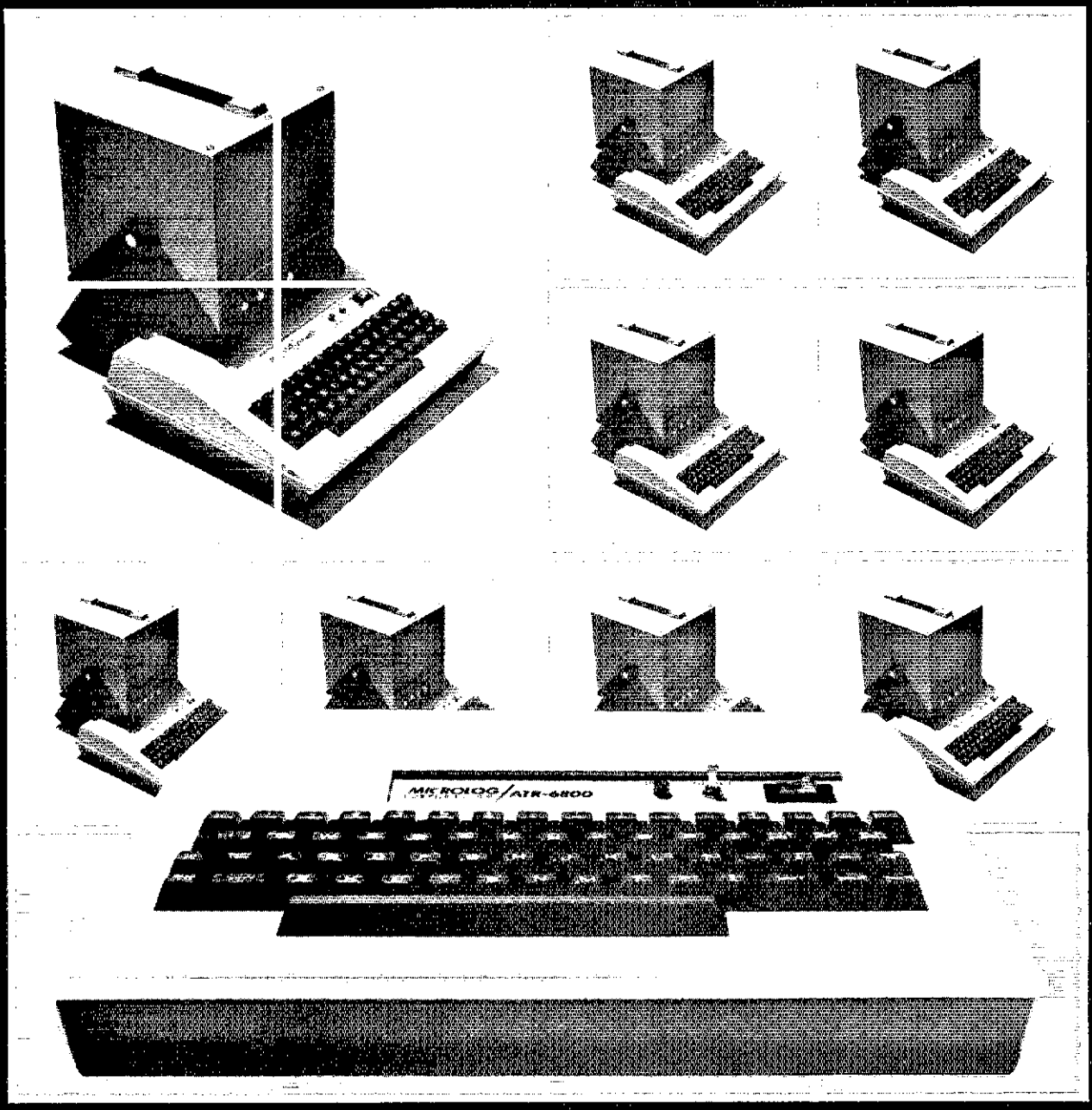

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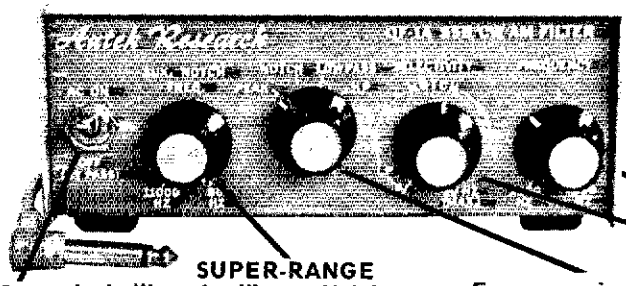

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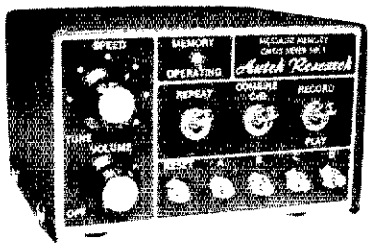

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creation of Skywarn program for northeast Ohio. Club officers for 1980 include: Lake Erie Amateur Radio Assn: WB8YJR, pres; W8AJR and AB8P, vice pres; K8AES, secy.; WB8GHG, treas.. Milacron ARC: AF8J, pres; AG8J, vice pres.; K8RIQ, secy.; WD8SDL, treas. Parma Radio Club: K8OZ, pres; WD8RZG, vice pres.; WB8RSM, secy.; WA8GMT, treas. Appointments: EC, WD8BGF/Ross, WA8RUO/Preble. OES, WA8STX; OTS, WB8IGL, KB8LQ. Local net reports:

Net	QNI	QTC	Sess.
BRTN	470	132	30
COARES	67	12	3
HCARC	41	0	4
TSRAC	402	77	23
VWGEN	47	5	4

Traffic: KB8KV 24, W8RG 24, WD8OZM 23, WB8WNH 22, WB8NHV 21, WA8BOV 19, WD8OYK 18, WB8TPX 18, N8VT 18, K8CKY 17, K8DL 15, WD8INK 15, W8BHL 14, W8MGA 14, WA8TSX 13, KB8LQ 12, WB8MRL 11, WD8OPQ 11, KA8DJZ 10, WB8QXN 10, WA8S1X 10, WA8HGH 9, W9NJP 9, WD8OHU 9, WD8QMP 9, WD8DCK 8, WD8OAC 8, WB8VLR 8, K8CYX 6, WB8LWY 6, WB8VZX 6, W8IM 5, WD8PID 5, WB8PIY 5, WA8RUO 5, WB8ICL 4, K8IOW 4, W8KN 4, W8ZM 4, N8BKH 3, WB8YF 3, WB8NTR 3, WB8YUS 3, W8EK 2, WB8KKI 2, WB8YIJ 2, W8XT 2, WD8OTO 1

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Ollinger, K2AV — SEC: WB2VUK. STM: WA2SPL. ASCM: WB2VUK WB2COY W2IT WB2KDC. NM: W2CS W2WSS KB2JG WB2QOH WB2ZCM WB2EAG. Nets: NYPON 6 P.M. 3913 ESS (slow) 6 P.M. 3590, NYPSTFN 6 P.M. 3925, NYS 7 & 10 P.M. 3677, 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/TT 66/06 M/W/F 615/015. Results Nov. 11 Preparedness Duel: Putn 1396, Dutc 1266, West 1238, Rens 960, Ulst 788, Oran 554, Alby 516, Warn 400, Wash 358, Colu 346, Schn 226, Sara 180, Rock 114, Gree 92, Sull 48. Note that one of the smallest counties won overall. Congrats to Putnam EC KB2KW & his crew. SCM's award for population weighted score to Dutchess. Best accuracy (1.0 error/msg) to Washington Co. Yarns about duel too many to list here. Any reader desiring analysis of msg errors, insights, etc, s.a.s.e. to W2IT 1536 Hanover St. Yorktown Hgts, NY 10598. Elsewhere, WA2BLC's satellite setup was subject of spot on WRGB-TV. Congrats. Also to WA2GPB reelected Supervisor, Town of Bethlehem. Regret to report as Silent Keys long-time area hams W2BBT W2FGI WA2BYT. PSHR: WB2HDU W2CS N2BDW WA2SPL WB2ZCM WB2MCO W2YJR WB2EAG N2YL. Traffic: WA2SPL 1284, WB2EAG 314, WB2MCO 224, N2YL 189, WB2HDU 165, WB2ZCM 146, W2IT 132, W2CS 102, W2YJR 87, WA2EQW 86, KB2KW 85, N2BDW 48, AA2Y 44, W2EFU 37, K2AV 29, WB2SON 26, W2IQK 24, K2HNW 20, K2DN 18, WA2CJY 10, W2SZ 6.

NEW YORK CITY — LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst. SCM: Steve Bloom WB2IDP. NM/STM: WB2BNY. NM: WB2HIQ KA2DBW. NYC Asst. KA2CNN. The following are nets in and around the section.

Net	Time/Day	Freq.	Mgr.
NLI*	1900 Dy	3630	WB2BNY
NLI*	2200 Dy	3630	WB2BNY
NSPN*	1815 Dy	3928	WB2HIQ
ESS	1800 Dy	3590	W2WSS
BAVTN*	2030 Dy	147.315	KA2DBW
WB2ACN	2100 MW	146.64	WB2BNY

Nets denoted with an asterisk are NTS section nets. All times local. High QNI NLI: K2GCE WA2UWA WB2BNY K2LIE W2MLC. NSPN: WA2UWA WB2HIQ WB2BNY WA2USJ. KA2CNN. BAVTN: KA2CNN KA2DBW N2BGR WA2MEE N2BKK. Congratulations to following new appointees. KA2CNN as Assistant SCM with regard to New York City. KA2DBW as Net Manager of BAVTN and to WA2MEE as Asst. Manager for BAVTN. QQ reports received from N2NT K2POY and K@CVD/2. I regret to report W2HU in Westbury as a Silent Key. Congratulations to N2BAE on his upgrade to Advanced and his new call KB2MU. Received very impressive bulletin from Metroplex the up and coming repeater club in the New York metropolitan area. They are bound to set a record for most repeaters on most different bands. MAARC reports membership now over the 250 mark and that they had N2NY give a talk on antennas at their November meeting. Old time cw man, W2AHV, finally broke down and bought a 2-m fm rig. Is now active on BAVTN. Suffolk County Radio Club had an interesting talk by W2HD at their November meeting. This club reports it has now gone international with SU1BA joining. Grumman Radio Club had a talk by W2NZ on ham radio and computers at their November meeting and they also participated in the Juvenile Diabetes Hoopathon. Participating were KA2CWT KA2CWS K2DOD K2CMV K2CRL WA2PFF and WA2BGE. Staten Island Radio Club had a talk by W2GHK on the history of their club. MAARC now running a swap and shop net on their repeater at 9:30 P.M. Congratulations to KA2DTD on new call KB2W and to WB2FEK on new call KB2J. WA2KXE reports being active in several nets this month although he did not handle any traffic. WB2IDP is now over the 100 mark in countries worked but getting them confirmed is another story. K2IZ reports new antenna system on all bands. W2DBQ reports new antenna system on all bands. W2DBQ reports renewing genitol acquaintances on 160 meters. W2DX moved to new condominium in Deer Park and is on the air with indoor antennas. W2GKZ busy repairing tower before the cold weather. NLI welcomes back W2GP after an extended absence. Hope 1980 got off to a good start for everybody in the section. Traffic: K2GCE 188, KA2CNN 164, WA2UWA 148, W2GKZ 144, K2LIE 87, W2MLC 73, N2BGR 68, KA2DBW 55, WB2BNY 44, WB2RVA 29, WB2IDP 24, WA2MEE 19, W2DBQ 18, WB2HIQ 6, K2IZ 4, N2NT 1.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF. STM: W2XD. NMs: K2VX WA2OPY W2PSU WB2RMI W2TCA W2UEZ and WA2YGZ/2.

Net	Mgr.	Freq.	Time/Days	Sess.	QNI	QSP
NJN	W2UEZ	3695	7 P.M. Dy	30	521	299
NJN	W2UEZ	3695	10 P.M. Dy	30	291	129
NJSN	WA3YGZ	3735	6:30 P Dy	30		
NJPN	K2VX	3950	6:00 P Dy 9:00 A Su	34		
NJVN	W2TCA	49/49	10:30P Dy	27	132	78
UCEN	WB2RMI	085/685	7:30P Dy	30	185	53
OBTN	WA2OPY	72/12	Dy	30	256	48
NJRTTY	W2PSU	147.51	Dy	30		

At the BARA meeting, WA2YOS gave an interesting talk on curing RFI/TVI. BARA's cw net has moved to 21.175.

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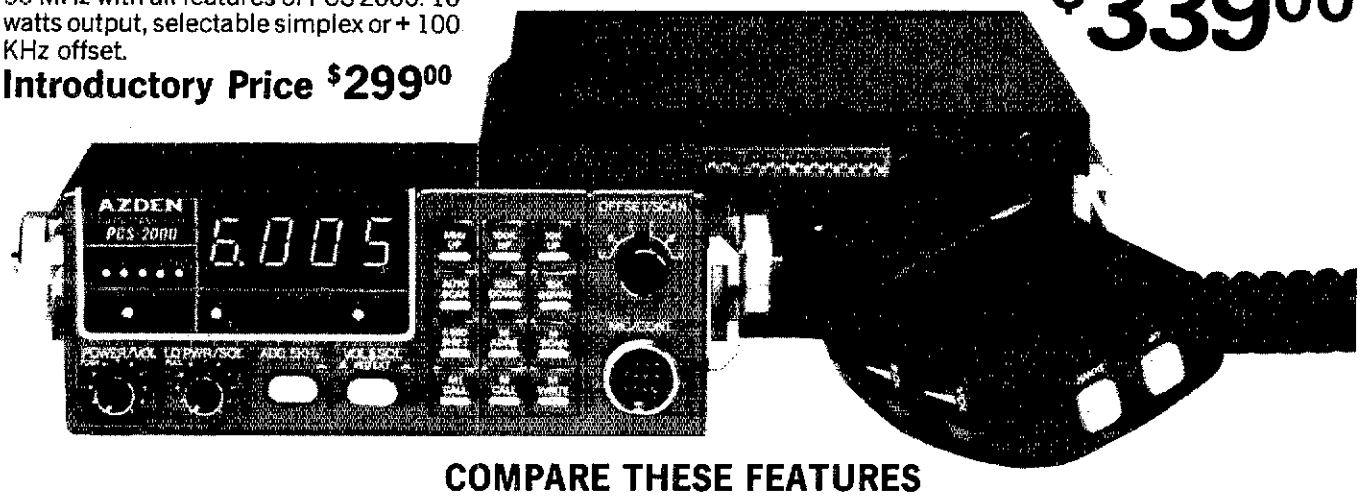

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- **LARGE ½-INCH LED DISPLAY:** Easy-to-read frequency display minimizes "eyes-off-the-road" time.
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The new name for the old "550 Club" is "The Ramapo Mountain Amateur Radio Club, Inc." and is an affiliated club of the ARRL; club station is WA2SNA; club repeater is WB2AHD; meetings are the first Wed of each month at American Legion Hall, Oakland, NJ (PO Box 364 — 07436). The tri-county Radio Assn had its 45th Anniversary dinner at the King George Inn. Mt. Bethel. K2BPP gave a well received talk to TCRA on his travels to the North Pole. He is mounting another expedition for April 1980 and hopes to work more hams this time. He is taking 3 new Collins transceivers. Look for him! Holmdel ARC elected the following: W2XD, chmn.; W6UGT, vice chmn.; WA2RLS, secy; WB2SWF, unit 1 rep.; N2DR unit 2 rep.; W2FZY Crawford Hill rep. The New Jersey Radio Club Information Net had 41 QNIs with 12 clubs represented. Congrats to N2NS, EC of Union County, for a job well done. He will be moving to Columbus, OH next year and felt a new EC should be appointed. N2AIH and W4YID/5 picked up a distress signal from GH6RL to learn that the Saipan operator's secy. had inadvertently swallowed a dog's mange medicine rather than her cough medicine. Both operators quick work in calling Poison Control Centers in their areas kept the secy. from death by obtaining the antidote ipecac — all within a space of 15 minutes. We will miss W2MJA who is moving to Asheville, NC. He was an excellent editor of the "Forty Nine," club newspaper of the Ramapo Mountain ARC, Inc. Sussex County ARC held an equipment clinic Nov. 15 to troubleshoot club members equipment. Their publication "QSC" contains typical exam questions on the Advanced and Extra class licenses. They plan operation "North Pole" in which the SCARC will bring the voice of Santa into hospital rooms of area children via Amateur Radio. Haven't heard from the Fairlawn ARC's publication "QRZ" in a long time — how about it? K2FZ is using his TRS-80 basic language for his work and made a knitting chart for his XYL. He is working with PASCAL language and utilizes the TRS-80 for RTTY. WA2OVE made DXCC. K2BLA elected pres. of Split Rock ARA and allows NJVN to pass traffic on its repeater. AF2L reports WB2JHN attempting DXCC QRP/Mobile with modified CB on 10 ssb. WA2UUY a General. W2UVW made 5-band DXCC No. 776 after 10 years of work without beam antennas — only simple wires! W2NKD enjoying new Swan Astro 150 and reports DX on 10 to be great! Glad to see K2ZFI back in the nets. KA2FKX made General. Hope you all had a very happy holiday season. Traffic: (Nov.) W2RO 503, W2UEZ 347, W2CQB 297, KB2HM 176, K2VX 160, AG2R 157, WA2OVE 152, N2CR 149, WB2IQM 144, WA2MVO 112, W2SQ 105, WB2RMJ/T 93, W2XD 64, W2ICA 54, N2BC 50, WB2RMI 47, AF2L 45, W5DTR/2 33, WA2OWR 28, WB2KLF 23, W2UH 20, WB2AIU/T 18, W2CVW 18, N2SU 17, WB2JVE 16, K2WM 15, W2CC 13, WA7DPK/2 9, W2NKD 8, W2CU 2, K2ZFI 2, KA2EKX 1. (Oct.) N2SU 27, N2BC 6.

MIDWEST DIVISION

IOWA: SCM, Max B. Otto, WØLFF — If you want your repeater or net to be listed in the directory, send me a s.a.s.e. for the proper registration form. Congrats to WBØCAD for upgrade to General, and KAØEHI for Tech. WØGA and KØKWU have DXCC. WB6SMI is new in Toledo. United Electronics Institute ARC in West Des Moines is an affiliated society. WAØMJQ and KØKOP flushed the bunny in Burlington in twenty minutes. WBØKG has 50 MHz all phone WAS and 600 Club 6m Award. WØSWY has new HW2031. WØEJ and N4RR both have new 110 ft. tower. U of I officers: WRØVRO, pres.; WBØTJD, vice pres.; WAØMKE, sec./treas. The 3900 Club has over 600 members, and their Hamboree will be at The Oasis, Sioux City Airport on March 29th. A successful Mall Demo at Marshalltown given an assist by KØGVG WAØHFO WAØMIT WBØZKG NØAHJ KAØCLO KØKOJ WDØAFM AKØP WDØGAQ. Eastern Iowa DX Assn has 38 members. Confirm a QSO with three members of the Marshalltown Club, and get an attractive cert. NTS-TEN 98% via WØSS. AEØR WØYLS AIØO KAØX KØGP WBØUPF WBØPYD NØSM WØFO KØEVH WBØNSS. DTRN 100% with WAØAUX. Humboldt had good SEC and WDØBBE found the "lost" boy. Happy Sausage Day.

Net	Freq.	Time(Z)/Days	QNI	QTC	Sess.
TLCN	3560	0030 Dy 0400	354	155	60
Iowa Code	3713	0100 T-T-S	47	11	13
Iowa 75M	3970	1830 M-S	1188	106	26
Iowa 75M	3970	2330 M-S	866	46	26

Traffic: WAØAUX 515, WØYLS 186, KAØX 66, WBØUPF 58, AEØR 56, WØLFF 31, KØGP 30, WBØPYD 25, WBØNSS 14, KØOEI 13, WBØAVW 9, WDØHNB 7.

KANSAS: SCM, Robert M. Summers, KØBXF — SEC: WØKL. Net Mgrs: WØOYH WØFT WDØESF WAØSZS. It is with deepest sorrow we have to report that WBØOBH of Wichita passed away the day before Thanksgiving. He has been one of the big keys in our cw traffic network. He has accepted liaison function from KS to the Tenth Regional Net and then on to CAN for so long it will almost seem like starting the nets all over again without him. Speaking of liaison function reminds me to ask for some additional help in doing same from our phone nets to the cw traffic net, so the NTS chain will be more efficiently operated here in Kansas. OKS could use a few good cw ops who can help pick up the out of state traffic on KSBN etc and take it to the OKS net or act as liaison on to TEN. Why not give it a try? There are a few great rewards, personal satisfaction that you are still a full rounded out amateur that can still function even if the pile phone rig does poop out. Traffic: WØOYH 124, KØEZ 116, WDØACG 110, WØFIR 91, KØBXF 64, WAØLBB 71, WØAM 63, WØFT 57, WØCHJ 30, WBØFBP 27, WØPR 27, WØFDJ 18, NØIN 16, WØRBO 12, WØKL 6, WAØOWH 2, WAØRXS 2.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst SCM: Joe Flowers, WØOTF. SEC: WBØFKY. Congrats to KØJEO on his 77th birthday. New officers and new board members have been selected for the Heart of America Radio Club. New officers are: WBØLFY, pres.; WBØPTZ, vice pres.; WBØUZJ, secy.; WBØYBC, treas. The Heart of America Radio Club is now sponsoring an Explorer Post dedicated to Amateur Radio. The first meeting is scheduled for the second week in Jan. The HARC Novice Classes are drawing to a close. Some of the participants have received their licenses in the mail by now and those who have passed the code are waiting for the written tests to be sent by the FCC. The class was a big success and thanks and congrats to WBØUZJ WBØLFY WDØHTC WBØYBC on a job well done.

Net	QNI	QTC	Net	QNI	QTC
HBN	408	48	ACE	6	0
MEOW	468	62	SOEN	67	6
MOSSBN	752	37	MON	204	177
NEMOE	106	4	MON 2	134	49

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AM 6 kHz at −6dB, 12 kHz at −60dB
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ATLAS	
350XL Xcvr	$599
350XL/DD6 Digital	699
350XL/DD6/305	799
350PS AC supply	149
350PS/302 Console	249
DMK-XL Mobile mt	25
210/NB Xcvr	399
210X Xcvr	399
210X/NB Xcvr	439
220CS AC supply	99
110L Xcvr (RX+TX)	279
DMK Mobile mt	19
CIR	
BPS-200 AC ps	$ 79
CLEGG/SQUIRES-SANDERS	
22'er FM series 25	$139
FM-27A 2m FM Xcvr	149
FM-27B 2m FM Xcvr	179
FM-21 220 FM Xcvr	79
Desk cgr for HT-146	19
COLLINS	
75A-4 Rcvr (1003)	$299
75A-4 Rcvr (3880)	349
75S-3 Ham Rcvr	450
75S-3B Ham Rcvr	599
75S-3B Rcvr (round)	649
75S-3C Rcvr (round)	899
51S-1 SW Rcvr	1295
32S-1 Transmitter	275
32S-3 Transmitter	599
30L-1 Amp (round)	599
62S-1 VHF conv	599
312B-4 Console	199
516E-1 KWM-1 DC ps	69
KWM-2 Xcvr	575
KWM-2/rej (round)	675
KWM-2A Xcvr (round)	899
312B-5 PTO console	299
351D-2 Mobile mt	49
516F-2 AC supply	175
PM-2 Port AC ps	125
MP-1 DC supply	75
COMDEL	
CSP-11 Speech proc	$ 59
COMMTECH	
Magnum 6 For KWM-2	$ 69
DENTRON	
HF-200A Xcvr	$439
HF-ACS AC ps	59
80-10AT Tuner	39
160-10AT-3kw tuner	129
MT-3000A Tuner	239
MLA-1200 RF deck	175
MLA-1200/AC ps	249
MLA-2500 Linear	569
DRAKE	
2C Ham Rcvr	$189
2CS Speaker	19
2CQ Spkr/Q-mult	29
R-4 Ham Rcvr	259
R-4A Ham Rcvr	279
R-4B Ham Rcvr	329
R-4C Ham Rcvr	429
MS-4 Speaker	19
SPR-4 SW Rcvr	349
SC-2 2m conv	69
TR-3 Xcvr	299
TR-4 Xcvr	389
TR-4C Xcvr	449
TR-4C/blanker	499
TR-4CW/RIT Xcvr	549
TR-7/CW filter	1099
TR-6/NB 6m Xcvr	589
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-7 Matcher	129
MN-2000 Matcher	175
MN-2700/balun	219
W-4 Wattmeter	49
ML-2 2m FM Xcvr	119
TR-22 2m FM Xcvr	129
TR-22C 2m FM Xcvr	149
AC-10 AC ps	39
AA-22 Amp/preamp	79
EBC	
EBC-144Jr 2m FM Xcvr	$149
GALAXY/HY-GAIN	
Galaxy V Mk III Xcvr	$199
GT-550 Xcvr	249
AC-400 AC ps	75
SC-550 Speaker	19
R-530 SW Rcvr	599
AC-210 AC ps/amp	19
FM-210 2m AS IS	29
GONSET	
GC-105 2m AM Xcvr	$ 49
HALLICRAFTERS	
SX-122A SW Rcvr	$225
SR-400 Xcvr	349
SR-400 Cyclone III	475
P-500AC AC ps	75
HAMMARLUND	
HQ-110A Ham Rcvr	$149
S 100 Speaker	9
HK-1B Keyer	29
HY-GAIN	
3750 Xcvr	$799
ICOM	
DV-21 2m dig VFO	$129
IC-215 2m FM Xcvr	149
IC-22S 2m FM Xcvr	189
IC-230 2m FM Xcvr	199
IC-245 2m FM Xcvr	299
IC-280/remote kit	299
IC-202S 2m SSB Xcvr	179
IC-211 2m Xcvr	499
IC-3PS AC supply	49
IC-3PA AC supply	49
JOHNSON	
275w matchbox/SWR	$ 99
Kw matchbox/SWR	169
KLM	
Multi-2700 2m Xcvr	$499
Echo II 2m SSB Xcvr	199
PA10-40BL 2m amp	149
PA10-70B 2m amp	99
PA15-160BL 2m amp	199
KENWOOD	
TS-120S Xcvr	$499
VFO-120 VFO	119
TS-520S Xcvr	575
TS-820 Xcvr	675
TS-820/dig/filt	799
TS-820S Xcvr	799
SP-820 Speaker	49
TS-900 Xcvr	450
PS-900 AC ps	89
R-820 Ham Rcvr	788
R-599 Ham Rcvr	249
T-599D Xmtr	375
R-300 SW Rcvr	199
TS-600 6m Xcvr	549
TV-506 6m Xvtr	169
TV-502 2m Xvtr	189
TV-502S 2m Xvtr	219
TR-7400A 2m FM Xcvr	289
TR-7500 2m FM Xcvr	199
TS-700SP 2m Xcvr	499
MIDLAND	
13-500 2m FM Xcvr	$119
13-510 2m FM Xcvr	269
13-509 220 FM Xcvr	129
MIRAGE	
B 108 2m FM amp	$129
MURCH	
UT-2000A Tuner	$ 99
NDI	
HC-1400 2m FM Xcvr	$249
NATIONAL	
NC-300 Ham Rcvr	$119
NC-303 Ham Rcvr	149
NCX-3 80-20m Xcvr	129
NCX-5 Xcvr	199
NCX-A AC supply	75
VX-501 Remote VFO	125
PANASONIC	
RF-8000 SW Rcvr	1499
RF-4900 SW Rcvr	299
REGENCY	
HR-2A 2m FM Xcvr	$ 99
HR-2MS 2m FM Xcvr	99
HR-220 220 FM Xcvr	189
P 110 AC ps	39
EC-175 Counter	149
ROBOT	
60 Viewfinder	$129
70 Monitor	199
80 Camera	199
80A Camera	229
SBE	
SB-34 Xcvr	$199
SPECTRONICS	
SC-30 Counter	$ 88
SC-250 Counter	39
STANDARD	
146A 2m FM HT	$129
C-118 2m FM HT	149
USA-2 Charger	29
SWAN	
400 Xcvr/410 VFO	$199
117B AC supply	65
MB-80A 80m Xcvr	179
P-1215 AC supply	49
SS-200 Xcvr	349
PS-20 AC supply	95
270 Cygnet Xcvr	329
350A Xcvr w/ps	389
14A DC conv	39
350 Xcvr	239
350C Xcvr	289
500 Xcvr	299
500C Xcvr	329
500CX Xcvr	379
700CX Xcvr	399
HF-700S Xcvr	399
117C AC supply	69
117XC AC supply/spkr	99
PSU-3A AC ps	129
510X Xtal osc	39
508 Remote VFO	125
VX-1 VOX	19
VX-2 VOX	29
WM-200A Meter	49
WM-1500 Meter	49
600T Transmitter	359
600R/SS-16B Custom	349
600SP Patch	59
ICAF Audio notcher	19
Mk II Linear	599
FM 2X 2m FM Xcvr	99
TEMPO	
Tempo One Xcvr	$289
AC One AC ps	89
VHF/One + 2m Xcvr	199
TEN-TEC	
570 Century 21	$249
276 Calibrator	19
Triton II Xcvr	369
Triton IV Xcvr	475
Triton IV/dig	599
252M AC supply	99
252G AC supply	99
252 AC supply	75
262 AC supply	99
262G AC supply	99
243 Remote VFO	99
670 Keyer	19
KR-40 Keyer	49
KR-50 Keyer	69
WILSON	
Mk II 2m HT/batt	$169
WE-800 2m FM Xcvr	299
WC-14 Charger	9
YAESU	
FT-901DE Xcvr	$799
FT-301 Xcvr	499
FT-301D Xcvr	549
FP-301 AC ps	99
SP-120 Speaker	19
YO-301 Scope	179
FT-7 Xcvr	379
FT-401B Xcvr	489
FV-401 Ext VFO	89
SP-401PB Sp/patch	39
FTDX-570 Xcvr	449
FTDX-560 Xcvr	399
SP-560 Speaker	19
FL-101 Xmtr	349
FR-101 Dig Rcvr	375
FLDX-400 Xmtr	269
FRG-7 SW Rcvr	239
FV-101B VFO	99
FP 12 AC ps	99
FTV 650 6m Xvtr	139
FTV-250 2m Xvtr	189
FT-625RD 6m Xcvr	599
FT-221 2m Xcvr	359
FT-221R 2m Xcvr	399
YC-221 Dig display	79
CPU-2500RK 2m FM	399
CPU-2500R 2m FM	359
FT-2 Auto 2m FM	99

(1) This list was prepared from an inventory taken on the date shown. The quantities vary. In some cases there are several of one item, others, only one. Due to the lead and distribution time of this publication some of the items may have already been sold by the time you see this ad. 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 and made ready for shipment **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	**reg.**	**NOW**
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	34	29
ALLIANCE	**reg.**	**NOW**
HD-73 Rotor	$154	109
ATLAS	**reg.**	**NOW**
350-PS/302 Console	$458	299
DMK/XL Mobile mt	65	39
210X Xcvr	765	519
210X/NB Xcvr/blanker	810	549
215X Xcvr	765	519
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
VX-5 VOX kit for 220-CS	60	49
200-PS Portable supply	105	89
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
CDI	**reg.**	**NOW**
AM filter for FT-101	$ 39	29
CES	**reg.**	**NOW**
800-YS Scanner, FT-227R	$ 99	69
251T Program dialer	99	79
CIR	**reg.**	**NOW**
Astro 200 Xcvr	$995	599
Astro 200/CW filter	1045	649
Astro 200A Xcvr	1095	699
BPS-200 AC supply	135	108
SPR-200 Speaker	30	24
SPS-200 AC ps/speaker	165	139
SOC-200 Stn console	295	236
MIC-STA Desk mic	38	29
CUSHCRAFT	**reg.**	**NOW**
A14-2 2 el 20m beam Truck	$119	99
A14-3 3 el 20m beam Truck	169	129
A21-3 3 el 15m beam Truck	99	79
A28-4 4 el 10m beam	89	69
DENTRON	**reg.**	**NOW**
160-AT 160m ant tuner	$ 59	49
160-10AT-3Kw Ant tuner	229	139
PS 10 VOM/wattmeter	49	39
PS-20 VOM/wattmeter	69	49
WP-2A PEP meter (Fla)	99	79
W-1 Wattmeter/SWR	69	55
WV-1 VHF meter (Clev/Fla)	69	55
F 1 FS meter (Clev)	19	15
AF-1A Speech processor	199	149
HF-ACS 12v 10A supply	129	59
DENTRON (New Displays)	**reg.**	**NOW**
GLA-1000 Linear	$379	249
Clipperton L Linear	699	499
MLA 2500B Linear	999	749
MT-3000A Tuner	349	299
MT-2000A Tuner	199	149
Super Tuner Plus Tuner	149	129
Jr Monitor Tuner Tuner	79	59
DRAKE	**reg.**	**NOW**
R-4C Receiver (Fla)	$699	575
T-4XC Xmtr & AC-4 ps (Fla)	849	699
MS-4 Speaker (Fla)	33	25
AN-5 Shortwave ant	8	5
MN-4C Tuner	189	119
MN-7 Tuner	189	139
WH-7 Wattmeter	89	69
34PNB Blanker	100	89
DRAKE - Continued	**reg.**	**NOW**
1525EM Encoder mic	49	39
DSR-2 SW Rcvr	4200	2700
FINCO	**reg.**	**NOW**
A6-5 5 el 6m beam	$ 46	29
A2-5 5 el 2m beam	27	19
A2 10 10 el 2m beam	44	29
HY-GAIN	**reg.**	**NOW**
3750 Xcvr DEMO	1895	895
203BA 3 el 20m beam Truck	139	109
3806 2m FM HT	189	88
3807* Nicad battery	34	24
1106* Wall charger	9	5
* Accessories not sold separately.		
ICOM	**reg.**	**NOW**
IC 245 2m FM Xcvr	579	399
IC-245/SSB 2m Xcvr	699	499
IC 3PA Power supply/spkr	99	59
IC-30A 450 FM Xcvr DEMO	449	399
IC-211 2m Xcvr DEMO	899	599
KLM	**reg.**	**NOW**
Force 5 Xcvr w/ps	1344	795
661 6m Xcvr	695	499
Multi-2000 2m Xcvr	879	450
PA2-140B 2m 2/140w amp	229	159
PA30-140BL 2m 30/140w	189	149
PA2-70BC 220 2/70w amp	169	129
PA10-60BC 220 10/60w amp	149	119
PA10-70C 450 10/70w amp	229	179
MIDLAND	**reg.**	**NOW**
13-510A 2m FM synth Xcvr	$399	329
13-510 2m FM Xcvr DEMO	399	299
13-505 2m FM Xcvr DEMO	229	179
18-940 2m tnk/roof ant	31	15
18-941 2m magnet ant	37	19
18-950 220 tnk/roof ant	31	15
18-951 220 magnet ant	37	19
MIRAGE	**reg.**	**NOW**
B-108 5-15/80w 2m amp	$169	149
B-1016 5-15/160w 2m amp	279	249
B-3016 15-45/160w 2m amp	239	209
NYE	**reg.**	**NOW**
250-25-3 500w tuner/relay	$212	99
250-25-4 500w tuner	202	99
PALOMAR	**reg.**	**NOW**
Kachina 6 & 10m Xcvr	$689	499
REGENCY	**reg.**	**NOW**
DFS-5K Dig selector Whamo	$199	69
EC-175 175 MHz counter	449	249
ROBOT	**reg.**	**NOW**
400 SSTV scan converter	$795	636
SILTRONIX	**reg.**	**NOW**
FC-1 5 KHz-40 MHz counter	$169	89
SPECTRONICS	**reg.**	**NOW**
SC-30 30 MHz counter	$169	79
SC-250 250 MHz counter	219	119
STANDARD	**reg.**	**NOW**
C-118 2m FM HT/batt/cgr	$313	169
C-118/TTP 2m FM HT/TTP	373	229
146A 2m FM HT/cgr/batt	350	199
C-6500 SW receiver	379	249

continued - next page

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Closeout and Overstock equipment continued from Used Gear listing.

SWAN	reg.	NOW
100MX Xcvr	$699	549
350A Xcvr DEMO	599	399
HF-700S Xcvr	699	499
HF 700S/SS-16 Xcvr	799	595
PSU-3A AC supply/spkr	179	139
WM 6200 6 & 2m wattmeter	87	59
WM-1500 Wattmeter	74	59
WMM-200 Mobile VHF meter	49	39
WM-200A SSB PEP meter	89	69
PS-20 AC supply	179	129
FC-76 40 MHz counter	169	89
ST-1 Antenna tuner	189	129
LP-3400 Low pass filter	49	39
14C DC module	119	69
MB-40H 2 el 40m beam Truck	219	179
TPL	**reg.**	**NOW**
PS3-A12D 12v 20A supply	$136	76
TEN-TEC	**reg.**	**NOW**
Triton IV Xcvr DEMO	$699	579
Triton IV/digital DEMO	869	699
262G PS w/VOX DEMO	139	99
252G Power supply DEMO	109	89
251 Power supply	85	69
VHF ENGINEERING	**reg.**	**NOW**
SYN II 2m synth DEMO	$239	189
WILSON	**reg.**	**NOW**
1402/TTP HT w/touch tone	$316	199

The following model 2m HT's are without the high/low pwr. switch & batt. LED.		
Mk II HT/batt/wall cgr/TTP	332	219
Note: High/low switch may be installed on Mk II/IV by AES for $20.00.		
System 1 5 el 20-10m (Clev)	299	199
System 2 4 el 20-10m beam	249	149
M 320 3 el 20m beam	149	99
M-105 5 el 10m beam (Fla)	114	89
WV-1 40-10m vert. radials	79	64
M-66 6 el 6m beam	104	69
M 64 4 el 6m beam	69	39
M-211 11 el 2m beam (Fla)	33	29
M-29 9 el 2m beam	54	29
M-27 7 el 2m beam (Fla)	26	19
WM-62 6/2m mobile ant	29	19
YAESU	**reg.**	**NOW**
FT-901D Xcvr	1259	899
FT-901DE Xcvr	1259	899
FT-301AD/dlx ps/scope	1437	999
FP-301 Power supply	157	149
SP-120 Speaker	25	19
SP 101B Speaker		25
YC-601B Digital display	235	199
YO-101 Monitor scope	320	279
FTV-650B 6m transverter	239	199
FTV-250 2m transverter	275	239
FR 101S Receiver	599	375

FR-101 DIG Receiver	749	475
FL-101 Transmitter	649	425
SP-401PB Speaker/patch	59	49
FT-7 20w PEP Xcvr DEMO	499	429
FT-227RA 2m FM synth Xcvr	399	329
CPU-2500R 2m FM Xcvr	559	459
FT-202R 2m FM HT	199	139
NC-1 cgr, 8 AA nicads	57	49
HICKOCK Test Gear	**reg.**	**NOW**
38 Counter/wattmeter	$279	139
215 Transistor analyzer	115	57
217 Transistor analyzer	219	109
244 Power supply	125	62
256 CB/RF sig generator	250	125
385 512 MHz counter	499	249
NLS Test Equipment	**reg.**	**NOW**
LM-300 3-digit multimeter	$114	57
LM-4/LH 4-dig multimeter	230	115
LM-40 4-digit multimeter	209	104
SC-5 512 MHz prescaler	89	44

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New officers for the Kansas City DX Club are: KAØBCW, pres.; KØVBU, vice pres.; WBØTNY, secy.; AKØA, treas. Many outstanding efforts during recent contests were received from Kansas City DX Club members. Several scores of 100K and over were turned in and one score turned in by WBØTCO for SS fone looks like it will set a new record for MO thus breaking the one set previously by WØZLN. The recent CQ WW fone scores show a club effort of approximately 3.5 million by ABØI in the multi-single category and a cw estimated score of 1 million plus by ABØI and KØRWL in the multi-single and NØTT with 550K in the single operator category. ARRL 10 meter contest estimates of over 500K were received from WØXK, Missouri and NØXA, Kansas, both KCDX Club members. Congrats to the following new licensees. Novice: KAØs GBP GCT GDH GDK GDM GDZ GEA GED GEE GEG GEH GEI GEJ GEM GEY GFC GFH GFI GFJ GFL GFW GGC GGF GGI GGM GGO. Tech: NØs BGY BHF BHG. Gen: NØs BGH BIP. ADV: WAØOHK KBØJU. Traffic: WØBMA 642, KØONK 517, WØBV 199, KØSI 110, WØOUD 94, WØOTF 78, WBØSND 41, KAØE 25, WØVTF 23, KØBM 17, AGØC 3, KØRWL 2.

NEBRASKA: SCM, Rex P. Greenwell, KØKP. SEC: WAØASM. Congrats to OO, KØBRS, for the fine effort in the November FMT. His error was only 2 hertz. Listen for the big signals from the shack of WØERW. He has a new antenna system as a result of his skyhook raising party. FB! WBØUED has been operating on 40 mtrs with his new Tuna Tin 2, listen for him on 7147 kHz. The annual Lincoln ARC Tovathon went off well again this year. The hard working crew had a great time and earned some excellent community good will. The Tovathon was co-sponsored and broadcast on KLIN Radio. Nice job! The Pine Ridge ARC is conducting ham radio courses in Chadron at the Chadron State College. Students are studying hard and we hope for some new General Class operators by spring. New QCWA officers: WØUS, pres.; WØAP, vice pres.; WØUOJ, secy., WØVYX, treas. KØTVD waited 20 years and finally worked 9N1MM, congratulations! Nets: 160 mtr wx QNI 521; Cornhusker QNI 857, QTC 50; Platte Valley QNI 68, QTC 4; PM Net QNI 202, QTC 62; QCWA QNI 54, Western QNI 597, QTC 48; Grand Island ARES QNI 155, Eastern Nebr 2-meter QNI 25. Traffic: KØAIE 85, WØEUT 84, KØBRS 64, WØHOP 53, WBØGMQ 19, WØHTA 14, WØNIK 7, KØSFA 2.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, William J. Pace, W1UJ — Asst. SCM: WA1LOU. SEC: W1SY. STM: WB1AIU. NMs: K1EIR K1EIC WB1CPF WA1ELA WA1LOU.

Net	Freq	EST	Sess.	QTC	QNI
CN	3640	1900/2200 Dy	60	256	351
CPN	3965	1900 M-S 1000 Su	30	118	375
NENN	3720	1815 Dy			
Nutmeg	28/88	2130 Dy	30	121	362
RASON	13/73	2100 MWFSu	17	15	117
WESCON	28/18	2030 Dy	30	124	467

CN Hi QNI WB1CEG WB2PJU W1WP. CN/CPN and Nutmeg/WESCON roster/routing guides are available from W1DPR; send a large s.a.s.e. AREA repeater is now on 147.915/315; it's located in Prospect and callsign is N1ADE/R. K1BYD and WA1VNX have built an ATV repeater which is now operational in Naugatuck. A Radio Alert System has been installed on the Norwalk repeater; similar to the NOAA Weather Warning System, a 1050 Hz tone transmitted for 15 seconds will activate ham shack alarms whenever there is a need for emergency communications. Traffic: WB1CPF 235, K1GF 224, WB2PJU 130, W1DFT 112, W1BDN 110, W1HMJ 106, W1GVT 54, WB1FZX 53, WB1CEG 51, K1XA 47, K1DM 46, K1AQE 40, WB1DGR 40, WB1ESJ 38, WB1DOP 34, WA1WOG 31, K1EUW 26, WA1LOU 25, WA1UUA 18, WB1ACZ 15, W1KV 12, W1CUH 6, W1QV 5, W1JTD 2.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — SEC: WA1BLG. STM: WA1TBY. EC reports from W1LE W1XA KA1BTV W1ALP. OO reports from W1HL W1NF W1UI W1EGE WA1NAE K1LWI. OES reports from AE1X W1XA W1EGE. OBS reports from WA1QAA K1UR W1XA W1ALP. OVS reports from W1GXT W1JR.

Net	Mgr.	Freq.	Time/Dy	QNI	QTC
NEEPN	K1BZD	3.945	0830 Su	56	20
M FARAD	WA1LAD	3.925	1300 M-Sa	214	81
EMRI	WA1VAB	3.658	19/2200 Dy	1113	366
HHTN	K1BSO	04/64	2230 Dy	725	292
EM2MN	WA1IFE	90/30	2000 MWF	94	35
EM2MN	WA1IFE	145.8	2000 TTh	—	—
EMRISS	KA1BJY	3.715	2030 Dy	22	6
EMRIPN	W1FJI	3.898	1730 Dy	401	270

By the time you read this, the great results from WARC will be old news. See you on 10, 18 and 24 MHz. As I write this, we are experiencing really great openings on 6 meters. In this regard, W1GXT reports "the best six meter DX in 22 years with many stations finishing up their 50 MHz WAS. The band was even open to the west coast on 52.525 MHz fm several times." Also WA1OJX worked WB1BZJ on 6 meters. Not unusual except that they worked each other through the Olympia WA rptr — over 3000 miles away. SE Mass ARA new officers: W1FJI, pres., W1LE, vice pres., WB1ERS, secy.; WA1BZJ, treas.; W1SSS WA1CLU trustees; W1ATI WB1BUG, board of Dir. Framingham Club had interesting talks on Amateur Radio in Germany and Sweden by DK9CF and SMØCOP. Mitre Bedford Club had talk by K1CCL on real world antennas. Wellesley Club officers: WA1POY, pres.; K1UR, vice pres.; N1ADY, corr. secy.; WA1YAU, res. secy.; WA1TBY, treas. Billerica Club officers: WB1DFO, pres., N1AAO, vice pres.; WB1GEX, secy/treas.; W4HMV, dir at large. Massasoit Club had their annual banquet with 70 in attendance. Sturdy Mem Hosp ARC planning Christmas QSOs for the children in pediatrics surgical unit with Santa. Middlesex Club officers: K1FB, pres.; K1NDF, vice pres.; WA1KRI, secy., W1LJO, treas. Whitman Club running Novice class for CAP Squadron. Chelmsford club is planning to work on changing the wording of a zoning by-law to protect hams. During the weekly Capeway club on the air get together they worked W6RO on the Queen Mary. WA1TBY and KA1BJY have changed the time of EMRISS to 2030 local. This will provide better liaison to other nets. W1NF reports that W1MZ/MM on a vacation in Argentina with XYL. Foxboro Comp hams provided communications for marathon in Foxboro. WB7TPY operating from Boston Red Cross and trying to get others to do the same. W1ALP licensed 55 years. W1AAU in hospital. K1KYB got married. K1EMU moved to Newton Centre. Traffic: (Nov) WA1TBY 560, K1BA 308, WA1VAB 308, KA1GC 283, KH6JNQ/1 250, WA1YWK 200, W1PEX 197, KA1BJY 190, W1ATX 176, K1GN 172, WB1ACA 170, W1XA 135, K1BSO 133, N1AMF 134,

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Experienced operators recognize that the audio quality of the transmitter is limited by the quality of the input from the microphone. On the air, there's no mistaking the crisp, intelligible messages from Shure microphones.

Shure microphones have been the overwhelming choice of professional communications users all over the world for over 30 years. And, many of the milestone improvements developed for the demanding professionals are found on Shure microphones for amateur radio. Described below are just some of the Shure-developed advances that have eliminated many field maintenance costs common to amateur radio microphones.

ARMO-DUR® Case: Lightweight, immune to oil, grease, fumes, salt spray, sun, rust, and corrosion. Prevents RF burn!

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To improve your on-air intelligibility we suggest the following Shure Microphones for amateur radio applications:

	Mobile Application	Fixed Station Application
SSB	414A* 407A* 577A**	444* 526T Series II
FM	414B* 507B* 577B**	450 526T Series II

*General recommendation: Consult equipment instruction manual for correct microphone impedance.
**Noise-canceling.

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Controlled Magnetic® Fixed Station Microphone (Models 444, 450)
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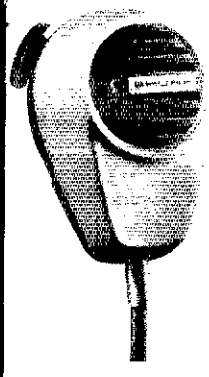

Omnidirectional Mics (Models 407A, 407B, 507B)
Small, easy-to-handle design, with rugged Dynamic or CONTROLLED MAGNETIC® transducers for excellent voice intelligibility. Hum-shielded and insulated against shock. Model 507B Dynamic version features extended low and high frequency response, especially suitable for mobile FM transmitters. Modular construction simplifies field service.

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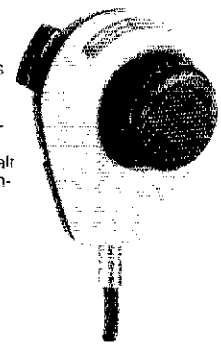
Ideal for miniaturized or portable communications systems, or where dashboard space is limited. The 414 Series CONTROLLED MAGNETIC® microphones are about half the size and weight of conventional microphones—yet they are rugged units, recommended for critical outdoor or indoor applications.



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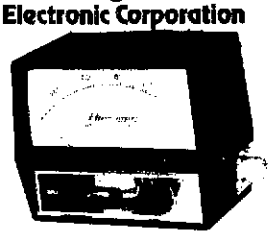

The 4360, 4362 HAM-MATE Directional Wattmeters are insertion type instruments for measuring forward or reflected power in 50-ohm coaxial transmission lines. They are direct descendants of the model 43 THRULINE® Wattmeter — the professional standard of the industry — and will accurately measure RF power flow under any load condition. Each wattmeter is made up of a precisely machined section of 50-ohm line, a rotatable sensing element and meter calibrated in watts, all mounted in a high-impact plastic housing. It is this type of solid construction and the directional THRULINE coupling circuit, without toroids, that account for the superiority of the HAM-MATE Wattmeters.

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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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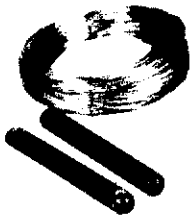

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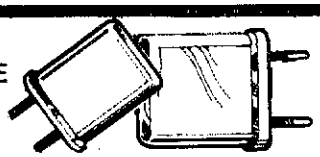

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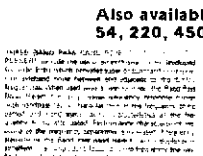

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MAINE: SCM, Ed Bristow, WA1MUX — Know your ECs. Civ/EC: York/K1ZIT, Franklin & Oxford/WA1QIK, Washington/N2KG, Penobscot/W1HDC, Somerset/WB1BYR, Aroostook/WA1YNZ, Sagadahoc/K1GDI, Piscataquis/K1OJN, Kennebec/W1JTH, Androscoggin/WA4UJJ, Cumberland/K1MON. Counties not mentioned contact WA4UJJ, SEC, for info & to help. N1RP to Costa Rica in Jan. will be N1RP/TI2 for couple yrs. We'll miss you. W1NBQ & W1KRH to TX for winter. WB1GRT, SARAs activities mgr, generated wide publicity for Xmas message service, far off as WI. WCARA has Century 23 vibeyer & xtal cal. New 15 meter beam for WB1GXP. PSHR W1RWG AF1L WB1BYR. Sess/QNI/QTC: SGN 26/1113/278; PTN 30/257/191; SPSN 10/58/8; MPSN 4/51/6; AFN 4/43/0. Traffic: (Nov) W1RWG 193, W1YA 176, WB1BYR 162, AF1L 78, WA1JZP 72, N5YX/1 62, W1KX 58, N1RP 51, W1AHM 46, W1CTR 37, WA1MUX 34, WB1GLH 34, W1GKJ 31, W1JTH 29, W1BMX 25, W1BJ 19, WB7VKH/1 19, KA1DDJ 16, WA1YNZ 18, KA1EO 13, WA1JHT 13, WA4UJJ/1 8. (Oct) K1GUP 55.

NEW HAMPSHIRE: SCM, Robert G. Mitchell, W1SWX/W1NH. SEC: K1RSC. STM: W1TN. NMs: N1NH WB1HFI. Congratulations to W1TN as your system Traffic Manager, and WB1HFI as Net Manager. Don't forget the New Hampshire QSO Party on Feb 2, 3 and 4. Details from Nashua Area ARC and K1HI. Control operators for the WR1ABO 220 machine are W1TXK W1KVZ WA1RPO. First 6 meter WAS for NH by W1FZ. Congrats. KA1CB has new 75 foot tower and 3 Long John Yagis. WB1EHV enjoyed Ladies Night at the Port City ARC. Seen on the Hyways and Byways, WB1DCS W1HRI W1FZ WB1AFS and W1VAU. The NHN had 131 checkins and 131 traffic. W1ICU is the first NH station to make the DXCC Honor Roll. The GSFM Net had 411 checkins and 153 traffic. WB1BRE has new tower. W1RCC has hum free power supply. K1LB is getting microprocessor fever. W1GUX attended the Yankee Chapter OCWA picnic on Mt. Kearsarge. K1GO K1HI and K1CII assisted with W1HR's election of Bnhn 45. K1MFQ worked Alaska and Yukon on 6 meters. K1RSC vacationed in Canada. K1OX rebuilding house after bad fire. W1BXM has new 2-meter antenna. Welcome back WB1ELP. Hope Santa brought everything you wanted. Traffic: K1BGS 915, W1TN 232, K1OSM 207, N1NH 149, W1GUX 101, K1YMH 79, WB1HFI 74, K1ACL 52, WB1DSW 34, WA1YAZ 32, W1MHX 31, WA1PEL 30, K1ACL 27, KA1CB 18, WB1HGQ 16, N1ALM 14, K1UQX 14, K1NH 9, W1NH 6.

RHODE ISLAND: SCM, J. Titterington, W1EOF — SEC: K1DT. STM: N1RI. Congrats to KA1CDW now a General. KA1BBY is new OTS. EBAWA operated N1RI in 160 meter contest and scored their highest ever, 50,000 points. Great work, gang! EMRI Slow Speed Net on 3715 kHz is on at a new time, 8:30 P.M. local time. If traffic handling scares you, please listen in and see how easy it really is. Most of the clubs had Christmas parties for the holiday season. I would appreciate more input for this column. We can't print it if we do not hear from you. I do not really write the column, only put down what I hear from and about you. RIEM 2-meter Tfc Net had an excellent month, sess 22, QNI 250, tfc 105. WA1CSO, net mgr, & WA1WKK, asst. mgr, should be commended. Traffic: KA1BTU 65, W1EOF 61, N1RI 55, WA1CSO 32, K1GOW 18, AE1S 6, WA1VTZ 4, KA1BBY 2.

VERMONT: SCM, Bob Scott, W1RNA — Contrary to the comments of some, ALL of our nets handle tfc. Believe Jay tpt 146.745. Oct- Apr has net 2000 hrs Sat. K1OXD can be found 7.233 MHz 2 to 3 times a week. W1AIM has wrkd 24 states on 2-mtr and 21 countries on 6 mtr, needs Africa. AE1J wrkd 6 continents in 10 hr 6 min on hf. Anyone heat? New NCS VT SSB, WA1OOV K1OXD N1ARI. SEC wrkg to tie out 2-mtr repeaters together for emergencies. GMN 26/527/65; VTSSB 28/502/124; Carrier 26/449/34; VTP 4/65/6; VTHFD 4/62/21. Silent Keys: W1EJF, St. Johnsbury; WA1EOI, Montpelier. There is a definite time limit for info to me for this column. It has to be mailed to ARRL 7th of month; 6th of month receipt by me. It would be great to hear more VT stns on our nets. Traffic: K1BQB 242, AE1T 10, W1RNA 19.

WESTERN MASSACHUSETTS: SCM, Bill Lowe, W1TM — SEC: WA1DNB. STM: W1KK. NMs: WA1MJE, W1UD. New OTS: WB1HIH. W1DWA again active in NTS. W1KK with new rhomic antenna on 20m. Received several reports concerning DX openings on 6 meters. W1KZS and WA1RFA report contacts with several KL7s. This activity qualifies both for WAS using 6m. K1SF reports 6m contacts with KL7 and Montana, needs only KH6 for 6m WAS. WA1RFA also reports 6m contact with KX6. Several stations active in the ionospheric Hole experiment in September received certificates of appreciation from the U.S. Air Force Geophysics Lab at Hanscom Air Force Base. Congrats to WA1COF and WB1EHS on Extra and WA1YJN on Advanced. This is my last report as SCM. I have enjoyed my term. Will continue to be an active OTS. Traffic: (Nov) K1SSH 268, W1TM 252, W1UD 232, W1DWA 97, WA1MJE 62, W1KK 51, WA1OPN 41, W1EFC 39, K1JHC 32, W1BVR 19, WA1YYW 19, WB1HIH 12, K1BE 9, W1DOY 8, W1ZPB 8. (Oct) K1SSH 210, WA1MJE 186, K1IJV 46, W1EFC 28.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — It is with regret that I report KL7EMA a Silent Key. He died suddenly at his home in Kodiak. Net reports are: Alaska Snipers, 30 sessions, 1006 ckins. Alaska Pacific Net, 20 sessions, 1227 ckins. Alaska Bush Net, 30 sessions, 1041 ckins. Sesaw Net, 10 sessions, 135 ckins. No other nets reported this month. Yours truly provided communications from the South Pole to Alaska for one of the party commemorating the 50th anniversary of Admiral Byrd's expedition to the South Pole. An Alaskan flag was planted at the South Pole. All of the 6 meter stations in Alaska are busy as the band has been open most of the month. Traffic: AL7O 188, KL7O 144, KL7P 43, KL7RF 39, KL7IYX 30, KL7JFT 5.

IDAHO: SCM, Lem Allen, W7JMH — PARC bulletin points out that when something goes wrong with your rig, look for something simple first (very good advice!). The Pocatello repeater has been winterized and is working very well on 147.66/06. KARS Bunny Hunts are getting to be a tradition! W7LOT is chmn of "Ham Meet 80," to be held May 17 at the Kootenai County Fairgrounds.

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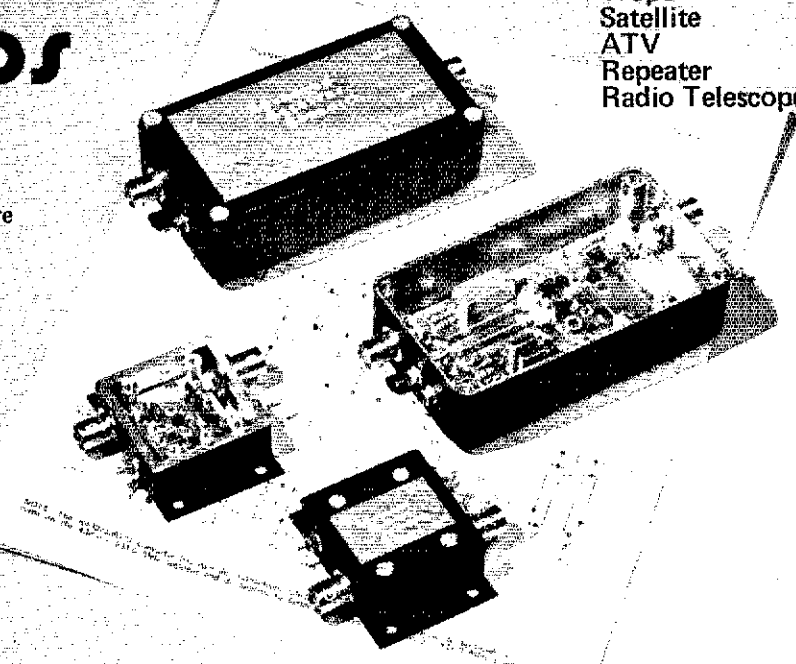

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144VD	144-146	< 1.8	49.95
220VD	220-222	< 2.0	49.95
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432/435VD	432-434 & 435-437	< 2.2	69.95
PREAMPS			
28VD	28-30	< 1.1	24.95
50VD	50-54	< 1.3	24.95
144VD	144-148	< 1.5	24.95
220VD	220-225	< 1.8	24.95
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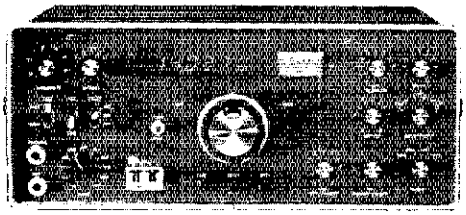
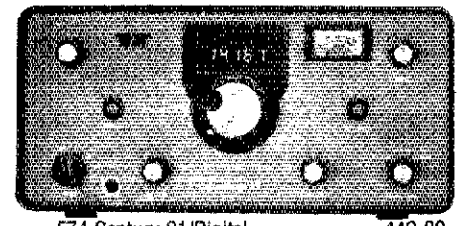


545 160-10m OMNI Series B	949.00
546 as above w/Digital Readout	1119.00
217 500 Hz 8-Pole CW Filter	55.00
218 1.8 kHz 8-Pole SSB Filter	55.00
243 Remote VFO	139.00
252MO 18A 110 vac power supply	139.00
252MO/E 18A 110/230v supply	146.00
540 80-10m 200w Xcvr	$699.00

544 As above, w/Digital readout	869.00
252M 18A 110 vac power supply	139.00
262M As above, w/VOX	159.00
242 Remote VFO	179.00
245 150 Hz CW filter	25.00
570 Century 21 70w CW Xcvr	349.00



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670 Century 21 Keyer	29.00
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277 Antenna Tuner/SWR Bridge	85.00
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- WRU--receive only messages directed to you, acknowledge *Station ready to receive*, then save message on cassette - all automatically. No operator intervention required. Receive messages while away.
- Provision to call subprograms from the M800 operating system. This feature allows for future expandability of the M800 software. As a demonstration of its potential, you will receive a subprogram on cassette which will send either of two different real-time pictures (Custom PIX!).
- Instant callsign insertion. Enter other fellow's call just once, then press a single key to send entire ID exchange:
  W9XYZ HERB DE RON N6EE
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This will be a biggy, plan to attend. W7GCL has a new Triton IV. Remember, if your activities and traffic totals are not reported in this column, send your SCM a message the first of each month!

Net	Freq.	Time	Sess	QNI	QTC
CD	3990 ssb	8:10 A M-F	22	566	12
FARM	3935 ssb	7 P Dy	30	1455	40
IMN	3635 cw	7:30 P M-F	22	176	70
TV Emg	145.44 FM	9 P Su	4	118	—
Mini Cassia	VHF FM	—	4	22	1
Mt. Harrison	146.40/00 FM	—	1	20	—

Traffic: W7GHT 380, K7IV 24, W7JMH 16, W7HZL 12.

MONTANA: SCM, Robert Leo, W7LR — K7WNE: 37/97 QRV Missoula, Union Peak end Dec. W7KNT new Extra Missoula, VHF mtg Jan 2 9:30 A.M. 4 B's rest. W7DB sends ARRL bulletins. WB7UTJ has vy successful 7240 net, 14 checkins fm MT, WY, ND, CO, ID. They handle considerable traffic now & tie into other nets. IMN: QTC 70, QNI 176. N7AGP in Gt Falls ARC Newsletter writes of repeaters: 19/79 Zortman, 37/97 Hinsdale, 31/91 Havre, 13/73 Gt. Falls. W7IDK wrte: WB7UOA, B QSY to Butte. W7ETP new Havre ham. KA1EA writes: OSCAR users: WA7OBH KA7DLC KA1EA W7RZY, W7JR EME work. K7CZQ home fm hospital. New ARC in Livingston. W7KNT QSO 118 JA's on 6 meters. Has 49 states on 6. WA7OBH 43 states on OSCAR. K7JWC used 2 mtrs to reports bad auto accident. Red Lodge 01/61 rptr doing well. New Gallatin ARC officers: KB7BJ, pres., WB7STG, vice. pres.; WB7OYP, secy.; N7AIT, newsletter ed. N7ANB W7LR work on 220 link for Bridger, Steamboat repeaters. Traffic: (Nov) WB7UTJ 30, W7NEG 7, W7DB 6, W6HAH 2, W7LR 2. (Oct) W7TGU 126.

OREGON: SCM, Dale F. Justice, K7WWR. — Section Nets

Net	Time/Days	Freq.	QNI	QTC	Sess.
OSARES	0115Z Dy	3993.5	484	162	30
OSARES	0300Z Dy	3993.5			
BSN	0145Z Dy	3908	642	45	30
OSN a	0245Z Dy 0330	3585	126	107	30
PdxAARES	0330Z Dy	147.32	462	35	24
WCN	0300Z Dy	3702	324	148	30
1676	0300Z Dy	146.76	279	119	30
JCARES		147.06	121	11	6
Clatskonic ARES	6:00 P M.	147.64/ 147.04	—	—	12

N7DB reports lots of DX on six meters to JA's, HL, and heard some Europeans. New TERAC officers for 1980 are: W7UDM, pres., WB7CHK vice pres., N7CE secy., W7JXU treas. Hoodview ARC did back to back marathons. Results were excellent. The EARS dinner was attended by NW Vice-Director K7BT. The SCM and SEC were also speakers. All spoke on current matters. New Prairie Peak repeater on 224.1 works the Willamette Valley and some coastal spots. Traffic: (Nov) W7VSE 730, WA7IHS 347, K7NTS 193, K7ZIG 81, K7OPW 60, WB7OEX 51, K7WWR 41, W7LNE 32, W7LT 23, WB7OIJ 6. (Oct) W7VSE 901, W7XI 44.

WASHINGTON: SCM, Bob Klepper, W7IEU — STM: W7UZX, SEC, WA7BWK. Nets reporting are:

Net	Time(Z)	Freq.	QNI	QTC	Sess.
NTN	1930	3970	1532	108	30
WARTS	0200	3970	3286	328	30
NWSSBN	0230	3945	695	41	30
WSN	0245/ 0545	3590	586	229	59
MPRTN	0130/ 0615	146.92	153	115	60

I'm sorry to have to report so many SK's this month, they are: W6BCY K6RKZ W7BVM W7OUK W7PNX W7ZEV W7ERH operated both phone and cw during SS. K7FR has moved to a new antenna farm. WB7UPU has upgraded. W7BCS/N7CT reports very good results in both SS and CQWW contests. WB7QWC assisted in planning new system for Snohomish County ARES and will be Net Manager for the Nt section when the plan is implemented. BEARS Rptr K7NWS/R is back up to full power and now has battery back up system. Snohomish City ARES now have two nets in operation. The 146.18/78 net meets Mondays at 8 P.M., the 147.78/18 net meets Tuesdays at 7:30 P.M., the move was made to prevent tying up the long range capabilities of the .92 rptr which will still be utilized when needed. K7VNI took the Skagit/Whatcom Bunny Hunt Challenge Cup back to Whatcom County. RASC members say wait until next year! North Seattle ARC members enjoyed the presentation of the FD operation from the Space Needle by WB6RTG and WB7PSP. Skagit City EC, KL7JEB, has completed the new ARES emergency plan for the county and urges all those not signed up in ARES to consider signing up. W0ERK and N7AEN are new members of Clark County ARC. Members of Clark City ARC enjoyed a tour of the Trojan Nuclear plant. Mount Baker ARC held their November meeting at the Air National Guard facilities at the Bellingham airport and took a tour of the facilities and communication equipment. W7IIE visited FCC while on vacation in Washington DC and found the visit informative. Traffic: (Nov) W7DZX 619, KL7JEB 584, WB7WOW 349, W7LUP 264, N7AFZ 252, K7GXZ 236, WB7TQF 202, N7AJ 150, W7IEU 122, WB7OFH 78, WA7BDD 70, WA7PHO 61, W7GB 38, W7RUN 37, KA7AWH 36, N7AFY 34, W7FBU 32, WB7OAS 31, W7ZEV 27, W7LG 26, W7FJZ 23, WB7EBP 15, WA7EDO 15, WA7TWB 11, N7RV 9, WB7QWC 8, W7APS 7, W7BGS 6, K7FR 6, W7ERH 4, W7KZ 3, W7AIB 1. (Oct) N7RV 35, W7AIB 3.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: K6UWR W6ZF VE2AQV/W6. SEC: K6UWR. PSHR for Nov: W6OA, W6JXK. K6UGS enjoying Mission Trail Net after 20 year absence. WA6JVZ applied for CCXX and DXCC awards. N6IG worked 10 states on six using a 40 meter dipole. W6ZF feeling mighty good after tests and treatment at David Grant Medical Center. Travis AFB. Good to hear from you again. MDARC members acting as instructors for 80 students enrolled in evening code and theory classes at College Park High School. Shown operating his "Station of the Month" in their club publication, "The Carrier," is Asst SCM VE2AQV/W6. WB6BMR new Pres. of SCARS. 1980 NBARA officers: WB6WYF, pres.; WD6FVF, vice pres.; Marge Snell, secy.; WB6UUR, treas. W6PSJ up from So. Cal. and sporting new KT-34 in Napa. 1980 SARO officers include W6HUY, pres.; K6TI, vice pres. K6ARE and N6OP, section OO stations, keeping busy. They are joined this month by new OO, KB6LL. Traffic: (Nov) W6OA 273, W6IXK 190, K6UGS 46, WB6UZX 40, WA6JVZ 6. (Oct) K6UGS 21.

NEVADA: SCM, Ralph E. Covington, W7SK — LVRAC had a wonderful Christmas dinner and much thanks to WD9CKM for a fine job in organization. SNARS also put on a fine dinner with entertainment provided by the

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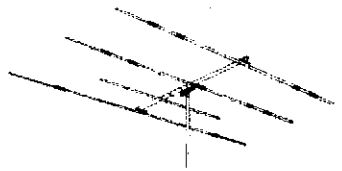

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Hy-Quad	2 el. 10-15-20M Quad	274.95	219.95	12AVQ	20-10M Trap Vertical	42.95	34.95
205BA	5 el. "Long John" 20M beam	329.95	259.95	14RMQ	Roof Mounting kit (verticals)	33.95	29.95
155BA	5 el. "Long John" 15M beam	199.95	169.95	5BDQ	80-10M Trap doublet	109.95	89.95
105BA	5 el. "Long John" 10M beam	129.95	109.95	2BDQ	80-40M Trap doublet	59.95	49.95
204BA	4 el. 20M beam	249.95	199.95	6BB	6 el. 6M beam	119.95	99.95
204MK5	5 el. conversion kit	99.95	79.95	203	3 el. 2M beam	15.95	14.95
153BA	3 el. 15M beam	89.95	79.95	205	5 el. 2M beam	21.95	19.95
103BA	3 el. 10M beam	74.95	59.95	208	8 el. 2M beam	29.95	26.95
402BA	2 el. 40M beam	239.95	189.95	214	14 el. 2M beam	34.95	29.95
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ARX-2	2 Mtr. Ringo Ranger	39.95	32.95	A144-20T	2 Mtr. "Twist" 20 ele.	69.95	56.95
AR-6	6 Mtr. Ringo	39.95	32.95	A147-20T	2 Mtr. beam	67.95	54.95
ARX-220	220 Mhz. Ringo Ranger	39.95	32.95	A430-11	432 Mhz. 11 ele. beam	37.95	31.95
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	39.95	32.95				

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5-BTV	10-80 Mtr. Vertical	139.95	99.95
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RM-75S	75 Meter Super Resonator	38.95	29.95
G6-144B	2 Mtr. Base Colinear	89.95	69.95
G7-144	2 Mtr. Base Colinear	139.95	99.95
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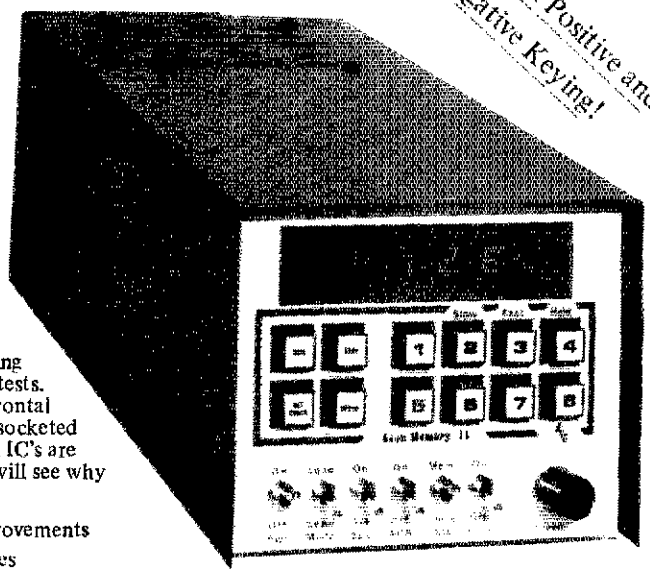

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Reno Banjo Band. New officers for SNARS 1980 are: WA7KCD, chmn.; KA7AFT, vice chmn.; W7UIZ (who else would work so hard for free?) secy/treas.; K7VY, PIO; K7SER W7AAA and WA7NHJ, dir. NARA's dinner was at the Big Yellow House in Reno and special thanks to W7DIK and XYL for a fine job. Nevada Sagebrush Net meets nightly 0330Z, 3898 kHz with master traffic man, W7BS, as the new net manager and all are welcome. A reminder to members and station appointees to send station activity reports in by the 5th of month. Traffic: N7AKX 186, W7BS 166.

PACIFIC: SCM, Pat Corrigan, KH6DD — STM: W6KON. SEC: KH6CKJ. Our congrats to the new officers of Hono. ARC: KH6WM, pres.; KH6CX, vice pres.; KH6CKJ, secy.; KH6EVY, treas. Also AH6K will be heading up the Big Island ARC this year. KH6AN writes that he is the contact point for KH6's wanting to go on a tour to Seattle for the 1980 ARRL National Conv. to be held July 25-27. Full details from him. KH6CKJ has 105 amp batt power for his station now. KH6ILR sporting new TS-120S & Clipperton L along with HALSt-5000. He is just finishing complete emerg. plan for Oahu ARES. AH6K, EC-Hawaii, conducted ARES drill in conjunction with local REACT. Congrats to KH6IHP with 32 states on 2-m (moonbounce) now. N6SF in KH6 for Thanksgiving and did some contest operating again from here. JA1KSO was here recently on honeymoon. Ex-KH6RG on from IL as AA6I/9. Traffic: KH6ILR 76, KH6H 31, KH6CKJ 30, KH6JJP 20, AH6K 4.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: W6NJU. A special welcome to W6CFQ the new Emergency Coordinator for Sacramento County. They Yuba/Sutter ARC will use the Yuba City Red Cross facility for their emergency base. They are assembling ants and equipment for emergency and Field Day use. KA6JNX is the new SEC of the Tahoe AR Assn. Congrats to KA6JTY on getting his Tech. K6HHD has become an ARRL Life Member. W6GO may have made the national high in the Pioneer QSO Party. The Pioneer Radio Club has placed 7 teletype units in the Pioneer deaf program. WB6GFJ has transfered the OSCAR Bureau in order to devote more time to emergency communications and OSCAR work. N6JV finally worked VT on 160 meters to complete 6BWAS. Traffic: W6SX 77, W6DEF 30, W6RSP 3.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: WB6ZRK. Congrats to WB6EFY on upgrade to General. N6KM has new Midland 220 MHz synthesized rig. Murphy plagued W6LFJ/Alcatraz. W6GGR active as OBS and also working on interface to use a computer for cw and RTTY. N6CT enjoying the excellent 6 meter conditions. W6EAJ/W6YSK active on 160 meters. WB9LOZ new editor of SFRC newsletter. W6RQ was visited by G3Y8H and also reports large number of sunspots viewed through his telescope. Best of luck to K6CTQ in his antenna zoning battle. SS clean sweeps reported: cw: W6BIP (+WA6DJI) N6BV AA6GM K7SVI/6; phone: W6BIP (+WA6DJI WA6PYN). W6BIP (+WA6DJI AA6GM) over 1 million points in cw CQ WW DX contest. K6PR now a Silent Key. Traffic: (Nov) WB6AMP 302, K6TP 193, W6GGR 10, N6KM 8 (Oct) W6RNL 170, K6TP 128, W6GGR 2. (Sept) K6TP 99, K6PB 85.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. W6EJQ and K6JFS are Silent Keys. The Stockton ARC is having an "in club" contest to see which member works all CA counties first, beginning Oct. 1, 1979. Turlock ARC has 120 members. W6DPD has DXCC mixed. New appointment: N6YD as OO. Renewals: WA6CTR and W6AJH as EC; WA6YAB as SEC. NCN for Nov: 1 QNI 391, QTC 234. VHF QNI 1090, QTC 334. W6JPU has a solid state 75S-3C. WA6SZE has a new 10m beam. KA6BTW has a TR7625. KA6GCF has a keyer. W6ONK has a TR 7400A and TS 700A. WB6ITM has a MN2000. K6XJ worked 50 states on 6 meters. WA6JDB has a KDK 2016. W6NRO has a FT 625RD. K6RPH is building vhf amplifiers. W6DPD W6XP K6XJ K6PKO K6RPH WA6JOV K6YK AA6S WA6OIB and W6YKM are working DX on 6 meters. The Fresno Hamfest is May 9-11, 1980, at the Hacienda (formerly the Sheraton). Traffic: N6AWH 232, W6DPD 18, WA6JDB 11, WB6TTP 8, WA6WDL 6, WA6YAB 6, N6AMA 4, WB6WYA 2.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. NM: W6RFF. Plan your vacation for ARRL Nat. Convention in Seattle July 25-27. New officers for SCCARA are WA6DXP, pres.; WB6YRS, vice pres.; WD6CHD, secy.; WD6DOK, treas. SCCARA also going full speed ahead on Pac Div Convention plans. NPSARC with new officers: KB2ID, pres.; KB6BR, vice pres.; WD4LUN, secy.; WD6DGN, treas.; and new members WB6ZSB WA6ZMX KB6VR. Six NPSARC members delivered Meals on Wheels for the elderly. PAARA members upgrading are WA6OFN KA6DQR and KA6BEU all to General. SLVARC reports a good year for the club and for WR6AOK, also a new member WB6IZD. 1980 officers for SMRC are: W6KXG, pres.; K6ITL vice pres., WA6FXC, secy.; W6UQ, treas.; W6AQR, prog dir. Memorex ARC has elected KA6GET, pres.; WB6HYA, vice pres.; KA6DIR, secy.; KA6ETF, treas. They are working toward ARRL affiliation. FARS reports the SPECS repeater fund and equipment progressing very well and should be on the air shortly. Will be located at El Camino Hospital. SCVRS members WA6REH WB6SFC WB6OCO and N6AKK participated with communications for RUNATHON. Their bulletin voice of .76 had a good article on loop antennas. W6XN presented a slide program on amateur satellites before the SCCARC in Santa Cruz. Also in SC, WB6MLY WB6PCC WB6QHF and others working ATV, info from QHF. WA6SVW still looking for other small computer users. VE2AGF spoke to SMRC on travels in China. CCRC Circle published a list of nets and their frequencies. The SCV ARES Net meets Wed 7 P.M. on WR6ADX and WB6IZF as net control. New member of NCCC is KC6D. ARRL Communications Department appointments are available in the SCV section. If interested let me know and an application will be sent to you. Traffic: W6YBV 226, W6RFF 63, WA6HAD 33, W6OII 26, W6KZJ 15, W6ZRJ 14.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — STM: N4UE. SEC: K4CJZ. Congrats to WD8NYN new Net Manager of the Carolinas Morning Net which meets daily at 0800 local on 3727 kHz. Many clubs with new officers including: Western Carolina ARS (Asheville): KA4CAC, pres.; WA4UTY, vice pres.; KA4BZC, secy.; N4ARZ, treas. Brightleaf ARC (Greenville): K4QO, pres.; KE4I, vice pres.; WA4SLD, secy/treas.; WA4DAN, editor. Mecklenburg ARS (Charlotte): WA4OBO, pres.; KK4L, vice pres.; WD4MAC, secy.; W4MHF, treas.; WD4ABZ, WD4JWO, WA4ZQQ, WA4OJU, members of board. CNN

has new asst. Net Manager, WD4JJK of Cary. WA4YMM now teaching Novice Classes in Fayetteville. Cape Fear ARS (Fayetteville) club members went on tour of VOA Greenville site last month. Charlotte ARC preparing for big marathon in January, providing communications for this big event. WD4SFA now General and WA4WGX now KS4O. We will miss KK4M and WA4SES, moving out of state. Mount Hemby will never be the same. Congrats. to the Mecklenburg ARS, Wa4BFB, national champs in the Fall VHF Contest and to the Alamance ARC for sponsoring such a fine NC QSO Party in Dec. New Appointees this month include W4VTP OTS, KB4PD EC Cumberland Co, WD4FXY EC High Point, and WB6OTS OTS. See you in the DX contest this month. Be ready for the Roanoke Division Convention in Charlotte March 22-23. Traffic: K4GCN 298, WD4CNQ 247, WD8NYN 240, WD4EPO 212, WB4WII 198, WB4MXG 166, KB4IZ 152, W4EAT 129, K4DHX 94, WA4SRD 93, W4FMN 80, KF4R 80, W4PCN 78, K4VHT 75, AB4S 65, K4MC 62, WD4CFZ 58, W4OFO 56, KK4M 50, W4HKB 44, W4RVE 43, WA4IHG 42, N4UE 39, WB4VVL 39, WD4FJM 38, WD4NAO 34, WD4JJK 32, W4ACY 30, K4FTB 29, W4CTP 29, WB4CES 28, WA4OJU 27, N4ZH 26, KA4DNL 23, WD4AIE 20, WA4CUD 18, WD4HYM 17, WB4VQZ 16, WB4VHE 12, KA4IUY 8, K4AI 5, W4EHF 5.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst SCM: WB4UDK. SEC: WD4HBX. STM: W4ANK. NMs: WA4SJS KA4BGX. RTTY net on 146.25/85 with KA4V WA4KOX WA4LOG K4KEP on Mon 9:30 P.M. Won't you join them. Congrats to new Novices and upgrades: KA4LRM KA4KHJ KB4XV WD4GAR KA4KYB WD4DOM KA4EMZ KA4GUT WB1AFI/4 WB4KVS WD4DOG. Congrats to new officers Anderson ARC: WA4JWS, pres.; KC4W, vice pres.; WA4ZSO, secy.; N4BTF, treas.; WD4BUH, act. dir. Check-ins/traffic: SCSSBN 1385/214; Blue Ridge 2-Meter Net 599/24; Anderson 2-Meter Net; 492/18, CNN 328/98; Lancaster County 2-Meter Net 188/14; Western SC Emergency Net 128/0; Newberry County ARES Net 40/8; Dillon County Emergency Net 16/0; CNE 30 sess. Traffic: K4ZN 395, WD4RMA 215, WD4AWN 207, W4FMZ 143, W4ANK 125, W4NTO 117, W4DAW 96, KA4ASJ 59, KA4BGX 52, W4MTK 39, K4FRX 37, W4NQL 29, WB4MXW 25, N4BOD 24, W4FVV 23, WB4UDK 21, WD4EDM 19, K4VIA 12, WD4BUM 11, WA4VYS 10, WA4ASZ 9, WD4HBX 8, WB8TCT/4 8, WA4SJS 7, N4EE 6, K4LYU 4, W4DRF 2, WD4FJP 2, WA4JWS 1.

VIRGINIA: Rick Genter, K4BKX — ASCM: Buddy Smith, W4YE. SEC: N4NK. STM: W4SQQ. Chief OO: W4HU. Chief OVS: WA4PGI.

Net	kHz	Time (PM)	Sess	QTC	QNI	Mgr.
VNTN	3907	noon	30	213	344	N4LE
VSBN	3947	6/10:15	60	708	1416	W4JK
VSN	3660	6:30	30	144	302	WA4YIU
VN	3680	7/10	59	478	692	WB4FLT

Word just received is that WARC is over and ham radio made significant gains; no loses. Vic Clark, W4KFC, was there working hard for ham radio world-wide. Another Virginian, N4FK was a USA delegate. ASCM, W4YE, has taken over the Official Bulletin Station program. If your repeater doesn't have an OBS, contact him. Many of the other groups already have. Don't be left out! WA4LJI has a new Yaesu YO-100 monitor scope. His Rockbridge ARES group is conducting license classes instead of drills at present. WA4YIU is now mobile 80-10 with a new Atlas 210. WB4UHC is running liaison between 4RN and SAN for WA4CCK. KI4W is our newest OO. WA4QWC is the net secy. for the SVEN. W4JUJ is back on the air following a hospital stay. KB4QD has a new TS-120. K4BAV's Alexandria ARES group has new antennas up and is looking for a new repeater. We now have a Virginia Public Service Award which brings a very attractive certificate thanks to the art work of W4JUJ. This year's recipients are N4AZI W4WWQ W4JK WA4CCK WB4PNY and WB4UHC. Four to six will be awarded annually to those who have performed beyond the call of duty i their public service efforts. WA4CCK is the new Olympic Torch Run coordinator. Many familiar VA calls were heard in COWW and SS recently. KØJH wrote his last report in the Persian Gulf. He is presently working as a ship board radio operator after retiring from the Navy. Traffic: KB4N 767, WB4PNY 664, W4JK 573, WA4CCK 458, K4KNP 336, WA4LJI 290, W4SQQ 280, N4NK 270, K8LGA 233, WB4FLT 205, K4BKX 204, W4UQ 182, WA4STO 181, K4AXF 162, N4IF 136, K4GR 120, W3BBN 109, W3BBQ 109, N4LE 108, K4JM 99, WA4YIU 96, KB4OG 83, N4AZI 82, W4NWM 63, WB4SHK 63, AA4CK 59, WD4POZ 53, WD4FTK 50, K4EJ 47, AK4L 44, WD4NEI 43, W4OKN 40, WB4UHC 40, N4FM 38, W4CEU 37, N4YO 37, KA4ETG 32, N9ASX 30, N4BJX 28, KI4W 27, WA4QWC 26, W4SUS 25, W4YVG 25, W4TZC 22, WD4CNG 21, WB4ZWT 21, WD4DUU 20, WA4FDV 20, W4JUJ 20, KB4OF 20, K4HBE 19, WB4ZNB 19, WA4NTP 18, K4DHB 15, WD4EUV 15, KA4GIO 15, WB4KIT 13, WB4OQZ 12, KA4EWG 11, WB4FMD 11, WB4FNW 11, K4VWK 10, KB4OB 9, N4DW 8, KØJH 8, W4YE 8, WB4NEE 7, KJ4J 7, WA4YJF 7, W4KX 6, W4KXE 6, WB4MAE 6, WA4ONR 6, W4PVA 6, W4WWQ 6, WB4ZWT 6, K4ITV 5, N3RC 5, WA4ISA 4, WB4LAB 4, KØLB 4, WB4ODZ 4, WA1VRL 4, WA4FGJ 3, N4BHI 2, WA4JUO 2, KB4QD 2, WA4WOG 2, W4DM 1, WD4KUK 1, N4OT 1.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — SEC: K8QEW. NMs: K8MHR WD8JYM WB8AKQ. STM: WA8WPW. Liaison stations are badly needed for DBRN at 2130Z daily on 3940. If available, contact K8MHR. KARC assisted the Red Cross with their annual Blood Drive again in Dec. This activity was spearheaded by WD8OZT. New ECs: WB8YJJ, Nicholas Co; WD8RNR, Wayne Co.; WD8SEN, Putnam Co. WD8EAV has been appointed OBS. UHF — VHF Repeater Advisory Committee has been formed as an adjunct of the WV St. Amateur Radio Council. Chairman is K8LG. Question of the Month — How can you have a circus if all the clowns check out?

Net	Freq.	Time(Z)	Ck-In	Ttc	Sess.
Hillbilly	14290 Su	1700	189	64	4
Phone	3990 Dy	2200	982	144	30
Midday	3990 Dy	1600	274	42	28
CW	3567 Dy	2300	210	95	30
Bk. Diamond 2M	2-m		25	12	4

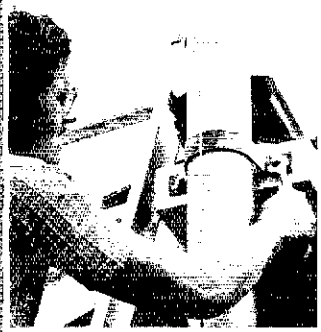
Traffic: WA8WPW 534, WB8AKQ 260, WD8BNR 108, W8HZA 56, W8JWX 49, WD8EAV 43, K8MHR 40, WD8PQG 35, WD8DHC 29, KA8ETV 26, WD8LDY 25, N8AJC 23, WD8JYM 16, W8CKX 15, K8QEW 14, W8YP 12, W8CNF 11, WA8LZF 11, K8KT 10, WD8JGS 9, WB8UDY 4.

ROCKY MOUNTAIN DIVISION

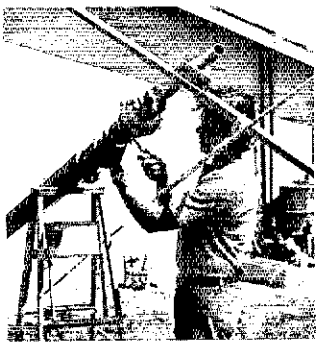
COLORADO: SCM, Robert W. Poirier, KØDJ — SEC: WØGOW. STM: WBØMCL. NMs: ADØA WDØAIT KØCNV WØHE WØHXB WBØZQG. Recent upgrades from the Clement ARC classes are WDØENW WBØVNS KAØFPJ and

New, Stronger Wilson Towers

Hinged Base Plate - Concrete Pad, Heavy Duty Winch

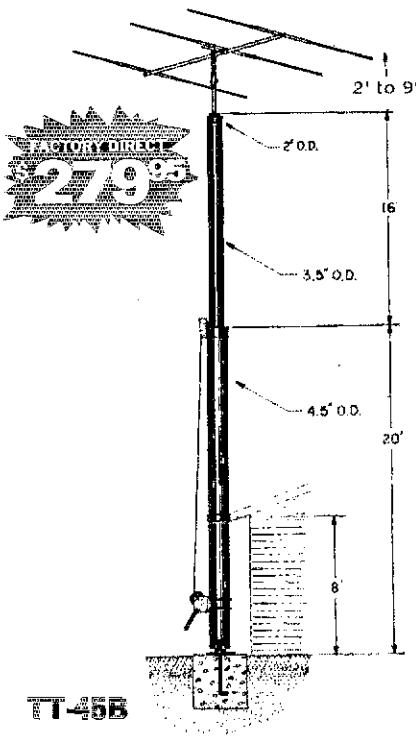


Mounting the House Bracket



The Hinged Base Plate allows tower to be tilted over for access to antenna and rotor from the ground.

FACTORY DIRECT $279.95



TT-45B

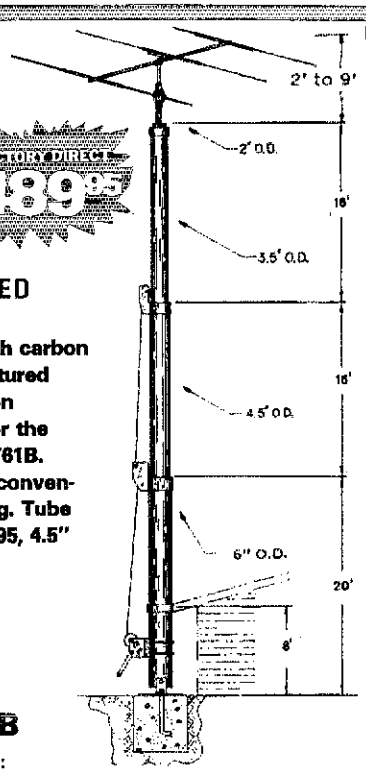
FEATURES:

- Maximum Height 45' (will handle 17 sq. ft. @ 38 ft. or 10 sq. ft.@45 ft)@50 mph
- 1200 lb. winch
- Totally freestanding with proper base
- Total Weight, 243 lbs.

The TT-45B 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.)

FACTORY DIRECT $489.95



NEW IMPROVED FEATURE

A new high strength carbon steel tube manufactured especially for Wilson Systems, is used for the new TT45B and MT61B. 25% stronger than conventional pipe or tubing. Tube size: 3.5" O.D.@.095, 4.5" & 6" O.D.@.120.

MT-61B

FEATURES:

- Is freestanding with use of proper base
- Maximum Height 61' (will handle 17 sq. ft.@ 53 ft. or 10 sq. ft.@61 ft.)@50 mph
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight, 400 lbs.

Recommended base accessory: RB-61B , FB-61B

The MT-61B is our largest and tallest freestanding tower. By using the RB-61B rotating base fixture the MT-61B 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

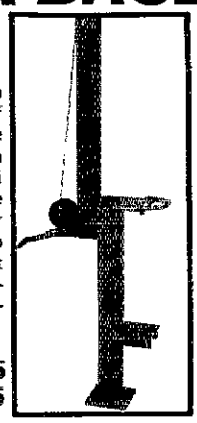
All towers use high strength heavy galvanized steel tubing that conforms to ASTM specifications for years of maintenance-free service. The large diameters provide unexcelled strength. All welding is performed with state-of-the-art equipment. Top sections are 2" O.D. for proper antenna/rotor mounting. 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. Prices and specifications subject to change without notice.

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.

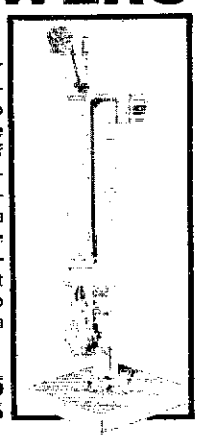
FB-45B . . . $114.95
FB-61B . . . 169.95

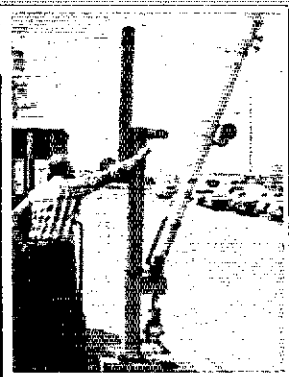


ROTATING BASE

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.

RB-45B . . . $179.95
RB-61B . . . 249.95





Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

ORDER FACTORY DIRECT 1-800-634-6898

WILSON SYSTEMS, INC.

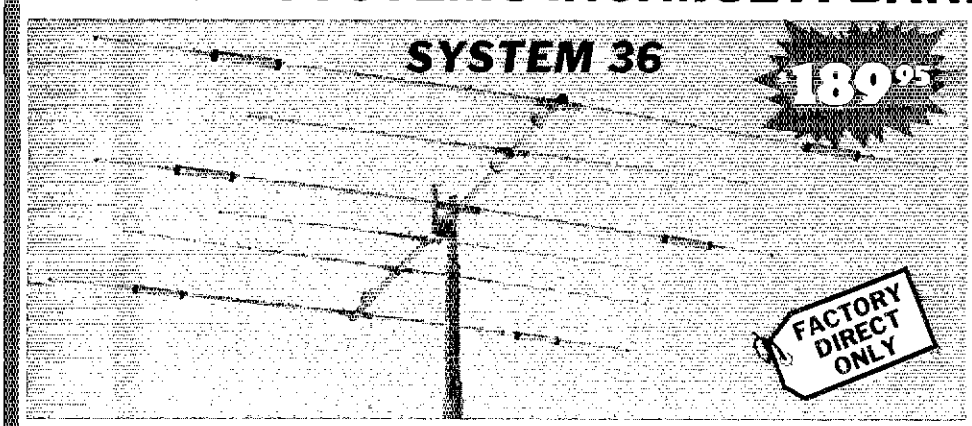
4286 S. Polaris Ave., Las Vegas, Nevada 89103

NEW
ST64 - 64 ft. Stacking Tower
ST77 - 77 ft. Stacking Tower
CALL FOR INFORMATION

WILSON SYSTEMS INC. MULTI-BAND ANTENNAS

SYSTEM 36

$189.95



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.

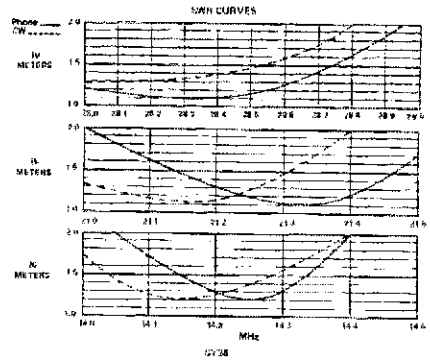
SPECIFICATIONS

Band MHz 14-21-28
Maximum power input . Legal Limit

VSWR @ resonance . . . 1.3:1
Impedance . . . . . 50 ohm

Boom (O.D. x Length) . . 2" x 24' 2½"
No. of Elements. 6
Longest Element . . . . . 28' 2½"
Turning Radius . . . . . 18'6"
Maximum mast diameter . 2"
Surface area . . . . . 8.6 sq. ft.

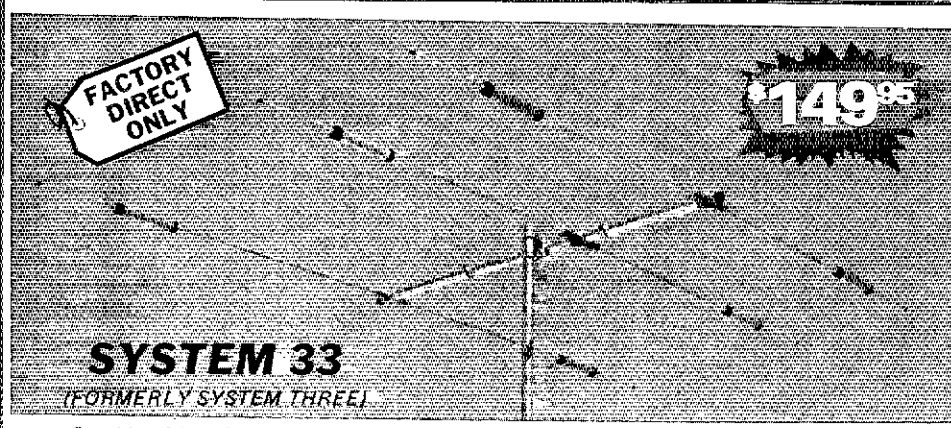
Matching Method. . . . . Beta
Wind Loading @ 80 mph . . . 215 lbs.
Maximum wind survival . . . 100 mph
Feed method . . . . . Coaxial Balun (supplied)
Assembled weight (approx) . 53 lbs.
Shipping weight (approx) . . 62 lbs.



SYSTEM 33

(FORMERLY SYSTEM THREE)

$149.95



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 lightweight antenna makes installation of the "SYSTEM 33" quick and simple.

SPECIFICATIONS

Band MHz 14-21-28
Maximum power input . Legal Limit

VSWR at resonance . . . 1.3:1
Impedance . . . . . 50 ohms

Boom (O.D. x length) . . 2" x 14'4"
No. of elements 3
Longest element. . . . . 27'4"
Turning radius. . . . . 15'9"
Maximum mast diameter . 2" O.D.
Surface area . . . . . 5.7 sq. ft.

Wind loading at 80 mph . . . . 114 lbs
Assembled weight (approx) . . 27 lbs.
Shipping weight (approx) . . 42 lbs.
Direct 52 ohm feed – no balun required
Maximum wind survival . . . . 100 mph

$49.95

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

- 19' total height
- Self supporting – no guys required
- Weight – 14 lbs.
- Input impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter 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

$10.95

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.

WSI WILSON SYSTEMS, INC.

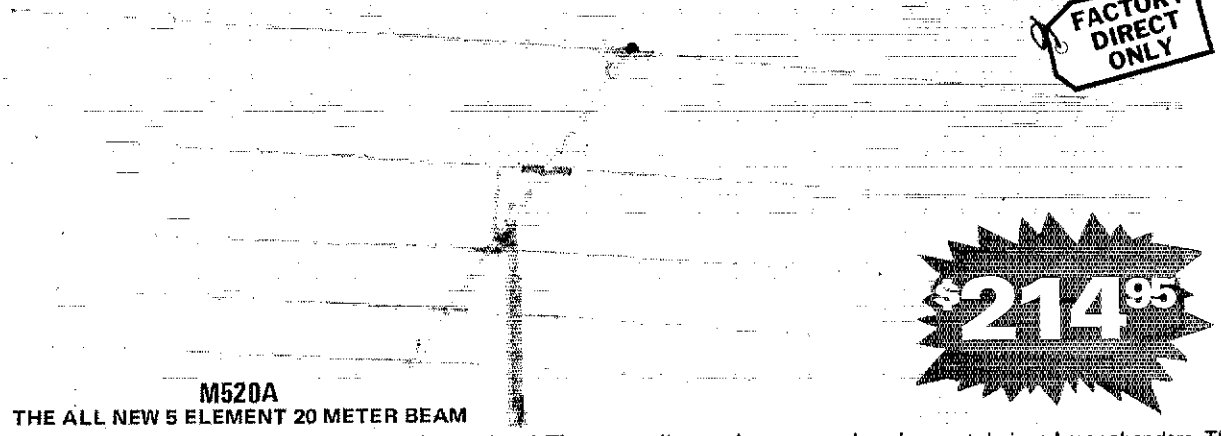
4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice

ORDER FACTORY DIRECT 1-800-634-6898

WILSON MONO-BAND BEAMS

FACTORY DIRECT ONLY

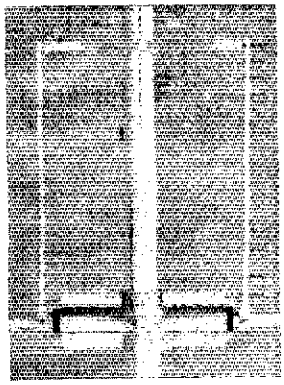


$214.95

M520A
THE ALL NEW 5 ELEMENT 20 METER BEAM

At last, the antennas that you have been waiting for are here! The top quality, optimum spaced, and newest designed monobanders. The Wilson System's 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 unnecessary weak point to the antenna boom.



Wilson's Beta match offers maximum power transfer.

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 guide-lines 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.

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 for 1.1:1 VSWR	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			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	CALL		400 KHz	1.1:1	50 Ω	Beta	5	25'3"	2"	26'0"	17'6"	4.2	107	2"	41
M415A	15	FACTORY		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

WILSON SYSTEMS, INC. 4786 S. Polaris
Las Vegas, NV 89103 – (702) 739-7401

FACTORY DIRECT ORDER BLANK

Toll-Free Order Number
1-800-634-6898

WILSON SYSTEMS ANTENNAS

Qty	Model	Description	Shipping	Price
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	$149.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	199.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	49.95
	GR-1	Ground Radials for WV-1A	UPS	10.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	214.95
	M-420A	4 Elements on 20 Mtrs.	UPS	149.95
	M-515A	5 Elements on 15 Mtrs.	UPS	129.95
	M-415A	4 Elements on 15 Mtrs.	UPS	84.95
	M-510A	5 Elements on 10 Mtrs.	UPS	84.95
	M-410A	4 Elements on 10 Mtrs.	UPS	69.95
	WM-62A	Mobile Antenna: 5/8 λ on 2, 1/4 λ on 6	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 SPECIAL

AIRCRAFT CABLE:
3/16", 1x19: .10/ft (min. 1000 ft)
1/8", 1x19: .06/ft (min. 1000 ft)
Heavy duty 6" turnbuckles: $1.50 ea. (min. 10)
12" eye bolts, 1/2" stock: .75 ea. (min. 10)
Cable clamps: .25 ea. (min. 50)

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45B	Freestanding 45' Tubular Tower	TRUCK	$279.95
	RB-45B	Rotating Base for TT-45A w/tilt over feature	TRUCK	179.95
	FB-45B	Fixed Base for TT-45A w/tilt over feature	TRUCK	114.95
	MT-61B	Freestanding 61' Tubular Tower	TRUCK	489.95
	RB-61B	Rotating Base for MT-61A w/tilt over feature	TRUCK	249.95
	FB-61B	Fixed Base for MT-61A w/tilt over feature	TRUCK	169.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100 ft. and in 50' multiples.
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Ninety Day Limited Warranty. All Products FOB Las Vegas, Nevada

PRICES EFFECTIVE FEBRUARY 1, 1980

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City _____ State _____ Zip _____

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WDØCNT. Congrats to all. WØGW, who has been doing plenty of traveling of late, back from month long trip in Houston. WDØDNM and WAØKHN active on two-meter cw in Granby. WDØDNM is also new assistant manager for TWN(D). KBØCY's recent projects include a homebrew touchtone pad. OVS, WØYK, reports working into Alaska on six-meters on Nov. 22. One of his contacts stated during the QSO that he worked several JA's and others in the Pacific. With moody conditions on hf, perhaps six is the place to go for DX! W7LYA in Story, WY has been experimenting with methods of predicting earthquakes through the use of Amateur Radio. He needs operators with spare time to do some band monitoring. If interested, contact me or write Box 391, Story, WY., 82842. Net ttc: Columbine: 30 sessions, QNI 1092, QTC 101, informals 150, QNF 1020; CWN: 30 sessions, QNI 238, QTC 191, QNF 1166; Hi-Noon: 29 sessions, QNI 1240, QTC 184, informals 225, QNF 1090. Traffic (Nov) WØWYX 2554, WAØHJZ 1137, WBØMTA 413, WBØZQY 306, WØLAE 177, KØDJ 173, WDØDNM 161, WDØDEX 127, WØGO 71, WØMDT 60, WBØYKH 54, WØNFW 48, WØTX 6. (Oct) WØWYX 2333, WBØMTA 506, WDØAIT 292, WAØYNP 94.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs WD5AHH and K5KPS. Southwest Net (SWN) meets daily on 3585 kHz, at 2000 local time and handled 163 msgs with 151 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 195 msgs with 1278 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 89 msgs with 790 checkins. Yucca 2-mtr Net handled 10 msgs with 409 checkins. Sorry to report W5TSC as a SK. K5MAT rpts FB 6 mtr openings to 46 states with his 20W rig. NM Emergency Services Council and the 1550th Air Search & Rescue sponsored a one day Helo Tng, couse at Kirtland AFB. Traffic: W5UH 498, W5DAD 378, KL7HSF 266, N5NG 243, W5JDV 55, WA5MIY 30, W5ENI 27, W5BWV 10.

UTAH: SCM, Royce Henningson, K7QEQ — STM: W7OCK. SEC: WB7FCB. The Beehive Utah Net for the month of Nov. held 30 sess and had a total number of check-ins of 131 and handled 80 pieces of traffic. Net certificates were issued to WB7RCH and N7AVI. N7BKA is a new Tech opr in SLC and it is reported WA7JJL is active on UGN. The Utah Code Net is a cw net for slow-speed operators to build up their speed and learn to handle traffic. If you are interested, check in on 3710 kHz at 0215Z daily. K7VJP got back on the air for the first time in 10 years. Welcome back. Traffic: K7HLR 174, NØAHA 117, WA7MEL 79, WA7JRC 68, W7RO 18, W7OCX 17, W7UTM 11.

WYOMING: SCM, Chester G. Stanwaity, W7SDA — Asst. SCM: K7IKO. SEC: WB7EIN. NMs WB7NHR WA7WFC W7LYA. Congratulations to WB7PLU of Lander, WB7NVS of Sheridan, and WB7QQA of Manderson on upgrading to Advanced. Also to WB7WVO of Manderson to General. Many Cheyenne amateurs helped with communications during the recent snow storm in southeastern WY. Sheridan amateurs also furnished communications for city and county officials when high winds caused power and telephone outages and range fires in Sheridan county. WB7NHR reports WCN held 22 sessions with 683 QNI and 18 QTC. WAØPFJ reports Jackalope net held 26 sessions with 702 QNI. We regret having to report WA7RBW of Casper and KA7FAR of Lander Silent Keys. Traffic: W7LYA 449, W7YWW 236, WA6GYQ 163, K7KSA 98, WA7SGG 18.

SOUTHEASTERN DIVISION

ALABAMA: SCM, William E. Scates, WA4JYU — SEC: W4IBU. STM: WA4JDH. New appointments: EC Butler County, WB4JAX; EC Cleburne Co., KA4CMD. Congratulations to KB4QG on becoming 2nd YL Extra Class in the Alabama Section. The Huntsville club has undertaken a super project. They have started a HARC scholarship fund. As we in Alabama get into the winter months, the Nov. 25 Montgomery tornado reminds us that Feb. and March will bring more of the same. We still need a number of emergency coordinators in about 3/4 of the counties. Let's jump in and help W4IBU put together an EC plan that this section can be proud of. Along this line, the American Red Cross in Birmingham and Montgomery is solidly behind these two clubs. BARC just moved into new quarters that are really nice. Montgomery Red Cross is helping to put together something on that order in the capitol city. Traffic: WA4JDH 1202, N4CCT 393, W4CKS 149, K4EWD 62, K4AZO 58, W4UP 44, WA4ZPZ 31, WA4FYO 28, W4IBU 23, WD4LMJ 23, KB4UI 23, WA4JYU 19, KA4IVO 15, K4UMD 14, WB4EKJ 10, WA4JPK 6, WB4TVY 6.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: K4SWJ. Asst. SEC: WB4HXE. STM: WA3NAZ/4. NMs: WD4ADV (ARES) K4DMK (GCN) W4GH (GA TFC Nets) W4HON (VHF) K4VHC (RTTY) W4WXA (GSN) WB4ZOJ (GTN) WB4ZVX (GSSBN).

Net	Freq.	Time (All EST)	QNI	QTC
GCN	3995	0700 M/S 0800 Su	618	38
GTN	3718	1815 Dy	255	39
GSN	3595	1900 & 2200 Dy	543	302
GSSBN	3975	1830 Dy	1937	226
ARES	3975	1700 Su	141	
GA TFC A*	7243	1200 Dy		
GA TFC B*	3955	1830 Dy		

*Totals are combined: QNI 493, QTC 147. Albany ARC new officers, K4GCR, pres.; WA4HGS, vice pres.; WD4IBT, secy.; WA4BDE, treas.; KB4AJ, WA4BDD WD4ICC KA4KBZ WA4KCL WA4MMK K8UTY/4 WA4VYR K4XA, board. The section has many fine clubs, join and help support these fine organizations. KA4GCQ now General, N4AWZ now KS4Q. With spring just around the corner, it will be Hamfest time once again. Help conserve on gas by inviting others to go with you. WD4ADV & XYL WD4BCO have had recent trips to the hospital. All nets showing good participation. ARES showed winter time improvement. For those clubs who publish a newsletter, your SCM would like to be put on the list. It sure does help in writing this monthly column. Tnx. W4TJS & XYL W4YEK will soon be moving to the country. It has been one of their dreams since retirement. Good DX. Traffic:W4WXA 281, K4AZM 172, WD4ADV 146, WA3NAZ/4 128, W4GH 101, WB4ZOJ 81, N4UZ 64, K4EV 57, WD4LYV 51, W4CZN 50, W4ELO 49, K4JNL 34, W4HON 22, W4AAY 18, W4BIA 18, K4VHC 14, K4WC 14, WA4PUP 7, WA4GPY 6, K4PIK 6, K4HBI 5.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH

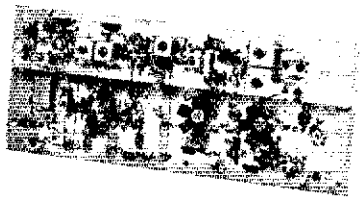
Net	Freq.	Time/Days	QNI	QTC	Mgr.
NFPN	3950 kHz	2330Z Dy	1471	264	WD4PDK
QFN	3651 kHz	0000/ 0300Z Dy	737	785	WD4LUG
AFPN	7272 kHz	1730Z Dy	376	310	W4IRA
QFNS	3715 kHz	0100Z Dy	389	167	WA4PFK

GET ON PHASE THREE FOR MUCH LESS THAN YOU THINK!

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.

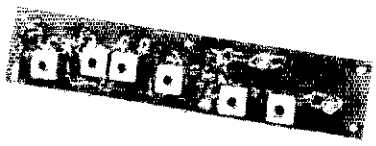
Extra crystal for 432-434 MHz range $5.95
XV4 Wired and tested $149.95

XV2 VHF KIT - ONLY $69.95

2W p.e.p. output with as little as 1mW 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
XV2-5	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-146	50-52

XV2 Wired and tested $109.95

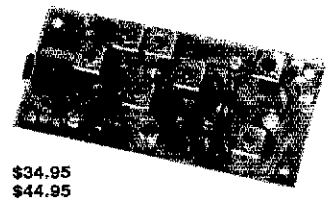


XV28 2M ADAPTER KIT - $24.95

Converts any 2M exciter to provide the 10M signal required to drive above 220 or 435 MHz units.

Easy to Build FET RECEIVING CONVERTERS

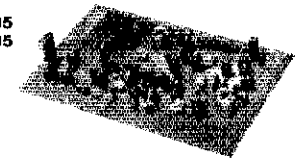
Let you receive OSCAR and other exciting VHF and UHF signals on your present HF or 2M receiver



VHF KIT $34.95
VHF Wired $44.95

MODEL	RF RANGE	OUTPUT RANGE
CA28	28-32 MHz	144-148 MHz
CA50	50-52	28-30
CA50-2	50-54	144-148
CA144	144-146	28-30
CA145	145-147	28-30
or	144-144.4	27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of	26-28
(less xtal)	Aircraft Band	or28-30

Kit less xtal $29.95



UHF KIT $34.95
UHF Wired $44.95

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-5	435-437	28-30
C432-4	432-436	144-148

Kit less xtal $29.95

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 $44.95
T50-150 6-chan, 2M, 2W Kit $44.95
T50-220 6-chan, 220 MHz, 2W Kit $44.95
T450 1-chan, 450 MHz, ¾W Kit $44.95

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.

LPA2-15 6M, 2M, 220; 15 to 20W $59.95
LPA2-30 6M, 2m; 25 to 30W $89.95
LPA2-40 220 MHz; 30 to 40W $119.95
LPA2-45 6M, 2M; 40 to 45W $119.95
LPA4-10 430MHz; 10 to 14W $79.95
LPA4-30 430MHz; 25 to 30W $119.95

See catalog for complete specifications

FAMOUS HAMTRONICS PREAMPS

Let you hear the weak ones too!
Great for OSCAR, SSB, FM, ATV. Over 14,000 in use throughout the world on all types of receivers.

P9 Kit $12.95
P14 Wired $21.95
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 2 ⅝
- Models available to cover any 4MHz band in the range 20 to 230 MHz
- 20 dB gain
- 12 Vdc

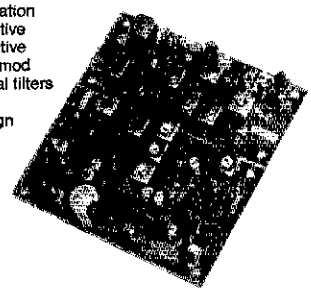
P15 Kit $18.95
P35 Wired $27.95

- Covers any 10 MHz band in UHF range of 380 to 520 MHz
- 20 dB gain
- 2 stages
- 12 Vdc

NEW VHF/UHF FM RCVRS

Offer Unprecedented Range of Selectivity Options

- New generation
- More sensitive
- More selective
- Low cross mod
- Uses crystal filters
- Smaller
- Easy to align



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
WX-25 Weather Tone Alert $24.95

NEW R110 VHF AM RCVR

AM monitor receiver kit similar to R75A, but AM. Available for 10-11 M, 6M, 2M, 220 MHz, and 110-130 MHz aircraft band. $74.95

IT'S EASY TO ORDER!

- Write or phone 716-392-9430
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ATLAS	
RX110 Receiver	$173.00
RX110S Receiver	203.00
PS110H Power Supply	68.00
MM-110 Mobile Mnt.	27.00
215X w/NB	599.00
ALLIANCE	
HD-73 Heavy duty rotor	119.95
ALDA	
103 w/NB, Xtal cal., mike, bracket, PS 115 Power Supply	479.95
CDE	
CDE-44 Rotor	95.00
DENTRON	
GLA-1000 1KW Amp	299.00
MLA-2500B 2KW Amp	839.00
Clipperton L 2KW Amp	549.00
MT-2000A 3 KW Tuner	154.95
MT-3000A 3KW Tuner	329.00
WV-1 VHF Power/SWR Meter	59.95
WP-2A-HF Peak Reading Power/SWR Meter	84.95
PS-20-VOM/SWR/Power Meter	59.95
PS-10-VOM/SWR/Power Meter	41.95
ICOM	
IC-701 w/Power Supply	1199.00
IC-211 2 meter/all mode	699.00
IC-215 2MFM Portable	175.95
IC-202S 2M SSB/CW Port.	272.95
IC-402 430MHZ SSB/CW Port.	361.95
IC-3PS Power Supply	82.95
IC-3PE Power Supply	82.95
IC-EX1 701 Interface	29.95
IC-30L 430 MHZ Amplifier	121.95
IC-EX106 FM Option (551/551D)	117.95
IC-EX107 Vox Option (551)	102.95
IC-EX108 P.B. Tune (551)	51.95
KLM	
15-160 BL 2 M Linear Amp.	229.00
SWAN	
FS-2 Field Strength/SWR Meter	$ 16.50
FS-1 Field Strength Meter	15.50
SWR-3 SWR Meter	15.50
WM-2000A H.F. P.E.P. Meter	83.95
HFM-200 Mobile Power/SWR Meter	41.95
WM-6200 VHF Power/SWR Meter	76.95
WM-2000 HF Meter	59.95
TEN-TEC	
KR-20A Keyer	55.00
YAESU	
FV-901 VFO	339.00
FT-101DC Converter	42.00
YC-500S 500 MHZ Freq. Counter	265.00
YC-500J 500 MHZ Freq. Counter	199.00
YO-101 Scope	259.00
YC-221 Display	99.00
FT-127RA 220 MHZ Mobile	399.00
FT-7B Transceiver	599.00
FT-101Z Transceiver	669.00
CPU-2500R/K 2 Meter mobile	499.00

USED EQUIPMENT

ALLIED	
A-2517 Xcvr. w/PS/Spkr.	$429
ATLAS	
210X (Special Edition) w/N.B.	429
215X w/N.B., DMK	429
200PS Power Supply	69
COLLINS	
75S-3B Rcvr.	649
75-S-3 Rcvr.	479
KWM-2 (Round Emblem) Xcvr.	1099
KWM-2 Xcvr.	599
KWM2-A Xcvr.	795
516F-2 Power Supply	149
LC-1-32S Processor	69
CLEGG	
Zeus 331 6 & 2 meter Xmtr.	89
C.T.G.	
Magnum Six Speech Processor	69
DRAKE	
2B Rcvr.	189
R-4B Rcvr.	349
T-4X Xcvr.	339
TR-6 w/N.B.	589
MS-4 Speaker	19
AC-4 Power Supply	89
7075 Desk Mike	25
2BQ Qmult/spkr.	39
DENTRON	
WP-1A 2KW Power/SWR meter	99
HF-200A Xcvr. w/HF-ACS P.S., Mike	559
80-10 AT Tuner	39
ELECTRONIC RESEARCH CORP.	
SL-55 Audio Filter	49
HAMMARLUND	
HQ-170 Rcvr.	169
HENRY	
100 AL10 w/PS 1220B Supply & Cabinet	249
HEATHKIT	
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SB-634 Station Console	169
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IC-22S Xcvr. w/5/8 wave ant.	219
IC-215 w/BC-20, xtals	159
IC-202S SSB/CW Port.	159
IC-3PA D.C. Supply	49
IC-245 Xcvr.	299
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275 Watt Matchbox	59
275 Watt Matchbox w/SWR Meter	119
KENWOOD	
R-300 Rcvr.	239
TS-600 Xcvr.	549
R-820 Deluxe Rcvr.	759
KLM	
10-160BL Linear Amp.	189
NATIONAL	
NCX-5 Xcvr. w/PS/Spkr.	359
REGENCY	
HR-6 Xcvr.	115
HR-2 Xcvr	99
SBE	
Model 36 Xcvr. w/digital readout, P.S. /Spkr.	429
TEN TEC	
Triton IV Xcvr. w/CW Filter	519
Triton II Xcvr. w/252 P.S.	499
244 Digital Display	139
Argonaut w/210 P.S.	219
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Tempo One Xcvr. w/AC One, P.S.	429
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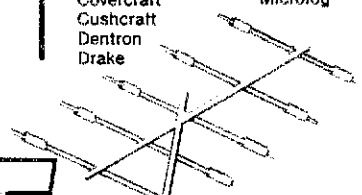

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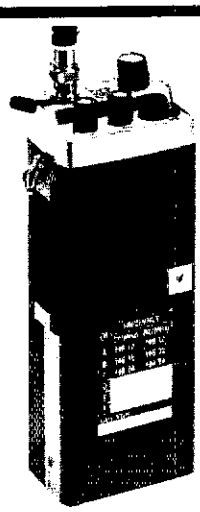

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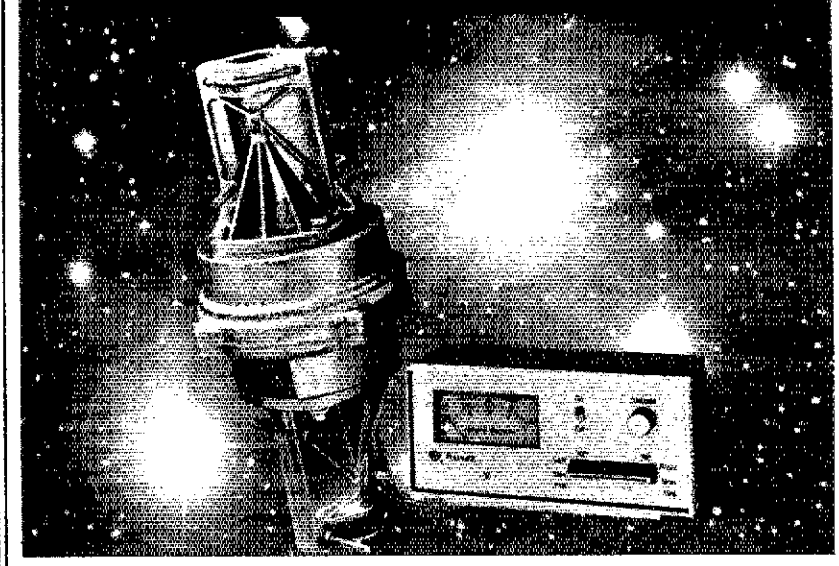

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New appts.: WD4MFJ and WB4PKW OES. KB4B earned SNC on QFN. Escambia County hams provided primary communications during train derailment near Molino. Some 34 hams active, including EC WA2GIN/4 WA4VRY WB4PKW KA4IMH KA4DLC K4SOI Florala Chapter, QCWA, reactivated in Fort Walton, contact W4WNY for details. W4RTN and WA4GHE have a new repeater in Perry on 37/97, with antenna at 600 ft. Gator Radio Club, W4DFU, has new officers: WD4JZM, pres.; N4ASN and WD4ASY. They have a new TH6DXX up 100 ft. WB4RIS trying to get a RTTY converter going. K4VX worked up some zone/country dupe sheets for N. FL DX Assn. members. WA4FCD a Silent Key this month. 1980 NOFARS officers are WD4ETG, pres.; WA4SGF, vice pres.; WD4IGP secy.; WD4KKF, treas.; N4BZH, act. mgr. Club now boasts 263 members! Jax RANGE going to microprocessor control for 16/76 and 28/88 repeaters. WA4GNI now prexy of U. of Central Fla. AHC; club just affiliated with ARRL. Orlando ARC and CFRA discussing possible merger. Over in Daytona Beach, DBARA and DBRA have already voted to merge. DB has a new slow speed cw net, meeting at 0130Z on 21.130 kHz. WA4CRI is NM, KB4T back on NTS nets with new 80/10m antenna system; also passed 1st phone exam. Traffic: (Nov) WD4HIF 747, AA4FG 627, WD4IIO 436, N4WA 264, WD4HXS 255, N4BBY 251, WD4DNC 213, WA4CRI 211, N4PL 173, WB4WOO 137, WD4LUG 133, N4BZH 132, WB4TZH 124, WD4NYY 104, W4JL 102, WA4EYU 96, WB4DTS 91, K4BZS 80, KF4U 77, N4EC 71, WD4PGS 68, W4KIX 61, WD4PDK 59, WB4ADL 54, W4MGO 51, WB4RIS 50, W4RH 49, K4RNS 47, W4LDM 41, WB4FJY 39, W4MVG 22, KB4T 11. (Oct) KB4B 109, WA2GIN/4 102, WD4ETG 53, W4LDM 50, KB4T 15.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. New appointments: WD4PGG, EC Osceola County; KA4FZI and KA4GDV OTS; KR4X, EC Hillsborough County effective Dec. 1st. The Clearwater Convention was well attended with a fine round of banquets and meetings. Significant was the weather meeting with Fred Crosby of NOAA Weather Center, Ruskin FL, making a pitch for Radio Amateur cooperation in reporting weather phenomena. Accordingly, we are starting an amateur weather net Thursday evenings at 8 P.M. on the SPARC repeater 147.66/147.06. All Radio Amateurs within range and interested in cooperating with the Weather Bureau are invited to check in. This is something we have negotiated and talked about for over 2 years, and we haven't been able to get anything started. The weather center has not been too eager to do anything in the past, so let's see how this works out. Congrats to WA4WOU and KA4DWG who upgraded to General during the FCC exams at Clearwater Convention. We are sorry to hear FCC has stopped giving exams at hamfests again due to budget limitations. We are pleased to hear that WARC-79 treated Amateur Radio well and that we are getting new frequency bands at 10, 18 and 24 MHz. Better get those log periodic antennas now. They are sure to be in short supply when these bands open. We are well-pleased with the performance of our section (and combined-section, Northern and Southern Florida) traffic nets going into the Holiday Season. We are especially pleased with WA4PFK's leadership/management of QFNS and same with W4IRA on AFPN, although his tenure was supposed to be "only temporary" until WA4NBE could get damage from Hurricane David repaired. K5IHH/4 is relieving N4AUO Dec. 1 as manager of SPARC Repeater Net. Thanks for a job well done. Traffic handlers don't forget a new set of ARL message numbers goes into effect on January 1st. Looking for you, at Orlando Hamcation January 5 and 6. In the meantime, best Seasons Greetings. Traffic: (Nov) W3CUL 3384, W4MEE 744, K4TH 564, W3VR 533, K4SCL 524, WA4PFK 459, W4NFK 346, W4GPL 310, KM4G 288, K4ZK 217, WD4COL 214, WB4FVV 214, WB4WYG 213, W4LX 203, K4EUK 181, WA4EIC 153, WB4PIB 153, KA4FZI 117, W4IRA 117, WD4ISN 97, KE4O 89, WB4AID 87, WA4HXU 71, KA4BBA 62, WD4CHO 49, W4AZJ 40, W4WYH 36, KB4OW 35, WB4FVN 31, WA4UOQ 26, W4SMK 25, K8PXM/4 23, N4APE 22, WB4SNX 21, WA4FKE 20, WA4HLV 20, W3HAE/4 17, WR4NJU 16, N4AUO 14, W4TJM 8, WB4ZVD 5, WD4PUV 4, WD4KPG 4, WB4DWU 1, WA4HKP 1. (Oct) WD4EGT 52, W4ROA 13, WD4PUV 10.

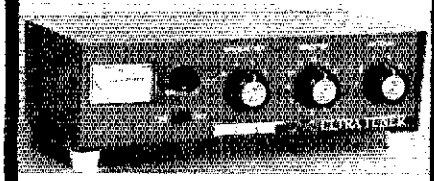
WEST INDES: SCM, Julio Negroni, KP4CV — Novice classes at San Patricio Clubhouse culminated with exams on Nov. 15 and Nov. 30. KP4CV and at times KP4BCZ were in charge. Technician - General classes also ended in November, KP4BCZ instructor. The PR YL Club had a well attended pre-Thanksgiving dinner party Nov. 17. KP4EJI and KP4CL hosted at KP4CL's residence. As usual with YL activities, YLs and OMs in attendance had a very good time. A Novice class was started Nov. 27 at the Engineers and Surveyors Association with KP4JL and KP4CV as instructors. SCM, KP4CV, started the transmission of bulletins and ARRL information thru PR Amateur Radio Club Net on Sun at 10 A.M. Sad note of the month: KP4CB died November 22. ARRL and hamdom lose one of its strongest columns.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AC7D — WB7UZK rpts that the Scottsdale RC provided communications for the Fiesta Bowl Marathon, approximately 4000 runners participated in the 26 mile course and over 40 states were represented. This program was sponsored by the AZ Health Plan, Pnx, and chaired by W7UQO. The Scottsdale repeater, 16/76 was used during this exercise. RC elections results: TRA, WA7RWY, pres.; N7EH, vice pres.; WB7CGQ, secy.; W7UV, treas.; K7OMR and WB7DJT, bd. mem. W7GMR, one of the founders of the TRA, pres. and chmn. of the Eng. Group has been transferred to the Martin Co. in Denver, CO. A banquet was held in his honor, good fortune and we all thank you for your outstanding contributions. K7OMR headed a group of TRA members providing communications for the Muscular Dystrophy Walk-a-thon 13 Jan. The AARC has a new net on 147.87/27, 7 P.M. Thurs. ARCA officers for 80: WB7TJV, chmn.; WB7DGP, vice chmn.; K7OMR, secy.; WA7JEI, treas. Flagstaff Jr. High has fourteen students in their radio course. A special tribute to W7YS who is beginning his fourth year of working with these youngsters. He is also club trustee for WB7OWW, FJHS. ARCA sponsored hamfest will be held at the Oasis Park, Mesa, AZ on Mar 9th in lieu of S. MTN Park, Phnx. Net ltr: SWN QNI 151, QTC 163; A-10, QNI 964, QTC 183; Cactus, QNI 1107, QTC 147. Traffic: W7EP 250, K7MC 165, W7LVB 163, WA7KGE 84, K7NTG 74, K7UXB 64, K7NMQ 49, WB7NJY 31, AC7D 23, WA7WEB 8, K7JKM 7, WA7NXL 7, WB7VON 6, K7ROH 6, N7EH 5.

LOS ANGELES: SCM, Perry Masterson, KD6C — The month of November seems to have been a good traffic

SST T-4
ULTRA TUNER DELUXE



ULTRA TUNER DELUXE Matches any antenna — coax fed or random wire on all bands (160-10 meters). Tune out the SWR on your antenna for more efficient operation of any rig. Home, mobile, portable—only 4" x 2½" x 4¼". • **300 watt RF output** capability • **SWR meter** with 2-color scale • **Antenna Switch** selects between two coax fed antennas, random wire, or tuner bypass • **Pi-network** design.

only $64.95 • **Attractive** black

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New

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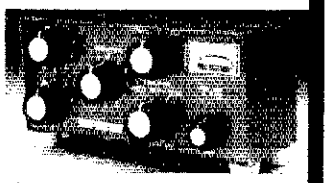

Most versatile antenna tuner available. Any antenna — coax fed or random wire (160-10m.). Front panel function switch selects between two circuits — a Pi or L network — or tuner bypass. Front panel antenna switch. Relative output meter. 200w output — will work with virtually any transceiver. 6⅛" X 3" X 3". Attractive bronze finished enclosure.

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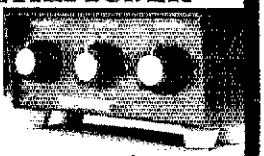

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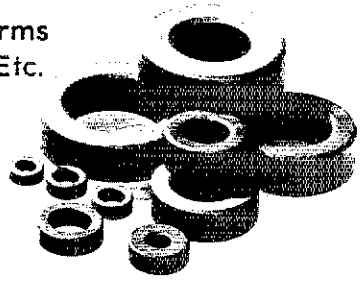

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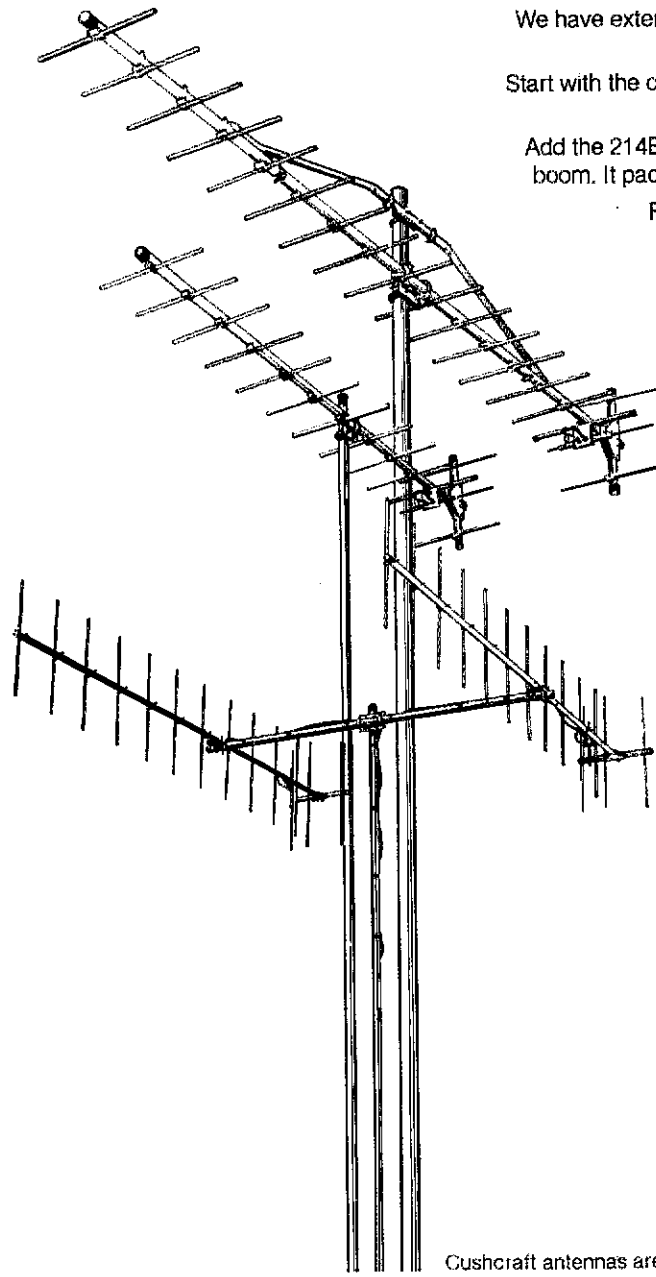

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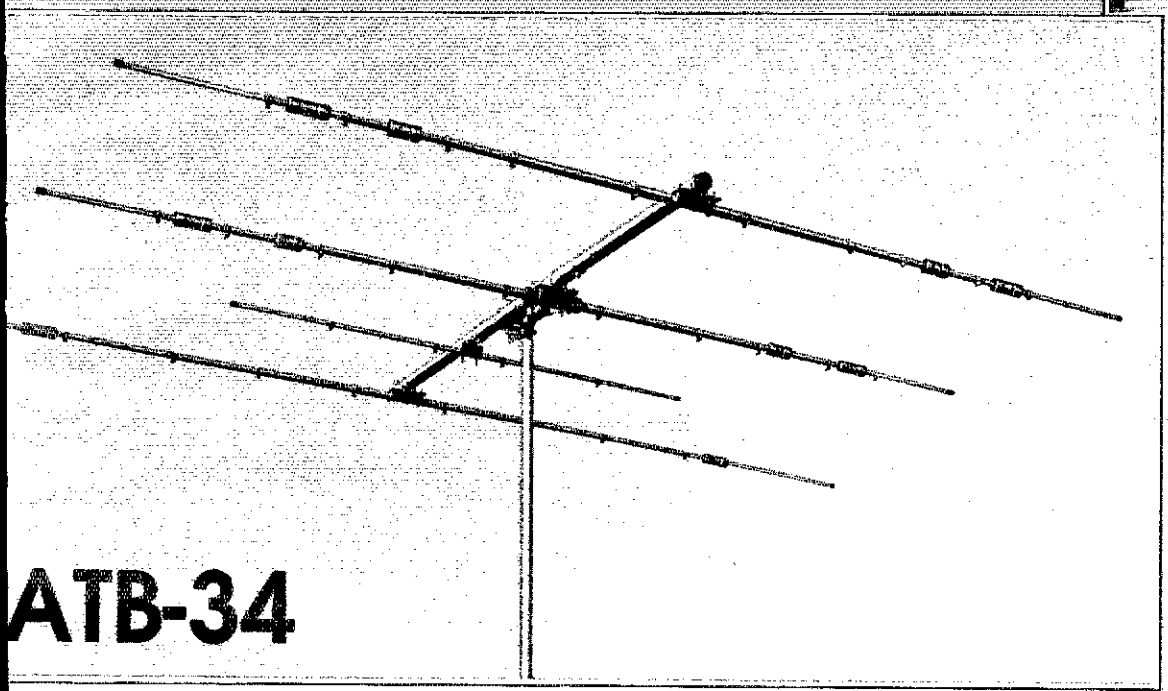

ATB-34

Punch through the pile-ups with an ATB-34, the only three band beam to give you real full size performance. We invite a full comparison and ask you to check ATB-34 element lengths, check the trap design and construction. Check the spacing and the specially developed balun. All of these features add up to the no compromise performance that you expect from Cushcraft.

SPECIFICATIONS

Gain	*
F/B Ratio Avg.	*
3dB Beam Width	62°
Nominal Impedance	50 ohms
Power Handling	2000 Watts PEP
Boom Length	18'
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-9 catalog.

ATV-5

Cushcraft vertical antennas are designed to meet the exacting demands of your amateur radio station. They give top performance in easy to use packages. They can be installed at ground level or roof top.

Durability is guaranteed with double wall seamless aluminum base sections and fiberglass high Q traps. If you are interested in local contacts or long path DX communications, a Cushcraft vertical antenna is your best choice.

ATV-3	ATV-4	ATV-5
10-15-20 Meters	10-15-20-40 Meters	10-15-20-40-80 Meters
Height 13'7" (4.2m.)*	Height 19'2" (5.9m.)*	Height 24'9" (7.4m.)*

ALL MODELS

Power Handling 2000 Watts, Nominal Impedance 50 ohms, Maximum Mast Size 1¾" O.D. Termination: accepts PL-259

*Nominal height when set for phone operation

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month for the section. Except for a few QO reports, the only reports were from the traffic people. The section has a new SEC. He is WB6FAK and he can be reached on telephone 213-956-3132. He has some good ideas to improve the ARES for the Los Angeles Section. Please give him your cooperation when called or better still, call or drop him a card and ask what you can do. I received approximately 90 CD 98 cards from the members as a result of the Directors Letter. For those of you who don't recall, a CD 98 is a registration form for the Amateur Radio Emergency Service. It is my and WB6FAK's intention that each and every card will be acknowledged. It will take some time to get 90 plus cards out, but those of you who registered your station will get a reply. As most of you are aware, the amateur community has not been to well organized for emergencies. With all of your cooperation and participation, we will try to have a ARES second to none. Several communication official appointments have been cancelled this past month due to no reported activity. Activity must be reported at least every two months. If you are one who has missed in this detail, your appointment may have been cancelled. If you miss the CD bulletin, you will know you are no longer an appointee. Another way of knowing is drop me a card or call. Cancelled appointees must re-quality for a new appointment if desired. Traffic: W6IHN 134, WA6LVO 116, KB6FC 110, N6PZ 90, K6OWA 79, KB6OT 76, WB6YID 54, WB5FKU 42, W6RRO 30, W6BWG 27, WA6OCM 12, K6CL 9, N6NQ 4, W6NKE 2.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STMs: N6GW. SEC: W6INI. Asst SEC: N6RD. ECs by District: WB6HFE (Northern), W6OGC (Eastern), W6INI (Central), WD6CSS (Southern), W6JHG (Imperial). Unusual weather conditions kept ARES members on standby for Red Flag Alerts into December, well beyond the "normal" fire season. New EC for Imperial County is W6JHG. Club officers for 1980: Palomar ARC: WB6ZJZ, pres.; WA6HPP, vice pres.; WA6ZKC, secy.; K6SLA, treas. North Shores ARC: WB6OXM, pres.; WA6LZA, vice pres.; WA6EOO, secy.; W6JMA, treas. Imperial Valley ARA: WD6GUL, pres.; WA6ATIP, vice pres.; WA6MIW, secy.; WB6RMG, treas. WA6CQE is working for 5BWAS on cw. W6HUJ active on SCN and RN6. Amateur Radio Swap Meet first Sat. each month at Santee Drive-in Theatre, from 0700 to 1200. Palomar ARC sponsors T-hunts at 1030 on 2nd and 4th Sundays, starting at County Center on Melrose Drive, Vista. Poway ARC's new Motorola repeater has temporary location near Lake Dixon, Escondido. Freq 147.225/825. S D Repeater Assn is developing plans for its own repeater site on Mt Otay. Bureau of Land Management appears favorable to the application. Traffic: (Nov) WB6PVH 513, WA6AMK 487, N6AWC 156, K6HAP 140, W6HUJ 122, N6GW 114, WB6MLB 110, N6AT 85, WB6FTY 50, WA6UFY 30, WA6SKU 16, WA6CQE 14. (Oct) WB7SUA 46.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — NMs: N6WP W6KPS K6DZT. The Section Emergency Coordinator slot is vacant. Simi Settlers ARC are very active with WB6QNX and WD6EZY coordinating "Operating Santa Claus" this year; providing comms for the Sinaloa Jr Hi School Run with KA6BQT WD6BZN WA6DUH WB6QKF WB6QNX and WD6EVT helping out and a talk on disaster traffic handling by WB6QKF and KB6FR/3. Santa Barbara club enjoyed a talk on solar power by WA6GDC and W6THR. Sulphur Mountain Repeater Assn. officers for 1980 are: K1HCG, pres.; WB6BPL, vice pres.; WA6UEO, secy.; N6MA, treas. WD6BCN and WA6IJZ bd reps. WA6KTZ active promoting DX and contesting for the Santa Barbara club. W6FLL has been NCS'ing for the Gold Coast Emergency Net on Mon. K6DZT received his WAZ award, is on 160 meters now, and is working DX on 6 meters. W6ZRR sent 134 bulletins on fm and RTTY. N6TR set a section record in sweepstakes on phone with over 255K. He had 175K on cw. WA6MSL WA6ATE and KA6EKP now Advanced. KA6APB now N6CBI, and KA6IJR new Novice. W6BQG is now a Silent Key. Reports the Central Coast ARC bulletin. PSHR: N6WP 81, K6YD 68, N6YH 48, K6DZT 13, N6MA 12, N6TR 4. Traffic: N6WP 319, N6YH 110, K6YD 80, WB6TRP 54, N6MA 38, K6DZT 8, N6TR 6.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Asst SCM: AE5C. SEC: N5WB. STM: W5VMP. NMs AA5J AE5I. The Deep East Texas ARC is hosting the Texas VHF-FM Society Winter meeting on Feb. 8, 9, & 10, 1980, at the Holiday Inn, Lufkin, TX. Talk-in on .34/.94 and .52. Congrats to new Plano ARK officers W5TUU, vice pres.; WB5LSR, comm.; WD5HDM, secy.; AC5Y, pr. Denton Co. Public Service Net meets each Tuesday at 2100 local on 146.31/.91. Your QNI needed! Attention all Emergency Coordinators, your annual report is due now! This is a manditory report. Send to Joe Blair, N5WB, SEC, 1612 Glenwick, Plano, TX 75075. Congrats to W5HMR who takes over the helm as Texas tfc. net mgr. for 1980. New slow speed cw net "The TSN" meets nightly at 2000 local on 3645. AA5J is net mgr. NCS will answer you at the speed you check-in. Here is a chance to learn tfc handling from real "pros" and build up your code speed at the same time! New officers Dallas ARC: AA5D, pres.; WB5UJU, vice pres.; WB5LHN, secy.; K5JII, treas.; AE5C, dir.; WB5JBP, dir. BPL for Nov.: W5TI, PSHR Nov.: N5AWG WB5JYI WD5EUE WD5IVD AE5I AJ5F AA5J WB5LAT WA5QFD W5VMP W5HMH. Wanted: Emergency Coordinator for San Angelo area; long hours, low pay, excellent benefits! Contact N5WB (address above). Traffic: W5TI 615, WB5OXE 181, WD5EUE 171, AA5J 166, N5BT 136, WA5INJ 119, N5AWG 113, W5VMP 103, WD5IVD 97, AE5I 85, WB5JYI 72, WB5LAT 76, WB5BKM 72, W5HMR 59, WA5QFD 58, K5MC 54, KB5DR 44, WA5EZT 32, W5CTZ 25, K5PC 25, WA5KGZ 24, KA5CRL 18, WD4SIH 18, KA5Q 16, WB5YYK 13, AJ5F 9, WD5GFP 2.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — WA5AFO & WD5IFB new OTS. N5WM latest WAS on 6 meters; congrats. N.E. OK groups getting 'Sky Warn' training. Now is the time to get ready for the spring storm season. Antennas, rigs and 'Sky Warn' training. Get it NOW and be ready. Edmond has ATV repeater on air. Woodward showed off their new EOC at the winter meeting of ORS, FB. 2 leadership reports missing, as I write this. Reports from 4 of 11 OBS; 1 of 3 OO; 2 of 4 OVS. Which one are you? WB5MVR made Extra, been missing him on nets. WA5UBO has new QTH with room for lots of antennas. It is time to register ALL nets and repeaters for the directories. Getting some FB reports from the local nets, and learn of new ones every few days. Would like to get a list prepared of all OK nets registered or not, I would add it to the ht list that I hand out. Grady/Caddo Co. group using 146.52 and doing FB work. Hope that you had a FB Holiday Season. Traffic

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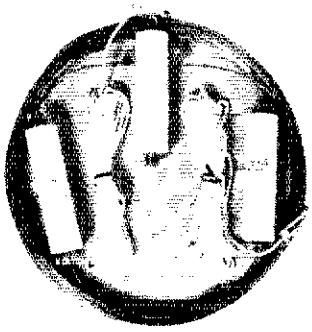

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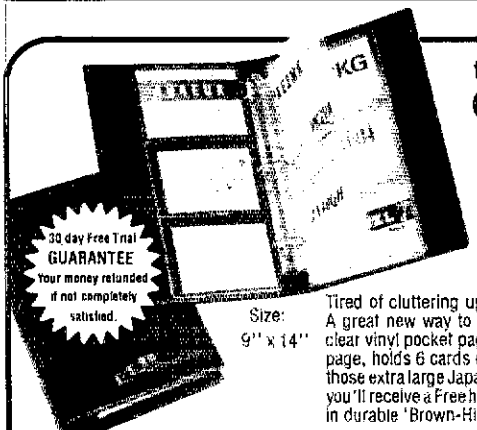

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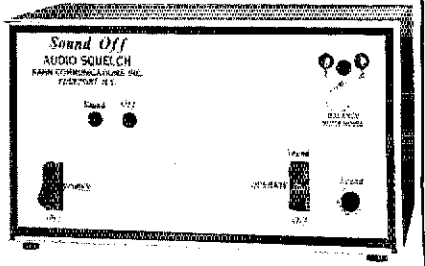

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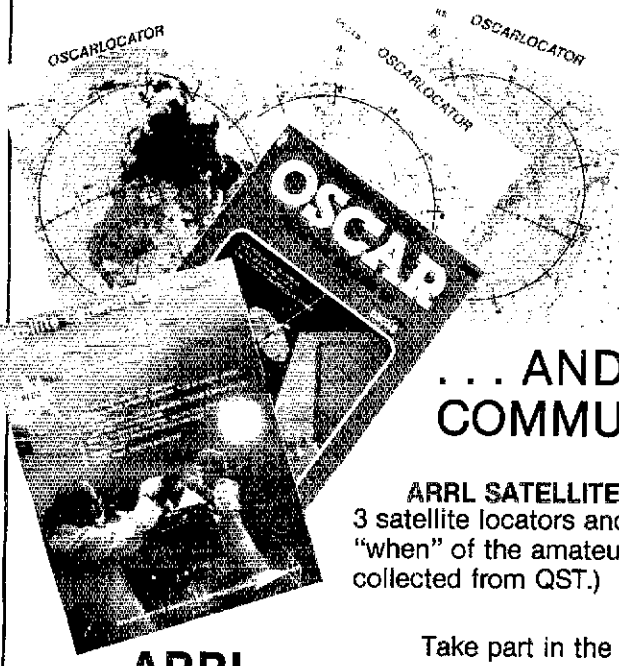

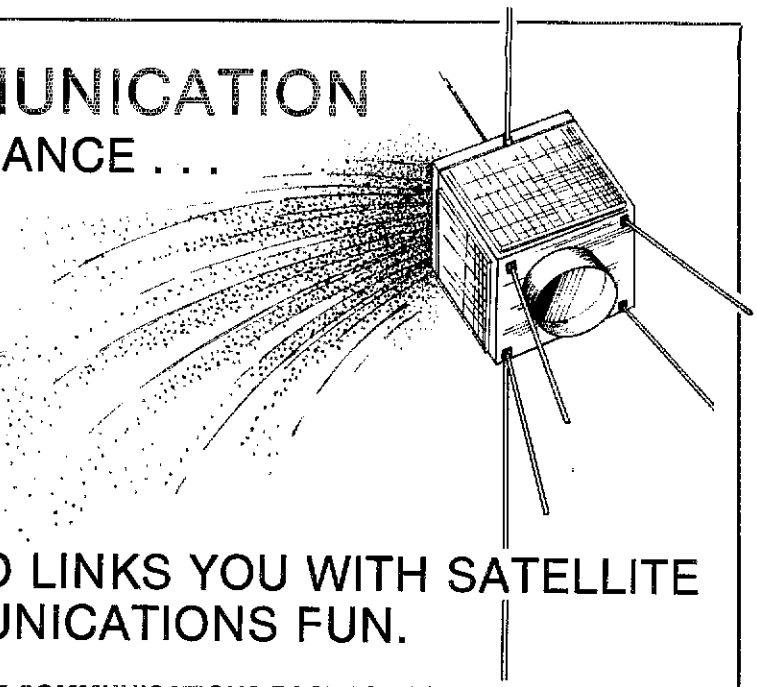

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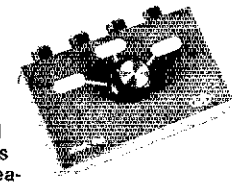

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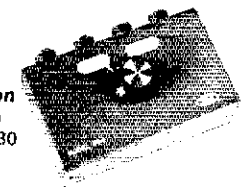

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SOUTHERN TEXAS: SCM, Roger Coday, N5FN — Assistant SCM: N5TC. SEC: AK5N. Net Managers-at large: N5TC, phone. WA5RKU, cw. WA5RKU, one of the mainstays in the NTS has moved from Lufkin, TX to OK. On behalf of the STX Section, here's wishing him the best of luck in future endeavors. STX's loss is OK's gain. N5TC appointed Section Traffic Manager effective Jan. 1. WA5OCP, OVS, worked W6 on 6 mtr. late in Oct. via Es propagation. Says it's the first time in several years for this propagation path in Oct. Also, had a nice write up on 10 GHz 100 watt amplifier he has under construction. TCARS (Harris/Montgomery Counties) holding licensing classes and meetings every Thursday, 7:30 P.M. reports WB6EJF. Alvin Community College ARC has elected new officers: WB5KIV, pres.; WB5PBL, vice pres.; KB5KF, secy/treas. WB5UYV getting active again on 75/80 mtrs. after having antenna troubles. WD5JJS reports Brenham ARC repeater on 147.255/.855 now has battery backup for emergency power. WB5CIT, OO, OVS, has added a Mo. 28 ASR 11Y to his shack. The Deep East Texas ARC is hosting the winter meeting of the Texas VHF-FM Society Feb. 8, 9, 10 in Lufkin. Talk in on 34/94 and 52 simplex. Lots of activites are planned. WB5AHN has his 449.0/444.0 MHz repeater operational from Clute. Houston SHOT Chapter of 10-10 International had its annual "Bash" with usual good barbeque and a nice turnout. WD5AAH reports the Brazosport ARC Novice classes are going well with several candidates having passed code tests. The San Antonio ARC annual Christmas party was a great success with over 200 attending. W5BGE did a fine job coordinating the effort. In attendance were West Gulf Div. Director W5GM and Vice Dir. W5EDZ. K5HZR missing some net time due to catching up on mechnic work on his automobile. The best of New Year wishes to all from N5FN and XYL KA5CRA. Traffic: (Nov.) W5KLV 617, WB5YDD 353, W5SPE 169, N5TC 160, WA5RKU 139, K5HZR 138, K5PE 112, WD5BIP 100, WB5CIT 88, WB5MMI 84, KA5CDX 65, WA5RVT 58, AK5N 50, W5KR 49, K5QEW 34, AK5M 29, N5FN 25, W5SPD 30, K5DG 16, WD5GKH 14, WB5EFJ 8, WB5UYV 6, KB5NX 7, KD5O 6, WD5JJS 3. (Oct.) W5SPE 145, WB5UYV 4. (Sept.) W5KR 8, WB5UYV 6. (Corrected Sept.) WB5YDD 552.

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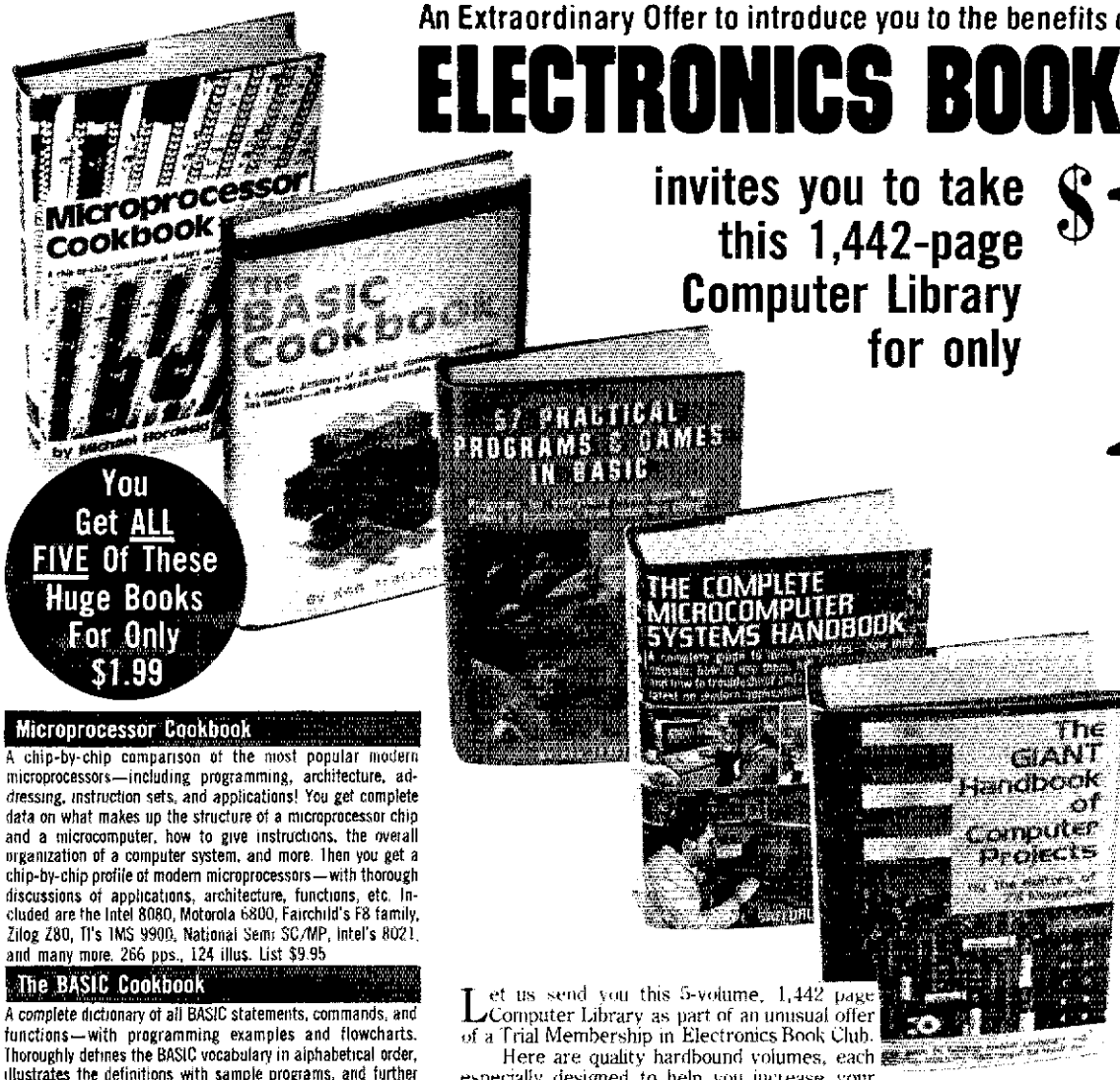

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	200	2.6	8.5
	300	3.3	10.8
	400	3.8	12.5
8214 26¢/ft.	50	1.2	3.9
	100	1.8	5.9
	200	2.6	8.5
	300	3.3	10.8
	400	3.8	12.5
8237 23¢/ft.	100	2.0	6.6
	200	3.0	9.8
	400	4.7	15.4
	900	7.8	25.6
8267 30¢/ft.	100	2.0	6.6
	200	3.0	9.8
	400	4.7	15.4
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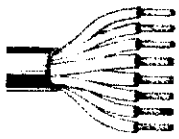

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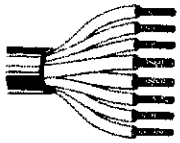

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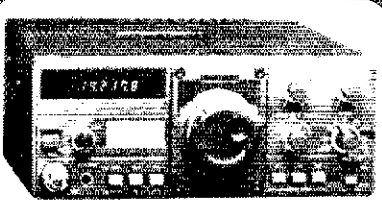

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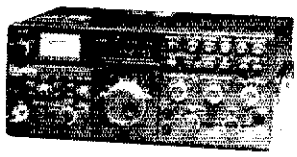

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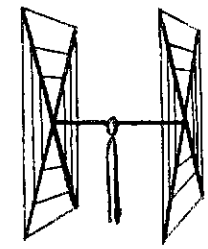

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722 VFO	39
730 Modulator	39

Elmac
AF-67 Transmitter	$ 45
PMR-8 Receiver	79

Genave
GTX22M FM	$165
GTX-200 2M FM	149

Globe/Galaxy
VHF 6+2 Transm	$ 39
Chief Transmitter	39
Galaxy III Xcvr	159
Galaxy V Xcvr	189
Galaxy V Mk II	239
GT-550 Xcvr	279
GT-500A Xcvr	329
AC-400 Supply	79
FM-210 2M FM	95

Gonset
Com II 2M	$ 75
Com II 6M	69
Com IV 2M	129
GC-105 2M	115
G-28 Xcvr	149
G-50 Xcvr	149

Hallicrafters
S-108 Receiver	$ 99
SX-101 Receiver	159
HT-32 Transmitter	179
HT-32B Transmitter	269
SX-99 Receiver	79
SX-115 Receiver	349
HT-37 Transmitter	159
HT-40 Transmitter	49
SX-99 Receiver	99
SX-117 Receiver	189
SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
HT-44 Transmitter	159
SX-111 Receiver	149
SX 122 Receiver	249
S-36 UHF Receiver	125

Hammarlund
HQ-110 A VHF Receiver	$189
HQ-110C Receiver	119
HQ-110AC Receiver	149
HQ-145X Receiver	169
HQ-170C Receiver	159
HQ-180 Receiver	379
HQ-215 Receiver	259
SP-600 Receiver	179
HX-50 Transmitter	169

Heathkit
SB-300 Receiver	$199
SB-301 Receiver	229
HR-10-B Receiver	69
SB-303 Receiver	269
SB-220 Linear Amp	449
SB-102 Trivcvr	379
DX-60B Transmitter	69
HW-32 Transmitter	85
HW-100 Transceiver	249
SB-100 Transceiver	299
SB-401 Transmitter	249
SB-101 Transceiver	349
SB-650 Digital Freq. Display	149
HW-30 Twoer	29
Also Sixer	29
H-10 Monitor	69
VHF-1 Seneca	79
HW-12 Transmitter	75
HP-23 AC Supply	49
HP-23B AC Supply	59
HW-202 2M FM Xcvr	159
SB-620 Spectrum Analyz	120
SB-102 Xcvr	369
SB-610 Scope	95
HA-20 6m Linear	125
SB-634 Console	175
SB-604 Spkr	29.50
SB-644 VFO	129.50
SB-230 Linear	359
SB-104 Transceiver	625

ICOM
IC-21 2M FM Xcvr	$299
IC-230 Demo	369
IC-22A 2M FM Xcvr	185
IC-30A 432 MCFM	269

Johnson
1-KW Matchbox/SWR	$195
Courier Linear	139
Ranger I Transmitter	85
Ranger II Transmitter	139
Valiant I Transmitter	129
Invader 2000 Xmitt	495

Kenwood
T-599 Transmitter	$289
R-599 Receiver	289
TS-520 Tranc	625
QR-666	259
QR-666 Receiver	239
TV 502 Transvertor	179

Knight
T-60 Transmitter	$ 39
r-100 Receiver	59
TR-108 Trancur 2M	79

Lafayette
HA-800 Receiver	$ 89
HP-350 Receiver	149
HE-45 Transceiver	49

Midland
509 H.T.	$149

Millen
92200 Transmatch	$149
90651-A Grid Dipper	95

National
NC-270 Receiver	$119
NC-300 Receiver	129
NCX-5 Transceiver	279
NCX-5MKII Transcvr	299
NC-303 Receiver	199
AC-500 AC Supply	69
NCX-500 Transceiver	199
NCX-3 Transceiver	169
NC-190 Receiver	149
NC-105 Receiver	69

Regency
HR-2B 2M FM	$169
HR-220 FM 220 MC	185
AR-2 2M Amplifier	85
HR-25 2M FM	225
HR-6 Meter FM	189

SBE
SB-34 Transceiver	$249
SB-33 Transceiver	189
SB-144 2M FM	175
SBZ-LP Linear	179

Standard
SRC-146 HT	$149
826 M Trnscvr	195
SRC-144	395
SRC-851T	250

Swan
700-CX Xcvr	$459
260 Cygnet	289
270 Cygnet	329
500 Xcvr	
500 CX Xcvr	389
117-XC AC Supply	95
14X DC Module	39
MK II Linear	475
KK VI 6 Meter	550
250 C 6M Xcvr	349
FM 2X2M Xcvr	169
FM-1210A 2M	249
350 Transceiver	269
350C Xcvr	299
600R Receiver	339
600T Transmitter	399
410 VFO	79

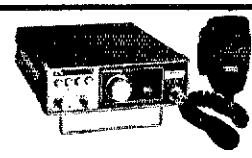
Tempo
Tempo one Xcvr	$299
AC One Supply	79
FMH 2M H.T.	149
CL-220 Trncur 220 MC	179
FMH 2M w/Talkie	149

Ten Tec
PM-3 Trnsur	$ 49
KR-40 Keyer	79
RX-10 Receiver	49
S-30 Signalizer	29
Triton II	479

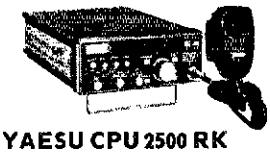
Yaesu
FT-401 Xcvr	$499
FRDX 400SD Rec	325
FT 2 Auto 2M FM	249
FT-101B Xcvr	549
FL-2100B Linear	295
FV-101 VFO	79
101E Xcvr Demo	695

Test Equipment Bargains
Boonton "Q" Meter	$295
Tektronix 5140	249
Tektronix 545A	950
5 3/54A Plug-in wide band preamp	75
Hickok 695 Generator	69
Bendix BC221 Freq Meter	39
Polarad Spectrum Analyzers A84T	1695
Hewlett Packard 400C	75
Precision E-400 Signal Generator	125
Electro Impulse Spectrum Analyzer	395
Dyna/Sciences Model 330 Digital Multimeter	195
Hewlett Packard 4905A Ultra Sonic Detector	550
Hewlett Packard 120A Scope	250
TS-323/UR Frequency Meter	175
Hewlett Packard 4910B Open Fault Locator	650
General Radio 650A	150
Measurements Mod 80	195
Nems Clark 1400	495
Ballantine 300H	175
PACO Scope Mod-S-50	75
Singer FM-10C	3495
Simpson 260 V.O.M.	49.50

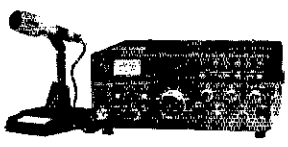
The inventory quantities of the items shown in this list vary. There may be one or several of any item. Some items may be sold by the time you read this ad. It is also likely that we have items in stock that are not listed, as a result of the many trades we make each day. We reserve the right to sell 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.



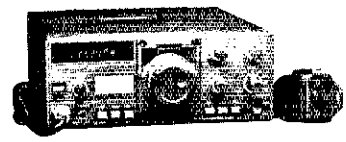
YAESU FT227RA
Regular $399.00
Cash (no trades) $339.15



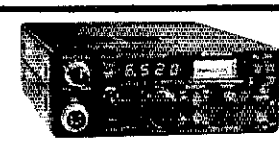
YAESU CPU 2500 RK
(With Keyboard MIC)
Reg. $585.00
CASH (No Trades) $497.25



KENWOOD TS 180S
Retail $1,149.95
w/D.F.C.



KENWOOD TS 120S
Retail $699.00



KENWOOD TR7625
Regular $425.00
Cash (No Trades) $375.00

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HAMTRONICS
DIVISION OF
Trevose Electronics

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TREVOSE, PA. 19047
Telephone:
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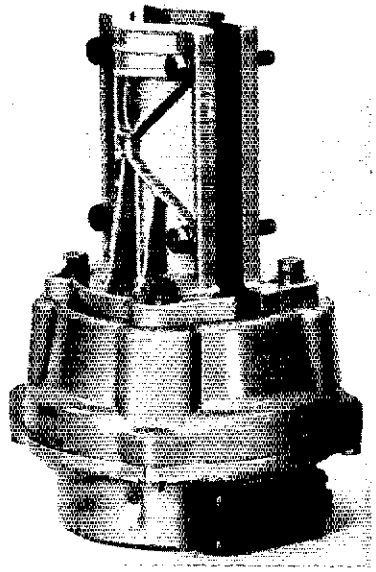
84.95

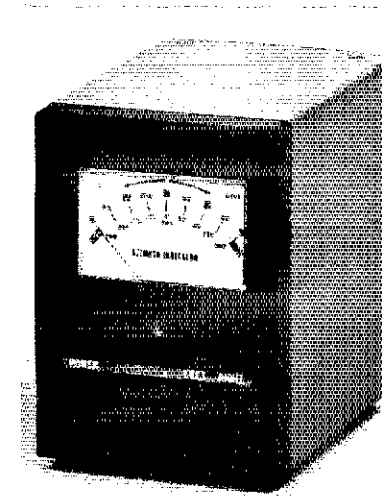


MODEL	KR-2000	KR-600	KR-400
Height Width	13 5/8" 8 7/8"	10 5/8" 7 1/8"	10 5/8" 7 1/8"
Weight	19.8 lbs.	10.1 lbs.	9.9 lbs.
Vertical Load	550 Lbs.	440 lbs.	440 lb.
Wind Load Ft. ^{2}	32 ½	16½	7½
Suggested Retail	$ 399.95	$ 202.95	$ 116.95
TET Price	$ 289.95	$ 139.95	$ 84.95

CONTROLLER FEATURES :
Large commercial quality meter with Solid State regulated supply in the control circuit provides accurate direction indication

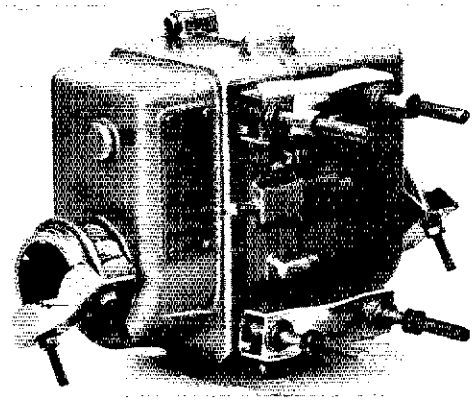
KR-400

EASY-ALIGNING MAST CLAMPS :
Our new mast guage (Patent Pending) eliminates any alignment problems. An antenna mast of 1½" - 2½" in diameter can be accomodated.



SPECIFICALLY DESIGNED FOR OSCAR MOON BOUNCE
180 DEGREES ELEVATION

KR-500
149.95



Call Toll Free
1-800-654-3231

TET U.S.A., INC.

425 Highland Parkway, Norman, Oklahoma 73069
Oklahoma Residents Call (405) 360-6410

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 permited 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. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

CQ and QST 1950-1978 also 73 and Ham Radio issues for sale. Two dollar minimum order. Cost 50 cents each 1976 and later issues - all other 30 cents each including USA shipping. Send s.a.s.e., chronological order and payment to W6LS, 2814 Empire Ave., Burbank, CA. 91504. Available issues and refund sent within one month.

ICOM-701 International Users' Club. Details s.a.s.e. N8RT, Pohorence, 9600 Kickapoo Pass, Streetsboro, OH 44240.

KENWOOD International Users' Club is now operational. S.a.s.e. for details. N8RT, Pohorence, 9600 Kickapoo Pass, Streetsboro, OH 44240.

ROCHESTER Hamfest & NY State ARRL Convention, May 16-17. Add your name to mailing list. Send QSL to Rochester Hamfest, Box 1388, Rochester, NY, 14603. Phone 716-424-1100.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samon, 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 1981, Gallatin TN 37066.

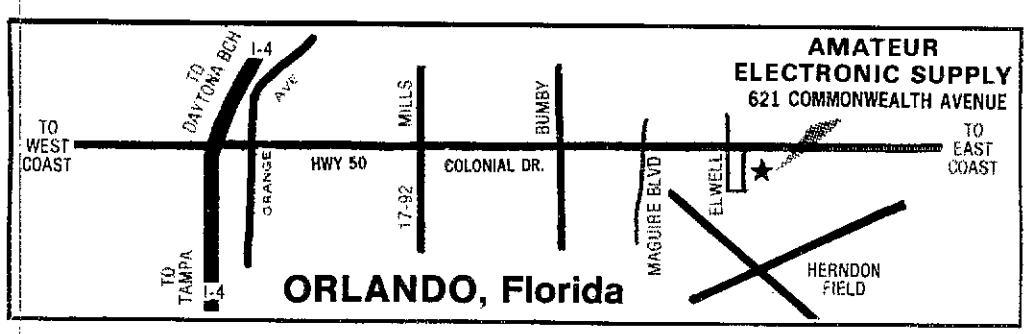
FREE Samples — Stamp appreciated. Samcards, 48 Monte Carlo Dr., Pittsburgh, PA 15239.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps apreciated. 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

QSLs Second to none. Same day service. Samples 50 cents. Include your call for free decal. Ray, K7HLR, Box 331, Clearfield, UT 84015.



Hams -

When touring **FLORIDA** be sure to visit the **AMATEUR ELECTRONIC SUPPLY** Branch Store located at:

621 Commonwealth Ave.

ORLANDO

Phone: (305) 894-3238

Florida in state WATS: 1-800-432-9424

Visit our **Wickliffe, Ohio (Cleveland area)** Branch Store

28940 Euclid Avenue

Phone: (216) 585-7388

Ohio in state WATS: 1-800-362-0290

Conveniently located on the far east side of Cleveland, just 4 blocks east of the Euclid Avenue exit of I-90.

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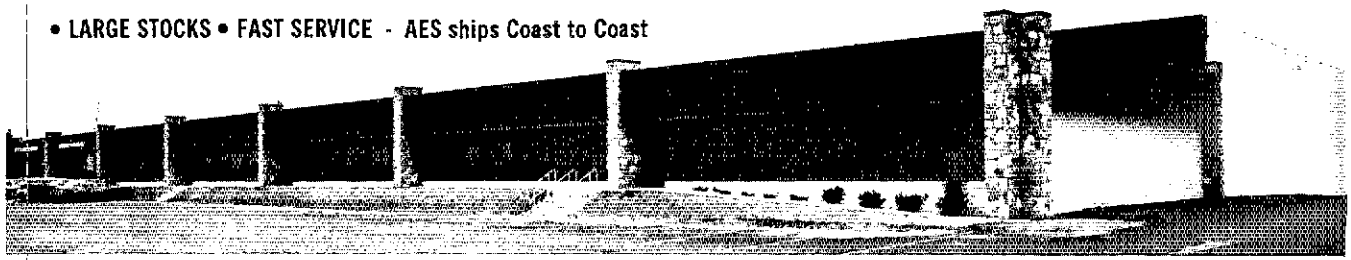

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New AES Branch Store in LAS VEGAS at 1072 Rancho Road; Phone: (702) 647-3114; Outside Nevada WATS: 1-800-634-6227.

In CHICAGO visit our Associate Store - ERICKSON COMMUNICATIONS at 5456 N. Milwaukee Avenue; Phone: (312) 631-5181

Call Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro area) 1-800-242-5195

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QSLS — Variety, value, quality, custom, samples and catalog 45c. Alkanprint, Box 3494, Scottsdale AZ 85257.

QSLs — The KØAAB collection plus many new custom designs. Send No. 10, 28c, s.a.s.e. for free samples and prices. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

CREATIVE QSL Cards — Personal attention. Imaginative new designs. Send 50c. Receive catalog, samples. Wilkins Creative Printing, P. O. Box 787-1, Atascadero, CA 93422.

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QSLs by W7HUL. Samples 50c. 8511 19th Ave. N.W., Seattle, WA 98117.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

NAMETAGS — 1-1/2 × 2-1/2 One line $2.50. Each additional line $0.50. 12 colors. Tag-it Co., Box 2062, Indianapolis, IN 46206.

RUBBER stamps $3.50 includes postage. NJ residents add tax. Clinton Hoar, W2UDO, 32 Cumberland Ave., Verona NJ 07044.

QUALITY QSLs, Samples 35c. Kleinheinz, 1313 Willow, Chippewa Falls, WI 54729.

QSL cards — Eyeball cards — Rubber stamps — Name tags — Emblems — gift items — free catalog — Rusprint, Box 7575, Kansas City, MO 64116.

QSLs & rubber stamps. All top quality merchandise. QSL samples and stamp catalog 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

QSLs — Finest Quality. Many colors and cards to choose from. Samples 50c. Specialty Printing, Box 361, Duquesne, PA 15110.

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QSLs samples and catalog 50c. Ritz Print Shop, 5810 Detroit Ave., Cleveland, OH 44102.

CLUB Call pins: 3 lines, 1-1/4, $1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner 2041 Linden St., Ridgewood NY 11227.

QSLs — Printed from your design — samples 25c. Custom QSLs — 1301 Geil, Des Moines, IA 50315.

CQ Contesters, DX'ers — QSL cards only $14.95 per thousand. Very nice card — why pay more? S.a.s.e. for samples. N5AWD — A1 QSL Cards, 1310A Ave. M., Plano, TX 75074.

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CALL-PLATES, 2 × 8" laminated plastic- red, black or walnut. White characters. $2.50 prepaid. K2KJ, Engravomatic, 37 Zeek Road, Morris Plains, NJ 07950.

RUBBER stamps, 4 lines $3.00 or 4 lines with ARRL emblem $3.50, postpaid, Ø available. Julian, Box 43121, Louisville, KY, 40243.

General

CANADIAN surplus catalogs. Jam packed with goodies. Rush $1. Etcox Electronics, 183G Hymus, Pointe Claire, Quebec H9R 1E9.

FOR SALE: Heath HW101 with power supply, speaker, mic. Excellent condition. $500. (factory aligned). VE4ADZ, 204-728-2876.

WANTED: A licensed Ham in Vancouver, B.C. area, for one to one instruction to achieve license for individual. Will pay top rates. 689-4422 or 261-4471.

BARRY Falcon, 180 Dudley Avenue, apt. 704, Thornhill, Ont., Canada, L3T 4X2, Tel.: 416-881-7273, would like to beg, buy or borrow a service manual and an owners manual for a Hallicrafters S-40A.

WANTED: working or not. Used Drake RV-4C VFO and 34-PNB. Ken Pisichko, VE4ZD, Gillam, Manitoba, Canada.

SPIDERS for boomless quads. Heliarc welded aluminum. Al's Antennas, 1339 South Washington Street, Kennewick, WA 99336.

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SERVICE by W9YKA. Professionnal grade lab, FCC 1st class license. Amateur and industrial ssb-fm equipment. Repairs, calibration, modifications, consultation. Reasonable rates. Write or call Robert J. Orwin, Communications Engineer, P. O. Box 1032, La Grange Park, IL 60525. 312-352-2333.

WANTED: Radios, parts, books, magazines before 1928. W6ME 4178 Chasin Street, Oceanside, CA 92054.

VERY interesting! Next 7 issues $2. Ham Trader Yellow Sheets, Wheaton, IL 60187.

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ARCOS — Amateur Radio Component Service. VHF/UHF high power amplifier kits, parts and accessories. High voltage power supplies. Proven performance in world-wide use. Dowkey, Elmac, Bird, KLM. Sase for catalog. Fred Merry (W2GN) 35 Highland Drive, East Greenbush, NY 12061.

RALPH Hicks, W5BCO, Dealer: Motorola, Atlas and Magnus ssb. P. O. Box 15633, Tulsa, OK 74112. 918-582-1333.

MANUALS for most ham-gear made 1937/1970. Send 25c coin for 16 page "Manual Catalog" postpaid. H. I. Inc., Box Q864, Council Bluffs, IA 51502.

COLLINS repair and alignment, $75. Former Collins engineer, First Radiotelephone, Extra, calibration laboratory, K1MAN 207-495-2215.

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando, FL 32806.

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WANTED: Hallicrafters receivers, transmitters, parts, accessories and manuals for private collection. C. Dachis, WD5EOG, 4500 Russell, Austin, TX 78745.

FREE-Fascinating Electronics Idea Book — hundreds of unusual parts & surplus items unavailable in stores or catalogs anywhere. Bargain prices on everything. Write today for latest issue. ETCO Electronics, Dept. 075, Box 762, Plattsburgh, NY 12901.

MOBILE Ignition Shielding gives more range, no noise. Kits and custom systems. Literature. Estes Engineering. 930 Marine Dr., Port Angeles WA 98362.

TRS-80 programs, DXCC, WAS tracking. Dup-search, log contests. List $1.00 refundable. WA4PYF Box 145; Lithonia, GA 30058.

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QST Collector looking for ARRL 1914 and 1915 List of Member Stations and map, QST March — September 1916. Ed Kalin, K1RT, 75 Tumblebrook Lane, West Hartford, CT 06117. 203-233-9915.

VHF Amplifier kits, ssb-fm, 75 watt, complete kit, see Sept. QST, 1979, pages 11-16, $99.95 post paid. Communication Concepts, Inc. 2648 North Aragon Ave., Kettering, OH 45420.

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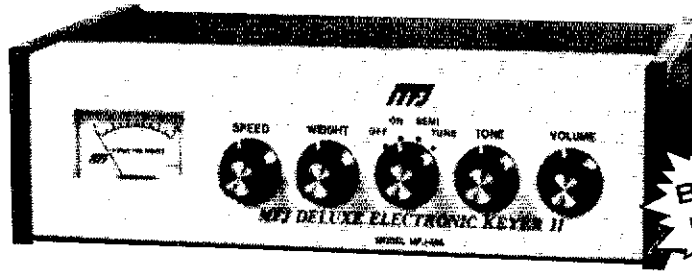

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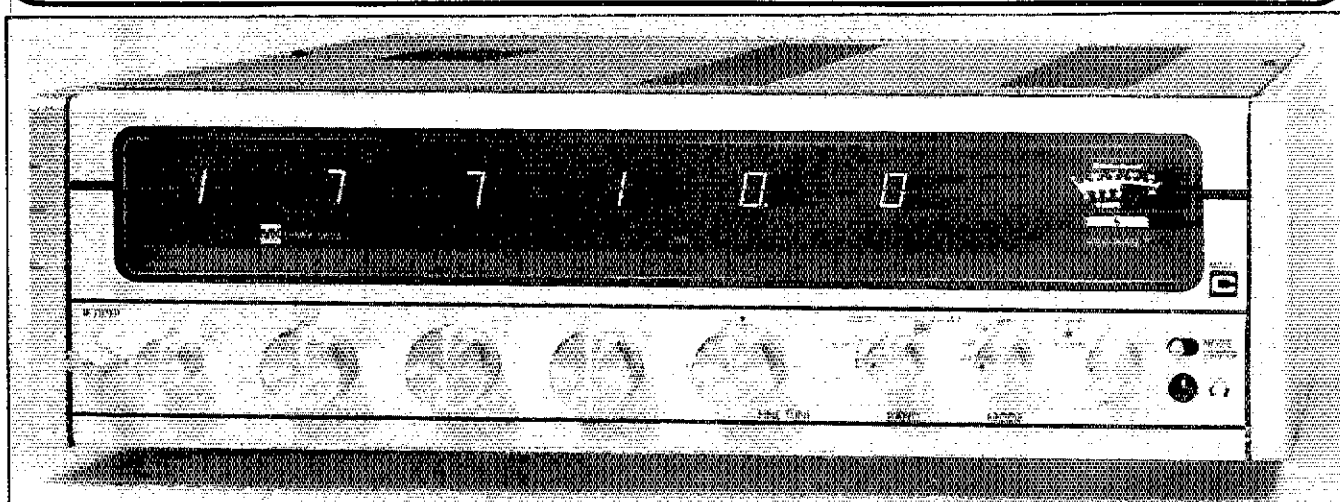

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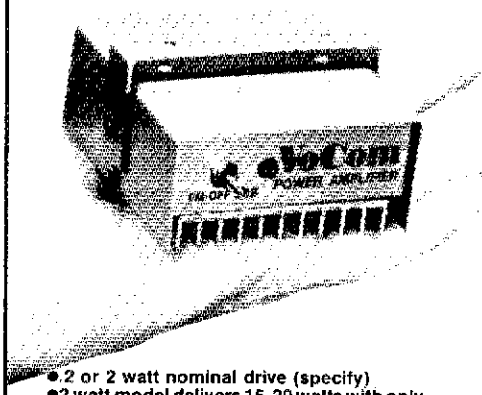

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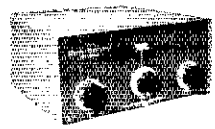

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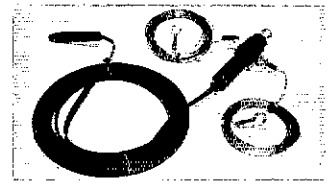

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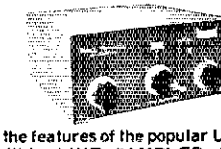

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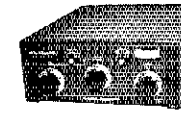

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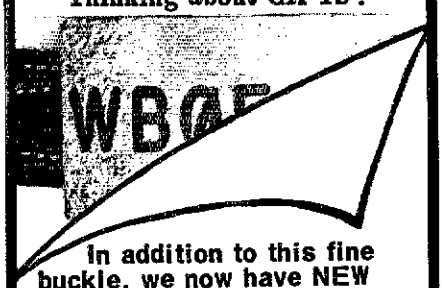

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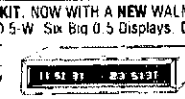

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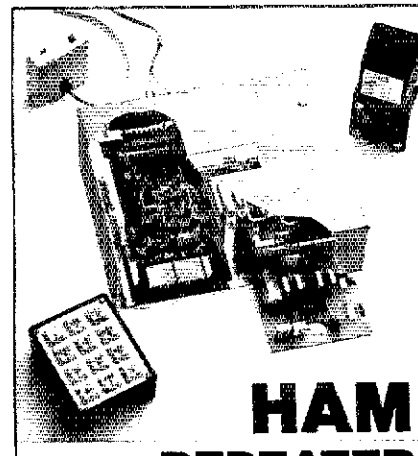

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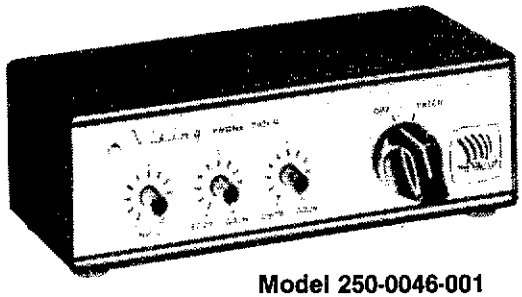

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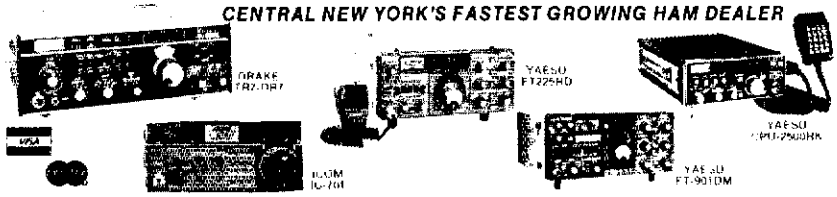

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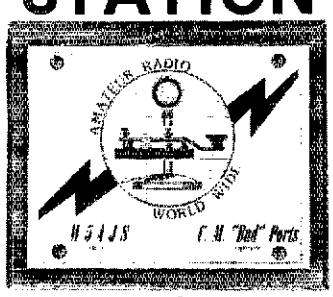

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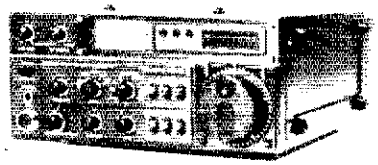

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50.000-53.9999 MHz, 100W, SSB, FM (optional), CW, AM. Utilizes microcomputer based 100Hz step Digital PLL synthesizer. Dual VFO's with 3 memories. Dual all mode scanning system. Pass band tuning with RF processing and VOX included. FM optional, AC Power Supply optional.

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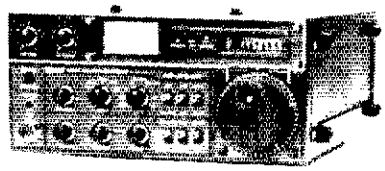

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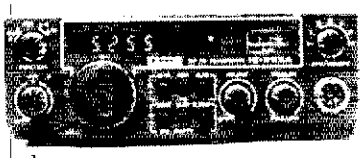

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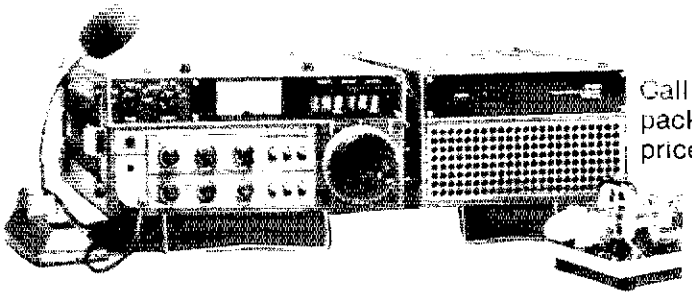

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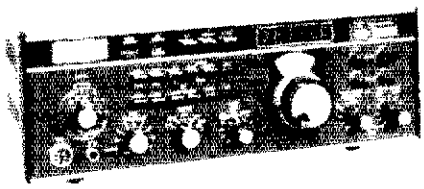

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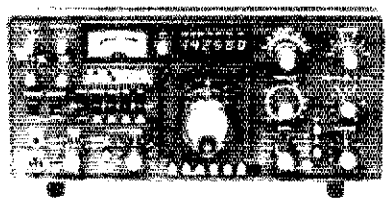

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WANTED - old microphones — pre 1940, for my microphone museum. Also mic-related items. Write Bob Paquette, 443 N. 31 St., Milw. Wi, 53208.

WANTED: Collins 30S-1, 62S-1, Telrex antennas 4 el and larger, towers, QST magazine collection 50s to current. Equipment Mint condition only please! for sale: Henry 2K-2 converted to 2K-3 by Henry, Collins 30L-1, Collins KWM-2A. All in like-new condition. Best offer. Hugh Smith, KA7CPA, 3609 SW Juneau, Seattle Washington 98126. 1-206-937-7155.

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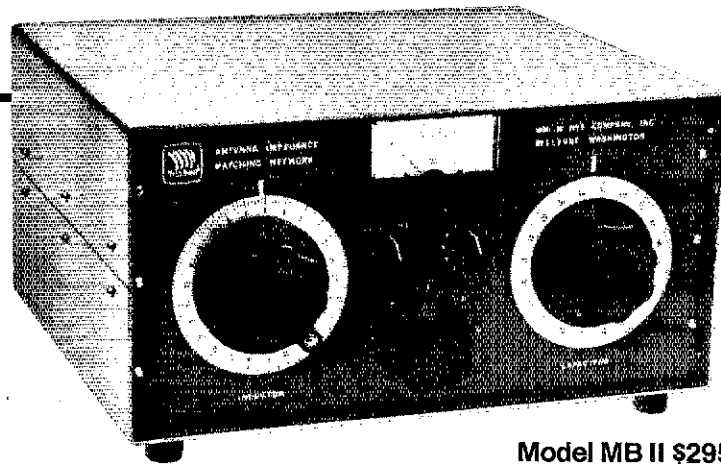

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COMPLETE set of 73 Magazines, every issue published, in excellent condition, will sell or trade. K8YAH, Ron Vanke, 2700 Patrick Ave., Columbus, OH 43229.

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DRAKE TR-3, RV-3, AC-3, MS-3 $350. Transceiver recently factory aligned. W7LQF, 314-278-1767.

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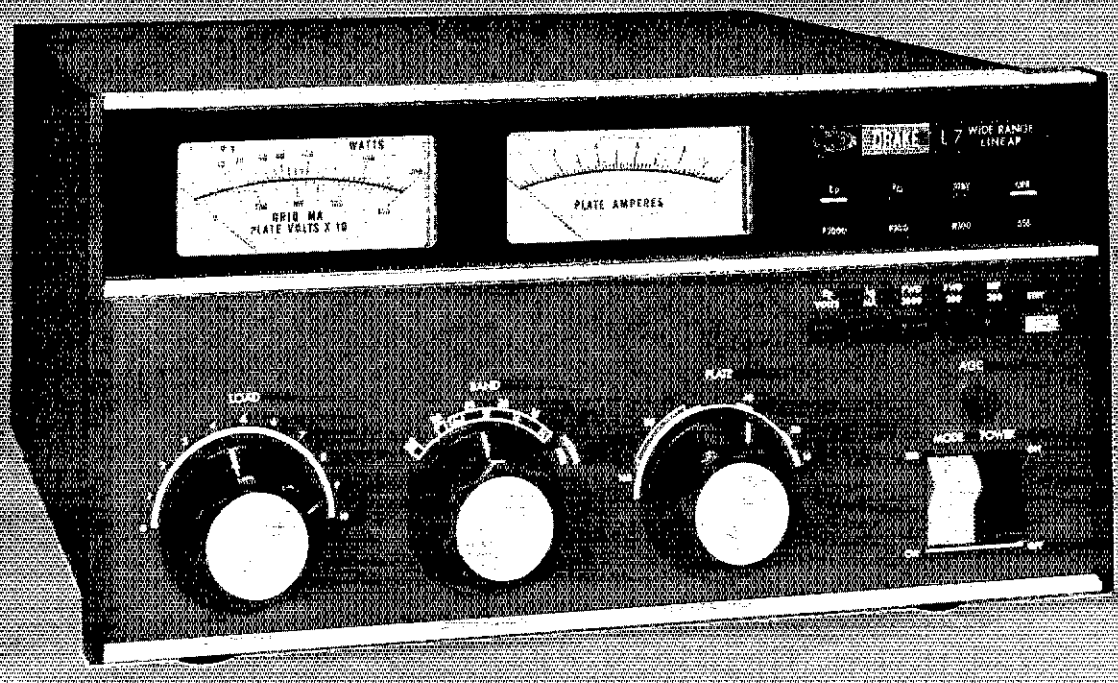
Drake L-7 Continuous Duty 160-10* Meters 2kW Linear Amplifier

Model 1528



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.

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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.

DON & MIKE guaranteed goodies: Collins KWM380 begins shipment Spring 1980 — get your deposit in now! Tonna F9FT16EL $59.95; Kenwood TR7625 $339.; TR7600 $299.; Icom IC701/ac/mic $1195; Dentron GLA1000 $319.; new Palomar kW + tuner with noise bridge $299.; Vibroplex, Bencher stock; new Hygain HG35MT2 tower $299.; Icom IC255A $349.; Rohn 20 percent off dealer prices; Sprague 100 mfd/450V dc cap $2.; Amphenol silver plate PL259 69c; Ham/4 $139; HamX $189.; Mallory 2.5A/1000PIV epoxy diode 19c; Cetron 572B $29.50; Janel QSA5 $41.95; Telrex TB5EM stock $415.; Rohn 25G $45.; prices FOB Houston. All items guaranteed. Madison Electronics, 1508 McKinney, Houston, TX, 77002 713-658-0268.

FOR SALE: Valiant I, needs work, have all the dope, $50. 6 & 2, $40; SX-101, Mark III, $100; SX-101A, $100; Ameco converter for 2 meters, $30. No shipping, pick-up only: 609-296-2975.

DRAKE Twins-R 4B, T 4XB. Receiver fully xtaled. Flawless condition. Both for $625, includes MS-4. SB-610 sig. Monitor $75. SB-620 spectrum analyz. $100. WA2MKD, J. R. Owens, 66 Templar Way, Summit, N.J. 07901 201-273-4056.

SELL: Swan 350 w/117X ps plus Shure HT-44T mike. $260 WA2YDI, Thayer 47, Cambridge, MA 02138.

SALE: 40 meter cw QRP transmitter, portable, Scott Stamper, P. O. Box 3102, Clarksville, TN 37040.

CENTURY-21, absolute mint condition $265, I ship. Cliff Eley, 11 Rosedale Ave., Morris Plains, NJ 07950. 201-538-0690 after six weekdays.

SELL Yaesu FT-301S and FL-110 solid state amplifier, excellent. $575. WB3AGL, 814-265-1779.

Yaesu FT901D, SP901 speaker 5 hours use. Immaculate. $875. UPS paid WBØNZV, 3915 S. 33, Lincoln, NE 68506. 402-489-5165.

SWAN 600-R custom receiver. Equipped with SS-16B filter, noise blanker, audio notcher-peaker. Mint condition. $359. W4OLI, 811 Jacaranda Dr., Harbor Bluffs, FL 33540 813-585-9688.

WANTED: RAX rcvr, TA-12 Bendix transmitter, TU for APR-1, manual for APN-9 Loran rcvr. Command receivers. Prefer unmodified, but will consider others. Buy or trade. W9POC, 725 College Way, Carmel, IN 46032.

30 FT. Universal tower. Tek 531 scope, plug-ins, Cushcraft 2m twist, SB-220, Ham-III rotor, old HP test equipment, more — Columbia University ARC, 212-280-7424.

WANTED: ARRL Annual Reports prior to 1976. Neil Friedman, N3DF, 6616 River Trail, Bethesda, MD 20034.

MAKE Offer: DeForest Catalog "D;" Duck Catalog 13, 1919; Electro Importing Catalog 22, 1920. W7RIY Box 30061 Seattle, WA, 98103.

YAESU Twins, FT101B & FL-2100 $750. Swan SS-200-A w/16B filter & ac supply, solid state broad band no tune. $495. Larry Arnold, K4AET, 804-758-5147.

WANTED for parts: Any condition, SB-220, SB-200, or any commercially-built linear amplifier. Bob, W5SEP, Rte. 1, Box 13E, Elkins, AR, 72727.

TEN-TEC Century 21 $290. Ten-TEc 544 digital $721 Hy-Gain 14 AVQ vertical $56. All new. Supina, 525 Ridge, State College, PA, 16801.

WANTED: S-Line, KWM2A, 30L1, 30S1 in any condition. W9QYH, 1605 Ridge Rd., Green Bay, WI 54304.

2-METER portable: Kenwood TR-2200A, Drake microphone, 1/4 wave mag mount antenna $200/offer. KØJHV 612-432-8139.

DRAKE T4XC, R4C, AC4, $975. K4IMK, 404-648-2370.

WANTED: RV-4 VFO. Write with price asked; I'll pay shipping. Bob, WD8NKT.

WANTED for HRO-60: A, AC coils. Have HRO-60 A coil, sell or trade. Tom, N6TG. 213-282-3327.

DRAKE TR-72 loaded; 6 amp supply; both mint. $225. for both. WA3HVR. 215-398-3942.

PRIOR year(s) Callbook(s). Buy/sell/consignment. S.a.s.e. WB1ASX.

SBE SB-34, $195. 80-15m ssb, built-in ac-dc p/s. Complete with ac & dc cords & manual. John, K3KR 717-748-8859.

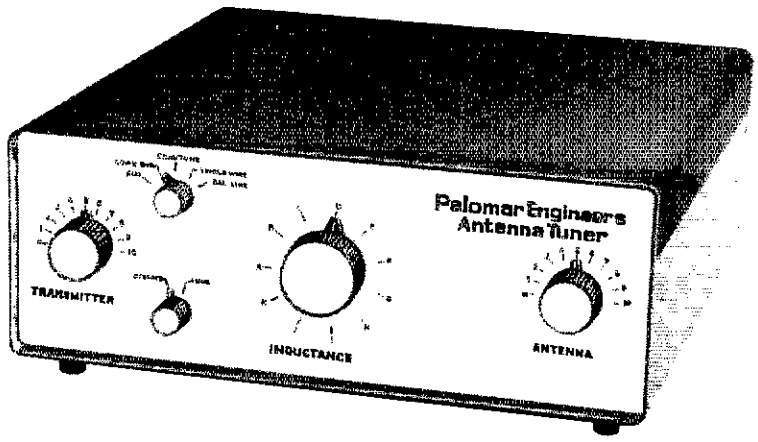
DRAKE T4XC, R4B, MS4, AC4, extra xtals, original owner. Cables and manuals, local deal preferred. $850. 215-644-3285. John Tate, W3FYW, 9 Diane Dr., Malvern, PA 19355.

ROSS' specials: Hy-Gain TH6DXX $225. TH3MK3, $190. 18ATV, $75. Cushcraft ATB-34 $208. ARX 2 $29. A14711, $29. A14711 $29. ATV5 $84. Mosley TA-33 $177. CL 33 $204.49. Atlas accessories: DMK-XL $50. 220CS $125. 220GS VX-5 $165. Astro 200 Accessories SOC-200 Digital Clock, 10 minute timer, phone patch, $190. BP2 200 20 Amp AC supply $85. SPR-200 speaker $20.56. BIL-200 mobile mount, $8.00. Amcom BS misc 6 amp base supply with clock, $89. 2M15B 80W Base Power amplifier with AC supply, $185. 2M15R Remote Mobile 80W amplifier, $130. Yaesu FT-107 $924. FV-107 $113.85. FC-107 $127.68. FV-107 $113.85. Kenwood TR 2400 $347.70. TS 120S $598.29. R 1000 $418.88. Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830. Close Mondays at 2:00.

WANTED TMC GPR-92 receiver in excellent to mint condition only. John Callan, 65 Beechcroft St., Brighton, MA 02135.

REPLACE rusted antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 365, 230 Woods Lane, Somerdale, NJ, 08083.

Antenna Tuner



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MAKE AND MODEL OF SET	CW (Hz)[1]						SSB-AM (kHz)[2]					SEE NOTES
	125	250	400	500	600	800	1.8	2.1	2.4	4.0	6.0	
YAESU	$55 EACH											3
FT-101/F/FR-101		✓		✓	✓		✓			✓	✓	11c
FT-301/FT-77		✓		✓			✓		✓	✓		
FT-901/FT-101ZD		✓		✓			✓			✓		11
FT-401		✓		✓			✓	✓				4
FRG-7, FRG-7000									✓			12
KENWOOD	$55 EACH											4
TS520/R599		✓	✓				✓					
TS820/R820		✓	✓				✓	*	2nd IF			9
HEATH	$55 EACH											2
* ALL BUT SB104		✓	✓				✓	✓				
DRAKE	FOR PRICES SEE NOTES											2
R-4C	GUF-1						(BROAD 1st IF)			✓	✓	6
	GUF-2						(NARROW 1st IF)					7
	✓	VERY SHARP CW (2nd IF)										8
	GUD — PRODUCT DETECTOR KIT											9
COLLINS	SPECIAL $125 EACH											3
75S-3B/C	✓	EQUALS OR EXCEEDS $400 COLLINS UNIT										10

NOTES:

1. a) **250 Hz Filters**. Very sharp, ideal for DX and contest work, yet not too narrow for ordinary operations.
   b) **400 and 500 Hz Filters**. Slightly narrower than 6-pole or less usually available as options; and superior 8-pole type.
   c) **600 Hz Filters** for '101 are 6-pole. $45 each.
2. a) **1.8 kHz Filters**. Intended to supplement (or supplant) standard SSB filters whose bandwidth is about 33% greater. Useful in overcoming QRM.
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   d) **6 kHz Filters**. Essential for optimum reception of short-wave broadcasts, CB, etc.
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	TS-520SE	545B (Omni-A)		FT-901DM
	TR-7600	546B (Omni-D)		FT-227RB
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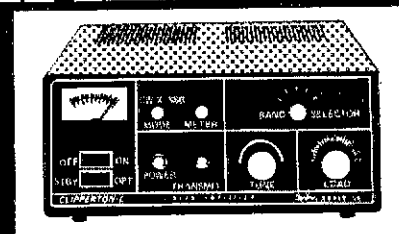

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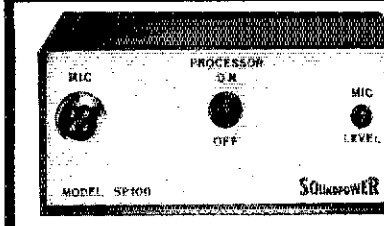

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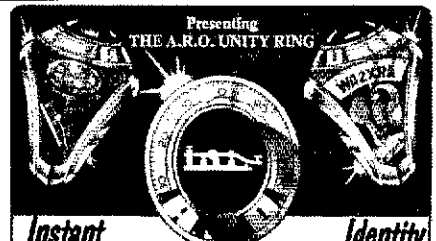

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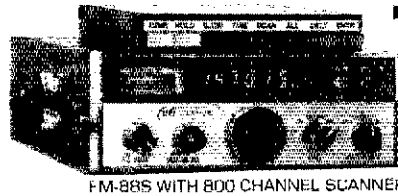

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Hints & Kinks 4
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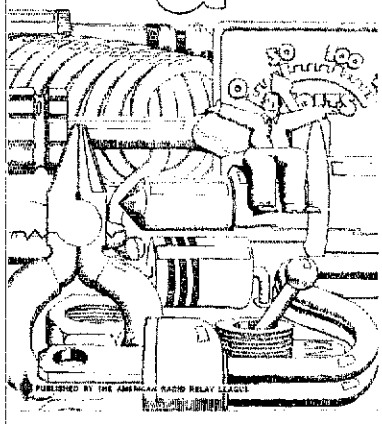

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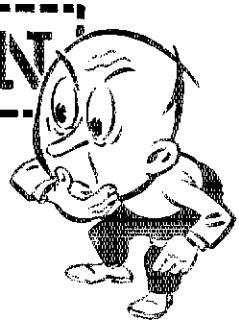

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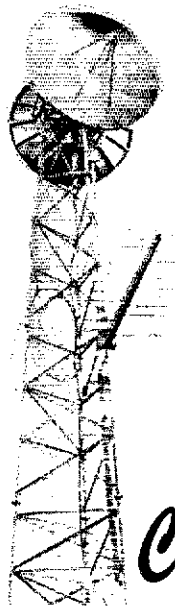

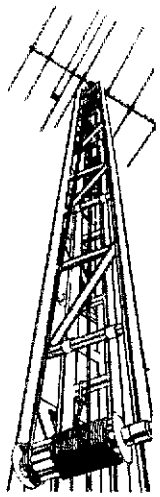

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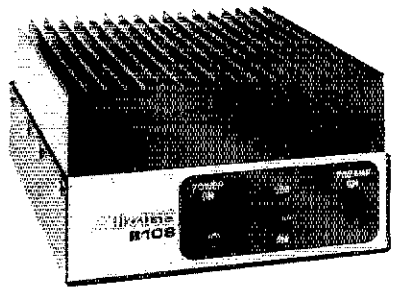
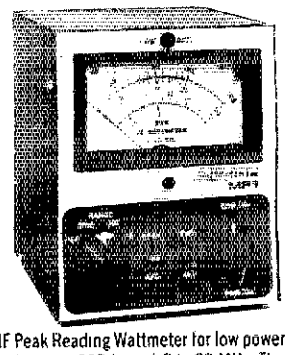


MIRAGE B-108 Solid State VHF Power Amplifier with built-in receive preamplifier. 144-148 MHz. 13.6vdc @ 10-12A. Rated for 5 to 15 watts in and 80 watts nominal output. Operates with as little as 1 watt. 1-2 watts in gives 15 to 30 watts output. Linear for FM, CW and SSB. External or automatic internal relay keying w/adjustable delay. Switchable preamplifier provides a noticable improvement in weak signal reception. 10db gain/2.5db N.F. Optional remote control head. 5⅜"w x 3"h x 8"d, 3 lb. 5 yr warranty. (1 yr on power transistors)..... **$169.95**

B1060 Features same as B-108 except rated for 5 to 15 watts in for 160 watts nominal output. 1 to 2 watts in gives 30 to 60 watts out. Overtemp protection. 13.6vdc @ 20-25A. 5⅜"w x 3"h x 12"d, 5 lb. **$279.95**

B3016 Same as B1060 except rated for 15 to 45 watts in for 160w output. **$239.95**

RC-1 Remote control head w/18' cable..... **$24.95**



MP-1 HF Peak Reading Wattmeter for low power CW, AM, FM or high power SSB from 1.8 to 30 MHz. Three power ranges; 25, 200 and 2000 watts - Forward & Reverse. No add-ons or plug-ins required. Reads Average Power or Peak to show true SSB power output. Measures SWR with as little as 1 or 2 watts directly without charts or graphs. Coupler can be remotely mounted up to 4' away. Uses 9v bat. or opt. AC adapt. 5¾"h x 4½"w x 5¾"d... **$119.95**

MP-2 VHF Wattmeter. Features similar to MP-1 except frequency range is 50 to 500 MHz and power ranges are 50, 500 and 1500 watts..... **$119.95**

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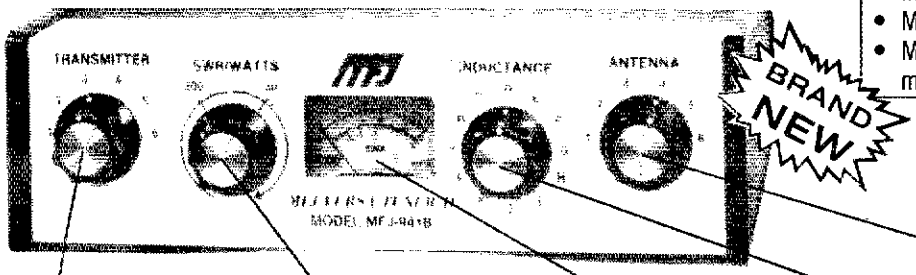
This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

MFJ LOWER PRICES!

NEW, IMPROVED MFJ-941B HAS . . .
- More inductance for wider matching range
- More flexible antenna switch
- More sensitive meter for SWR measurements down to 5 watts output



NEW LOWER PRICE

$79.95

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B Versa Tuner II with all these features at this price:

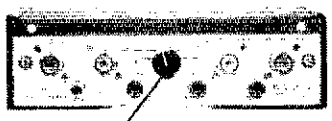
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balanced lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.



ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 8x2x6 inches fits easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER. NEW LOWER PRICE

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Same as MFJ-941B but less 6 position antenna switch.

NEW MFJ-944 HAS 6 POSITION ANTENNA SWITCH ON FRONT PANEL. NEW LOWER PRICE

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Same as MFJ-941B but less SWR/Wattmeter.

NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz. NEW LOWER PRICE

$59.95

Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

MFJ-901 VERSA TUNER MATCHES ANYTHING, 1.8 THRU 30 MHz. NEW LOWER PRICE

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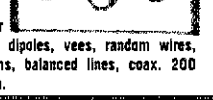

Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

MFJ-900 ECONO TUNER MATCHES COAX LINES/RANDOM WIRES. NEW LOWER PRICE

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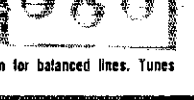

Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

MFJ-16010 RANDOM WIRE TUNER FOR LONG WIRES. NEW LOWER PRICE

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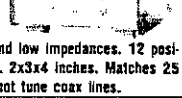

1.8 thru 30 MHz. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz. Does not tune coax lines.

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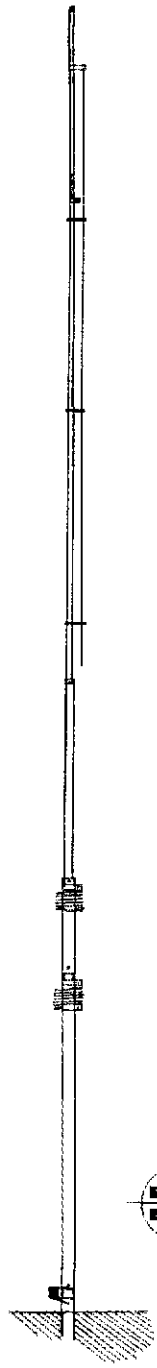

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The HF5V-III uses only two high - Q L-C circuits (not traps!) and one practically lossless linear decoupler for completely automatic and low VSWR resonance (typically below 1.5:1) on 80 through 10 meters, inclusive.

And for completely automatic operation on 160 through 10 meters, simply install the TBR-160 M unit at the base of the HF5V-III ! (What other vertical offers you a "top band" option plus simultaneous resonances on 80 through 10 meters?)

For further information, including complete specifications on the HF5V-III and other Butternut antenna products, ask for our latest free catalog. If you've already "gone vertical" and are happy with your present system, ask for one anyway - - there's a lot of information in it about vertical antennas in general, ground and radial systems, plus helpful tips on installing any vertical on rooftops, on mobile homes, etc.

Suggested Amateur Net: HF5V-III - - $98.00* (available 15 Oct.)
TBR-160 - - $34.50

*An export/DXpedition version suitable for surface parcel post shipment outside the USA - - or as "hand luggage" - - is available at a slight additional cost.

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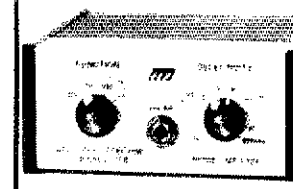
MFJ SUPER CW/SSB FILTERS



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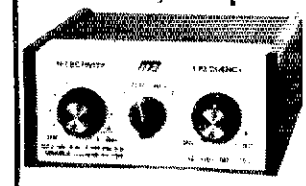
MFJ-721

MFJ-721 SUPER SELECTOR CW/SSB FILTER gives 80 Hz BW, steep SSB skirts, noise limiting.
CW Filter gives 80 Hz BW. No ringing. 8 poles give super steep skirts (60 dB down one octave from center freq. of 750 Hz). No tunable filter can match performance. BW: 80, 110, 150, 180 Hz. Reduces noise up to 15 dB.
SSB Filter improves readability. Reduces splatter, hiss, static, noise, hum. IC active filter has 375 Hz highpass cutoff; 2.5, 2.0, 1.5 KHz (36 dB/octave) lowpass cutoffs.
Works with any rig. AM, SSB, CW. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs. Speaker and phone jacks. Phones disable speaker. OFF bypasses filter. 9-18 VDC, 300 ma. 5x2x6 inches. Optional AC adapter, $7.95.
Switchable noise limiter for impulse noise, trough clipper removes background noise.
Simulated stereo for CW lets ears, brain reject QRM. Yet, hear off frequency calls

Tunable Filter

Instantly zero in SSB/CW signals with tunable peak, notch, lowpass filter.



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MFJ-751

MFJ-751. Peak, notch or lowpass signals, zero in with freq. control, adjust bandwidth for minimum QRM. Double tuned for extra steep skirts.
Linear freq. control tunes 300 to 3000 Hz. Output is constant as bandwidth is varied flat to 40 Hz. Tight notch to 70 db. 5x2x6 in.
Hear off frequency calls with simulated stereo.
Works with any rig. Plugs in phone jack. 2 watts for speaker. 110 VAC or 9-18 VDC. 300 ma. One year unconditional guarantee.

MFJ-721 has 4 CW stages for super steep skirts. Best for CW. **MFJ-751** is best for general use when versatility is more important.

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COLLINS 3253 with 516F-2 supply, low hours, excellent, $625. K6POU, 415-934-2962.

FOR SALE: Mosley tri-band TA-36 and Mosley dipole TD-2 antennas. Rohn tower, 55 ft. (tilts). Ham-M rotator. 1-814-362-3365.

ICOM 22S, Drake TT, P.L. — $195; SB-200 — $285; Dentron MT-3000A — $220; Standard, commercial quality, 450 MHz HT — $250; Charlie, N2HA, 212-268-2654.

EIMAC 4X150A's, new, $19. postpaid. heath HG-10B, mint, $35.; HR-10, $45. Paul Husby, WØUC, 1700 Ridgewood Lane, Roseville, MN, 55113. 612-644-1069.

CALLBOOKS wanted, pre-1940. KH6GI, 3144-A Charles, Honolulu, HI, 96816.

COLLINS — KWS-1 376 $450 with spare P.A. tubes; 75A-4 4986 $425; W8GNS 513-232-5574.

DRAKE T4XC, R4B, MS4, AC4 mint, $895. WB5DJA, 817-387-0461.

SELL: Heath HD-1250 dipmeter $45, Eico signal generator 0.15 to 435 MHz $75, Eico regulated power supply 13.8V/2.2A $15, ERC SL-56 audio filter $50, wanted: Dentron MLA-2500, Drake L-4B linears in mint condition. DJ 8 GO. 914-473-4453.

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ROBOT 400 FS-II TV camera with close up lens. Conrac 10 inch monitor all $800. Collins KWM2 with DX Engineering processor, 516F-2 power supply. $750. WB2LTS, 516-643-2412.

YAESU FT-7, mint condition with mobile mount, $345., plus shipping, also 100W solid state linear amp. 80-10m $95. Ray Mertens, 2201 Glenwood Road, Vestal, NY, 13850 WA2QEW. 607-748-1497.

FOR SALE: Kenwood TS-520. Excellent condition. $475. John Merry, W2FOR. 40 Phelps Ave., New Brunswick NJ 08901 201-846-9243.

SALE: Tempo S1 ht with leather case $290. Drake TR-72 with 13 sets xtals $200. Both mint with manuals and original cartons. WA8KIF, 11006 St. Rt. 124, Hillsboro, OH, 45133 513-466-2384.

FOR SALE: Old QSTs, state wants. Charles Williams, 400 Broadway, Cincinnati, OH, 45202, W8AXQ.

CODE practice cassettes — Computer generated, perfect code. High quality, full 90-minute cassettes. QSO tapes very much like FCC code exam. Printed text included. 25 QSOs at 15 wpm order no. C7 — 25 QSOs at 22.5 wpm order no. C8. Other types and speeds available. All cassettes $5.95 each ppd. S.a.s.e. for catalog. MC and Visa welcome. Fast service! K5SMG, John C. Tarvin, 14480 Shadowlane Ct., Morgan Hill, CA 95037 408-683-0287.

FOR SALE: Heathkit SB303, SB401, speaker, mike $375. SB220, two spare 3-500Z tubes $575. Slinky antenna $15. HD15 phone patch $25., reflectometer $15. mint. Gary Edwards K4ASM, 516 Crystal Drive, Madeira Beach, Florida 33708.

COLLINS: KWM-2, $525; 516F-2, $150; 30S1, $1950; 312B4, $225. All perfect. W9ZR, Box 301, DePere, WI, 54115. 1-414-532-6643.

KENWOOD TR-7500, $200., Motorola Metrum II, 10W 2/1 repeater offset, $150. Tempo 130A10 amplifier, $125. Ameco TX-62, $65. John Johnson, WB6LMN, 15200 Magnolia 19, Westminster, CA, 92683.

DRAKE TR-3 with factory installed TR4C filter, AC4, $325 or best offer. 712-379-3230 Ron, AKØN, Essex, IA 51638.

HAL DKB-2010 dual mode keyboard with 128 key buffers $300. Microlog AVR-1 $200. Both mint. W4JMD, 919-793-4866.

RICO VTVM model 232 $35. MFJ Versatuner model 941B $40. Both ppd WØJDH, 327 6th St. N.W., Valley City, ND 58072.

SELL: Drake TR-3, AC4, MS4, Excellent, with manual. $310. Tempo FMH 2 meter hand-held with touch tone, telescopic and rubber antennas, six channels, new pads and charger. Just back from Henry service with narrow filter. $150. Realistic PRO-1B VHF monitor, tunable or xtal, retuned to cover 143-164 MHz, mint $40. Allen Zitrin, W2ZX, 2429 Barker Ave., Bronx, NY, 10467 212-652-0969.

TEMPO One with AC-One, mint condition, $350, firm. Write WD4NCN, 355 Cumberland Dr., Danville, VA 24541.

BUYING 450-TH/TL tubes any condition for collection. $5. plus shipping. Bill Collier, 705 Hugh Ave. N.E., Roanoke, VA 24019.

HUNTSVILLE, AL. resident who has the 450-TH/TL tubes. I have neither your address nor name. K4VCP, 705 Hugh Ave. N.E., Roanoke, VA 24019.

DRAKE T-4X, R-4A, MS-4, AC-4, EV mic, all cables, manuals, 160-10m xtals, extra finals. Will not separate. $690 ppd UPS (CONUS only) certified check or m.o. Pete, KH6GK, 808-499-2035 or write (see 80 callbook for adr).

MAKE offer: Heath HX-10 SSB transmitter. Heath HD-10

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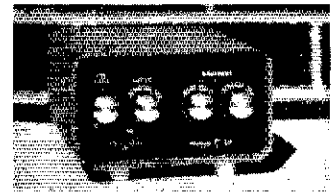

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(3.5 × 5.5 × 7.5 Inches)

The brand new SL-56 Audio Active Filter supercedes our SL-55 in both concept and performance. Consolidation of many components has allowed us to make 13 operational amplifiers (compared to 6 in the SL-55) into a filter guaranteed to out perform any other at a cost only slightly higher than the SL-55. The features of the SL-56 are so advanced from its predecessor that calling it the SL-55A is not justified. Unlike other filters that simply offer a choice of one or two filter types at a time (notch, bandpass, etc.) SL56 provides what is really needed - the simultaneous action of a 6 pole 200 Hz fixed highpass filter and a 6 pole 1600 Hz fixed lowpass filter with a 60 dB notch which is tunable over the 200-1600 Hz range. This 3 filter combination is unbeatable for the ultimate in QRM free SSB reception. Adjacent channel QRM is eliminated on the high and low sides at the same time and does not introduce any hollowness to the desired signal. On CW the SL-56 is a dream. The lowpass, highpass and notch filters are engaged along with the tunable bandpass filter (400-1600 Hz) providing the needed action of 4 simultaneous filter types. The bandpass may be made as narrow as 14 Hz (3dB). Additionally, a special patented circuit follows the filter sections which allows only the peaked signal to "gate itself" through to the speaker or headphones (8-2000 OHMS). Receiver noise, ring and other signals are rejected. This is not a regenerator, but a modern new concept in CW reception. The SL-56 connects in series with the receiver speaker output and drives any speaker or headphones with one watt of audio power. Requires 115 VAC. Easily converted to 12 VDC operation. Coal black cabinet and wrinkle gray panel.

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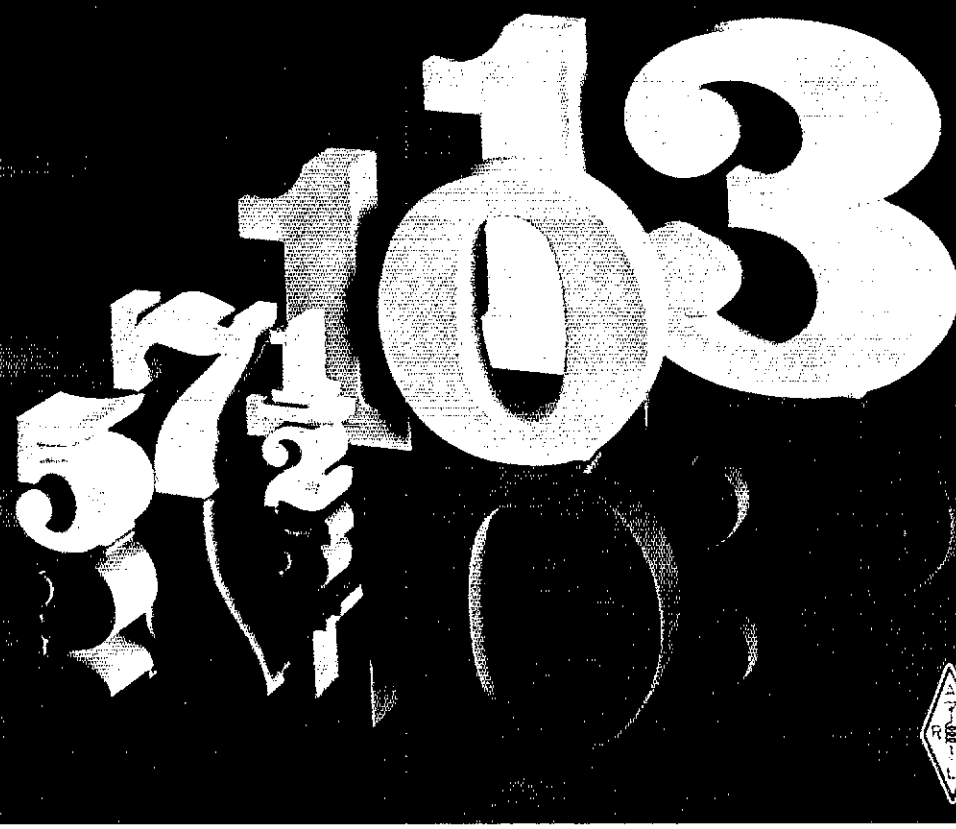

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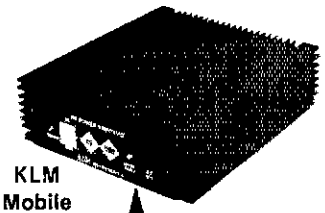

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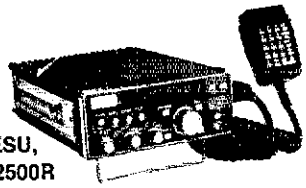
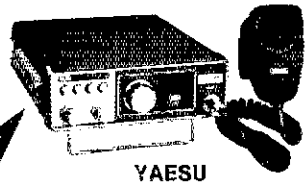
KLM electronics, inc.



YAESU, CPU-2500R 25 watts.

YAESU



YAESU Memorizer FT-227R, Selectable power, 1-10 watts.

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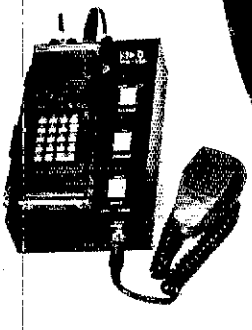
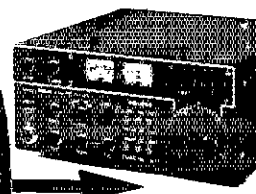
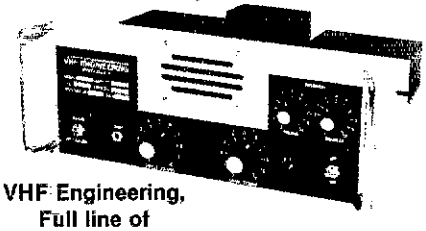


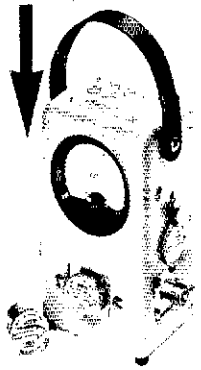


ICOM

IC-211 Transceiver, also complete line of HF.

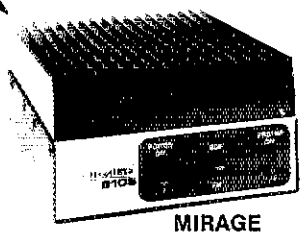


VHF Engineering, Full line of repeaters and amplifiers in stock.



BIRD ELECTRONICS, Full line of elements in stock.

MIRAGE



MIRAGE B 108, 5 to 15 watts in, 80 watts out.

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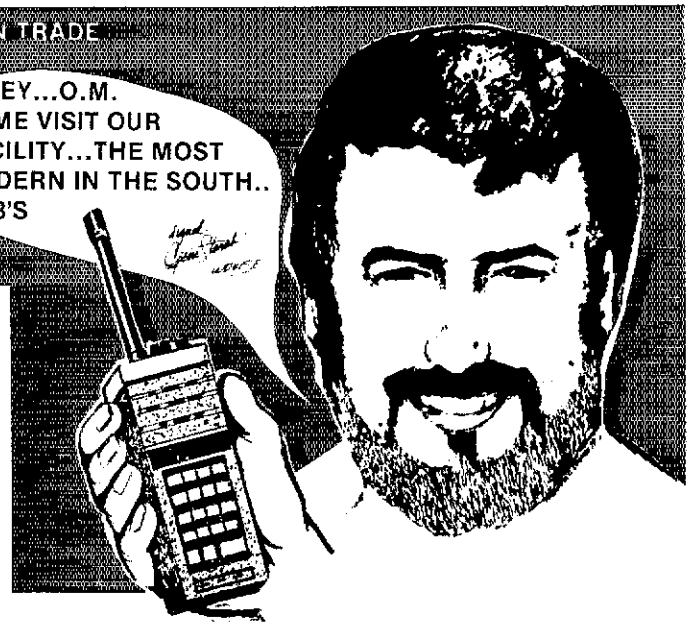

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KLM/N&G MA-25B
Power Amplifier
SPECIFICATIONS

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

Custom designed and built for N&G by KLM for use only with the Yaesu FT-207R.

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Preferred by the professionals: Gordon Lane, N4BUO Eastern Airlines Pilot

keyer. Homemade linear with heavy duty ps. No shipping. W6TF, Los Angeles area 213-881-1009.

WANTED: two Lafayette HA-750 transceivers in excellent operating condition. K5MID, 400 NW 20th Street, Oklahoma City, OK, 73103.

ROBOT SSTV station: Model 70A monitor, 80A camera, 80 viewfinder. $425 or trade for synthesized HT. WA4FTX Glen, 4005 Tanglewood N. Apt. 493 Palm Beach Gardens, FL, 33410. 305-622-1604.

SALE: SB-400, SB-300, SB-600, SB-630 station console, $475, Lafayette HA-800 receiver $50, SB-500 2 meter transverter, has bad tube, $50. All in excellent condition. WB5IGF, Joel Harrison, P. O. Box 1332, Searly, AR 72143, 268-9540.

CLEGG Venus with p.s. mint, Heth HW-2036A kit $10 under current price, TMC ssb converter, Clegg 99er, Challenger, Valiant, SX-101A. McFadyen, WA4KBP, 919-799-6084, 406 Pettigrew, Wilmington, NC, 28403.

CX11-A transceiver wanted — also Tektronix 7000 series oscilloscope. Sell/trade new Eimac SK-300 $115, Henry Radio 2K-3 $800. WA6BUS.

HAMTRONICS XV2-4 transmitting converter 10m to 2m, complete, $50. LPA2-45 amplifier, 45 watts output, in carton, unassembled, $95. Heath SBA-104-1 blanker complete, $20. Panasonic RF 2800 $95. Flesher TU-170 complete $150. Above equipment in mint condition. Add UPS. D. Sowers, K4SUE, 522 McGeorge Dr., Vinton, VA., 24179. 703-890-2372.

HRO-5, PS697, 9 coils, manual $250, Scott 800B chassis $300, AK55T, F4A speaker $55. Martin, WB2VVQ, Rte. 49, Pittsfield, MA, 01201 1-413-442-5435.

HEATH 10 MHz scope model 10-4555, mint $295. Crescent freq. counter model 300-600 $125. Hustler mobile ant. 5/8 wave model CG 144 $30. B&K Dummy Load Wattmeter model 333 $75. Write: John Neugent, 2428 Libal, Green Bay, WI 54301.

WANTED: Ten-Tec 405 linear for 509. KA1DBH, Orrington, ME 04474.

DRAKE TR-4 AC3/MS4 $450. TR22C fully crystalled $175. K1WVY. 617-237-5981.

WANTED: Yaesu FV-101 external VFO. Stu, KA1CLA, 30 McKeon Drive, N. Attleboro, MA, 02760. 617-699-2169.

YAESU FRG-7 receiver $200., Heath HW-16 cw transceiver $100. Both excellent shape with manuals. Hamp. 408-624-1171 after 6PM PST.

FOR SALE: Drake R4 receiver, $225; T4X transmitter, $275. Both for $450. Both recently aligned by Drake. W6NZB. 213-943-3441.

AS-NEW QSTs, 11/45 thru 12/75 plus 37 older copies, $135 & COs. 10/54 thru 10/71 plus 10 older copies, $50 & Several older Handbooks and Callbooks $2 each. New Eimac 4E27A/5-125B, $20. W4BBL.

HY-GAIN TH-3JR with BN-86 balun in original shipping carton I ship. $80. Martin, 3045 Ala Napuaa Place 1606 Honolulu, HI 96818.

HEATHKIT SB-104 with factory built receiver, ac power supply, station speaker. Exc. cond. $700. Call 215-384-6428. WB3DPR.

WANTED: SX-88 radio for parts. RME22 preamp for parts. K7GCO, 202 S 124th, Seattle, WA, 98168, 206-243-5174.

5kV single phase regulators, $100. Teletype punch tape, 11/16" wide x 8" rolls, .50c ea Jack, KA4CDC, 205-272-2839.

DRAKE R4B very good condition. $319. WA4MIT, 305-339-9677.

PANIC sale, need cash! HW12A, $67. HW32A, $67. SB600/HP23, $49. HW8, $79. 1410 Keyer, $34. HW202/Micoder, $99. K3JZH.

SALE — Heath HW-8 & p.s. — New factory calibrated $120. KA4KCO. 904 S. 4th Ave., McRae, GA 31055 ph. 912-868-2235.

WANTED: 195-2S pi-network, pair 4-400A chimneys, variable capacitors, high voltage RF switches, amplifier parts, N7BEK, 9458 N. Burr, Portland, OR 97203.

VIDEO: RCA TC-1055 b/w camera $270., three video transmitters with p/s cabinate $45. WA4BUE, 804-424-1855.

HEATH IT-3120 FET/transistor tester. Have two — sell one. New, built, tested: $60. Used (IT-121): $45. Bill Phillips, 420 James Road, Palo Alto, CA, 94306. 415-493-8022.

SB-400 transmitter. Excellent. $160PP. WA5OXK, 504-392-9101.

ACCESSORIES: Telex GB-1200 headset/boom $49., Converters: Janel CF-144 $70., Ameco CN-50/144 $40. WA4BUE, 804-424-1855.

ATRONICS code reader, telephone amplifier and c.p.o. will enable deaf & dumb radio operator to QSO another operator either on the telephone or over the air by cw. Price $235, f.o.b. David Harrell, W5CVQ, 2110 Matthews Drive, Austin, TX, 78703.

HEATH SB-401/SB-301/SB-600, Shure mic. 526T $535. SB-630 $100 SB-614 $100 or all for $700. all manuals WB1HGN. P. O. Box 6, Averill, VT., 05901, 802-266-3347.

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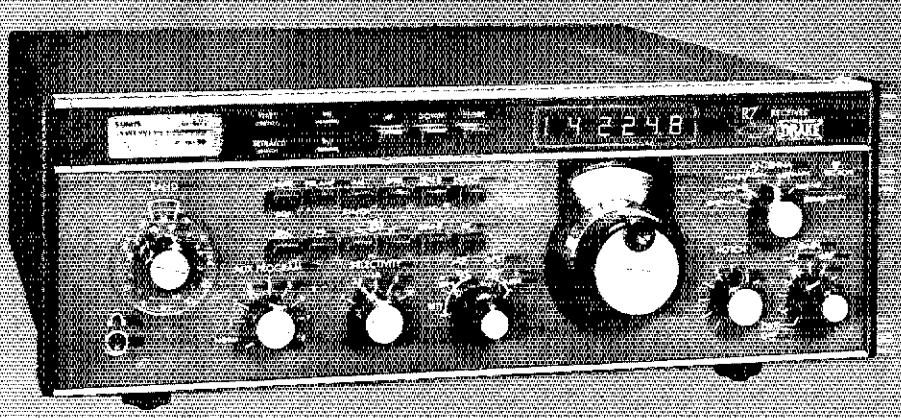
WB2TTW selling most everything acquired in last 3 years. HW-8; HQ-170; Johnson Navigator; homebrew

Drake R-7 Synthesized, General Coverage Receiver

Model 1240



Full general coverage receptio 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, 20 240 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. Pro vides true impulse type noise blanking performance

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 −128 dBm). .01-1.5MHz Less than 1.0μV for 10 dB S+N/N

Sensitivity (a-m): 1.8-30 MHz 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

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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)

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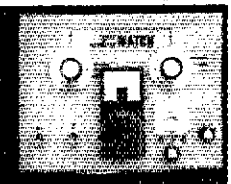

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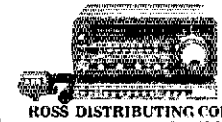

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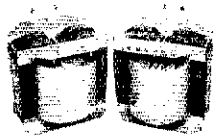

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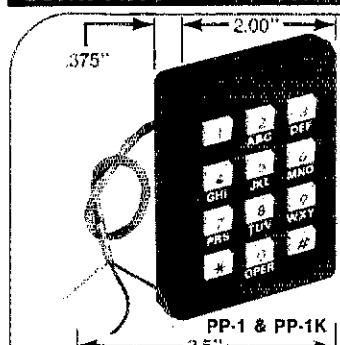

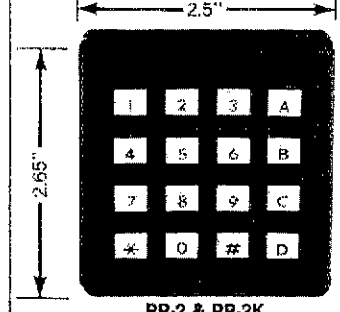

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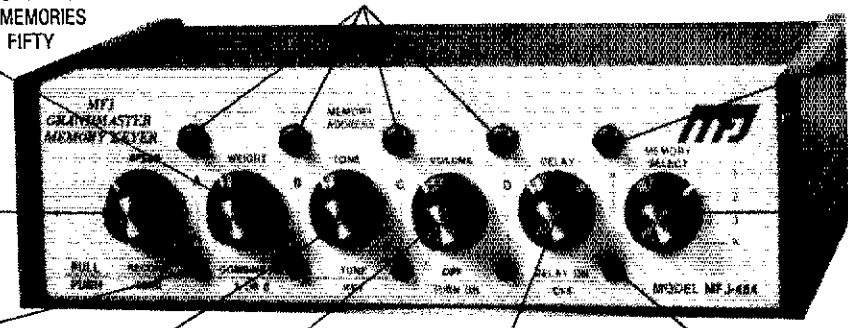

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Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

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!

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Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

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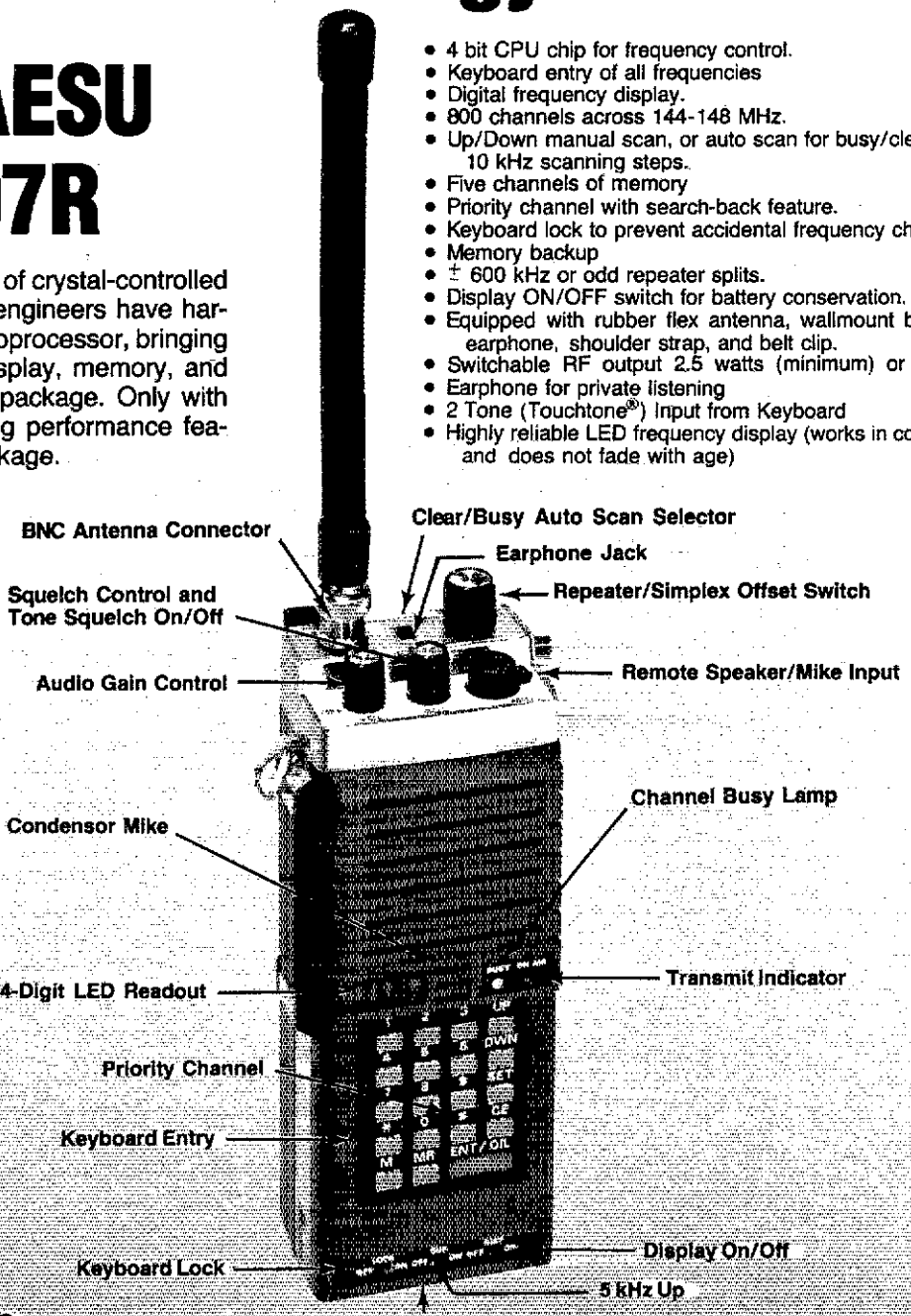
- 2 Tone (Touchtone®) Input from Keyboard
- Highly reliable LED frequency display (works in cold temperatures and does not fade with age)



SPECIFICATIONS:

GENERAL

Frequency coverage: 144-148 MHz
Number of channels: 800
Emission type: F3
Batteries: NiCd battery pack
Voltage requirement: 10.8 VDC ± 10% maximum
Current consumption:
Receive: 35 mA squelched (150 mA unsquelched with maximum audio)
Transmit: 800 mA (full power)
Case dimensions: 58 x 181 x 54 mm (HWD)
Weight (with batteries): 660 grams

RECEIVER

Circuit type: Double conversion superheterodyne
Intermediate frequencies:
1st IF = 10.7 MHz
2nd IF = 455 kHz
Sensitivity: 0.32 uV for 20 dB quieting
Selectivity: ± 7.5 kHz at 60 dB down
Audio Output: 200 mW at 10% THD

Price And Specifications Subject To Change Without Notice Or Obligation

TRANSMITTER

Power Output: 2.5 watts minimum /200mW
Deviation: ± 5 kHz
Spurious radiation: -60 dB or better
Microphone: Condenser type (2000 ohms)

OPTIONS

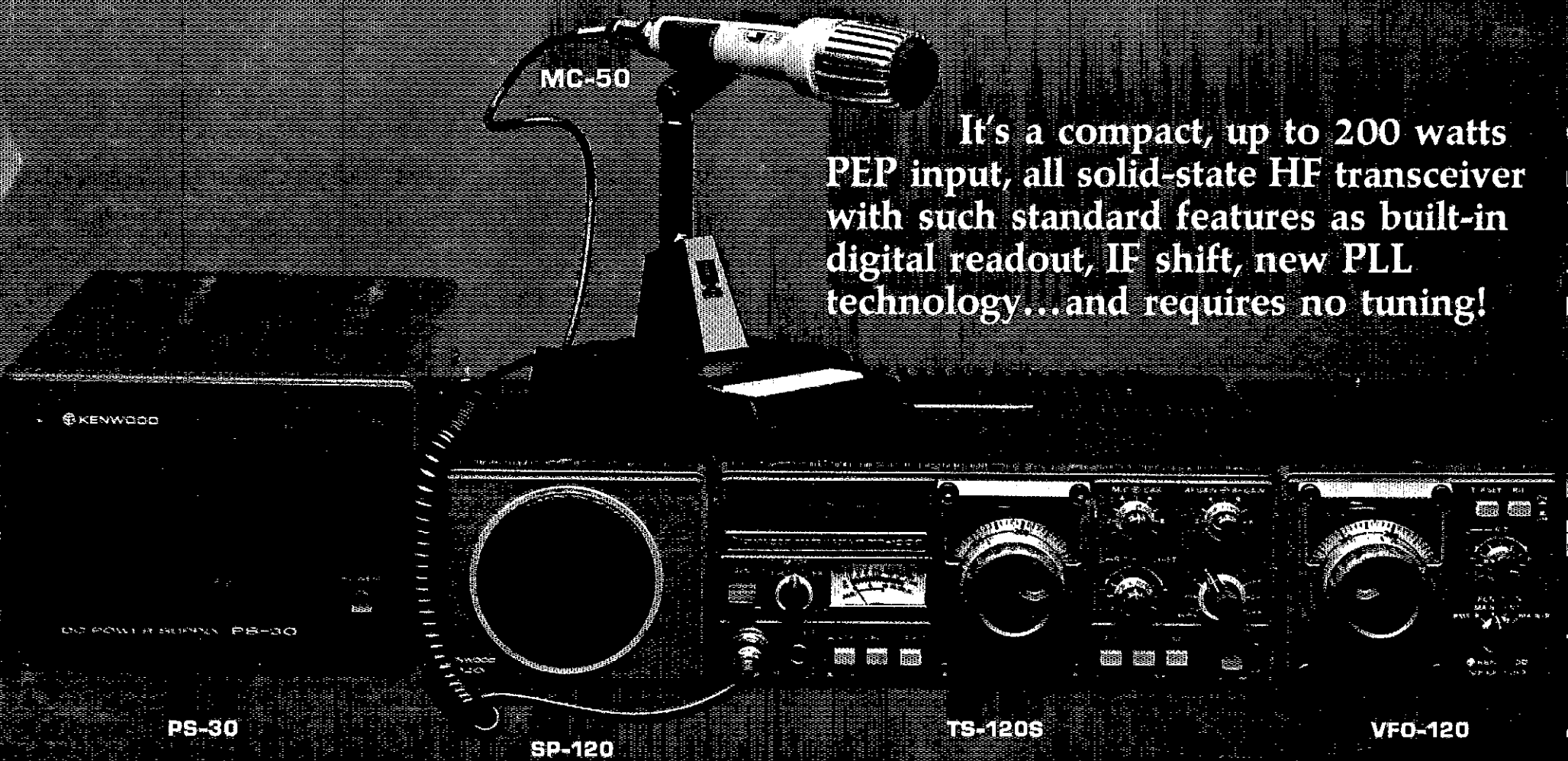
LC-C7 Leather Carrying Case
YM-24 Remote Speaker/Microphone
Tone Squelch Unit
NB-P9 Battery Pack
NC-2 Quick Charger

YAESU
The radio.

180

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
YAESU ELECTRONICS Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

TS-120S...A big little rig.



It's a compact, up to 200 watts PEP input, all solid-state HF transceiver with such standard features as built-in digital readout, IF shift, new PLL technology...and requires no tuning!

Exciting and perfect for car or ham shack use! But, there's more to say about the TS-120S! This unique all solid-state HF, SSB/CW transceiver produces a hefty signal and also offers a lot of other features in a very attractive, compact package. See this new model at your Authorized Kenwood Dealer!

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