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Kingman—12

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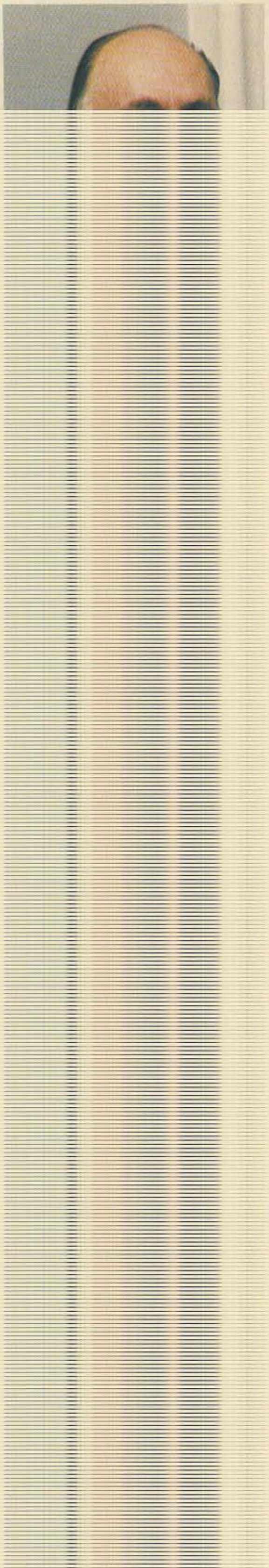

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so. Perhaps in another generation it will be possible to do more with amateur radio. There are some hints at better and cheaper educational systems which could eventually benefit these small, poor countries

The historical system for teaching the code is to start people off with the individual characters, teaching them the dot and dash equivalents of each letter, number, and punctuation mark. Then the code is

bination up in a table in the mind, and write it down.

This plateau holds fast until the person develops a completely new way of translating the code. With some people, this is

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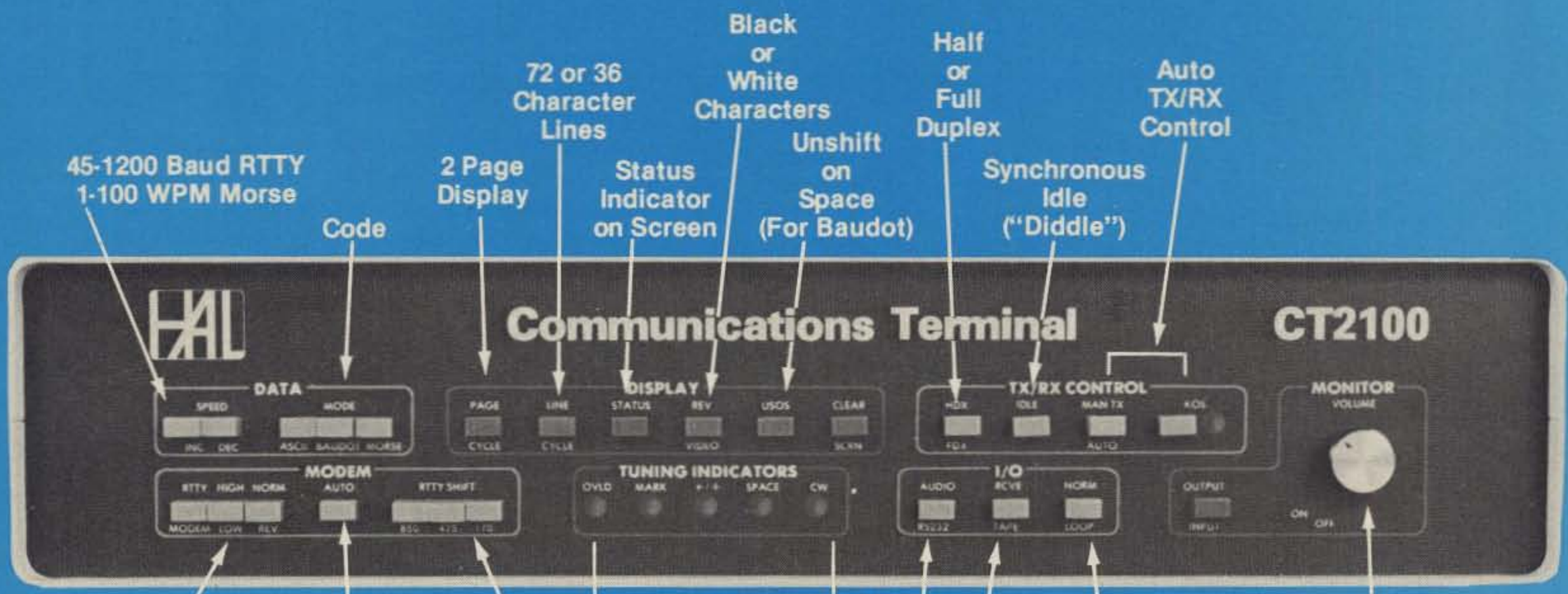

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solidified; *Banyandah* was to sail to Hawaii early in 1981, outfit herself with complete base-camp equipment, and be ready for the first group of operators by spring. Unfortunately, Harry's time to organize such a massive undertaking diminished as his electronic repair business in Sydney grew, and by late 1980 it became obvious that he would not be able to help on the first leg of this epic adventure.

At that time, the thirty-eight foot *Banyandah* was in the mid-north Pacific, battling heavy seas and gale-force winds on an early-winter crossing from Japan to Hawaii. It appeared that K/P would be an all-American operation, so I turned to my good friend, Karl Jensen KJ7B, in Seattle for help. With his usual efficiency, Karl put the word out through all the DX clubs and bulletins while spreading it across the airwaves. The initial response for the three operators needed was terrific; within a week he had a two-page list of potential candidates. But these glad tidings were short-lived; after the full requirements were explained to each candidate, all but two dropped out. To some, the three-thousand-dollar financial commitment was too steep (although as full-scale DXpeditions go, it was cheap). But to all, the real problem lay in the enormous time required to complete the two operations and make the 2,300-mile voyage. Not many people can afford thirty-five to forty days away from family or employer.

Upon our arrival in Honolulu in early December, we still had only two operators willing to challenge K/P. One, the eventual DX King of Kingman, was a quiet, family man from Minnesota. George Carleton AD0S had a burning desire to try his hand at big-time DXing. In our chats, enthusiasm seemed to ooze from his every rf wave. He was a social worker at one of the state hospitals back in Bremer, Minnesota. A plodder, a converted CB operator, he took to the challenge of DXing like a big gun from W6-land. George and his friends outgrew the local radio club when they met resistance for more DX activities. They formed their own club, the Paul Bunyan Wireless Association, immediately entered every club contest around, and offered night courses for future hams.

George and I were so diametrically opposite in backgrounds that we immediately formed a fast friendship. While I've always been a globe-traveling gypsy, working and living in almost every part of the world, George had never left his native mid-America. He married his childhood sweetheart, stuck with his original employment, and carved a homestead out of thirty acres of rural forested land.

The other operator, the third corner of the triangle, was a fine and proven contest operator from California. Kingman was his dream and an allband operation his goal. More about him later.

As the New Year rolled in, *Banyandah* lay under the highrises at Waikiki and we still had four months of preparations before us. A daily planning session was set up on 15m, with Karl KJ7B acting as the group's central coordinator. Tasks were assigned, with one operator to solicit equipment from manufacturers, the other to solicit financial aid and sponsors. My wife, Judith, and I started the laborious chore of purchasing the numerous supplies and modifying our ship to hold them.

For the base camp, we purchased two large Coleman tents, three folding tables and chairs, a propane cooker, pots and pans, dishes, water containers, sleeping bags and air mattresses, flashlights and internal lighting, all with spares and backups. In other words, our list included everything necessary to exist on a bare pile of shells in the middle of the ocean. On the critical power plant side, we chose the best: two Onan 2.5-kW portable gasoline generators modified especially with automatic oil feeders. They were expensive, but they came with built-in fuel pump, oil pressure pump, and a robust cast-iron engine. A selection of spares also was taken so that any breakdown could be remedied, including a broken crank rod. Hundreds of other items also were loaded aboard for the base camp: large-capacity plastic fuel drums, funnels, fuel transfer pumps, separate power leads for each station, and home-made twenty-seven foot push-up towers with four-foot long stainless steel anchoring stakes.

From left to right: George AD0S, Judith Binder, the author, and Bill W6HTH, aboard the S.Y. Banyandah *before departing for Kingman.*

And let's not forget the food. Case after case came aboard as Judith returned from her forays into Honolulu's markets. Can you imagine the quantity and variety necessary to feed five adults plus our two children for five weeks without a supermarket in sight for a thousand miles?

On the electronics side, matters were not progressing as smoothly. Manufacturers' budgets were getting tighter and tighter. In the past, outright donations


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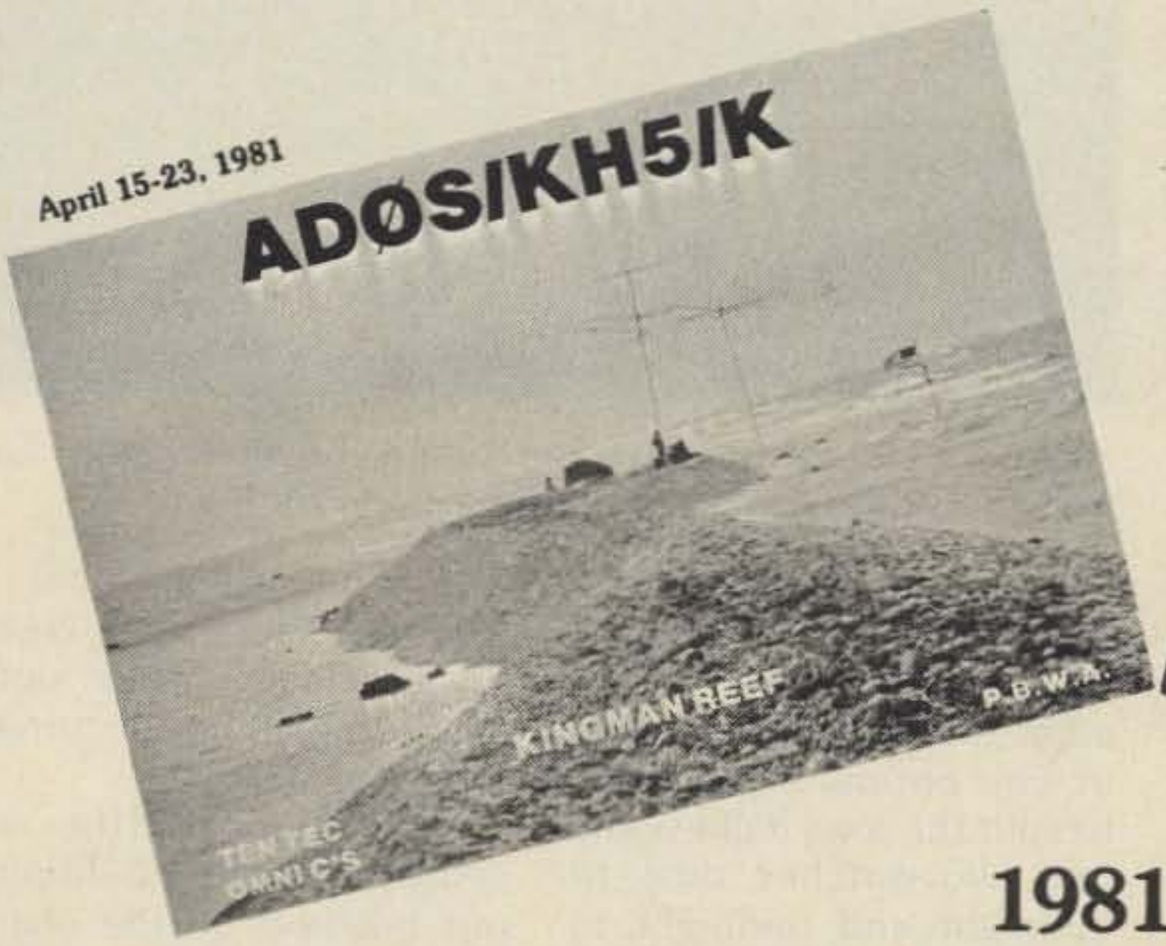
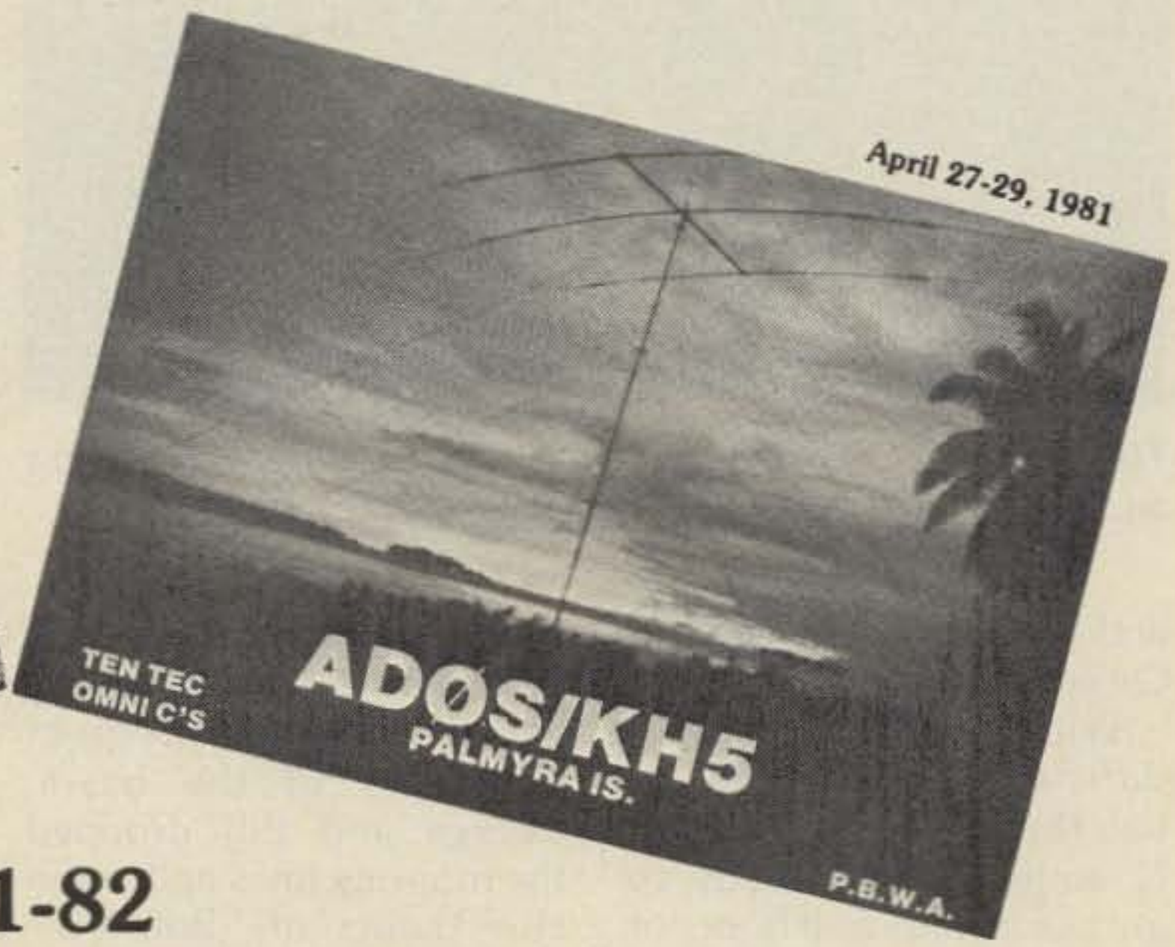
"all other gear gave us trouble... the TEN-TECs just kept working great."





1981-82 Trans Pacific DX Expedition used TEN-TEC OMNI-C transceivers.

KINGMAN REEF, PALMYRA, TOKELAU — 33,000 contacts without a miss.

As George Carleton (ADØS ex KH5K) said in a letter to TEN-TEC... *"12,100 QSO's from Kingman, 8100 for me, 3100 in the first sitting with the rig on a continuous 33 hours except for 2 minute gas breaks... all other gear gave us trouble due to salt spray – the TEN-TECs just kept working great.*

"This is the most QSO's ever from Kingman and all were barefoot. A few times generators ran out of gas during rainstorms with rigs operating on TX... no problem with voltage drop, and no damage. No tuners were used... only your rigs and (antennas). The wind blew continuously from 20 knots to 50-60 knots and we literally had to open the tent to let the rain out, salt water and spray everywhere, watches quit, keyers and linear (other brands) quit after the first QSO – arcing due to salt spray, but the TEN-TECs never even got warm when the tent was around 100°F.

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The TEN-TEC OMNI-Cs went on to serve on Palmyra and Tokelau with equally impressive results and we thank the group for their letters—we couldn't have said it better.

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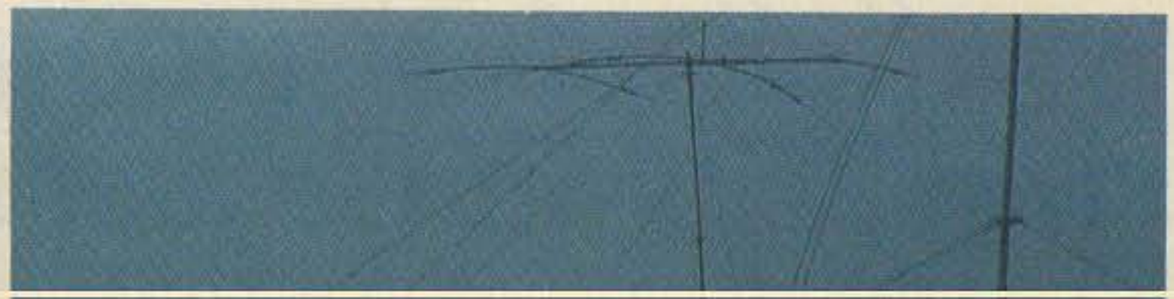
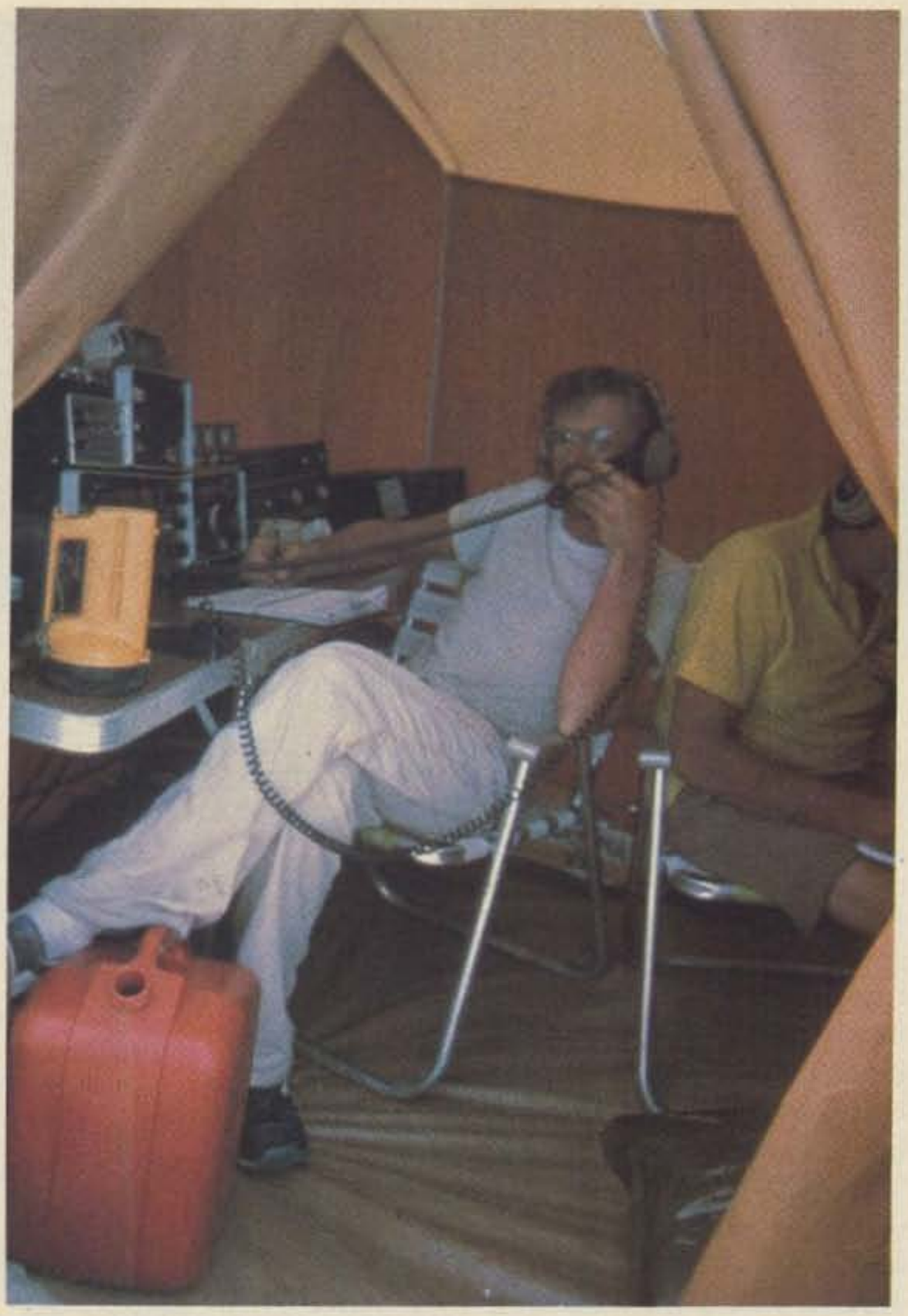


strange forces. For thousands of miles they will remain constant, flowing in one direction at a reliable rate, but upon an approach to land, with the sea bottom suddenly rising, they become unpredictable. To make matters worse, somewhere in this area we would leave one current and enter the world's strangest current, the equatorial countercurrent. This narrow band of water defies all sense by moving directly opposite to the normal trade winds. Its northern limit shifts back and forth across the region at a whim of some unseen force, causing distress among all ship captains who sail this area. Normally, a very wide berth would be given to Kingman, but it was my job to find it safely.

Soon the wind freshened and swung ominously to the southeast. Rain began to fall. It increased until my vision was down to a scant fifty feet. But *Banyandah* heedlessly sailed on, blindly cutting through the water while closing the distance between us and one of this ocean's worst navigational hazards. As the miles ticked off, I held my breath and prayed that my instruments and sights were correct and that our luck would hold. Every few minutes I poked my head above the spray dodger and peered into the rain and gloom, expecting to see that flash of white signalling breakers and destruction.

By 0400 hours, I had had enough and dropped the headsail and mizzen. Quietly, the ship came into the wind, gently rocking in the swell. I woke Judith and crawled into the bunk. "Wake me if the stars show," I said, and immediately fell asleep.

Just before 0600, I was up again. The storm had passed and the first tinges of pink lit the eastern horizon. Quickly Judith and



George AD0S, making one of the 12,176 KH5/K QSOs.

I measured the angle between horizon and our favorite navigational stars, jotting down the exact time of each sight. My voice calling out "Mark!" at each sight must have woken George and Bill; sleep was still in their eyes when they crawled out of the stern cabin. George scanned the blank horizon and said with a grin, "No trees in sight yet." And we all laughed since this was the Minnesotan's usual way of greeting a new day at sea.

The star sights didn't take long to work out and showed that we were still thirty miles from that danger which had seemed so near in the rain and the dark. The current had worked its magic and had pushed us away instead of closer. The wind had gone with the passing rain, leaving a calm sea and a bright hot day. Now under power, we continued on a new heading. A scum line was passed—a convergence of currents trapping bits of floating plastic and discarded light bulbs, all alive with small crabs and tiny fish. All morning I tracked the sun with my sextant, and my chart became a mess of intersecting position lines, each a bit closer. By the time the sun reached its azimuth we were very close, and conditions were perfect for a landing.

At 1300 hours I climbed our forty-five-foot mast and scanned the horizon. The sea was flat and calm, the horizon sharp but empty. At 1400, with (supposedly) only six miles to go, I climbed again. There! Just near the edge of the world a vague splash of white showed for a moment and I couldn't believe my luck. The breakers of Kingman Reef were in sight! At deck level, the rest of the crew jumped up and ran to the rail, but nothing could be seen. For the next hour they strained for their first glimpse. Finally, with only two miles to go, George let out a whoop of delight. The rest happened fast. One moment a flat sea, the next a long line of small breakers off our beam and the sea changed from deep blue to aquamarine. Coral heads seemed to rush up to meet us. As we crossed the sunken reef, they were plainly visible even though the depth meter recorded seventy-five feet.

Portable KH5/K first appeared as a heap of brilliant yellow-white sand, sterile and completely devoid of vegetation. The ridge of fine coral rubble and upturned coral boulders was the result of thousands, maybe millions, of years of the sea crashing against the outer barrier reef and washing the broken bits of coral and dead shells into a pile. Excitement ran high as we toured the area in the lee of the cay, taking soundings for anchoring.

It was then that we met the first evidence of Kingman's wildness. Although the depth recorder showed a steady bottom, it was over two hundred feet down! And it was all the same, right up to the perpendicular cliff of reef. At a quarter mile off, I said a silent prayer and lowered the anchor down into the blue, paying out every inch of warp, shaking my head as it slithered over the bow rollers and disappeared from sight.

The cay seemed to grow smaller instead of bigger as we approached in our ten-foot aluminum dingy. Soon it could be seen that its side was steep and not the long gentle slope we had first seen. Kingman was not smooth sand but an im-

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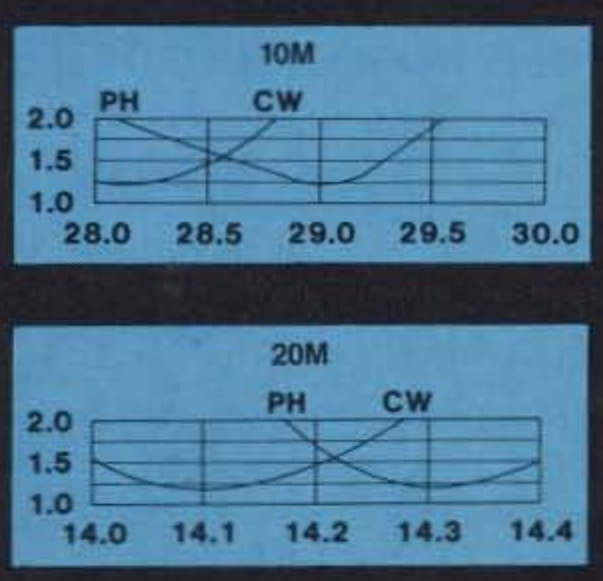

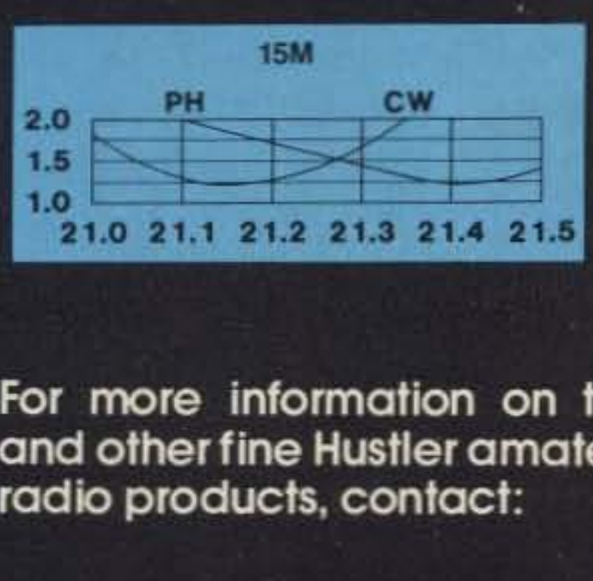

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teen hours after we began. Not surprisingly, it was between George and Mike AFØT, with a "job well done" message from Minnesota. It *had* been a job

We rounded the island's eastern tip just after lunch and sailed along its southern shore, feasting our eyes on the greens and yellows while savoring the

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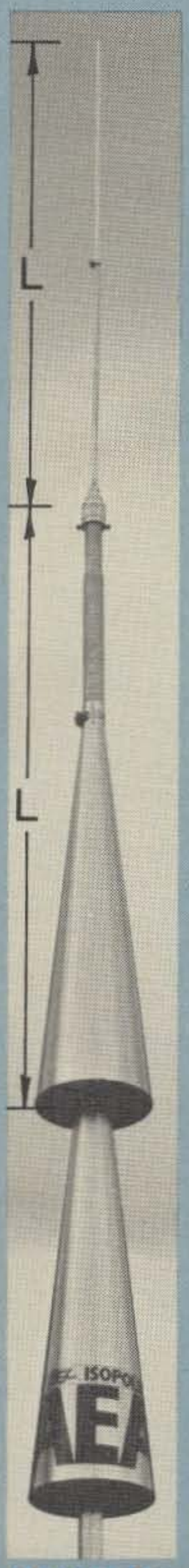

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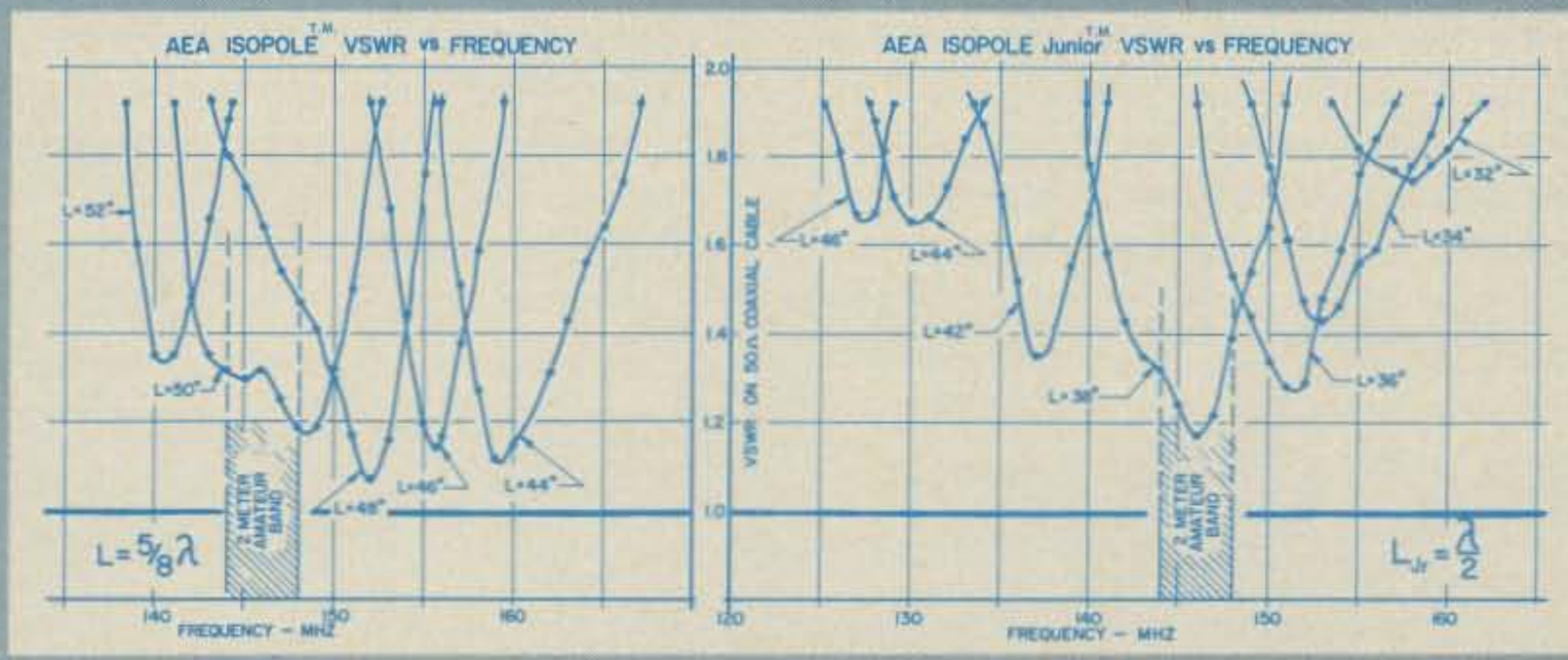

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stores) appears to provide a good, inexpensive solution.

Ground

A quarter-wave antenna requires a low-resistance ground to be an efficient radiator. The station equipment must be properly grounded to keep rf off the equipment chassis and to prevent rf feedback. The grounding arrangement that met these requirements is shown in Fig. 2. The heavy straps shown are all 3/8" braid.

It is common practice to increase radiating efficiency (reduce ground losses) of electrically short antennas by laying quarter-wave conductors out in all directions from the base of the antenna either on or below the ground—the more radials the better. Since in this installation the base of the endfed inverted-L is terminated at the house and because of the narrow width of the lot, even a small number of radials cannot be accommodated. I settled for one 135-foot radial connected to the common ground point inside the window, dropping directly from the window to the ground below and running approximately under and approximately parallel to the horizontal portion of the antenna. The single radial is buried a few inches under the ground to get it out of harm's way.

It did not take long to determine that this antenna and ground combination was a good radiator. However, it left much to be desired as a receiving antenna. Consistently, I was being copied by stations that I could not pull out of the noise. Consistently, the other stations were copying stations that I could not copy. My station was "receiving limited."

Receiving Antenna and Preamplifier

In searching for a better

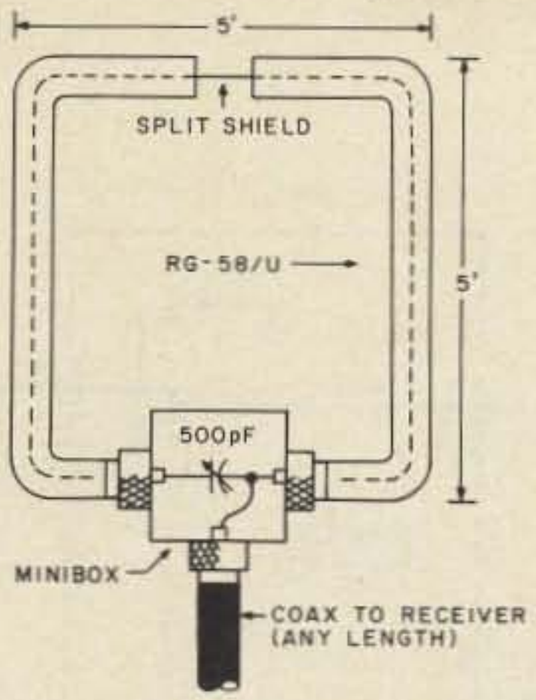


Fig. 3. Loop receiving antenna.

receiving antenna, I came across the 5-foot, single-turn, shielded loop in *The ARRL Antenna Handbook* (see Fig. 3). Much to my surprise and delight, this little loop mounted two feet above the ground and working into a preamplifier proved to be a simple, convenient antenna with superior performance. The loop was made of RG-58/U coax mounted on a 6½-foot wooden dowel mast with light wood cross pieces. The mast was mounted on a TV antenna rotor which was in turn mounted on a 2-foot-square plywood base. RG-58/U was also used for the feedline. With the recent reopening of 160, it would be better to construct the loop and feed using lower-capacitance RG-59/U foam cable. This would provide increased performance across the band.

The signal level produced by the loop antenna is quite low but easily can be boosted to an acceptable level with a simple transistor preamplifier. Because the preamp I used was home-built and because there are some associated system ramifications, a description of the circuit is included here (Fig. 4).

This simple preamp was not designed, but rather built from the simplest FET circuit I could find out of

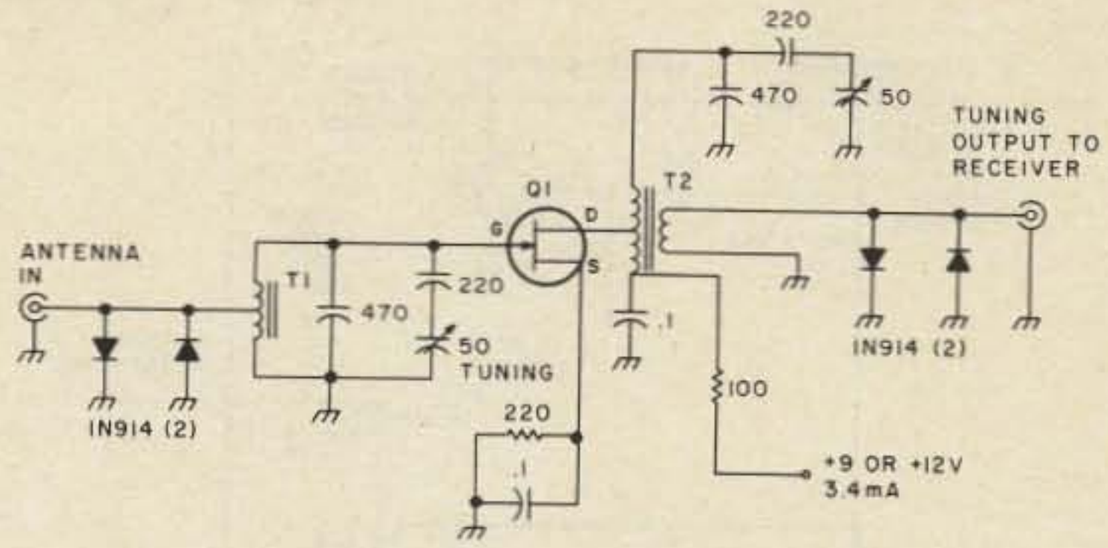


Fig. 4. 160-meter preamplifier. Q1—FET, Radio Shack 276-2036; T1—Amidon T50-2 toroid core, approximately 50 turns (core full), tapped at 6 turns; T2 is the same as T1 except that it is tapped at the center and has a 6-turn link over the ground end.

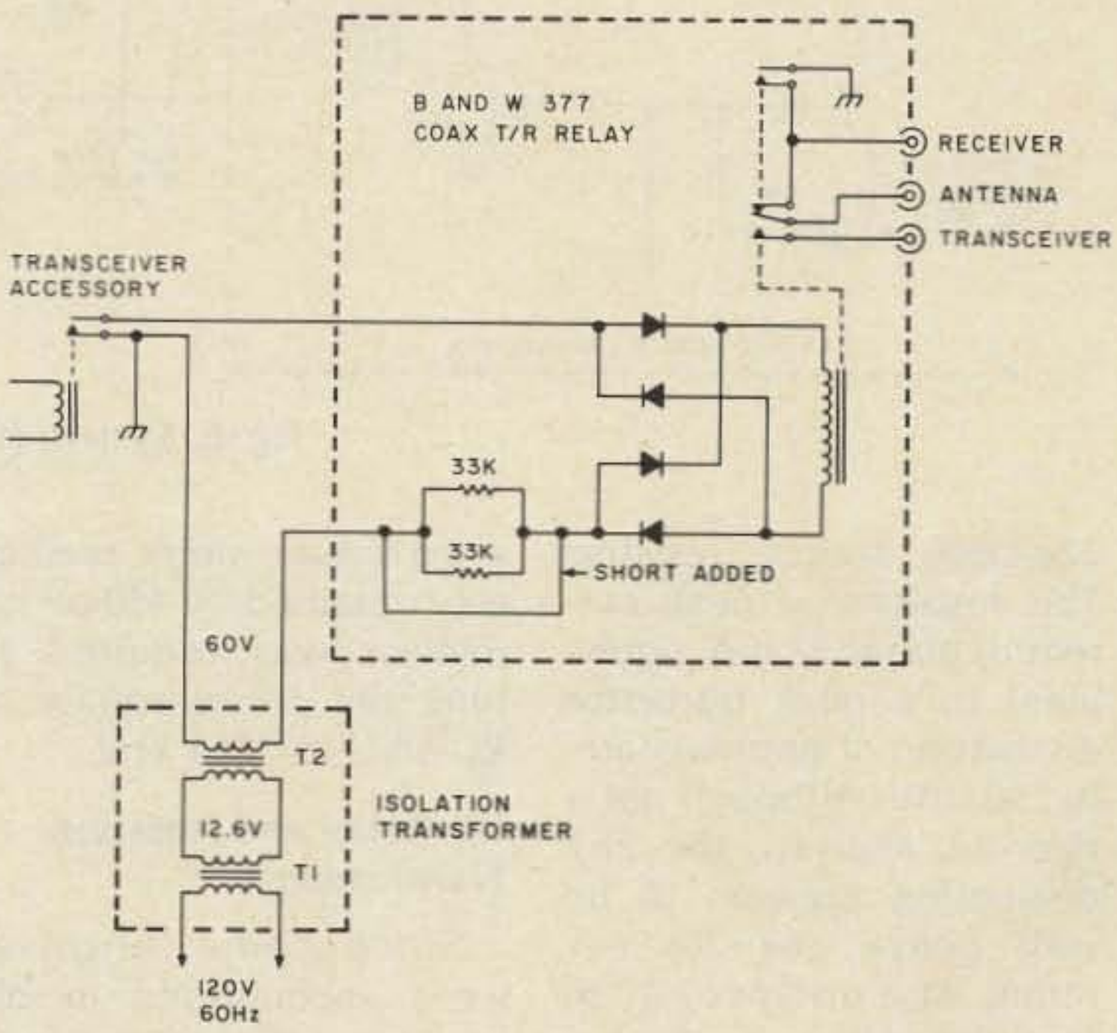
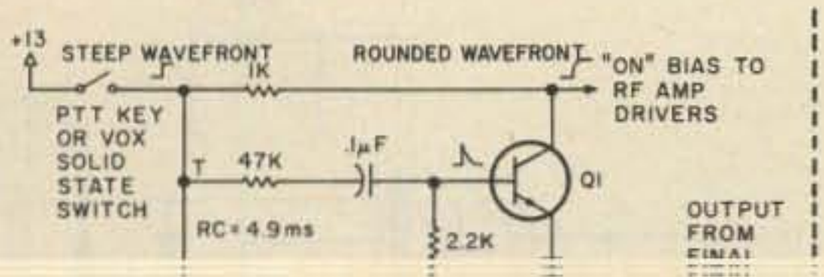


Fig. 5. T-R relay details. T1—Radio Shack 273-1505, 120:12.6 V, 1.2 A; T2—Radio Shack 273-1386, 120:25.2 V, 0.3 A.

available parts. The input and output tuned circuits were arranged to cover 1800 to 1850 kHz. It could undoubtedly be improved, possibly by broad-banding, to eliminate the need for tuning. It provides a gain approaching 20 dB, but in my "brassboard" model is uncomfortably close to oscillation. It performed well enough on the first try that no effort was put into improving it. It would have to be modified to cover more than the 1800-to-1850-kHz portion of the band.

Since this article was first written, the 160-meter band has been opened to 1900 kHz and the loop performance has been improved by replacing the preamp in Fig. 4 with an untuned broadband preamp at the base of and connected directly to the loop.

Note the protective diodes in both the input and output of the preamp. The input is wide open on transmit and there is a danger of transmitting into the output, hence the diode protection on both ends. With 100 Watts into the inverted-L and with the loop antenna about 10 feet from the downlead, a peak audio-frequency signal of 6 volts is developed across the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1K
ROUNDED WAVEFRONT
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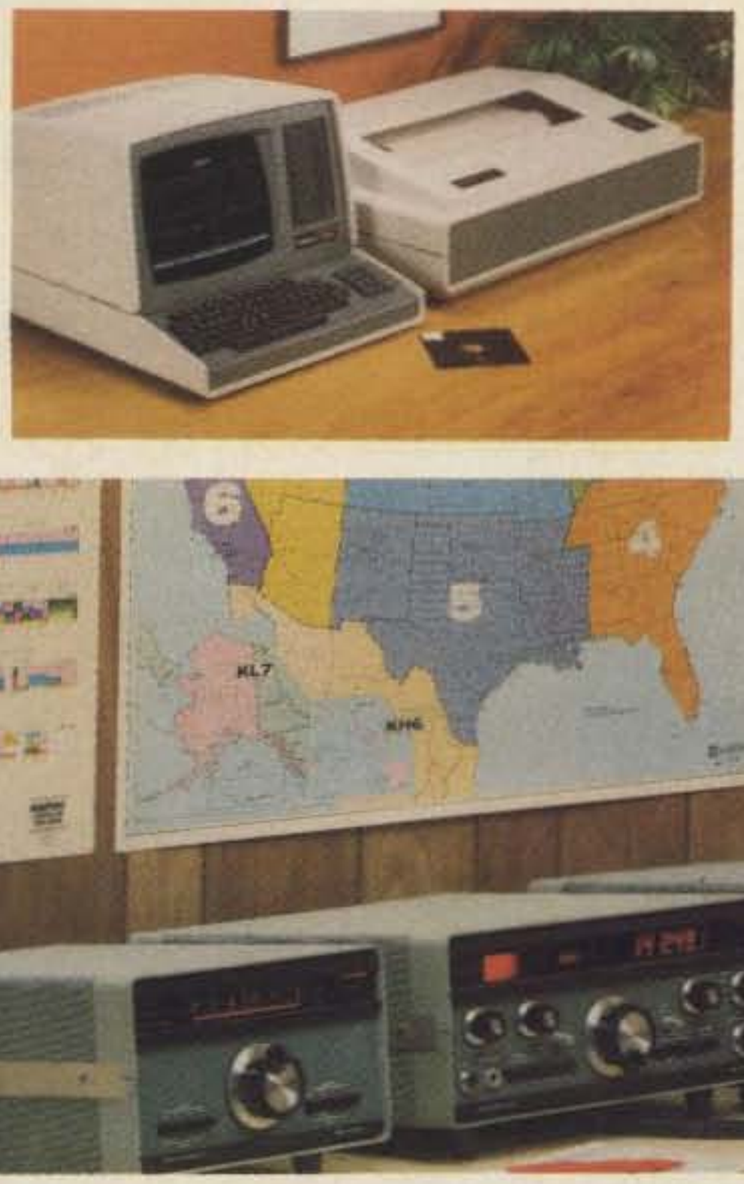

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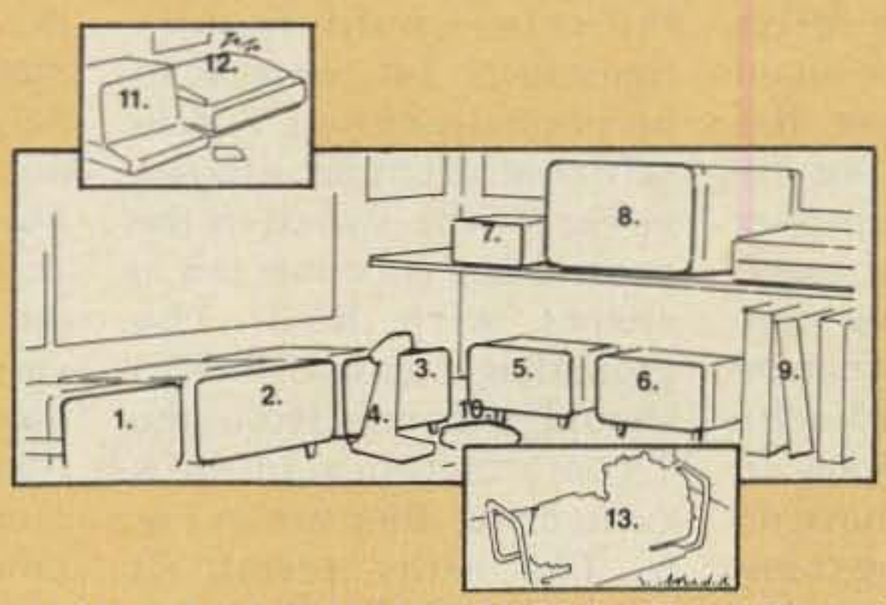

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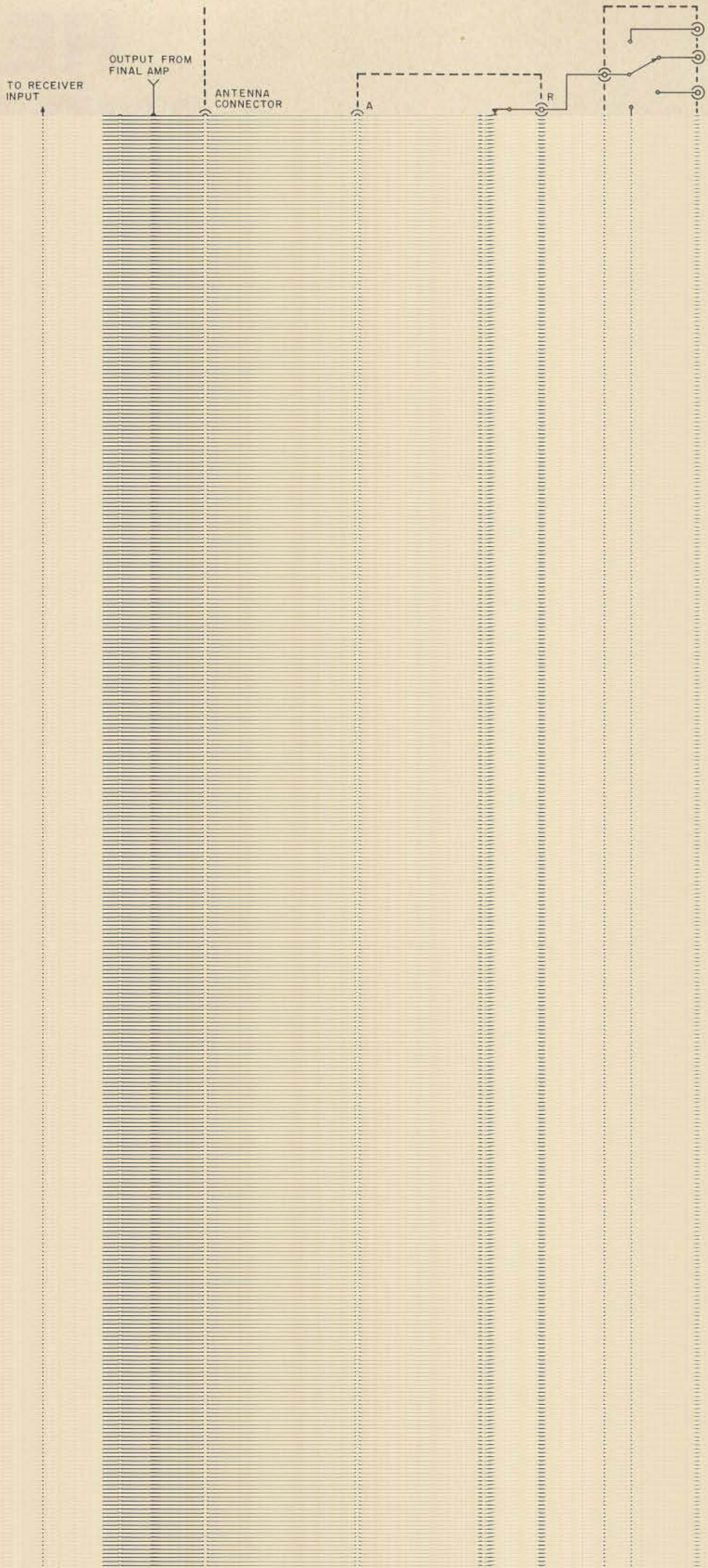
tor and capacitor in series with the base of Q1 applies a decaying pulse to the base until the capacitor is charged, after which the



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CNW418 (not shown)—Same specifications as CNW518 except: **Power Rating:** SSB-500 watts PEP, CW-200 watts • **Dimensions:** 225W x 90H x 245D m/m

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more heat, which causes more current. Eventually, the transistor can self-destruct. VMOS FETS have just the opposite effect—more heat tends to decrease current flow.

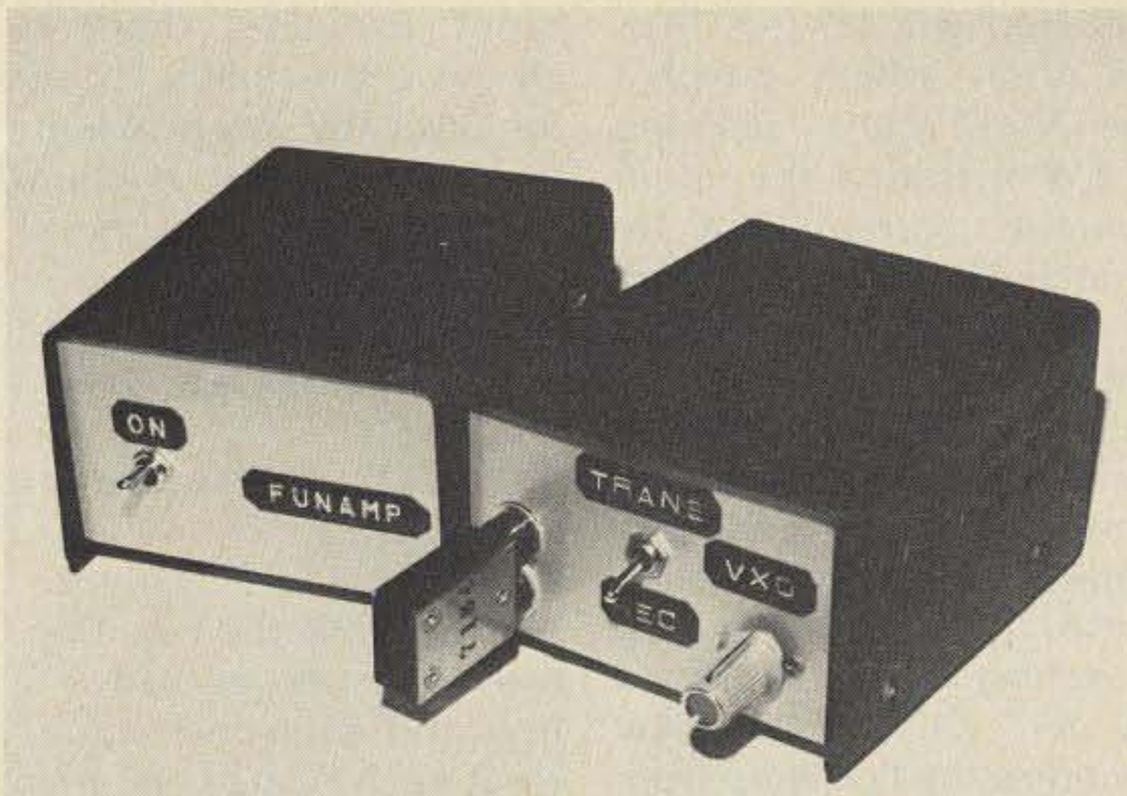
Mismatch burnout occurs in regular transistors when an impedance mismatch occurs between the load (antenna) and the output network. This is seen when a high swr exists—such as with an open line or non-resonant antenna. This condition can destroy most transistors quickly, but the VMOS FET comes through with flying colors.

Additional benefits of the VMOS FET are the ease of parallel use and ease of matching input and output. In order to reach the 20-Watt output level with Radio Shack parts, it was necessary to parallel three VN67AF VMOS FETs. No current hogging exists with VMOS, so no "ballasting" resistors were needed.

One problem of the VN67AF VMOS is the built-in static protection zener diode. This diode limits the maximum gate-to-source voltage which in turn limits the output power. Unfortunately, Radio Shack sells only the VN67AF. VMOS devices are manufactured without the zener diode, but in order to meet the objective of Radio Shack part usage, they were not used.

Fig. 1 shows the simple schematic of the Fun-Amp. I decided to use as simple a design as possible and thus eliminated an input network and an intricate output transformer. A good design goal for home-built equipment is "make it as simple as possible." The amplifier, however, does not suffer in performance due to the simplicity.

The input from the Fun-Mitter is applied to a "pi-type" attenuator (R1, R2, R3). This reduces the input power to the VMOS FETs to the needed level. The Fun-Amp can be driven with only 2 Watts, if desired, to reach the 20-Watt output level. This will be described in detail later. Three VN67AF VMOS FETs are used in parallel to generate the 20 Watts of rf power. Each FET supplies about 1/3 of the total power.



Because of the VMOS's built-in zener diode, CR1 has been added to the circuit. It clips the input sine-wave signal so that it does not go negative. If CR1 was not in the circuit, the FET would quickly be destroyed.

There is no forward bias used on the FETs and thus the amplifier operates in Class C. This is significant for two reasons. One, the amplifier can be used only for CW operation. SSB operation will result in severe distortion. Secondly, Class C operation results in high efficiency (power in/power out), which is a definite plus.

The output network consists of L2, L3, and C3. This network is commonly referred to as a T-network and its function is to match the output impedance of Q1-Q3(16Ω) to the 50Ω antenna load. It also offers some harmonic attenuation. L2 and L3 are constructed from Radio Shack 10-μH rf chokes—a technique familiar to builders of the earlier gear.

The amplifier is operated from +24 V, same as the Fun-Mitter. Current needed for the amplifier is around one Amp. The power supply described in the Fun-Mitter article should work fine, provided the regulator is mounted on a good heat sink, such as part number 276-1361. Total demand from the supply if both the Fun-Mitter and Fun-Amp

Parts List

C1	570 pF (470 and 100 in parallel)	272-125 272-123
C2,C5	0.1 uF	272-135
C3	80m: 1000 pF	272-126
	40m: 470 pF	272-125
C4	.01 uF	272-131
C6	10 uF, 35 V dc	272-1013
CR1	1N914 small signal silicon	276-1122
CR2	1-Amp, 50-V diode	276-1101
J1,J2	SO-239	278-201
J3,J4	Phono jack	274-346
K1	DPDT relay	275-206
L1	10-uH rf choke	273-101
L2	Modified 10-uH rf choke	273-101
	For 80 meters remove 14 turns	
	For 40 meters remove 19 turns	
L3	Modified 10-uH rf choke	
	For 80 meters remove 10 turns	
	For 40 meters remove 15 turns	
Q1-Q3	VN67AF VMOS power FET	276-2071
R1,R3	For 5-Watt Fun-Mitter use 150Ω,1/2 W	271-013
R2	For 5-Watt Fun-Mitter Use 33Ω,1/2 W	271-007
R4	47Ω, 1/2 Watt	271-009
R5	47k Ω,1/4 Watt	271-1342
R6	155Ω (three 470Ω, 1/2 W in parallel)	271-019
S1	SPDT switch	275-612
Misc.	TO-220 heat sink (3)	276-1363
	Heat sink grease	276-1372
	Case	270-251
	Hardware	64-3012 64-3019
	Wire	278-1304

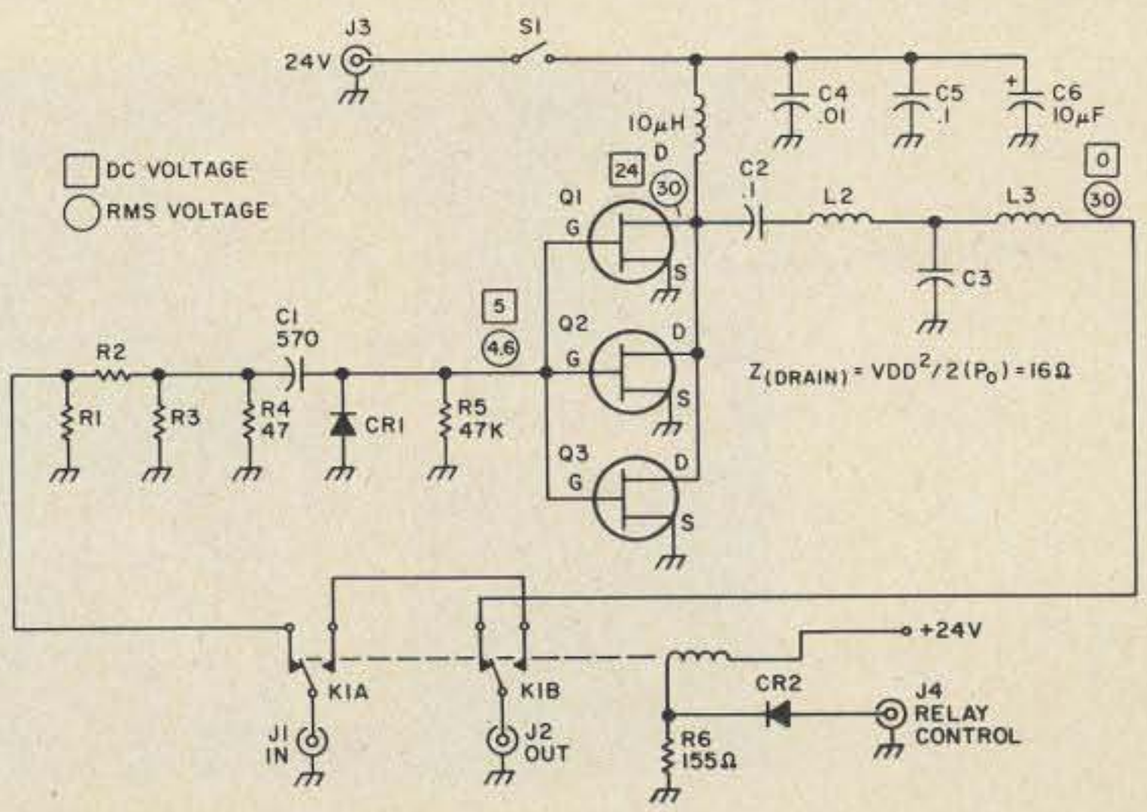


Fig. 1. Schematic.

are used will be less than 1.5 Amps, which is within the LM317 ratings. Because of CW operation, the actual average current will be around 3/4 Amp (50% duty

proof projects, there is always a possibility for error. Basically, any problems that hams have encountered have been in one of three areas:

in power, a method is needed to dissipate the heat produced in Q1-Q3. Radio Shack heat sinks designed for a TO-220 transistor case are used for this purpose

all rf connections to and from the relay and the PC board. Number 18 gauge (or similar) hookup wire can be used for the supply lead to and from J3 and S1

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Capable of communication rates to 300 baud, the TU-300 is designed specifically for modern high-speed and standard RTTY applications. The TU-300 operates with standard microcomputer, TTY and radio equipment and is TTL and RS 232-C compatible. Controllable by remote, this next generation terminal unit with innovative modular design provides more than six times the conventional amateur data transmission rate using present radio and computer equipment. Featuring three frequency shifts, the TU-300 is the only 300 baud terminal unit offered in easy to construct kit or wired.

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- bar graph tuning and LED function indicators
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- easy to tune multipole active filters
- TTL and RS 232-C compatible I/O's
- optional 20 and 60ma optically isolated loop supply
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For more information about the TU-300, contact:

Flesher Corporation

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913-234-0198 • Telex 437125

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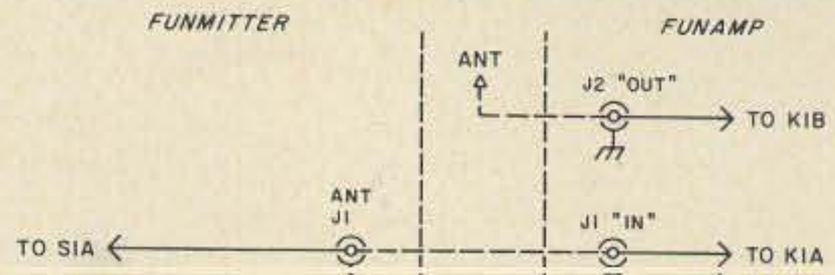
occur between ground and the drains of Q1-Q3 (with S1 off). This reading will vary depending on the model of ohmmeter you have and the polarity of the leads

meter and about 20 Watts of rf should appear at J2 as seen on a wattmeter.

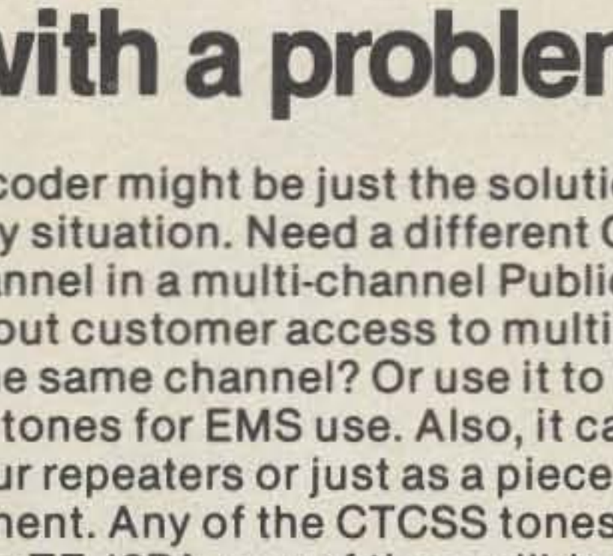
If desired, the Fun-Amp can be driven with less than



Stuck with a problem?

Our TE-12P Encoder might be just the solution to pull you out of a sticky situation. Need a different CTCSS tone for each channel in a multi-channel Public Safety System? How about customer access to multiple repeater sites on the same channel? Or use it to generate any of the twelve tones for EMS use. Also, it can be used to access Amateur repeaters or just as a piece of versatile test equipment. Any of the CTCSS tones may be accessed with the TE-12PA, any of the audible frequencies with the TE-12PB. Just set a dip switch, no test equipment is required. As usual, we're a stickler for 1day delivery with a full 1 year warranty.

- Output level flat to within 1.5db over entire range selected.
- Immune to RF.
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.



TE-12PA

67.0 XZ	85.4 YA	103.5 1A	127.3 3A	156.7 5A	192.8 7A
71.9 XA	88.5 YB	107.2 1B	131.8 3B	162.2 5B	203.5 M1
74.4 WA	91.5 ZZ	110.9 2Z	136.5 4Z	167.9 6Z	
77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
79.7 SP	97.4 ZB	118.8 2B	146.2 4B	179.9 6B	
82.5 YZ	100.0 1Z	123.0 3Z	151.4 5Z	186.2 7Z	

- Frequency accuracy, ±.1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order.
- Continuous tone

TE-12PB

TEST-TONES:	TOUCH-TONES:		BURST TONES:			
600	697	1209	1600	1850	2150	2400
1000	770	1336	1650	1900	2200	2450
1500	852	1477	1700	1950	2250	2500
2175	941	1633	1750	2000	2300	2550
2805			1800	2100	2350	

- Frequency accuracy, ±1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

$89.95

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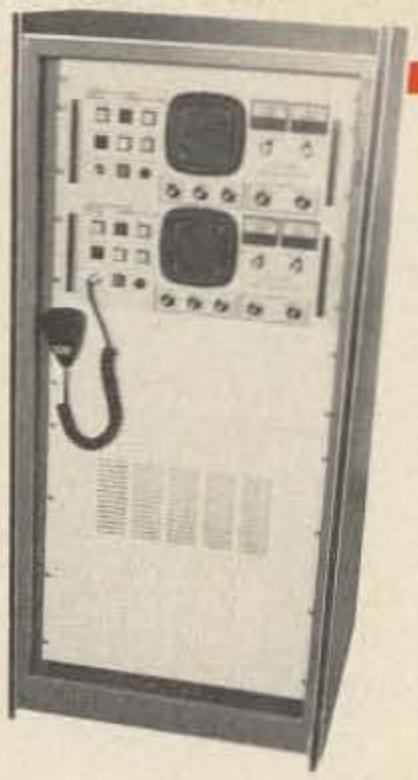
10M FM Repeaters, Remote Bases,



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These are Professional "Commercial Grade" Units—Designed for Extreme Environments (– 30 to + 60° C).

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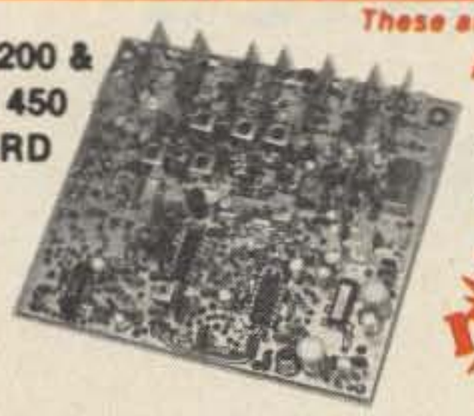

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SCR200 VHF Receiver Board

Totally New Advanced Design!

8 Pole Front End Fltr. + wide dynamic range—reduces overload, spurious Resp. & IMs!

Sens. 0.3 uV/12dB SINAD typ.

Sel. -6dB @ ± 6.5 KHz. -130dB @ ± 30KHz. (8 Pole Crystal + 4 Pole Ceramic Fltrs.

'S Meter' Discriminator & Deviation Mtr. Outputs!

Exc. audio quality! Fast squelch! w/0.0005% Crystal. *("Super Sharp" IF Fltr. also avail.)*

SCR200 Receiver Assembly

- **SCR200 mounted in shielded housing**
- Completely asmbld & tested, w/F.T. caps, SO239 conn.

As used in the SCR1000. Ready to drop into your system! *High Recommended!*

SCR450 UHF Receiver Bd. or Assy.

- Similar to SCR200, except 420-470MHz

SCAP Autopatch Board

Provides all basic autopatch functions
Secure 3 Digit Access; 1 Aux On-Off function,
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Write/call for details and a data sheet

RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land Line Control of Repeater
- Includes land line "answering" circuitry

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- Adjustable ID tone, speed, level, timing cycle
- 4 Input AF Mixer & Local Mic amp
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- CMOS logic, PROM memory—250 bits/channel
- Up to 4 different ID channels!
- Many other features. Factory Programmed

FL-6

FL-6 Rcvr. Front-End Preselector

- 6 Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz).
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CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX Shutdown/Reset, etc.
- Includes Inputs & Outputs for panel controls & lamps

Repeater Tone & Control Bds.—For SCR1000/4000 & CTC100/ID250 only

TRA-1 "Courtesy Tone Beeper" Board

- Puts out a tone beep apx. 1 sec. after RX sig. drops—thus allowing time for breakers
- Resets T.O. Timer after "beep"

TMR-1 "Kerchunker Killer" or "Time Out Warning Tone" Bd.

- For **One** of above 2 functions
- "Kerchunker Killer" provides adj. delay (0-10 sec.) for *initial rptr. access*. Auto-Reset at end of QSO.
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PSM-1 Repeater Power Supply Mod Kit

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- For SCR-1000 or SCR-4000
- Replaces Darlington Pass Tr.—*for improved reliability*
- Includes new overvoltage "Crowbar" shutdown circuit.
- Complete kit, w/assembled PC board. $19.50 + $3.50 shipping/handling.

PRM200 Power Supply Filter Cap/Regulator/Metering Board

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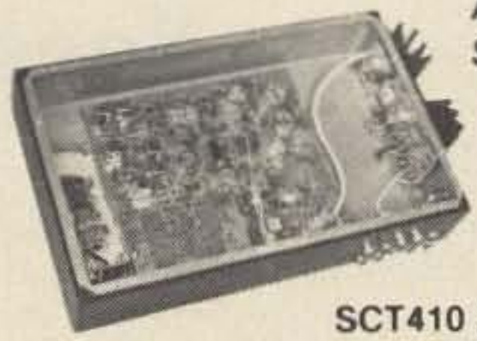
- Includes 14,000 µF Filter Cap, Reg. IC and Driver Trans., V/I Meter shunts and cal pots.
- Requires Xfmr., Br. Rect., Pass Tr./Heat Sink, (Optional Meter), for complete supply.

10M ALSO AVAILABLE See Aug. 73 Ad.



SCT410 XMTR. ASSY.

SCT110 VHF Xmtr/Exciter Board

- 7 or 10 Wts. Output 100% Duty Cycle!
- Infinite VSWR proof.
- True FM for exc. audio quality.
- Designed specifically for continuous rptr. service. Very low in "white noise."
- Spurious -70 dB. Harmonics -60 dB.
- With .0005% xtal.
- **BA-10 30 Wt. Amp board & Heat Sink,** 3 sec. L.P. Filter & rel. pwr. sensor. **BA75 75 Wt. unit also available.**

SCT110 Transmitter Assembly

- *SCT110 mounted in shielded housing.*
- Same as used on SCR1000.
- Completely assmbld. w/F.T. caps, SO239 conn.
- 7, 10, 30, or 75 Wt. unit.

SCT410 UHF Transmitter Bd. or Assy.

new

- *Similar to SCT110, 10 Wts. nom.*
- Avail. w/ or w/o **OS-18 Super High Stability Crystal Osc./Oven.**
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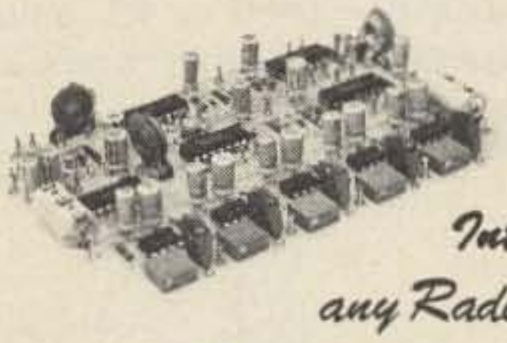
- Varies B + to control Pwr. Out
- Switchable Hi, Low, or Med. Pwr. out, locally or remotely. Adj. levels.



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Interface to any Radio or AF system!

- 3 digit ON, 3 digit OFF control of a single repeater function. Or, (optional) 2 functions (2 digits ON/OFF each)
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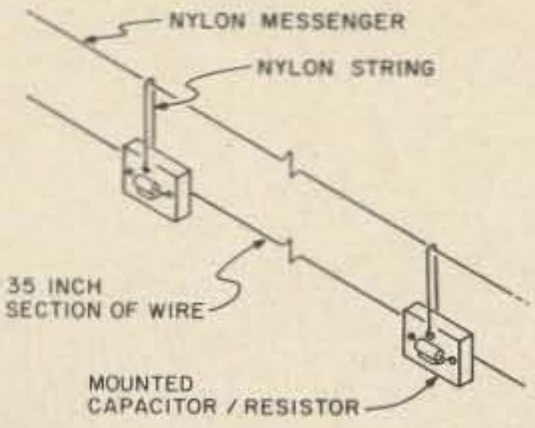

Fig. 3. Nylon messenger and 1 section of antenna.

tenna was suspended. Initially, I hung the messenger 3½ feet above the ground.

Next, I made a jig on a piece of wood which had two nails separated exactly 35 inches. Then I bent 48 pieces of wire around the nails, leaving a 2-inch tail at each end. The tails are used to tie in the resistor/condenser combination. When you've finished cutting and bending the 48 pieces of wire, put them aside in a neat arrangement so they won't snarl.

I used 46 one-Watt resistors, with a value of 47k, and 46 Mallory SXM 339 capacitors, 390 pF, at 160 volts dc. Prior to installing these capacitors, I found that 2 were defective, and 1 was not within tolerance. The testing of the capacitors prior to installation can save you a lot of problems and work later on.

The next job was to make 48 insulators and the feedpoint insulator. I used some 1/8-inch Lucite that I had in the junk box. Figs. 1 and 2 give the details. The next step involved mounting and soldering a capacitor and resistor to each section of wire. Remember, you have 48 sections of wire and only 46 capacitor/resistor combinations. Start at the feedpoint insulator and connect the first section of wire (the end without the insulator) to the feedpoint insulator solder lug and solder it.

The other end of the wire will have the capacitor/resistor mounted on an insulator. Refer to Fig. 1 and note the hole at the top middle of the insulator. I used a 7-inch piece of nylon string and suspended the insulator about 3 inches below the messenger. I continued this process until all the sections were installed and soldered. Using this method of suspending the wire sections allows the antenna to ride free, with no mechanical strain on it whatsoever. So far the antenna has withstood 45-mph winds, rain, and hot sun without any problems. Fig. 3 shows a section of the completed antenna.

The mechanical work is now completed, and we're ready to begin the preliminary antenna tests. I used the authors' design criteria[1] for a 40-meter antenna with a low frequency cutoff of 7050 kHz. I connected a 3-turn loop at the feedpoint insulator and, using a grid-dip meter, resonance occurred at 7002 kHz. Next, the 300-Ohm TV feedline was connected to the feedpoint. About 80 feet of line was needed to reach the shack. I prefer the use of an antenna tuner rather than a 4:1 step-up transformer, because a tuner permits you to tune out any residual reactance in the overall antenna system. Next, I tuned up the transceiver on 7200 kHz and adjusted the antenna tuner for minimum swr between the exciter and the input of the antenna tuner. Using a Bird wattmeter, I set the output of the exciter to 1 Watt. Any swr meter will serve the same purpose; the main consideration here is that only a minimum of power is required to excite the antenna. The rf indicator which I used to check each section of the antenna consisted of a 50 μA meter, using a couple of 1N34s as rectifiers. A 6-inch piece of wire was used as the rf probe. Next, I walked the entire length of the antenna, holding the rf probe at a uniform distance from the antenna, and checked each section. At the ends of each section, I recorded 12 μA, and near the middle of each section, the rf probe indicated 29 μA. These same approximate readings occurred at each section, right down to each end. In other words, I had a uniform radiating surface over the entire length of the antenna. Remember, this antenna is only 3½ feet above ground. It didn't take me long to get back into the shack and fire up on 40 meters.

The first thing that I noticed was that the receiver was very quiet. Signals were right up there in strength. I made three contacts (about 200 miles) and my reports were Q5 and S9 plus. This was with 100 W dc input. I left the antenna at 3½ feet for about a month and did a lot of listening and QSOing. The results have been more than gratifying.

My next task was to raise the antenna to 50 feet. This was a snap with the nylon messenger. All I had to do was coil the antenna up, take it to the mast, stretch it out, attach the feedpoint insulator to the halyard, and pull it up. Next the ends of each messenger were snaked through and among the trees and secured wherever convenient. I find it difficult to describe the physical configuration of the antenna, but the feedpoint is up about 50 feet and the rest of the antenna is hidden among the trees. I have 86 trees on the property and an XYL who loves trees; 'nuff said.

All in all, I'm very happy with the results of this antenna and I'm thankful to W4FD and W4ATE for providing me with a very interesting and rewarding project. ■

References

1. Harry A. Mills, Gene Brizendine, "Antenna Design: Something New," *73 Magazine*, October, 1978.
2. Harry A. Mills, Gene Brizendine, "The CCD Antenna—Another Look," *73 Magazine*, July 1981.

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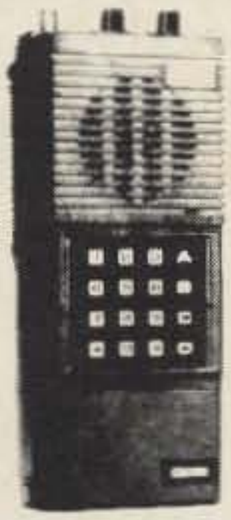

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stallation would be exactly ten feet above the roof. I had a two-story house with the point of the roof 25 feet above ground level, so the beam would just clear the roof.

"Like most homeowners, I am concerned about the aesthetics of our community and adherence to the community's deed restric-

the street in front of my neighbors' houses behind mine. I figured there were 26 homes from which my neighbors would be able to

put up the beam were justified, as I worked several new countries in a matter of an hour. My HW-101 was producing 599 signals from

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● Built in nicads for the memory retention which has drain in nano-amps, not milli-amps. The internal battery will hold the memory for up to one year! No other radio offers you this feature.

● Fast and easy dialing. Full solid state dialing and you can choose from the front panel either a fast or slow dial rate.

● No relays are used, only solid state switching. This eliminates a trouble spot many radios encounter.

● KDK has also eliminated another trouble spot by completely hand wiring each radio. No internal plugs to become intermittant and no wire wraps either, just good solid wiring.

● KDK gives you one of the hottest receivers you can find. By using UHF (not VHF) dual gate MOS-FETs with electronic auto tuning for the RF amplifier and the first mixer, you have a combination of ultra sensitivity and maximum quietness.

● The audio output stage in the 2025A Mk II uses an integrated circuit which has internal protection against over-voltage and shorted output conditions. Plus it is a high audio output chip – just what you need in a noisy mobile situation.

● The transmitter uses direct VCO varicap modulation for true FM. Your transmitted audio sounds as it should; crisp, clear and natural.

● The power output stage of the 2025A Mk II will not break down even with an infinite VSWR load, and uses heavy duty solid state antenna switching with a four stage low pass filter. All this gives you an exceptionally clean, spur free output.

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● You can switch from 25 watts to 3 watts low power.

● And, of course, the DC cable is included along with the microphone and mobile mounting bracket.

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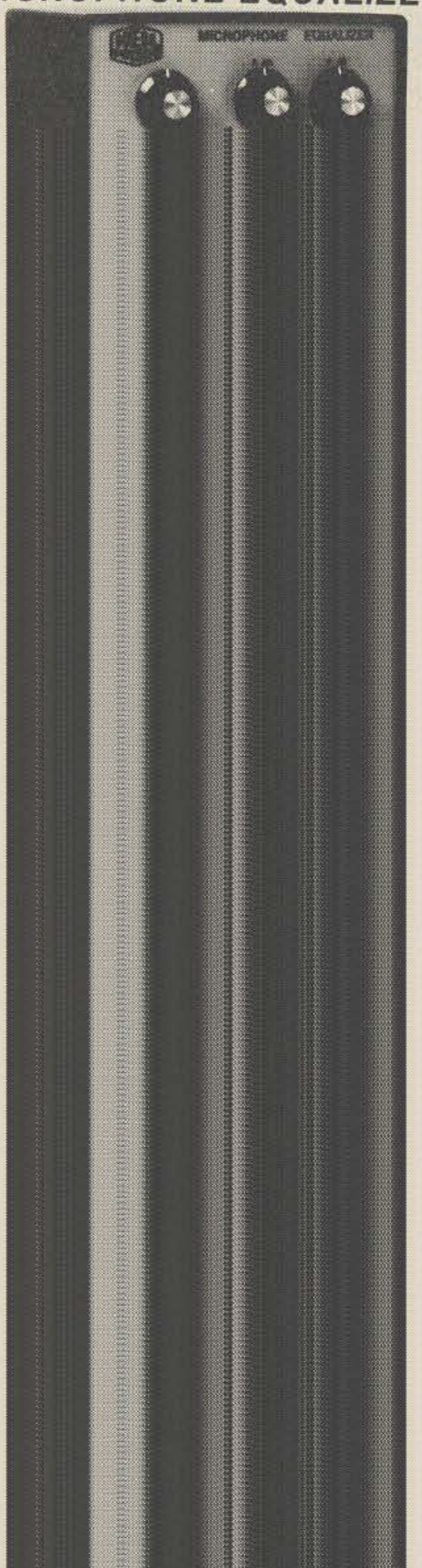

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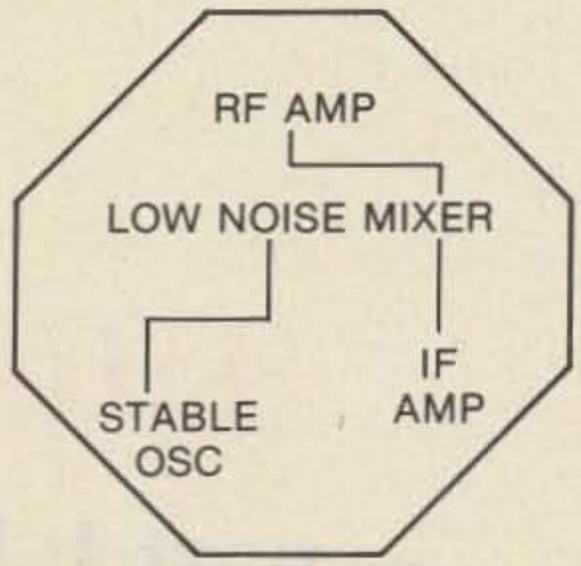

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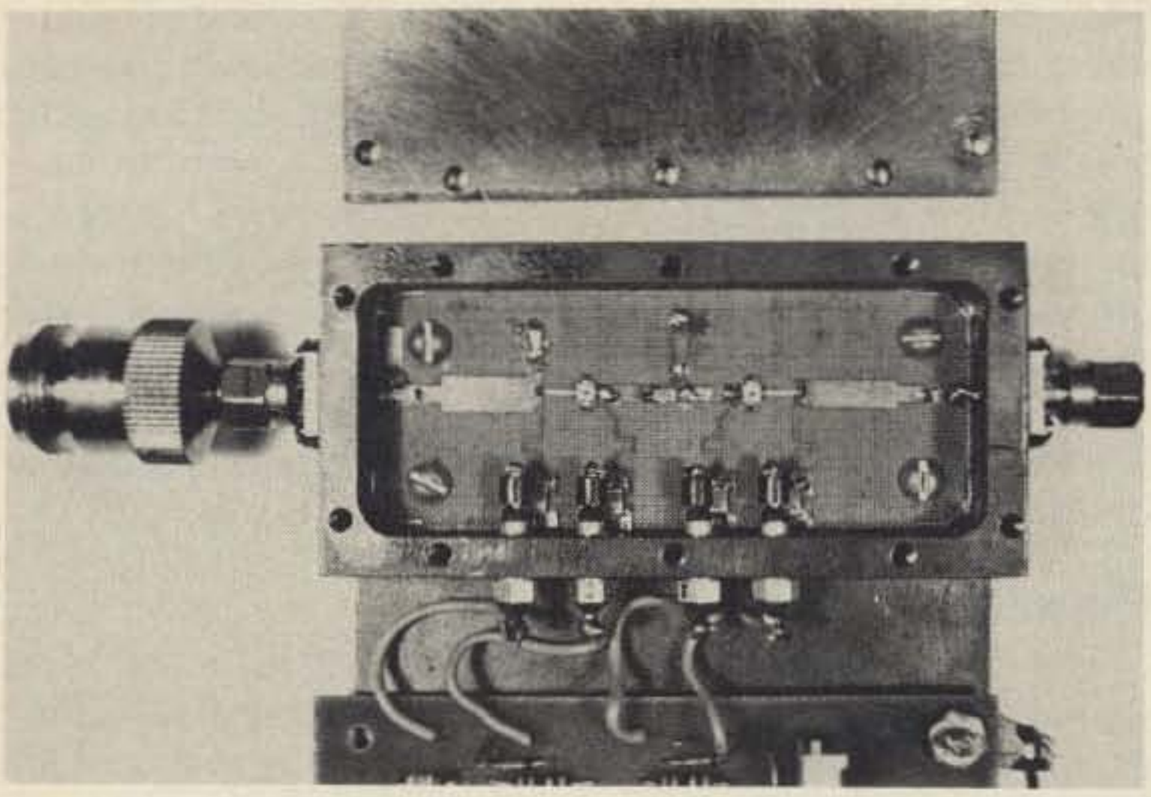
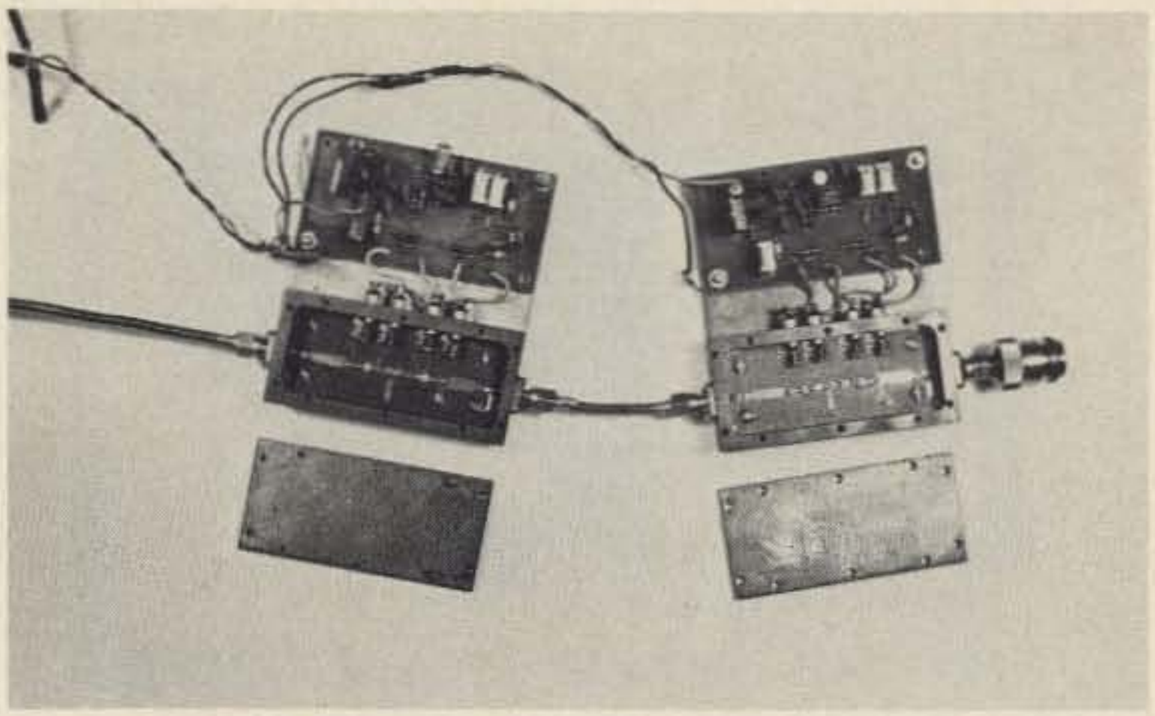


One stage of the low noise amplifier (LNA) described in "Job's Own LNA," 73 Magazine, February, 1982.



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average technician can easily duplicate our system. You don't have to be a microwave engineer to make it work.

To develop the complete satellite TV receiving system, we used 15 square feet of printed circuit board, 18 pounds of ammonium persulfate etchant for the board, 5 pieces of 10" × 20" photo reversing film making negatives for boards, 48 pounds of coffee, and 32 cartons of cigarettes. We designed, built, and debugged approximately 40 individual printed circuit boards trying various circuits.

We will describe as we go some of the things we tried that either didn't work or didn't meet our expectations. During our development, we were extremely fortunate to have a professional video technician, Alex Guarino WA4OCG, to critique our received signal video and offer suggestions on improving it. Alex now favorably compares our received video with the commercial cable TV installations with which he is familiar.

We had never seen a satellite TV installation before we got our homebrew system working and, during the development of our system, we did not have access to any test equipment that functions on the satellite TV frequencies. The only test equipment used to debug the system was an old Heathkit Tunnel Dipper (grid-dip meter), a sweep generator, a marker generator, and a 5-MHz Heathkit oscilloscope. So, if we can make a receiver work with our very limited test equipment, we feel that any average technician, using our proven PC board designs, can easily duplicate our system.

The "IV" in the 'Lite Receiver IV* signifies that it is the fourth generation receiver that we have built. The last two were built from the exact PC boards which are in these articles, and they worked the first time power was applied!

*'Lite Receiver IV is a trademark of Martcomm, Inc.

70-MHz Bandpass Filter and I-f Amplifier

Just like your ham band receiver, the signal from the mixer contains many signals and noise. Therefore, the first step after the mixer is to clean up the signal and eliminate all frequencies we don't need. The output of the mixer is a low-level signal of approximately −50 dBm. Refer to Fig. 2, the filter/amplifier schematic. This low-level signal is applied to IC A-1, a Motorola MWA-120 broadband amplifier with 14 dB of gain.

70-MHz Bandpass Filter/i-f Amplifier Parts List

1 2-1/4" × 4" × 2-1/2" minibox, Bud CU-3003A
1 PC board, double-sided (Martcomm, Inc., Box 74, Mobile AL 36601)
3 MWA-120 ICs
1 7815 voltage regulator
2 1-uF tantalum capacitors, 35 volts
3 470-Ohm, ½-Watt resistors
2 2200-Ohm, ¼-Watt resistors
1 470-Ohm, ¼-Watt resistor
1 51-Ohm or 47-Ohm ¼-Watt resistor
2 .01-uF disc ceramic capacitors
2 J. W. Miller coils, L1 and L4, 49A678MPC, .60-.074 uH
1 J. W. Miller coil, L5, 49A347MPC, .250-.415 uH
2 J. W. Miller coils, L2 and L3, 49A537MPC, .393-.657 uH

Total cost is approximately $60.00.

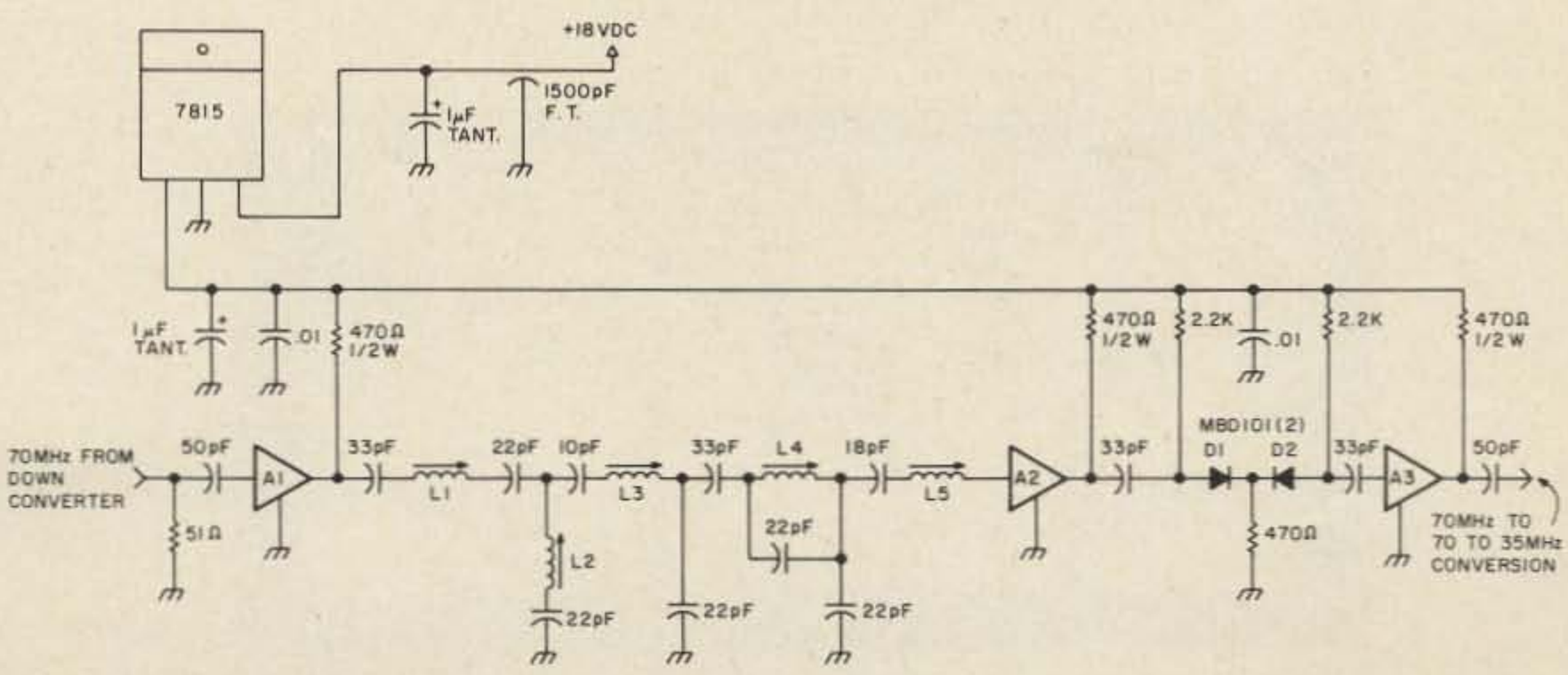
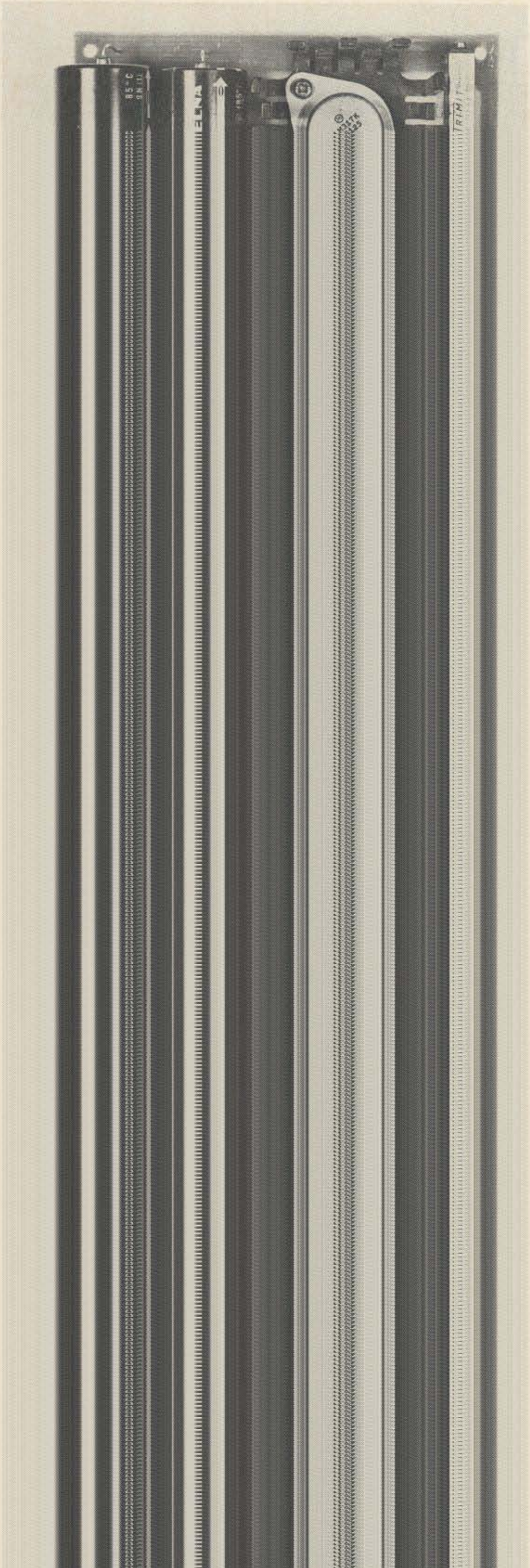


Fig. 2. 70-MHz filter/amplifier schematic.



(PLL) was chosen for the video detector since it can demodulate very low signal levels. But the PLL is prone to overload, so one stage of limiting using hot-carrier di-

minibox. The 1500-pF value is not critical, and you can substitute any reasonably close value. A word of caution about the Motorola MWA-120s. Buy them only

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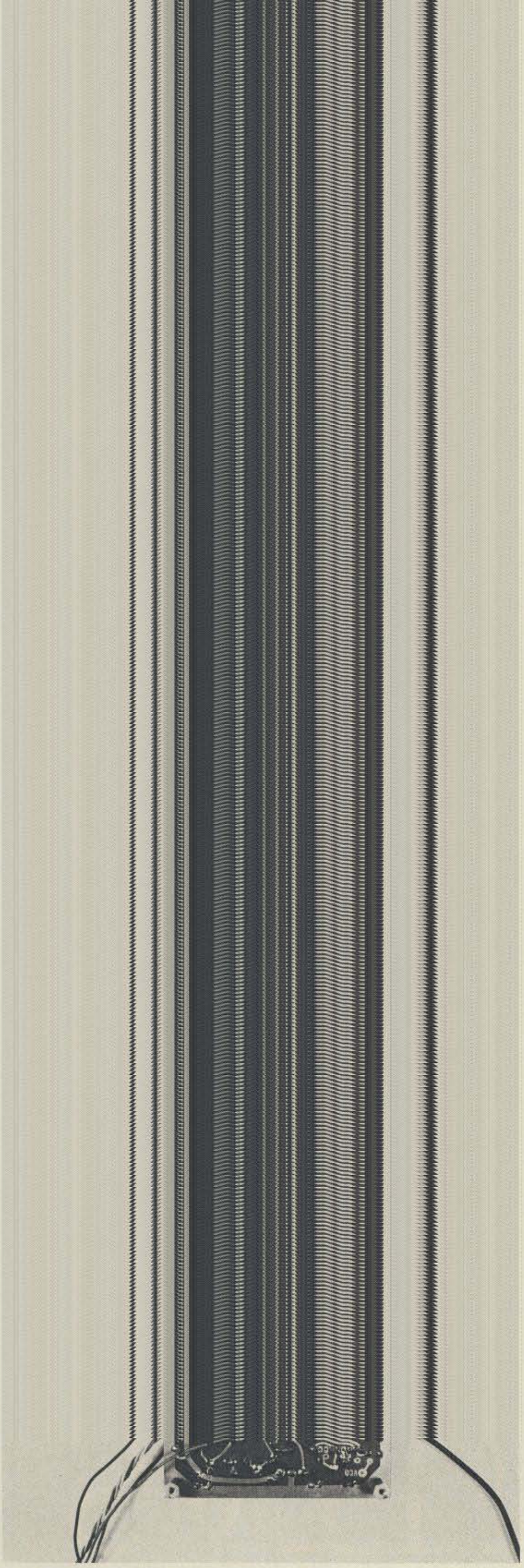

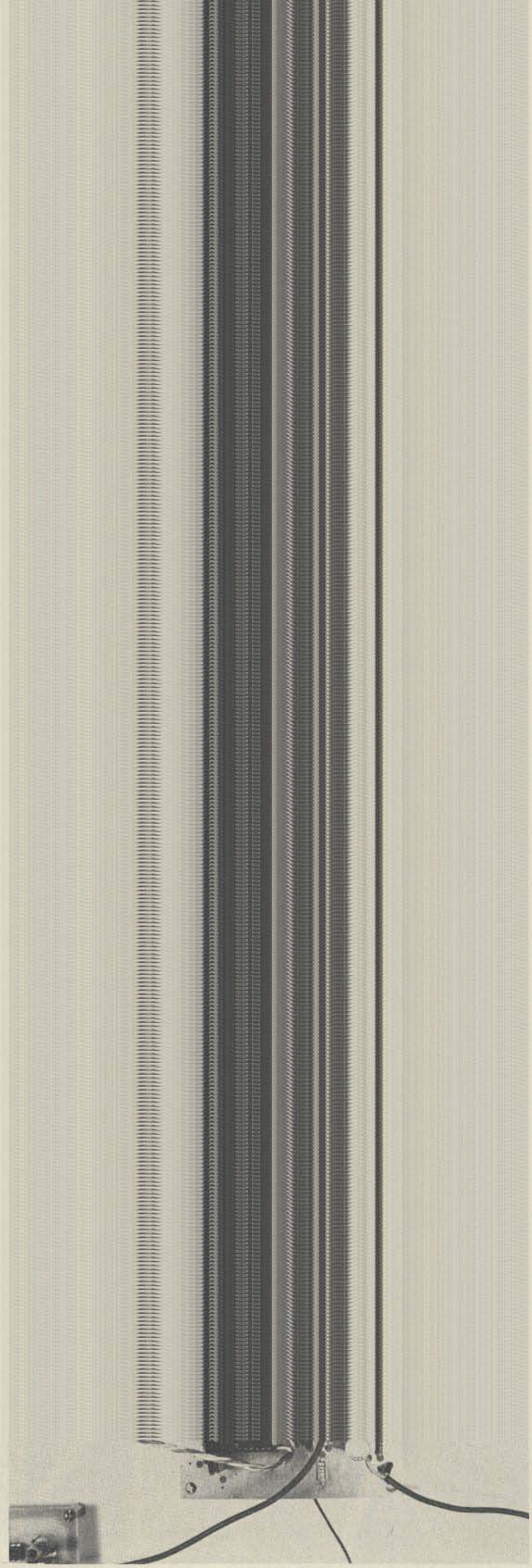

pletely within its specifications. Only slightly better performance was obtained, primarily reduced smearing of bright colors. The divider approach required extra if

1—12 volts dc, pin 10—6 volts dc, for a 75-MHz lock frequency at 0 degrees Centigrade. We reduced the pin 1 supply voltage to 8

modulator circuit from the Signetics application notes. The circuit is very simple and gives excellent results. Although the PLL is being

MWA-120s, you should buy your 564 from a reputable supplier and avoid the surplus outlets. You might want to buy an extra just in

audio and AFC-1 pickoff points are at the emitter of this transistor. The AFC-2 junction point is on the collector of this transistor. The de-emphasis filter also connects to the 2N2222 emitter, and then goes through an audio trap to the NE592 video amplifier.

The NE592 has complementary outputs, which makes it simple to provide video reversal (not all transponders use the same video polarity). The output of the 592 feeds the base of another 2N2222. The emitter of the second 2N2222 is ac-coupled to the base of a third 2N2222 whose base is clamped with a zener diode and a hot-carrier diode to keep the 30-Hz energy dispersal waveform from appearing at the video output. The 30-Hz component, if not removed, will wreck your vertical sync. The 1-volt video output is ac-coupled and terminated with a 100-Ohm resistor.

Construction

To make construction really simple, a PC board layout and parts overlay is provided. See Fig. 8. The PC board is double-sided G-10. The parts overlay is shown in Fig. 9.

For easiest assembly, install all resistors first and then the capacitors and chokes. Transistors are installed next, being sure that they are properly inserted. Power up the board and check the ouput of the voltage regulators for correct voltage before inserting the ICs. Save the ICs for last. You can use a socket for the NE592, but do not use a socket for the NE564.

Tune-Up

The joy of using the NE564 becomes evident when you get to the alignment procedure. Set the 1k pot and 10k pot at mid-position. Apply power. Adjust the 1k pot for 5 volts dc on pin 10 of the 564. Connect a frequency counter or grid-dip meter to the "VCO out" point on the board and adjust the variable capacitor for a 70-MHz vco frequency. Assuming that you have the rest of your system working, connect the output of the 70-MHz filter i-f amplifier board to the video demodulator board. With a video monitor attached to the video output, you should have satellite TV! Congratulations!

The final adjustment is made while watching video on your TV. Adjust the 10k pot for 1-volt video out or at least good contrast on your monitor. Now is the time to adjust the 1k pot on pin 10 of the 564. Monitor the pin 10 voltage while adjusting the pot. Changing

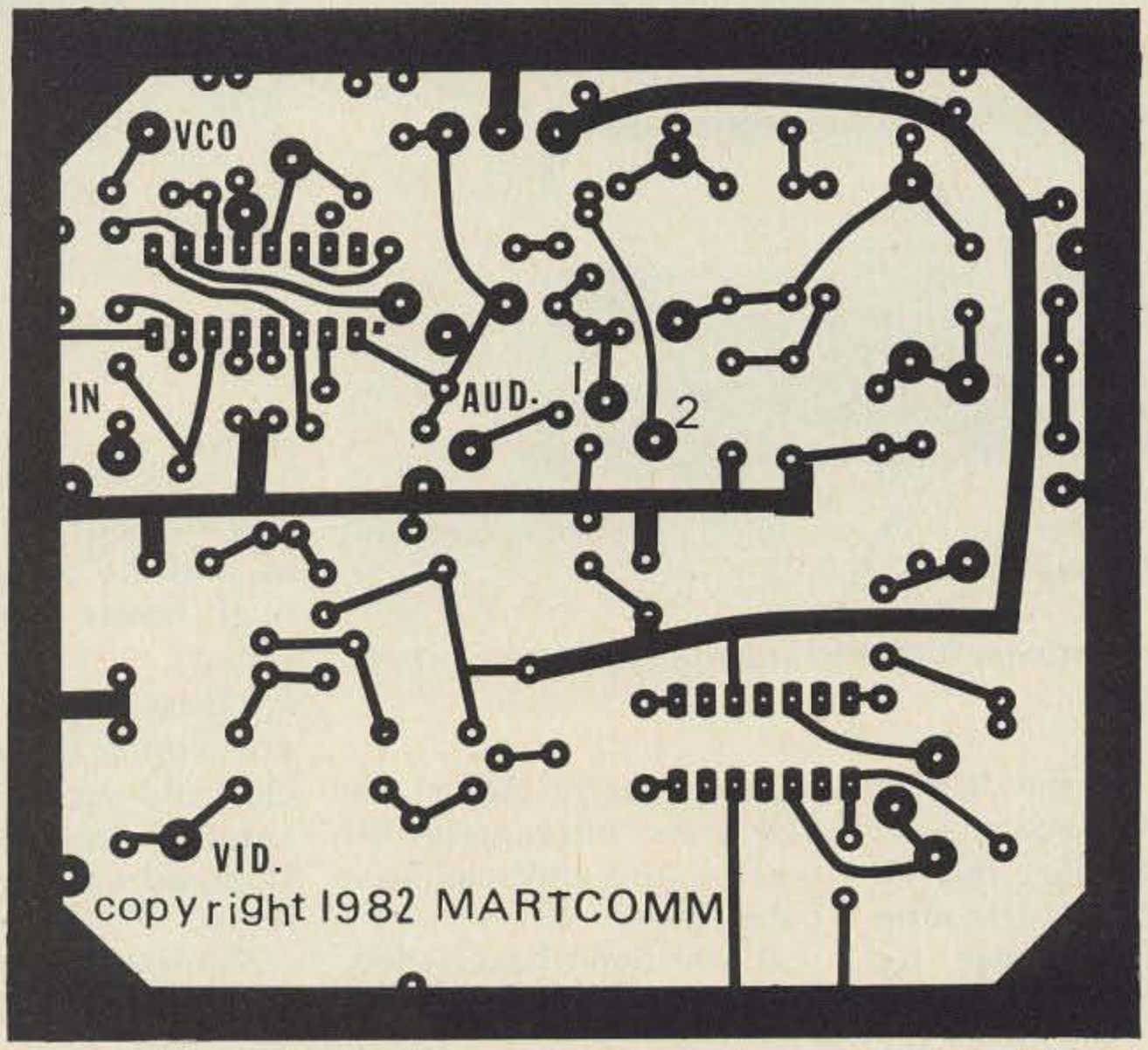

Fig. 8. Video demodulator PC board.

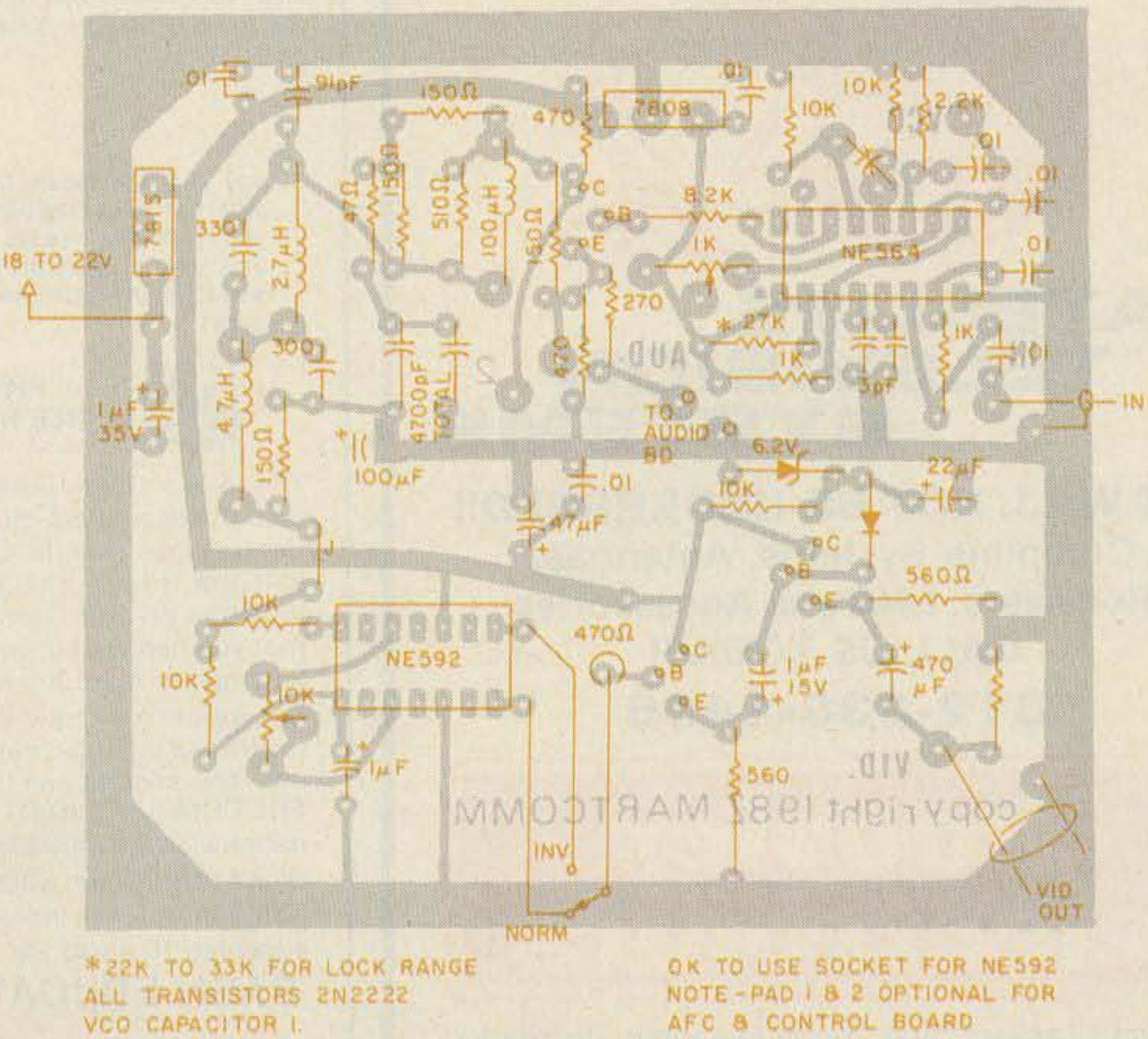

Fig. 9. Component layout for video demodulator board.

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The Universal Circuit

Or you can build a fixed-frequency detector. The most popular circuit in use today is one using a single IC. Known by such names as the LM3065, CA3065, or MC1358, this simple chip is nothing more than a quadrature detector which forms the guts for most TV-set sound circuits. See Fig. 3. The subcarrier feeds a bandpass filter tuned to the appropriate frequency which in turn feeds the chip for detection and de-emphasis.

Deep in its heart of darkness, the chip amplifies the signal into limiting before it is detected. In addition, the chip also contains an electronic attenuator and an output driver amp. A variable resistor from pin 6 to ground controls the electronic attenuator. Minimum resistance gives maximum volume. The distortion specs on the amp are not too sweet so it is best ignored. Besides, you can get nearly 0 dBm out of the bare detector, anyway—more than enough to ionize the plastic transistors in any amplifier.

You can build one of these detectors in an evening, but there is a better way. Buy it already built! As I've mentioned before, regular TV sound detectors are just about the same thing, circuitwise, except that they are tuned to 4.5 MHz. They differ from satellite audio ever so slightly in frequency, de-emphasis, and bandwidth. Interestingly enough, the entire sound section for an RCA XL-100 TV contains just such a circuit on the small PC card seen in Fig. 4.

Build It Quick and Dirty

The XL-100 sound modules are available at most TV distributors. They cost about 15 dollars and are a bargain when you consider what your time is worth these days to build one from scratch. Order an RCA part number MAA001A.

The units come tuned to 4.5 MHz for TV sound. Just a few mods will make them tunable from 5 MHz to nearly 8 MHz. Change the value of C290 to 50 pF. Also change C295 to 25 pF. This will shift the unit from 4.5 MHz to about 6.5 MHz. Then solder a .01-μF capacitor from pin 13 on the chip to a ground trace. This sets the de-emphasis to 75 μsec.

Build a well-regulated supply the easy way by using a molded plug-in dc charger/power supply connected to a large-value capacitor and a 3-terminal regulator as seen in Fig. 5. Just be sure to include the capacitor on the output of the regulator or it will quickly lose its cool in the worst way.

Everything should fit into a small 2 × 5 box even if you use a soldering gun rather than a pencil iron. See Fig. 6 for an idea on layout. Use whatever connectors you have in your junk box. Nothing is critical except for the mandatory use of coax from the receiver to the unit. The tap-off in the receiver is simply the same place the other sound detectors connect, usually right after video detection.

Tune-up is easy. Use your ear and twist T299 and L299 until you hear sound. A better way is to feed your signal generator into the unit while looking at pin 9 on the chip with a scope. Once you see rf, back down the generator below limiting (done by the chip) and peak T299 and L299 for the frequency you want. If you can frequency-modulate the generator, by all means do so and set it for ±75-kHz deviation. Then look at the demodulated audio and adjust L299 for the best waveform. A THD analyzer can be used to improve the distortion specs with a variable resistor in parallel with C295 and L299 to lower the Q.

Next, align the bandpass-filter coils simply by peaking. You may not need the coils at all depending on the prefiltering done in the receiver. The ideal coil adjustment method is to first peak everything including L299. Then short the second coil with a 10-Ohm resistor (you'll need more umph from the rf generator) and peak again. Remove the resistor, back down the generator, and re-peak the second coil.

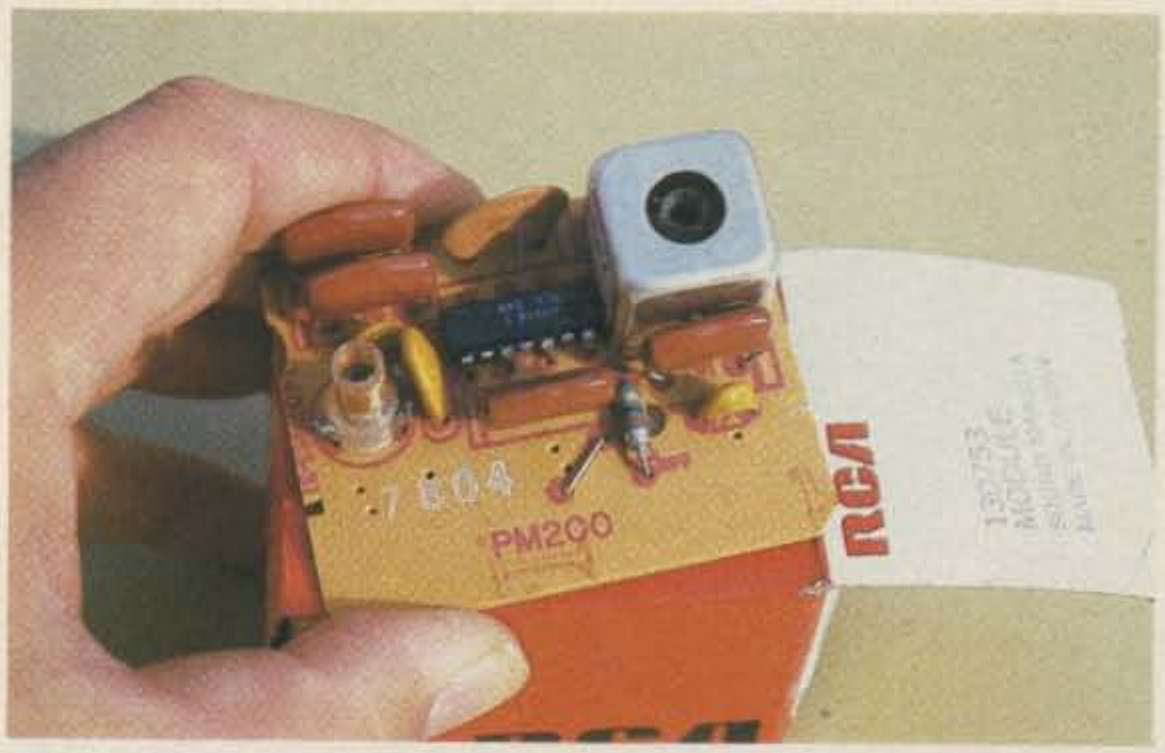

Fig. 4. Known by TV servicemen as the PM200, this small card holds nearly an entire TV-set sound section. It's a natural for cheap satellite audio recovery.

Bells, Whistles, and Distortion

If the subcarrier decoder is intended as a TV sound detector, you'd better leave the 50k volume-control pot in the circuit so that you can adjust audio drive to a subsequent rf remodulator. If you are feeding another amp, you could just as well forget the pot by grounding pin 10 on the board (pin 6 on the chip). This will set the output at maximum, about 0 dBm across 600 Ohms using a 12- to 16-volt supply.

You can save in the amplifier department, too. The amplifier for an RCA XL-100 is also available. Order MAN002A and use the circuit in Fig. 7 for intercon-

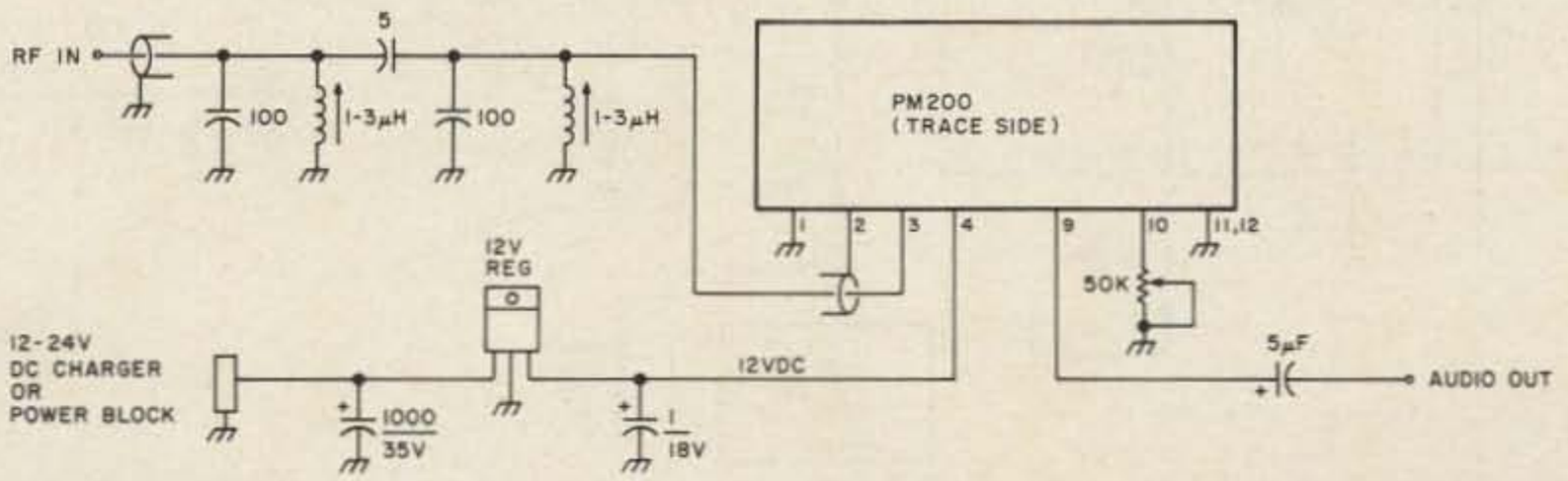

Fig. 5. The PM200 becomes an FM subcarrier decoder with three mods and a few external parts. Use your ear or an rf signal generator to tweak it into operation. Forget the input bandpass network if the receiver already has a high-pass filter for subcarriers.

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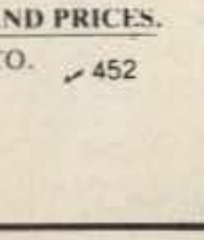

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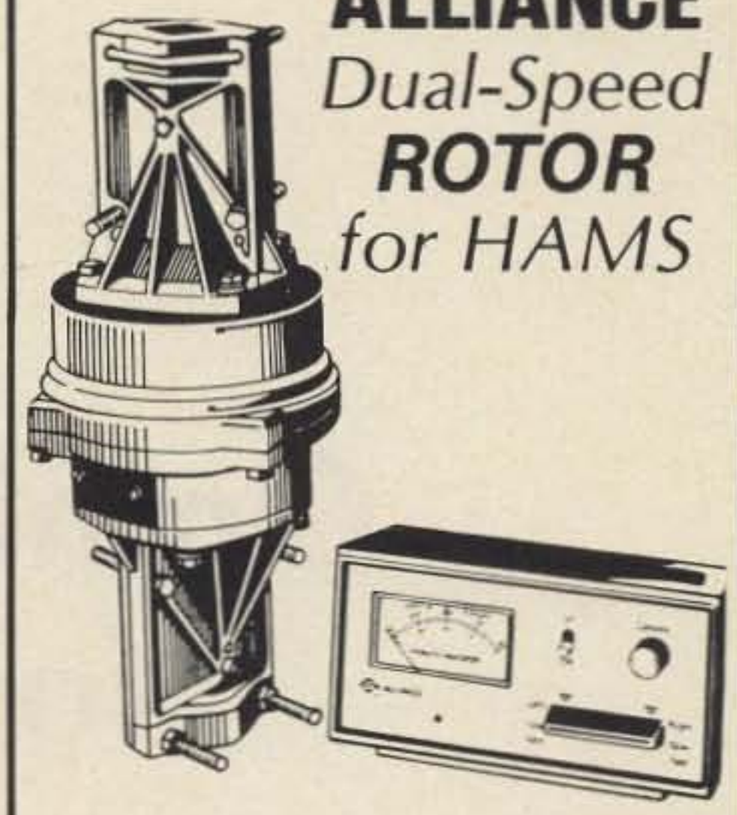

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the matching decoupling section.

Construction

Add one half inch to the calculated length to allow for exposing the center conductor so it can be connected to the other element. See Fig. 2. Cut the jacket, shield, and dielectric with one cut. A sharp knife or X-acto® miter saw should be used to make the cut. After all the elements are cut to length, then cut the jacket back three-eighths of an inch and tin both the center conductor and shield using a 25-Watt iron—too much heat will melt the dielectric.

Now that all parts are tinned, solder the parts together with a maximum of one-eighth-inch separation between elements. After completion, check for shorts by visual inspection as the antenna is at dc ground. Excess flux should be scraped off, but do not use any chemical flux remover as it can contaminate the dielectric. The whip on the top is connected to both the center and shield. The matching section is a quarter-wave coax stub shorted at both ends and a piston trimmer capacitor. See Fig. 3.

Tune-Up

Adjust the trimmer for minimum vswr. If the minimum is at one end of the trimmer, then adjust the spacing of the stub to feedline distance. One-eighth inch is normal for the spacing.

Housing

The antenna is housed in PVC pipe. The heavy wall is the one to use and it is also known as schedule 40 PVC. One-inch diameter can be used for either the 1241-MHz model or the 434 model, but if the antenna is to be mounted as a free-standing antenna, the 434-MHz housing should be tapered. This can be done with ¾-inch, 1-inch, and 1¼-inch pipe. The pipe may need to be heated to make a better fit. Pipe caps are used to keep the rain out of the housing and the bottom should be open so it can breathe. The antenna can be mounted one half wavelength from a mast for a cardioid pattern and the gain will increase 2 dB over that of an omnidirectional pattern. See Fig. 4 for the patterns.

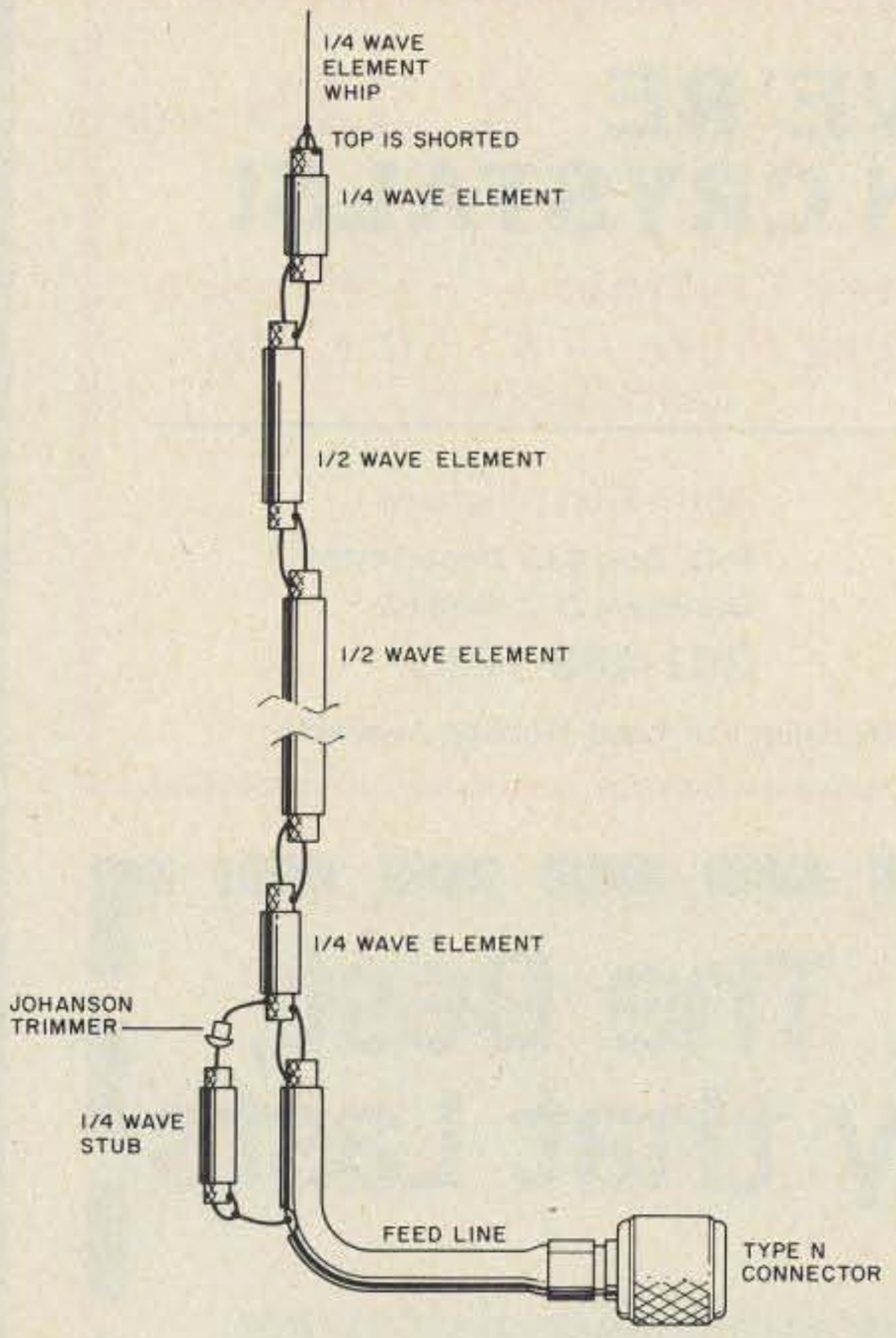
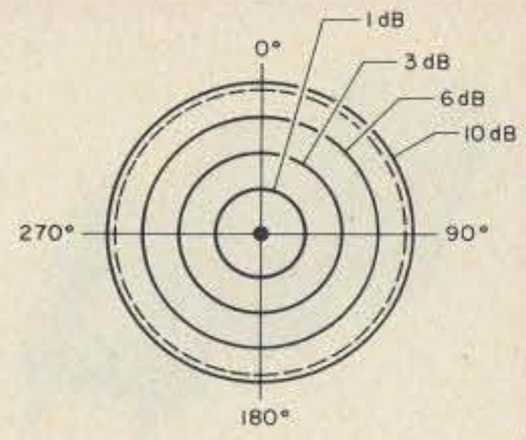


Fig. 3. 8 elements = 6 dB. 16 elements = 9 dB.



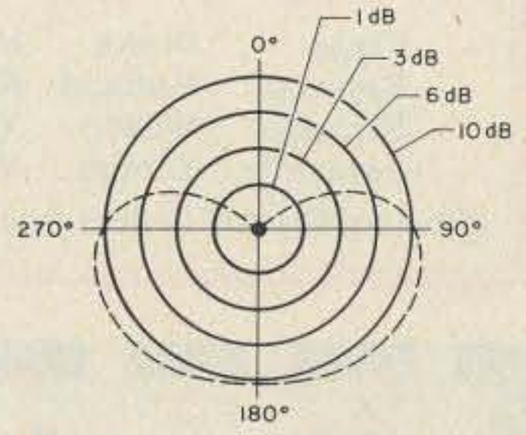


Fig. 4. (a) Omnidirectional pattern. (b) Cardioid pattern.

Conclusions

Construction time is one to two evenings. Take your time and you will have a better working antenna. The 434-MHz version has been in use for one year now on Mount Wilson and has survived all four seasons from 100 degrees heat to snow and ice. Many of these particular antennas in Los Angeles and San Diego have been built and used with the same results as I have obtained. Recently, a second 1241-MHz version was installed on Mount Wilson for the aural transmitter on the ATV repeater. It is identical to the one used for the visual transmitter and the results have been good.

Acknowledgements

I would like to thank Jay N6BDT for his help in testing the antenna, and also all others who helped me in this endeavor. ■

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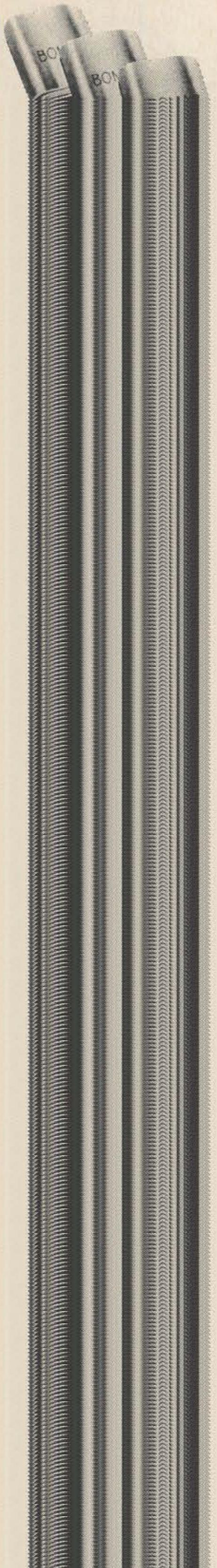

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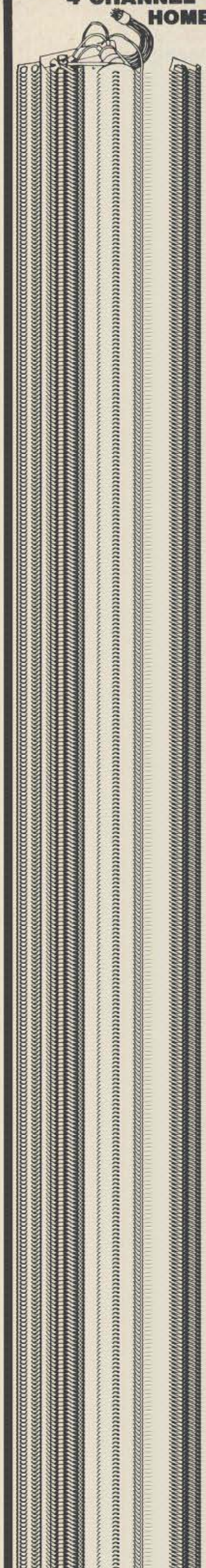

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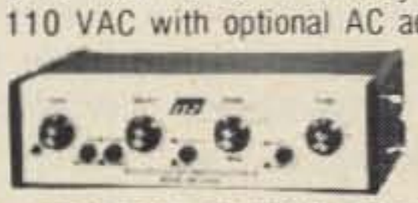

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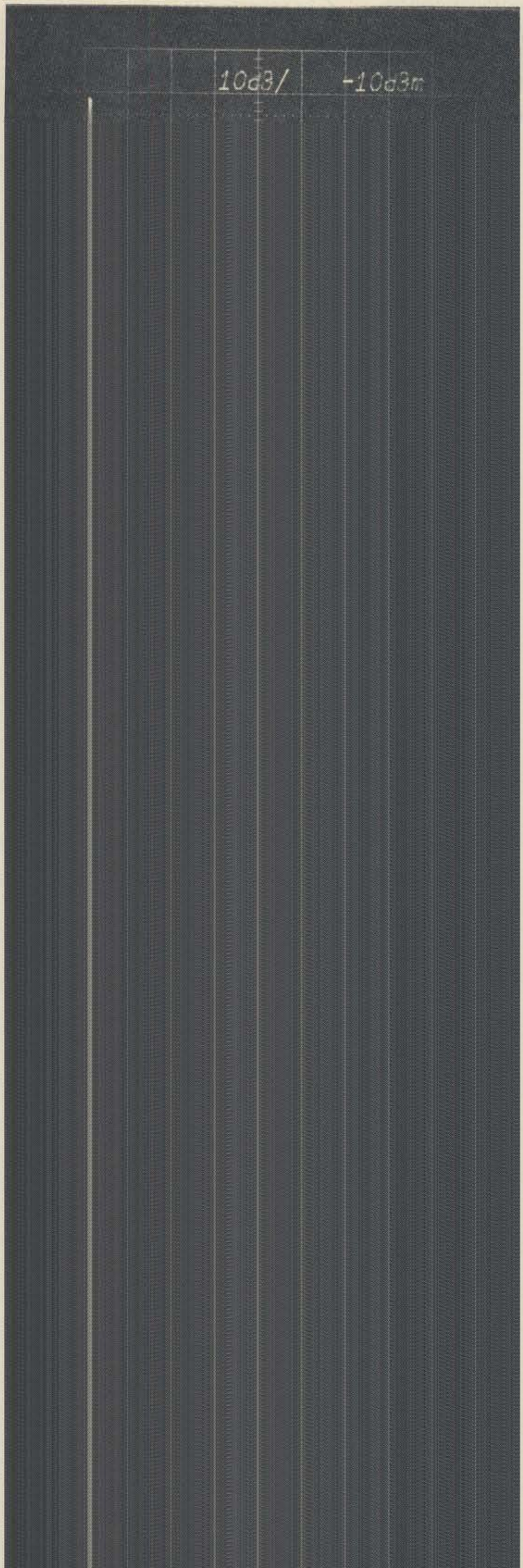
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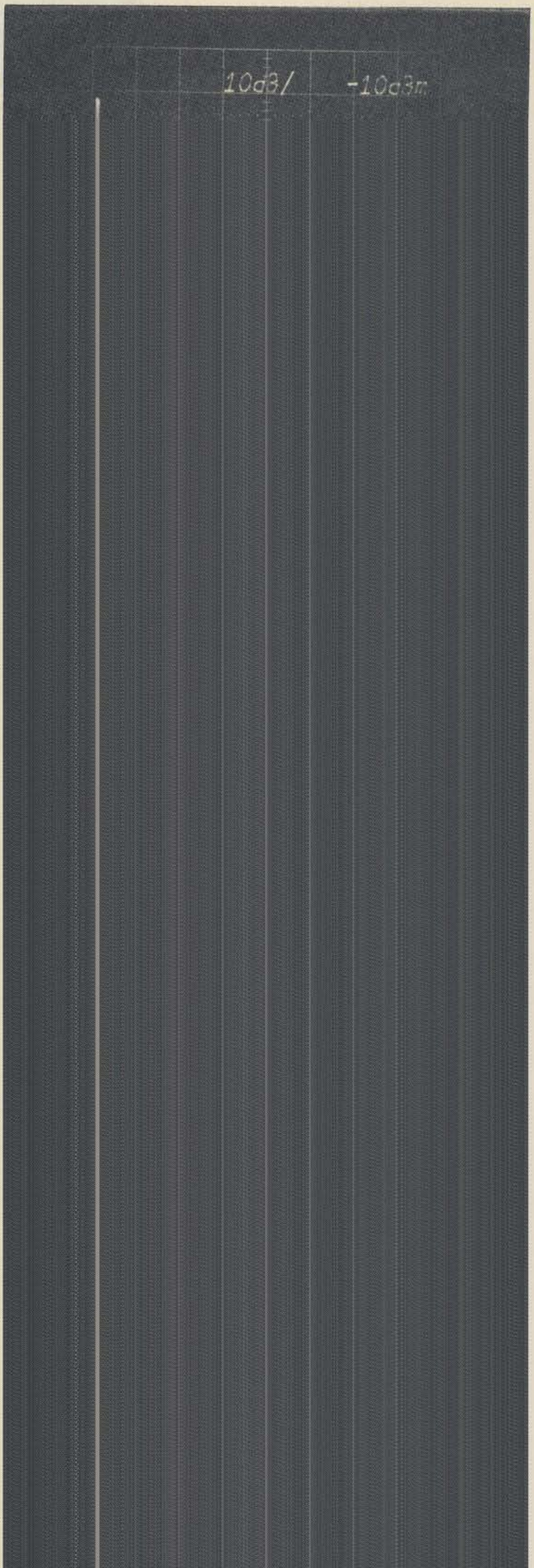
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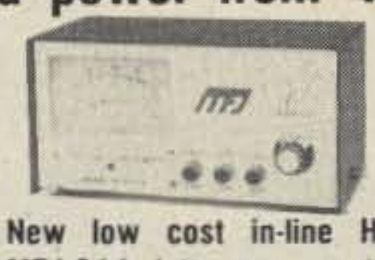
MFJ HF SWR/Wattmeter reads SWR, forward, reflected power from 1.8-30 MHz.



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MFJ-814

New low cost in-line HF SWR/Wattmeter. MFJ-814 lets you monitor SWR, forward, reflected average power in 2 ranges from 1.8 to 30 MHz. Read 200/2000 watts forward. 20/200 watts reflected power. SWR, 1:1-6:1.

Easy push-button switch operation: has power/SWR, high/low range, forward/reflected push-button switches. SWR sensitivity control.

Lighted meter (requires 12V). Rugged aluminum eggshell white, black cabinet. 6¼x3¼x4¼". SO-239 coax connectors, 2 color meter scale.

MFJ VHF SWR/Wattmeter/ Field Strength Meters

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New low cost VHF operating aids.

MFJ-812, $29.95: Read SWR from 14 to 170 MHz to monitor antenna and feedlines.

Read forward and reflected power at 2 meters (144-148 MHZ). 2 scales (30 and 300 watts).

Read relative field strength from 1 to 170 MHz. Binding post for field strength antenna.

Easy push-button operation: has forward/reflected and SWR/field strength push buttons.

Aluminum eggshell white, black cabinet. 4¼x2¼x2¾". SO-239. 2 color meter scale.

MFJ-810, $24.95: similar to MFJ-812 less field strength function.

MFJ "Dry" 300 W and 1 KW Dummy Loads.

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MFJ-260

Air cooled, non-inductive 50 ohm resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, de-rating curves to 5 minutes. **MFJ-260 (300 W).** SWR: 1.1:1 to 30 MHz, 1.5:1 for 30-160 MHz. 2½x2½x7". **MFJ-262 (1KW).** SWR 1.5:1 30 MHz. 3x3x13".

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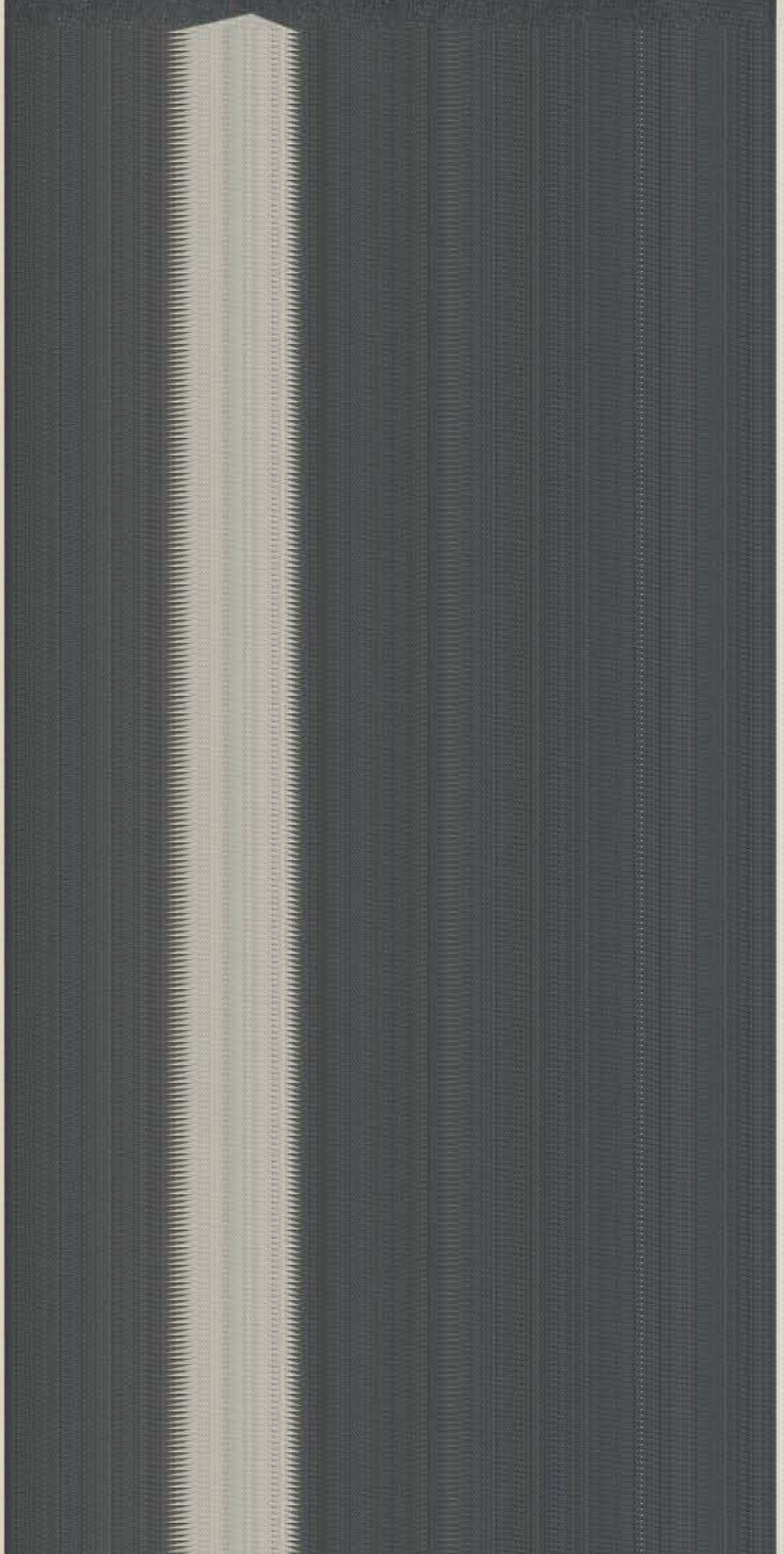
A HAM FIRST . . .



ferent distribution of spurious signals results, but no significant improvement.

In Photo G, we see the results of substituting an

strength of the spurs would have been achieved only by the reduction of the main transmitting power from, say, 100 Watts to about 16

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Dr. Richard L. Schatz WA3GWY
Box 31A, RD #1
Sugarloaf PA 18249

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Program listing.

```
10 CLS:CLEAR 2000
35 POKE 16422,141:POKE 16423,5
37 REM                  ====================================
40 REM                  PROGRAM BY DR.RICHARD L.SCHATZ WA3GWY
42 REM                  BOX 31A RD#1 PARADISE ACRES
```

```
1370 IF(QX=>.2519)AND(QX =<.2542)LPRINTTAB(30);"SWR 2.2-1.8:1 "
1390 IF(QX =>.2543)AND(QX=<.256)LPRINTTAB(30);"SWR 2.7-2.2:1"
1410 IF (QX=> .257) AND (QX =< .259) LPRINT TAB(30); "SWR IS 3:1
 OR MORE"
1430 IF(QX =>.35)AND(QX=<.38)LPRINTTAB(30);"SWR 2:1 OR MORE"
1435 IF(QX>.161)AND(QX<.1625)LPRINTTAB(30)"2.1:1-2.5:1"
1445 IF(QX<.167)AND(QX>.164)LPRINTTAB(30)"1.7:1-2.1:1"
1450 IF(QX=>.167)AND(QX =<.174)LPRINTTAB(30);"SWR 1.6 OR LESS"
```

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Full-Wave 80-Meter

Flat-top	Total Wire	Length/Side	Feeder Length (Max) Each
257.70	283.10	64.42	20.30

which turned out to be a personal vendetta: "Do you think we could allband this thing? You don't need it with your beam, but it would be a blessing to a lot

struction data to those who want to stop reading right now and go to work!

As depicted in Table 1, the full-sized antenna will

Introducing incredible tuning accuracy at an incredibly affordable price: The Command Series RF-3100 31-band AM/FM/SW receiver.* No other shortwave receiver brings in PLL quartz synthesized tuning and all-band digital readout for as low a price.† The tuner tracks and "locks" onto your signal, and the 5-digit display shows exactly what frequency you're on.

There are other ways the RF-3100 commands the airways: It can travel the full length of the shortwave band (that's 1.6 to 30 MHz). It eliminates interference when stations overlap by narrowing the broadcast band. It improves reception in strong signal areas with RF Gain Control. And the RF-3100 catches Morse communications accurately with BFO Pitch Control.

RF-6300 8-band AM FM SW

Want to bring in your favorite programs without lifting a finger? Then consider the Panasonic RF-6300 8-band AM/FM/SW receiver (1.6 to 30 MHz) has microcomputerized preset pushbutton tuning, for programming 12 different broadcasts, or the same broadcast 12 days in a row. Automatically. It even has a quartz alarm clock that turns the radio on and off to play your favorite broadcasts.

The Command Series RF-3100 and RF-6300. Two more ways to roam the globe at the speed of sound. Only from Panasonic.

*Shortwave reception will vary with antenna, weather conditions, operator's geographic location and other factors. An outside antenna may be required for maximum shortwave reception.

†Based on a comparison of suggested retail prices.

This Panasonic Command Series™ shortwave receiver brings the state of the art closer to the state of your pocketbook.

With PLL Quartz Synthesized Tuning and Digital Frequency Readout.

Panasonic.
just slightly ahead of our time.

380

(this, of course, is the standard formula for the total length of any quad). FL=2W+2L; in this, the flat-top is equal to twice the available width plus twice

tuners, but all the above findings were recorded without their use. We did hook my tuner to the wire, just to make sure one could be used, and had no trouble at

topped off with a printout for him of his choice of quad versions.

It is for this reason that I included the program with this article. It could be

viously. The decimal comparisons in lines 1110 through 1550 were made from proportions calculated from our swr findings; lines 1630 through 1730

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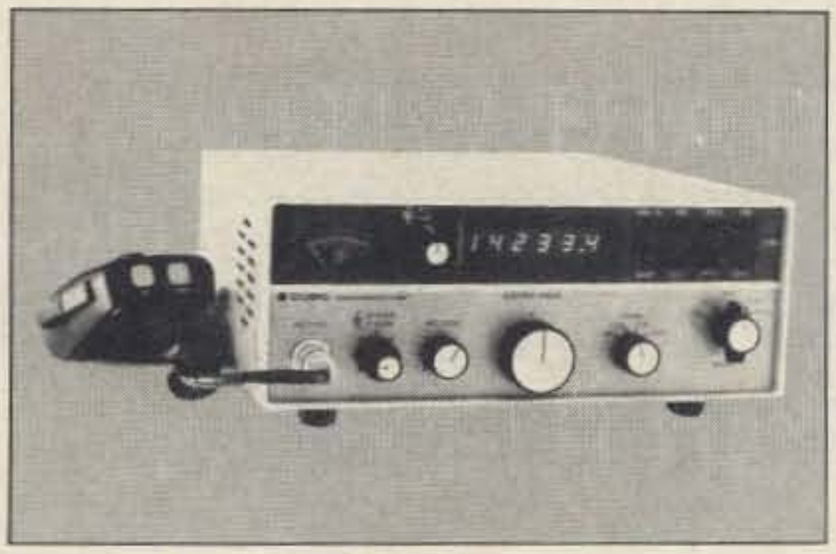

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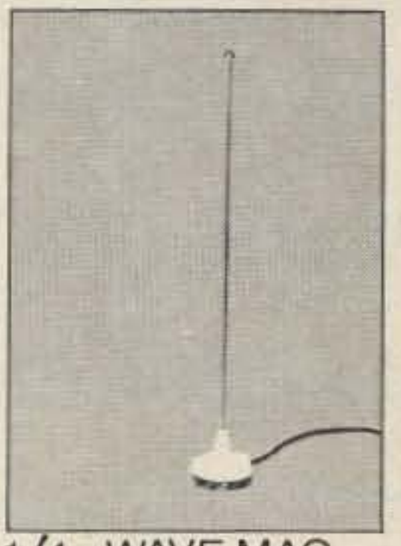

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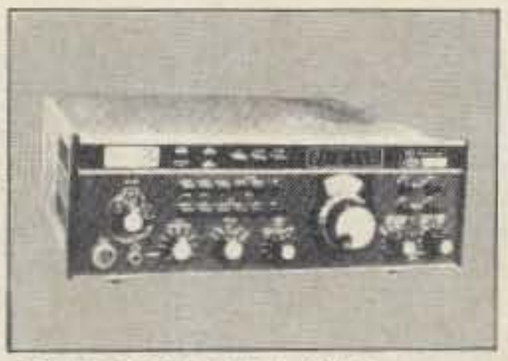

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SOME BASIC MATH

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- Recall specific messages
- Delete specific message
- Send message directory
- De-activate MAILBOX system
- Send operating instructions
- Request 1 of 10 billboard messages
- Change operating speed
- Beacon mode
- User assigned key words

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Also utilizes the 24k character battery-backed memory for permanent storage. Variable format allows for short "CONTEST" type entries with auto-assigned consecutive number & time with worked/not worked and automatic "CALL & LOG" features. Or, use a longer format for some personal info on each new QSO. You'll have instant recall of his name, QTH, & rig as well as the date & time of the last QSO.

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Now you can generate professional quality messages with our Message Editor program.

- Full cursor control
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Insert blocks of text and make spot corrections. Here's a list of some of its features:

- HELP file display
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24576 BYTES or characters of storage for you to run your BASIC programs, keep the station log or implement the MAILBOX. The internal battery will maintain ALL this memory as well as the normal ATR-6800 "HERE-IS" & parameter storage for up to a week. And, there's no need to keep the ATR on for one night to charge the battery. We've provided a jack for you to plug in an external low current 6 to 15 volt DC source for charging. (We have a small wall transformer power supply available.)

"BASIC" Language

Commands	Statements		Functions
LIST	REM	END	ABS
LLIST	DIM	GOTO*	INT
RUN	DATA	ON..GOTO*	RND
NEW	READ	ON..GOSUB*	SGN
ATR	RESTORE	IF..THEN*	CHR
	LET*	INPUT	USER
	FOR	PRINT*	TAB
	NEXT	LPRINT*	
	STOP	PATCH	
	GOSUB*	RETURN	

*Flags statements that may be used in the direct mode (No statement numbers)

Math Operators

- – Unary negation
- * Multiplication
- / Division
- + Addition
- – Subtraction

Relational Operators

- = Equal
- <> NOT equal
- < Less than
- > Greater than
- <= Less than or Equal
- >= Greater than or Equal

Line Numbers may be from 0001 to 9999

Variables	Simple Variables	Single alphabetic or Single alphabetic and a single digit
		Single alphabetic
	Arrays:	One or two dimensions
Backspace	Backspace	
Line delete	Delete	
Panic Button	Should bring back to the READY mode regardless of what the BASIC user program is doing.	

NOTE: With the addition of this total package all of the programs contained in applications module one are internal to the ATR-6800 except SSTV. In other words, you do not need an external module in the communications mode. "Basic" and Message Editor programs are, however, provided in a new applications module. (A separate SSTV module is available for $49.95 if ordered with this package.)

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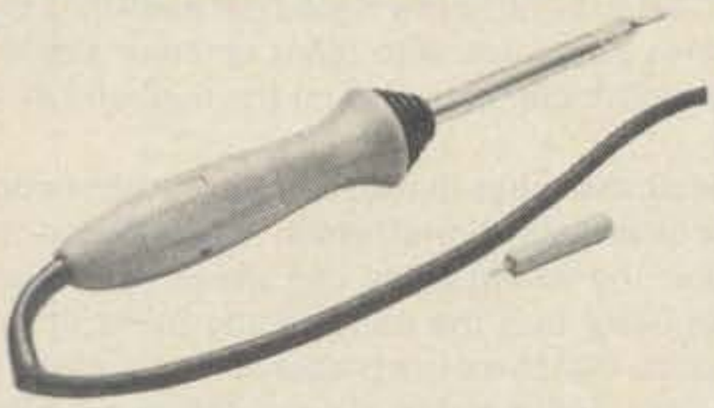

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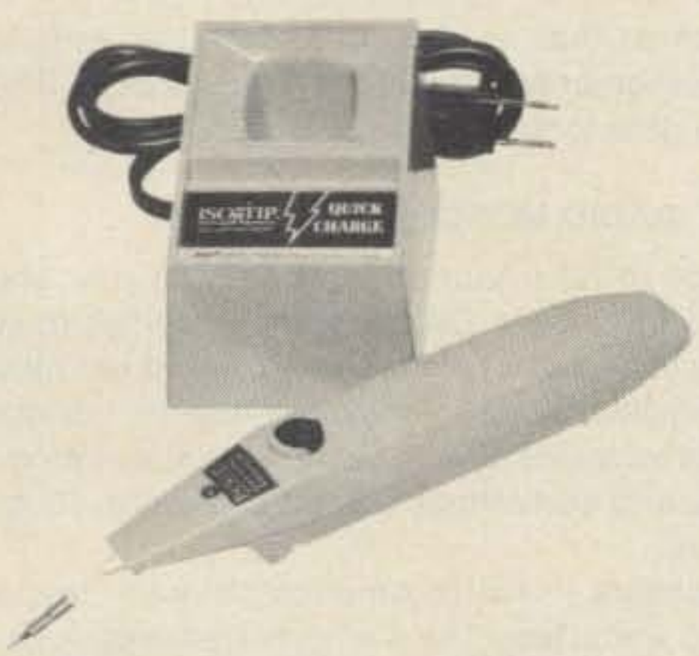

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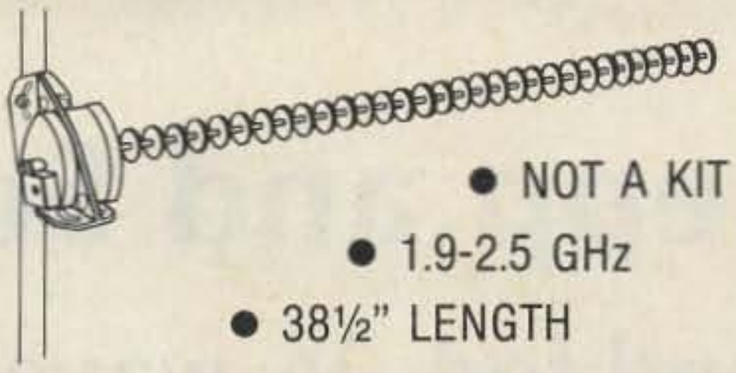

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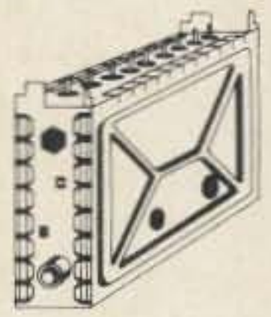

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Antenna Input 75 ohms
Channels 14-83 Output Channel 3

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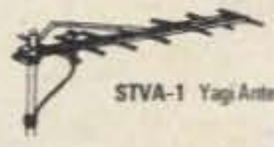

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—an end-fed, ½-wave antenna

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You probably have some idea of what a Zepp antenna is. It's end-fed with open-wire line and has to be tuned using a transmatch, right? Well, Zepp is a nickname applicable to many kinds of antennas. Generally, any end-fed, half-wave antenna is a variation of the Zepp.

How did they ever come up with a name like Zepp? How does the Zepp antenna work? Can you use a Zepp, or variation, to advantage at your station?

The True Zepp

The Zepp originated from the demand for an end-fed antenna that did not require a substantial ground to work against. At first thought, this might seem like an unrealistic idea. But it can be done.

Fig. 1 shows the evolution of the Zepp, so named because it was first used as an antenna dangled from a zeppelin! A full-wave antenna has a low resistive impedance when fed at a current maximum (a). Current feed of a full-wave antenna mandates that one side be 1/4 wavelength and the other side be 3/4 wavelength. The apex angle at (a) is 180 degrees, but smaller angles will work. The antenna will work even if the apex angle is zero degrees (b). When the apex angle is zero degrees, we in fact have a half-wave piece of wire fed at the end by a quarter-wave section of parallel-wire line.

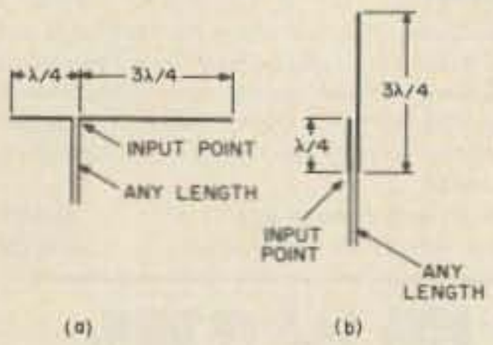

Fig. 1. At (a), a full-wave current-fed antenna. The apex angle is 180 degrees. If this antenna is folded over on itself (b), we have the classical Zepp antenna. To be a true Zepp, it should be fed directly at the input point.

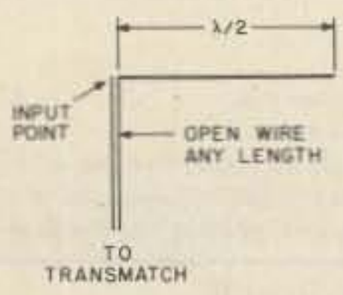

Fig. 2. The version of the Zepp most commonly used among hams. It operates at the fundamental and all harmonics.

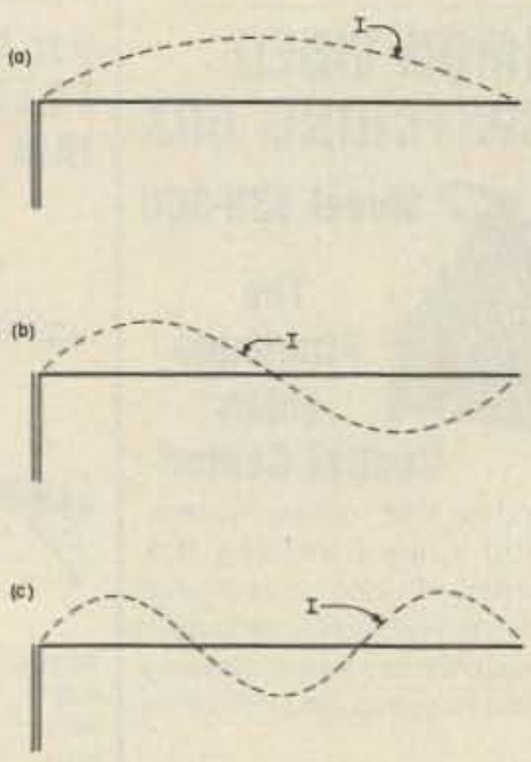

Fig. 3. Harmonic operation of the half-wave Zepp. At (a), operation on the fundamental (1/2-wave); at (b), second-harmonic operation (full-wave); at (c), third-harmonic operation (3/2-wave).

At the input point of the transmission line in Fig. 1(b), the impedance is a pure resistance of a very low value. The quarter-wave piece of line, formed from the folding over of the original full-wave antenna, acts like an impedance transformer, bringing a high impedance down to a low one.

How the Zepp Works

The radiating part of the Zepp is, of course, the half-wave part extending past the parallel-wire line. One end of the line is just left hanging. How can this work?

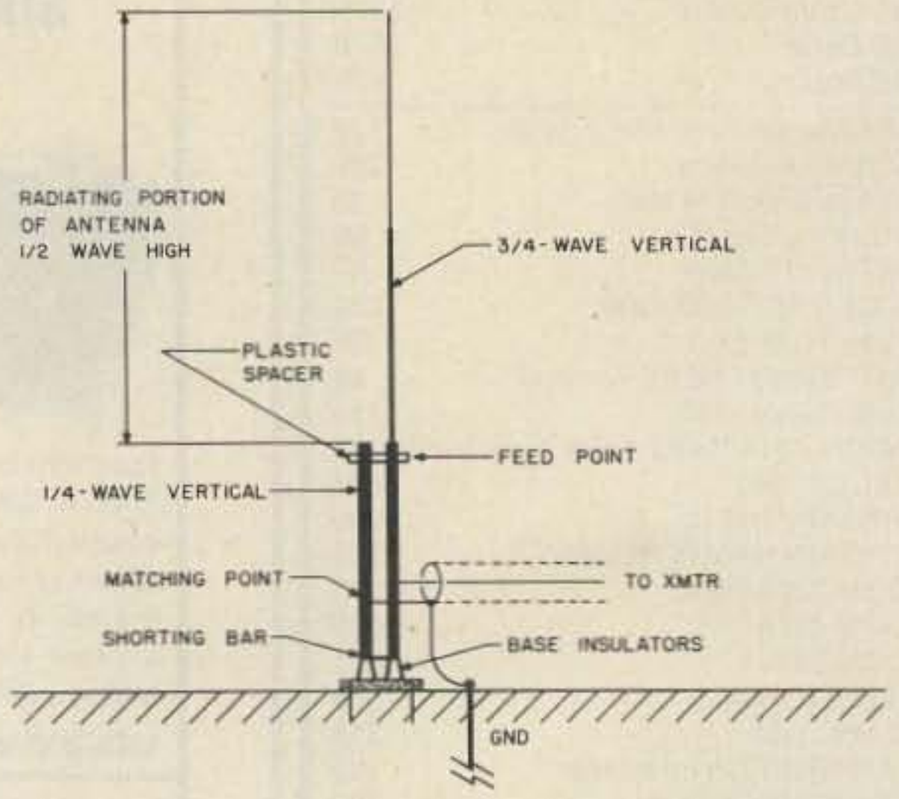

Fig. 4. The J-pole. The bottom end is shorted and the matching point adjusted for minimum swr at resonance. The height of the matching section in feet is 2.80/f, where f is given in MHz. The overall height of the structure is 700/f. This is a monoband antenna.

above utility lines. Also, some guy back in the 1700s already proved that thunderstorms contain electrical energy. There is no need for you to prove it again.

Conclusion

The Zepp is versatile because end feed is physically convenient. This results in some line radiation, but if the antenna is located wisely and cut to the proper length, this problem is not serious.

The Zepp may be operated at any harmonic, although the bandwidth tends to be narrow. As a rule, consider the useful bandwidth of a Zepp to be 50 kHz either side of resonance, whether it is operated on the fundamental or a harmonic. Example: A Zepp that is a half wavelength at 7050 kHz may be used between about 7000 and 7100, 14050 and 14150, 21100 and 21200, and 28150 and 28250 kHz. (Outside these ranges, the antenna will work, but there will be significant radiation from the feedline.)

Now dig out those old porcelain insulators (you *did* save them, didn't you?) and that 300-foot roll of stranded no. 14 copper wire you bought last year at Dayton for $1.50 and thought you could never use. Hang a Zepp someplace! ■

Notes

[1] For wire antennas, use the formula: length (feet) = 468/f, where f is given in MHz, for the length of a half wave. This is only approximate and may have to be pruned, but it represents the best average value.

[2] After the antenna has been cut according to the formula, you can find its resonant frequency by using a field-strength meter placed a few feet from the feedline near the transmitter. The resonant frequency is the frequency where the field strength is minimum, indicating minimum line radiation. Then, the antenna may be pruned until its resonant frequency is as desired.

The voltage at the end of the half-wave radiator is applied across a theoretically infinite impedance, which causes rf current to flow along the wire. It's kind of like shaking the end of a loose clothesline to make waves up and down the rope; although we never actually *pull* on the rope, the waves nevertheless occur along its length.

In theory, the Zepp is a balanced antenna because the impedance is infinite both at the free end of the line and at the terminated end. In practice, however, there is no such thing as an infinite impedance. The impedance at the free end of the line is *extremely* high, that at the terminated end is *very* high. They're a little different, and this unbalances the currents in the feedline. Consequently, the line radiates to some extent. This radiation can be minimized by ensuring that the impedance at the feedpoint is a pure resistance and is as high as practicable. This requires that the radiating part of the Zepp be *exactly* a half wavelength long,[1] and also that the antenna be placed as much in the clear as possible, to maximize the impedance at the ends of the radiating length of wire.[2]

Yet, even if we dangle this contraption from a zeppelin at 40,000 feet, it won't be perfectly balanced. The feedline will invariably radiate a little energy. A properly operating Zepp is not too bad about this—it's almost as good as a center-fed antenna.

The Usual Zepp

Most hams who use a Zepp have an installation something like that shown in Fig. 2. With this kind of system, a transmatch is necessary since we don't know what the impedance will be like at the station. This kind of Zepp will work at the fundamental frequency (the band where it's 1/2 wavelength) and all harmonic frequencies. At any harmonic, the Zepp has a current node at the feedpoint. Harmonic operation of the Zepp is shown in Fig. 3.

The Zepp is somewhat temperamental about departures from its resonant frequency. Even a tiny change in frequency will move the current node away from the feedpoint—either out onto the radiating part of the antenna (frequency too high) or down into the transmission line (frequency too low). But the node at the loose end of the line cannot move. The result: line radiation! The Zepp is a narrowband antenna.

What if you have no transmatch and do not exactly feel like running out to your local ham shop and plunking down a hundred dollars or so to buy one of those fancy things they're selling nowadays? Can you still use a Zepp? Definitely. Fig. 4 shows one way to get a good match to 52- or 75-Ohm coaxial cable. Fig. 5 illustrates a second method. When the correct matching point is found, the swr is 1 at resonance.

Vertical Sans Radials

Of course, we can orient a Zepp in any direction we want. Figs. 4 and 5 show two vertical Zepp antennas. The antenna in Fig. 4 is often called a J-pole and is fairly common at VHF. But it is practical down to about 20 meters, and if you're ambitious, you might want to try building one for 40. In Fig. 5 is a method of feeding a half-wave radiator. This is definitely practical down to 40 meters. Both of these schemes constitute Zepp feed. Both of these antennas are monobanders, though, because of the matching technique used.

These antennas do not need any radial system. In both instances, the base impedance is very high and thus ground loss is kept to a minimum. Adding radials to the antenna in Fig. 5 will improve its performance, because of the gain resulting from the image signal. (This will provide the equivalent of a 2-element collinear.)

Other Zepps

A half-wave sloper may be fed at the end instead of in the center. The performance of the antenna will be the same in either case. This is shown in Fig. 6(a).

Zepp feed, because of its convenience, allows an exotic method of getting the antenna up in the air. This is shown in Fig. 6(b). The feedline should be TV-type twinlead, in order to minimize the weight, and the kite may have to be pretty big. But this idea has been used successfully on 160-meter endeavors when the wind is strong enough! One word of caution: Make sure the system is not flown

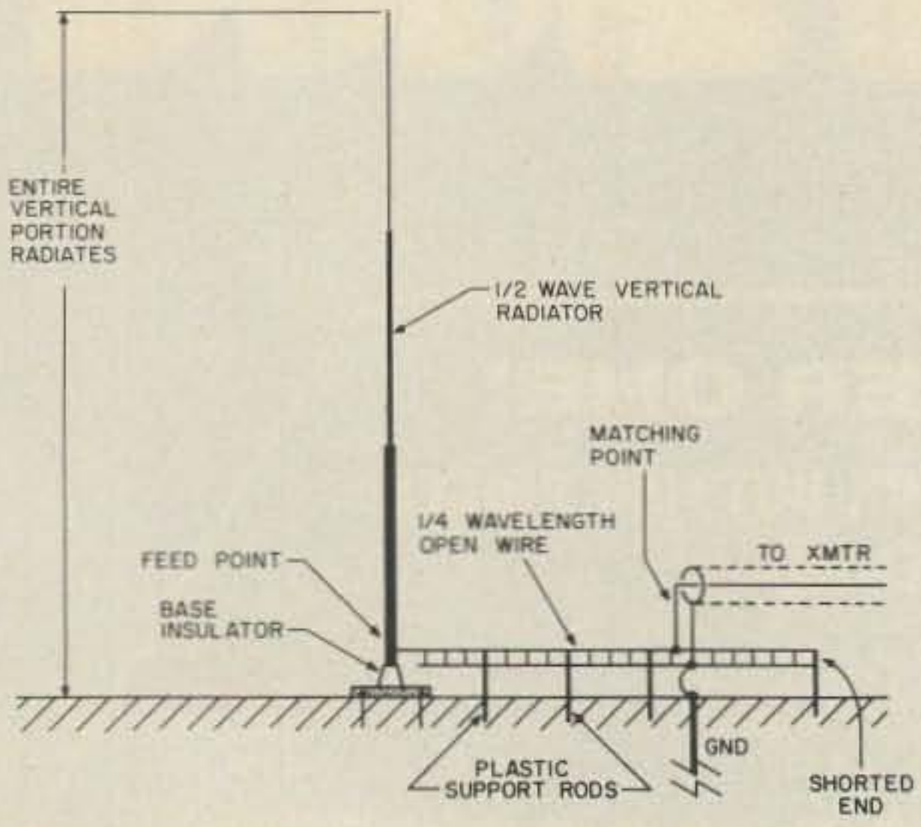

Fig. 5. Zepp feed for a half-wave vertical. The length of the open-wire matching section in feet is 275/f. (Don't use TV twinlead!) Adjustment of the matching point is required; a good starting point is 1/6 of the way from the shorted end to the antenna end of the matching section for this antenna and for the J-pole.

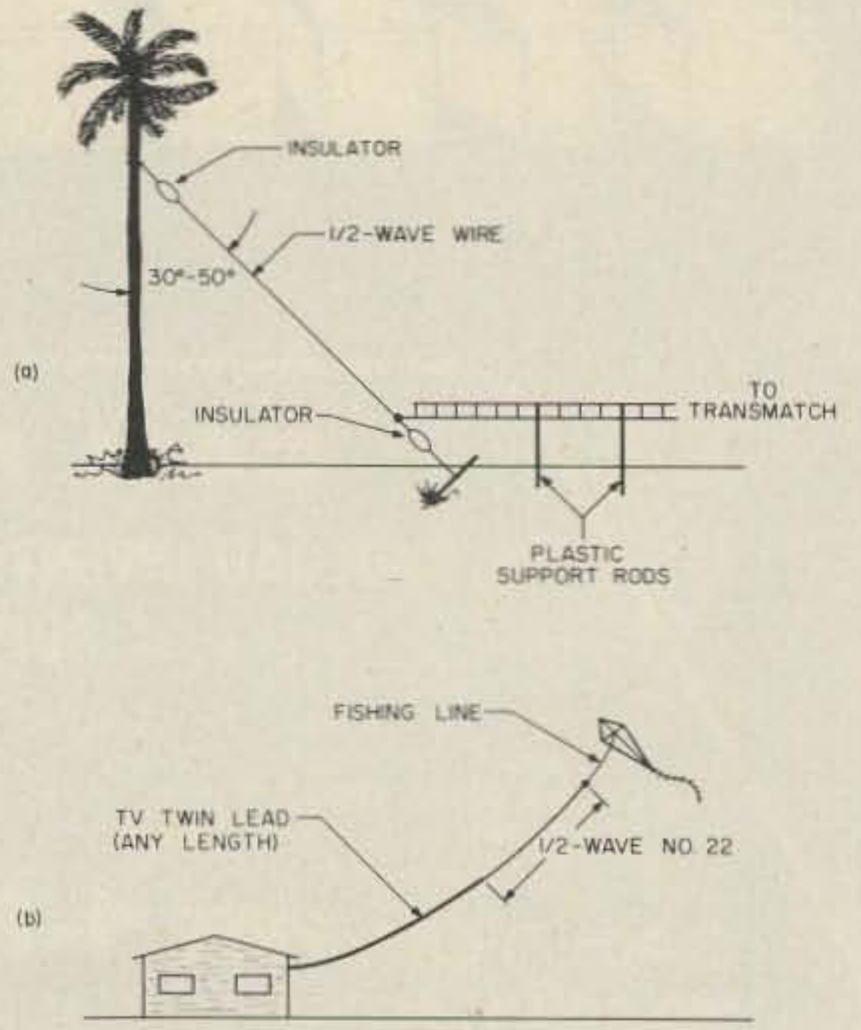

Fig. 6. At (a), end feed for a half-wave sloper. At (b), well, end feed for a half-wave sloper! These antennas will work at the fundamental and all harmonics.

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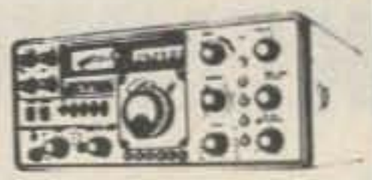

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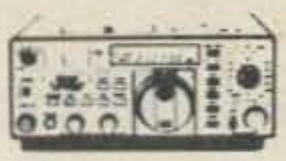

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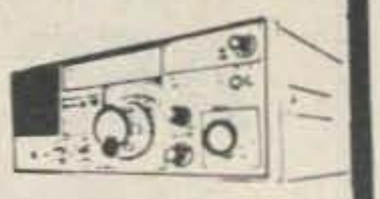

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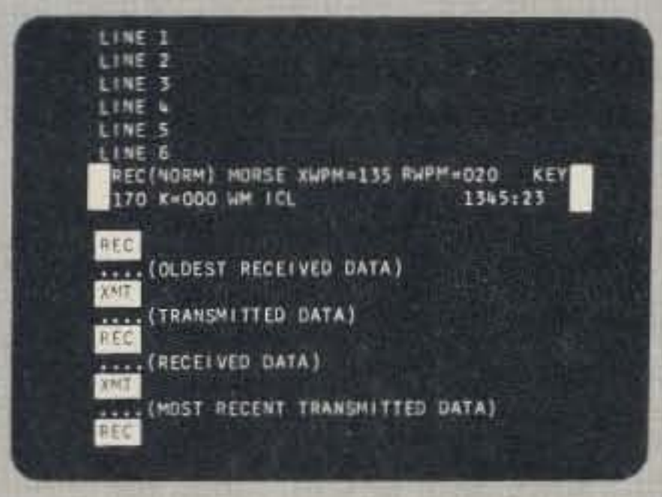

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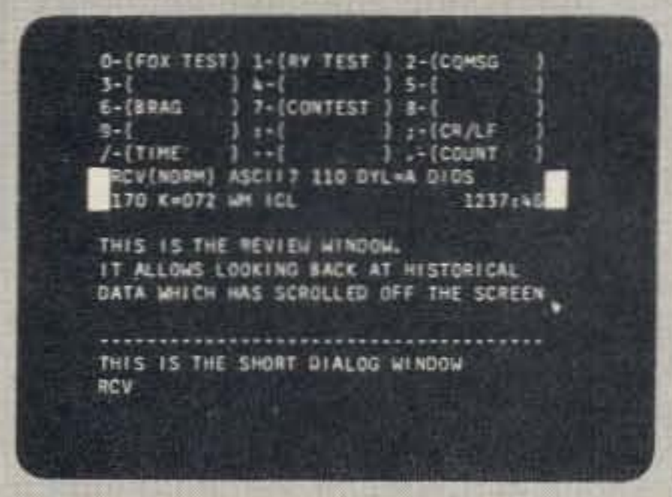

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See List of Advertisers on page 130

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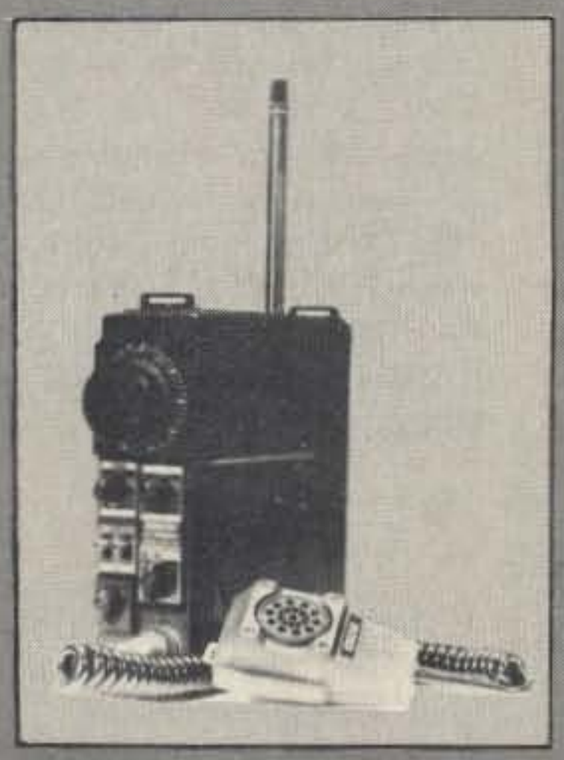

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SOCIAL EVENTS

from page 90

.34/.94. For more info, advanced reservations, or raffle tickets, send an SASE to Jerry Frederick N0BNG, 1127-104th Avenue West, Duluth MN 55808.

LUFKIN TX
MAY 14-16

The Region Four Air Force MARS will hold their annual convention on May 14-16, 1982, at the Ramada Inn, Lufkin TX. Friday night there will be an administrative meeting of all headquarters personnel and all Region Four officials, and Saturday there will be a series of programs. A banquet will be held on Saturday night. For further details, please contact Ed Langston AFA4KH, Convention Chairman, 1123 Sayers Street, Lufkin TX 75901.

CADILLAC MI
MAY 15

The 22nd annual Swap Shop & Eyeball QSO will be held on Saturday, May 15, 1982, from 8:00 am to 4:00 pm at the Wexford Civic Arena, US 131 North, Cadillac MI. Tickets are $2.50 and 8-foot tables are $4.00. There will be prizes, plenty of parking, and lunches available. Talk-in on 146.37/.97. For further information, contact Wexaukee Amateur Radio Association, PO Box 163, Cadillac MI 49601-0163.

DURHAM NC
MAY 15

The Durham FM Association will hold the annual Durhamfest on May 15, 1982, at the South Square Mall, US 15-501 south, Durham NC. Admission is $3.50 with no additional charge for tailgating or dealers' spaces. Features will include prizes and a flea market. Motels, a restaurant, facilities, tables, and power will be available. Talk-in on 147.825/.225. For more information, write Durhamfest, Box 777, Hillsborough NC 27278.

ROGERS AR
MAY 15

The Northwest Arkansas Amateur Radio Club, Inc., will hold its 2nd annual hamfest/swapmeet on Saturday, May 15, 1982, from 8:00 am to 4:00 pm at the Community Building (Old Armory), US Hwy 71, Rogers AR. Commercial exhibitors' and flea market tables and spaces are free. Doors will open at 6:00 am for setup. Main prize tickets are 3 for $5.00 or $2.00 each and prizes include a complete Kenwood station consisting of TS-130S, ac power supply, and MC-50 mike. There will also be door prizes, free parking, and programs, including MARS, DX, and Skywarn. Talk-in on 146.16/.76 or 146.52. For more information, write Mary Webb KA5HEV, PO Box 338, Prairie Grove AR 72753, or call (501)-846-2847.

BATON ROUGE LA
MAY 15-16

The Baton Rouge Amateur Radio Club will hold its annual hamfest on Saturday and Sunday, May 15-16, 1982, at Catholic High School, 855 Hearthstone Drive, Baton Rouge LA. There will be swap tables, dealers' exhibits, technical forums, and activities for the non-ham wives and children. Talk-in on .19/.79 and .52 simplex. For further information, write BRARC, PO Box 4004, Baton Rouge LA 70821.

ATHENS OH
MAY 16

The Athens County ARA annual hamfest will be held on Sunday, May 16, 1982, from 8:00 am to 4:00 pm at the Athens City Recreation Center, East State Street, Athens OH. There will be a free flea market for electronics-related items on a large paved area and some indoor space available on a first come, first served basis. Setup is at 7:00 am. Food, free parking, and several nearby restaurants will be available. Tickets are $1.00 in advance and $2.00 at the gate. Talk-in on .34/.94. For further information, send an SASE to ACARA, PO Box 72, Athens OH 45701, or phone Joe Follrod WB8DOD at (614)-797-4874.

MARSHALL MO
MAY 16

The Indian Foothills Amateur Radio Club will hold its 7th annual hamfest on May 16, 1982, at the Saline County Fairgrounds building, Marshall MO. Tickets are $2.00 each or 3 for $5.00 at the door, or 5 for $5.00 in advance. There is no charge for tables but reservations are requested. Registration will be at 8:00 am and coffee and breakfast rolls will be available from 8:00 am to 10:00 am. Lunch (all you can eat) will be at 11:30 am. The drawing will be held at 2:30 pm with a first prize of a KDK 2025 Mark II. Talk-in on .52, .28/.88, and 147.84/.24. For additional information and advance tickets, contact Jim Little KB0DA, 405 E. Rosehill, Marshall MO 65340, or call (816)-886-8583 after 5:00 pm, or K0BVB at (816)-886-2837.

EASTON MD
MAY 16

The eighth annual Easton Amateur Radio Society Hamfest will be held on May 16, 1982, rain or shine, from 8:00 am to 4:00 pm at the Easton Senior High School cafetorium, Rte. 50, just south of Easton at mile marker 66. The donation is $2.00 with an additional $2.00 for tables or tailgaters. Talk-in on .52 and 146.445/147.045. For more details, write Van Herridge WB3HGQ, Box J, St. Michaels MD 21663 or Easton Amateur Radio Society, Inc., Box 781, Easton MD 21601.

WEBSTER MA
MAY 16

The Eastern Connecticut Amateur Radio Association will hold its 8th annual flea market and auction on Sunday, May 16, 1982, starting at 9:00 am, rain or shine, at the Point Breeze Restaurant, Webster Lake, Webster MA. Admission is $1.00 and table reservations are $5.00 in advance or $7.00 at the door. Food and drinks will be available as well as free parking. The auction will be held at 1:00 pm. Talk-in on 147.885/.285 K1MUJ and 146.52. For reservations and additional information, contact Dick Spahl K1SYI, Lake Parkway, Webster MA 01570, or phone (617)-843-4420 after 7:00 pm.

WABASH IN
MAY 16

The Wabash County Amateur Radio Club will hold its annual hamfest on Sunday, May 16, 1982, from 5:00 am until 4:00 pm at the Wabash County 4-H Fairgrounds, Wabash IN. Admission will be $3.00 at the gate or $2.50 in advance. There will be plenty of food and parking available, as well as free overnight camping on Saturday. Talk-in on 147.63/.03 or 146.52. For tickets or more info, send an SASE to Dave Spangler N9ADO, 45 Grant Street, Wabash IN 46992.

EVANSVILLE IN
MAY 16

The Tristate Amateur Radio Society (TARS) will hold its annual hamfest on Sunday, May 16, 1982, beginning at 6:00 am CDT at the Vanderburgh County 4-H Center, Evansville IN. Admission is $2.00. Tables will be available in the air-conditioned indoors. An outdoor flea market will also be featured. Talk-in on 147.75/.15 and 146.19/.79. For additional information and table reservations, contact Hal Wilson WB9FNN, RR 8, Box 427B, Evansville IN 47711.

WRIGHTSTOWN PA
MAY 16

The Warminster Amateur Radio Club will hold its annual hamfest on Sunday, May 16, 1982, from 7:00 am to 3:00 pm at the Middletown Grange Fairgrounds, Wrightstown PA, near Philadelphia. Admission is $3.00 at the gate with an additional $2.00 for each 8-foot seller's space. Children and spouses will be admitted free. If pre-registered by May 1, 1982, the admission fee will be $1.00 less. Door prizes will be awarded every half hour beginning at 9:00 am. Talk-in on 147.690/.090 and 146.520. For more information, write PO Box 113, Warminster PA 18974, or call Bill Scott KA3CHB at (215)-249-0568 after 6:00 pm.

FRESNO CA
MAY 21-23

The Fresno Amateur Radio Club, Inc., will hold its 40th annual hamfest on May 21-23, 1982, at the Hacienda Inn, Clinton and Highway 99, Fresno CA. The full advance registration cost is $20.00. On Friday, activities will include registration, a golf tournament, and wine tasting; on Saturday, swap tables, commercial exhibits, a luncheon program, a CW contest, MARS meetings, a transmitter hunt, a No Host Cocktail Hour, and a banquet with speaker, Dr. Henry Richter; on Sunday, a

WPSS Breakfast. Talk-in on 146.34/.94. For advance registration or more information, contact the Fresno Amateur Radio Club, Inc., PO Box 783, Fresno CA 93712.

GORHAM ME
MAY 22

The Portland Amateur Wireless Association and the Southern Maine University Radio Club will hold their annual flea market on May 22, 1982, from 8:00 am to 4:00 pm (inside if it rains) at the Gorham ME campus. The cost is $1.00. Food will be available. Talk-in on 146.73R and 146.52S. For additional information, write John Taylor N1SD, 44 Milton Street, Portland ME 04102, or call (207)-773-2651.

GREEN BAY WI
MAY 22

The Green Bay Mike and Key Club will be holding its seventh annual swapfest on Saturday, May 22, 1982, from 8:00 am to 3:00 pm at the Norwood School, Norwood and Ninth, Green Bay WI. Admission is $1.50 in advance by May 1st, and $2.00 at the door. Table space is $2.00, and there will be one free admission for every 2 tables bought. Door prizes will be given away and food and beverages will be available. Talk-in on 147.72/.12 and 146.52. For more information, contact Bob Duescher KA9BXG, 1011 13th Avenue, Green Bay WI 54302 or phone (414)-497-7880.

WEYMOUTH MA
MAY 22

The South Shore Repeater Association will hold its ham radio/electronic/computer flea market on Saturday, May 22, 1982, at Weymouth South High School Cafeteria, 300 Pleasant Street, Weymouth MA. Admission is $1.00 for each buyer and tables are $5.00 in advance or $8.00 at the door. Doors open for sellers at 9:00 am and for buyers at 10:00 am. Food and refreshments will be available. For directions or table reservations, please contact SSRA, c/o David Newman, PO Box 447, Abington MA 02351.

KNOXVILLE TN
MAY 22-23

The 1982 ARRL Delta Division Convention and the sixteenth annual Knoxville Hamfest will be held on Memorial Day Weekend, May 22-23, 1982, at Bearden High School, Knoxville TX. Forums will be on the future of amateur radio, DXCC, the CQ 5B-WAZ program, fast-scan TV, computers and amateur radio, and the ARRL. Other activities include programs for non-ham ladies, a shuttle bus to the World's Fair, an indoor and outdoor flea market, an exhibit area, and the verifying of QSL cards by Don Search W3AZD and Bob May K4SE. Both 4-land QSL bureaus will be in attendance and cash prizes will be offered in the Ron McKean Memorial CW competition. For more information, please write Delta Division Convention, c/o Ray Adams N4BAQ, 5833 Clinton Highway, Suite 203, Knoxville TN 37921, or phone (615)-688-7771 (days) or (615)-687-5410 (nights).

HARTWELL GA
MAY 22-23

The Anderson, Hartwell, and Toccoa Amateur Radio Clubs will hold the 4th annual Lake Hartwell Hamfest on May 22-23, 1982, at the Lake Hartwell Group Camp, located on Highway 29, 4 miles north of Hartwell GA. Features include free admissions, free camping, and free flea market space. Activities include a left-footed CW contest, horseshoes, bingo, and many other activities for the whole family. Fishing, swimming, and camping are available on the site. The campground will open at 6:00 pm Friday and the main prize drawing will be held at 2:00 pm Sunday. Talk-in on 146.19/.79, 147.93/.33, and 146.895/.295. For further information, contact Ray Pettit WB4ZLG, Rte. 1 Dooley Drive, Toccoa GA 30577.

BOULDER CO
MAY 23

The Rocky Mountain VHF Society will hold the annual spring hamfest on Sunday, May 23, 1982, from 9:00 am to 3:00 pm, rain or shine, at the Boulder National Guard Armory, 4750 North Broadway, Boulder CO. The admission donation will be $2.00 per family and there is no seller's charge. The gates will open for sellers at 8:00 am and they suggest you bring your own table. The door prizes will include a synthesized FM transceiver, and extra raffle tickets will be available. In addition to the big ham swap, there will be technical demonstrations and seminars, covering topics such as fast-scan ham TV, microwaves, satellite communications, etc. Food and drink will be available. Talk-in on 146.16/.76 and 146.52. For more information, contact Richard Ferguson KA0DXM, 1150 Albion Road, Boulder CO 80303, or phone (303)-449-2871.

NATCHEZ MS
MAY 23

The Old Natchez Amateur Radio Club (ONARC) will hold its hamfest on Sunday, May 23, 1982, at the Natchez Convention Center, Natchez MS. Doors will open at 8:00 am and there will be food available as well as free admission and free swap tables. Talk-in on 146.31/.91. For further information, contact S. W. Gates N5AXV, PO Box 203, Natchez MS 39120.

ISLIP LI NY
MAY 23

The Long Island Mobile Amateur Radio Club will hold the ARRL Hamfair '82 on May 23, 1982, at the Islip Speedway LI NY. General admission is $2.00 and $5.00 per car space will be charged for exhibitors. Food and refreshments will be available at the track. There will be door prizes and special prizes drawn all day from 9:00 am to 4:00 pm. Talk-in on 146.85 (a 4Z PL will extend your range into New York City). For more information, call Sid Wolin K2LJH at (516)-379-2861, or Hank Wener WB2ALW at (516)-484-4322 in the evening.

BURLINGTON KY
MAY 23

The Northern Kentucky Amateur Radio Club will hold its annual Ham-a-rama on Sunday, May 23, 1982, at the Burlington Fairgrounds, Burlington KY (off 275, Burlington-Florence exit). Individual tickets are $4.00, family tickets are $6.00, and each ticket entitles you to the major prize drawing at 4:00 pm. First prize is a Kenwood low-band TS-130S or $500, second prize is a Kenwood HC-10 station clock, and there will be a special raffle for an Icom 2AT. Features will

Continued on page 146

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- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

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D-40	40,15	66	28.95	24.95
D-20	20	33	27.95	23.95
D-15	15	22	26.95	22.95
D-10	10	16	25.95	21.95
Shortened dipoles				
SD-80	80,75	90	35.95	31.95
SD-40	40	45	32.95	28.95
Parallel dipoles				
PD-8010	80,40,20,10,15	130	43.95	39.95
PD-4010	40,20,10,15	66	37.95	33.95
PD-8040	80,40,15	130	39.95	35.95
PD-4020	40,20,15	66	33.95	29.95
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S-80	80,75		$11.95 pr	
S-40	40		$10.95 pr	

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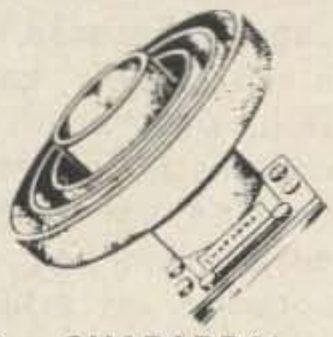

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Surviving the Unthinkable

— part I: the ham's role

Today they hauled out the last of the Civil-Defense supply cans from our office building. It wasn't much of a loss, however, because long ago the familiar drab green cans with their black lettering had been emptied of their contents. Once they had stored food, water, medical supplies, radiation-monitoring equipment, clothes, etc., enough material for several hundred people to survive for two weeks after a worldwide nuclear holocaust.

The fallout shelter sign is a symbol of protection which is now giving way to crisis relocation plans.

But the food grew rancid and the other materials deteriorated. With several reorganizations of the building, the cans constantly were reshuffled into corners until, finally, there was no other place to put them but out with the trash. Tonight they most likely grace the garage of a member of the maintenance staff who saw them as too good to discard and recovered them to use for workshop trash, discarded cuttings from his table saw, or some such refuse.

The case here is common. The once-familiar sight of fallout shelter supplies gracing the basements of public buildings has all but disappeared. Only a few of the once-common fallout shelter signs remain. Most likely, if you care to check a building displaying a shelter sign, you will find plenty of shelter and no usable supplies.

So, what would happen if our nation's 225 million people suffered an attack by a nation using nuclear warheads? Are we totally unprotected? Out of luck? Frankly, according to civil-defense planners, people heading for those old-style shelters might be out of luck, anyway. The shelters are often located in downtown areas of large metropolitan areas. With a direct hit to one of these cities, it is very likely that the shelter would provide as much protection to its occupants as no shelter at all. Cities where this problem is expected to occur are shown

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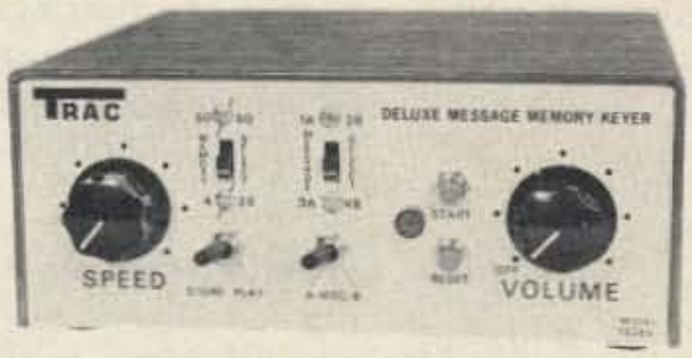

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Fig. 1. The dots here represent possible high-risk areas which require crisis relocation plans.

in Fig. 1, which is a map of cities most likely to receive direct hits in an all-out nuclear war.

The idea of these home cities being targets of some foreign nuclear power is not a pleasant thought. But in a world of increasing tensions, there no doubt will be an increased interest in our praying for peace, and also preparing for our own personal defense in the event our world leaders some day fail to keep the peace.

As an alternative to hiding in big-city shelters, planners suggest that it may be better to move people out of the crucial areas where devastation is most likely to occur. (Fig. 2 shows the sphere of effect for each 1-megaton device.) This plan is apparently patterned after a Russian plan discovered several years ago.

According to a recent publication of the Federal Emergency Management Agency, which now handles civil defense, the new plan is as much a negotiation plan as anything. They feel that in a game of superpower brinksmanship, where each side will see just how far the other will go before "pushing the button," the Russians would most likely evacuate their cities as a defense mechanism before launching an attack on us. Naturally, the planners feel our intelligence sources would let us know of the evacuation. At that point, we would rely on our country's availability of rapid transit and family cars to completely evacuate before the Russians do. We would then declare that since we're safe and they're not, they should back off and forget about blowing us to oblivion.

There are some good points about the plan. It is true that the United States has great versatility due to our widespread use of private cars, while the Russians cannot afford to have a car in every garage and would need to rely on trains, buses, and "marching routes" to move their people 30 to 200 miles from major cities. An illustration of their plan is shown in Fig. 3. The weather, however, complicates survival, as shown in Fig. 4.

Calculating the cold hard facts and the alternatives of attack plans, civil-defense authorities in the US figure that if the Russians attacked before evacuating, they would lose about 100 million civilians. On the other hand, if they evacuate first, they would lose a mere 20 million.

A non-classified Federal Emergency Management Agency report issued in October, 1980, states five key points about a Soviet attack strategy.

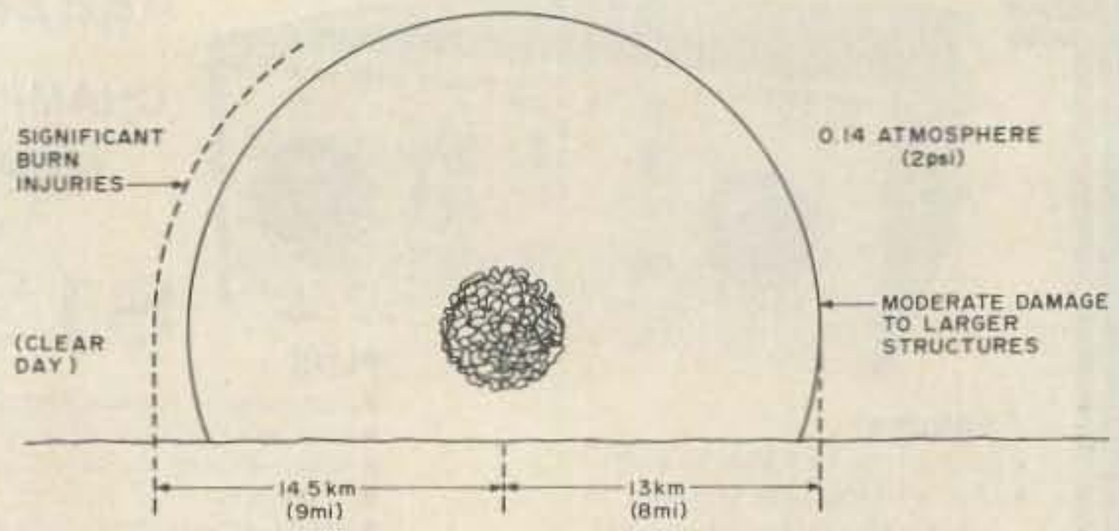


Fig. 2. Expected effects of 1-megaton air blast.

"1) The Soviets probably have sufficient blast-shelter space in hardened command posts for virtually all of the leadership elements at all levels (about 110,000 people).

2) With a few hours of warning or less, the Soviets would suffer over 100 million casualties, but a large percentage of the leadership elements probably would survive.

3) With 2 or 3 day of preparation, the Soviets would suffer less than 50 million casualties.

4) With a week (or more), they would suffer casualties in the low tens of millions.

5) Therefore, the critical decision to be made by the Soviet leaders in terms of sparing the population would be whether to evacuate cities. Only by evacuating the bulk of the urban population could they hope to achieve a marked reduction in the number of urban casualties."

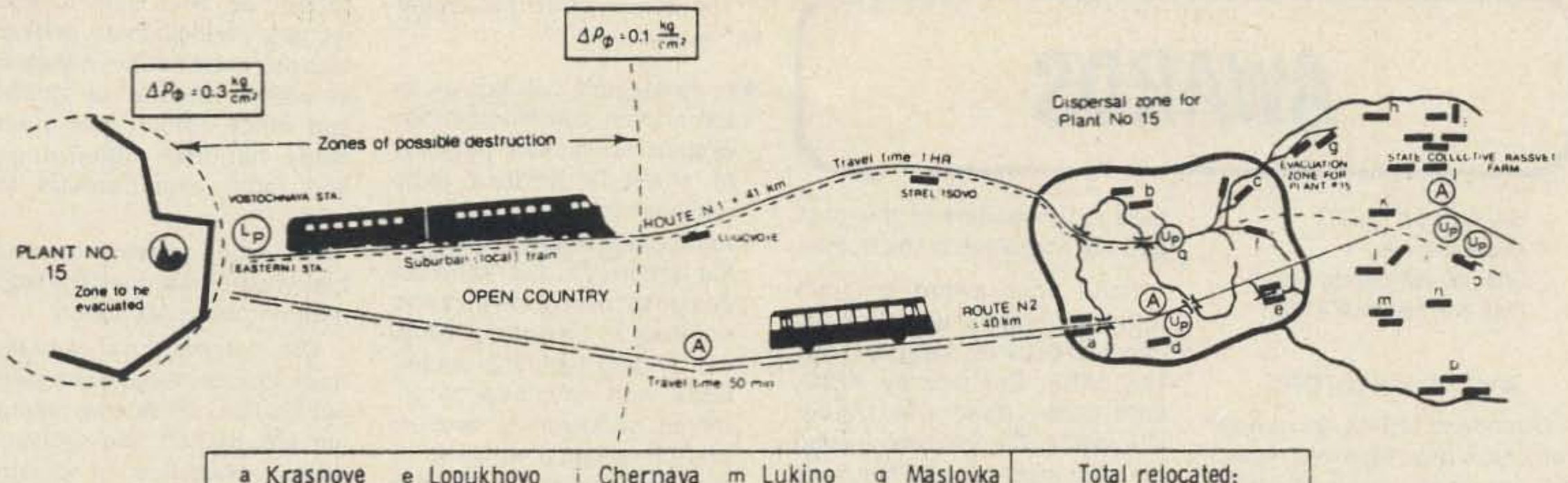
The same reasoning applies to the United States. The most horrifying part of the statistics is that at the very least we're talking about tens of millions of lost lives. And that doesn't count radiation sickness, burns, exposure, starvation, etc.

The United States system was scheduled to be in place for most all cities during 1981. Under the system, planners believe that 80% of our population would survive to rebuild. Again, they do not estimate the aftereffects of such a disaster on the survivors of any nation.

Even after the plans are completed, there will be much additional work to be done: Shelters need to be constructed; managers need to be trained; tests of the system must be made, followed by evaluation of the tests and redirection based on the results of the tests.

Amateur radio is not mentioned in the FEMA publication sent to me regarding the crisis relocation plan. The response I received from an FEMA official states, "Those amateur radio operators who operate with Radio Amateur Civil Emergency Services (RACES) are still a very important part of civil preparedness. RACES licenses as such are no longer being issued by the FCC, but each RACES operator uses his own call letters. However, these persons must be recognized as part of the civil-preparedness organization in order to operate during emergencies under the auspices of RACES. Any RACES planning should be done with your own state of Iowa and the FCC."

Such planning is of little consolation to the residents of a state when they find out that nearly all of the state's (Iowa) 4,000 hams cannot operate, and the few licensed to operate the state's RACES station left the state one day ahead of a nuclear attack.



a Krasnoye	e Lopukhovo	i Chernava	m Lukino	q Maslovka Station	Total relocated:
b Maslovka	f Dvoriki	j Pavlovo	n Markovo		311 workers & employees
c Karpovo	g Vyselki	k Sredniy	o Zhuravlevo		253 dependents
d Setun'	h Krapivino	l Goloveno	p Aleshkino		564

Ⓛp Loading point Ⓤp Unloading point

Fig. 3. According to the Federal Emergency Management Agency, this diagram shows Soviet plans for a crisis relocation program. The plan calls for dispersal of the population and daily commuting of workers to their places of employment.

By comparison, the May, 1980, issue of *73 Magazine* carried an article which described amateur activities when about 300,000 people came to Des Moines, Iowa, for an afternoon visit with Pope John Paul II. More than 150 local and state-wide amateur radio operators provided excellent health and welfare services that day. The ratio of ham operators to population was about one amateur station for every 2,000 people. A substantially greater ratio was provided in areas where the sick and invalids were.

The situation in Des Moines was perhaps the best possible test of a crisis relocation program anywhere in the world since planners considered the notion of relocating hundreds of thousands of people. It was a complex program which was not easily undertaken. But on the specific point of supply of amateur radio operators, if the same ratio of amateur radio stations to population were applied to a national crisis-relocation program, *one out of every three* amateur radio stations in this country would need to be on the air in some assigned duty all the way from two meters through 160 meters. CW, FM, and SSB, in hundreds of orderly, planned, and tested networks, would be needed.

Fig. 4. This is one of many possible distributions of fallout from a nuclear attack on the United States. The actual distribution would, of course, depend on the location and number of actual strikes and weather conditions.

It is extremely unlikely that the present RACES system could come close to meeting the needs. As of December, 1979, there were only 610 officially licensed RACES stations on the FCC's books. We would need no less than 112,000 dedicated patriotic and very brave volunteers and their equipment.

The time is definitely here for amateurs to approach their local civil-defense authorities and the FCC to have this now-sophisticated service available on a widespread basis to every interested amateur radio operator in the event of a national emergency. Amateur radio is the only service which can provide a most-reliable communications system under severe circumstances when, for example, the entire telephone system would be rendered totally useless, merely because major switching locations would no longer exist!

Ham radio operators should be encouraged to improve their Morse-code capabilities, because under such strenuous situations, when even an amateur system may reach its peak in traffic-handling capabilities, every cycle of bandwidth of spectrum space is vital to the proper completion of the task. Currently, only CW operation can offer a bandwidth of just a few hundred cycles.

Right now, none of us, in our wildest dreams, can imagine how horrifying the world would be after a nuclear war. Our surviving population would need all the possible assistance that could be mustered, including medical supplies, food, and shelter, to name only a few. The existence of the top-notch amateur system like the one we now have could be the single most important item and could provide the key to our success.

In part II of this article, I will provide some details on just what can be done at each of our ham stations to lessen the danger to our communications systems. Some methods are simple, others incredibly expensive, but all of us can do something. ■

Acknowledgement

Figs. 1 through 3 are from *US Crisis Relocation Planning*, Federal Emergency Management Agency, 1980.

AWARDS

Bill Gosney KE7C
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AWARD DIRECTORY

Countless letters and phone calls have been received regarding a proposed award directory, supposedly being sponsored by this magazine. To set the record straight and to avoid any further confusion, allow me to say that such a *73* publication just does not exist. That, of course, does not mean one will not be available in the distant future!

To attempt such an endeavor, the compiling of precise and up-to-date information becomes paramount and obviously the most difficult task. Unfortunately, too often, the author of such a publication has to be at the mercy of the various amateur radio clubs and organizations to provide him with the necessary input to make such a volume a reality. However, due to the apparent lack of interest of so many to submit information about their respective awards programs, we have almost discounted the idea altogether. Those who are theory-oriented will understand that no input is directly proportional to negative output!

However, to preserve the well-known Wayne Green tradition, "never say die," another attempt will be made to remuster the readership for their help to fill this void in our award files. We could use data on any award program you or your local club may be sponsoring, as well as any information regarding other award programs you may be aware of.

When you forward the various rules for each award, be sure to include an original of each award certificate so that it may be published in its entirety. After all, this is free advertising, ladies and gents! Don't you realize the exposure you'll be getting? The fact is, you will not have to pay $1500 per page as all advertisers have to just to get their message across to the readers. Take advantage of this unbelievable offer which only Wayne Green himself could extend to the readers of the most popular magazine in the hobby!

Send your award program rules and original award certificates directly to: Awards Directory, Attn: Bill Gosney KE7C, 2665 Busby Road, Oak Harbor WA 98277. Do not delay—send me your input today. Then, over the months ahead, perhaps we can put together the directory you've all been waiting for.

INTERNATIONAL AMATEUR RADIO SOCIETY

The International Amateur Radio Society (IARS) is an achievement, educational, public service, and amateur radio honor fraternity. It is the parent organization for the International Certificate Hunters Club (CHC), the International Shortwave Listeners Certificate Hunters Club (SWL-CHC), the International Amateur Radio Journalistic Society (IARJS), and the International Flying Hams Club (FHC), along with many affiliated subdivisions worldwide called either chapters or amateur radio associations.

The IARS publishes the *International Amateur Radio Society Annual,* which incorporates *The Directory of Certificates and Awards*, copyrighted internationally. The IARS also publishes the newsletter *Dialog*, through the IARJS, and the newsletter *Xtra*, the official house organ which reports news, special events, DX forecasts, and other items of interest to all members.

Through the CHC, the IARS sponsors many operating events, community services, achievement awards, and on-the-air nets. The IARS and its affiliates do not engage in partisan politics, but do take interest and action with regard to matters concerning the world's radio amateurs. It seeks to assist and cooperate with the many national amateur radio organizations (such as the ARRL, RSGB, JARL, etc.) in nations the world over. Although we may not always agree with what or how they do things, we acknowledge their efforts and lend them our support and participation.

The purposes of this organization are:

- to create and maintain an international communications system composed primarily of on-the-air amateur radio networks for all amateurs;
- to institute educational training programs and activities designed to advance the radio amateur's operating proficiency and technical knowledge, with emphasis on on-the-air gentlemanly conduct and compliance with the intent and interest of applicable national regulatory laws;
- to institute worldwide educational programs promoting improved human relations, international goodwill, and fellowship among men and women everywhere, without restriction or discrimination as to race, creed, color, national origin, political views, or religious belief;
- to promote the concept that shortwave listeners (SWLs) are fraternal kin to licensed amateurs and should be included in their programs and affairs;
- to promote the general welfare and survival of amateur radio as established under the International Communications Treaty;
- to publish educational books, magazines, newsletters, and literature in fields relating to international amateur radio; and
- to provide a comprehensive awards program, through the CHC, and to encourage and document the communication skills displayed by licensed radio amateurs and shortwave listeners.

The IARS, IARJS, CHC, SWL-CHC, and the FHC were created by Clif Evans K6BX in 1960 and have been protected as part of the copyrighted works of the Directory of Certificates and Awards. At the time of OM Clif Evans' death, the IARS, IARJS, CHC, SWL-CHC, and the FHC, along with 100 chartered, affiliated subdivisions called either chapters or associations, had over 22,000 members on the rolls, representing over 250 countries from all six continents.

They are making every effort possible to contact all of the members they have lost touch with since the death of Clif Evans and the closing of the old headquarters. Individual notification has been sent to each member via the bureau, and new club literature has been sent (via air mail) to all previous officials and office holders along with many national organizations and radio clubs around the world.

They look forward to all of their members around the world returning to active status.

The *International Amateur Radio Society Annual* is a yearly publication containing operating information and technical data, schedules of coming events of interest to the amateur community, net listings, DX tips, and much more. Included in the *IARS Annual* is *The Directory of Certificates and Awards*, the most comprehensive digest and guide to award-hunting ever offered to the amateur. The *IARS Annual* is also the organization's yearbook, offering a retrospective view on the past year and a look into the coming year, complete with IARS information on rules, codes, membership listings, and other items of interest to both the membership and amateurs at large.

The *IARS Annual* is published, revised, and updated annually in November, and covers in depth those topics not found in other handbooks. No amateur radio library is complete without it!

IARS Divisions Defined

IARJS: an international organization that provides a free and uncensored outlet for ideas, opinions, and proposals on behalf of amateur radio, through articles submitted by its members. These articles appear in the IARJS newsletter, *Dialog*, which provides its contributors an opportunity to inform radio amateurs throughout the world of conditions and situations affecting amateur radio. *Dialog* is a forum in which journalists and editors from around the world can exchange thoughts, ideas, and opinions on all matters concerning the future of amateur radio.

CHC: an international organization created to maintain an international communications system composed primarily of on-the-air amateur radio networks for all amateurs. The CHC also provides a comprehensive awards program and a vehicle for the procurement of awards from the many organizations around the world. Through its

system of networks, it provides the availability of contacts necessary for the achievement of these awards.

SWL-CHC: a mirror image of the CHC. SWL-CHCers seek the same achievement as radio amateurs except on a heard basis. All radio amateurs are also SWLs in half of all they do on the bands and are invited to participate in this division. The SWL-CHC also can provide the call-sign necessary for QSLing through the bureau.

FHC: self-explanatory. Membership is available to any licensed radio amateur or SWL who holds, or has ever held, any nature of pilot's license or designation: aircraft, lighter-than-air vehicle, space, or glider.

Net Activity

CHC nets are 10, 15, 20, 40, and 75 meters as the demand dictates. Some of our nets are: CHC DX net, 0200 to 0500 UTC, 14.298 ± QRM, daily; CHC DX net, 1900 to 2200 UTC, 21.370 ± QRM, daily; and CHC Pacific family hour, 0000 to 0300 UTC, 21.370, daily.

Old CHC/New CHC

If you were familiar with the previous organization under Clif Evans K6BX, you will notice that they have instituted some drastic changes in both the way the club is handled and its value system. The new organization bears little resemblance in many areas to its predecessor, and they are sure you will find the changes to your liking. It is a blend of old and new and should be worthy of your review.

Membership is not a requirement for participation in either the awards program or any net activity. Membership is available with each division independently. Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification (unless otherwise specified). When membership is attained, a membership number is issued which one holds *forever* regardless of change in name, call, QTH, class or license, or status of membership. Membership numbers and certificates are issued independently by each division. Membership in one division does not constitute membership in another.

Dues are payable during the first month of each year, January 1-31, following initial joining. Failure to pay dues will result in the member status being changed to inactive. Inactive members do not receive the newsletters, special club services, or voting rights when applicable. Inactive members always retain their original number. A member can go inactive in one division and still stay current in another. Payment of only present year's dues (not past) will restore any member to active status.

Newsletters are included with each membership, but are only available to members on active status. Articles are solicited from the members. They welcome information on all subjects pertaining to amateur radio, including hints and kinks, your local club's activity, awards issued by other organizations, etc.

Certificates of membership are issued to each new member with the approval of their application. They are of the highest quality and are very worthy of display.

Fees/dues for the IARS, CHC, SWI-CHC, and FHC are as follows: joining each division—$6.00 (overseas—$7.00, no prorating); yearly dues, each division—$4.00 (overseas—$5.00), all due Jan. 1st.

For additional information about this complex organization, address all inquiries to: Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

CENTER OF POPULATION AWARD

The geographical population center of the USA is close to St. Louis MO. To achieve this award, work one station in each state which borders Missouri. Work one station in Arkansas, Illinois, Iowa, Kentucky, Kansas, Nebraska, Oklahoma, and Tennessee, plus one station in St. Louis MO. Send list showing calls and log data plus $1 to Dean Cowden KK0V, 2317 Lee St., Poplar Bluff MO 63901.

USA AWARDS PROGRAM

There is no limit to the frequency this award is issued an applicant. An applicant can work any band or mode of operation. Endorsements are $1.00 each. Application for this awards program should be made to Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

The Worked All United States Award is issued in four classes. Class AA is for DX stations only and requires the applicant to work all 50 US states. Class A1 is for domestic stations and they, too, must work all 50 states for this class of award. Class A2 requires 40 states be worked while class A3 requires 30 states be worked and confirmed.

There is a Double Worked All States Award and the only requirement here is that you work two separate stations in the required number of states for the class of award you are attempting to pursue.

Likewise, there is a Triple Worked All States Award for which you must work a minimum of three separate stations in each of the required US states.

While you are at it, consider the Worked US States and State Capitals Award. Here, points are accumulated for each state and capital city worked. A single point is earned for each. To qualify for class A (DX only), 100 points must be earned. Class B requires 80 points, while class D requires 60 points.

To add insult to injury, included in the USA Awards Program is the Worked All States, Capitals, and Counties Award. Here again, the award is based on a point system. Each state is worth one point, two points are earned for each state capital city worked, and a total of ten points is earned for working all counties in a single state. Should you accumulate 600 county points, a trophy will be awarded. The class AA award is given for 600 points, class A for 500 points, class B for 400 points, class C for 300 points, class D for 200 points, class E for 100 points, and class F for 75 points.

ALL ALASKA COUNTIES

The Moose Horn Amateur Radio Club of Penai Peninsula, Alaska, announces the availability of their award for the State of Alaska. The award, in the form of a certificate, is available to licensed amateurs worldwide.

Certificates will be issued with endorsements for special modes or bands such as: class 1 (CW), class 2 (AM), class 3 (SSB), class 4 (RTTY), class 5 (mixed mode), and suffixes A (one band) and B (mixed bands). For example, certification or endorsement for an award on 20-meter SSB would be class 3A.

To qualify for this award, applicants must make four contacts in Alaska, one for each of the four judicial districts of Alaska. Of these, one contact must be made with a member of the Moose Horn Amateur Radio Club. All contacts must be made on or after August 15, 1961. It should be noted that the present system of judicial districts will be used in lieu of counties until such time that the State of Alaska adopts a system of actual counties.

To apply for the AACA, provide a list of confirmed contacts, certified by either two amateur operators, a local radio club official, or a notary public. Forward the verified list along with one US dollar or three (3) IRCs to cover air mail return of your award. All applications should be addressed to Ken Smith KL7JFY, PO Box 1682, Soldotna AK 99669.

By the way, here is a list of the

members of the Moose Horn ARC: KL7EJM, EK, EKN, EKO, FG, GIC, GJY, GNP, HHF, HQK, IEL, IFX, IN, ISO, ISP, IQQ, IQP, IZH, JDR, JFY, JL, KJ, LB, LE, NH, AL7BU, WL7ACQ, AEG, AJF, WB9NES, and VE6NH/KL7.

USS LING

On May 8, 1982, the weekend before Armed Forces Day, so as to not conflict with the operations of the Armed Forces activities, the Meadowlands Amateur Radio Association will be on board the *USS Ling* (SS297), docked on the Hackensack River in Hackensack, New Jersey, and will be operating under club station call N2BMN. The operation will begin on Saturday, May 8, at 1500Z and end at 2100Z. The following frequencies will be operated throughout the day, alternative between CW, SSB, and FM:

MODE	FREQ.	BAND
CW	14.060	20m
SSB	14.310	20m
CW	7.115	40m
CW	7.060	40m
SSB	7.250	40m
CW	28.110	10m
CW	28.060	10m
SSB	28.650	10m
CW	144.100	2m
SSB	144.150	2m
FM	146.150	2m
FM	146.550	2m

For confirmation of QSO, please send a large SASE (8½" x 11") to Ralph Francavilla N2BMN, 154 Redneck Avenue, Little Ferry NJ 07643.

NETHERLANDS-AMERICAN BICENTENNIAL

The Holland (MI) Amateur Radio Club will operate K8DAA plus other participating stations for the Netherlands-American Bicentennial during Tulip Time, May 12 through May 16, 1982. Operations will be in all phone bands and possibly some CW. One contact with K8DAA (club station) or two participating stations qualifies for a certificate. QSL to: HARC, PO Box 92, Zeeland MI 49464.

ARMED FORCES DAY

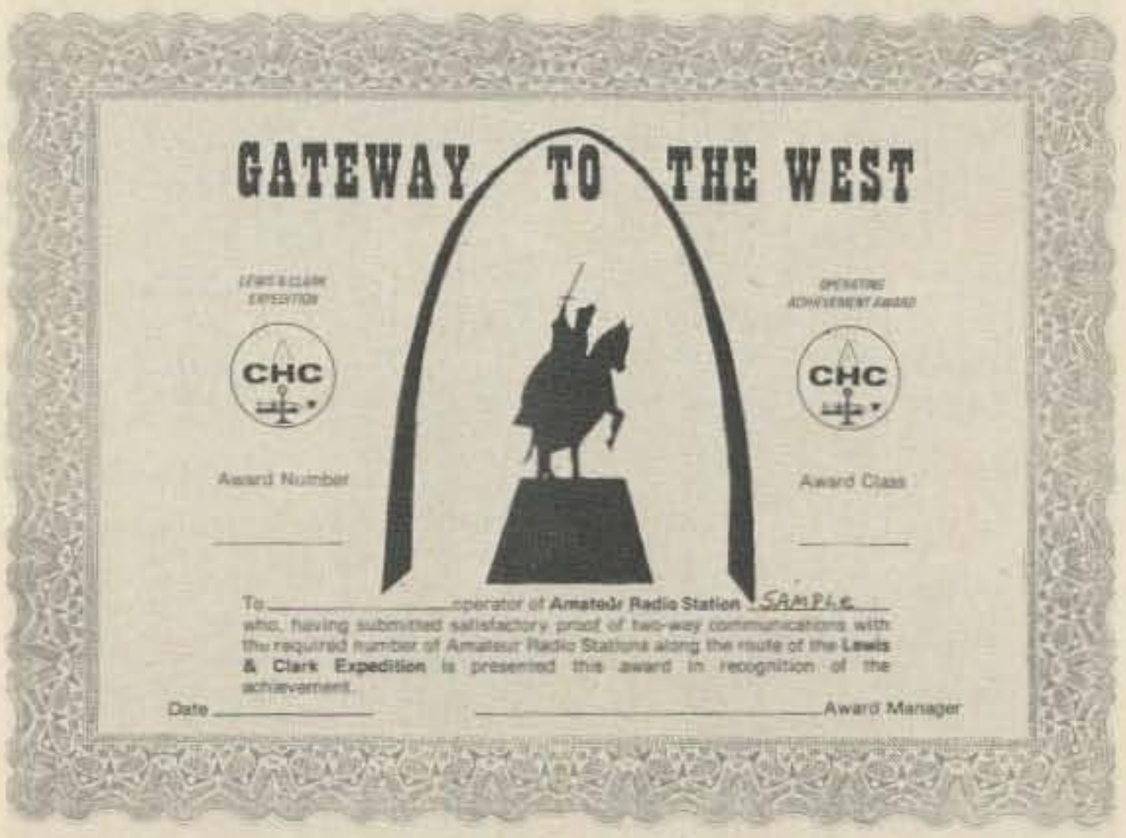
This year's observance of Armed Forces Day will include the operation of an amateur radio station from the United States Air Force Museum at Wright-Patterson Air Force Base, near Dayton, Ohio. Operating under the callsign K8DMZ, the station will be on the air from 1400Z to 2200Z on Saturday, May 15th. Operators will work primarily in the General class phone segments of 75, 40, 15, and 10 meters with periodic CW excursions to the Novice subbands. FM and SSB operations on 2 meters also are planned. The specific frequencies to be used will depend upon existing band conditions. To commemorate the event, the Museum will issue a special certificate for each two-way contact. This will be the first time an amateur radio has operated from the Museum in conjunction with a special event.

First established in 1923, the United States Air Force Museum is the oldest and largest military aviation museum in the world. It is located six miles northeast of Dayton at historic Wright-Patterson Air Force Base and is close to the Huffman Prairie site where the Wright Brothers conducted many experimental flights following their first successful powered flight at Kitty Hawk, North Carolina.

For further information, contact: Mr. Joe Ventolo, USAF Museum, Wright-Patterson AFB, Ohio 45433, (513)-255-3284, or the Museum's Public Affairs Officers, Dick Baughman or Linda Smith.

GATEWAY TO THE WEST ACHIEVEMENT AWARD

Work stations in states through which the Lewis and Clark expedition passed. Work one station in each of the following states: Idaho, Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, and Washington, plus one station in St. Louis MO. Send list showing calls and log data plus $1 to Dean Cowden KKØV, 2317 Lee St., Poplar Bluff MO 63901.



CAPE HATTERAS LIGHTHOUSE I

The weekend of May 15 and 16, the Rockingham County ARC will be operating from the Cape Hatteras Lighthouse on the outer banks of North Carolina. This lighthouse, which at 208 feet is the tallest brick lighthouse in the country, is designated as a national historic landmark and is seen by over a million visitors each year. But this beautiful sentinel is in danger of falling victim to the Atlantic's turbulent forces. Once 1500 feet from the shoreline, it now stands less than 70 feet from the water—despite various efforts to control the erosion.

The RCARC hopes its mini-expedition will help to draw national attention to this graceful and historic landmark. Operating frequencies will be 30 kHz up from the bottom of the General portion in each band, both phone and CW.

CAPE HATTERAS LIGHTHOUSE II

When the Cape Hatteras Lighthouse was completed in 1870, it was 1500 feet from the shoreline. Today, it is 70 feet—and closing. The Cary Amateur Radio Club, Cary, North Carolina, will draw world attention to the peril of this keeper of the "graveyard of the Atlantic." On May 29-30, whether the lighthouse is still standing or not, Cary ARC members and friends will put two HF stations on the air from a site close to "the big candle." The targeted time for operation is 9:00 am (1300Z), Saturday, May 29, to noon (1600Z), Sunday, May 30, 1982. Operation may start sooner and last longer, depending on conditions and people power.

Planned frequencies for operation are: CW-3552, 7052, 14052, 21052, and 28052 kHz; SSB-3988, 7288, 14288, 21388, and 28588 kHz. The callsign will be NB4L (New Blood for Lighthouse).

Every station making a contact with NB4L during the special event can receive a commemorative 8.5" x 11" certificate by sending an appropriate SASE (1 oz., folded or unfolded) with QSL card containing the correct log information to Chuck Davis NB4I, 304 Atchison St., Garner NC 27529.

There is a public effort to raise funds to save the Cape Hatteras Lighthouse from the onslaught of the Atlantic. While many of the Cary ARC members may favor that project, this special event is only meant to focus attention on the peril of the Lighthouse. There is no connection with any fund raising.

SECOND ANNUAL COMMEMORATION OF MT. ST. HELENS ERUPTION

W7AQ, the Yakima Amateur Radio Club, will operate a special event station in commemoration of the second anniversary of the eruption of Mt. St. Helens in Washington State.

On May 18, 1980, at approximately 8:32 am local time, Mount St. Helens, located in southwestern Washington State, erupted violently. The 9677-foot summit was reduced to 8364 feet. A crater 2100 feet in depth was produced. Over one cubic mile of matter was thrown into the atmosphere.

Yakima, Washington, is located 80 miles northeast of the volcano. W7AQ was starting its hamfest activities that morning. By 10:30 am, the sky became as black as midnight. The light of the sun would not be visible until the next day.

Over 600,000 tons of volcanic dust and ash, which covered the city of 50,000 up to one inch in depth, was removed by cleanup over the next several weeks.

Join us in commemoration from May 16 at 1800 to 0200 of May 17 UTC. Frequencies will be 25 kHz up from the bottom of the General phone edge, ± QRM and band conditions. CW will be up 25 kHz from the Novice band

edge, ± QRM and band conditions and at 14.050 ± QRM and band conditions. A QSL will be available for an SASE. Send QSLs to: W7AQ, Yakima ARC, PO Box 9211, Yakima WA 98909.

MEMPHIS TN

The Memphis (TN) Radio relay Club will operate on May 22 and 23, 1982, for a weekend of the sixth Memphis in May Festival. Frequencies: CW—7,125 kHz ± QRM and 14,180 kHz ± QRM; SSB—7,280 kHz, 14,305 kHz, 21,400 kHz, 28,650 kHz, and 146.52 MHz ± QRM. Operating hours: 1400-2000 UTC, May 22, and 1200-1800 UTC, May 23, 1982. Special certificates will be issued for confirmed contact and large 9″ x 12″ SASE sent to N4ERU or N4CWS, 2071 Victoria, Memphis TN 38116.

PORT JERVIS, NEW YORK

The Orange County ARC will operate WB2TSA to celebrate the tenth anniversary of the club and the diamond jubilee of the city of Port Jervis, New York, on May 29 from 1400-2200 UTC and May 30 from 1400-2000 UTC. Frequencies 10 kHz up from lower general phone bands. QSL for SASE to OCARC, PO Box 434, Cornwall-on-Hudson, New York 12520.

DOGWOOD FESTIVAL QSO PARTY

The annual Dogwood Festival celebrated in Fairfield, Connecticut, will also be observed on the air by members of the Greater Fairfield Amateur Radio Association with its Dogwood Festival QSO Party on Saturday, May 8th. Members of the club will operate on six amateur bands with the club call WB1CQO and explain the significance of the festival, which marks the blossoming of the 30,000 pink and white dogwood trees in the town of 55,000 persons. Fairfield's Dogwood Festival began in 1936, although the original trees were imported from Japan in 1895 and earlier. Thousands of visitors flock to see the pink and white blossoms in full bloom during May.

WB1CQO will be on the air May 8 from 1300-2200 UTC (9:00 am to 6:00 pm) EDST. A special commemorative QSL card will be available to confirm each QSO.

Dogwood Festival stations will operate on these SSB frequencies: 3.975, 7.235, 14.330, 21.420 and 28.710 MHz. FM operation: 146.55 simplex.

Special QSLs will be sent upon receipt of an SASE or IRCs to QSL manager Grace von Stein KA1JT, 248 Euclid Avenue, Fairfield CT 06432, USA.

BISHOP MULE DAYS

The Bishop (CA) Amateur Radio Club will operate KA6AMT from the mule capital of the world, Bishop, California, on May 31st in recognition of the annual Bishop Mule Days celebration.

Frequencies: Phone—3.905, 7.240, 14.295, and 146.34/94. Certificate for a large SASE sent to Bishop Amateur Radio Club, PO Box 1024, Bishop CA 93514.

TIMBUCTOO

A special event station will be operated by the Yuba-Sutter Amateur Radio Club from the historic gold rush town of Timbuctoo, located in the mother lode country of California's Sierra Nevadas. Listen for callsign N6DDP from 1700Z May 15, 1982, to 0100Z, May 16. For a commemorative QSL, send an SASE to Y-S ARC, PO Box 1169, Yuba City CA 95992. Frequencies: 28.620-.630, phone; 21.150-.160, CW; 14.310-.320, phone.

MOSCOW OLYMPICS

The Moscow, Tennessee summer "Olympics" will be held in Moscow on May 14, 15, and 16, 1982. Communications for this annual event will be provided by the Mid-South VHF Club of Memphis. A special events station, KU4K, will be operating SSB from the site on 28.8, 14.28, and 7.2 MHz. There will be an OSCAR station in operation as well. Amateurs contacting KU4K are invited to QSL via Box 88, Moscow TN 38057. The summer Olympics is a benefit educational fund for the children of the men who lost their lives in the aborted Iranian hostage rescue attempt. Last year over $30,000 was raised for the benefit of approximately 17 children.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

against the speed of the brain and are stopped.

Once this limitation was understood, it made sense to stop trying to learn code with the old system. Articles were written about it and new code courses devised to get around that old slow method and the resulting plateau. I tried to get the ARRL to recognize the futility of their old system but got nowhere. Hams had always learned code that way and they were not going to change.

After giving up on the ARRL trying to help hams learn the code, I sat down and made up my own code tapes, using the new, much faster and easier, learning system. I brought these out on cassettes as the *73* Blitz Code Course. I soon was getting letters from thousands of new hams thanking me for breaking the situation for them. Many had tried and tried the ARRL tapes and had thought they were never going to learn the code. Now they found that within a few hours they were on top of it.

My "Genesis" cassette starts off the beginner with the simplest of code characters, starting with E, I, S, and H. Then, instead of going on to the rest of the 26 letters, I immediately start sending simple words. These characters are each sent at 13 wpm speed, right from the start, thus reinforcing the sound of the character. The letters are spaced for five wpm copying.

The quick change to sending words gets the student used to success. Simple messages are being copied within minutes of starting to learn the code. This is a tremendous psychological boost.

The first one-hour tape teaches all of the letters, numbers, and punctuation marks, complete with some cute messages to make the learning experience fun. Many people are thus able to master all of the needed characters within a couple of hours of work with this tape.

The next step is my "Stickler" tape. . .again with all characters sent at 13 wpm speed, but spaced for six wpm throughout. By standardizing on 13 wpm sound patterns, the groundwork is laid for passing the 13 wpm exam. The "Stickler" is all five-character code groups and has been designed by me to be as frustrating as possible. By the time you are able to copy this code tape 100%, you should be able to breeze through any FCC exam for 5 wpm, half drunk and in your sleep. Many hams tell me that by the time they can handle this nasty tape they can copy 13 wpm of clear text with no problems.

I want to be sure that my students are overtrained. The test, particularly if it is in front of an FCC examiner, can throw even a normal person into panic. Well, there is nothing which calms the nerves as much as sitting down to do a code test and having the code sound like it is coming at two wpm. It's all in the psychology.

For the next test, I have the most miserable tape you've ever heard. The "Back Breaker," at 14 wpm, will drive you right up the wall. You won't believe what a bastard I am until you try my "Back Breaker" tape and suffer. Heh, heh. But again, when you sit down for 13 per in plain text you will not believe how slow it sounds. Many students start laughing when they hear it, losing all their tensions.

Every now and then someone writes in asking for a copy of the code groups on my cassettes. I flatly refuse to send them a copy. The reason is simple. . .I don't want them using the tapes to test code-copying speed. The system is to use the tapes, picking out the characters you recognize. You keep working at this until you automatically copy all of them. You'll know full well

when you miss one, so you don't need a cheat sheet to check. I want you to practice without the pressure to perform. Such pressures take all the fun out of code. Learning the code should be and can be fun. The more you can do to make it fun, the faster you are going to learn it. The more pressure you put on yourself, the longer it is going to take and the more unpleasant it is going to be.

The fact is that a skill with the code is a lot of fun to have. I'm hoping that we can eliminate the pressures entirely by getting the code test out of the ham license requirements, replacing it with a technical exam which means something. Then I think we will have a lot more hams developing their code ability... and enjoying it.

For the Extra class license, I have a 21 wpm cassette. Once you can handle this one you will be able to copy plain language at almost 30 wpm.

From a practical point of view there is little difference in learning the code at 13 wpm, 20 wpm, or even 50 wpm. The process is about the same and the length of time it takes to master any of these speeds is about the same. We have had some interesting experiments with starting newcomers right out at 50 wpm... and succeeding!

The *73* code courses are available from us by mail order. They are also stocked by most ham stores. These stores are still selling the ARRL course...the one which I feel has lost us several hundred thousand hams. Many clubs are still taking hour after hour, struggling with the 1930s code system from the League. Modern ideas sure are difficult to get across.

FIGHTING BACK

Every now and then I get a stroke of inspiration. The other day, while I was sitting in the lounge of a restaurant waiting for my name to be called to get a table, a chap next to me started smoking a cigar. Being, as you may know, a non-smoker, I had immediate need of a gas mask. Cigarettes are annoying, but a cigar or pipe is just too much. I got up and went to another restaurant.

There must be some way to fight back. There really has to be a way. That was the train of thought that brought on one of my all too few strokes of semi-genius. If these turkeys can stink up the air I have to breathe, what's wrong with me stinking right back at them? How about an aerosol can of stink?

The first thought was to see about getting some cans of methane. Then I could sort of spray it and pretend that I fired back with a built-in weapon. But, alas, that might get ignited by the cigar or pipe and blow both of us to smithereens. No, the stink should be as offensive, but not be explosive. Perhaps skunk juice or hydrogen sulphide (rotten eggs). Yes, that would do it.

Put out in small pocket- (purse-) sized cans, I think it would sell. We might call it FIGHT BACK. It would be the first way for non-smokers to even the score. At $1 a can, it should sell well, Hmm, I'll have to look into this.

FOREIGN AID

One of the great benefits of amateur radio is that it allows us to sit and talk at length with hams in foreign countries. Unfortunately, few of us take the time to try to get to know amateurs in other countries, which is both our loss and theirs. Most of us are so swept up with contests and working countries that we say to hell with the chap at the other end.

I remember when I first moved to New Hampshire and went on the air. I found myself being called quite often by hams "needing New Hampshire." This quickly got to me. These chaps had no interest in me or in New Hampshire. All they were interested in was a QSL card. Now what is the possible value of a card from someone you didn't even bother to do more than casually bump into on the band? Hams needing New Hampshire seem to go out of their way not to get involved with any real conversation. They are almost always uninterested in paying any dues for the card in the way of an interesting contact. The QSL card is supposed to be the final courtesy. In this case, it is often the *only* courtesy involved.

Amateurs in all foreign countries run into this syndrome. In the rare ones, they seldom run into much else. If they get fed up with non-contacts with hams in search of their pasteboards and start making contacts by calling some of the stronger stations... or hams they know.. the hunters make their lives miserable with break-ins, tail-endings, and the like. If ignored, these QSL hunters can get vicious. This can diminish the fun of amateur radio substantially.

There probably isn't much that can be done about this whole lousy situation as long as the fascination continues for being high on the ARRL Honor Roll. Can I call it a dishonor roll?

At any rate, if you should want to fight the self-destructive urges to treat DX operators as mere QSL factories for your collection...providing you with an ever higher listing on an occasionally printed list in an obscure magazine and not much else to show for a lifetime of DX-ing...then perhaps you can join me in finding out that many DX hams are highly interesting people. I can tell you this: Once you start talking with them, you are sure to become addicted to it.

You know that in a country where there are from one to ten hams you are not likely to be talking with a blue-collar worker. It is highly likely that you will be talking with a relatively important or wealthy person. He is also likely to be particularly interesting, if you can get him to talk.

One of the conversational openers which I've found to work has to do with asking about their country. From there, I just sit back and listen. You know, it wouldn't hurt you to invest in one of the almanacs and read up on some of the smaller third-world countries so that you'll have some questions to ask which show more than a casual interest.

One of the subjects which may interest you has to do with aid funds the country is probably getting from ours. This can bring about an interesting conversation in some cases...and embarrassed silence in others. I have the advantage of getting around to visit hams in many of the third-world countries, so I ask about foreign aid when I visit them...and find many open to give vent to their feelings about this.

Since this is where I was heading when I started, it isn't exactly a digression. This business of foreign aid has been bugging me for a long time. The way the situation is set up right now, this money is wasted for the most part. It doesn't have to be.

As I wrote recently, the heads of a great many of the third-world nations are kept in position by virtue of the money they are able to grab for their supporters. Even the poorest of countries can be bled further by these pirates. But they are expert at working on the sympathies of the wealthier nations to get aid funds. The US is a particularly good sucker for this. Rarely does even 10% of this "aid" money accrue to the benefit of the poor people of the countries.

Presuming that Uncle Sap is going to continue to try to buy friendship (a commodity which seemingly can't be bought) with handouts, we could at least send aid which would be more difficult to turn into cash and at the same time provide some feedback of the money to US industries. My proposal is for future aid to take the form of goods, not cash, and that this should be goods from small business manufacturers rather than the big corporations. That would keep most of the lobbyists out of the pork barrel.

When we send cash, the most desired commodity, to these countries, most of it ends up in Switzerland without even coming near the people for whom it was intended.

Getting back to amateur radio, as you talk with the DX amateurs I think you'll find them enthusiastic for you to visit them. And I've found that a surprisingly high percentage of these amateurs manage to get to the US now and then. See if you can get them to include a day or two visiting you. Then you'll be able to find out a lot of things which they really couldn't talk about over the air.

Remember that 97.1e has to do with your ability to contribute to international goodwill. Pile-ups and tail-ending are not likely to do this. Presenting the friendly face of America to the world will. It's up to you whether we look like ugly Americans or not.

LETTERS

"CRACK THE WHIP"

First of all, I do enjoy your magazine and respect your right to an opinion on various topics (although sometimes I disagree), but on this business of a code-free license, I must make an objection.

I don't understand how Japan can have so many more amateurs than the US when the current *Callbooks* don't support this statement. But regardless, I will accept your word as you are in a better position than I am to know.

In my opinion, the reason why the US is declining in new engineers and high technology is because the youth of America is not made of the same fabric as that of our oriental brothers. At age 30, I am currently enrolled in an electronics program at a local community college and it is my impression that most of the "fresh-out-of-high-school" crowd are there merely because of parental pressure to get a degree. This school has one of the most thorough and modern electronics programs in the state and can compete equally with any big university on the educational level.

But the fact still remains that most of the younger students are "just going for a degree" and could really care less about the field they are pursuing. Possibly at one time they happened to open up a transistor radio, marveled at how it could do what it does, and decided this would be a less boring field than, let's say, social science or psychology.

The Japanese seem always to do things a little better, kind of a oneupsmanship, if you will, than their counterparts of the west. It is because they want to, Wayne ...not because someone is standing over them with a whip!

If there is a minute problem with lids in Japan, what with their code-free licensing, that doesn't necessarily mean the same will hold true here.

You have stated that our technology could be much improved by technicians and engineers that were "sparked on" by being exposed to amateur radio during their youth. Well, if this is the case, then why didn't this happen with the Citizens Band service of the past? You couldn't have an easier way to get a ticket and get on the air than just to send off to the FCC for an instant license. Granted, a lot of superior hams graduated from the CB ranks and a lot of them probably went on to become technicians and engineers, but you know as well as I that the overwhelming majority did not. And look what the CB service is now without the *discipline*! Notice the emphasis on the word discipline? Learning code is a matter of discipline, period! There is no other word for it; that is it, in black and white. The Japanese are disciplined. As a matter of fact, they are noted for it. Maybe that is why they can handle a code-free licensing program without any problems.

How would you compare American youth to Japanese youth? Is one better than the other? No, but one is more disciplined. In WWII, we destroyed Japan and rebuilt it and, as a consequence, they became more disciplined. Given that fact, who do you think would be more arrogant? We have enough arrogance on the bands already. Let's try to get more discipline on the bands and not open up the floodgates for more arrogance. I don't think your theory holds too much water, Wayne. I teach new Novices and they *can* learn the code and *enjoy* doing so. It's just a matter of presentation and a little discipline.

It's been a while since this country has led the industry and I'm afraid it will be a lot longer until we can change the attitude of the people, especially that of the youth. Besides, if the overwhelming majority of hams today don't prefer a code-free license, why fight it? This *is* supposed to be our service, isn't it? We should have some say about how we want it! There will always be enough people to keep us a viable commodity on the FCC "exchange." And those are the ones we want. *Disciplined!*

Dave Peckham KD9D
Decatur IL

Dave, such a bunch of questions! Good ones, though, so let me tackle them one at a time. First, regarding the Callbook. *If they listed only the Extra class US hams, the US* Callbook *would be small, too. The Japanese* Callbook *is huge because they list all classes of licensees ...over half a million of them. Now, about American kids and technology...the magic happens in the teen years. In the past, about 75% of the new hams were teenagers, with the old ARRL polls showing 50% being either 14 or 15 years old. There is now and there always has been an enormous difference between the type of engineer we get from dedicated teenage hams and from people who decide to just go for a degree. That's the same now as it always was and the chap who goes for a degree is usually a grave disappointment by comparison. Boy, I've known a lot of 'em.*

Now about CB. Dave, think about it...the mess is awful, with piles of interference, contacts which are even more boring than most ham contacts (yes, I know that's hard to believe), bodacious signals, and so on...how do you honestly expect anything good to come from such an incubator? The few CBers who managed to be salvaged by friendly hams are a blessing to us and to CB, but they are few, with most of those exposed to CB recoiling from the gore. No, there is a world of difference between an interference-hassled contact on one of the CB channels and a half-hour rag chew with someone in Germany or Australia, so please don't try to equate the two in your mind.

The Japanese aren't any better than we are. They just went the right way when we went the wrong with that foolish attempt to return to prewar Class A and B licensing in 1963. We now know how to fill our bands with crazies...use a code test and let Bash do away with the technical requirements with his books and blitz one-day memorization bashes. If you want garbage, you know how to get it. And Dave, remember that in 1969 the overwhelming percentage of the hams hated two-meter FM and didn't want to read about it or hear about it. Every now and then amateur radio needs someone to provide some leadership. I've found that in the long run people (even hams) will think things through and eventually get away from slogan thinking and work for what is in the long-range interest of amateur radio. We really couldn't ask for more proof that the code is a total failure as far as keeping out the nitwits (my apologies to any nitwits reading this and taking offense...which is an unlikely prospect) out of the hobby. Now that we have a way to easily cheat on the technical test, all we need is a way to cheat on the code and you have what you asked for: open sesame. I want to throw out the proven loser, code, and substitute a meaningful technical entry exam...one that can't be bashed.

If we get our spirit up, we can beat the hell out of any country in the world...including Japan. We can out-invent them, out-produce them, and out-quality them ...if we decide that it is important to us. I want to get this started by getting kids infected with the ham bug when it is the easiest to pass along this infection: in high school. Dave, if we can get even half of the ham clubs to get some enthusiasm for selling amateur radio... classes...monitoring systems to keep our bands clean...emergency cadres so we will be ready to provide quick service for any kind of emergency...pressures on our high schools to start and support ham clubs...we'll be able to change the world in ten years. Or we can sulk and let amateur radio rot away the way it has for the last few years. Your choice. — Wayne.

CATCHING THE DREAM

Wayne, your editorials always ring my bell. You have the best interests of amateur radio at heart — we know that. I admire your business acumen; you are a true pioneer. I met you a couple of times at Dayton and enjoyed your magnetic and energetic personality.

Yet, agreement we don't have. You constantly compare American and Japanese amateurs to our disadvantage. Each has different goals and attitudes. The civilizations are vastly different. Japan may have no code requirement for entering amateur radio, but many Japanese amateurs are competent CW operators. I just don't believe our declining ranks results from the code requirement.

With that out of the way, what makes a prospective American

radio amateur stick with it, become a ham, and advance in rank? It's not the presence or absence of a requirement. It's the degree of personal drive inherent in the individual as well as how he latches onto the opportunities that come his way. As I see it, Wayne, if he is interested, he will keep at it until he makes the grade.

If Johnnie is let off from learning how to read, Johnnie is going to be let off from mathematics and a lot of other school requirements. From what I have seen of the Japanese civilization, Hiko and Toshio are not passed for non-achievement in school. Japanese education is strict and no-nonsense.

I learned Morse code in the Boy Scouts; my high school supported an excellent radio club. While a senior, I was permitted an operating hour daily in the club station as long as my grades were up. True, I had advantages, but I made use of them and passed my exams fair and square fifty years ago. Passed my Extra class thirty years ago.

Continue to agitate against the code requirement, Wayne, but I don't think it will stop the young in heart who have really caught the dream.

Paul L. Schmidt W9HD
Bloomfield IN

Paul, I agree with you. I don't think the code has much to do with our declining ranks. I think that if we can get the kids exposed to amateur radio rather than CB. . .or drugs. . .we'll get into clining ranks. The code is a loser as far as separating the wheat from the chaff. We need to get back to having this a technical hobby. If we insist on hams having an understanding of radio instead of merely having to pass a stupid code-skill test, a test which has flooded us with dregs from the pits. . .we might be able to look for some progress and have more pride in our hobby and hams. The cretins who are screwing up amateur radio are naturally repelled by 73, so I can write freely about them. You are right about education, too. . .there is much to be said for some of the no-nonsense Japanese approach as opposed to the Dr. Spock permissiveness which we have fallen into over the last twenty years. Every psychological survey shows that kids respond better to much stricter guidelines. . .and are happier. But that would force the average parent to look up from the television set now and then. . .so forget it. No, if we're going to get kids out of the mess they're in, we're going to have to trap them with the fun of amateur radio. . .the fun of talking with the world. . .the fun of building. . .the fun of learning . . .of experimenting. . .of doing things few others can do. I feel this is a tremendous resource and should be used to change our country and give it back some pride. — Wayne.

CALL FOR PAPERS

Papers are invited for the 1982 Annual VHF Conference to be sponsored on October 23, 1982, by the Electrical Engineering department, Western Michigan University. Principal emphasis will be placed on engineering developments applied to radio communication, design, and construction on the frequencies of 30 to 1200 MHz. Papers on a wide range of subjects are solicited including, but not necessarily limited to, these:

Antennas and transmission lines
Applications of microprocessors
Audio-frequency equipment used with VHF transmitters and receivers
Emergency gear
Grounding and shielding
Keying, break-in, and control circuits
Measurements and test equipment for VHF
Mobile and portable equipment
Modulation and mixing
Narrowband voice modulation
Noise reduction
Phase-locked loop uses
Picture transmission and reception
Power supplies including switchers
Production technology and model building
Propagation
Recent equipment/new apparatus
RTTY
Satellite and Moonbounce topics
State-of-the-art semiconductors, ICs, and filters with applications
Transceivers

One of the basic purposes of this Conference is to provide a maximum opportunity to present findings by those experimenting, designing, constructing, testing, and inquiring into problems and methods applicable to VHF radio. This is an opportunity for beginning or mature researchers to report their findings to their peers. We especially encourage the inexperienced inquirers to obtain some experience by presenting a paper at our VHF Conference.

Authors wishing to present papers should send a synopsis or abstract (typically one or two pages with diagrams) describing the paper to Dr. Glade Wilcox W9UHF, Chairman, VHF Conference, Department of Electrical Engineering, Western Michigan University, Kalamazoo MI 49008. Foreign authors are requested to have a US contact.

Deadline for submission of synopses is June 30, 1982. Speakers will be notified of acceptance by July 4, 1982. Reproducible copy for the printed proceedings should be mailed to the Chairman two weeks prior to the day of the Conference.

Glade Wilcox W9UHF
Kalamazoo MI

ELMER LIVES

After reading the November, 1981, issue, and noting the letters to the editor from Frank D. Windsor and Tom Taorimina, I felt that I could no longer be silent. I am an aspiring Novice who hopefully will have upgraded to General by the time you receive this.

I became interested in ham radio as a youngster, but did not have the time necessary to devote due to college, medical school, residency, and then early struggling years of practice. In November, 1981, I learned the code and began to study theory. I immediately ran into problems, and needed to discuss my problems with someone more knowledgeable than myself. One of my patients (N9ATB) overheard my predicament and offered his services. Within two weeks, he had guided me past all of the rough spots; frequently he allowed me to listen and observe at his home while he made QSOs. He administered my Novice examination for me in early January.

As I progressed and started to increase my code speed, several other hams became known to me. I also discovered that another physician in my community was a ham. KB9DD has spent many hours working with me and has even made practice QSO tapes for me so that I could become more proficient at code and be really ready for the General exam. His assistance has been invaluable to me.

Through people like this I have come to truly appreciate the amateur radio spirit. I am no babe-in-the-woods: I have heard the foul language on 20 and am aware of the other problems that Frank and Tom illustrate, but I am certainly not convinced that things are as bad as they say. Elmer is sure alive and well here. All of the hams I know are courteous, helpful, and represent their hobby as true gentlemen. It is my privilege to join their ranks. I only hope that someday I can provide as much help and encouragement to a potential licensee.

Gregory L. Darrow, M.D.
Janesville WI

CHEAP-SCAN!

I read your article by Jeff DeTray WB8BTH regarding memory scan for the TR-9000. I am the owner of one myself and, like Jeff, realized to top off a great rig surely Kenwood could have had a memory scan. Well, here's the bottom line: the TR-9000 does have a memory scan; they just haven't brought the function out to a control! I sympathize with Jeff. His memory scan cost him $39.95; mine cost the price of one silicon diode, two pieces of wire, and some thinking.

The TR-9000 is microprocessor-controlled. (At this point, get your TR-9000 manual out.) Find the circuit diagram of board X53-11G0-11. (If you don't have a manual, rip the lid off your rig and remove the front control section by removing 4 screws, 2 on each side — allowing the front section to be moved to see and work on the board behind it.) Note Q15, the microprocessor; now all you have to do is connect pin 13 (PE-1) through a silicon diode to pin 38 (PB-1). Obviously, you won't want the scanner running continually, so a switch is needed. As some of the switches on the TR-9000 are DPDT and only used as SPST, I used the unused side of the NB switch.

Trace PE-1 + PB-1 on the board 'til a suitable pick-off point is found. Then remove the front panel, remove the power/volume control, and you will see

on the circuit board where one side of the NB switch is not used.

The result is that when NB is out, the scanner is in and can be controlled by scan and hold buttons manually. And when a signal is present, it will stop until it ceases, and then continue. If mike P/T is operated, the scanner will stop and has to be restarted manually by pushing SCAN on your rig.

A simple addition to a fine rig.

R. M. Somann-Crawford VK7RC
Tasmania, Australia

FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc. (FAR), a nonprofit organization with headquarters in Washington DC, plans to award nine scholarships for the academic year 1982-1983. The Foundation, composed of fifty local area amateur radio clubs, fully funds two of these scholarships from the proceeds of the Gaithersburg (MD) Hamfest. It administers, without cost to the donors, two scholarships for the Quarter Century Wireless Association and one each for the Richard G. Chichester Memorial, the Radio Club of America, the Young Ladies' Radio League, the Edmund B. Redington Memorial, and the Amateur Radio News Service. The last-named award is new this year.

Radio amateurs holding at least an FCC General class license or equivalent may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. The scholarship awards range from $300 to $900, with preference given in some of them to residents of specific geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by a letter or QSL/postcard postmarked prior to May 31, 1982, from me.

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

Hugh A. Turnbull W3ABC
6903 Rhode Island Avenue
College Park MD 20740

WOODPECKER REFORMED?

Over the past several months, the amateur bands have experienced to a varying degree deliberate interference that has acquired the label "The Woodpecker."

I have read of efforts to have this interference eliminated, by political and non-political bodies. However, all efforts in the past have not been effective. Based on the old-time adage of "if you can't lick them. . .", perhaps we could take advantage of this activity.

There are various propagation indicators and forecasts to aid amateurs in their efforts to communicate. Why cannot the Woodpecker be used in the same manner? It should certainly provide band-opening information, at least in some direction.

I wonder, if worldwide attention were given to this activity on a scheduled basis, perhaps the instigators of this noise might feel they are contributing too much to the welfare of others. When WWV and others give the solar-flux index, they could also give the "Woodpecker: forecast for various frequencies and times." I'm sure this information is being kept somewhere; let's put the Woodpecker to good use!

Glenn A. Churchill KA2IOI
Hudson Falls NY

FCC SPELLING

This is in reference to the letter from Bill Crowley on page 121 of the February, 1982, issue of *73 Magazine.*

There are no incorrectly spelled words in any of the Morse code tapes which the FCC uses to test amateur radio operators. The word "Springfield" is contained in some of the tapes, and it is spelled correctly, not with a "C" as Mr. Crowley alleges.

After the publication of Mr. Crowley's letter, the cassettes used by the Boston office were double-checked to see if the tapes had somehow been garbled or partially erased. It was found that these tapes are in good condition.

I regret that Mr. Crowley felt it necessary to encourage others to complain about a situation which does not exist. The Commission continues to make every possible effort to ensure that the amateur radio examinations are unambiguous and straightforward.

Vernon P. Wilson
Chief, Regional Services Division
FCC
Washington DC

Now we have heard the FCC's side of the story. What has been your *experience? — N8RK.*

A MATTER OF CHOICE

Sorry, Wayne, but Jim Owens W5FQE's letter (January, 1982) hit the nail on the head. My wife renewed last year's subscription only because she got it mixed up with *QST.*

Mitch Armstrong W7CDM
Puyallup WA

This letter was forwarded to us by QST. *— Ed.*

ATLANTA SCHOLARSHIPS

The Atlanta Radio Club announces that three (3) cash $500.00 scholarships will be awarded to graduating high-school seniors who enter an accredited college or university in the fall of 1982. Recipients must be duly licensed amateur radio operators at the time of application.

This is the fourth consecutive year in which the Atlanta Radio Club has been able to award scholarships to deserving amateurs. The three scholarships to be awarded in 1982 represent an increase of one additional scholarship over past years.

For additional information and application forms, write to Phil Latta W4GTS, Secretary, Atlanta Radio Club Scholarship Committee, 259 Weatherstone Parkway, Marietta GA 30067.

Completed applications, along with the required high-school transcript, must be postmarked not later than July 1, 1982.

Morris Johnson KB4IT
Atlanta GA

FATHER OF SSB?

Jeanne Hammond's excellent article, "The Father of FM," in the February, 1982, issue does not mention single sideband. I believe Major Armstrong was the first to use this type of radio communication, and I mentioned this in my book, *Radio Stations Common? Not This Kind.* If anyone does not agree with this record, would they please provide the source of the detail on who they believe was first with sideband? Major Armstrong had so many firsts that we now take for granted that Jeanne probably did not mention this one because she was concentrating on his accomplishments with FM.

Spud Roscoe VE1BC
Sambro Head NS
Canada

EYEBALL TIME

July of this year marks the 25th reunion of the VHF radio amateurs who were members of the Oklahoma Central 6-Meter Club, later known as the Oklahoma Central VHF Club. All persons who were at any time members of this group are urged to write immediately to T. W. Stevens W5VCJ, PO Box 976, Edmond OK 73083. Give him your name, address, and present call and indicate whether you are interested in attending the reunion, which will be held at the same time as but not in conjunction with the Oklahoma City "Ham Holiday."

Carl C. Drumeller W5JJ
Warr Acres OK

HAM HELP

I need a schematic and manual for a Fluke 8120A digital multimeter. I will pay for copies or will copy and return originals. Thanks.

Geoff. Chadwick KA7MKN
Box 361
Red Lodge MT 59068

I will pay any reasonable price for a manual and schematic for the Model 680-0 Itron frequency counter, or I will copy and return your original.

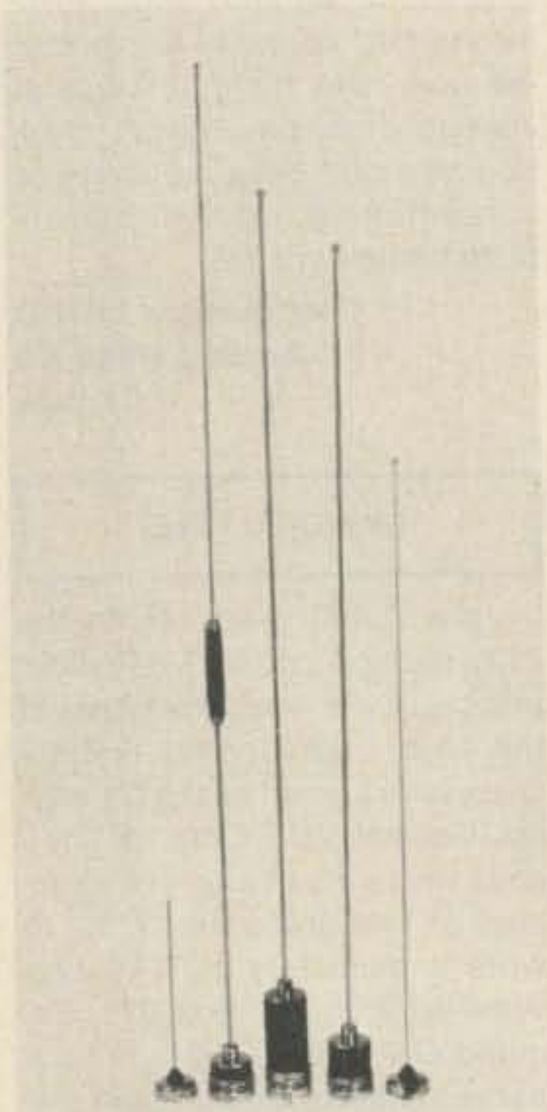
James Dickinson W4LLF
1408 Monmouth Ct. W.
Richmond VA 23233

NEW PRODUCTS

PROFESSIONAL-AMATEUR ANTENNA SERIES

Valor Enterprises has introduced the Pro-Am (Professional-Amateur) line of antennas, mounts, and accessories that are compatible with the Motorola TAD and TAE mounts, a system used extensively by the amateur and commercial communities.

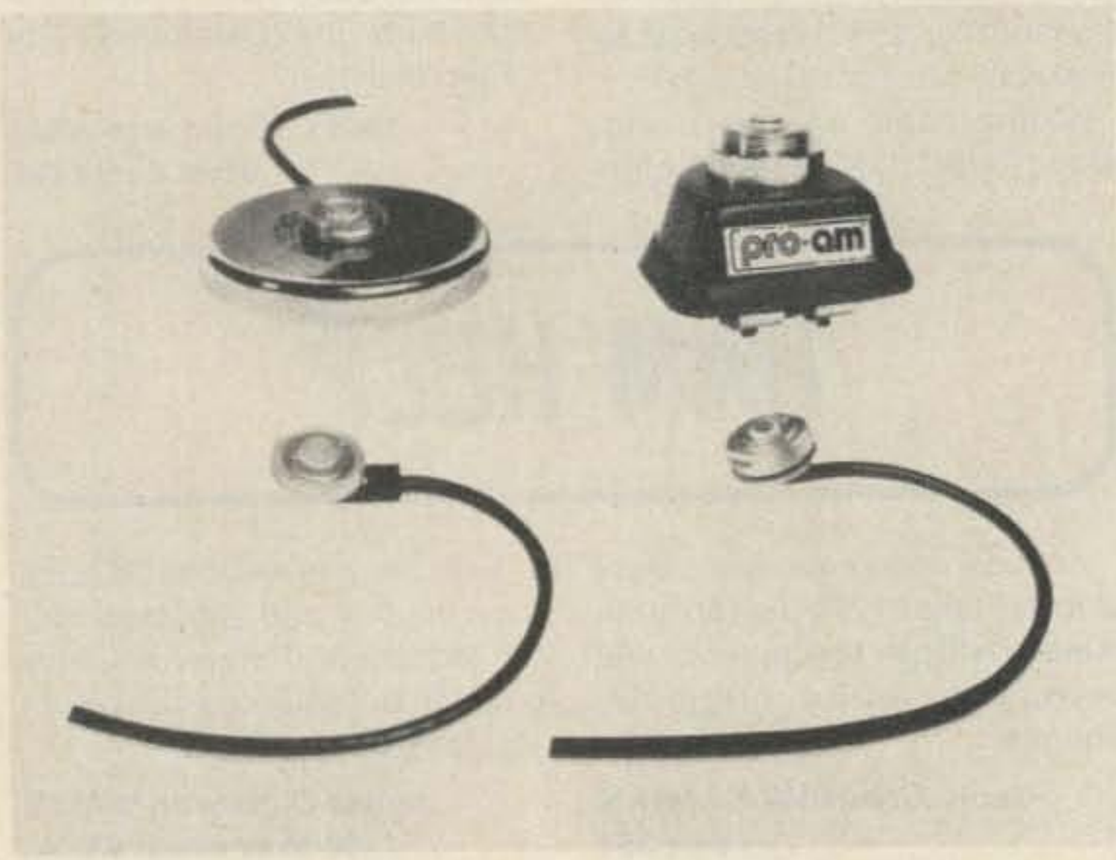
Four mounts are offered. The model PAS ($11.25) is a basic surface mount that installs in a ¾" hole (lower left in photo). Valor's model PAS38 ($11.25) basic surface mount installs in a ⅜" hole (lower right), while the model PAT ($14.85) is a no-hole trunk mount (upper right). The fourth mount, model PAM ($22.00), is a low-profile magnetic base (upper left).



Valor Enterprises' Pro-Am antennas.

The Pro-Am antennas are available in four categories. Left to right in photo: models PAQ ($5.95), of which there are twelve versions, act as ¼-wave whips for frequencies between 136 and 866 MHz; model PUB ($24.50), a 5-dB collinear series, available for 440-512 MHz; model PLB ($26.35), a ¼-wave, base-loaded antenna that can be selected to cover any frequency in the 27-to-54-MHz spectrum, and model PHB ($23.25), a ⅝-wave design that offers 3 dB of gain on the two-meter and 70-cm bands. (Another model PAQ is on the right.)

All models are engineered for demanding environments, featuring stainless-steel whips, nickle-chrome-brass parts, and "O"-ring seals. For more information, contact: *Valor Enterprises, 185 West Hamilton St., West Milton OH 45383.* Reader Service number 482.



Valor Enterprises' Pro-Am antenna mounts.

KENWOOD'S TS-930S HF TRANSCEIVER

Trio-Kenwood has announced the development of a top-of-the-line, all solid-state, high-frequency transceiver, the TS-930S. Designed to cover all amateur bands from 160 to 10 meters, the TS-930S also incorporates a 150-kHz-to-30-MHz general-coverage receiver which offers excellent dynamic range. Among the more interesting features to be found on this model are an automatic antenna tuner, dual digital vfos, eight memory channels, dual-mode noise blanker, i-f notch filter, fluorescent tube display, rf speech processor, rf step attenuator, and 100-kHz marker.

Kenwood's TS-930S HF transceiver.

Special circuitry allows the operator to adjust the i-f passband characteristics for rejection of interference and includes a tunable audio filter for CW reception. Power input is 250 W PEP SSB, 250 W dc on CW, 140 W dc on FSK, and 80 W dc on AM. The built-in power supply operates on 120, 220, or 240 V ac. Kenwood's newest HF transceiver will have a list price under $2000. For more details, write to *Trio-Kenwood Communications, PO Box 7065, Compton CA 90224.*

220-MHZ ALL-MODE AMPLIFIER

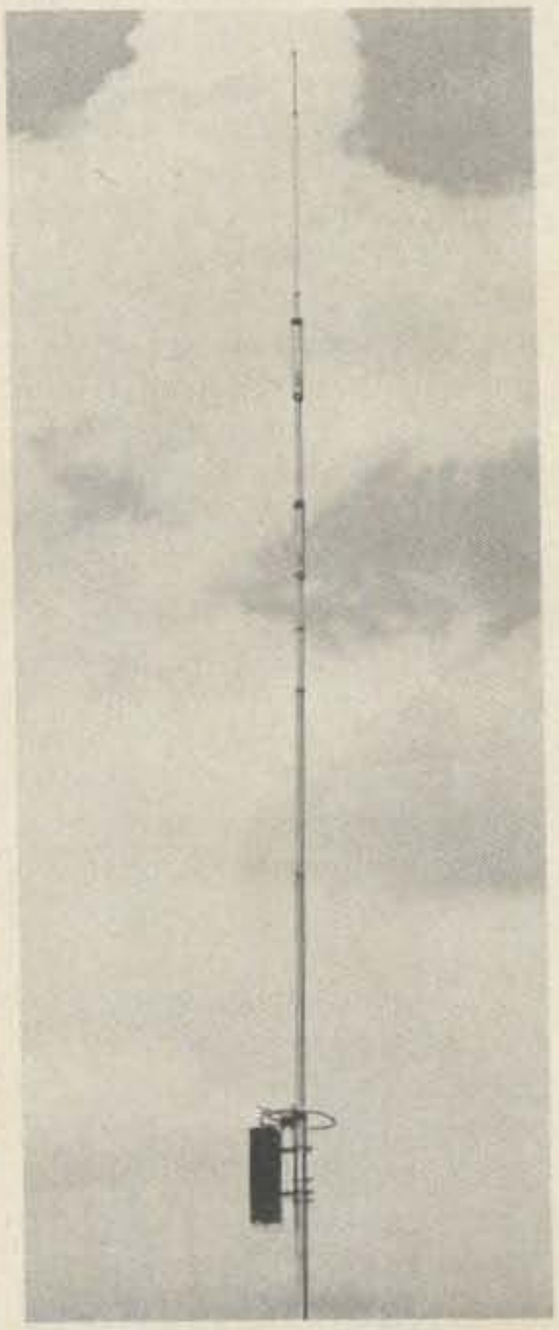
Mirage Communications Equipment, Inc., has announced the release of a new 220-MHz amplifier. The C106 amplifier is a solid-state, "all-mode" amplifier designed to be used in the 220-to-225-MHz amateur band. It will amplify a 10-Watt radio to more than 60 Watts output, or a 2-Watt radio to 25 Watts out. Since the C106 is biased as a linear amplifier, it can be keyed with as little as 300 milliwatts.

Other features include remote operation with the optional RC-1 remote head, and external or internal keying circuitry. The C106 lists for $199.95. For further information, contact *Mirage Communications Equipment, Inc., PO Box 1393, Gilroy CA 95020.* Reader Service number 490.

NO-RADIAL VERTICAL ANTENNA

Cushcraft has introduced the R3, a no-radial 10-, 15-, and 20-meter gain antenna. The R3 is perfect for limited-space applications like condominiums, apartments, mobile homes, and small urban lots. It is a ½-wavelength, endfed 22' radiator with remote tuning for broadband coverage.

Installation is very simple, with only one square foot of space needed. It also can be telescoped for easy carrying and storage. Because of its unique design, the R3 does not need a tower, rotator, large support mast, or tuner. For more in-



Cushcraft's R3 no-radial vertical antenna.

Henry Radio's all-channel marine portable.

formation, contact *Cushcraft Corp., PO Box 4680, Manchester NH 03108.* Reader Service number 476.

ALL-CHANNEL MARINE PORTABLE

Henry Radio is introducing a marine VHF-band portable, the Tempo M1. The M1 operates on every marine channel, both US and international, with all the necessary offsets built in. It also includes all weather channels and a channel 16 override function. Channel selection is made by a thumbwheel switch on the top panel.

Other features include a one-hour, quick-charge-type battery, permanent memory, a high-power, 2½-Watt position, and a low-power, 1-Watt position. Accessories will include a charger, holster, amplifier, and high-capacity batteries.

The Tempo M1 is available through the Marine Division of Henry Radio. The suggested list price is $495.00. For more details, contact *Henry Radio, 2050 S. Bundy Dr., Los Angeles CA 90025; (215)-820-1234.* Reader Service number 480.

TELEREADER TERMINAL

The Hal Communications CWR-670 is a compact electronic communications terminal designed for reception of Baudot and ASCII radioteleprinter signals as well as Morse code signals. The CWR-670 includes built-in RTTY and Morse demodulators and video-generation circuits. The very small size of the CWR-670 makes it ideal for applications where space is limited.

The Hal CWR-670 Telereader terminal.

Since the terminal operates from 12 V dc, it may easily be used in locations where ac power is not readily available. The video-output screen of the CWR-670 is formatted in pages of 16 lines, 32 characters per line; a total of two page screens may be selected. The internal RTTY demodulator allows selection of three standard shifts. A parallel ASCII-printer output is also provided. The CWR-670 has a list price of $495.00. For more information, contact *Hal Communications, Box 365, Urbana IL 61801; (217)-367-7373.* Reader Service number 483.

REPEATER CONTROLLER

Advanced Computer Controls has introduced its new microcomputer-based RC-850 repeater controller. The controller's characteristics are remotely configured by the repeater owner with highly-secure tone commands. No hardware or software changes are required to modify control operator and user codes, ID and tail messages, Morse code speed, pitch and level, and a host of other functions.

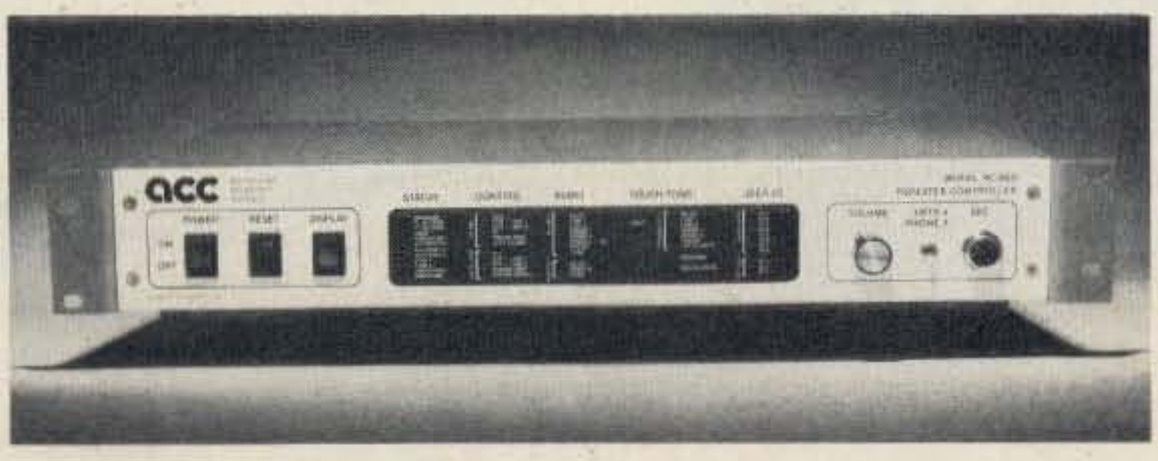
The RC-850 controller's autopatch is based on a store/forward technique where the user enters a phone number and the controller actually dials the phone using either touchtone™ or dial pulses. Logic outputs allow remote control of equipment at the repeater site. A voice-telemetry option adds a natural-sounding speech synthesizer with analog-measurement capability.

The controller uses CMOS logic and low-power, analog circuitry to minimize current consumption. The RC-850 is priced from $1850. For more information, contact *Advanced Computer Controls, 10816 Northridge Square, Cupertino CA 95014; (408)-253-8085.* Reader Service number 478.

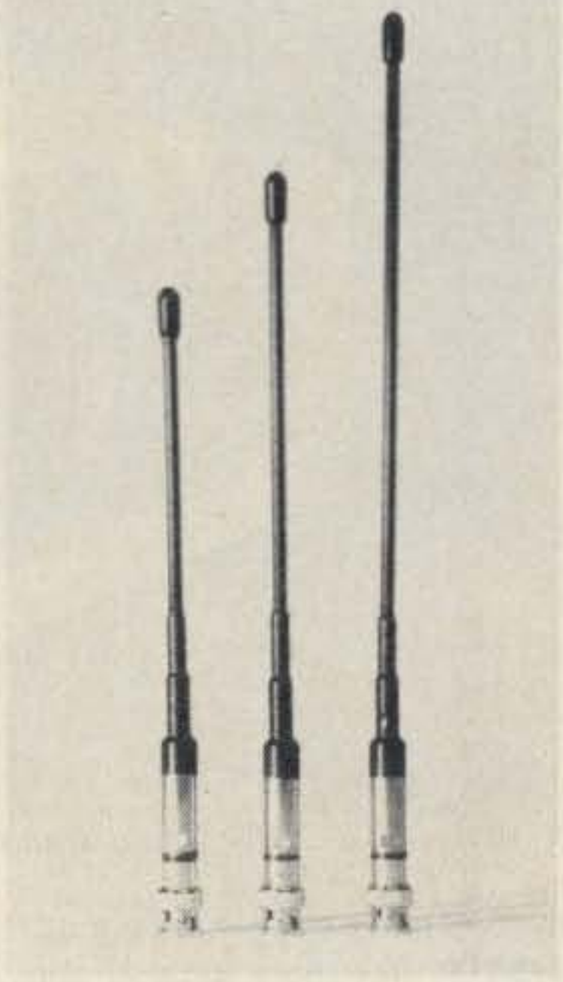
RTTY PROGRAM

The Egbert RTTY program transmits and receives RTTY without the need for any expensive interface hardware. The Apple cassette ports connect directly to the transmitter/receiver. Program capabilities include 60-, 67-, 75-, and 100-wpm Baudot and 110-baud ASCII, type-ahead buffer, canned messages, and automatic CW identification.

The program runs on the 48K Apple II and requires an Apple disk with DOS 3.2 or 3.3. The program and instruction manual cost $42.45 and are available from *W. H. Nail Co., 275 Lodgeview Dr., Oroville CA 95965.* Reader Service number 487.



The RC-850 repeater controller.



Centurion International's flexible antenna.

FLEXIBLE ANTENNA

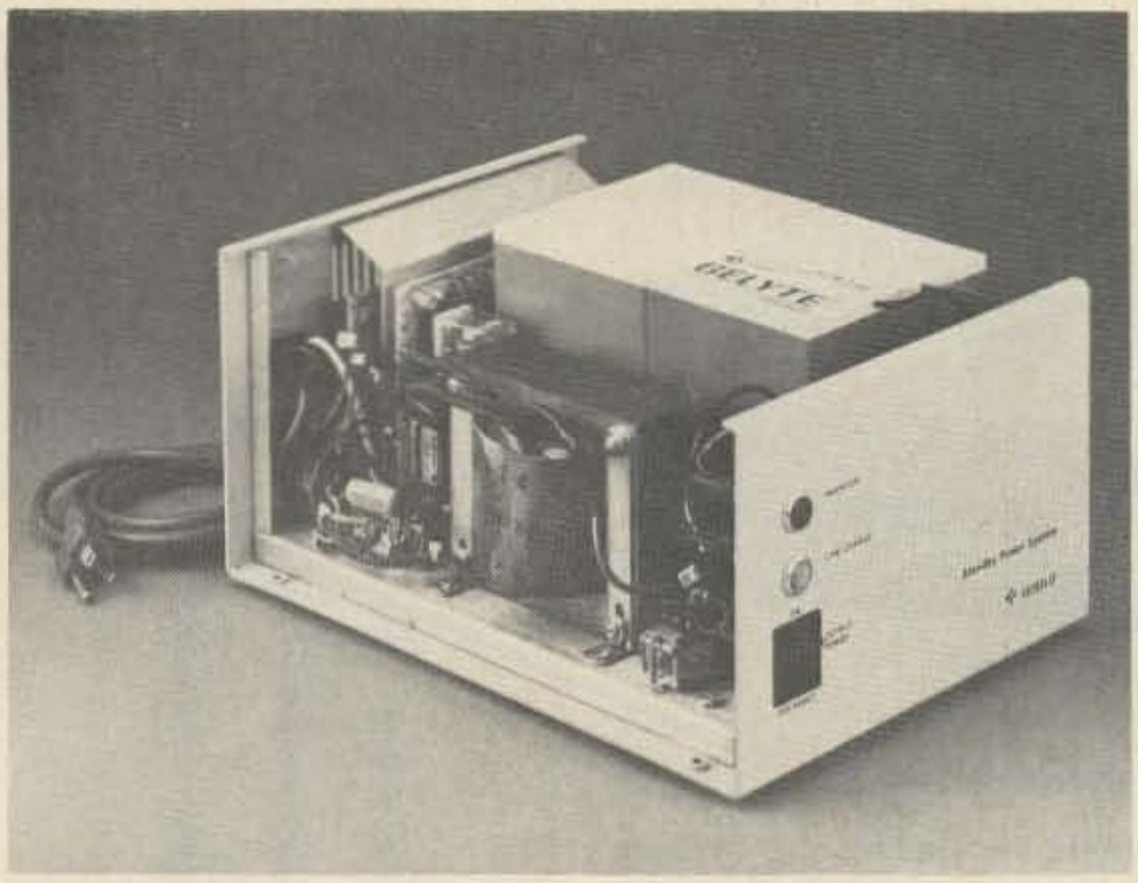
Centurion International has introduced a new flexible UHF gain antenna for use with handheld radios. The antenna features an endfed design and represents a ½-wave radiator with approximately 2.5 dB gain over a ¼-wave portable whip antenna.

The antenna is factory-tuned to discrete frequencies from 406 to 512 MHz and has a usable bandwidth of 20 MHz. The base is fitted with a BNC connector. Designated Style G, the new antenna ranges in length from 7 to 13 inches and lists for $17.50. For more information, write or call *Centurion International, PO Box 82846, Lincoln NE 68501; (402)-467-4491.* Reader Service number 484.

STANDBY POWER SYSTEM

The Portable Battery Division of Gould, Inc., has announced a Standby Power System (SPS) which provides 200 Watts of emergency power at 120 volts for 20 minutes, taking over the job of supplying power within one cycle of power failure.

As long as the power is constant into the SPS, the current passes through to the computer or other device being powered. However, if power drops below 102 volts, a sensing device immediately switches to an internal battery and turns on a red indicator light. If the power outage is brief, the device will automatically transfer back to line power and recharge the internal battery. Gould's standby power



The Gould standby power system.

Daiwa's booster amplifier.

system has a suggested price of $489.00. For more details, contact *Gould, Inc., Portable Battery Division, PO Box 43140, St. Paul MN 55164.* Reader Service number 486.

MORSEMATIC KEYER UPDATE

Advanced Electronic Applications, Inc., has announced the latest generation of the MorseMatic keyer, the MM-2. The MM-2 is a full-feature, paddle-input keyer that offers virtually all the features of the MM-1 predecessor plus CMOS memory and a new price. Like the MM-1, the MM-2 offers features that include an automatic serial-number generator, an automatic beacon mode, and an automatic speed-increasing Morse code trainer mode.

The MM-2 keyer comes in an rf-protecting metal package and is powered by 10 to 16 V dc. Independent + and – output keying allows connection to virtually any amateur transmitter. For further information on AEA's new $139.95 keyer, write *Advanced Electronic Applications, Inc., PO Box 2160, Lynwood WA 98036, or call (206)-775-7373.* Reader Service number 491.

COMPANDOR KIT

Advanced Analog Systems has announced a design evaluation kit for the Signetics NE572 dual-programmable compandor. The kit, designated AAS572, contains a printed circuit card, integrated circuits, and all components necessary to construct a complete audio compandor.

The system consists of two compressors and two expandors. Input to the compressor section consists of a high-performance, low-noise voltage follower. The system can be evaluated with either a single 2:1 compressor or by switching the ratio selector for 4:1 compression. There is also a choice between 1:2 and 1:4 expansion. Power requirements are plus and minus 15 V. The AAS572 costs $65.00 in single quantities. For more details, contact *Advanced Analog Systems, 790 Lucerne Dr., Sunnyvale CA 94086; (408)-730-9786.* Reader Service number 488.

BOOSTER AMPLIFIER

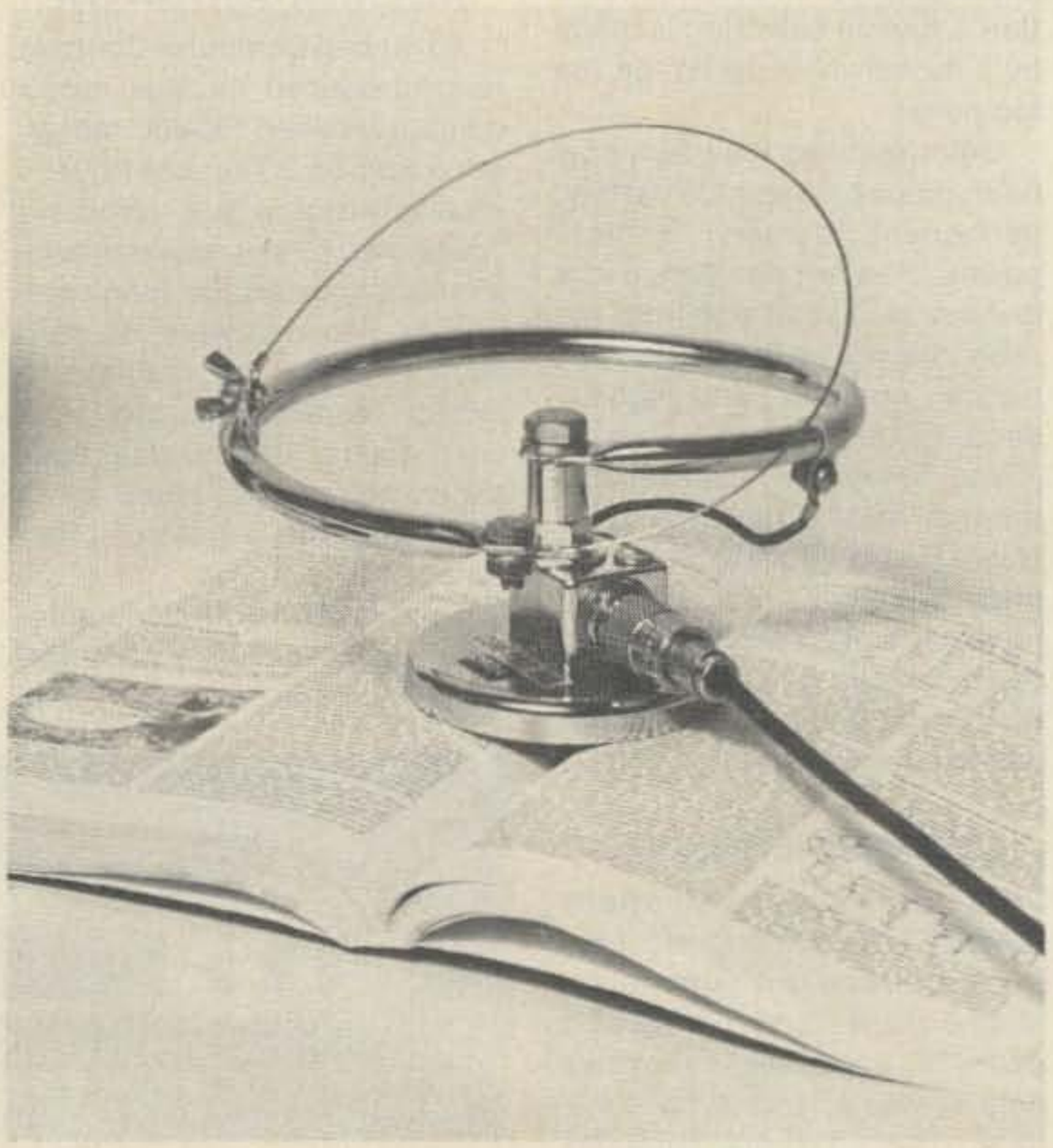
Daiwa announces a compact, lightweight amplifier, the LA2030, intended for the owners of two-meter, hand-held transceivers. It is available in three versions, depending on the power output of your transceiver. All versions can deliver a maximum of 15 or 30 Watts from 144 to 148 MHz.

The Daiwa LA2030 includes rf power metering and protection circuitry. The unit comes equipped with a BNC input and SO-239 output. Three feet of coax and BNC connectors are included in the $121.00 price. For more information, contact *MCM Communications, 858 E. Congress Park Dr., Centerville OH 45459; (513)-434-0031.* Reader Service number 481.

TWO-METER DDRR ANTENNA

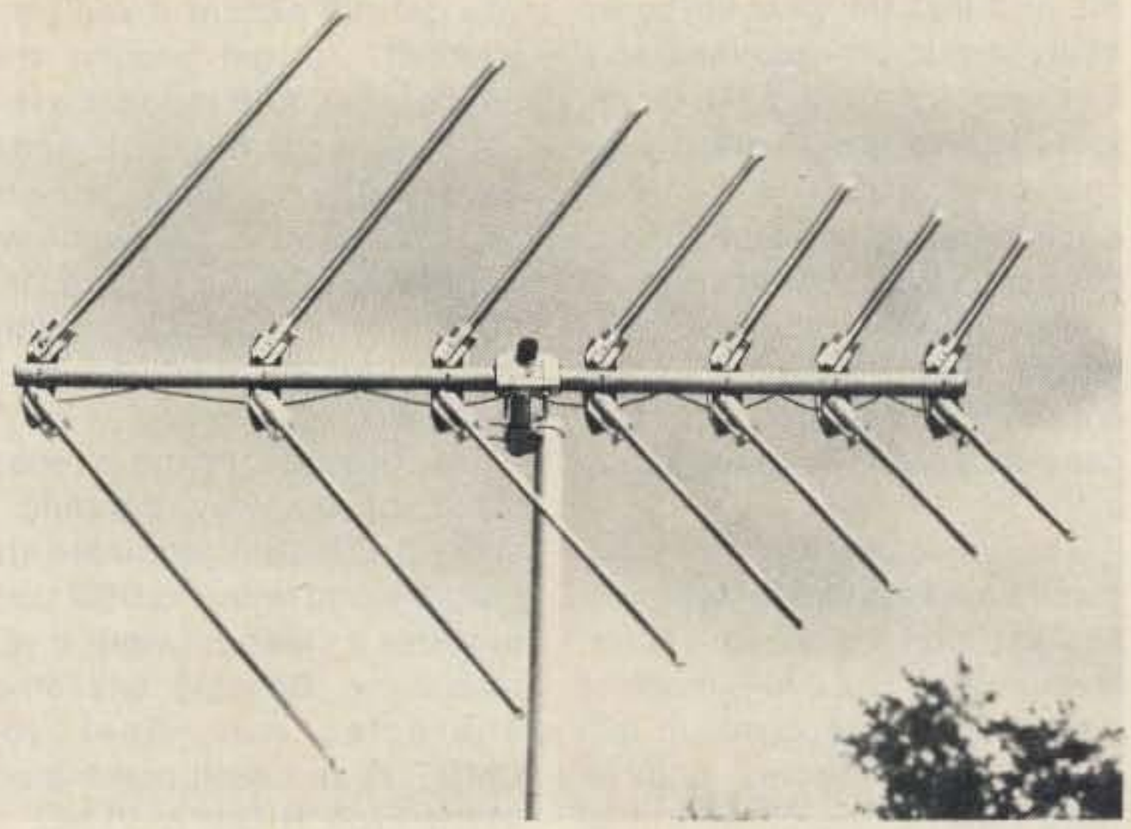
High efficiency and small size are two key features of the Comrad Industries CR2A two-meter antenna. The CR2A is an adaptation of the Northrop Direction Discontinuity Ring Radiator (DDRR). Comrad's CR2A offers vertical polarization in a low-profile package suitable for either base or mobile use. Priced at $39.00, the CR2A is available from *Comrad Industries, 1635*

MorseMatic keyer update, the MM-2.



Comrad's two-meter DDRR antenna.

Heath's portable oscilloscope.



Low-power, wideband antenna.

West River Parkway, Grand Island NY 14072. Reader Service number 477.

SATELLITE TELEVISION RECEIVER

Arunta Engineering Company has introduced the DD 3000 stereo satellite television receiver. The DD 3000 can process multiplex, matrix, and discrete modes of stereo transmission in either wide- or narrow-deviation format.

Other significant innovations include a simplified installation requiring only an RG-59 cable between the receiver and remote downconverter, which transmits i-f, LNA power, and tuning voltage. With a suggested list price of $2995, the DD 3000 is available from *Arunta Engineering Co., PO Box 15082, Phoenix AZ 85060; (602)-956-7042.* Reader Service number 479.

PORTABLE OSCILLOSCOPE

Heath Company is introducing its first portable oscilloscope. The IO-3220 20-MHz oscilloscope can be used for most electronic measurement and comparison needs. It offers dual-trace capability, X-Y inputs, and a special algebraic add function. The IO-3220's sensitivity allows it to measure vertical signals as low as two millivolts. The scope's accuracy is rated within ± three percent on both horizontal and vertical measurements.

The IO-3220 oscilloscope is sold in kit form for $689.95. A factory-assembled version, the SO-3220, sells for $995.00. For more information on this portable oscilloscope, contact *Heath Company, Dept. 350-455, Benton Harbor MI 49022.* Reader Service number 489.

LOW-POWER WIDEBAND ANTENNA

Grove Enterprises has announced that their scanner beam antenna, the ANT-1, works for low-power transmitting as well as receiving. The beam works on 144-148 MHz, 220-225 MHz, and 420-450 MHz. The average vswr is 1.6:1. Because of its highly directional design, forward signal radiation is "targeted" towards distant repeaters or base stations, increasing the range of low-power transceivers.

For more information about the ANT-1, priced at $49.95, contact *Grove Enterprises, Dept. C, Brasstown NC 28902; (800)-438-8155.* Reader Service number 485.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Last month I described what may be the ultimate in RTTY output devices: a synthesized voice. Using the new Votrax Type 'N Talk, a self-contained speech synthesizer, and a 6800 computer, this setup allows conventional RTTY to be presented to the operator not as text on a page or view screen, but as an easily understandable computerized voice, capable of pronouncing whatever is sent. This month, let's look at the programming.

The program is written for my 6800 system, which, in its current state of evolution, uses the GIMIX GMXBUG version 3.0 monitor, the GIMIX VDM, and a Smoke Signal disk system, running under DOS68 version 6.1. Along with the video board, assigned to port #4 in the GIMIX system, GMXBUG supports a printer or other output device on either port #3 (serial) or port #4 (parallel). Output vectors are provided to direct data to the VDM, printer, or both. By connecting the Type 'N Talk to port #3, as a serial device running at 1200 baud, we can take advantage of this capability in the demonstration program. Lacking this feature, as in a system using another monitor, separate video and speech output routines could be used with minimal rewriting.

The program itself follows the flowchart presented last month fairly closely. Beginning at $0100, the first chores taken care of are housekeeping: clearing the screen, setting the GIMIX-software-controlled bell to a high pitch and short duration, and initializing the PIA for input. The output vector is also set so that both the screen and voice are initially active.

The actual receiving loop is next down the line. The keyboard is checked for input first. If there is no data found (we will cover what happens when there is input in a little bit), the PIA is checked. The RTTY input is fed to the least significant bit of the "B" side (B0) of a PIA located in port #5. If a START pulse is not found, then a loop back to the keyboard check is executed. By the way, since we are interfacing via an RS-232-type line to the demodulator, recall that the START, which is sent as a "0" level (or space), is represented by a positive voltage. Thus, reading a "1" on the B0 line translates to a space; a "0" is mark, the resting condition.

Once a START pulse is found, a counter is set up and five data pulses are read in. The step-by-step process is covered in the remarks in the program source listing. After screening for case shifts, spaces (which initiate a downshift-on-space), and carriage returns, otherwise unremarkable letters are decoded in a simple indexed table lookup.

The ASCII character, once retrieved from the table, is output by way of the GIMIX OUTCHR routine. As stated above, this routine will vector to either the screen only, the printer (voice) only, or both. However, I only provide the facility within this program to select screen only or screen and voice.

Now, let's get back to keyboard input. I wanted to provide a way to give commands without worrying over accidentally hitting a key and messing something up. So, in the best tradition of secure devices, only one key is recognized while receiving: the ESCAPE key. Hitting any other key is ignored. Striking the ESC key results in two effects. A flag, called the Command Flag (CMDFLG) is set to "1". This indicates that an ESC has been

hit, and that the next keyboard input should be examined as a command character. Then the local bell is rung, to verify receipt of the ESC.

Once the Command Flag has been set, several commands will be recognized by the system. A look at them reveals: V = voice *on*; S = silent—voice *off*; C = caps mode *on*; D = caps mode *off*.

The voice on and off commands are handled by storing a $01 or $00 in the output vector, respectively. The CAPS mode of operation was touched on last month, but deserves another word now. In the conventional mode, CAPS off, words are pronounced as they are spelled. However, groups of letters which are unpronounceable are still attempted, no matter how mangled the effort. Thus, a typical RTTY sign off, such as "N3BRD DE WA3AJR BCNU KKKK," is pronounced. . .well you get the picture if you try it yourself. To get around this problem, a CAPS mode is available, in which groups of capital letters will be spelled out one by one. This is exactly what we need in a RTTY program, and the "C" and "D" commands allow you to turn this mode on or off as needed.

One other command is recognized, by the way. Sending a second ESC will terminate the program and return to DOS. Just provides a clean getaway, if you follow me. Sending any other character will clear the CMDFLG and send nothing out to the Type 'N Talk or VDM.

Granted, this demonstration program is just that, a demonstration. But I feel it shows the kernel of a system that would be useful to many hams — especially visually-handicapped ones.

One feature of this column that many of you have expressed a particular fondness for is the range of material covered. I don't want to disappoint you, so let's go from high tech to basics. Bob Henry, a Boston MA reader, dropped me a line with two good questions. He begins by asking what a "cursor" is for. For the uninitiated, the cursor is the little box, blinking or solid, or sometimes an underline, that scoots along on a video screen just ahead of where you last typed. Why? Try to imagine a typewriter, Bob, where the whole page was somehow suspended in front of you. When you hit the keyboard the characters are placed on the page in order, but that little plastic thingy that normally sits dead center, and through a hole in the center of which the typebar hits the paper, is missing. How do you know where you are? Where to space? If a new line has started? With a typewriter all that information is provided by that guide and the position of the carriage. With a video screen, there ain't no such guide. That is what the cursor is for!

Bob's other question involves an item touched upon above: unshift-on-space. Recall that on RTTY, using five-level Murray code, two cases — letters and figures — are available. Now, if you miss a "LTRS" or "FIGS" code, the proper case will not be selected, and gibberish will result. On ham RTTY, numeral groups are rarely sent. The odds are that if a space is sent, what follows is in the letters case. Let me illustrate. If I send "DE WA3AJR IN MARYLAND," recall that the "3" is preceded by a FIGS and followed by a LTRS. If that LTRS is missed, what prints out is "DE WA3-'4 8, .-46)-,$", all after the 3 being in figures case. With downshift on space, the first space forces letters case, and "DE WA3-'4 IN MARYLAND" results. Less is missed.

Program listing.

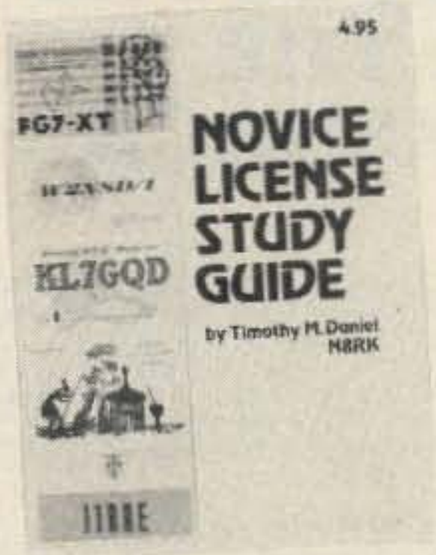
```
                        1:          NAM   SPEAK.TTY
                        2:          OPT   NOG,NOG

                        4: ********************************
                        5: *   DEMONSTRATION PROGRAM      *
                        6: *            TO                *
                        7: * OUTPUT RTTY  AS SPEECH ON    *
                        8: *  THE VOTRAX TYPE 'N TALK     *
                        9: *                              *
                       10: * FOR MAY, 1982 "RTTY LOOP"     *
                       11: *  by MARC I. LEAVEY, M.D.     *
                       12: ********************************

                       14: *<>* EXTERNAL REFERENCES *<>*
001B                   15: ESC     EQU   $1B
B014                   16: PIA     EQU   $B014
3F11                   17: OUTCHR  EQU   $3F11
3F16                   18: PCRLF   EQU   $3F16
3F17                   19: PFFEED  EQU   $3F17
3F26                   20: INKEY   EQU   $3F26
3F27                   21: PRINT   EQU   $3F27
A036                   22: OUTPTR  EQU   $A036
A037                   23: NULCNT  EQU   $A037
A03E                   24: PRFLAG  EQU   $A03E
A03F                   25: DURATN  EQU   $A03F
A041                   26: PERIOD  EQU   $A041
D283                   27: ZWARMS  EQU   $D283
                       29: *<>* MURRAY/ASCII TABLE *<>*
0000                   30:         ORG   $0
0000 7F                31: LTRTBL  FCB   $7F
0001 4B                32:         FCC   \KQU\
0004 00                33:         FCB   0
0005 4A                34:         FCC   \JWAXFYSBDZEVCPIGRL\
0017 00                35:         FCB   0
0018 4D                36:         FCC   \M%H\
001B 20                37:         FCB   $20
001C 4F                38:         FCC   \O\
001D 00                39:         FCB   0
001E 54                40:         FCC   \T\
001F 00                41:         FCB   0
0020 7F                42: FIGTBL  FCB   $7F
0021 28                43:         FCC   \(17\
0024 00                44:         FCB   0
0025 27                45:         FCC   \'2-/!6\
002B 07                46:         FCB   7
002C 3F                47:         FCC   \?&"3;:08$4)\
0037 00                48:         FCB   0
003B 2E                49:         FCC   \.,@ 9\
003D 00                50:         FCB   0
003E 35                51:         FCC   \5\
003F 00                52:         FCB   0
                       55: * STORAGE AND STRINGS
0040 00 00             56: TABLE   FDB   0
0042 0B 00             57: RCVDLY  FDB   $B00        60 WPM (45.45 BAUD)
0044 00                58: CMDFLG  FCB   0
                       60: *< MAIN PROGRAM STARTS HERE >*
0100                   61:         ORG   $100
0100 3F 17             62: START   FDB   PFFEED      Clear video screen
0102 CE 2000           63:         LDX   #$2000      Set GIMIX "bell" for short
0105 FF A03F           64:         STX   DURATN      duration and a
0108 B6 10             65:         LDA A #$10        high pitched
010A B7 A041           66:         STA A PERIOD      tone...
010D B6 FF             67:         LDA A #$FF
010F B7 A03E           68:         STA A PRFLAG      Set up for serial printer
0112 7F A037           69:         CLR   NULCNT      Output no nulls
0115 B6 01             70:         LDA A #$01        Set output for both
0117 B7 A036           71:         STA A OUTPTR      Screen and "Printer" (Voice)
011A 4F                72: PIAINT  CLR A             Initialize input PIA
011B CE B014           73:         LDX   #PIA
011E A7 02             74:         STA A 2,X
0120 A7 03             75:         STA A 3,X
0122 B6 04             76:         LDA A #$4
0124 A7 03             77:         STA A 3,X
                       78: *
                       79: * RECEIVING ROUTINE
                       80: *
0126 3F 26             81: RCVING  FDB   INKEY
0128 27 49             82:         BEQ   STBAUD
012A 7D 0044           83: COMAND  TST   CMDFLG      Has an ESC been sent?
012D 26 0D             84:         BNE   ESCSNT      Yes, try to process command
012F B1 1B             85:         CMP A #ESC        No, is this an ESC?
0131 26 40             86:         BNE   STBAUD      No, forget it!
0133 7C 0044           87:         INC   CMDFLG      Yes, set the Command Flag
0136 B6 07             88:         LDA A #$07        Ring the local bell to
0138 3F 11             89:         FDB   OUTCHR      confirm ESC receipt.
013A 20 37             90:         BRA   STBAUD      ... and continue monitoring
013C 7F 0044           91: ESCSNT  CLR   CMDFLG      Clear the Command Flag
013F B1 1B             92:         CMP A #ESC        Is input another ESC?
0141 26 03             93:         BNE   NOTESC      No...
0143 7E D283           94:         JMP   ZWARMS      Yes, get out of here!!
0146 B1 43             95: NOTESC  CMP A #'C         C = CAPS ON
0148 26 04             96:         BNE   NOTAC
014A B6 15             97:         LDA A #$15        TNT Code for CAPS ON
014C 20 1D             98:         BRA   PNTESC      Send code to TNT
014E B1 44             99: NOTAC   CMP A #'D         D = CAPS OFF
0150 26 04            100:         BNE   NOTAD
0152 B6 16            101:         LDA A #$16        TNT Code for CAPS OFF
0154 20 15            102:         BRA   PNTESC
0156 B1 56            103: NOTAD   CMP A #'V         V = Voice ON
0158 26 07            104:         BNE   NOTAV
015A B6 01            105:         LDA A #$01
015C B7 A036          106:         STA A OUTPTR      Vector to Screen and "Printer"
015F 20 12            107:         BRA   STBAUD
0161 B1 53            108: NOTAV   CMP A #'S         S = Voice OFF (Silent)
0163 26 0E            109:         BNE   STBAUD      Whoops!  Forget it fellows...
0165 4F               110:         CLR A
0166 B7 A036          111:         STA A OUTPTR      Vector to Screen only
0169 20 08            112:         BRA   STBAUD
016B 36               113: PNTESC  PSH A             Send ESC seq to TNT - save A
016C B6 1B            114:         LDA A #ESC        Load it with an ESCAPE
016E 3F 27            115:         FDB   PRINT       Send that out
0170 32               116:         PUL A             Retrieve code to send
0171 3F 27            117:         FDB   PRINT       ... and send that out
0173 CE B014          118: STBAUD  LDX   #PIA         Now check for TTY input
0176 A6 02            119:         LDA A 2,X         Look for a START pulse
0178 4D               120:         TST A
0179 27 AB            121:         BEQ   RCVING      Not there yet, keep looping
017B BD 43            122:         BSR   RMS10       Found one, delay 1/2 pulse
017D C6 05            123:         LDA B #$5         Set up five bit counter
017F 4F               124:         CLR A             Clear the A accumulator
0180 48               125: CHLOOP  ASL A             Shift the A accumulator one left
0181 BD 3A            126:         BSR   RMS20       Wait one pulse length
0183 CE B014          127:         LDX   #PIA        Pick up pulse in progress
0186 AA 02            128:         ORA A 2,X         Stuff it into character in formation
0188 5A               129:         DEC B             Decrement the counter
0189 5D               130:         TST B             Are we done?
018A 26 F4            131:         BNE   CHLOOP      No... do it again
018C BD 2F            132:         BSR   RMS20       Yes, wait until last pulse is over
018E B1 1D            133:         CMP A #$1D        Is this a CAR RET?
0190 26 04            134:         BNE   ISFIGS      No, do next check
0192 3F 16            135:         FDB   PCRLF       Yes, output CR/LF pair
0194 20 90            136:         BRA   RCVING      ... and wait for next character
0196 B1 04            137: ISFIGS  CMP A #$04        Is this a FIGS?
0198 27 0F            138:         BEQ   FIGS        Yes, go to FIGS routine
019A B1 00            139:         CMP A #$00        Is this a LTRS?
019C 27 04            140:         BEQ   LTRS        Yes, go to LTRS routine
019E B1 1B            141:         CMP A #$1B        Is this a SPACE?
01A0 26 0F            142:         BNE   GETCHR      No, process character normally
01A2 CE 0000          143: LTRS    LDX   #LTRTBL     Choose LTRS table
01A5 DF 40            144:         STX   TABLE       Store it as active table
01A7 20 0B            145:         BRA   GETCHR      Process character, if any
01A9 CE 0020          146: FIGS    LDX   #FIGTBL     Choose FIGS table
01AC DF 40            147:         STX   TABLE       Store it as active table
01AE 7E 0126          148:         JMP   RCVING      Look for next character
01B1 B7 01B7          149: GETCHR  STA A LOCATE+1    Store Murray code as offset
01B4 DE 40            150:         LDX   TABLE       Pick up current table
01B6 A6 00            151: LOCATE  LDA A X           Load A with ASCII value
01B8 3F 11            152:         FDB   OUTCHR      Put out through GIMIX routine
01BA 7E 0126          153:         JMP   RCVING      Loop for next character
                      154: *
01BD 8D 01            155: RMS20   BSR   RMS10       Two 10s = One 20!
01BF 01               156:         NOP
01C0 DE 42            157: RMS10   LDX   RCVDLY      Pick up delay factor
01C2 09               158: RMLOOP  DEX               Decrement it
01C3 26 FD            159:         BNE   RMLOOP      Loop 'til done...
01C5 39               160:         RTS               ... then exit
                      161: *
0100                  162:         END   START
     NO ERROR(S) DETECTED
```

RADIO BOOKSHOP

FOR THE NOVICE



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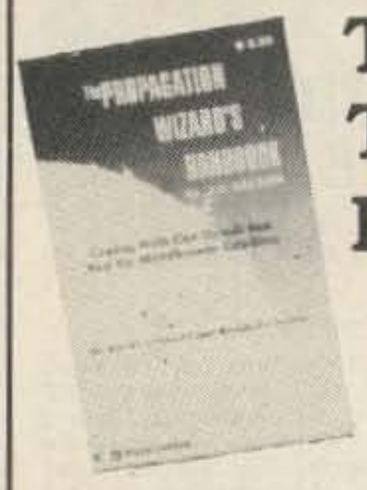

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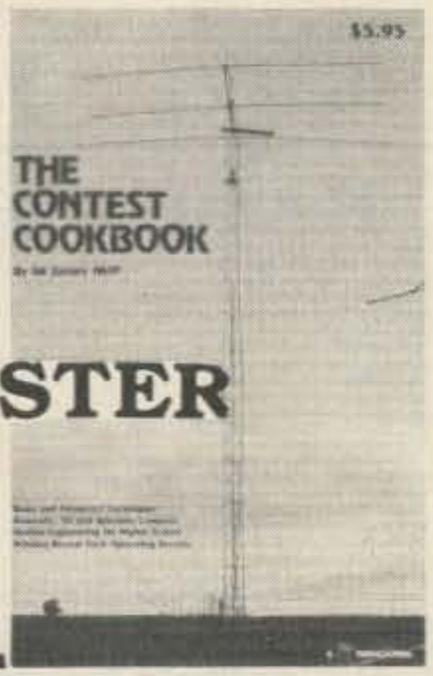

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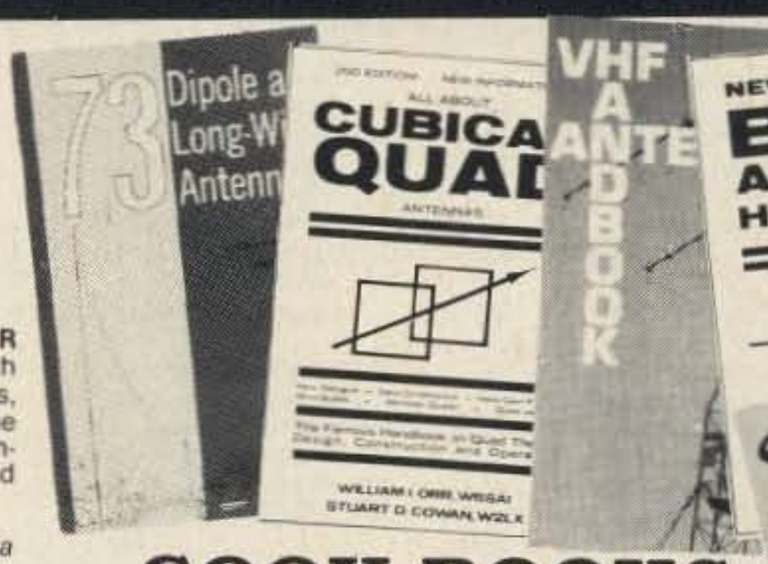

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CONTESTS

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COUNTY HUNTERS
SSB CONTEST
Contest Periods:
0001 to 0800 GMT May 1
1200 GMT May 1 to 0800 May 2
1200 to 2400 GMT May 2

Please note the two 4-hour rest periods. Mobiles may be worked each time they change counties or bands. Mobiles that are contacted on a county line count as one contact but 2 multipliers. Fixed stations may be worked by other fixed stations only once during the contest. Repeat QSOs between fixed stations on other bands are not permitted. Fixed stations may be worked by mobiles each time they change counties or bands. Repeat contacts between mobiles are permitted provided they are on a different band or county. Mixed-mode contacts are permitted provided that one station is on SSB. Contacts made on net frequencies will not be allowed for scoring in this year's contest.

EXCHANGE:

Signal report, county, and state or country.

FREQUENCIES:

Suggested frequencies are as follows: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28625-28650. There will be a "mobile window" of 10 kHz on the following frequencies: 3925-3935, 7225-7235, 14280-14290. Mobiles will be in this 10-kHz segment and fixed stations are asked to refrain from calling "CQ contest" in the mobile window. After working mobiles in the "window," fixed stations are requested to QSY outside the "window" to work fixed stations in the contest. This will allow the mobiles running lower power a chance to be heard and worked in the contest. There will be a special effort to work DX on 28.636 by mobiles.

SCORING:

Contact with a fixed US or Canadian station = 1 point; contact with a DX station (KL7 and KH6 count as DX) = 5 points; contact with a mobile station = 15 points. The multiplier is the total number of US counties plus Canadian stations worked. The final score is this multiplier times the total QSO points.

AWARDS:

MARAC plaques to the highest scoring fixed US or Canadian station, DX station, and top 2 scoring mobile stations. Certificates to the top 10 fixed and mobile stations in the US and Canada, and to the highest scoring station in each DX country.

ENTRIES:

Logs must show date and time, station worked, reports exchanged, county, state, band, claimed QSO points (1, 5, or 15), and each new multiplier must be numbered. Logs and summary sheets are free for a #10 SASE or SAE and appropriate IRCs. Write John Ferguson W0QWS, 3820 Stonewall Ct., Independence MO 64055. All entries must be received by June 15th to be eligible for awards. DX entries should use air mail. Winners will be announced at the 1982 Independent County Hunters Convention during July and in the MARAC newsletter.

SEVILLE
WORLDWIDE CONTEST
Starts: 1600 UTC May 1
Ends: 2000 UTC May 2

This contest is sponsored by the Seville (Spain) City Council and organized by the Seville Radio Club. Only single-operator entries are eligible. You may operate 24 hours of the 28-hour contest period, with 4 hours of rest taken in one or two periods. Contacts are allowed on SSB and CW, but a station may be worked only once per frequency band.

BANDS:

80 through 10 meters.

EXCHANGE:

RS(T) plus QSO number beginning with 001.

MULTIPLIER:

DXCC countries worked on each band.

POINTS:

Contacts between stations in the same country count 2 points. Contacts between stations in different countries count 3 points. Exception: Contacts between EA, EA6, EA8 and EA9 count only 2 points.

SCORING:

Total QSO points times sum of multiplier points.

AWARDS:

Certificates will be awarded to the top-scoring station in each continent, each country, and each W/K, VE, JA, and EA call area. The Seville City Council will award an all-expense paid trip to Seville's April Fair Feast to the top-scoring EA and non-EA stations.

ENTRIES:

All times must be in UTC. Indicate multipliers in your log the first time they are worked on each band. Make a separate log and dupe sheet for each band. Include a summary sheet containing scoring information for each band, a station description, and a signed declaration that you have observed the contest rules and the regulations for amateur radio in your country. Please include your comments and photographs.

Entries must be postmarked no later than June 30th. Send entries to: Seville Worldwide Contest, Radio Club Sevilla, PO Box 555, Sevilla, Spain.

DISQUALIFICATION:

Violation of the contest rules, violation of amateur radio regulations, unsportsmanlike conduct, excessive duplicate contacts, or unverified QSOs will be deemed sufficient cause for disqualification. Decisions of the Contest Committee are final.

MICHIGAN QSO PARTY
Contest Periods:
1800 GMT Saturday, May 15 to 0300 GMT Sunday, May 16
1100 GMT Sunday, May 16 to 0200 GMT Monday, May 17

This year's QSO party will be sponsored by the Oak Park ARC. Phone and CW are combined into one contest. Michigan stations can work Michigan counties for multipliers. A station may be contacted once on each band/mode. Portable mobiles may be counted as new contacts each time they change counties.

EXCHANGE:

RS(T), QSO number, QTH as

CALENDAR

May 1-2	County Hunters SSB Contest
May 15-17	Michigan QSO Party
May 22-23	Mt. Saint Helens QSO Party
Jun 5	Jefferson Davis QSO Party
Jun 12-13	ARRL VHF QSO Party
Jun 12-13	Worldwide South America CW Contest
Jun 18-20	Summer SMIRK Party
Jun 20-21	*A5 Magazine* Worldwide SSTV DX Contest
Jun 26-27	ARRL Field Day
Jul 10-11	IARU Radiosport
Jul 17-18	International QRP Contest
Aug 7-8	ARRL UHF Contest
Aug 7-8	*A5 Magazine* F5TV UHF Contest
Aug 14-15	European DX Contest—CW
Sep 11-12	ARRL VHF QSO Party
Sep 11-12	European DX Contest—Phone
Oct 16-17	ARCI QRP CW QSO Party
Nov 6-7	ARRL Sweepstakes—CW
Nov 13-14	European DX Contest—RTTY
Nov 20-21	ARRL Sweepstakes—Phone
Dec 4-5	ARRL 160-Meter Contest
Dec 11-12	ARRL 10-Meter Contest

✓See List of Advertisers on page 130

QSL OF THE MONTH: KX6SS

The colorful flag of the Marshall Islands provides an attractive design for the QSL of Keith R. Merrick KX6SS. Keith also holds callsigns KG6SS and WA1GYS.

To enter our QSL of the Month Contest, put your card *in an envelope* and mail it, along with your choice of any book from *73*'s Radio Bookshop, to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which are not sent in an envelope (the Postal Service does *occasionally* damage cards) and do not specify a book will not be considered.

Kansas Amateur Radio

Public service in local and worldwide communications

NEWSLETTER OF THE MONTH

Amateur radio publications don't have to be either strictly local or strictly national in scope. This month's winner, *Kansas Amateur Radio*, is a good example of a regional publication.

Editor (and owner) KC0GL publishes *K.A.R.* quarterly in a magazine format. The January issue is printed on glossy stock and is 24 pages long. The layout is neat and the graphics are good; it's a professional-appearing publication. *Kansas Amateur Radio* covers what its name implies: the whole range of ham radio activities in Kansas, including net and club news, information about Kansas hams, and occasional technical articles.

This unique magazine is funded by reader contributions and a small amount of advertising revenue. It's a strictly nonprofit operation that relies almost totally on reader support, both financial and editorial — as KC0GL puts it, "if you write it, we will print it!"

A lot of small clubs don't have enough going on to warrant a full newsletter each month. Support of a publication like *Kansas Amateur Radio* may be a more practical way for some clubs to get their news into print than undertaking the effort required to put out a good club newsletter. A group of clubs might even consider banding together to produce a cooperative newsletter. There's strength in numbers.

state, country, or Michigan county.

FREQUENCIES:

Phone—1815, 3905, 7280, 14280, 21380, 28580.

CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125.

VHF—50.125, 145.025.

SCORING:

Multipliers are counted only once. Michigan stations score 1 point per phone QSO and multiply by the total number of states, countries, and Michigan counties. Each CW contact counts 2 points; KL7 and KH6 count as states; VE counts as a country. Maximum multiplier is 85.

Others take QSO points times the total number of Michigan counties. QSO points are 1 point per phone QSO and 2 points per CW QSO. Maximum multiplier is 83.

All stations score 5 points for each club station contact with W8MB.

VHF-only entries: same as above except multipliers per VHF band are added together for total multiplier. Score 5 points for each OSCAR QSO. No repeater contacts are allowed.

AWARDS:

Michigan trophies to high Michigan score, high Michigan (Upper Peninsula) score, high aggregate club score. Plaque to high VHF-only entry and high mobile. Certificates to high score in each county with a minimum of 30 QSOs. Out-of-state high trophy and certificates for high score in each state and country. Added this year is a trophy for the highest scoring Michigan multi-operator score.

ENTRIES:

A summary sheet is requested showing the scoring and other pertinent information, name and address in block letters, and a signed declaration that all rules and regulations have been observed. Michigan stations include club name for combined club score. Party contacts do not count toward the Michigan Achievement Award unless one fact about Michigan is communicated. Members of the Michigan Week QSO Party Committee are not eligible for individual awards. Decisions of the Contest Committee are final. Results will be final on July 31st and will be mailed to all entries. Mailing deadline is June 30th to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

MICHIGAN ACHIEVEMENT AWARD

This will be the 24th year that hams have had their own program to publicize Michigan and its products. Just as for past years, the Governor will award Achievement Certificates to hams who take part in telling the world of Michigan's unlimited resources, opportunities, and advantages. Certificates are awarded on the following basis:

1. A Michigan ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding Michigan.

2. An out-of-state ham, including Canada, submits log information and names and addresses (if possible) of at least five Michigan hams who relate facts to him about Michigan.

3. A foreign ham, excluding any resident of Canada, submits the call letters and name and address plus log information for at least one Michigan ham who has told him about Michigan.

Only QSOs made during Michigan Week, May 15-22, will be considered valid. All applications for certificates must be postmarked by July 1st and mailed to Governor William Milliken, Lansing MI 48902.

MT. SAINT HELENS QSO PARTY
Starts: 0001 GMT, May 22
Ends: 2359 GMT, May 23

The Clark County Amateur Radio Club, W7AIA, is pleased to announce the second annual QSO party marking the second anniversary of the cataclysmic explosion of nearby Mt. Saint Helens. This disastrous volcanic eruption took the life of Reid Blackburn KA7AMF, who was an active member of their club. Reid was monitoring a USGS observation station near the base of the mountain at the time of the eruption.

Any amateur station making one contact with W7AIA during the two days of the QSO party will be eligible to apply for the Mt. Saint Helens Award, a color certificate featuring a photograph of the awesome eruption of the volcano on May 18, 1980.

Look for W7AIA on the following frequencies (plus or minus QRM): SSB—3895, 7230, 14280, 21360, 28505; CW—3705, 7105, 21105, 28105; VHF—various Vancouver and Portland area repeaters.

To apply for the award, send log information or QSL card and $2.00 (or 8 IRCs) to: Award Manager, W7AIA, PO Box 1424, Vancouver WA 98668. All proceeds from the award will go to the Reid Blackburn Scholarship Fund which has been established by the *Columbian*, a Vancouver newspaper. So far, 647 amateurs have applied for the award, which has provided for a $1,000 contribution to the scholarship fund.

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REVIEW

ICOM'S IC-720A TRANSCEIVER

Although the four buildings at *73 Magazine* are each more than a mile apart, no telephone is needed when new equipment arrives for review. The *73* hams start forming lines the minute word gets around that equipment has arrived. Responding to that call, I was informed that the senior staff was so pleased with my previous reviews of dummy loads, power supplies, and BNC-to-garden-hose adaptors that they were going to give me a shot at a real radio.

Real radio is an understatement when it comes to Icom's newest all-mode, general-coverage transceiver, the 720A. This state-of-the-art solid-state rig should fill the bill for just about all devotees of the various modes of amateur communications available to us today on the HF bands. The first two days that the rig was available to me, it was put to use at W2NSD/1 where it was compared to several other transceivers in the station at the same time. In typical Icom fashion, the 720A's receiver outperformed all others — no mean feat when you consider that the Icom has a general-coverage receiver covering 100 kHz to 30 MHz.

The 720A arrived at my station the evening that the ARRL 10-meter contest started and I thought that I would attempt to put the rig through its paces during part of the contest. As it came from the box, 15 minutes prior to the start of the contest, those familiar words "some assembly required" echoed in my mind. The separate power supply (IC-PS15) attached to the 720A with no problem. Two of the phono jacks, on the rear panel, serve dual functions. As it comes from the box, these jacks are set up to provide an input for a low-band antenna and transverter/scope output. If you wish to use a linear amplifier, you must change the position of an internal connector, converting the function of these jacks to provide ALC and relay outputs. The conversion of these jacks required a few minutes study of the manual and less time in effecting the change.

With a few minutes left before the start of the contest, I thought I would take a look at the general-coverage frequencies. At that time of night, reception was good on the lower bands. I was surprised at the fidelity of the AM reception with only the standard filter in place.

My first encounter was with a Colombian station on 5 MHz playing traditional music. Having lived in Colombia for several years, it brought back memories and made me an instant SWL nut. Other treats in the first tour around the bands were an Austrian Christmas music special, a Spanish-language discussion of solar flux, a British Broadcasting Company London *Times* news program, a Portuguese discussion of the economic situation in the United States, and, of course, the old standby, Radio Moscow, with an editorial on the United States' deployment of the neutron bomb in Europe. No tour would have been complete without a stop on the low end of 8 MHz where the CW maritime traffic, with its near-perfect code, is a great place to increase or maintain your code speed.

Icom's IC-720A transceiver alongside the PS-15 12-volt power supply.

An interesting feature of the 720A was noted during this tour. While listening to one of the AM broadcasts, I noted that our old friend, the Russian woodpecker, was as prominent here as he is on the ham bands. Out of curiosity, I turned on the noise blanker and watched the interfering signal fall from 20 dB over S9 to S3. I still knew the offending signal was there, but it was much less bothersome.

Looking up at the clock, I found that the contest was already four hours old (later diagnosed as SWLer's disease). I decided to get a good night's rest and tackle the pileups in the morning. At first light I was on the bands. My first contact was W2NSD/1, 5-9 New Hampshire. Not bad, but I decided to use my limited time to hunt for countries. In eight hours, I racked up 47 countries and got a feel for how the 720A performed.

Operator's Manual

The first thing that impresses the new owner of a 720A is the clarity of the operator's manual. It begins with a concise walk-through of all controls and external connections (more than 50). It next provides detailed explanations of the major controls. A description of the circuit operation follows, remarkably understandable for a rig of this complexity. The section on maintenance and adjustments, along with photographs, covers most problems that might be encountered. While the schematic is small, a large-scale parts layout, in four colors, will prove invaluable for repairs.

My concern for the understandability of the owner's manual is sparked by the fact that I am a rural ham, living more than seventy miles from the nearest ham store and doing most repairs at home. With the 720A's manual, I would have no qualms about undertaking most repairs in the shack.

Icom Pioneers Again

The radio itself is small, measuring 4" × 9" × 12" and engineered to maximize the use of space. It appears to be most functional when placed at eye level. With the 720A, Icom introduces a pioneering method of function and mode selection, similar to the system used by many pocket calculators. Push-buttons replace many of the knobs used by old-fashioned rigs. Several of the controls are dual-function. While first impressions yield the feeling that you will never understand all of the controls, a few hours of use will convince you of the functionality of this method as you quickly jump from band to band, change modes, and select filters with this new system.

The receiver, unquestionably the hottest I have ever used, utilizes low-noise FETs in the rf amplifier to aid sensitivity and double conversion, with high side injection and steep-skirted filters for maximum selectivity. The receiver covers 0.1 to 30 MHz in 1-MHz steps. A two-position button allows you to step through the covered frequencies, stopping at ham bands only or at any 1-MHz segment. The operating frequency is determined by a microprocessor-controlled PLL. One of the most interesting features of this radio is a low-pass-filter unit which employs a motor-driven rotary relay-switching circuit that selects various filter components for each band. During receive, the low-pass unit offers a high degree of adjacent channel rejection; during transmit, it removes harmonic components. The relay also delivers different control voltages to a plug on the rear panel for each band, thus allowing automatic band change for a linear amplifier and automatic antenna selection with external relays.

Operating Controls

The number of controls offered by the 720A provides maximum flexibility but makes description of the actual ease of operation difficult. In order that my written description does justice to the user-friendly 720A, the controls will be divided into four groups.

- Frequency selection. This group includes band-stepping switches, the switch to select one of the two vfo's available, main tuning knob, tuning-rate select buttons, and RIT button.
- Mode Selection. These include CW, SSB, AM, FM, RTTY, and a reverse-sideband select button.

- Ancillary controls. These include the transmit/receive switch, af and rf gain controls, microphone and power output controls, noise blanker, pass-band tuning, and attenuator.
- Display. These include operating frequency, mode, sideband (u or l) and LEDs to indicate that certain functions or filters have been selected.

Operation

SSB and CW operation is straightforward. The frequency selection is made easy by the use of three tuning rates. Major changes can be made with the tuning speed button at a 1-kHz rate. The two other rates are 100 Hz and 10 Hz. The tuning knob is equipped with an adjustable brake that controls the friction on the knob. As it came from the factory, mine was too loose and had to be tightened. The rig is equipped with two vfo's and operation may be on either one or both (split), removing the need for an external vfo.

In this time of crowded band conditions, three features of the 720A make it an ideal operator's rig. The attenuator not only adds a 10-dB pad to the receiver front end, but also removes the rf amplifier. This reduces interfering signals and yields more stable reception. Pass-band tuning (PBT) accomplishes with one control what it takes other rigs two or three to do. PBT narrows the bandwidth (selectivity) of the frequencies that will pass through the crystal filter. This effectively reduces interference from nearby signals. The noise blanker, as I mentioned, is effective in reducing the interference from the woodpecker as well as the usual pulse-type trash such as ignition noise. Living out in the country where automobile traffic is about as common as QSL cards from BY-land, I parked my Subaru under a wire antenna and let it idle. If you are not familiar with this car, it is the noisiest (rf-wise) that you will run into. Letting it idle at 2000 rpm, I returned to the receiver and found the blanker to be effective.

The transmitter lived up to my expectations on SSB. With the obligatory "this is with the processor on" routine, I found that the processor had an above average or acceptable rating from the listeners. The VOX worked with no adjustment and it was not necessary to go under the top access lid.

Speaking of "under the lid," in addition to the fifty some odd controls and jacks that the 720A has on the outside, a convenient top access lid houses additional controls. CW sidetone, meter-function select, and VOX control, that require seldom adjustment, are housed under this top lid.

CW operation is just as easy as SSB. The rig did not have the optional 500-Hz filter, but the 1.1-kHz filter provided proved to be adequate for casual use. Upon selecting the CW mode, an LED indicates the filter width and the PBT functions as it does on SSB, allowing the PB width to be narrowed by 800 Hz. Semi-break-in is possible using the VOX switch.

Other Modes

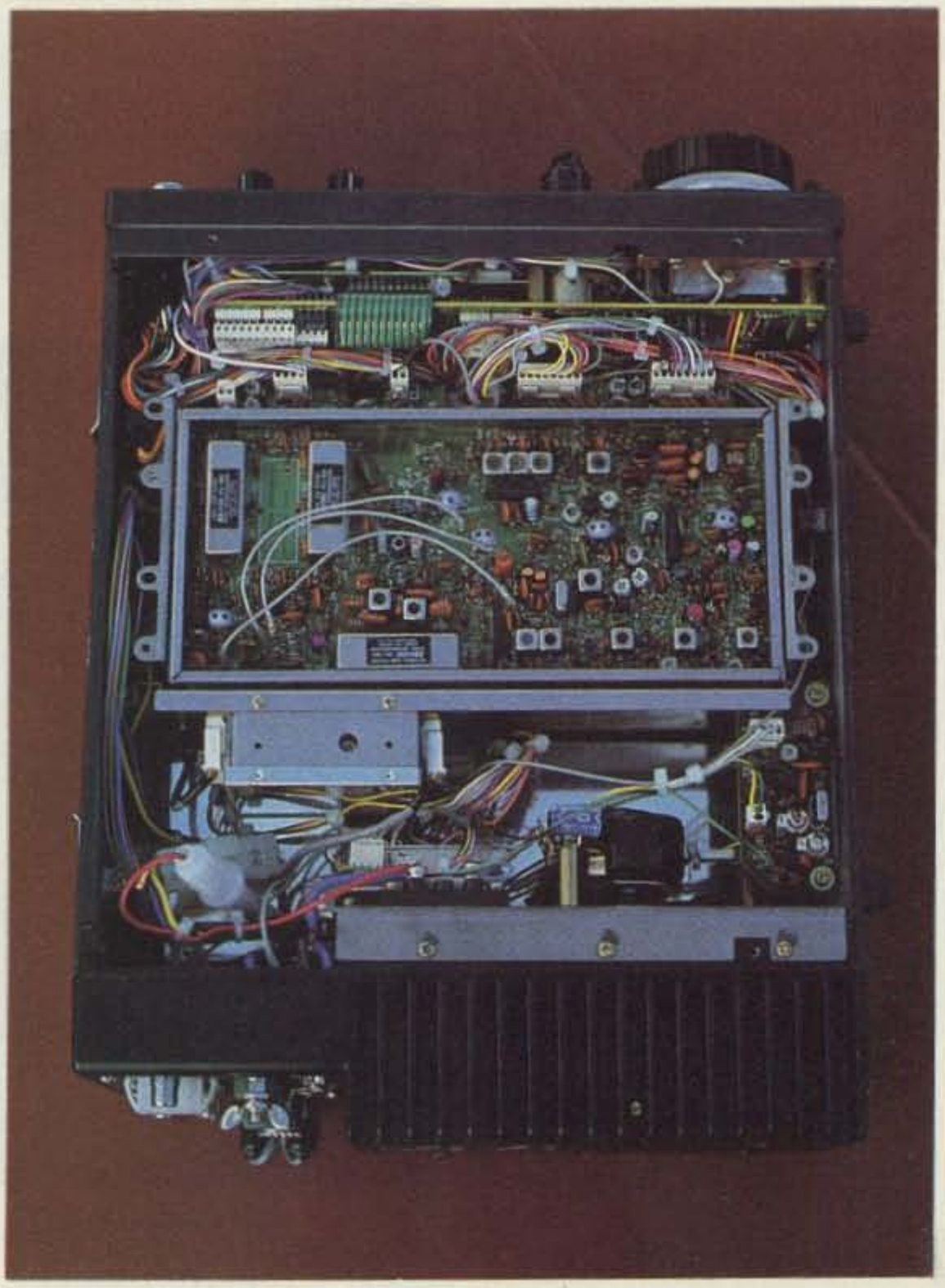
The 720A is equipped for FSK operation and narrow shift tones are available to be sent to a terminal unit. AM operation had to be tried since there is an abundance of 75-meter phone stations here in the Northeast. Reports of "broadcast quality" were heard more than once, giving me the interest to look into this mode further. During operation in this mode, the meter measures carrier power and the operator is cautioned that if he expects to operate for more than ten minutes, power should be reduced to the 70% level.

The finals are protected by a circuit that reduces power in an inverse ratio to swr. In addition, there is a cooling fan that is activated during the transmit mode by a thermal switch. The operator's manual cautions you that should the fan go to high speed, you should *stop* operating at once. I must admit that prior to operating this radio I was a "tube final" type and somewhat nervous about solid-state finals. As I spend most of my operating time on wire antennas, using a tuner, I approached my first 720A band change with trepidation. Relieved by the rapid response of the protection circuit, I adopted a more cavalier attitude with later changes. Since I spend a good part of my time chasing HK3DMD around the bands trying to link up for our regular sked, I can now appreciate the benefits of quick band changes offered by the 720A's solid-state finals.

In summary, the Icom 720A, in the hands of this operator, has proven to be a versatile and practical ham rig. In the course of two months' operation, no major problems were encountered. While not inexpensive, the unit's distinctive features gave me hours of enjoyment and broadened my perspective. The proof of the pudding is in the eating. Should you doubt my opinions, go to your nearest dealer and try the rig yourself. I guess the strongest case for ownership of the 720A is to ask if anyone wants to buy my old rig.

The Icom IC-720A and matching PS-15 power supply have a list price of $1498. For more information, contact *Icom America, 2112 116th Ave. NE, Bellevue WA 98004.*

Joe Hayes AE1K
Stoddard NH



Top view of the 720A. The i-f module's cover has been removed, showing the location of the crystal filters.

KB1T CONTEST CALENDAR

There was a time, not too many years ago, when calendars were plain and ordinary. Functional, yes, but not very exciting. All that's changed. The walls of our homes and offices are now covered with calendars for cat haters and cat lovers, calendars from the Sierra Club and the oil companies, Right to Life and Playboy Philosophy calendars, even calendars devoted to pictures of polar bears (no kidding!). At long last, radio amateurs can join the calendar craze with one of their very own: the Contest Calendar from KB1T Radio Specialties.

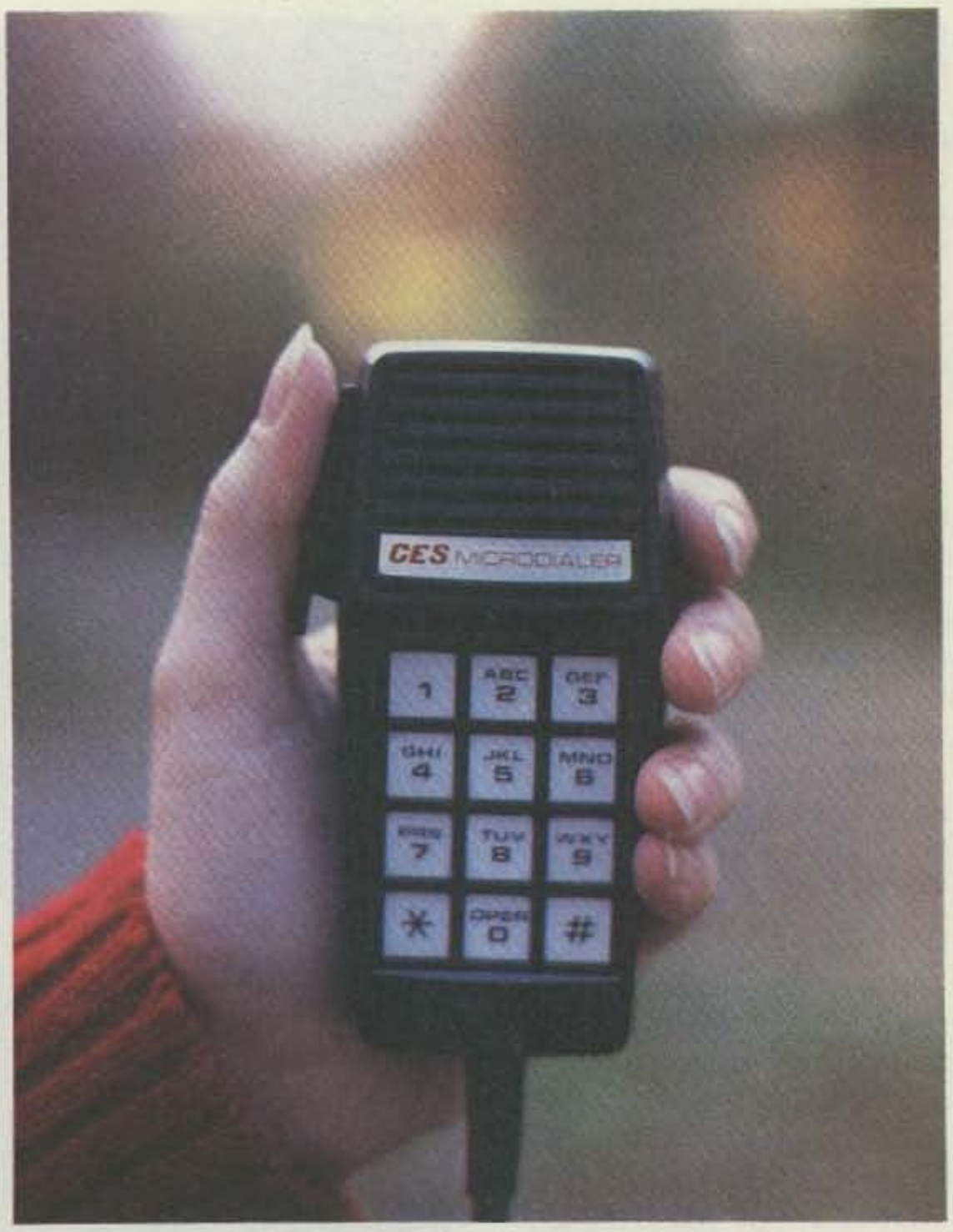
The Contest Calendar is both functional and beautiful. On the functional side, it's a large, 18- x 18-inch, single sheet calendar, showing all 12 months at once. The center of the calendar features a great circle map of the Earth, centered on the USA, a handy aid to pointing your beam. Arrayed around the map are the individual calendars for the 12 months of the year. The weekends of major contests are highlighted in red with an abbreviated name of the contest and the mode (CW, phone). On the 1982 version, my count showed 28 contest weekends listed. The arrangement of the calendar on one sheet and the highlighting of the contest weekends make it easy to plan for upcoming oper-

ating activities—or anything else—at a glance.

And beautiful? The Contest Calendar is a work of art. The graphic design is bold, uncluttered and elegant. The entire calendar is printed on chromed mylar with the map in black. The 12 individual calendars have white backgrounds, with black numerals and red for the contest listings. It is the first and only ham shack accessory I have owned that non-amateurs seem to appreciate as much as fellow hams. It seems to draw more than its share of approving comments.

The Contest Calendar comes with four small adhesive tabs, allowing it to be mounted on a wall. I suspect many owners are framing theirs, however. Any active amateur, especially the contester, will appreciate the Contest Calendar. It's priced at $4.50, from *KB1T Radio Specialties, Box 1015, Amherst NH 03031.* Reader Service number 493.

Jeff DeTray WB8BTH
***73 Magazine* Staff**



The CES 635 Microdialer. (Photo by KA1LR)

PACKET RADIO BOOK

The preface to *Packet Radio,* published by Tab Books, Inc., begins by asserting, "This book was written to provide an easy entry into the utterly fascinating world of packet radio." I'm not sure that any single volume could give an *easy* introduction to this highly complex subject, but this book comes pretty close. Actually, it is must reading for anyone even mildly interested in RTTY, networking, or computer communications in general.

There is a wealth of practical information here that authors Robert Rouleau and Ian Hodgson give merely as a background to the main subject. They offer, for example, a fairly lively review of the RS-232C interface, with lots of discussion of the vagaries of interfacing nonstandard equipment. I for one was thrilled to discover that there is a pair of inexpensive chips available which convert TTL-level signals to RS-232C and back again!

The chapter on resource sharing via multiplexing should be read by everyone. It's only a basic introduction to the subject, but it is fascinating to someone who has never considered the subject before (which is to say, most hams!).

The chapters covering packet itself are solid and meaty—I won't reveal the chapter titles because they might scare off the faint-hearted. They sound more formidable than they really are.

The material on high-speed data transmission via HF radio is must reading for any ham who dreams of 9600-baud QSOs. The problems of bandwidth, S/N ratio, path loss multipath, Rayleigh fading, propagation delay distortions, and woefully unsuitable transmitters and receivers are discussed in a matter-of-fact manner. If you dream of a quick and dirty improvement to our present RTTY system, a read through this section will be a sobering experience.

The bottom line, though, is that packet techniques are being used, today, and with reasonable success. To find out more, buy this book! For information, contact: *Tab Books, Inc., Blue Ridge Summit PA 17214.* Reader Service number 496.

Paul Grupp KA1LR/4
Casselberry FL

THE CES MICRODIALER

For those who have never encountered an autodialing microphone before, it is a device designed to store several phone numbers and feed them into an FM transceiver at a predetermined speed at the press of a button. This is the basic function it must perform—but manufacturers and users alike soon discover that an autodialer must have several other features to perform adequately in the real world.

Like the Heathkit μMatic memory keyer (to be reviewed in June), the CES Microdialer is a second generation microprocessor-controlled device designed to make life a little easier for the amateur radio operator. Also like the Heathkit, the Microdialer has solved many of the problems experienced with the generation of devices that preceded it.

One of the most striking improvements incorporated into the Microdialer is found in its layout. It makes sense to have the buttons and the mike element on the same side of the microphone. Several microphones have the touchtone™ buttons on one side and the mike element on the other. These must be hung up carefully, to avoid pressing one of the buttons by accident. This is a small point, however, compared to some of the other problems the Microdialer solves.

Some owners of earlier autodialing microphones were quite chagrined to discover that their mikes occasionally suffered a glitch which locked their rig in the transmit mode. Hard luck if it happened when the rig was unattended! It was clearly injurious to the microphone, transceiver, and the blood pressure levels of others trying to use the frequency. CES cured the disease by removing the regulator chip (a source of heat) from the mike, putting in the radio instead, and tying the microprocessor's reset pin to the hangup hook. As long as the mike hanger on the vehicle's dashboard is grounded (and you use it!), there is no chance of an accidental transmission. Grounding the reset pin also lowers the mike's current drain from 120 mA off-hook to 60 mA on-hook. The dashboard in my car is plastic, so I simply ran a wire from a bolt in the firewall to one of the screws on the mike hanger. PL™ users should note that there is an extra conductor in the mike cable which can be used to enable a PL decoder when the mike is hung up and disable it when it is removed from its hanger. Nice touch!

Programmed to Please

The Microdialer really shines in the ease-of-use department. For example, when you dial a number in the automatic mode, the mike keys up the rig for .3 seconds before sending a tone—sort of a "look out equipment, here come some tones!" This feature alone allows me to use the Microdialer on several repeaters that won't accept my other dialer, which keys the PTT line at the same instant it sends the first tone.

Another welcome feature is the programmable pause. This allows you to program the autopatch access code (up to three digits) and a phone number into the same memory. The mike dials the access code, switches back to receive for two or three seconds so you can make sure that the dial tone is there, and then keys the transmitter and dials the number. If your repeater has some perverse speed requirements, you can program

the mike to send the access code at one speed and the phone number itself at another. And to make all this happen, all you have to do is push "*" and one of the numeric keys. The looks of envy you'll get from other hams when you set all this in motion are worth every penny you pay for the mike! If you are motivated by more practical considerations, consider that you can easily call home, the police, or whatever with the Microdialer, while your vehicle is in motion, without taking your eyes off the road for a second.

Entering numbers into memory is no easier or harder than with other autodialers we have tried. Memories 1 through 5 hold up to eleven digits, and 6 through 0 hold up to seven. Dialing speeds from one to eight digits per second can be programmed, and I am happy to report that there are several touchtone decoders in common use which can cope with the highest speed.

One repeater I use is plagued by a childish individual who frequently transmits tones while a user is trying to dial a number. With the Microdialer, I could bring up the patch and dial the number before our "friend" could find his or her mike.

Installing the Microdialer

If the Microdialer has any weakness, it lies in the simple fact that it involves some installation. Let's face it: There are a lot of guys who are too lazy to use a soldering iron. If a microphone doesn't come with the right plug for their rig attached, they aren't interested. To them I say, turn the page and read another article.Those of you who aren't afraid of a little work, read on!

The first thing you have to deal with is the regulator. CES solved a major problem by removing it from the mike case, but they created a minor one while doing it. You have to find a spot inside the rig for the tiny board which holds a 7805 regulator and a couple of filter caps. You also have to supply it with an unswitched source of 12 V dc. If you are using a rig over a year old, this doesn't present any problem, as there is usually lots of room for additions. I chose to use the Microdialer with my Kenwood TR-7730, one of the smallest rigs available. Getting the 12 V dc was easy—finding a spot big enough for the regulator board was not. There is a nice opening at the rear of the rig that Kenwood suggests is good for a CTCSS encoder. It may be OK for the encoder, but the rf from the adjacent final amplifier added an unhealthy dose of hum to our audio when the regulator board was put there. I finally ended up removing the internal speaker, which I never used anyway. This yielded plenty of room for the microphone's regulator and a Communications Specialists programmable CTCSS encoder/decoder board. I stored the speaker and its mounting hardware in a safe place, in case I wanted to restore it to its original condition. If there's a will, there 's a way, and if it'll fit in a 7730, it'll fit anywhere!

In Use

I found the Microdialer an extremely helpful addition to my mobile VHF installation. Compared to the microphone supplied with the TR-7730, the microphone element itself has a wider frequency response, with a noticeable improvement in lower midrange response. On the negative side of the ledger, it also has considerably less output, requiring the mike gain control inside the TR-7730 to be set much higher than previously required. This means that I cannot easily switch back and forth between the CES and Kenwood microphones.

I also found that the transmitter goes into the transmit mode for a brief moment when my sample is hung up on the grounded hanger. When I say brief, I really mean brief; it has never been long enough to bring up a repeater. I did not try the microphone with other radios, so I cannot say if this is only a problem with my particular installation or could be expected in others as well. In any case, it is not a serious problem, but you should be aware that it is there.

I am particularly fond of the microphone's shape and size. Many microphones must be held carefully, or your hand will cover the element, yielding muffled audio. You have to really work at it to make this happen with the Microdialer. It may be of little consequence to southerners, but dwellers in the land of snow and ice will be happy to hear that the microphone cable is made of a material which stays flexible at a far lower temperature than other cables we have encountered.

Another point worth noting is that when used in the manual mode, the Microdialer behaves like a normal, run-of-the-mill touchtone pad. Certain other autodialers become rather churlish in the manual mode, beeping irritably and locking up for a second or two if you try to make it do something it thinks it shouldn't be doing. Rest assured that the Microdialer is too well-mannered to engage in such loutish behavior!

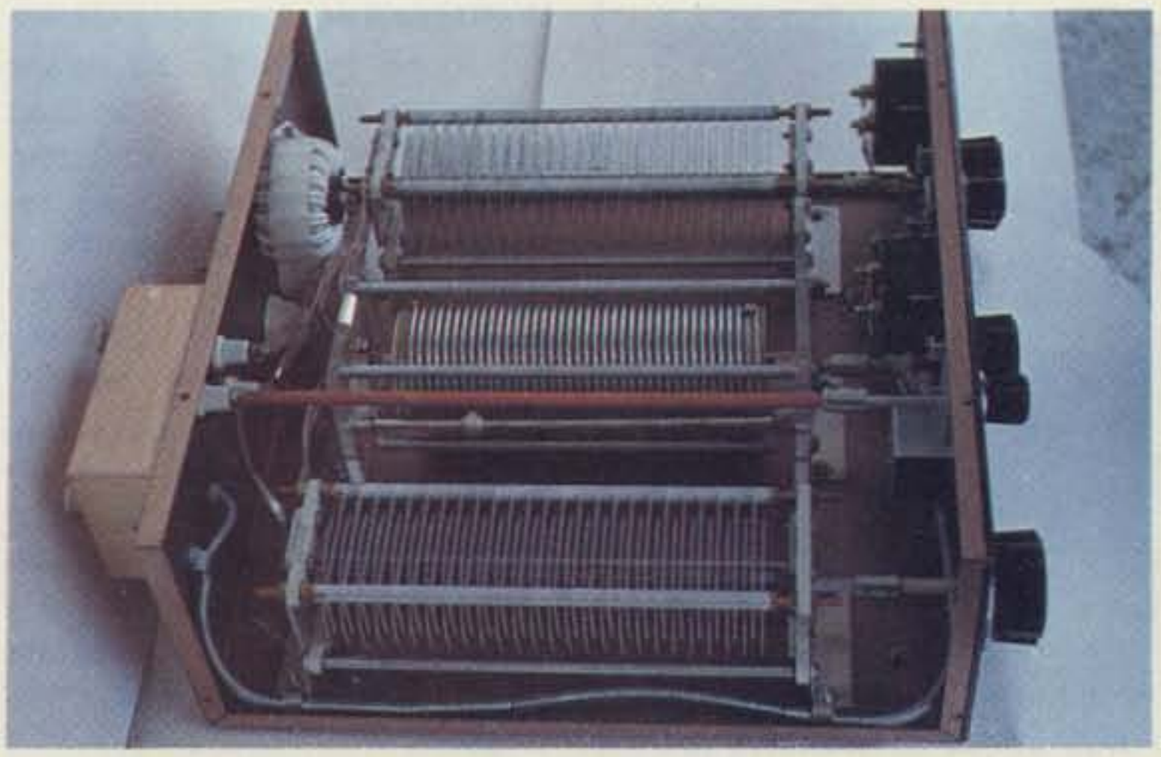
Conclusion

If you use an autopatch a lot, or frequently access your repeater's control functions, an autodialing microphone can uncomplicate your life. The CES Microdialer incorporates some much-needed improvements over previous units and is priced at $59.95 for a 500-Ω model. The only feature that is missed is the ability to permanently store a series of numbers on a ROM chip. Maybe next year...

For more information, contact *CES, 260 W. New England Ave., Winter Park FL 32789.* Reader Service number 494.

Paul Grupp KA1LR/4
Casselberry FL

The Heath SA-2060 tuner features two meters. (Photo by N8RK)



Two variable capacitors and a roller inductor form a T-network in Heath's SA-2060 tuner. (Photo by N8RK)

HEATHKIT'S SA-2060 TUNER

It's easy to say that a tuner's a tuner, but if that's so why can you build one for next to nothing or spend over six hundred dollars for a motorized autotuning marvel? The answer boils down to power handling capability and convenience. Heathkit's model SA-2060 antenna tuner represents a good compromise between the extremes of tuner design. Selling for $254.95, it's rated to handle the full legal power limit, contains a built-in wattmeter and antenna switch, and uses a roller inductor rather than the tapped coil used in many tuners, making it a lot easier to use than that coil-and-jumper-clips device you built as a Novice.

The SA-2060 uses the now standard T-network matching scheme and with its roller inductor can provide a match to some loads that tuners using tapped coils simply can't cope with. It

covers frequencies from 160 to 10 meters and can handle random wire or balanced feed antennas. A built-in 4:1 balun helps tame the wild impedances that are sometimes found when using tuned feeders.

When this kit arrived, my first thought was that there couldn't be much involved in building an antenna tuner, since at the minimum only two or three components are required. Well, when Heath tells you that you *build* this tuner, they mean it. It's up to you to assemble the two variable capacitors out of metal plates, ceramic insulators, and threaded rods. The roller inductor also needs assembly, although thankfully the coil itself is prewound.

Heath says that this kit is a three-evening project. That isn't far from the mark, although I spent considerably more time because of a modification I wanted to make (more on that later).

Although the instructions put the capacitor and coil assembly about halfway through the project, I'd suggest putting them together at the beginning so that all the little parts they use are out of your way. Assembly of the capacitors is for the most part very easy and great therapy after a hard day at work. Just keep slipping those little metal plates onto the assembly. It's a lot like threading popcorn onto a thread at Christmastime.

The rf sensing assembly for the wattmeter and the antenna switching circuitry are preassembled in a box which mounts on the back of the tuner chassis. Providing the critical wattmeter circuits already assembled and calibrated was a great move on the part of Heath. Not only did it speed up construction, but it's nice to be able to rely on their calibration (my tests show the SA-2060's meter to read within 5% of other meters used at W2NSD/1). The wattmeter actually uses two meters, one to show forward power on scales of 0-200 or 0-2000 Watts, and the second to read either reflected power (on scales of 0-50 or 0-500 Watts) or swr.

I found the reflected power mode to be easier to use than the swr mode when adjusting the tuner. All that's really necessary is to adjust for 0 Watts reflected power, so there's no need to know actual swr. Having dual meters is very convenient, since some tuning combinations can produce misleading reflected power or swr readings. By keeping an eye on both forward and reflected power, it's easy to spot these conditions and to tune for optimum settings.

The SA-2060 antenna switch provides three positions. One routes the signal through the wattmeter but bypasses the tuner, while the other two select coax-fed antennas which go through both the meter and the tuner circuitry. There's no way, however, to switch the tuner in or out of line on a specific antenna—If you want to run the antenna through the tuner, you must do so all the time. This isn't really such a bad thing, since the tuner does act as a low-pass filter and helps prevent TVI, but it is inconvenient to have to adjust the tuner before using that antenna even if the swr in the part of the band being used is low enough such that the tuner isn't really needed.

There is a serious problem with this antenna-switching scheme if you want to use both coaxial and wire-fed antennas. The random wire/balanced feed terminals are connected to the tuner *before* the antenna switch, with the result that any antenna hooked up to these terminals is always in line and will be paralleled with a coax antenna selected by the antenna switch. This renders the switching system almost useless, since before switching to a coax antenna you have to go behind the tuner to disconnect the wire one. Fortunately, the fix for this problem is rather simple if you're willing to drill a hole in the chassis and change around some wiring (see box and photo).

With the antenna switching changed as described, the tuner is a joy to use. It handles a full kilowatt with ease (although the tuner should be adjusted before running at the power level—no tuner is designed to handle the voltages that may appear when feeding a kW into 15:1 swr!), and it survived the toughest test I can think of. While driving a vee beam with full power on 80 meters, the open feeder arced through a supporting board. The feeder was burned in two and the board caught fire, but the tuner survived this rather severe mismatch with no more than a brief arc between capacitor plates. Never let it be said that we baby equipment at W2NSD/1!

In more normal use at my home station, the SA-2060 has easily matched every so-called radiator I've connected to it, including a very badly mismatched vertical, a more-than-random random wire, and a coax-fed collinear dipole that

SWITCHING MODIFICATION FOR THE HEATH TUNER

The Heathkit SA-2060 antenna-switching problem described in the review is easily correctable.

The purpose of this modification is to disconnect random wire or balanced feed antenna terminals from the tuner circuit unless switch position COAX 2 is chosen.

As originally designed, the random/balanced antenna terminals were connected to the output of the tuner *before* the antenna switch. Thus, if an antenna was connected to either of these terminals, it would always be fed in parallel with any coaxial feed antenna chosen by the antenna switch. To avoid radiating on two antennas at once, it was necessary to disconnect the wire antenna from the back of the tuner when a coax antenna was used, and no antenna could be connected to the switch position selected when a wire antenna was to be used. This arrangement rendered the antenna switch useless to those who use both coax- and wire-fed antennas.

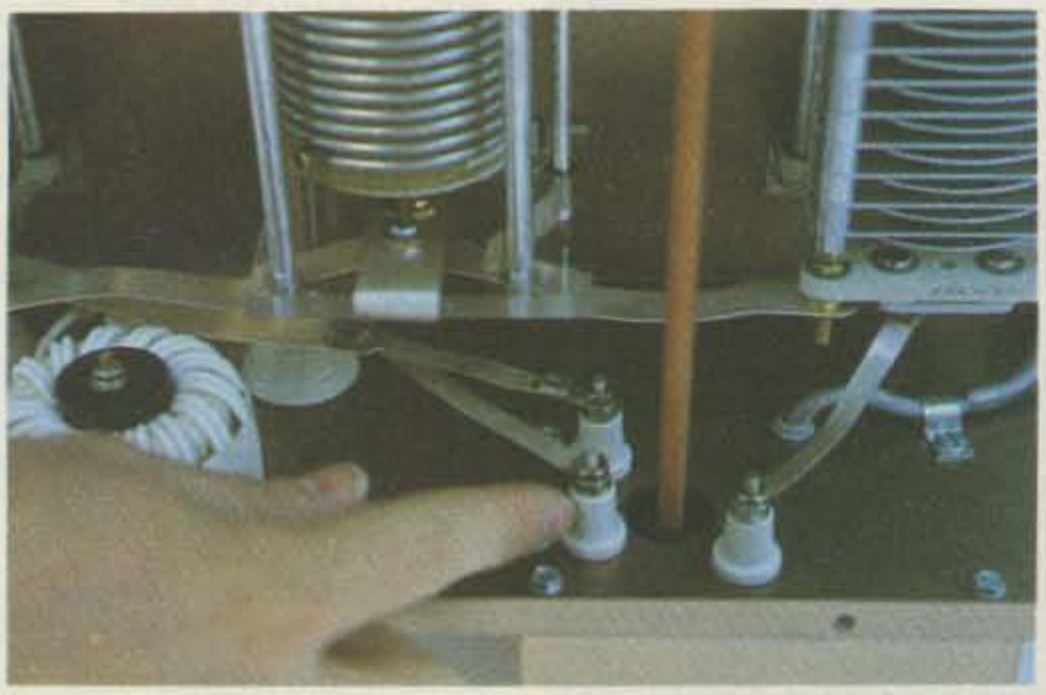
My solution was to move the connection point for the random/balanced terminals from the input of the coax switch to the COAX 2 output of the switch. Now, the wire antenna is connected to the tuner only when the COAX 2 position is selected, and a coax antenna can be used at COAX 1 without fear of feeding two antennas in parallel. The COAX 2 position can still be used to select a coax-fed antenna if no wire antenna is used.

The change involves mounting an additional ceramic feedthrough from the antenna switch box into the tuner chassis. This feedthrough is connected by a short strap to switch lug 6 inside the switch box. Lug 6 is also connected to the COAX 2 chassis connector.

The random antenna terminal is connected to the new feedthrough rather than to capacitor C2 as in the original design. No other internal connection is made to the random terminal. C2 is connected directly to the feedthrough from the switch box which was orginally connected to the random terminal. The additional parts necessary can be ordered from Heath.

After studying the layout of the tuner, the whole process is easier to do than to describe. The only cautions are to drill the new hole with enough clearance to allow the feedthrough to miss the lip of the switch box (see photo for feedthrough location) and to make sure all the rf-carrying straps have as much separation from each other and from the chassis as possible.

John Ackermann AG9V/1
***73 Magazine* Staff**



An extra feedthrough insulator was added to increase the versatility of Heath's SA-2060 tuner. (Photo by N8RK)

presented a proper match at no given frequency. This tuner replaced another inexpensive commercial one, and I've found the change to be most refreshing. I no longer have problems with being able to almost, but not quite, get a perfect match, and the built-in metering and switching (as modified) have eliminated the need for two other accessories, giving me a little more room on the operating table.

If you're in the market for an antenna tuner that includes some of the convenience features we've come to expect from the high-priced supertuners but still carries a reasonable price tag, the Heathkit SA-2060 may be your answer. The only real flaw with the unit, the antenna switching, won't bother those who don't use wire feeders, and those who do can easily cure the problem. You'll have to invest some of your time in building this tuner, but the results (and savings) can be gratifying.

For more information, contact the *Heath Company, Benton Harbor MI 49022.* Reader Service number 492.

John Ackermann AG9V/1
***73 Magazine* Staff**

FUN!

John Edwards KI2U
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HOBBY VIDEO

Offhand, I can think of only one occasion in my life when amateur radio and commercial video met. Since I need a justification for writing a column about hobby video in a ham magazine, let me tell you about it.

It happened on the day I took my Extra test (the time I passed). I had just left the Federal Building on New York's Varick Street with my interim permit clutched firmly in my fist. As I was making my way over to Washington Square to catch the subway back home, I suddenly noticed in front of me a bunch of klieg lights, cameras, and a typical Greenwich Village street with cars and street signs of an early-1960s vintage.

"Could you hold it a minute, fella?" a man in a light-colored windbreaker asked me.

"Sure," said I. "Hey, what's going on here?" I inquired, asking the obvious, as usual.

The guy in the windbreaker paused for a second, looked me over very closely, and said: "It's okay. Go on ahead. Your clothes fit into the period, anyway." So, with that I slipped between two wooden barriers and continued my eastward march.

I'm about halfway along the block when a taxi comes tearing down the street with a 1959 Chevy sedan in hot pursuit. The cab smashes into a fire hydrant directly across from me and two rough types jump out of the car and put the collar on the taxi driver. It was, of course, a part of a movie—a TV movie, as it turned out. And the Panavision camera caught me as a horrified onlooker. I later saw the movie on ABC, but I guess my scene landed on the editing room floor—I wasn't in the completed film.

So, that was the day broadcast television and ham radio made almost simultaneous appearances in my life. Listen, it may not be the greatest story ever told, but at least it gave me a lead to this month's column.

On a wildly different note, I know someone who is writing a high-school electronics textbook. As a plug for ham radio to a potentially ripe audience, this chap thought he would include some information about the OSCAR satellites in his book. My friend wrote to the ARRL asking for a couple of black and white photographs so that his readers could get an idea of what an amateur-built satellite looks like.

The upshot of his efforts, sad to say, was a letter from HQ saying that the League's OSCAR photos are for use only in their own publications and "are not for dissemination to the general public." Wonderful. So the League doesn't want the general public to know what the OSCAR satellites look like. It's a great boost to our hobby when only hams can find out about OSCAR.

All in all, another tidbit of information to remember the next time a League official lets loose some of that babble about your dues going toward more than just a magazine subscription. Phooey!

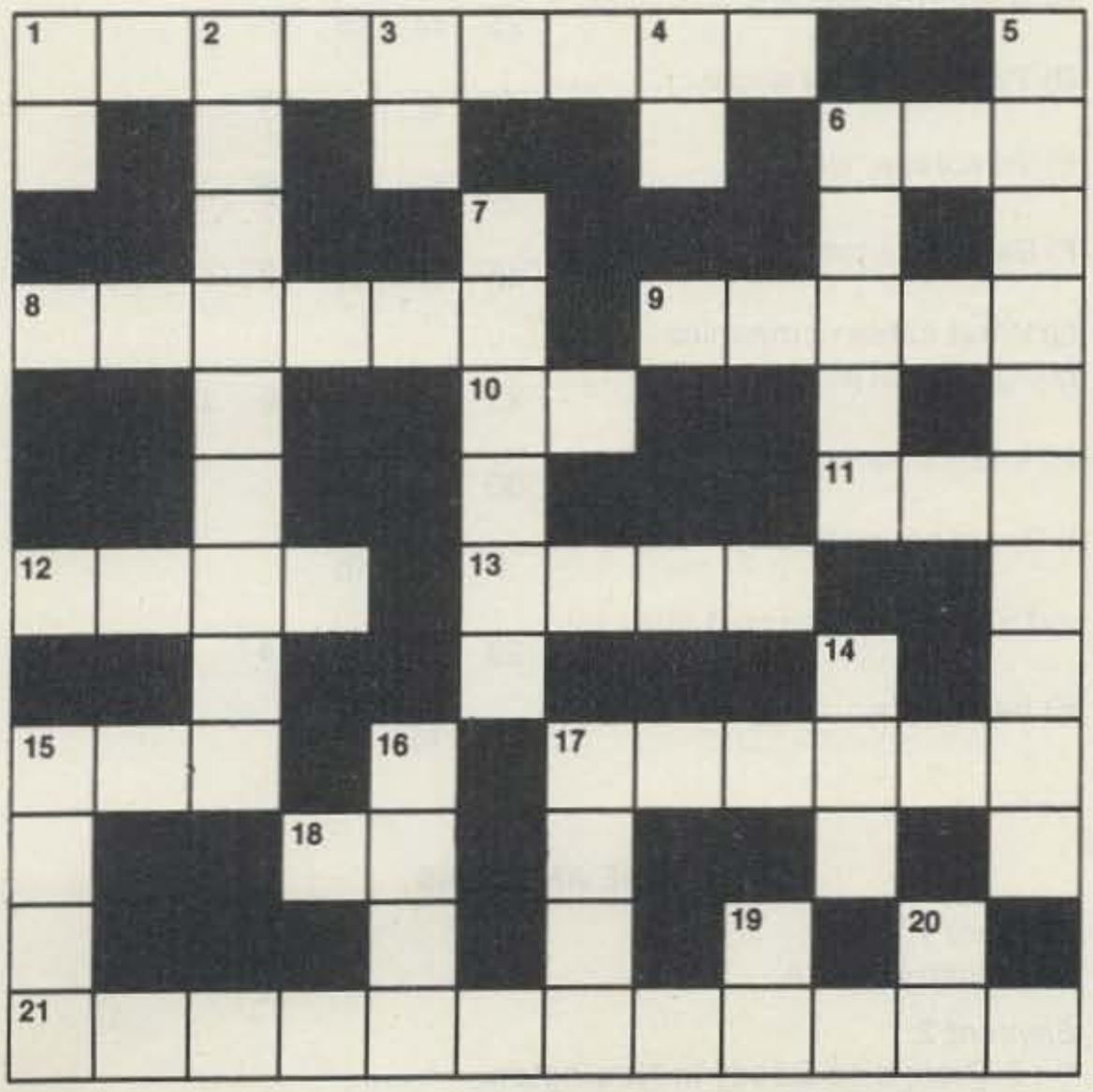

Illustration 1.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) Curves formed by the intersection of a cone with a plane parallel to its side.
6) Satellite TV preamp (abbr.)
8) TV bird
9) A TV distribution medium
10) Not color TV (abbr.)
11) Relative (abbr.)
12) Money: kilo _____
13) Satellite home video (abbr.)
15) Shorting buzz
17) Satellite TV "belt"
18) Our continent (abbr.)
21) User's end of satellite system (2 words)

Down

1) Board type (abbr.)
2) Another TV bird (2 words)
3) LNA transistor (abbr.)
4) Antenna mount:_____
5) Man-made moons
6) The human work needed to install a home satellite system
7) Satellite motions
14) Hobby video is entering a new _____
15) Rent a VCR
16) Composer you may hear on "Bravo"
17) Broadcaster's slang for a compact tape package
19) Antenna tuner (abbr.)
20) Yes opposite

ELEMENT 2—MULTIPLE CHOICE

1) Where did Howdy Doody live?

			1	I	2	H	3	D	4	A	5	F	6	B	7	E	8	D	9	C
10	I				11	C	12	J	13	G	14	J	15	B	16	K	17	A	18	C	19	H
20	G	21	F	22	F				23	B	24	K	25	C	26	B	27	I	28	J		
29	E	30	H	31	E	32	A	33	D	34	A	35	F			36	E	37	B	38	J
39	G			40	F	41	F	42	F	43	G			44	C	45	G	46	D		

Illustration 2.

1. Doodyland
2. Doodyville
3. Doodytown
4. Newington CT

2) Of the following television personalities, which one isn't (or wasn't) a ham?

1. Andy Devine
2. Arthur Godfrey
3. Dick Van Dyke
4. Stu Gillam

3) On *The Man From U.N.C.L.E.*, what was the name given to the communications link used by Napoleon Solo and Ilya Kuryakin?

1. Channel 19
2. Five-two direct
3. Interlink 12
4. Channel D

4) Who is ABC's science editor?

1. Hector Fuentes
2. Roy Neal
3. Jules Bergman
4. Murray Greshner

5) What is the present location of RCA's Satcom III?

1. Over the Pacific Ocean
2. Over the Atlantic Ocean
3. Over the Indian Ocean
4. Nobody knows

P	A	R	A	B	O	L	A	S			S
C		C		P			Z		L	N	A
		A			O				A		T
W	E	S	T	A	R		C	A	B	L	E
		A			B	W			O		L
		T			I				R	E	L
B	U	C	K		T	V	R	O			I
		O			S				E		T
H	U	M		B		C	L	A	R	K	E
I			N	A		A			A		S
R				C		R		A		N	
E	A	R	T	H	S	T	A	T	I	O	N

Illustration 1A.

ELEMENT 3—TRUE-FALSE

	True	False
1) The first TV movie ever made starred Ronald Reagan.		
2) Home Box Office is owned and operated by the *Washington Post* and *Newsweek*.		
3) Of the estimated 3.9 million people who viewed the 1947 World Series on television, 3.5 million were situated in bars.		
4) The "Overmyer Network" was a 1960s attempt at forming a fourth TV web.		
5) The first experimental TV station was W2XBS.		
6) There's no "Channel One" because the FCC forgot to allocate it.		
7) The CBS system for color television would have required a mechanical disk rotating on the front of your TV picture tube.		
8) Wayne Green once worked as a TV cameraman at WPIX-TV, Channel 11, in New York.		
9) The first patent for a device that could send pictures by wire was granted to a German in 1919.		
10) An episode of *Hazel* dealt with the problem of TVI. On this show, Mr. Baxter's reception of a golf telecast was ruined by a local ham.		

ELEMENT 4—HAM ACROSTIC
(Illustration 2)

Guess the words defined and write them over the numbered dashes. Next, place each letter in the correct square in the puzzle. The black squares show word endings. The completed puzzle will form a statement relating to this month's topic.

A) VCR format..... 17 34 4 32

B) Signal interfaces..... 6 37 15 26 23

C) Goes with picture..... 25 44 18 9 11

D) TVRO antenna angle..... 46 8 3 33

E) Videotape "outs"..... 36 31 7 29

F) Satellite's job..... 40 5 35 42 41 21 22

G) What cable companies like to bring against pirates..... 43 45 20 39 13

H) International radio-TV body..... 30 19 2

I) Opera house seen on "Bravo"..... 1 27 10

J) TVRO setup can cost this..... 28 12 38 14

K) Iraq prefix..... 24 16

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—2 There's no Doody in Newington.
2—3 But his agent is.
3—4 Remember? They had those little HTs that never seemed

to be limited in range or vulnerable to jammers.

4—3 Roy Neal works for NBC, Murray Greshner is the cop on *The Odd Couple* and I don't know who the heck Hector Fuentes is.

5—4 Satcom III (not to be confused with its replacement, Satcom IIIR) was lost shortly after launch. Nobody knows for sure where Satcom III is, but I understand they're watching some great movies up on Pluto.

Element 3:

1—True *The Killers*, in 1963. It was his last acting job—on screen, anyway.
2—False Time-Life.
3—True And make that a double, please.
4—True It didn't work.
5—True Operated by NBC in New York.
6—False There is a Channel One, but we call it "6 meters."
7—True The FCC thought RCA's all-electronic system was somewhat better.
8—True Smile.
9)—False Paul Nipkow was granted a German patent for such an instrument in *1884*!
10—True And I've got a recording of the program to prove it!

Element 4:
See Illustration 2A.

SCORING

Element 1:
Twenty-five points for the completed puzzle, or ½ point for each question correctly answered.

Element 2:
Five points for each correct answer.

Element 3:
Two and one-half points for each correct answer.

Element 4:
Twenty-five points for the completed puzzle, or one point for each correct answer.

So, do you know the difference between a plate and a dish?

1-20 points—Sees only snow
21-40 points—Dish pointed at Earth
41-60 points—Fuzzy picture
61-80 points—Sharp black and white picture
81-100 + points—Closed-circuit image

READER'S CORNER

Last January's puzzle concerning the five stations and their DX schedules provoked a sizable flurry of mail — some of it indignant. As a few of you discovered, there were actually *three* solutions to this puzzle. Here they are:

		M	U	L	T	I	P	O	I	N
T		D	I	S	T	R	I	B	U	T
I	O	N		S	Y	S	T	E	M	
P	I	R	A	T	E	S		D	O	N
T		M	I	S	S		O	U	T	

Illustration 2A.

	Name	Call	Working Now	Working Next
1.	Bob	W1WW	Korea	Mongolia
	Dan	W1YS	Mongolia	Hong Kong
	Jack	W1XT	Hong Kong	Japan
	Pat	W1BX	Japan	Taiwan
	Tom	W1JO	Taiwan	Korea
2.	Bob	W1WW	Taiwan	Mongolia
	Dan	W1YS	Mongolia	Hong Kong
	Jack	W1XT	Japan	Korea
	Pat	W1BX	Korea	Taiwan
	Tom	W1JO	Hong Kong	Japan
3.	Bob	W1WW	Taiwan	Mongolia
	Dan	W1YS	Mongolia	Hong Kong
	Jack	W1XT	Hong Kong	Japan
	Pat	W1BX	Korea	Taiwan
	Tom	W1JO	Japan	Korea

Gail Graham W5MLY worked out a beautiful Pascal program to solve this problem on a North Star Horizon computer. I wish I could print the run here, but it's much too long to fit within this column's limited space. I just wish to thank Gail on a magnificently executed job. And thanks, too, to everybody who wrote in.

Winners:

Found 3 solutions: Jerry Wetzel W3DMB, Gail A. Graham W5MLY.

Found 2 solutions: Mark E. Zaleski KA8BPY.

Found 1 solution: Michael S. Bilow N1BEE, Jim Connolly KA1UI, Harry D. Thomas KA1NH, Larry D. Peterson N2AMW, Hank Wellburn WA2JOX, John Wilcox KS4B, B. B. Jessee III N4DEK, Dallas W. Wilson KA6EOL, Roberta Horton KA7CUY, Daren Horton WB7VDJ, Richard C. Sowler W8FEM, Ricahrd C. Bonar WD8ORI, Kent S. Doub KF8Z, Daryl L. Waite K9JPQ, Bob Koelling KC0BL, Jerry Moore W0HMA.

Didn't find a solution, but either tried or made a puzzle comment: N2AMS, KA3IBI, WD4DAH, WD4ODS, WD9ATJ, KA9BAI, KA9KAW, KB9RR, KL7RA.

FCC

Reprinted from the Federal Register

Expansion of the Telephony Segments of the High Frequency Amateur Radio Service Bands

AGENCY: Federal Communications Commission.

ACTION: Notice of inquiry and proposed rule.

SUMMARY: The Commission proposes to make additional segments of the 14 MHz amateur band available for telephony operation. The Commission is also inquiring about making additional segments available for telephony operation in the other high frequency (HF) amateur bands (those amateur bands between 3 and 30 MHz). Congestion on the frequencies currently authorized for telephony use is causing the employment of this mode to become increasingly difficult. The proposed rules revision would help alleviate this situation in the 14 MHz band. The inquiry looks towards finding a suitable set of frequencies for telephony expansion in the other HF amateur bands.

DATES: File comments on or before July 1, 1982, and reply comments on or before August 2, 1982.

ADDRESS: Federal Communications Commission, Washington, DC 20554.

FOR FURTHER INFORMATION CONTACT: Steve Lett, Private Radio Bureau, (202) 632-7597.

SUPPLEMENTARY INFORMATION:

Adopted: February 11, 1982.

Released: February 24, 1982.

Introduction

1. Notice of Inquiry and Proposed Rule Making in the above-entitled matter is hereby given.

2. The Commission has before it at this time seven petitions for rule making which request that the Amateur Radio Service Rules (Part 97) be amended by provide for the use of telephony operation (emission types A3 and F3) on additional portions of the amateur high frequency (HF) bands—the bands between 3 and 30 MHz. Six of the petitions propose some particular portion of certain bands for additional telephony authorization. Four of the petitions propose that additional telephony privileges be divided among or limited to certain operator classes. The petitions are described in the following paragraphs.

3. RM–3705, submitted by Philip Galasso and received by the Commission on 18, 1980, requests that the frequencies 3750–3775 kHz, 7050–7100 kHz, 14100–14200 kHz, 21200–21250 kHz and 28200–28500 kHz be added to those authorized for telephony in the United States. It further requests that these additional telephony privileges only be granted to Amateur Extra Class operators and that power input during such operation be limited to 250 watts. The petition claims that expansion of frequencies for telephony operation is warranted due to congestion on the currently authorized telephony subbands and under-utilization by U.S. stations of the frequencies proposed for expansion. Lack of use by U.S. amateurs is attributed to incompatibility between telegraphy operation currently authorized for U.S. stations and telephony operation in common use by

foreign stations. Operator class and power restrictions are requested by the petition to help ". . . assure minimum interference to the existing radiotelephone users of these frequencies. . . ."

4. RM–3729, submitted by David Novoa and received by the Commission on June 30, 1980, requests that the frequencies 7075–7100 kHz and 14175–14200 kHz be allocated for exclusive use by Amateur Extra Class licensees and that telephony operation be authorized on these frequencies. This petition also cites crowding on existing telephony subbands and incompatibility of domestic telegraphy operations with foreign telephony operations as reasons for expanding the telephony subbands. The petition further claims that protection for foreign amateurs from powerful U.S. stations is no longer necessary and that foreign stations, in fact, favor a subband expansion which would enable them to engage in an exchange of telephony communications with U.S. stations on a single frequency.

5. RM–3734, submitted by James Simon and William Bennett and received by the Commission on August 1, 1980, requests that the frequencies 3750–3775 kHz, 7050–7150 kHz, 14100–14200 kHz, 21200–21250 kHz and 28400–28500 kHz be made available for telephony use by U.S, amateurs. This petition again cites overcrowding on currently authorized telephony subbands and lack of further need for protection of foreign stations as reasons for its request.

6. RM–3778, submitted for the Willamette Valley DX Club by Robert Herndon and received by the Commission on October 7, 1980, requests that the frequencies 3750–3775 kHz, 7050–7100 kHz, 14100–14200 kHz, 21200–21250 kHz and 28400–28500 kHz be authorized for telephony operation since, it contends, "the United States no longer has the dominant amateur population and there is little reason to think that the expansion of U.S. amateur (telephony) privileges into previously reserved frequencies will result in undue hardship on foreign amateurs." The expansion is necessary, it claims, to relieve congestion on currently authorized telephony subbands.

7. RM–3831, submitted by Ronald Kramer and received by the Commission on November 7, 1980, petitions the Commission to increase the portion of each amateur frequency band between 1.8 and 30 MHz available for voice (telephony) communication and correspondingly decrease the portion of each band available for telegraphy communications. The petition claims this is necessary since the telephony mode is becoming increasingly popular.

8. RM–3833, submitted by Fred Huntley and received by the Commission on January 13, 1981, requests that "Extra Class Amateur Radio licensees be granted radiotelephone operation privileges between 7.100 and 7.150 MHz" and that "(s)uch operation be authorized a maximum power input of 250 watts." The petition proposes that this additional operation be on a shared basis with existing Novice class operations. Relief of congestion and interference on the existing telephony segment of that band is cited as necessitating this action.

9. RM–3860, submitted by the American Radio Relay League (ARRL) and received by the Commission on March 9, 1981, requests that the frequencies 14150–14200 kHz be added to those authorized for telephony use and that operator privileges on the revised telephony portions of the 14 MHz band be changed to the following: 14150–14175 kHz, Amateur Extra Class only; 14175–14225 kHz, Amateur Extra and Advanced Classes; 14225–14350 kHz, Amateur Extra, Advanced and General Classes. The petition cites growing congestion in the present telephony subbands as warranting expansion of the subbands. The operator privilege changes are proposed by the petition in the interest of lessening the impact of telephony subband expansion on foreign amateur operations.

Background

10. The Commission has traditionally designated particular portions of the heavily used HF amateur frequency bands for operation using certain emission modes, while only permitting other modes on different portions of the bands. These designations have served to segregate incompatible operating modes. Since the early days of radio, simultaneous use of incompatible modes on the same frequencies has worked to the mutual detriment of communications using all modes. Placing certain emission modes on different frequencies avoids this type of interference and has the further beneficial effect of indicating to amateur operators where, in the amateur bands, to seek out certain forms of operation.

11. The subband allocations [1] have also been arranged to protect international amateur radio operations. Foreign operators have consistently, in the past, objected to expansion of U.S. subbands for increasingly popular, wide bandwidth emissions such as telephony.[2] They have claimed that such an expansion would create a situation where high powered U.S. stations would overrun low power foreign stations and effectively prohibit the foreign stations from using those bands.

12. Protection of foreign stations has also benefited U.S. operators desiring to contact them using telephony. The U.S. operator can listen for the foreign stations in a portion of the band where strong U.S. signals are not present [3] and then reply on frequencies within the U.S. telephony subbands. The foreign operators then listen for the U.S. stations in the U.S. telephony subbands.[4]

13. Current regulations permit emission type A1 Morse telegraphy operation on all amateur radio frequencies. This unique universal authorization for that mode results from its character as an efficient and widely recognized communications language that can be employed with the simplest type of equipment. In the amateur 160 meter band (1800–2000 kHz) type A3 telephony operation is currently permitted on all frequencies. In all HF amateur bands roughly half of the band may be used for A3 or F3 telephony emissions. The limitations on telephony operation in most of the HF bands were instituted in order to prevent such operation from overwhelming telegraphy operations as well as to protect international operations. Type F1 digitally coded emissions (radioteletype) are permitted in all portions of the HF bands where telephony operation is not permitted since this type of operation is more harmonious with type A1 operation. The only other modes permitted on the HF bands, emission types A5 and F5 "slow-scan" television operation and emission types A4 and F4 facsimile operation, require a bandwidth approximately equivalent to telephony operation and consequently are permitted in the telephony subbands.[5] This current state of subband allocation in the HF amateur bands is the result of the Report and Order in the last proceeding dealing with expansion of the telephony subbands.[6]

14. Small portions of the various subband allocations are reserved for Amateur Extra Class and Advanced Class licensees. These portions were set aside to help provide an incentive for amateurs to upgrade their license operator class. This program of reserved operator privileges resulted from the proceeding dealing with incentive licensing and distinctive call signs.[7]

Proposal

15. The Commission proposes to expand telephony privileges in the 14 MHz amateur band by adding the frequencies 14150–14200 kHz to those currently authorized for such use. We feel this action is warranted due to the extreme congestion experienced by amateurs on the existing 14200–14350 kHz telephony subband. Although the various petitions' requests ranged from a subband that would start as low as 14100 kHz and extend to 14350 kHz, to a subband that would start as high as 14175 kHz and extend to 14350 kHz, we have selected a starting point of 14150 kHz to propose as a compromise between competing objectives. We anticipate that our proposal would provide substantial relief to the current overcrowding in the 14 MHz telephony subband while causing only a minimal disturbance to international operations. The increasing sophistication of equipment used by both foreign and domestic amateur operators leads us to believe that foreign stations should not experience undue interference from U.S. operations and that U.S. amateurs attempting to contact foreign stations should have less difficulty using single frequency operation (as opposed to "split operation") than they have had in the past. We propose retaining the frequencies 14100–14150 kHz for traditional weak signal and other international operations by not changing the modes authorized on those frequencies.

16. Since we do not anticipate a significant detrimental impact on international operations from our proposal, and since we desire to provide the maximum relief possible from the current overcrowding, we propose to make all of the additional telephony subband frequencies available to Amateur Extra Class, Advanced Class and General Class operators. To this end, we have specifically proposed to not change any of the operator privileges. However, we invite comments as to whether it would be desirable to delete from General Class operators the privileges between 14150 kHz and 14200 kHz, and instead, add privileges between 14225 kHz and 14275 kHz to those authorized for General Class operators. In this way, the telephony subbands available to General Class operators will be contiguous. Also, consistent with our action in PR Docket 80–252 to permit the use of television and facsimile on most portions of the HF bands where telephony is permitted, we propose to include the use of type A4, A5, F4 and F5 emissions in the new 14150–14200 kHz subband allocation. We are not proposing a stricter power limitation for the additional subband allocation since we do not feel this would make any significant contribution toward avoiding interference.

Inquiry

17. The 14 MHz amateur band has one of the two smallest telephony subband allocations and is, perhaps, the most popular HF amateur band due to its reliability for long distance communications. Because of these factors, we believe that crowding on this band is severe enough to transcend much of the controversy surrounding telephony subband expansion, and for this reason we have set forth a specific proposal for that band. However, we are not proposing expansion of any of the other telephony subbands between 3.5 and 29.7 MHz because we feel the issues involved are too inadequately defined for us to commit ourselves to any particular course of action. Instead, we invite the submission of comments and supporting information with which these issues may be clarified. The Commission recognizes that the existing telephony subbands are often seriously overcrowded. However, we request commenters to weigh the magnitude of this problem against the issues addressed in the following questions:

A. Would expansion of the telephony subbands have a major detrimental impact on domestic telegraphy operations?

B. Do non-U.S. stations still have a legitimate requirement to be protected, on some frequencies, from U.S. telephony operations?

C. Does the current trend toward the use of transceivers (with a common transmit and receive tuner) make the reservation of frequencies suitable for contacting foreign stations using "split operation" unnecessary or undesirable?

D. Should additional subband allocations for telephony be contiguous with the existing telephony subbands?

E. Would it be appropriate to relocate the existing Novice subbands to new frequencies within the same HF bands in order to make a telephony subband expansion more orderly?

F. Are the current exclusive subbands for Amateur Extra and Advanced Class operators sufficient to meet the goals of our incentive licensing program if all additional telephony frequencies are authorized to General as well as Amateur Extra and Advanced Class operators?

G. How should the recent expansion of the Canadian telephony subband in the 7 Mhz band influence proposals for a U.S. telephony expansion in the same band?

18. We also encourage commenters to make specific recommendations as to what frequencies would be best suited to use for additional telephony privileges and the relative occupancy of those frequencies. Comments about related matters not explicitly mentioned above are also invited.

Conclusion

19. Notice is hereby given that it is proposed to amend 47 CFR Part 97 in accordance with the proposals set forth in the attached Appendix. Notice is also given of inquiry into the matter discussed above.

Procedural Matters

20. For purposes of this non-restricted notice and comment rule making proceeding, members of the public are advised that *ex parte* contracts are permitted from the time the Commission adopts a notice of proposed rule making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting or until a final order disposing of the matter is adopted by the Commission, whichever is earlier. In general, an *ex parte* presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written *ex parte* presentation must serve a copy of that presentation on the Commission's

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[1] The term "subband" is popularly used to describe a segment of a frequency band where authorized modes of emission or authorized operator class privileges are different from those in other portions of the same band. This term is used throughout the text for the sake of clarity.

[2] Depending on the specific emission mode employed, telephony operations in the HF amateur bands occupy a bandwidth roughly between 3 kHz and 7kHz. The more popular telephony modes in use today (principally A3J single sideband) occupy somewhat less than 4 kHz. On the other hand, telegraphy emissions used in the HF bands (both A1 and F1 types) occupy less than 1 kHz.

[3] This portion of a band, where domestic telephony operation is not permitted and where operators listen for foreign stations to contact, is commonly known as the "DX window."

[4] This form of operation where an amateur transmits to a station on one frequency and listens for the station's reply on another frequency is commonly known as "split frequency operation."

[5] Authorization of emission types A5 and F5 "slow-scan" television operation, along with types A4 and F4 facsimile operation, in entire HF telephony subbands was the subject of the proceeding in PR Docket 80–252. See Report and Order, 47 FR 2872, January 20, 1982.

[6] Report and Order in Docket 19162, 37 FR 21325, October 7, 1972.

[7] Report and Order in Docket 15928, 32 FR 12682, September 1, 1967.

Secretary for inclusion in the public file. Any person who makes an oral *ex parte* presentation addressing matters not fully covered in any previously-filed written comments for the proceeding must prepare a written summary of that presentation; on the day of oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each *ex parte* presentation described above must state on its face that the Secretary has been served, and must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's rules, 47 CFR 1.1231. A summary of the Commission's procedures governing *ex parte* contacts in informal rule makings is available from the Commission's Consumer Assistance Office, FCC, Washington, DC 20554, (202) 632–7000.

21. Authority for issuance of this Notice is contained in Sections 4(i), 303(r) and 403 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 303(r) and 403. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before July 1, 1982, and reply comments on or before August 2, 1982. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information, is placed in the public file, and provided that the fact of the Commission's reliance on such information is noted in the Report and Order.

22. In accordance with § 1.419 of the Commission's rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, DC.

23. The Commission has determined that Sections 603 and 604 of the Regulatory Flexibility Act of 1980 (Pub. L. 96–354) do not apply to this rule making proceeding since the proposed rules would only change operating practice. These changes would not compel amateur operators to purchase new equipment and consequently would have no significant economic impact on them or any small businesses, small organizations or small governmental jurisdictions.

24. It is ordered that the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and that the Secretary shall also cause a copy of this Notice to be published in the **Federal Register**.

25. For further information on this proceeding contact Steve Lett, Federal Communications Commission, Private Radio Bureau, Washington, DC 20554, (202) 632–7597.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083; 47 U.S.C. 154, 303, 307)

Federal Communications Commission.

William J. Tricarico,

Secretary.

Appendix

PART 97—AMATEUR RADIO SERVICE

It is proposed that paragraph (a) of § 97.61 of the Commission's Rules and Regulations, 47 CFR 97.61, be amended as follows:

In the table in that paragraph, the row beginning with "14200–14350 (kHz)" would be revised by beginning the row with "14150–14350 (kHz)" so that the entire row reads as follows:

14150-14350	A3, A4, A5, F3, F4, F5.

§ 97.61 [Amended]

HAM HELP

Does anyone have information on the whereabouts of VP6LX (April, 1963) or W2PCJ/KJ6 (August, 1963)?

George Oster K0EDA
524 6th St.
West Des Moines IA 50265

Can anyone suggest a cure for the rf feedback coming out of my TS-130's headphones and speaker when I use 10-meter phone?

Marvin Rosen N3BQA
20 W. Madison St.
Baltimore MD 21201
(301)-685-6308

I would like to hear from collectors of antique radios.

Ed Best AK4W
2004 University Dr.
Durham NC 27707
(919)-489-2164

I am looking for any information on changes that can be done to a Heathkit HW-101 to better its performance or add extra features.

Gary Johnson WD8SDO
6616 Maplewood Ave.
Sylvania OH 43560
(419)-882-0121

I would like to have a copy of the manual, circuit diagram, and crystal information on the Standard SR-C146 two-meter handheld transceiver.

Dennis Sladen VE1BZJ
Site 16A Box 4, RR#4
Armdale B3L 4J4
Nova Scotia, Canada

I am in need of a schematic, manual, and alignment instructions for an E. H. Scott Laboratories AN/SRR-3 WWII Navy receiver.

Cal Cotner K4JSI
5324 N. 27th St.
Arlington VA 22207

CORRECTIONS

"The Masher," an article in the March, 1982, issue of *73*, has a capacitor incorrectly labeled. C3 in Fig. 2 and on the parts list should be a 1-uF capacitor.

Power Gain Systems' new product announcement in the March, 1982, *73* had an incorrect phone number. Power Gain Systems can be reached at (318)-325-4754. Since publishing the prices for the coaxial dipole, *73* has learned that the antennas now list for $44.95 and $49.95.

Tim Daniel N8RK
***73 Magazine* Staff**

SOCIAL EVENTS

from page 105

include door prizes every hour, indoor vendors, a flea market, and nets and group meetings. Food and drink will be available. Talk-in on 146.19/.79 and 147.86/.26. For further information, write Jack R. Thompson KA4RKS, 637 Wolf Road, Covington KY 41015, or call (606)-291-2153.

MUNCIE IN
MAY 23

The 3rd annual Muncie Area Amateur Radio Club Hamfest will be held on May 23, 1982, from 8:00 am to 3:00 pm at the Ball State University indoor track building, Muncie IN. Tickets are $2.00 in advance or $3.00 at the door. All activities are under a roof and there will be forums, prizes, refreshments, and parking available. Flea market tables are $4.00 on a first-come basis, and setup will be 6:00 pm to 1:00 am on Saturday and 6:00 am to 7:45 am on Sunday. Talk-in on 146.13/.73, 146.52, and 223.10/24.70. For further information, contact Terry Evans WD9HQH, 522 S. Brotherton, Muncie IN 47302, or phone (317)-282-0615.

FREETOWN MA
MAY 23

The Fall River Amateur Radio Club will hold its flea market on Sunday, May 23, 1982, from 10:00 am to 4:00 pm at the American Legion Hall, Freetown MA. Admission is $1.00 and flea market spaces are $7.00 in advance or $9.00 at the door (the table price includes 2 admissions). Free coffee will be available. Talk-in on 147.63/.03 and .52. For space reservations, send a check payable to Fall River Amateur Radio Club to Ann M. Carro KA1DNB, 652 Old Colony Terrace, Tiverton RI 02878.

GEORGETOWN IL
MAY 23

The 13th annual Danville Area Hamfest will be held on May 23, 1982, at the fairgrounds in Georgetown IL. The gates will open at 6:00 am. Adult tickets are $2.50 in advance and $3.00 at the gate; children under 14 years of age will be admitted free. There will be a free outdoor flea market area (please bring your own tables, chairs, and power cords). The indoor area will be available at additional cost. Overnight camping, with or without water and electrical hookups, is $5.00 per vehicle per night. Activities will include door prize drawings, family entertainment, forums, and much more. Refreshments, free coffee, and free parking will be available. Talk-in on 146.22/.82 and 146.52. For more information on tickets and/or tables, contact Wendell Lyons KA9AYS, Hamfest Chairman, 903 Polk Street, Danville IL 61832 or phone (217)-431-2124.

PITTSBURGH PA
MAY 23

The 28th annual Breeze Shooters Hamfest will be held on May 23, 1982, from noon to 5:00 pm at the White Swan Park, Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport, Pittsburgh PA. Registration is $2.00 or three for $5.00. Activities are a free flea market, prizes, a CW contest, and a family amusement park. Sheltered tables for vendors are available by advance registration only. Talk-in on 146.28/.88 or 29.0. For further information, contact Joe Kyler K3SJD, 4430 Evergreen Road, Pittsburgh PA 15214, or phone (412)-931-2756.

PARAMUS NJ
MAY 23

The Bergen Amateur Radio Association will hold a Swap 'n Sell on May 23, 1982, from 8:00 am to 4:00 pm at Bergen Community College, 400 Paramus Road, Paramus NJ. Buyers will be admitted free. There will be tailgating only and spaces are $3.00 (bring your own tables). For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

FREMONT OH
MAY 23

The Ohio Radio Club and the Ottawa County Amateur Radio Club will hold a hamfest on May 23, 1982, at the fairgrounds in Fremont OH. Dealers may set up at 7:00 am and gates will open at 8:00 am. Advance tickets are $2.50 and $3.00 at the door. Talk-in on .31/.91 and .52. For table reservations and tickets, send an SASE to John Dickey W8CDR, 545 N. Jackson Street, Fremont OH 43420.

WEST FRIENDSHIP MD
MAY 30

The Maryland FM Association will hold its annual hamfest on Sunday, May 30, 1982, from 8:00 am to 4:00 pm at the Howard County Fairgrounds, West Friendship MD (about 30 miles west of Baltimore). Admission is a $3.00 donation, tailgating is $3.00, advance reserved tables are $6.00 each, and tables at the hamfest will be $10.00. Talk-in on 146.16/.76 and .52. For more information, write MFMA Hamfest Committee, Post Office, Harmans MD 21077. For table information and reservations, contact John Elgin WA3MNN, 5495 Apt. 2, Harpers Farm Road, Columbia MD 21044, or phone (301)-596-3741.

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place.

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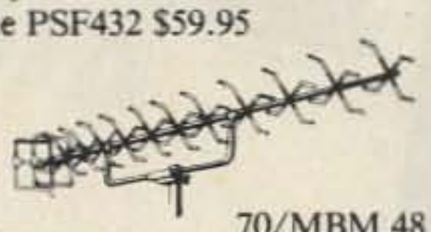

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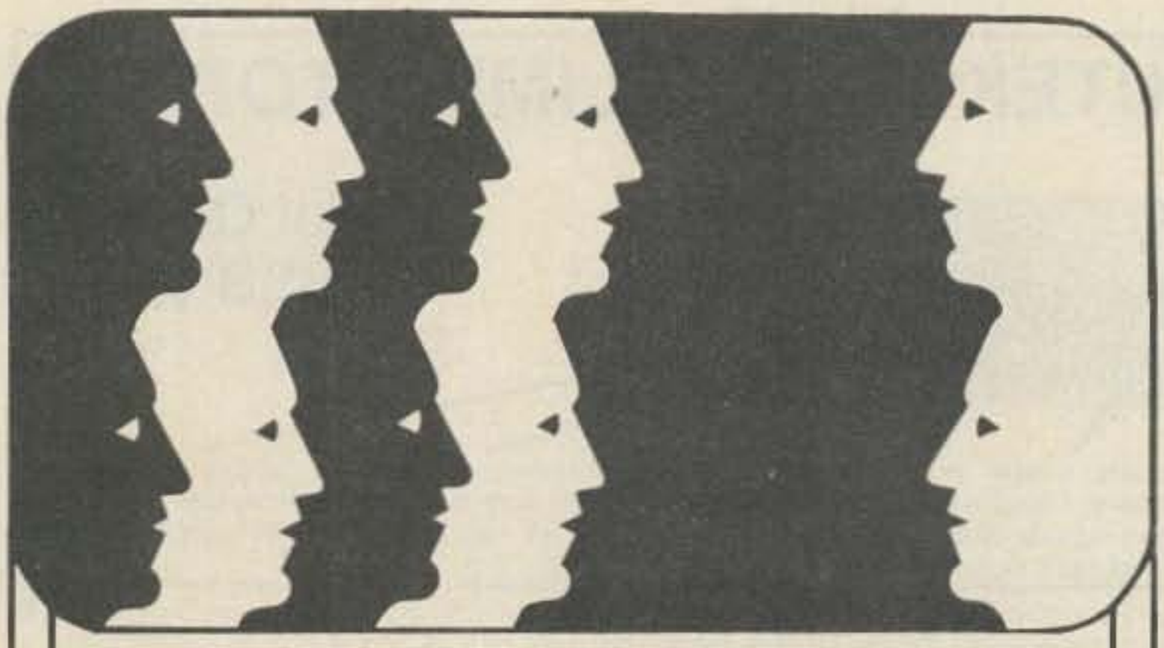

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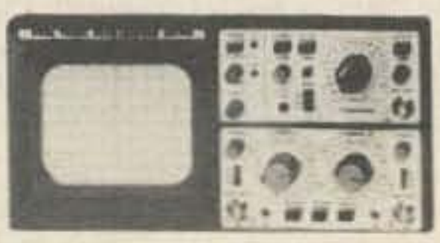

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This is the Regulator Card from our famous **20A Power Supply Kit**. Although we ran out of the transformers and heatsinks, many customers have been able to locate their own. The regulator card performs the actual voltage regulation and has adjustable fold back current limiting. Output voltage **is stable to 200MV from 0 to 20 Amps and adjustable from 11 to 14 Volts.** Designed to drive 2 high current NPN transistors (2N3771, 2N5301 or equiv.). The unit assembles quickly. Included are all the on board components including a driver transistor and over-temp shutdown sensor. Designed to screw down to a standard 3" diameter computer grade filter cap. The quality plated PC card is 3-1/2" x 4 3/4".

WITH INSTRUCTIONS

REGULATOR CARD KIT	**$14.95**
HIGH CURRENT PARTS	
(2 - 2N3772 & 2SA Bridge)	$5.00
51,000 MFD @ 40V Computer Grade	$3.50

Requires Transformer with 16 - 19 VAC Out @ The Current You Expect To Draw.

THE SUPER MUSIC MAKER KIT REVISION 2 – $24.95

Now you can play hundreds of songs using the Bullet **Super Music Maker**. The unit **features a single factory programmed microprocessor IC** that comes with 20 pre-programmed short tunes. By adding the additional PROMS (2708's) the system can be expanded to play up to **1000 notes per PROM**. The kit comes with **all electronic components (less the PROM)**, and a drilled, plated and screened PC Board which measures 4" x 4½". The **7 watt amplifier** section is on the same PC board and drives an 8 ohm speaker (not included). Since the unit works on **12 VDC** or **12 VAC**, vehicle or portable operation is possible. **What do you get for $24.95? Everything but a speaker, transformer, case, switches, and PROM.** Additional 2708 PROM's album containing popular tunes are available for **$9.95** each. Lists of available PROM albums are available on request.

DIP Switches One 8 pos., One 5 pos.	2.00/Set
(Can be **directly soldered** to PC Bd. to access tunes)	
Rotary Switches Two 5 position	2.50/Set
(For **remote wiring** to PC Bd. to access tunes)	
Attractive Tan Plastic Case	8.50
Wallplug Transformer	3.00
(For operation on 117VAC house voltage)	

INVENTORY CLEARANCE

CA3080 TRANS COND AMP	.88
TLO-82 DUAL BI-FET AMP	.88
CD4566 CMOS – 50/60 CNTR	.88
MC3301 QUAD OP AMP (HSE #)	.44
FPT500 PHOTO TRANSISTOR	.44
TIP 110 NPN DARL. 2A IC	.88
TEMP CONTROLLED HOTPLATE 5"x10" TEMPERED GLASS 110°F to 160°F	1.88
3850 (F8) MICRO P CHIP	2.88
10103 SENSITIVE GATE SCR	3/.88

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ELECTRO SPACE PRINTED CIRCUIT CARD EJECTORS

For 1/16 thick cards (.072 slot)

Stock No.	Color	1-24	24-49	50-Up
11450	White	$.25	$.21	$.19
11451	Red	.25	.21	.19

ELECTRO SPACE PRINTED CIRCUIT CARD INJECTOR/EJECTORS FOR 1/16 THICK CARDS

11452	White	$.27	$.23	$.20
11453	Red	.27	.23	.20

ARIES ZERO INSERTION FORCE SOCKETS

- Cam actuated, true zero insertion force
- tin plated solder tail pins
- capable of being plugged into DIP sockets

Stock No.	No. Pins	1-24	25-49	50-Up
11055	24	$4.06	$3.60	$3.25
11056	28	4.25	3.77	3.40
11057	40	4.90	4.34	3.91
11058	64	9.89	8.76	7.90

Texas Instruments Low Profile Sockets, tin plated phosphor bronze contact pins with gas-tight seal.

Stock No.	No. Pins	1-24	25-99	100-Up
11201	8	$.15	$.13	$.12
11202	14	.18	.15	.14
11203	16	.21	.18	.16
11204	18	.24	.21	.19
11205	20	.27	.24	.21
11206	22	.30	.26	.23
11207	24	.33	.30	.25
11208	28	.38	.34	.29
11209	40	.53	.45	.40

Pin Straightening Tool puts devices on their true row to row spacing. One side is for .300 center devices, flip tool over for devices on .600 centers. Put device in tool, squeeze, bowed leads come back to proper spacing.

Stock No. 11059 ..... $12.95

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Stock No.	Output Voltage	Output Current Rating	Dimensions (HxWxD) In Inches	Price
13802	5	3.0A	4-7/16x4x2	$38.00
13803	12	1.5A	4-7/16x4x2	38.00
13804	15	1.2A	4-7/16x4x2	38.00
13806	24	0.75A	4-7/16x4x2	38.00
13808	5	6.0A	5-5/8x4-7/8x3-3/16	57.00
13809	12	4.0A	5-5/8x4-7/8x3-3/16	57.00
13810	15	3.3A	5-5/8x4-7/8x3-3/16	57.00
13812	24	2.0A	5-5/8x4-7/8x3-3/16	57.00

HEX-WIK SUPERIOR SOLDER REMOVAL BRAID

Stock No.	Braid Size	Ft./Spool	Price
50041	1/16	5	$2.10
50042	5/64	5	2.25

RCA C/MOS

Stock No.	RCA No.	1-24	25-Up
44001	CD4001BE	$ .36	$ .33
44002	CD4001UBE	.36	.33
44007	CD4007UBE	.36	.33
44011	CD4011BE	.36	.33
44012	CD4011UBE	.36	.33
44013	CD4013BE	.56	.52
44015	CD4015BE	1.07	1.01
44016	CD4016BE	.59	.55
44017	CD4017BE	1.07	1.01
44019	CD4019BE	.59	.55
44020	CD4020BE	1.18	1.12
44023	CD4023BE	.36	.33
44024	CD4024BE	.92	.87
44025	CD4025BE	.36	.33
44027	CD4027BE	.68	.64
44030	CD4030BE	.59	.55
44040	CD4040BE	1.18	1.12
44046	CD4046BE	1.56	1.48
44049	CD4049BE	.57	.54
44050	CD4050BE	.57	.54
44051	CD4051BE	1.18	1.12
44052	CD4052BE	1.18	1.12
44053	CD4053BE	1.18	1.12
44054	CD4054BE	1.96	1.85
44056	CD4056BE	1.96	1.85
44060	CD4060BE	1.48	1.40
44066	CD4066BE	.78	.74
44069	CD4069UBE	.36	.33
44070	CD4070BE	.44	.41
44071	CD4071BE	.36	.33
44076	CD4076BE	1.26	1.20
44081	CD4081BE	.36	.33
44093	CD4093BE	.78	.74
44098	CD4098BE	1.56	1.48
44502	CD4502BE	1.72	1.64
44511	CD4511BE	1.26	1.20
44522	CD4520BE	1.18	1.12
44590	CD22100E	2.49	2.35
44591	CD40103BE	1.96	1.85
44592	CD40106BE	.84	.80

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SINTEC	RCA No.	1-24	25-49
40122	C122D	$1.22	$1.16
42322	T2322D	1.46	1.38
42700	T2700D	2.07	1.96
42800-1	T2800B	1.58	1.50
42800-2	T2800D	1.90	1.79
42850	T2850D	2.06	1.95
40029-1	TIP29	.60	.57
40029-2	TIP29A	.64	.61
40031	TIP31A	.74	.70
40121	TIP121	1.43	1.35
40125	TIP125	1.37	1.29
42955	MJ2955	1.16	1.10
43055	RCA3055	1.03	.97
42102	2N2102	1.28	1.22
42270	2N2270	.82	.78
43053	2N3053	.61	.58
43054	2N3054	1.37	1.29
43055-1	2N3055	1.03	.97
43055-2	2N3055HOM	1.62	1.54
43439	2N3439	1.73	1.65
43440	2N3440	1.25	1.19
43771	2N3771	2.92	2.76
43772	2N3772	3.18	3.00
43773	2N3773	3.22	3.04
44036	2N4036	1.08	1.02
44037	2N4037	$ .86	$ .82
45294	2N5294	.80	.76
45296	2N5296	.80	.76
45320	2N5320	1.25	1.19
45321	2N5321	1.02	.96
45322	2N5322	1.61	1.53
45415	2N5415	1.60	1.52
45416	2N5416	2.17	2.06
45784	2N5784	1.37	1.29
46044	2N6044	2.04	1.93
46101	2N6101	1.25	1.19
46103	2N6103	1.25	1.19
46107	2N6107	.82	.73
46109	2N6109	.82	.78
46111	2N6111	.80	.76
46254	2N6254	2.16	2.05
46290	2N6290	.80	.76
46292	2N6292	.80	.76
46386	2N6386	1.05	.99
46387	2N6387	1.15	1.09
46388	2N6388	1.28	1.22
46474	2N6474	1.03	.97
46667	2N6667	1.49	1.44
46668	2N6668	1.60	1.52
40347	40347	1.22	1.16

MEMORIES (RAMS, E PROMS)

Stock No.	Description		Price
47825	2708	8K E PROM	$ 4.75
47830	2516	16K E PROM	7.95
47832	2716	16K E PROM	7.95
47835	2532	32K E PROM	15.75
47837	2732	32K E PROM	15.75
47838	2764	64K E PROM	37.95
47640	2114-L-3	1K x 4 STATIC RAM	4.75
47645	4044	4K x 1 STATIC RAM	6.45
47650	4116-3	16K DYNAMIC RAM	3.50

IC Insertion/Extraction Kit, includes DIP IC extractors and inserters to accomodate all IC's from 14 to 40 pins. C/MOS safe.
Stock No. 13309 ..... $34.95

ELPAC POWER SUPPLIES DC/DC CONVERTERS

Stock No. 300 MW Type	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (MA)	Dimensions (HxWxD) In Inches	Price
13825	3.0-7.0	12±0.6	0-25	.48x.51x3.05	$7.00
13826	3.0-7.0	12±0.6	0-25	.48x.51x3.05	7.00
13827	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.00
13828	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.00
13829	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.00
13830	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.00
1.5 W TYPE					
13831	4.0-7.0	12±0.6	125	.651x1.2x1.77	23.00
13832	4.0-7.0	12±0.6	125	.651x1.2x1.77	23.00
13833	4.0-7.0	15±0.7	100	.651x1.2x1.77	23.00
13834	4.0-7.0	15±0.7	100	.651x1.2x1.77	23.00
13835	4.0-7.0	28±1.4	50	.651x1.2x1.77	23.00
13836	4.0-7.0	28±1.4	50	.651x1.2x1.77	23.00

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- Miniclamp AC Volt-Ammeter

Stock No.	AC Amperes Ranges	Price
13730	0-25A	$39.50
13731	0-50A	39.50
13732	0-100A	39.50

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- VOM-MULTITESTER Versatile Volt-Ohm Milliammeter (Stock #13729) $13.95

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Stock No.	Dia.	Length (feet)	Weight (Oz)	Price
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50076	.062	25	4	4.36
50077	.062	50	8	6.02
50078	.032	33	1.5	4.08
50079	.032	89	4	5.16
50080	.032	175	8	6.82

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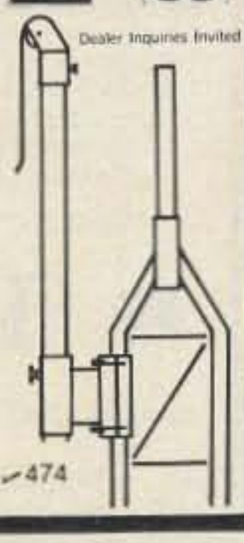

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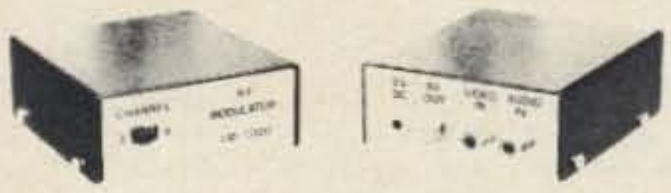
RF MODULATORS



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for Kenwood TR-2400 stops and locks on busy, or stops and resumes when carrier drops. Controlled by keyboard, no switches to add. Installs easily inside rig, six simple connections, no modifications. Does not use space provided for PL.
Assembled—$24.95 Kit—$14.95

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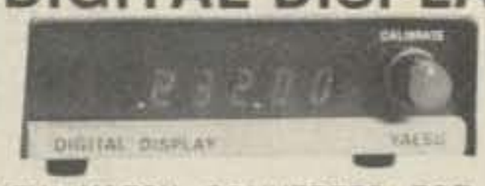

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• Covers 100 to 185 MHz in 1 kHz steps with thumbwheel dial • Accuracy 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • Spurs and noise at least 60 dB below carrier • RF output adjustable from 5-500 mV at 50 ohms • Operates on 12 Vdc @ 1/2 Amp • Available for immediate delivery • $349.95 plus shipping • Add-on Accessories available to extend freq. range, add infinite resolution, voice and sub-audible tones, AM, precision 120 dB calibrated attenuator • Call for details • Dealers wanted worldwide.

VANGUARD LABS ✓311
196-23 Jamaica Ave., Hollis, NY 11423
Phone: (212) 468-2720

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QSL'S CUSTOM MADE ALL CRYSTALS from $4.00

CB to 10 Meter Conversions
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your rig from $45: New from us from $179

SEE US AT OVER 70 SHOWS A YEAR, CALL OR WRITE FOR QUOTE, CATALOG, INFORMATION, QSL SAMPLES (50 cents)

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YAESU FT-207R OWNERS

AUTO SCAN MODULE AND BATTERY SAVER KIT

WRITE FOR CLUB DISCOUNTS

15 minutes to install; scan restarts when carrier drops off; busy switch controls automatic scan on-off; includes module and instructions.

Model AS-1. $25.00

FT-207R BATTERY SAVER KIT MODEL BS-1 $14.95

*No more dead batteries due to memory back-up
*30% less power drain when squelched
*Simple to install; step-by-step instructions and parts included
*4 mA memory backup reduced to 500 μA.
*45 mA receiver drain reduced to 30 mA.
*Improved audio fidelity and loudness

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ANAHEIM, CALIFORNIA 92803 ✓400

AMP LETTER

(AMP´LET TER) n. 1. An Amateur Radio publication devoted to the design, construction, and operation of Amateur Amplifiers. 2. A newsletter that can save you money on your next amplifier construction project. 3. A source of parts and information.

The AMP-LETTER is published and mailed First Class every three weeks (17 times/year). It is organized into five departments:

I Editor's Corner
II Letters
III Tech Topics & Tips
IV Feature Article
V AMP-LETTER TRADER

Have parts to sell? Run an ad in the AMP-LETTER TRADER. Subscriber rate is 10¢ per word.

The AMP-LETTER believes that homebrewing an amp can be fun, educational, and half as costly as buying a commercial amp.

A one year subscription to the AMP-LETTER is $18.00/year (17 issues). Mention "73" Magazine and you may subscribe at the special one time rate of $15.00/year.

DON'T MISS A SINGLE ISSUE OF THE AMP-LETTER

AMP-LETTER
RR2 Box 39A ✓97
Thompsonville, IL 62890

Place an ad, 10¢/word

Send $2.00 for a sample copy, or $15.00 for a full year of the AMP-LETTER.

See List of Advertisers on page 130

Start taking calls in curious places with the revolutionary, new Cordless *Escort*® Phone.

Special Purchase—The *Escort*® Cordless Telephone!

We are pleased to announce the Escort Mark III is now available at special pricing. We bought the manufacturer's entire inventory-- and we are passing the savings on to you!

The Escort Mark III was originally designed to retail for $199.95. Now, we suggest a retail price of $169.95 to $189.95. Or, you can move them out at $149.95. In any event, you'll like the profit margins.

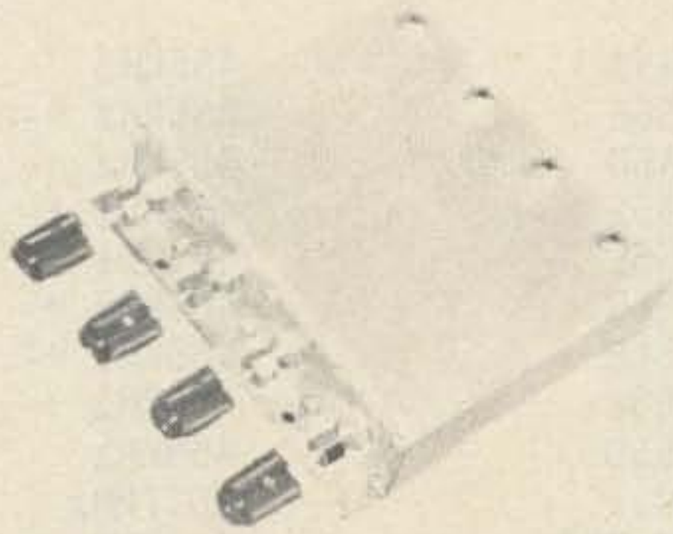
QUANTITY	*DEALER PRICE*	*GROSS PROFIT AT $149.95*
1—2 units	69.75 each	*53%*
3—5 units	64.50 each	*57%*
6—11 units	62.50 each	*58%*
12—23 units	60.75 each	*59%*

On all orders of 12 or more, we pay the freight! This is your opportunity to stock up for the Christmas buying season. These are ideal gift items, that will really move out!

ESCORT MARK III SPECIFICATIONS

VHF DUPLEXERS

This duplexer was made for RF Harris Mobile Phones and Two Way Radios. These duplexers can be used in any mobile phone or two way radio system, along with having the capabilities to be modified for UHF use. The physical dimensions are 3 3/5" Long, 4 2/5" Wide, and 1 1/10" Deep. The approximate weight is 18 oz./1 lb. 2 oz.. PRICE **$74.99**



- Operates as a regular telephone on touch-tone or rotary dial systems
- Range up to 300 feet
- Ni-Cad rechargeable batteries included in telephone
- Charger built into base transmitter
- Simple plug-in installation!
- High-performance antenna
- Full duplex, answer and dial out
- Full FCC approval

Exactly As Shown

HOW WE CUT THE CORD.
The new Cordless Phone works on a simple, highly sophisticated principle. A small base station plugs into your regular phone jack, and an electrical wall outlet. The base station then transmits any in- or out-going call to the handheld receiver, anywhere up to 300 feet.

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MHz electronics

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"FILTERS"

Collins Mechanical Filter #526-9724-010 Model F455Z32F
455KHz at 3.2KHz Wide. $15.00

Atlas Crystal Filters

5.52-2.7/8	5.52MHz/2.7KHz wide 8 pole	
5.595-2.7/8/U	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.595-.500/4/CW	5.595MHz/.500KHz wide 4 pole CW	
5.595-2.7/LSB	5.595MHz/2.7KHz wide 8 pole lower sideband	
5.595-2.7/USB	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.645-2.7/8	5.645MHz/2.7KHz wide 8 pole	Your Choice
9.0SB/CW	9.0MHz/ 8 pole sideband and CW	$12.99

Kokusai Electric Co. Mechanical Filter #MF-455-ZL-21H
455KHz at Center Frequency of 453.5Kc Carrier Frequency of 455Kc 2.36Kc Bandwidth $15.00

Crystal Filters

Nikko	FX-07800C	7.8MHz	10.00
TEW	FEC-103-2	10.6935	10.00
Tyco/CD	001019880	10.7MHz 2 pole 15KHz Bw. Motorola #48D84396K01 Thru #48D84396K05	4.00
Motorola	4884863B01	11.7MHz 2 pole 15KHz Bandwidth	5.00
PTI	5350C	12MHz 2 pole 15KHz Bandwidth	5.00
PTI	5426C	21.4MHz 2 pole 15KHz Bandwidth	5.00
CD	A10300	45MHz 2 pole 15KHz Bandwidth (For Motorola Communications equipment)	5.00

Ceramic Filters

Murata	BFB455B	455KHz	$ 2.40
	CFM455E	455KHz +- 5.5KHz	6.65
	CFM455D	455KHz +- 7KHz	6.65
	CFR455E	455KHz +- 5.5KHz	8.00
	CFU455E	455KHz +- 1.5KHz	2.90
	CFU455G	455KHz +- 1KHz	2.90
	CFW455D	455KHz +- 1KHz	2.90
	CFW455H	455KHz +- 3KHz	4.35
	SFB455D	455KHz	2.40
	SFE10.7	10.7MHz	2.67
	SFG10.7MA	10.7MHz	10.00
Clevite	TO-01A	455KHz	5.00
	TO-02A	455KHz	5.00
Nippon	LF-B4/CFU455I	455KHz +- 1KHz	5.80
	LF-B6/CFU455H	455KHz +- 1KHz	5.80
	LF-C18	455KHz	10.00
Tokin	CF455A/BFU455K	455KHz +- 2KHz	4.80
Matsushira	EFC-L455K	455KHz	7.00

ROTRON MUFFIN FANS Model Mark 4/MU2A1
These fans are new factory boxed 115vac at 14watts 50/60cps. Impedance Protected-F
CFM is 88 at 50cps and 105 at 60cps. $ 7.99

SPECTRA PHYSICS INC. Model 088 HeNe Laser Tubes.
Power output 1.6mw. Beam Dia. .75mm. Beam Dir. 2.7mr. 8Kv starting voltage
68K ohm 1watt ballast 1000vdc +-100vdc 3.7ma. TUBES ARE NEW $59.99

"AMPLIFIERS"

AVANTEK LOW NOISE AMPLIFIERS

Models	UTC2-102M	AP-20-T	AL-45-0-1	AK-1000M
Frequency Range	30 to 200MC	200 to 400MC	450 to 800MC	500 to 1000MC
Noise Figure	1.5dB	6.5dB	7dB	2.5dB
Voltage	+15vdc	+24vdc	-6vdc @ +12vdc	+12vdc @ -12vdc
Gain	29dB	30dB	30dB	25dB
Power Output	1dB Gain +7dBm	1dB Gain +20dBm	1dB Gain -5dBm	1dB Gain +8dBm
Price	$49.99	$49.99	$49.99	$69.99

Mini Circuits Double Balanced Mixers

Model RAY-3
Very High Level (+23dBm LO) 70KHz to 200MHz LO,RF,DC to 200MHz IF
Conversion Loss,dB One Octave From Band Edge 6Typ./7.5Max. Total Range 6.5Typ./8Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 55Typ./45Min. Mid. Range (LO-RF/LO-IF) 40Typ./30Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 30Typ./25Min.
Price $24.99

Model TSM-3
Standard Level (+7dBm LO) .1MHz to 400MHz LO,RF,DC to 400MHz IF
Conversion Loss,dB One Octave From Band Edge 5.3Typ./7.5Max. Total Range 6.5Typ./8.5Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 60Typ./50Min. Mid. Range (LO-RF/LO-IF) 50Typ./35Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 35TYP./25Min.
Price $11.99

Hewlett Packard Linear Power Microwave RF Transistor HXTR5401/35831E

Collector Base Brakedown Voltage at Ic=100ua	35volts min.
Collector Emitter Brakedown Voltage at Ic=500ua	30volts min.
Collector Cutoff Current at Vcb=15v	100ua max.
Forward Current Transfer Ratio at Vce=15v,Ic=15ma	15min,40typ,125max
Transducer Power Gain at Vce=18v,Ice=60ma,F=2GHz.	3dBmin,4dBtyp
Maximum Available Gain at Vce=18v,Ic=60ma,F=1GHz/F=2GHz	14dB typ,8dB typ
Price $29.99	

Motorola RF Power Amplifier Modules

Model	MHW612A	MHW613A	MHW710	MHW720
Frequency Range	146 to 147MHz	150 to 174MHz	400 to 512MHz	400 to 470MHz
Voltage	12.5vdc	12.5vdc	12.5vdc	12.5vdc
Output Power	20watts	30watts	13watts	20watts
Minimum Gain	20dB	20dB	19.4dB	21dB
Harmonics	-30dB	-30dB	40dB	40dB
RF Input Power	400mw	500mw	250mw	250mw
Price	$57.50	$59.80	$57.50	$69.00

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"TRANSISTORS"

WATKINS JOHNSON WJ-M62 3.7 to 4.2GHz Communication Band Double Balanced Mixer $100.00

SSB Conversion Loss	4.9dB Typ.	6dB Max.	fR 3.7 to 4.2GHz
	5.5dB Typ.	6.5dB Max.	fI DC to 1125MHz fL fR
			fI 880MHz fL fR
SSB Noise Fiqure			fR 3.7 to 4.2GHz
	4.9dB Typ.	6dB Max.	fI 30 to 1125MHz fL fR
	5.5dB Typ.	6.5dB Max.	fI 880MHz fL fR
Isolation			
fL at R	30dB Min.	40dB Typ.	fL 2.8 to 5.35GHz
fL at I	25dB Min.	30dB Typ.	fL 4.5 to 5.35GHz
	20dB Min.	30dB Typ.	fL 3.6 to 4.5GHz
	15dB Min.	25dB Typ.	fL 2.8 to 3.6GHz
Conversion Compression	1dB Max.		fR Level +2dBm
Flatness	.2dB Peak to Peak Over any 40MHz Segment of fR=3.7 to 4.2GHz		
Third Order Input Intercept	+11dBm		fR1=4GHz fR2=4.01GHz Both at -5dBm fL=4.5GHz
Group Time Delay	.5ns Typ.	.75ns Max.	fR3.7 to 4.2GHz fL 3480MHz @ +13dBm
VSWR	L-Port	1.25:1 Typ.	2.0:1 fL 2.8 to 5.35GHz
	R-Port	1.25:1 Typ.	2.0:1 fR 3.7 to 4.2GHz fL fR
		1.4 :1 Typ.	2.0:1 fR 3.7 to 4.2GHz fL fR
	I-Port	1.5 :1 Typ.	2.0:1 fI=100MHz
		1.3 :1 Typ.	2.0:1 fI=500MHz
		1.8 :1 Typ.	2.5:1 fI=1125MHz

SGS/ATES RF Transistors

Type.	BFQ85	BFW92
Collector Base V	20v	25v
Collector Emitter V	15v	15v
Emitter Base V	3v	2.5v
Collector Current	40ma	25ma
Power Dissipation	200mw	190mw
HFE	40min. 200max.	20min. 150max.
FT	4GHZ min. 5GHz max.	1.6GHz Typ.
Noise Fiqure	1GHz 3dB Max.	500MHz 4dB Typ.
Price	$1.50	$1.50

Motorola RF Transistor

MRF901	2N6603
25v	25v
15v	15v
3v	3v
30ma	30ma
375mw	400mw
30min. 200max.	30min. 200max.
4.5GHz typ.	2GHz min.
1GHz 2dB Typ.	2GHz 2.9dB Typ.
$2.00	$10.00

National Semiconductor Variable Voltage Regulator Sale !!!!!!!!!

LM317K	LM350K	LM723G/L	LM7805/06/08/12/15/18/24
1.2 to 37vdc	1.2 to 33vdc	2 to 37vdc	5, 6, 8,12,15,18,24vdc
1.5Amps	3Amps	150ma.	1Amp
TO-3	TO-3	TO-100/TO-116	TO-220/TO-3
$4.50	$5.75	$1.00 $1.25	$1.17 $2.00

P & B Solid State Relays Type ECT1DB72

5VDC Turn On 120VAC Contact 7Amps
20Amps on 10"x10"x.062" Alum.Heatsink with
Silicon Grease $5.00

*May Be Other Brand Equivalent

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"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min	F=2GHz	dB 2.4 Typ.	MAG F=2GHz	dB 12 Typ.	$5.30
	F=3GHz	dB 3.4 Typ.	F=3GHz	dB 9 Typ.	
	F=4GHz	dB 4.3 Typ.	F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacutures and described in the Motorola RF Data Book.

10pf	22pf	30pf	40pf	100pf	250pf	1 to 10pcs.	.60¢ each
13pf	25pf	32pf	43pf	120pf	820pf	11 to 50pcs.	.50¢ each
14pf	27pf	33pf	62pf	180pf		51 to 100pcs.	.40¢ each
20pf	27.5pf	34pf	80pf	200pf			

NIPPON ELECTRIC COMPANY TUNNEL DIODES

		MODEL 1S2199	1S2200 $7.50
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ration (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

List all Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

PRICE $7.50

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"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$ POR	SK626	Chimney	$ 7.70
SK406	Chimney	35.00	SK630	Socket	45.00
SK416	Chimney	22.00	SK636B	Chimney	26.40
SK500	Socket	330.00	SK640	Socket	27.50
SK506	Chimney	47.00	SK646	Chimney	55.00
SK600	Socket	39.50	SK711A	Socket	192.50
SK602	Socket	56.00	SK740	Socket	66.00
SK606	Chimney	8.80	SK770	Socket	66.00
SK607	Socket	43.00	SK800A	Socket	150.00
SK610	Socket	44.00	SK806	Chimney	30.80
SK620	Socket	45.00	SK900	Socket	253.00
SK620A	Socket	50.50	SK906	Chimney	44.00

JOHNSON TUBE SOCKETS

124-115-2/SK620A	Socket	$ 30.00	124-113 - Bypass Cap.	$ 10.00
124-116/SK630A	Socket	40.00	122-0275-001 Socket (For 4-250A,4-400A,3-400Z, 3-500Z)	10.00 2/$15.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_o), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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"TUBES"

TUBES	PRICE	TUBES	PRICE	TUBES	PRICE
2E26	$ 4.69	5721	$200.00	8462	$100.00
2K28	100.00	5768	85.00	8505A	73.50
3B28	5.00	5836	100.00	8533W	92.00
3-500Z	102.00	5837	100.00	8560A	55.00
3-1000Z/8164	300.00	5861/EC55	110.00	8560AS	57.00
3CX1000A/8283	200.00	5876A	15.00	8608	34.00
3X2500A3	200.00	5881/6L6	5.00	8624	67.20
4-65A/8165	45.00	5894/A	45.00	8637	38.00
4-125A/4D21	58.00	5894B	55.00	8647	123.00
4-250A/5D22	68.00	6080	10.00	8737/5894B	55.10
4-400A/8438	71.00	6083/AX9909	89.00	8807	1000.00
4-400C/6775	80.00	6098/6AK6	14.00	8873	260.00
4-1000A/8166	300.00	6115/A	100.00	8874	260.00
4CS250R	69.00	6146	6.00	8875	260.00
4X150A/7034	30.00	6146A	6.50	8877	533.00
4X150D/7035	40.00	6146B/8298A	7.50	8908	12.00
4X150G	50.00	6146W	14.00	8916	1500.00
4X250B	30.00	6159	11.00	8930/X651Z	45.00
4CX250B/7203	45.00	6161	70.00	8950	10.00
4CX250F/7204	45.00	6291	125.00		
4CX250FG/8621	55.00	6293	20.00	6BK4C	5.00
4CX250K/8245	100.00	6360	4.00	6DQ5	4.00
4CX250R/7580W	69.00	6524	53.00	6FW5	5.00
4CX300A	99.00	6550	7.00	6GE5	5.00
4CX350A/8321	100.00	6562/6794A	25.00	6GJ5	5.00
4CX350FJ/8904	100.00	6693	110.00	6HS5	5.00
4X500A	100.00	6816	58.00	6JB5/6HE5	5.00
4CX600J	300.00	6832	22.00	6JB6A	5.00
4CX1000A/8168	300.00	6883/8032A/8552	7.00	6JM6	5.00
4CX1500B/8660	300.00	6884	46.00	6JN6	5.00
4CX3000A/8169	300.00	6897	110.00	6JS6B	5.00
4CX5000A/8170	400.00	6900	35.00	6JT6A	5.00
4CX10000D/8171	500.00	6907	55.00	6KD6	5.00
4CX15000A/8281	700.00	6939	15.00	6K66/EL505	5.50
4E27/A/5-123A/B	40.00	7094	75.00	6KM6	5.00
4PR60A	100.00	7117	17.00	6KN6	5.00
4PR60B/8252	175.00	7211	60.00	6LF6	6.00
KT88	15.00	7289/3CX100A5	34.00	6LQ6	6.00
DX362	35.00	7360	11.00	6LU8	5.00
DX415	35.00	7377	67.00	6LX6	5.00
572B/T160L	44.00	7486	75.00	6ME6	5.00
811	10.00	7650	250.00	12JB6A	6.00
811A	13.00	7843	58.00		
812A	15.00	7868	4.00	"WE ARE ALSO LOOKING FOR TUBES NEW/USED ECT."	
813	38.00	7984	12.00		
4624	100.00	8072	55.00		
4665	350.00	8121	50.00	WE BUY SELL OR TRADE	
5551A	100.00	8122	85.00		
5563A	77.00	8236	30.00		
5675	15.00	8295/PL172	300.00		

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TEKTRONIX OSCILLOSCOPES	PRICE
MODEL 453 Portable 50 MHz Dual Trace.	**$1200.00**
MODEL 453A Portable 60 MHz Dual Trace.	**$1400.00**
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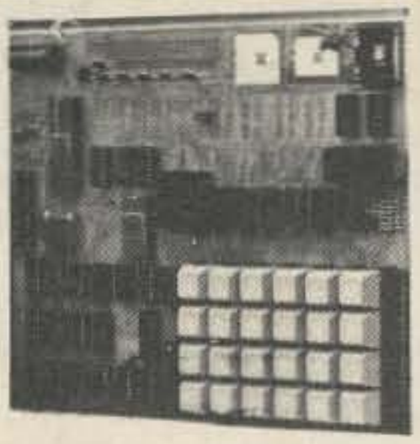

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Free 14 page brochure of complete Super Elf system.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

ELECTRONIC SYSTEMS KITS

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95,** Kit (P/N 2A) **$51.25,** Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20,** Kit (P/N 210A) **$119.55.**

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) **$15.65,** Kit (P/N 120A) **$69.95.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. No PC board. **$8.95**

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June *Radio Electronics*.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$79.95.**

1802 16K Dynamic RAM Kit $149.00

Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00.**

S-100 4-slot expansion $ 9.95

Super Monitor VI.I Source Listing $15.00

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor;, fully expandable. **$419.00.** 4K version **$449.00.** 4K Assembler **$35.00.** 8K Basic Interpreter **$65.00.**

Special small power supply 5V 2A 24V .5A assem. in frame **$59.00.** Molded plastic enclosure to fit both AIM 65 and power supply **$52.50.** AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. **$559.00.** 4K **$579.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor $1295.00.** RAM Board Kit (16K, **$195**) (32K, **$215**). VD640 Video Interface Kit **$119.00.** A&T **$149.00.** Complete AIM 65 in thin briefcase with power supply **$518.00.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$629.00**

AIM 65/KIM/SYM/Super Elf 44 pin expansion board, board with 3 connectors **$22.95.**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: Send for excellent pricing/margin program.**

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

RAMSEY ELECTRONIC'S Inc.

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PARTS WAREHOUSE

We now have available a bunch of goodies too good to bypass. Items are limited so order today

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Call Your Phone Order in Today

TERMS: Satisfaction guaranteed or money refunded. C.O.D. add $2.00. Minimum order $6.00. Orders under $10.00 add $1.50. Add 5% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$14.95**
FM-3 Wired and Tested **19.95**

Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1 **$8.95**

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 **$2.95**

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

CPO-1

Runs on 3-12 Vdc 1 wall out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**
Alarm clock, 12 hour only, DC-8 **$29.95**
12V DC car clock, DC-7 **$29.95**

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

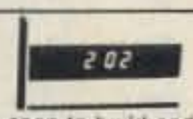
Complete kit, WL-1 **$6.95**

Tone Decoder

A complete tone decoder on a single PC board. Features 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1 **$5.95**

Car Clock



The UN-KIT, only 5 solder connections

Here's a super looking, rugged and accurate auto clock, which is a snap to build and install. Clock movement is completely assembled — you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell — assures you of a highly readable display, day or night. Comes in a satin finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify).

DC-3 kit, 12 hour format **$22.95**
DC-3 wired and tested **$29.95**

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.

MB-1 Kit **$4.95**

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

Complete kit, SM-3 **$2.95**

60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma) 1 min/month accuracy TB-7 Kit **$5.50**
TB-7 Assy **$9.95**

Calendar Alarm Clock

The clock that's got it all: 6-.5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup, and lots more. The super 7001 chip is used. Size 5x4x2 inches. Complete kit, less case (not available)

DC-9 **$34.95**

Under Dash Car Clock

12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDS, high accuracy (.001%), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer atuomatically adjusts display to ambient light level.

DC-11 clock with mtg. bracket **$27.95 kit**
DM-1 dimmer adapter **$2.50**
Add $10.00 Assy. and Test

Video Terminal

A completely self-contained, stand alone video terminal card. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Features are: single 5V supply, XTAL controlled sync and baud rates (to 9600), complete computer and keyboard control of cursor. Parity error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 6416 is 64 char. by 16 lines with scrolling, upper and lower case (optional) and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation.

RE 6416, terminal card kit (add $60.00 for wired unit) **$189.95**
Lower Case option **$13.95**
Power Supply **$14.95**
RF Modulator kit **$7.95**

PARTS PARADE

IC SPECIALS

LINEAR

301	$ .35
3241	$1.50
380	$1.50
555	$ .45
556	$1.00
565	$1.00
566	$1.00
567	$1.25
741	10/$2.00
1458	$ .50
3900	$ .50
3914	$2.95
8038	$2.95

CMOS

4011	.50
4013	.50
4046	$1.85
4049	.50
4059	$9.00
4511	$2.00
4518	$1.35
5639	$1.75

READOUTS

FND 359 .4" C.C.	$1.00
FND 507/510 .5" C.A.	1.00
MAN 72/HP7730 .33" C.A.	1.00
HP 7651 .43" C.A.	2.00

TRANSISTORS

2N3904 NPN C+F	15/$1.00
2N3906 PNP C+F	15/$1.00
2N4403 PNP C+F	15/$1.00
2N4410 NPN C+F	15/$1.00
2N4916 FET C+F	4/$1.00
2N5401 PNP C+F	5/$1.00
2N6028 C+F	4/$1.00
2N3771 NPN Silicon	$1.50
2N5179 UHF NPN	3/$2.00
Power Tab NPN 40W	3/$1.00
Power Tab PNP 40W	3/1.00
MPF 102/2N5484	$.50
NPN 3904 Type T+R	50/$2.50
PNP 3906 Type T+R	50/$2.50
2N3055	$.60
2N2646 UJT	3/$2.00

TTL

74S00	$ .40
7447	$ .65
7475	$ .50
7490	$ .50
74196	$1.35

SPECIAL

11C90	$15.00
10116	$ 1.25
7208	$17.50
7207A	$ 5.50
7216D	$21.00
7107C	$12.50
5314	$ 2.95
5375AB/G	$ 2.95
7001	$ 6.50

FERRITE BEADS

With info and specs **15/$1.00**
6 Hole Balun Beads **5/$1.00**

Sockets

8 Pin	10/$2.00
14 Pin	10/$2.00
16 Pin	10/$2.00
24 Pin	4/$2.00
28 Pin	4/$2.00
40 Pin	3/$2.00

Diodes

5.1 V Zener	20/$1.00
1N914 Type	50/$1.00
1KV 2Amp	8/$1.00
100V 1Amp	15/$1.00

25 AMP
100V Bridge
$1.50 each

Mini-Bridge 50V
1 AMP
2 for $1.00

Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting. ½" center, ½" leads, bag of 300 or more. **$1.50**

Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc.
5 for $1.00

Mini 8 ohm Speaker

Approx. 2¼" diam. Round type for radios, mike etc. **3 for $2.00**

Slug Tuned Coils

Small 3/16" Hex Slugs turned coil 3 turns. 10 for $1.00

CAPACITORS

TANTALUM Dipped Epoxy	ALUMINUM Electrolytic		DISK CERAMIC	
1.5 uF 25V 3/$1.00	1000 uF 16V Radial	$.50	.01 16V disk	20/$1.00
1.8 uF 25V 3/$1.00	500 uF 20V Axial	$.50	.1 16V	15/$1.00
.22 uF 25V 3/$1.00	150 uF 16V Axial	5/$1.00	.001 16V	20/$1.00
	10 uF 15V Radial	10/$1.00	100 pF	20/$1.00
			.047 16V	20/$1.00

DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

Ceramic IF Filters

Mini ceramic filters 7 kHz B.W. 455 kHz $1.50 ea.

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$ .50**

Trimmer Caps

Sprague - 3-40 pf
Stable Polypropylene
.50 ea.

Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

Mini RG-174 Coax

10 ft. for $1.00

Coax Connector

Chassis mount BNC type **$1.00**

9 Volt Battery Clips

Nice quality clips **5 for $1.00**
⅜" Rubber Grommets **10 for $1.00**

Parts Bag

Asst. of chokes, disc. caps, tant., res-stors, transistors, diodes, MICA caps etc.
sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

Leds - your choice, please specify

Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

Crystals

3.579545 MHZ	$1.50
10.00000 MHZ	$5.00
5.248800 MHZ	$5.00

AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end.

8.5 vdc @ 20 mA	$1.00
16 vac @ 160mA	$2.50
12 vac @ 250mA	$3.00

Solid State Buzzers

small buzzer 450 Hz, 86 dB, sound output on 5-12 vdc at 10-30 mA, TTL compatible **$1.50**

AC Outlet

Panel Mount with Leads **4/$1.00**

Audio Prescaler

Make high resolution audio measurments, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$29.95**
PS-2 wired **$39.95**

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity. specify -10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$22.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay
TR-1 Kit **$6.95**

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V @ 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain.
50 for only $9.00 **10 for $2.00**

Regulators

78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

Shrink Tubing Nubs

Nice precut pces of shrink size: 1" x ¼" shrink to ⅛". Great for splices. **50/$1.00**

Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**
Opto Reflectors - Photo diode + LED **$1.00 ea.**

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

See List of Advertisers on page 130

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FT 902DM, FT101ZD

TR 2500

KENWOOD TS 830S, TS 530S

YAESU FT480R,
FT 680R, FT780R

TR7730

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B- 1016, B 3016, D 1010
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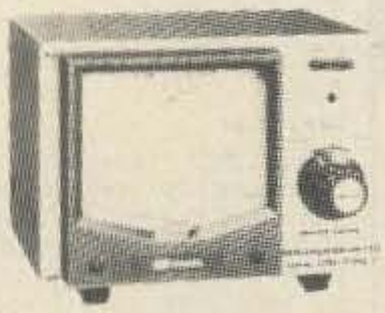
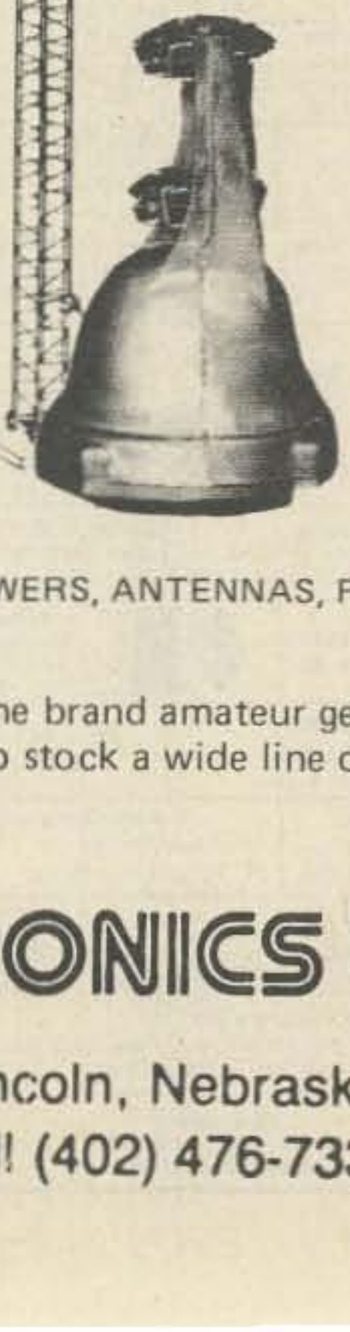
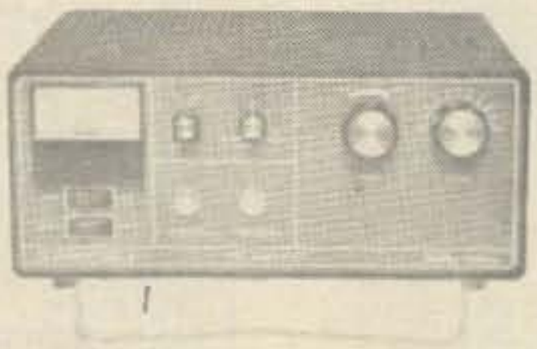
IC 720A, IC 730



DAIWA CN 720B

OUR MOST POPULAR SCANNER
JIL SX-100 16 CHANNEL
PROGRAMMABLE SCANNER
STILL ONLY $199.95





BIG POWER ON TWO METERS.
500 WATTS!!
DENTRON CLIPPERTON V

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Communications Center is proud to offer name brand amateur gear at discount prices backed by knowledgable sales & service personnel. We also stock a wide line of reconditioned used gear. Call today for your cash quote or trade.

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QUALITY VHF/UHF KITS AT AFFORDABLE PRICES

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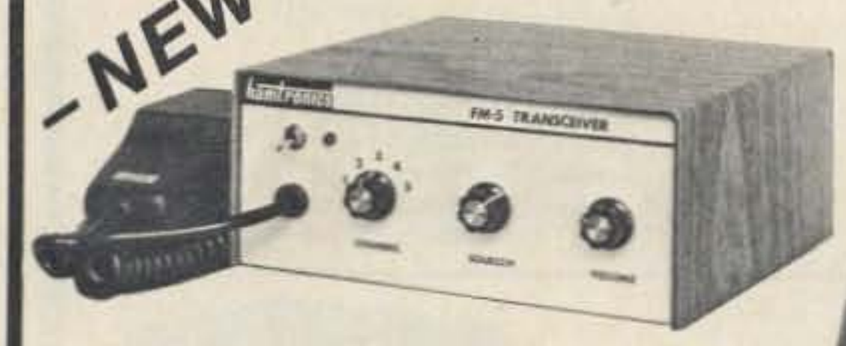
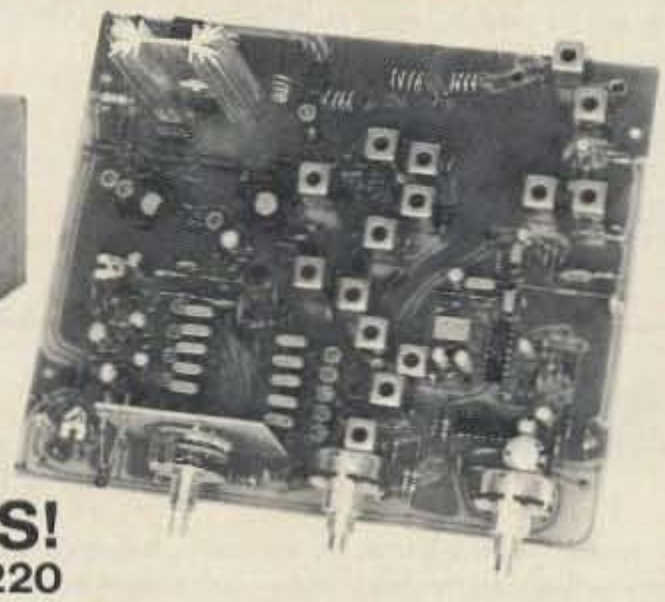




SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

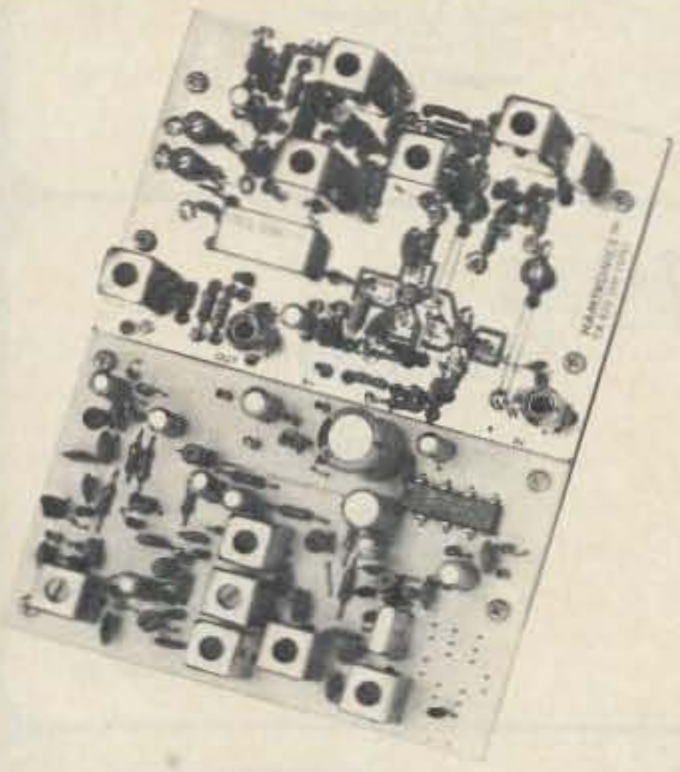
10 watts, 5 Channels, for 6M, 2M, or 220

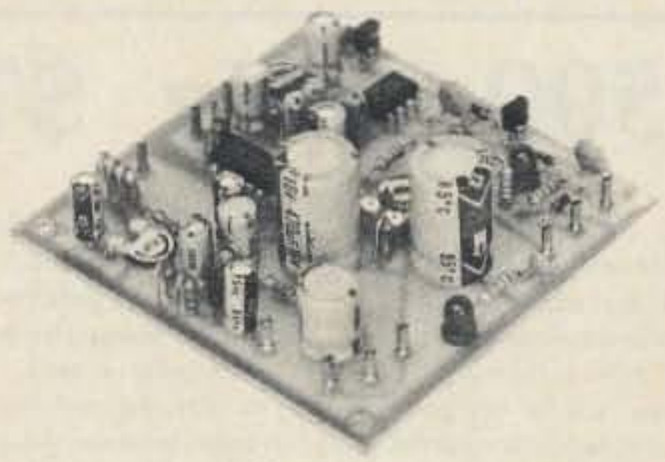
FM-5 PC Board Kit – **ONLY $159.95** complete with controls, heatsink, etc.

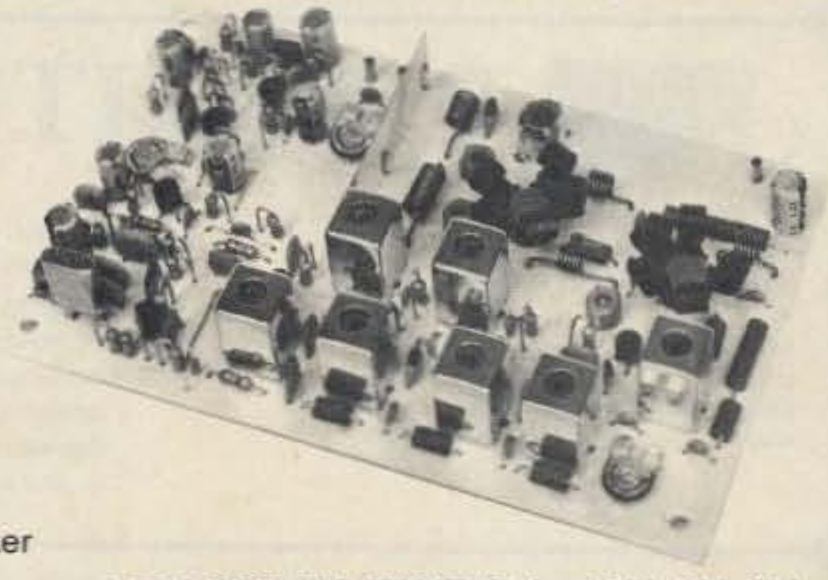
★ **SPECIAL OFFER** ★

Free cabinet kit, complete with speaker, knobs, connectors, hardware. A $59.95 value, yours free with purchase of kit. Hurry! Offer limited.

HIGH QUALITY FM MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.







- **R76 VHF FM RECEIVER** for 10M, 6M, 2M, 220, or commercial bands. Fantastic selectivity options. Kits from $84.95 to $109.95
- **R450 UHF FM RECEIVER** for 380-520 MHz bands. Kits in selectivity options from $94.95
- **R110 VHF AM RECEIVER** Kit for vhf aircraft band or ham bands. Only $84.95.

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BP-1 Nicad pack + AC Adapter/Charger	12.95
OV-1, Micro-power Oven time base	49.95
External time base input	14.95

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40°C. Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

7 DIGITS 525 MHz $99.95 WIRED

SPECIFICATIONS:

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:	
CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES:	
MINI-100 wired, 1 year warranty	$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

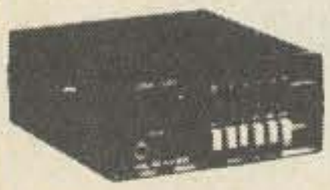
SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

PRICES:	
CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

DIGITAL MULTIMETER $99.95 WIRED



PRICES:	
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DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack +AC adapter/charger	19.95
MP-1, Probe kit	2.95

The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

SPECIFICATIONS:

DC/AC volts:	100uV to 1 KV, 5 ranges
DC/AC current:	0.1uA to 2.0 Amps, 5 ranges
Resistance:	0.1 ohms to 20 Megohms, 6 ranges
Input impedance:	10 Megohms, DC/AC volts
Accuracy:	0.1% basic DC volts
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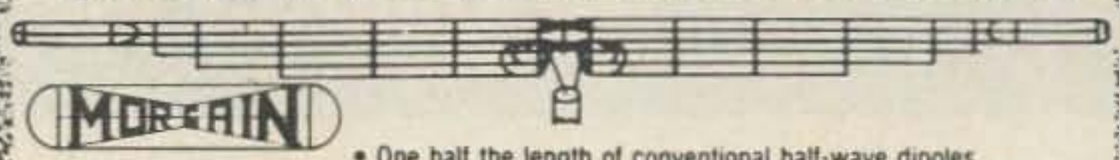

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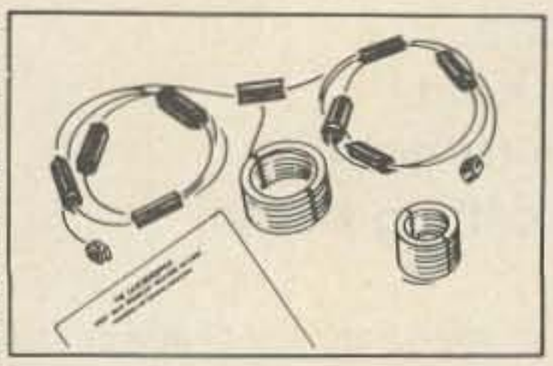

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74S114	.79	74S242	3.25	74S941	3.15

CA–LINEAR

CA3010H	.99	CA3060N	1.25	CA3089N	3.75
CA3013H	2.15	CA3080H	1.25	CA3096N	3.95
CA3023H	3.25	CA3081N	2.00	CA3130H	1.39
CA3035H	2.49	CA3082N	2.00	CA3140H	1.25
CA3039H	1.35	CA3083N	1.60	CA3160H	1.25
CA3046N	1.30	CA3086N	.85	CA3401N	.59
CA3059N	3.25			CA3600N	3.50

CD–CMOS

CD4000	.39			CD 4098	2.49
CD4001	.39			CD4506	.75
CD4002	.39			CD4507	.99
CD4006	1.19	CD4041	1.49	CD4508	3.95
CD4007	.25	CD4042	.99	CD4510	1.39
CD4009	.49	CD4043	.89	CD4511	1.29
CD4010	.49	CD4044	.89	CD4512	1.49
CD4011	.39	CD4046	1.79	CD4514	3.95
CD4012	.25	CD4047	2.50	CD4515	2.95
CD4013	.49	CD4048	1.35	CD4516	1.49
CD4014	1.39	CD4049	.49	CD4518	1.79
CD4015	1.19	CD4050	.69	CD4519	.89
CD4016	.59	CD4051	1.19	CD4520	1.29
CD4017	1.19	CD4052	1.19	CD4526	1.79
CD4018	.99	CD4053	1.19	CD4528	1.79
CD4019	.49	CD4056	2.95	CD4529	1.95
CD4020	1.19	CD4059	9.95	CD4543	2.79
CD4021	1.39	CD4060	1.49	CD4562	11.95
CD4022	1.19	CD4066	.79	CD4566	2.79
CD4023	.29	CD4068	.39	CD4583	2.49
CD4024	.79	CD4069	.45	CD4584	.75
CD4025	.23	CD4070	.55	CD4723	1.95
CD4026	2.95	CD4071	.49	CD4724	1.95
CD4027	.69	CD4072	.49	MC14409	17.95
CD4028	.89	CD4073	.39	MC14410	18.95
CD4029	1.49	CD4075	.39	MC14411	15.95
CD4030	.49	CD4076	1.39	MC14412	15.95
CD4034	3.49	CD4078	.55	MC14419	7.95
CD4035	.99	CD4081	.39	MC14433	15.95
CD4040	1.49	CD4082	.39	MC14538	2.49
		CD4093	.99	MC14541	1.95

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LITRONIX Stick Display Sale

WHILE THEY LAST! — SALE!

MULTI-DIGIT REFLECTOR ARRAYS FOR CLOCKS

Part Number Color	[illegible]	Polarity	Description	Overall Size	Light Output	Forward Voltage	Continuous Current	Price	2 FOR SALE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/2.95
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/2.95
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/7.95
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/2.95

MULTI-DIGIT REFLECTOR ARRAYS

Part Number Color	[illegible]	Polarity	Description	Overall Size	Light Output	Forward Voltage	Continuous Current	Price	2 FOR SALE
[illegible]	[illegible]	C.C. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.79	2/.99
[illegible]	[illegible]	C.A. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/1.19
[illegible]	[illegible]	C.C. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/1.95
[illegible]	[illegible]	C.A. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2/3.49

NATIONAL Stick Display Sale

LIMITED QUANTITY! — SALE!

LED NUMERIC ARRAYS

PART NO.	DIGIT SIZE (RED)	FORMAT	DRIVE Comm. Cathode/Comm. Anode	OVERALL SIZE	PRICE	SALE
[illegible]	[illegible] Bubble Stick	888888	C.C. 6 Digit Multiplexed	[illegible]	[illegible]	2/.99
[illegible]	[illegible] Bubble Stick	888888888	C.C. 9 Digit Multiplexed	[illegible]	[illegible]	2/.99
[illegible]	[illegible] Bubble Stick	888888888	C.C. 9 Digit Multiplexed	[illegible]	[illegible]	2/.99
[illegible]	[illegible] Bubble Stick	88 88	C.C. 4 Digit Multiplexed	[illegible]	[illegible]	2/.79
[illegible]	[illegible] Bubble Stick	8 88 88	C.C. 5 Digit Multiplexed	[illegible]	[illegible]	2/.59
[illegible]	[illegible] Bubble Stick	88888888	C.C. 8 Digit Multiplexed	[illegible]	[illegible]	2/1.19

MULTI-DIGIT LED NUMERIC DISPLAYS

PART NO.	DIGIT SIZE (RED)	FORMAT	DRIVE	OVERALL SIZE	PRICE	SALE
[illegible]	.3 No Decimal	88	C.C. 2 Digit Direct	[illegible]	[illegible]	2/.79
[illegible]	.3 No Decimal	88	C.A. 2 Digit Direct	[illegible]	[illegible]	2/.99
[illegible]	.5 No Decimal	88	C.A. 2 Digit Direct	[illegible]	[illegible]	2/1.49
[illegible]	.5 No Decimal	88	C.A. 2 Digit Direct	[illegible]	[illegible]	2/1.49
[illegible]	.5	88	C.C. 2 Digit Multiplexed	[illegible]	[illegible]	2/1.79
[illegible]	.5	88	C.C. 2 Digit Direct	[illegible]	[illegible]	2/1.79
[illegible]	.7	88	C.C. 2 Digit Multiplexed	[illegible]	[illegible]	2/1.95
[illegible]	.3	[illegible]	C.C. 8 Digit [illegible]	[illegible]	[illegible]	2/.89
[illegible]	.3	8888	C.C. 4 Digit Multiplexed	[illegible]	[illegible]	2/.89
[illegible]	.3	+1888	C.A. 3½ Digit Multiplexed	[illegible]	[illegible]	2/1.49
[illegible]	.3	[illegible]	C.C. 4 Digit - Colon PM Indicator	[illegible]	[illegible]	2/1.19
[illegible]	.3	[illegible]	C.C. 6 Digit - AM/PM, Failure Ind	[illegible]	[illegible]	2/3.95
[illegible]	.3	88888888	C.A. 8 Digit Multiplexed	[illegible]	[illegible]	2/3.95
[illegible]	.3	8888	C.C. 4 Digit Multiplexed	[illegible]	[illegible]	2/4.95
[illegible]	.3	8888	C.A. 4 Digit Multiplexed	[illegible]	[illegible]	2/4.95
[illegible]	.5	+1888	C.A. 3½ Digit Multiplexed	[illegible]	[illegible]	2/5.95
[illegible]	.5	[illegible]	C.C. 4 Digit - AM/PM, Colon Ind	[illegible]	[illegible]	2/3.95
[illegible]	.5	8888	C.C. 4 Digit Multiplexed	[illegible]	[illegible]	2/5.95
[illegible]	.5	8888	C.A. 4 Digit Multiplexed	[illegible]	[illegible]	2/5.95
[illegible]	.5	+8888	C.C. 3½ Digit Multiplexed	[illegible]	[illegible]	2/3.49
[illegible]	.5	88888	C.A. 5 Digit Multiplexed	[illegible]	[illegible]	2/3.49
[illegible]	.7	888888	C.C. 6 Digit Multiplexed	[illegible]	[illegible]	2/4.95

*Standard Stocked Items — only pin-out specifications available on non-stocked items

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500	200	2.49	10,000	18	3.95	27,000	10	2.95
1,250	3	.95	11,000	19	4.95	32,500	25	4.95
1,500	25	1.95	11,000	95	5.49	40,000	25	5.95
1,500	50	2.95	11,000	60	5.95	43,000	10	5.95
2,000	10	2.95	13,000	18	2.95	50,000	20	7.95
2,250	100	3.95	14,000	13	2.95	52,000	20	5.95
2,300	33	2.95	14,000	85	3.95	50,000	15	5.95
2,500	15	2.95	18,000	10	3.95	58,000	20	5.95
3,000	25	1.95	20,000	20	2.95	65,000	10	7.95
3,600	40	3.95	20,000	55	3.95	73,000	5	7.95
4,500	50	3.95	21,000	15	3.95	80,000	15	9.95
5,500	25	4.49	23,000	7	1.95	90,000	15	8.95
6,100	40	2.49	23,000	10	2.95	100,000	10	8.95
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LOW PROFILE (TIN) SOCKETS

	1-24	25-49	50-100
8 pin LP	.17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)

	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL (GOLD) STANDARD

	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	.59	.54	.49
10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.40	1.35	1.23
24 pin WW	1.39	1.26	1.14
28 pin WW	1.69	1.53	1.38
36 pin WW	2.19	1.99	1.79
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ASST. 2	5ea.	68 Ohm 82 Ohm 100 Ohm 120 Ohm 150 Ohm 180 Ohm 220 Ohm 270 Ohm 330 Ohm 390 Ohm	50pcs.	$1.95
ASST. 3	5ea.	470 Ohm 560 Ohm 680 Ohm 820 Ohm 1K 1.2K 1.5K 1.8K 2.2K 2.7K	50pcs.	$1.95
ASST. 4	5ea.	3.3K 3.9K 4.7K 5.6K 6.8K 8.2K 10K 12K 15K 18K	50pcs.	$1.95
ASST. 5	5ea.	22K 27K 33K 39K 47K 56K 68K 82K 100K 120K	50pcs.	$1.95
ASST. 6	5ea.	150K 180K 220K 270K 330K 390K 470K 560K 680K 820K	50pcs.	$1.95
ASST. 7	5ea.	1M 1.2M 1.5M 1.8M 2.2M 2.7M 3.3M 3.9M 4.7M 5.6M	50pcs.	$1.95
ASST. 8R		Includes Resistor Assts. 1-7 (350 pcs.)		$10.95 ea.

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INTERSIL

Part No.	Function	Price
7045IPI	CMOS Precision Timer	14.95
7045EV/Kit*	Stopwatch Chip, XTL	24.95
7106CPL	3½ Digit A/D (LCD Drive)	16.95
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	29.95
7116CPL	3½ Digit A/D LCD Dis. HLD.	18.95
7117CPL	3½ Digit A/D LED Dis. HLD.	17.95
7201IDR	Low Battery Volt Indicator	2.25
7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	12.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	13.95
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
7215IPG	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
7216AIJI	8-Digit Univ. Counter C.A.	32.00
7216CIJI	8-Digit Freq. Counter C.A.	26.95
7216DIPI	8-Digit Freq. Counter C.C.	21.95
7217IJI	4-Digit LED Up/Down Counter	12.95
7218CIJI	8-Digit Univ. LED Drive	10.95
7224IPL	LCD 4½ Digit Up Counter DRI	11.25
7226AIJL	8-Digit Univ. Counter	31.95
7226AEV/Kit*	5 Function Counter Chip, XTL	74.95
7240IJE	CMOS Bin Prog. Timer/Counter	4.95
7242IJA	CMOS Divide-by-256 RC Timer	2.05
7250IJE	CMOS BCD Prog. Timer/Counter	6.00
7260IJE	CMOS BCD Prog. Timer/Counter	6.25
7555IPA	CMOS 555 Timer (8 pin)	1.45
7556IPD	CMOS 556 Timer (14 pin)	2.20
7611BCPA	CMOS Op Amp Comparator 5MV	2.25
7612BCPA	CMOS Op Amp Ext. Cmvr. 5MV	2.95
7621BCPA	CMOS Dual Op Amp Comp. 5MV	3.95
7631CCPE	CMOS Tri Op Amp Comp. 10MV	5.35
7641CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7642CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7660CPA	Voltage Converter	2.95
8038CCPD	Waveform Generator	4.95
8048CCPE	Monolithic Logarithmic Amp	21.60
8069CCQ	50ppm Band—GAP Volt Ref. Diode	2.50
8211CPA	Volt Ref/Indicator	2.95
8212CPA	Volt Ref/Indicator	2.95

74C

74C00	.39			74C221	1.95
74C02	.39	74C95	1.59	74C240	2.25
74C04	.39	74C107	1.89	74C244	2.25
74C08	.39	74C151	2.95	74C373	2.49
74C10	.39	74C154	3.95	74C374	2.59
74C14	.75	74C157	2.25	74C901	.69
74C20	.39	74C160	1.69	74C903	.69
74C30	.39	74C161	1.60	74C911	10.95
74C42	1.39	74C162	1.49	74C912	10.95
74C48	1.95	74C163	1.69	74C915	1.69
74C73	.79	74C164	1.59	74C917	10.95
74C74	.79	74C173	1.39	74C922	5.49
74C85	1.95	74C174	1.39	74C923	5.75
74C86	.39	74C175	1.19	74C925	7.50
74C89	6.95	74C192	1.69	74C926	7.50
74C90	1.29	74C193	1.69	80C95	.79
74C93	1.29	74C195	1.59	80C97	.79

LINEAR

LH0002CN	6.85			LM702H	.79
LM10CLH	4.50			LM703CN	.89
LM11CLH	4.75	LM340T-5	1.25	LM709N	.29
LH0070-OH	4.95	LM340T-12	1.25	LM710N	.79
TL071CP	.79	LM340T-15	1.25	LM711N	.79
TL072CP	1.39	LM341P-5	.75	LM723N	.69
TL074CN	2.49	LM341P-12	.75	LM733N	1.00
LH0082CD	35.80	LM341P-15	.75	LM739N	1.19
TL082CP	1.19	LM342P-5	.69	LM741CN	.35
TL084CN	2.19	LM342P-12	.69	MC1741SCG	3.00
LH0094CD	36.80	LM342P-15	.69	LM747N	.79
LM300H	.99	LM348N	1.25	LM748N	.59
LM301CN	.35	LM350K	5.75	LM1014N	2.75
LM302H	1.95	LF351N	.60	LM1310N	1.95
LM304H	1.95	LF353N	1.00	LM1458CN	.59
LM305H	.99	LF355N	1.10	LM1488N	1.25
LM307CN	.45	LF356N	1.10	LM1489N	1.25
LM308CN	1.00	LM358N	1.00	LM1496N	1.95
LM309H	1.95	LM359N	1.79	LM1556V	1.75
LM309K	1.25	LM370N	4.49	LM1800N	2.95
LM310CN	1.75	LM373N	3.25	LM1871N	5.49
LM311/CN	.90	LM377N	2.95	LM1872N	5.49
LM312H	2.49	LM380N	1.25	LM1877N-9	3.25
LM317MP	1.15	LM381N	1.95	LM1889N	3.20
LM317T	1.75	LM382N	1.79	LM1896N	1.75
LM317K	3.95	LM384N	1.95	LM2002T	1.49
LM318CN	1.95	LM386N-3	1.29	LM2877P	2.05
LM319N	1.95	LM387N	1.45	LM2878P	2.25
LM320K-5	1.35	LM389N	1.35	LM2896P-1	2.25
LM320K-12	1.35	LM392N	.69	LM3189N	2.95
LM320K-15	1.35	LF398N	4.00	LM3900N	.69
LM320T-5	1.25	LM399H	5.00	LM3905CN	1.25
LM320T-12	1.25	TL494CN	4.49	LM3909N	1.15
LM320T-15	1.25	TL496CP	1.75	LM3914N	3.95
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LM337T	1.95	NE555V	.39	ICL8038B	4.95
LM337MP	1.15	LM556N	.99	LM13080N	1.29
LM338K	6.95	NE564N	3.95	LM13600N	1.49
LM339N	.99	LM565N	1.25	75138N	1.95
LM340K-5	1.35	LM566CN	1.95	75450N	.89
LM340K-12	1.35	LM567V	1.25	75451CN	.39
LM340K-15	1.35	NE570N	4.95	75492	.89

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100 pf	.08	.06	.05	.022µF	.09	.07	.06
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.33/35V	.39	.34	.29	4.7/25V	.63	.56	.45
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Axial	1-99	100-499	500+	Radial	1-99	100-499	500+
.47/50V	.16	.14	.10	.47/25V	.15	.13	.12
1.0/50V	.19	.16	.12	.47/50V	.16	.14	.13
3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21
470/25V	.54	.49	.45	100/50V	.37	.34	.31
1000/16V	.79	.69	.61	220/16V	.25	.21	.19
2200/16V	.89	.79	.69	470/25V	.35	.31	.27

See List of Advertisers on page 130

DEALER DIRECTORY

Phoenix AZ
The Southwest's most progressive communications company stocking Kenwood, Icom, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! **Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.**

Culver City CA
Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego. Call us for a low quote.

Fontana CA
Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Diego CA
We buy and sell Surplus Army Navy Electronic, also Terminated Material. What do you want to sell? Write for catalogue. **Electronictown, Inc., 440-7th Avenue, PO Box 2048, San Diego CA 92112, 232-9379.**

San Jose CA
SAN FRANCISCO BAY AREA
Homebrewers' haven; tons of new and used Ham/Computer gear and components. Serving Hams since 1958. We specialize in ICOM, KLM, Mirage, Comptronix. We ship worldwide. **Tele-Com Electronics, 15460 Union Avenue, San Jose CA 95124, 377-4479.**

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Bay area's newest Amateur Radio store. New & used Amateur Radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santee & many more. **Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.**

Smyrna GA
For your Kenwood, Yaesu, ICOM, Drake and other amateur needs, come to see us. **Britt's Two-Way Radio, 2506 N. Atlanta Rd., Smyrna GA 30080, 432-8006.**

Preston ID
Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Terre Haute IN
Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc., #9 Meadows Center, P.O. Box 3300, Terre Haute IN 478003, 238-1456.**

Littleton MA
The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters. Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, CAM. **TEL-COM Inc. Communications & Electronics. 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.**

Ann Arbor MI
See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN and W8RP behind the counter. **Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104. 668-8696.**

Hudson NH
New England's Distributor and Authorized Service Center for all Major Amateur Lines. **Tufts Radio Electronics, Inc., 61 Lowell Road, Hudson NH 03051, 883-5005.**

Somerset NJ
New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventory of new and used specials. Most major brands in stock. Complete service and facilities. **Radios Unlimited, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873; 469-4599.**

Syracuse-Central NY
HAM-BONE RADIO SAVES US LOT OF $$$ on all Icom, Ten-Tec, Hygain & Kantronics Gear. Fast, Dependable Service Before & After the Sale! Service is Our Main Business! Need Cash-Ham-Bone will sell your gear for 10% commission. 3206 Erie Blvd. E., Syracuse 13214, 446-2266.

Philadelphia PA/ Camden NJ
Waveguide & Coaxial Microwave Components & Equipment. Laboratory Grade Test Instruments, Power Supplies, Buy, Sell & Trade all popular makes—HP, GR, FXR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs, 1423 Ferry Ave., Camden NJ 08104, 541-4200.**

Amsterdam NY
UPSTATE NEW YORK
Kenwood, ICOM, Drake, plus many other lines, Amateur Dealer for over 35 years. **Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010, 842-8350.**

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Featuring: Kenwood, Yaseu, ICOM, Drake, Ten-Tec, Swan, DenTron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products. You won't be disappointed with equipment/service. **Radio World, Oneida County Airport-Terminal Building, Oriskany NY 13424, 337-0203.**

Columbus OH
The biggest and best Ham Store in the midwest featuring quality Kenwood products with working displays. We sell only the best. Authorized Kenwood Service. **Universal Amateur Radio Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

Bend OR
Satellite TV. Known brands. Call today for more information and inquire about our dealer program. **WESPERCOM, P.O. Box 7226, Bend OR 97708, 389-0996.**

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ICOM, Bird, CushCraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, CDE, AEA, Vibroplex, Ham-Key, CES, Amphenol, Sony, Fanon/Courier, B&W, Ameco, Shure. **LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.**

Dallas TX
Dealer in Used Computer Hardware & Electronic Parts. Special on Daisy Wheel Printers. Xerox Word Processing Equipment, Dual Card Printers and Display Systems. Catalog $1.00. **Rondure Company (The Computer Room) Dept. 73, 2522 Butler St., Dallas, TX 75235.**

San Antonio TX
Amateur, Commercial 2-say. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard, Vibroplex, Midland, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc. 2317 Vance Jackson Road, San Antonio TX 78213, 938-3350.**

Vienna VA
The Washington metropolitan area's leading supplier of the latest in Amateur Radio and Test Equipment. On your next trip to the Nation's Capital, stop by and see us. **Electronic Equipment Bank, Inc., 516 Mill St. N.E., Vienna VA 22180, 938-3350.**

DEALERS
Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the July '82 issue must be in our hands by May 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	21	14A	14	14	7A	14	21	21A	21A	21A	21A
AUSTRALIA	21	21	14	14	7B	7B	14B	14B	14B	14B	14	21
CANAL ZONE	21	14	14	14	14	7	14	14	21	21	21A	21A
ENGLAND	14	7	7	7	7	14	14	14	21	21	21	14
HAWAII	21	21	14	7	7	7	14	14	14	14	21	21
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	21	14	14	7B	7B	7	7	7	7	14	14	14
MEXICO	21	14	14	14	7	7	14	14	14	21	21A	21A
PHILIPPINES	14	14	14	7B	7B	7B	7B	7B	14	14	14	14A
PUERTO RICO	21	14	14	14	7A	7A	14	14	21	21A	21A	21A
SOUTH AFRICA	14	14	7B	14	14	14	21	21	21A	21A	21A	14
U. S. S. R.	14	7	7	7	7	7A	14	14	21	14	14	14
WEST COAST	21	14	14	7	7	7	7A	14	14	14A	21	21

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7A	7	7	7	7	7A	14	14	14
ARGENTINA	21	21	14A	14	14	7A	7	14A	21A	21A	21A	21A
AUSTRALIA	21	21	14	14	14B	7B	14B	14B	14B	14B	14A	21
CANAL ZONE	21	14	14	14	14	7	14	21	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	14	14	14	14	14A	14
HAWAII	21	21	14	14	7A	7A	14	14	14	14	21	21
INDIA	14	14	14B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21	14	14	14B	7B	7	7	7	7	14	14	14
MEXICO	21	14	14	14	7	7	14	14	14	21	21A	21A
PHILIPPINES	14	14	14	14B	7B	7B	7B	7B	14	14	14	14A
PUERTO RICO	21	14	14	14	7A	7A	14	14	21	21A	21A	21A
SOUTH AFRICA	14	14	7B	7B	7B	7B	14	14	21	21	21	14
U. S. S. R.	14	7	7	7	7	7	14B	14	14	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	14	7A	7	7	7	7	7A	14	14	14
ARGENTINA	21	21	14A	14	14	7A	7	14	21	21	21A	21A
AUSTRALIA	21A	21A	21	14	14	14	14	14	14B	14B	21	21
CANAL ZONE	21	14A	14	14	14	7	14	14	14	21	21A	21A
ENGLAND	14	7	7	7	7	7	7B	14B	14	14	14	14
HAWAII	21A	21A	21	14A	14	14	14	14	14	21	21	21A
INDIA	14	14	14	14	7B	7B	7B	14B	14	14	14	14
JAPAN	21	21	14	14	14B	7	7	7	7	14	14	14A
MEXICO	21	21	14	14	7	7	7A	14	14	21	21A	21A
PHILIPPINES	21	14	14	14	14B	7B	7B	7B	14	14	14A	21
PUERTO RICO	21	14A	14	14	7A	7A	14	14	14	21	21A	21A
SOUTH AFRICA	14	14	7B	7B	7B	7B	14B	14	14	14	21	14
U. S. S. R.	14	7	7	7	7	7	7	14B	14	14	14	14
EAST COAST	21	14	14	7	7	7	7A	14	14	14A	21	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair G = Good
P = Poor * = Chance of solar flares; # = of aurora

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
						1 G/G
2 G/G	3 G/G	4 G/F	5 G/F	6 G/F	7 G/G	8 G/G
9 G/F	10 G/F	11 G/G	12 G/G	13 G/G	14 G/G	15 G/G
16 G/F*	17 F/F*	18 F/F*	19 F/F	20 F/F	21 G/F	22 G/G
23 G/G 30 G/G	24 F/P 31 G/G	25 F/P	26 G/G	27 G/G	28 G/G	29 G/F

NEW

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz - 30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC, 30, 17, and 12 meter bands, on SSB, CW, FSK, and AM. Features 150 kHz - 30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch changes in 1-MHz steps. A new, innovative, quadruple conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuit with cooling fan, SWR/Power meter built-in.
- **Automatic antenna tuner, built-in.**
  Available with AT-930 antenna tuner built-in, or as an option. Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for maximum flexibility, coupled with smooth, quiet operation. Switchable to semi-break-in.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz receive frequency shift.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slopes of the IF passband, for best interference rejection.
- **CW VBT and pitch controls.**
  CW VBT (Variable Bandwidth Tuning) control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100-kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Fluorescent tube digital display has analog type sub-scale with 20-kHz steps. Separate 2 digit display indicates RIT frequency shift.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power", plus improved intelligibility. Separate "IN" and "OUT" front panel level controls.
- **One year warranty.**
  The TS-930S carries a one year limited warranty on parts and labor.

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- MC-60 (S-8) deluxe desk microphone with UP/DOWN switch.
- TL-922A linear amplifier.
- SM-220 station monitor.
- HC-10 digital world clock.
- HS-6, HS-5, HS-4 headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street,
Compton, California 90220

KENWOOD
...pacesetter in amateur radio

Specifications and prices are subject to change without notice or obligation.

FT-230R: QUITE A SIGHT! (AND EASY TO SEE, TOO!!)

Sporting an all-new Liquid Crystal Display, the FT-230R is Yaesu's high-performance answer to your call for a very affordable 2 meter mobile rig with an easy-to-read frequency display! The FT-230R combines microprocessor convenience, a sensitive receiver, a powerful yet clean transmitter strip, and the new dimension of LCD frequency readout. See your Authorized Yaesu Dealer today — and go home with your new FT-230R!

SALE SUBJECT
FCC CERTIFICATION

- LCD five-digit frequency readout with night light for high visibility day or night.
- Two VFOs for quick QSY across the band.
- Ten memory slots for storage and recall of favorite channels.
- Selectable synthesizer steps (5 kHz or 10 kHz) in dial or scanning mode.
- Priority channel for checking a favorite frequency for activity while monitoring another.
- Unique VFO/Memory Split mode for covering unusual repeater splits.
- Up/Down band scan plus memory scan for busy or clear channel. Scanning microphone included in purchase price.
- Full 25 watts of RF power output from extremely compact package.
- Built-in automatic or manual tone burst.
- Optional synthesized CTCSS Encode and Encode/Decode boards available.
- Lithium memory backup battery with estimated lifetime of five years.
- Optional YM-49 Speaker/Microphone and YM-50 DTMF Encoding Microphone provide maximum operating versatility.

FT-208R
FM Handheld
2 Meters

FT-708R
FM Handheld
70 cm

And don't forget! Yaesu has a complete line of VHF and UHF handheld and battery portable transceivers using LCD display!!!

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SSB/CW/FM Portable

FT-690R - 6 Meters
USB/CW/AM/FM Portable

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The radio.

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