

July 1982 \$2.95
Issue #262

73[®] MAGAZINE

FOR RADIO AMATEURS

Salute to CW!
8 Articles

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Invisible Menace?**
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Cover: Photo by F. Dale Williams K3PUR, Littleton CO.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



DAYTON '82

It isn't just the flea market with over 500 small entrepreneurs selling out of their trucks, campers, and cars. It isn't the nearly 200 exhibitors inside the rambling Wampler's arena. It isn't the 25,000 or so hams and their families which descend upon Dayton in April every year. Pandemonium.

Whenever I hear about some hamfest or a computer show pulling 20,000, I think of what it takes to handle the crowds at Dayton and how many people this really is all in one area. The fields are packed with cars for a half mile or so around the arena area. The cavernous arena buildings are packed with people. No matter how many there are inside, it seems as if the flea market area outside is still so busy that it is difficult to get around.

Dayton attracts average hams from several nearby states. But more than that, most of the real "movers" of the hobby... the hams who are doing the building, the inventing, the pioneering... come from everywhere in the country. These are

the hams who make amateur radio the incredible hobby that it is.

Other hamfests may have technical sessions, but these are attended by merely interested amateurs. At Dayton, the attendance of these tech sessions is made up of the hams who are doing things. Here, one gets to say hello to the top DXers, the DXpeditioners, the slow-scan three-dimensional color experimenters, the packet switching fanatics, and the spread-spectrum aficionados.

While several of the other larger hamfests have gone to rather great lengths to bring in computer-oriented exhibitors, Dayton has maintained a straight ham approach which has kept this field of ham activity at a relatively low profile. Yet this year, when we counted the exhibits, we found that about 15% of them were computer-oriented. This is low, of course, compared to the computer interest in the ham world. Our most recent survey of the 73 readership showed that the ownership of microcomputers is up to 39%

now. In another year perhaps 50% of the readers will have microcomputers.

I tried to give a talk during the hamfest, but the meeting "room" was so terrible that I gave up. The temperature was well into the sleep zone and the noise was such that someone three feet away had trouble hearing what was going on. The area was just one part of a huge building, with deafening noise coming from all sides. I don't think I'll try that again. I'll bet it was 90° or more in the room, with only enough seats for about 70% of those who came to hear me.

My talks are generally rather low key, with some time required for the humor to come through. I do speak about serious things, but I don't take many of them seriously. And I don't do well when I have to communicate by yelling at people.

I'll no doubt continue to go to Dayton, but only to say hello, find out what's new, and get together with my friends in the industry.

HARRY, WHERE ARE YOU?

Missing for the first time in years at Dayton was the flushed cherubic face of Harry Dannals. I, for one, am sorry to see good old Harry go. And I have to admit that I was darned upset when I learned that the ARRL board just plain outright dumped him. Now what would it have cost them to be nice about it and give him a President Emeritus position?

Dick Baldwin, also not visible at Dayton, seems to have fallen in the same black hole now occupied by Harry, but at least with a face-saving title to make it look better. That's what they did with John Huntoon when the

power politics at HQ dumped him a few years ago. Anyone remember John?

You know, one of the surprises I got when I went around to visit some wealthy hams back in 1960 had to do with Dick Baldwin. I'd been fired by CQ as editor and had this crazy idea of starting my own ham magazine. I was hoping to find a ham with enough money to get a new magazine started. One chap I visited said he thought the idea was a good one, but that it was too dependent upon just one person: me. He was right about that, of course. He also mentioned that Dick had been around with a similar proposition a few days before.

I dropped Dick a note asking if he might be interested in a joint venture. He wrote back saying no. Well, I went ahead without any financing and Dick never did. Oh, it was nip and tuck for several years, particularly when the ham business fell to pieces after the 1963 ARRL proposal for changing the licensing structure back to the 1930s form. That's when we lost 85% of the sales of ham gear in just one year and all of the major manufacturers were forced out of the industry.

The ten years after that of no growth were hard ones for me and 73. It wasn't until I managed to sell the idea of FM and repeaters that the industry (and 73) turned around.

Harry, who had retired from his job at Sperry in order to be available for the General Manager's position, may have to unretire. I wonder what went wrong for him? I'm told by the ARRL insiders that he performed the most exhaustive campaign for the job in history... at League expense. Perhaps it was his bitter opposition to having a woman on the board. Well, no matter... Harry is well out of the rat race and the demands of the ARRL presidency. I was worried that the even greater pressures of being General Manager might be too much for him. Perhaps he can relax now and add at least twenty years to his life. This may be the best thing that has happened to Harry in years... instead of the disaster which it first appears.

INSTANT LICENSES

At long last a solution to the code exam has been effected. Now it is no longer necessary

VOLUNTEERS NEEDED

How would you like to be on the "inside" of a major amateur radio contest? Here's your chance!

We're looking for volunteers to become members of the 73 Magazine Contest Committee. Anyone with an interest in contesting and a willingness to work hard is welcome. Committee members will help with the following:

1. Contest rules and ethics.
2. Forms and correspondence.
3. Log checking and scoring.
4. Filling out and mailing awards.

Heading up the Contest Committee is Bill KE7C. Please drop Bill a note (with SASE) and let him know where you can help. Write to Bill Gosney KE7C, 73 Contest Committee, 2665 North Busby Road, Oak Harbor WA 98277.

We want you on the 73 Contest Team!

Power up.



40 W, 15 memories/offset recall, scan, priority, DTMF touch-pad

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- **15 multifunction memory channels, easily selectable with a rotary control**
M1-M13... memorize frequency and offset (± 600 kHz or simplex). M14... memorize transmit and receive frequencies independently for nonstandard offset. M0... priority channel, with simplex, ± 600 kHz, or nonstandard offset operation.
- **Internal battery backup for all memories**
All memory channels (including transmit offset) are retained when four AA NiCd batteries (not Kenwood supplied) are installed in battery holder inside TR-7850. Batteries are automatically charged while transceiver is connected to 12-VDC source.
- **Extended frequency coverage**
143.900-148.995 MHz, in switchable 5-kHz or 10-kHz steps.

- **Priority alert**
M0 memory is priority channel. "Beep" alerts operator when signal appears on priority channel. Operation can be switched immediately to priority channel with the push of a switch.
- **Built-in autopatch touch-pad (DTMF) encoder**
Front-panel touch pad generates all 12 telephone-compatible dual tones in transmit mode, plus four additional DTMF signaling tones (with simultaneous push of REV switch).
- **Front-panel keyboard**
For frequency selection, transmit offset selection, memory programming, scan control, and selection of autopatch encoder tones.
- **Autoscan**
Entire band (5-kHz or 10-kHz steps) and memories. Automatically locks on busy channel; scan resumes automatically after several seconds, unless CLEAR or mic PTT button is pressed to cancel scan.
- **Up/down manual scan**
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- **Repeater reverse switch**
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Other accessories not shown:

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for anyone to bother to learn even one single character of the Morse code to get a ham license. The solution to the code problem is so simple I'm amazed that no one ever thought of it before. Once you get the concept, you see that we no longer have to argue about the code.

At Dayton someone was selling a cassette with the FCC code test on it. With today's miniature cassette recorders it is a snap to have one in your pocket and record the tests as they are being given. Well, someone did this and was selling the tapes at Dayton. Once you have that all you have to do is get someone to translate it for you, memorize the short text, and present yourself for the test.

The FCC is so underpowered these days that they really don't have the personnel to devise a lot of different tests. I'll bet that at best they have maybe two for Morse code, if that many. There are no indications that the Commission is going to get more money from Congress, so it is unlikely that there will be much doing in the way of changes.

So, by the time you put the Bash books together with a cassette of the code test, you have a ham license that anyone who can read and write can get. No more is there a need for that tedious learning of the code. No more struggling with theory or the rules. Bash gives you the answers to the written exam and the code cassette solves that problem.

Who will be the first Extra to get licensed with no ham knowledge whatever? Or perhaps I should ask, who was the first?

As a humorous side note: the FCC recently was handed a code test exam which was 100% perfect. Well, perhaps almost perfect. You see the answers were perfect for the other test... not the one given.

WE NEED KIDS

With all due respect to Bash and his one-day blitz cram courses, at \$175 for one day it is unlikely that we are going to get many kids into the hobby via this mercenary system.

Now, I have the greatest admiration for Bash and his bid to outdo Don Miller in making money out of amateur radio. I'm sure he will find no shortage of well-to-do hams who want to get a higher license without having

FCC DELETES 97.71 AND 97.74

"Unenforceable, burdensome and unnecessary" is how the FCC described 97.74, a rule requiring amateurs "to provide for measuring the station's emitted carrier frequency and to establish procedures for independently checking it regularly." In their April 1 meeting, the commissioners voted to delete 97.74 and 97.71, a rule which required transmitters operating below 144 MHz to have adequately-filtered plate power supplies. In deleting 97.71, the Commission said "the rule itself is inappropriate and outmoded."

to learn one bit of theory. Just ten of his weekend sessions a year should net him around \$150,000. One really has to admire that, no matter what the consequences to the hobby.

His system is simple and it works. He sits you down for a full day of memorizing the answers to the questions. He has you write down the answers you are going to need the following day on the exam... write 'em two or three times to make sure they are well-established in your short-term memory. As an aspiring General or Advanced, you can't lose. Neither can Bash.

All this has absolutely nothing to do with the major crisis in amateur radio: the need for new hams. Novices... teenagers. We already have all of the old men we need in amateur radio—now what we need is to see about 100,000 new Novices per year to get our rusty old hobby jumping again. That would spur technical developments and building (kids really love to build) and get some life into things.

What has your club done to get a ham group started in the

local high school? If we don't even give the kids a chance to be exposed to amateur radio, we have no gripe when they turn to drugs, drinking, getting into car accidents, malicious destruction, spray painting everything in sight, and getting all of your girls pregnant. At least give them an alternative!

NAVASSA TIME

The May 3rd issue of *Time* had a nice article on the recent hamming of Navassa Island. As one of the few persistent (stupid) enough to go there twice, I read the item with more than average interest.

The first trip, in 1958 (KC4AF... a call now held by a chap in Alabama), saw six of us chartering a motor-sailer in Nassau and making our way down the Bahamas to Haiti through a heavy storm. We just barely missed crashing on a reef when we got to Haiti before dawn. It was a hell of a trip and we found ourselves about 50 miles off course by the time we

Continued on page 118

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 (*Option)
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 Power requirements: AC 100/117/220/240V, 50/60Hz, 50VA
 Dimensions and Weight: 340mm(W) x 140mm(H) x 300mm(D); Approx. 7.5kg
 Preset memory (Option): 24ch
 Frequency stability: Less than 50Hz per hour after warming up.
 Image rejection ratio: 70dB or more
 IF rejection ratio: 70dB or more
 Input impedance: 50 to 75 ohms, unbalanced
 AF outputs:
 Speaker output: 1W or more (4 ohms)
 Record/line output: 1mW or more (600 ohms)

Highest grade all-wave receiver

NRD-515

Best for 59

Transmitter, NSD-515



SPECIFICATIONS

Rated output power: 100W NSD-515 (50W 28MHz band)
 Frequency range: 1.8MHz-2.0MHz/3.5MHz-4.0MHz/
 7.0MHz-7.3MHz/14.0MHz-14.35MHz/
 21.0MHz-21.45MHz/28.0MHz-29.0MHz/
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Log of the Colorado Queen

— wet, wild Field Day fun

F. Dale Williams K3PUR
5592 S. Moore Street
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Spring, as reflected in the short-lived green sheen of the foothills, was well settled in the Rocky Mountains when the members of a Denver area amateur radio club gathered to discuss the 1978 Field Day activities. The interests of the club had varied over the years, but the recent increased appeal of contesting and the technical antenna expertise promised in the

form of a full-size 40-meter beam to help fill in the propagation holes in 10-20 meters convinced the membership to go all out for top spot in the Field Day results.

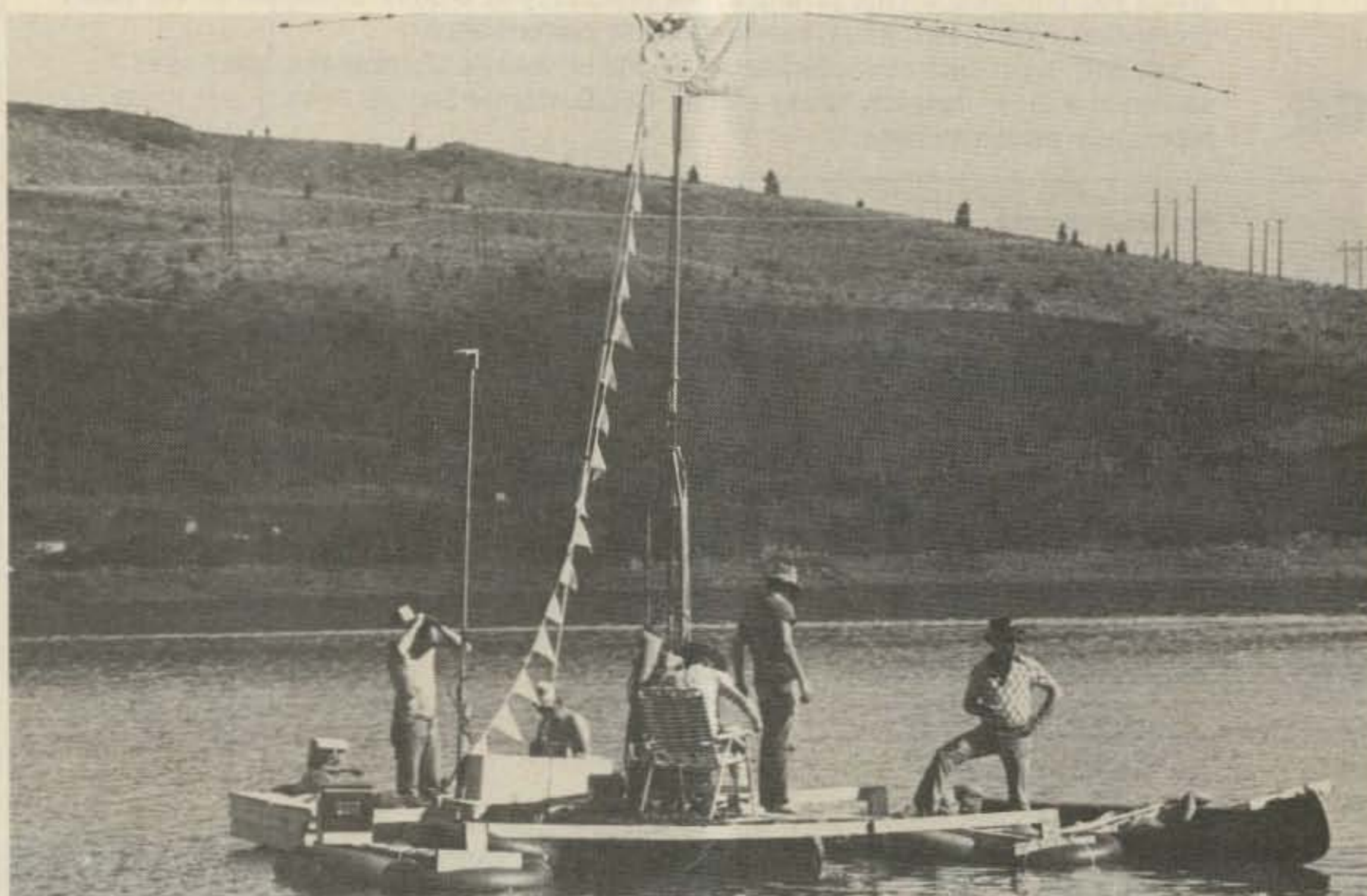
Without debating the good and bad points of Field Day, suffice it to say that participation can be divided into two broad classifications—high key and low key. Those groups scoring high obviously are in the high-key category which describes the organization, planning, and pressure required. The pursuit of a hobby is supposed to be fun and the belief that a sense of

personal accomplishment could be achieved without the peer pressures for maximum contacts led to the breakaway, following the 1978 Field Day activities, of five members of the club who subsequently formed "the crew."

When the crew, consisting of Al NØAUS, Pete N6EBC (ex-WDØBJY), Gary WDØGGL, Glen WDØFEO, and Dave WB8KYP, meets, they have only two goals: having fun and planning technical projects which some people say can't be done. It was this attitude that prevailed at the first

meeting of the group where plans were formed to construct a floating all-band station. Once the concept was agreed upon, it became obvious that this vessel would require a name befitting its heritage. Since NØAUS had a thing for the *African Queen*, having seen the movie more times than he could remember, it wasn't long before the group came up with some apropos phonetics and a name: CQ, the *Colorado Queen*.

During the winter, plans for a 1979 summer launching were made with reckless abandon and much beer. Chatfield Reservoir, south of Denver, at an elevation of 5432 feet, was chosen as the site of operations and WDØFEO offered the use of his 10-man white-water rubber raft as the ship of destiny. As might be expected, the selection of a suitable antenna and how to mount it to a rubber raft were the biggest problems. The final solution involved a 14AVQ all-band vertical, owned by WDØFEO, and a floating platform. A hollow steel pipe and flange were attached to the center of a large diameter circular section of plywood through which a hole had been drilled in the center. Three 900 x 16 truck inner tubes were mounted under the platform to provide flotation and stability; three outriggers, emanating from the



The crew and the Colorado Queen preparing to begin the weekend operations.



WB8KYP readies the triband beam for a little more height.

platform and made from 2 x 4 x 12s, supplied guy points for the vertical which was attached to the pipe. A long cable connected to and extending through the center of the pipe into the water served as system ground. Support framework for the equipment and personal gear was ably constructed through the experience of WD0FEO and the crew's labor.

Now consider, for a moment, a 14-foot rubber raft powered by a 3.5-horsepower motor towing the antenna platform just described with the vertical via a 30-foot rope. While underway, the floating antenna platform maintains its distance, but when the raft is stationary, the weight of the rope and coax connecting the rig on the raft to the antenna tend to draw the platform closer as the cable sinks into the water. A number of four-inch styrofoam balls, with a hole cut through the center

for the coax, solved this problem and prepared the *Queen* for her August 18th inaugural voyage.

With a Yaesu FT-101EE powered by two paralleled lead-acid batteries, various 2-meter hand-helds, assorted swr meters, and other gear on board and an appropriate christening with white lightning, the historical launching of the first mile-high freshwater mobile took place amidst the curious gazes of swimmers, boaters, and sunbathers. During the weekend of operation, many contacts were made, lots of time was spent rag-chewing as opposed to exchanging callsign, signal strength, contest number and best wishes, and most important of all, a fun time was had by all, including WB8KYP who towed a stranded cabin cruiser back to shore with his "shuttle canoe" and paddle power. The only casualties, other than operator sunburn, on this



The backup Kenwood, unloaded by WD0FEO, provided flawless operation.

first voyage were a water-logged 2-meter hand-held and damp finals in the FT-101EE.

It is a well-known fact that the higher the antenna, the better the communications. Therefore, Green Mountain Reservoir, at an elevation of 8200 feet, was chosen by the crew for the 1980 launching of the *Colorado Queen*. Besides that, WD0FEO offered the use of the family cabin for a weekend of revelry. The same basic raft and antenna platform were used with some extra framing and plywood floor added to the raft for rigidity and the addition of equipment boxes to preclude some of the water

problems encountered the previous year.

After a successful launching and an uneventful morning of operation, the crew was languishing on the deck, contemplating the relative merits of Coors beer, better known as Colorado Kool-Aid, when the capricious mountain weather made one of its abrupt changes. In less time than it takes to QRX, the sun disappeared and 70-mile-per-hour winds whipped the surface of the water into a rough pattern of whitecaps. Since the closest land was in the form of an island, the crew cranked up the 3.5 pony-power engine and headed the *Queen* for the leeward side. The

bamboo mast supporting WDØFEO's 2-meter beam split with a resounding crack and the antenna was fished out of the drink by means of the still attached coax.

When the island was finally reached, everyone disembarked to attempt to find some shelter. It was a short time later when it was discovered that no one had dropped anchor or tied up the raft, which was now making good time away from the island. Luckily, the shuttle canoe was still on the shore and the chase began. In the ensuing recovery, to add insult to injury, WDØFEO's ten-gallon hat was blown into the water where it promptly sank beneath the waves. Repeated efforts to recover this well-worn relic were all in vain, although WB8KYP swears he saw a catfish wearing something similar as it jumped in front of the raft.

No sooner was the raft secured back at the island than some crew members decided that the original cargo of three cases of beer was fast being depleted and some suntan lotion to soothe the morning's ultraviolet onslaught was in order. What is it they say about discretion being the better part of valor? Anyway, WDØGGL and WB8KYP volunteered to take the canoe and attempt to refurbish the supplies. In an adventure about which the residents along the shoreline still chuckle, these two stalwarts paddled and bailed their way to the far shore, in the only vessel on the water, oblivious to the binocular-equipped audience watching from the many windows on land. Reportedly, the trip back to the island after obtaining the necessary replenishments was much easier with the wind at the rear. Sunday dawned bright and clear, providing a fine atmosphere for the conclusion of that year's freshwater operation with only a Yaesu 2-meter

rig sustaining water damage and WB8KYP once again coming to the rescue of a stranded cabin cruiser, but this time he was prepared (?) with a 1.7-horsepower Neptune engine mounted on his shuttle canoe.

By 1981, the crew was looking for bigger and better challenges to conquer with the *Colorado Queen* and had made the operation an annual event taking place the weekend following the July 4th holidays. Commensurate with the arrival of spring, the crew, minus N6EBC who had been transferred to California, gathered to begin construction of the latest version of the *Colorado Queen*.

Over the winter months a new design for the antenna platform had evolved, made necessary by the decision to use WB8KYP's TH-3Jr. tri-band beam. WDØFEO had

managed to find a small boat dock which had four 50-gallon drums attached underneath for flotation and steel-rimmed wheels mounted on the sides for easy water entry and exit. Six 900 x 16 truck inner tubes were added for stability and two 2 x 4s for attaching the floating dock to the framework of the raft. Three holes drilled at the center of the dock allowed the mounting of a steel tower section which was guyed to the four corners of the dock superstructure. The mast was then slipped through the tower pipe and the triband beam mounted on top. Enough mast was used to allow the antenna to be raised between six and fifteen feet and still offer the capability of armstrong rotation.

The first test of this water mobile antenna barge almost drowned two of the

crew due to its top-heavy attitude. Subsequently, an exercise with a local firm's Computer Aided Design equipment showed that a 180-pound counterweight suspended nine feet below the water line would stabilize the platform. Oh, the wonders of modern technology. The counterweight was constructed and made adjustable so that it could be raised when approaching the shore or lowered to 14 feet for windy conditions.

As the weekend of July 11-12 drew closer, construction activity intensified. Boxes to hold the lead-acid batteries were built, a bracket assembly to provide mounting of the 14AVQ to the raft frame for 40- and 80-meter operation was completed, and white paint flowed freely.

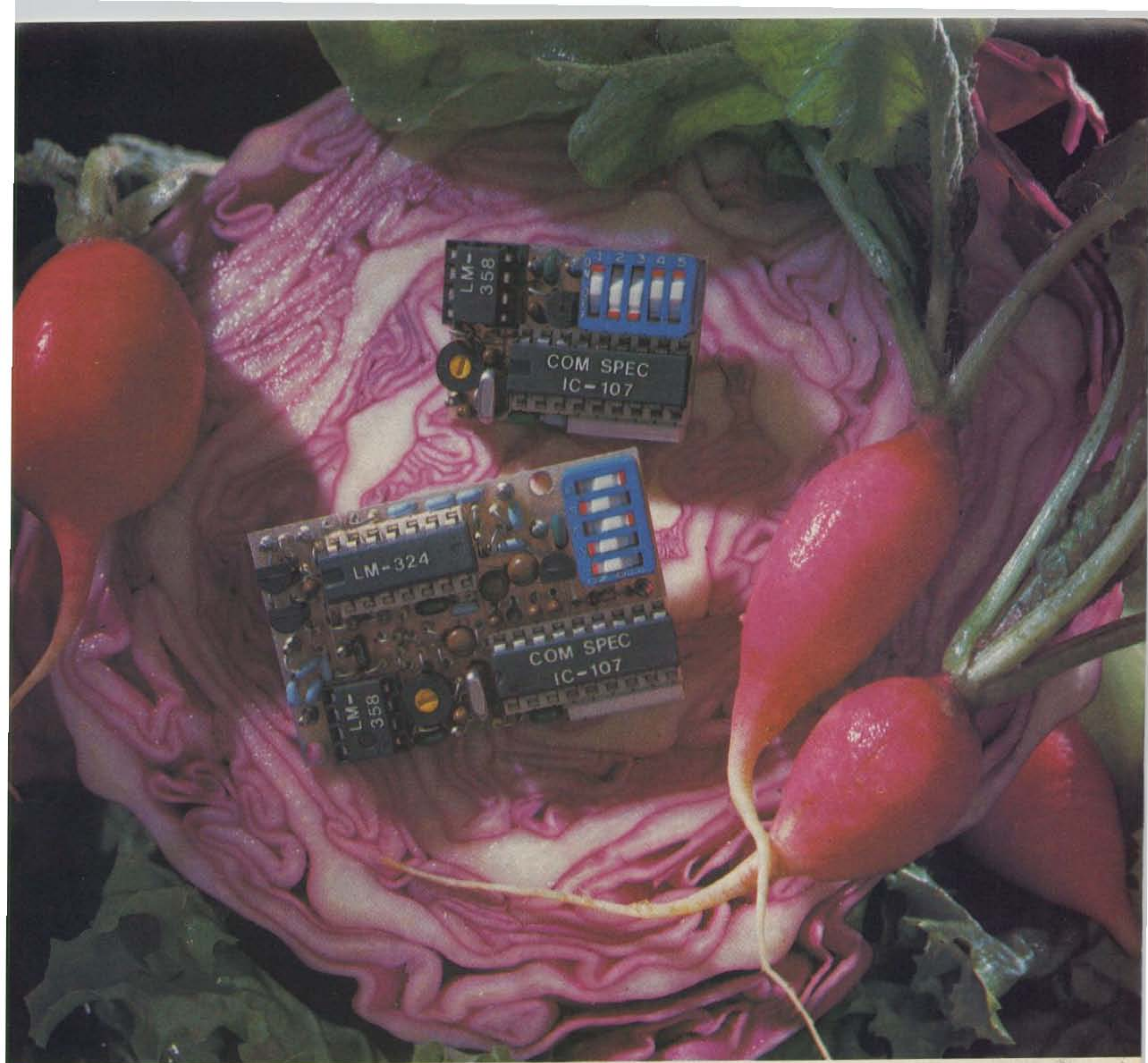
By the time launch day 1981 arrived, the crew had put in at least 480 man hours in labor alone. The arrival in Denver of N6EBC a few days prior to the weekend signalled the imminent pack-up and departure of the crew for the mountains. Assembly of all the miscellaneous parts, all prepared and marked beforehand, took about two hours on Friday.

Meanwhile, N6EBC had brought along some Santa Maria beans from California which he put in a borrowed enamel pot, then adding some "miscellaneous condiments" before placing them on the gas-modified woodstove to cook. I have been known to prepare some pretty bad-looking vittles, but I have never seen anything eat the enamel off the inside of the pot like those beans did. Thank goodness the sirloin roasts with the secret flavoring, barbecued over an open oak fire, were really good.

Bright and early Saturday morning, the rigs and equipment were loaded into the raft and hooked up and the third annual launching of the *Colorado Queen* became history—or so it was



WDØGGL relaxes as the sun tries to burn off the early morning mountain mist.



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supposed to be. Output power from the Yaesu FT-101B was almost nil and the LEDs on the front of the Icom 2-meter rig would not even glimmer. Power connections were checked and rigs exchanged without success. Finally someone got the bright idea of measuring the voltage of the batteries. Eureka, a brand new heavy-duty battery had a shorted cell and was pulling the parallel battery combination down to about 8.5 volts. The extra drain on the good battery limited current capacity for the day's operation, even after the bad battery was replaced.

Late Saturday afternoon some clouds moved in and the wind picked up, causing a slightly earlier than usual beaching of the *Queen* for the first day. A Kenwood TS-520S was put in service Sunday morning but the skip was not too long, with most of the QSOs originating out of the eighth call area.



From the operating position, N6EBC and N0AUS divide their activities between testing 807s and logging contacts.

Shortly before noon on Sunday, the clouds and wind returned from the opposite direction and the smell of ozone in the atmosphere indicated a high level of static electricity. As WD0FEO guided the floating station into the dock, the static build-up became so bad that a humming and discharge clicking were clearly audi-

ble, but the antennas were grounded and the equipment was removed without incident. Despite these technical problems, poor band conditions, high wakes from power boats pulling water skiers (which made the tri-band elements flap through a three-foot arc), and the many visitors that WB8KYP shuttled back and forth in

his canoe, the two days of freshwater mobile operation, gourmet food, and 14 cases of beer made for an unsurpassed weekend of camaraderie and enjoyment.

What will the crew do for an encore? Well, plans are already underway for the construction of a motorized dock large enough for the TH-3Jr. at 30 feet, the 14AVQ vertical, a 2-meter mast and five-eighths groundplane, a gasoline generator, a Model 35 Teletype, three operating positions, and many creature comforts. When not in use, the dock will serve its normal purpose.

If you didn't manage to get your call letters entered into the log of the *Colorado Queen* for 1981, you missed the opportunity of receiving a fine 8 x 10 color picture QSL card. Mark your calendar now for July 10-11, 1982 — the crew will be listening for you. ■

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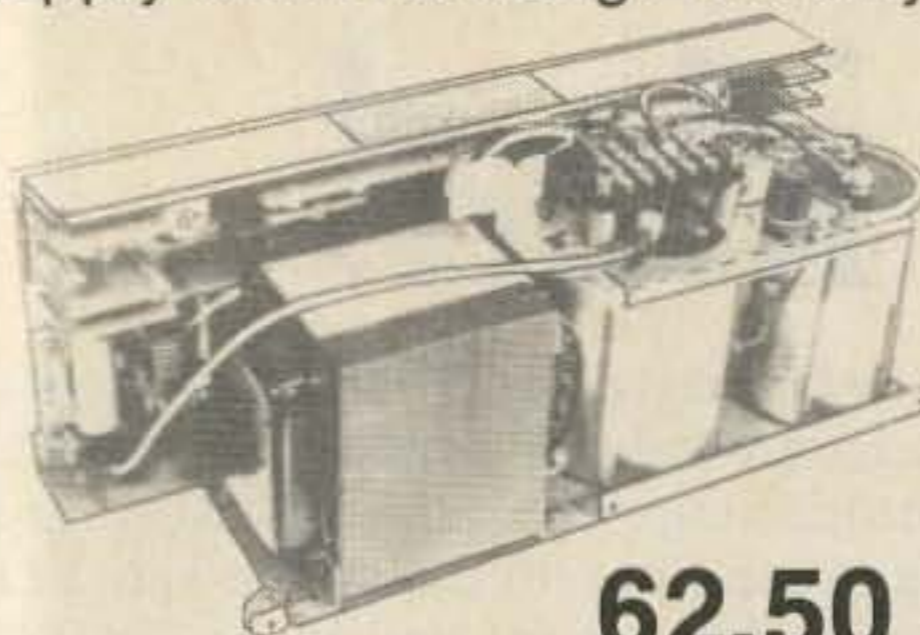
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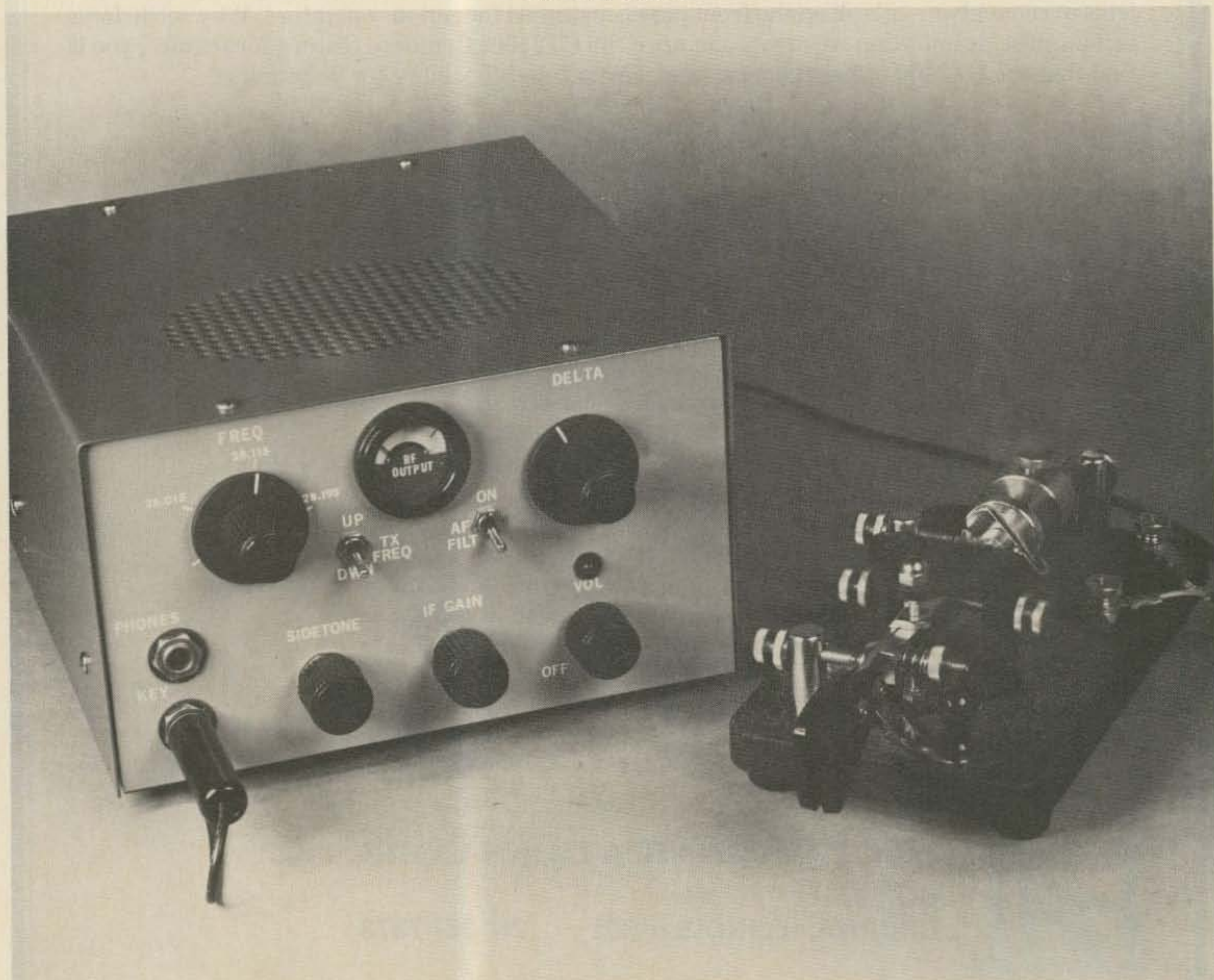
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CB to CW?

— converting the Hy-Gain board

Photos by W1GSL



Operator's view of the transceiver. Note the insulating washers around the key and phone jacks. The internal dc power ground is floated from the cabinet to permit use of an external supply of either polarity. Front panel is 7" × 4".

Penn Clower W1BC
459 Lowell Street
Andover MA 01810

If you're one of the thousands of hams who bought one of those Hy-Gain CB set printed circuit boards for a song when they appeared on the surplus market, then this may be the article you've been waiting for. Described here is a neat little ten-meter CW rig that boasts a feature you won't get in the standard HF transceiver: full break-in. The rig is built around the Hy-Gain board and is inexpensive to duplicate. You don't have to buy any new crystals or exotic ICs; in fact, the design philosophy has been to add nothing which couldn't be found at the local Radio Shack outlet. If your junk box contains a few old transistor radios and a twelve-volt power source, you shouldn't have to buy anything at all.

Before getting into the actual conversion steps, let's review what we have and where we're taking it. The circuit boards on the surplus market were destined to go into a whole family of Hy-Gain sets (models 2679, 2680, 2681, and 2683, at least). The receiver is a dual-conversion superhet with i-fs at 10.7 and .455 MHz. The transmitter is AM with an output between 3.5 and 6 Watts depending on individual transistor characteristics and the supply voltage. The heart of the frequency-determining scheme is a PLL-02A phase-locked loop chip, and it is possible to put the rig on ten meters by rearranging the wiring of the channel selector switch and modifying some of the other loop components. The theory behind the

means of changing the frequency coverage is described in my earlier article ("CB to 10," 73 Magazine, September, 1980) in more detail than I will go into here. I strongly suggest that you get and study that earlier article along with a circuit diagram of the board (I use the Sams Photofact folder covering the Hy-Gain model 2679A) before you start this project. The modifications aren't difficult, but I won't repeat here large sections of the earlier article. The modifications described here are given in three stages. First, the basic conversion to CW on ten meters: the frequency change, the bfo, fine tuning, and putting the transmitter on CW. Second are some convenience features: side-tone oscillator, detector modifications, rf/i-f gain control, transmitter frequency offset, and an active audio filter. The final stage is the modification to give full break-in. There are a lot of circuit changes involved in the complete conversion and I strongly suggest that you make and try them out one at a time. Troubleshooting a problem can be fairly easy when you know that it must be due to those last five wires you

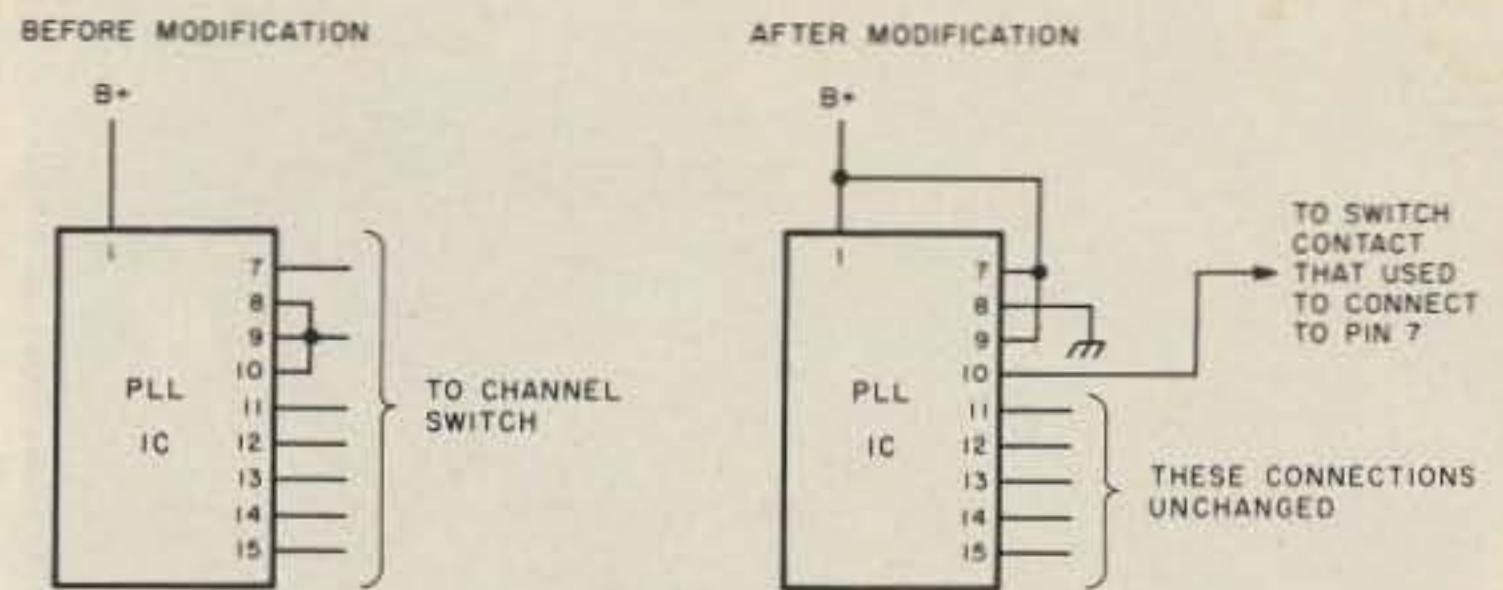


Fig. 1. Channel selector modification.

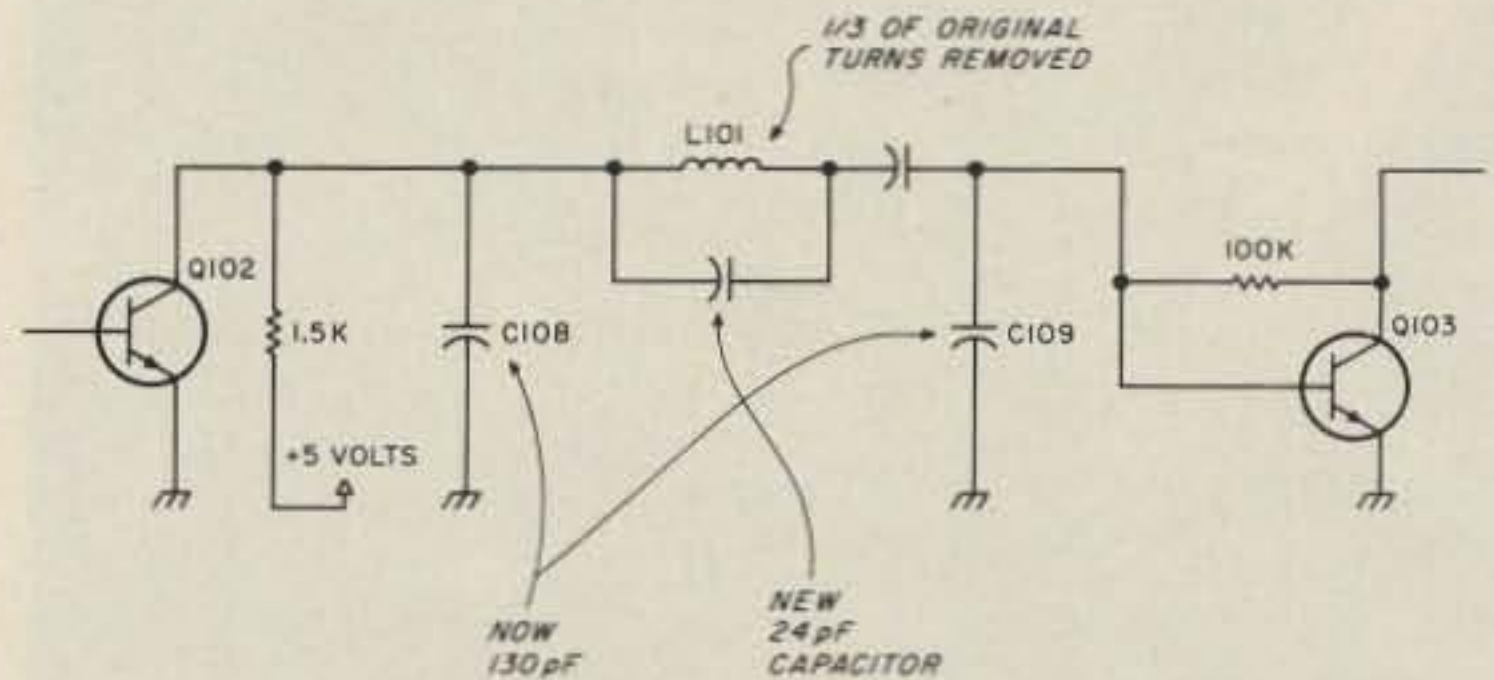


Fig. 2. Modifications to increase bandwidth of low-pass filter.

moved. A lot more time and test equipment will be needed if the set is silent and the cause could lurk in any of a half dozen modified areas. There are a lot of circuit changes involved in the complete conversion but most can be made and tested a few at a time.

A complete "road map" of the conversion is shown in Fig. 16 where a block diagram of the transceiver shows how the various steps fit into the big picture. For a starting point, it is assumed that your board is checked out and working as designed on 11 meters.

Several last precautions are in order before getting down to circuit details. Hy-Gain made a lot of these boards in many different

varieties. Many have open areas on the circuit board which when filled with components add features like the i-f noise blanker. Don't worry too much about the missing components, but if you are given a choice, take the board with the most parts in it.

There are two different audio amplifier ICs in the sets I have seen: the pin-out and circuit are different, so you should watch out for that. Some boards were made to have the channel switch solder directly to the board, while others had posts for wire leads—this is a minor matter, but something you may have to allow for.

There is one crucial dif-

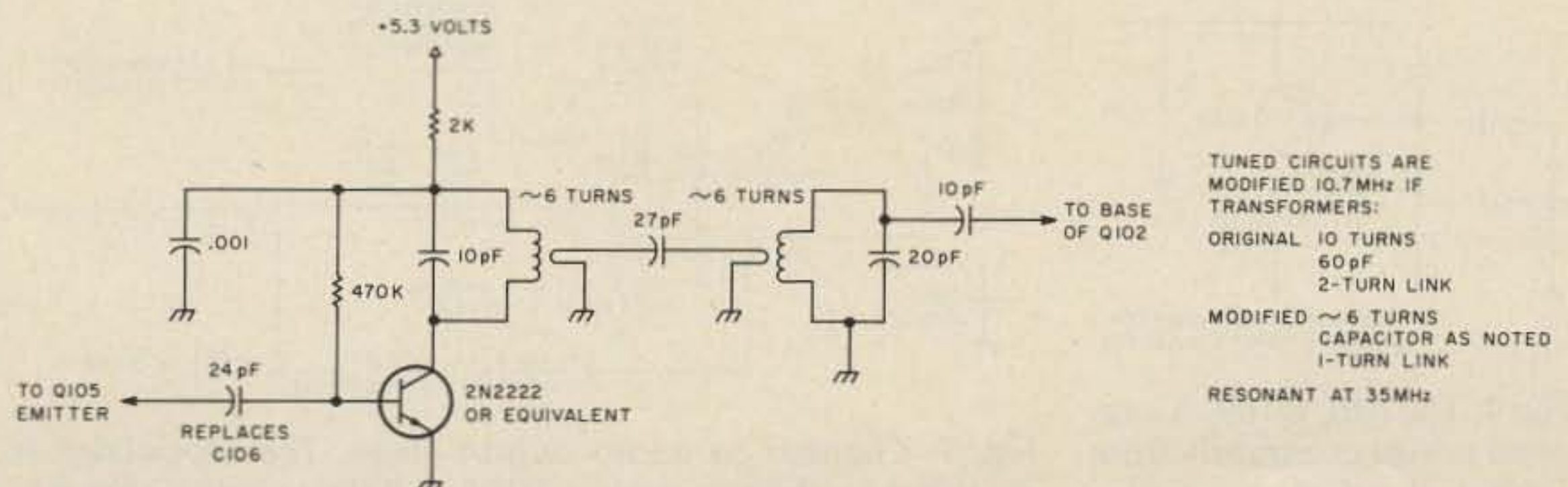
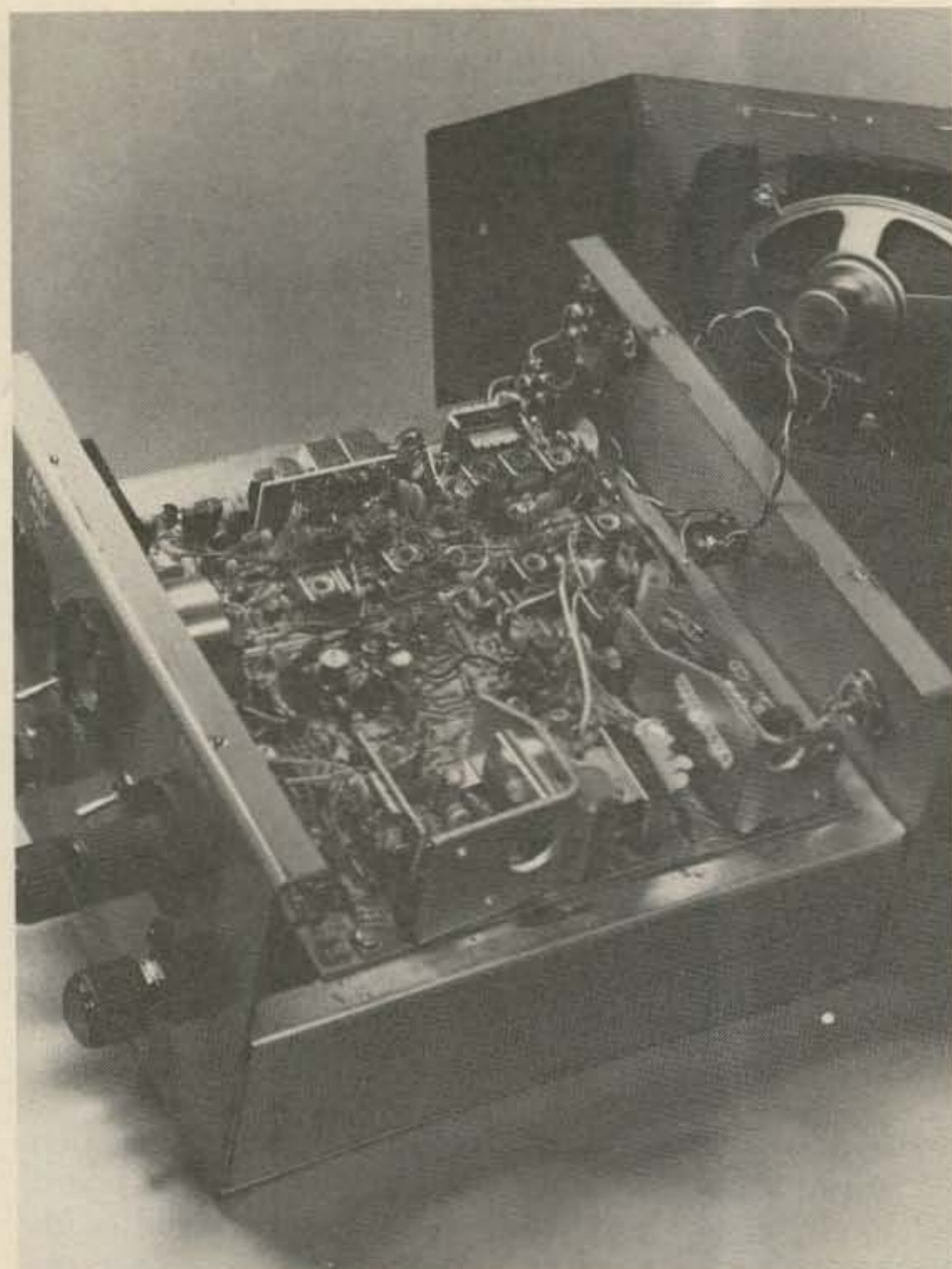


Fig. 3. Tripler schematic diagram.



Interior view. Note the tripler board and the active filter board mounted upright from the main circuit board. Also shown is the method of mounting the speaker inside the top cover.

ference between the boards presently available—the PLL IC sometimes has 16 leads and sometimes has 18. The 16-pin packages may have one of several type numbers, but all are similar to the PLL-02A and can be converted as described in this (and the earlier) article. The 18-pin PLL IC is a dead end. These boards were destined to go in the Hy-Gain 16, a uP-con-

trolled trunk mount model with a fancy calculator-like microphone/control unit. The PC card communicated with that unit via a serial data bus controlled in part by extra circuits inside the 18-pin PLL IC. Those boards cannot be converted as described here. If you have one of those boards, your best bet is to get the microphone and interface card that go with the main

board and put it on 10 by changing the 11.806-MHz crystal.

Stage One—The Basic CW Conversion

The first and biggest step in modifying the rig is getting the operating frequency to ten meters. The conversion of the phase-locked loop requires three main steps: changing the programming of the loop divider, increasing the passband of the low-pass filter following the loop mixer, and adding a frequency tripler between the 11.806-MHz crystal oscillator and the loop mixer. Changing the loop frequency programming is the easiest step of the three. The PLL-02A chip contains a nine-stage binary divider which, along with the 10-kHz reference derived from the 10.240-MHz oscillator, sets the loop operating frequency. The divider is switched by changing the dc levels on pins 7 through 15. A logic one (5 volts) on a particular pin will enable the division controlled by that pin. All nine control pins are manipulated by the channel switch so that for channel 1 the overall division is 224 while on channel 40 the division is 268. The plan is to change this switch coding and therefore the operating frequency.

we could change the divisor code to correspond to 328 on that channel instead of 224. Unfortunately, we can't make completely arbitrary changes in the divisor size because we are stuck with the channel switch and the code built into it. However, it is possible to reroute the connections between the switch and the PLL chip so that channel 1 moves up 960 kHz to 27.925 MHz. This means that channel 8 will then fall on 28.015 MHz and channel 40 on 28.365 MHz. The bulk of ten-meter CW activity takes place in the lower 200 kHz of the band, so the seven lower channels won't really be missed.

Now for the actual wiring changes. The schematic of the change is shown in Fig. 1. First cut apart pins 8, 9, and 10 of the IC on the circuit board foil. Pin 7 is disconnected from the channel switch and connected to +5 volts at pin 1, and the same is done for pin 9. Pin 8 is grounded and pin 10 is connected to the switch terminal that used to go to pin 7. That's all there is to the channel selector modification.

The frequencies for the new channels are given in Table 1 along with the appropriate phase-locked loop coding. The logic 1 level corresponds to 5 volts, while the 0 is ground, and you will want to run down the IC pins with a voltmeter to verify that the correct code for a particular channel actually shows up. There are several types of 40-channel switches sold for use with this board and it is easy to get confused about where the 5 volts goes in and the various IC pin connections come out.

Notice that the 10-meter channels, like the CB channels, are 10 kHz apart but that some frequencies are skipped and others are out of order. Be careful of the

For example, note that since channel 1 is on 26.965 MHz and the steps are 10 kHz apart, we could move channel 1 to 28.005 MHz if

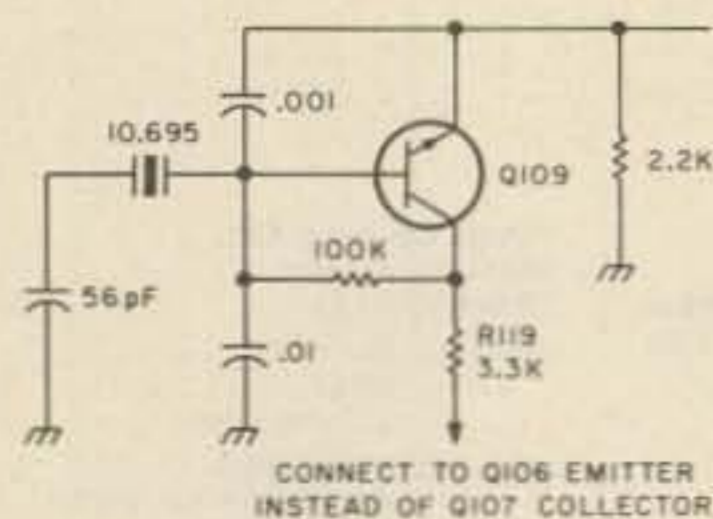


Fig. 4. The bfo, Q109, is supplied power constantly from Q106 instead of only during transmit.

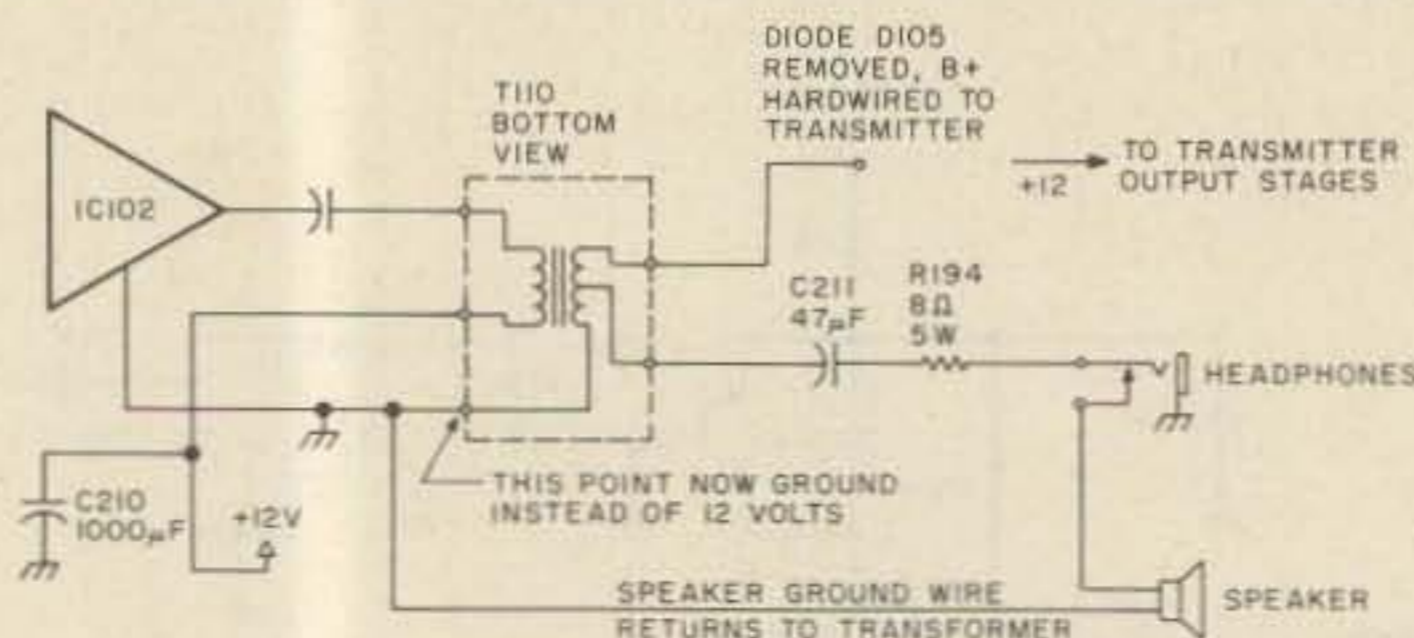


Fig. 5. Changes to audio output stage. The modulator is disabled by the removal of D105 and the speaker circuit is now operated at ground potential.

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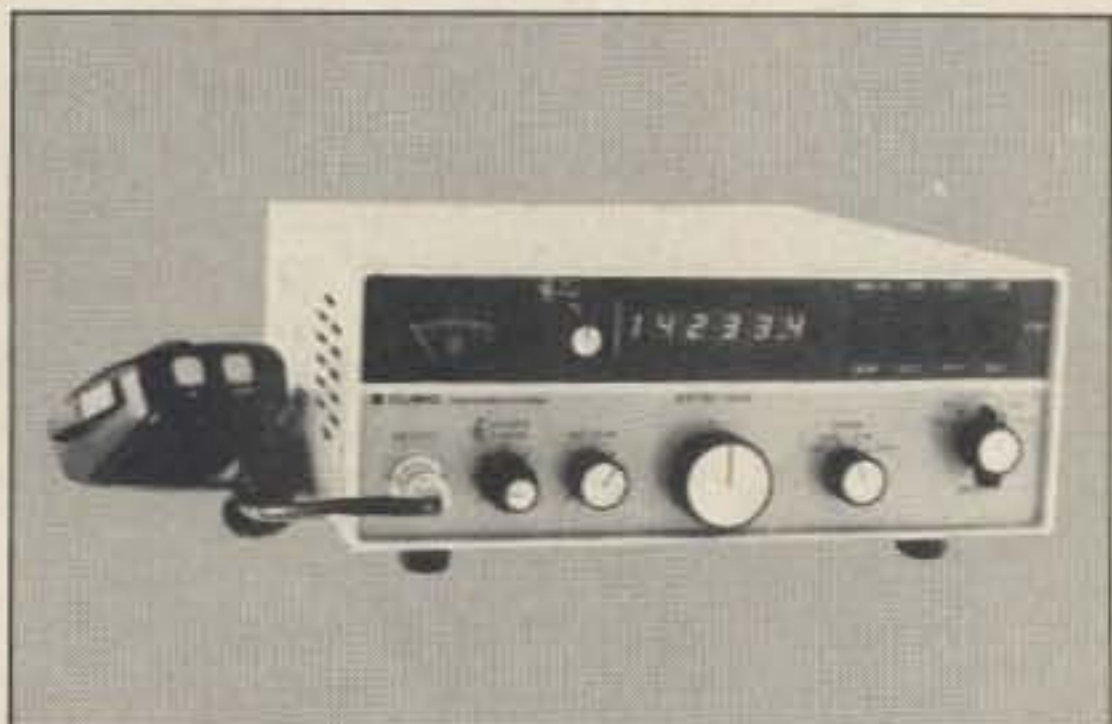
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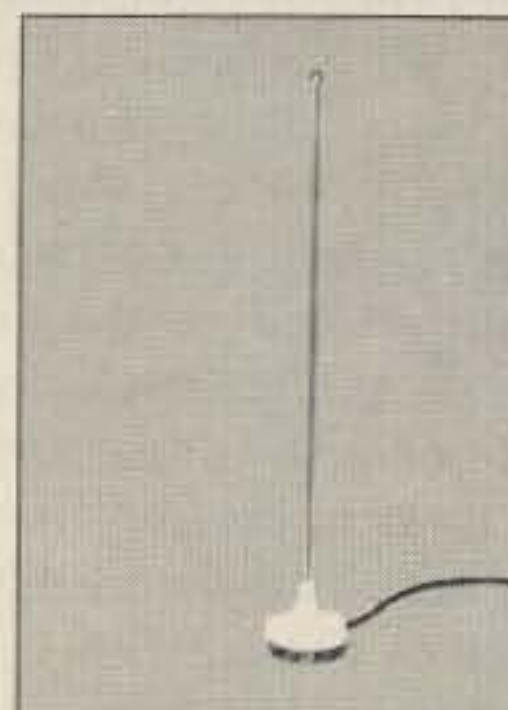
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band edges, particularly if you're a Novice and especially after the fine-tuning modification is added.

The next step is to change the passband of the low-pass filter between the loop mixer, Q102, and the mixer buffer, Q103. This modification is necessary because the highest frequency passing through this filter is now 3.64 MHz instead of 2.68 MHz. The circuit changes, shown in Fig. 2 are straightforward. C108 and C109 are reduced from 330 to 130 pF, about one-third of the turns are removed from L101, and the inductor is paralleled by a 24-pF capacitor. These changes are fairly non-critical; the set described in the earlier article used 180-pF capacitors, half the turns on L101, and 82 pF in parallel with the coil. The values shown in Fig. 2 work fine, but if you have some capacitors that are slightly larger, don't be afraid to try them.

The final and probably most complex change is the addition of the tripler following the 11.806-MHz oscillator. The mixer input is really looking for the third harmonic of that frequency, but the Hy-Gain designers were able to save a stage by letting the mixer do the frequency multiplication as well as the mixing function. That trick doesn't work as well for us because the loop operating frequencies are shifted enough that some of the spurious mixer products cause trouble. As explained in the previous article, these spurious products can actually prevent lock on frequencies higher in the ten-meter band. The CW end of the band is close enough to the CB frequencies that the loop will lock without the tripler addition, but I found that the fine-tuning modification (described later) would not function properly. The frequency would shift all right, but over a portion of the

shift range an unwanted beat note would appear in the mixer output. This beat would cause FM on both the transmitted and received signals. The tripler completely cured the problem, but you may elect to first get the loop running without that added complication as an easy means of verifying the other PLL modifications. By all means do add the tripler before getting on the air, or be prepared to get a lot of reports of hum on your signal (and don't be fooled, as I was at first, by looking at your output envelope and seeing no modulation—it sounds like AM hum, but being FM won't show on a scope.

The tripler schematic shown in Fig. 3 is simpler than the one described in the first article, but works just as well. A single stage multiplies the 11.806-MHz signal and two lightly coupled tuned circuits select out the 35.4-MHz signal. The tuned circuits used in this version are 10.7-MHz i-f transformers modified by the removal of half the turns on the core and replacement of the 55-pF stock capacitors with 20-pF units. Some experimentation may be necessary to get the circuits resonant at 35 MHz, and a good grid-dip meter is an invaluable aid. There are other techniques which would work well. For example, if you're really well equipped, you could use a variable frequency signal source and a high bandwidth oscilloscope. Of course, you can use any other type of tuned circuit—whatever the junk box has as long as it fits into the space available.

As shown in the photographs, I built the circuit on a small scrap of printed circuit board and supported it by the stiff leads used to supply power and signals to the board. This isn't the most mechanically rugged technique, but it is neat and

| Channel | Frequency | PLL Pin Levels | | | | | | | | |
|---------|-----------|----------------|----|----|----|----|----|---|---|---|
| | | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 |
| 1 | 27.925 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 2 | 27.935 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 3 | 27.945 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 4 | 27.965 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 5 | 27.975 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 6 | 27.985 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7 | 27.995 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |

The above channels not in the 10-meter amateur band.

| | | | | | | | | | | |
|----|---------|---|---|---|---|---|---|---|---|---|
| 8 | 28.015 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 9 | 28.025 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 10 | 28.035 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 11 | 28.045 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 12 | 28.065 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 13 | 28.075 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 14 | 28.085 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 15 | 28.095 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 16 | 28.115* | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 17 | 28.125* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 18 | 28.135* | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 19 | 28.145* | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | 28.165* | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 21 | 28.175* | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 22 | 28.185* | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 23 | 28.215 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 24 | 28.195* | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 25 | 28.205 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 26 | 28.225 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 27 | 28.235 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 28 | 28.245 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 29 | 28.255 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 30 | 28.265 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 31 | 28.275 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 32 | 28.285 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 33 | 28.295 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 34 | 28.305 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 35 | 28.315 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 36 | 28.325 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 37 | 28.335 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 38 | 28.345 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 39 | 28.355 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 40 | 28.365 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |

*These frequencies are in the Novice segment.

All frequencies given are nominal and may vary ± 5 kHz or so if you include the fine-tuning modification.

Table 1. New channel frequencies and PLL coding.

with careful placement of the support leads is strong enough to be reliable. I reinforced the wires where they entered the main circuit board with a small drop of epoxy cement so that the stress would not be on the thin circuit foil below the board.

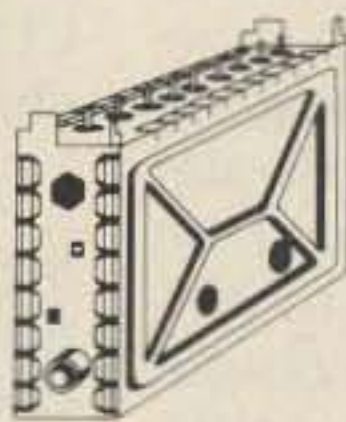
Once these circuit modifications are made, the loop can be adjusted for proper operation. Monitor the dc voltage on the positive side of C115 and adjust the vco

slug (T101) so that the voltage varies from a low of around a volt on channel 1 to a high of about two volts on channel 40. The voltage should change slightly each time the channel switch is advanced. This voltage is a measure of the driving force necessary to pull the vco from its free-running frequency (set by T101) to the frequency requested by the channel selector; in fact, a meter inserted at this point could be calibrated to

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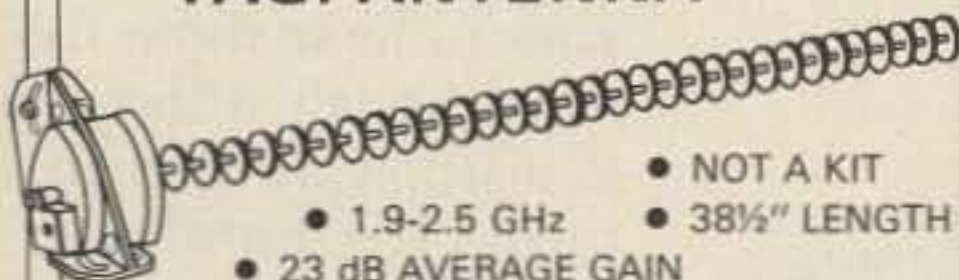
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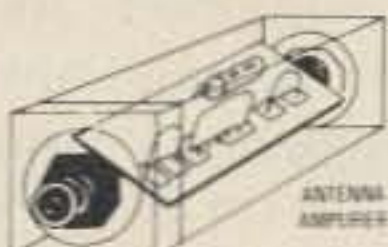
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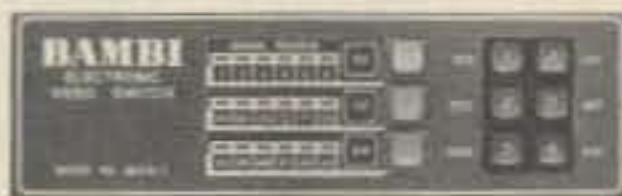
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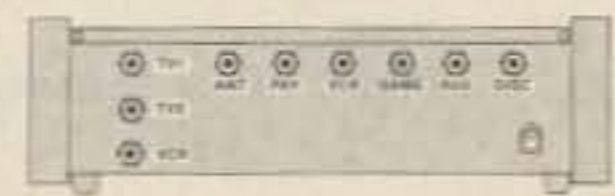
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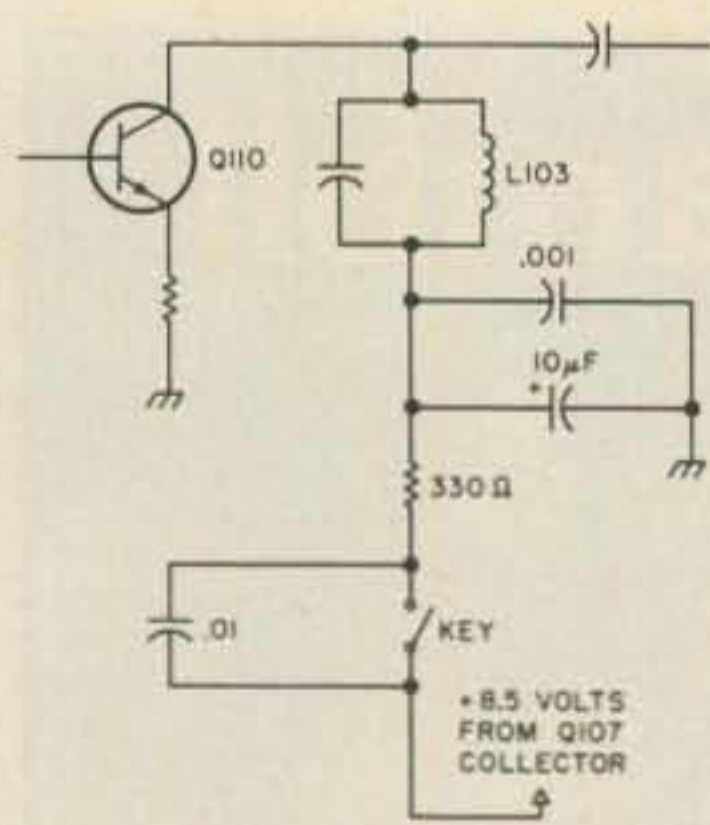


Fig. 6. Circuit modification to allow transmitter keying at the transmitter mixer, Q110.

read the ten-meter operating frequency.

Knowing this, you can easily determine if the phase-locked loop is running normally. If, for example, you can switch channels without changing the voltage at C115, then the vco frequency hasn't moved as it should and something is wrong. If the voltage seems to hop around in great leaps as you rotate the channel selector, then the channel switch is probably wired up to the PLL incorrectly.

Another good means of testing for proper operation is to listen to the output of the loop mixer with a receiver. Remember that on channel 1 the loop divider is set to 320 and that on channel 40 it is set to 364. That means that the output of the mixer buffer, Q103, will be at 3.200 MHz on channel 1 and 3.640 MHz on channel 40. Accordingly, when the channel is set to 36, the output of Q103 should be on 3.600 MHz, and that can be easily verified by connecting one end of a length of wire to the antenna terminal of an 80-meter receiver and wrapping the other end (insulated, with no direct electrical connection) around Q103. You can figure out which channel position corresponds to 36 by counting backwards from channel

40; that channel you can find by watching for the large voltage change across C115 as the loop jumps from channel 40 to channel 1.

As an aside, it's interesting to note that the rig can now be used as a crystal-controlled calibrator which can be walked in precise 10-kHz steps across the bottom portion of 80 meters. The 3.600-MHz output on channel 36 can be zero beat with your crystal calibrator by adjusting the 10.240-MHz oscillator; then the PLL signals will be just as accurate on any of its channels as your calibrator is at 3.6 MHz.

With the PLL modifications complete and operating, the set should operate as an AM rig (into a dummy only!) from 27.925 to 28.365 MHz. By peaking up the receiver front end (T104 and T105) and connecting an antenna, you should be able to hear some CW signals, though without a bfo you won't be able to copy them. The transmitter can be peaked into a dummy load by adjusting L103, L102, T102, T103, L106, L109, and L110. You'll find that the first three adjustments mentioned are the sharpest tuning ones. I would suggest peaking everything up on 28.115 MHz (channel 16) since most of your operation will be within 100 kHz of that frequency.

The remaining steps in the basic CW conversion are the bfo addition, the AM to CW transmitter change, and the provision for fine tuning. These steps were covered in detail in the first article so will only be mentioned briefly here. The bfo is actually the 10.695-MHz transmit carrier oscillator, Q109, which can be turned on during receive by connecting the supply end of the 3.3k emitter resistor (R119) so that it gets 8.5 volts all the time in-

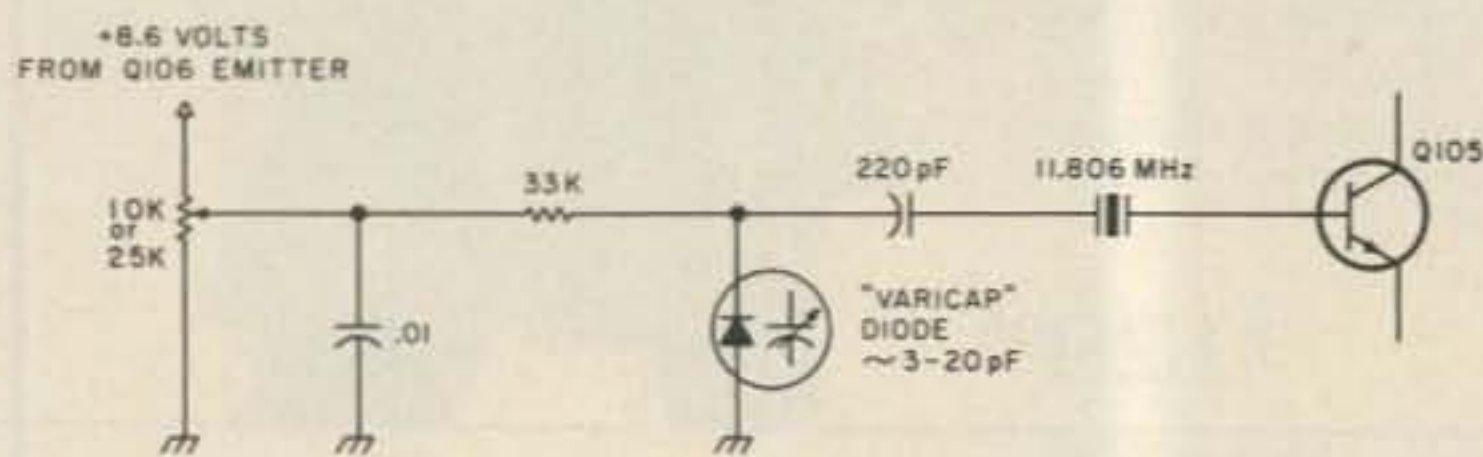


Fig. 7. Fine tuning with a varicap diode.

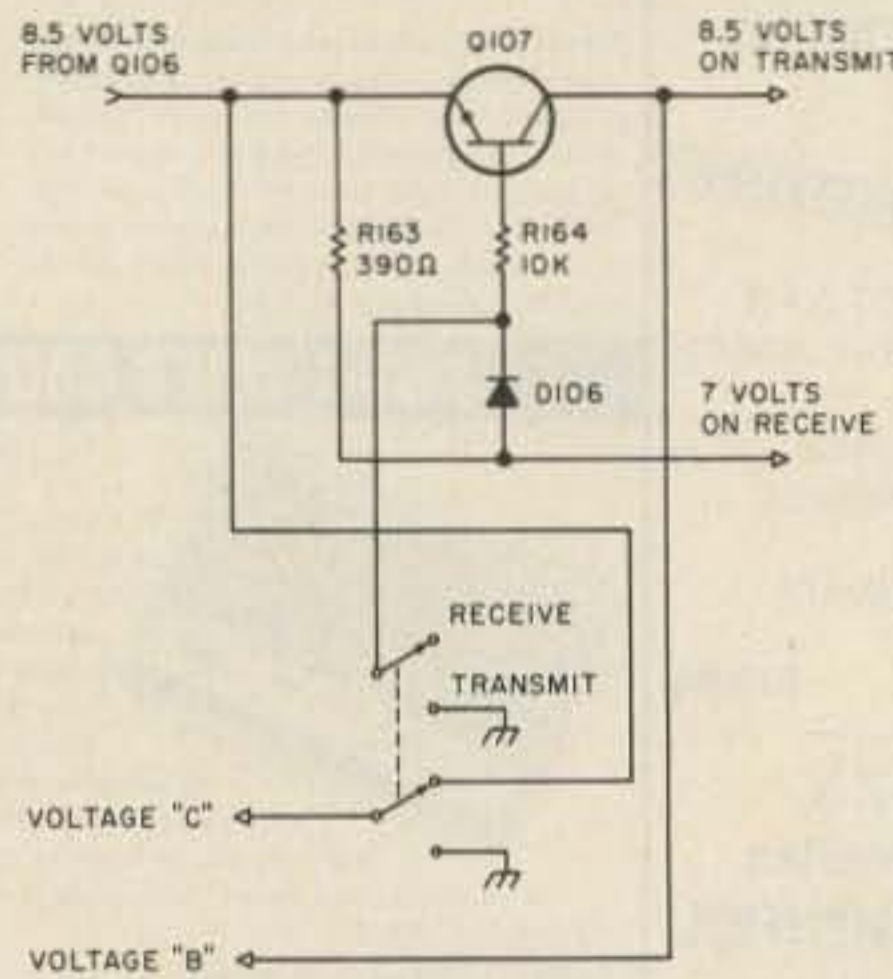
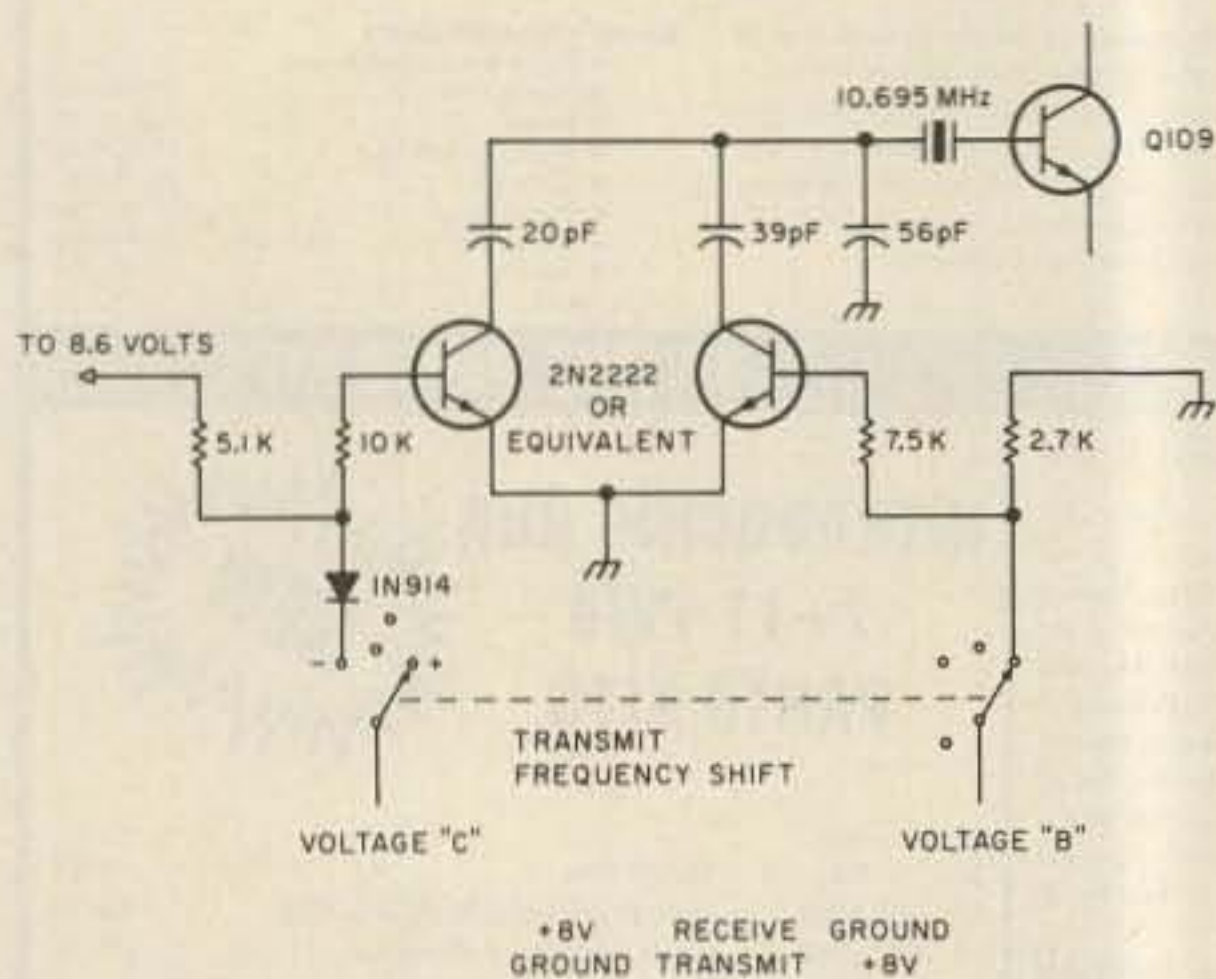


Fig. 8. (a) Circuit to provide a selectable frequency offset during transmit. (b) Circuit for manual T/R switching.

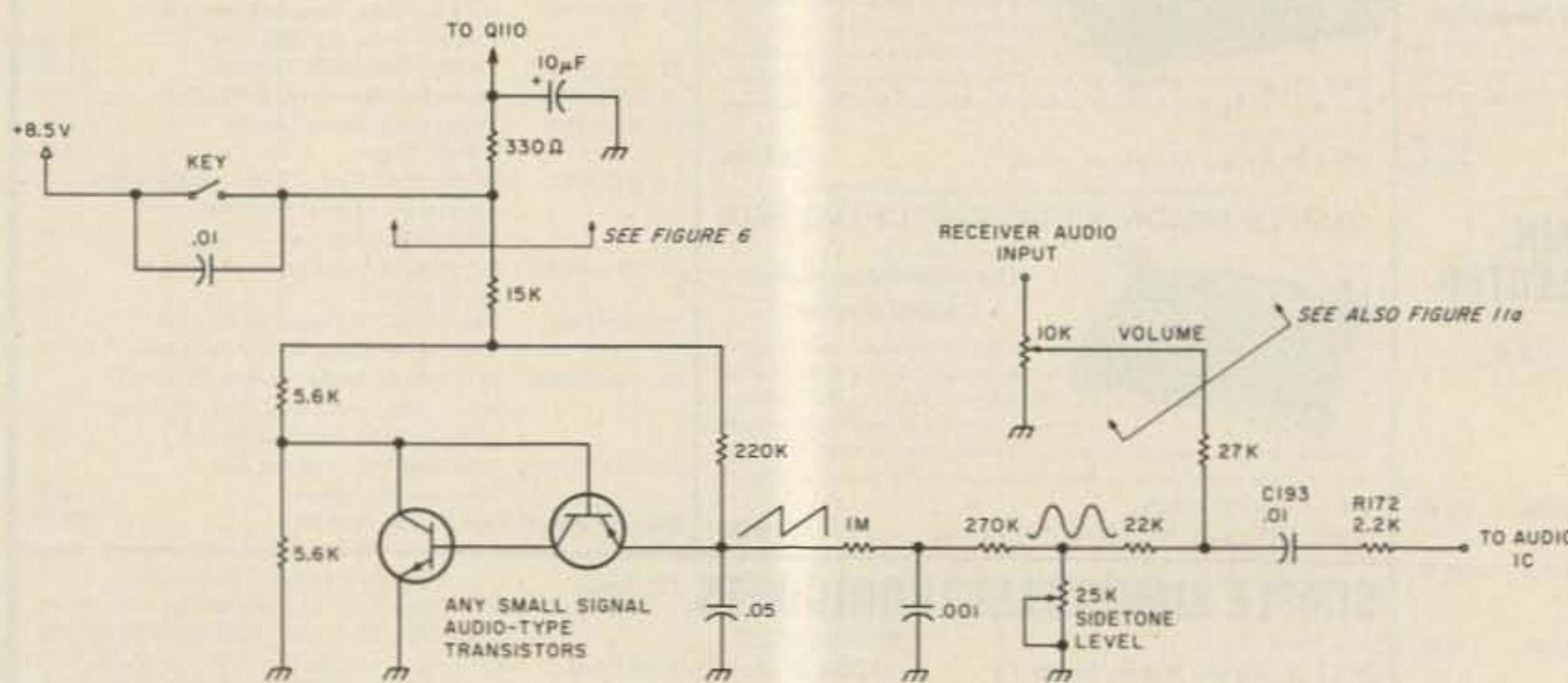


Fig. 9. Sidetone oscillator circuit.

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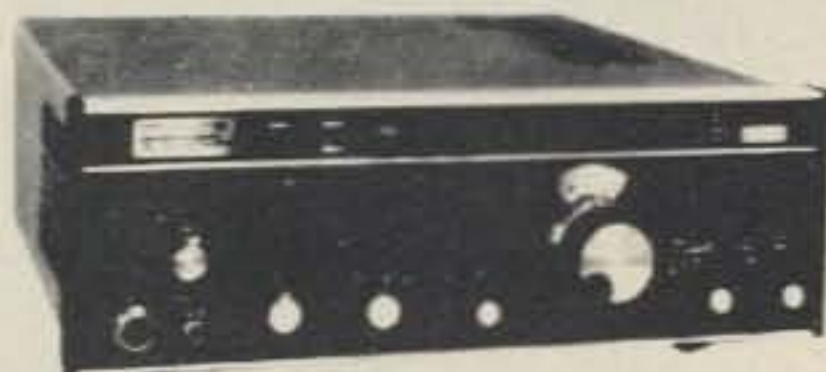
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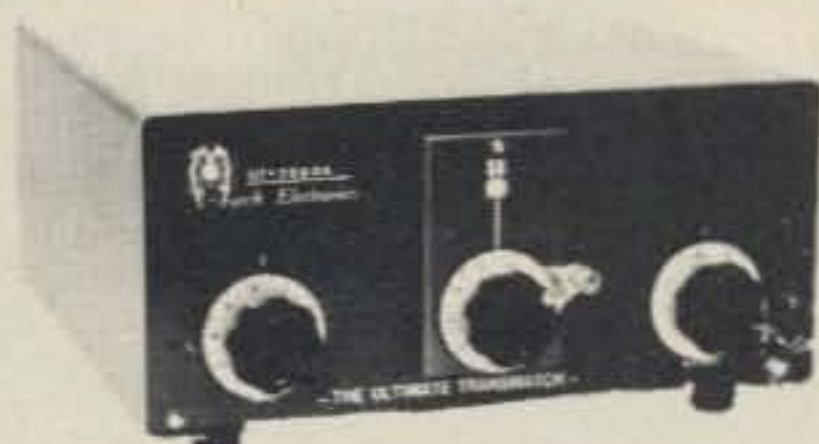


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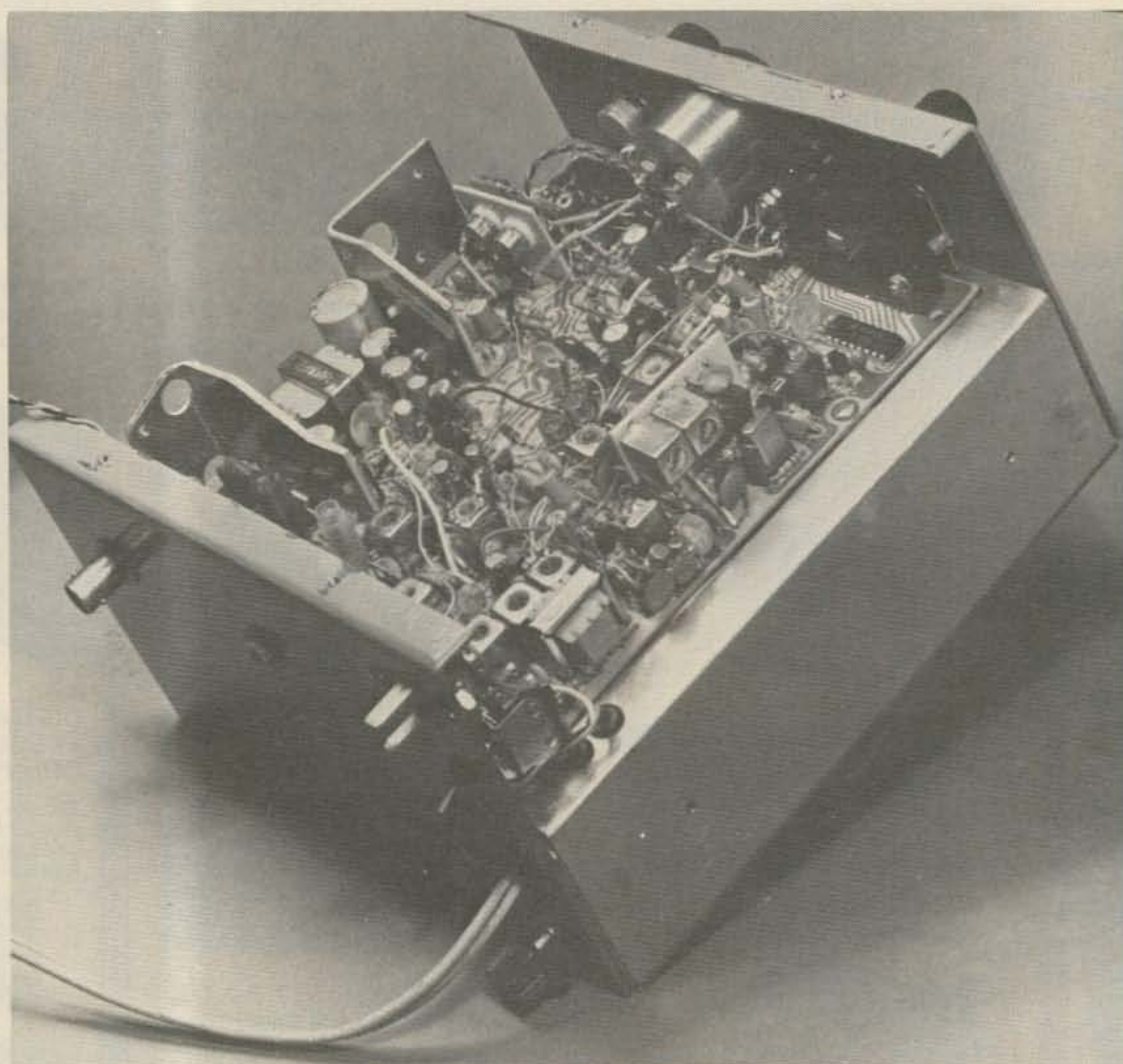
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stead of only when the rig is transmitting. The emitter of Q106 (the 8.5-volt voltage regulator) is a convenient source for this voltage. The circuit change is shown in Fig. 4.

Putting the transmitter on CW is almost as simple. First the modulator output is disconnected from the transmitter driver and final amplifier by the removal of diode D105 (located just behind the audio transformer). The transmitter stages are then powered by wiring the 12-volt line directly to what used to be the cathode end of the diode. The final and driver are class C amplifiers so they won't draw any current until driven and there is no need to switch this power line. It is prudent to keep a load on the audio power stage at all times, but at this point there is no load during transmit because the modulator function is disconnected. The microphone push-to-talk switch normally opens the speaker circuit during transmit and that should be rewired so that the lower end of the speaker is connected to ground at all times. The output transformer is also rewired so that the speaker circuit does not operate with a 12-volt bias. This step helps reduce speaker thumps caused by the 12-volt supply dropping when the transmitter is keyed. These modifications to the transmitter are shown in Fig. 5.

Finally, some provision must be made for keying the transmitter, and that is done by keying the B+ line feeding the transmit mixer as shown in Fig. 6. The RC filter added in series with the power lead softens the rise and fall times enough to give brisk but clickless keying.

The fine-tuning modification is shown in Fig. 7. The 11.806-MHz heterodyne os-



Back inside view. Note rear panel BNC for rf, miniature jack for external speaker DPST switch and male jack for external dc supply, and ac fuse for internal supply.

cillator is tuned over about a 4-kHz range with a varicap diode, thus giving after frequency multiplication a 12-kHz shift in operating frequency. If your junk box doesn't have any varicap diodes, you could substitute a 35-to-55-pF trimmer capacitor, but the diode is a neater method. Not all tuning diodes are the same and you may have to try several or put several in parallel in order to get the required frequency change. Notice that as the oscillator is moved around in frequency, the phase-locked loop will force the vco to move in step so that the output signal of the loop mixer (Q103) will not change in frequency.

At this stage of development the rig is ready to go on the air. Keep in mind that the zero-beat frequency is the transmit frequency

and people will have a tendency to move in that direction. Once you realize that is happening, you can ask the other fellow to stay a kHz offset from your transmitting frequency, or you can simply move the fine-tuning knob a bit when you start to receive. That's a nuisance, but not really a big problem when you get used to it.

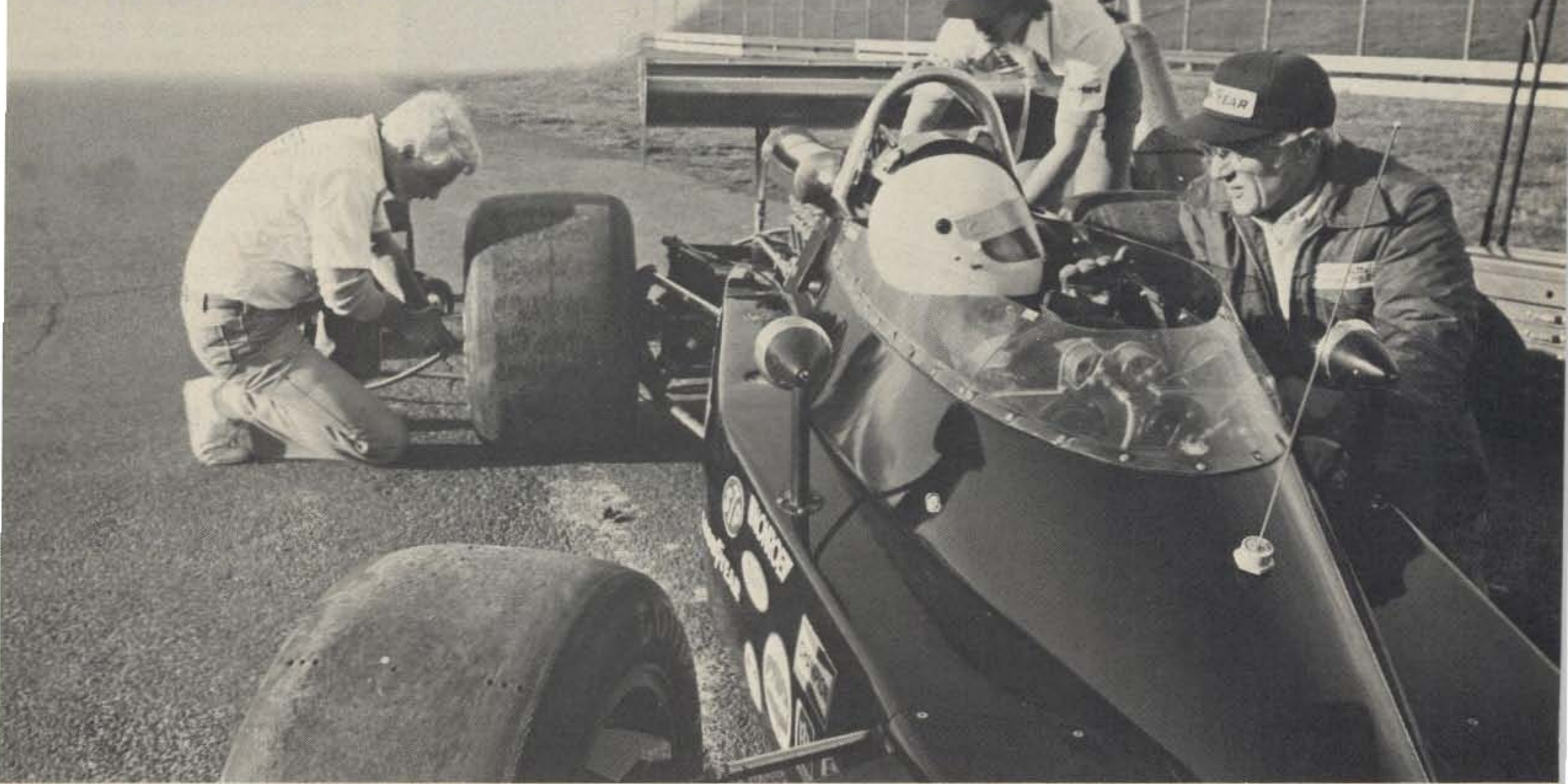
Stage Two—Some Convenience Features

There are a lot of features which can be added to the basic transceiver to increase operating convenience. The most appreciated will probably be a means of automatically offsetting the transmitter's frequency from the receiver's and the sidetone oscillator. The receiver performance can be increased considerably by removing the agc circuit-

ry, which is now responding to the bfo instead of the other station anyway, and controlling the rf and if gains from a front-panel potentiometer. There are some changes which can be made to increase the sensitivity of the detector—mainly the removal of the noise limiter. Last but not least is the addition of an active audio filter to give the receiver some much needed selectivity.

The way to offset the carrier oscillator is shown in Fig. 8. If you examine the printed circuit foil closely, you'll find that this same technique was destined to be used on the 10.24-MHz oscillator as a receiver offset option. Somehow it seems more natural to move the transmitted frequency without affecting the receiver. Depending on the characteristics of in-

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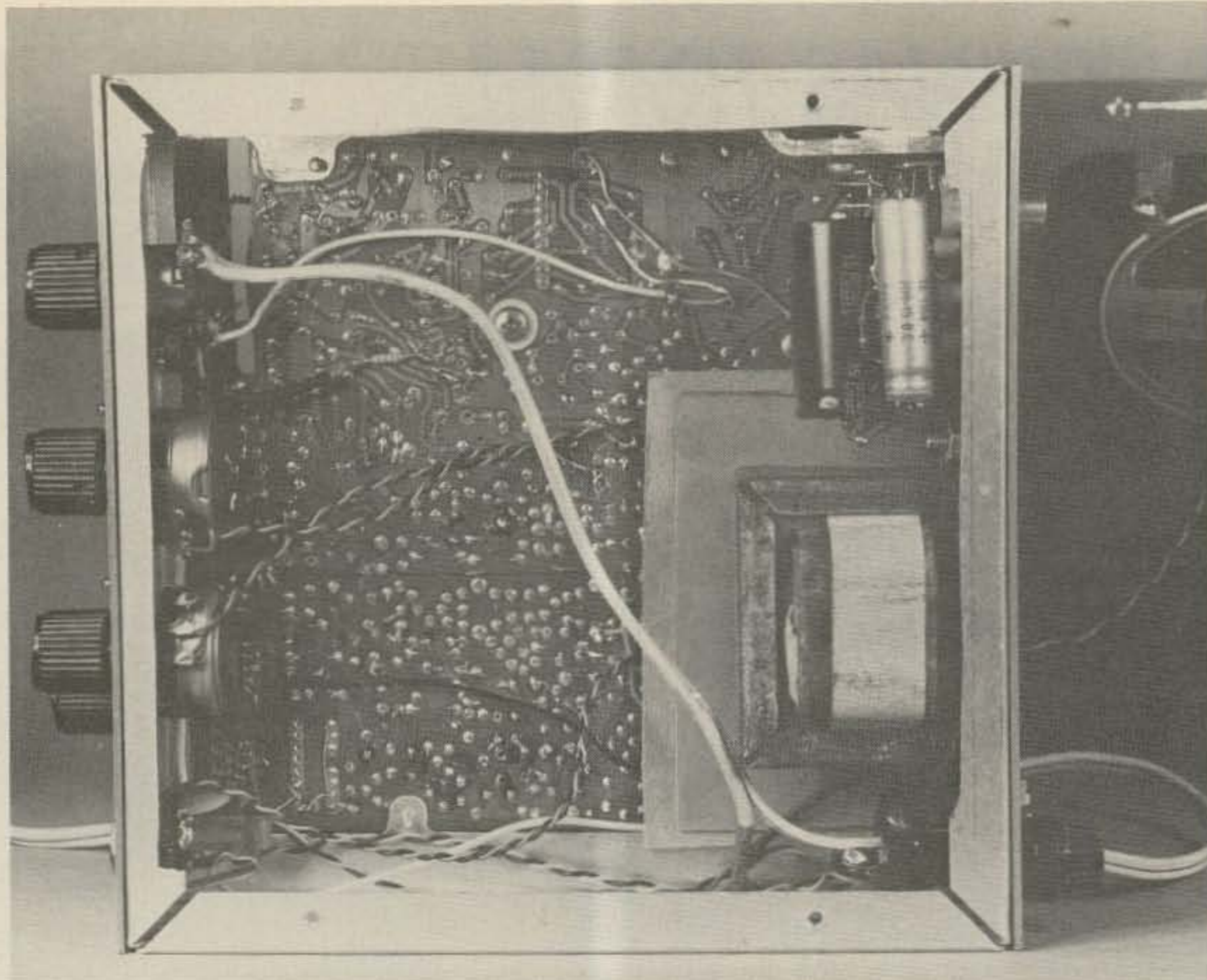
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Bottom view. Power supply module in place. Rectangular object behind the transformer is the magnetic shield described in the text. Power supply connecting wires are left long enough to allow the module to be moved for circuit board servicing. Note that the cut-out portion of the chassis top allows for dc isolation of the PC board ground.

dividual crystals, there may be some changes required in the sizes of the 56, 39, and 20-pF capacitors. Those values with my crystal gave a ± 700 -Hz offset. The circuit shown is designed to be mated with voltages available from the break-in sequencing circuits described later. If you are going to use a mechanical switch for the transmit-receive change-

over, then the circuit of Fig. 8(b) is an easy means of getting the two controlling voltages.

The circuit for the side-tone oscillator is shown in Fig. 9. There is nothing special about this circuit, but it does use few parts and draws only about .3 mA of current. The tone can be adjusted by changing the size of the 220k resistor if

desired. The oscillator generates a sawtooth which is a bit harsh-sounding, so a low-pass filter comprised of a 1 meg resistor, the .001-uF capacitor, and the 270k resistor is used to smooth out the waveform. There is nothing critical about any of these components or the transistors used and value changes of as much as 30% will probably go unnoticed.

Several changes were made to the detector circuitry to make it more suitable for CW use. The "before" and "after" schematics are shown in Fig. 10. Two changes are clearly needed: The S-meter and agc are removed because they now respond to the bfo signal instead of incoming Morse signals. This was particularly troublesome since the agc insisted on keeping the receiver gain low, and so the first change is to control the agc line with a front-panel 25k pot. (I had hoped that this control wouldn't be necessary and that the receiver could be set for maximum gain, but it turns out that strong signals on nearby frequencies, i.e., local CBers and worse, can cross-modulate the front end and show up in the audio output. This is probably due to using the 10.695-MHz bfo as much as poor front-end design. In the future, I want to try adding a proper 455-kHz bfo, but for now I can significantly reduce the problem by using the i-f gain control and switching when necessary to a horizontal dipole. Most CB operation is with vertical antennas, so the local operators are attenuated by 3 or 4 S-units when a horizontal antenna is used.)

Also removed from the detector circuit is the noise

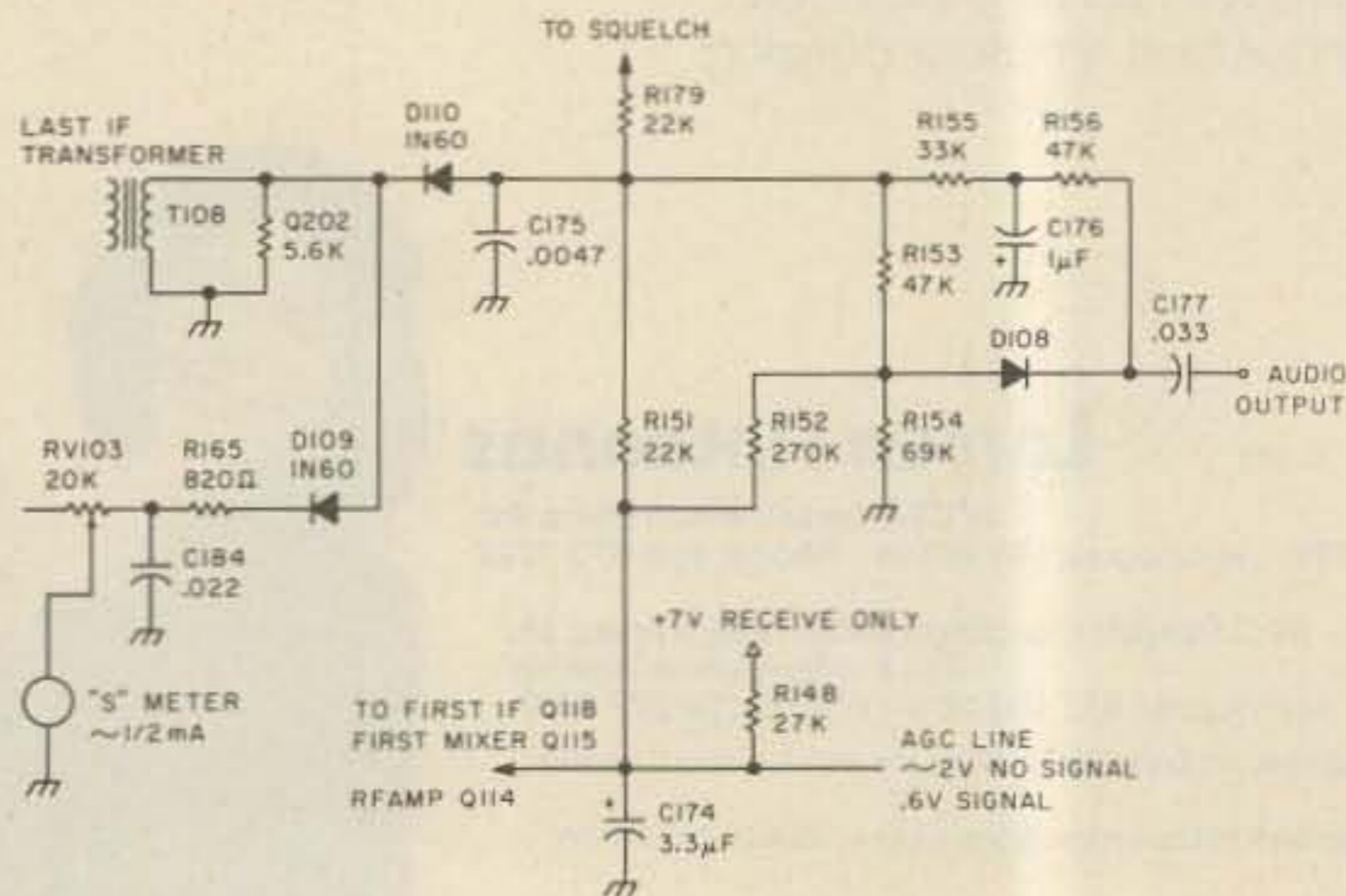


Fig. 10(a). Detector circuit before modification.

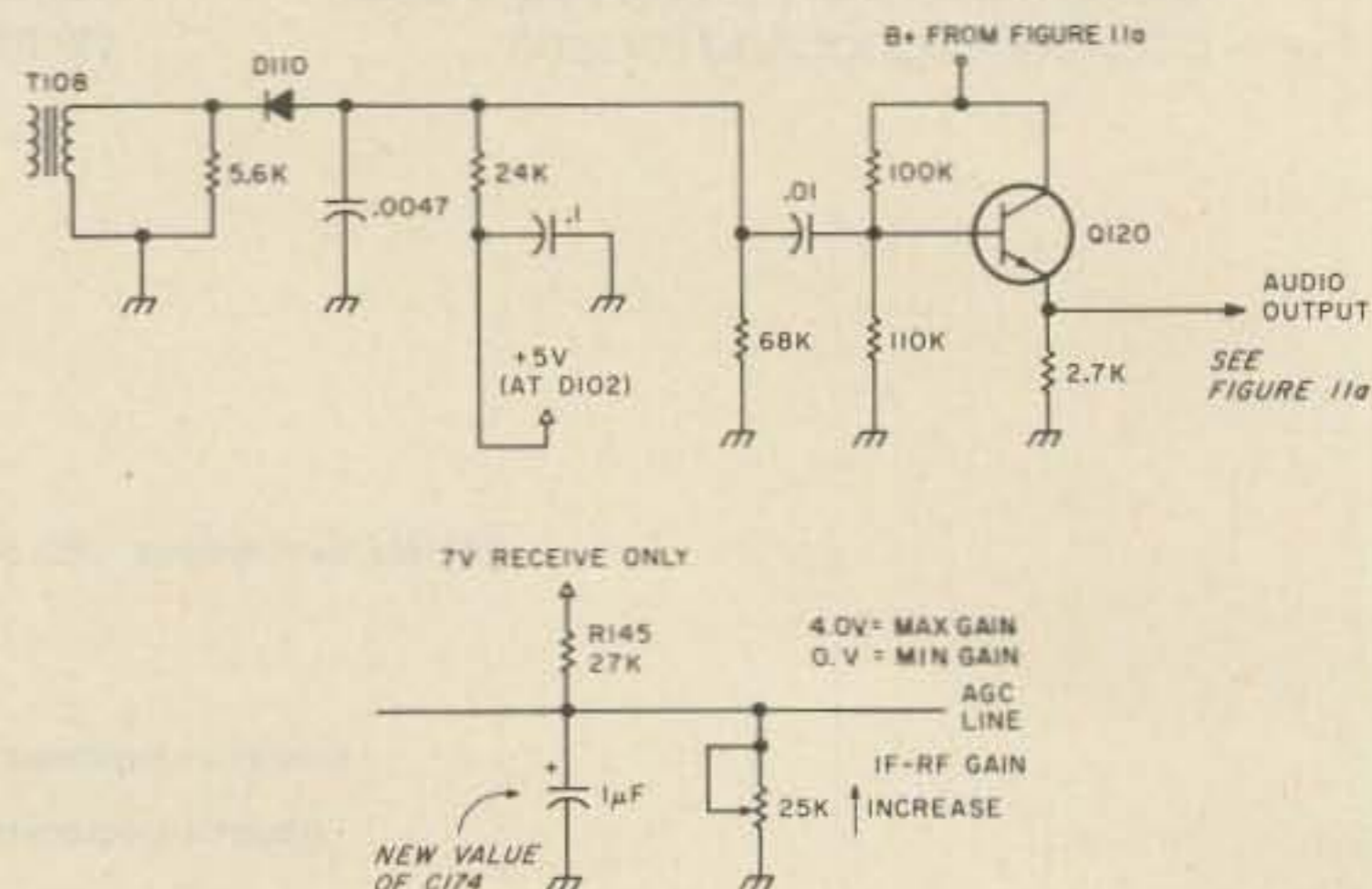


Fig. 10(b). Detector circuit after modification.

limiter consisting of R155, R156, C176, and D108. These components are in a rather clever arrangement which clips both low-level fuzz and high-level spikes. Interestingly, the circuit on the board is always wired up and operating and it was only the models which had the provision for turning the circuit off (by putting a switch in place of the jumper J106) that advertised the feature!

The squelch is also removed, but the squelch transistor, Q120, is rewired as an emitter-follower buffering the audio output signal. There are two reasons for this addition. It was found in the breadboard stage that the original volume control setup, a 50k pot from C177 to ground, was susceptible to picking up hum as I probed around the circuit board with a finger. The use of an emitter-follower makes it possible to have all of the wires leaving the board be low-impedance lines, while at the same time the high-impedance portions of the circuit are kept physically small, which means that hum is much less of a problem. The emitter-follower is also a good interface between the detector and the active audio filter. As can be seen in Figs. 11(a) and 10(b), the same B+ decoupling circuit is used to power the active filter and emitter-follower. There is a lot of audio gain after these circuits and a well-filtered voltage source is a must to prevent audio oscillations.

The audio filter design is straight from *Solid State Design for the Radio Amateur* (an ARRL publication). A peaked low-pass characteristic was chosen because of its high attenuation above the cutoff frequency. Two sections are used, each with a Q near 5 and a cutoff frequency of about 800 Hz; the overall

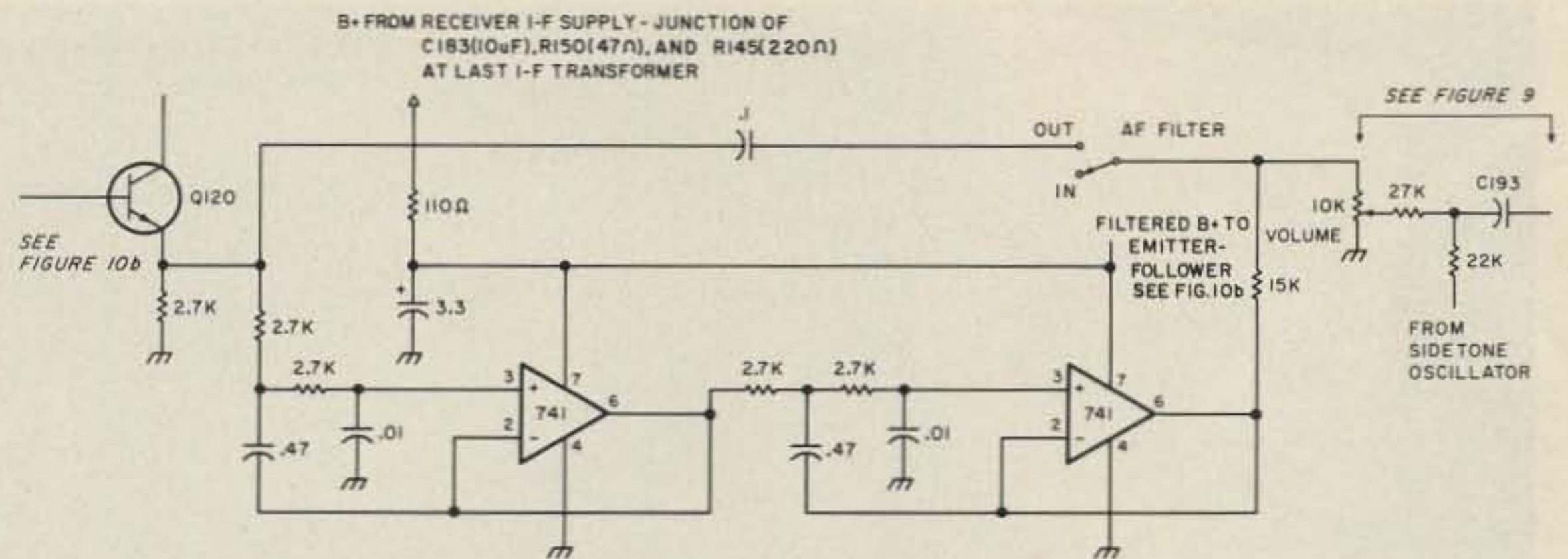


Fig. 11(a). Circuit diagram for active filter.

frequency response is shown in Fig. 11(b). The two op amps are operated between ground and the 12-volt supply, with the input signal being biased at 6 volts by the emitter-follower. This arrangement saves the several resistors which would otherwise be necessary to derive the bias voltage. The output of the filter is fed to the volume control through a 15k resistor, thus providing some attenuation to compensate for the peaking above unity gain which occurs at the cutoff frequency.

The 15k value was chosen so that the speaker level of an 800-Hz tone is approximately the same either with or without the filter being used. The resistor also serves the purpose of providing a high-output impedance for the filter—when the filter is switched "out," what actually happens is that the low-impedance output of the emitter-follower attenuates the filter output into insignificance. The audio from the volume control is fed into the IC audio amplifier as indicated in Figs. 9 and 11. The filter is quite a help when the band gets crowded, often making otherwise impossible contacts easy copy. With the filter switched out, it is easy to quickly scan the band using only the channel switch since even signals several kHz from bfo zero beat can then be copied.

The rf voltmeter shown in the photographs was introduced simply by inserting parts into the proper holes on the circuit board. This was another feature not wired until the last stages of manufacture. The only departure I made from the Hy-Gain layout is the replacement of the variable resistor (Rv104) on the circuit board) with a fixed 15k unit. That gives about half scale on my meter, a .5-mA unit, with five Watts of output. You can change this as necessary to fit the meter you choose. The circuit, shown in Fig. 12, has a 10-uF capacitor to filter the rectified waveshape so that the pointer won't slam back and forth with keying.

Stage Three—Full Break-in

Full break-in CW operation is something that few newer hams have experienced, principally because many amateur transceivers are designed with sideband in mind and CW added as a "tack-on." With full break-in it is possible to hear the other fellow sending whenever your key is up, even in the middle of a letter. When the stations at both ends of a QSO have break-in capability, the conversation is

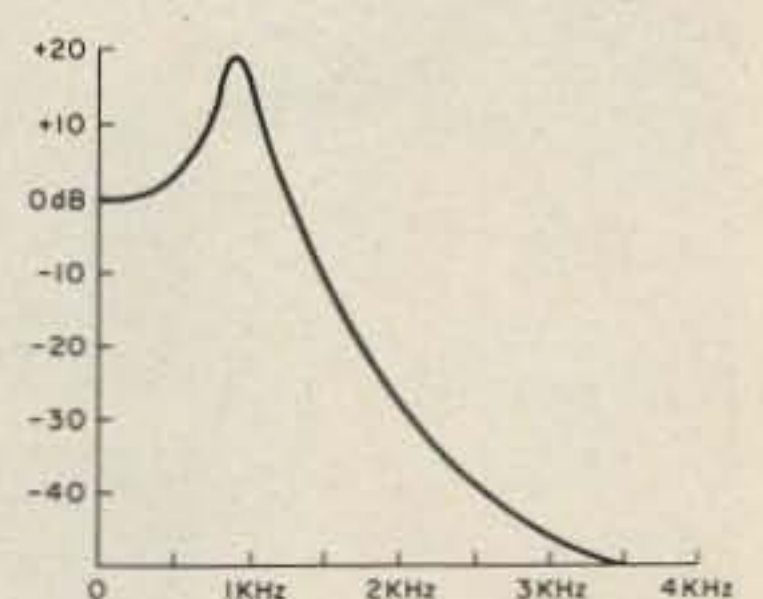


Fig. 11(b). Measured performance of filter.

very much more natural than the usual segmented contact. Break-in is also a good operating feature: It's much easier to make and continue QSOs under difficult conditions when you can hear what's going on during your transmission.

The big problem with getting a transceiver to operate full break-in successfully is the elimination of clicks and thumps in the receiver as the rig is switched rapidly between transmitting and receiving. Many things must occur in an ordered sequence as the rig is keyed. When the key is closed, the receiver must be biased off—the rf amplifier must be disabled, the agc turned down, perhaps an i-f stage muted as well. Any frequency offset in the vfo must be done before the

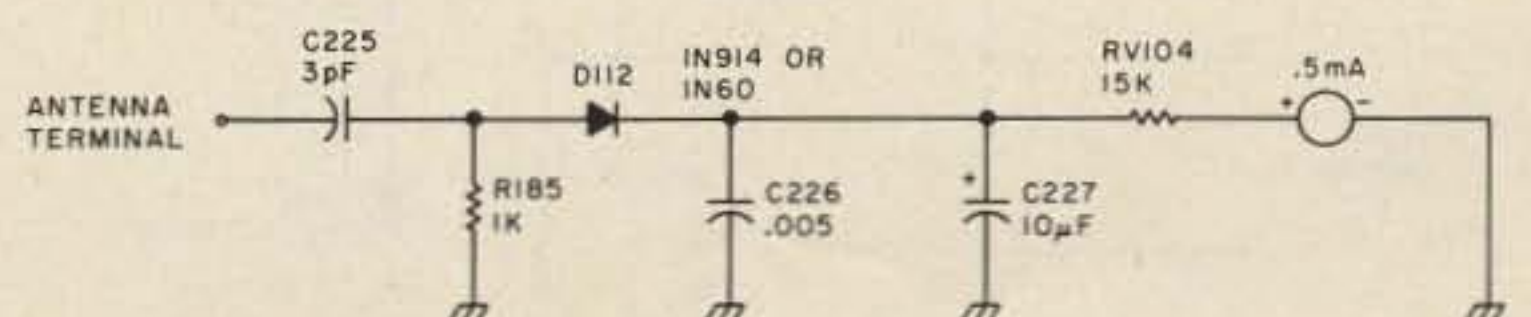
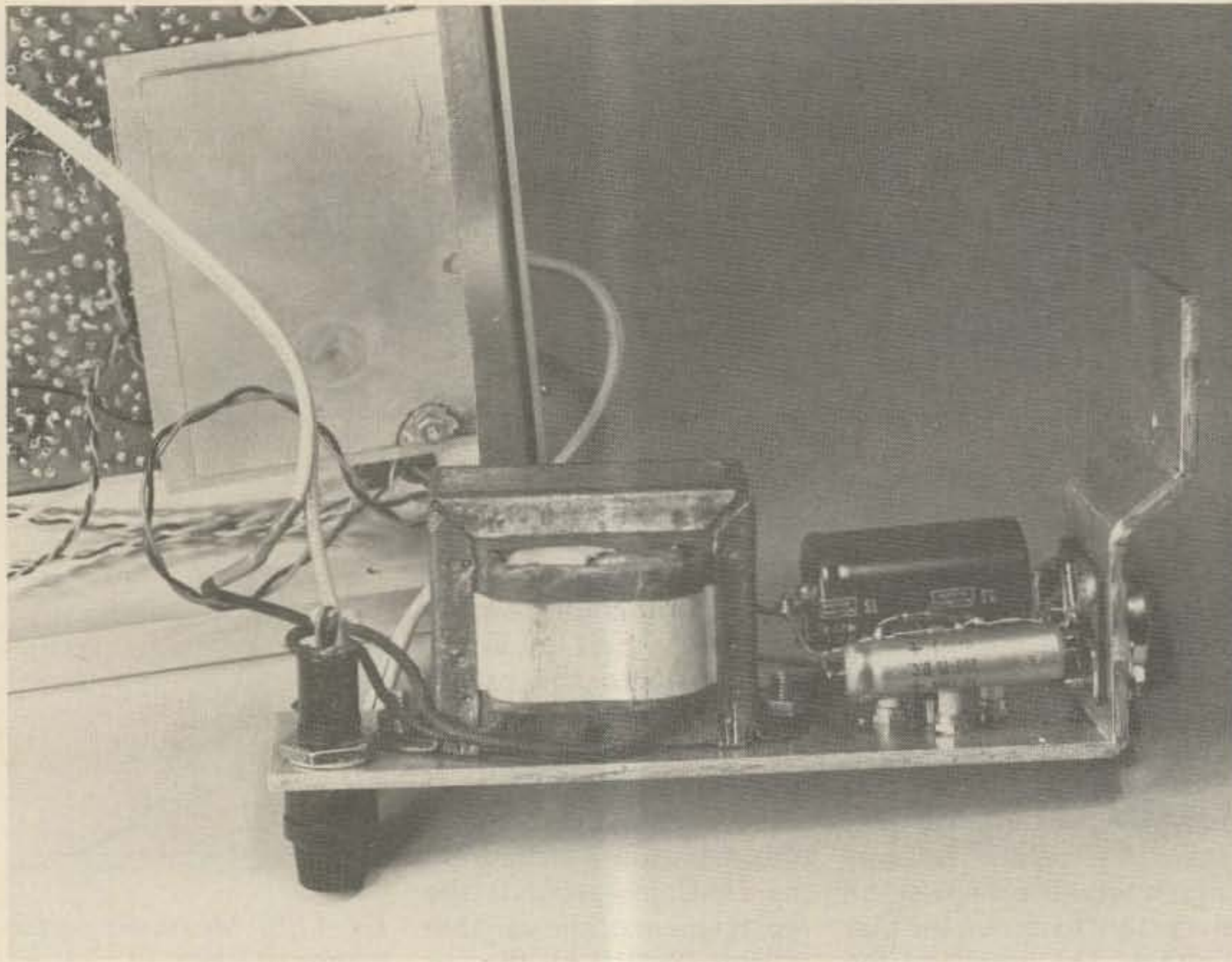


Fig. 12. Rf voltmeter added by putting parts into the appropriate positions on the PC board.



The power supply module removed from the main chassis to show construction. The aluminum bracket is 1/8" thick and transfers the power dissipated from the IC regulator into the main chassis.

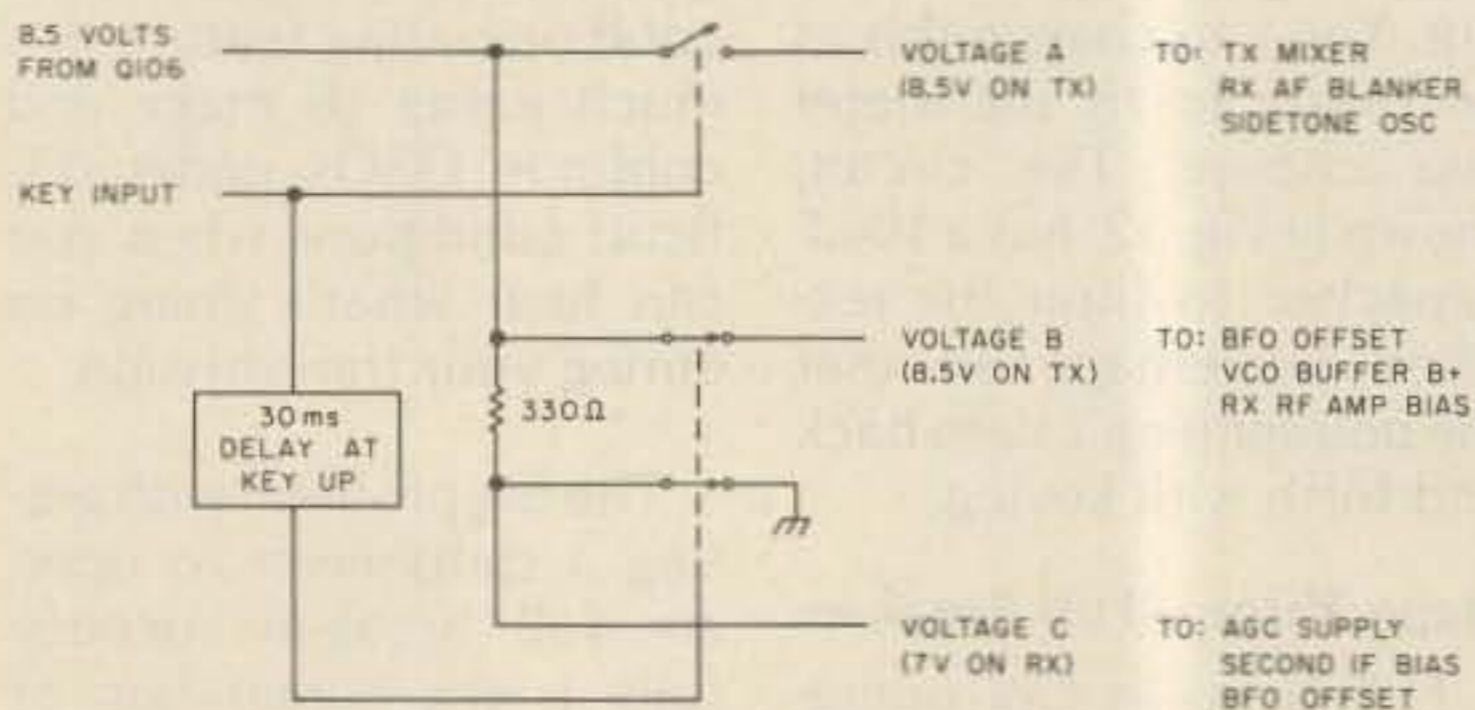


Fig. 13(a). Block diagram of break-in timing system shown in receive mode. Note that voltage C is inverse of voltage B.

transmitter comes on, and some sidetone must be inserted into the audio amplifier. The rf envelope must come up smoothly to avoid over-the-air clicks. When the key is raised, nothing should happen until the rf output has smoothly died away; then the vfo shift must be reinstated and the receiver reactivated. Most importantly, all of

these big shifts in operating condition should occur rapidly, yet without causing undue disturbances in the output audio. Ideally, the operator listening to the receiver would hear his own keying just as if it were coming from another station over the air. A very good break-in system is difficult to come by, and the circuits worked out for this application, while not providing perfect break-in, certainly provide acceptable performance.

The heart of the break-in circuitry, shown in Fig. 13, requires the addition of three transistors labeled Q1, Q2, and Q3. When the key is closed (keying current is 7 mA, which should be compatible with any keyer), Q107 is turned on directly and its output turns on the transmitter and turns off the receiver audio with a circuit which will be described shortly. The grounded keying terminal also provides a rapid discharge path for the 4.7- μ F capacitor. Notice that while this capacitor can discharge through the signal diode, it must recharge more slowly through a 10k resistor. That inequality will provide a 30-ms recovery delay to keep the receiver off until the transmitter output has decayed completely away. The voltage across the 4.7- μ F capacitor drives the base of Q1, and the emitter of that transistor is biased at about 2.4 volts by a forward-biased diode and an LED (which serves double duty as a front-panel power indicator). As the voltage at the base of Q1 rises and falls past 3 volts or so, the transistor turns on and off, switching in turn Q2 and Q3. The timing waveforms are shown in Fig. 13(c), with the exception of voltage B, which does pretty much the opposite of voltage C. The important fact to note is that while all three of these controlling voltages switch

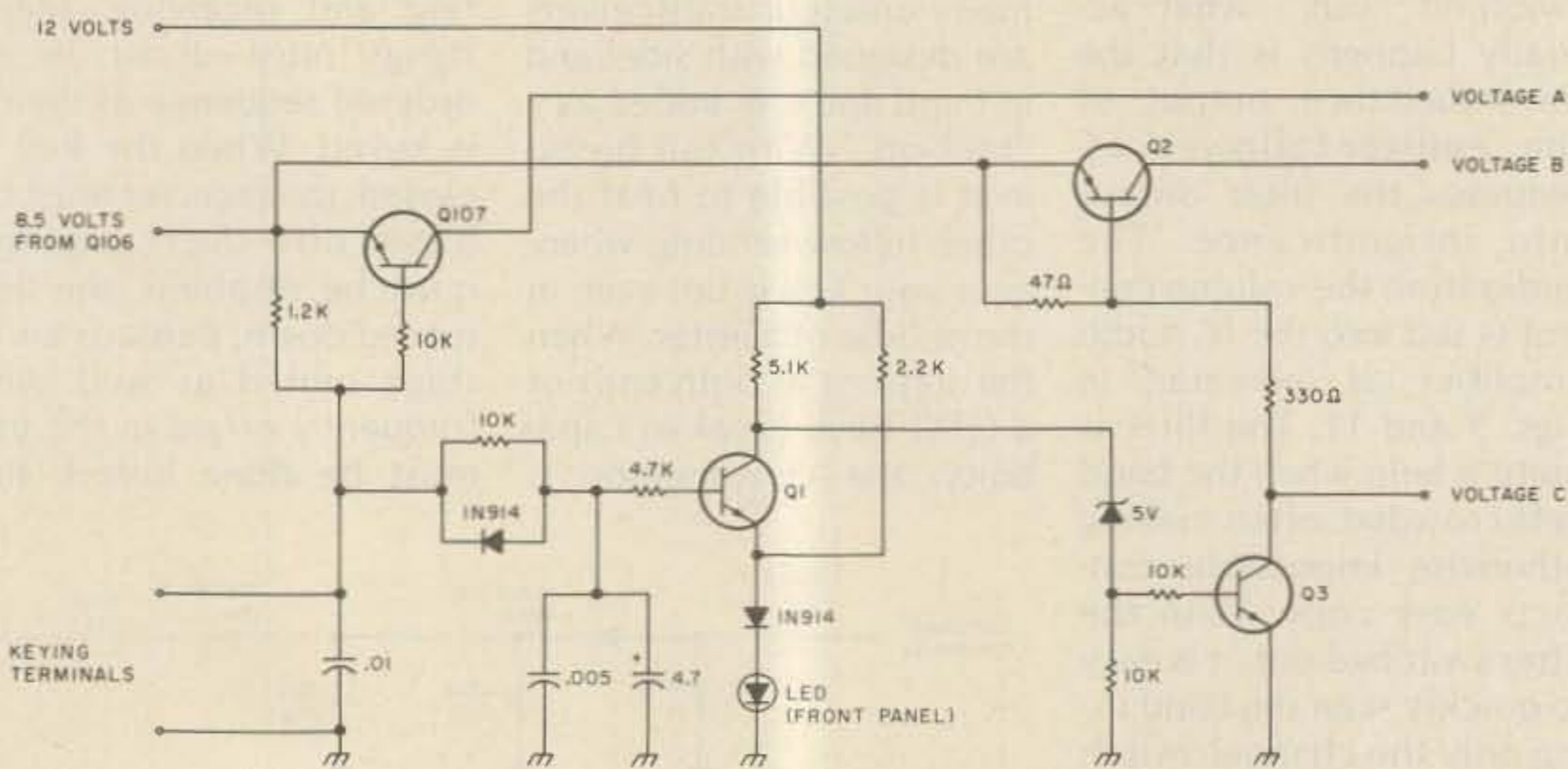


Fig. 13(b). Schematic diagram of break-in timing system. The transistors are general-purpose low power types.

simultaneously at key-down, only the collector voltage of Q107 switches immediately at key-up. As shown in Fig. 13(c), the 30-ms delay gives plenty of time for the transmitter to get off the air before the receiver is turned back on. Also indicated in Fig. 13(b) and Fig. 16 is where the three controlling voltages go in the rig as a whole.

The sequencing circuits just described give plenty of receiver protection during keying, but unfortunately they are not thumpless. Some additional quieting was achieved with the addition of the simple audio blanker shown in Fig. 14. I've used this system for several months and find its performance quite acceptable. Being a bit of a perfectionist, however, I have looked into the reasons for the remaining thumps. The complete cure would seem to require a soft exponential transition of perhaps 10-ms time constant on all of the keying waveforms controlling the receiver. The rf amplifier bias, second i-f bias, and agc line inputs are relatively easy to filter by the addition of the proper capacitors, but vco buffer B+ must be powered from a low-impedance source during transmit and so would require either the addition of another transistor or a change in the timing circuits to ensure that the receiver is off when buffer B+ is stepped up or down. Turning the receiver off exponentially may require a different sequencing circuit in any case to delay the transmitter turn-on. The system described in Fig. 13 works fine, but if you enjoy experimenting, you might look into some variations.

One last hint on reducing keying noise: Be sure to return the speaker ground wire to the circuit board as closely as possible to the ground pin of the audio IC.

This will be pin 2 if the IC is a BA521 or pin 9 if it is a TA7205. Otherwise, the heavy transmitter keying current (around 1 Amp) can couple into the speaker wiring and cause a click that is not muted by the receiver gain control.

Odds and Ends—Power Supply, Cabinet, Future Work

All in all, this makes a very nice little CW rig. The only reason it might be classified as a toy is that it is so inexpensive to get on the air. If your junk box contained several old transistor radios, the total cash outlay for the project to this point should be something less than \$20. I built the rig to this level and used it for about a month before deciding on a cabinet. The construction for the final enclosure is pretty well explained by the photographs. The board was mounted into the top surface of a 7" x 7" x 2" chassis, front, back, and bottom plates were added, and a U-shaped cover was fabricated to form the top and sides. A 2½" x 4" oval speaker rescued from a junk TV set was mounted behind a grid of holes drilled in the top of the U. The holes were drilled using a piece of scrap perfboard as a guide—that made it easy to get such a nice even array. A piece of thin black cloth contact-cemented over the holes from the rear (after painting the box) protects the speaker from dust and dirt. The U-shaped piece happens to be a section cut from a large steel chassis bottom plate so I was able to solder nuts to the underside as anchors for the speaker mounting clamps.

It is certainly a convenience to have a built-in ac-operated power supply, and with any number of excellent IC regulators available for a couple of

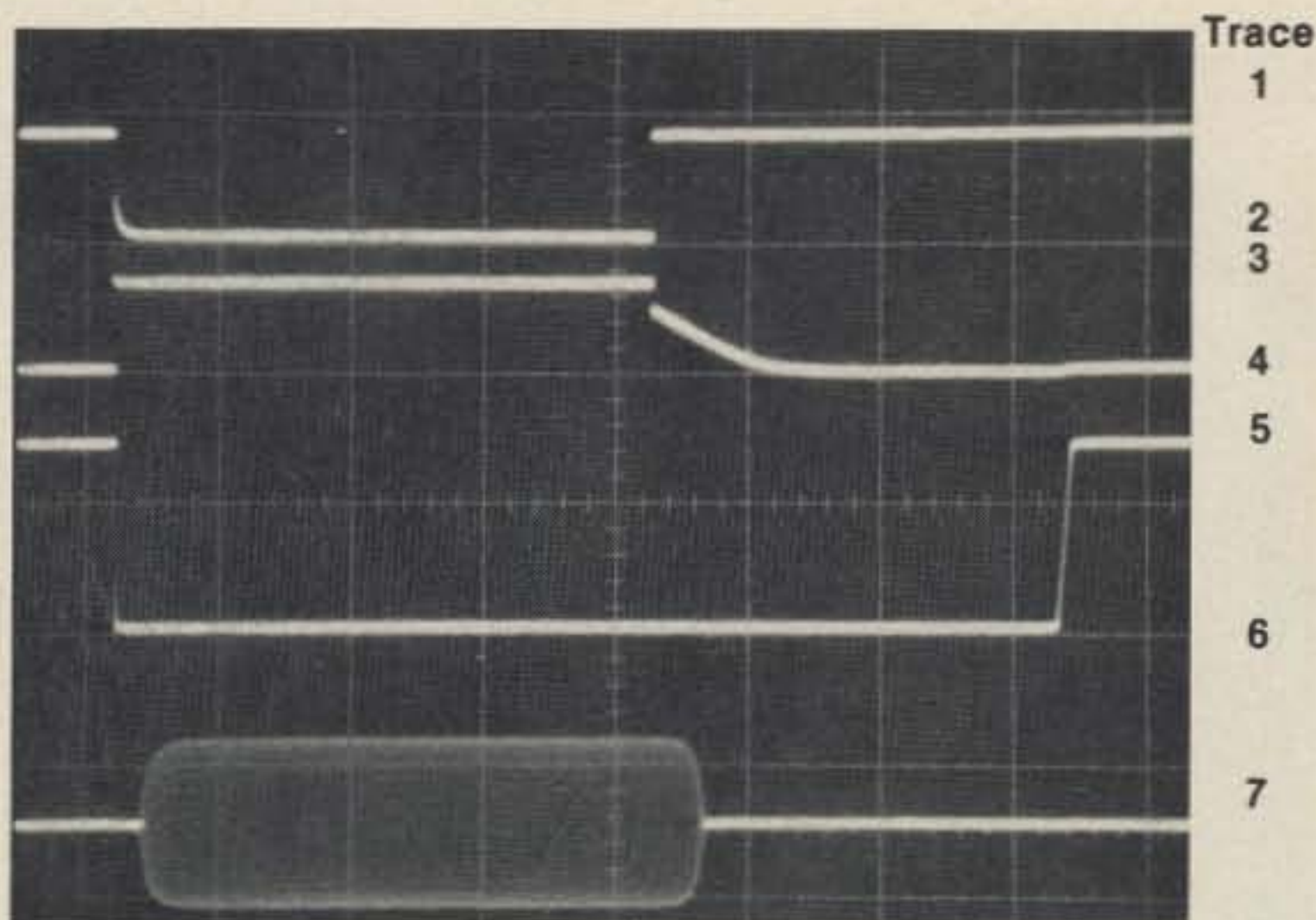


Fig. 13(c). Timing waveforms. Horizontal scale is 10 ms per division; character shown is one dot at 30-wpm rate. Trace 1 is key-up position; 2 is key down; 3 is +8 volts and 4 is ground (voltage A, Q107 collector); 5 is +8 volts and 6 is ground (voltage C, Q3 collector); 7 is rf envelope output, 50 volts/div., 62-Ohm dummy load.

dollars, it seemed a shame to tie up a bench supply. The power supply shown in the photographs was built around a transformer and regulator found in my junk box. The circuit suggested in Fig. 15 will fit in the same space and shouldn't cost more than \$15 if you buy all new parts.

As can be seen in the photographs, the power supply is built as a separate module. The aluminium bracket is fashioned from part of an old 1/8" thick rack panel and fits up against the insides of the main chassis which then serves as a heat sink. To provide for portable opera-

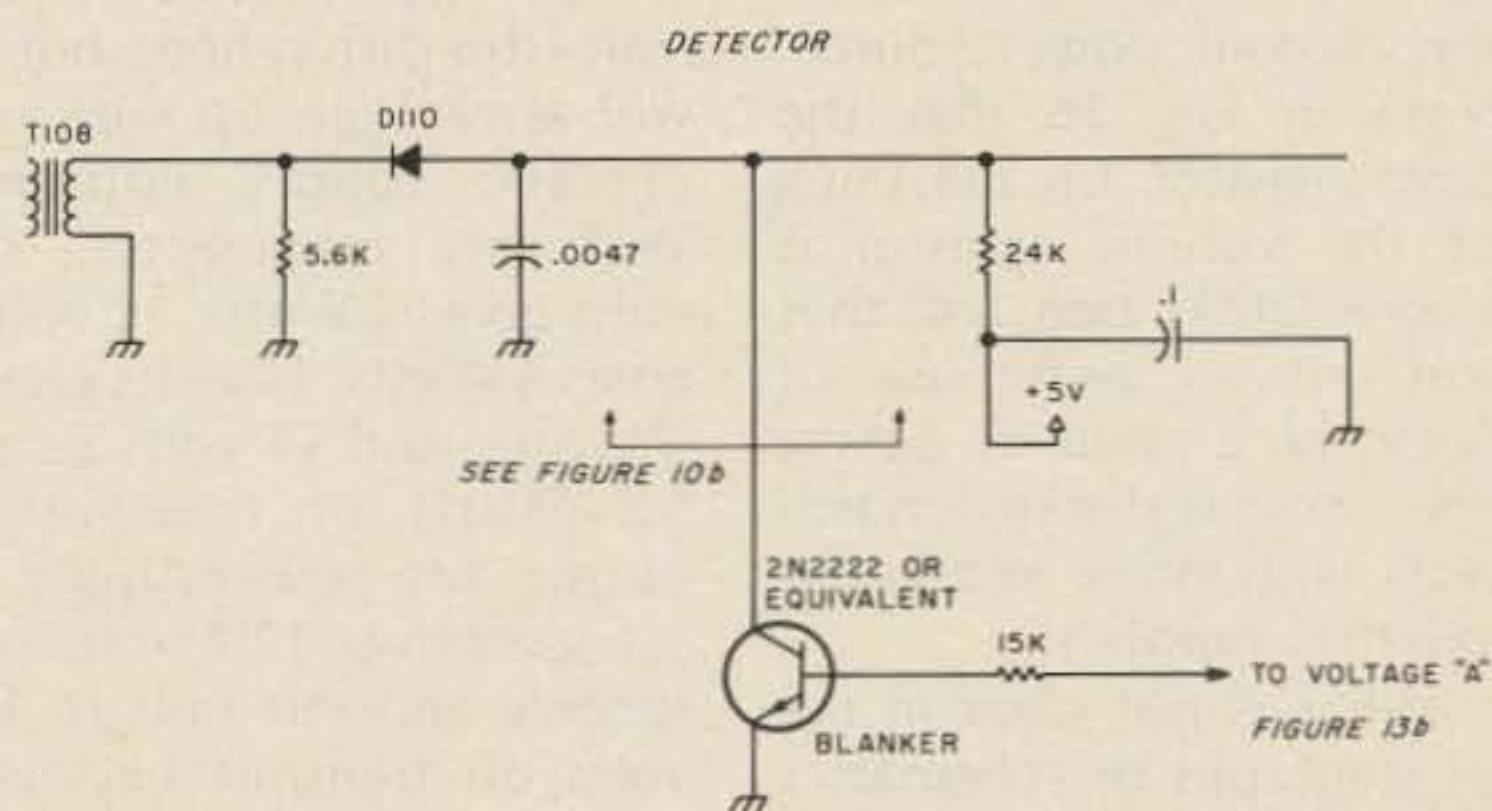


Fig. 14. Audio blanker circuit.

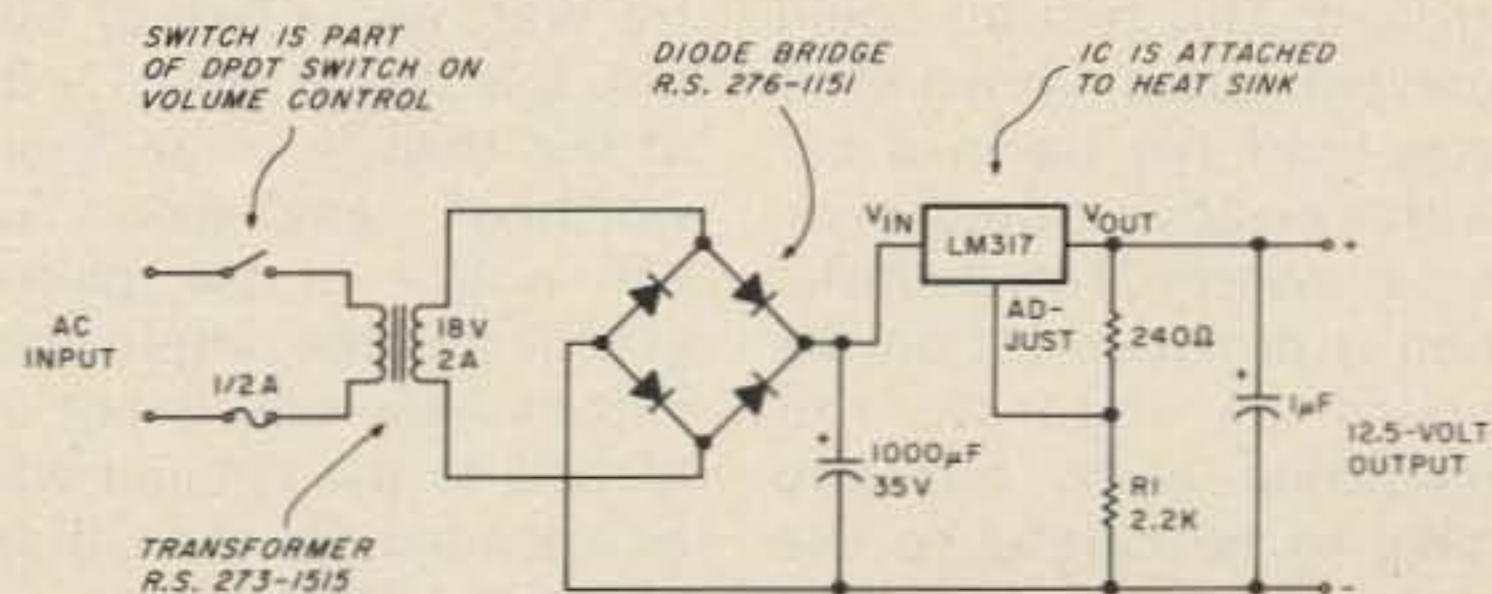
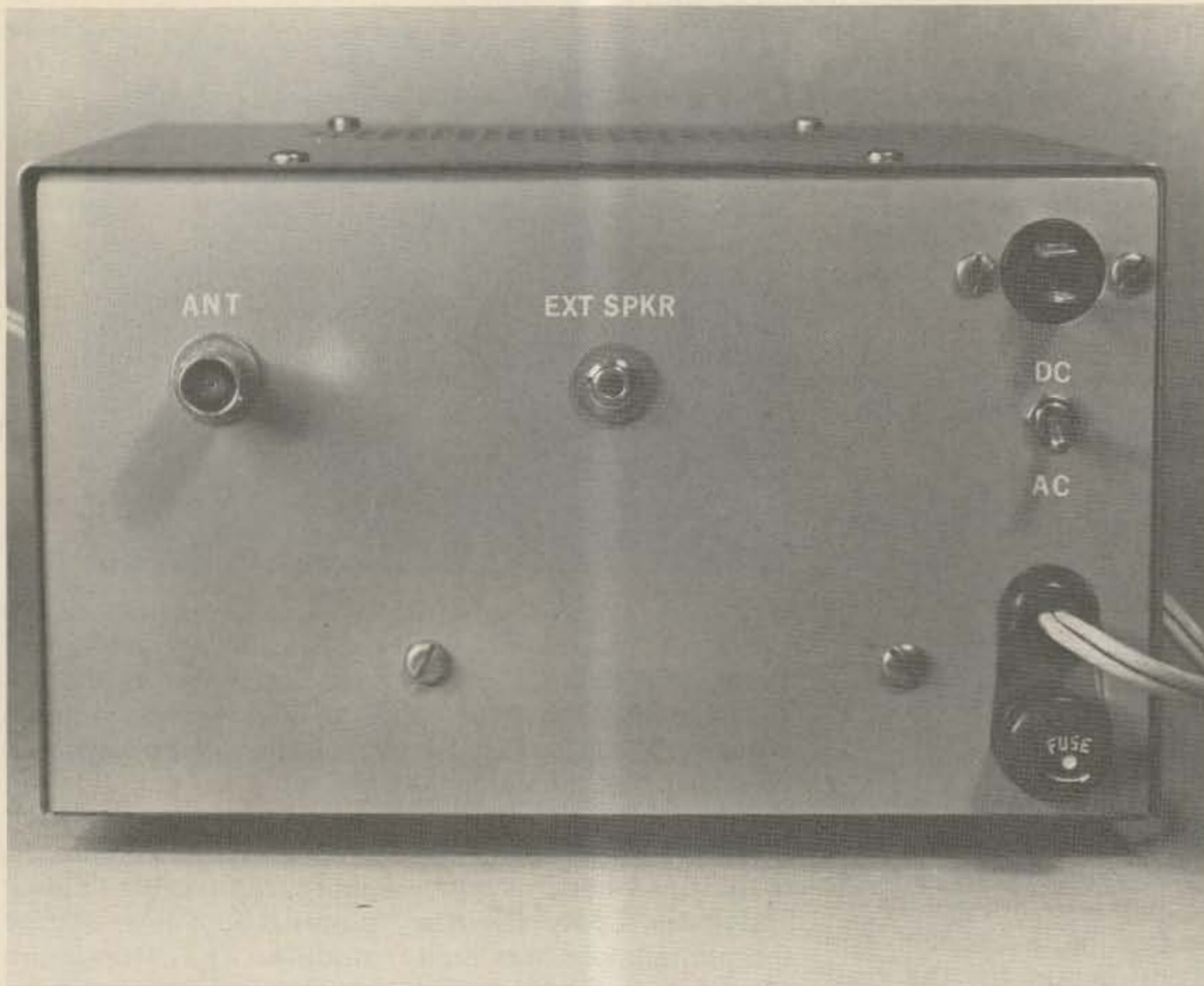


Fig. 15. Suggested circuit for ac-operated power supply. Output voltage should be no lower than 12 to 12.5 volts at 1.5 Amps of load current. Output voltage may be adjusted by making small changes in R1.



The rear panel. The antenna shield is ac coupled to the circuit board ground. Note the isolating washer around the external speaker jack.

tion with an external 12-volt battery, a DPDT switch and male jack are mounted on the rear of the set to select the desired power source. Note in Fig. 16 that the power switch on the back of the volume control is also a DPDT unit and that this allows switching of both the ac and dc power lines so that the switch will work with either internal or external supplies.

What is not clear in the photographs or schematics is that the entire enclosure is isolated by capacitors from the circuit board's dc ground. This feature could prevent some fireworks if you used the rig in a car with a positive ground electrical system! The dc isolation is provided for on the board by separate foil mounting pads, but you have to be careful to use isolating washers when mounting the key and headphone jacks.

While on the subject of power supplies, a word or

two about dc supply voltage is in order. The transmitter rf output will vary from set to set because of transistor differences, but it will always go up with increased supply voltage. With my transmitter, 11 volts gives 3 Watts, 12 volts gives 4 Watts, 14 volts gives 5 Watts, and 15 volts gives 5.5 Watts of transmitter output. My power supply is set to deliver 12.7 volts on receive and this falls to 12 volts on transmit because of the 1.5-Amp current drain. Going to a 15-volt supply would provide an extra Watt and a half of output, but that is only 1.4 dB or less than 1/4 of an S-unit worth of signal gain. You will notice in the photographs that the output transistor's heat sink is not attached to the cabinet wall as intended for the CB application. With a 12-volt supply, the final stage input is about 11 Watts, and with 4 Watts of output power, that leaves 7 Watts of heat

to be dissipated by the heat sink. After a long transmission, the heat sink gets warm to the touch though not uncomfortably so. Higher input power would probably require that some attention be paid to this heat sink as well as the power supply. All in all, it doesn't seem worth the trouble for less than 1/4 of an S-unit.

Whenever a power transformer is mounted in close proximity to sensitive circuits, the possibility exists of magnetically coupling 60-Hz hum into the signal path. For this reason, the transformer was mounted as far as possible from the audio section of the printed circuit board. Despite this precaution, there was a noticeable amount of hum modulating the received signals whenever the internal supply was used. This problem was completely cured by shielding the circuit board from the transformer with a 2 1/2" x 3 1/2"

plate of sheet steel. As can be seen in the under-chassis photograph, this shield is mounted directly between the power transformer and the circuit board with a slightly larger rectangle of thin cardboard between the shield and circuitry to prevent shorting the PC runs together. The longer wire ends protruding below the PC card were also trimmed with a pair of side cutters to keep them from wearing their way through the cardboard. The shield is held in place by a nut soldered to one corner which is engaged by one of the screws holding the circuit board to the chassis.

The conversion steps described in this article are mostly simple circuit changes, but they often require the addition of several parts to the modified circuit. If you haven't worked much with printed circuit boards, you may wonder how additional parts can be added to an existing foil pattern. Actually, there are several ways to accomplish that feat.

First, there are lots of unused foil islands on this board. Most of these were supposed to be used in the addition of optional features and so are available to use when making circuit additions.

Next, there is a lot that can be done to add parts by modifying existing foil runs. Often in changing a circuit a long foil run is freed up when the component or circuit at one end is no longer needed. A sharp knife can be used to cut and remove a short section to open the circuit, and then the remainder of the run can be sectioned into several other islands. To make connection to these islands, a small hole can be drilled next to the foil (runs are so narrow that drilling a hole through them can ruin them) and the paint scraped off the copper to permit soldering.

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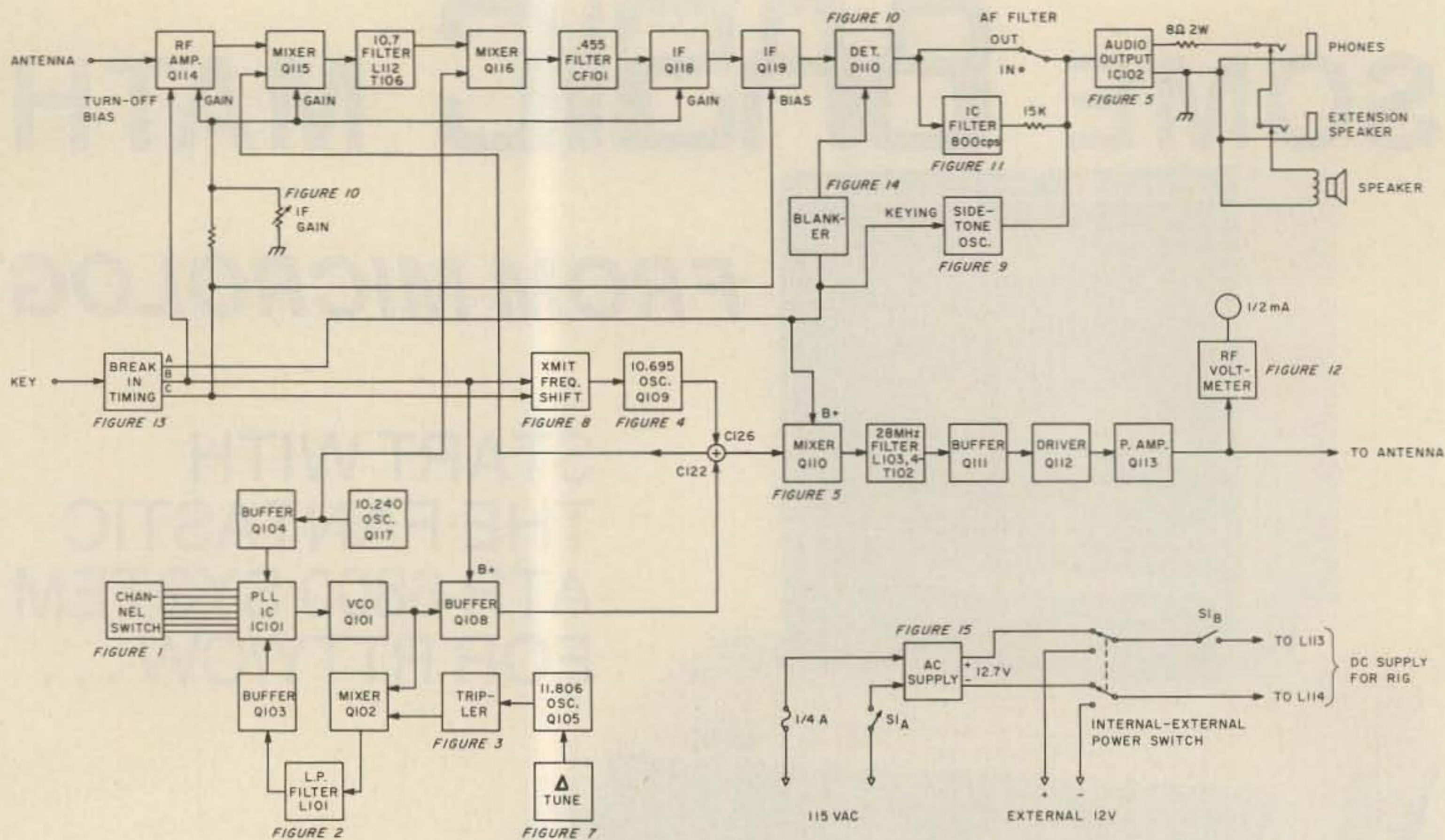


Fig. 16. Block diagram of the converted transceiver.

Be sure to leave the section of copper long enough that the whole strip won't come unglued when you solder to it. Remember that for modification purposes the primary need is for component support since the actual circuit connections can be made with small insulated jumpers. To provide adequate support, it is not necessary that each of a component's leads be anchored to the foil. It is quite acceptable, for example, to have a small resistor standing upright with only one end actually soldered to the board and the top end connected elsewhere with a jumper.

It is also possible to make connections by soldering new leads to other wires where they come out on the top of the circuit board, though this technique is less desirable because it can mean that to disconnect one component may require unsoldering several.

The principal thing to remember when you're look-

ing for a way to add a component is that you're modifying the board, not manufacturing it. Amateurs often unconsciously accept the manufacturer's techniques as ideal standards when actually the manufacturer laid out the board the way it is only so that it could be built efficiently and reliably by the people and machines on his production line. The techniques suggested here, while certainly not as efficient in construction time, can be just as reliable as the manufacturer's if they are applied neatly and carefully. Take the time to make good neat solder joints. If a part seems loose on top of the board or a component wire has to support a heavy mass, use a dab of epoxy to help carry the load. A lot of the problems I had with these boards were due to something like a support wire on one of the output coils coming loose on the underside of the board and causing intermittent open circuits. A little care in con-

struction can make a big difference in reliability.

This project got started because the basic circuit board was so cheap that I just had to find a use for it. The guiding philosophy has been to keep the cost down by avoiding expensive or exotic parts. There are no crystals to be ordered and no strange ICs you have to mail away for; if your junk box doesn't have what you need, the local parts store probably does. This design approach has produced a rig whose performance is better than I had expected, but there are still improvements to be made by the experimenter. The thing which has the biggest payoff potential is an improved bfo. The 10.695-MHz technique works, but the bfo signal passes through all of the i-f stages of the receiver and that puts a limit on the i-f gain usable (before the receiver chokes on its own bfo) and probably generates some spurious responses as well. A bfo at 455 kHz has several advan-

tages aside from the i-f considerations: The detector stage could be replaced with one of the simpler product detectors for better linearity, a separate agc detector could be included and the agc put back into service, and (though much less important) the S-meter could be hooked back up. There are two ways to go about adding the bfo—with and without a crystal. If you have or can get a 455-kHz crystal, you're all set; otherwise, you might try making a free-running oscillator with an old i-f transformer. The free-running version may work fine—after all, the frequency is low and drift certainly isn't the problem it used to be in the vacuum tube days.

In closing I would like to express my appreciation for the photography and help with the text tendered by Steve W1GSL. In a project of this size, it is easy to get lost in small details, so an impartial but informed observer is an invaluable aid. ■

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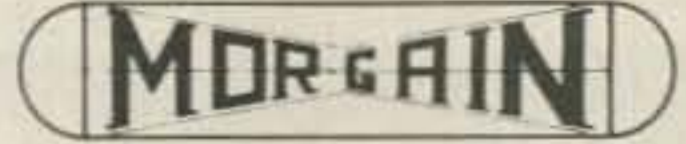
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As he concludes another contact, he habitually spins the antenna switch, sam-

pling the various rhombics he uses for receiving while trying to pull yet another signal up out of the pack that has zero-beat on top of him. Europe, the Med, the Persian Gulf, Africa, the South Atlantic—as the rhombics click by, one signal finally surfaces above the rest.

Tapping his bug in response, the operator keys his remote transmitter. From the shore of a sleepy tidal marsh green with sea grass five miles away, his antennas—mostly dipoles, and curtains—march out toward the rolling Atlantic. Two 4-500s drive two 4-5000s and his

signal is easily heard on the other side of the world.

After a brief exchange of formalities, the text of a message is passed between another ship at sea and the largest and oldest commercial CW station still operating in the United States: RCA Globecom's WCC. In a few minutes the shift will end, the paddle will be passed, and another watch in the life of a professional CW operator will come to an end on Cape Cod.

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Fig. 1. List of hams working at WCC.



Fig. 2. In this rustic, ivy-covered building with a history as long as radio communication itself, 900 messages a day are handled by 21 professional CW operators, almost half of whom are hams.



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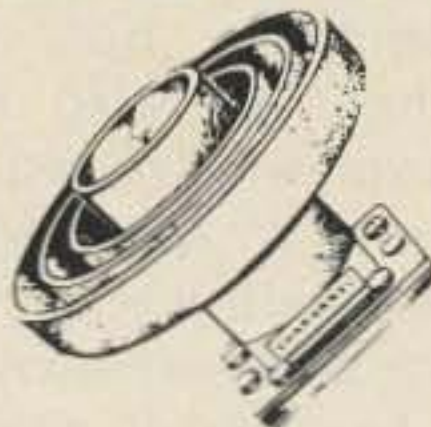
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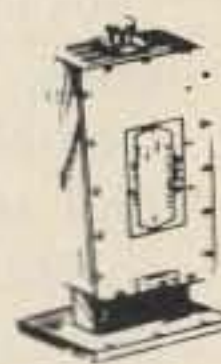
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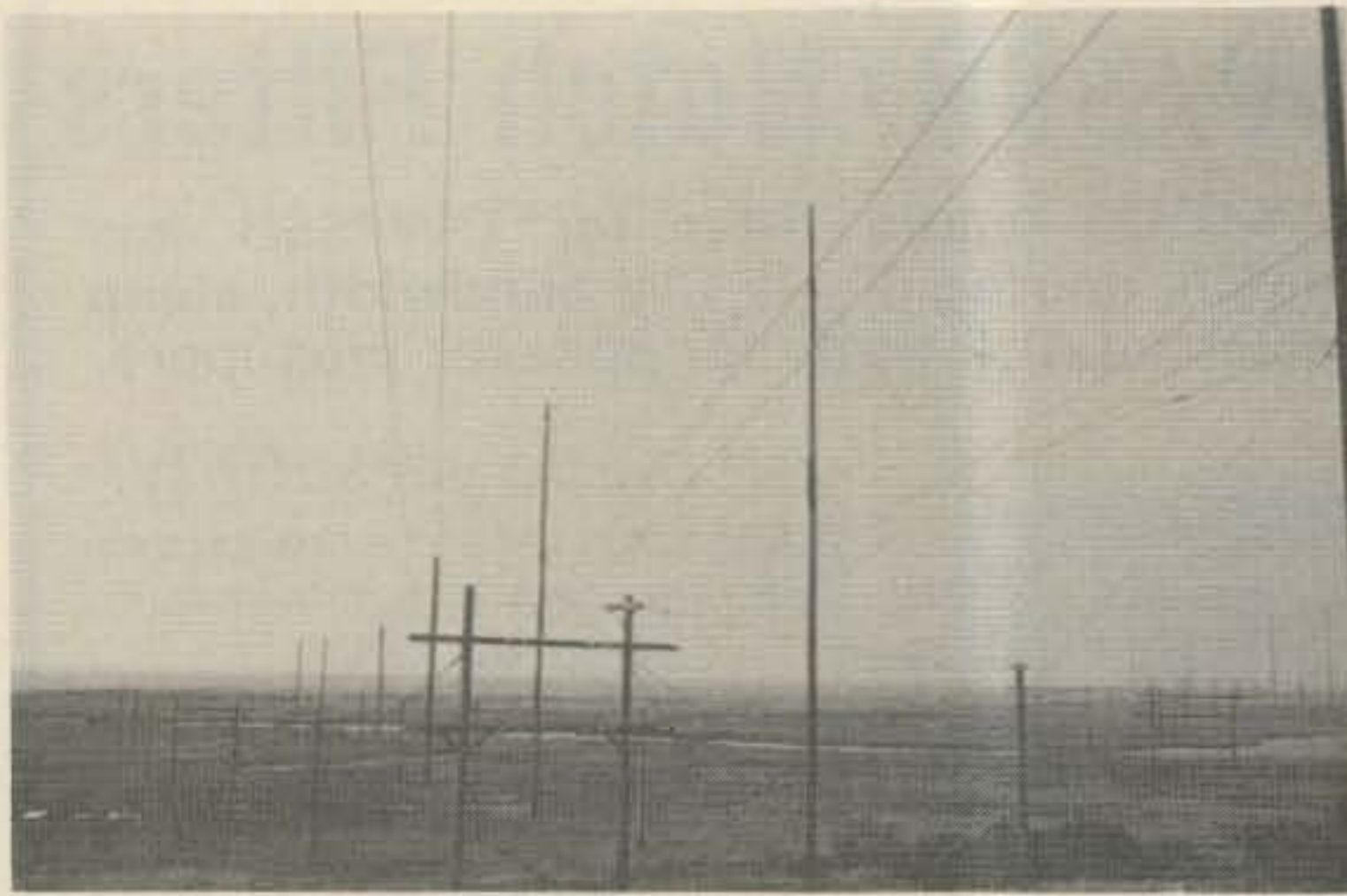


Fig. 3. At a remote transmitter site on the edge of a tidal marsh, WCC's antennas march out toward the Atlantic Ocean. These doublets and dipoles are fed with 10 kW of rf on 6, 8, 12, 16, and 22 megahertz.

message was sent from nearby South Wellfleet), are still intact. Most stand vacant now, victims of a technology to which they helped give birth. One, however, is as busy as ever.

Though methods of long-range radio communications have changed drastically during the last 60 years, the nobility of WCC remains. This station, which once provided weather information for Charles Lindbergh, maintained contact with Richard Byrd on his ill-fated trek to the pole, and monitored, then lost, Amelia Earhart's distant transmissions, has survived. And, in spite of the pressures for modernization, development, and progress surrounding them, these buildings, like the CW they shelter, are holding their ground in 1982.

What impresses most on a visit to WCC is the fact that in this high-speed, packet radio, orbiting-satellite world we live in, there is still a place where the Morse code is hammered out twenty-four hours a day, for a profit.

Edgar Hammons, manager of WCC: "Well, though we've seen a gradual decline over the last four years in the number of CW messages we handle, we're still quite busy." Though it

may be on the decline, the WCC CW traffic list is, nonetheless, impressive. During the course of one twenty-four-hour operating day, 900 messages will be handled by WCC—most of them on CW. In rotating shifts, the station's 21 CW operators provide thousands of ships at sea with a reliable and inexpensive means of contacting their home offices.

"Satellites and digital communications are fine," says Hammons, but, he adds, "they are also extremely expensive to install and maintain." A modern shipboard satellite terminal can cost a ship owner over \$50,000. As a result, many owners cling to CW and WCC as their only reliable communications link.

In addition to conventional CW, WCC offers customers with the proper equipment SITOR communications services. SITOR (Simplex Telex Over Radio) operates as an answer-back RTTY system. Running at 75 baud (50 wpm), SITOR transmitters and receivers at WCC echo message characters back to the ships that transmitted them. The result is error-free automated copy. In some instances, SITOR-equipped ships and their home offices can be connected directly through WCC for more private (and



Fig. 4. A new sign welcomes visiting amateurs to RCA's oldest commercial radio facility.

expedient) communications. A three-minute SITOR exchange with WCC costs an American ship about \$9, a substantial savings over the CW rate which is based on a 52¢-per-word charge.

For the time being, however, CW is still the mainstay of WCC operations. After the hourly traffic list is broadcast by the station on the 4-, 8-, 12-, 16-, and 22-megahertz marine bands, CW signals pile up for each of the eight operators manning the shift. Once he establishes contact with a ship, a WCC operator types the text of the message he has received or sends the text of the message he is holding. Received messages at WCC are passed to one of three printer clerks via a small conveyor belt. The printer clerks then key the typewritten messages into a teleprinter that connects directly to an RCA message-center computer in New Jersey. At this point, the computer takes over and automatically telexes the message to its final destination.

The obvious thing about WCC's message-handling procedures is that they are highly labor intensive: It takes a lot of people to get a message delivered. Ac-

cording to manager Hammons, however, staffing the station poses little problem, despite its location on remote Cape Cod. "We have no openings here at present," says Hammons, "although we frequently do. In fact," he adds, "I have two applications for CW operator in my desk drawer right now. Tell your readers that I'm always glad to get new applications, though."

WCC's operating staff numbers 34; 21 are CW operators, nine are marine telex clerks, and four are technicians. There are 13 hams on the staff (See Fig. 1), almost 40% of the total employees! The starting salary for a CW operator is approximately \$23,000 per year and the present contract calls for 10% yearly increases in wages.

Where does WCC find professional CW aficionados to man its station? Basically, there are two sources. Station operators come from the ranks of the military or from the ranks of amateur radio. Of the 21 full-time CW operators at WCC, eight are hams. In addition, all four technicians who attend to the day-to-day equipment maintenance and repair are hams.

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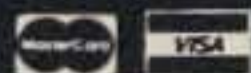
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Fig. 5. K1TV manning the SITOR transmitter.



Fig. 6. A typical WCC operating position. Emphasis is put on receiver performance and typing ability.

hams operating at WCC includes a second class commercial telegraph license and a well-worn Vibroplex bug. Hand keys are available at each operating position, but, in a partial concession to modernity, most operators prefer to use their own mechanical keyer. No electronic keyers are in evidence, although one ham on the staff has been experimenting with the use of a CW keyboard.

Traffic at WCC is usually passed at around 15 words per minute but, in some cases, more slowly if the shipboard operator is not up to speed with the WCC crew. The quality of the code coming into WCC, both in tone and in style, varies. Some shipboard signals chirp like late-night Russian DX on 40 meters,

and some of the fists sending these signals are straight out of the Novice bands.

Through it all, however, the cool professionalism of the WCC crew prevails. It is only rarely that the text of a message must be repeated by a tired operator in a distant port of call.

The Future at WCC

The future of WCC as a CW operation is open to question. Ed Hammons, conceding that CW is being eclipsed by the more cost-effective SITOR system, thinks CW will be around for some time, however. "I believe that we will always have Morse code," he said, adding that, "eventually it may not be the biggest segment of our business." Hammons went on to say that SITOR is gaining in

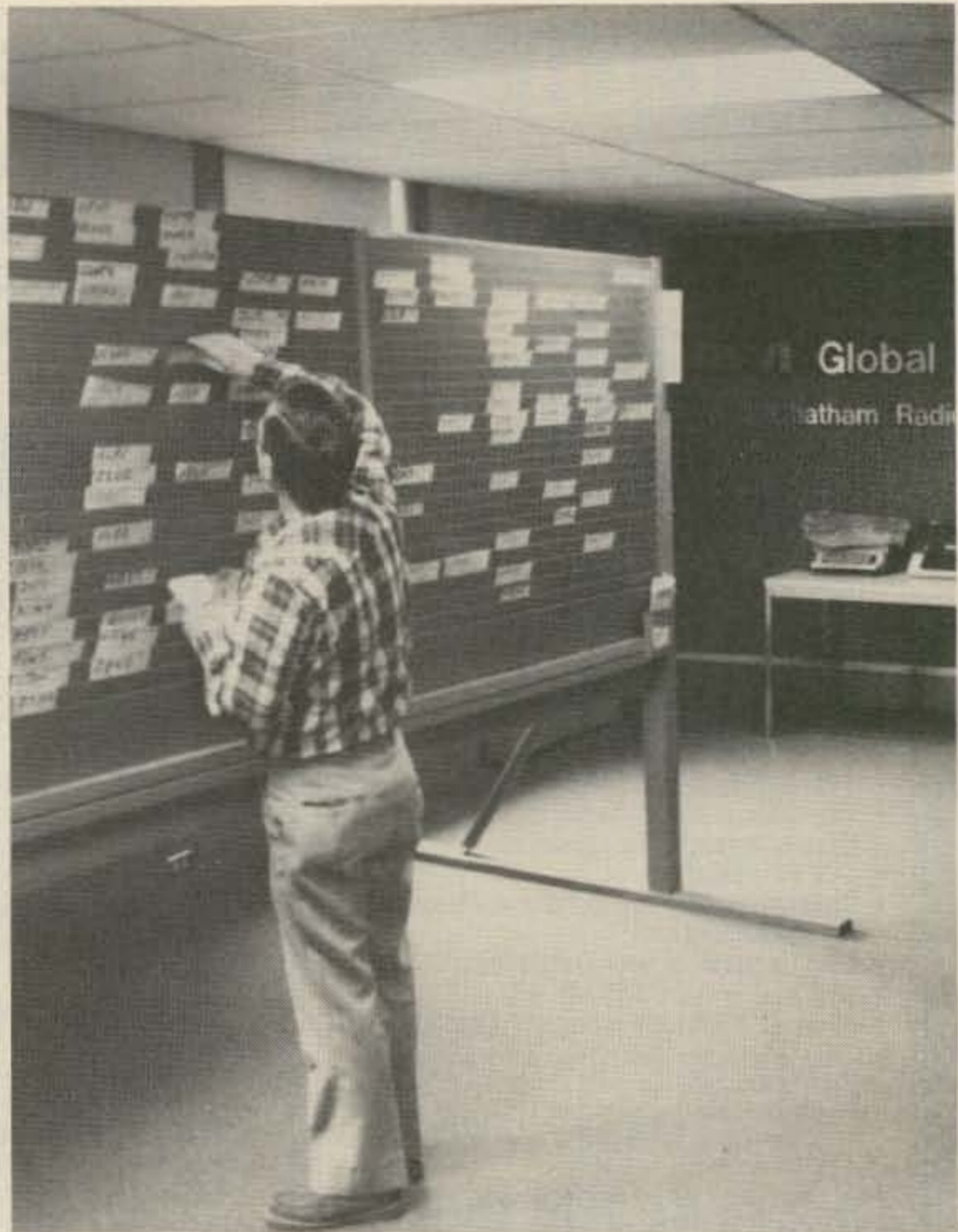


Fig. 7. Outgoing traffic is posted on the WCC message board. Between 700 and 1000 pieces of traffic are handled on a typical day.

popularity rapidly and that, at present, WCC is handling a new ship on SITOR almost every day.

For the CW operators at WCC, all of whom take turns babysitting the SITOR equipment now and then, CW remains more than a business; for most, it is a passion. One of them who argued most adamantly for the maintenance of high-quality standards on CW, as well as for the retention of CW as a requirement for amateur licensing, was not even a ham. He simply felt that CW was "something special, something human" in our digitally-automated world of tomorrow.

Sentimentality aside, the fact remains that a substantial portion of the message traffic that passes between the U.S. merchant fleet and their home offices in this information age in which we live does so via CW. For beleaguered CW stalwarts who

constantly find themselves on the defensive when confronted by their SSB- or ASCII-loving ham brethren, that may be comforting to remember.

It may also be reassuring to remember that, should the cares of this modern information age become too great, there is an alternative. In a quiet village on old Cape Cod there is an ivy-covered building with a history as long as radio communications itself where a CW-loving ham can earn a decent living by pounding out ten kilowatts of Morse for all the ships at sea. All he needs is a love of CW and a well-broken-in, vintage Vibroplex bug.

Amateurs visiting Cape Cod are welcome to tour WCC. The station management requests that all visits be made between 8 am and 4 pm, weekdays only, and, when possible, arranged one day in advance. ■

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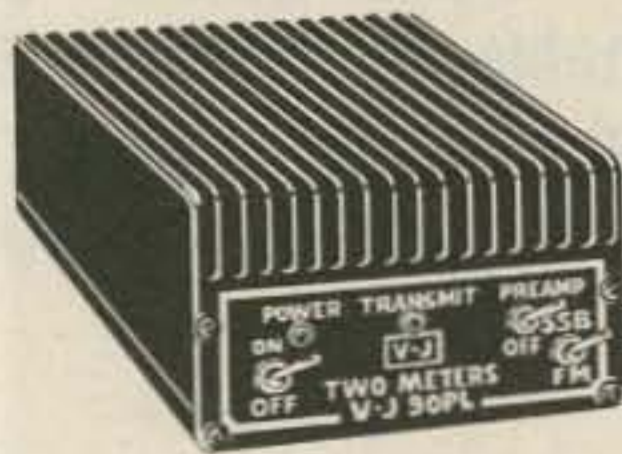
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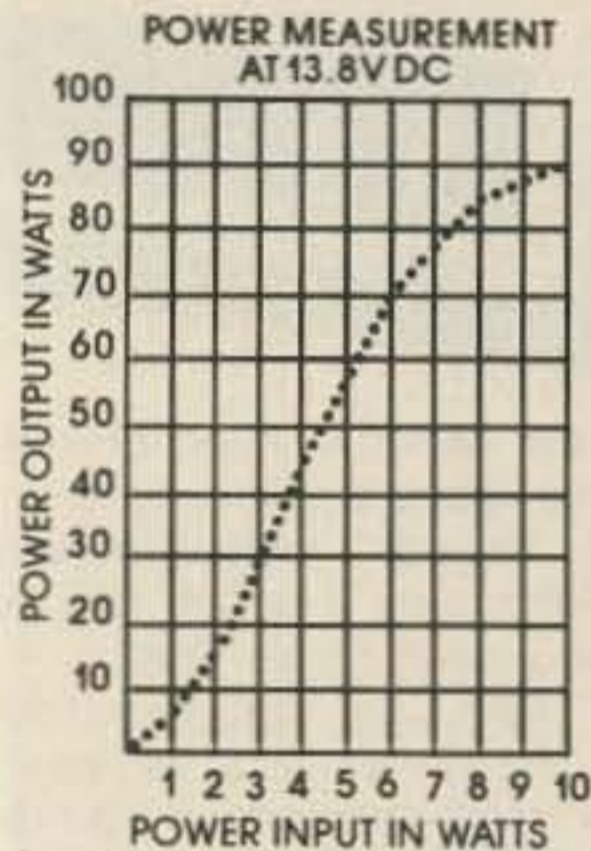


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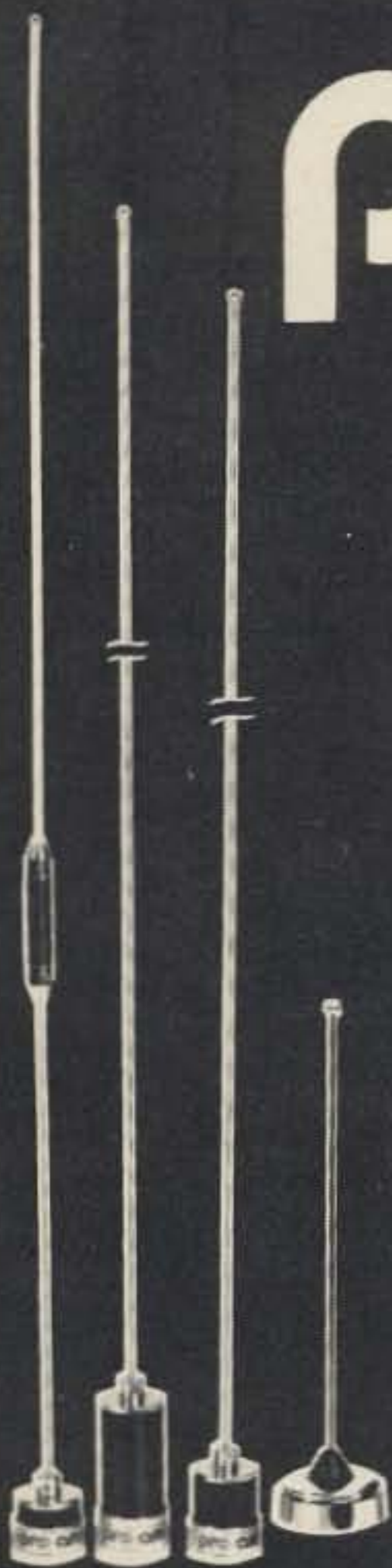
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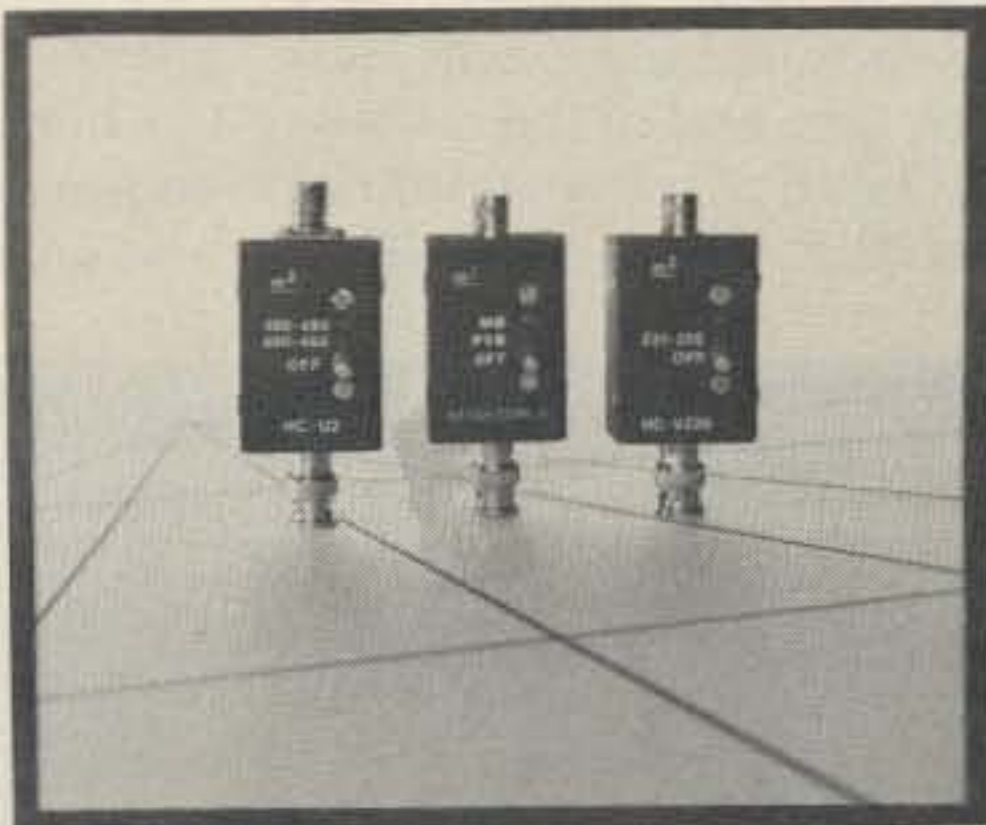
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dustry. (How would you signal an oncoming train that a bridge was washed out?) It was just as important that the girls knew how to signal for help using Morse code. Hence, our program on emergency communications.

The cpo itself was built using 1 IC, 1 capacitor, and 1 speaker! The volume was sufficient for our meeting area and four C-cells wired in series provided the required 6 volts. Did I say 6 volts? Oh, yes, not wishing to build a 5-volt power supply (as required by the Schottky IC) for the circuit, I just used a voltage-divider network consisting of two resistors wired in series with the battery pack. One resistor was 10 Ohms, the other was 50 Ohms. The 50-Ohm resistor will function just like a miniature 5-volt battery. One end of the resistor will be the positive terminal and the other end will be

the negative terminal. The current drain of the IC is so small that there is no problem with this arrangement.

The circuit was soldered directly to an IC socket and the speaker. I could have soldered directly to the IC pins, but happened to have a spare 14-pin socket in my junk box.

I used two 100-Ohm resistors in parallel to produce 50 Ohms. A standard 51-Ohm resistor would have worked just as well, as the maximum voltage for the IC is 5.25 volts.

The schematic diagram is self-explanatory. Build it and enjoy! ■

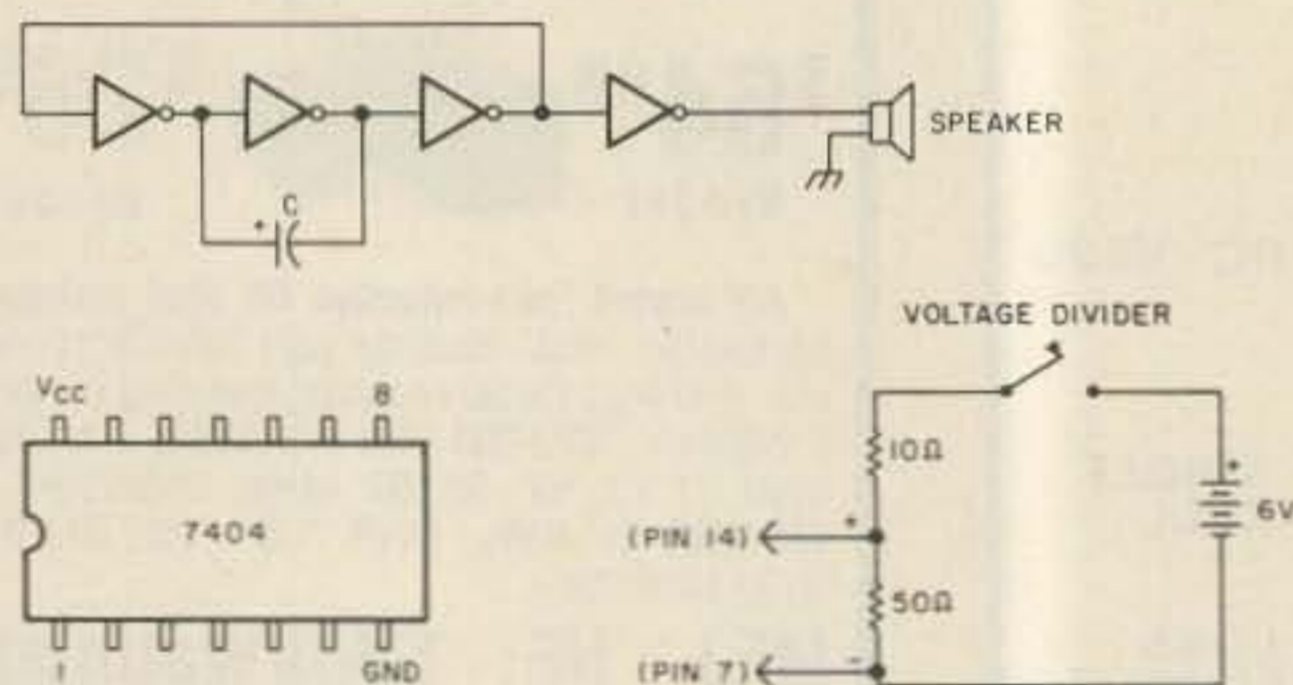


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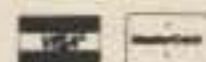
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Coherent CW for VHF

— will it work?

The so-called system of "coherent CW," which is actually a form of matched filtering with extremely narrow bandwidths, has been applied to the high-frequency spectrum and should have interesting VHF applications. Information is typically communicated at a bandwidth of only 10 Hz, resulting in a remarkably high signal-to-noise ratio. Successful contacts have been carried on at low power levels (such as 1 Watt) on 80 meters and over long distances (California to Asia) on 20 meters.

Interesting technical by-products have been the development and use of the Petit filter with readily adjustable narrow bandwidths, the production and use of high-quality frequency synthesizers, and major advances in frequency stability, along with greatly improved methods of frequency measurement. Another important factor is the use of keyers with precision timing and phasing for each bit of each Morse element, using either the Accu-Keyer or special computer keying programs.

To our knowledge, the application of all of these technologies has not been made to VHF communication, but some of them may hold promise for important future advances at these higher frequencies.

Why Narrow Bandwidth at VHF?

The use of FM and the promise of packet communication at high speeds has drawn attention to the advantages of the wider bandwidths available at VHF. But for some applications,

a completely opposite approach may be better. Suppose that we would prefer to get maximum range or highest intelligibility for only a brief message or one that might just as well go slowly. This could be, for instance, where the most important information might be evidence of contact through call letters and a signal report.

Let us make a simplifying assumption (not exactly true) that the methods of modulation and detection would be the same for either wide- or narrow-bandwidth communication and that the bandwidth required is the same as the bits sent per second. Curiously, 10 kHz completely filled for one second with 10,000 bits of information (as in a packet) would transmit exactly the same number of bits as 1,000 separate channels, each 10 Hz wide and each transmitting only 10 bits during the second (as in CCW). Noise power on each channel is proportionate to channel bandwidth. So, for the same signal-to-noise ratio, each narrowband signal using one milliwatt would do as well as the packet transmitter using 1 Watt. All the narrowband stations together would use

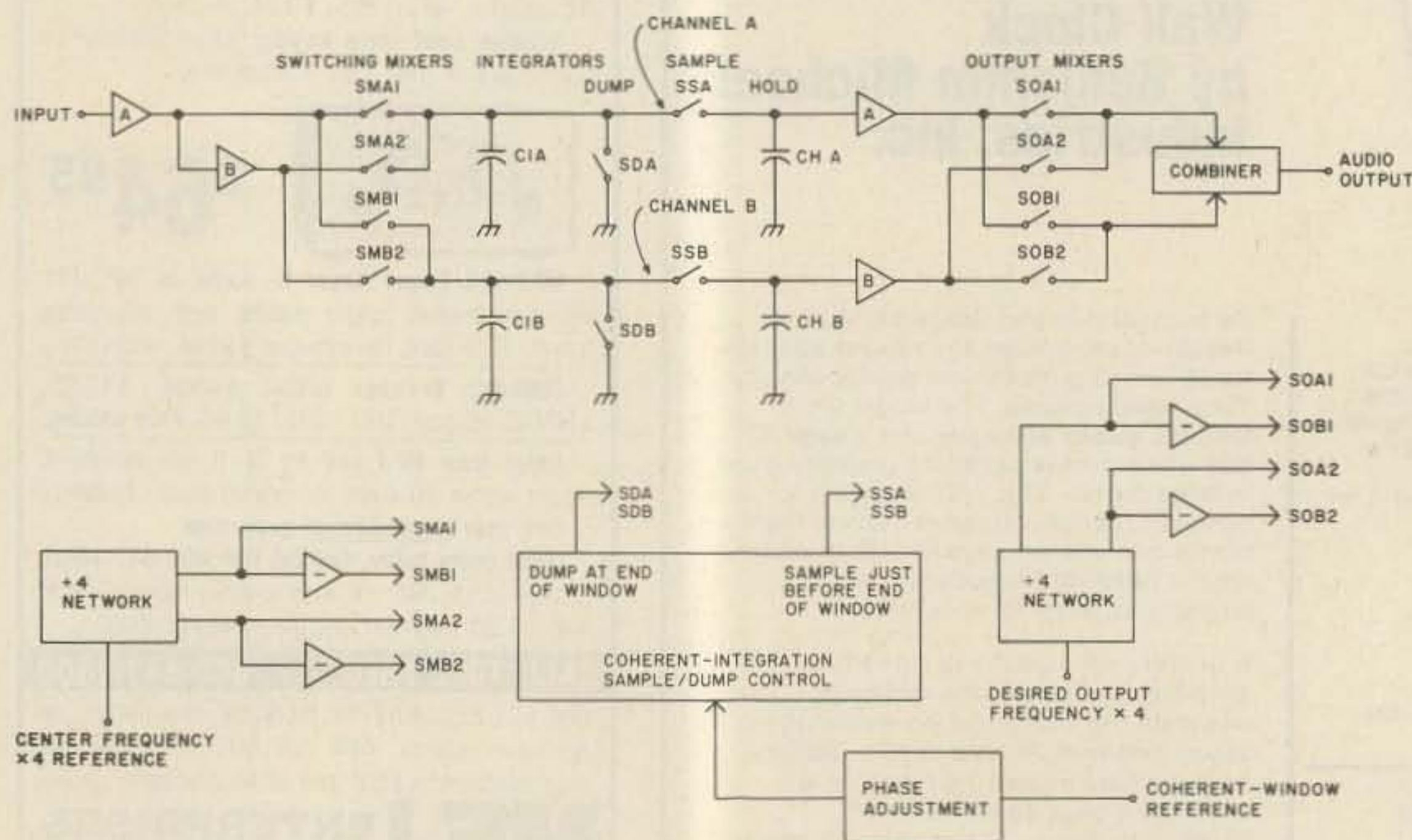


Fig. 1. Block diagram of the Petit filter (originally appeared in QST, May, 1981).

1 Watt—or if we preferred to use only one channel, we would use the same total amount of energy by taking 1,000 seconds to send the same message!

Thus, neither method has an inherent advantage in bits of information per unit of transmitted energy. So our choice will be made by whether we prefer speed at higher power or slowness at lower power (or perhaps greater range at the same power, at the sacrifice of speed).

We should note that if the total time is minimally used by packets or if the total frequencies are minimally used by lower-power narrowband signals, the chances of interference to either mode by the other mode in the same frequency range are very slight. Each tends to be immune to the other. (This will not apply, of course, if some greedy DXer tries a kilowatt on CCW!)

The Narrowband Matched Filter

We usually think of Morse code in terms of dot and dash patterns, each attached to a particular letter, number, etc. But Morse can be just as well conceived as a digital system based on an "on" (=one) or "off" (=zero) condition during a series of equal time intervals. Each time interval would be the length of a dot. A dot is a single one. A dash becomes three consecutive ones. A space within a character is usually one zero, between characters is three consecutive zeroes, and between words is seven consecutive zeroes.

If the timing of the Morse transmitter is precisely controlled, it will be sending a serial stream of digital information in classical binary form. Then a receiver can be constructed with a filter and detector carefully

matched to decipher the digital message.

Despite the title of "coherent" CW, there is no way to preserve the phase coherence between the transmitted and received waves. Ionospheric or tropospheric media always cause some phase disturbances. The true essence of CCW is in the use of a matched filter.

At code speeds used by amateurs, bandwidths of matched filters can be extremely small. Typical dot lengths are a tenth of a second, producing about 12-wpm code speed. A Petit filter matched to such a signal has a 3-dB bandwidth of only 9 Hz. This allows for an outstandingly good signal-to-noise ratio.

The Petit Filter

The Petit filter refers to a design by Ray Petit W7GHM. Although the details of its circuit are described in the bibliography at the end of this article and will not be repeated here, a block diagram is shown in Fig. 1. The filter has several distinct features:

1. It operates near zero beat. Usually the filter bfo is at 1 kHz and it tunes to a receiver signal output very close to 1 kHz.

2. Two filter channels are used with a 90-degree phase difference between them. This quadrature phasing is necessary because near zero beat there is always the possibility that output in one channel alone might be in such a phase as to give almost no output. In that case, the quadrature channel output would be nearly maximum. Adding the two channels ensures an output whenever a signal is really present. The phase shift between the two 1-kHz-filter bfo signals is obtained by properly dividing 4 kHz by 4.

3. Matching is achieved by using a high-precision secondary frequency standard to control all func-

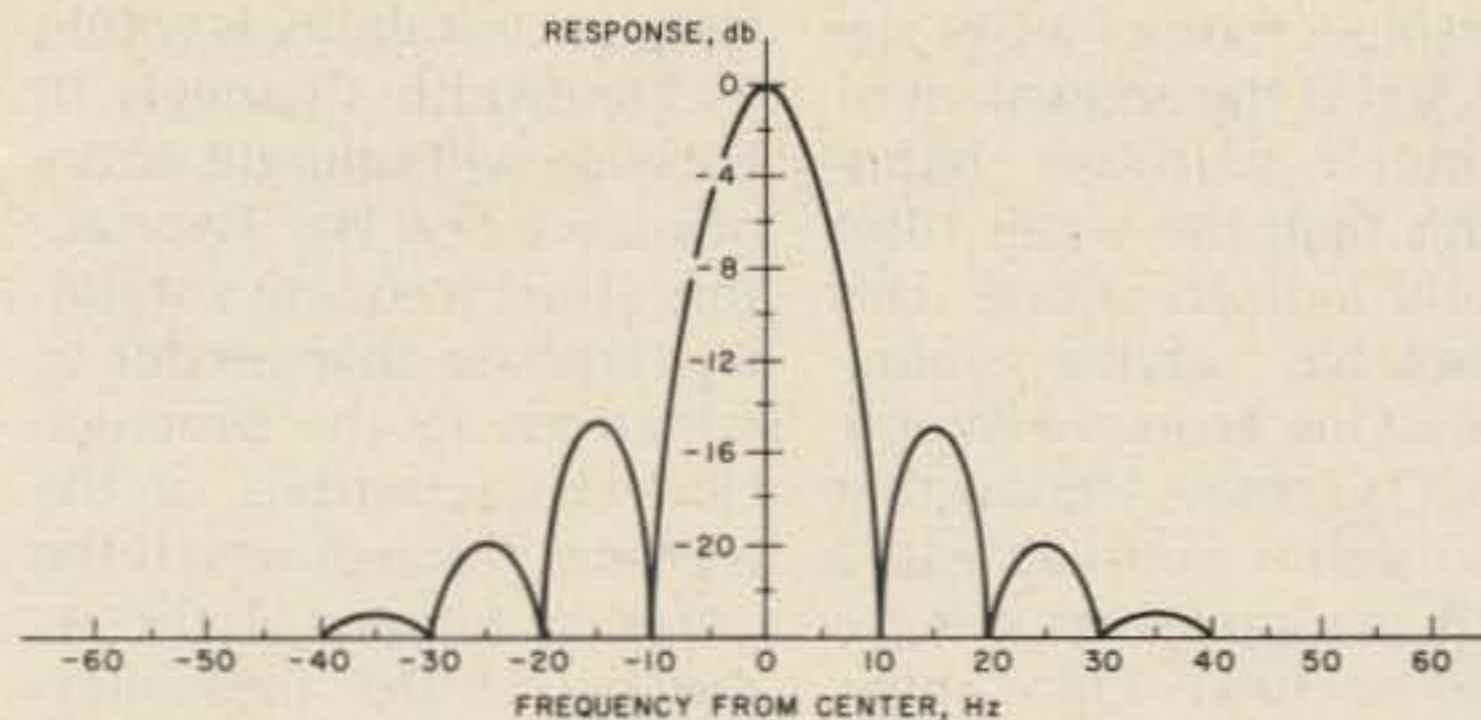


Fig. 2. Petit filter response curve (originally appeared in CQ, June, 1977).

tions on both transmitter and receiver. This not only ensures close tolerance in receiver tuning (within 1 Hz), but also close synchronization between received digital pulses and filter pulse sampling. A controlled-pulse repetition rate is not sufficient to hold this synchronization; the phasing of the time sampled by the filter must also be adjusted so that the transmitted signal is framed within a "window" opened to each signal pulse. Ten phasing-switch positions allow adjustment of the framing in 10-ms steps. Initial adjustment is made by listening for the clearest reception of a series of transmitted dots.

4. Each 100-ms window opening is the result of an integrating circuit in each filter channel. The integrated output is remembered for the next 100 ms by a sample-and-hold circuit. The latter either sets the level of a tone modulator for audio readout or else crosses a threshold for digital detection. At the end of the 100-ms interval, the output of the integrator is dumped by a shorting switch so that the next sample can begin. Note that the total independence of each sampling time interval disallows the "ringing" so common to very selective bandpass filters. Ringing is a condition of slow buildup and decay that can make a Morse signal sound so mushy as to be unreadable. The Petit filter is immune to ringing.

The selectivity curve of the Petit filter is shown in Fig. 2. It does have side lobes that are still fairly high, although they remain quite close to center frequency. These side lobes might be diminished or eliminated by using other kinds of filters or by modifying the Petit filter. They are partly the consequence of the assumption in the design of the Petit type of filter that the Morse digital information is in pulses with zero rise and fall times—an inaccurate assumption.

Bandwidth may be adjusted easily by changing the sampling time interval. For instance, 1-second dot intervals will produce a bandwidth of only about 1 Hz, pulling signals out of the noise in a most impressive manner.

Signal-to-Noise Improvements

Some taped samples of 80-meter signals received by W3QVC and lab tests by W7GHM using the Petit filter are available for loan/purchase/copy from W3QVC at a minimal cost.

On an abstract numerical basis, signal-to-noise ratio is inversely proportional to receiver bandwidth. Thus, a 10-Hz-wide channel would give a signal-to-noise power advantage of 210 times (23 dB) compared to a 2100-Hz channel (a typical bandwidth for SSB voice communication).

In practice, the human ears and brain allow a degree of concentration on

the single tone of a CW signal that is the equivalent of a much narrower bandwidth than the wider filter would indicate alone. This effect has varying evaluations. One estimate (Woodson, *QST*, May, 1981) is that "this skill is worth at least a 6-dB margin when using a 2300-Hz filter. QRM, however, is often a confusion factor and therefore causes more degradation of copy than an equivalent amount of random noise. These psychological factors are difficult to quantify, but probably reduce the advantage of CCW over ordinary CW."

Woodson then gives comparisons of CW and CCW at different power levels in 14-MHz communications in 1975 between JR1ZZR and W6BB. Both modes were taped simultaneously on separate stereo channels and each channel was played back to four moderately experienced CW operators. The conclusion saw "an estimated 13-W CW signal as equivalent to a 0.1-W CCW signal in communications effectiveness, or a 24-dB superiority for CCW." (He should have said "21 dB" for that power gain.)

The taped laboratory experiments of W7GHM indicate that a CW signal 5 dB below the white noise level using a 500-Hz filter is just barely audible and only occasionally readable. The addition of a 10-Hz-wide Petit filter brings it to an easily copied level at what Petit describes as a "signal-to-noise ratio of 12 to 15 dB."

When Petit then drops a signal 14 dB below the noise and changes his filter to only 1-Hz bandwidth, the results are truly astonishing. The signal goes from completely lost in the noise up to 15 dB above the noise—a gain of 29 dB!

Frequency Stability

A narrowband system can work only if its overall

frequency stability is within its bandwidth. Channels 10 Hz wide will tolerate errors of only a few Hz. Two factors affect frequency stability: (1) phase changes due to variations in the propagation characteristics of the medium through which the wave is sent, and (2) the accuracy of the frequency-control systems for the transmitter and receiver.

Phase changes during propagation set an almost absolute limit to the narrowness of the bandwidth that can be used. How could we imagine, for instance, that a VHF signal broadly modulated by the undulations of aurora reflection could be contained within a 10-Hz channel?

So far we do have some experience with CCW in long-distance HF communication. Woodson says: "For 14-MHz signals, motion in the F layer typically produces 2 or 3 Hz of phase (or frequency) modulation for a JA to W6 path. (We have also observed what appears to be propagation time delays under poor band conditions.)" Woodson goes on to speculate about VHF applications: "CCW might be used for EME communication, but the problem is complicated because of lunar-motion Doppler effects. One might need a computer to calculate the frequency at which the signal is expected to return."

A more practical solution to the Doppler problem with satellite repeaters might be reached through tight phase-locking to the satellite beacon signal, followed by computerized selection of the receiver frequency for a given transmitter. Even this would involve the solution of a complex puzzle.

VHF experimenters will have to discover what atmospheric conditions will allow the practical application of CCW to the VHF and UHF bands. Exactly what

phase shift is introduced in tropospheric propagation? Can frequency modulation be confined to 2 or 3 Hz? On what bands, under which circumstances?

Questions like these, with answers not yet available, determine the ultimate possible narrowing of bandwidths. But the picture is less cloudy, indeed hopeful, when we consider the area of equipment frequency control.

Secondary Frequency Standards

The accepted frequency accuracy for HF CCW equipment is one part in ten to the seventh power. This allows for an error of not more than 1 to 2 Hz in either the transmitter or the receiver—adequate for 10-Hz bandwidths. The required precision is met by carefully constructed room-temperature oscillators with temperature compensation through suitable capacitors across the crystal.

VHF CCW calls for at least an order of magnitude of improvement in frequency accuracy. Frequency standards dependable to one part in ten to the eighth are not so simple. They use excellent crystals and both crystal and oscillator are enclosed in two concentric proportionately temperature-controlled ovens. The one ray of hope for amateur use of these standards is that they are available on the surplus market from time to time, currently costing about \$75.

The setting of the exact frequency of such a standard is also a problem—but not unsolvable. HF propagation phase shift makes WWV unusable for most people for standardizing frequency to better than one part in ten to the seventh. Higher accuracies can be obtained from one of three comparisons: (1) with WWVB at 60 kHz, (2) with Loran C at 100 kHz, or

(3) with TV network colorburst signals.

Comparison With Primary Standards

Don Gross has developed a receiver that allows the signal from WWVB to gate a frequency counter. The frequency of his secondary standard is multiplied by ten, resulting in a 10-MHz wave to be counted. By using 100-second gate times, his standard can be measured to parts in ten to the ninth. Counting errors are typically only 1.4 digits (or 1.4 parts in ten to the ninth) during the midday hours when 60-kHz propagation is most stable. The addition of a voltage-variable capacitor to the frequency standard allows easy trimming adjustments to a part in ten to the ninth. Drift is so slight that such trimming is needed only two or three times a week.

Such high accuracies are possible when WWVB is received on a good balanced and shielded loop antenna and when the receiver bandwidth is narrow enough to provide a good signal-to-noise ratio. The Gross receiver converts the 60-kHz signal to 1.11 kHz, where it passes through an N-path filter only 0.1 Hz wide. It is then re-converted to 60 kHz, limited and zero-crossing detected, then frequency divided to provide the counter gate control. Both the down- and the up-conversions use heterodyning frequencies derived from the secondary standard.

Bert De Kat has developed an effective and fairly simple method of measuring frequency by using Loran C. He uses a switch-controlled frequency-divider system to derive from his secondary standard the pulse repetition rate (PRF) of any Loran C station. (This divider is derived from Fig. 7, *Burhans*, 73, May, 1978, ignoring the slave window timer.) He sets his PRF to

coincide with the nearest station and uses this locally-derived signal to trigger his oscilloscope. A broad-banded 100-kHz shielded loop and amplifier provide the Loran C signal to be displayed on the scope. By switching to a one-digit miscount in the divided frequency, the position of the display can be slowly moved across the screen until it reaches a suitable spot; the count is then corrected and the waveform stays in position. By using a high-grade oscilloscope, it is possible to expand any small portion of the 100-kHz waveform. By choosing the third zero-crossing of a pulse being built up, it is easy to keep track of the length of time that part of the wave moves across a measured part of the screen. This information can be used to measure the phase drift of the secondary standard. This measure is highly accurate, since the chosen part of the waveform is purely ground-wave and therefore stable in its propagation. Frequency is readily measured in parts in ten to the ninth or better.

Other methods of precise frequency measurement are covered in the bibliography.

Frequency Synthesizers

Since every frequency and timing element must be accurately controlled, high-quality frequency synthesizers are important. Ray Petit has done outstanding work in this direction. Although the bibliographic references to his synthesizers do not represent his latest developments, they show examples of excellent equipment that can be used to tune in either 100-Hz or 10-Hz increments, all phase-locked to the secondary frequency standard.

Keyers

The keyer that lends itself especially well to the timing requirements of

CCW is the Accu-Keyer described in many issues of the ARRL *Radio Amateur's Handbook*. The oscillator part of this keyer is eliminated. A 10-Hz square wave derived from the frequency standard is connected in its place. This same 10 Hz is sent to the clock input of two D flip-flops: The Q output of one of these goes to the dot input of the keyer; the Q output of the other provides the dash input. The paddle (preferably a dual squeeze type) connects to the D inputs of the flip-flops. Debouncing can be arranged by connecting a resistor from each paddle output to the keyer positive voltage and a capacitor from each paddle to ground. CMOS versions of the Accu-Keyer are easily constructed and they are advantageous. The result of this circuit modification is a keyer that follows the desired CCW timing cycle to perfection.

Computerized keying is becoming increasingly popular. Some commercial keyers can be modified for the external timing and phasing required for CCW; others cannot. W3QVC had hoped that his M-80 Morse program for his TRS-80 would be adaptable to CCW. Although its keying speed can be fine tuned, its phase cannot be linked to the secondary frequency standard. As a result, with much that has been learned from volume 4 of the *Disassembled Handbook for the TRS-80* mentioned in the bibliography, he is encouragingly engaged in the production of a machine language Morse program for the TRS-80 (either Model I or Model III) that can use external clocking derived from his frequency standard.

Conclusion

CCW is just beginning to make its mark in amateur radio communication. With all the technological advances now at hand, there is

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every reason to consider the possible usefulness of CCW in the VHF range. There is plenty of room for new experiments! ■

Bibliography

Burhans, R. W.:

"If You Want To Know Where You Are: The Mini-L Loran-C Receiver," *73 Magazine*: Part I, April, 1978; Part II, May, 1978.

Disassembled Handbook for the TRS-80, Vol. 4, Richcraft Engineering, Chautauqua NY 14722, 1981.

Hewlett-Packard: *Timekeeping and Frequency Calibration*, Application Note 52-2, 1976.

National Bureau of Standards:

Davies, Kenneth: *Ionospheric Radio Propagation*, NBS Monograph 80, 1965.

NBS Radio Stations.

NBS Time and Frequency Bulletin.

The New NBS Frequency Calibration Service. (On use of TV network color-burst signals.)

Time and Frequency Users' Manual, NBS Technical Note 695, 1977.

Petit, Raymond C., W7GHM:

"Coherent CW: Amateur Radio's New State of the Art?", *QST*, September, 1975, p. 26.

"Frequency Synthesized Local Oscillator System for the High Frequency Amateur Bands," *Ham Radio*, October, 1978, p. 60.

"Phase-Locked 9-MHz BFO," *Ham Radio*, November, 1978, p. 49.

"Phase-Locked Up-Converter," *Ham Radio*, November, 1979, p. 26.

"Technical Topics," *Radio Communication* (RSGB), June, 1975, p. 462; July, 1976, p. 517.

Weiss, Adrian, W8EEG:

"Coherent CW—The CW of The Future?", *CQ*: Part I, June, 1977, p. 24; Part II, July, 1977, p. 48.

"QRP," *CQ*, January, 1978, p. 44.

Woodson, Charles, W6NEY:

"Coherent CW," *QST*: Part I—"The Concept," May, 1981, p. 11; Part II—"The Practical Aspects," June, 1981, p. 18.

"World of Amateur Radio," *Wireless World*, March, 1975.

Electric Health via Negative Ions

— combatting an invisible menace

Scientists studying "ill winds" have unearthed some amazing facts. First of all, there really are ill winds, air masses that produce nervous and physical symp-

toms in weather-sensitive people.

In our country, these symptoms have long been considered purely psychological, or just in one's

mind, but in other countries such as Germany and Israel, they have long been related to bad winds, the Foehn in Germany and the Sharan in Israel.

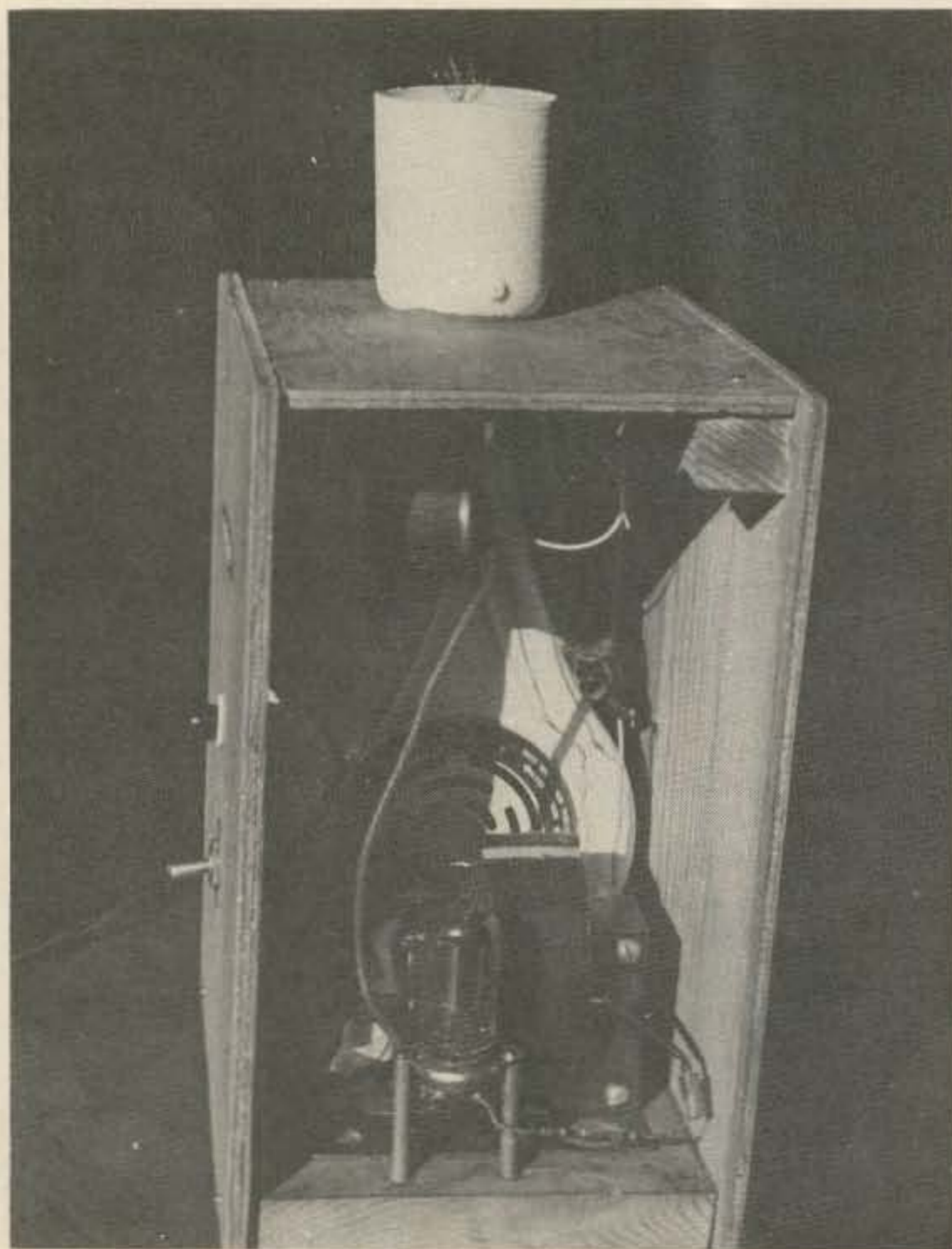
Scientists have found that these air masses produce measurable changes in our bloodstream. And they believe they have found out how.

It seems that even before these winds sweep across an area, the positive ionization of the air increases enormously. In normal air,

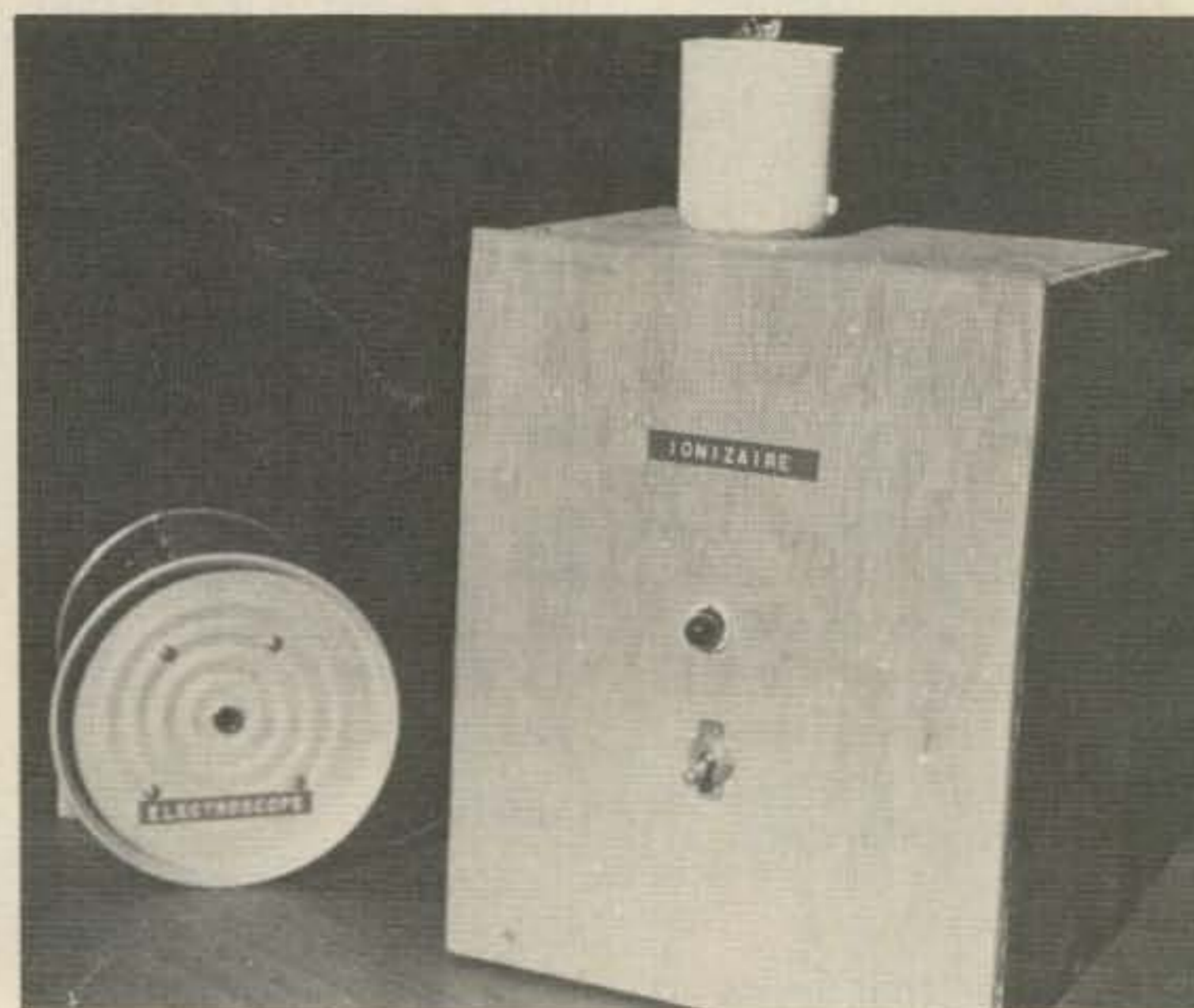
for every four negative ions there are five positive ions.

These positive ions in some way seem to increase the serotonin in the blood. This is a hormone whose properties are just now being investigated. Already we know serotonin has a great deal to do with our nervous condition, our moods, etc.

Before the ill winds come, the positive ionization of the air increases over 3000%. It's no wonder, then, that people can be affected. Doctors in Israel



Inside the ion generator. Old hair dryer (without heating elements) is used to disperse ions.



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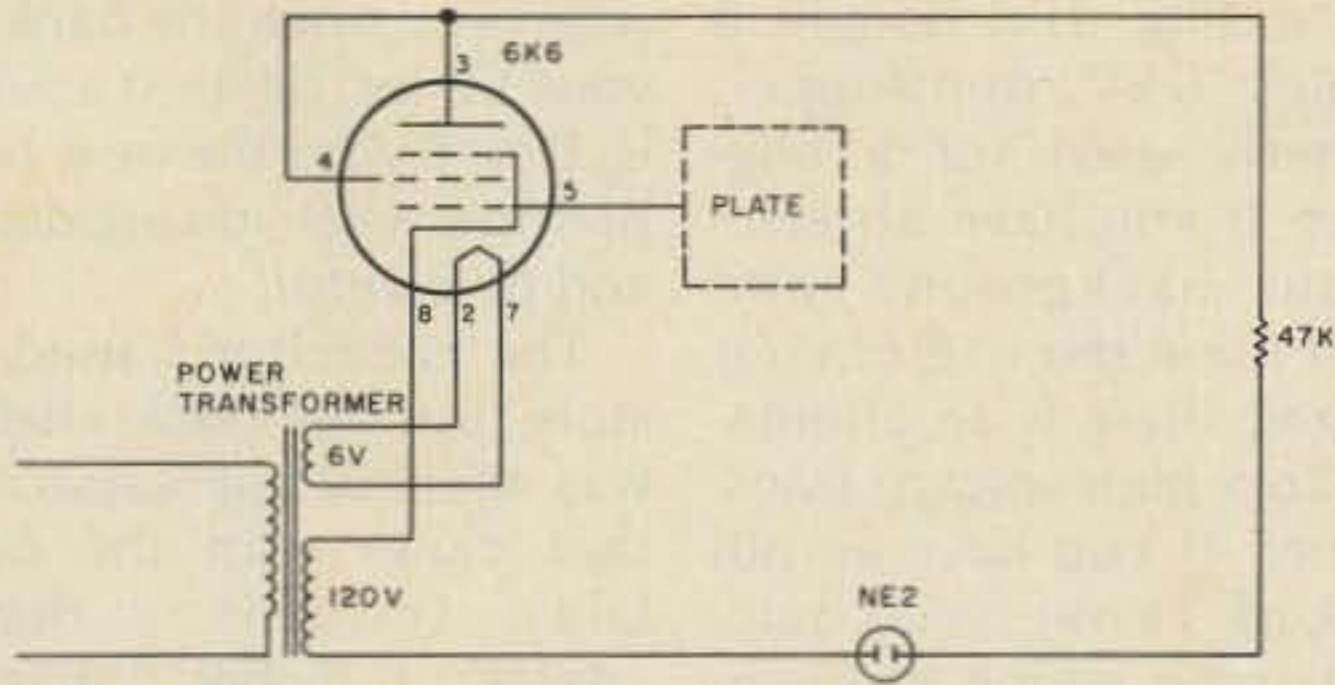


Fig. 1. Schematic of negative-ion-sensing electroscope.

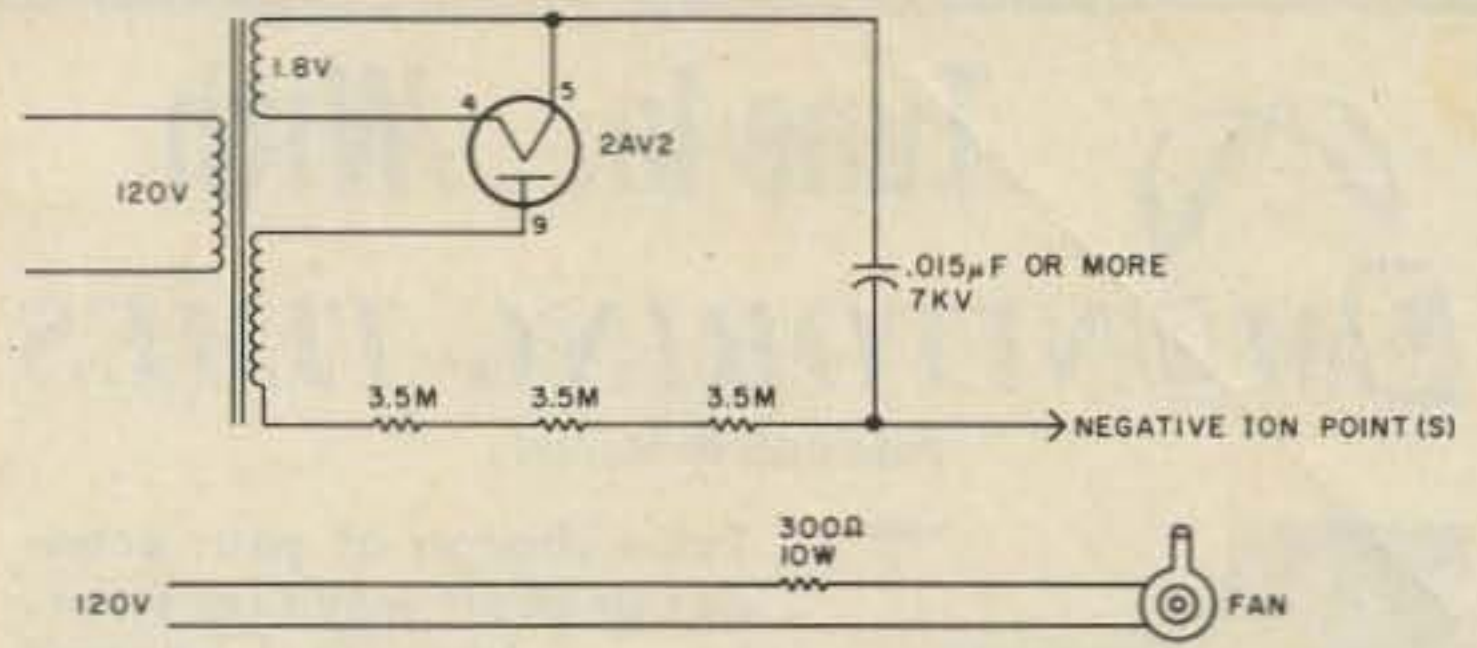


Fig. 2. Negative-ion generator.

often treat the nervous and physical ailments of their patients at these times by drugs that inhibit the action of serotonin, with almost magical results; moods change dramatically.

In our country, we also have such ill winds: the Santa Ana in California and the Chinook of the Rocky Mountains. You have perhaps experienced the exhilarating effects of the air at the seashore, near a waterfall, or in the mountains. In such places, the *negative* ions predominate.

As we become more and more "civilized," we also live in more completely air-conditioned environments. This air-conditioning not only warms or cools the air, it often deprives it of most of its negative ions. Air pollution outside our homes has the same effect. Tobacco smoke, besides being offensive to many noses, also depletes our working and living environments of negative ions, thereby adding to our nervous tension, so we pull out another cigarette, compounding the felony.

The mood we are in while we work is important. The Federal Aviation Administration is even studying the possibility that the imbalance in positive/negative ion concentration in cockpits may contribute to pilot error, resulting in dangerous situations for all on a flight.

This new knowledge of our environment and how it affects us has promoted the

rise of several companies producing negative-ion generators, on the theory that if we can change the ion balance in our living or working environment to favor the negative-ion concentration, it will result in better feelings and better work, as well as help purify the air.

Most of these companies are really trying to give us something for our money, but some do it better than others. Some ion generators produce mostly ozone, which is not the negative ions we want; in fact, it has been found detrimental to health.

Later in this article I will detail how you can build your own negative-ion generator. But first we should have a way of telling whether we are really getting negative ions or positive ions or just ozone. We can't see any of these. Ozone we can detect if our nose is in good functioning condition, but only our moods could tell us whether there are too many positive ions in our environment.

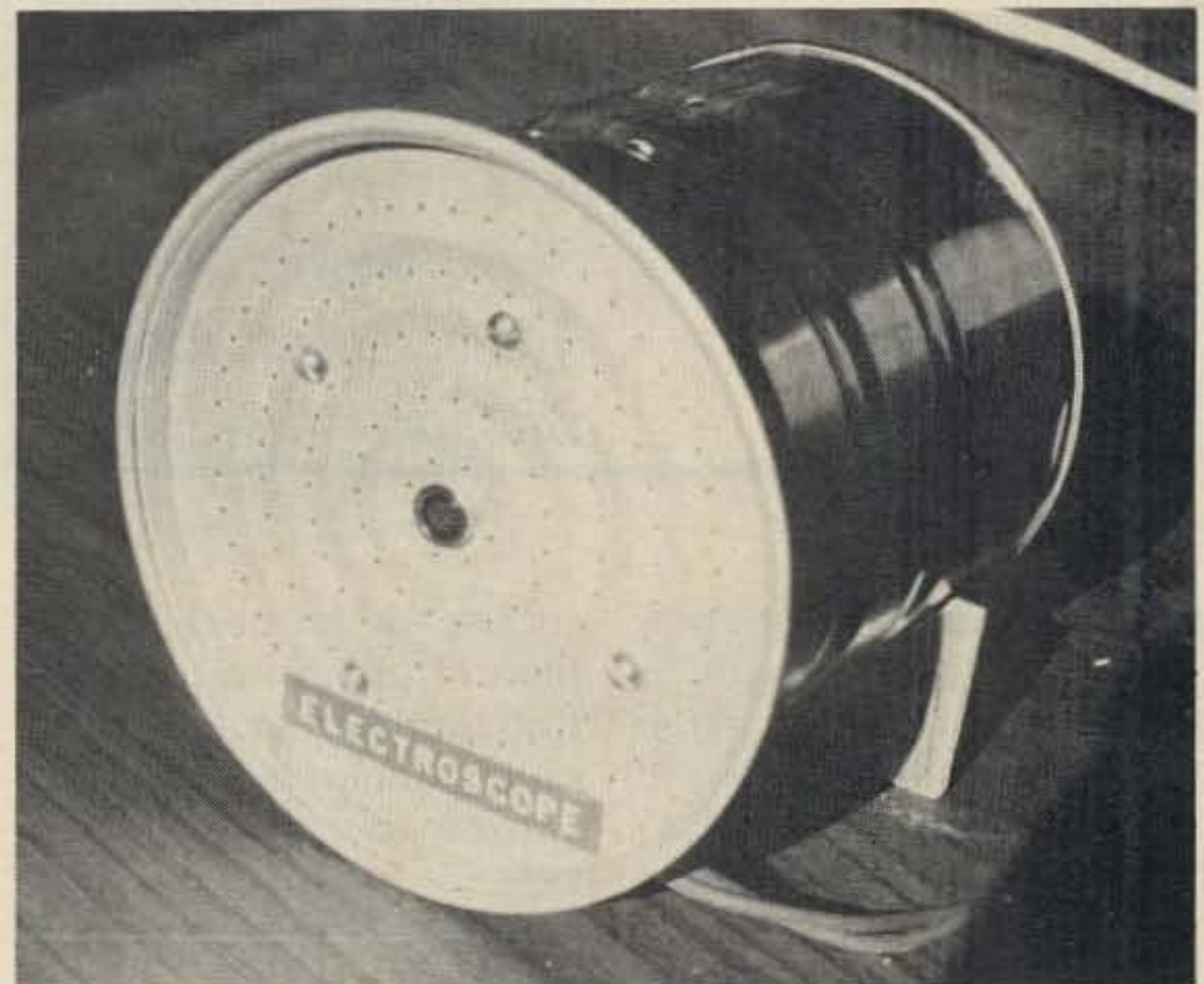
So, although we can produce our own negative ions, we need a method of detecting these helpful ions. What we need is a negative electroscope. You may be familiar with electroscopes used in high-school science classes, two-leaf affairs made of thin foil which separates when electrostatically charged. The difficulty with these is that they will react to either a positive or a negative charge. So we still are in the dark as to

which ions we have generated, if any.

The Negative Electroscope

Fig. 1 shows how to build a simple *negative* electroscope which reacts to a concentration of negative ions. As you may know

from your knowledge of vacuum tubes, a negative charge on the grid of a tube prevents current from flowing in the tube. In this circuit the grid is connected to a pick-up plate some five inches (13 cm) in diameter. When this plate is in a nega-



Outside view of electroscope.



Inside the electroscope.



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tive field (negative ions produce a negative field), it places this negative charge on the grid of the tube and the neon bulb in the plate circuit goes out, showing that current in the tube has been cut off by a negative charge on the grid.

Any triode tube may be used, or a multi-element tube with the screen grid connected to the plate (ignore other elements except filament, cathode, and grid). If the cabinet is made of wood or plastic, you don't need the isolation transformer. But be careful that no high voltage is on any external surface.

I found an aluminum plate from a discarded percolator to be about the right size. I mounted the neon bulb (with its resistor) in the ready-made hole in the center of this plate. Then it was simple to mount a small filament transformer and the tube

socket to the back of this plate. I didn't use an isolation transformer as only the plate connected to the grid can be touched from outside, and it has only the voltage of the surrounding air.

Usually the neon bulb will be on because the ordinary air conditions are positive, which allows some plate current to flow. Touching the plate will sometimes cause the neon to go out, but more often than not it will light brighter. You can experiment with this electroscopes by combing your hair and bringing the comb next to the plate or walking across the carpet towards the plate. As you will find, most of the static charges produced are of a positive polarity and will make the neon glow even brighter.

The Negative Ionizer

To build the negative

ionizer (Fig. 2), I bought a surplus 6-kV transformer, formerly used for a bug-killer. If you have an electronic background and don't mind the size of your ionizer, there is an alternative to a high-voltage transformer. If you have an old working TV set, you could, with some wiring changes, bring out the negative high-voltage lead of your TV fly-back power supply and use it to generate your negative ions. The anode lead going to the picture tube is positive. In front of the ordinary TV set you will find an overabundance of positive ions. Perhaps this is partly the cause of our moody reaction to television!

I used an ordinary 2AV2 tube for rectifying the high voltage. If you have some very high-voltage diodes, these could be used, but they are not as tolerant of sparks and corona discharge as tubes are.

Build the whole ionizer in a wooden or plastic case or insulate heavily—five or six kilovolts is lethal! The extra 10-megohm resistor (actually three 3.5M resistors) is in the positive lead to ensure that anyone coming into accidental contact with the cathode, or negative-ion lead, will not be seriously shocked. According to Ohm's Law, this 10M resistance would allow about 0.7 mA of current to flow. You probably get much more than this in the thousand-volt shock you get by walking across the carpet and touching someone.

Despite this 10M precaution, shield the negative-ion point or cluster as well as possible from prying fingers. Be sure to keep the whole apparatus out of reach of children altogether. The shock that one can get from this ionizer is not serious but could easily produce a jerk of the arm that could upset and knock down the ionizer with more serious consequences. As

when you open the back of your TV set, the best advice is: Don't! And the next best is: Know what you are doing and be careful!

The capacitor I used to store up the 6-kV charge was the 0.015- μ F capacitor that came with the bug-killer. To build a better charge, a higher capacity could be used here (but be sure it is a high-voltage type). With the 6 kV, I had some trouble with arcing and corona discharge at the tube socket. The 10M resistor helped reduce this, and some anti-corona spray made it manageable. The corona discharge usually produces positive ions, so it is undesirable.

I first made the negative discharge element a point (a filed-down iron nail), but later added some extra points to increase the discharge. Perhaps you would like to use a piece of copper mesh such as is used in cleaning utensils. In any case, try to shield this in some way or keep it out of reach of children.

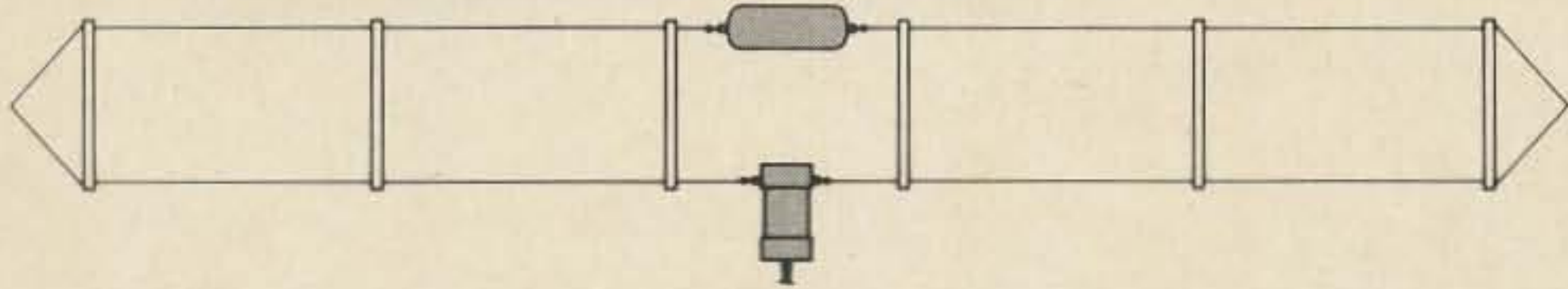
I found the 6-kV bug-killer transformer had enough space to wind a few extra turns on, to light up the filament of the 2AV2. If you can't do this or decide to use another rectifier, a separate transformer could be used for the filament. One advantage to using a high-voltage diode would be the saving of this extra transformer.

I also enclosed in my box an old hair-dryer blower (the heating element had burned out). In series with this I connected a 10-W resistor to slow it down a bit. In this way I had a slight breeze blowing up out of the ionizer to disperse the negative ions generated. But this is a refinement that may not be necessary.

"An ill wind blows no one good" says an old adage. Build this ionizer and be prepared to combat this invisible menace. ■

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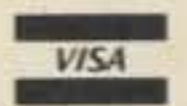
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- It works. (Slicker than a politician on the day before election.)
- The price. (How does less than \$10 sound?)
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- It's simple. (You can build it in less than an hour. You don't have to understand—just follow the pictures and the instructions.)

So if you're tired of crackles, pops, roars, whistles, and worse yet, interfering stations, this is the gadget for you. You can dial them out almost like magic!

The filter uses only one integrated circuit, the LM-324 quad op amp, which is available at Radio Shack for about \$1.50. Also required are some resistors and capacitors, a speaker, and a power supply (batteries will do). If you'd rather travel by Cadillac than skateboard, add a phone jack and construct a power supply as shown in Fig. 3.

The design is nothing new—as a matter of fact, it is based on a filter design shown in the spec sheet for the LM-324. We have added to the design to provide for an adjustable bandpass, and we have tried to write simple directions for construction. Those who are experienced builders are not likely to need or follow our instructions, so we are writing for the person who has never, ever even seen an integrated circuit.

Decisions, Decisions, Decisions

OK, if you are convinced that you can live no longer with QRM and QRN, it's time to make some decisions.

(a) What kind of cabinet? How about a cigar box; maybe a small plastic box; or try one of those small metal card-file boxes from the stationery counter at Woolco.

(b) Chassis—Experienced builders will probably use perfboard or printed circuits, but beginners will probably do better with a small piece of plywood, about 3" x 5". Use small nails for terminals or tie-points, preferably soldered.

(c) Power supply—The operating voltage can be anything from 5 to 14 volts. The unit draws 120 mA at 9 volts. An ordinary 9-volt transistor radio battery will give about 4 hours continuous service, but four C or D cells in series will last several hours longer. (Later we will discuss the elimination of the transistor post-amplifier. Without the transistor, the unit draws only

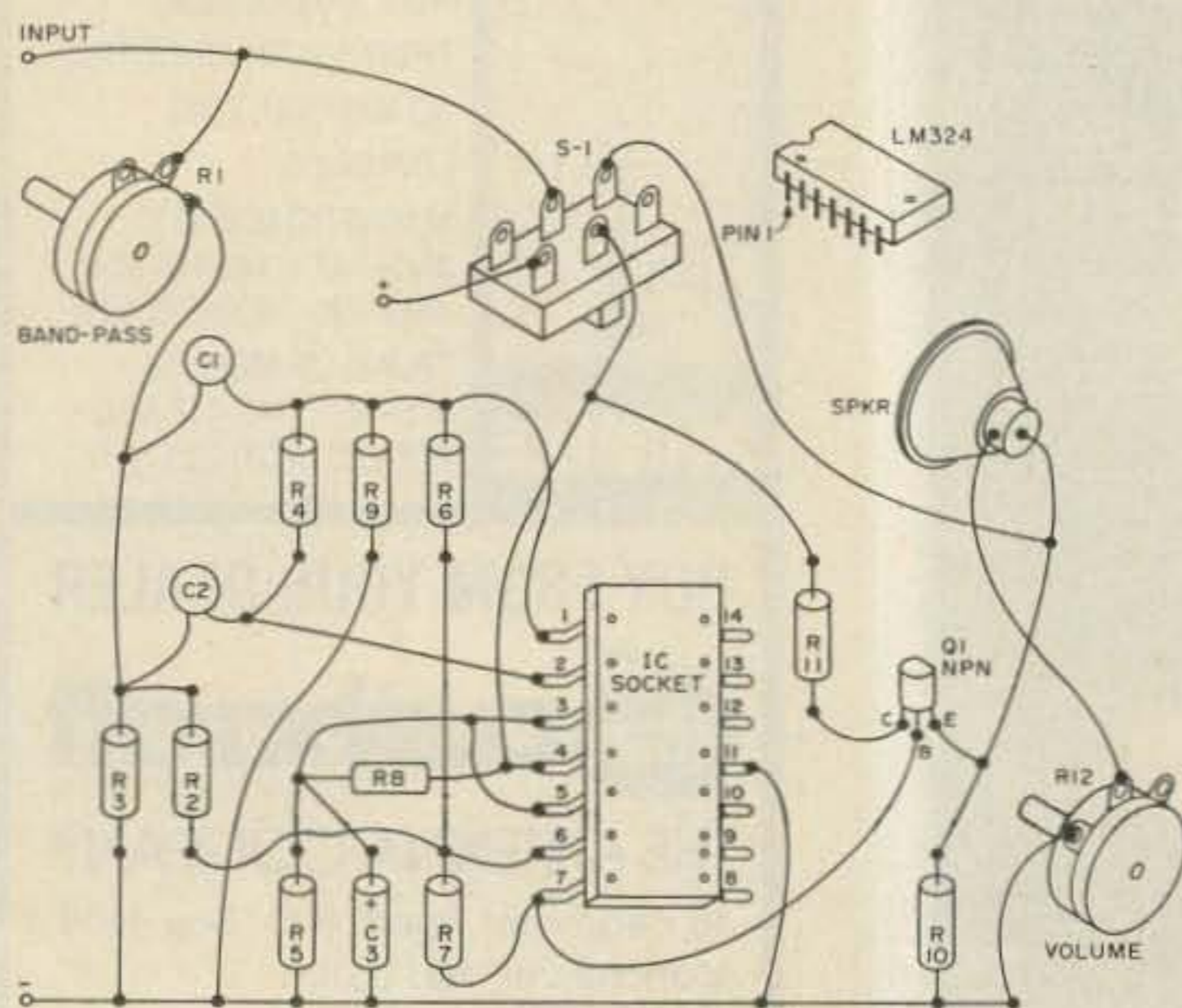


Fig. 1.

20 mA at 9 volts. Your battery would last a long time assuming you remember to turn off the power when the unit is not in use.)

If you opt to construct a power supply to operate from house current, try the one in Fig. 3. It's simple and inexpensive.

(d) Phones, speaker, or both?—The design shows a speaker within the unit, but if you feel you might want to use phones, install a phone jack. Sorry, we can't draw a picture for this; there are just too many types of phone jacks. Consider, though, that the output of the filter is at a constant volume regardless of the input. Many times you will hear a signal at full volume that you cannot hear at all with the unaided ear. You don't have to depend on phones to pick out the weak ones.

(e) Center frequency—This unit should have a center frequency (in its sharpest mode) of about 700 Hz. That is, if capacitors C1 and C2 are actually 0.1 uF. Unfortunately, capacitors are flighty things; the actual capacitances are almost never the same as the marked capacitances. So, "ye pays yer money, and ye takes yer chances." More likely, the center frequency will be about 5% to 10% below the designed center frequency. If you would like a different center frequency, the Design Notes give alternative component values.

About Construction

The LM-324 looks like a fat centipede. Pins are numbered counterclockwise beginning to the left of the notch when viewed from the top. (Remember, George, that's clockwise when viewed from the bottom or pin side.) Most ICs also have a small dot marking pin 1. If this is your first IC project, invest six bits in a 14-pin wire-wrap IC sock-

et (that's the one with the long pins). It'll save a lot of cussing—believe it!

The bandpass control (R1) may be 50k to 100k Ohms. The filtering is sharpest when R1 is set at a high resistance, and when R1 is very low, the bandpass is so wide it seems there is no filter at all. When R1 is at 80k Ohms or higher, the bandpass is less than 4% of the center frequency, which is too narrow for ordinary CW use. Most noise disappears when R1 is set at about 30k Ohms, and a setting of 50k Ohms will narrow the bandpass to less than 40 Hz.

Make your connections to the power switch (S1) so that when the power is off, the signal is bypassed around the unit direct to the speaker. See the illustration in Fig. 1.

The transistor used as a post-amplifier needs to have a power dissipation rating of better than 1.5 Watts. The 2N2222 can handle this, but if you substitute another NPN, check it after a couple of minutes of use to see if it is heating too much. You may control this by putting 50 to 150 Ohms resistance between the plus voltage terminal and the collector of the transistor. (This is shown in the drawing as R11. Naturally, if the transistor you use can handle the power without overheating, you may eliminate R11.)

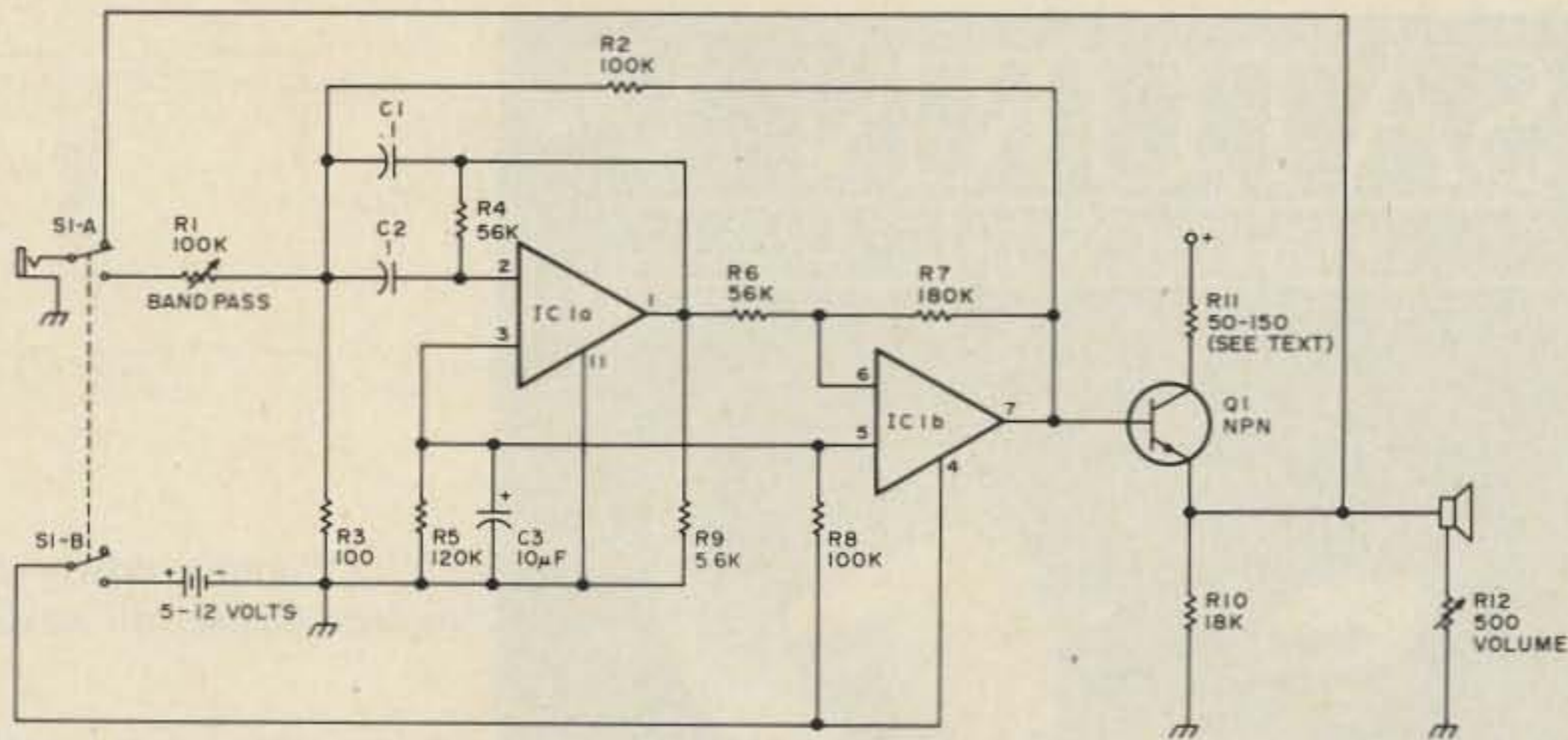


Fig. 2.

PARTS LIST (All resistors 1/4 Watt)

| | |
|--------|--|
| R1 | 50k Ohm to 100k Ohm variable resistor |
| R2, R8 | 100k Ohms |
| R3 | 100 Ohms |
| R4, R6 | 56k Ohms |
| R5 | 120k Ohms |
| R7 | 180k Ohms |
| R9 | 5.6k Ohms |
| R10 | 18k Ohms |
| R11 | 50 to 150 Ohms (see text) |
| R12 | 500 Ohm variable resistor |
| C1, C2 | .1 uF |
| C3 | 10 uF |
| C4 | 1000 uF |
| Q1 | 2N2222 or equivalent NPN transistor (see text) |
| IC1 | LM-324 quad op amp integrated circuit |
| S1 | Double-throw, double-pole slide switch |
| | Small speaker |
| | Battery (see text) |
| | For optional power supply see Fig. 3. |
| | IC socket 14-pin wire wrap |

The LM-324 filter produces reasonable volume into a small speaker without further amplification. If your shack is not noisy, simply connect one leg of your speaker to pin 7 of the LM-324 and eliminate transistor Q1 and also resistors R10, R11, and R12. The volume will then be

enough to be heard clearly from a distance of 10 to 15 feet. (Remember the weak signals sound just as loud as the strong ones.)

Using the Filter

Connect the input of the filter to the phone jack or external speaker connections of your rig. Turn R1 to

Design Notes

Desired Center Frequency

| Component | 710 Hz | 816 Hz | 850 Hz | 1020 Hz |
|---------------|--------|--------|--------|---------|
| R4, R6 | 56k | 51k | 47k | 39k |
| R2 (R4 × 1.5) | 82k | 75k | 72k | 62k |
| R3 (R4/623) | 91 | 82 | 75 | 62 |
| R5 | 120k | 100k | 100k | 100k |
| R7 (R4 × 3) | 160k | 150k | 150k | 120k |
| R8 | 100k | 100k | 100k | 100k |
| R9 | 5.6k | 5.6k | 5.6k | 5.6k |

(Computed to nearest standard values—R4 and R6 are considered critical. Other values may vary up to 25%.)

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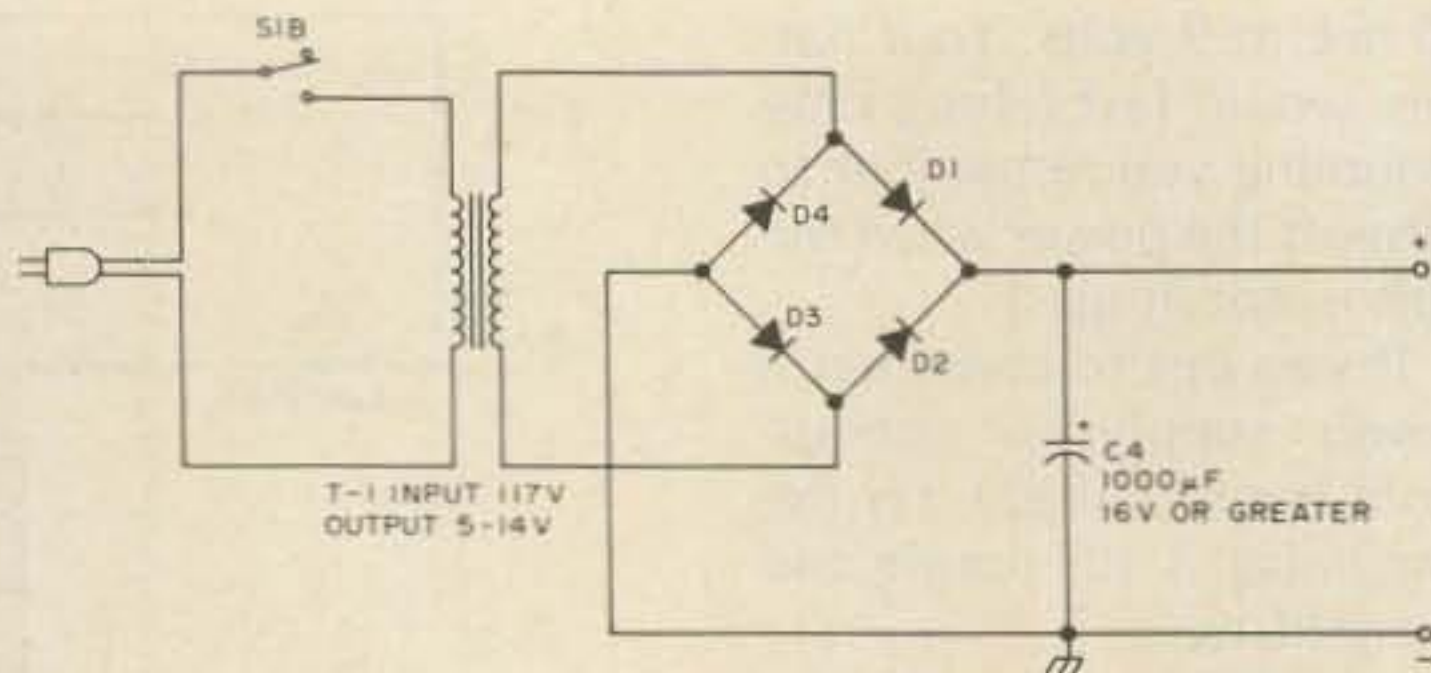


Fig. 3. Simple power supply. D1-D4 can be almost any diodes, or use full-wave bridge (Radio Shack 276-1161).

its lowest resistance setting. With the power on, you can hear both the desirable and undesirable as you tune across the band. When you have located the signal you want, narrow the filter by adjusting R1, bandpass control, until the undesirable is eliminated. (You may have to slightly retune your receiver as you tighten down on the filter, but you'll soon learn to recognize the center frequency and tuning will be fast and easy.) Keep the volume of the receiver as low as possi-

ble. If you get a chug-a-chug sound, you're using too much volume. Remember, the filter will pick up some signals when the volume is turned so low you can't hear them ordinarily.

We've tried to keep it simple—so if you're too tired to build this yourself, give this article and the parts to one of the kids. ■

Editor's Note

Shortly before publication, 73 learned that R5 should be changed to 68k for best performance. Please note this change.

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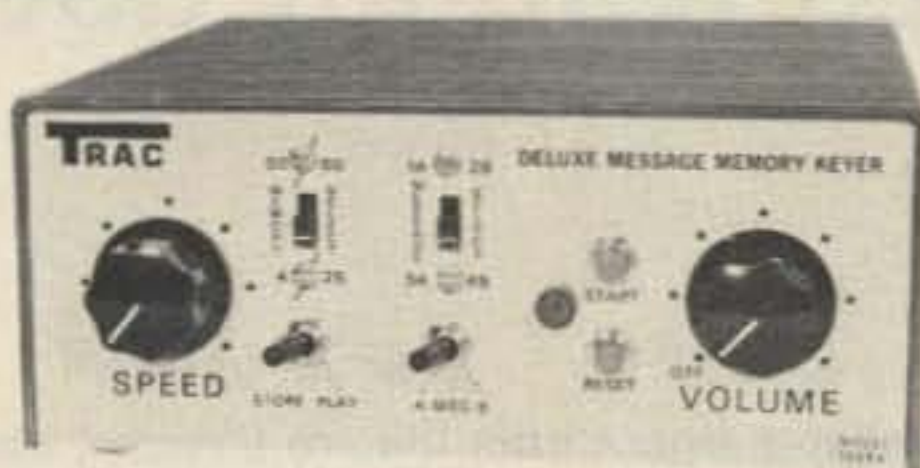
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The True-Blue Keyer

— its speed readout doesn't lie

Editor's Note: The 8044 keyer chip used here is available from Curtis Electro Devices, Box 4090, Mountain View CA 94040; telephone (415)-964-3846.

This article describes a project that started as a typical electronic keyer and ended up including a self-contained readout that displays words per minute (wpm). This keyer is unique because of its ability to digitally display the speed in wpm of the keyer IC before either the dot or dash paddle is closed. Additionally, it will display the sender's speed in wpm during a CW transmission. These features were designed into the project using all CMOS technology and mechanical coupling between the keyer and image clocks.

The project features common keyer controls such as speed, volume, tone,

weight, sidetone on/off, and transmitter tune with added front-panel switches for display calibrate and image/keyer display.

Circuit Operation

The use of a calibrated, tracking image clock is the circuit's simple method of generating a clock frequency when there is no clock output from the keyer IC, as in a standby condition. When the operator starts sending CW with the paddles, the logic circuitry transfers the wpm display from reading the image clock to reading the keyer clock. The display is updated every 1.2 seconds and will show the correct

wpm after the first two update periods. A lower CW speed than the preset level will register if the operator is not sending at the proper rate and with the correct spacings. This feature provides visual feedback, telling the operator if his fist needs some correction. The display will never show a wpm level in excess of the preset value no matter how fast the paddles are actuated because the counter records only the number of clock pulses for 1.2 seconds generated by a particular frequency (speed) selected by the speed control.

Upon completion of the last CW character and, hence, the last keyer clock pulse, the display will show a reduced wpm or even zero for a short interval. Again, the logic functions and the display shows the output of the image clock.

Circuit Description

The display keyer can best be described by separating it into three sub-circuits. The block diagram of Fig. 1 shows these circuits in their simplest form for those interested in following the logic sequence.

The heart of the system is the 8044 IC. This sub-circuit

is shown in Fig. 2. Generally, I used the published circuit* with a few modifications. As shown in Fig. 2, these mods were not major circuit changes but just use of what the 8044 had to offer. For instance, the dot and dash terminals (pins 2 and 7) are normally high during standby. This was used very conveniently to drive the Exclusive NOR, U4a, a CD4077. Another connection to pin 8 of the 8044 was used for clock frequency pick-off to drive the counter and display circuit (Fig. 4) via an FET bilateral switch, U5a, 1/4 of a CD4066.

Another switch, U5c, was wired to the base of the 2N1613 driver transistor. This FET switch grounds the base of the driver transistor when U4b, pin 11 (Fig. 3), is high, thereby preventing the transistor from being keyed during clock calibration.

The output keying transistor, a 2N4356, is configured to drive a grid-block input circuit. Choice of this transistor will depend on your transceiver's grid-

*8044 Keyer Data Sheet, Curtis Electro Devices, Inc., revised February 23, 1979.



Display keyer.

block voltage. My HW-101 presents -50 V dc at the key jack, so this transistor with its BV_{ceo} of 80 V dc has an adequate margin.

The final mod to the keyer circuit was the addition of the dual, 500k single-shaft pot. The keyer clock is controlled by R1A, while R1B (Fig. 3) controls the image clock frequency. Use of this dual pot mechanically couples the two clocks together to provide proper tracking and the correct wpm display during standby conditions.

The second sub-circuit is shown in Fig. 3. All of the switching and timing functions are controlled by this circuit. The positions of FET switches U5a and U5b as well as SW1 and SW2 are in a standby, ready-to-transmit mode. The logic states of the CD4077 that are useful for this circuit are $L+L=H$, $H+H=H$, $H+L=L$. The following logic states exist for Fig. 3 as shown. U4a pins 1 and 2 are high, thus pin 3 is high. U4c pin 6 is high and pin 5 is low, thus pin 4 is low. U2 is wired as a positive retriggerable monostable. With U2 pins 8 and 12 low, pin 10 will be low. U4d pins 8 and 9 are low, thus pin 10 is high. U4b pin 12 is high and pin 13 is low, thus pin 11 is low and U5c is open.

During standby conditions, the image clock, U3, wired as a free-running astable has its output pin 10 routed to the counter via the closed bilateral FET switch, U5b.

When a dot or dash paddle is closed, U4a's input state will become either $L+H=L$ or $H+L=L$. As you can see, U4a's output will be forced low in either case. This low is inverted by the controlled inverter, U4c, whose positive output triggers U2. U2's monostable pulse width is set to four seconds by the 1 meg and $1\mu\text{F}$ RC combination. This pulse width was

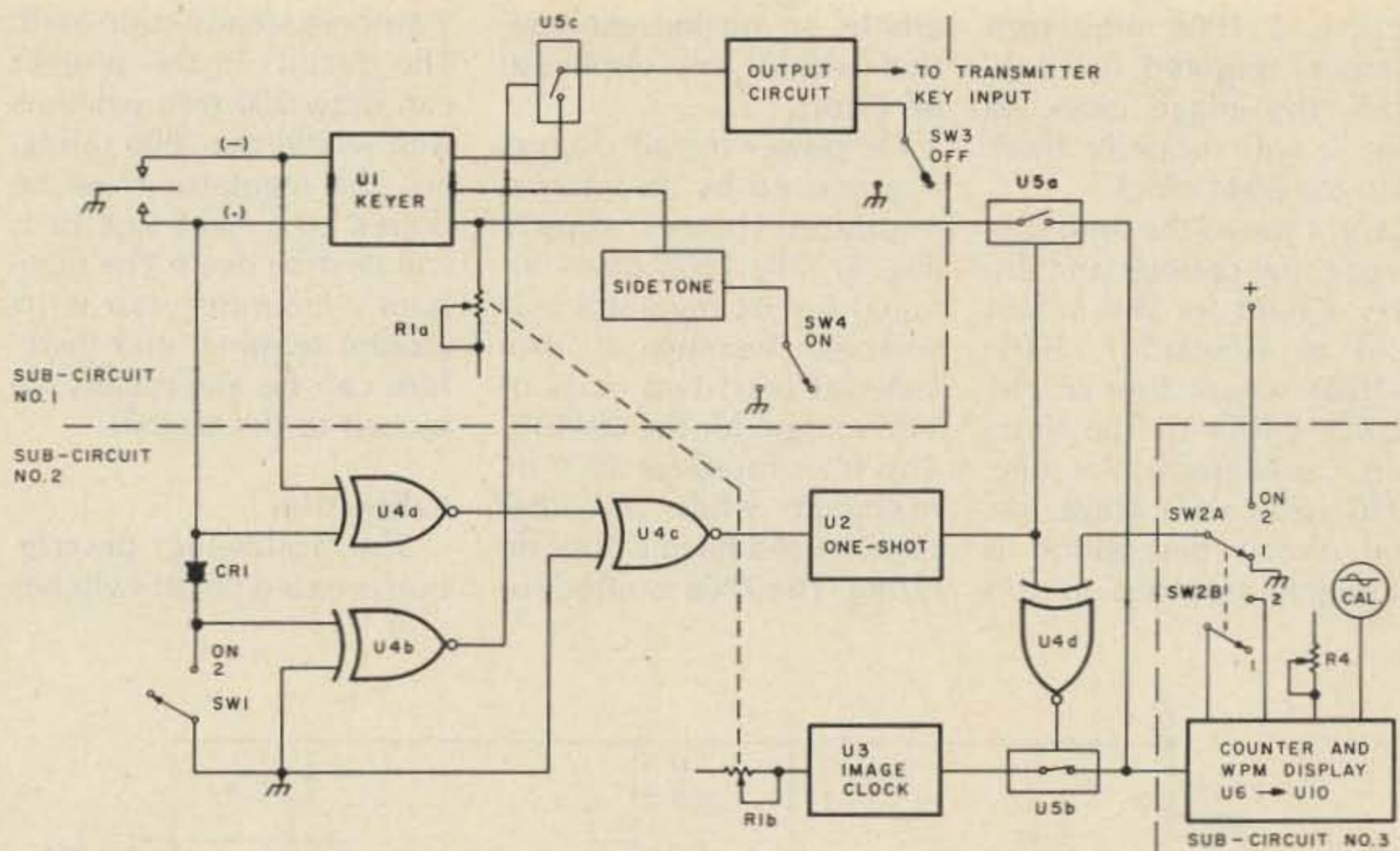


Fig. 1. Display keyer block diagram.

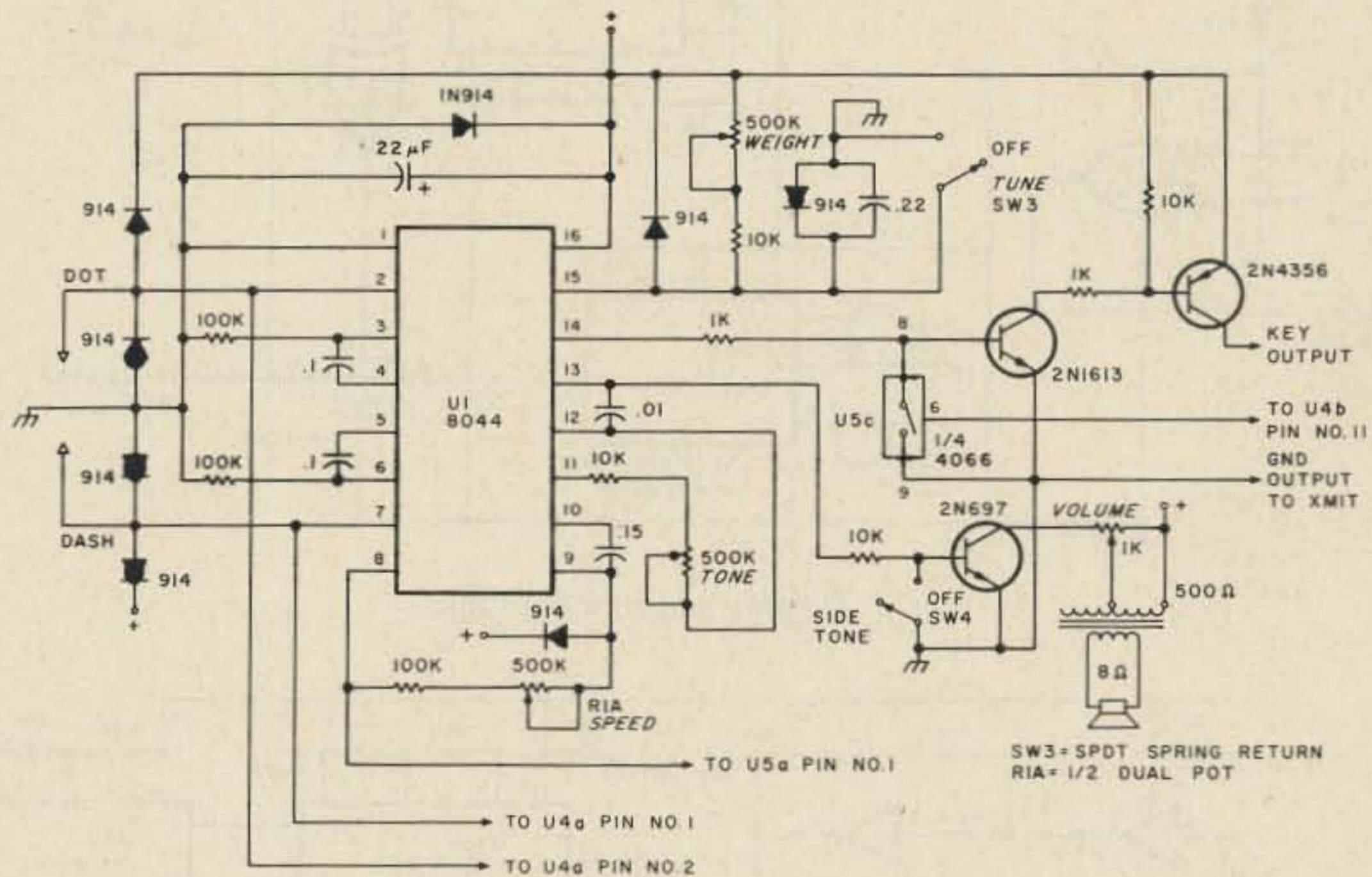


Fig. 2. Keyer and output circuits.

selected to accommodate low-speed operation, which may include long pauses. If the pause is greater than the pulse width, the display will revert back to the image clock. As long as this condition exists, the display will continue to show random numbers as it bounces between the two clock outputs. U2 pin 10 will remain high for positive retrigger pulses arriving at its input within the four-second on-time. U4d pin 8 now remains high, which forces

pin 10 low and opens U5b. The high on U2 pin 10 also controls U5a, causing this switch to close and routing the 8044's clock output to the counter and display circuit. The display now registers the wpm of the transmitted CW up to the maximum set by the speed control.

The logic transfers just described will remain in effect until there is a pause greater than four seconds. Upon completion of the last paddle closure, either a

dot or a dash, U2 is retriggered for its last cycle. After four seconds, all logic states will revert back to the standby condition, with the display showing the image clock wpm. During this transition, the display may show a double-zero indication because there is no clock output from the 8044 and U2 has not returned to zero on pin 10, closing U5b and opening U5a.

The image clock, U3, uses R1b for setting the clock output on pin 10.

Rcal is a 100k multi-turn trimpot required to calibrate the image clock so that it will properly track with the 8044 clock.

Fig. 4 shows the third sub-circuit, the counter and display. Credit for this circuit goes to Howard F. Batie W7BBX whose fine article, "QRQ, QRS—By the Numbers," appeared in the June, 1980, issue of 73 Magazine. The circuit description is thoroughly covered in this

article, so further explanation would just duplicate his effort.

Dc power for all circuits is produced by an internal regulated power supply (Fig. 5). The 7808 three-terminal 8-V dc regulator was selected because it provides at least two volts of V_{dd} margin for the 8044 IC. This IC is rated for 10 V dc maximum while all other CMOS used have a 20-V dc rating. The 7808 is rated for

1 Ampere steady-state load. The circuits in this project can draw 200 mA, which is well within the 7808 rating, but the regulator must be bolted to a heat sink or it will destroy itself. The regulator's mounting tab is its ground terminal and therefore can be electrically attached to the chassis.

Calibration

The following description is based on all switches

positioned as shown in Figs. 2, 3, and 4 and the paddles are open.

After ac power is applied, I suggest a warm-up time of five minutes. If all circuits are working properly, the display should indicate a two-digit number.

The 8044 IC is capable of 8 to 50 wpm with the values shown. The image clock was calibrated using Rcal and a speed setting of 30 wpm. This provides tracking within 1 to 2 wpm from 8 to 30. Above 30 wpm, I experienced difficulty in getting proper tracking because of nonlinearities in the image clock. If the speed control is advanced above 30, the image display will increase very rapidly and show a false number. At these higher speeds, with the paddles open, a momentary indication of the correct speed is available when the front-panel clock switch is transferred to the 8044 position. During CW transmission, the display will read correctly for any speed over 30 wpm.

SW1 is an SPDT spring-return switch used during calibration of the image clock

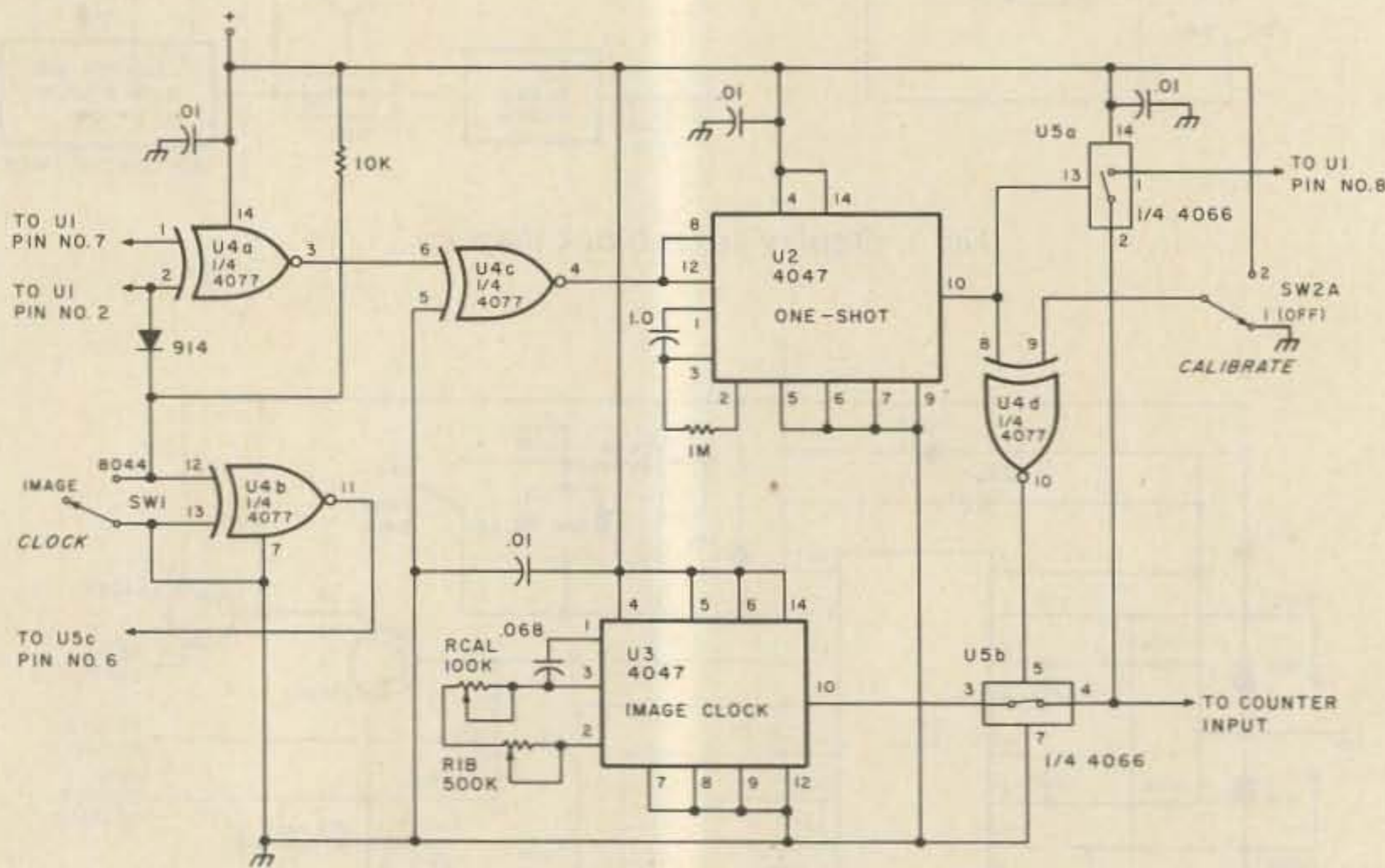


Fig. 3. Display sequencing logic.

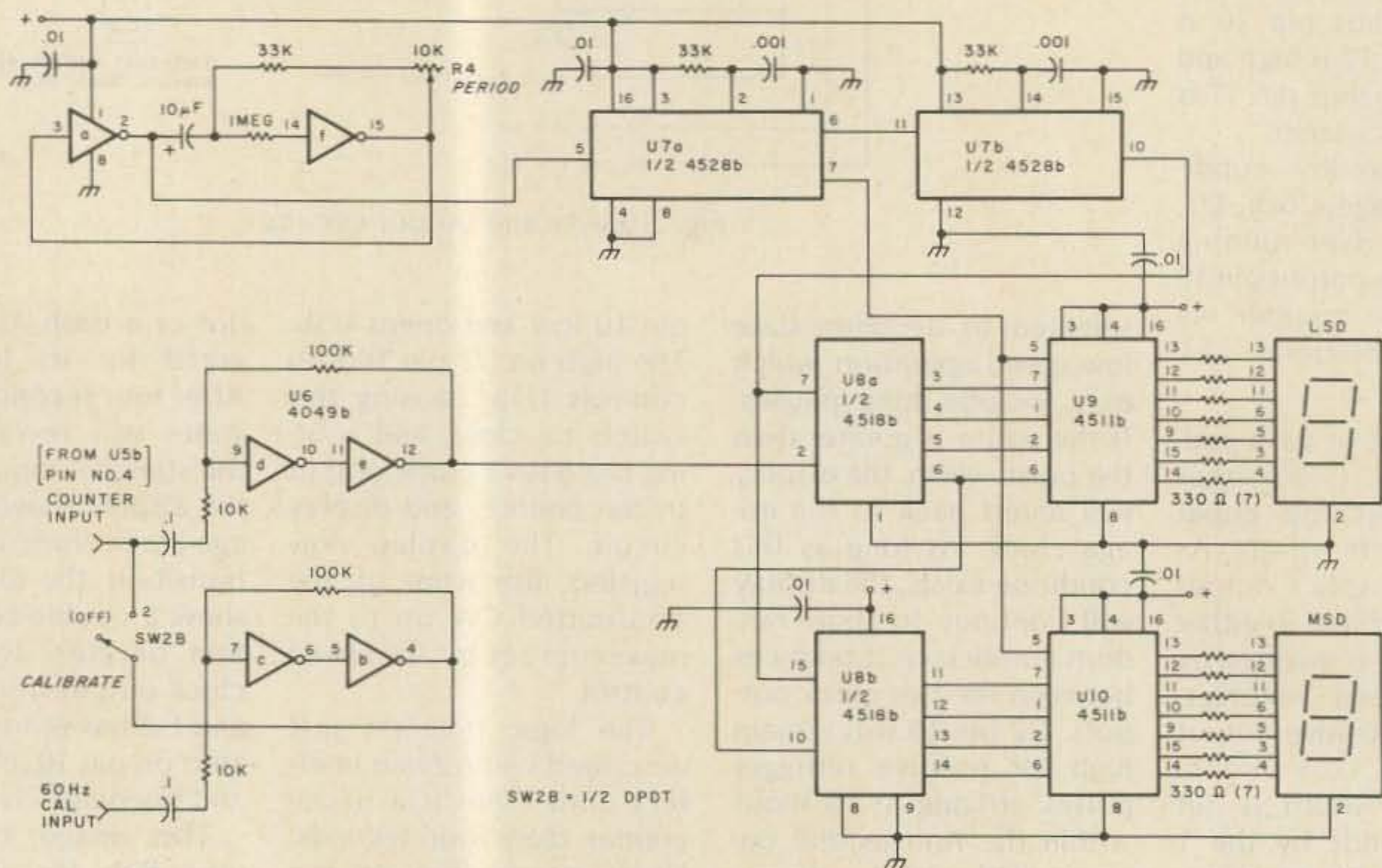


Fig. 4. Counter and wpm display circuit.

to match the 8044 clock. When SW1 is closed, the high on U4b pin 12 via the 10k pull-up resistor is grounded. This does two things: First, the 8044 is turned on through the 1N914 between U4a pin 2 and U4b pin 12. Second, U4b pin 11 goes high, which closes U5c, preventing any transmitter keying during clock calibration. The image clock could be calibrated by simply closing the dot paddle, but this is not recommended because the transmitter would be keyed unnecessarily.

SW2 is a standard DPDT toggle switch used to change the logic state on U4d pin 9 for counter period calibration. A high on pin 9 and a low on pin 8 will force U4d pin 10 low and open switch U5b. With switches U5a and U5b open, the counter input is open and ready to accept the 60-Hz calibration signal.

The counter circuit calibration uses SW2b to connect U6b pin 4 to the input of U6d pin 9. The remaining counter and display circuitry was used as it appeared in W7BBX's article.

The first calibration step is to set the period, or gating time, of the frequency counter. This time period is controlled by adjusting R4 in Fig. 4. Incidentally, I recommend that a multi-turn trimpot be used for R4 to reduce the sensitivity of this adjustment. The calibration source is a low-voltage 60-Hz signal from the transformer secondary. With 60 Hz and a 1.2-second gating

period, the wpm calculates to be 72. Therefore, with the front-panel Calibrate switch (SW2) up, R4 should be varied until a steady reading of 72 registers on the display. Remember to rotate R4 slowly, allowing the counter to count all the pulses during the gating time. When this step is complete, return SW2 to the down position.

The second calibration step involves setting the output frequency of the image clock to coincide with the 8044 clock at 30 wpm. Pressing the front-panel Clock switch (SW1) presents the 8044's clock to the counter/display circuit and registers it directly in wpm. The idea here is to adjust the 100k trimpot, Rcal (Fig. 3), so the image clock matches the 8044 clock. Next, release SW1 and adjust Rcal for the correct wpm. Rotate the Speed control (R1A/B) counter-clockwise and check for proper tracking at lower settings.

This completes the calibration for the display keyer and only leaves the remaining keyer controls, which are self-explanatory.

Component layout isn't critical. For ease of fabrication and checkout, I constructed the counter/display circuits on one perf-board and the keyer with switching/timing logic on another. The power supply is mounted to a third perf-board with the 7808 near the center. The regulator's metal heat sink is connected to the rear chassis wall.

The display keyer project

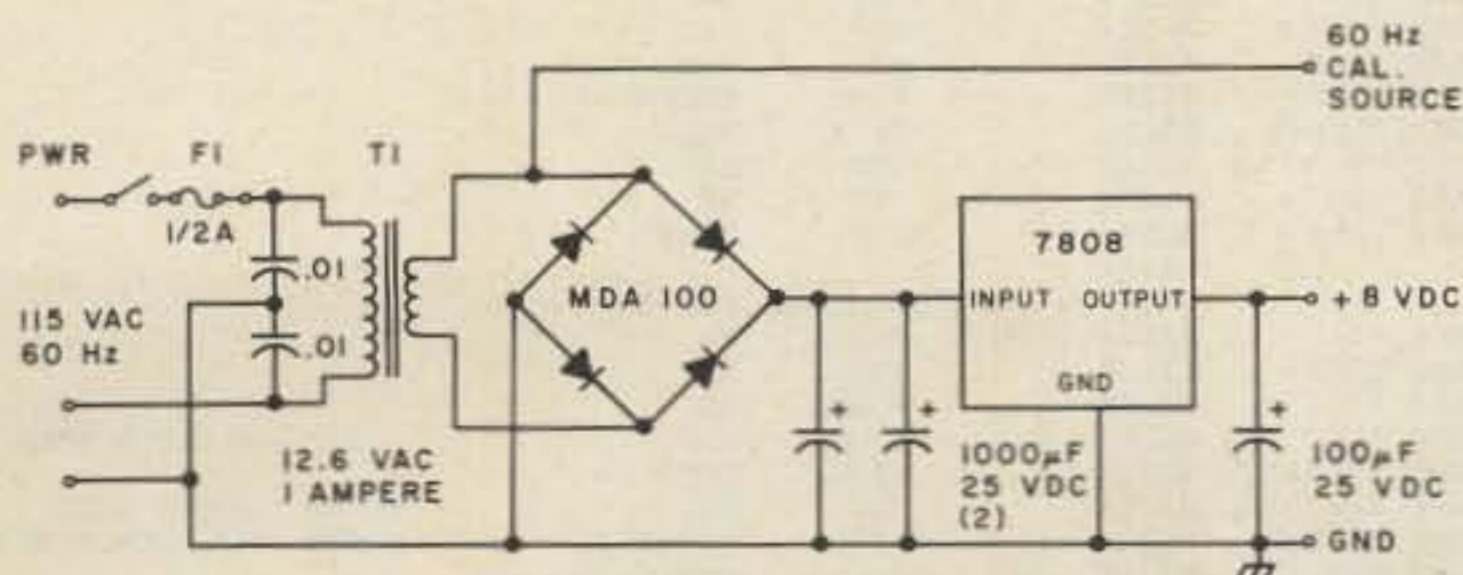


Fig. 5. Power supply.

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was fun to design and build and with its completion has added another dimension to my CW operation. The usefulness of the wpm readout has proved to be more than expected, with its constant reminder of CW speed. Besides being useful

on the air, the project makes an excellent CW practice machine. The trainee can develop and improve both his speed and coordination using the display and sidetone as indications of his sending quality. ■

Top view of the display keyer, showing the three perfboards. Speaker, ac fuse, input and output jacks are on the rear panel.

See List of Advertisers on page 114

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```

00100 ;TRS-80 CW KEYBOARD BY K8TT (9/8/80)
00110 ;SENDS CW OUT THE CASSETTE AUXILIARY PLUG
00120 ;SHIFT KEY + UP ARROW WILL INCREASE SPEED
00130 ;SHIFT KEY + DOWN ARROW WILL DECREASE SPEED
00140 ;BREAK KEY CLEARS SCREEN AND STOPS OUTPUT
00150 ;TO ENTER MESSAGE: HIT # THEN 1,2,3, OR 4 -
00160 ; TYPE IN MESSAGE - HIT (BREAK) WHEN DONE.
00170 ;TO SEND MESSAGE: HOLD (SHIFT) & PRESS 1,2,3,OR 4.
00180 ;
00190 ;INITIALIZATION
4A00 00200 ORG 04A00H
4A00 CDC901 00210 START CALL 01C9H ;CLEAR
4A03 3E00 00220 LD A,0 ;STOP OUTPUT
4A05 D3FF 00230 OUT (0FFH),A
4A07 3E5F 00240 LD A,05FH ;TURN ON CURSOR
4A09 322240 00250 LD (4022H),A
4A0C 21003C 00260 LD HL,3C00H ;SET OUTPUT CURSOR
4A0F 220050 00270 LD (5000H),HL
4A12 21006A 00280 LD HL,06A00H ;INITIALIZE BUFFER
4A15 EB 00290 EX DE,HL ;DE IS REAR
4A16 21006A 00300 LD HL,06A00H ;HL IS FRONT
4A19 3600 00310 LD (HL),0 ;NO OUTPUT BEFORE INPUT
00320 ;
00330 ;INPUT-OUTPUT CALLING SEQUENCE
4A1B CD234A 00340 AGAIN CALL INPUT
4A1E CD674A 00350 CALL OUTPUT
4A21 18F8 00360 JR AGAIN
00370 ;
00380 ;STORE KEY ENTRIES IN BUFFER AND DISPLAY ON CRT
4A23 D5 00390 INPUT PUSH DE
4A24 E5 00400 PUSH HL
4A25 CDA54B 00410 CALL KEYSCHN
4A28 E1 00420 POP HL
4A29 D1 00430 POP DE
4A2A B7 00440 OR A ;FIX FLAG
4A2B C8 00450 RET Z ;GO TO OUTPUT IF NO INPUT
4A2C FE01 00460 CP 01H ;IF BREAK KEY CLEAR
4A2E 28D0 00470 JR Z,START ; & STOP SENDING
4A30 FE1A 00480 CP 01AH ;SPEED DECREASE
4A32 CA4B4B 00490 JP Z,DECSPP
4A35 FE1B 00500 CP 01BH ;SPEED INCREASE
4A37 CA544B 00510 JP Z,INCSPP
4A3A FE40 00520 CP 40H ;ENTER MESSAGE
4A3C CA1A4C 00530 JP Z,MSTART
4A3F FE21 00540 CP 21H ;MESSAGE #1
4A41 CA794C 00550 JP Z,MES1
4A44 FE22 00560 CP 22H ;MESSAGE #2
4A46 CA884C 00570 JP Z,MES2
4A49 FE23 00580 CP 23H ;MESSAGE #3
4A4B CAD74C 00590 JP Z,MES3
4A4E FE24 00600 CP 24H ;MESSAGE #4
4A50 CA064D 00610 JP Z,MES4
4A53 E5 00620 PUSH HL
4A54 D5 00630 PUSH DE
4A55 CD3300 00640 CALL 33H ;VIDEO OUTPUT
4A58 D1 00650 POP DE
4A59 E1 00660 POP HL
4A5A FE08 00670 CP 08H ;ERASE LAST ENTRY
4A5C 2004 00680 JR NZ,NODEL
4A5E 2B 00690 DEC HL
4A5F 3600 00700 LD (HL),0
4A61 C9 00710 RET
4A62 77 00720 NODEL LD (HL),A
4A63 2C 00730 INC L ;BUMP BUFFER
4A64 3600 00740 LD (HL),0 ;ZERO NEXT BYTE OF BUFFER
4A66 C9 00750 RET
00760 ;
00770 ;OUTPUT CW TO CASSETTE PORT FROM BUFFER
4A67 1A 00780 OUTPUT LD A,(DE) ;GET DATA
4A68 B7 00790 OR A ;FIX FLAG
4A69 C8 00800 RET Z ;GO IF BUFFER EMPTY
4A6A FE20 00810 CP 20H ;SPACE?
4A6C CA184B 00820 JP Z,WSPACE;IF SO, SEND IT
4A6F FE5B 00830 CP 05BH ;REJECT NON TABLE STUFF
4A71 F29A4A 00840 JP P,GOOF
4A74 4F 00850 LD C,A ;SAVE CHAR FOR SEND
4A75 D62C 00860 SUB 02CH ;MAKE START OF TABLE 0
4A77 FA9A4A 00870 JP M,GOOF
4A7A D5 00880 PUSH DE
4A7B E5 00890 PUSH HL
4A7C 6F 00900 LD L,A ;MAKE DATA 16 BIT
4A7D 2600 00910 LD H,0
4A7F 11754B 00920 LD DE,TABLE;GET BASE ADDR OF TABLE
4A82 19 00930 ADD HL,DE ;FIND ELEMENT BY INDEXING
4A83 7E 00940 LD A,(HL) ;GET CODE FROM TABLE
4A84 E1 00950 POP HL
4A85 D1 00960 POP DE
4A86 0600 00970 LD B,00H ;BIT COUNTER
4A88 07 00980 NEXT RLCA ;LOOK FOR 0 TO START
4A89 05 00990 DEC B
4A8A 280E 01000 JR Z,GOOF ;NO START BIT - NO SEND
4A8C 38FA 01010 JR C,NEXT
4A8E 07 01020 MORE RLCA ;NEXT BIT INTO CARRY
4A8F 3834 01030 JR C,DASH ;IF 1 SEND DASH
4A91 CD9C4A 01040 CALL DOT ;IF 0 SEND DOT
4A94 05 01050 DARET DEC B
4A95 28F7 01060 JR NZ,MORE ;GET NEXT BIT
4A97 CDF64A 01070 CALL CSPACE ;SPACE AT END OF CHAR
4A9A 1C 01080 GOOF INC E ;BUMP BUFFER
4A9B C9 01090 RET
01100 ;
01110 ;DOT ROUTINE
4A9C F5 01120 DOT PUSH AF
4A9D C5 01130 PUSH BC
4A9E DDE5 01140 PUSH IX
4AA0 E5 01150 PUSH HL
4AA1 3E2E 01160 LD A,2EH ;INSERT DOT AS SENT
4AA3 CD694B 01170 CALL CURS ;FIX SENDING CURSOR
4AA6 E1 01180 POP HL
4AA7 DDE1 01190 POP IX
4AA9 3E01 01200 LD A,1
4AAB D3FF 01210 OUT (0FFH),A
4AAD CD5D4B 01220 CALL DELAY
4AB0 DDE5 01230 PUSH IX
4AB2 E5 01240 PUSH HL
4AB3 3E20 01250 LD A,20H ;CLEAR THE DOT
4AB5 CD694B 01260 CALL CURS
4AB8 E1 01270 POP HL
4AB9 DDE1 01280 POP IX
4ABB 3E00 01290 LD A,0
4ABD D3FF 01300 OUT (0FFH),A
4ABF CD5D4B 01310 CALL DELAY
4AC2 C1 01320 POP BC
4AC3 F1 01330 POP AF
4AC4 C9 01340 RET
01350 ;
01360 ;DASH ROUTINE
4AC5 F5 01370 DASH PUSH AF
4AC6 C5 01380 PUSH BC
4AC7 DDE5 01390 PUSH IX
4AC9 E5 01400 PUSH HL
4ACA 3E5F 01410 LD A,5FH ;INSERT DASH
4ACC CD694B 01420 CALL CURS
4ACF E1 01430 POP HL
4AD0 DDE1 01440 POP IX
4AD2 3E01 01450 LD A,1
4AD4 D3FF 01460 OUT (0FFH),A
4AD6 0E03 01470 LD C,03H
4AD8 C5 01480 DAHDLY PUSH BC
4AD9 CD5D4B 01490 CALL DELAY
4ADC C1 01500 POP BC
4ADD 0D 01510 DEC C
4ADE 20F8 01520 JR NZ,DAHDLY
4AE0 DDE5 01530 PUSH IX
4AE2 E5 01540 PUSH HL
4AE3 3E20 01550 LD A,20H ;CLEAR THE DASH
4AE5 CD694B 01560 CALL CURS
4AE8 E1 01570 POP HL
4AE9 DDE1 01580 POP IX
4AEB 3E00 01590 LD A,0
4AED D3FF 01600 OUT (0FFH),A
4AEP CD5D4B 01610 CALL DELAY
4AF2 C1 01620 POP BC
4AF3 F1 01630 POP AF
4AF4 189E 01640 JR DARET
01650 ;
01660 ;CHARACTER SPACE ROUTINE
4AF6 F5 01670 CSPACE PUSH AF
4AF7 DDE5 01680 PUSH IX
4AF9 E5 01690 PUSH HL
4AFA 79 01700 LD A,C ;GET CHARACTER BACK
4AFB CD694B 01710 CALL CURS
4AFE 23 01720 INC HL ;BUMP CURSOR ADDR
4AFP DD7500 01730 LD (IX+0),L ;SAVE NEW CURSOR ADDR
4B02 DD7401 01740 LD (IX+1),H
4B05 E1 01750 POP HL
4B06 DDE1 01760 POP IX
4B08 3E00 01770 LD A,0

```


I have been looking for a good program to make it possible for me to use my TRS-80 computer to send CW over the air. I wrote this one, with the following features:

- The transmitter is keyed through the cassette auxiliary plug and does not use the TRS-80 relay.
- Input and output speeds are independent so that you can type well ahead of what is being transmitted.
- The output speed can be increased or decreased at any time by holding the

shift key and pressing the up or down arrow key.

- The input is displayed on the screen and can be edited before it is sent out by using the backspace key.
- The character being output is indicated by being removed temporarily from the CRT display, with the dots and dashes displayed in its place as they are sent. Afterwards the character is replaced. This goes on simultaneously with the addition of new characters. You always know exactly where the sending routine is operating.

• Messages can be typed out on the screen, edited, and then stored for later output. When called, the entire message is instantly placed on the screen in the proper sequence and is treated exactly like text you are typing.

- Hitting the break key will clear the screen and the buffers and stop the output.
- The output is perfect machine code of whatever is put on the CRT, including proper spaces.

Operation

Using Edtasm or Tbug,

make an object program tape and load it. Operation is extremely simple. Just start typing and anything you type will be displayed and sent.

If you want a faster output speed, hold the shift key and press the up arrow key. Each time you do this, the speed is incremented. To decrease the speed, use the down arrow key in the same way.

To store a message for later use, first press the @ key and then key 1, 2, 3, or 4. Type in your message (up to 256 characters), edit it,

```

4B0A D3FF 01780 OUT (0FFH),A
4B0C 0E02 01790 LD C,02H
4B0E C5 01800 CSDLY PUSH BC
4B0F CD5D4B 01810 CALL DELAY
4B12 C1 01820 POP BC
4B13 0D 01830 DEC C
4B14 20F8 01840 JR NZ,CSDLY
4B16 F1 01850 POP AF
4B17 C9 01860 RET
01870 ;
01880 ;WORD SPACE ROUTINE
4B18 P5 01890 WSPACE PUSH AF
4B19 DDE5 01900 PUSH IX
4B1B E5 01910 PUSH HL
4B1C 3E2D 01920 LD A,2DH ;SPACE MARKER
4B1E CD694B 01930 CALL CURS
4B21 E1 01940 POP HL
4B22 DDE1 01950 POP IX
4B24 3E00 01960 LD A,0
4B26 D3FF 01970 OUT (0FFH),A
4B28 0E04 01980 LD C,04H
4B2A C5 01990 WSDLY PUSH BC
4B2B CD5D4B 02000 CALL DELAY
4B2E C1 02010 POP BC
4B2F 0D 02020 DEC C
4B30 20F8 02030 JR NZ,WSDLY
4B32 DDE5 02040 PUSH IX
4B34 E5 02050 PUSH HL
4B35 3E20 02060 LD A,20H ;CLEAR SPACE MARKER
4B37 CD694B 02070 CALL CURS
4B3A 23 02080 HL ;BUMP CURSOR
4B3B DD7500 02090 LD (IX+0),L ;SAVE IT
4B3E DD7401 02100 LD (IX+1),H
4B41 E1 02110 POP HL
4B42 DDE1 02120 POP IX
4B44 F1 02130 POP AF
4B45 FE20 02140 CP 20H
4B47 CA9A4A 02150 JP Z,GOOP
4B4A C9 02160 RET
02170 ;
02180 ;SPEED CHANGE ROUTINES
4B4B 3AA44B 02190 DECSPD LD A,(SPEED)
4B4E C610 02200 ADD A,10H
4B50 32A44B 02210 LD (SPEED),A
4B53 C9 02220 RET
4B54 3AA44B 02230 INCSPD LD A,(SPEED)
4B57 D610 02240 SUB 10H
4B59 32A44B 02250 LD (SPEED),A
4B5C C9 02260 RET
02270 ;
02280 ; DELAY ROUTINE
4B5D 3AA44B 02290 DELAY LD A,(SPEED)
4B60 3D 02300 LOOP1 DEC A
4B61 F5 02310 PUSH AF
4B62 CD234A 02320 CALL INPUT
4B65 F1 02330 POP AF
4B66 20F8 02340 JR NZ,LOOP1
4B68 C9 02350 RET
02360 ;
02370 ;FIX THE SENDING CURSOR ROUTINE
4B69 DD210050 02380 CURS LD IX,5000H
4B6D DD6E00 02390 LD L,(IX+0)
4B70 DD6601 02400 LD H,(IX+1)
4B73 77 02410 LD (HL),A
4B74 C9 02420 RET
02430 ;
4B75 B3 02440 TABLE DEFNB 0B3H ;
4B76 FF 02450 DEFNB 0FFH ; DUMMY
4B77 95 02460 DEFNB 095H ;
4B78 D2 02470 DEFNB 0D2H ; /
4B79 DF 02480 DEFNB 0DFH ; 0
4B7A CF 02490 DEFNB 0CFH ; 1
4B7B C7 02500 DEFNB 0C7H ; 2
4B7C C3 02510 DEFNB 0C3H
4B7D C1 02520 DEFNB 0C1H
4B7E C0 02530 DEFNB 0C0H
4B7F D0 02540 DEFNB 0D0H
4B80 DB 02550 DEFNB 0DBH
4B81 DC 02560 DEFNB 0DCH
4B82 DE 02570 DEFNB 0DEH
4B83 FF 02580 DEFNB 0FFH
4B84 FF 02590 DEFNB 0FFH
4B85 FF 02600 DEFNB 0FFH
4B86 FF 02610 DEFNB 0FFH
4B87 FF 02620 DEFNB 0FFH
4B88 8C 02630 DEFNB 08CH

```

```

4B89 FF 02640 DEFNB 0FFH
4B8A F9 02650 DEFNB 0F9H
4B8B E8 02660 DEFNB 0E8H
4B8C EA 02670 DEFNB 0EAH
4B8D F4 02680 DEFNB 0F4H
4B8E FC 02690 DEFNB 0FCH
4B8F E2 02700 DEFNB 0E2H
4B90 F6 02710 DEFNB 0F6H
4B91 E0 02720 DEFNB 0E0H
4B92 F8 02730 DEFNB 0F8H
4B93 E7 02740 DEFNB 0E7H
4B94 F5 02750 DEFNB 0F5H
4B95 E4 02760 DEFNB 0E4H
4B96 FB 02770 DEFNB 0FBH
4B97 FA 02780 DEFNB 0FAH
4B98 F7 02790 DEFNB 0F7H
4B99 E6 02800 DEFNB 0E6H
4B9A ED 02810 DEFNB 0EDH
4B9B F2 02820 DEFNB 0F2H
4B9C F8 02830 DEFNB 0F8H
4B9D FD 02840 DEFNB 0FDH
4B9E F1 02850 DEFNB 0F1H
4B9F E1 02860 DEFNB 0E1H
4BA0 F3 02870 DEFNB 0F3H
4BA1 E9 02880 DEFNB 0E9H ;X
4BA2 EB 02890 DEFNB 0EBH ;Y
4BA3 EC 02900 DEFNB 0ECH ;Z
4BA4 A0 02910 SPEED DEFNB 0A0H ;A0H=15WPM - 50H=30WPM
02920 ;
02930 ;KEYSCN ROUTINE
4BA5 213640 02940 KEYSCN LD HL,4036H
4BA8 010138 02950 LD BC,3001H
4BAB 1600 02960 LD D,00H
4BAD 0A 02970 CHECK LD A,(BC)
4BAE 5F 02980 LD E,A
4BAF AE 02990 XOR (HL)
4BB0 73 03000 LD (HL),E
4BB1 A3 03010 AND E
4BB2 2008 03020 JR NZ,SRB
4BB4 14 03030 INC D
4BB5 2C 03040 INC L
4BB6 CB01 03050 RLC C
4BB8 F2AD4B 03060 JP P,CHECK
4BBB C9 03070 RET
4BBC 5F 03080 SRB LD E,A
4BBD 7A 03090 LD A,D
4BBE 07 03100 RLCA
4BBF 07 03110 RLCA
4BC0 07 03120 RLCA
4BC1 57 03130 LD D,A
4BC2 0E01 03140 LD C,01H
4BC4 79 03150 AGN LD A,C
4BC5 A3 03160 AND E
4BC6 2005 03170 JR NZ,FOUND
4BC8 14 03180 INC D
4BC9 CB01 03190 RLC C
4BCB 18F7 03200 JR AGN
4BCD 3A8038 03210 FOUND LD A,(3800H)
4BD0 47 03220 LD B,A
4BD1 7A 03230 LD A,D
4BD2 C640 03240 ADD A,40H
4BD4 FE60 03250 CP 60H
4BD6 3013 03260 JR NC,TEST
4BD8 CB08 03270 RRC B
4BDA 3031 03280 JR NC,SCHR
4BDC C620 03290 ADD A,20H
4BDE 57 03300 LD D,A
4BDF 3A4038 03310 LD A,(3A40H)
4BE2 E610 03320 AND 10H
4BE4 2828 03330 JR Z,DLY
4BE6 7A 03340 LD A,D
4BE7 D660 03350 SUB 60H
4BE9 1822 03360 JR SCHR
4BEB D670 03370 TEST SUB 70H
4BED 3010 03380 JR NC,COMPUT
4BEF C640 03390 ADD A,40H
4BF1 FE3C 03400 CP 3CH
4BF3 3002 03410 JR C,SHBIT
4BF5 EE10 03420 XOR 10H
4BF7 CB08 03430 SHBIT RRC B
4BF9 3012 03440 JR NC,SCHR
4BFB EE10 03450 XOR 10H
4BFD 180E 03460 JR SCHR
4BFF 07 03470 COMPUT RLCA
4C00 CB08 03480 RRC B
4C02 3001 03490 JR NC,CODE

```

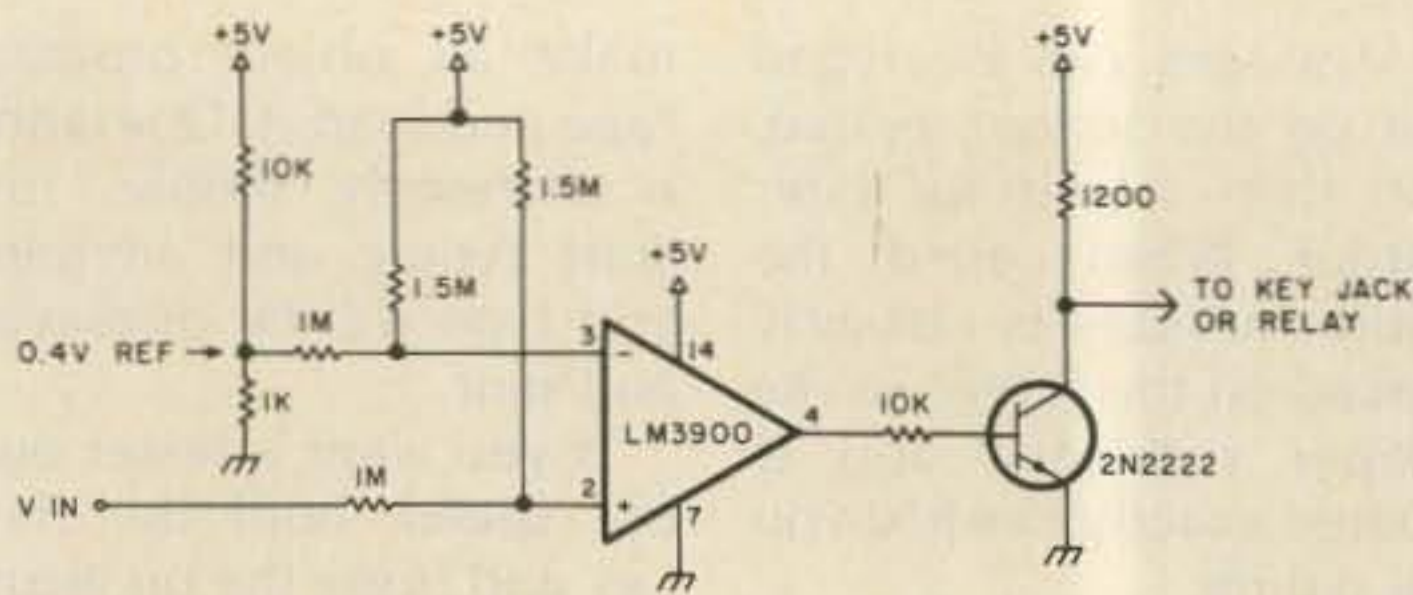


Fig. 1.

and after it appears on the screen just as you want it, press enter to store it. Up to four different messages can be stored.

When you want to send the stored message, hold

the shift key and press 1, 2, 3, or 4 according to which message you want. The entire message will appear on the screen immediately after anything you have already typed in and will be

sent in proper sequence when the output program gets to it.

Whenever you want to kill the output, hit the break key and you can start over.

The Program

The keyscan (02BH) subroutine in the ROM monitor contains a 17-millisecond delay. I had to rewrite this and put it in this program without that delay. Otherwise, typing in characters would mess up the output timing. Also, you will notice that I have used the keyscan subroutine as the ma-

ior part of the timing loops for output of code. This is the trick that makes it appear that output and input are independent.

The output cursor is stored at 5000H and adjusted as necessary by using index addressing. The input cursor is handled by the monitor program.

The message routines were greatly simplified by making use of the subroutine in the monitor at 40H. All I had to do was put the start of the message buffer in HL. The subroutine then stores the message and

```

4C04 3C      03500      INC      A
4C05 215000  03510  CODE  LD      HL,0050H
4C08 4F      03520      LD      C,A
4C09 0600    03530      LD      B,00H
4C0B 09      03540      ADD     HL,BC
4C0C 7E      03550      LD      A,(HL)
4C0D 57      03560  SCHR  LD      D,A
4C0E 010100  03570  DLY   LD      BC,01H
4C11 CD6000  03580      CALL   60H
4C14 7A      03590      LD      A,D
4C15 FE01    03600      CP      01H
4C17 C0      03610      RET     NZ
4C18 EF      03620      RST    28H
4C19 C9      03630      RET
          03640      ;
          03650      ;ENTER MESSAGE ROUTINE
4C1A CD2B00  03660  MSTART CALL   2BH      ;WAIT FOR MESS #
4C1D B7      03670      OR      A
4C1E 28FA    03680      JR      Z,MSTART
4C20 06FE    03690      LD      B,0FEH      ;MAX OF 254 CHARS
4C22 FE31    03700      CP      31H      ;MESSAGE # 1?
4C24 280F    03710      JR      Z,M1
4C26 FE32    03720      CP      32H      ;MESSAGE # 2?
4C28 281C    03730      JR      Z,M2
4C2A FE33    03740      CP      33H      ;MESSAGE # 3?
4C2C 2829    03750      JR      Z,M3
4C2E FE34    03760      CP      34H      ;MESSAGE # 4?
4C30 2836    03770      JR      Z,M4
4C32 C3004A  03780      JP      START      ;RESTART IF NO MESS #
4C35 210051  03790  M1   LD      HL,5100H      ;M1 BUFFER
4C38 CD4000  03800      CALL   40H      ;INPUT MESSAGE
4C3B 78      03810      LD      A,B      ;GET # CHARS IN M1
4C3C 6F      03820      LD      L,A
4C3D 3C      03830      INC     A
4C3E 320250  03840      LD      (5002H),A      ;STORE IT
4C41 3600    03850      LD      (HL),0      ;LAST BYTE 0
4C43 C3004A  03860      JP      START      ;M1 ENTERED
4C46 210052  03870  M2   LD      HL,5200H      ;M2 BUFFER
4C49 CD4000  03880      CALL   40H      ;INPUT MESSAGE
4C4C 78      03890      LD      A,B      ;GET # CHARS IN M2
4C4D 6F      03900      LD      L,A
4C4E 3C      03910      INC     A
4C4F 320350  03920      LD      (5003H),A      ;STORE IT
4C52 3600    03930      LD      (HL),0
4C54 C3004A  03940      JP      START      ;M2 ENTERED
4C57 210053  03950  M3   LD      HL,5300H      ;M3 BUFFER
4C5A CD4000  03960      CALL   40H
4C5D 78      03970      LD      A,B
4C5E 6F      03980      LD      L,A
4C5F 3C      03990      INC     A
4C60 320450  04000      LD      (5004H),A
4C63 3600    04010      LD      (HL),0
4C65 C3004A  04020      JP      START
4C68 210054  04030  M4   LD      HL,5400H      ;M4 BUFFER
4C6B CD4000  04040      CALL   40H
4C6E 78      04050      LD      A,B
4C6F 6F      04060      LD      L,A
4C70 3C      04070      INC     A
4C71 320550  04080      LD      (5005H),A
4C74 3600    04090      LD      (HL),0
4C76 C3004A  04100      JP      START
          04110      ;
          04120      ;MESSAGE SENDING ROUTINE
4C79 C5      04130  MES1  PUSH   BC
4C7A D5      04140      PUSH   DE
4C7B 0600    04150      LD      B,0      ;FIX BC COUNTER
4C7D 3A0250  04160      LD      A,(5002H)      ;GET # OF CHARS
4C80 4F      04170      LD      C,A      ;BC=# OF CHARS
4C81 E5      04180      PUSH   HL      ;MAKE FRONT BUFF
4C82 D1      04190      POP    DE      ;THE DESTINATION
4C83 210051  04200      LD      HL,5100H      ;M1 BUFF SOURCE
4C86 C5      04210      PUSH   BC
4C87 EDB0    04220      LDIR
4C89 C1      04230      POP    BC      ;MOVE IT
4C8A 1B      04240      DEC     DE      ;GET # OF CHARS
4C8B D5      04250      PUSH   DE      ;ADJUST BUFFER
4C8C E1      04260      POP    HL
4C8D E5      04270      PUSH   HL      ;NEW FRONT BUFF
4C8E DD212040 04280      LD      IX,4020H      ;SAVE IT
4C92 DD5E00  04290      LD      E,(IX+0)      ;CURSOR
4C95 DD5601  04300      LD      D,(IX+1)      ;IS DESTINATION
4C98 210051  04310      LD      HL,5100H      ;M1 BUFF SOURCE
4C9B 0B      04320      DEC     BC
4C9C EDB0    04330      LDIR      ;PRINT M1
4C9E DD7300  04340      LD      (IX+0),E      ;SAVE CURSOR
4CA1 DD7201  04350      LD      (IX+1),D
          ;
4CA4 E1      04360      POP    HL
4CA5 D1      04370      POP    DE
4CA6 C1      04380      POP    BC
4CA7 C9      04390      RET
4CA8 C5      04400  MES2  PUSH   BC
4CA9 D5      04410      PUSH   DE
4CAA 0600    04420      LD      B,0
4CAC 3A0350  04430      LD      A,(5003H)
4CAF 4F      04440      LD      C,A
4CB0 E5      04450      PUSH   HL
4CB1 D1      04460      POP    DE
4CB2 210052  04470      LD      HL,5200H
          B5 C5      04480      PUSH   BC
4CB6 EDB0    04490      LDIR
4CB8 C1      04500      POP    BC
4CB9 1B      04510      DEC     DE
4CBA D5      04520      PUSH   DE
4CBB E1      04530      POP    HL
4CBC E5      04540      PUSH   HL
4CBD DD212040 04550      LD      IX,4020H
4CC1 DD5E00  04560      LD      E,(IX+0)
4CC4 DD5601  04570      LD      D,(IX+1)
4CC7 210052  04580      LD      HL,5200H
4CCA 0B      04590      DEC     BC
4CCB EDB0    04600      LDIR
4CCD DD7300  04610      LD      (IX+0),E
4CCE DD7201  04620      LD      (IX+1),D
4CD3 E1      04630      POP    HL
4CD4 D1      04640      POP    DE
4CD5 C1      04650      POP    BC
4CD6 C9      04660      RET
4CD7 C5      04670  MES3  PUSH   BC
4CDB D5      04680      PUSH   DE
4CD9 0600    04690      LD      B,0
4CDB 3A0450  04700      LD      A,(5004H)
4CDE 4F      04710      LD      C,A
4CDF E5      04720      PUSH   HL
4CE0 D1      04730      POP    DE
4CE1 210053  04740      LD      HL,5300H
4CE4 C5      04750      PUSH   BC
4CE5 EDB0    04760      LDIR
4CE7 C1      04770      POP    BC
4CE8 1B      04780      DEC     DE
4CE9 D5      04790      PUSH   DE
4CEA E1      04800      POP    HL
4CEB E5      04810      PUSH   HL
4CEC DD212040 04820      LD      IX,4020H
4CF0 DD5E00  04830      LD      E,(IX+0)
4CF3 DD5601  04840      LD      D,(IX+1)
4CF6 210053  04850      LD      HL,5300H
4CF9 0B      04860      DEC     BC
4CFA EDB0    04870      LDIR
4CFC DD7300  04880      LD      (IX+0),E
4CFE DD7201  04890      LD      (IX+1),D
4D02 E1      04900      POP    HL
4D03 D1      04910      POP    DE
4D04 C1      04920      POP    BC
4D05 C9      04930      RET
4D06 C5      04940  MES4  PUSH   BC
4D07 D5      04950      PUSH   DE
4D08 0600    04960      LD      B,0
4D0A 3A0550  04970      LD      A,(5005H)
4D0D 4F      04980      LD      C,A
4D0E E5      04990      PUSH   HL
4D0F D1      05000      POP    DE
4D10 210054  05010      LD      HL,5400H
4D13 C5      05020      PUSH   BC
4D14 EDB0    05030      LDIR
4D16 C1      05040      POP    BC
4D17 1B      05050      DEC     DE
4D18 D5      05060      PUSH   DE
4D19 E1      05070      POP    HL
4D1A E5      05080      PUSH   HL
4D1B DD212040 05090      LD      IX,4020H
4D1F DD5E00  05100      LD      E,(IX+0)
4D22 DD5601  05110      LD      D,(IX+1)
4D25 210054  05120      LD      HL,5400H
4D28 0B      05130      DEC     BC
4D29 EDB0    05140      LDIR
4D2B DD7300  05150      LD      (IX+0),E
4D2E DD7201  05160      LD      (IX+1),D
4D31 E1      05170      POP    HL
4D32 D1      05180      POP    DE
4D33 C1      05190      POP    BC
4D34 C9      05200      RET
4A00 05210      END
00000 TOTAL ERRORS

```

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prints it on the CRT; at the end, the B register contains the number of characters in the message. This is saved to use when the message is called. The value is used by the LDIR routines which transfer the message to the sending buffer and to the CRT display.

I was tempted to go back and make the program more compact. However, that would make it more difficult to understand and to modify. To add more messages, you can use the ones in the program as a guide and add to the end of the program.

Interface

A schematic of a very simple circuit is presented which can be used to interface the computer with your transmitter. The tip of the cassette auxiliary plug changes voltage from 0.4 to 0.8 whenever OUT(OFFH), A with A=1 appears. This makes it possible to use a

low-voltage comparator to drive the transmitter. I measured the current in this circuit at less than 10 mA for a +5-volt supply. Any supply voltage from 4 to 36 volts can be used. Be sure to pick the two resistors in the reference voltage divider so that the reference is just slightly larger than 0.4 volts. When V in is larger than this reference, the output of the comparator goes high and turns on the transistor and this will ground its output. That will key a solid-state transmitter or a relay if you need it.

Conclusion

This program has made sending CW a real pleasure for me and I know the guy on the other end appreciates the perfectly-sent code. The computer is put into service by just plugging in the cassette auxiliary plug—the one in the middle. Correspondence always a pleasure. 73. ■

TERMINALL



apple*

+

TRS-80*

TERMINALL is a hardware and software system that converts your personal computer into a state of the art communications terminal. Terminal features simple connections to your computer and radio plus sophisticated and reliable software.

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■ Fantastic Morse reception. Six stage active filter demodulator copies the weak ones. Auto adaptive Morse algorithm copies the sloppy ones. Received code speed displayed on status line.

■ Outstanding documentation. Professionally written, 90 page user manual contains step-by-step instructions.

■ Built in, separate, multi-stage, active filter RTTY and CW demodulators. No phase lock loops. RTTY demodulator has 170 and either 425 or 850 Hz shift-keyboard selectable and uses either the panel meter or scope outputs for easy tuning. Copy the weak ones. Copy the noisy ones. Copy the fading ones.

■ Built in crystal controlled AFSK. Rock stable for even the most demanding VHF or HF applications. A must on many VHF RTTY repeaters.

■ Built in 110 or 220 volt AC power supply.

■ Built in parallel printer driver software. Simply attach a parallel ASCII printer (e.g. the EPSON MX-80) to your printer port to obtain hardcopy in all modes.

■ Multi level displays - allows examining and editing of historical text.

■ Word wrapping, word mode editing, diddle, ignore carriage returns, user programmable end of line sequence, adjustable carriage width, multiple user-defined WRU, transmit delay (fixed, none or auto adaptive), break mode and more!

■ The all-in-one TERMINALL design makes it great for use on HF or VHF. Ham, Commercial, SWL or MARS! SWL's: TERMINALL may be jumpered for either 425 or 850 Hz reception to copy news and weather services.



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TERMINALL T1 Communications terminal for the TRS-80 Model I. Requires a Model I TRS-80, 16K RAM and Level II BASIC. Includes software on cassette and disk, assembled and tested hardware and an extensive instruction manual. \$499.

TERMINALL T3 Communications terminal for the TRS-80 Model III. Requires a Model III TRS-80, 16K RAM and Model III BASIC. Includes software on cassette and disk, assembled and tested hardware and an extensive instruction manual. \$499.

TERMINALL T2 Communications terminal for the APPLE II. Requires an APPLE II or APPLE II PLUS with 48K RAM and disk. Software is provided on disk in DOS 3.2 format. Use MUFFIN utility to convert to DOS 3.3 format. Includes software on disk, assembled and tested hardware and an extensive instruction manual. \$499.

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- Exc. audio quality! Fast squelch! w/0.0005% Crystal. ("Super Sharp" IF Filtr. 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, Audio AGC; Built-in timers; etc. Beautiful Audio!
- Q1 inhibit bd. also available
- 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

ID250 CW ID & Audio Mixer Board

- Adjustable ID tone, speed, level, timing cycle.
- 4 Input AF Mixer & Local Mic amp.
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FL-6

FL-6 Rcvr. Front-End Preselector

- 6 Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz).
- Provides tremendous rejection of "out-of-band" signals w/out the usual loss! Can often be used instead of large, expensive cavity filters
- Extremely helpful at sites with many nearby VHF transmitters to "filter-out" these "out-of-band" signals.

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.
- T.O. Warning Tone provides alerting "warble tone" apx. 10 sec. before "time out."



PSM-1 Repeater Power Supply Mod Kit

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

PRM200 Power Supply Filter Cap/Regulator/Metering Board

- As used in the SCR1000 as main part of 13.8VDC/8A Pwr. Sply.
- 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.



SCT410 XMTR. ASSY.

SCT110 VHF Xmtr/Exciter Board

- 7 or 10 Wts. Output. 100% Duty Cycle!
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- Designed specifically for continuous rptr service. Very low in "white noise."
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- 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 asmbld. w/F.T. caps, SO239 conn.
- 7, 10, 30, or 75 Wt. unit.

SCT410 UHF Transmitter Bd. or Assy.

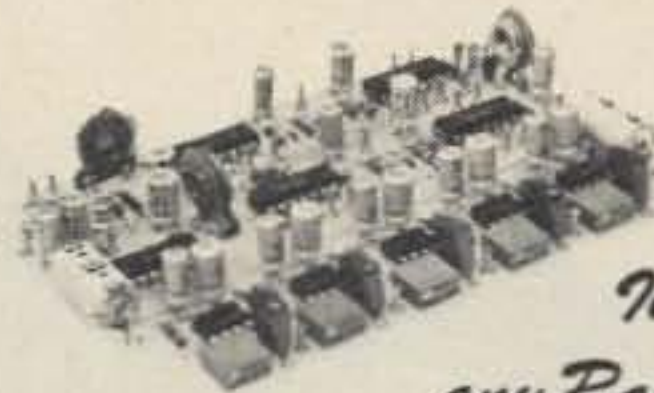
- Similar to SCT110, 10 Wts. nom.
- Avail. w/ or w/o OS-18 Super High Stability Crystal Osc./Oven.
- BA-40 40W. UHF AMP. BD. & HEAT SINK.

PCB-1 Xmtr. Power Control Board

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Control Board



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).
- Can be used to pull in a relay, trigger logic, etc.
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CW — The Air Force Way

Staff Sgt. Ed Metzler
Keesler Technical Training Center
Keesler AFB MS 39534

Thousands of hams use Morse code every day to make contact with friends and acquaintances around the world, but Morse systems operators in the Air Force use the international code for a more serious reason.

"The people we train here will go to various installations around the world, mainly to assist in communications-gathering operations," said Major Emmitt D. Lane, chief of the Systems Operations Branch at Keesler Technical Training Center, Keesler Air Force Base, Mississippi. "Our operators monitor and transcribe radio communications at many locations, providing the Air Force with a secure communications security program."

It's a critical job in today's complex, ever-changing world and it's the job of the Systems Operations Branch to see that the Air Force operators are highly qualified for their responsibilities. The branch is under the command of the 3300th Technical Training Wing, the Air Force's electronics training center. At Keesler, airmen selected for Morse systems operator duty undergo an intensive 21-week course of instruction that is divided into three blocks of instruction. Students must be able to transcribe 20 groups of code per minute to graduate from the course, although the average graduate does about 25 five-character groups a minute.

To achieve this end, students spend approx-

imately six hours a day, five days a week in the classroom. In block I, the students are introduced to international Morse code and typing.

"We teach by the reflex method," said Cicero Rhodes, an instructor supervisor who spent more than 20 years in the field before retiring from active duty.

"When the students hear the dahs and dits on their headphones, they automatically type the letter or number. After a lot of drill and repetition, it becomes second nature to them."

"Students learn the 31 characters during their first week of school," said Technical Sgt. Robert C. Templin, block I instructor.



Block I students are drilled on the basic characters of international Morse code.



A block I instructor uses the Vibroflex key to drill students before hooking into the distribution center.



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MMT 439-ATV \$379.95
MMT 1296-144 \$399.95
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Examples: MMC 432-28, MMC 426/439—ATV
MMK 1296-144, MMC 1280—ATV

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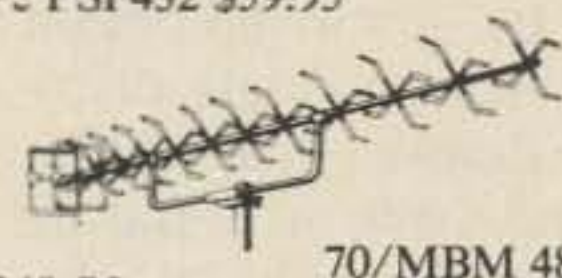
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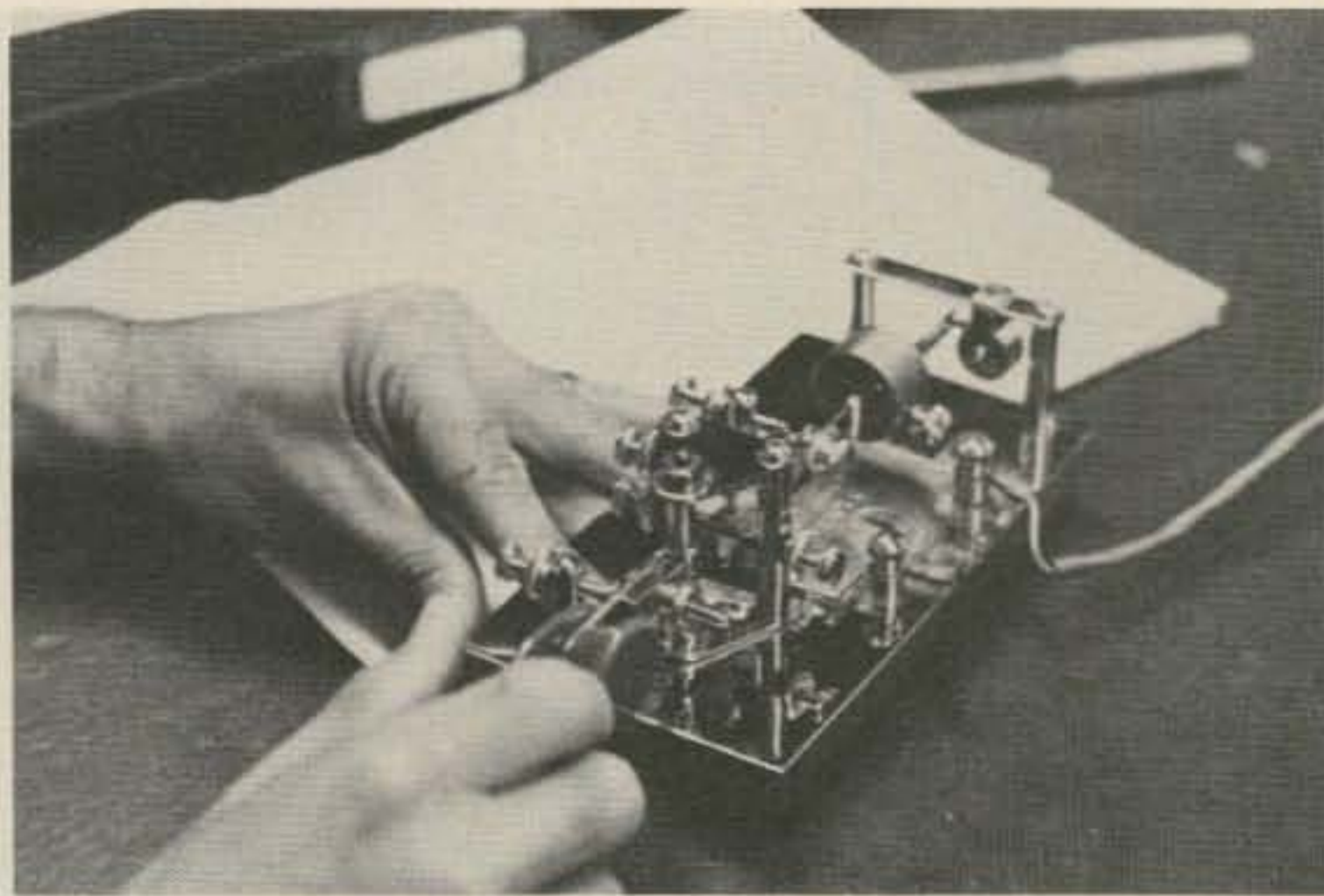
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✓436



A student in block III scans radio frequencies for message traffic.



A Vibroflex semi-automatic key used by instructors to drill students on individual characters.

"We combine learning the character sounds and typing. On day one, they learn the first finger characters as they appear on a standard typewriter, day two we teach second finger, and so on. By the end of the block, students are expected to copy 12 groups per minute."

Templin added that students who show effort, but have some difficulty learning the code, are set back in the course to bring their proficiency up. About 30 percent of the students, for one reason or another, do not graduate.

After learning the characters, the ditty-boppers, as they call themselves, work on their copy speed. As with learning the characters, this is done gradually.

"We start the classes at four groups per minute, then work up to 12," said Templin. "It's a matter of repetition and memorization." Codes are transmitted to the various classrooms by a closed-circuit system from a single distribution center. The center can send code in separate speeds to individual students or send uniform code to an entire class. The code tapes are made by the school staff, and unlike other branches of the military, are done by hand rather than computer. According to Rhodes, this personalized system allows for

more individual attention.

In the basic block, students spend three to four hours a day copying messages from the distribution center. Some time is also spent in character drills. Using the Vibroflex semi-automatic key, an instruc-

tor can drill the 20 or so students in his class on particular problem characters or patterns before hooking up to the center.

In blocks II and III, students continue to increase their copying speed while learning other facets

of the career field. In the intermediate block, students are taught radio wave and antenna theory and how to operate receivers. At the end of this block, students are able to copy 16 groups of code per minute. The last block deals with complex receiving using more than one receiver and locating copy on different frequencies. By the end of block III, students are expected to copy 20 groups per minute.

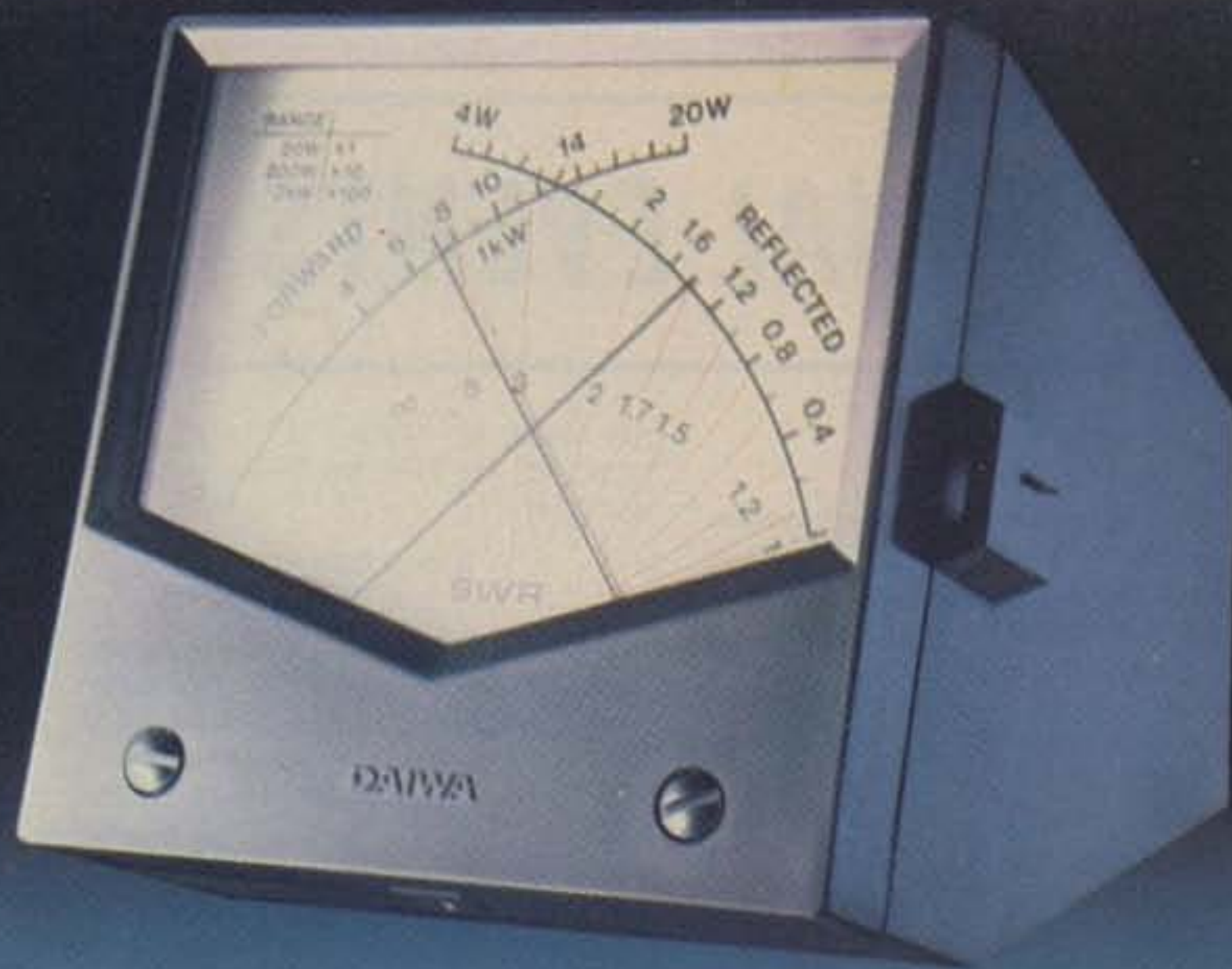
"It's a very demanding course," said Sergeant Templin. "The material is very abstract. If someone is having trouble with a particular character, you can't just say, 'OK, turn to page 14 in the text and read all about the letter C.' It requires a person who isn't nervous or high strung, who won't get upset about every mistake he or she makes."

"Like anything else, it takes a lot of practice and patience," Rhodes emphasized. "How many tennis balls do you think you'd hit perfecting your backhand? Our methods aren't hit and miss, by any means, but I would say that repetition is the keystone to learning Morse code."

"I'm confident our methods work and that we are turning out very capable people into the field," said Major Lane. "We have to; our graduates fill some of the most critical positions in the Air Force." ■



An instructor prepares a tape that will be used to broadcast from the distribution center.



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DK210—L.E.D. Speedmeter: Reads speed to 50 WPM • Laminar operation with squeeze key • Automatic, semi automatic, or tune modes • Dot-dash memory • Solid state keying • **Weight Control:** Adjusts dot-dash space ratio • **Dimensions:** 150W x 62H x 150D m/m • Rugged, all metal cabinet

DK200—Same as DK210 without L.E.D. speedmeter

NEW AF606K/AF406K All Mode Active Filters



Luxurious selectivity at an affordable price!

AF606K—Innovative PLL Tone Decoder circuitry locks onto the CW signal and reproduces it with incredible clarity • **Variable Notch Frequency:** 300-3000Hz • **CW Pass Band:** 140Hz, 110Hz, & 80Hz • Lowpass and Highpass filtering for excellent SSB reception • Built-in speaker • **Dimensions:** 150W x 62H x 150D m/m

AK406K—Same as AF606K without PLL Tone Decoder • **CW Pass Band:** 170Hz, 140Hz, 110Hz, 80Hz

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LA2030—Selectable power output: Low (15 watts) or High (30 watts) (all models) • **Power Input:** 150mW - 300 mW (LA2030A), 300mW - 600mW (LA2030B), 1.5 - 2.5 watts (LA2030C). Choose the model that's right for you • Fast acting protection circuitry • RF level indicator • BNC input, SO-239 output • **Compact size:** 90W x 42H x 121D m/m

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CNW518/CNW418 Manual Antenna Tuners



Maximize station performance with high quality Daiwa tuners.

CNW518—Frequency range: Amateur bands 3.5 - 30 MHz, including new WARC bands • **Power Rating:** SSB-2.5 kW PEP, CW-1 kW (50% duty) • Two antenna outputs for unbalanced lines • **Dimensions:** 225W x 90H x 275D m/m

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

CN520/CN540/CN550 Cross Needle Meters



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CN520—Frequency: 1.8 - 60 MHz • **Power rating:** 2 kW max. • **Sensitivity:** 40 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** 72W x 72H x 95D m/m

CN540—Frequency: 50 - 150 MHz • **Power rating:** 200 watts max. • **Sensitivity:** 4 watts minimum • **Accuracy:** Same as CN520 • **Dimensions:** Same as CN520

CN550—Frequency: 144 - 250 MHz • **Power ratings:** 200 watts max. • **Sensitivity:** 4 watts minimum • **Accuracy:** Same as CN520 • **Dimensions:** Same as CN520

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SOCIAL EVENTS

MILWAUKEE WI JUL 8-11

The YL International Single Sidebander's (YLISSB) 1982 Convention will be held on July 8-11, 1982, in Milwaukee WI. Activities will include the DX Roundup, the Systems Awards Banquet on Saturday night, and a major door prize of an Icom IC-2AT. Jean Chittenden WA2BGE will tell about her recent China trip. Pre-convention activities will begin July 5, 1982, with golfing, fishing, and side trips planned. Detailed information may be obtained by sending an SASE (business size) to Sus Musachi KB9OC, PO Box 18123, Milwaukee WI 53218.

STATE COLLEGE PA JUL 10

The Nittany Amateur Radio Club Ham Festival will be held on July 10, 1982, from 8:00 am to 4:00 pm, at the HRB-Singer picnic grounds, Science Park Road (between US 322 West and Rte. 26 East), State College PA. Talk-in on 146.16/76, 146.25/85, and 146.52. Features will include a flea market, technical sessions, numerous prizes and contests, and refreshments. Tickets are \$3.00; tailgating and tables are \$5.00. For more information, contact Richard L. Sine KB3WN 1600 E. Branch Road, State College PA 16801.

OAK CREEK WI JULY 10

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 10, 1982, from 7:00 am to 5:00 pm at the American Legion Post 434, 9327 South Shepard Avenue, Oak Creek WI. Admission is \$2.00 and includes a happy hour with free beverages. Prizes include a \$100 first prize and a \$50 second prize plus a variety of other prizes to be awarded during the day. Parking, a picnic area, hot and cold sandwiches, liquid refreshments, and overnight camping will be available. Talk-in on 146.94. More details, including a map, may be obtained from the South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

MILTON ONT CAN JUL 10

The Burlington Amateur Radio Club will hold the 8th annual Ontario Hamfest on Saturday, July 10, 1982, at the Milton Fairgrounds, Milton, Ontario. Admission is \$3.00 per person or \$2.00 for pre-registration. There will be a flea market, displays, an auction, contests, and prizes. Camping will be available and grounds will open Friday night for early campers. For pre-registration, contact Mike Cobb VE3MWR, PO Box 836, Burlington L7R 3Y7, Canada.

BOISSEVAIN MAN CAN JUL 10-11

The 19th annual International Hamfest will be held on July 10-11, 1982, on the Canadian side of the International Peace Gardens between Dunseith ND and Boissevain MAN in the Canadian Pavilion. Activities will include transmitter hunts, mobile judging, CW and QLF contests, seminars for OMs and YLs, flea markets, a ham auction, a Saturday night dance, a Sunday morning breakfast, and lots of great prizes. For more information, contact Bernie Arcand WD0MD, PO Box 53, Epping

ND 58843, or William M. Shryock, Jr. WD0GRC, 322 East 4th Street, Williston ND 58801.

RAPID CITY SD JUL 10-11

The Black Hills ARC will hold the annual South Dakota Hamfest on July 10-11, 1982, at the Surbeck Center, SD School of Mines and Technology, Rapid City SD. Pre-registration is \$7.00; registration at the door is \$8.00. There will be a prize drawing for pre-registrants, forums, contests, a picnic, and prizes. Tables are free for the flea market. Talk-in on .34/.94 (W0BLK). For further information, write Black Hills ARC, c/o Rudy WB0PWA, 4822 Capitol, Rapid City SD 57701.

MAPLE RIDGE BC CAN JUL 10-11

The Maple Ridge ARC will hold its Hamfest '82 on July 10-11, 1982, at the Maple Ridge Fairgrounds, located 30 miles east of Vancouver, Maple Ridge BC. Registration for hams is \$5.00; for non-hams over 12 years old, \$2.00. There will be food, prizes, a swap & shop, displays, a bunny hunt, ladies' and children's programs, and a main prize drawing for a Kenwood TR-2500. Camper spaces will be available (some with electrical hookups). Talk-in on 146.20/.80. For more information and registration, contact Maple Ridge ARC, Box 292, Maple Ridge BC V2X 7G2.

ALEXANDER NY JUL 11

The Genesee Radio Amateurs, Inc., will hold the second annual ARRL-approved Batavia Hamfest on Sunday, July 11, 1982, from 7:00 am to 5:00 pm at the Alexander Firemen's Grounds, Rte. 98 (nine miles south of Batavia), Alexander NY. Registration is \$2.00 in advance, \$3.00 at the gate, and \$1.00 for the flea market. There will be many prizes, a large exhibit area, OM and YL programs, contests, plenty of food, overnight camping, and a boat anchor auction at 3:00 pm. Talk-in on 4.71/5.31 (W2RCX) or .52. For advance tickets, make checks payable to Batavia Hamfest, c/o Gram, Inc., Box 572, Batavia NY 14020.

MCKEESPORT PA JUL 11

The Two Rivers Amateur Radio Club, Inc., will hold its annual hamfest on July 11, 1982, from 9:00 am to 5:00 pm, at the McKeesport Campus of Penn State University, McKeesport PA. There will be forums, prizes, food, an outdoor flea market, and indoor setups. Talk-in on 146.22/.82. For more information, telephone (412)-464-0550.

INDIANAPOLIS IN JULY 11

The Indiana State Amateur Radio Convention, in conjunction with the Indianapolis Hamfest and Computer Show, will be held on Sunday, July 11, 1982, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-465. Gate tickets are \$4.00 and entitle you to all activities, including the major prize drawing and hourly prizes. There will be inside and outside flea markets, a separate computer show and flea market, a commercial vendors' display area, technical forums, club activities, and ladies' programs.

There will be setups after 12:00 noon on Saturday, July 10th. Security will be provided Saturday night and Sunday, and camper hookup facilities will be available on the grounds. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

MANCHESTER NH JUL 17

The New Hampshire FM Association will hold an electronics flea market on Saturday, July 17, 1982, at the Manchester Municipal Airport, Manchester NH, beginning at 9:00 am. General admission is \$1.00 per person; sellers, \$5.00. Sellers should tailgate or bring their own tables. Commercial displays are welcome. Refreshments will be available and door prizes will be awarded. Talk-in on 146.52 FM and 124.9 AM. For further information, contact Dick DesRosiers W1KGZ at (603)-668-8880, or Doug Aiken K1WPM, 30 Meadowglen Drive, Manchester NH 03103, (603)-622-0831.

SHEBOYGAN WI JUL 17

The third annual Sheboygan County Amateur Radio Club Lakeshore Swapfest and Brat Fry will be held on July 17, 1982, from 8:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. There will be a public auction and prizes. Tables are free and camping will be available at Terry Andre State Park. For a flyer and additional information, write PO Box 895, Sheboygan WI 53081, or call (414)-457-3203.

HARBOR SPRINGS MI JUL 17

The Straits Area Amateur Radio Club will hold its annual hamfest on July 17, 1982, from 9:00 am to 4:00 pm at the Harbor Springs High School, Harbor Springs MI. Donations are \$2.00 at the door and table space is \$2.50. Doors will be open at 8:00 am for setups. Lunch will be served from 11:00 am to 1:00 pm and refreshments will be available during the day. There will be one main door prize and smaller prizes will be awarded hourly. The school parking lot is free for self-contained RVs to use for an overnight stay and many places of interest to YLs are available nearby. Talk-in on .52/.52 and 146.07/67. For more details, contact Mr. Bernie Slotnick KB8RE, 630 Ann Street, Harbor Springs MI 49740, or call (616)-526-5614.

EUGENE OR JUL 17-18

The Lane County Ham Fair will be held on July 17-18, 1982, at the Oregon National Guard Armory, 2515 Centennial, Eugene OR. Tickets are \$4.00 each and entitle the holder to one extra drawing ticket free if purchased before July 1st. Doors will open at 8:00 am Saturday and Sunday. Features will include a swap and shop at \$5.00 a table, a 2-meter bunny hunt, women's activities, a children's corner, computer demos, technical seminars, QCWA, and a grand prize of an Icom 730 low-band mobile rig. There will be an all-day snack bar, free parking for RVs (no hookups), and a Saturday potluck supper at 6:00 pm. Talk-in on .52/.52, 146.28/.88, 147.86/.26, and 3.910 HF. For advance tickets, send an SASE to Eunice Brown WA7MOK, 2456 Corral Court, Springfield OR 97477, or phone (503)-747-7939.

BOWLING GREEN OH JUL 18

The 17th annual Wood County Ham-A-Rama will be held on Sunday, July 18, 1982, at the Wood County Fairgrounds, Bowling Green OH. Gates will open at 10

am, with free admission and parking. There will be drawings for prizes; tickets are \$1.50 in advance and \$2.00 at the gate. Trunk sales space and food will be available. Advance table rentals are \$3.00 to dealers only. Saturday setup available until 8:00 pm. K8TIH talk-in on .52. For more info or dealer rentals, send an SASE to Wood County ARC, c/o S. Irons, PO Box 73, Luckey OH 43443.

WASHINGTON MO JUL 18

The Zero Beaters Amateur Radio Club will hold its hamfest on Sunday, July 18, 1982, at the Washington Fairgrounds, Washington MO. Talk-in on 147.84/.24. For more information, contact Rich Noelke WA0NUI, Rte. 3, 10 Richard Drive, Washington MO 63090.

CANTON OH JUL 18

The Tusco Radio Club (W8ZX) and the Canton Amateur Radio Club (WBAL) will hold the 8th annual Hall of Fame Hamfest on July 18, 1982, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is \$2.50 in advance, \$3.00 at the gate, and children under 16 will be admitted free. The flea market will open at 9:00 am and activities will include awards, forums, dealers, and XYL programs. Talk-in on 146.19/.79, 146.52/.52, and 147.72/.12. For reservations and/or information, contact Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

LA PORTE IN JUL 18

The LaPorte County Summer Hamfest will be held on Sunday, July 18, 1982, at the County Fairgrounds, LaPorte IN. Good food, cold drinks, and an indoor selling area will be available. For reservations and more information, write PO Box 30, LaPorte IN 46350.

GRAND RAPIDS MN JUL 18

The Range Wide Hamfest will be held on July 18, 1982, from 10:00 am to 4:00 pm at Gunn Park, Highway 38, 6 miles north of Grand Rapids MN. Admission and tables are free. Bring the family for a picnic, games, prizes, and fun. Parking and campgrounds will be available. Talk-in on 146.28/.88 and .52. For more information, write Bob WD0AAF, 736 Crystal Springs Road, Grand Rapids MN 55744, or call (218)-326-2268 (evenings).

OKANOGAN WA JUL 24-25

The Okanogan Valley International Hamfest will be held July 24-25, 1982, at the Okanogan County Fairgrounds, Okanogan WA. Registration is \$3.00 for hams and \$2.00 for non-hams. Activities will include bingo, a cake walk, a 2-meter bunny hunt, and a Sunday potluck dinner, followed by a drawing for prizes. Talk-in on 146.97. Hookups will be available for those who need them, and motels and restaurants are close by. For more information, contact Frank Bigelow WA7ZEV or Buck Buchanon W7GSN.

OKLAHOMA CITY OK JUL 23-25

The Central Oklahoma Radio Amateurs, Inc. will hold the Oklahoma State ARRL Convention at "Ham Holiday '82" on July 23-25, 1982, at the Myriad Convention Center, Oklahoma City OK. Pre-registration is \$6.00 and includes free flea-market tables. The pre-registration award is a Radio

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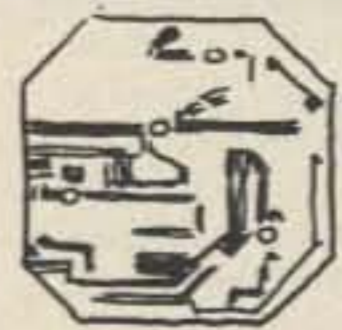
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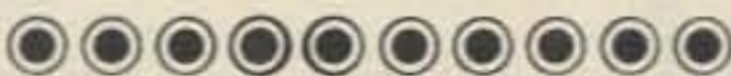
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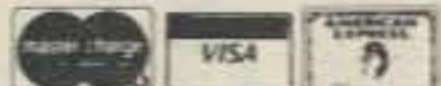
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**WELLINGTON OH
JUL 24**

The Northern Ohio Amateur Radio Society will hold its annual ARRL NOARS-

fest on Saturday, July 24, 1982, at the Lorain County Fairgrounds, 18 miles south of Lorain, one mile west of Route 58 on Route 18, Wellington OH. Admission tickets are \$2.50 in advance, \$3.00 at the gate, and are good for all prize drawings. Children under 12 will be admitted free. Admission tickets may be ordered from NOARSfest, PO Box 354, Lorain OH 44052. There will be over 100 prizes, including an Icom 730 and power supply, an Ameritron, Inc., A1-80 linear amplifier, and an Icom IC-2AT. Featured will be a large flea market with parking spaces at \$1.00 each, free parking, an indoor exhibit hall, refreshments, and free overnight camping (without hookups) on Friday. Indoor exhibit spaces with 8-foot tables are available at \$8.00 each. Send a check for advance reg-

istration to Ernie or Pat Jackson, 201 Park Avenue, Elyria OH 44035. Talk-in on 146.52/.52 and 146.10/.70.

**POUGHKEEPSIE NY
JUL 24**

The Mt. Beacon Amateur Radio Club will hold its annual hamfest on July 24, 1982, beginning at 8:00 am, at the Arlington Senior High School, Poughkeepsie NY. Admission is \$2.00 (XYLs and children admitted free), tailgating space is \$3.00 (includes 1 free admission), and a table space is \$4.00 (includes 1 free table and admission). There will be the free flea market tables indoors, parking door prizes, an auction starting at 2:00 pm, and hot food and beverages. Talk-in on 146.37/.97 and 146.52. For additional information, ad-

vance tickets, or registration, send an SASE to Walt Cotter WA2ZCN, North Hillside Lake Road, Wappingers Falls NY 12590, or phone (914)-226-6636.

**GREENVILLE OH
JUL 24-25**

The Treaty City Amateur Radio Association will be operating special event station W8UMD from the site of the Annie Oakley Days celebration, from 1600Z July 24 until 1600Z July 25. They will operate up 10 kHz from the bottom of the General band on 40 and 20 meters and will venture into the 40-meter Novice band occasionally. Send a business size SASE and QSL cards for a special certificate to TCARA, Box 91, Greenville OH 45331.

**WEST FRIENDSHIP MD
JUL 25**

The Baltimore Radio Amateur Television Society (BRATS) will hold its annual BRATS Maryland Hamfest on Sunday, July 25, 1982, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, about 15 miles west of Baltimore, in West Friendship MD. Indoor tables with ac power are \$15.00 each; without ac power, \$10.00 each. Indoor tailgating is \$5.00 per space; outdoor tailgating is \$3.00 per space. Overnight RV hookups will be available. For more information and reservations, write to BRATS, PO Box 5915, Baltimore MD 21208.

**CENTREVILLE MI
JUL 25**

The Amateur Radio Public Service Association of St. Joseph County MI will hold its 4th annual swap and shop on July 25, 1982, at the St. Joseph County Fairgrounds, Centreville MI. Doors open at 8:00 am. Tickets are \$2.00 in advance and \$3.00 at the gate. Indoor tables are \$2.00. Trunk sales are free. Camping is available Saturday night only for \$6.00. Talk-in on 146.52. For more information, contact Dennis Cutler N8DDU, 3051 Z Avenue, Vicksburg MI 49097.

**WHEELING WV
JUL 25**

The Triple States Radio Amateur Club will hold its 4th annual hamfest on Sunday, July 25, 1982, from 9:00 am to 4:00 pm, at Wheeling Park, Wheeling WV. Admission is \$2.00 (50/50); children under 12 will be admitted free. There will be major prizes plus door prizes every 15 minutes; a 15-minute auction every hour on the hour; free parking for 1,000 cars; refreshments; ARRL/SWOT/TSRAC booths; indoor dealer displays; and a flea market. There will be setups the night before or at 7:00 am Sunday morning. Talk-in on 146.31/.91 and 146.52. For advance dealer registration, electrical outlet and table requests, submission of free ads for the club's hamfest issue, and more information, contact TSRAC, Box 240, RD 2, Adena OH 43901.

**NEW ORLEANS LA
JUL 25**

The Delgado Community College Amateur Radio Club will hold its annual swapfest on Sunday, July 25, 1982, from 8:00 am to 4:00 pm, at the Peristyle in City Park, New Orleans LA. There is no charge for setting up, but those participating must bring their own tables. Admission is free. There will be plenty of free parking, and food and drinks will be available nearby. Talk-in on 146.67. For further information, contact Jim Wolfe, Club President, Delgado Amateur Radio Club, Delgado Community College, 615

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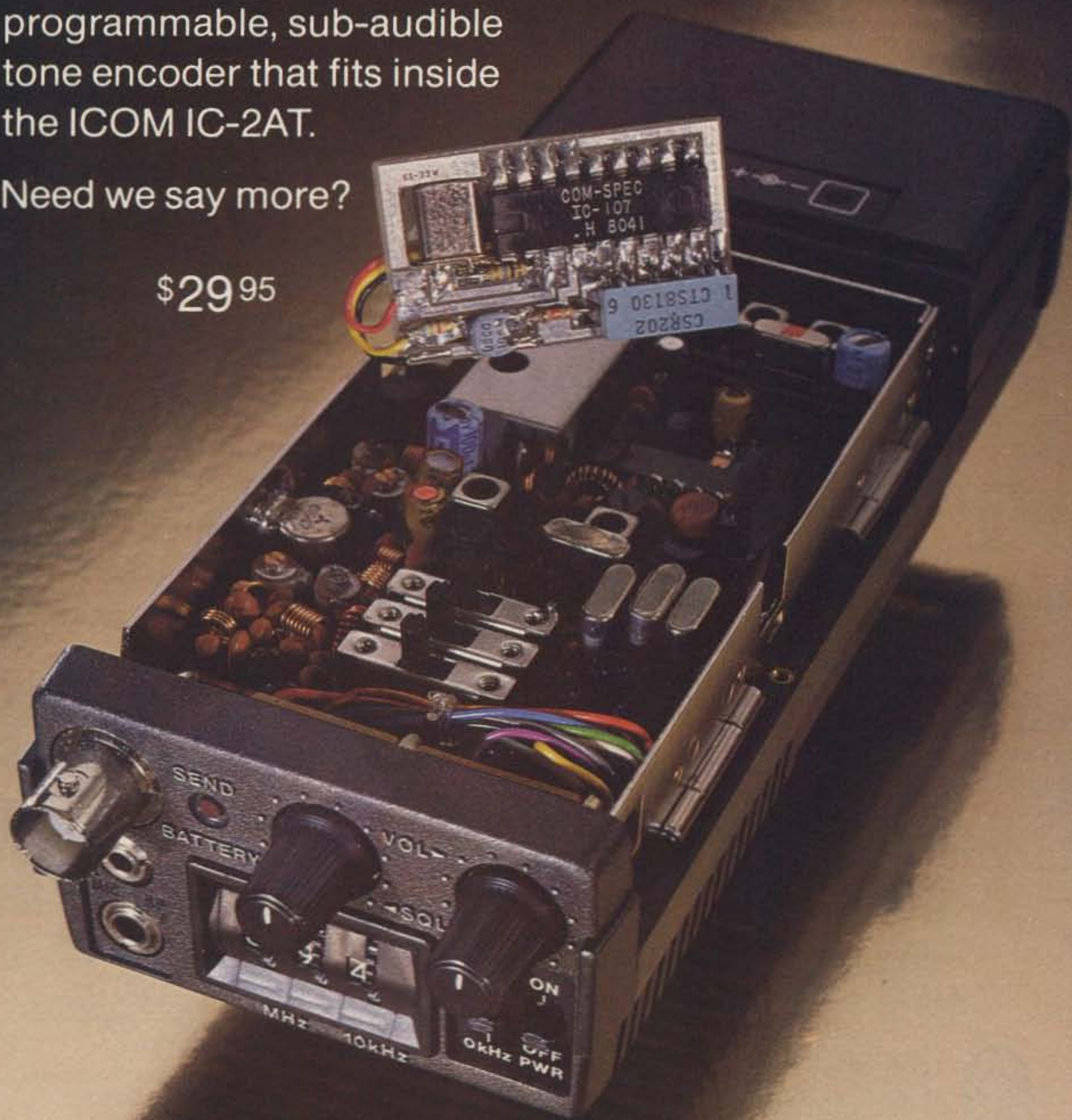
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TR-2500 FEATURES:

- Extremely compact and light weight 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches), 540 g, (1.2 lbs) with NiCd pack.
- LCD digital frequency readout.
- Ten memories includes "MO" memory for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5 kHz and larger (5, 10, 15, 20, 30 kHz... etc) to be programmed.



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- UP/DOWN manual scan.
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- 2.5 W or 300 mW RF output. (HI/LOW power switch).
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- Covers 143.900 to 148.995 MHz in 5 kHz steps.
- Optional power source, MS-1 mobile or ST-2 AC charger/power supply allows operation while charging. (Automatic drop-in connections.)
- High impact plastic case.
- Battery status indicator.
- Two lock switches for keyboard and transmit.

Standard accessories:

- Flexible rubberized antenna with BNC connector.
- 400 mA heavy-duty Ni-Cd battery pack.
- AC Charger.



Optional accessories:

- VB-2530 25 W RF Power amp, BNC-BNC cables, and mounting bracket, supplied.
- MS-1 13.8 VDC mobile stand/charger/power supply.

Optional accessories:

- ST-2 Base station power supply and quick charger (approx 1 hr.)
- TU-1 Programmable "DIP switch" (CTCSS) encoder.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.
- PB-25 Extra Ni-Cd battery pack, 400 mA, heavy-duty.
- BT-1 Battery case for AA manganese or alkaline cells.
- BH-2 Belt hook.
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TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/CW transceiver, featuring six memories, memory scan, memory back-up capability, automatic band scan, all-mode squelch, and CW semi break-in. Available with a 16-key autopatch UP/DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).

- FM/USB/LSB/CW all mode. The mode switch, with the digital step (DS) switch, determines the size (100 Hz, 1 kHz, 5 kHz, 10 kHz) of the tuning step.
- Six memories. On FM, memories 1-5 for simplex or ± 600 kHz offset, using OFFSET switch, Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan. Scans memories in which data is stored.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan. Scans within whole 1 MHz segments (ie., 144.0-144.999 MHz).
- Dual digital VFO's.
- Transmit frequency tuning while transmitting, for OSCAR operations.

Optional accessories:

- KPS-7 DC power supply for TR-9130 base station operation. 7 A intermittent, 6 A continuous, protection circuit built-in.
- SP-40 compact mobile speaker. Only 2-11/16 W x 2-1/2 H x 2-1/8 D (inches). Handles 3 watts of audio.
- TK-1 AC adapter for memory back-up (not shown).

- Squelch circuit, all modes (FM/SSB/CW).
- Repeater reverse switch.
- Tone switch.
- CW semi break-in circuit with sidetone.
- Digital display with green LED's.
- Compact size and lightweight. 170 (6-11/16) W x 68 (2-11/16) H x 241 (9-1/2) D mm (inch). 2.4 kg (5.3 lbs.) weight.
- Covers 143.9 to 148.9999 MHz.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- Transmit offset switch.
- High performance noise blanker.
- RF gain control.
- RIT circuit.

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"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.

- Wide receiver dynamic range, Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6L46B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

- Optional accessories:**
- SP-230 external speaker.
 - VFO-230 external digital VFO with five memories, digital display.
 - VFO-240 external analog VFO.
 - AT-230 antenna tuner.
 - YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
 - YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
 - KB-1 deluxe heavyweight knob.



TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.

- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Final amplifier protection circuit assures maximum reliability.
- Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available. TS-130S, with FA-4 installed, also available.
- Effective noise blanker.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional DFC-230 Digital Frequency Controller
 Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

- Optional accessories:**
- PS-30 matching power supply (TS-130SE).
 - KPS-21 power supply (TS-130SE).
 - PS-20 power supply (TS-130V).
 - SP-120 external speaker.
 - VFO-120 remote VFO.
 - FA-4 fan unit (TS-130SE).
 - YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
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 - AT-130 antenna tuner.
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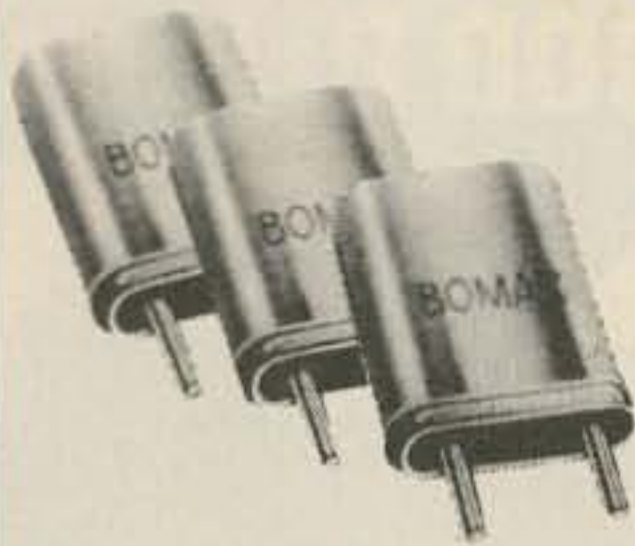
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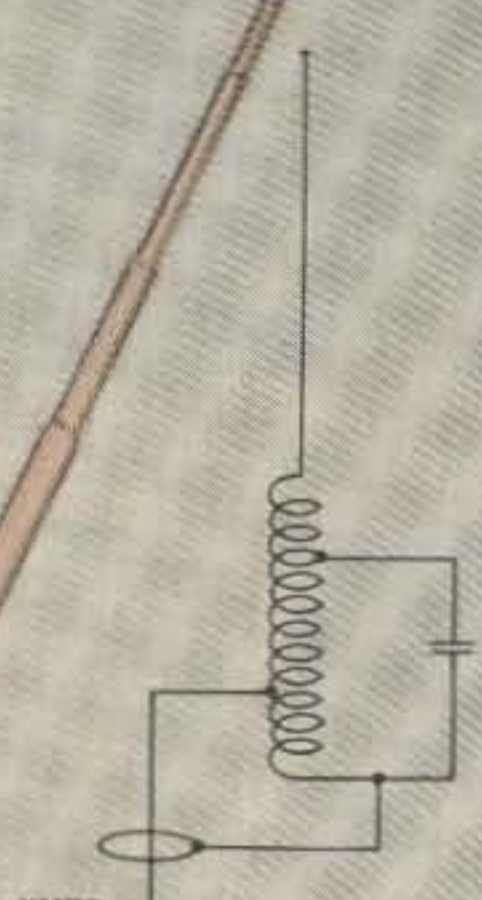
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- Gives your hand-held full quieting from places you're nearly dead in with a rubber duck.

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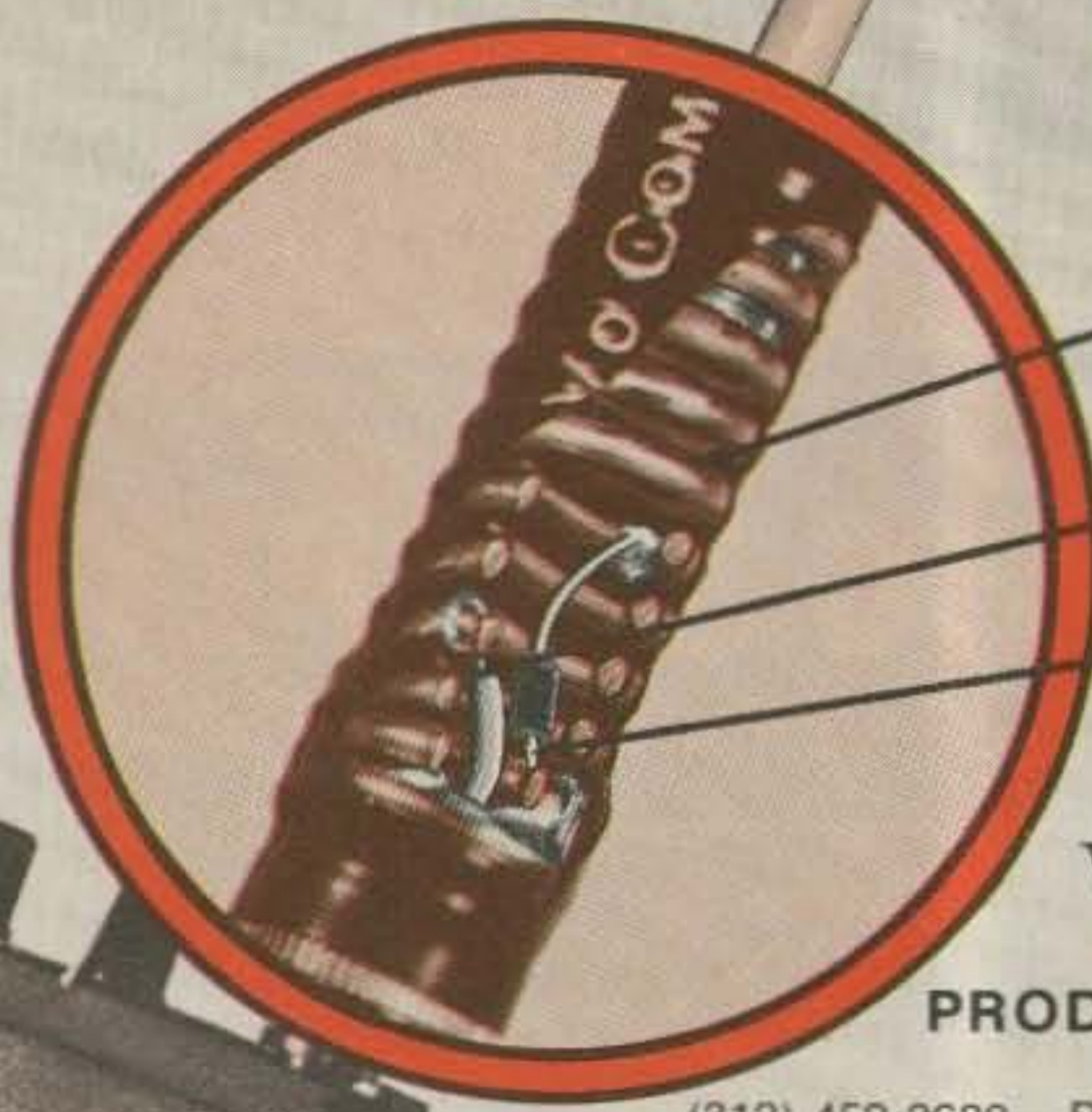
At right is the circuit that does it. The coil that doubles as a base spring is tap fed, and a matched capacitor completes the resonant circuit.

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
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I somehow find it hard to believe, but this column marks the beginning of the sixth year of RTTY Loop! Back in 1977, when I started this column in a local club newsletter, the most exotic item I was asked about was the Teletype® Model 28, or occasionally the Model 33. Now, in just a half-dozen years, the bulk of the questions concern adapting any of the myriad of personal computers to RTTY.

Many readers, having sensed my affection for the Motorola 6800 series of computers, have asked about programs directed towards that line. In the past, I have featured quite a few individual programs which allow receiving or transmitting RTTY on a 6800 system. One feature often requested, and certainly available on many commercial RTTY terminals, is the so-called "split-screen" capability. This is the display of both the received

signal and transmit buffer on the screen at the same time.

Let's take a look at what such a program requires, and over the next few sessions see if we can develop a reasonable technique for implementing a split-screen RTTY terminal. In doing this, I will try to keep within my design philosophy, which is: If it can be done in software, do it. While this sometimes increases the complexity of the written code, I believe that in the long run working out a logical software solution to problems provides both a straightforward method of problem-solving and a cost-effective approach for the ham on a budget.

The first step will be to define what this terminal will need to do. Let's require only the ability to handle 60-wpm Murray (Baudot) code; other speeds will not be hard to add, and a given code set will keep things simple for the time being. I would like the top half of the screen to display the received signal, with the most recent lines being maintained, and the bottom half to show the transmit buffer. You should be able to fill the transmit buffer while receiving and continue to add to it even while transmitting.

I am going to have to be rather specific on the hardware requirements. We will be writing for a Motorola 6800-based computer, with the I/O block located at \$8000, using the old "SWTPC" standards. A video-

mapped display will be a must. Users of "smart" terminals, such as the Soroco IQ-120, can position the cursor anywhere using escape sequences, and this could be used to implement a split-screen display. However, in order to selectively scroll the screen, manipulation of data will be required directly, and this will necessitate the type of access a video board allows. While I will be writing for a GIMIX board, the program should be general enough to allow any of the popular video displays to work.

Now, on to the program. In the past, I have received some letters critical of my rapid entry into source codes. It seems that all of you are not as comfortable as I in the realm of LDAA and CPX instructions. I therefore shall wade in from the shallow end, although I prefer diving right in. Let's start by looking at the logic involved for this program.

Well, not just yet. You see, that's been another criticism. Flowcharts, those indispensable tools of the computer programmer, are just so much gobbledygook to a good number of you. I have, in the past, presented several flowcharts without much in the way of background. I shall attempt to rectify this omission herewith.

A flowchart is a map, diagram, or skeleton of a computer

program, depending on how you look at it. Let's take a rather simple example. I say something like, "Take a number and call it A. Is it greater than 10? If so, print an H. If not, print an L. Now do it again." This sequence defines a logic sequence. Many of you familiar with BASIC, the rather universal higher-level language used in personal computers, could write rather rapidly from this description the program shown in Fig. 1. This would be one way to accomplish the task. Another is shown in Fig. 2, which is a 6800 assembly-language implementation of the same simple-minded job. I think you can see that there is quite a difference, and can imagine further differences when the process is extended to 6502-, 8080-, Z-80-, Pascal-, FORTRAN-, or APL-speaking computers. What is needed is some universal way to represent the logic sequence. That is the flowchart.

Steps in a flowchart are represented by boxes, each of which contains one logical process. This process may be a simple one-byte instruction or an entire subroutine. It doesn't matter, so long as it can be visualized as a unit. Different shaped boxes are frequently used to represent different types of processes. Three of those are shown in Fig. 3, with their definitions. There are many others, but these three will suffice for this month's flowchart.

```
0010 INPUT "TYPE A NUMBER",A
0020 IF A>10 GOTO 50
0030 PRINT "L"
0040 GOTO 10
0050 PRINT "H"
0060 GOTO 10
```

Fig. 1.

```
START JSR INPUT
      CHPA 10
      BGT HIGH
      LDAA 'L
      JSR OUTPUT
      BRA START
HIGH  LDAA 'H
      JSR OUTPUT
      BRA START
```

Fig. 2.

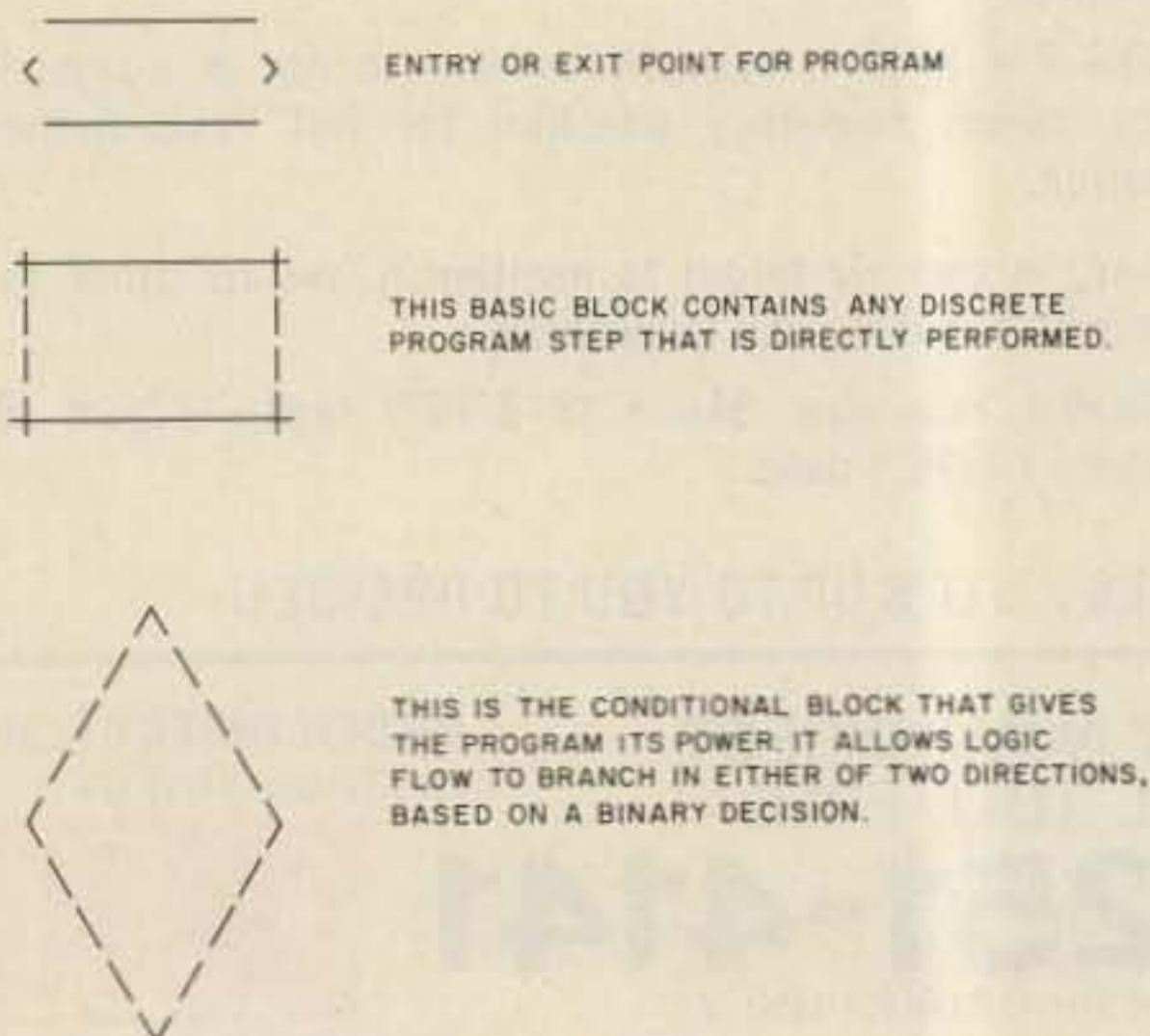


Fig. 3.

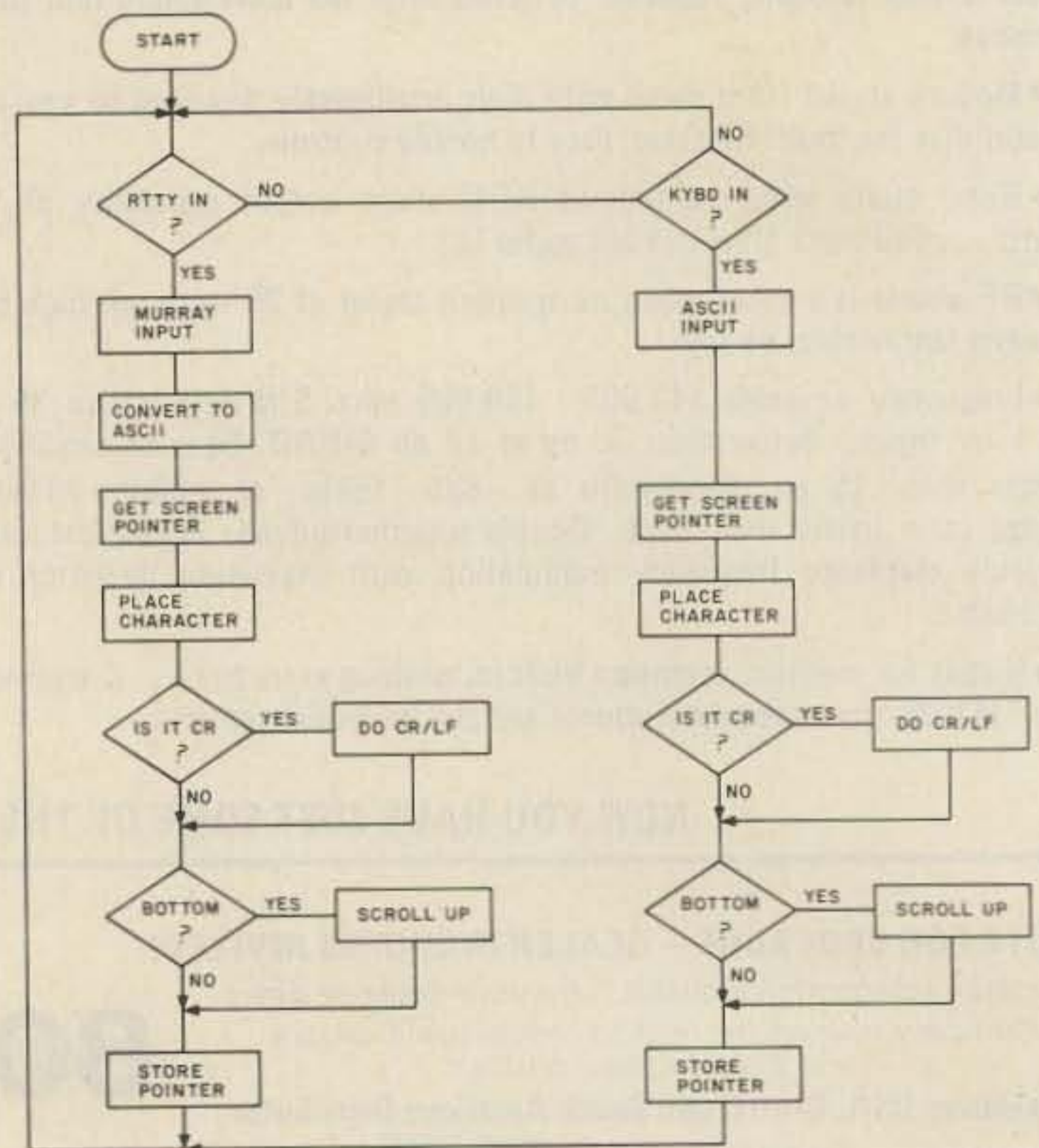


Fig. 4. Simple split-screen RTTY.

The boxes are connected by lines, through which logic flow is presumed to flow in a top-to-bottom, right-to-left direction. If flow is contrary to these directions, arrows are used to define such progression.

With this under our belts, let's take a look at the flowchart in Fig. 4. Entering at START, we immediately come to a decision. If there is a bit on the RTTY input pin, then a character is about to come in. If not, the local keyboard can be checked for input. If no data is found there, the program returns to check the RTTY once again and the loop continues.

If a character has been typed on the local keyboard, it is inserted into a buffer and displayed on the lower half of the screen. Later on, we will add some checking for special characters which will control the program or other features. For now, let's just be happy to fill the buffer.

Received RTTY characters are also stuffed onto the screen, but on the top half. During receipt of the RTTY character, however, there is quite a bit of time when the computer would be idling, waiting for these long, 21-ms pauses to go by. During these pauses, as shown in Fig. 5, the keyboard is checked once again. Input is allowed here, too, and again placed on the screen and stuffed into the buffer.

All this inputting and buffering requires a raft of pointers and protocols. Placing a character on the screen will require pulling a set of pointers from storage, placing the character on the screen, updating the pointers, checking to see if a new line must be started, and possibly scrolling that segment of the display. And all this must be accomplished within the wink of an eye.

Now that we have the road map, let's begin our journey. The program we will use is an imple-

mentation of an output routine which will serve as the window into the RTTY terminal we will be building. Before I go into the ins and outs of the program itself, maybe I'd better explain some of the rather peculiar GIMIX system function calls.

Like most operating systems, the GMXBUG monitor features a variety of routines which may be used to input or output characters or manipulate data in various ways. Unlike most, which use subroutine calls to access such routines (JSR ADDR or \$BD \$nnnn), GMXBUG provides for the use of the software interrupt (SWI or \$3F) instruction to create a set of two-byte pseudocodes. In the typical sense, one may write the code \$3F \$10 to input a character, for example, rather than the MIKBUG style \$BD \$E1AC (JSR INEE).
Moreover, GMXBUG features several routines not offered in other 6800 monitors, many of which demonstrate a high level

of utility. While these routines may be written in for systems based on another monitor, as long as they are here, why not use them? In order to allow the assembler to handle these two-byte pseudocodes, I write them as double-byte data statements (FDB) and call them as such.

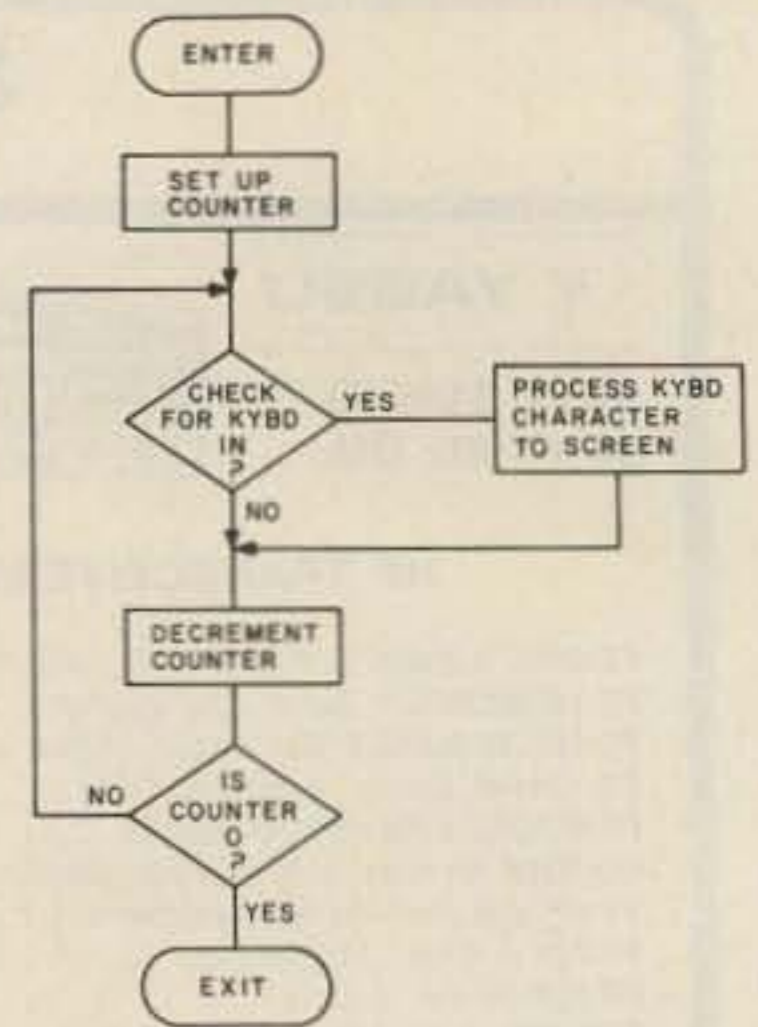


Fig. 5. Murray input delay routine.

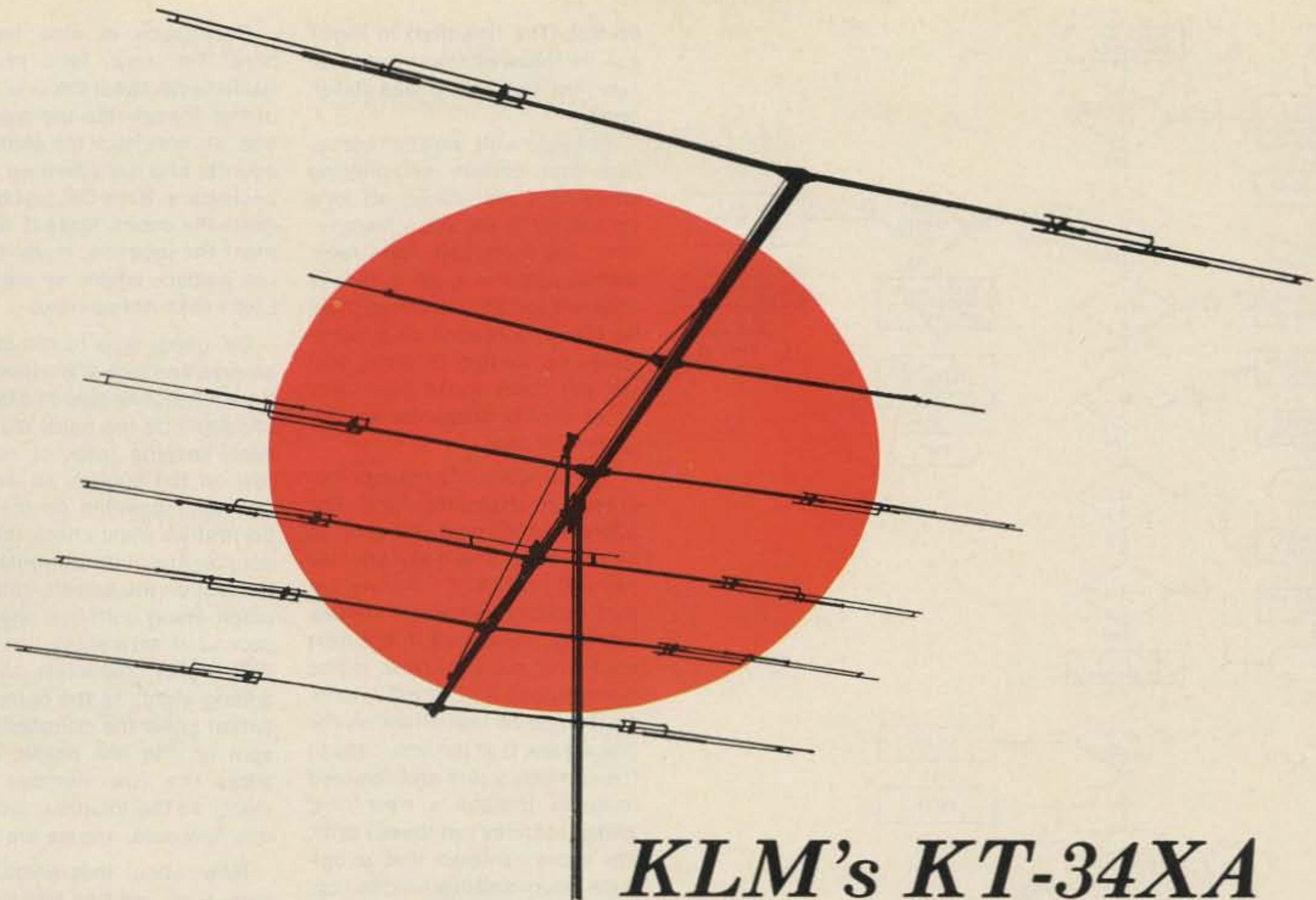
of utility. While these routines may be written in for systems based on another monitor, as long as they are here, why not use them? In order to allow the assembler to handle these two-byte pseudocodes, I write them as double-byte data statements (FDB) and call them as such.

```

1:      NAM    HALF SCREEN TEST
2:      *****
3:      # DEMONSTRATION ROUTINE TO #
4:      # OUTPUT ON THE LOWER HALF #
5:      # OF A GIMIX VDM #
6:      # VERSION 1.00 - FOR #
7:      # RTTY LOOP : JULY, 1982 #
8:      # MARC I. LEAVEY, M.D. #
9:      *****
10:     OPT    NOS,NOS
11:     #
12:     # GIMIX FUNCTION CALLS
13:     #
3F04   14: ADDAX EDU    $3F04    Add ACCA to INDEX
3F06   15: SUBAX EDU    $3F06    Subtract ACCA from INDEX
3F0E   16: MOVER EDU    $3F0E    Block Move Routine
3F11   17: DUTCHR EDU    $3F11    Normal character output
A002   18: BEGIN1 EDU    $A002    Lower bound for move
A004   19: END1 EDU    $A004    Upper bound for move
A014   20: BEGIN2 EDU    $A014    Lower bound to go to
21:     #
22:     # ENTRY POINT
23:     #
AB00   24:     DRG    $AB00    Unused in my system
AB00 B1 0D 25: HAFSCR CMP A    $*0D    Is it CR?
AB02 27 15 26:     BEQ    DOCR
AB04 B1 0A 27:     CMP A    $*0A    Is it LF?
AB06 27 14 28:     BEQ    DOLF
AB08 B1 07 29:     CMP A    $*07    Is it BELL?
AB0A 27 13 30:     BEQ    DOBELL
AB0C B1 0C 31:     CMP A    $*0C    Is it FF?
AB0E 27 12 32:     BEQ    DOFF
AB10 B1 08 33:     CMP A    $*0B    Is it BS?
AB12 27 11 34:     BEQ    DOBS
AB14 B1 20 35:     CMP A    $*20    Is it a Control Char?
AB16 2C 10 36:     BGE    PRINT
AB18 39    37: HAFXIT RTS
38:     #
AB19 7E AB46 39: DOCR JMP    CARRET    # Jumps to
AB1C 7E AB55 40: DOLF JMP    LINFED    # wherever called
AB1F 7E AB94 41: DOBELL JMP BELL      # for by the
AB22 7E AB97 42: DOFF JMP    FRMFED    # control
AB25 7E ABB1 43: DOBS JMP    BAKSPC    # character
44:     #
AB28 FE ABC6 45: PRINT LDX    LOCATE    Get spot for char
AB2B A7 00 46:     STA A X          Put char there
AB2D 0B 47:     INX
AB2E FF ABC6 48:     STX    LOCATE    Save next spot
AB31 F6 ABCC 49:     LDA B COUNT      Get line char count
AB34 5C 50:     INC B
AB35 F7 ABCC 51:     STA B COUNT
AB38 F1 ABCD 52:     CMP B ENDLIN      Is line full?
AB3B 27 01 53:     BEQ    NEWLIN      Yes, do CR/LF
AB3D 39    54: PEXIT RTS
55:     #
AB3E BD AB46 56: NEWLIN JSR    CARRET    Go do CR
AB41 BD AB55 57:     JSR    LINFED      and LF
AB44 20 F7 58:     BRA    PEXIT      then exit
59:     #
60:     #
AB46 FE ABC6 61: CARRET LDX    LOCATE    Get current locale
AB49 B6 ABCC 62:     LDA A COUNT      And current nr of chars
AB4C 3F 06 63:     FDB    SUBAX      Subtract the two
AB4E FF ABC6 64:     STX    LOCATE    Store that
AB51 7F ABCC 65:     CLR    COUNT      Clear char count
AB54 39    66: CARXIT RTS
67:     #
68:     #
AB55 B6 ABDO 69: LINFED LDA A ROMNR    Get current row nr
AB58 B1 ABCF 70:     CMP A HIROW
AB5B 27 10 71:     BEQ    SCROLL
AB5D 4C 72:     INC A
AB5E B7 ABDO 73:     STA A ROWNR
AB61 FE ABC6 74:     LDX    LOCATE
AB64 B6 50 75:     LDA A $B0
AB66 3F 04 76:     FDB    ADDAX
AB68 FF ABC6 77:     STX    LOCATE
AB6B 20 26 78:     BRA    LFEXIT
AB6D FE ABC8 79: SCROLL LDX    BGNVDM
AB70 FF A014 80:     STX    BEGIN2
AB73 B6 50 81:     LDA A $B0
AB75 3F 04 82:     FDB    ADDAX
AB77 FF A002 83:     STX    BEGIN1
AB7A FE ABCA 84:     LDX    ENDVDM
AB7D FF A004 85:     STX    END1
AB80 3F 0E 86:     FDB    MOVER
AB82 FE ABCA 87:     LDX    ENDVDM
AB85 B6 50 88:     LDA A $B0
AB87 3F 06 89:     FDB    SUBAX
AB89 B6 20 90:     LDA A $*20
AB8B A7 00 91: SCLOOP STA A X
AB8D 0B 92:     INX
AB8E BC ABCA 93:     CPX    ENDVDM
AB91 26 FB 94:     BNE    SCLOOP
AB93 39    95: LFEXIT RTS
96:     #
97:     #
AB94 3F 11 98: BELL FDB    DUTCHR    Just send the BELL out the
AB96 39    99:     RTS              old fashioned way!
100:    #
101:    #
AB97 FE ABC8 102: FRMFED LDX    BGNVDM
AB9A FF ABC6 103:     STX    LOCATE
AB9D 7F ABCC 104:     CLR    COUNT
ABA0 B6 ABCE 105:     LDA A LOROW
ABA3 B7 ABDO 106:     STA A ROWNR
ABA6 B6 20 107:     LDA A $*20
ABAA A7 00 108: FFLOOP STA A X
ABAA 0B 109:     INX
ABAB BC ABCA 110:     CPX    ENDVDM
ABAE 26 FB 111:     BNE    FFLOOP
ABB0 39    112: FFEXIT RTS
113:    #
114:    #
ABB1 F6 ABCC 115: BAKSPC LDA B COUNT
ABB4 27 0F 116:     BEQ    BSEXIT
ABB6 5A 117:     DEC B
ABB7 F7 ABCC 118:     STA B COUNT
ABBA FE ABC6 119:     LDX    LOCATE
ABBD 09 120:     DEX
ABBE B6 20 121:     LDA A $*20
ABCO A7 00 122:     STA A X
ABC2 FF ABC6 123:     STX    LOCATE
ABC5 39    124: BSEXIT RTS
125:    #
126:    #
ABC6 F4 10 127: LOCATE FDB    $F410
ABC8 F4 10 128: BGNVDM FDB    $F410
ABCA F7 7F 129: ENDVDM FDB    $F77F
ABCC 00 130: COUNT FCB    0
ABCD 50 131: ENDLIN FCB    80
ABCE 0D 132: LOROW FCB    13
ABCF 17 133: HIROW FCB    23
ABDO 0D 134: ROWNR FCB    13
135:    #
136:    #
137:    END
NO ERROR(S) DETECTED

```

Fig. 6.

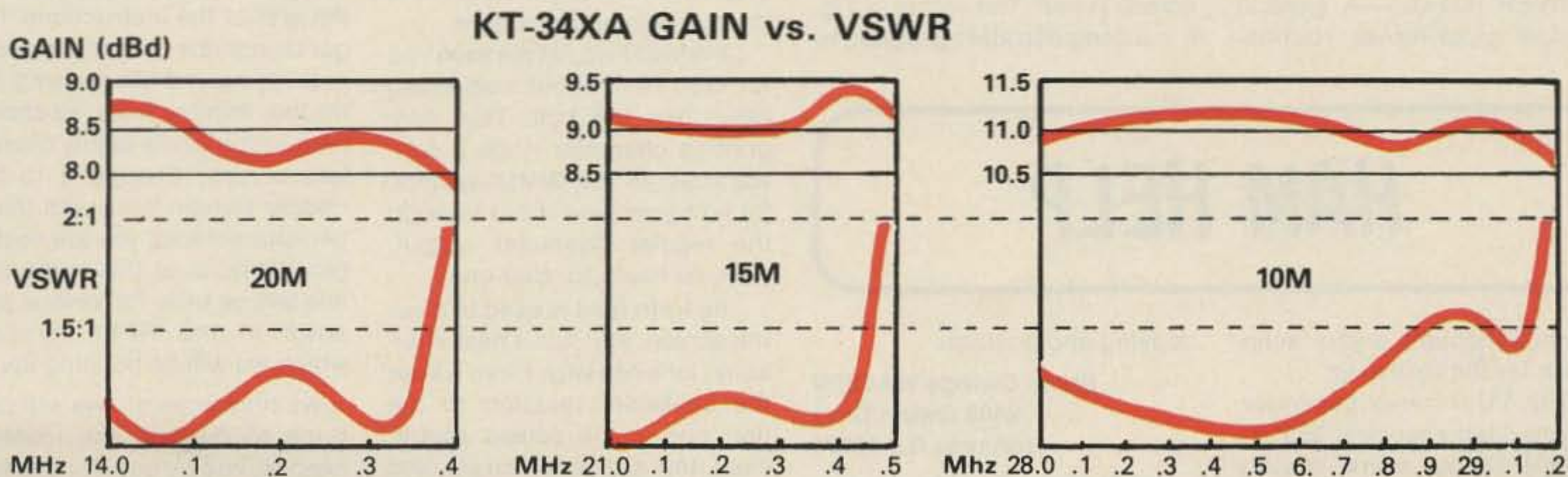


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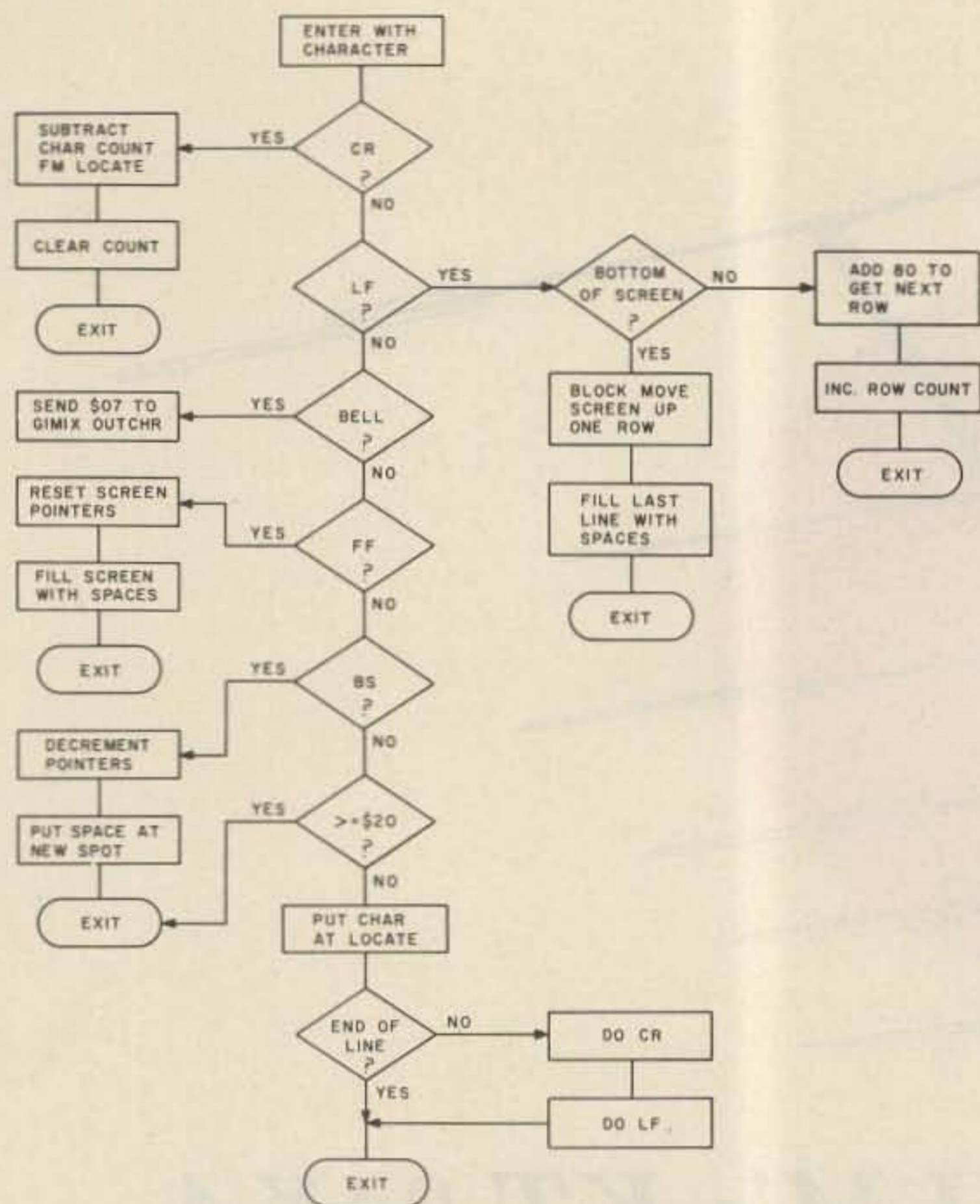


Fig. 7.

Routines used in this month's program include:

ADDAX (\$3F04)—Adds the contents of accumulator A to the contents of the index register and places the result in the index register. The addition is unsigned. The former contents of the index register are lost.

SUBAC (\$3F06)—Subtracts the contents of accumulator A from the contents of the index register and places the result in the index register. The subtraction is unsigned. The former contents of the index register are lost.

MOVER (\$3FOE)—A general purpose block-mover routine.

Moves the contents of memory starting at the address in BEGIN1 (\$A002) through the address in END1 (\$A004) inclusive to memory starting at the address in BEGIN2 (\$A014). Checks for overlap of source and destination areas. If necessary, the move is done back-to-front.

OUTCHR (\$3F11)—Conventional character output to the video-driver routines of the ASCII character contained in the A accumulator.

Enough background? OK, let's see how we can chop a screen in half. The listing in Fig. 6 is a demonstration program to

do this. The flowchart in Fig. 7 can be followed step by step, to see how the listing was developed.

To begin with, we shall recognize that certain non-printing characters are useful, so let's check for. A carriage return, line feed, bell, form feed, and backspace, each in turn is checked for. Should any of them be found, a branch to a corresponding routine is done, and we will cover those later. Any other control character we will ignore for now.

The handling of printing characters is straightforward. The address of the next character to be printed is stored at a spot we will call "LOCATE." So, we get that address, place the character there, increment to the next spot, and store it. Now, a line counter, call it "COUNT," is incremented to see where on the line we are. If at the end, calls to the carriage-return and line-feed routines initiate a new line. Which routines are these? Why, the same routines that a carriage return and line feed call up, no? Yes! And I bet you thought this was going to be complicated.

Now let's take a look at some of those special routines. What's that I hear? OK, carriage return, you first. What is a carriage return after all? A resetting to zero on the current line, that's all. So, to implement a carriage return, first we load the current location into the index register, then the character count (where on the line are we?) into the A accumulator. Subtract the two, using that SUBAX routine, and you have the beginning of the line. Store that as the new location, clear the line count itself, and the carriage return is done.

Line feed? No, let me save you for last. How about something easy, like the bell. This non-printing character rings a software bell in the GIMIX system. So let's just send it out through the regular character output. Well, so much for that one.

The form feed is used to clear the screen, and it is a neat character; let's see why. First, we set the character location to the first one in the screen sector, clear the character count and set the row counter to the first row. Next a loop is entered to load the entire screen window with spaces (\$20). When that's done, the screen is reset and clear.

Backspace is also not so hard. For now, let's prohibit backspacing past the beginning of the line up onto the previous line. So, we check the character counter and if it's zero we don't backspace. If it's OK, just decrement the count, store it, decrement the location, store it, and put a space where we are now. Like I said, not so hard.

OK gang, time to roll up our sleeves and look at the line feed. If we take it one step at a time, it shouldn't be too hard. We have been keeping track of current row on the screen, as well as character position on the line. So first we must check the row counter and, if the current row is the last on the screen, initiate a scroll. Hang onto that one for a second. If not a scroll, it is easy. With eighty characters per line, adding eighty to the current location gives the corresponding spot on the line below. Increment the row number, add eighty to the location, store all this new data, and we are done.

Now, about that scroll, let's look. First, we find the start of the second screen line; this will become the top line after the scroll. This address is stored in BEGIN1 for use by the MOVER routine. The end of the screen defines END1, and the data on display is shifted up one line. Now one more task needs to be taken care of. The last line on the screen is filled with spaces, clearing it for new data.

Note, by the way, that the carriage return does not initiate a scroll, nor does a line feed reset position within a line. It takes both!

The data and storage needed for the program is situated at the end of the instructions. I've got to indicate here that there is nothing sacred about using the bottom thirteen lines, as shown here, or the whole eighty characters across. Change it to the middle sixteen lines with thirty-two characters if you are nostalgic. Versions of this same routine will be used for several windows in the RTTY terminal which we will be building up.

As time goes on, we will continue to develop the routines needed, one by one, for this full-featured RTTY terminal. Next month, though, I'll take a crack at some of the mail from readers which has been piling up on my desk. That and more, in RTTY Loop to come.

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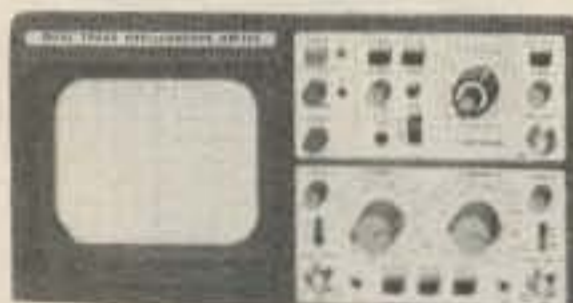
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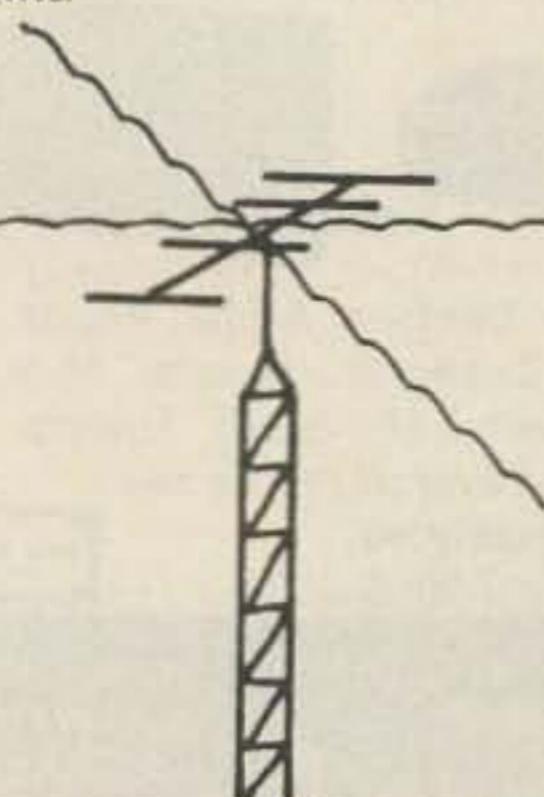
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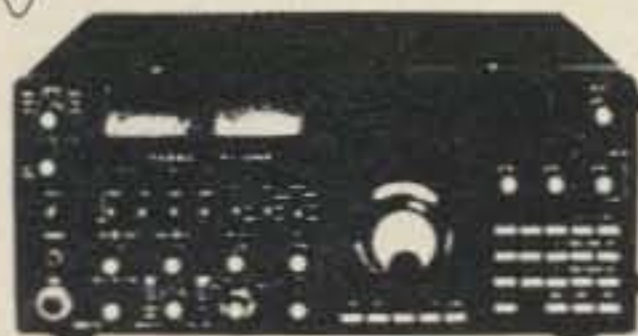
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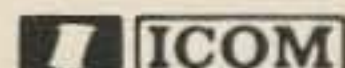
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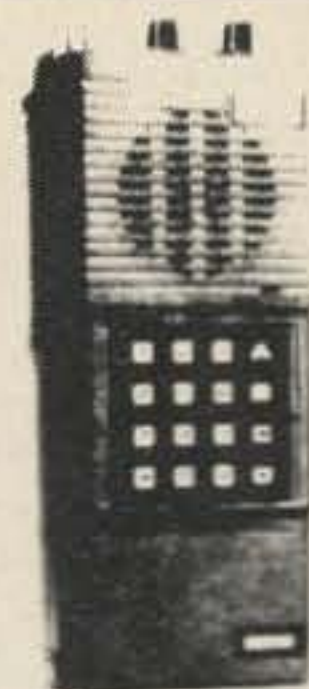
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Rockwell/Collins KWM380 - overpriced compared to the others but not going to be superseded by a new model next weekend. Yaesu FT-ONE - close to the KWM380. Time will tell if as reliable (We'll tell you.)

New TS930S - Too soon on this one, but the auto antenna tuner is nice.

More next month (Remember - You're only as good as your next big rig purchase at Madison!)

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Timothy Daniel N8RK
73 Magazine Staff

This is not the typical 73 construction article. Herman "Tex" Friedsam's satellite TV antenna is not offered in kit form, nor are a complete set of plans available.

Just in case you still want

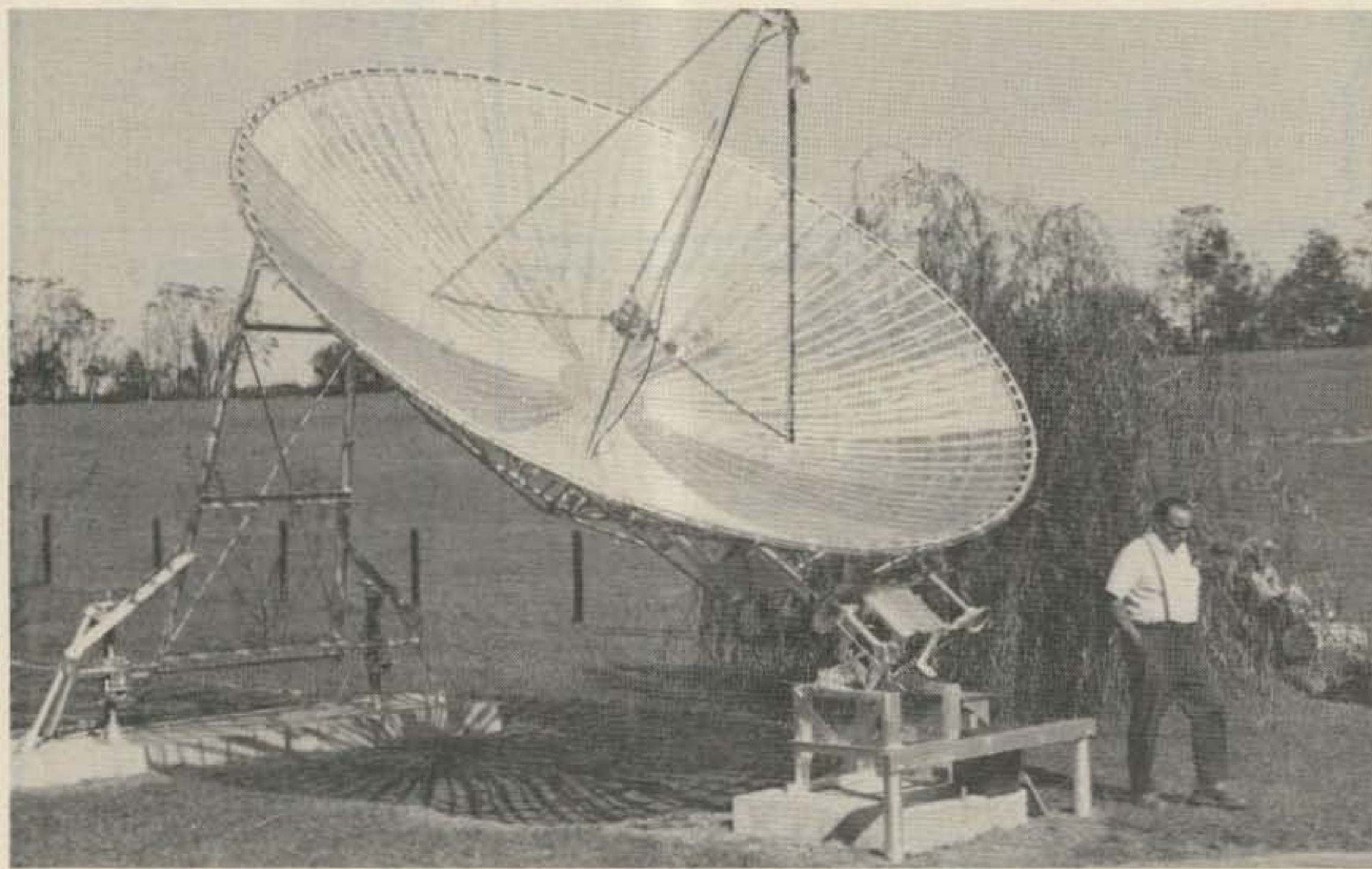
to give this project a try, here are some of the parts you will need: the magnesium bell housing for a helicopter's propeller, one line shaft from a cotton gin, and don't forget the swivel-type hitch from a cultivator. With those items acquired, it is time to continue the search, this time looking for

a worm gear reducer (Tex salvaged his from a brick factory's conveyor); you'll also need a frame for the drive mechanism—try the local hammer mill.

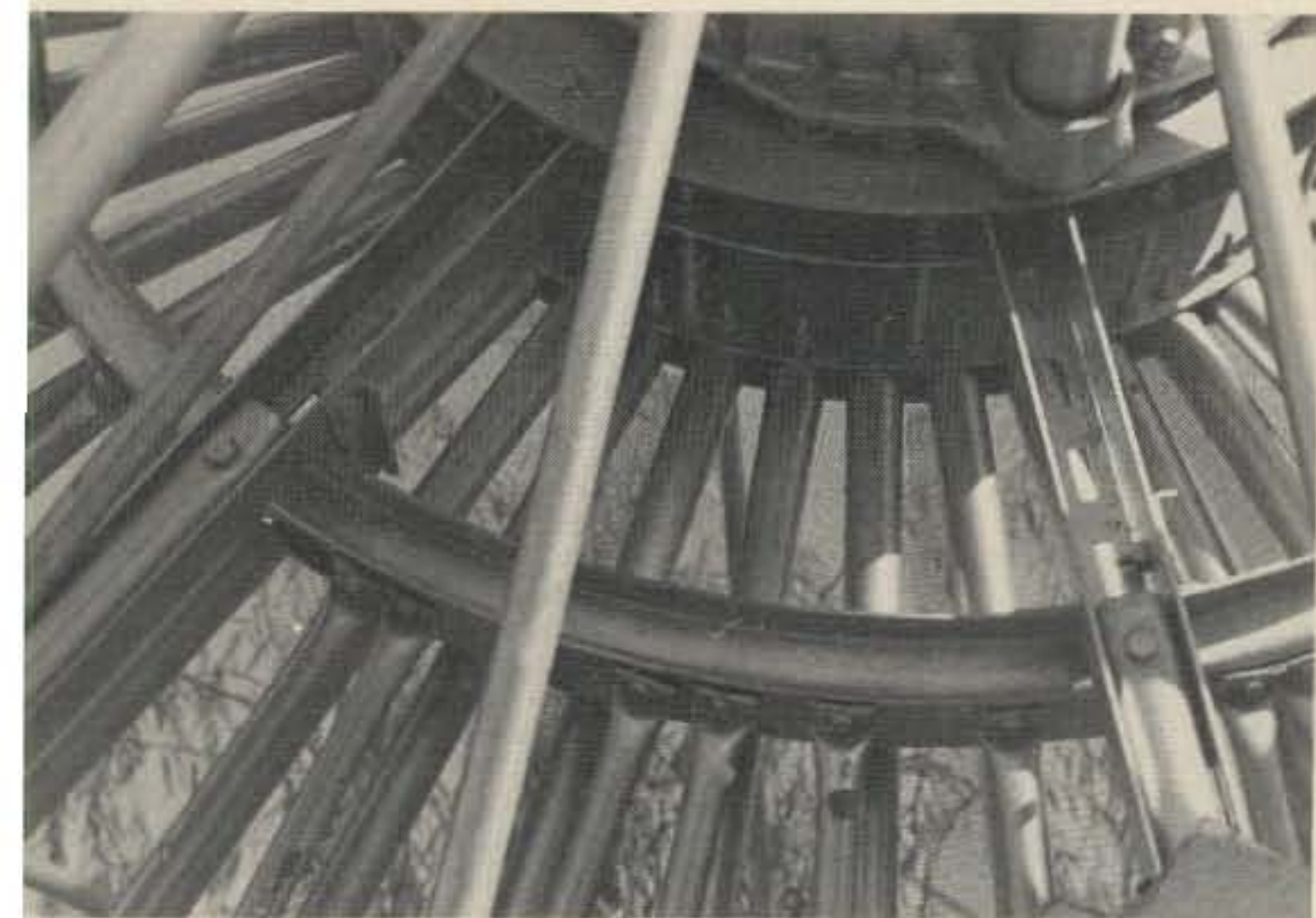
What may sound like a hopelessly incompatible pile of junk has become an engineering masterpiece in the small town of Marshall-

ville, Georgia. Tex, whose ham call is WA4OPY, approached this project like he does most things. Using his experience as a textile plant engineer, he started with an idea but not a plan. After collecting several of the key components, he settled on a design for a 15.27888-foot-diameter parabolic reflector. The 18 hours of research and planning were among the project's easiest work. Construction of the frame, which began in the spring of 1979, took almost 200 hours. Realizing that painstaking accuracy results in a better picture when you are done, Tex and a friend each spent 12 hours making a plywood template of the antenna's curved surface. Two thousand feet of electrical conduit and PVC pipe later, the frame was ready to cover with aluminum screen. The basic dish, when completed, weighed only 425 pounds.

Tex's research pointed out the imperfections of the polar mount, the traditional way a dish scans the hori-



Tex WA4OPY with his home-brew dish.



The antenna's hub is constructed around a helicopter's propeller bell housing. An octagonal frame, eight feet in diameter, extends outward, supporting the antenna's surface.



The feed assembly allows the horn polarization to be changed via a TV rotor and there is provision for very fine adjustments of the horn location. This allows the receive signal to be maximized.

zon. By building a frame that could be moved horizontally as well as in a polar arc, the WA4OPY antenna can be accurately positioned with a minimum of fudging. The major supporting axis is the only part of the system fabricated by an outsider. A 1/2-horsepower motor used to turn the dish is the only component that was purchased new. The rest of the parts were salvaged from local scrap piles. Being the owner of a hardware and variety store didn't hurt, nor did Tex mind using "scrap" from his brother-in-law's grain mill.

Patience seems to be the main rule behind this project. When it came time to fine-tune the antenna's surface, Tex spent 61 hours, much of it with a flashlight and a piece of shiny aluminum. When he was finished, the dish's focal point was no bigger than a nickel. As Tex got around to building a feed assembly, he decided that there was nothing suitable on the commercial market, so he designed his own. It worked so well that he has started to manufacture them for other hobbyists.

By April of 1981, almost two years after he started construction, Tex was ready to give his system a try. The

electronics, like the antenna, were home-built. The first pictures, in Tex's words, were "lousy images of a Snoopy cartoon." Today, "lousy" pictures have been replaced by clear reception and satellite television has become part of the Friedsam family life. The receiver has been built into an attractive piece of living room furniture and the dish, which sits across the driveway, moves somewhat mysteriously by remote control.

Tex carefully documented the construction of his system, keeping track of the materials and time he used. For instance, 1700 3/8-inch sheet-metal screws were needed to apply the aluminum screening, and it took 29 hours to install a shielded underground cable between the house and the dish.

Along the way there were many sources of frustration; for example, the frame broke when it was ninety percent complete. Tuning up the microwave circuitry required a signal generator that none of the local scrap piles could offer. Tex built his own, using a klystron tube.

Perhaps the most impressive fact concerning Tex's accomplishment was that

he had never seen a TVRO installation and he had never been within a mile of a large parabolic antenna. Working from theory and

the scrap piles of Marshallville, Georgia, he has built a functional monument to the home-brew spirit of radio. ■



The dish, which is almost 16 feet in diameter, has a frame built from PVC pipe and electrical conduit. The supporting bar, which spans the dish, is the only piece that Tex did not fabricate himself.



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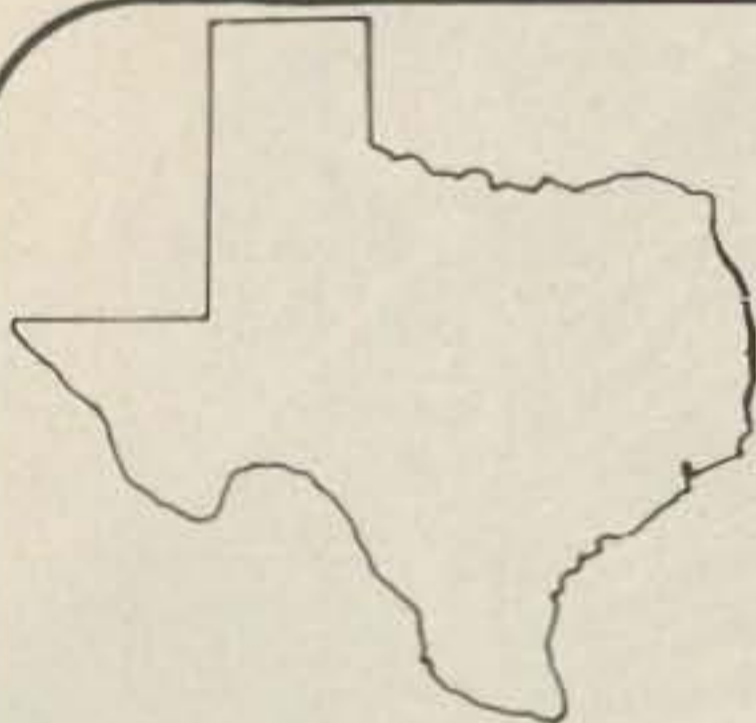
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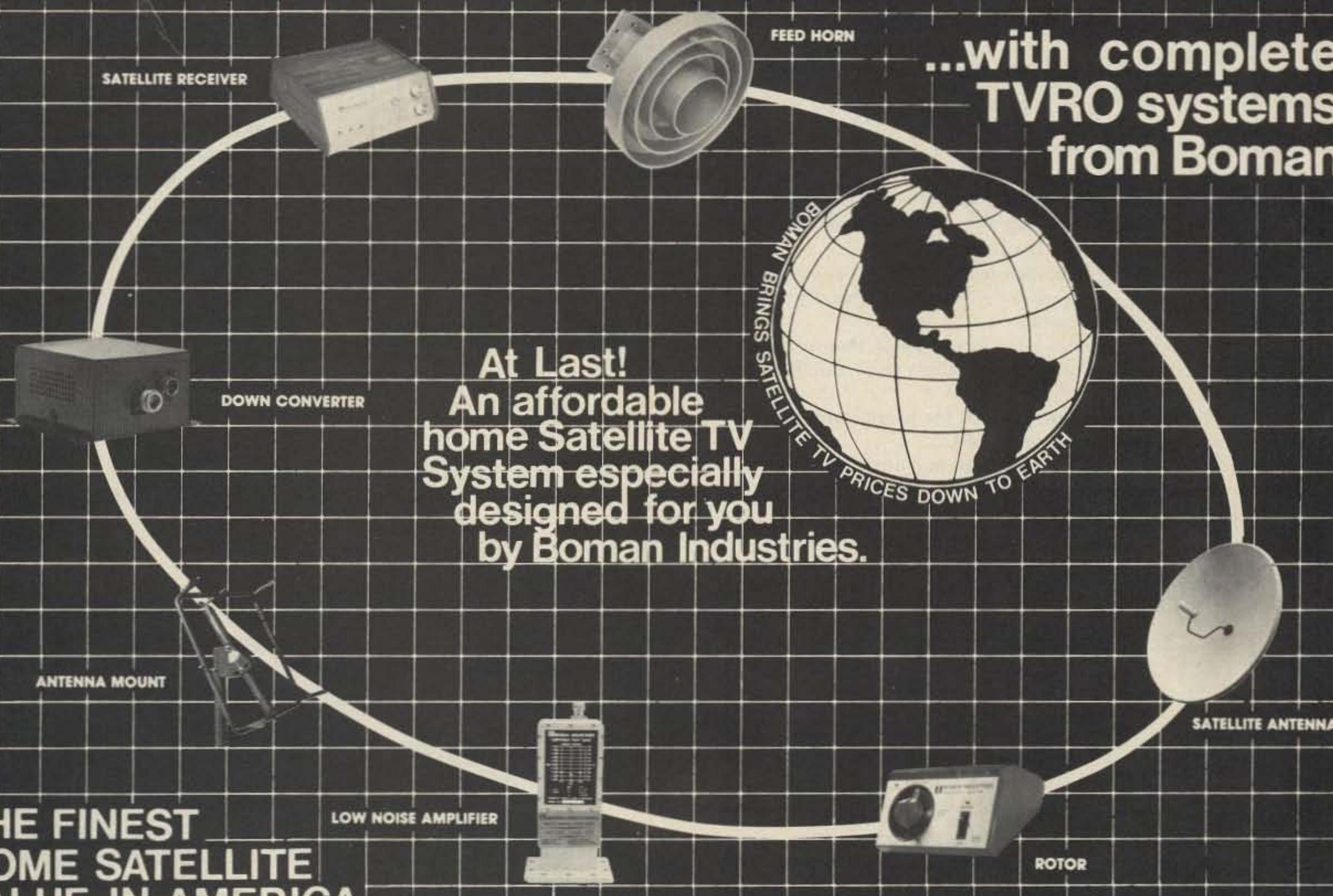
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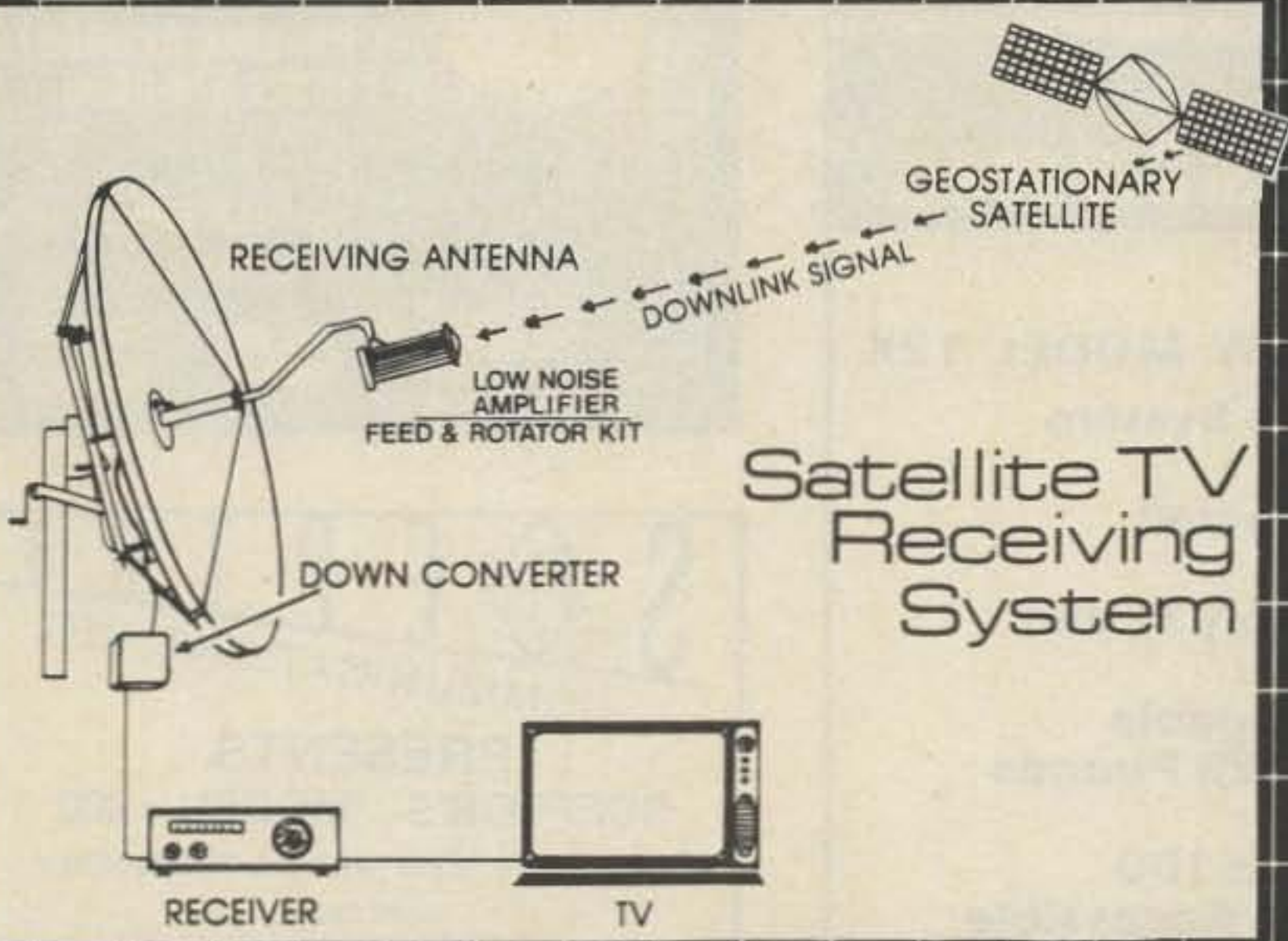
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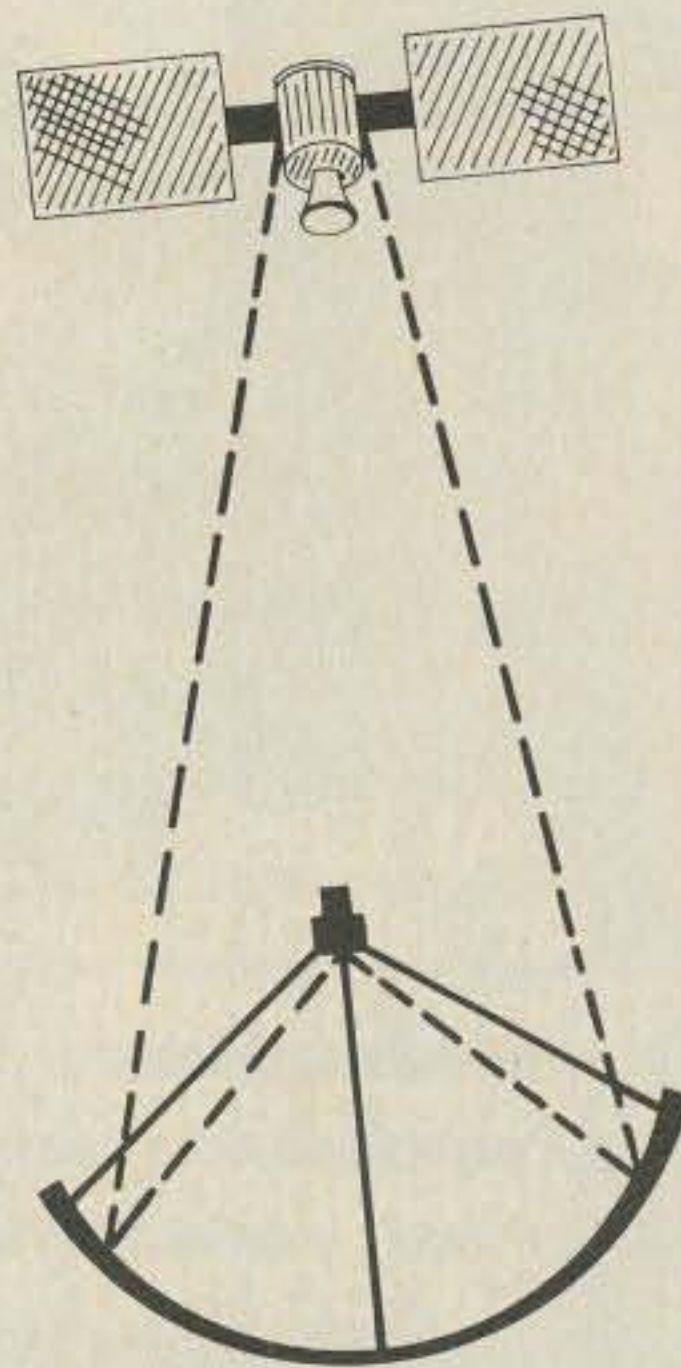
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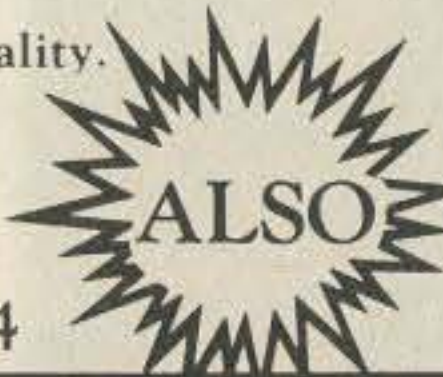
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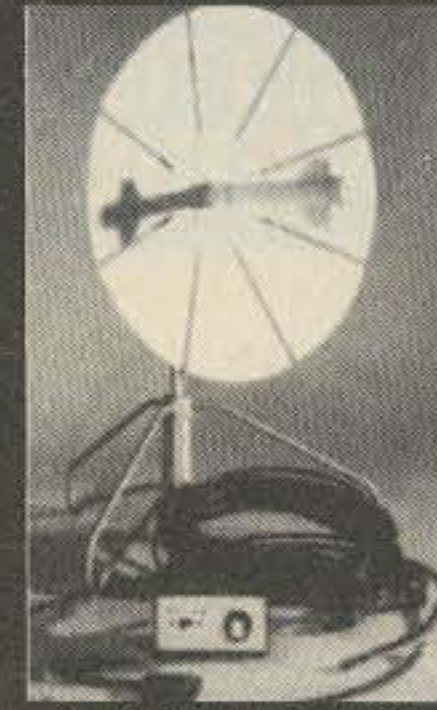
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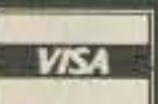
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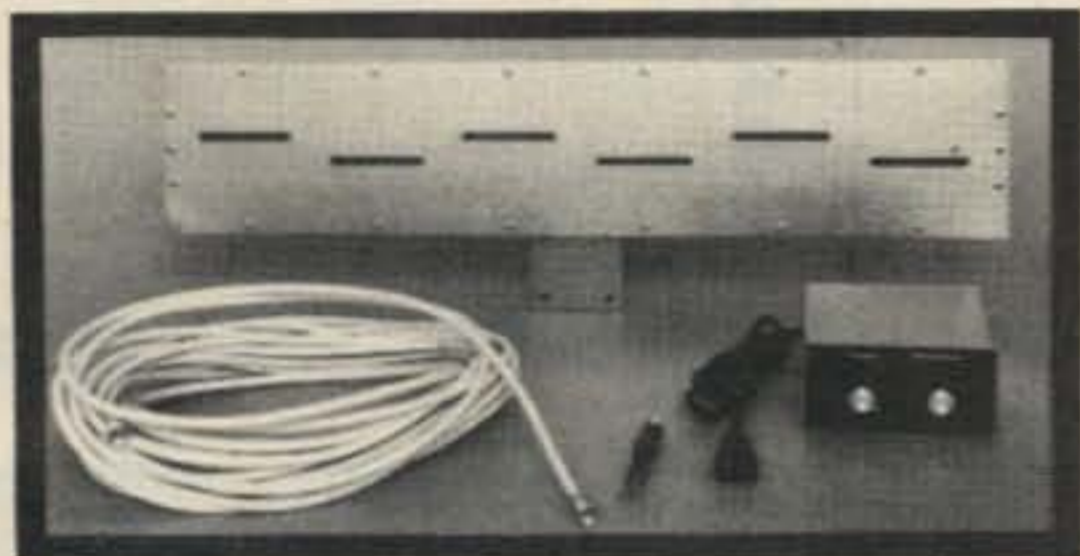
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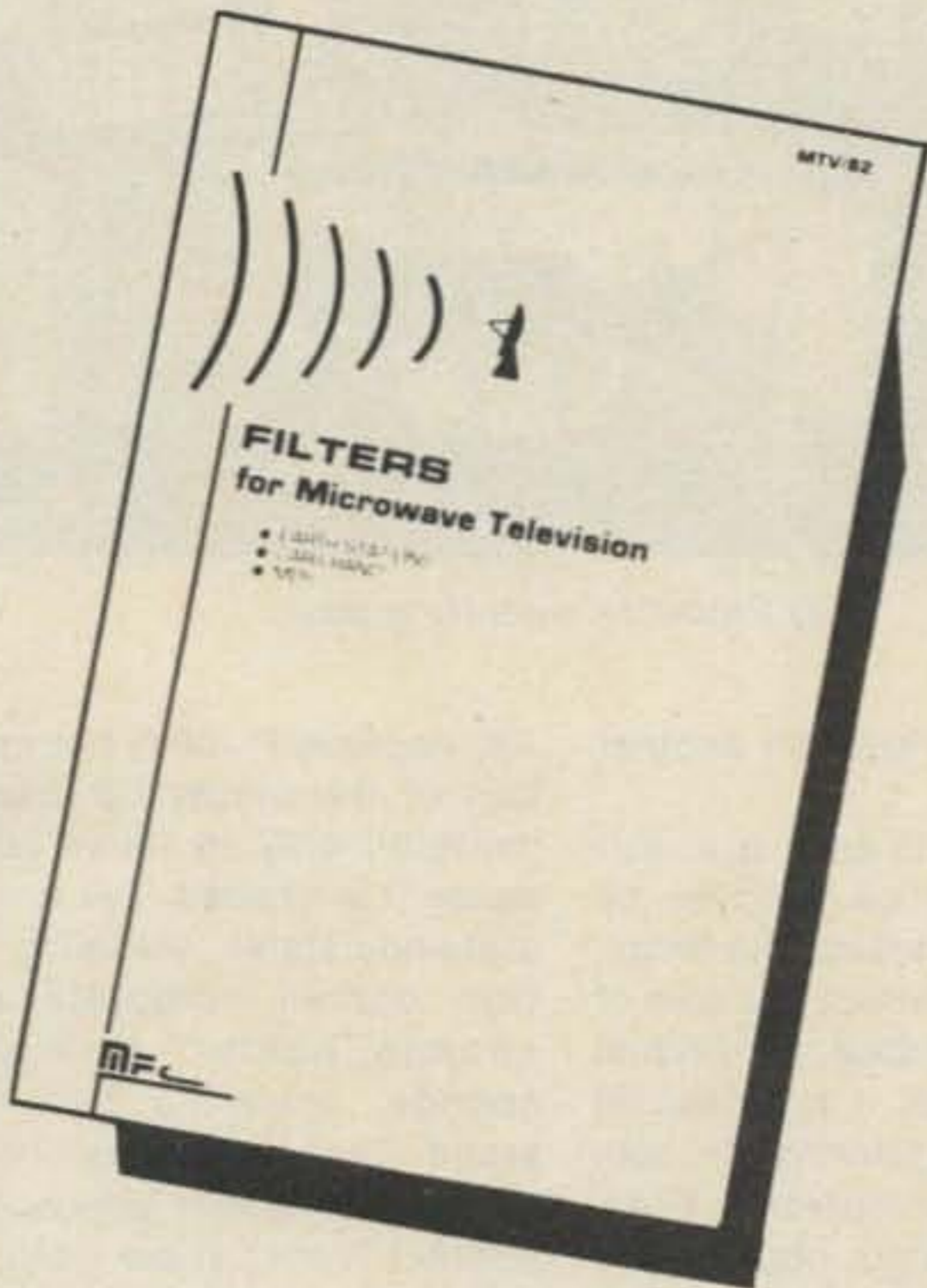
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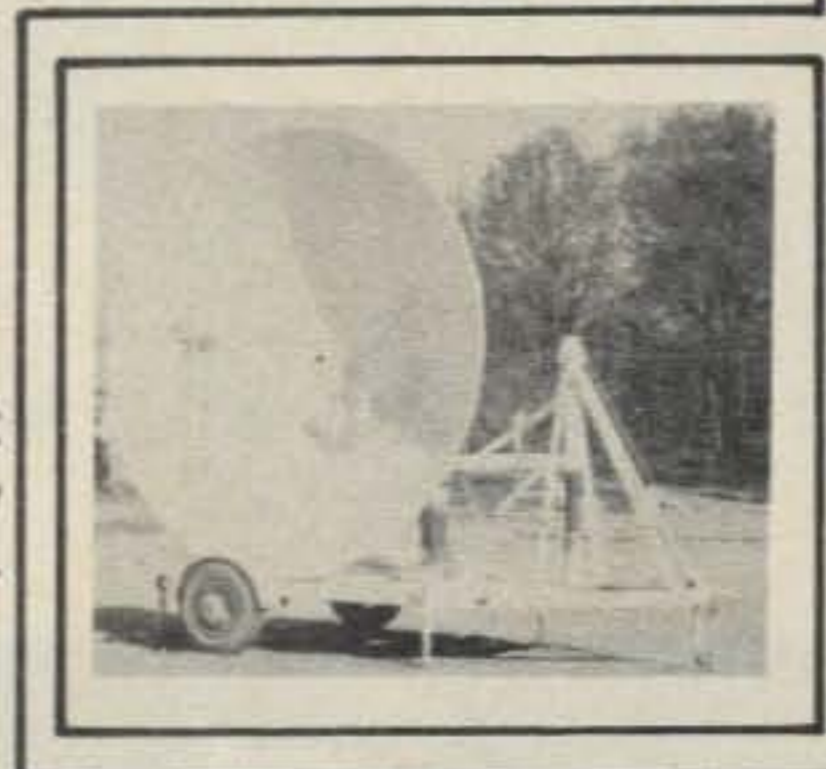
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NEW PRODUCTS

STRAIGHT-KEY KEYER

Designed exclusively for straight-key users, the Fist Fighter is an electronic keyer that accurately times the length of dots, dashes, and the spaces between them. The Fist Fighter uses a standard 1:3:1 timing ratio and requires no new hand motions. An automatic tune-up feature is built in so that normal key-down tune-up is possible, without the need for any extra switches. Speed is variable from about 3 to 30 wpm. The Fist Fighter will key grid-block and solid-state transmitters/transceivers. It is available in two forms: kits cost \$59.95 and an assembled version sells for \$79.95. Additional information and specifications are available from *The Blacksburg Group*,

Box 242, Blacksburg VA 24060. Reader Service number 482.

PHONE INTERCONNECT

The CES Model 560 interconnect is designed to interconnect a base station or control station to a telephone line. The 560 is a sampling type of interconnect, using no VOX circuits for control. The Model 560 is one way that repeaters located away from phone lines can have auto-patch capability. When the interconnect is in use, the control station will transmit for one second and then sample the receiver for ten to twenty-five milliseconds to determine if a station is transmitting. If a signal is found, the control station will stay on receive until it stops; if no signal is present, the control

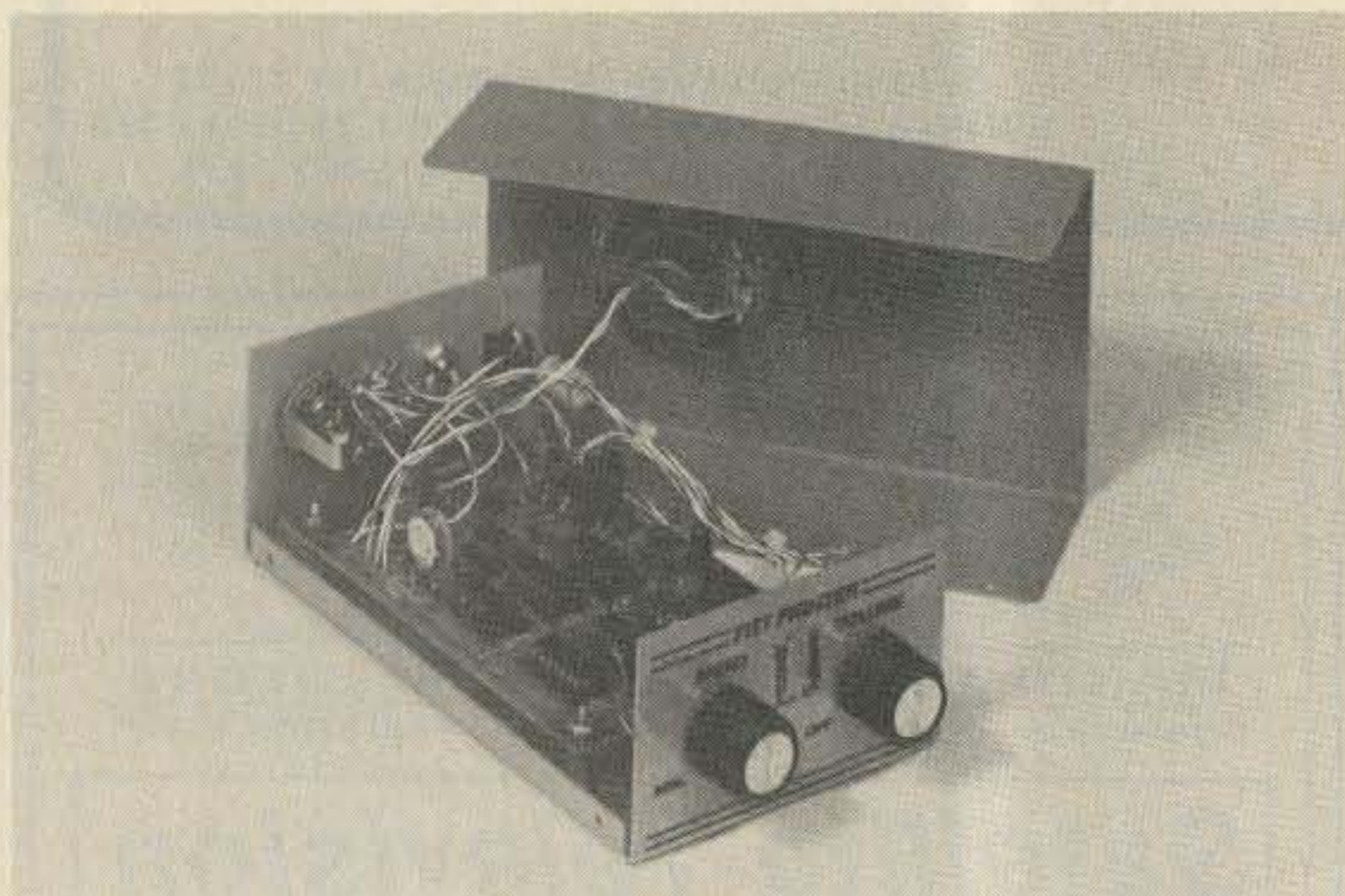


CQ Products' operating desk.

station will transmit for another second.

Toll-restrict and dial-out capability can be enabled by front-panel switches. The Model 560 does not affect the use of the control station for normal communication. It is priced at \$990. For more information, contact *Communications Electronics Specialties, Inc.*, PO Box 507, Winter Park FL 32790. Reader Service number 478.

700 degrees F. With the selection of the proper tip, heat is delivered only to those points where it is needed. The temperature-adjustable soldering station comes complete with sponge holder, tip-wiping sponge, soldering iron, and stand. The suggested price is \$47.75. For further information, contact *Wahl Clipper Corp.*, PO Box 578, Sterling IL 61081. Reader Service number 479.



The Fist Fighter.

SHACK FURNITURE

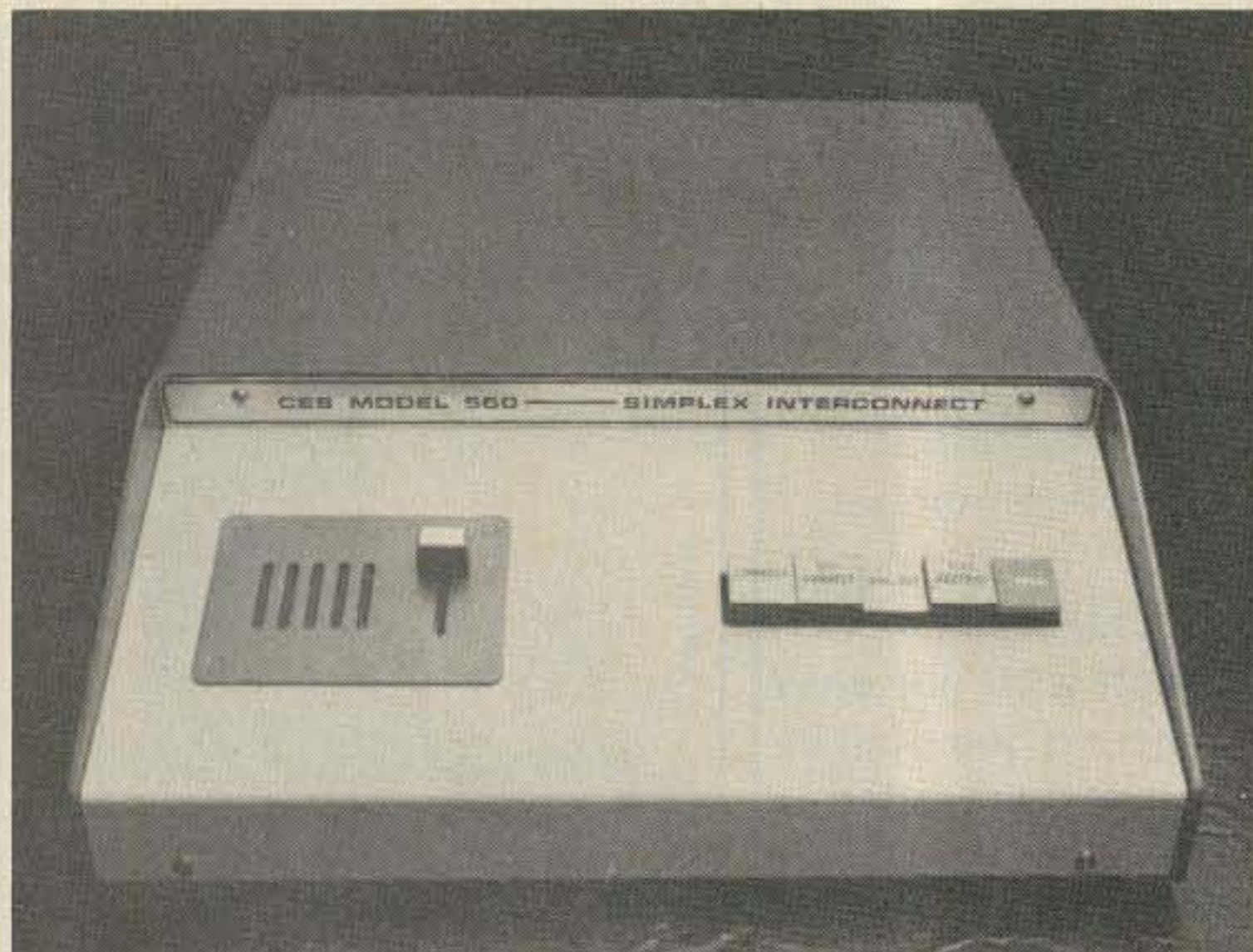
CQ Products announces the introduction of an operator's desk designed like an organ console to place all the operator's equipment within easy view and reach. The desk surface and shelves are constructed of 200-pound industrial-grade chipboard and are covered with formica. The two shelves are adjustable in height to accommodate virtually any ham or computer gear.

The desk is designed to fit into the corner of your ham shack and is also attractive enough to be placed in your living room or den. The desk occupies 60 inches from the room corner to each edge. It is priced at \$495. For more information, contact *CQ Products*, 8280 Janes Avenue, Suite 137-1700, Woodridge IL 60517. Reader Service number 476.

VHF KITS

The R76 VHF FM receiver kit is an improved version of the R75 receiver for 10m, 6m, 2m, 220 MHz, or the adjacent commercial bands. It features a very low-noise front end, pump-resistant squelch with hysteresis to lock onto fading signals, on-board volume and squelch controls for easy wiring, and fixed i-f filters for easy alignment. It is available in two selectivity options, starting at \$84.95.

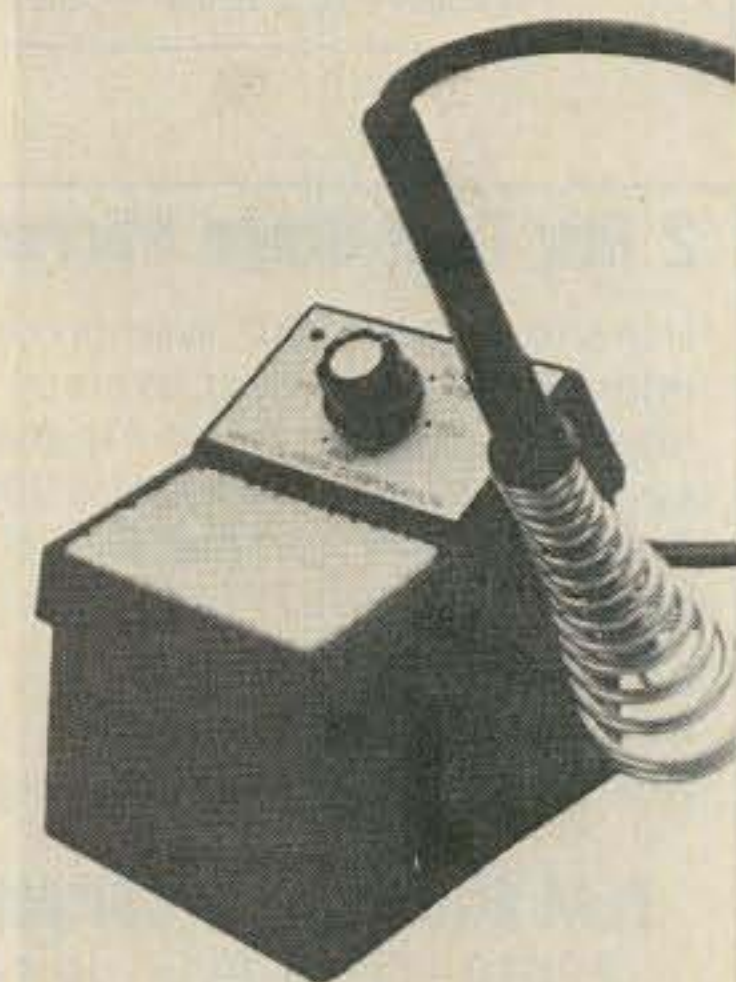
A new UHF receiver kit has also been introduced. The



CES's Model 560 phone interconnect.

MICRO SOLDERING STATION

The Wahl Clipper Iso-Tip 7470 micro soldering station eliminates continuous switching to maintain temperature and, therefore, the spikes that can damage delicate electrical components. The totally grounded unit can be adjusted for any temperature between 500 and



Wahl's Iso-Tip 7470 micro soldering station.

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| RG-11U | 19¢/ft |
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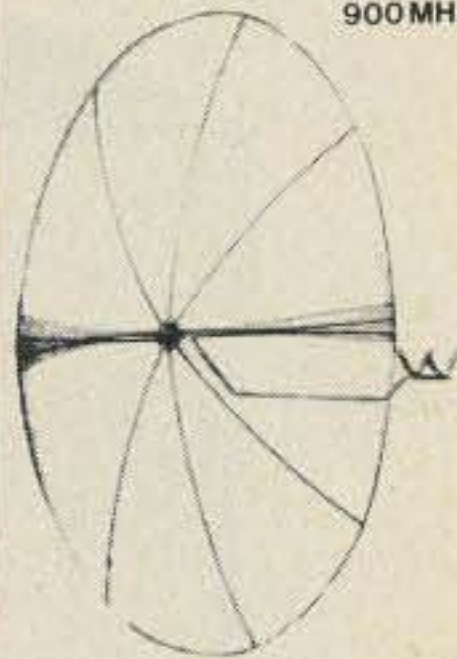
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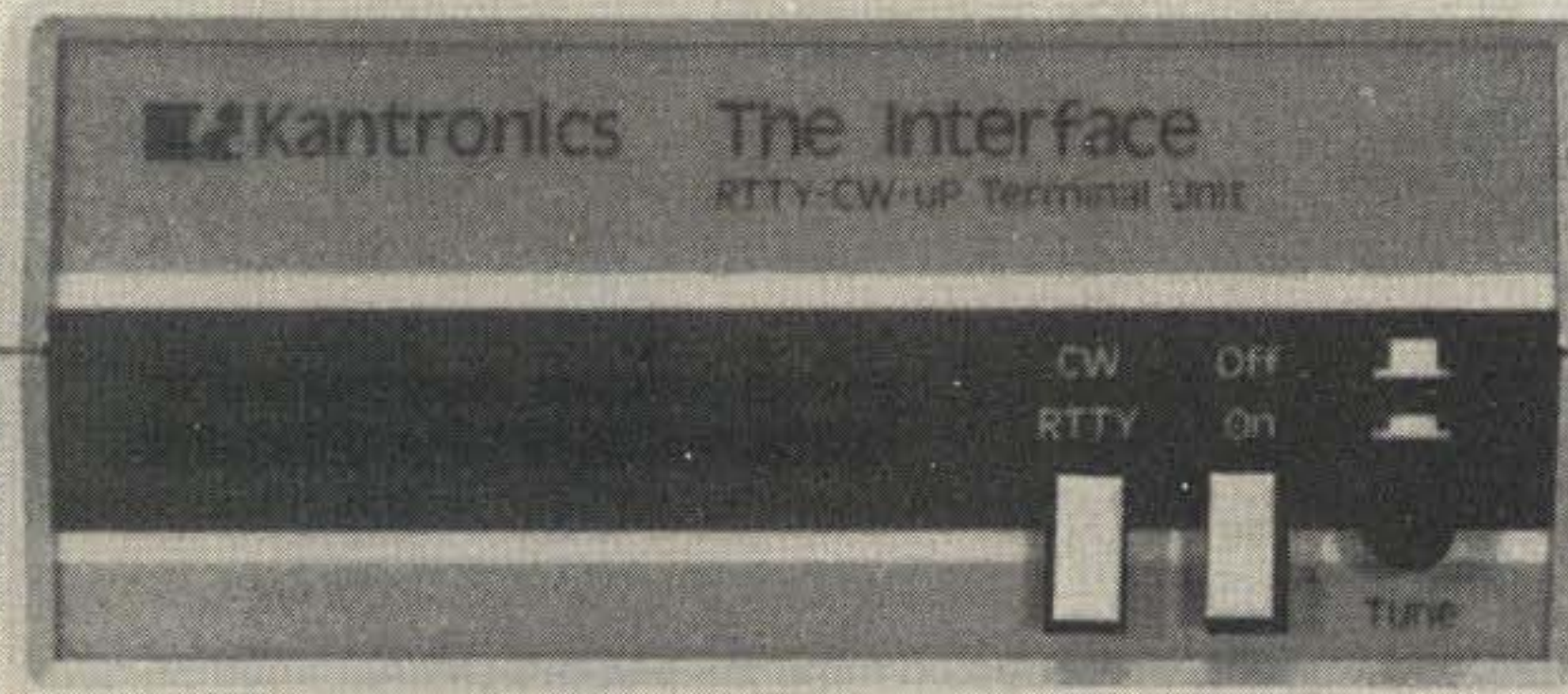
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| MRF 644/5D1088 | \$19.95 | UG 273/U | \$2.25 ea. |
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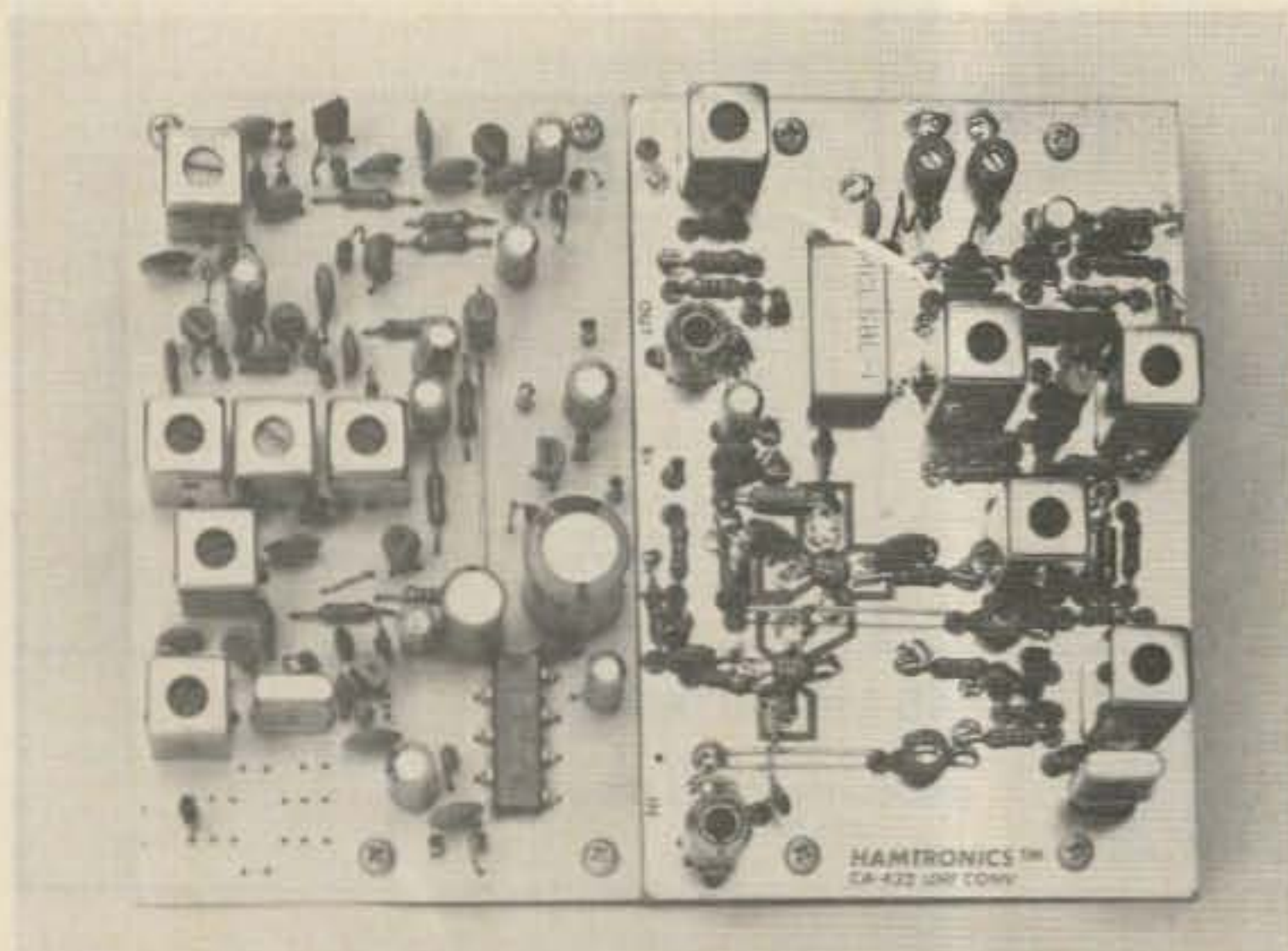
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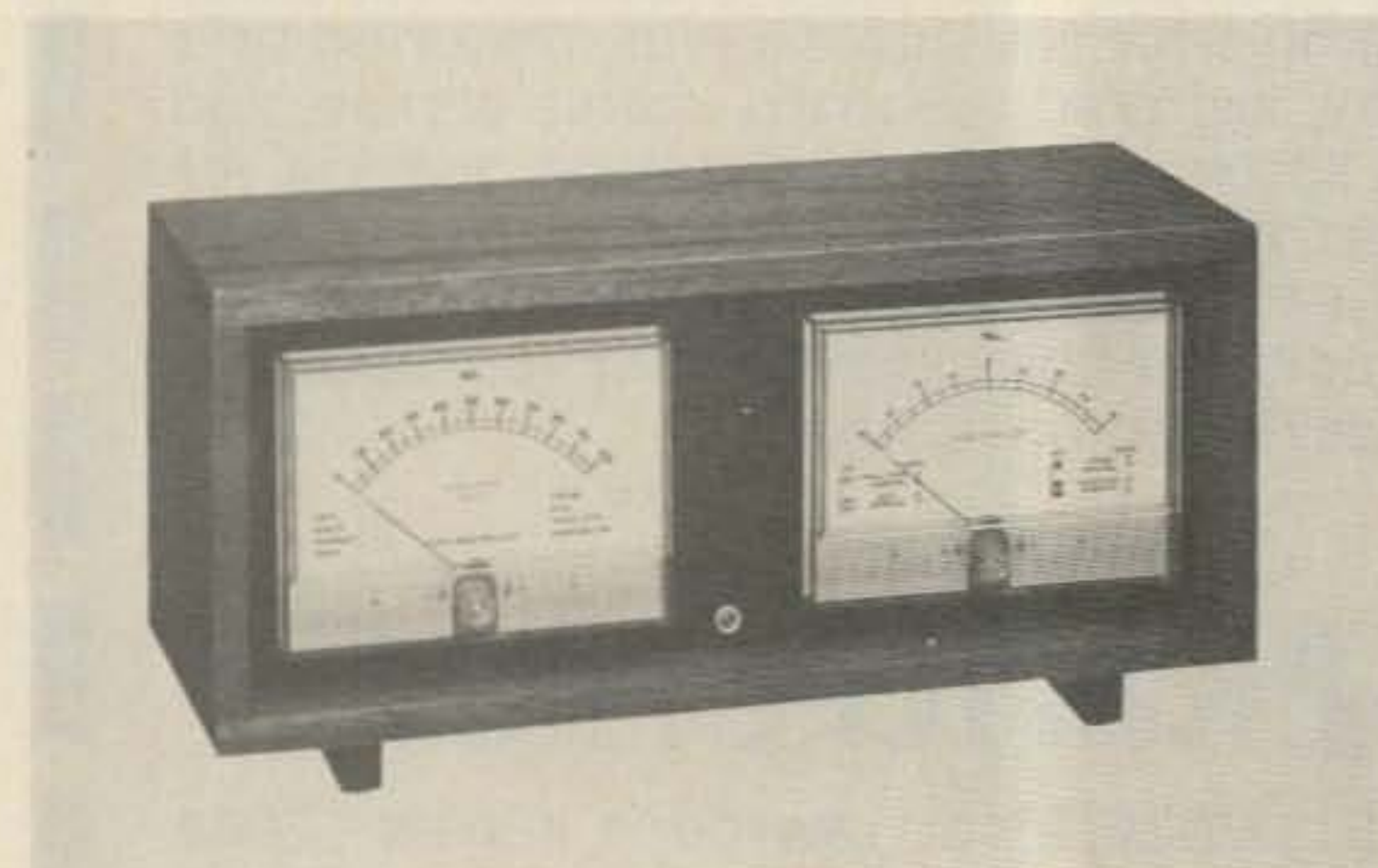
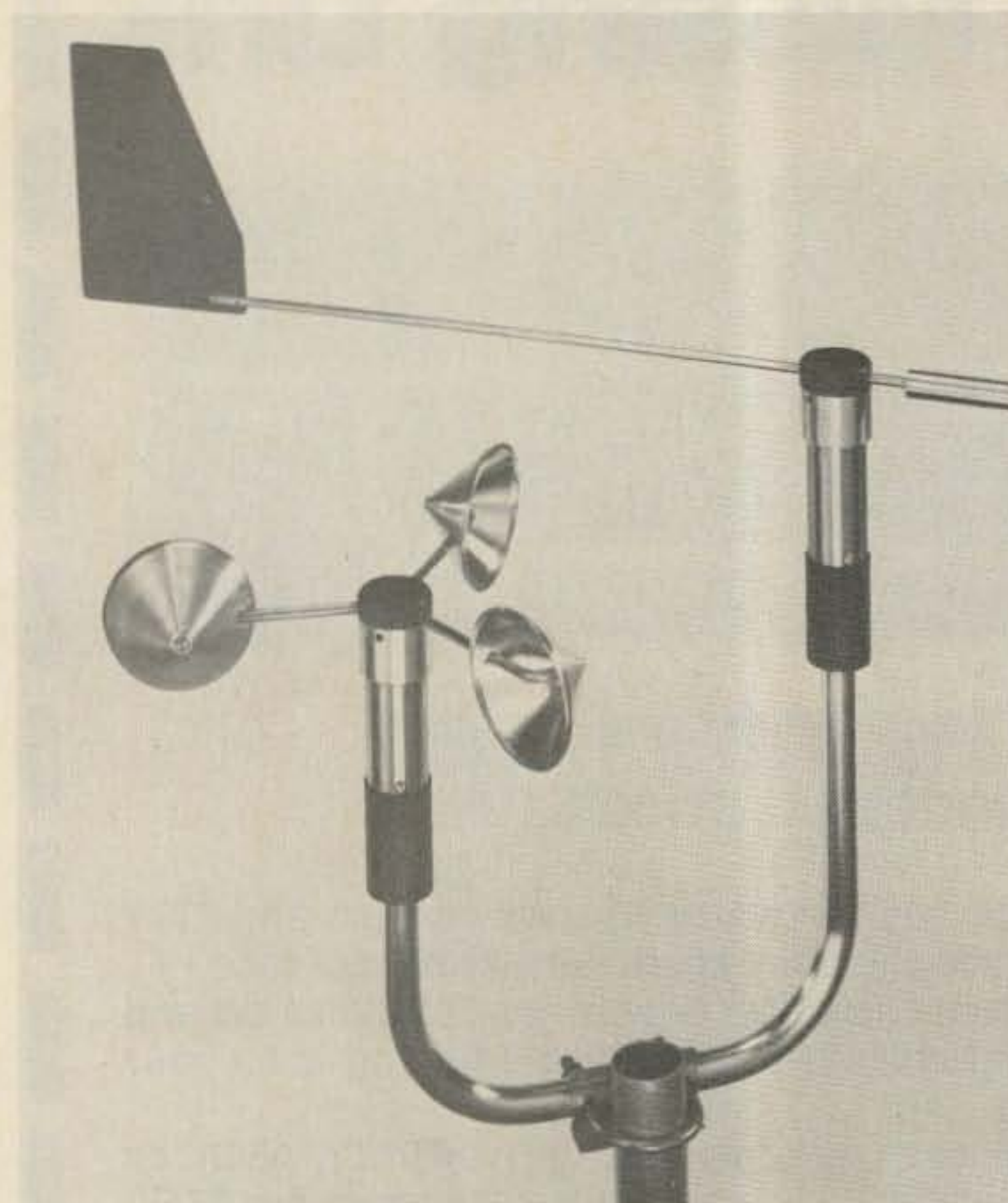


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TMAC Products' S.D.-500 weather station.



Palomar Engineers' PT-407 antenna tuner.

model R451 includes the features listed above plus automatic frequency control to lock onto drifting transmit signals. Kits are available with various options starting at \$94.95.

Hamtronics has a new line of low-noise amplifiers. In appearance, they resemble Hamtronics' earlier P30 and P432 receiver preamplifiers, but the circuit is new. They are optimized for lowest noise figure in the ham bands but can also be used on adjacent commercial bands. Noise figures typically run 0.5 dB at 28 and 50 MHz, 0.6 dB at 144 MHz, 0.7 dB at 220 MHz, and 0.95 dB at 432 MHz. Gain runs from 33 dB at 28 and 50 MHz to 17 dB at 432 MHz. The price is \$39.95 for the VHF units and \$44.95 for the UHF unit, all wired and tested.

The Hamtronics R110-450 UHF AM aircraft receiver may be used to listen to the Space Shuttle. Good results have been reported using simple UHF antennas. The special Shuttle receiver kit is available off the shelf for \$94.95.

For further information on these products, write to Hamtronics, Inc., 65-V Moul Road, Hilton NY 14468; (716)-392-9430. Reader Service number 480.

WEATHER STATION

TMAC Products is introducing the S.D.-500 weather station. This system provides wind velocity indications from 0-100 mph and wind direction readings covering 16 compass points. The console is constructed of hand-finished mahogany and the transmitter can be up to 300 feet away from the console and a 50-foot cable is supplied. The unit is powered by 155 volts ac. The list price is

\$360. For more information, contact TMAC Products, PO Box 28341, Columbus OH 43228. Reader Service number 483.

ANTENNA TUNER

The Palomar Engineers PT-407 is a general-purpose tuner for 1.8-30 MHz to match antennas fed with coaxial or open-wire lines, single-wire or mobile antennas. The 300-Watt power rating makes it just right for most transceivers. The PT-407 is an efficient tuner with a large airwound coil, a large balun for open-wire feed, and ceramic insulation throughout. It is housed in an 8" x 4" x 7" aluminum cabinet. All controls are on the front panel, coaxial connectors are S0-239, and porcelain insulators are used for balanced lines and single-wire inputs. The PT-407 antenna tuner sells for \$149.95. For more information, write to Palomar Engineers, 1924-F W. Mission Road, Escondido CA 92025.

SATELLITE STATION

The Ten-Tec Model 2510 contains a 435-MHz USB/CW transmitter and a high dynamic range 2-meter-to-10-meter receive converter. The Model 2510 and a 10-meter SSB/CW receiver provide full duplex, transmit, and receive functions for operating on the upcoming OSCAR Phase 3 satellite in Mode B.

The transmitter operates from 435 to 435.5 MHz (coverage can be extended to 437 MHz with an optional oscillator). Ten Watts out is available in USB and CW. The receive portion converts 144-146 MHz to 28-30 MHz. A 12-volt power supply is required. Amateur net price for



AEA's MBA-RC reader/converter.



Yaesu's FT-290R transceiver.

the Model 2510 is \$489. For more information, contact *Ten-Tec, Sevierville TN 37862*.

READER/CONVERTER

The Advanced Electronics Applications MBA-RC (Morse, Baudot, ASCII Reader/Code Converter) is actually several sophisticated devices all wrapped up in one package. The unit performs as a full-function decoder and display unit for Morse-, Baudot-, and ASCII-

coded signals, operating directly from the audio output of any stable communications receiver. The MBA-RC also encompasses a Morse, Baudot, and ASCII encoder and code converter. The unit will perform serial-to-parallel and parallel-to-serial code conversions as well as cross-mode conversions. All the necessary analog processing and tone generation for two-way contacts in any MBA codes is included.

Other features include a built-

in sidetone monitor, an FSK tone generator, and an automatic station ID message. The MBA-RC has a list price of \$469.95. For more information, contact *Advanced Electronic Applications, PO Box 2160, Lynwood WA 98036*. Reader Service number 477.

PORTABLE TRANSCEIVERS

The FT-290R and FT-690R are multi-mode battery portable transceivers for 2 meters and 6

meters, respectively. Designed for 2.5 Watts output on SSB, CW, and FM (the FT-690R also has AM), these transceivers use liquid crystal displays and include scanning in variable steps. The FT-290R and FT-690R are powered by alkaline or nicad C-cells (not supplied). The FT-290R is priced at \$399 and the FT-690R is offered for \$379. For more information, contact *Yaesu Electronics Corp., PO Box 49, Paramount CA 90723*. Reader Service number 481.

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ANNOUNCING

RF PRODUCTS announces production of 5/8 wavelength VHF telescoping antennas for 144-148 MHz (2M), 152-174 MHz and 220-225 MHz (1 1/4). These new antennas are intended for use on hand-held and base station transceivers. They are available with BNC connector, 5/16-32 stud, or PL-259 connector. A telescoping brass nickel-plated nine section radiator is used for lighter weight and less RF junctions than previously available 5/8 wavelength antennas. Maximum gain is achieved by the combination of a base spring for whip protection and a tuned matching network for minimum VSWR. Minimum 2-meter bandwidth for 1.5:1 VSWR is 3.5 MHz. Overall length with BNC connector is 44 1/4 inches (110.25 CM). The BNC connector and 5/16-32 stud models are intended for hand-held transceiver (HTs) use and the PL-259 model which includes a type M359 right angle adaptor is intended for direct rear mounting on base station transceivers. Suggested list price for all models is \$19.95 the most popular of which are listed below.

| P/N | DESCRIPTION | P/N | DESCRIPTION |
|---------|-----------------------|---------|---------------------------|
| 191-200 | 2 M, 5/16-32 stud | 191-800 | 1 1/4 M, 5/16-32 stud |
| 191-214 | 2 M, BNC connector | 191-814 | 1 1/4 M, BNC connector |
| 191-219 | 2 M, PL-259 connector | 191-819 | 1 1/4 M, PL-259 connector |

| ELECTRICAL SPECIFICATIONS | | MECHANICAL SPECIFICATIONS | |
|--------------------------------|------------|---------------------------|-------------------|
| Gain(ref. 1/4 wave helical) | 6db min | Length extended(2M) | 44 5/16" / 1125MM |
| Bandwidth(12M), 1.5:1 VSWR | 3.5MHz min | Length extended(1 1/4 M) | 43 7/8" / 1115MM |
| Bandwidth(1 1/4 M), 1.5:1 VSWR | 5MHz min | Length collapsed(2M) | 8 15/16" / 228MM |
| Maximum power(HT models) | 10 watts | Length collapsed(1 1/4 M) | 8 1/2" / 210MM |
| Maximum power(PL-259 model) | 30 watts | Weight | 2.2oz/80g |

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TEXTEDIT—A Complete Word Processing System in kit form

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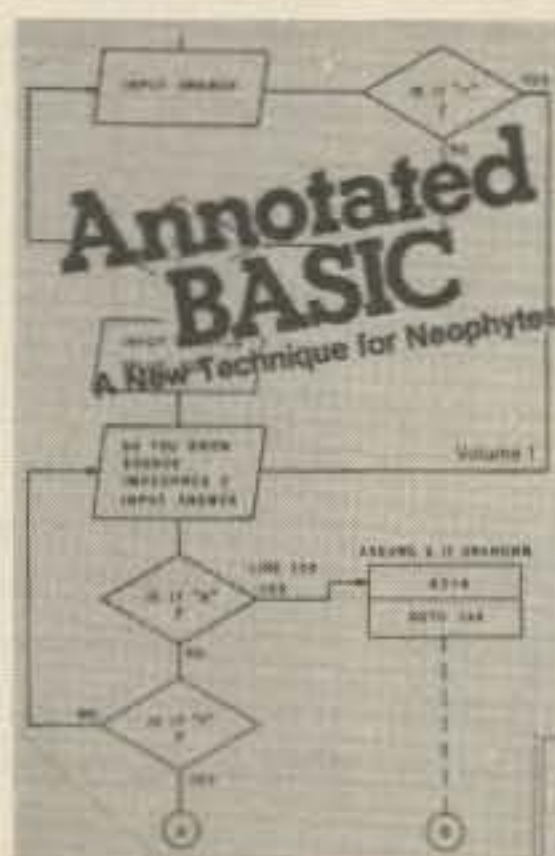
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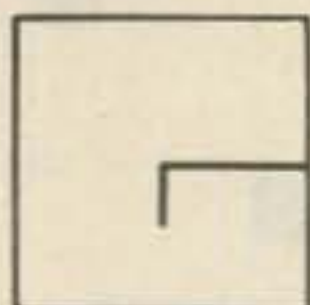
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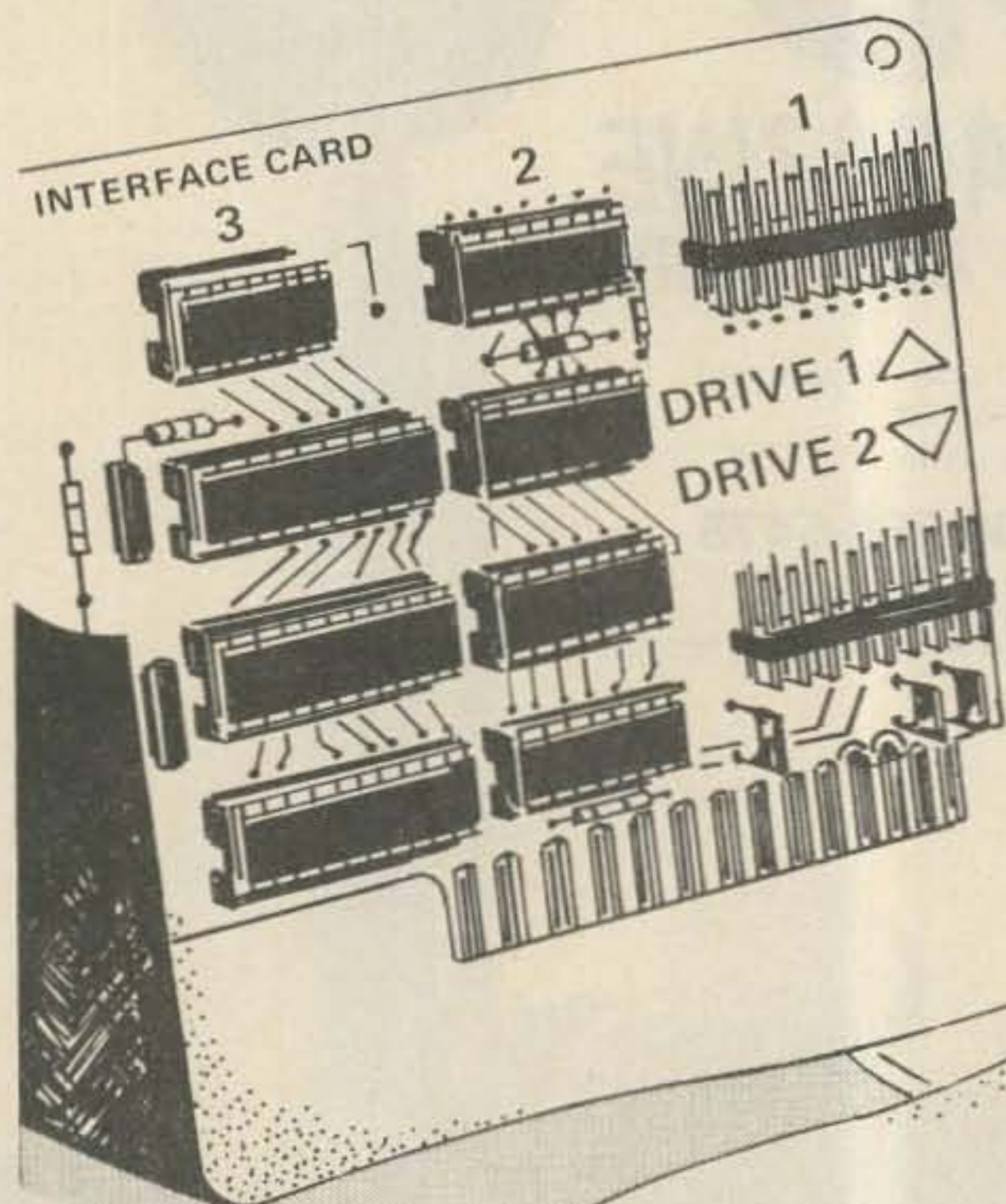
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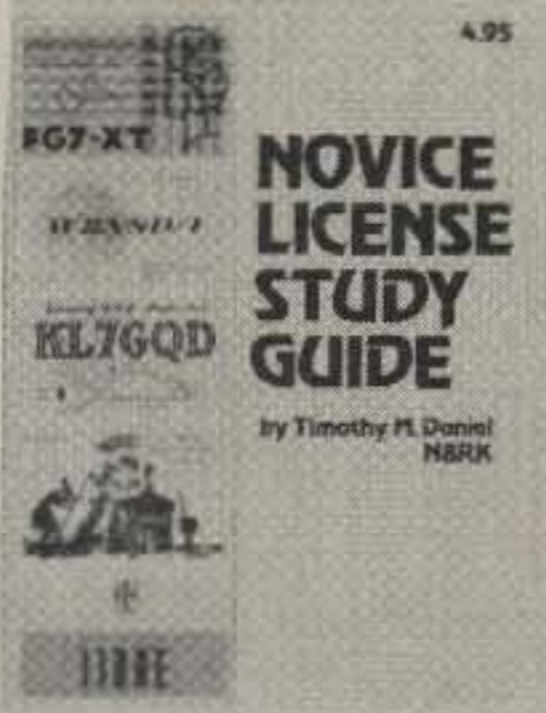
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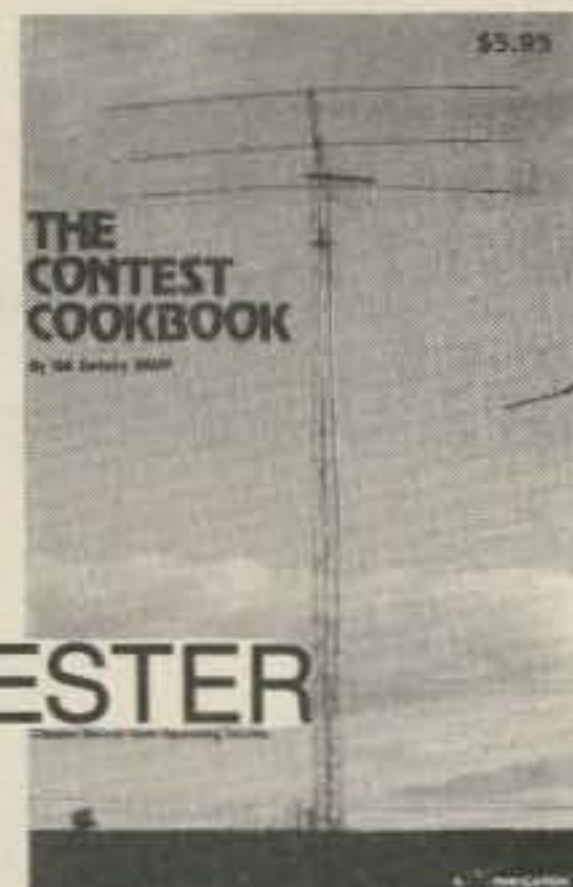
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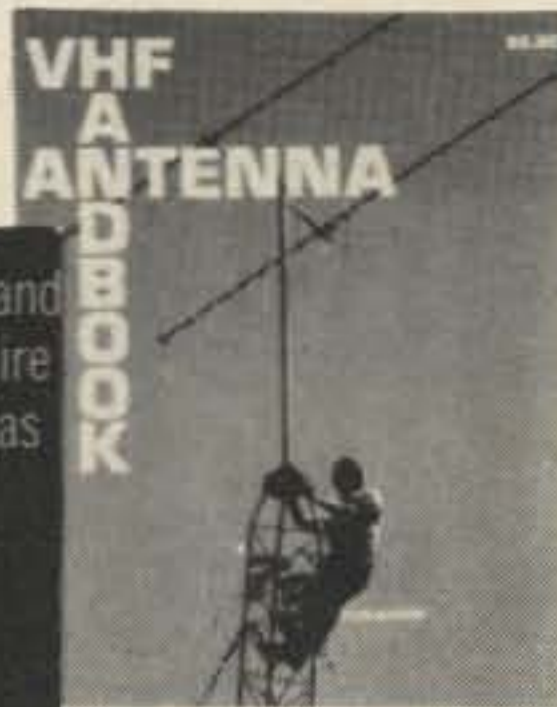
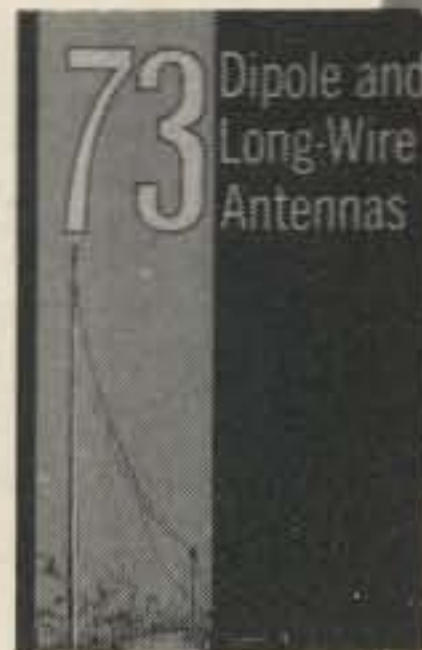
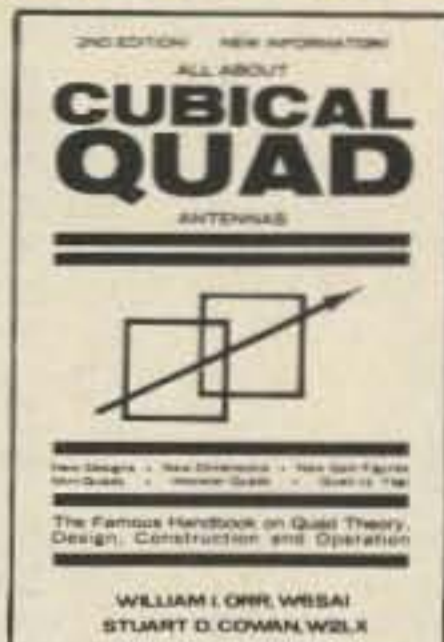
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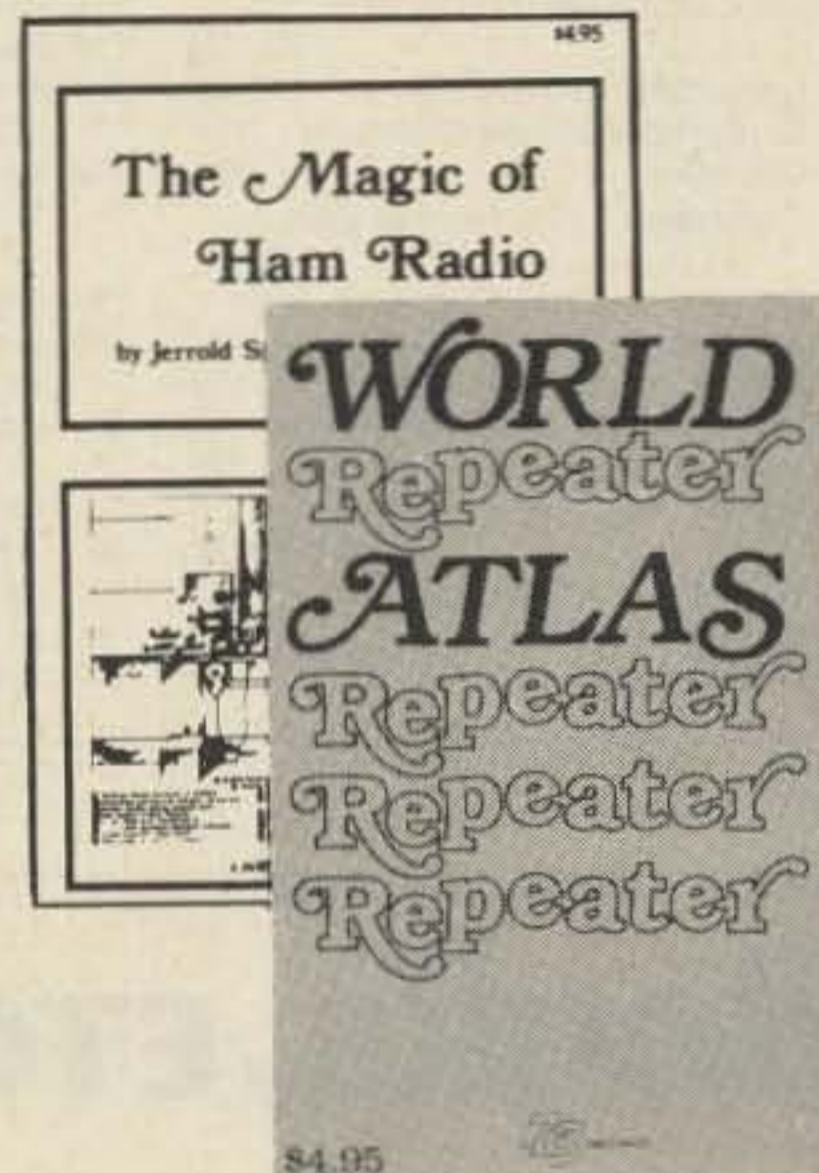
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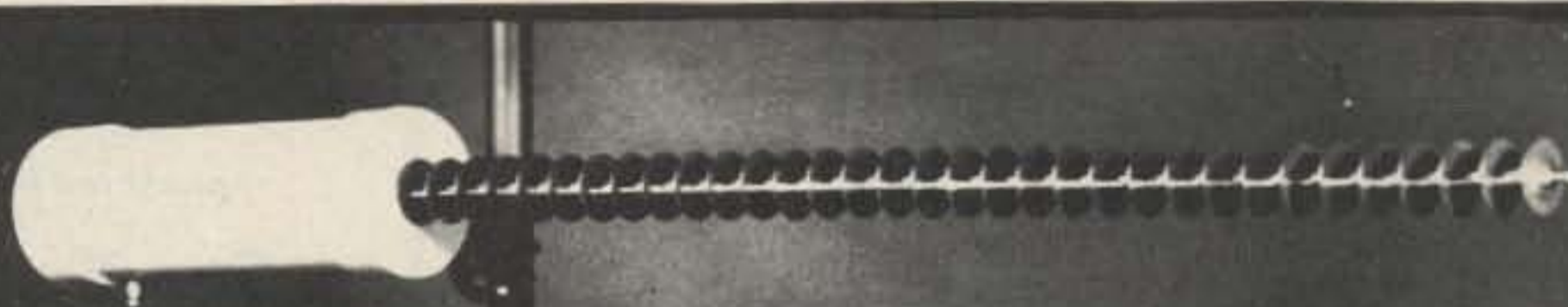
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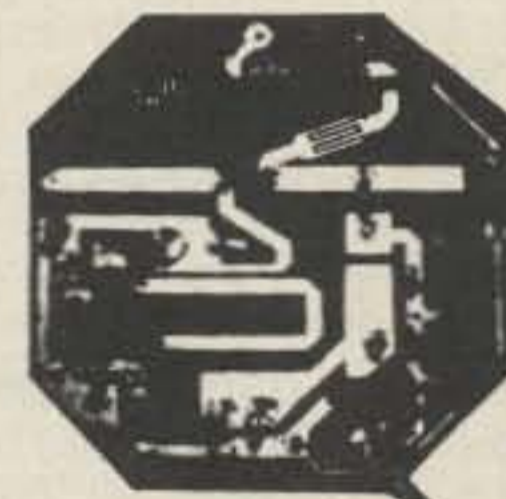
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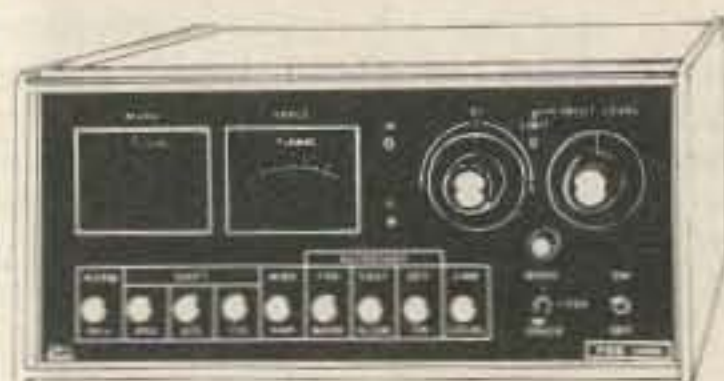
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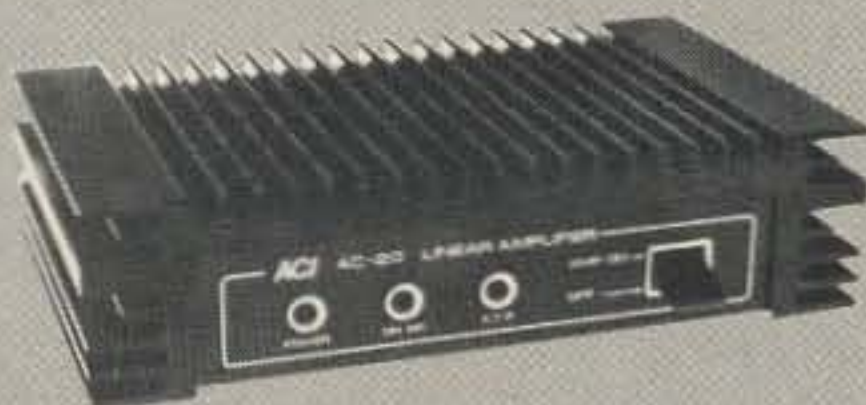
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W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

found Haiti. The Bahamas are treacherous, so we were very lucky not to run onto any of the thousands of shoals and reefs.

Exhausted by the storm, we found a protected bay and anchored to rest. A couple of hours later, we awoke to find ourselves at gunpoint—faced by a bunch of excited Haitians who had sneaked aboard our ship. They spoke no English and no one in our group spoke any French... except me. I quickly started trying to remember what I could of my high school French, twenty years unused and mostly forgotten. The menacing guns prompted my memory.

It turned out that these were police from nearby Mole St. Nicholas. They were convinced that they had captured a bunch of invaders bent on taking over Haiti and were looking forward to a good deal of publicity and perhaps rewards from the government. The idea died hard, but I finally convinced them that we were a scientific team. How could I ever explain to these simple people that we were hams bent on visiting a deserted island to set up a radio station for fun?

We visited the town. Have you ever visited a place where the average income is about \$50 per year? Some of our welfare customers should have a chance to see what real poverty can be!

From there we sailed across to Navassa and looked it over. Hmm. Formidable. Just one place to get up the cliffs which completely surround the island... and that via a wire rope ladder, with the waves shoving your boat into the undercut cliffs where it would be instantly shredded. We went back to Haiti to rent some Haitians and a small boat so we could get the ham gear onto the island.

At Cape Dame Marie, I once again managed to remember enough French to get the help we needed... and make the bargain. The head of the village

made the bargain and gave us two Haitians and a boat. We found out later that he had no intention of giving the two chaps one cent of the pay. We towed the boat with the Haitians behind our ship back to Navassa. On the way one of them managed to fall overboard. Luck was with us and one of our group was looking that way when it happened so we were able to stop and circle around to pick him up. Damned fool couldn't swim and he was thrashing around, which attracts sharks. He wouldn't have lasted ten minutes.

With the help of the Haitians we got all of our ham gear from the boat to the top of the cliff. I'm afraid that we had to do most of the work. It was hot and dry. The damned island is covered with cactus and a wide variety of bushes with burrs. They seem to jump out at you if you even get close to them.

We set up two stations, one right at the top of the cliff and the other a couple hundred feet away. We had an enormous gas-driven power generator, two complete towers with beams, and rotors. We spared no expense to be well equipped. Our main receiver was a Drake 1A, a sideband (and CW) only receiver. That was a new way to go back in the early days of sideband.

The ship headed back to Haiti after leaving us off, scheduled to return for us in a few days... we hoped. Soon after the ship left, we found that we had a little problem. Oh, the rigs worked fine, but the heat was merciless and we found that our water supply was zilch. It turned out that the 50 gallons of water we'd brought had been in a rusty drum and had all leaked out on the trip down. Chet had noticed this and solved the problem by not bothering to bring the drum with us to the island. So we were faced with several days without water on this tropical desert island.

A couple of us explored the island, hoping to find some water. At the very top of the island was a tower with a beacon light. It was powered by acetylene which was piped up from bottles kept in a small shed near the tiny bay where we had our ham rigs. We found the remains of a house where, in earlier days, a lighthouse keeper had lived. Digging down through the remains of the house we found a cistern under the rubble. It had quite a bit of slimy water still left in it... but water it was!

We brought the water down in cans and bottles and boiled it. After a day we got tired of the boiling procedure and decided to see if this was really necessary. Chet, who in many ways had managed to isolate himself from the rest of us, was chosen (without his knowledge) to be the guinea pig. We gave him the untreated water and waited to see if he would survive. He didn't seem to notice anything so we all switched to untreated water.

Navassa had not been active in many years so we had a ball on the air, knocking 'em off by the thousands. Talk about pile-ups!

When we were getting the equipment from the ship to the small boat and then from there up onto the island, some of the key beam antenna elements managed to slip out of the sling and fall into the water at the base of the cliff. I had my scuba tanks with me just in case of something like this, so I was elected to go after the lost aluminum.

It turned out that the water was only about 60 feet deep right there so I was able to surface dive and bring it all up. I can hold my breath for a minute or so and do pretty well in anything less than 75 feet without the scuba equipment... as long as it is just going down and then back up again. The many sharks and barracuda put the others off from much swimming. I tried to assure them that the fish were just curious and to ignore them, but I wasn't very convincing apparently.

Once the pileups ran down, we packed up and sailed back to Haiti where a couple of us left to fly home and back to business. Four of the group came back with the ham gear to Nassau. I eventually got back most of my ham gear, but never saw my two scuba tanks again.

I ran an article in CQ on the DXpedition, doctoring up the photo of the loading area and the cliff with a big "W2NSD" sign. This seemed better than the Coast Guard graffiti which was actually there. Later DXpeditions to Navassa brought paint planning to cover up my W2NSD with their calls. Not finding it, they painted their calls everywhere and made an awful mess.

I have a great 16mm color movie of the expedition which might be of interest some day. My slides were, unfortunately, out on loan to a ham club at the time I was fired from CQ, and I was never able to get them back.

In 1972, a group of hams from Atlanta decided to do a Navassa DXpedition trip and I got invited. The leader was Chaz Cone W4GKF, who also runs the yearly Atlanta Ham Festival and was recently involved with the new IBM microcomputer system.

This time we flew to Jamaica, where it was only an overnight boat trip to the island. Piece of cake.

The *Time* article was in error on a couple of minor points. The description of amateur radio as a burgeoning (to grow or develop rapidly) hobby is nice to read, but a bit optimistic. And I don't know how one makes mutton stew out of a goat. Goat stew, sure... and it can be delicious if you don't know the name of the goat involved.

They are right about one thing: DXpeditioning is exciting and fun. It is adventure and I guarantee that if you break loose and go on one, that you will never forget one single minute of the trip, no matter how long you live. There are not many adventures left like that in our protective (perhaps overprotective) world. Giving a few thousand hams a new country merely supports a branch of the hobby which is of questionable value—country chasing. Few hams in rare countries enjoy the pressures this forces on them, which leads to rare countries being even rarer... thwarting one of the basic values of amateur radio: international friendships.

Maybe we could set up a new rule which would *only* give country credit if you work a DXpedition.

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vation of China... perhaps you can take the time to break loose this fall and join me for a short trip to China. Ten of us went to Canton a little over a year ago and had an experience that none of us will ever forget.

This fall, starting in late October, there will be a tour of the electronics shows in Tokyo, Seoul, Taipei, and Hong Kong. From there we will go to Beijing for a couple of days and then on around to other electronics shows in Munich and London. Yep, this trip not only will get you into the most interesting places in Asia, including Peking, but is an around-the-world tour.

In general, the tour allows a couple of days for each electronics show and then one for travel, which means that the seven-city tour takes about three weeks. The cost is around \$4,000 and that includes first-class hotels, all transportation, and perhaps more meals than you may be able to handle. Some of the meals on these tours are spectacular.

At the shows you get to see the latest in consumer electronic equipment, small computers, and so on. We'll be meeting hams, of course. If you are in electronics you may find some products to import, some firms which want your products, or firms to make things for you. These shows are about the only practical way to reach the smaller businessmen in Asia.

If you're interested in racking up some memories for a lifetime, drop me a note and I'll see that you get the dope on the tour. I've been on it twice now and find it first rate.

AN ARRL RESPONSIBILITY

Many years ago, an amateur organization was formed for the main purpose of providing lobbying for the hobby and for funding legal fights against laws which would be seriously harmful to the hobby. The League spent a fortune to put that new organization out of business, fearing any rivals... even for purposes for which they were not responsible.

Okay... this, to my mind, puts some responsibility on their shoulders to stand up and fight when restrictive laws are passed which are harmful to amateur radio. A case in point is a recent ordinance passed by the city of Burbank, Illinois... and this one is hard to believe.

Firstly, they just recently passed a one-year moratorium on issuing any permits for amateur antennas. Secondly, there is an \$11 yearly fee for the inspection of each antenna, with a \$10 follow-up fee if the antenna does not pass inspection and has to be reinspected.

Even antennas already in place must be registered, with a lot of legal details plus a proof of bond, proof of insurance on the antenna, proof of inspections, and so on. The bond, by the way, requires those responsible for the installation to put up \$5,000 which is kept by the

city. The wording of the ordinance could be construed to force any amateur putting up his own antenna to put up this \$5,000 bond.

The real capper is the last part of the law which makes it illegal to cause any interference to radios, televisions, musical instruments, hi-fis, and so on. The fine set for this is a minimum of \$25 and a maximum of \$1,000 for each offense.

This sort of mischief *must* be fought. If it is permitted to stand in one city we can only expect it to proliferate, with each city pointing to the previous ones for legitimacy of the law. Yet fighting laws such as this, which seem silly, but which *are* laws, is an expensive undertaking. Who is going to pay to fight these laws?

I realize that there are a lot of amateurs who believe that *any* law must be obeyed and that it is un-American to even try to fight laws, good or bad. The fact is that there are a lot of really bad laws around and we either have to fight them or else give up more and more of our freedom.

You know, these same television viewers who gang up to force hams off the air will be the first ones to be screaming for ham communications when an emergency strikes. Speaking of emergency communications, the more we can organize this aspect of amateur radio, the stronger case we'll have when we have to deal with idiots such as the ones who put through the Burbank ordinance. Trying to reason with them as mere hobbyists trying to enjoy our hobby won't cut a lot of mustard.

It's funny about our laws. There has been a lot of fuss lately about driving and drinking, yet the courts seem to be fighting the laws and doing all they can to make sure that these drunken turkeys are back in cars again. We had one up here who had a record of drunk driving... and being let loose. He got soused one night, got behind the wheel... turned his truck over... some people helped him turn it back again and he went on a few minutes later to wipe out three kids when he drove over the line into their lane. The police gave him a drunk meter test, but the court wouldn't allow the results to be mentioned in the trial. And so it goes with laws.

As far as crazy laws are con-

NEWSLETTER OF THE MONTH

This month marks the 12th part of 73's Newsletter of the Month series. It seems appropriate to close the first year of the contest by reviewing our eleven winners.—N8RK.

73's August, 1981, pick was the Richardson Wireless Klub's *Chawed Rag*. We appreciated their decision to cover upcoming club activities rather than the minute details of what went on at the last club meeting.

September's choice, *The Birmingham Amateur Radio Club Newsletter*, offered some good technical information. They included details about a simple RTTY station as well as featured a monthly "Technical Corner" in which real-life problems were discussed.

The October winner came from the San Diego Repeater Association. *Squelch Tales* boasts several pages of paid advertising each month. This defrays the publication costs, leaving the club's resources available for other projects.

The name *Squelch Tale* (this time with no "s") popped up again in November. We applauded the Chicago FM Club for their newsletter's eye-catching appearance: a consistent, clean-looking layout that ensures readers will spend some time with each issue.

Rounding out the 1981 winners was *The Scuttlebutt*, published by the Yankee Clipper Contest Club. The Clippers leave no stone unturned in a quest for club members who can provide connections to keep the cost of producing the *Scuttlebutt* to a minimum.

The Wheaton Community Radio Amateurs' *The Hamletter* caught our eye in January, 1982, with its two-color printing job and large number of black and white photos. *The Hamletter* masthead gives more than a list of officers; you'll also find details about when the club meets each month and where to look for the local repeaters and nets. These kinds of details make a newsletter friendly and helpful to new readers.

Humor was a key feature in the February winner, *The National Hampoon*. This publication of the Cleveland-based South East Amateur Radio Club relates a lot of information about the doings of individual members in a good-natured, fun way.

A statewide organization, the Wisconsin Association of Repeaters, was recognized for its newsletter in the March, 1982, issue of 73. Our judges said, "A newsletter editor needs to keep in mind the audience he is trying to reach; if he gives his specialized audience the specialized information that they joined together to learn, they will be happy both with the newsletter and the club."

April's pick, the Metroplex Amateur Radio Communications Association newsletter, was recognized for its beautiful layout. This publication is another example of utilizing the talents of your club members—the editor is a commercial artist.

The May winner, *Kansas Amateur Radio*, is a good example of the fact that a publication doesn't always need the backing of a club. This statewide newsletter is a nonprofit venture that relies on readers for financial and editorial support. The result is very impressive.

Rounding out the first year of 73's Newsletter of the Month Contest was *The Log*, published by the Northern Ohio Amateur Radio Society. *The Log* includes something for everyone: reports for awards chasers, the contest crowd, DX hounds, traffic handlers and Novices.

cerned, we need to keep our eyes out for them and make sure that the ARRL, our *only* national club, is held responsible for our protection. Remember that they are our *only* club because they have spent the money it took to shoot down all the others. I'm not pot-shotting the League—only pointing out the facts and the responsibilities which we, as members, have to hold them to.

GENERAL NOTES

Every now and then a reader writes in with indignation that he (or she, rarely) has written me a letter and I have not personally answered. First, let me assure you that I do, indeed, read my mail. If you write to me, I will get the letter. The odds are not so good that you will get an answer, for the simple reason that I am but one person and you, the reader, are one of about 750,000 who read my magazines each month. You get the picture?

The average magazine editor writes a paragraph or two a month, an exercise not likely to get many readers fired up into a letter-writing frenzy. My extended editorials in five monthly magazines seem to flip the more delicately balanced (unbalanced?) readers into an ennui which is only surmounted by a long letter to Wayne... some enthusiastic and others vituperative. I seem to have a halo when viewed from some angles and distinct horns from others.

The fact is that I am someone who is trying mightily to make up for a deprived childhood. I really wanted to get a small printing press when I was a kid and have been taking out the re-

sulting frustration on a growing number of not very innocent bystanders. I've got one now and I am having a ball.

Mind you, whether I can answer or not, I *do* want to hear from you. If you have anything to tell me about some of my editorials, I am always open to more data. Emotional reactions? No. Reasoned arguments? Sure. And if you run into newspaper or magazine clippings I might have missed, I would really appreciate getting them. You probably already know about my interests, such as anything to do with amateur radio, microcomputers, education, UFOs, radar, TVRO... things like that.

If you have a subscription problem, I'm sympathetic but almost as helpless as you are. Send word of your problem to 73 Subscription Dept., Box 931, Farmingdale NY 11737, and give *all* of the details. If this manages to fail to help after about six weeks, the next step is to write to the Circulation Manager, 73 Magazine, Peterborough NH 03458. If that doesn't get action, try General Manager Debra Boudrieau, Wayne Green, Inc., 80 Pine Street, Peterborough NH 03458. If that, too, fails, let me know and I will rattle the chains.

If you need a back issue, try your best to identify it. We don't have a staff sitting around ready to try to find articles via a clue or two. Check our yearly index for hints. Check our Radio Bookshop for back issue prices... if we have the issues.

We have just enough people here to barely get the magazine out each month, so there is no

one sitting around to give technical help or to design circuits for you. If you do have a question, please send it to the Technical Editor, 73 Magazine, Peterborough NH 03458, complete with an SASE... and then hope that he gets some time. For the most part, you want to try to deal with the author of an article, remembering that he, too, may be up to here in trying to keep up with correspondence. It is not unusual for an author to get a thousand letters after a particularly interesting article. Now, how is he going to handle all of that?

ARTICLES

In the main, we are looking for construction projects. I have this bee in my bonnet about getting hams into building again, even if I have to drag them kicking and screaming into it... as I did with FM and repeaters. Boy! Did the readers hate FM when I started with *that*!

Articles are simple to write. You must type them in upper- and lowercase characters. You must double-space and leave generous margins on the pages for editing. We are now able to accept articles written on your TRS-80 I and III. Send in both the disk and a double-spaced printout. Then we will be able to do the editing on the printout and update the disk, finally dumping the edited article from the disk directly into our typesetting system. That will speed things up for us substantially.

We're also looking for articles which may help encourage schools to set up ham clubs. I feel that the future of both

amateur radio and the technology of our country depends on this development.

Photos are most helpful in making the article interesting for the readers. If you have built a gadget and are not equipped with a first-rate camera, please send in the unit so that we can shoot it. We have a Mamiya RB-67 and can do a professional job. No more fuzzy Polaroids, okay? It takes a large-format camera and good lighting to turn out a good photo.

One more thing: Don't ever, ever send your article to two magazines at the same time.

THE PHONE

My apologies to readers wanting to get through to me on the phone. What with trying to manage six monthly publications, nine separate divisions of the company, do consulting, get to shows, give talks, keep up with the literature in two fields, and even ham a bit, my time even for telephone calls is very limited. This means it is getting more and more difficult to break through to me. But if I don't do that, I won't keep all these things growing... or be able to write all these editorials (*no smart remarks*).

In general, if my calendar permits, I'm available for talks to groups at \$1,000 plus expenses for Sherry and me. Consulting runs about \$500 a day plus expenses for the two of us, whether it is worth it or not. The same goes for the talks. The steep prices make it so that I have more time to do my work... though I've had no complaints as yet.

CORRECTIONS

In the review of the CES 635 Microdialer (May, 1982, p. 138), we stated an incorrect price. The correct price for this microphone is \$99.95.

Jeff DeTray WB8BTH
73 Magazine Staff

In the April issue, page 10, the article "Watching the Weather" will undoubtedly interest many hams having the old deskfax in their parts closet.

There is, however, one portion of the layout which in my opin-

ion can be simplified and possibly be made less expensive. This involves the need to reduce the drum rpm from 180 to 120 which, in the article, requires a 40-Hz voltage amplifier. The same rpm requirement can be met by leaving the motor as a straight 120-volt, 60-cycle unit and changing the output gearing.

Standard gear catalog listings do not show a 1.0-inch-center distance with the required 30 to 1 ratio. I guess nothing in our hobby comes easy, and a little

work is required. There is, however, a gear set which comes close to the 1.0-inch-center distance spacing and the exact ratio.

The data are as follows:

● Worm Gear—32 diametral pitch, face width 7/32, bore: .25 diameter, hub diameter 11/16, projection 5/16, 60 teeth, 1.875 PD; catalog #D-1132, item code 13514.

● Worm—32 diametral pitch (double thread), PD .438, bore 3/16; LTHB item code 12922.

● Source—local industrial distributor handling Boston Gears. The manufacturer is Boston Gear Division, 14 Hayward St., Quincy MA 02171, (617)-328-3300.

Since the center distance will

now be 1.156 inches with the new gears instead of the original 1.0 inch, it becomes an easy job with the help of a drill motor and a half-round file to lower the motor 5/32 of an inch. The worm will fit as is, but a new pin hole may have to be drilled. The worm gear must be reworked from a .250-diameter center hole to a .500 diameter. Once installed, the standard input of 120 volts at 60 Hz will drive the drum at 120 rpm.

This will eliminate the 80-kHz oscillator, the divider chain, the 40-Watt amplifier, and, of course, the autotransformer.

John Watzke K8OXI
9910 Shore Drive
Pigeon MI 48755

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE POSTMAN RETURNS

From Guam to Austria, Alaska to Florida, hams from all over the globe responded to the 1982 edition of the annual Fun! poll. The results, as always, were fascinating, and I wish to thank everyone who participated. I also want to thank my postman, who once again risked his back delivering all those envelopes.

Frankly, what always astounds me about this poll is not only the number of people who take the time to fill out a rather lengthy questionnaire, but also the number who write very long and generally thoughtful letters. Amateur radio will always be a vital hobby as long as there are people around who care about its future.

So thanks once again to the 1,016 of you who wrote in. Here's what you had to say.

ELEMENT 1—BACKGROUND

- 1) Sex:
A) Male—91% B) Female—9%
A three percent increase in the number of female amateurs over last year. An encouraging trend, but not conclusive enough to indicate a real trend.
- 2) Age:
A) 15 or below—5% B) 16-21—6% C) 22-39—49%
D) 40-59—27% E) 60 and above—13%
Not very encouraging for our hobby's future.
- 3) License class:
A) Novice—6% B) Technician—10% C) General—30%
D) Advanced—40% E) Extra—14%
Compared to last year, seems like there's been an upswing in upgrading.
- 4) Number of years licensed:
A) 1 year or less—4% B) 1-5 years—33% C) 6-10 years—8%
D) 11-20 years—29% E) 21 years and up—26%
The old-timers reign.
- 5) Do you have a new (post-March '78) call?
A) Yes—45% B) No—55%
The new calls have an 8% increase over last year.
- 6) How many hours a week do you devote to amateur radio?
A) 0-1 hour—5% B) 2-5 hours—29% C) 6-10 hours—44%
D) 11-20 hours—16% E) 21 or more hours—6%
About the same statistics as last year.
- 7) Which HF band do you most use?
A) 80-75 meters—15% B) 40 meters—20% C) 20 meters—21%
D) 15 and/or 10 meters—35% E) Don't operate HF—9%
As the sunspots diminish, so does 15- and 10-meter operation—down from 43% last year.
- 8) Which VHF-UHF band do you most use?
A) 6 meters—3% B) 2 meters—71% C) 220 MHz—6%
D) 420 MHz and/or up—1% E) Don't operate VHF-UHF—19%
Spread out, guys!
- 9) Which mode do you most use?
A) SSB—41% B) CW—20% C) FM—30% D) RTTY—5%
E) Other—4%
If CW is so great, why does its popularity keep dropping?

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenditures.)

- A) \$0-\$250—39% B) \$251-\$500—30% C) \$501-\$1,000—24%
D) \$1,001-\$2,500—4% E) \$2,501 and up—3%

A continued downward trend.

ELEMENT 2—SOCIAL CHARACTERISTICS

- 11) Has amateur radio influenced your career choice?
A) Greatly—25% B) Somewhat—26% C) Not at all—49%
Quite an impressive statistic, really.
- 12) Do you answer QSLs with no return postage?
A) Yes—76% B) No—24%
The fact that the word "Novice" was eliminated from this question, plus two postage increases, might account for the 20% positive response drop.
- 13) Politically, how would you define yourself?
A) Conservative—40% B) Middle-of-the-road—51% C) Liberal—9%
I've always felt hams were a pretty conservative lot, and it looks like my suspicions were correct. Being a C person, I feel pretty lonely.
- 14) Do you think amateur radio will exist 20 years from now?
A) Yes—87% B) No—13%
Hams are a pretty optimistic lot.
- 15) Have you ever had a fight with a family member over amateur radio?
A) Yes—71% B) No—29%
Wow! I want the first aid concession at the next hamfest.
- 16) Do you have any relatives who are hams?
A) Yes—49% B) No—51%
- 17) Are most of your friends (more than half) hams?
A) Yes—40% B) No—60%
Takes one to know one—almost.
- 18) Did you ever use a "cheat book" (not counting the ARRL License Manual) to upgrade your license?
A) Yes—16% B) No—84%
No comment.
- 19) If someone offered you five million dollars, tax-free, on the condition that you give up amateur radio forever, would you?
A) Yes—81% B) No—19%
We raised the ante by four million over last year and got 20% more takers. As for the other 19%, I still say every man has his price. How about 10 million?
- 20) Do you belong to a local ham radio club?
A) Yes—45% B) No—55%
Not good enough.
- 21) Have you ever attended a ham flea market?
A) Yes—79% B) No—21%
If you haven't, you don't know what you're missing.
- 22) Have you ever attended the Dayton Hamvention?
A) Yes—24% B) No—76%
I haven't made it since 1978, but it was a gas!
- 23) Would you pay five dollars to join the ARRL if they offered no magazine, QSL services, awards, or technical and instructional help?
A) Yes—22% B) No—78%
Guess it must be that great magazine that makes the League. I, for one, love to regale my friends on 15 with the latest activity reports.
- 24) Would you like to see another national organization compete with the ARRL?
A) Yes—22% B) No—78%
Hoo boy! Did I raise a hornet's nest with this one. One respondent even went so far as to call me a rabble-rouser. I take no stand on this question, but judging from the results, I certainly wouldn't invest my money in the stock of a competitor.

ELEMENT 3—OPERATING HABITS

- 25) Would you favor a licensing system that had only two classes: Novice and General or Communicator and General?
A) Yes—58% B) No—42%
So much for incentive licensing.
- 26) Would you like to see the FCC turn over amateur testing responsibility to clubs?
A) Yes—61% B) No—39%
Many of those who were against were afraid of abuses.
- 27) Do you think religious and politically-oriented nets have a place in ham radio?
A) Yes—79% B) No—21%
Hey, you guys who picked B. Haven't you ever heard of free speech?
- 28) Should contests be outlawed?
A) Yes—31% B) No—69%
Emotions ran hot and heavy on this one.
- 29) Do you think the FCC should assign exclusive frequencies and times to nets?
A) Yes—7% B) No—93%
Vot a very attractive proposition.
- 30) Do you think the FCC should assign exclusive frequencies to repeaters?
A) Yes—20% B) No—80%
don't like the idea, either.
- 31) Should there be a no-code, VHF and above, "Digital class" license? This license would require a heavy theory test and carry no phone or CW privileges (except perhaps for ID purposes).
A) Yes—34% B) No—66%
can't figure it: Some letters were downright hostile to the influx of computer users on the bands, as if they were taking over the hobby. Many respondents seemed to welcome the digital ticket idea, but not enough to make a majority.
- 32) Should there be a no-code 220-MHz, "Communicator class" license? This license would require a moderately difficult theory test and carry only F3 privileges at a maximum of 50 Watts.
A) Yes—41% B) No—59%
A hard core of respondents seemed to be against dropping the code test for any type of license.
- 33) Do you own a microcomputer?
A) Yes—39% B) No—61%
can't see how a technically-inclined person can be without one.
- 34) What sort of CW sending device do you most often use?
A) Straight key—56% B) Keyer—25% C) Bug—4%
D) Keyboard—6% E) Never operate CW—9%
Last year, I accidentally left out bugs and received scores of letters asking why. This year, I insert the classification and find out only 4% use them. Can't win.
- 35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes—75% B) No—25%
Compared with last year, our skills are diminishing.
- 36) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes—11% B) No—89%
About the same as last year.
- 37) Do you think the FCC affects amateur radio in a positive manner?
A) Yes—48% B) No—52%
A little more positive than last year.
- 38) Do you ever speak to foreign, non-English-speaking hams in their own language?
A) Always—3% B) Sometimes—15% C) I attempt it—25%
D) Rarely—6% E) Never—51%
No substantial change over last year.
- 39) Do you feel yourself competent to replace the finals in a tube-type rig?
A) Yes—91% B) No—9%
Does anyone still own a tube rig? Only kidding!

- 40) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes—80% B) No—20%
A soldering iron? I thought it was an electric cigar!
- 41) Have you ever built an electronic project from a kit?
A) Yes—98% B) No—2%
A ham isn't a ham unless he's unpacked all of those little brown bags before opening the instruction booklet.
- 42) Have you ever "home-brewed" an electronic project from a book or magazine?
A) Yes—75% B) No—25%
A bit down from last year. For shame on those who haven't.
- 43) Have you ever designed your own electronic project?
A) Yes—61% B) No—39%
Hasn't everyone?
- 44) What do you think of contesting?
A) Great—15% B) Good—20% C) Okay—17% D) Don't like it—29% E) Despise it—19%
You're 59 New York.
- 45) What do you think of DXing?
A) Great—40% B) Good—31% C) Okay—19% D) Don't like it—5% E) Despise it—5%
QSL via the bureau.
- 46) What do you think of repeaters?
A) Great—35% B) Good—30% C) Okay—22% D) Don't like them—8% E) Despise them—5%
Wait for the beep.
- 47) What do you think of traffic handling?
A) Great—10% B) Good—35% C) Okay—40% D) Don't like it—14% E) Despise it—1%
- 48) Do you plan to use Phase III OSCAR within a year of its launch?
A) Yes—28% B) No—72%
Looks like that passband is going to get pretty crowded.
- 49) Do you plan to use the new 10.1-MHz band within one year of its opening?
A) Yes—40% B) No—60%
That should be around Jan. 1, 2065, at the rate the U.S. Senate is moving.
- 50) Do you believe amateurs should have the right to build, use, and sell equipment for the reception of subscription television?
A) Yes—24% B) No—76%
I should have left "sell" out of the question. Seems many amateurs think they should be able to pirate signals for their own use, but not for others.

SELECTED COMMENTS

- Too many private repeaters tying up amateur frequencies. Some systems have only three people on them.—KB6BO.*
- Morse code should be outlawed as a requirement, although I love it.—K6XR.*
- Amateur radio needs quality, not quantity. We should strive to keep the standards high.—WB5ZDP.*
- We will keyboard and computerize ourselves away from the human fashion of hamming.—W4YDL.*
- Let's have more polls—these are FUN!!—KF4W.*
- I think the Communicator class is a very good idea. I am partially deaf. Code is very hard for me. This may give deaf people a chance to communicate by RTTY.—KA7CYE.*
- After 21 years of hamming, I earned my Extra class license and not a word of congratulations from the ARRL or any manufacturer of ham gear.—KD1J.*
- This has been the only column you've put in print that I knew all the answers to.—N7AVM.*

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CANADA CONTEST

Starts: 0000 GMT July 1
Ends: 2400 GMT July 1

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all amateurs, and everybody works everybody. Entry classes include single operator/all bands, single operator/single band, and multi-operator/single transmitter/all bands. There are separate single-operator QRP (5 W dc, 10 W PEP out) and single-operator non-Advanced amateur classes.

Use all bands from 160 to 2 meters on CW and phone combined. All contacts with amateur stations are valid. Stations may be worked twice on each band, once on CW and once on phone. No crossmode contacts, and no CW contacts in the phone bands are allowed.

EXCHANGE:

Signal report and consecutive serial number starting with 001; VE1 stations should also send their province (NS, NB, PEI).

SCORING:

Score 10 points for each contact with Canada, 1 point for contacts with others. VE0 counts as Canada. Score 10 points for each contact with any CARF official news station using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band, on each mode (12 provinces/territories × 8 bands × 2 modes for a maximum of 192 possible multipliers). Contacts with stations outside Canada count for points but not multipliers.

FREQUENCIES:

Phone—1810, 3770, 3900, 7070, 7230, 14150, 14300, 21200, 21400, 28500, 50.1, 146.52.

CW—1810, 3525, 7025, 14025, 21025, 28025, 50.1, 144.1.

Suggest phone on the even hours (GMT), CW on the odd hours (GMT). Since this is a Canadian-sponsored contest, remember to stay within the legal frequencies for your country!

AWARDS:

A plaque will be awarded to the highest score single operator/all bands entry. Certificates will be awarded to the highest score in each category in each province/territory, US call area, and DX country.

ENTRIES:

A valid entry must contain log sheets, dupe sheets, a cover sheet showing claimed QSO points, a list of multipliers, and a calculation of final claimed score. Cover sheets and multiplier check lists are available. Entries should be mailed within one month of the contest, with your comments, to: CARF, PO Box 2172, Stn. D, Ottawa, Ontario K1P 5W4, Canada.

Results will be published in TCA, the Canadian amateur magazine. Non-subscribers may include an SASE for a copy of the results.

INTERNATIONAL QRP CONTEST

Starts: 1500 GMT July 17
Ends: 1500 GMT July 18

The first International QRP Contest is being sponsored by the World QRP Federation (WQF) and offers a variety of awards for leading stations. This is a CW-only event with separate categories for single- or multi-operator stations, and for those operating fixed or portable. Multi-operator stations may be on the air for the entire 24-hour contest period, while single-operator entries must be off the air for at least an eight-hour period. All stations may be worked once per band for QSO and multiplier credits.

EXCHANGES:

RST, QSO serial number, and class (599 001/2D). Add X after RST if crystal-controlled (559X 001/2D).

FREQUENCIES:

The traditional QRP frequencies will be utilized: 1810, 3560, 14060, 21060, and 28060, all plus or minus QRM.

OPERATING CLASSES:

1 = single operator, 2 = multi-operator, A = fixed station up to 2 Watts input or 1 Watt output, B = fixed station up to 10 Watts input or 5 Watts output, C = portable station up to 2 Watts input or 1 Watt output, D = portable station up to 10

Watts input or 5 Watts output, and E = QRO stations of more than 10 Watts input or 5 Watts output.

SCORING:

Count 1 point for QRP to QRO contacts, 2 points for QRP to QRP. For multipliers, count 1 if both stations are in the same country, 2 if the other station is in another country on the same continent, 3 if the other station is in another country and on another continent. For scoring purposes, all call areas within a country are counted as multipliers (e.g., 10 for W/K, 8 for VE, 10 for PY, etc.). For crystal stations with a maximum of three crystals per band, QSO and multiplier points are doubled. Contacts with crystal-controlled stations count double. Band points are the QSO points per band times the multiplier points per band. Final score is the sum of band points from each band.

AWARDS:

DL-AGCW will provide awards for fixed station leaders and band leaders. QRP ARCI will provide plaques to the first place single- and multi-operator portable stations worldwide plus certificates for the multiple- and single-operator portable station in each country with two or more entries.

ENTRIES:

Send logs within six weeks of conclusion of the contest as follows: fixed stations to Siegfried Hari DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, West Germany; portable stations to William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161, USA.

INTERNATIONAL WORLDWIDE DX SSTV CONTEST

Starts: 0000 GMT July 17
Ends: 2400 GMT July 18

This is the second annual DX SSTV contest sponsored by A5 ATV Magazine. This is a 48-hour SSTV video contest using 80 through 10 meters within the recommended SSTV calling/operating frequencies listed below. To encourage use of all bands, extra bonus points are granted on the 10-, 15-, 40-, and 80-meter band segments. Single- and multi-operator stations are recognized with cross-band contacts not permitted. Individual contacts count only

CALENDAR

| | |
|-----------|---------------------------------------|
| Jul 1 | CARF Canada Day Contest |
| Jul 10-11 | IARU Radiosport |
| Jul 17-18 | International QRP Contest |
| Jul 17-18 | A5 Magazine Worldwide SSTV DX Contest |
| Jul 24-26 | CW County Hunters Contest |
| Aug 7-8 | ARRL UHF Contest |
| Aug 14-15 | European DX Contest—CW |
| Aug 14-16 | New Jersey QSO Party |
| Aug 21-22 | SARTG Worldwide RTTY Contest |
| Aug 21-22 | A5 Magazine F5TV UHF Contest |
| Aug 28-29 | Occupation Contest |
| Sep 11-12 | ARRL VHF QSO Party |
| Sep 11-12 | European DX Contest—Phone |
| Sep 11-12 | Cray Valley RS SWL Contest |
| Sep 18-20 | Washington State QSO Party |
| Oct 2-3 | California QSO Party |
| Oct 16-17 | ARCI QRP CW QSO Party |
| Oct 16-17 | Pennsylvania 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 |
| Dec 19 | CARF Canada Contest |

once per band with repetitive multi-band contacts acceptable.

Callsigns and video reports must be in "video" form. Mugshots of the station operator, family, or friends can count only once. Slower clock-rate speeds are encouraged in either 128/16.5-second or 256/31-second timebases. Color work must contain a minimum of 2-color overlay to qualify with standard RGB frame transmissions. Motion SSTV must have a minimum of 2 frames sent with automatic-receive switching circuitry or manually operated switching by the receiving operator, and 64 x 64 "quadrant" storage of no less than 4 separate pictures with replays.

SCORING:

Each SSTV two-way contact is worth 5 points within the same country and 10 points for DX out-of-country. Contact bonus points are available as follows: mugshots—1 point, slow speed—2 points, quad frame—3 points, motion SSTV—4 points, high resolution—5 points, and color SSTV—10 points.

A band multiplier of 3 can be claimed for contacts on 40 and 30 meters, and 2 for contacts on 10 and 15 meters. Stations with over 25 DX countries worked—add 25 points, 50 DX countries—add 50 points, and over 100 DX countries—add 100 points!

FREQUENCIES:

Advanced/Extra—3845, 7220, 14230, 21340, 28680, 50.150.

General—3990, 7290, 14340, 21440, 28680, 50.150.

AWARDS:

First-place winner receives 3-year subscription (worth \$60) to *A5 ATV Magazine* with front-cover picture plus a Gold Certificate. Second- and third-place winners receive one-year subscriptions and Gold Certificates. All entries regardless of score receive Gold Certificates suitable for framing. Results will be in the November issue of *A5 ATV Magazine*.

ENTRIES:

Submission of logs and totaled scores must be post-marked no later than August 1st and submitted to: Contest Manager, *A5 ATV Magazine*, PO Box H, Lowden IA 52255-0408. Logs will be returned as will any photos, etc. Some log sheets

RESULTS

1981 PENNSYLVANIA QSO PARTY
(QSOs and Score)

| Top Seven—Eastern PA | | | Out of State—Top Ten | | | Mobiles | | |
|----------------------|-----|--------|----------------------|------|---------|--------------------------------------|-----|--------|
| WB3DJF | 748 | 97,216 | AE3Y | 311 | 23,072 | KB3NQ | 369 | 35,424 |
| K3ONW | 543 | 79,401 | VE3BR | 234 | 18,467 | KA3DXR | 247 | 22,244 |
| AA3B | 570 | 77,166 | K2POF | 166 | 11,500 | W3YA | 102 | 6,075 |
| KC3N | 559 | 76,328 | W2IMO | 171 | 11,398 | Ctr.Co. EOC (WB3AEI, WB3DVH, WN3VAW) | | |
| K3NB | 539 | 72,200 | K9GDF | 170 | 10,951 | | 31 | 819 |
| N3AMK | 568 | 70,437 | K1BV | 156 | 8,677 | | | |
| AI3Q | 491 | 57,684 | W1DWA | 128 | 7,943 | WA3QNT/m | 269 | 24,157 |
| | | | W2EZ | 110 | 7,755 | (from 9 counties) | | |
| | | | N2CIW | 142 | 7,384 | K3BS/m | 327 | 19,293 |
| | | | N4FAI | 110 | 6,750 | (from 18 counties) | | |
| Top Seven—Western PA | | | Multi-Operator | | | N2BLT/m | 104 | 4,368 |
| AD8J/3 | 502 | 62,628 | K3ZUF | 1384 | 194,207 | (from 6 counties) | | |
| N3BBH/3 | 580 | 51,216 | KB3S | 526 | 73,593 | Check log: | | |
| KA3BFX | 398 | 45,177 | K3CR | 583 | 70,750 | W3HDH/m | 433 | 39,849 |
| KA3FMH | 382 | 42,864 | AG3R | 417 | 52,781 | (from 15 counties) | | |
| WB3IET/3 | 396 | 40,788 | | | | | | |
| AG3H | 250 | 38,500 | | | | | | |
| N3BMV | 390 | 37,536 | | | | | | |

| Clubs | Location | Score | Entries | Top Scorer |
|--------------------------------------|-----------------|---------|---------|------------|
| Penn Wireless Association | Bucks County | 425,570 | 16 | WB3DJF |
| Erie Amateur Radio Association: | Erie | 296,651 | 22 | KA3BFX |
| Nittany Amateur Radio Club | State College | 264,723 | 13 | N3BBH |
| Delaware-Lehigh Amateur Radio Club: | Northampton Co. | 217,510 | 8 | K3ZUF |
| Hazleton Amateur Radio Club | Hazleton | 161,728 | 11 | AI3Q |
| Penn State University Radio Club | University Park | 95,509 | 3 | K3CR |
| Frankford Radio Club | Philadelphia | 74,181 | 2 | — |
| Mon-Valley Amateur Radio Association | Washington Co. | 73,593 | 2 | — |
| Murgas Amateur Radio Club | Luzerne County | 63,399 | 6 | WB3FYT |
| Carbon ARCs | Carbon County | 61,739 | 4 | WB3JZE |
| Point Radio Operating Society (PROS) | Allegheny Co. | 36,231 | 2 | — |
| Harrisburg Amateur Radio Club | Harrisburg | 35,226 | 4 | W3ADE |
| Reading Amateur Radio Club | Berks County | 33,198 | 3 | WA3JXW |
| Tioga County Amateur Radio Club | Tioga County | 26,929 | 2 | — |
| Mobile Sixers | Chester County | 9,505 | 2 | — |

and DX country lists are available from WB0QCD.

CW COUNTY HUNTERS CONTEST

Starts: 0000 GMT July 24

Ends: 0200 GMT July 26

The CW County Hunters Net invites all amateurs to participate in this year's contest. All mobile and portable operation in less-active counties is welcomed and encouraged. Stations may be worked once on each band, and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RST; state, province, or country; and US county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier.

FREQUENCIES:

Frequencies are 3575, 7055, 14070, 21070, and 28070. It is strongly requested that only P or M category stations call CQ or

QRZ on 40 meters below 7055 and on 20 meters below 14070, with all other stations spreading out above those frequencies.

SCORING:

QSOs with fixed stations are 1 point, QSOs with portable or mobile stations are 3 points. Multiply the number of QSO points times the number of US counties worked. Mobiles and portables calculate their score on the basis of total contacts within a state for the state certificate, and calculate their score on all operation if they operated from more than one

state in competition for the High Portable or High Mobile Trophy.

AWARDS:

Certificates will be awarded in three categories:

1) Highest fixed or fixed-portable station in each state, province, and country with 1,000 or more points.

2) Highest station in each state operating portable from a county which is not his normal point of operation, with 1,000 or more points.

3) Highest station in each state operating mobile from 3 or more counties with a minimum

RESULTS

RESULTS OF A5 ATV MAGAZINE WORKED ALL STATES SSTV CONTEST

(Full results appeared in the June issue of *A5 ATV Magazine*, PO Box H, Lowden IA 52255-0408.)

The top 5 entries from 59 entries received:

- 1st—Luis Chartarifsky XE1LCH
- 2nd—Roland Soucie N6WQ
- 3rd—Larry Benson K9KQO
- 4th—John Hudak III KA3X
- 5th—Harry Harchan W2GND

of 10 QSOs in at least each of 3 counties.

Trophies will be awarded to the highest single-operator station in the US in categories P and M. The Awards Committee

may issue additional awards.

ENTRIES:

Logs must show category, date/time in GMT, station worked, band, exchanges, QSO

points, location, and claimed score. All entries with 100 or more QSOs *must include a check sheet of counties worked or be disqualified from receiving awards.* Enclose a large SASE if

results are desired. Logs must be postmarked by September 1st and sent to: CW County Hunters Net, c/o Jeffrey P. Bechner W9MSE, 673 Bruce Street, Fond du Lac WI 54935.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

CHINA

China. The very word conjures up visions of mystery and Marco Polo. And to DXers China means Number 1 on everyone's Most Wanted List. The *DX Bulletin* annual survey (the benchmark of the Most Wanted Lists) continues to show China in the top spot again this year.

Over the past few years, the China rumors have been flying thick and fast. "China will be opening soon." "Hundreds of China stations will start operating next week." And so on. One prominent New Zealand amateur came within inches of spurring China into the amateur radio arena, but his US citizenship sabotaged the effort.

The positive attitude of the China authorities encourages the rumors and rumor-followers. Unlike many countries where amateur radio is flatly prohibited, China has been enthusiastic about the future role of amateur radio. It is just a matter of time.

That time may have finally come. On March 29, BY1PK ap-

peared on 15 meter CW, working (of course) JAs.

Tom Wong VE7BC clearly performs the role of hero in this operation. His tireless efforts over the past few years have just begun to provide fruit. Tom has been instrumental in funneling equipment, training materials, books, and expertise from the ARRL and other stateside organizations to the appropriate authorities in China.

The BY1PK operation represents not a one-shot, contest-style operation, but the re-awakening of amateur radio in the most populated country in the world. Although China will move slowly in the amateur radio field, it is moving in the right direction, and the next few years should see that Number 1 ranking slip further and further down the Most Wanted survey.

The "Other" China

The neophyte DXer, unfamiliar with the prefix BY, might turn to the International Prefix Allocation List to locate the source of the signals. The list shows all the B callsigns as belonging to China. The *Call-*

book shows no China amateurs. Or does it?

Just before the BY listing in the *Callbook* is the BV listing: two amateurs. If the BY call signifies China, what does the BV signify? Answer: The "other" China—our former ally, Taiwan, the Republic of China.

Not to be confused with the People's Republic of China, Taiwan is the last refuge of the anti-Communist forces driven out of mainland China after World War II. The Nationalist government of Taiwan considers itself to be the legitimate authority over all of China, hence the BV callsign.

But only two amateurs in a country as rich and well populated as Taiwan? A small amateur population is more typical of a smaller, undeveloped country, a distinction hardly appropriate for industrial Taiwan. So why only two hams?

The question is not why there are only two amateurs in Taiwan, but rather why there are any amateurs at all. Taiwan considers itself still at war with the mainland government. Both sides would like the other to go away, to reunite the country (shades of Korea and Vietnam here). And military governments under states of war or emergency are notoriously reluctant to allow free use of the amateur bands.

One of the very first proclamations under the martial law in Poland was the crackdown on amateur radio activities. Even in the US, amateur radio activity ceases during wartime.

We can understand why a country at war would feel uncomfortable about permitting unrestricted use of the amateur bands. The independence of the amateurs and the tremendous flexibility of amateur equipment are powerful communications tools to those on the outs with the government.

The increasing use of amateur radio gear in illegal drug shipments demonstrates that ham radio equipment and expertise can be a disturbing factor in sensitive political differences.

Hence many countries simply prohibit all amateur radio activities; witness Albania, for example.

So we return to our original question: Why is there any amateur radio activity at all from a divided country engaged in a "civil war"?

First, there is really only one amateur in Taiwan, with two callsigns: Tim Chen operates BV2A on CW and BV2B on SSB. Somehow a single individual has obtained permission to operate amateur radio in Taiwan. But that permission is probably the most restricted amateur radio authority short of a flat-out ban. Tim's operating authority restricts him to specified times and frequencies. Can you imagine your radio license specifying the exact frequency and time of operation? It would certainly put a crimp in your DXing.

Fortunately for DXers throughout the world, Tim maintains his activity, keeps to his schedules, and regularly provides QSLs from the "other" China.

Look for Tim Wednesdays between 1200 and 1600Z on one of the following frequencies: 14025, 14040, 14218, or 14250. Tim usually shows up on CW first and switches to SSB a little later. Tim also has operating permission Saturday from 2300 to 0200Z. When band conditions permit 15-meter operation, Tim operates on 21030, 21110, 21270, and 21350. And more recently Tim has added the 10-meter frequency of 28530 to the possibilities.

Tim QSLs consistently either direct to Box 101, Taipei, Taiwan, Republic of China, or via QSL manager K2CM at his *Callbook* address.

If you hear BV2B on 20 meters and have trouble breaking through the pileup, perhaps your choice of phonetics could use improvement. Let's continue our discussion from last month.

PHONETICS

Last month we discussed the different kinds of phonetic call-



In addition to working on his monthly DX column for 73 Magazine, Chod Harris VP2ML leads a very demanding life. Here he's shown slaving away at his VP2 QTH.

signs: standard, place names, and "cute" phonetics. Now we look at how you evaluate your own choice of phonetics and how you can select alternate phonetics.

A phonetic call should have two characteristics: The call must be unambiguous, and it should punch through the pileup. Removing ambiguity from a potential phonetic call-sign is easy: Pick easily recognized words which have no common homophones (a word that *sounds* similar, but is spelled differently).

A couple of examples of what *not* to do might illustrate this: A W5 called me using "Motel" as a phonetic. The confusion between this and "Hotel" is obvious. And one Field Day, an amateur called me with the phonetic suffix, "Fuzzy Wuzzy Wabbit!" I was forced to ask for clarification: "Is that R as in Rabbit or W as in Wabbit?" Back came the reply, "Wabbit! Wabbit, wabbit, wabbit!" Memorable, but not very effective in a DX pileup. Stick with less confusing phonetics.

Selecting a phonetic call with punch is more difficult. I suggest going to a station equipped with an oscilloscope monitor of the outgoing signal. Try different phonetics and combinations of phonetics while watching the scope. Look for those phonetics which give the greatest average output, or the "blockiest" output pattern. Lacking a scope, try watching the relative power output meter on your rig. Again, try to keep the average power as high as possible.

The two "cute" phonetics mentioned last month (W1No-Good and WA9BlackWhiteYellow) are very effective because they share the two most important characteristics of good

phonetics: They are unambiguous and they really cut through the pileups. Watch your output meter while saying "No Good" or "Black White Yellow" to see what a good phonetic does for your average output.

Also, individual amateurs in foreign countries might have a particular difficulty with one of your choices. For one reason or another, an amateur might have a block against that particular phonetic and fail to understand even under good conditions. Be flexible, and don't be afraid to shift to a backup set of phonetics when the first fails after a couple of tries. On the other hand, wait until the DX station is obviously struggling with the call before you switch your phonetics. You use phonetics to *reduce* ambiguity, and throwing dozens of different phonetics at the DX station will more likely confuse the poor DXer and decrease the chances for a successful contact. Keep your different phonetics to a minimum and use an alternate set only when necessary.

I found that three sets of phonetics covered almost any situation. A short, punchy set worked for good conditions, where I knew my call would get through, or for tailending: "Sugar Queen Baker." I tried a slightly longer set when the first one failed: "Sierra Quebec Bravo." This set had the advantage of very high average output; I could really hang the relative power output meter up with Number 2. The final set was the lousy condition set: "Santiago Quebec Bolivia," to be used only under adverse circumstances, when repetition of the other two failed miserably. I used this phonetic *after* contact was established. If the DX station did not have my call correctly, or continued to struggle with the

call, I would switch to the longer phonetic.

Many amateurs use phonetics for the *suffix* of their call but ignore the *prefix*. When the only stateside calls began with K, W, WA, and WB, the possibilities for error remained small. But even the advent of WD calls rapidly discredited this practice. The current proliferation of similar sounding prefixes (KB, KD, KE) makes the use of phonetics for both prefix and suffix mandatory.

Testing Your Choice

The ideal way to test your phonetics is to get on the air and start throwing your call into pileups. Does the call get through? Do the DX stations get your call correctly? The best test of a given set of phonetics is success. If it works, try it again. If it works again and again, use it a lot. If it does not cut the pileup, try another combination until you find the most effective.

One sure sign that a given phonetic doesn't work for your combination of voice and station is a pattern of consistent error when the DX station comes back to you. For example, I quickly found that "Whiskey Alpha One Sierra Queen Bravo" was often answered with WA1S something B." Watching the output scope showed me the problem: Output dropped to near zero on the "Queen." That letter wasn't getting through. A switch to "Quebec" (although opening the door for confusion with Canadian stations) eliminated the lost letter phenomenon.

More Than One?

After experimenting in front of the output monitor (into a dummy load or empty band, of course) and testing the DX waters in numerous pileups, you

will find a phonetic call which meets the requirements of lack of ambiguity and good penetrating power. You will be tempted to use this phonetic call in every DX circumstance. Unfortunately, life, and especially DXing, is not that simple. The best set of phonetics for one band or band conditions might not be competitive at another time. A short, snappy phonetic call might be just the thing for 10 meters when it is wide open, but the same combination on 80 might be destroyed by a single static crash.

Finally, phonetics are very personal. What works for one voice, rig, and microphone might not work for another combination. Guest operators at the big contest multi-multis are familiar with this problem. Each operator has to experiment to find the phonetics which work best. Meanwhile, see you in the pileups! Next month we'll have a treat for the CW DXers, as we examine zero-beating.

NOTES FROM ALL OVER

JO1CRA gives the following address for WH0AAB: Hide-haru Aimonio, 2644 Tsuruda, Utsunomiya-City, Tochigi, 320 Japan. N0BNY reports a July operation from VP2K (on his honeymoon!). Pat also QSLs the VP1MK operation at his home address: 2770 South 13th Street, Omaha NE 68108, with SASE. K9MK/5 handles his own QSLs for his /VP2A and /V2A operations at 6061 Dunson Court, Watauga TX 76148. V2AMK should be QSLed to N0DH/7 at 2031 East Gary, Mesa AZ 85203. And finally Nick Percival 9Y5NP of the Trinidad and Tobago Amateur Radio Society announced the 50 Years of Amateur Radio special prefix for his country: 9Y50. Look for Nick and other Trinidad amateurs using this prefix for the rest of 1982.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORKED ALL ZONES

The WAZ award will be issued to any licensed amateur station

presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards which may be checked by any of the authorized CQ checkpoints or sent directly to the WAZ Award Manager, Mr. Leo Haijsman W4KA,

1044 Southeast 43rd St., Cape Coral FL 33904. Many of the major DX clubs in the US and Canada and most national amateur radio societies abroad are authorized CQ checkpoints. If in doubt, consult the WAZ Award Manager. Any legal type of emission may be used, providing communication was established after November 15, 1945.

The official CQ WAZ Zone Map, and the printed zone list which follows these rules, will

be used in determining the zone in which a station is located.

Confirmation must be accompanied by a list of claimed zones, using CQ form 1479, showing the call letters of the station contacted within each zone. The list should also clearly show the applicant's name, call letters, and complete mailing address. The applicant should indicate the type of award for which he is applying, such as all-SSB, all-CW, or mixed. In re-

mote locations and in foreign countries, a handwritten list may be submitted and will be accepted for processing, provided the above information is shown.

All contacts must be made with licensed, land-based, amateur stations operating in authorized amateur bands.

All contacts submitted by the applicant must be made from within the same country. It is recommended that each QSL clearly show the station's zone number. When the applicant submits cards for multiple call signs, evidence should be provided to show that he or she also held those call letters.

Any altered or forged confirmations will result in permanent disqualification of the applicant.

Include with the application the processing fee (subscribers, \$4.00; non-subscribers, \$10.00) and a self-addressed envelope with sufficient postage stamps or international reply coupons to return the QSL cards by the class of mail service desired and indicated. CQ subscribers should include a recent mailing label (or copy) with application. International reply coupons equal in redemption value to the processing fee are acceptable. Checks should be made out to Mr. Leo Haijsman, WAZ Award Manager.

In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single-sideband operation. The phone certificate requires that all contacts be two-way phone; the SSB certificate requires that all contacts be two-way SSB.

If, at the time of the original application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application, provided a copy of the original authorization signed by the WAZ manager is enclosed.

Decisions of the CQ DX Awards Advisory Committee on any matter pertaining to the administration of this award will be final.

All applications should be sent to the WAZ Award Manager, W4KA, after the QSL cards

have been checked by an authorized CQ checkpoint.

Zone maps, printed rules, and application forms are available from the WAZ Award Manager. Send a self-addressed envelope, 4" x 9½" with 28¢ postage, or a self-addressed envelope and 2 IRCs. For rulings on borderline areas, consult the WAZ Award Manager.

SINGLE-BAND WAZ

Since January 1, 1973, WAZ awards have been issued to licensed amateur stations presenting proof of contact with the 40 zones of the world on one of the five high-frequency bands, 80-10 meters. Contacts for a single-band WAZ award must have been made after 0000 hours GMT, January 1, 1973. Proof of contact shall consist of proper QSL cards checked by the DX Editor, the WAZ Manager, or an authorized CQ checkpoint. Single-band certificates will be awarded for both two-way phone, including SSB, and two-way CW. The single-band WAZ program is governed by the same rules and uses the same zone boundaries.

5-BAND WAZ

On January 1, 1979, the CQ DX Department, in cooperation with the CQ DX Awards Advisory Committee, announced the 5-band WAZ.

Applicants who succeed in presenting proof of contact with the 40 zones of the world on the five high-frequency bands—80, 40, 20, 15, and 10 meters (for a total of 200)—will receive a special certificate in recognition of this achievement.

These rules were in effect as of July 1, 1979, and supercede all other rules. Five-band WAZ will be offered for any combination of CW, SSB, phone, or RTTY contacts, mixed-mode only. Separate awards will not be offered for the different modes. Contacts must have been made after 0000 hours GMT, January 1, 1979. Proof of contact shall consist only of proper QSL cards checked by the WAZ Award Manager, W4KA. The first plateau will be a total of 150 zones on a combination of the five bands. Applicants should use a separate sheet for each frequency band, using CQ form 1479.

A regular WAZ or single-band WAZ will not be a prerequisite for a 5-band WAZ certificate. All

applications should show the applicant's WAZ number.

After the 150-zone certificate is earned, the final objective is 200 zones for a complete 5-band WAZ. CQ is donating plaques for the first 5 winners, after which the applicant will have a choice of paying a fee for his plaque and/or applying for an endorsement commemorating this achievement.

The applications should be sent to the WAZ Award Manager, W4KA. The 5-band award is governed by the same basic rules as for the regular WAZ and uses the same zone boundaries.

THE WPX AWARD

The CQ WPX award recognizes the accomplishments of confirmed QSOs with the many prefixes used by amateurs throughout the world. Separate distinctively-marked certificates are available for 2 x SSB, CW, and mixed modes, as well as the VPX award for shortwave listeners and the WPNX award for Novice amateurs.

All applications for WPX certificates (and endorsements) must be submitted on the official application form CQ 1051A. This form can be obtained by sending a self-addressed stamped envelope to the WPX Award Manager, Bob Huntington K6XP, 5014 Mindora Dr., Torrance CA 90505. It is highly desirable to use business-size envelopes, 8½" x 11", for this purpose.

All QSOs must be made from the same country. All call letters must be in strict alphabetical order and the entire call must be shown. All entries must be clear and legible.

Certificates are issued for the following modes and numbers of prefixes (crossmode QSOs are not valid for the CW or 2 x SSB certificates): mixed (any mode)—400 prefixes confirmed; CW—300 prefixes confirmed; 2 x SSB—300 prefixes confirmed. Separate applications are required for each mode.

Cards need not be sent but must be in the possession of the applicant. Any and all cards may be requested by the WPX Award Manager or by the CQ DX Committee. The application fee for each certificate is \$4.00 for subscribers and \$10.00 for non-subscribers, or the equivalent in IRCs. All applications and endorsements should be sent to the WPX Award Manager.

Prefix endorsements are issued for each 50 additional prefixes submitted. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 MHz—50; 3.5 MHz—175; 7 MHz—250; 14 MHz—300; 21 MHz—300; and 28 MHz—300. Continental endorsements are given for working the following numbers of prefixes in the respective continents: North America—160; South America—95; Europe—160; Africa—90; Asia—75; and Oceania—60. Endorsement applications must be submitted on CQ form 1051A. Use separate applications for each mode and be sure to specify the mode of your endorsement application. For prefix endorsements, list only additional call letters confirmed since the last endorsement application.

A self-addressed envelope and \$1.00 or 5 IRCs are required for endorsement stickers.

The two or three letter/numeral combinations which form the first part of any amateur call will be considered the prefix. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. The following would be considered different: W2, WA2, WB2, WN2, WV2, K2, and KN2. Any prefix will be considered legitimate if its use was licensed or permitted by the governing authority in that country since November 15, 1945.

A suffix would designate portable operation in another country or call area and would count only if it is the normal prefix used in that area. For example, K4IIF/KP4 would count only if it is the normal prefix used in that area. For example, K4IIF/KP4 would count as KP4. However, KP4XX/7 would not count as KP7 since this is not a normal prefix. Suffixes such as /M, /MM, /AM, /A, and /P are not counted as prefixes. An exception to this rule is granted for portable operation within the issued call area. Thus, contacts with a special prefix such as WS2JRA/2 count for WS2; however, WS2JRA/3 would count for W3.

All calls without numbers will be assigned an arbitrary 0 plus the first two letters to constitute a prefix. For example, RAEM counts as RA0, AIR as AI0, UPOL is UP0. All portable suffixes that contain no numerals will be assigned an arbitrary 0.

For example, W4BPD/LX counts as LX0 and WA6QGW/PX counts as PX0.

THE VPX AWARD

The VPX, or verified prefixes award, can be earned by short-wave listeners (SWLs) who possess QSL cards confirming reception of at least 300 different amateur prefixes. No mode endorsements are available. Applications are submitted to the WPX Award Manager in accordance with the WPX rules.

THE WPNX

The WPNX award can be earned by USA Novices who work 100 different prefixes prior to receiving a higher-class license. The application may be submitted after receiving the higher license, providing the actual contacts were made as a Novice. Prefixes worked for the WPNX award may later be used for credit toward the WPX award.

The rules for the WPNX award are the same as for WPX, except that only 100 prefixes must be confirmed and that applications are sent to the WPX Award Manager.

THE CQ DX AWARD

The CQ CW DX award and CQ SSB DX award are issued to any amateur station submitting proof of contact with 100 or more countries on CW, or SSB. Applications should be submitted on the official CQ DX award application.

All QSOs must be 2-way SSB or 2-way CW—crossmode or one-way QSOs are not valid for the CQ DX awards. QSLs must be listed in alphabetical order by prefix and all QSOs must be dated after November 15, 1945. Except for the mobile endorsement, all QSOs must be made from the same call area.

QSL cards must be verified by one of the authorized checkpoints for CQ DX awards or must be included with the application. If cards are sent directly to the Award Manager, Billy Williams N4UF, 911 Rio St. Johns Dr., Jacksonville FL 32211, postage for their return by first-class mail must be included. If certified or registered mail return is desired, sufficient postage should be included.

Country endorsements for 150, 200, 250, 275, 300, 310, and 320 countries will be issued. To promote multiband usage and

special operating skills, special endorsements are available as follows:

- a 28-MHz band endorsement for the 100 or more countries confirmed on the 28-MHz band;
- a 3.5/7-MHz band endorsement for 100 or more countries confirmed using any combination of the 3.5- and 7-MHz bands;
- a 1.8-MHz band endorsement for 50 or more countries confirmed on the 1.8-MHz band;
- a QRPP endorsement for 50 or more countries confirmed using 5 Watts input or less;
- a mobile endorsement for 50 or more countries confirmed while operating mobile. The call area requirement is waived for this endorsement;
- an SSTV endorsement (CQ SSB DX award only) for 50 or more countries confirmed using 2-way slow-scan TV;
- an OSCAR endorsement for 50 countries confirmed via amateur satellite.

A fee of \$4.00 for subscribers and \$10.00 for non-subscribers (or the equivalent in IRCs), to defray the cost of the certificate and handling, is required for each award. An SASE or one IRC is required for each endorsement.

The ARRL DXCC country list constitutes the basis for CQ DX award country status. Deleted countries will not be valid for the CQ DX award. Once a country has lost its status as a current country, it will automatically be deleted from our records.

All contacts must be with licensed land-based amateur stations working in authorized amateur bands. Contacts with ships and aircraft cannot be counted.

USA-CA AWARD PROGRAM

The United States of America Counties award, sponsored by CQ, is issued for confirmed contacts with specified numbers of US counties under rules and conditions hereafter stated.

The USA-CA is issued for seven (7) different classes, each a separate achievement as endorsed on the basic certificate by the use of a special seal for each higher class. Also, special endorsements will be made for all-one-band or -mode operations subject to the rules.

Class USA-500 requires 500 counties, USA-1000 requires 1000 counties and 25 States, USA-1500 requires 1500 coun-

ties and 45 states, USA-2000 requires 2000 counties and 50 states, USA-2500 requires 2500 counties and 50 states, USA-3000 requires 3000 counties and 50 states, and the ultimate award, USA-3074-CA, is issued for all 3074 counties in all 50 states. The USA-3074 award-ee is given a special honors plaque for a cost of \$35.

USA-CA is available to all licensed amateurs everywhere in the world and is issued to them as individuals for all county contacts made, regardless of calls held, operating QTHs, or dates whatever. Special USA-CAs are also available to SWLs on a heard basis.

All contacts must be confirmed by QSL and such QSLs must be in one's possession for identification by certification officials. Any QSL card found to be altered in any way disqualifies the applicant.

For mobile and portable operations, the postmark will identify the county unless information stated on QSL cards makes other positive identification. In the case of cities, parks, or reservations not within counties proper, applicants may claim any one of the adjoining counties for credit (once).

The USA-CA program will be administered by a CQ staff member acting as USA-CA custodian, and all applications and related correspondence should be sent directly to him at his QTH. Decisions of the custodian in administering these rules and their interpretation (including future amendments) are final.

The scope of USA-CA makes it mandatory that special record books be used for application. For this purpose, CQ has provided a 64-page, 4¼" by 11" record book which contains application and certification forms and which provides record/log space meeting the conditions of any class of award and/or endorsement required.

A completed USA-CA record book constitutes the medium of basic application and becomes the property of CQ for record purposes. On subsequent applications for either higher classes or for special endorsements, applicants may use additional record books to list required data or may make up their own alphabetical lists conforming to requirements.

Record books can be obtained directly from CQ, 76 N

Broadway, Hicksville NY 11801 for \$1.25 each. We recommend that two be obtained: one for application use and one for personal file copy.

To apply, make the record book entries necessary for county identity and enter other log data necessary to satisfy any special endorsements (band/mode) requested.

Be sure to have the certification form provided signed by two licensed amateurs (General class or higher) or an official of a national-level radio organization or affiliated club, verifying that QSL cards for all contacts as listed have been seen. The USA-CA custodian reserves the right to request any specific cards to satisfy any doubt whatever. In such cases, applicants should send sufficient postage for return of cards by registered mail.

Send the original completed record book (*not* a copy), certification forms and handling fee. The fee for non-subscribers to CQ is \$10.00 or 40 IRCs; for subscribers, the fee is \$4.00 or 12 IRCs. CQ subscribers should include a recent mailing label with their application (or copy). Send to USA-CA Custodian, Ed Hopper W2GT, Box 73, Rochelle Park NJ 07662. For later applications for higher class seals, send the record book or a self-prepared list (per rules) and \$1.25 or 6 IRCs (handling charge). For application for later special endorsements (band mode) for which certificates must be returned for endorsement, send certificates and \$1.50 or 8 IRCs for handling charges. Note: At the time any USA-CA award certificate is being processed, there are no charges other than the basic fee, regardless of the number of endorsements or seals; likewise, one may skip the lower classes of USA-CA and get higher classes without losing any lower awards credits or paying any fee for them.

SALMON-A-RAMA

The Racine Megacycle Club will be operating W9UDU, a special event station, during SALMON-A-RAMA from July 10th through July 18th, 1982. Operating dates and times: July 10, 11, and 17—1100Z-2300Z; July 18—1100Z-2000Z. Frequency: Fish locators have identified good fishing grounds in the General portion of the phone

bands on 10, 15, and 20 meters. Go fishing for W9UDU and receive a special QSL for an SASE to: W9UDU Racine Megacycle Club, c/o American Red Cross—Lakeshore Counties, 4521 Taylor Avenue, Racine WI 53405.

For more information, contact David Voss WB9USI, President, Racine Megacycle Club, 3333 Standish Lane, Racine WI 53405.

WAPAKONETA OH

The Reservoir Amateur Radio Association will operate K8QYL from 1300Z July 17 to 0400Z July 18 and again from 1300Z to 1900Z, July 18, from the birthplace of Neil Armstrong, the first man on the moon. Frequencies: phone—3940, 7260, 14285, 21360, and 28590, plus or minus QRM; CW—50 kHz up from the

bottom of the band at the beginning of the odd hours. Check-ins invited on K8QYL/R (147.93/147.33). Certificate for QSL and SASE to: K8QYL, PO Box 268, Celina OH 45822.

TOM SAWYER DAYS

The Hannibal Amateur Radio Club, Inc., will issue a second annual special certificate from the National Tom Sawyer Days celebration in Mark Twain's boyhood home town, Hannibal, Missouri, on July 3-4, 1982. Hours: 1500-2100 UTC both days. Frequencies: phone—7.245, 14.290, 21.400, and 28.700; CW—7.125 and 21.125 MHz. The club will also be observing our 50th anniversary. Help us celebrate! To receive the certificate, send a large (8" x 10") SASE and your personal QSL card confirming

the contact to the Hannibal Amateur Radio Club, Inc., W0KEM, 2108 Orchard Avenue, Hannibal MO 63401.

BONFIELD IL

Commemorative amateur radio station K9JLK will be operating from the Bonfield, Illinois centennial celebration from 1300Z, July 4, 1982, through July 5. Operating frequencies will be 223.50, 144.250 (SSB), 146.520 (FM), 50.115, 28.600, 21.400, 14.325, 7.275, and 3.8-3.9. For QSL, send an SASE to Jerry Whalen WB9WOC, RR 2, Kankakee IL 60901.

WINONA MN

The Winona (MN) ARC will operate WB0NIU on July 3 to commemorate the 125th anniversary of the signing of the charter of

the city of Winona. Winona is a river town in SE MN. The station will operate from 1500Z to 2100Z on 7.245, 14.290, 21.365, and 28.650 MHz. A special QSL for working this station will be available by SASE to Erik W. Brom WB0NIU, 3655 6th St., Winona, MN 55987. Other area stations will also be using these cards.

CELINA OH

The Reservoir Amateur Radio Association will operate W8DN from 1300Z to 1800Z, July 24, from the courthouse lawn during the Celina Lake Festival. Frequencies: phone—3940, 7260, 14285, 21360, 28590, plus or minus QRM. Check-ins are invited on WB8FNB/R on 146.01/146.61. Certificate for QSL and SASE to W8DN, PO Box 268, Celina OH 45822.

LETTERS

KB7NW A WINNER

I would like you to know that the article "Pacific Odyssey" by KB7NW was one of the best I have read in a long time. I thought the way it was organized and presented was top-notch, as was the use of photographs to supplement the excellent story line. I could almost feel I was there!

If you give awards for well-presented articles, J.D. Binders' "Pacific Odyssey" to Kingman and Palmyra sure get my vote!

This article is a credit to your magazine.

Homer Lasitter W6QX
La Jolla CA

We're glad you liked "Pacific Odyssey," Homer. And thanks for writing. Not only will the author enjoy your comments, the 73 staff appreciates the feedback. We encourage readers to let us know when they particularly like (or dislike) something in 73.—N8RK.

NO NUKES—I

I am a firm believer in our First Amendment rights, but I take issue with the basic premise of the May, 73, article, "Surviving the Unthinkable." Yes, I agree

that hams have a responsibility to be prepared for emergencies, but nuclear war IS unthinkable. There would be NO survivors. Preparing for a nuclear holocaust assumes there must be one, and that attitude just might help it happen. Hams should not give in—we must fight for our right to a life of peace.

David Stoft WD6DXX
Spokane WA

NO NUKES—II

I am upset by the "Surviving the Unthinkable" article in your May, 1982, issue, for several reasons. A sense of practicality plus the firm grasp on Murphy's Law which most amateurs have should reveal the weaknesses of the FEMA claims for how we shall evacuate. Missiles take only 30 minutes to arrive, and it will take far longer for all those in target areas to depart. To hope for any better circumstances is to hope that one's new antenna installation is going to go in without a hitch. Wishful thinking will not hack it.

True, amateurs can help in almost any emergency, but I feel that all amateurs should be burning the airwaves now to try to talk to anyone anywhere on the planet to forward the goal of preventing "the unthinkable."

To cheerfully accept ten million deaths is insanity, no matter what the format!

I sense that this is another "Gee, gosh, we can be so helpful" article. I do not want to be in the position of trying to provide emergency service to what would be left. I would rather work now at some other solution to the problem than get firsthand experience on how Murphy would operate with nuclear weapons as tools of his "whatever can go wrong, will" policy.

Amateurs have a unique ability to speak to peoples of other countries. Let's use that ability to forward efforts to prevent a nuclear conflict, rather than become another vulture watching over a possibly dying America as a part of this government's new Civil Defense push.

David Gibbons
Carmichael CA

BASH REHASH

Concerning the ongoing Dick Bash story, I'd like to add another log to the fire.

When's the last time you sat back in your favorite chair with a copy of QST's Q & A manual? Unless you're sitting on a bed of nails with five kids screaming around you and the TV set too loud, within a few minutes after opening the front cover, you'll be checking the insides of your eyelids for holes. In short, it's more boring than a monotonous voice telling you last week's news.

The questions in that venerable manual are not quite the same as found on the FCC tests, but then again, if you look closely, they're not all that much different, either. The tricky part is trying to wade through what is termed an answer without having to reread it many times. By then, your attention and patience are wearing thin. After a few pages of this you begin to wonder if it's worth it. Those of stout heart and strong desire may make it just a bit further, but eventually the book is closed and gathers dust. The *Ameco Study Guide* is not quite as bad as it lays out the explanation without so much fairy dust sprinkled on it. If you haven't had the time to look over one of Dick Bash's books, he does give the test question and the test answer, but it doesn't just stop there. It explains why that is the correct answer and does it with enough literary flair to keep your interest to the point of making a more lasting impression.

For several years in the Army, I taught basic electricity and aircraft electrical systems to servicemen who not only didn't want to be there, but some of them shouldn't have even been there to begin with. Vietnam caused some barrel scraping near the end. How do you teach people like that? You create an atmosphere or situation that captures their interest. It wasn't easy and most instructors didn't even try, but when you succeeded you knew it and the students

knew it, too. I was also partly responsible for writing tests and lesson plans. My approach was somewhat similar to Dick's although greatly restricted due to bureaucratic regimentation.

Have you ever met Dick Bash? He's outgoing and congenial but a bit of a maverick, like most people who create or lead. He saw a weakness in the self-tutorial method of teaching a complex subject that was sorely lacking in instructional material that filtered out the black boxes, witches, and demons. There are those in this world who consider electronics as "black magic" and some of them are hams. Basic electricity, if taught properly, can be interesting and informative. If college courses are offered for electronics, how does the average person expect to learn it without some help?

Letters to editors are strange things. This is my first and probably last one. Every subscriber gets to read the editorial—which is really only one man's opinion—and the mass is left to draw its own conclusions but based only on the editorialized facts. The editor may consider it his prerogative to tell it the way he sees it, and who's to dispute it? I feel you were wrong to so vehemently condemn Dick Bash as you did and not give everyone the facts of what the book is really like. I've met Bash class graduates and find them no different from hams I met 10 or 15 years ago. We need to increase and strengthen our numbers and I don't feel one bit like we're compromising ourselves with Dick's books.

I can almost understand QST not wanting to run his ads. After all, a "non profit" organization in the publishing business with a corner on most of the "instructional material" has to protect its own interests. Doesn't it? What all this boils down to is this: Whether you consider the Dick Bash books unethical or not, they get the job done of informing and teaching. Even my wife learned enough to evoke a response of, "So that's how it works!" I'm not going to fault Dick's system one bit because it works. What I do fault is your remarks of "poison" and "being insidious" without ever telling what the books are like and letting people draw their own conclusions. I would expect that of

a rag like the *National Enquirer*, but not from *73 Magazine*.

**Fred Palmer WA5WZD
Corinth TX**

Have I met Bash? Heck, Dick worked for us here for a while. He drove us crazy and we gave up trying to harness him. We parted good friends and I think stay that way. Dick knows what I think of his "system" and why.

The Bash approach does give some slight attention to explanations, but the brunt of his books is to present, word for word, the questions you are going to face...and their answers. The one-day intensives are designed to fill your short-term memory with the questions and answers, not long-term real understanding of electronics and radio. If you are unable to take the FCC test the next day after an intensive by Bash, you can be in deep trouble.

One of the more serious disasters of our whole educational process has to do with the continued use of short-term memory for the passing of tests instead of getting the information into the long-term memory. This is why so many students have little recollection of a course once they have passed it. This was my major gripe with college, where the emphasis was on read-and-take-a-quiz, with little effort to discuss the material and thus give it a chance to be understood and filed away in more permanent memory.

The Navy, on the other hand, had a fantastic course in electronics, where they taught theory and then immediately took you into a lab to work with that theory and thus grow to really understand it. In classes, we discussed the theory until we were able to think in electronic terms. If I'm able to get a college started, it is going to teach the students to think, not memorize. They are going to learn about electronics and then work with it. They will learn about communications and then learn to design, build, and service equipment. They will learn computer design...and repairs. They will learn to write programs and fix 'em.

It may be that amateur radio has so fallen apart under the pressures to let in one more friend or wife that it no longer is even considered important for hams to understand radio. If so,

we should formally agree with this and throw away our charter, section 97, and put amateur radio and CB together into one service, being honest about our motives.

Fred, when I suggest that hams get mad about this and rush to their neighborhood ham store and rip Bash's cheat books to shreds, I know...as do you, if you think about it instead of reacting...that what will happen is a rush to buy these short cuts to getting a ticket. They do work. It is now possible to get a ham ticket without really knowing a damned thing about electronics or radio. People with a knack for the code can learn it enough to pass the test in about one hour. That's how long it took me to get to 5-wpm solid copy right from not knowing a single character.

If it's easy ham tickets you want, Fred, you've got 'em now. But I don't see that bringing in many hams. Hell, we can't even give ham tickets away these days. Now, I may be wrong about wanting hams to clean up the act...to get our clubs to start teaching the fundamentals of theory and making sure that newcomers qualify. Most of my mail says I have a lot of hams backing me, but there are opponents such as you.

Perhaps we are still being too strict in our tests. One could certainly make a case for the amateur tests being biased so that they exclude blacks, women, Chinese, Latin-Americans, and other such groups. Perhaps it is time for a move toward affirmative action and an open-door policy for these under-represented groups. Should we start seeing how simple we can make the procedure in order to give these minorities (and the female majority) their "rights"?—Wayne.

NO MISTEAK HERE

This letter is in reference to FCC spokesman Vernon Wilson's denial of misspellings on FCC code tapes (page 121, 73, May, 1982).

Over the last few years I have taken one General class test and two Extra class tests (one failed because of nerves and pressures and one passed with 100% a month later). I found these tests to be difficult. However, there were no misspelled words, irregularities, or even

sneaky tricks. I even had Springfield on one (spelled correctly). Interestingly, one fellow told me after the test that he had copied Springvale; another had copied Springdale.

Under the extreme pressure we hams generate within ourselves at test time, I believe it is quite possible to sincerely, but incorrectly, copy "mistakes" that simply are not there.

**Lincoln Thorner KS2H
New York NY**

KS2H's letter is like several others we have received. No one has come forward with documented evidence of a misspelling on the FCC code exams.—N8RK.

BRAINS NOT FISTS

I have here in front of me the March issue of *73 Magazine*, but what I want to talk about is not how much I like it but your stand concerning the requirement for the Morse-code test.

There should be no question but that in this day and age of space exploration and digital electronics, this requirement is pathetically antiquated and comparable to requiring Greyhound drivers to know how to handle a Conestoga wagon. It serves no purpose other than to keep away from amateur radio technically competent people who have neither the patience nor the time to waste in learning a skill that has no place in state-of-the-art electronics.

All of the surveys that showed "overwhelming opposition" to a no-code license have been performed with no objectivity and a lot of bias in a group of individuals who had a vested interest in the outcome. Nobody should be a part of, or a judge in, a contest of any kind who thinks: "What? A no-code license? Over my dead body! Let them sweat it out as I did!" You don't have to be endowed with divinatory powers to know beforehand the outcome of such a survey. In other words, newcomers not welcome!

Keep up the good work and be sure that once again we will see in the future who was right. What we need today is brain, not fist! Your suggestion to use technical knowledge as a filter, instead of Morse-code skill, does make a lot of sense.

Oh, by the way, let me tell you that I am not a frustrated would-

be ham who flunked the code test. Many years ago, more than I care to remember, I had to get a commercial second-class radio operator's license (including Morse at 20 wpm), and to this day I fail to see what good can come to amateur radio by turning the code skill into a fetish.

It is about time that some common sense is written into these regulations.

**Paulo G. Lefevre
PY1AQL/CT1EM
Carcavelos, Portugal**

Olé. — Wayne.

HORSERADISH DISPLAY

I've been fascinated by QSL cards since I was an SWL in the early 1950s. A QSL is a special thing—representative of the individual, locale, and country of origin. I am quite aware of the expense involved, be it the simplest "Quick Print Shop" shot of a hand drawing or the elaborate five-run or color photographic rendition.

The thing that moved me to write this letter is the volume of cards seen since become a DX QSL manager (CE5BYY). Gentlemen—the ladies are now left out, they do it right—the blotter paper and repetitiously inane renderings passing this way don't even rate a shoe box as a repository. As a person driving up in an unwashed, beat-up automobile makes a lasting first impression, so do your cards.

It pains me to see that cards from the South Pacific that ten short years ago had swallowtail butterflies, birds of paradise, and outrigger canoes now look like the cards of members of the Southern California DX Club. How many cards can a person with DXCC, WAZ, and God-knows-what-all possibly send? Economy seems to rule, however, and I would offer the following comments.

1. Lack of return postage is a paramount issue as it makes the card expense critical.

2. The card's free, the freight ain't.

3. If you care and really have had at least one original thought in your life, consider the fact your card represents *you*, so do it cute, professionally, or at least in good taste and design.

If you're tired of seeing your country QSL display looking like horseradish and mustard, the solution really rests with you

and the merchants of mediocrity who simplify the continuation of the problem. The DX is really waiting for you to get your act together.

**Terry F. Staudt W0WUZ
Evergreen CO**

Readers who don't like horseradish are encouraged to submit a QSL card to 73's monthly contest. You will find details with this month's winner.—N8RK.

DX FOR THE BLIND

Two years after losing my sight from detached retinas, I obtained my Novice class license. Six months later, I achieved General class status and have been a DXer ever since. Two common problems for the blind DXer are the inability to obtain current DX information and the difficulty of filling out DX cards.

I am writing this letter to inform blind DXers of a new and exciting service. The Braille DX Service provides: (1) a monthly cassette recording of current DX activity and expeditions, as well as important QSL information, and featuring the Kansas DX Association monthly newsletter, (2) a current DXCC countries list in Braille or on cassette tape, including regular up-to-date prefix changes, and (3) a personal QSL manager for outgoing cards. Volunteers fill out the blind DXer's QSL cards, and log information is passed, either by on-the-air schedules or simply by mailing the information direct to the volunteer. Log information can be recorded on cassette tape and mailed to the volunteer.

Membership is simply a one-time \$2.00 donation to help purchase blank cassette tapes for the monthly newsletter. The Kansas DX Association has demonstrated their interest in this program by providing a cassette recording of the monthly newsletter and volunteer QSL managers for the blind DXer.

**Phil Scovell AF0H
Lakewood CO**

3 CHEERS FOR MFJ

I want you to know about an experience I had with one of your advertisers. Two years ago at the Atlanta Hamfest I purchased an MFJ-962 antenna tuner. Well, as you might know, I probably loaded it wrong and

blew a small coil in the swr bridge circuit. I called them on their WATS line, and it was not until later that I read down the page a bit and saw that I had called the sales number and not the parts and service department. A very pleasant YL answered and, not understanding what I wanted to order, she connected me to an OM by the name of Stan. I explained to Stan that I had blown the coil, that the unit was out of warranty, and that I wanted to order another. Well, a strange thing happened for these times, as Stan refused to sell me the coil; instead, he insisted that I give him my name and address and he would get one out to me in the mail...at *no charge!* Now that is what I call darn good business PR.

It was not so much the cost (or in this case, non-cost) as it was the pleasant manner in which this was handled, and I would appreciate it if you would let your readers know about one of the "good guys"—MFJ Enterprises of Mississippi State, Mississippi.

**Don Williams Sr., Publisher
68 Micro Journal
Hixson TN**

HAM PEACE CORPS

In your 73 issue of November, 1981, I saw your editorial about South Africa and would like to record my disapproval of your visit to the Republic of South Africa.

South Africa is the only remaining country which violates human rights on the basis of race (skin pigmentation). This violation is perpetual and cannot be transcended (because you cannot change your color) and is grossly unfair to its people and the people of the world (because such ideas might spread out of South Africa to the rest of the world again). Therefore, it is necessary to fight such an unfair system by all means, including withholding technology, sports contacts, amateur radio contacts, etc.

Why? Because the racist minority in power (which does not include all South African whites) can use such technology to oppress the majority and international sports and cultural contacts to win international acceptance and legitimacy. Building up communication technol-

ogy through amateur radio is one such example—communication technology can be used to spread ideas of apartheid and for police and military purposes.

You might say, sure, South Africa violates human rights, but what about other dictatorial regimes in Africa/South America/Asia? There, oppression is through ideology (belief systems) or money (class background of a person), etc., and boycott action against them is valid and is practiced, e.g., against Chile, Poland, etc. The only similar case is the caste system, as it is practiced in the feudal and backward areas of India—where you are born into a caste and are discriminated against.

As a citizen of a multi-racial democracy (the same as in your case) where people of various races (Caucasian, Mongolian, and Negroid) live in harmony, settle, and marry across regions and are guaranteed the same constitutional rights, I think it is our duty to discourage contacts with South Africa.

Right now, the Republic of South Africa is involved in a PR campaign (albeit the organization of such a campaign may well be loose) and is trying to get scientists, scholars, and sportsmen to visit them (e.g., UK cricket players, Taiwanese scholars, etc.). Clever as they are, they sent Dr. Christian Barnard (the famous heart surgeon and a believer in racism) to India, knowing that he would be the least objectionable here.

I respect 73 for its boldness (in criticism of regulatory bodies), its presentation (which is lucid and interesting), and its keeping abreast of new technology, and this is the very first time I feel the urge to express my disapproval. I hope that you will take it in a constructive spirit and respond to my arguments.

**Gopal Kamat VU2JE
Bombay, India**

Well, Kamat, just in case there are some readers who agree with your thinking, it might be prudent to answer your criticisms. Let's go back a few years to the time when the US was involved with Vietnam. Recall with me, if you will, that my country was being severely criticized by much of the world. Many people were busy not visiting the US be-

cause it was involved in that unpopular war.

Possibly, Kamat, you were not a reader of 73 during those years. If you had been you would know that there were a number of Americans who were not in favor of the war. Some reacted by being completely negative about it... just get out and leave 'em alone. Others recognized the problems involved, but felt that there was more than one way to respond. Indeed, I made a trip around the world and talked with hams in many countries about the situation. As a result, I developed a plan which I felt was far better than fighting. I distilled the ideas I ran into in Yugoslavia, Thailand, Singapore, and New Caledonia as I talked with hams in these countries.

My plan seemed relatively simple, workable, and most likely to result in avoiding further bloodshed. I am convinced that if the US had followed it that a unified Vietnam would be free of communism... as would Laos and Cambodia. I wrote of my plan in 73 and got hundreds of letters supporting it. I also sent it to Congress, but as far as I know not one copy ever got through the assistants. I failed... but at least I tried.

Now, about South Africa. Sure, many people are at odds with the South African government. But does that mean that we have to hate South Africans? What possible benefit is that to anyone? I went to South Africa to visit the hams and computer fanatics, not the government. As a matter of fact, I don't think I met anyone from the government.

The people that I did meet and talk with are as helpless about the policies of their government as I was about mine. They, sad-

ly, have far less freedom to speak up in criticism... but then there are very few countries which are as permissive as the US. And remember, please, that there are some government agencies in the US which will not permit open criticism. Our country is good in many ways, but it is far from free as yet.

May I contrast your negative attitude with my positive one. You advocate not visiting countries of which you disapprove. I advocate visiting them and advocating changes to them which will improve the situation. Indeed, while I was in South Africa I went on television during prime time and said flat out that it was time for them to consider making some moves to change their basic policies. I am told that over a million blacks and whites saw my broadcast.

I think I got their attention when I put it this way... I explained that there are about 59 countries in Africa and that approximately 58 of these hate South Africa. I suggested that perhaps it was time to start doing something to counter this... and I had a positive suggestion, not a negative one.

As I pointed out, we are entering an electronic age. Computers and telecommunications are inseparable with the future. I also pointed out that unless South Africa did something... and quickly... the country would be passed by in technology. To keep up with the need for people to invent, build, operate, and service the technology of the future, they are in need of tens of thousands of technicians and engineers.

The only reasonable source of this many technical people will be for South Africa to make it a policy to introduce amateur

radio and computer clubs in their high schools. They will have to get teenagers interested in technical careers.

Okay. The next step is an obvious one... the need for technical colleges to bring these interested teenagers up to the state-of-the-art in electronics, communications, and computers. This can be done either the expensive way... by the government paying for it... or it can be done by getting private industry to pick up most of the tab. I suggested they consider my plan for opening a college which is integrated with several local electronics businesses. In this way, the students would get the best of the formal technical education... and the practical professional experience of working with a business firm.

Further, I proposed that they include plenty of business courses so that the students would be well rounded in both technical matters and business. I suggested that they teach advertising, writing, speaking, finance, hiring, personnel management, purchasing, and so on.

The income from working with the on-campus firms would keep the end cost of the education low and within the reach of most middle-income families.

Then, once this idea had sunk in, I proposed what my interviewer called the Electronic Peace Corps. This was a plan to bring in worthy students from the other African countries for a free education in this new type of school. The cost would be low and the students, once they returned to their native countries, would soon rise to the top by virtue of their education and experience.

The people in the other African countries realize that they

have no opportunity for a good education unless they leave their country. At present, the only sources for a free education lie in Moscow and Havana. These are not very attractive alternatives. Further, the people in these countries realize that they are on a downward spiral, something which only an infusion of educated people can change.

The courses in South Africa would not, at first, be very popular because of the hatred. But something as valuable as that for nothing might overcome all sorts of emotional blocks. South Africa would have to see that the black students were treated fairly and given the best of educations. I think the floodgates would open and eager students would come in from all over Africa.

It will take a long time to change Africa... but isn't it time to get started? There are tremendous resources in Africa... with plenty of country for farms, millions of educable people, and nowhere to go but up. Yes, there are tremendous obstacles. I've been there and seen them. I've talked about them with ham friends in many of the African countries. We're looking at several generations before things are really changed.

But with educated entrepreneurs in more and more African countries it could be possible to stop the destruction of these countries by their despot leaders and to start working for their eventual strength.

Isn't it better to visit a country and make a try at doing something to help change things? The thousands of people who have not visited South Africa have done nothing. It may be that my voice has been completely lost... but I did try.—Wayne.

REVIEW

ICOM IC-4A 440-MHZ HT

I recently purchased an Icom IC-4A 440-MHz hand-held FM transceiver because I wanted to get on the FM portion of the 3/4-meter band in the most cost-effective manner possible. I wanted to move up from the Motorola T-44, which lacks frequen-

cy stability and is quite large and heavy. I believe that I made a very good decision and if you'll read on, I'll be glad to tell you why.

First, I decided that my next rig would be new. With a unit straight from the factory, you

get some kind of a warranty—at least saying that it will work right from the start. (Everything that I ever bought used always had something wrong with it.) Usually one faces a minor thing such as a noisy volume control or a worn-out switch. But if it is an intermittent problem that wants to be hard to trace down, may God help you! Also, when people sell their old gear they seem to want almost what they paid for it way back when. This is good salesmanship, I suppose, but I'd rather spend the ex-

tra bucks for state-of-the-art and a warranty.

No Crystals

Second, I decided that the rig would be synthesized. Activity on 440 is growing as more and more of the two-meter-FM crowd are getting one of the current crop of 70-cm FM hand-held units (Icom IC-4A, Yaesu FT-708R, Tempo S-4, Santec ST-440/up). Therefore, more repeaters are bound to appear.

Transmit and receive crystals of the high-accuracy (HA) vari-



Photo A. The IC-4A hand-held 440-MHz FM transceiver. (Photo by Michael D. Landis)

ety go for just over thirteen dollars a copy (anything less just doesn't make it). After a one- to two-week wait, the crystals arrive, and after installing them in the radio, you get to adjust those tiny trimmer capacitors until you are exactly on frequency. Also, the price of twenty crystals, as an example (ten for transmit and ten for receive), times thirteen dollars each comes to \$260, which is about what I paid for my IC-4A.

The IC-4A offers 2000 possible channels—the top 10 MHz of the 420-to-450-MHz band, in 5-kHz steps. The thumbwheel switches select the frequency in 1-MHz, 100-kHz, and 10-kHz steps, with the 5-kHz select switch just to the right of the thumbwheel switches. (The switch at the extreme right is not used by Icom—it is there for you to wire up a switchable tone encoder.)

The antenna connector is a BNC type, and below it are external microphone and speaker jacks. To the right of the antenna connector is an LED which lights during transmit. It also serves as a battery indicator; if it goes out while you are squeezing the push-to-talk switch on the left side of the radio, your battery has just died. (You can,

as soon as you notice the LED go out, immediately unkey, then key up again and say rapidly, "This is [your callsign]—clear," if this makes you feel better. You may even get through. If not, the next person in line will probably sign you out.)

On the back of the radio are three slide switches. The rf power switch, which is the top one, selects between .15 Watts out in the low position and 1.5 Watts out in the high position. In the low-power position, you draw only 43% of the current that you do in the high position, so you can transmit about twice as long. But remember that you're putting out only one-tenth the power. I do not consider this to be a good enough trade to warrant the use of the low-power position unless I am within spitting range of a repeater.

Below the power-select switch is a duplex/simplex select switch, and below that is a +5-MHz/-5-MHz transmit offset switch. Don't ask me why Icom does not use a single three-position switch that has 5 down, simplex, and 5 up on it. My IC-4A does not have an out-of-band transmit-inhibit circuit in it since the HT will transmit

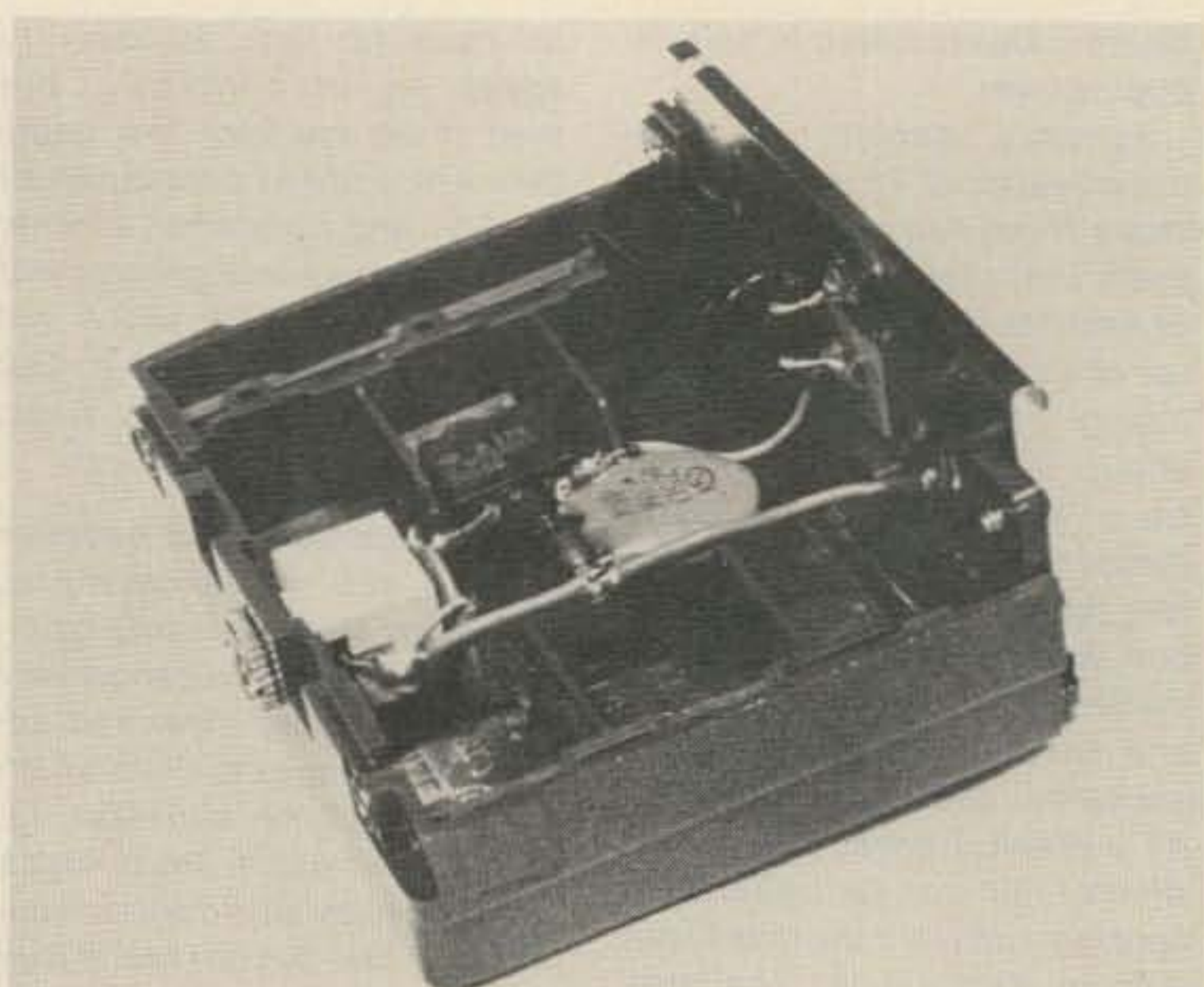


Photo B. The regulator circuit in the BP-4 case. (Photo by Michael D. Landis)

from 435.000 MHz to 454.995 MHz when in the duplex mode.

The microphone is located on the front of the radio case to the bottom right of the speaker, just above the word "microphone" that is molded onto the case. I was so used to those CB-type hand-helds where the speaker is used as the microphone that it took me a while to realize that I was directing my voice into the wrong place. Talk into the lower-right corner of the speaker where there is a little rectangular slot cut into the case, and you will get full audio quality!

The unit comes in a grey plastic case, lacks the bells and whistles that inhabit the fronts of other brands of HTs, and doesn't have as much shiny metal. To me, it looks more like a policeman's HT than a ham's playtoy.

Along with the radio you get the rubberized flexible antenna, a BP-3 battery pack and a wall charger for it, a metal belt clip and two screws with which to attach it to the radio, a hand strap (which I never use), an earphone (which I never use), and one each submini plug and mini plug for the external mike and speaker jacks. You also get an instruction manual which gives a good general idea of what is going on, and two separate sheets which are quite detailed schematic and circuit board layouts. The size and appearance of the rig is identical to the IC-2A/AT, and except for antennas, they use the same accessories.

The radio will not scan unless you want to wear out your fingers on the thumbwheel switches, so you must own a programmable scanner or know the frequencies you will be using. Otherwise, you may need to get one

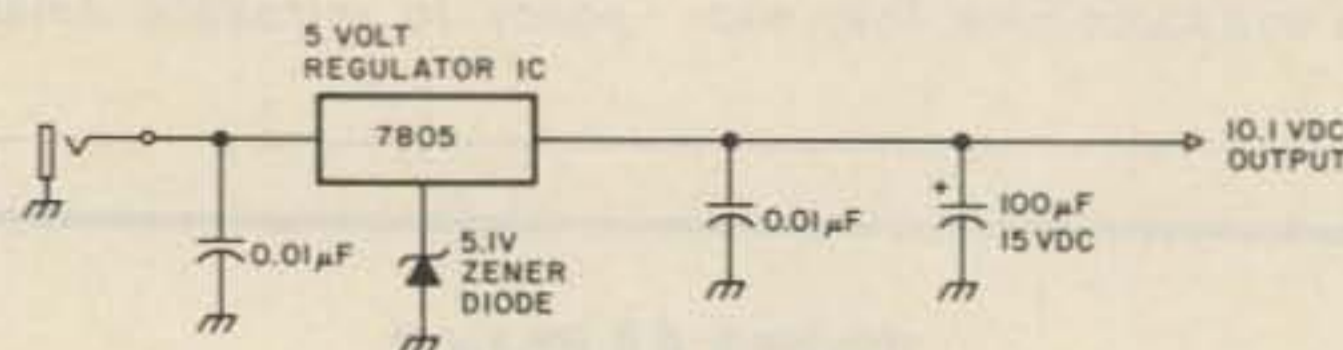


Fig. 1. Regulator built into a BP-4 battery case.

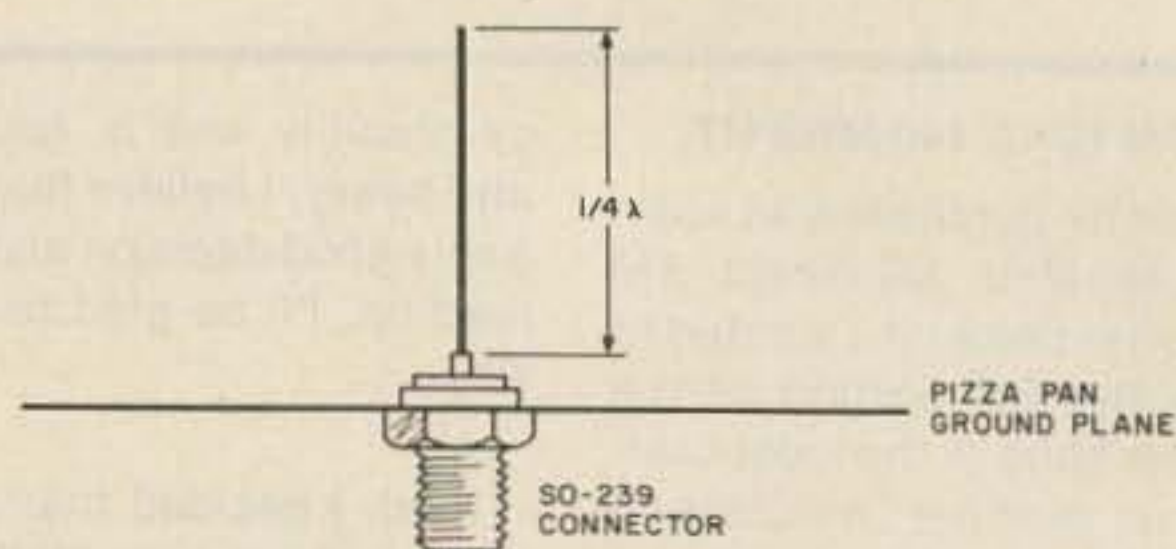


Fig. 2. An improvised quarter-wave ground-plane antenna.

of the band-scanning rigs instead of this one.

For some serious rag-chewing with this rig, you need either a basketful of batteries or an ac-operated power supply. I have built a regulator circuit into a BP-4 battery pack case which allows me to use the car battery (via a cigarette lighter power adapter and a miniature plug) or my unregulated 13.8-V-dc power supply at home. The schematic for the regulator is shown in Fig. 1, and Photo B is a close-up of the finished product. (If you don't like my way, you can look up WB3JJF's article in the February, 1981, issue of *Ham Radio*.)

When I'm at home, I use an improvised quarter-wave ground-plane antenna that works quite a bit better than the rubberized whip antenna. It consists of a pizza pan (for the ground plane) with a hole in the center to hold an SO-239 jack. (See Fig. 2.) I soldered a stiff copper wire to the top of the jack. A PL-259 plug with RG-58/U or RG-8/U cable is screwed onto the connector, and the length of the copper wire whip is trimmed to one-quarter wavelength or for lowest standing-wave ratio at your favorite frequency.

Unfortunately, I don't have a lot of sophisticated test gear, but I can tell you that .3 microvolts of signal will definitely quiet all the rushing noise in my receiver. The power with a fresh battery is somewhat higher than that stated in the manual, and most amazing of all (to me) is that all channels are stable, with very little frequency drift.

I got my IC-4A for just under \$260 from my local ham radio store in December, 1981, and for another twenty dollars or so, I could have gotten the touchtone™ pad version.

I want to thank WA8JJI for the improved antenna idea, my sister Frances for the permanent loan of two of her pizza pans, and also Mike Landis, who took the pictures.

Now I can hardly wait for Icom to come out with its 23-cm (1215-1300-MHz) band HT. For more information, contact *Icom America*, 2112 116th Ave. NE, Bellevue WA 98004.

**Walter R. Stringer N8BSG
Ferndale MI**

IC-25A 2M FM MOBILE RIG

It may be a mystery to most of us how the manufacturer man-

aged to stuff so many components, operating features, and good ideas into so small a package, but it is no mystery that the trend in ham gear today is toward the small. In this ham's opinion, with reference to medium power (25-W) VHF ham gear, the apogee of miniature electronics is reached by the Icom IC-25A two-meter FM mobile rig.

Features

The rig measures a mere 5" by 2" by 7" and weighs in at a paltry 3.3 pounds. Within these lilliputian dimensions, Icom has crammed 48 transistors, 5 FETs, 19 ICs, 91 diodes, and a 4-bit microprocessor to keep track of the lot. The result of this shoe-horning is a feature-packed mobile radio that offers the user: 25-W/1-W power outputs, scanning of five memory and two vfo frequencies, full or programmed band scan, programmable splits for non-standard repeaters, dual-speed vfo tuning in 5-kHz or 15-kHz steps, seven-segment S/rf LED bar display, priority channel function, normal/reverse function for monitoring repeater inputs or working inverse splits, and, most important, two fully-independent vfo's. And all this from the front panel!

Should you require more options, you need only open the top cover to gain access to: a scan speed control, a scan-stop timing control, a scan-stop timer switch, and a scan-stop function switch. The last allows the operator to choose either busy or open channels for scan-stop.

By comparison, the rear panel is simple. Here, arrayed around a massive heat sink of the SC1019 power amplifier, is a power-connection cable, an SO-239 antenna connector, and an external speaker jack (4 to 8 Ohms).

The IC-25A is designed to run off a 13.8-V-dc source, and no provisions are made for reversing the negative ground configuration of the supply. The manufacturer claims that the unit draws 400 mA in squelched receive and 600 mA with full audio output of 2 Watts. In the transmit mode, the rig draws 1.3 A at one Watt out and a healthy 4.8 A for the full 25-W output. Icom suggests that a 6-A supply be used in base-station applications.

Design

Electrically, the IC-25A exemplifies solid design practice. The transmitter uses a double-balanced mixer and variance-reactance frequency modulation to generate 16F3 output. A high-impedance dynamic mike with built-in touchtone™ pad and preamplifier is provided as standard equipment. The receiver employs a double-conversion superhet scheme (i-fs at 16.9 MHz and 455 kHz) as well as a MOSFET rf amplifier. A double-balanced mixer, two monolithic crystal filters, and several ceramic filters are provided to improve selectivity.

The most unusual aspect of the IC-25A's design is the dual vfo system. The rig's heredity can be seen clearly from its frequency-control system, and anyone who has ever operated an Icom 701, 720, 730, etc., will feel quite at home with the IC-25A. At the heart of the frequency-control system is a digital phase-locked loop (PLL) circuit that generates 40-MHz and 122-MHz signals.

A rotary encoder connected directly to the main tuning dial generates clock pulses for up/down frequency selection. A 4-bit-wide CPU chip running under the control of Icom firmware provides the smarts. The result is an extremely flexible frequency-control system that allows for continuous tuning in 5-kHz or 15-kHz steps, depending on which of the two vfo's is chosen.

About the only feature left out of the IC-25A's frequency selection system is the ability to memorize offsets. As a result, operator intervention is required if operation is desired on a memory frequency with a new split.

Performance

The bottom line for any piece of mobile gear is its performance on the open road. After commuting with the IC-25A for more than three months, I can say honestly that it is one of the friendliest mobile rigs I have ever used. Of paramount importance in a rig this size is front-panel layout. With 13 controls jammed into an 11-square-inch area, the ergonomics of the layout had better be good.

Vfo and memory-selection channel switches are located toward the driver, on the left side of the front panel. The large main tuning knob also is skewed to the left. Volume/on-off and

squelch/high-low power controls are placed adjacent to one another and, immediately above them, three push switches provide easy (yet isolated) access to scan-width control, simplex/duplex control, and Nor/Rev function.

The one inconvenient placement on the front panel is the proximity of the memory-write switch and the scan-stop switch. A problem often occurs when, in an effort to initiate scanning, an operator inadvertently depresses the memory-write switch. When this happens, an erroneous frequency (whatever happens to be in the vfo at the time) will be written into one of the memory channels. The problem is further compounded by the identical feel of the switches. (Mike-scan control is an option, however.)

Another front-panel shortcoming involves the display. Aside from the normal visibility problems inherent with red displays operating in bright sunlight, the IC-25A display is difficult to read because it uses an LED instead of a full 7-segment digit in the 5-kHz position. As a result, it can be difficult to discern whether the frequency is 7.37 or 7.375. There seems to be room on the front panel for a full-size 4-digit display, and the rig certainly would benefit from the addition of a real digit in the 5-kHz position.

Used in conjunction with a 1/4-wave whip, the IC-25A was able to access any repeater I heard. In fact, it often heard too much. My unit displayed adjacent-channel interference on strong signals (40-60 dB) 15 kHz away from the center of the passband, resulting in cross-modulation of the incoming audio. The problem seemed more acute on the high side of the passband, indicating a slight receiver alignment irregularity. In any case, the problem, though annoying, was apparent only on the strongest of signals.

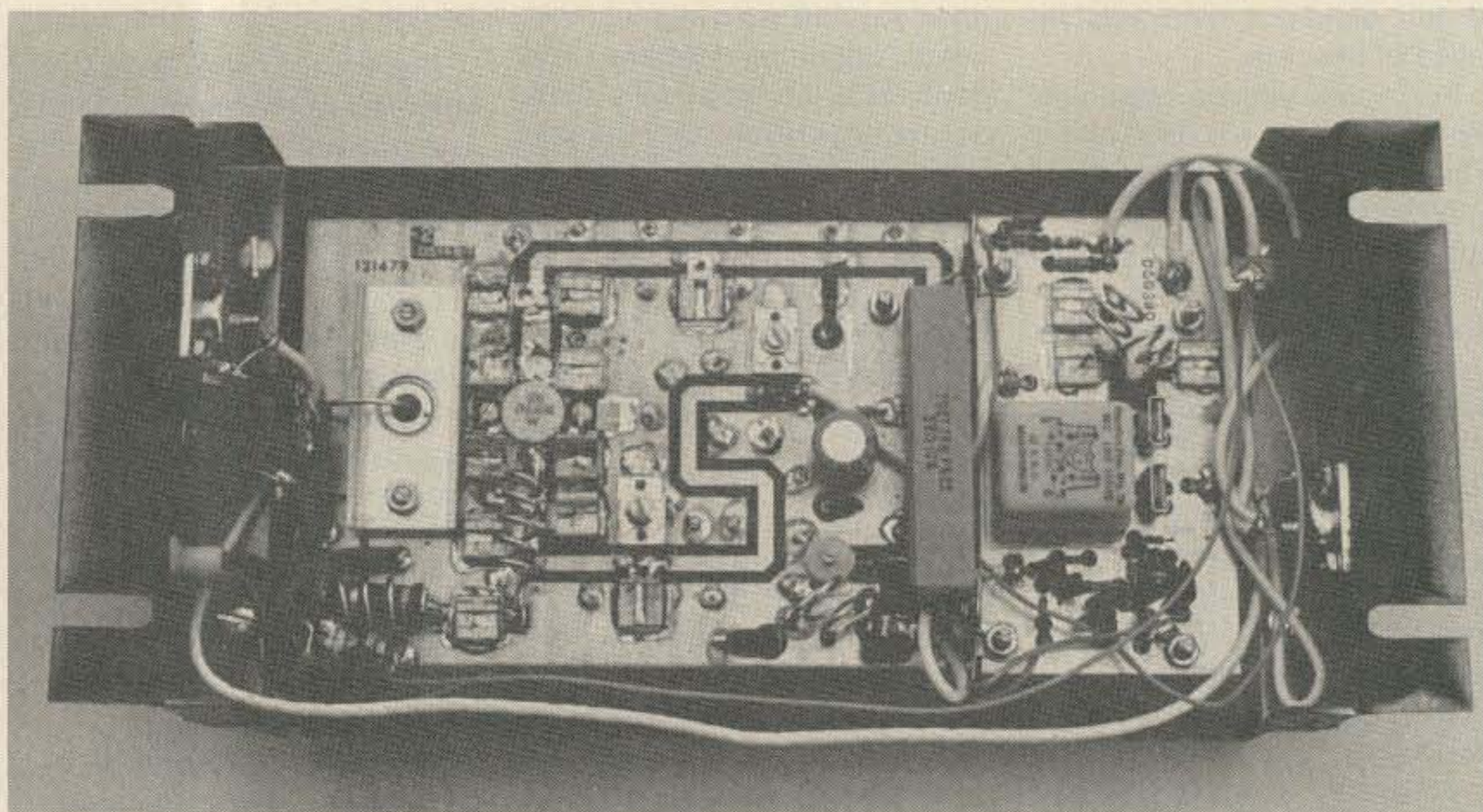
With any radio of this complexity and compactness, documentation is crucial. Icom has done a laudable job in this area, and its efforts are by no means limited to the 34-page owner's manual. An 11" by 16" schematic is included as well as life-size component overlays for each PC board. When used in conjunction with the comprehensive theory-of-operation section of the manual, graphics like these could get hams once more into

troubleshooting and even repairing their own gear.

The IC-25A is an impressive package of performance and features at a very competitive price. (The list price is \$349.) Its small size will make it attractive to owners of today's gas-efficient micro-cars, and as an added benefit, when installed in-dash like a normal car radio, the rig is relatively immune to theft. If you want big radio functions in a small package, Icom's new IC-25A is worth your consideration.

For more information, contact *Icom America*, 2112 116th Ave. NE, Bellevue WA 98004.

Chris Brown KA1D
Groton MA



Heath VL-1180 All-Mode VHF Amplifier. The amplifier board is on the left, T-R board on the right.

HEATHKIT MODEL VL-1180 ALL-MODE VHF AMPLIFIER

New England is a land of hills and valleys; it's challenging country for 2-meter mobile operation. I discovered just how challenging shortly after installing a 10-Watt rig in my car. Delighted at being able to hear my buddies chatting on a popular repeater some 20 miles distant, I attempted to join the conversation. "Sorry old man, you're not quite making the machine." How humiliating!

An amplifier was definitely in order. And since my 2-meter rig is an all-mode radio, I wanted an amp suitable for SSB and CW, as well as FM. The Heathkit VL-1180 All-Mode VHF Amplifier had just been announced. As a long-time Heathkit builder, I couldn't resist.

Description

The VL-1180 is a linear amplifier covering the 144-148-MHz range. It is designed for use with exciters providing between 1 and 10 Watts of drive. A Motor-

ola MRF-247 transistor is used as the final, and the nominal output is 75 Watts with 10 Watts input. Insertion loss is 0.6 dB. The amplifier features a self-contained transmit-receive (T-R) relay which is keyed either by a push-to-talk line from the exciter or by the rf sensing circuit built into the VL-1180. The amplifier operates on 11.5-15 V dc and draws 11 Amps at 75 Watts output. Standby current is a mere 3 mA.

The VL-1180 measures 2-1/2 x 4-5/8 x 10-1/2 inches and weighs 3-1/2 pounds. A power switch is the only control provided. The power leads and T-R switching line (if used) enter the amplifier by way of a three-conductor Molex® plug.

Except for connectors and the power switch, all components in the VL-1180 mount on a pair of double-sided printed circuit boards. The larger of the two holds the amplifier circuitry. A smaller board contains T-R

switching. Assembling the amplifier took five easy evenings. While no insurmountable problems were encountered, the amplifier board was a challenge in one respect.

In order to ensure a good connection between the ground foils on the top and bottom of the board, you are instructed to install and solder in place 47 tiny rivets. While tedious, this is a simple procedure. The rub comes when, in six places, you are required to solder a metal-cased mica capacitor to the circuit board, squarely on top of a rivet head. Due to the presence of the rivet, it is difficult to get the "continuous bonding" between capacitor and PC foil called for in the manual. A simple relocation of the six offending rivet holes would cure a minor but aggravating problem. As with all Heathkits, the best course is to follow the instructions as closely as possible.

With the VL-1180 temporarily installed in my car, alignment was a breeze, requiring about 15 minutes from start to finish. Tune-up is accomplished with a minimum of equipment: a 2-meter exciter, an swr meter, and a dummy load. Heath deserves a round of applause for designing an amplifier that is so easy to align; they even supply the necessary alignment tools. When aligned at 146 MHz, the output with 10-W drive was at least 80 W across the entire 2-meter band. One Watt of drive produced 9 Watts out. Input swr was less than 1.5:1 throughout the band.

The additional power provided by the VL-1180 has made all the difference in my FM mobile operations. No more humiliation when attempting to join the fun on the repeater! The amplifier has proven itself on SSB as well. I have spent many a Sunday afternoon atop our local drive-up mountain talking to the SSB boys on 144.2 MHz, using a portable five-element beam.

After more than six months of heavy use, the VL-1180 continues to perform well. Output power is unchanged from the original 80 Watts. The low standby current drain means that the amplifier can be left turned on at all times, unless the car isn't going to be driven for weeks on end.

Summary

Heath has done a nice job in creating an all-mode 2-meter linear kit that goes together without much difficulty and doesn't require a sophisticated test bench to align. A solution to the rivet problem should be considered, however, even if it's only to acknowledge it in the manual. Ideally, Heath should switch to a circuit board with plated-through holes.

The bottom line is, that despite minor construction difficulties, my VL-1180 worked the first time out and has worked ever since. It's hard to ask more from any piece of equipment. The VL-1180 is priced at \$137.95 from *Heath Company*, Benton Harbor MI 49022. Reader Service number 475.

Jeff DeTray WB8BTH
73 Magazine Staff

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SATELLITES

PHASE IIIB LAUNCH DELAYED

We'll all have a bit more time to prepare for Phase III satellite activity. The European Space Agency (ESA) has announced a delay of at least two months in the flight that is scheduled to carry AMSAT's Phase IIIB satellite. At best, the launch will now occur in late September; it was originally set for July.

The problem is not with the Phase IIIB satellite or the Ariane launch vehicle, but with the design of the satellite that is to be the main payload on several Ariane launches. A similar satellite, MARECS-A, was launched in December and has developed some unexpected problems. Until the causes and cures for the problems can be determined, the scheduling of the Phase IIIB launch will remain uncertain.

TEN-TEC RIG

At the Dayton Hamvention in late April, Ten-Tec displayed a prototype of a rig designed to ease the average amateur into Phase III satellite communications, using the Mode B (435-144 MHz) transponder. The new unit contains a 10-W, 435-MHz CW/SSB transmitter and a 2-to-10-meter receive converter. Assuming you already have 10-meter receiving capability, you need only add antennas for 435 and 144 MHz to complete your Phase III satellite station. Ten-Tec doesn't plan to release the rig until Phase IIIB is safely aloft, i.e., sometime this fall.

ORBITAL CALENDARS

Project OSCAR, a California-based group of amateur satellite enthusiasts, has produced a comprehensive calendar of orbital predictions covering OSCAR 8 and all six Soviet RS satellites. This volume gives the time and longitude of the northbound equatorial crossing for each orbit of each satellite from May 1 through December 31, 1982. It's a must for satellite chasers. The calendar is available for an \$8.75 donation. Your check or money order payable to Project OSCAR, Inc., should be mailed to POB 1136, Los Altos CA 94022. The price includes postage.

Thanks to *AMSAT Satellite Report* for some of the preceding information.—WB8BTH.

ORBITAL INFORMATION

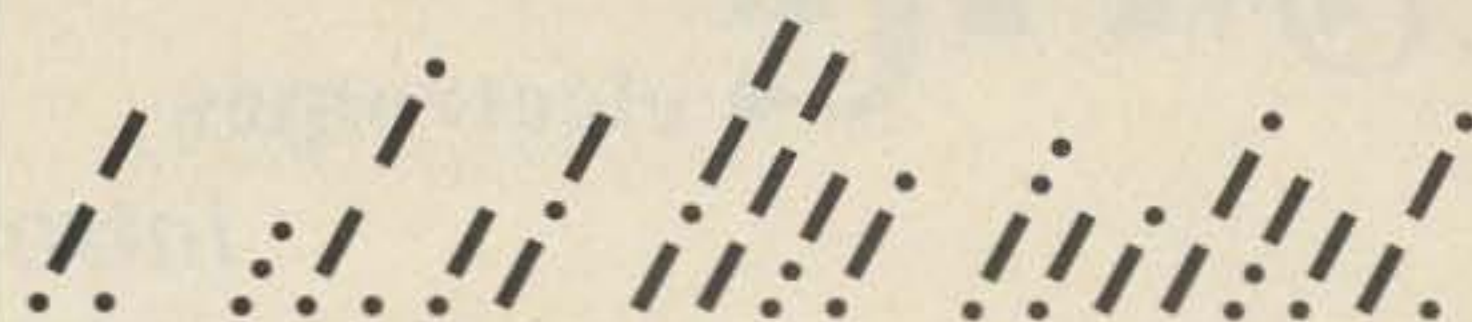
OSCAR 8 Reference Orbits - July

| Date | Time (UTC) | Eq. Crossing (Degrees West) |
|------|------------|-----------------------------|
| 1 | 0132:12 | 95.3 |
| 2 | 0136:35 | 96.5 |
| 3 | 0140:59 | 97.6 |
| 4 | 0002:12 | 73.0 |
| 5 | 0006:36 | 74.2 |
| 6 | 0011:00 | 75.3 |
| 7 | 0015:23 | 76.5 |
| 8 | 0019:47 | 77.6 |
| 9 | 0024:11 | 78.8 |
| 10 | 0028:34 | 79.9 |
| 11 | 0032:58 | 81.1 |
| 12 | 0037:22 | 82.3 |
| 13 | 0041:45 | 83.4 |
| 14 | 0046:09 | 84.6 |
| 15 | 0050:33 | 85.7 |
| 16 | 0054:56 | 86.9 |
| 17 | 0059:20 | 88.0 |
| 18 | 0103:44 | 89.2 |
| 19 | 0108:07 | 90.4 |
| 20 | 0112:31 | 91.5 |
| 21 | 0116:55 | 92.7 |
| 22 | 0121:18 | 93.8 |
| 23 | 0125:42 | 95.0 |
| 24 | 0130:05 | 96.2 |
| 25 | 0134:29 | 97.3 |
| 26 | 0138:53 | 98.5 |
| 27 | 0000:06 | 73.8 |
| 28 | 0004:30 | 75.0 |
| 29 | 0008:53 | 76.1 |
| 30 | 0013:17 | 77.3 |
| 31 | 0017:41 | 78.5 |

OSCAR 8 Reference Orbits - August

| Date | Time (UTC) | Eq. Crossing (Degrees West) |
|------|------------|-----------------------------|
| 1 | 0022:04 | 79.6 |
| 2 | 0026:28 | 80.8 |
| 3 | 0030:52 | 81.9 |
| 4 | 0035:15 | 83.1 |
| 5 | 0039:39 | 84.3 |
| 6 | 0044:03 | 85.4 |
| 7 | 0048:26 | 86.6 |
| 8 | 0052:50 | 87.7 |
| 9 | 0057:14 | 88.9 |
| 10 | 0101:37 | 90.0 |
| 11 | 0106:01 | 91.2 |
| 12 | 0110:25 | 92.4 |
| 13 | 0114:48 | 93.5 |
| 14 | 0119:12 | 94.7 |
| 15 | 0123:36 | 95.8 |
| 16 | 0127:59 | 97.0 |
| 17 | 0132:23 | 98.1 |
| 18 | 0136:46 | 99.3 |
| 19 | 0141:10 | 100.5 |
| 20 | 0002:24 | 75.8 |
| 21 | 0006:47 | 77.0 |
| 22 | 0011:11 | 78.1 |
| 23 | 0015:34 | 79.3 |
| 24 | 0019:58 | 80.5 |
| 25 | 0024:22 | 81.6 |
| 26 | 0028:45 | 82.8 |
| 27 | 0033:09 | 83.9 |
| 28 | 0037:33 | 85.1 |
| 29 | 0041:56 | 86.2 |
| 30 | 0046:20 | 87.4 |
| 31 | 0050:44 | 88.6 |

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Ask for Dou "Joe" Chin—KB2MU

HARVEY

25 W. 45th St., N.Y., N.Y. 10036 (212) 921-5920

Introducing TVRO CIRCUIT BOARDS Satellite Receiver Boards—Now in Stock

DUAL CONVERSION BOARD \$25.00

This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages.

SIX 47pF CHIP CAPACITORS

For use with dual conversion board \$6.00

70 MHz IF BOARD \$25.00

This circuit provides about 43dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board bandpass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than 1/2 dB. Hybrid IC's are used for the gain stages.

SEVEN .01 pF CHIP CAPACITORS

For use with the 70 MHz IF board \$7.00

DEMODULATOR BOARD \$40.00

This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, de-emphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC.

SINGLE AUDIO \$15.00

This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO \$25.00

Duplicate of the single audio but also covers the 6.2 range.

DC CONTROL \$15.00

SPECIAL SET OF FIVE BOARDS \$100.00

INCLUDING DUAL AUDIO (2 single audio boards)

1900 to 2500 MHz MICROWAVE DOWNCONVERTER

MICROWAVE RECEIVER This receiver is tunable over a range of 1900 to 2500 MHz approximately, and is intended for amateur use. The local oscillator is voltage controlled, making the I.F. range approximately 54 to 88 MHz for standard TV set channels 2 thru 7.

| | | | | | | | | |
|--|--------|---------|---|---------|----------|---------|---------|--------|
| P.C. BOARD with DATA | 1 to 5 | \$15.00 | 6 to 11 | \$13.00 | 12 to 26 | \$11.00 | 27 - up | \$9.00 |
| P.C. Board with all parts for assembly | | \$49.99 | P.C. Board with all chip caps soldered on . . . | | | \$30.00 | | |
| P.C. Board with all parts for assembly | | | P.C. Board assembled & tested | | | \$69.99 | | |
| plus 2N6603 | | \$69.99 | P.C. Board assembled & tested with 2N6603 | | | \$79.99 | | |

HMR II DOWNCONVERTER with Power Supply, Antenna (Dish) & all Cables for installation. 180 Day Warranty.

| | | | | | |
|--------|----------|---------|----------|---------|----------|
| 1 to 5 | \$150.00 | 6 to 11 | \$140.00 | 12 - up | \$125.00 |
|--------|----------|---------|----------|---------|----------|

YAGI DOWNCONVERTER with Power Supply, Antenna (Yagi) & all Cables for installation. 90 Day Warranty.

| | | | | | |
|--------|----------|---------|----------|---------|----------|
| 1 to 5 | \$150.00 | 6 to 11 | \$140.00 | 12 - up | \$125.00 |
|--------|----------|---------|----------|---------|----------|

YAGI DOWNCONVERTER as above but Kit. (NO CABLES) With Box.

| | | | | | |
|--------|----------|---------|----------|---------|----------|
| 1 to 5 | \$125.00 | 6 to 11 | \$115.00 | 12 - up | \$100.00 |
|--------|----------|---------|----------|---------|----------|

HMR II DOWNCONVERTER as above but Kit. (NO CABLES) With PVC.

| | | | | | |
|--------|----------|---------|----------|---------|----------|
| 1 to 5 | \$125.00 | 6 to 11 | \$115.00 | 12 - up | \$100.00 |
|--------|----------|---------|----------|---------|----------|

SPECIAL NEW STOCK OF CARBIDE DRILL BITS—YOUR CHOICE \$1.99

| | | | | | |
|--------|-------|----|----|----|----|
| 1.25mm | 13/64 | 36 | 47 | 55 | 63 |
| 1.45mm | 19 | 37 | 48 | 56 | 64 |
| 3.2mm | 20 | 38 | 49 | 57 | 65 |
| 3.3mm | 24 | 39 | 50 | 58 | 67 |
| 1/8 | 26 | 40 | 51 | 59 | 68 |
| 3/16 | 29 | 44 | 52 | 60 | 69 |
| 5/32 | 30 | 45 | 53 | 61 | |
| 7/32 | 31 | 46 | 54 | 62 | |

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.

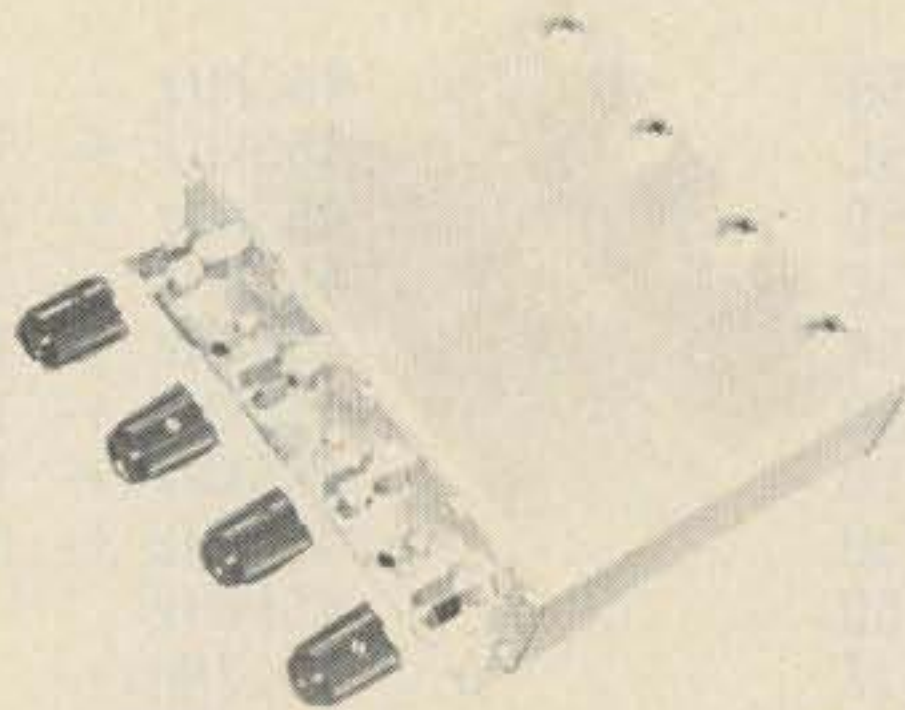
| QUANTITY | DEALER PRICE | GROSS PROFIT AT \$149.95 |
|-------------|--------------|--------------------------|
| 1—2 units | 69.75 each | 53% |
| 3—5 units | 64.50 each | 57% |
| 6—11 units | 62.50 each | 58% |
| 12—23 units | 60.75 each | 59% |

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

"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 | T0-01A | 455KHz | 5.00 |
| | T0-02A | 455KHz | 5.00 |
| Nippon | LF-B4/CFU455I | 455KHz +- 1KHz | 5.80 |
| | LF-B6/CFU455H | 455KHz +- 1KHz | 5.80 |
| | LF-C18 | 455KHz | 10.00 |
| Token | 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. | <u>TUBES ARE NEW</u> \$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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MHz electronics

"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 Figure 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 Figure | 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 |
| T0-3 | T0-3 | T0-100/T0-116 | T0-220/T0-3 |
| \$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 | |
| Conversion Compression | 8.5dB Max. 50 to 300MHz | |
| | .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 manufactures 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.

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EIMAC TUBE SOCKETS AND CHIMNEYS

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|--------|---------|--------|--------|---------|---------|
| 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 | 10.00 |
| | | | (For 4-250A, 4-400A, 3-400Z, 3-500Z) | | 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 output, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), 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.

Toll Free Number
800-528-0180
(For orders only)

MHz electronics

"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 | WE BUY SELL OR TRADE | |
| 4665 | 350.00 | 8121 | 50.00 | | |
| 5551A | 100.00 | 8122 | 85.00 | | |
| 5563A | 77.00 | 8236 | 30.00 | | |
| 5675 | 15.00 | 8295/PL172 | 300.00 | | |

NOTICE ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE !!!

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MHz electronics

| TEKTRONIX OSCILLOSCOPES | PRICE | MODEL 544 50 MHz Bench Scope with a CA Dual Trace. | \$ 650.50 |
|--|-----------|---|-----------|
| MODEL 453 Portable 50 MHz Dual Trace. | \$1200.00 | MODEL 543A 33 MHz Bench Scope with a CA Dual Trace. | \$ 475.50 |
| MODEL 453A Portable 60 MHz Dual Trace. | \$1400.00 | HEWLETT PACKARD OSCILLOSCOPES | |
| MODEL 454 Portable 150 MHz Dual Trace. | \$1800.00 | MODEL 180A Main Frame. | \$ 675.00 |
| MODEL 454A Portable 150 MHz Dual Trace. | \$2000.00 | MODEL 180E Main Frame. | \$ 750.00 |
| MODEL 455 Portable 50 MHz Dual Trace. | \$1800.00 | MODEL 181A Main Frame. | \$1000.00 |
| MODEL 475 Portable 200 MHz Dual Trace. | \$2640.00 | MODEL 182A Main Frame. | \$ 900.00 |
| MODEL 475A Portable 250 MHz Dual Trace. | \$2940.00 | MODEL 183A Main Frame. | \$1000.00 |
| MODEL 7514 Storage Oscilloscope with a 7A15A and a 7A15AN-11 Amplifier and a 7B50 Time Base. | \$3500.00 | MODEL 180 SERIES PLUG-INS | |
| MODEL 577D1 Storage Curve Tracer with a 177 adapter. | \$3233.00 | 1801A Dual Trace 50 MHz. | \$ 495.00 |
| MODEL 577D2 Curve Tracer with a 177 adapter. | \$2796.00 | 1803A Differential. | \$ 775.00 |
| Tektronix Lab Cart Model 3 | \$ 316.00 | 1804A Quad Trace 50 MHz | \$ 795.00 |
| | | 1807A Dual Trace 50 MHz | \$ 375.00 |
| | | 1815A TDR/Sampler with a 1816A DC to 4 GHz. | \$1500.00 |
| | | 1821A Time Base & Delay Generator. | \$ 495.00 |
| | | 1822A Time Base & Delay Generator. | \$ 525.00 |
| | | 1831A Direct Access 600 MHz.* | \$ 200.00 |
| | | 1840A Time Base & Delay Generator.* | \$ 450.00 |
| | | 1841A Time Base & Delay Generator.* | \$ 675.00 |
| | | *For 183A Only. !!!!!!! | |
| | | TELEQUIPMENT MODEL D83 Oscilloscope Dual Trace Portable 50 MHz. With a V4 and S2A Plug-In. | \$1200.00 |
| MODEL 547 50 MHz Bench Scope. With a 1A1 Dual Trace. | \$ 722.50 | DUMONT MODEL 1062 Oscilloscope Dual Trace 65 MHz portable. | \$ 750.00 |
| With a 1A2 Dual Trace. | \$ 637.50 | TEKTRONIX | |
| With a 1A4 Quad Trace. | \$ 872.50 | MODEL RM565 Dual Beam Oscilloscope 10 MHz with a 3A6 Dual Trace and a 3A72 Dual Trace. | \$1107.50 |
| With a 1A5 Differential. | \$ 722.50 | MODEL 549 Storage Oscilloscope Bench 50 MHz with a CA Dual Trace. | \$1000.00 |
| With a 1A6 Differential. | \$ 612.50 | MODEL 647A Oscilloscope Bench 100 MHz with a 10A2 Dual Trace and a 11B2A Time Base. | \$1200.00 |
| or with 1 of each above. | \$1667.50 | | |
| MODEL 545 30 MHz Bench Scope with a CA Dual Trace. | \$ 412.50 | | |
| MODEL 545A 30 MHz Bench Scope with a CA Dual Trace. | \$ 437.50 | | |

ORDERING INSTRUCTIONS

DEFECTIVE MATERIAL: All claims for defective material must be made within sixty (60) days after receipt of parcel. All claims must include the defective material (for testing purposes), our invoice number, and the date of purchase. All returns must be packed properly or it will void all warranties.

DELIVERY: Orders are normally shipped within 48 hours after receipt of customer's order. If a part has to be backordered the customer is notified. Our normal shipping method is via First Class Mail or UPS depending on size and weight of the package. On test equipment it is by Air only, FOB shipping point.

FOREIGN ORDERS: All foreign orders must be prepaid with cashier's check or money order made out in U.S. Funds. We are sorry but C.O.D. is not available to foreign countries and Letters of Credit are not an acceptable form of payment either. Further information is available on request.

HOURS: Monday thru Saturday: 8:30 a.m. to 5:00 p.m.

INSURANCE: Please include 25¢ for each additional \$100.00 over \$100.00, United Parcel only.

ORDER FORMS: New order forms are included with each order for your convenience. Additional forms are available on request.

POSTAGE: Minimum shipping and handling in the US, Canada, and Mexico is \$2.50 all other countries is \$5.00. On foreign orders include 20% shipping and handling.

PREPAID ORDERS: Order must be accompanied by a check.

PRICES: Prices are subject to change without notice.

RESTOCK CHARGE: If parts are returned to MHZ Electronics due to customer error, customer will be held responsible for all extra fees, will be charged a 15% restocking fee, with the remainder in credit only. All returns must have approval.

SALES TAX: Arizona must add 5% sales tax, unless a signed Arizona resale tax card is currently on file with MHZ Electronics. All orders placed by persons outside of Arizona, but delivered to persons in Arizona are subject to the 5% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 days after receipt of parcel. Claims must include our invoice number and the date of purchase. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY
NO INFORMATION WILL BE GIVEN. 1-800-528-0180.

| FAIRCHILD VHF AND UHF PRESCALER CHIPS | | PRICE |
|---------------------------------------|---|---------|
| 95H90DC | 350MC Prescaler divide by 10/11 | \$ 8.50 |
| 95H91DC | 350MC Prescaler divide by 5/6 | 8.50 |
| 11C90DC | 650MC Prescaler divide by 10/11 | 15.50 |
| 11C91DC | 650MC Prescaler divide by 5/6 | 15.50 |
| 11C06DC | UHF Prescaler 750MC D Type Flip Flop | 12.30 |
| 11C05DC | 1GHz Counter Divide by 4 (Regular price \$75.00) | 50.00 |
| 11C01FC 82S90 | High Speed Dual 5/4 Input NO/NOR Gate Pre-settable High Speed Decade/Binary Counter used with the 11C90/91 or the 95H90/91 Prescaler can divide by 100. (Signetics) | 15.40 |
| 11C24DC | This chip is the same as a Motorola MC4024/4324 Dual TTL Voltage Control Multivibrator. | 5.00 |
| 11C44DC | This chip is the same as a Motorola MC4044/4344 Phase Frequency Detector. | 3.37 |

GENERAL ELECTRIC CO. GUNN DIODE MODEL Y-2167
 Freq. Gap (GHz) 12 to 18, Output (Min.) 100mW, Duty (%)
 CW, Typ. Bias (Vdc) 8.0, Type. Oper. (MAdc) 550, Max. Thres.
 (mAdc) 1000, Max. Bias (Vdc) 10.0. **\$39.99**

VARIAN GALLIUM ARSENIDE GUNN DIODES MODEL VSX-9201S5
 Freq. Coverage 8 to 12.4GHz, Output (Min.) 100mW, Bias
 Voltage (Max.) 14vdc, Bias current (mAdc) Operating 550 Typ.
 750 Max., Threshold 850 Typ. 1000 Max. **\$39.99**

VARI-L Co. Inc. MODEL SS-43 AM MODULATOR
 Freq. Range 60 10 150MC, Insertion Loss 13dB Nominal,
 Signal Port Imp. 50ohms Nominal, Signal Port RF Power
 + 10dBm Max., Modulation Port BW DC to 1KHZ, Modulation
 Port Bias 1ma. Nominal. **\$24.99**

| AVANTEK CASCADABLE MODULAR AMPLIFIERS | | |
|--|---------------|-------------------|
| | Model UTO-504 | UTO-511 |
| Frequency Range | 5 to 500 MHz | 5 to 500 MHz |
| Gain | 6dB | 15dB |
| Noise Figure | 11dB | 2.3dB to 3dB |
| Power Output | + 17dB | - 2dB to - 3dB |
| Gain Flatness | 1dB | 1dB |
| Input Power Vdc | + 24 | + 15 |
| mA | 100 | 10 |
| | PRICE \$70.00 | PRICE \$75.00 |

| HEWLETT PACKARD MIXERS MODELS | | |
|----------------------------------|--------------------|--------------------|
| | 10514A | 10514B |
| Frequency Range | 2MHz to 500MC | 2MHz to 500MC |
| Input/Output Frequency L & R | 200KHz to 500MC | 200KHz to 500MC |
| | X | DC to 500MC |
| Mixer Conversion Loss (A) | 7dB | 7dB |
| | (B) | 9dB |
| Noise Performance (SSB) (A) | 7dB | 7dB |
| | (B) | 9dB |
| | PRICE \$49.99 | PRICE \$39.99 |

**FREQUENCY SOURCES, INC MODEL MS-74X
MICROWAVE SIGNAL SOURCE**

MS-74X: Mechanically Tunable Frequency Range (MHz) 10630 to
 11230 (10.63 to 11.23GHz) Minimum Output Power (mW) 10, Overall
 Multiplier Ratio 108, Internal Crystal Oscillator Frequency Range
 (MHz) 98.4 to 104.0, Maximum Input Current (mA) 400.

The signal source are designed for applications where high stability
 and low noise are of prime concern. these sources utilize fundamen-
 tal transistor oscillators with high Q coaxial cavities, followed by
 broadband stable step recovery diode multipliers. This design
 allows single screw mechanical adjustment of frequency over stan-
 dard communications bands. Broadband sampling circuits are used
 to phase lock the oscillator to a high stability reference which may
 be either an internal self-contained crystal oscillator, external
 primary standard or VHF synthesizer. This unique technique allows
 for optimization of both FM noise and long term stability. List Price
 is \$1158.00 (THESE ARE NEW) **Our Price—\$289.**

HEWLETT PACKARD 1N5712 MICROWAVE DIODE
 This diode will replace the MBD101, 1N5711, 5082-2800,
 5082-2835 ect. This will work like a champ in all those
 Down Converter projects. **\$1.50 or 10/\$10.00**

**MOTOROLA MHW1172R LOW DISTORTION
WIDEBAND AMPLIFIER MODULE.**
 Frequency Range: 40 to 300 MHz., Power Gain at 50MHz
 16.6min. to 17.4max., Gain Flatness ± 0.1 Typ. ± 0.2
 Max. dB., DC Supply Voltage - 28vdc, RF Voltage Input
 + 70dBmV **PRICE \$29.99**

GENERAL ELECTRIC AA NICADS
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C.O.D.: Acceptable by telephone or mail. Payment from customer will be by cash, money order or cashier's check. We are sorry but we cannot accept personal checks for C.O.D.'s.

CONFIRMING ORDERS: We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, customers will be held responsible for any charges incurred, plus a 15% restock charge on returned parts.

CREDIT CARDS: WE ACCEPT MASTERCARD VISA AND AMERICAN EXPRESS.

DATA SHEETS: When we have data sheets in stock on devices we do supply them with the order.

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9 DIGITS 600 MHz \$129⁹⁵ WIRED

PRICES:

| | |
|--------------------------------------|----------|
| CT-90 wired, 1 year warranty | \$129.95 |
| CT-90 Kit, 90 day parts warranty | 109.95 |
| AC-1 AC adapter | 3.95 |
| 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 \$99⁹⁵ 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 \$79⁹⁵ 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 \$159⁹⁵ WIRED



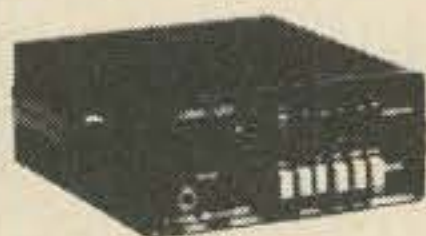
SPECIFICATIONS:

| | |
|--------------|---|
| 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 \$99⁹⁵ WIRED

PRICES:

| | |
|---------------------------------------|---------|
| DM-700 wired, 1 year warranty | \$99.95 |
| 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 3 1/2 digit, 1/2 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 |
| Power: | 4 'C' cells |

AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

\$29.95 Kit \$39.95 Wired

ACCESSORIES

| | |
|---|---------|
| Telescopic whip antenna - BNC plug..... | \$ 7.95 |
| High impedance probe, light loading..... | 15.95 |
| Low pass probe, for audio measurements..... | 15.95 |
| Direct probe, general purpose usage..... | 12.95 |
| Tilt bail, for CT 70, 90, MINI-100..... | 3.95 |
| Color burst calibration unit, calibrates counter against color TV signal..... | 14.95 |

COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

\$34.95 Kit \$44.95 Wired

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SOCIAL EVENTS

from page 78

City Park Avenue, New Orleans LA 70119.
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FLAGSTAFF AZ JUL 30-AUG 1

The Amateur Radio Council of Arizona will hold its 32nd annual hamfest from July 30 through August 1, 1982, at the Fort Tuthill Fairgrounds, just a few miles south of I-40, Flagstaff AZ. There will be thousands of dollars in prizes, improved XYL activities, a swapfest, a transmitter hunt, speakers, forums, awards, exhibits, and entertainment on Friday and Saturday nights. Overnight camping facilities will be available. Talk-in on 147.870/146.270. For further information, contact Wm. Oliver Grieve W7WGW, 4301 N. 31st Avenue, Phoenix AZ 85017, or call (602)-246-0200.

KINGSFORD MI JUL 31-AUG 1

The Mich-A-Con ARC will hold the 34th annual UP Hamfest on Saturday, July 31, and Sunday, August 1, 1982, at the Dickinson County Armory on M-95, Kingsford MI. Tickets are \$2.50 at the door (no advance sales) and registration will begin at 9:00 am on both days. There will be prizes, family activities, and a Saturday night banquet. Advance banquet reservations are needed since seating is limited. Plenty of free parking will be available. Talk-in on 146.25/.85 and .3922. For further information, write UPHAMFEST-82, 105 East Breitung Avenue, Kingsford MI 49801.

ANGOLA IN AUG 1

The Steuben County Radio Amateurs will hold the 24th annual FM Picnic and Hamfest on Sunday, August 1, 1982, at Crooked Lake, Angola IN. Admission is \$2.50. There will be prizes, picnic-style BBQ chicken, inside tables for exhibitors and vendors, and overnight camping. (A fee will be charged by county park.) Talk-in on 146.52 and 147.81/.21.

PITTSBURGH PA AUG 1

The 45th annual South Hills Brass Pounders and Modulators Hamfest will be held on August 1, 1982, from 10:00 am to 4:00 pm, at South Campus, Community College of Allegheny County, Pittsburgh PA. Admission is \$2.00 or 3 for \$5.00. There will be computer, OSCAR, and ATV demonstrations, as well as a flea market. Talk-in on 146.13/.73 and 146.52. For further information, contact Andrew L. Pato WA3PBD, 1433 Schauflier Drive, West Homestead PA 15120.

BELVIDERE IL AUG 1

The Big Thunder ARC will hold its annual hamfest on Sunday, August 1, 1982, at the Boone County Fairgrounds, Route 76, Belvidere IL. Admission is \$2.00 in advance and \$2.50 at the gate. A fee will be charged for 8-foot tables and there will be indoor space available in the exhibit building, as well as outdoor space in swappers' row. Sellers will be able to set up Saturday evening or at 7:00 am on Sunday. Features will include door prizes, a main prize, food, and refresh-

ments. Camping will be available on Saturday evening (there will be a charge for electricity). Talk-in on 146.52 and 147.975/147.375. For further information or tickets, send an SASE to Jim Grimsby, 418 Beacon Drive, Belvidere IL 61008.

LEVELLAND TX AUG 1

The Hockley County Amateur Radio Club and the Northwest Texas Emergency Net will hold their 17th annual picnic and swapfest on Sunday, August 1, 1982, beginning at 8:00 am at the city park in Levelland TX. This event is for the entire family. Bring your own picnic basket for lunch at 12:30. A two-meter FM transceiver is the grand prize. A \$3.00 registration is requested but not required. There will be swapping all day, with tables provided. Talk-in on .28/.88.

GLEN MI AUG 1

The Black River Amateur Radio Club will hold the 29th annual Southwestern Michigan VHF Picnic on Sunday, August 1, 1982, at the West Side County Park near Glen MI. (Take exit 30 from I-196 and follow the signs.) There will be swimming, a playground, a small flea market, and door prizes. There is no food available at the park, so bring your own picnic basket. Registration is \$1.00. For additional information, contact Ed Alderman K18Z, RR #2, Box 44, Lawrence MI 49064.

POMONA CA AUG 7

The Tri-County Amateur Radio Association will hold its annual hamfest/picnic on Saturday, August 7, 1982, from 7:00 am to 1:00 pm, at the Los Angeles County Fairgrounds, Pomona CA. All buyers, sellers, and computer buffs are welcome. There will be prizes, exhibits, and refreshments. Talk-in on 146.025/.625. For more information, write to TCARA Hamfest Chairman W6ELZ, PO Box 142, Pomona CA 91769.

JACKSONVILLE FL AUG 7-8

The Greater Jacksonville Hamfest Association will hold the annual Jacksonville Hamfest and Northern Florida ARRL Convention on August 7-8, 1982, at the Orange Park Kennel Club, located near the intersection of I-295 and US 17 just south of Jacksonville. Advance registration is \$3.50 and is available from Robert J. Cutting W2KGI, 1249 Cape Charles Avenue, Atlantic Beach FL 32233. Registration at the door is \$4.00. The FCC will administer amateur and commercial radio operator exams on Friday, August 6th, at the hamfest site. Those wishing to take the exams should apply to the Atlanta FCC office as soon as possible. Swap tables are \$12.00 per table for both days (no one-day tables) and table reservations, as well as advance registrations, are available from Andy Burton NX4G, 5101 Younis Road, Jacksonville FL 32218. A full slate of programs is scheduled, along with meetings of statewide and regional nets and organizations, plus competitions including a rabbit hunt and pileup contest. The headquarters hotel is the Best Western First National Inn just across from the hamfest. Special rates may be obtained by writing to Jim Canfield KD4CG, 996

Dostle Circle, Orange Park FL 32073. Talk-in on 146.16/.76 and 146.07/.67.

SAUK RAPIDS MN AUG 8

The St. Cloud Radio Club will hold its annual hamfest on Sunday, August 8, 1982, from 8:30 am to 4:00 pm, at the Sauk Rapids Municipal Park, Sauk Rapids MN. Talk-in on 146.34/.94. For more information, contact Mike Lynch, 2115-1st Street, St. Cloud MN 56301, or call (612)-251-2297.

MONTGOMERYVILLE PA AUG 8

The Mid-Atlantic Amateur Radio Club announces its annual J. B. M. Hamfest to be held on Sunday, August 8, 1982, from 9:00 am to 4:00 pm, rain or shine. Tailgate setup begins at 8:00 am. Located at the Route 309 Drive-In Theater, 1/4 mile north of Route 63, Montgomeryville, PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission: \$2.50, with \$1.00 additional for each tailgate space. Non-licensed XYLs and children admitted free. Ample parking, refreshments, raffles, door prizes, and more. Talk-in on WB3JOE/R (147.66/.06) or 146.52 simplex. For further information, write the club, PO Box 352, Villanova PA 19085.

TACOMA WA AUG 14-15

The Radio Club of Tacoma will hold Hamfair 82 on August 14-15, 1982, at the Pacific Lutheran University campus, Tacoma WA. Registration is \$5.00 and dinner is \$7.50. Activities will include technical seminars, a flea market, commercial booths, an ARRL meeting, a repeater forum, a VHF tweak and tune clinic, prizes, raffles, and a loggers' breakfast. Talk-in on 147.88/.28. For more information, contact Grace Teitzel AD7S, 701 So. 120th, Tacoma WA 98444, or phone (206)-564-8347.

WILMINGTON DE AUG 15

The seventh annual New Delmarva Hamfest will be held on Sunday, August 15, 1982, from 8:00 am to 4:00 pm at Gloryland Park, Bear DE (5 miles south of Wilmington). Admission is \$2.25 in advance, \$2.75 at the gate. Tailgating is \$3.50. Limited tables will be available under the pavilion, but bring your own to be sure. Food and drinks will be available. First prize is an Atari® Home Video Game System. Talk-in on .52 and .13/.53. For more information and a map, send an SASE to Stephen Momot K3HBP, 14 Balsam Road, Wilmington DE 19804. For advance tickets, make checks payable to Delmarva Hamfest, Inc.

TIOGA COUNTY PA AUG 21

The Tioga County PA ARC 6th Annual Amateur Radio Hamfest will be held on Saturday, August 21, 1982, from 0800 to 1600 at a new location at Island Park, just off US Rte. 15, Blossburg PA. There will be a flea market, food, free camping, an auction, an H/T door prize, etc. Talk-in on .19/.79 and .52. For more information or advance tickets, write Tioga Co. ARC, PO Box 56, Mansfield PA 16933, or contact Paul Sando KC2AZ, 606 Reynolds Street, Elmira NY 14904 on .19/.79 or .96/.36.

MARYSVILLE OH AUG 21-22

The Union County Amateur Radio Club will hold the Marysville Hamfest on Saturday afternoon and all day Sunday, August 21-22, 1982, at the fairground in Marysville (near Columbus) OH. Admission is \$2.00 in advance or \$3.00 at the gate. Flea mar-

ket space is \$1.00. Food, beverages, and free overnight camping, movies, and popcorn will be available. Featured on Saturday night will be a free square dance (with a live band) followed by a big country breakfast available all night. Door prizes, ladies' programs, and ARRL, FCC, and MARS meetings will be featured on Sunday. Talk-in on 146.52 and 147.99/.39. For additional information, write UCARC, 13613 US 36, Marysville OH 43040, or call (513)-644-0468.

ST. CHARLES IL AUG 22

The Fox River Radio League will host the Illinois State ARRL Convention in conjunction with its annual hamfest, both to be held on August 22, 1982, from 8:00 am to 4:00 pm, at the Kane County Fairgrounds, St. Charles IL. Tickets are \$2.00 in advance and \$3.00 at the gate. For advance tickets, send an SASE to J. Dubeck KA9HQY, 1312 Bluebell Lane, Batavia IL 60510. There will be commercial exhibits, a flea market, contests, demonstrations, forums, prizes, and hot food. Talk-in on 146.94. Exhibitors, dealers, and vendors should contact G. R. Isely WD9GIG, 736 Fellows Street, St. Charles IL 60174.

WENTZVILLE MO AUG 22

The St. Charles Amateur Radio Club, Inc., will hold Hamfest 82 on August 22, 1982, at the Wentzville Community Center, Wentzville MO. Tickets in advance are \$1.00 each or 4 for \$3.00; at the door, they are \$1.50 each or 4 for \$5.00. Admission is \$1.00 per car. There will be prizes, contests, a flea market, food, and air conditioned exhibitions buildings. For tickets, motel and camping information, prize lists, dealer reservations, etc., write SCARC Hamfest 82, c/o Mike McCrann WD0GSY, 25 Elm Street, St. Peters MO 63376.

SEWELL NJ AUG 29

The Gloucester County Amateur Radio Club will hold its fourth annual GCARC Ham/Compfest on Sunday August 29, 1982, from 8:00 am to 3:00 pm at the Gloucester County College, Tanyard Road, Sewell NJ. Tickets are \$2.00 in advance and \$2.50 at the door. The tailgaters' and dealers' charge is \$6.00 and includes one free admission. Doors will open at 7:00 am for setup. There will be speakers, seminars, contests, FCC exams, and prizes, including a Radio Shack TRS-80 computer and a Yaesu FT-208R. Talk-in on 146.52 and 147.78/.18. For more information, contact GCARC Hamfest Committee, PO Box 370, Pitman NJ 08017, or phone (609)-456-0500 or (609)-338-4841 (days) or (609)-629-2064 (evenings).

BUTLER PA SEP 12

The Butler County Amateur Radio Association will hold its annual hamfest on Sunday, September 12, 1982, from 9:00 am to 4:00 pm, at the Butler Farmshow Grounds at Roe Airport, Butler PA. Fly-in at Butler Farmshow Airport. Admission is a \$1.00 donation and children under 12 will be admitted free. Overnight campers are welcome and food and refreshments will be available. There will be an indoor flea market (vendor space will be \$3.00 per 8-foot table), a free outside flea market, free parking (including for the handicapped), and prizes, including a Kenwood TS-8305 HF transceiver. Talk-in on 147.96/.36, .52, and 147.84/.24. For additional information, contact Leighton Fennell, Crestmont Drive, RD 6, Butler PA 16001, or phone (412)-586-9822.

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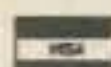
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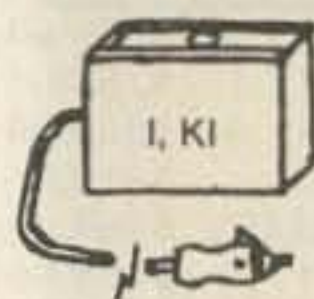
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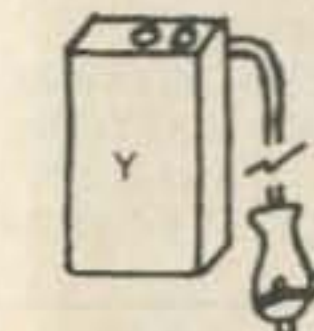
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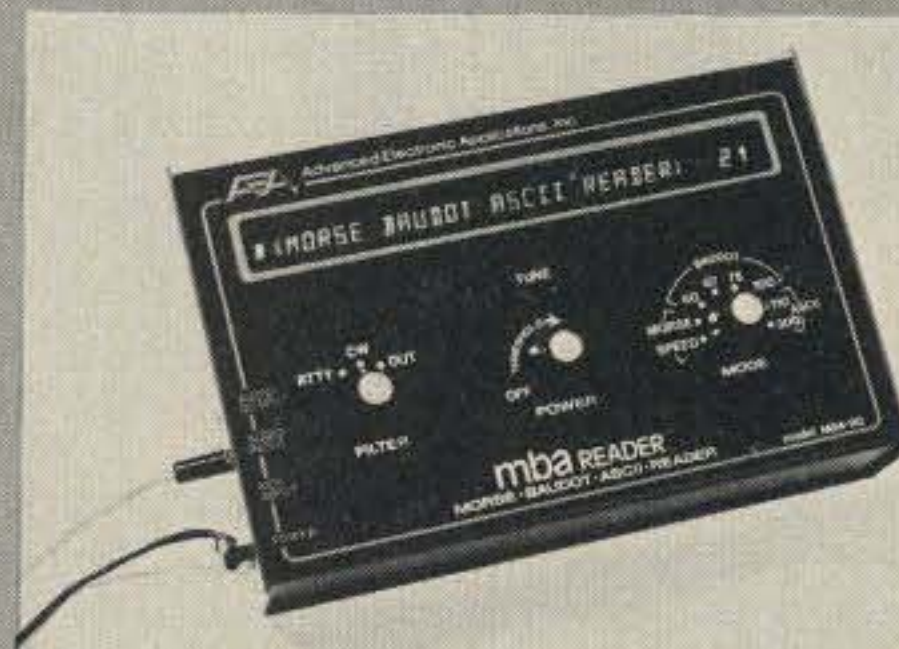
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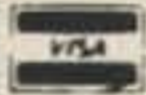
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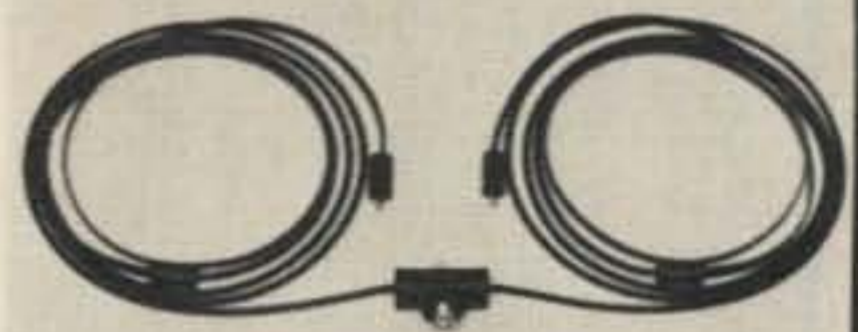
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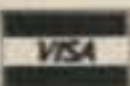
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| | <p>Whisper Light Kit</p> <p>An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 \$6.95</p> | <p>Tone Decoder</p> <p>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</p> | <p>CPO-1</p> <p>Runs on 3-12 Vdc 1 wall out. 1 KHZ good for CPO. Alarm, Audio Oscillator. Complete kit \$2.95</p> | <p>60 Hz Time Base</p> <p>Runs on 5-15 VDC. Low current (2.5ma) 1 min/month accuracy TB-7 Kit \$5.50 TB-7 Assy \$9.95</p> |
| <p>FM Wireless Mike Kit</p> <p>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</p> <p>FM-1 kit \$3.95 FM-2 kit \$4.95</p> | <p>Universal Timer Kit</p> <p>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.</p> <p>UT-5 Kit \$5.95</p> | <p>Mad Blaster Kit</p> <p>Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC</p> <p>MB-1 Kit \$4.95</p> | <p>Calendar Alarm Clock</p> <p>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</p> | <p>Under Dash Car Clock</p> <p>12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDs high accuracy (0.01%), easy 3 wire hookup, display blanks with ignition and super instructions. Optional dimmer automatically 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</p> |

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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

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**

PARTS PARADE

| <p>IC SPECIALS</p> <p>LINEAR</p> <p>01 \$.35 24 \$1.50 80 \$1.50 55 \$.45 56 \$1.00 65 \$1.00 66 \$1.00 67 \$1.25 41 10/\$2.00 458 \$.50 900 \$.50 914 \$2.95 938 \$2.95</p> <p>CMOS</p> <p>311 .50 313 .50 346 \$1.85 349 .50 359 \$9.00 511 \$2.00 518 \$1.35 539 \$1.75</p> | | <p>TTL</p> <p>74S00 \$.40 7447 \$.65 7475 \$.50 7490 \$.50 74196 \$1.35</p> <p>SPECIAL</p> <p>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</p> | | <p>Resistor Ass't</p> <p>Assortment of Popular values - 1/4 watt. Cut lead for PC mounting, 1/2" center, 1/8" leads, bag of 300 or more. \$1.50</p> <p>Switches</p> <p>Mini toggle SPDT \$1.00 Red Pushbuttons N.O. 3/\$1.00</p> <p>Earphones</p> <p>3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc. 5 for \$1.00</p> <p>Mini 8 ohm Speaker</p> <p>Approx. 2 1/2" diam. Round type for radios, mike etc. 3 for \$2.00</p> <p>Slug Tuned Coils</p> <p>Small 3/16" Hex Slugs turned coil. 3 turns. 10 for \$1.00</p> <p>CAPACITORS</p> <table border="1"> <tr> <th>TANTALUM</th> <th>ALUMINUM</th> <th>DISK CERAMIC</th> </tr> <tr> <td>Dipped Epoxy</td> <td>Electrolytic</td> <td>01 16V disk 20/\$1.00</td> </tr> <tr> <td>1.5 uF 25V 3/\$1.00</td> <td>1000 uF 16V Radial 1.50</td> <td>1 16V 15/\$1.00</td> </tr> <tr> <td>1.8 uF 25V 3/\$1.00</td> <td>500 uF 20V Axial 3.50</td> <td>001 16V 20/\$1.00</td> </tr> <tr> <td>.22 uF 25V 3/\$1.00</td> <td>150 uF 16V Axial 5/\$1.00</td> <td>100 pF 20/\$1.00</td> </tr> <tr> <td></td> <td>10 uF 15V Radial 10/\$1.00</td> <td>047 16V 20/\$1.00</td> </tr> </table> | | TANTALUM | ALUMINUM | DISK CERAMIC | Dipped Epoxy | Electrolytic | 01 16V disk 20/\$1.00 | 1.5 uF 25V 3/\$1.00 | 1000 uF 16V Radial 1.50 | 1 16V 15/\$1.00 | 1.8 uF 25V 3/\$1.00 | 500 uF 20V Axial 3.50 | 001 16V 20/\$1.00 | .22 uF 25V 3/\$1.00 | 150 uF 16V Axial 5/\$1.00 | 100 pF 20/\$1.00 | | 10 uF 15V Radial 10/\$1.00 | 047 16V 20/\$1.00 | <p>Crystals</p> <p>3.579545 MHZ \$1.50 10.00000 MHZ \$5.00 5.248800 MHZ \$5.00</p> <p>AC Adapters</p> <p>Good for clocks, nicad chargers, all 110 VAC plug one end</p> <p>8.5 vdc @ 20 mA \$1.00 16 vdc @ 160mA \$2.50 12 vdc @ 250mA \$3.00</p> <p>Solid State Buzzers</p> <p>small buzzer 450 Hz, 86 dB, sound output on 5-12 vdc at 10-30 mA, TTL compatible. \$1.50</p> <p>AC Outlet</p> <p>Panel Mount with Leads 4/\$1.00</p> | |
|--|-----------------------------------|---|--|--|--|----------|----------|--------------|--------------|--------------|------------------------------|----------------------------|--------------------------------|------------------------|----------------------------|------------------------------|--------------------------|----------------------------|----------------------------------|-------------------------|--|-----------------------------------|--------------------------|---|--|
| TANTALUM | ALUMINUM | DISK CERAMIC | | | | | | | | | | | | | | | | | | | | | | | |
| Dipped Epoxy | Electrolytic | 01 16V disk 20/\$1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5 uF 25V 3/\$1.00 | 1000 uF 16V Radial 1.50 | 1 16V 15/\$1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.8 uF 25V 3/\$1.00 | 500 uF 20V Axial 3.50 | 001 16V 20/\$1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| .22 uF 25V 3/\$1.00 | 150 uF 16V Axial 5/\$1.00 | 100 pF 20/\$1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| | 10 uF 15V Radial 10/\$1.00 | 047 16V 20/\$1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| <p>READOUTS</p> <p>4D 359 4" C.C. \$1.00 4D 507/510 5" C.A. 1.00 4N 72/HP7730 33" C.A. 1.00 P 7651 43" C.A. 2.00</p> | | <p>DC-DC Converter</p> <p>+5 vdc input prod. -9 vdc @ 30ma +9 vdc produces -15 vdc @ 35ma \$1.25</p> <p>25K 20 Turn Trim Pot \$1.00 1K 20 Turn Trim Pot \$.50</p> | | <p>Ceramic IF Filters</p> <p>Mini ceramic filters 7 kHz B.W., 455 kHz \$1.50 ea.</p> <p>Trimmer Caps</p> <p>Sprague - 3-40 pf Stable Polypropylene .50 ea.</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>TRANSISTORS</p> <p>0904 NPN C-F 15/\$1.00 0906 PNP C-F 15/\$1.00 4403 PNP C-F 15/\$1.00 4410 NPN C-F 15/\$1.00 4916 FET C-F 4/\$1.00 5401 PNP C-F 5/\$1.00 6028 C-F 4/\$1.00 3771 NPN Silicon \$1.50 5179 UHF NPN 3/\$2.00 wer Tab NPN 40W 3/\$1.00 wer Tab PNP 40W 3/1.00 PF 102/2N5484 1.50 N 3904 Type T-R 50/\$2.50 IP 3906 Type T-R 50/\$2.50 3055 1.00 2646 UJT 3/\$2.00</p> | | <p>Crystal Microphone</p> <p>Small 1" diameter 1/8" thick crystal mike cartridge .75</p> <p>Coax Connector</p> <p>Chassis mount BNC type \$1.00</p> <p>9 Volt Battery Clips</p> <p>Nice quality clips 5 for \$1.00 1/4" Rubber Grommets 10 for \$1.00</p> | | <p>OP-AMP Special</p> <p>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</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>Diodes</p> <p>5.1 V Zener 20/\$1.00 1N914 Type 50/\$1.00 1KV 2Amp 8/\$1.00 100V 1Amp 15/\$1.00</p> | | <p>Parts Bag</p> <p>Asst of chokes, disc caps, tant resistors, transistors, diodes, MICA caps etc sm bag (100 pc) \$1.00 lg bag (300 pc) \$2.50</p> <p>Connectors</p> <p>6 pin type gold contacts for mA-1003 car clock module price .75 ea.</p> | | <p>Regulators</p> <p>7812 \$1.00 7815 \$1.00 7905 \$1.25 7912 \$1.25 7915 \$1.25</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>25 AMP 100V Bridge \$1.50 each</p> <p>Mini-Bridge 50V 1 AMP 2 for \$1.00</p> | | <p>Leds - your choice, please specify</p> <p>Mini Red, Jumbo Red, High Intensity Red, Illuminator Red 8/\$1 Mini Yellow, Jumbo Yellow, Jumbo Green 6/\$1</p> | | <p>Shrink Tubing Nubs</p> <p>Nice precut pcs of shrink size 1" x 1/2" shrink to 1/4". Great for splices. 50/\$1.00</p> <p>Mini TO-92 Heat Sinks</p> <p>Thermalloy Brand 5 for \$1.00 To-220 Heat Sinks 3 for \$1.00</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>Opto Isolators - 4N28 type \$1.00 ea.</p> <p>Opto Reflectors - Photo diode + LED \$1.00 ea.</p> | | <p>Molex Pins</p> <p>Molex already precut in length of 7. Perfect for 14 pin sockets. 20 strips for \$1.00</p> | | <p>CDS Photocells</p> <p>Resistance varies with light, 250 ohms to over 3 meg 3 for \$1.00</p> | | | | | | | | | | | | | | | | | | | | | |

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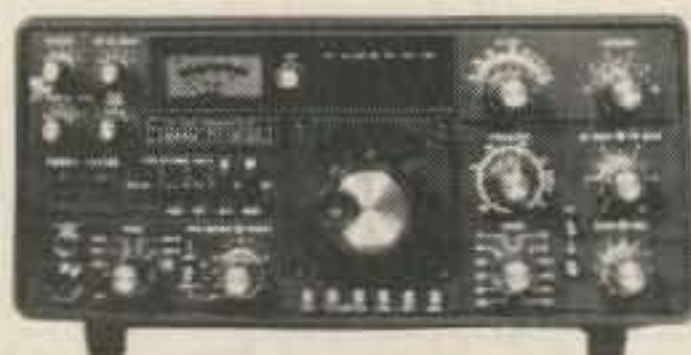
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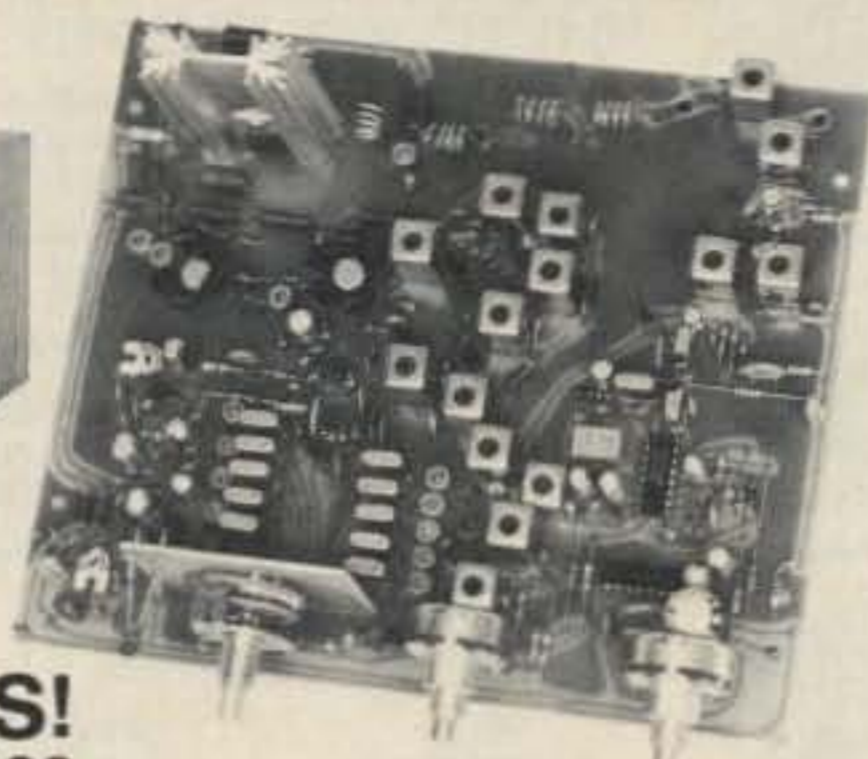
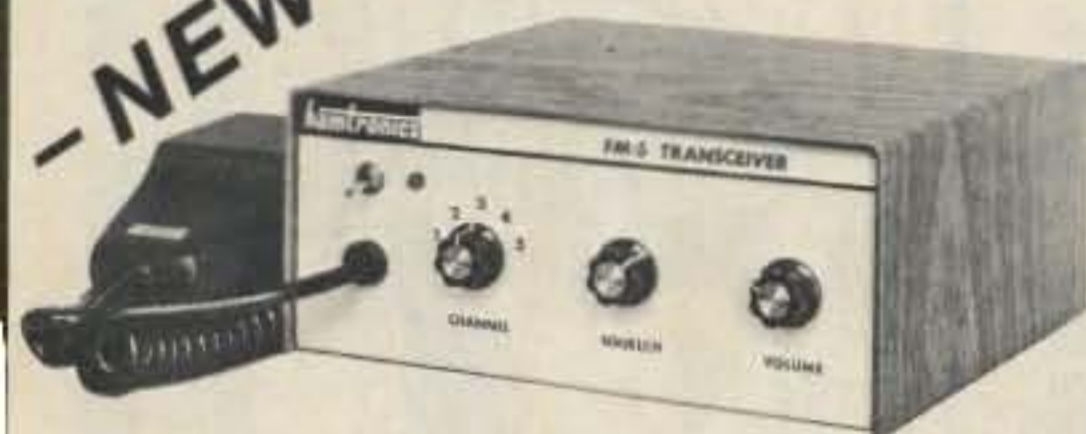
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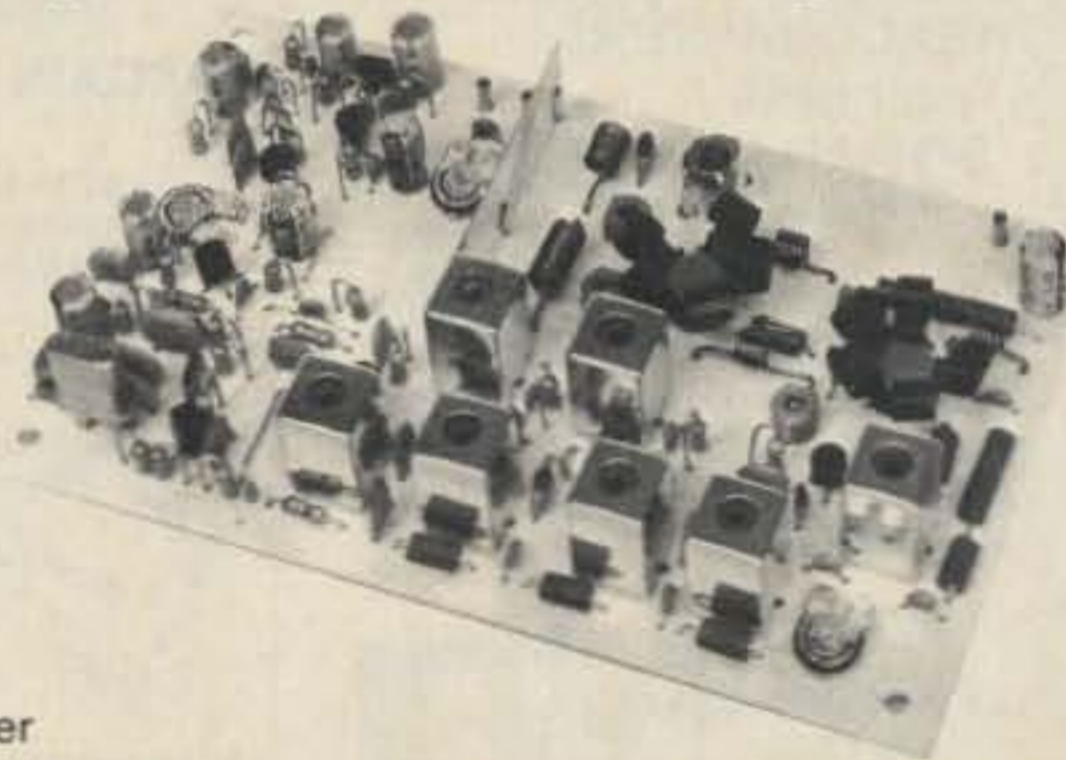
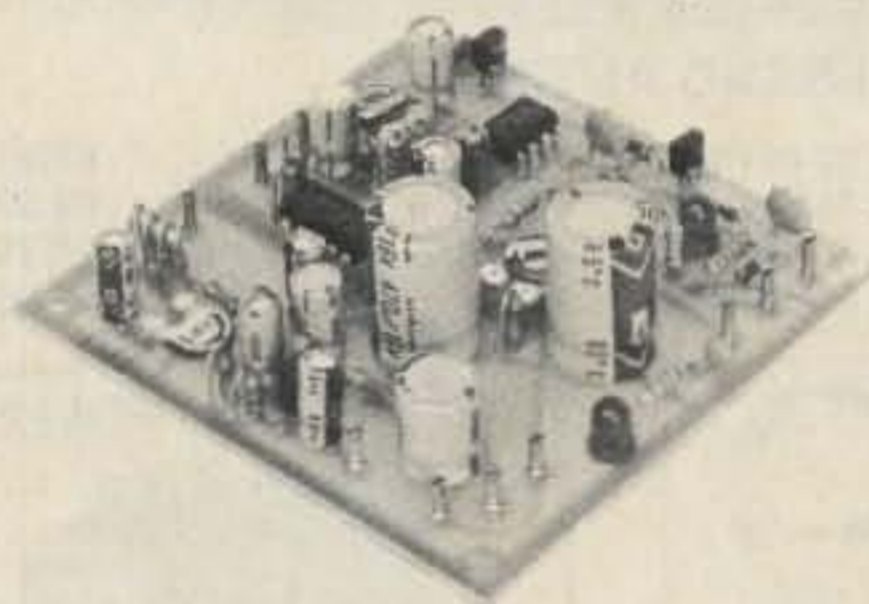
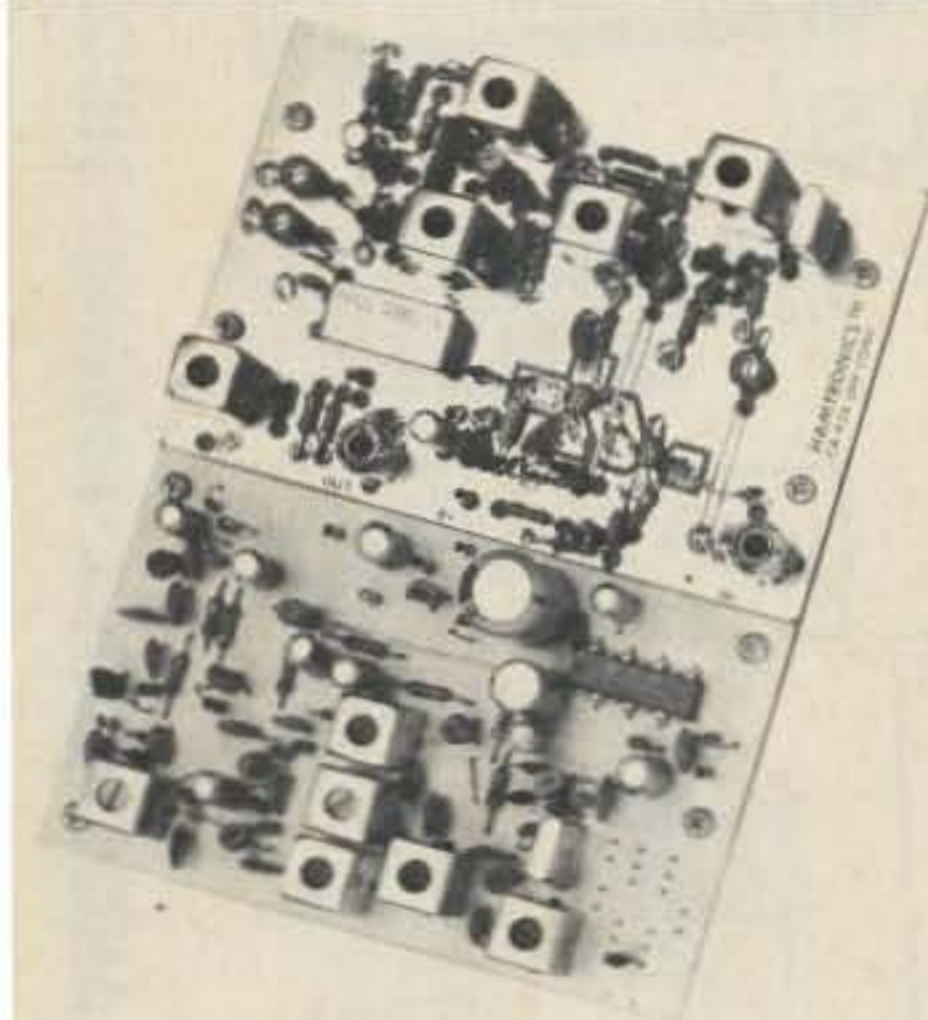
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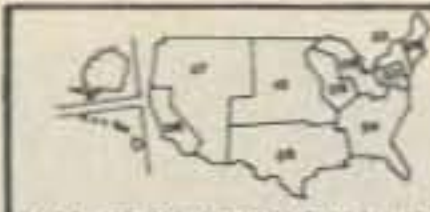
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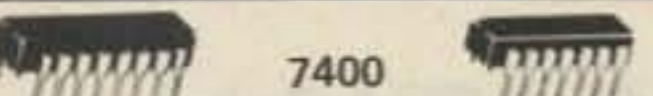


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7400

Table of 7400 series components including SN7400N, SN7401N, SN7402N, etc.

Table of 74LS series components including 74LS00, 74LS01, 74LS02, etc.

Table of 74S series components including 74S00, 74S01, 74S02, etc.

Table of CA-LINEAR and CD-CMOS components including CA3010H, CA3013H, CA3023H, etc.

OPTO ELECTRONICS - LEDS - G-GREEN, R-RED, Y-YELLOW, C-CLEAR. Includes diagrams of point source and diffused LEDs.

LED Mounting Hardware. Lists products like K22, K211, K208, etc.

LITRONIX-NATIONAL Stick Display Sale

Table of Litronix-National LED numeric arrays with columns for part no., digit size, format, overall size, price, and sale price.

COMPUTER GRADE CAPACITORS. Table with columns for MFD, WVDC, PRICE and sale price.

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CAPACITOR CORNER. Table of 50 VOLT CERAMIC DISC CAPACITORS and 100 VOLT MYLAR FILM CAPACITORS.

New Yaesu FT-102 Series Transceiver of Champions!



The long-awaited new generation of Yaesu HF technology has arrived! New research in improved receiver filtering and spectral purity is brought to bear in the competition-bred FT-102, the HF transceiver designed for active Amateurs on today's intensely active bands!

Unique Cascaded Filter System

The FT-102 utilizes an advanced 8.2 MHz and 455 kHz IF system, capable of accepting as many as three filters in cascade. Optional filters of 2.9 kHz, 1.8 kHz, 600 Hz, and 300 Hz may be combined with the two stock 2.9 kHz filters for operating flexibility you've never seen in an HF transceiver before now!

New Receiver Front End

Utilizing husky junction field-effect transistors in a 24 volt, high-current design, the FT-102 front end features a low-distortion RF preamplifier that may be bypassed via a front panel switch when not needed.

Notch and Audio Peak Filter

A highly effective 455 kHz IF Notch Filter provides superb rejection of heterodynes, carriers, and other annoying interference appearing within the IF passband. On CW, the Audio Peak Filter may be switched in during extremely tight copy conditions for post-detection signal enhancement.

Variable IF Bandwidth with IF Shift

The FT-102's double conversion receiver features Yaesu's time-proven Variable Bandwidth System, which utilizes the cascaded IF filters to provide intermediate bandwidths such as 2.1 kHz, 1.5 kHz, or 800 Hz simply by twisting a dial. The Variable Bandwidth System is used in conjunction with the IF Shift control, which allows the operator to center the IF passband frequency response without changing the incoming signal pitch.

Wide/Narrow Filter Selection

Depending on the exact combination of optional filters you choose, a variety of wide/narrow operating modes may be selected. For example, you may set up 2.1 kHz in SSB/WIDE, 1.8 kHz in SSB/NARROW, then select 1.8 kHz for CW/WIDE, and 600 Hz or 300 Hz for CW/NARROW. Or use the Variable Bandwidth System to set your SSB bandwidth, and use 600 Hz for CW/WIDE and 300 Hz for CW/NARROW! No other manufacturer gives you so much flexibility in selecting filter responses!

Variable Pulse Width Noise Blanker

To combat station noise, the "Woodpecker," and power line noise are modern-day enemies of effective Amateur operation. The FT-102 Noise Blanker offers improved blanking action on today's man-made noise sources (though no blanker can eliminate all forms of band noise) for more solid copy under adverse conditions.

Low Distortion Audio/IF Stage Design

That dynamic range, stability, and AGC problems have been largely eliminated thanks to improved technology, Yaesu's engineers have put particular attention on maximizing intelligence recovery in the receiver. While elementary cascading schemes often degrade performance, the FT-102's unique blend of crystal and ceramic IF filters plus audio tone control provides very low phase distortion, reduced passband ripple, and hence increased recovery of information.

Heavy Duty Three-Tube Final Amplifier

The FT-102 final amplifier uses three 6146B tubes for more consistent power output and improved reliability. Using up to 10 dB of RF negative feedback, the FT-102 transmitter third-order distortion products are typically 40 dB down, giving you a studio quality output signal.

Dual Metering System

Adopted from the new FT-ONE transceiver, the Dual Metering System provides simultaneous display of ALC voltage on one meter along with metering of plate voltage, cathode current, relative power output, or clipping level on the other. This system greatly simplifies proper adjustment of the transmitter.

Microphone Amplifier Tone Control

Recognizing the differences in voice characteristics of Amateur operators, Yaesu's engineers have incorporated an ingenious microphone amplifier tone control circuit, which allows you to tailor the treble and bass response of the FT-102 transmitter for best fidelity on *your* speech pattern.

RF Speech Processor

The built-in RF Speech Processor uses true RF clipping, for improved talk power under difficult conditions. The clipping type speech processor provides cleaner, more effective "punch" for your signal than simpler circuits used in other transmitters.

VOX with Front Panel Controls

The FT-102 standard package includes VOX for hands-free operation. Both the VOX Gain and VOX Delay controls are located on the front panel, for maximum operator convenience.

IF Monitor Circuit

For easy adjustment of the RF Speech Processor or for recording both sides of a conversation, an IF monitor circuit is provided in the transmitter section. When the optional AM/FM unit is installed, the IF monitor may be used for proper setting of the FM deviation and AM mic gain.

WARC Bands Factory Installed

The FT-102 is factory equipped for operation on all present and proposed Amateur bands, so you won't have to worry about retrofitting capability on your transceiver. An extra AUX band position is available on the bandswitch for special applications.

Full Line Of Accessories

For maximum operating flexibility, see your Authorized Dealer for details of the complete line of FT-102 accessories. Coming soon are the FV-102DM Synthesized VFO, SP-102 Speaker/Audio Filter, a full line of optional filters and microphones, and the AM/FM Unit.

Price And Specifications Subject To
Change Without Notice Or Obligation

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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 μ v, 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 high 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 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

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Specifications and price subject to change without notice or obligation.