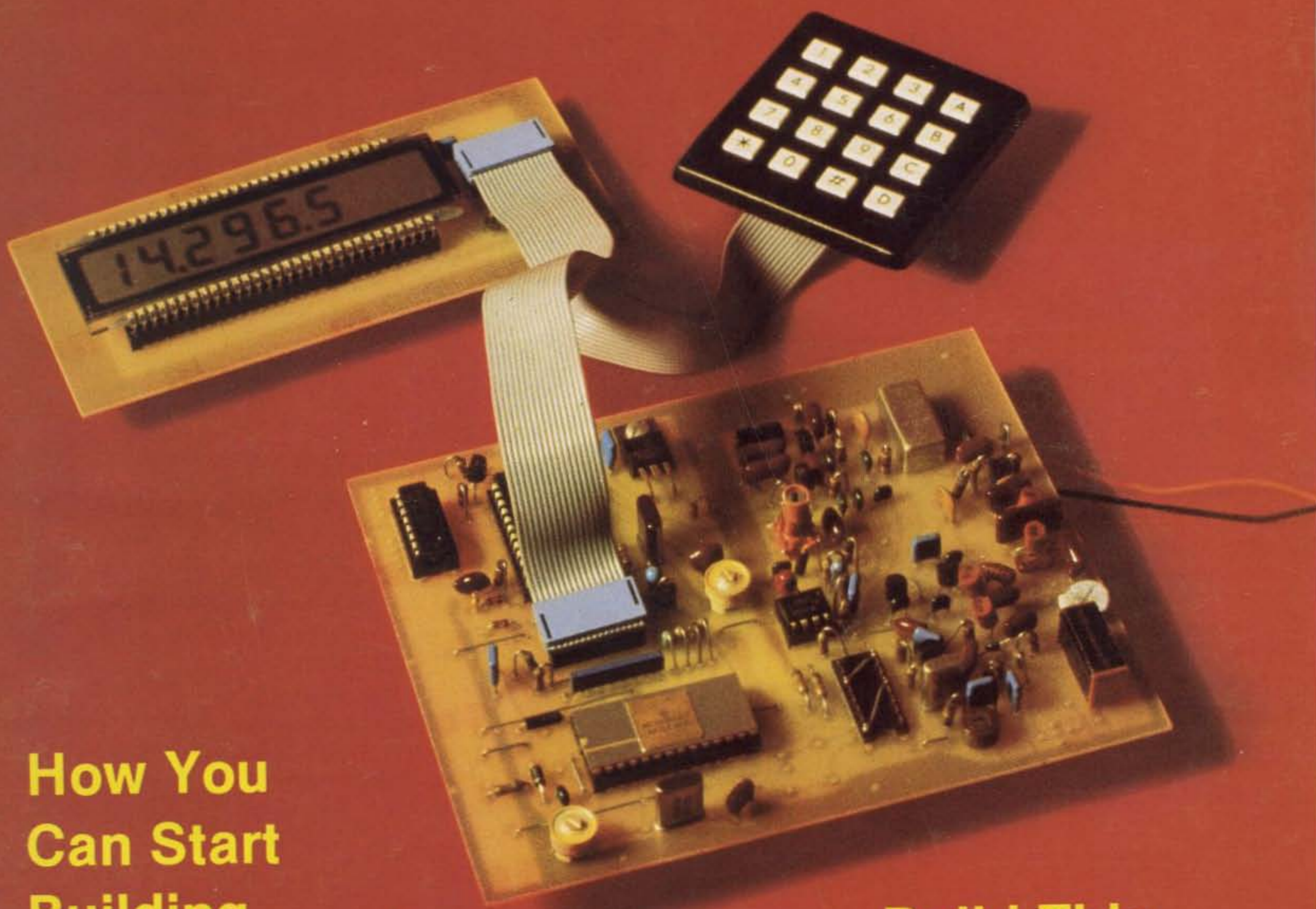


# 73 MAGAZINE

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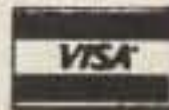
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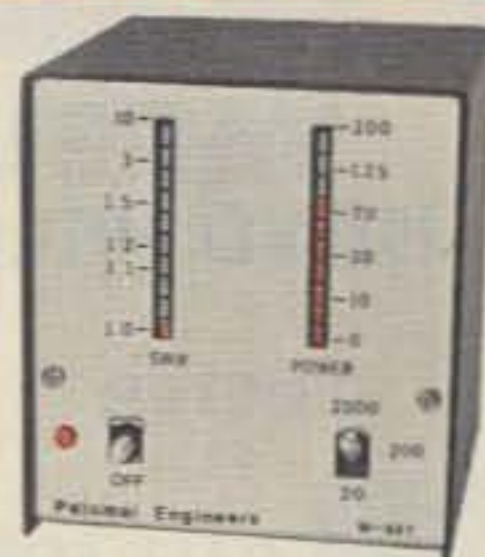
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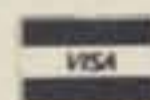
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# W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



## HOOKED

You know, after over forty years of hamming I still don't know exactly what it is that grabs the interest of a teenager and turns him from a normal rotten kid into a raving electronic maniac. I'm told by the doddering grey-bearded old-timers who have taken over most of the ham clubs in the country that youngsters are exposed to the whole world on television and thus find little exciting about talking to weird places.

Hmmm. I'm not convinced. No, amateur radio didn't gradually die off. It was killed with one blow back in 1963. Before that it had been growing at 11% per year for 17 years, right on up through the evolution of television. TV never even slowed it down.

My first exposure to amateur radio must have made a strong impression, because after 50 years I still remember it. Yep, sonny, I was a shaver of ten and while visiting the best friends of my grandparents in Bethlehem, New Hampshire, I met Harry Stevenson W1CUN. His mother, along with Johnny Macauley, ran the Valley View Inn. That was back in the heyday of hotels in Bethlehem. . .30 hotels and 100 rooming houses, the billboard at the entry to town said.

Harry was sitting there laconically talking on a 75m rig. . .a breadboard construction with a big copper tube final coil. He didn't pay a lot of attention to the visiting kid. It didn't occur to me, at ten, that I might ever be able to understand the wizardry of that mass of wires and tubes.

Like a time bomb ticking away, that experience lay hidden, waiting for the spark of puberty to set it off. By 14, I was already familiar with the excitement of the police calls at the top of the broadcast radio dial. Then all it took was an exposure

to a fantastic radio my grandfather in Littleton, New Hampshire had. . .with a shortwave band on it! Wow! There were all those foreign broadcast stations. . .and a myriad of hams. I was a roly-poly kid, but the family still had trouble tearing me away from the twenty-meter ham band to eat.

It was at just this juncture that some fiend dumped a box of radio parts in my lap one Sunday at church. Most of the parts were brand new and in their original cartons, so I couldn't just throw them away. Oh, I tried to sell them to the local radio repairman (now gone the way of the ice man), but he sneered at the parts as antiques. *Popular Mechanics* had a radio construction project each month, many of them using parts just like those in my collection, so I put together a radio in an old cigar box. . .and unfortunately it worked. I was hooked.

## HOME-BREW CONTEST WINNERS

- 1st place, \$250 prize: "Smart Squelch for Single-Sideband Receivers" by Frank Reid W9MKV and David Link W9YAN, both of Bloomington IN.
- 2nd place, \$100 prize: "Six-Meter Double-Sideband QRP Transmitter" by Larry Jack KL7GLK of Annapolis MD.
- Honorable mention, \$50 each: "MB-1 Function Circuit" by Mike Strange WA2BHB, Pine Hill NJ, "Splattometer" by Penn Clower W1BG, Andover MA, and "Weather Converter for Your Two-Meter Rig" by Paul Danzer N1II, Norwalk CT.

We're sure you have heard it said that "hams are not building anymore; they're just appliance operators." Well, 73's Home-brew Contest proves that rumor to be baloney. We were literally buried with entries. The winning projects show that hams are not only building, but that they are still innovating, too.

Our editorial staff burned the midnight oil in early April, choosing five finalists from more than 100 entries. The winners were then picked by three of 73's veteran home-brewers: AG9V, K1XR, and W1XU.

The Home-brew Contest winners will be published in future issues of 73. In the meantime, keep your soldering iron hot—73 is having another contest. This time there will be a \$50 limit for the project's parts.

## \$\$ HOME-BREW II CONTEST \$\$

Between now and October 1, we'll be looking for articles describing the best home-brew projects in the land for under \$50. All useful projects will be published in 73, and the cream of the crop will share \$500 in cash prizes. Top prize in the contest is \$250, with \$100 going to the second place project and \$50 to each of three honorable mentions. These prizes are over and above the payment that all authors receive for having their articles published in 73.

### Contest Rules

1. All entries must be received by October 1, 1982. To enter, write an article describing your best home-brew construction project, and submit the article to *73 Magazine*. Any construction article received before the October 1 deadline is automatically entered in the contest. Any entries for the first Home-brew Contest which meet the \$50 requirement for Home-brew II will be automatically entered. If you haven't written for 73 before, please send an SASE for a copy of our author's guide.
2. The total cost of the project must not exceed \$50, even if all parts are purchased new. Be sure to include a detailed parts list, with prices.
3. All parts used in the project must be available to the average radio amateur or electronics experimenter. To be on the safe side, include sources for any unusual components.
4. Projects will be judged by the 73 technical staff on the basis of usefulness, reproducibility, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, i.e., not previously published elsewhere.
6. All rights to articles purchased for publication become the property of *73 Magazine*.

Send your entries to:

Home-Brew II Contest  
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Winners will be announced in the December, 1982, issue of 73. Have fun!





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The ham DXing originally got me interested, but I didn't get into that aspect of it until years later. I was mostly active in my early days on 160m and 2½m.

don't know. . .and that *might* be some of the reason for our low level of newcomers. Still, with the entry into amateur radio now at five words per minute and the

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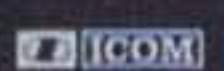
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# Build This Digital Vfo

## — a microprocessor makes it simple

**Ed. Note:** The MC6805T2L2 microprocessor IC used in this project must be ordered directly from Motorola. Send a money order only (no checks) for \$11.50, payable to Motorola, to: Tim Ahrens, Motorola, 3501 Ed Bluestein Blvd., Austin TX 78721, Attention: Mail Stop L-2787.

This article describes a microprocessor-controlled vfo which may be used as a remote vfo for existing stations or incorporated into new radio-system designs. The vfo features ten battery-backed-up memories, keypad entry of frequency, up/down scanning, a real-time clock, plus a liquid crystal display.

As a remote, the vfo tunes from 5 to 6 MHz in

100-Hz increments and is directly compatible with radios which use a 5-to-5.5-MHz internal vfo (e.g., FT-107, FT-707, etc.). If using one of these radios, only small modifications within the radio are required to allow the remote vfo to change bands at the touch of a finger!

### Microprocessor Selection

The vfo is designed a-

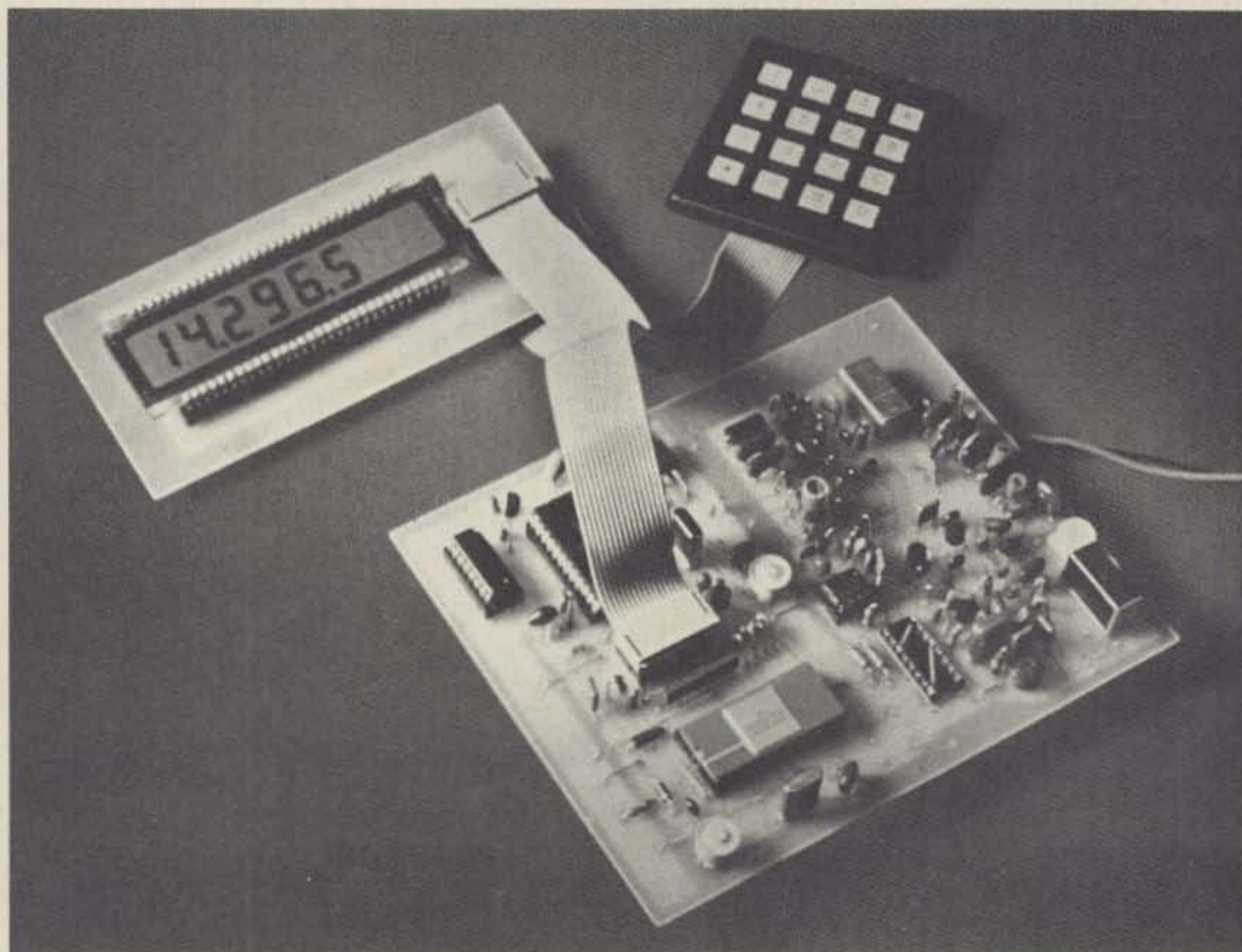
round Motorola's MC6805T2 microprocessor. Within this multi-function chip (now called a microcomputing unit—MCU—because of all the integrated functions on board), I/O plays a very important part. This is the portion of the MCU which does the actual communicating with switches, LEDs, bells, and whistles. The MC6805T2 MCU used in this project (we will refer to

it as the "T2") has a small amount of RAM, ROM (2.5 K bytes), a timer, parallel I/O lines, and one other feature that makes it ideal in the radio environment—a built-in frequency synthesizer. A block diagram of the synthesizer is shown in Fig.1(a); Fig.1(b) is a block diagram of the entire vfo.

The vco signal which is fed back into the T2 may have an amplitude as low as one-half volt and be as fast as 16 MHz. With external prescaling, the vco frequency may be considerably higher. However, any external prescaling will multiply the step size by the prescaling factor.

In addition to its on-chip synthesizer, the T2 contains enough ROM to hold all the software needed for the vfo control program. In fact, the T2 with the vfo program in ROM is available from any Motorola distributor.

An alternative to the T2 is the MC68705P3 MPU. The P3 is very similar to the T2 except that it requires an external synthesizer and it contains on-board EPROM instead of ROM. The EPROM on the P3 is user-programmable, so you should use the P3 if you need a control program other than the one avail-





able in ROM on the T2. See the box for further information on programming and use of the P3.

The circuit-board layouts given in this article can be jumpered for use with either MPU. The figures and text explain where differences occur. For those who prefer not to etch their own boards, a source for boards as well as components is given in the small box.

### Using the Vfo

Upon power-up, the MCU reads the last-entered frequency from the RAM on board a battery-backed-up MC146818 clock chip, enters it into the synthesizer, and displays it. If powering up from a "dead" system (no battery backup), garbage will be both displayed and entered into the PLL system.

After the power-up sequence is completed, numbers for a different frequency may be entered via the keyboard. When the display shows the frequency desired, depress "enter" and the PLL system will be set up. By entering the frequency in this manner, it is also stored in RAM so that if a power failure should occur, the correct frequency will be read from the battery-backed-up system and the PLL restored.

If the displayed frequency is to be stored into memory for later recall, press "memory" followed by a digit, 0-9. To retrieve a previously stored frequency, press "recall" followed by the desired digit. All of these memories have battery backup.

If you want to move up in frequency, press and hold the "up" button. If you want to go up fast, press and hold the "fast" button at the same time. The frequency will go up until it reaches XX.999.9, at which time it will roll over to XX.000.0. To make the system go down in frequency, the same procedure may be

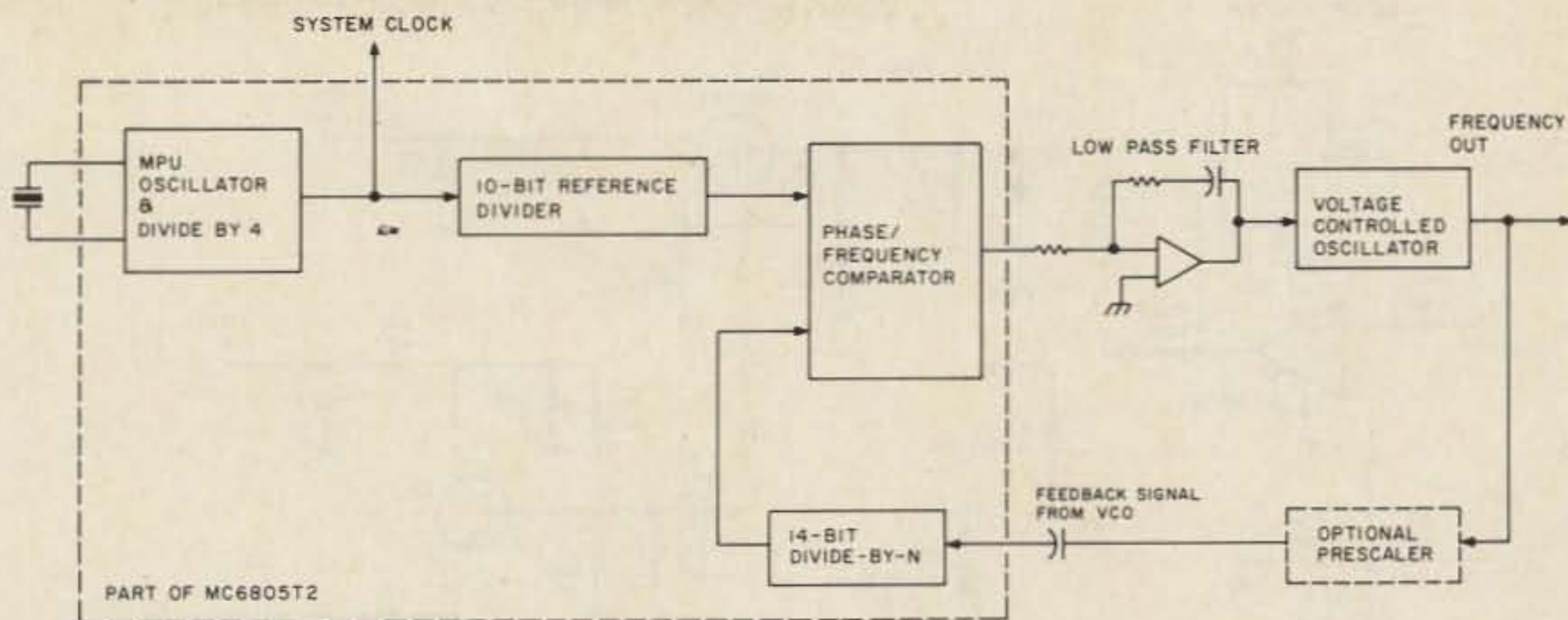


Fig. 1(a). Block diagram of synthesizer on MC6805T2 MCU chip.

followed using the "down" key.

To set the time, press "recall" followed by "memory." At this time, the display will show EEEEE, signifying that the time may now be entered. Enter the time in 24-hour format, and when satisfied with the display, press "enter." At this time, the data will be placed into the clock chip's registers and time-keeping will commence. When "enter" is depressed, the frequency that was on the display before setting the clock will be restored to the display. The actual PLL systems are not disturbed by entering into either this mode or the time-display mode.

To display the time with an update every second, press "recall" followed by "enter." You may exit this mode by pressing any key, which will return the display to the previous frequency.

As you can see, the combination of the MC6805T2 MCU and the MC146818 clock chip provides the radio designer with capabilities that far surpass the previously acceptable methods of frequency control. The 6818 may be omitted, but the clock feature, stored frequencies, and the battery backup of them will also be deleted.

### Vfo Circuit Design

The rf circuitry I used is

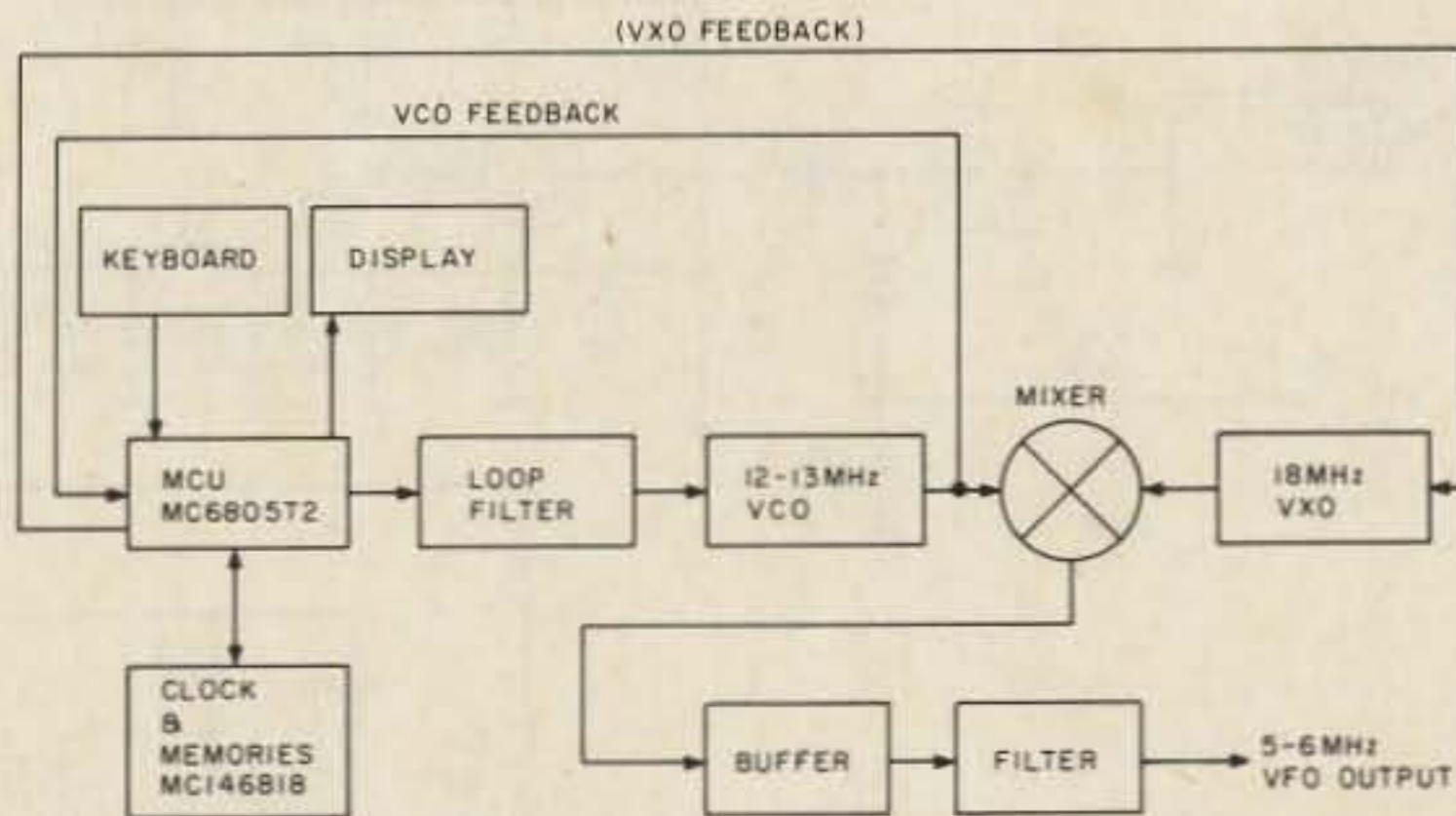


Fig. 1(b). Block diagram of entire microprocessor-controlled vfo.

given in Fig. 2, while the MCU and its peripherals are shown in Fig. 3.

As the MCU's minimum step is 1 kHz, some method of refinement must be incorporated because 1 kHz is not adequate resolution in the HF bands. By using four of the I/O lines from the MCU for a voltage-sum-

ming network, 100-Hz stepping increments may be realized. The output of the summing network is used as an "offset" voltage to shift the frequency of the vfo. Because the frequency will be locked (basically to itself), changing the main vco frequency would achieve nothing. There are, however, two methods of

### PARTS AVAILABILITY

The varactor diodes (D2 and D3) and most of the integrated circuits used in this project are Motorola devices and are available from Motorola distributors. In many parts of the country, Hamilton-Avnet Electronics is a source for these parts. Excluding the LCD unit, a set of ICs for this project should cost between \$45 and \$70, depending on which microprocessor you select for your version.

The MD108 double-balanced mixer is available for \$12 post-paid from ANZAC, 180 Cambridge St., Burlington MA 01803. A good selection of coils and forms can be found at RADIOKIT, Box 411S, Greenville NH 03048.

Parts, as well as circuit boards, are also available from Conversion Dynamics, 2218 Old Middlefield Way, Suite N, Mountain View CA 94043. Their version uses a double-sided PC board and an LED rather than LCD frequency display. Write to them for more details.



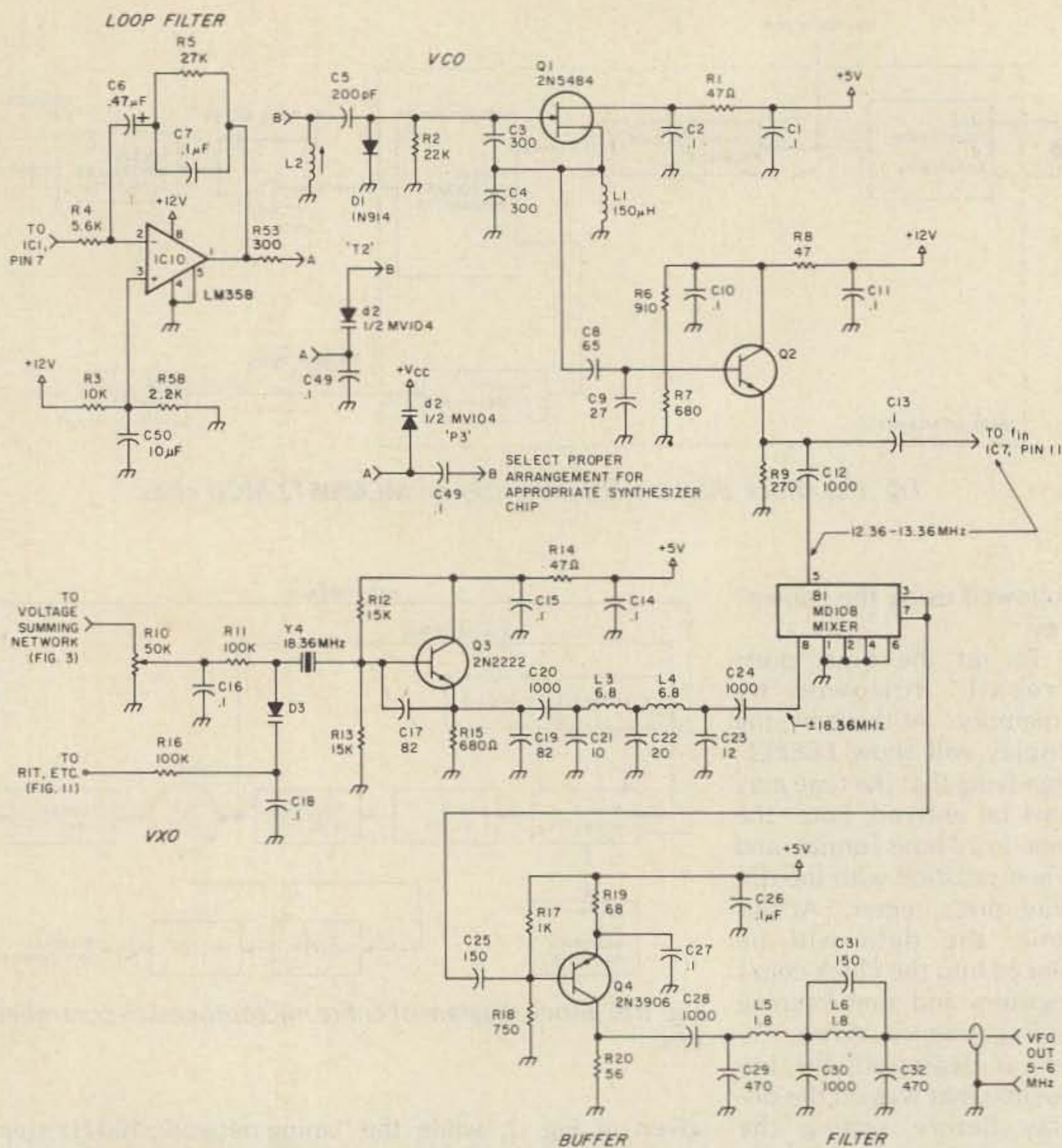


Fig. 2. Rf circuitry of vfo.

changing the frequency which would not affect the PLL system itself: Shift the reference frequency, or use an auxiliary variable crystal oscillator (vxo) and then mix the two frequencies together.

The first method was tried initially, but due to the low frequency of the crystal, I could not pull the oscillator far enough off frequency to provide the 100-Hz shift and still have provisions for RIT. So the second method, of an auxiliary vxo, was tried. The main vco tunes from 12.36 to 13.36 MHz and is then mixed with 18.36 MHz from the vxo to provide the necessary 5-to-6-MHz signal. This method of shifting through 100-Hz steps may seem a bit crude, but sever-

al commercial transceivers use this method. In fact, Icom's IC-730 uses this method to generate 10-Hz steps! Fig. 4, a spectrum analyzer photo, shows the actual vfo output.

The 18.360-MHz vxo crystal (Y4) was chosen because I had one; it is a 146.88-MHz transmit crystal for an HT-144. Either of two crystals may be used in the oscillator. An 18.360-MHz or an 18.860-MHz crystal may be selected by a jumper and a pullup/pull-down resistor on pin 27 of IC1 (see Fig. 3). The vco must be adjusted for the crystal you choose.

If a different frequency range is to be covered by the vfo, the frequency of the vxo crystal must be changed, and appropriate

modifications in the filters should be made. From this, it may be seen that almost any frequency may be generated from the vfo by simply changing the vxo crystal.

### The MCU and Clock Circuit

A version of the MC6805T2 is available from Motorola which already contains in ROM the program necessary to function as a vfo. This part is called an MC6805T2L2. The L2 signifies a specific program within a ceramic part, in this case, the vfo software. The MCU is used to gather data from the keyboard and execute any function which is "called up." The lines used for I/O are represented by PA0-PA7, PB0-PB7, and PC0-PC2. Port A is used for

both the keyboard and interface to the MC146818 clock chip. In this application, the clock chip is battery-backed-up, and when powered down draws only 300-400 microamperes from a four-and-one-half-volt source.

The B port is used to control the four bits of the voltage-summing network plus the read/write and control lines of the clock. The C port is used to control the clock and data lines of the liquid crystal display (LCD). Only two crystals are required in this part of the vfo—a 4.096 MHz for the MCU, and a 4.194 MHz for the clock chip. These frequencies are divided down by their respective hosts for internal timing.

All of the peripherals with the exception of the 6818 are serial devices. This means that the digital data which goes to each part requires only two lines, a data line and a clock line. In the MCU environment, I/O lines are at a premium; that is why data lines are common to all parts and only the clock or enable lines are separated from the rest.

### The Display

The display portion of the system uses the MC145000 multiplexed LCD driver and an 8-digit LCD, although only six digits are used.

The MC145000 requires a total of four lines—power, ground, clock, and data. This means that the display may be located away from the main PC board. This makes for a lot easier construction of the total project! Since this is digital data on two of the lines, use no more than about a foot of cable. Current consumption is quite low with this CMOS device—about 75 microamperes. As data is shifted into the 145000, every 8 bits will shift over one character from left to right. Even if only the right-hand-most digit is to be



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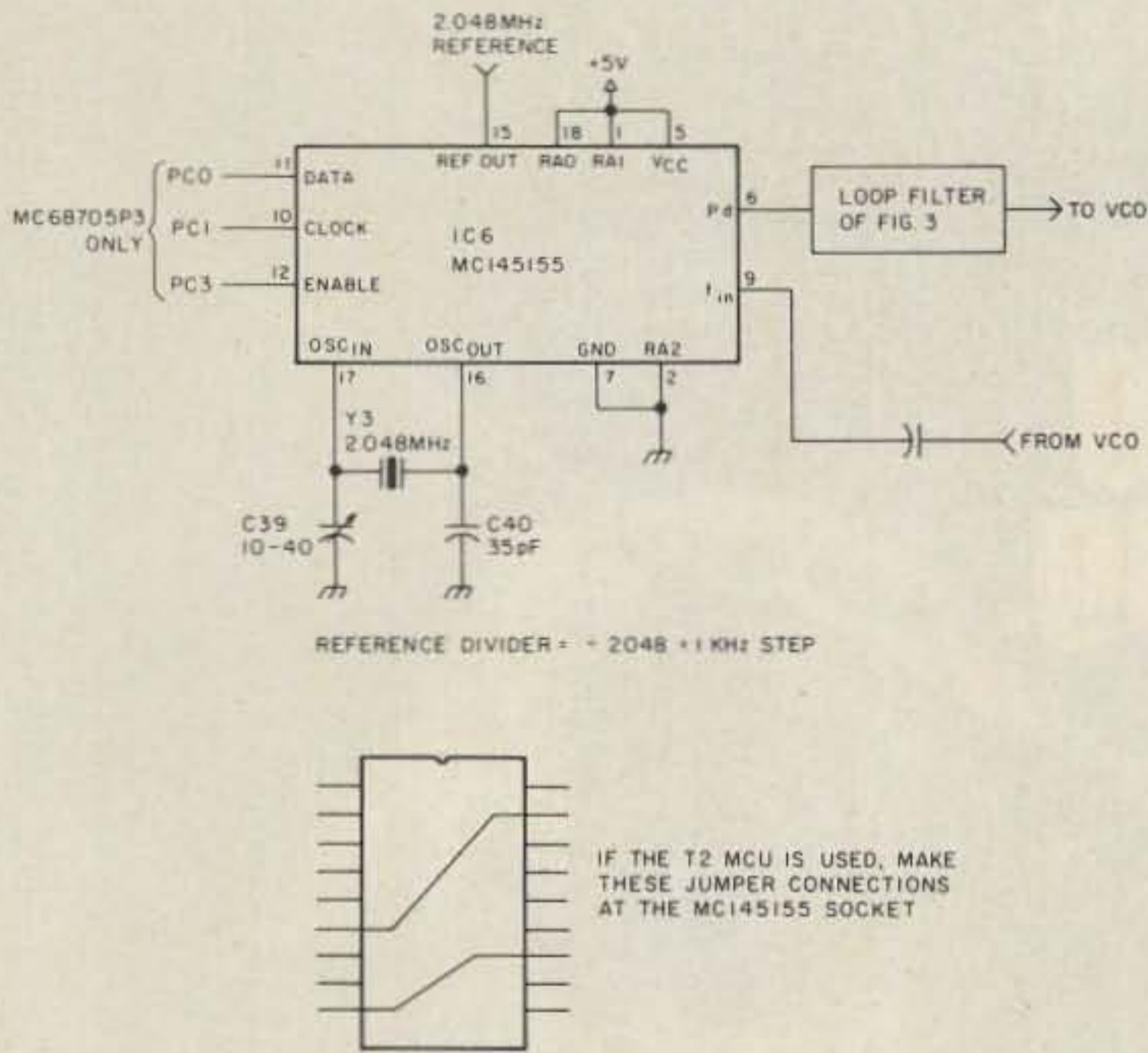


Fig. A. Using the MC145155 CMOS synthesizer.

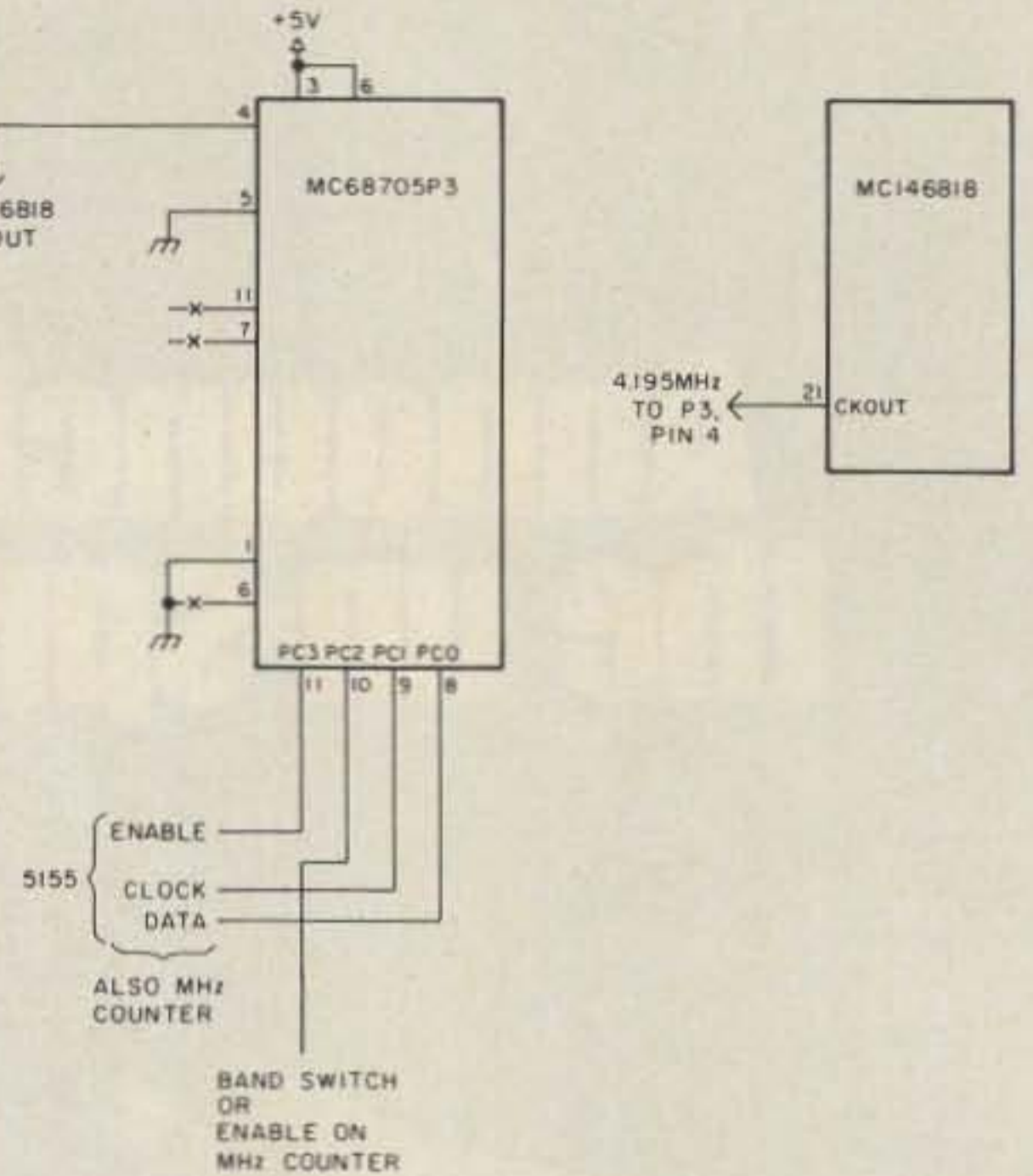


Fig. B. 6805 T2 vs. P3 differences.

### Using the P3

Although designed for the MC6805T2, the vfo software was given the capability of using the MC68705P3 as a host MCU. This MCU is identical to the T2 with the following exceptions:

- The P3 does not contain a PLL.
- The P3 is an EPROM-type part which programs itself.

In the early stages of the design, a T2 was not available and a "simulation" was made by using a P3 and an MC145155 CMOS synthesizer. If changes to the program are desired, you may use a P3 plus an MC145155 CMOS synthesizer to simulate the T2, as shown in Figs. A and B. This allows you to use the same basic core of the program and add enhancements that might be useful.

The actual software listing for the system is available from me on receipt of a large SASE plus \$3.00 to cover copying

costs. It may be entered into an MCM2716 2K by 8 EPROM for programming of the MC68705P3. Fig. C is a schematic for the programmer.

The MC68705P3 MCU has the capability of programming itself. By adding only one additional part (MC14040B), the P3 can read data from a 2K by 8 EPROM and program itself from it. Two LEDs are used, which signify that the device has been 1-programmed, and 2-verified.

Because the hardware required to program the P3 is so small, even the casual amateur/hobbyist may build a programmer to take advantage of the MCU's capabilities.

Either the T2 or the P3 with the MC145155 can be used with the circuit board presented in this article. If the T2 is used, the MC145155 is not needed and two jumper connections should be made at the MC145155 socket. See Fig. A.

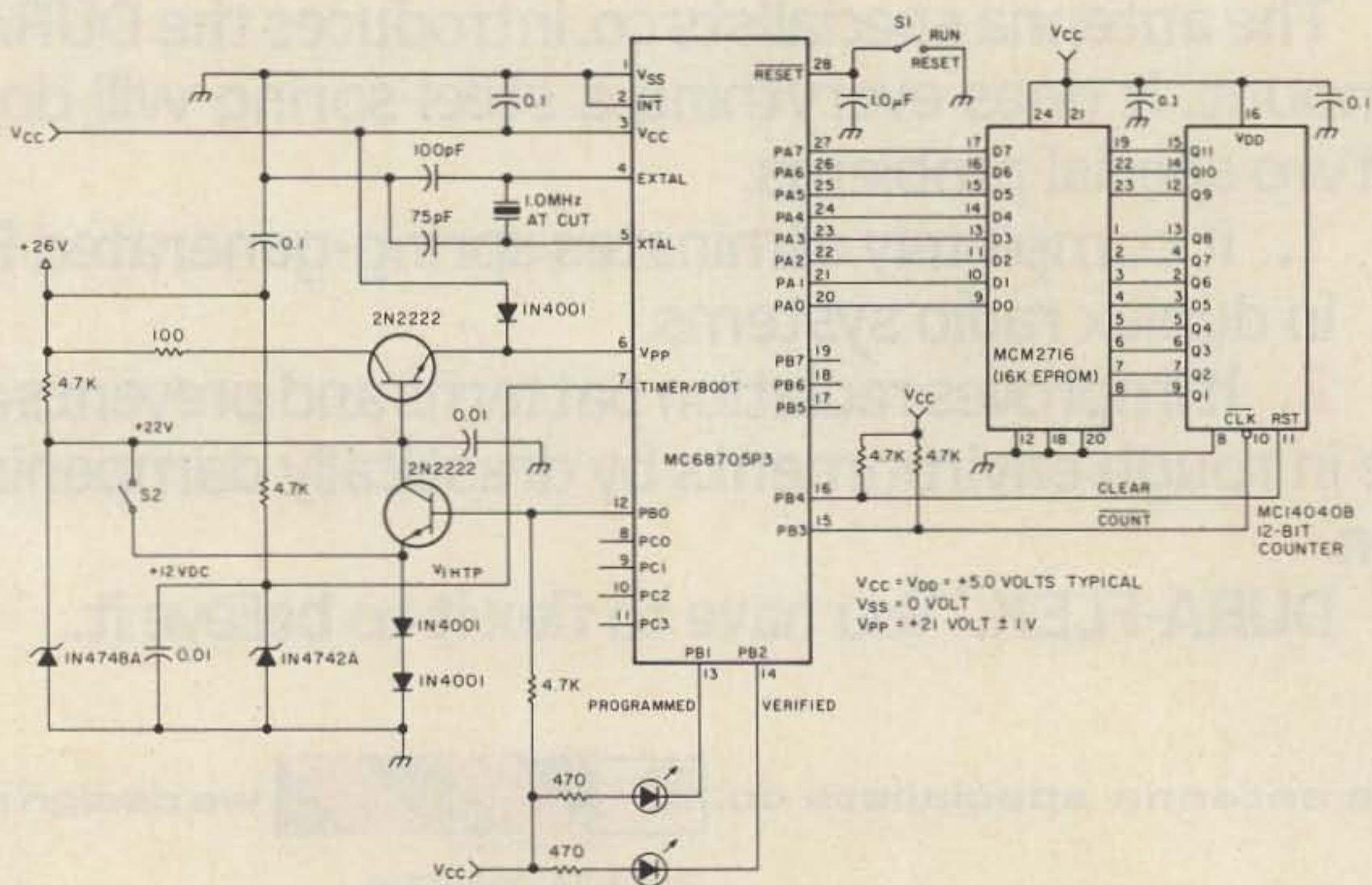


Fig. C. Programmer for the P3.



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- Easy to use mobile mount with instant disconnect knobs for fast, simple removal. DC Cable and mounting hardware, spare fuse, external speaker plug and complete simplified instruction book includes circuit diagrams and even complete alignment instructions! No extras to purchase!

- Control functions: Select memories, show memory channel number, or select memories and show frequency of channel, or dial frequencies with two speed selectable control. Instant choice of either 5 or 100 hz tuning steps. Band scan or frequency scan selectable.

- Frequency shown in 5 bright LED digits. LED indicator shows when signal is received (unsquelched), LED indicator shows transmit.

- Modern LED bar meter shows signal strength of received signal and on transmit shows relative output power.

- Microphone includes tone pad, and up and down buttons to change dial frequency or memory channels.

- A standard microphone with up-down buttons only is available separately.

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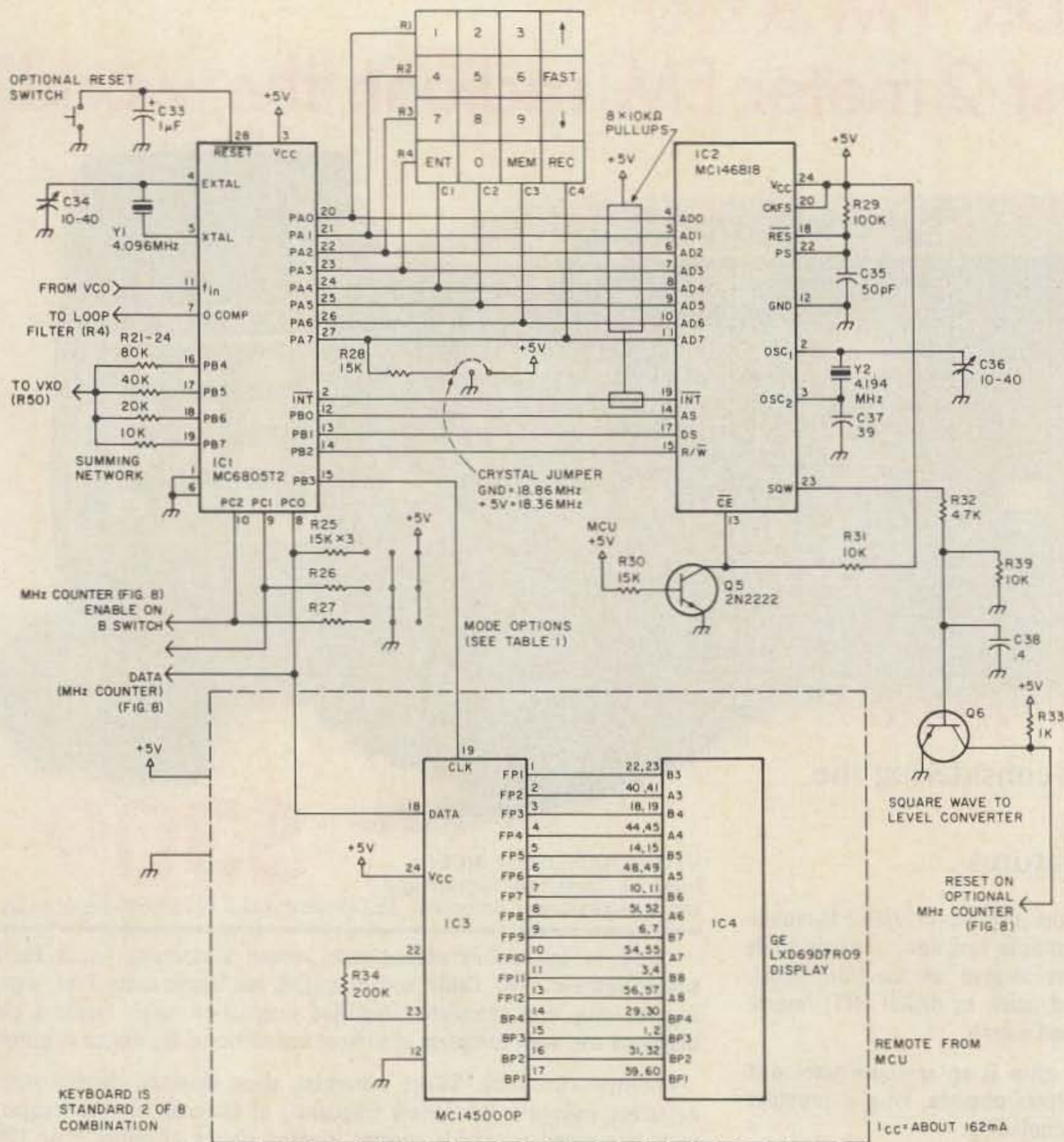


Fig. 3. MCU and peripherals.

changed, all 6 digits must be present to the 145000 (48 bits worth). Fig. 5 is a chart which relates bits to digit segments.

### The Real-Time Clock

The MC146818 is a new device which not only has a real-time clock in it, but

also contains 50 bytes of CMOS RAM. This makes the device an excellent choice, since data in the RAM may easily be saved in a power-down condition.

The 6818 has a clock generation circuit on chip which requires only a crystal, resistor, and two small capacitors to generate not only the time clock source, but also a clock signal for the rest of the system if desired. If the crystal mode is not chosen, the 6818 may be driven with an external frequency of 4.195 MHz, 1.048 MHz, or 32.768 kHz. An internal register tells the 6818 which frequency it is on. I have found that the 6818 draws less power when operating at the lowest frequency—32.768 kHz.

Displayed Digit	Display Format Hex Code
0	D7
1	06
2	E3
3	A7
4	36
5	B5
6	F5
7	07
8	F7
9	B7
A	77
b	F4
C	D1
d	E6
E	F1
F	71
P	73
Y	B6
H	76
U	D6
L	D0
blank	00
— (dash)	20
= (equal)	A0
n	64
r	60
°(degrees)	33

Note: A decimal point can be added to all but the right-most display digit by setting b3 [segment (3)] to a 1.

Fig. 5. Display codes of LCD readout.

In fact, by using an MC14069 inverter as a crystal oscillator at 32.768 kHz, less power is used than by using a 4.194-MHz crystal on the 6818! As with most parts of this type, the faster the clock, the more current required.

The MC146818 may be set up in a 12/24-hour type mode, plus alarms which may be set to interrupt at any time, including every hour, minute, or second. As shown in Fig. 6, there are 14 registers required to set up this data, and the entire memory map looks like 64 RAM locations.

Although the MC146818

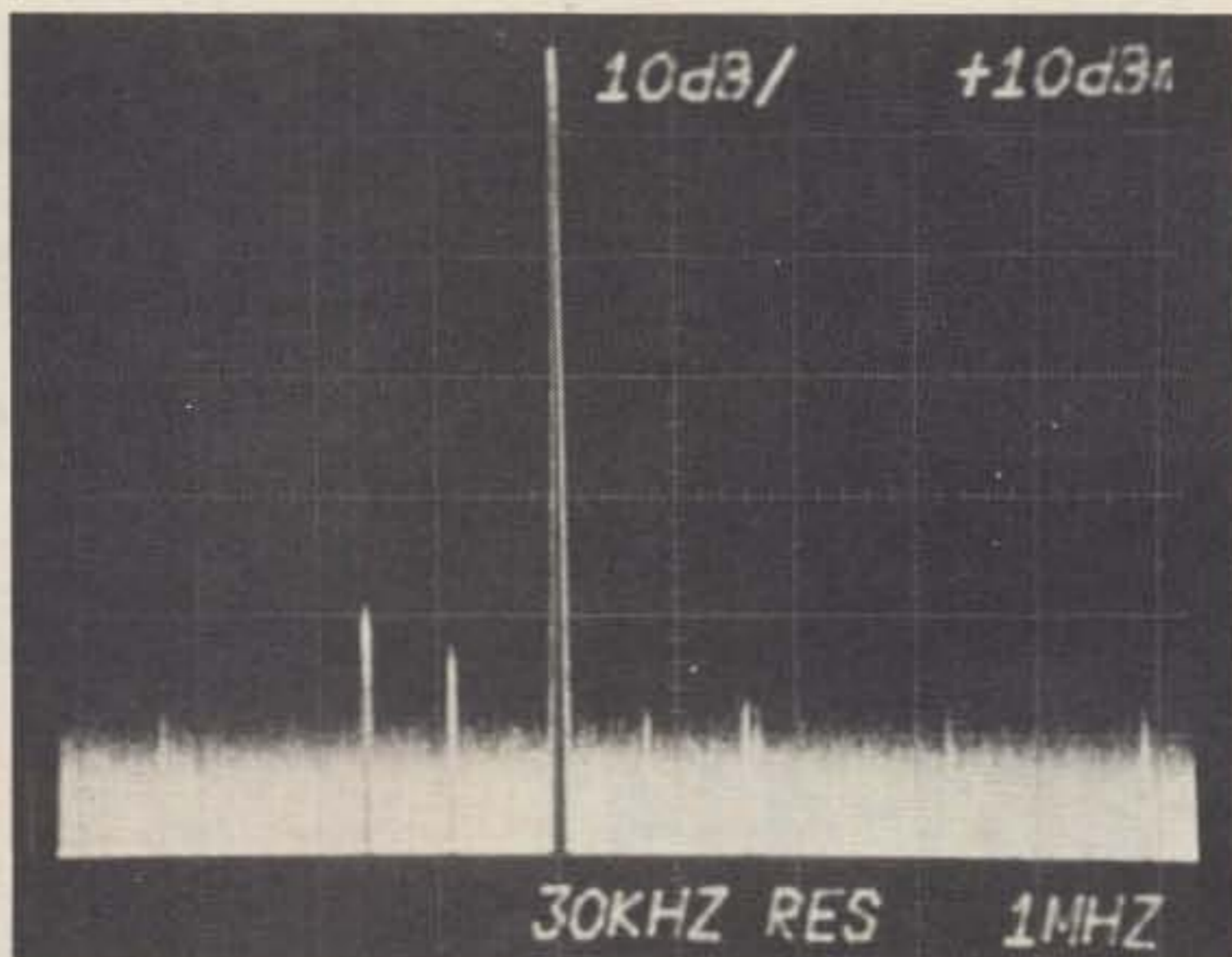


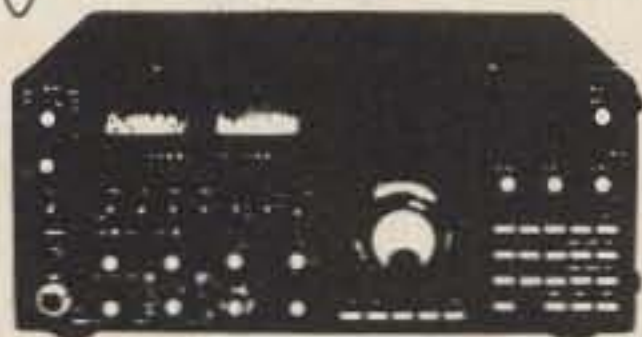
Fig. 4. Vfo output displayed on spectrum analyzer.



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### DONS CORNER

My spy at the Japanese factories, Tang In Stead, is back on my good side. If you have followed his doings, you will recall that he leaked the info on the new Kenwood TS-840s three months ago. Well take those three months, which is 90 days, add that to the number 840, and presto, the Kenwood TS930s. He was RIGHT! Just premature. . .but isn't that what spies are for? Tang has started rumblings about the new Icom HF rig that is about to debut. More on that next month.

Antennas, those things that you stick up on the roof or tower and then forget about, are evolving into new shapes. If you haven't checked yours recently, get up there and inspect the connectors, traps, guys, and joints. That next DX pile-up is the wrong time to discover the creeping crud. What with the new verticals and compact beams, there is no reason to use wire as your primary radiator. Call us and ask what the best alternative is for your set-up.

If you and the clan are going on a vacation, don't neglect the equipment you are taking along. Consider an amplifier, extra batteries, appropriate mobile antennas, power cords, scanning or DTMF mikes, mobile chargers, and so on. Think about how the rigs will be used and be prepared.

See you next month!

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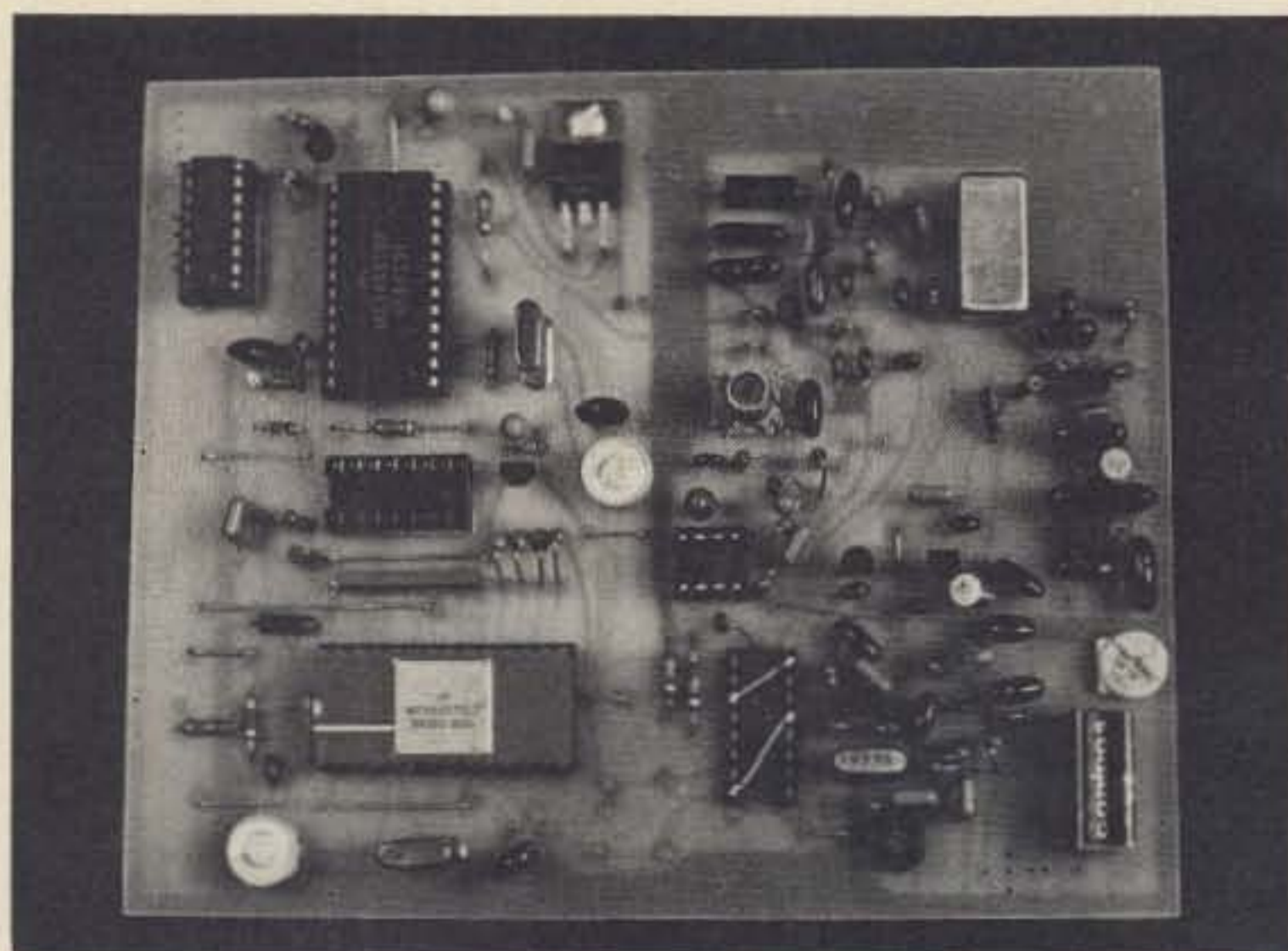


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Main circuit board, using the MC6805T2L2 MPU. If the alternate "P3" MPU is used, then the socket with jumpers at lower center would be replaced with an MC145155P synthesizer chip. The empty socket at left is for the plug-in cable to the keypad. At upper right is a metal can containing the double-balanced mixer.

clock chip is not designed to have any I/O pins, there is one way in which a single output bit may be "constructed." The SQW pin is a software-programmable clock output pin whose frequency is a derivative of the 6818's clock. The internal register which controls the frequency of the SQW pin can not only change the frequency of the pin, but it may also turn it off. By setting the frequency of the SQW to some relatively high frequency (it is not really that important) and providing some external filtering, when the clock is on, the output of the filter represents a "one" condition, and when off, represents a "zero" condition! This provides an extra I/O pin.

### Power Supply

To supply the MC146818 with voltage both when the main system is off and on, there need to be a few smarts involved. See Fig. 7. The trick required is to use D6 to initially raise the 5 volts from IC7 one diode drop higher (.7 V), then drop the supply voltage (Vcc) to both MCU and 6818 by separate diodes (D4 and D7). This ensures that both parts

are operating at basically the same voltage. For battery-backup operation, D5 is inserted from the plus lead of the battery to pin 20 of the 6818. This isolates the batteries from the rest of the system and doesn't allow any current to flow back into them when the main Vcc is on. If you are using nicads, a resistor of appropriate value could replace the diode to allow charging during on time. The value of this resistor is of little consequence to the 6818 when the main power is off because the current consumption of the 6818 is so low.

In addition to the voltage differential, there is another consideration regarding the chip enable (CE) line of the 6818. When the system is powered down (main power), the CE line of the 6818 should be brought high to ensure that the part is deselected. This is easily accomplished by using a transistor (Q5 in Fig. 3) in the classical inverter style. The base is tied to the MCU Vcc (through an appropriate resistor), and the collector resistor is tied to the 6818 Vcc. When the system is on, the collector is low, enabling the 6818, but it goes

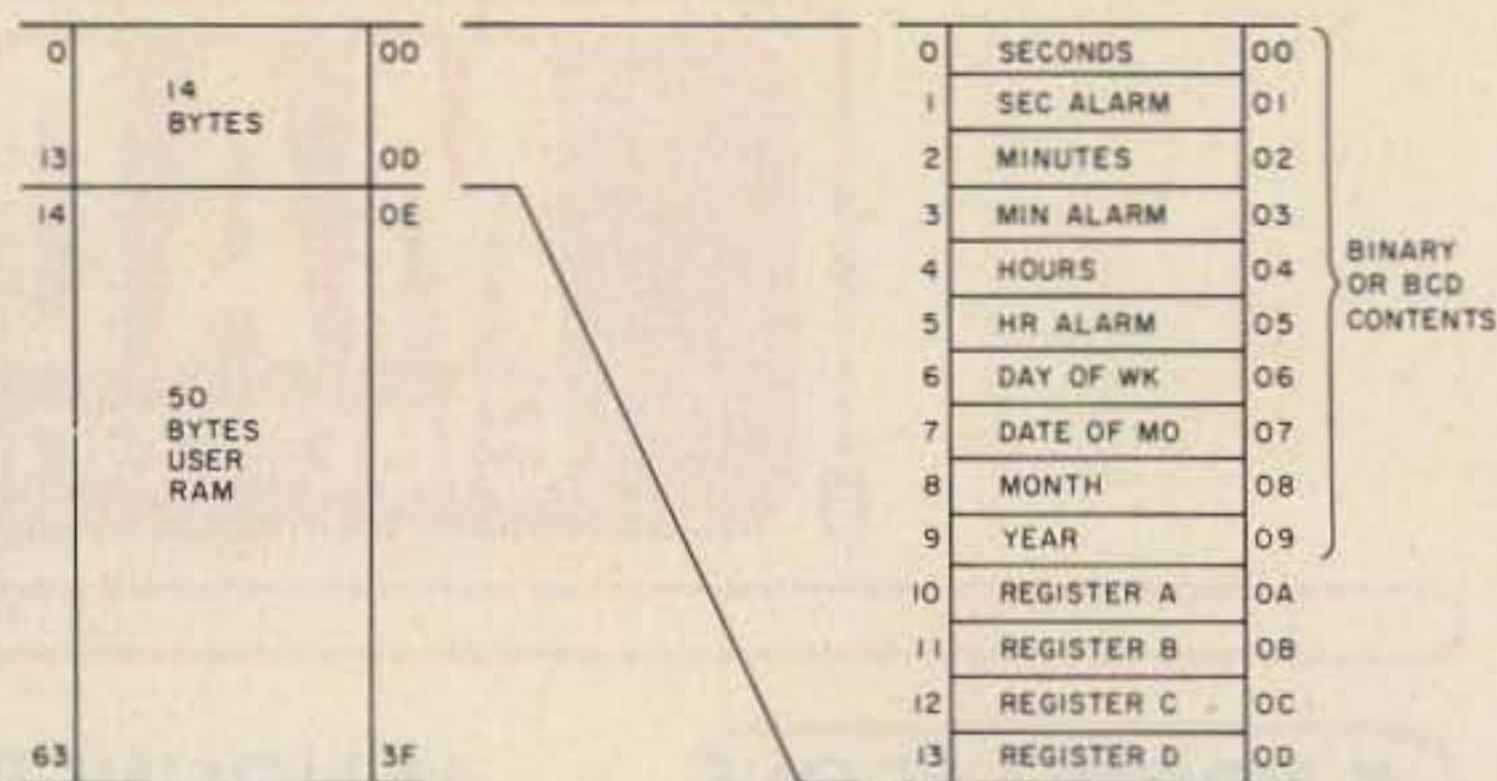


Fig. 6. Registers of the MC146818 clock chip.

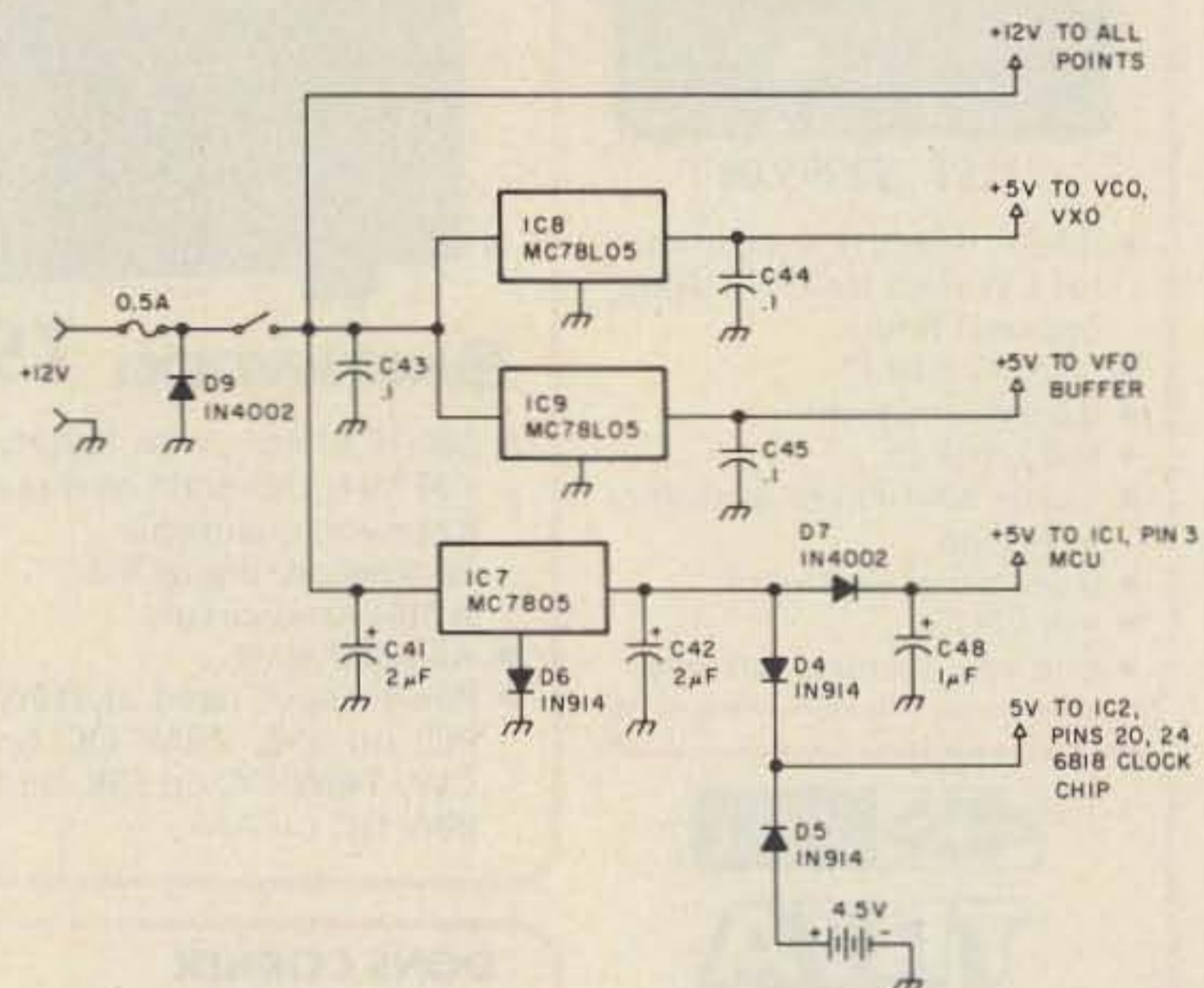


Fig. 7. Power supply. The regulated 12 V dc which drives this supply can often be derived from your transceiver. Otherwise, a simple 12-V-dc, 1-A source should be constructed.

high when the system gets turned off.

### The Keyboard

Because I/O lines are so valuable, each one commonly is given more than one function. Of course, every effort has been made to keep the number of lines required to a minimum (by using serial-type devices), but there are instances where large numbers of I/O pins are required. For instance, the 4x4 keypad requires eight lines just to decode the proper key. Yes, a two-to-four decoder could have been placed external to the MCU which would free up two additional lines, but it also would have required an external device to perform that function. The system designer must make the decision here. In this

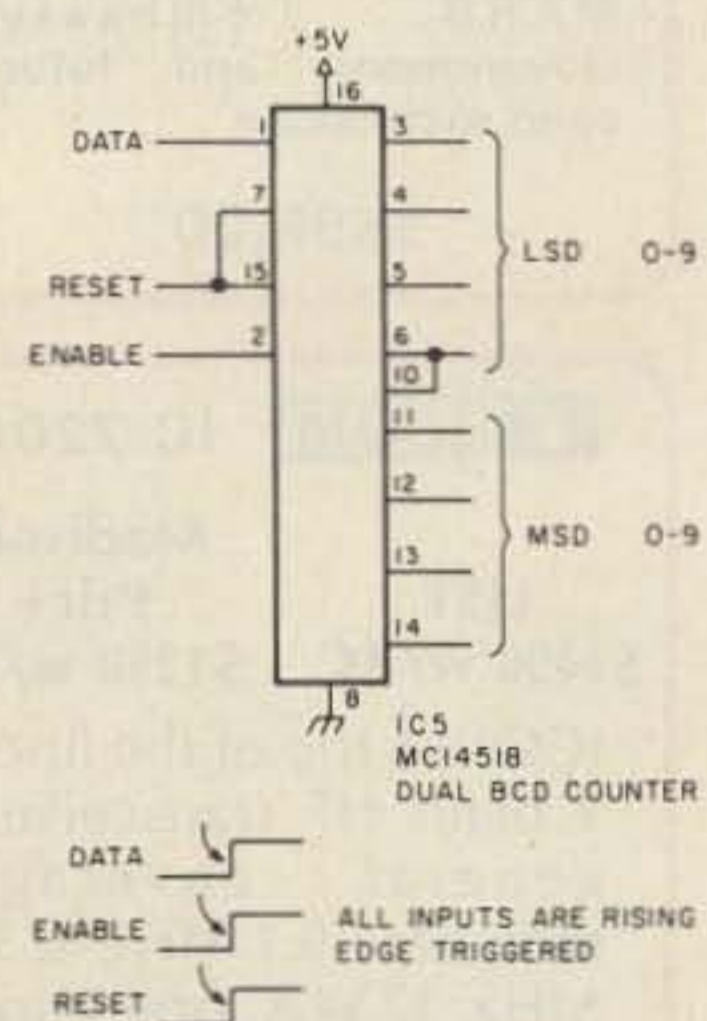


Fig. 8. MHz-counter option.

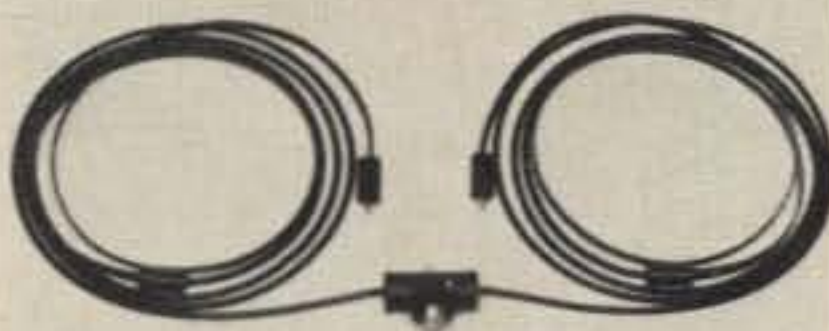
case, I chose to "multiplex" the data lines for the clock on the same I/O lines as those required for the keyboard.

The way the software works, immediately after a key is released, e.g., the "enter" key, the data direc-



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- Replaces center insulator
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  - Construction of antenna loading coils or multiband traps

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## DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
<b>Dipoles</b>				
D-80	80,75	130	\$31.95	\$27.95
D-40	40,15	66	28.95	24.95
D-20	20	33	27.95	23.95
D-15	15	22	26.95	22.95
D-10	10	16	25.95	21.95
<b>Shortened dipoles</b>				
SD-80	80,75	90	35.95	31.95
SD-40	40	45	32.95	28.95
<b>Parallel dipoles</b>				
PD-8010	80,40,20,10,15	130	43.95	39.95
PD-4010	40,20,10,15	66	37.95	33.95
PD-8040	80,40,15	130	39.95	35.95
PD-4020	40,20,15	66	33.95	29.95
<b>Dipole shorteners - only, same as included in SD models</b>				
S-80	80,75			\$11.95 pr
S-40	40			\$10.95 pr

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center insulator, No. 14 antenna wire, ceramic insulators, 100 nylon antenna support rope (SD models only 50) rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

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- Built-in 5 inch green CRT display
- Four page video screen display
- Six programmable HERE IS messages
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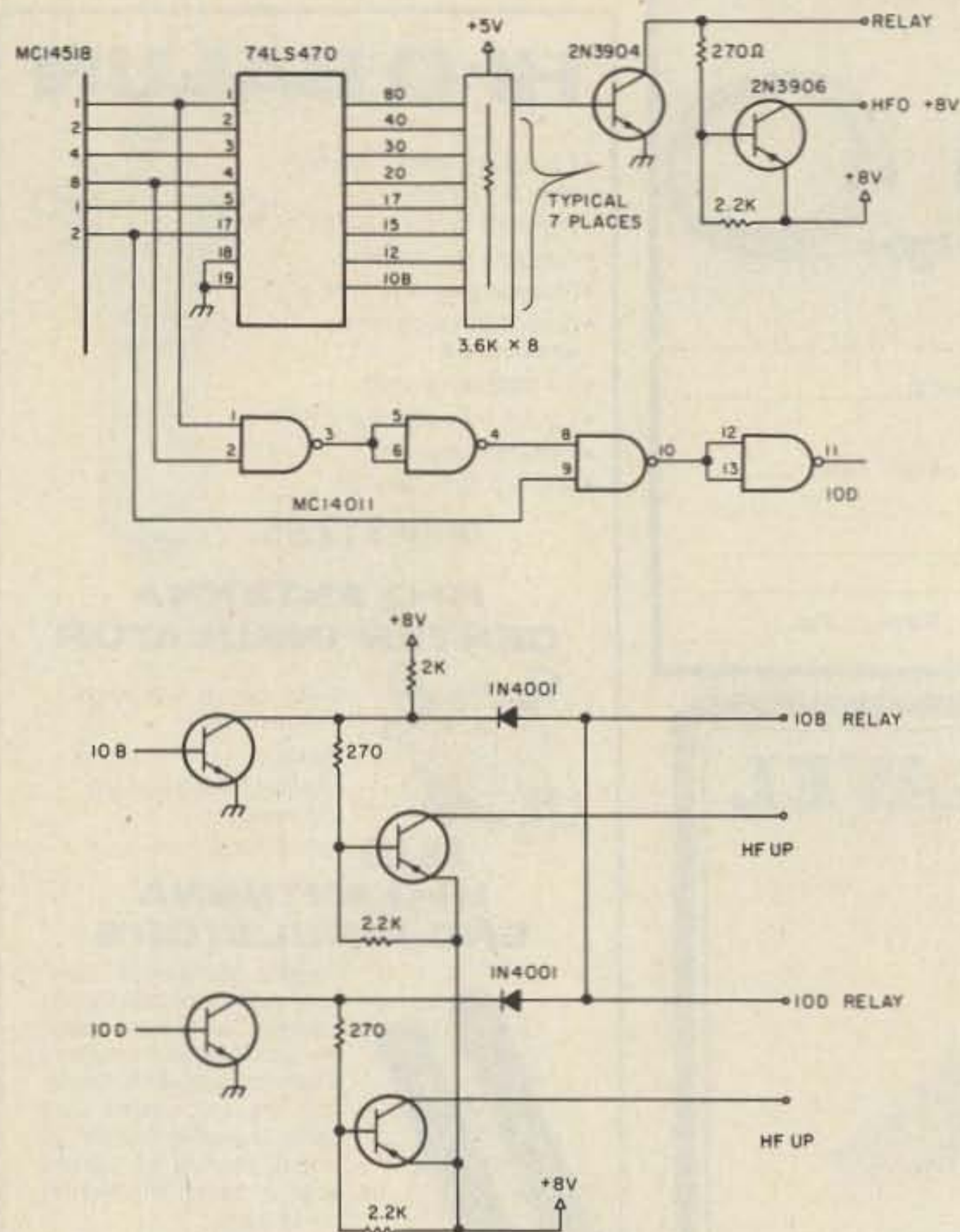


Fig. 9(a). This circuit provides automatic bandswitching for the FT-707. Alternative connections may be required for the FT-107 or other radios. Be sure to place the FT-707 band-switch in the unused position when this hardware is connected.

ADDRESS	DATA
\$03	\$80
\$07	\$40
\$10	\$20
\$14	\$10
\$18	\$08
\$21	\$04
\$24	\$02
\$28	\$01
\$29	\$03

All other locations are \$00.  
\$ denotes hexadecimal notation.

Fig. 9(b). This program must be burned into the 74LS470 PROM of bandswitching circuit.

tion registers in the MCU are set up to talk to the 6818. Data is then transferred to the 6818's RAM. As soon as the data transfer is complete, the MCU is re-configured for inputs from the keyboard. The actual transfer time is so short (< 300  $\mu$ s) that no matter how hard the operator tries, he cannot hit another key before the data transfer is

complete. While in the time-display mode, once every second an interrupt is generated. As soon as the MCU recognizes this interrupt, the MCU reads the time from the 6818 and displays it. As soon as that data is read, the MCU is re-configured for a keyboard entry. The rest of the one-second period, the MCU is waiting for a button to be pushed. The amount of time required to read the time (< 50  $\mu$ s) is the only time that depressing a key could possibly disturb the actual data read. But since any key depression would be greater than 20 ms, the incorrect frequency would be displayed, then immediately jump out of the time-display mode and redisplay the last frequency.

### Band and Mode Switching

For the vfo to be used conveniently with a multi-

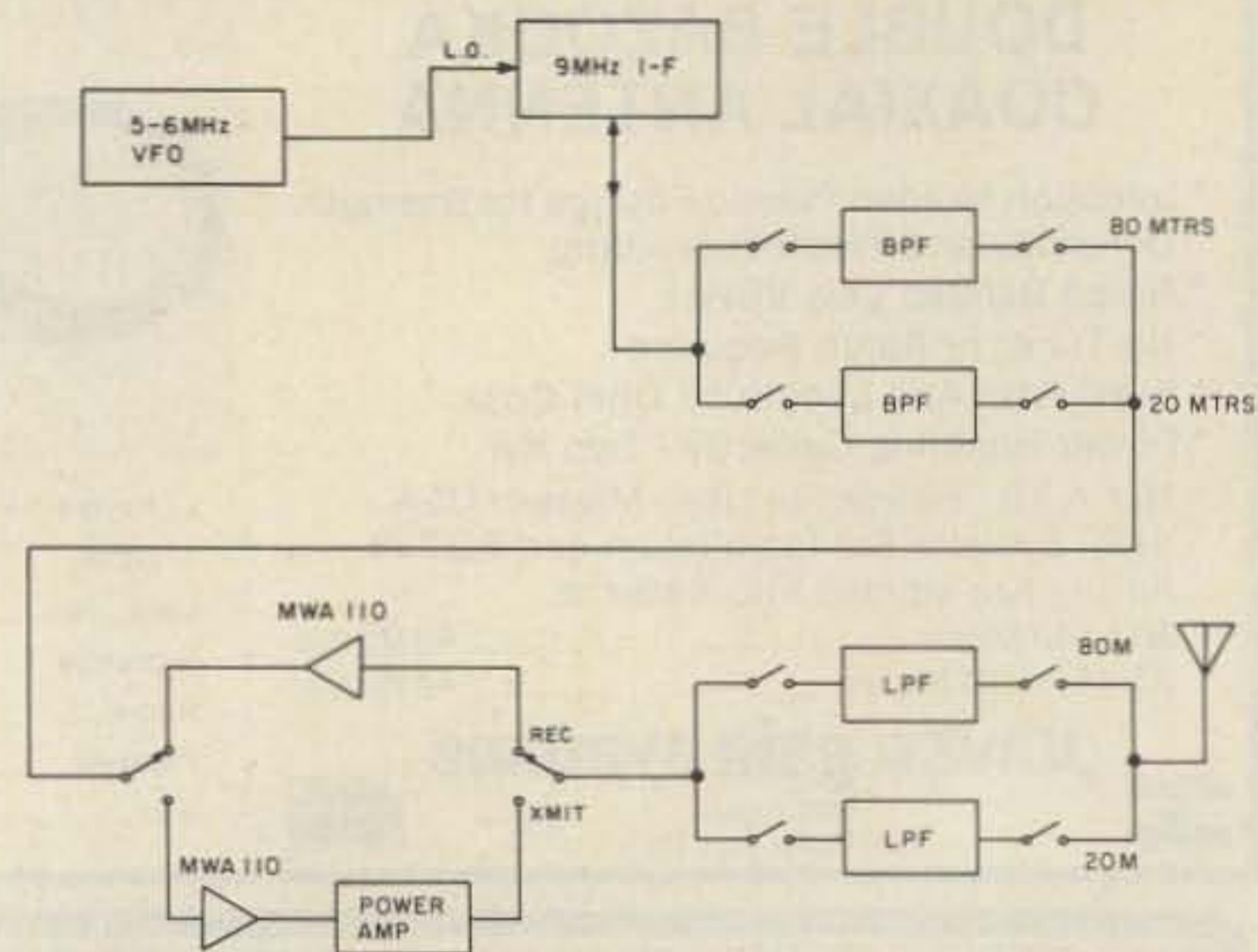


Fig. 10. Block diagram of a complete single-conversion transceiver controlled by the microprocessor vfo.

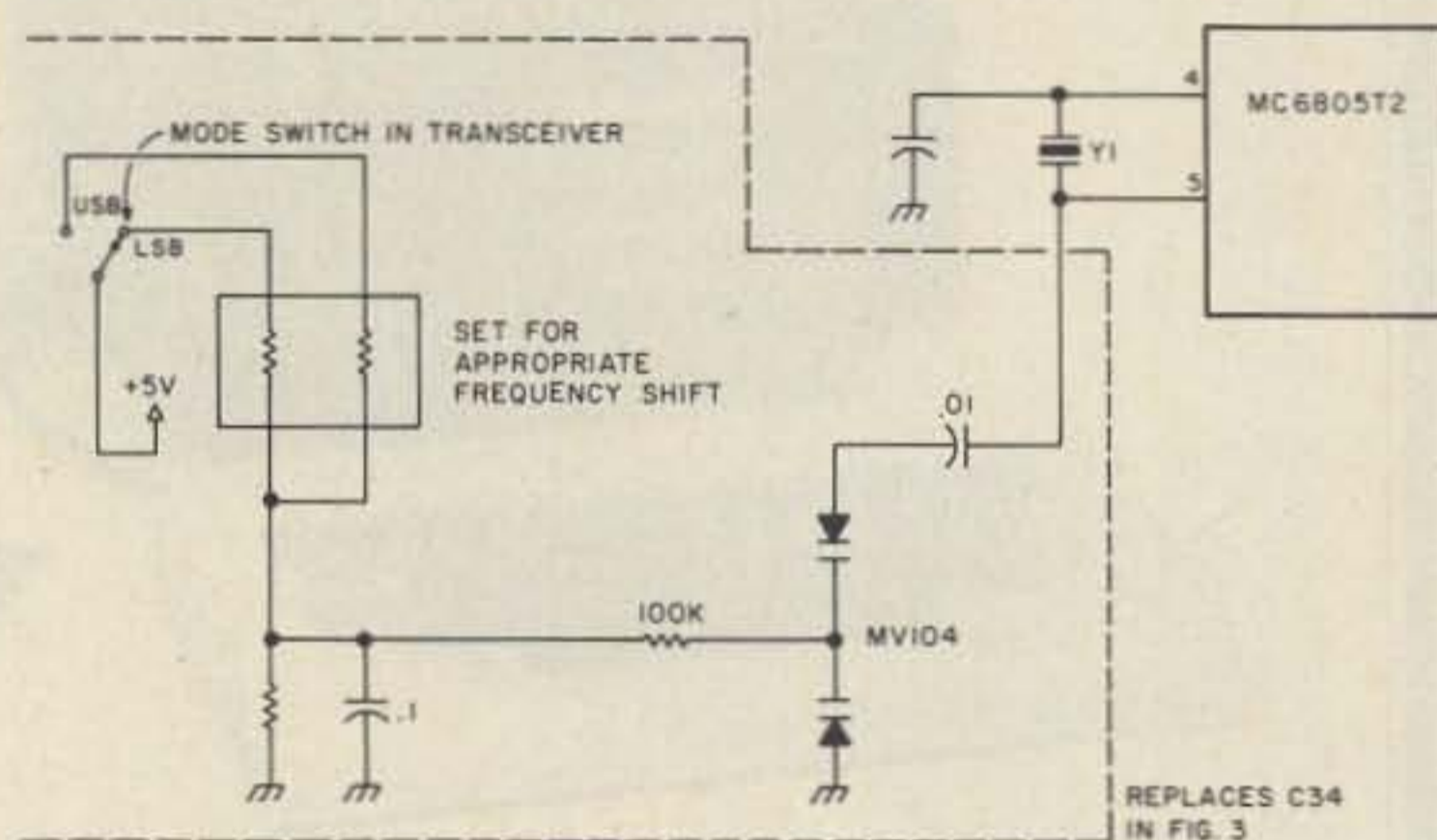
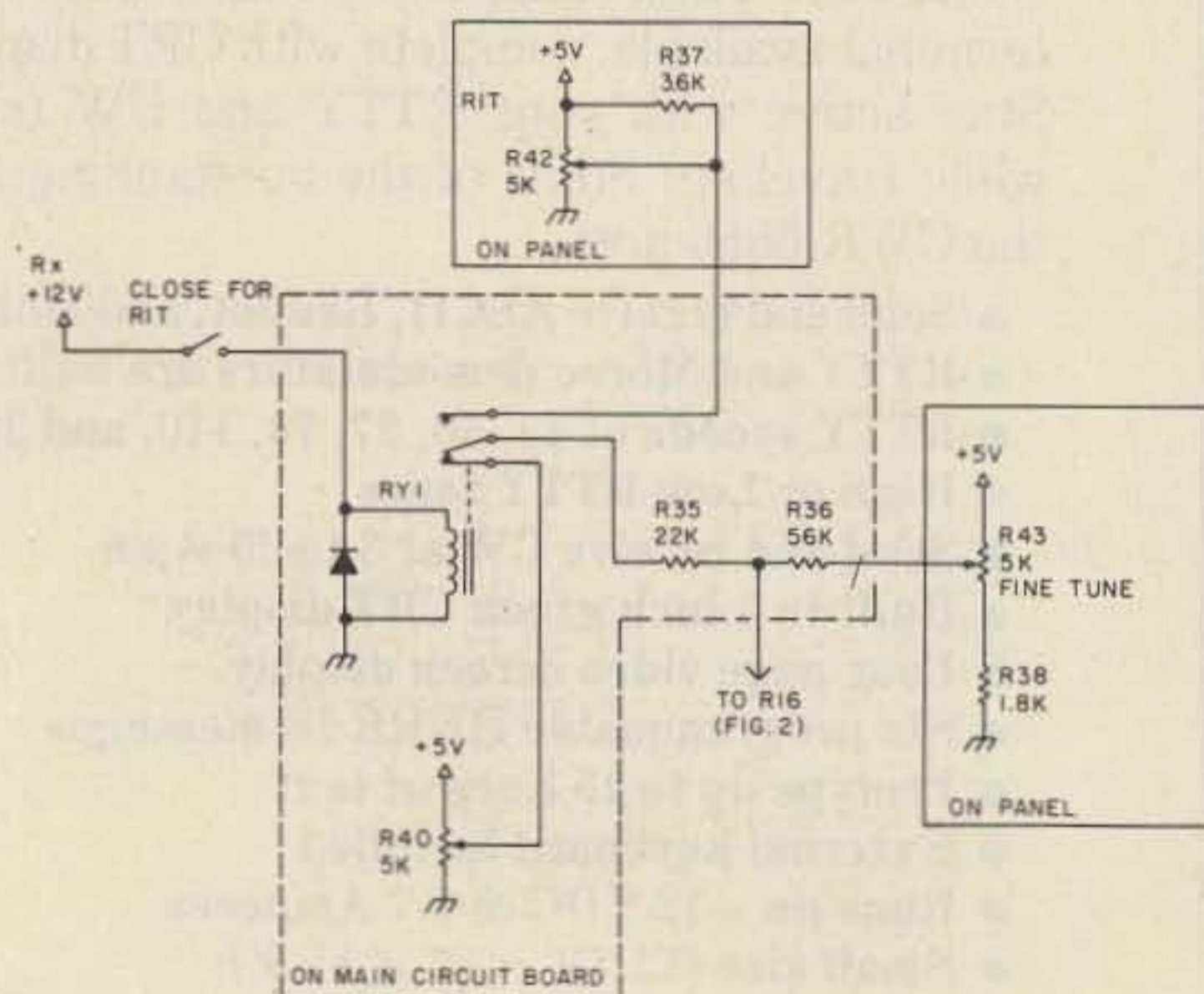


Fig. 11. Mode switching for rigs which display actual operating frequency (not carrier frequency).



SET RIT AND FINE TUNE FOR MID POSITION  
TURN ON RIT AND TUNE FOR BEAT NOTE  
TURN OFF AND ADJUST R40 FOR SAME PITCH  
USE AS REQUIRED

Fig. 12. Adding RIT and fine tuning to the vfo. Most of these components mount on the main circuit board.

band transceiver, some method must be provided to tell the external PLL system which MHz segment it is on. This function is implemented as follows.



Whenever the frequency is sent to the on-board synthesizer, the two most significant digits (MHz) are sent serially to the data pin (PC0). If operating on 5 MHz, the sequence of events is: (1) set up the 5-6-MHz synthesizer, (2) pulse the SQW pin of the 6818 (resets the external counter), (3) set the clock enable pin (allows clock line to increment counter), (4) send out five pulses (for 5 MHz), (5) clear the clock enable pin, and (6) continue with program.

The circuit for a simple decoding scheme using the MC14518 dual-BCD counter is shown in Fig. 8. One use for the outputs from the counter is to provide automatic bandswitching.

References were made earlier to bandswitching on an FT-107 or FT-707. Fig. 9(a) shows how it may be accomplished. By taking the outputs of the binary decoder of Fig. 8 and running them into a 74LS470 Programmable Read Only Memory (PROM), certain combinations of frequencies may be turned into levels which may drive circuitry to change bands. The PROM must be programmed as per Fig. 9(b). Unlike older transceivers, the FT-107 and 707 do not use a bandswitch which runs the entire depth of the rig. The actual switch is only a double-pole type which switches relays within the radio. By placing this switch in an unused position and adding appropriate drivers, the remote vfo can switch bands, too!

I originally used this vfo with a simple home-brew transceiver that operates on both 80 and 20 meters, with no external heterodyne oscillator. This single-conversion radio provides an excellent "simple" radio, with the T2 controlling everything, including the bandswitching of the filters.

Fig. 10 shows a block diagram of this radio.

The vfo provides the actual frequency selection, with the display presenting the operator with the carrier frequency. If you are upgrading a standard radio such as Heath or Collins where there was an analog method of readout, there will be no problem in conversion. But if you are already using a digital readout that displays not the carrier frequency, but the actual "talk frequency," then an additional modification must be made to the system. This mod will shift the reference oscillator by 1.5 kHz, either up or

MODE (PC2,1,0)	DISPLAY	VFO FREQUENCY	PURPOSE
000	3.0000	5.0000	INVERTED 80-20M
	3.9999	5.9999	AUTO REV ON 20
	14.0000	5.9999	MHZ NOT SENT
	14.9999	5.0000	PC2 1 = 80 0 = 20
001	XX.0000	5.5000	FT107 MODE
	XX.5000	5.0000	MHZ SENT
010	XX.0000	5.9999	INVERTED
	XX.9999	5.0000	MHZ SENT
101	XX.0000	5.0000	NORMAL
	XX.9999	5.9999	MHZ SENT
110	3.0000	5.9999	80-20M
	3.9999	5.0000	AUTO REV ON 20
	14.0000	5.0000	MHZ NOT SENT
	14.9999	5.9999	PC2 1 = 80 0 = 20

Table 1. Vfo options. MCU I/O pins PC0, PC1, and PC2 are strapped to 1 (+5 V) or 0 (ground), depending on the vfo mode you select.

Component	Parts List Value (Ω)	Quantity	Y4 RY1	18.36 or 18.86 MHz Relay (RIT)	
R1,8,14	47	3	C1,2,7,10,11,13,43,	.1 μF	17
R2,35	22k	2	44,14,15,16,18,26,		
R11,16,29	100k	3	27,45,46,49		
R4	5.6k	1	C3,C4	300 pF	2
R6	910	1	C5	200 pF	1
R7,15	680	2	C6	.47 μF	1
R9	270	1	C8	65 pF	1
R10	50k pot (small)	1	C9	91 pF	1
R12,13,15,26,27,28,30	15k	7	C12,20,24,28,30	1000 pF	5
R17,R33	1k	2	C17,19	82 pF	2
R18	750	1	C21	10 pF	1
R19	68	1	C22	20 pF	1
R20	56	1	C23	12 pF	1
R21	82k	1	C25,31	150 pF	2
R22	39k	1	C29,32	470 pF	2
R23	20k	1	C33,47,48	1 μF	3
R24,31,39,44-51,3	10k	12	C34,36	10-40 var.	2
R32	4.7k	1	C35	50 pF	1
R34	200k	1	C37	39 pF	1
R36	56k	1	C38	.47 μF	1
R37	3.6k	1	C39	*10-40 pF	1
R38	1.8k	1	C40	*39 pF	1
R40,41,42	5k pot (2 panel, 1 PCB)	3	C41,42	2 μF	2
R5	27k	1	C50	10 μF	1
R43	10 meg	1	Q1	2N5484	1
R53	300	1	Q2,3,5,6	2N2222	4
R58	2.2k	1	Q4	2N3906	1
L1	150 μH	1	D1,4,5,6	1N914	4
L2	1-2 μH (13 turns #28 1/4" form)	1	D2	MV104	1
L3,4	6.8 μH	2	D3	MV830	1
L5,6	1.8 μH	2	D7,9	1N4002	2
B1	MD108 double-balanced mixer	1	IC10	LM358	1
Y1	4.096 MHz	1	IC1	*MC6805T2 or 68705P3	1
Y2	4.194 MHz	1	IC2	MC146818P	1
Y3	*2.048 MHz	1	IC3	MC145000P	1
			IC4	GE Display	1
			IC5	MC14518P	1
			IC6	*MC145155P	1
			IC7	MC7805	1
			IC8,9	MC78L05	2

\*denotes MC68705P3 option.



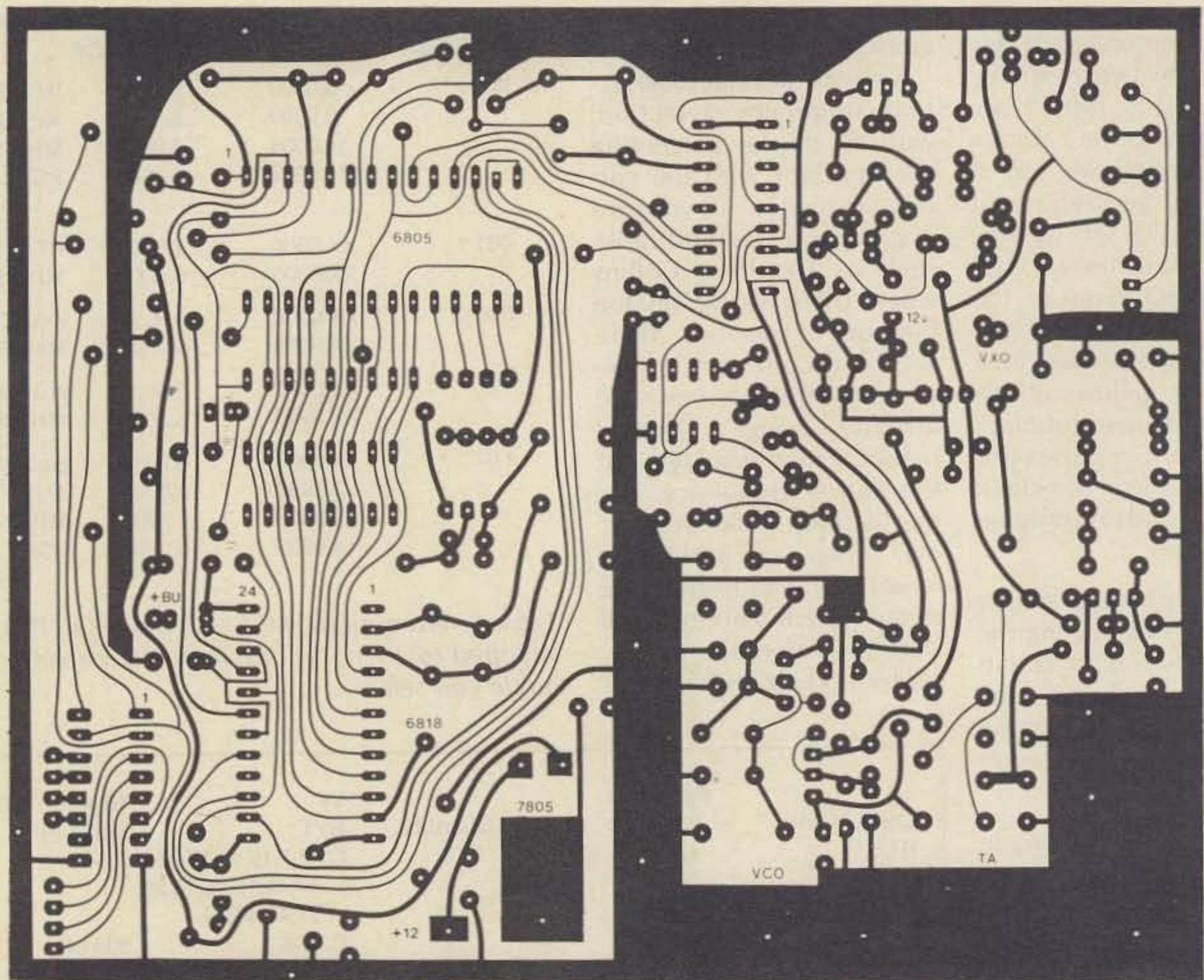


Fig. 13. Main vfo PC board (foil side).

down, depending on which sideband you are on. By tapping off the mode switch in the rig, the frequency may be shifted automatically.

Fig. 11 gives an example of how this may be accomplished. In this diagram, a voltage divider is switched, depending on what mode the radio is in.

Of course, an additional position on the switch may be used for CW, AM, etc. This mod must be made if using the vfo as a companion for another digital rig which uses a 5-to-6-MHz vfo.

#### RIT

In almost every rig that I've owned, receiver in-

cremental tuning (RIT) was a must for operating convenience. This vfo provides the user with not only a RIT control, but also a fine-tuning adjustment for stations between the 100-Hz resolution of the vfo. The foil pattern for all RIT components with the exception of the panel controls is on the PC board, including the

relay used to switch it in and out. Fig. 12 illustrates how the RIT is implemented. (Thanks to Yaesu for their design.)

#### Construction and Alignment

I recommend that the vco be built first. This is the most difficult portion of the vfo, and the rest comes easily once this is completed. After the vco is built, check its frequency range by turning the slug in coil L2. It should encompass the 12.36-13.36-MHz range required. After this has been built, build the rest of the rf section (18-MHz vxo and filters). Only after you have 5 to 6 MHz coming out of the filter stage should you proceed with the digital section. Depending on which parts you are using (T2 or P3), select the appropriate jumpers and install the rest of the parts. The 6818 fre-

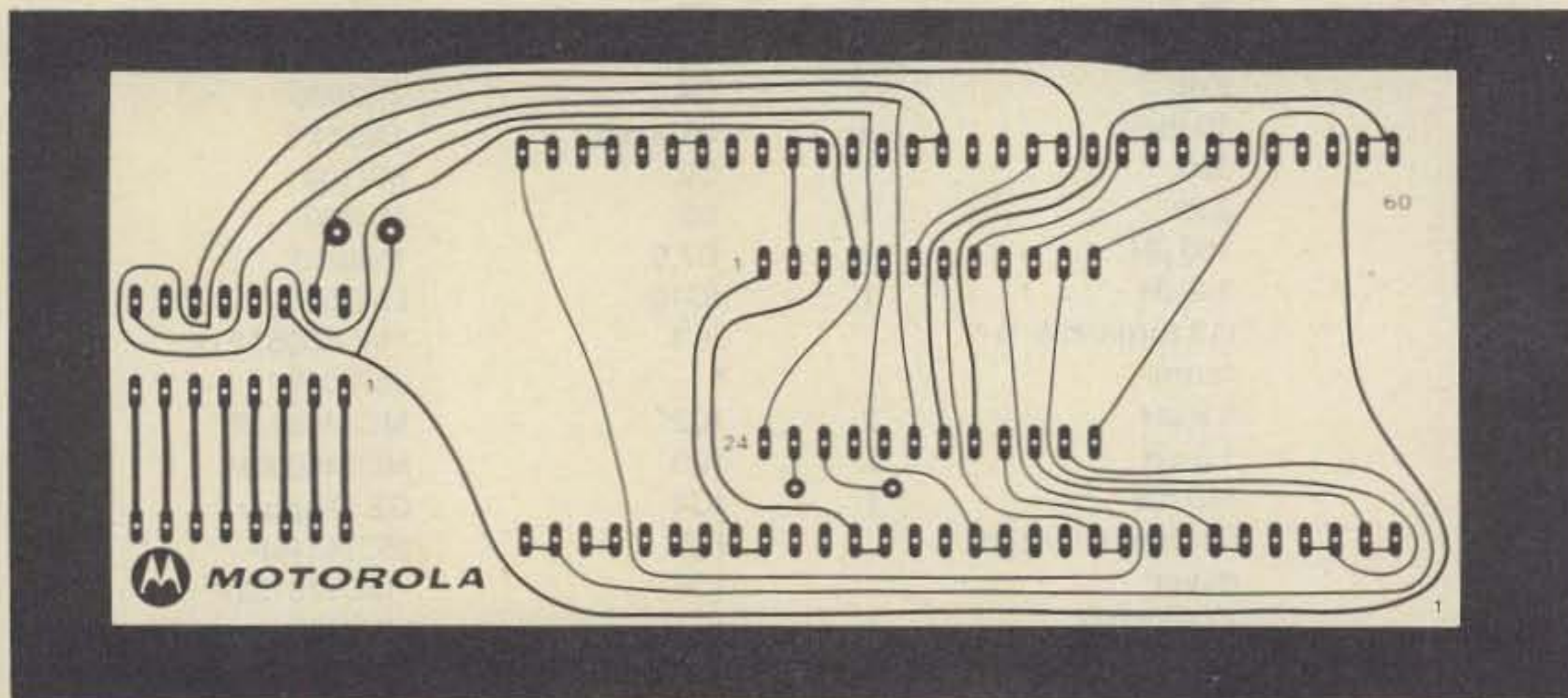


Fig. 14. Display PC board (foil side).



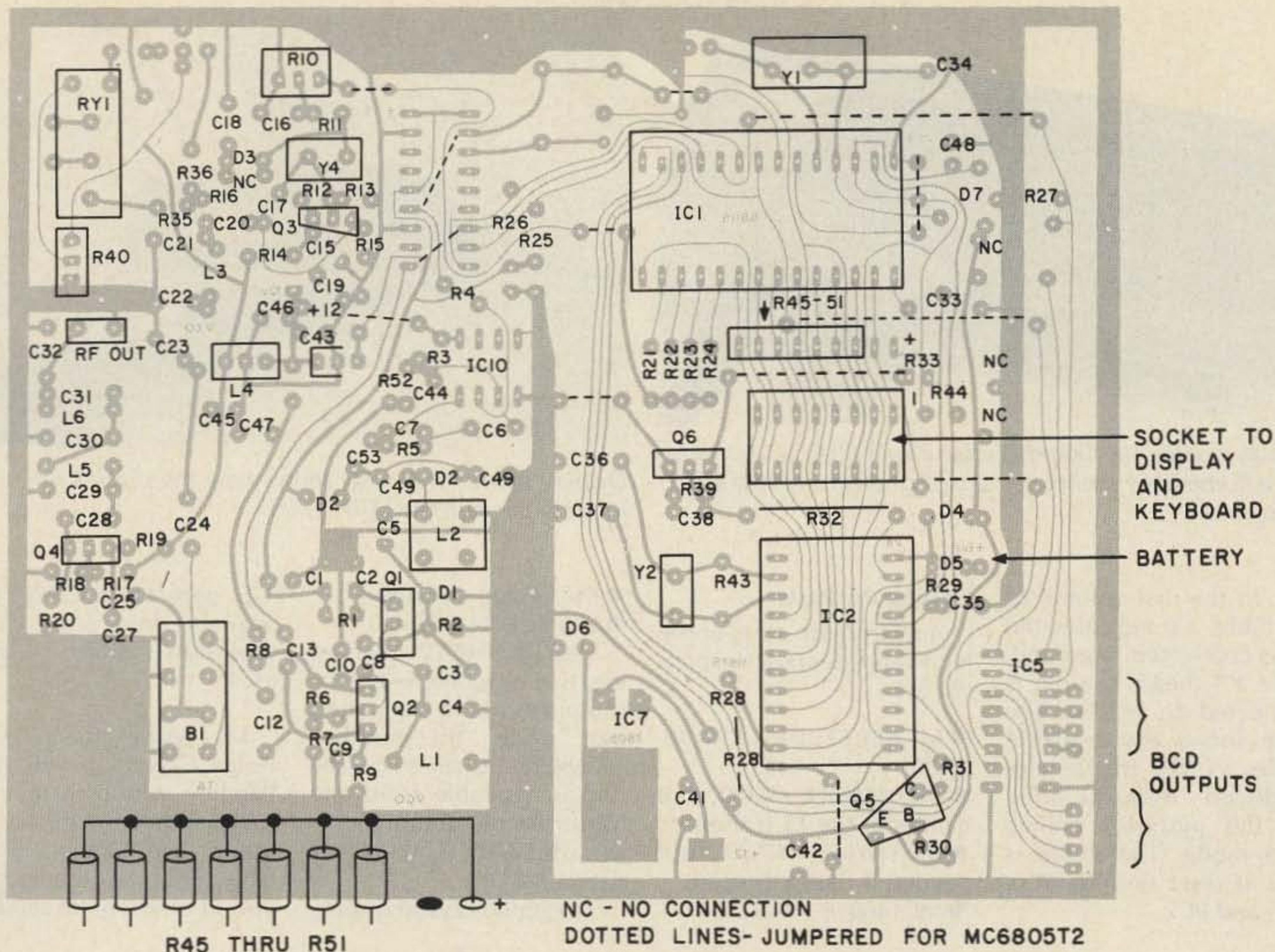


Fig. 15. Component placement, main board.

quency may be adjusted by placing a counter on pin 21. Trimmer C36 should be adjusted to read 4.194308 MHz. If you cannot bring it exactly on frequency, some adjustment of fixed capacitor C37 may be required.

If you are using the P3, the frequency of the MC145155 may be observed on pin 15 of the part. Adjust C39 for 2.048 MHz. If using the T2, use a low-capacitance probe on pin 5 of the MCU and adjust C34 for 4.096 MHz. If, upon power-up, the unit appears dead, it is time to borrow an oscilloscope to do some checking. First, check the jumpers and power supplies. Next, check to see that the oscillators are functioning properly.

If the unit seems to operate properly but the vco will not track, be sure that the loop filter is prop-

erly built and that there is a feedback frequency back to the PLL. Also, check for the obvious solder short.

Figs. 13 and 15 are the PC

layouts for the vfo and display, respectively. Figs. 14 and 16 show component placement.

Table 1 lists the available

modes of the vfo system. The modes are selected by strapping I/O pins PC0, PC1, and PC2 to either +5 V or ground through 15k resis-

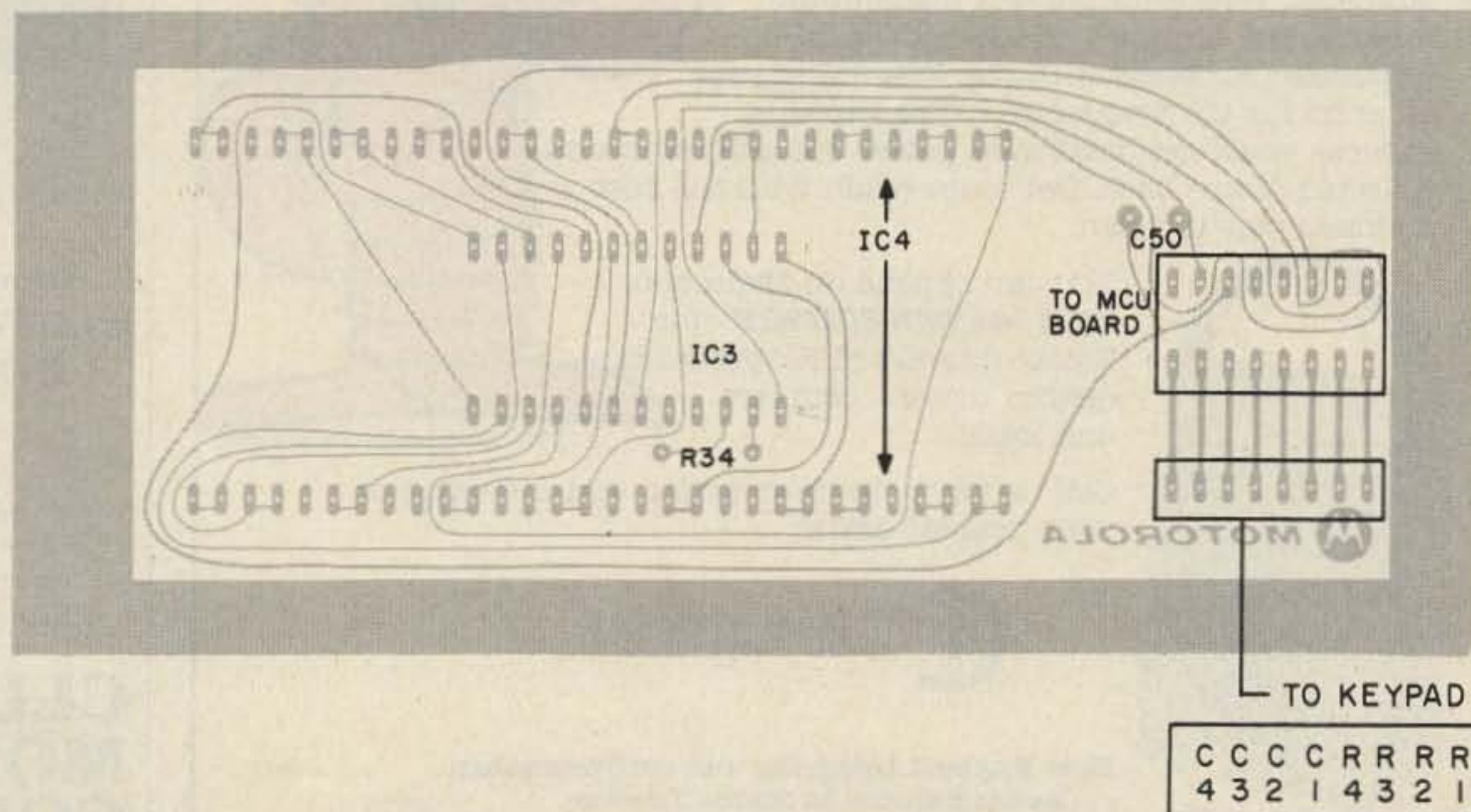
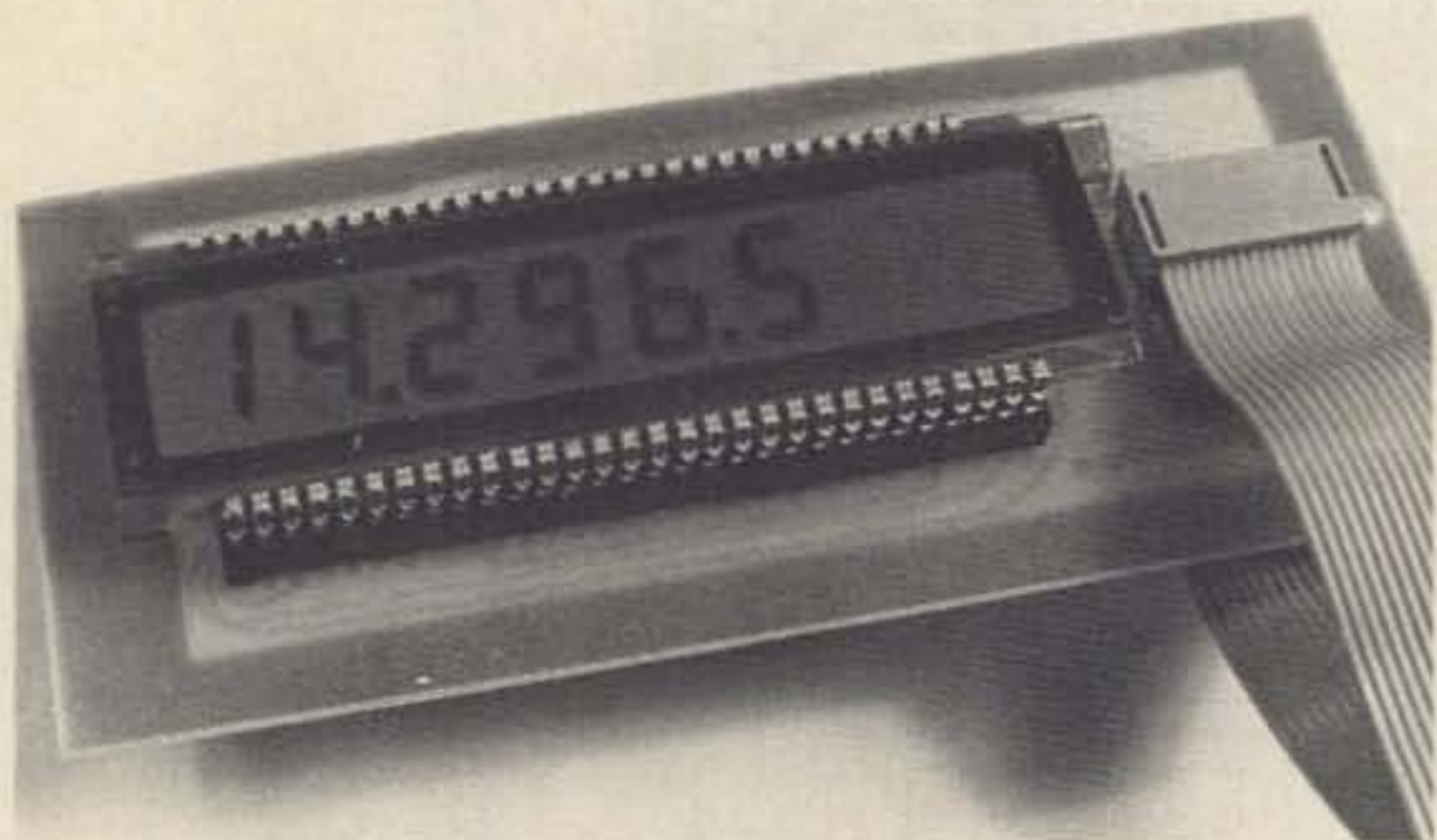
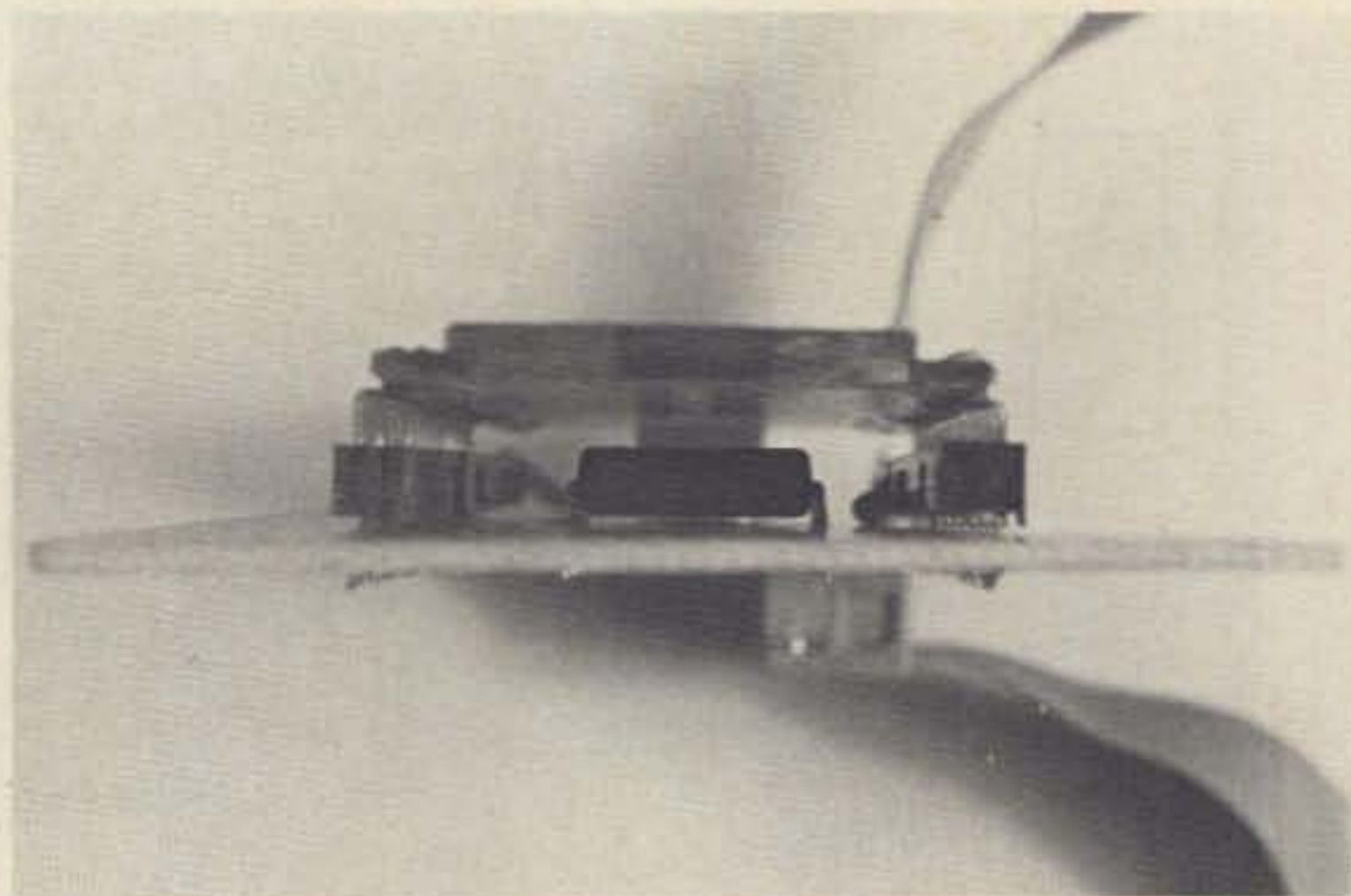


Fig. 16. Component placement, display board. Driver chip fits under display unit, on the same side of the board. Display unit is elevated above the board by segments of high-profile IC sockets (see photos).





Display board. The liquid crystal display (LCD) unit plugs into a home-brew socket composed of pieces of two 40-pin IC sockets.



Display board. This view shows how the display driver IC mounts beneath the LCD unit.

tors. In the first column of the table, a 0 indicates the pin is connected to ground, while a 1 means the pin is connected to +5 V. The table shows the available modes vs. the frequencies produced. Also included are the purposes behind each mode. The mode is read at reset time on PC0, PC1, and PC2.

#### Getting the Parts

Approximate costs of the high-value items of the project are:

- MC6805T2L2—\$12.00-15.00
- MC68705P3—\$50.00 (not needed if the T2 is used)
- MC145155—\$7.32 (not needed if the T2 is used)
- MC146818—\$10.00

- MC145000—\$12.49
- 8-digit LCD—\$26.40

The MC6805T2 containing the program used for this project is an evaluation part under the number MC6805T2L2 (ceramic case) and is available from any Motorola distributor, as is the MC68705P3, the alternative MPU.

The liquid crystal display

(GE part LXD69D7R09) is available from any GE distributor (Hamilton Avnet, etc.).

My heartiest thanks go to Helge Granberg and Mike Pendley, who provided me with some necessary rf savvy, and Ulrich Rohde, who gave me some insights into PLL system design. ■

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- P31 green, 12 inch display screen is built-in
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- On-screen status indicators with real time
- Upper-lower case ASCII with ALL control codes
- 45, 50, 57, 74, 100 baud Baudot
- 110, 150, 300, 600, 1200, 1800, 2400, 4800, and 9600 baud ASCII – full or half duplex
- 1 to 175 wpm send and receive Morse code
- Current loop or RS232 I/O interface
- ST6000 has tuning oscilloscope and loop supply
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The ultimate team...the new

# Drake "Twins"



The **TR7A** and **R7A**  
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## TR7A Transceiver

- **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).
- **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.
- New!** Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard, plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.
- New!** The very effective NB7 Noise Blanker is now standard.
- New!** Built in lightning protection avoids damage to solid-state components from lightning induced transients.
- New!** Mic audio available on rear panel to facilitate phone patch connection.
- **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

## R7A Receiver

- **CONTINUOUS NO COMPROMISE 0 to 30 MHz** frequency coverage.
- **Full passband tuning (PBT).**
- New!** NB7A Noise Blanker supplied as standard.
- **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.
- New!** Standard ultimate selectivity choices include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.
- **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

## The "Twins" System

• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by

appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

Specifications, availability and prices subject to change without notice or obligation.

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**COMING SOON: New RV75 Synthesized VFO**  
Compatible with TR5 and 7-Line Xcvrs/Rcvrs

- Frequency Synthesized for crystal-controlled stability
- VRTO (Variable Rate Tuning Oscillator\*) adjusts tuning rate as function of tuning speed.
- Resolution to 10 Hz
- Three programmable fixed frequencies for MARS, etc.
- Split or Transceive operation with main transceiver PTO or RV75



# New Drake TR5 Transceiver



## far above average!

**COMING SOON:**  
**RV75 Synthesized VFO**  
featuring the Drake "VRTO"

- Frequency Synthesized for crystal-controlled stability
- VRTO (Variable Rate Tuning Oscillator\*) adjusts tuning rate as function of tuning speed.
- Resolution to 10 Hz
- Three programmable fixed frequencies for MARS, etc.
- Split or Transceive operation with main transceiver PTO or RV75

\* Patent pending

With the new TR5  
versatility and value are spelled **D-R-A-K-E...**

## **D**YNAMIC RANGE

The dynamic range of the TR5 is unexcelled by any transceiver in its class. The TR5's greater than 0 dBm third order intercept point (85 dB two-tone dynamic range) at 20 kHz spacing can be achieved only by the use of a passive diode-ring double balanced mixer. Drake was the first to bring this technology to the Amateur market with a high-level mixer in the TR7.

## **R**ELIABLE SERVICE

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# Surviving the Unthinkable

## — part II: some practical ideas

In part I, I talked about the *idea* of emergency communications after a nuclear attack and the benefits the Amateur Service might provide. In this part, we'll talk about specific steps that each of us can take. First, though, let's set the stage:

Imagine this situation for a moment: The most incompetent of operators walked into your shack and for a

fraction of an instant connected your receiver's antenna terminals to a high-voltage distribution line. The result was a 40-kV, 1,000-Amp shock to the input of your receiver. There wouldn't be very much left of your sensitive input circuits, to say the least.

This sounds like an impossible situation. I only wish that it were truly impossible. But in today's cri-

sis-oriented world, the situation is indeed within the realm of possibility. The 40-kV shock is what civil-defense experts say would be the result of a nuclear blast in the vicinity of most any piece of unshielded wire, including telephone wires, power lines, antennas, and feedlines. The phenomenon is commonly referred to as a nuclear electromagnetic pulse (EMP or NEMP).

This kind of pulse is so extreme in amplitude that many normal lightning protectors are useless. For example, a typical lightning pulse has about a 100-microsecond duration, with a 5-microsecond rise to its peak. A high-altitude EMP pulse can be expected to have a 1-microsecond duration and a 10-nanosecond rise to its peak. That's not enough time for many common lightning arrestors to work.

In the following pages we'll talk about some of the EMP protective measures which should be taken on your equipment. Without protection, sensitive semiconductors would be most likely to fail and put you out of business when your services may be needed most.

But, first, why should we even be concerned about protection? After all, any nuclear exchange seems to be so outrageously incompetent on the part of world leaders that it seems that it never could happen. Unfortunately, however, we've seen in the last few years that many improbable things such as revolutions, hostage taking, etc., have actually occurred.

Even though we all hope and pray that a nuclear exchange does not occur, let us not underestimate the devastating and paralyzing effects of such an exchange. Simply imagine, for a moment, a world with *hundreds of millions* of US and Russian citizens killed and *tens of millions* more severely and untreatably burned, near death, and starving. Major cities, with their sophisticated hospitals, police, telephone communication systems, radio and television stations, transportation, food distribution networks, financial centers, and manufacturing centers all eliminated—gone—not much usable left, and most likely too radioactive to approach for many years to

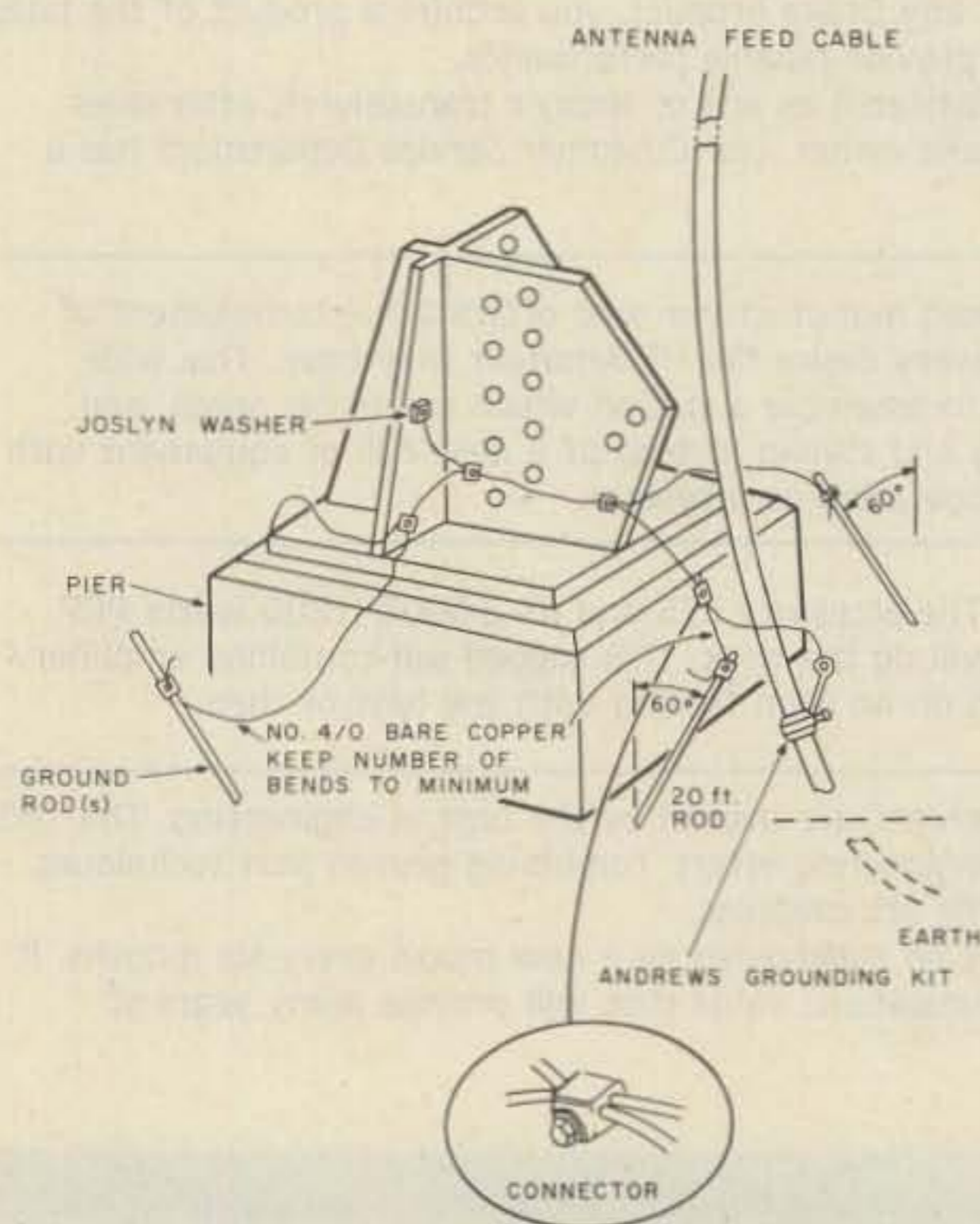


Fig. 1. Recommended ground connections at tower base.



come. The situation might be reminiscent of the Cambodian experience of recent years, where a ruthless and irresponsible leadership evacuated the cities and forced an entire country into an unnecessary disaster. Imagine that situation in your community, among your friends—perhaps worldwide!

However, even in the worst of disasters, there will be some survivors. If not us, then our friends or relatives. Perhaps our children or grandchildren will be among those fortunate survivors. There also will be some amateur radio operators. Perhaps the best thing that we can do for these people faced with a completely unknown and hostile environment is to ensure that they have every possible assistance available to help them through the crisis.

In communications, that assistance means that in a world where the established public system is no longer available, the technical preparations of amateur radio operators may make the difference between life and death for countless hundreds of thousands. It could be the final foothold in their struggle for survival. After all, assistance during disasters is one of our key elements, and a justification for an Amateur Radio Service. Only amateur radio operators can supply an organized communication system from almost every community in this country. Only amateur radio operators can supply this system with a substantial portion of the surviving equipment easily made operational after the shock of a nuclear explosion. Citizens Band equipment for the most part would be rendered totally useless by its unprotected reliance on semiconductors and its tendency for

total disorganization even in times when there is no crisis.

The job of amateur radio equipment protection is easy once we realize that it does not need to be difficult or complex. Most any technical or non-technical operator can accomplish some EMP protection on short notice, with a very small outlay of money. The objective is to safely bypass your equipment and any incoming connections when they are presented with an EMP signal composed of 40 to 50 kV and current in the order of 1,000 Amperes.

It is interesting to note that much of the EMP protective equipment available today has been designed since our country stopped testing nuclear weapons. As a result, none of it has received the only true test of reliability—on-the-job testing—although EMP simulators are used.

Because of the lack of widespread testing capabilities, the only really proven method of protection is also the simplest. Under this approach, all equipment to be protected should be disconnected from all external wires and

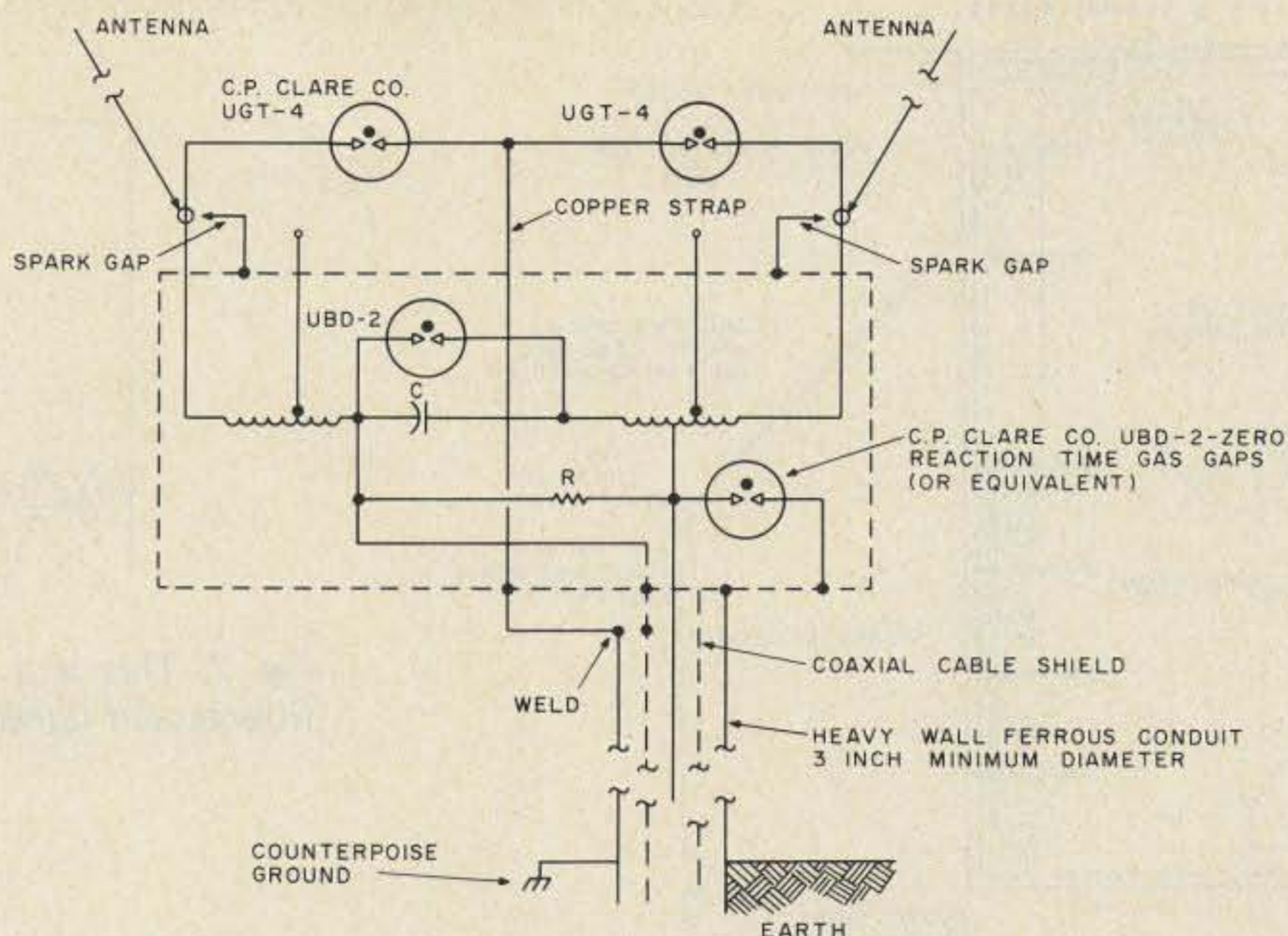


Fig. 2. Suggested use of gas gaps in an antenna balun. Note that this approach uses a thick-wall conduit around the coax.

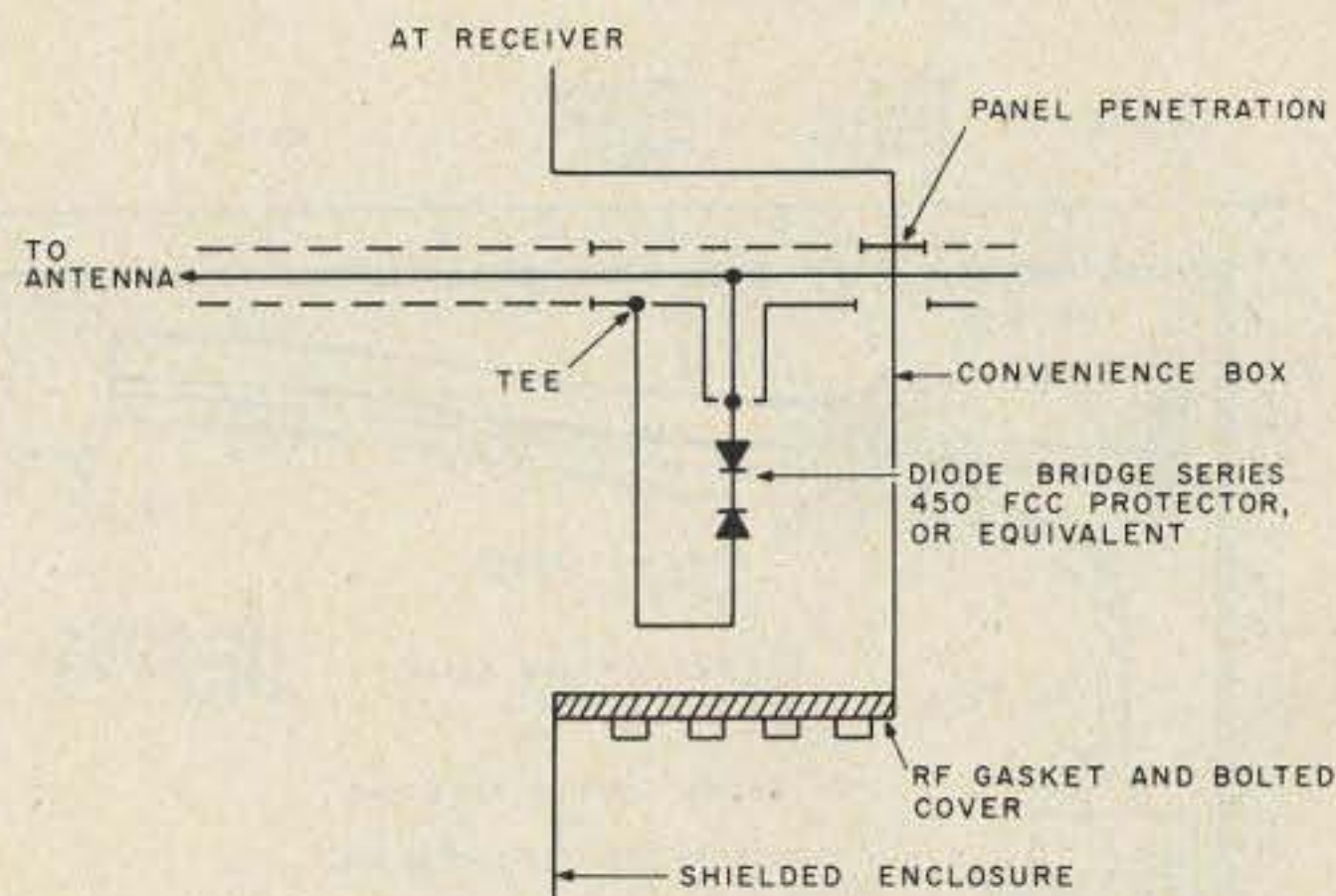


Fig. 3. Coaxial tee protectors used in a receiver circuit.

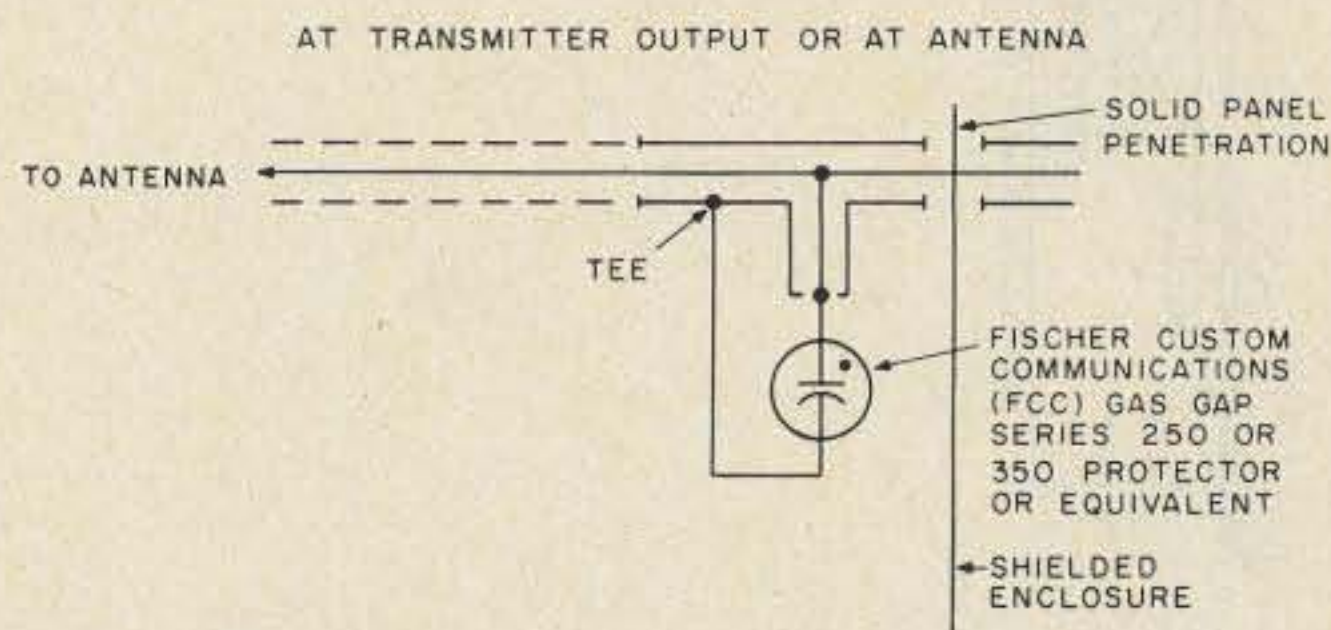


Fig. 4. Coaxial tee protectors shown in a transmitter circuit.

stored in a thoroughly sealed and shielded box. The box should have no holes where any kind of energy can get in and should have a skin made of 18- to 26-gauge metal to provide magnetic shielding for the equipment inside.

Since the civil-defense planners expect to have Americans moved to a safe

location 30 to 200 miles from their community, depending on the nature of threat to that community, the equipment should likewise be moved to a location 30 to 200 miles from the community.

Keep in mind when storing your equipment that power supplies also should be shielded and stored with



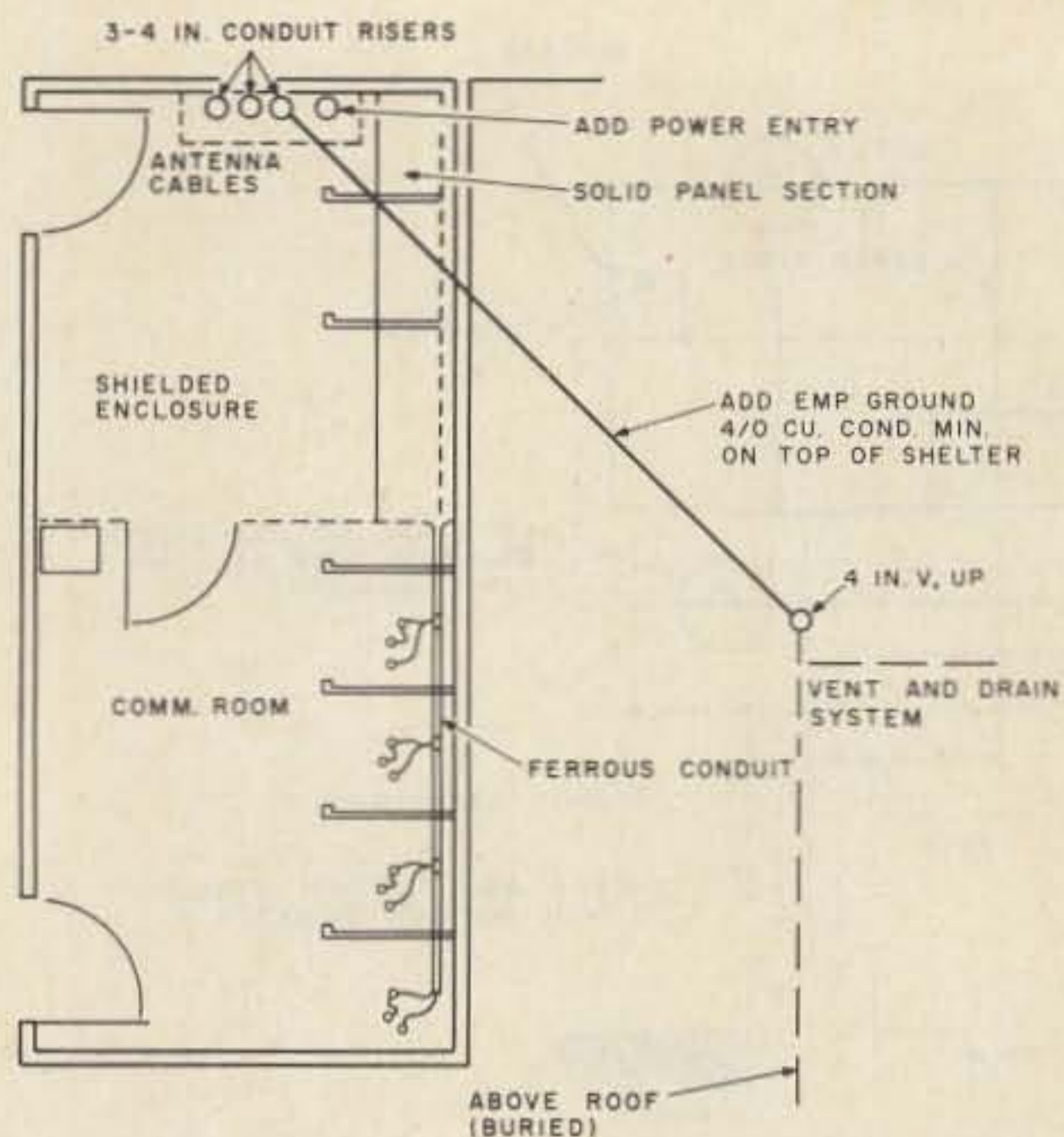


Fig. 5. Suggested layout for communications room with remote operation of equipment.

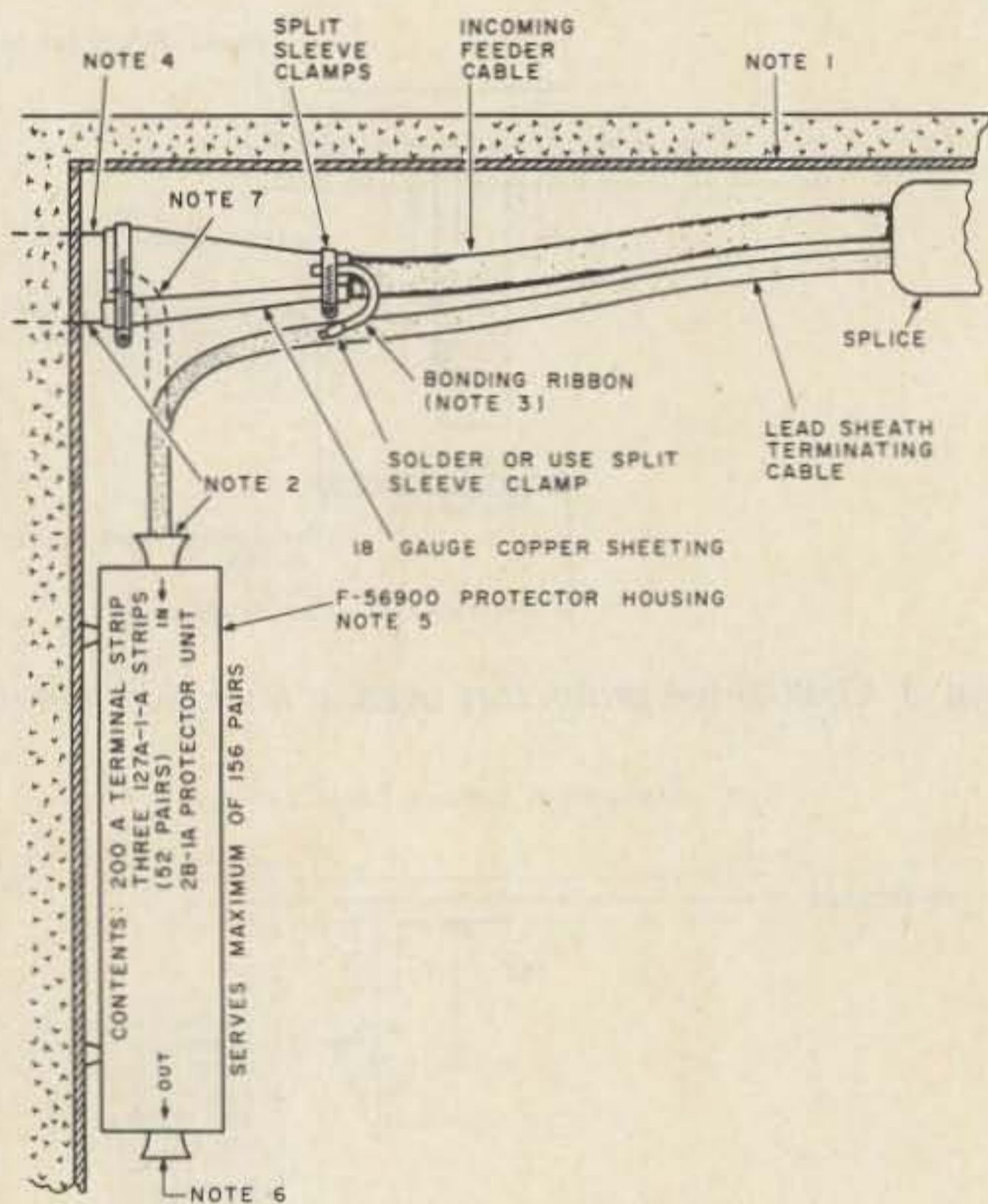


Fig. 6. This is one recommended method of protecting a telephone cable system against EMP transients. Note the heavy emphasis on shielding. The numbered notes refer to detailed construction specifications.

your equipment because they are just as susceptible to an EMP transient signal as is your sensitive transmitting and receiving equipment. A publicly-released 1970 Department of Defense publication suggests that if equipment must be used during a threat of nuclear attack, at

least one set of equipment (and likely more) should be held in reserve in the event of any equipment failure. In the ideal case, ham operators should have a reserve available due to equipment failure caused by every succeeding attack.

Good grounds are very important to EMP protec-

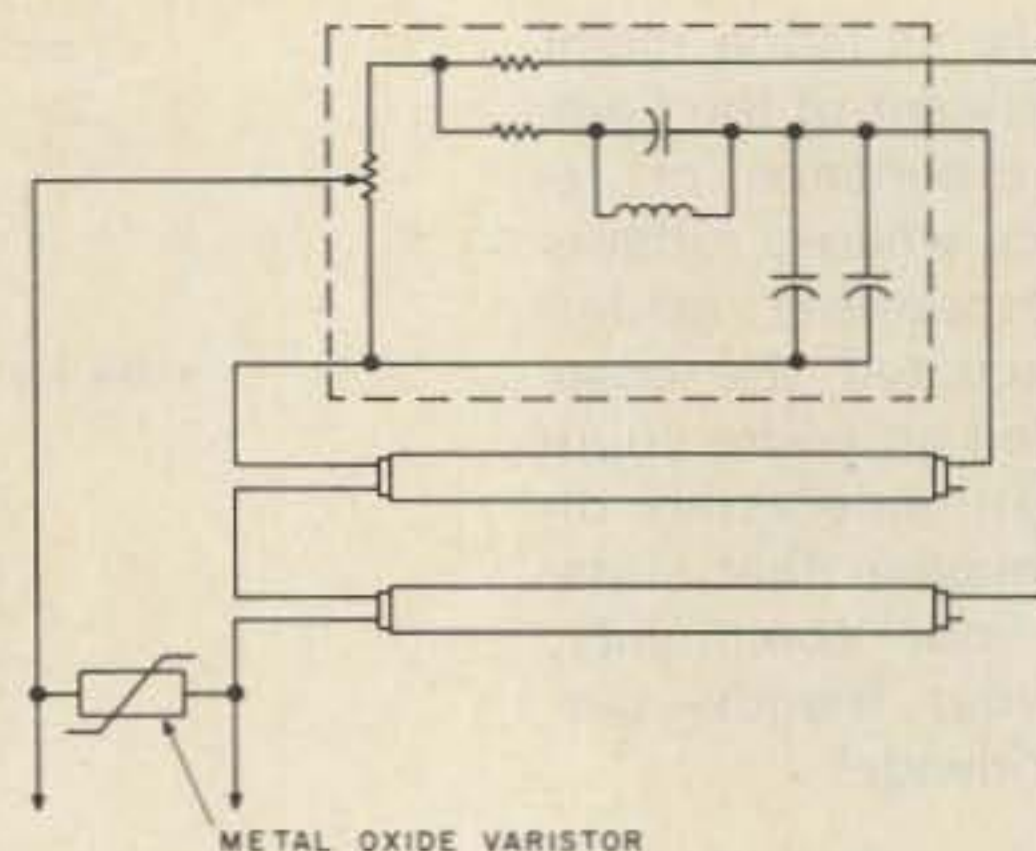


Fig. 7. This is a typical varistor installation applied to a fluorescent lighting circuit.

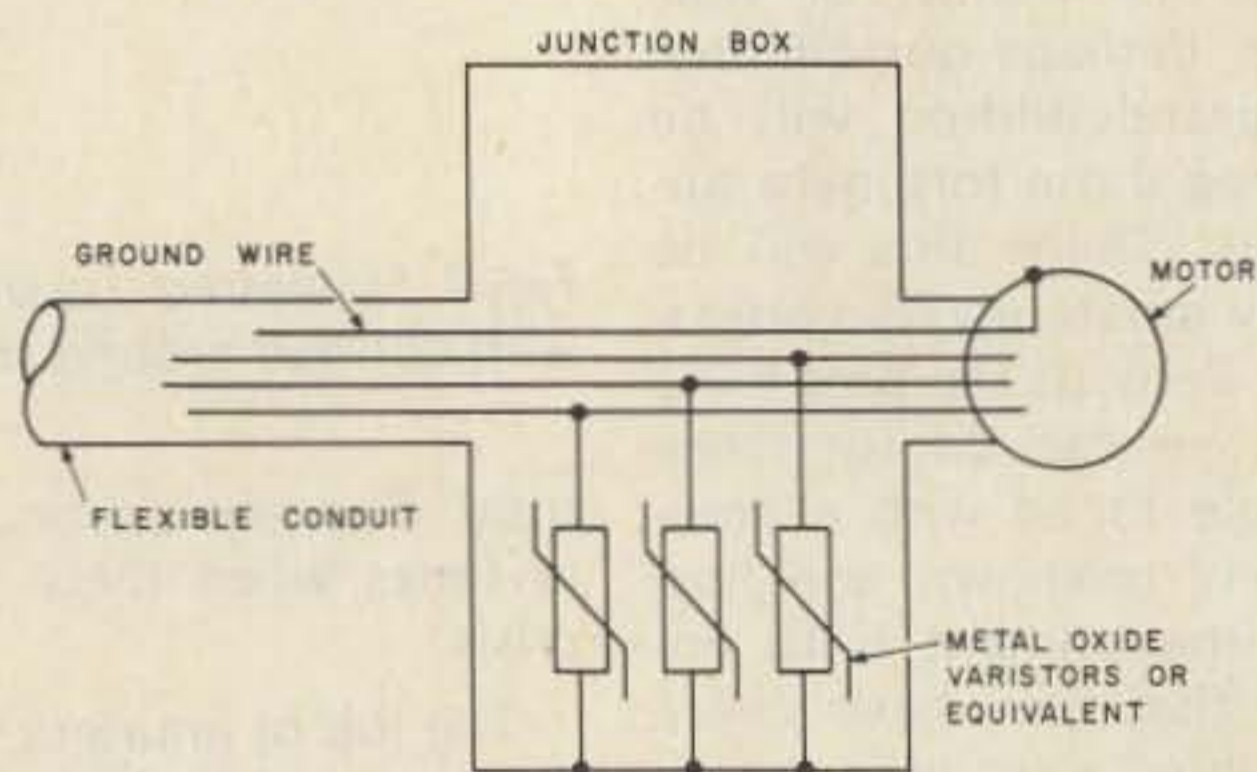


Fig. 8. This is a suggested circuit for EMP protection of a 3-phase, 4-wire motor using metal-oxide varistors (MOVs) connected between each hot wire and ground.

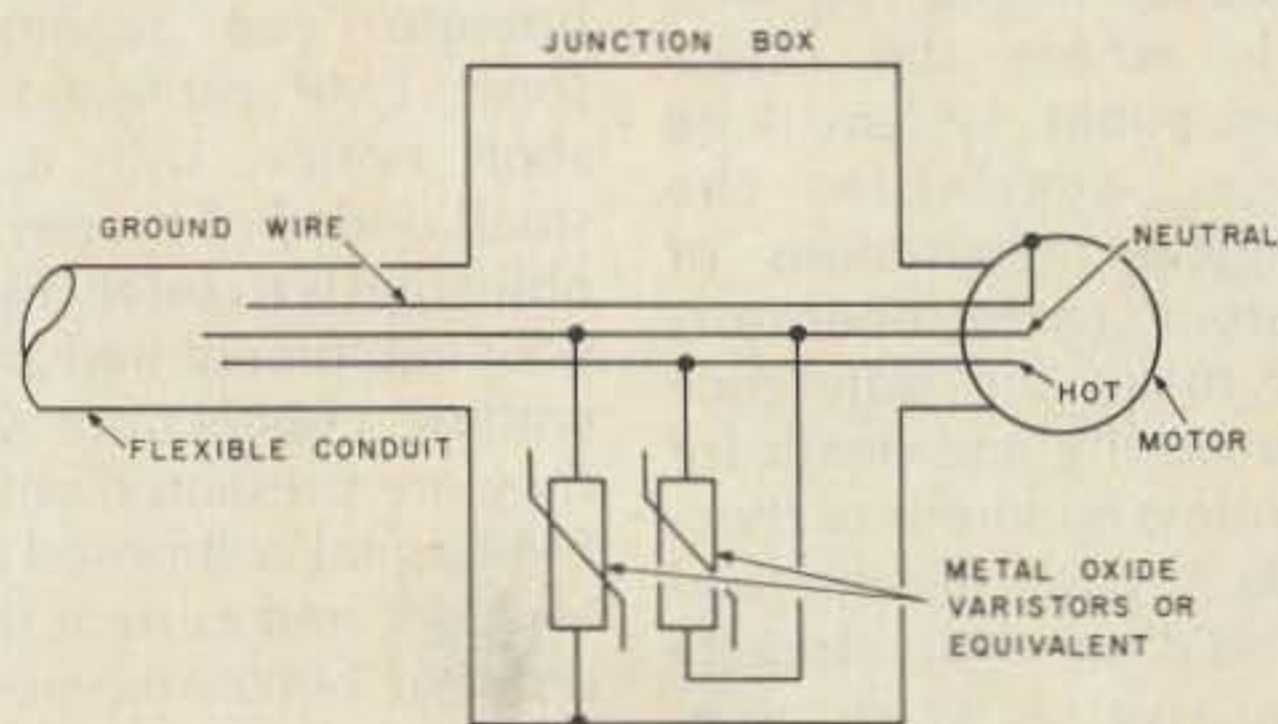


Fig. 9. Single-phase motor protection using MOVs between hot wires and ground.

tion, and antennas should be well grounded. But a smart operator would keep a longwire and tuner stored as if to be used for Field Day for, in any emergency, the antennas can be expected to take the brunt of the effects and may need to be replaced in the fastest time possible.

The Department of Defense publication *EMP Protective Systems* suggests several approaches which should be used if you're going to shut down for a while

in anticipation of an attack. First, you should open the master power switch at your service entrance. Second, all circuit breakers should be opened and all critical equipment should be turned off or disconnected.

When the equipment and power are to be restored, all circuits should be checked for arc-overs or damage before power is restored. Be sure to disconnect telephone and cable television connections, because the advice indicates that there



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could be a problem with any wire coming into your home. Since the EMP energy in long overhead wires can be extremely hazardous, be sure people stay away from these wires during a time of possible attack.

If you must have some radio equipment operating, dig out your old tube-type equipment and use it. Tubes are much less sensitive to high-voltage shocks and are more likely to recover. It is felt that less protective shielding is necessary for broadcast receivers with loopstick antennas or receivers with short antennas, including two-meter equipment. Again, however, because there are so many unknowns, a wise operator would most likely consider any equipment in full use to be vulnerable.

More advanced EMP protective measures which allow more operating versatility also have been published under the name of the Defense Civil Preparedness Agency and may be obtained from the Federal Emergency Management Agency in Washington, DC (ask for publication TR-61-B). These approaches to the problem center around the use of gas-gap arrestors, metal-oxide varistors (MOVs), coaxial tee protectors for antenna cables, and improved grounding. Some of their suggestions are described here, so you can start on your protection right away. The approach requires some expense and would be used if you would anticipate operating during a nuclear threat.

Improved grounding of a tower is extremely important for supplying a low-impedance path to ground for EMP current. The suggested way to accomplish this is shown in Fig. 1. The tower should be connected to the ground rods using 4/0 wire.

An alternative is to install 20 radials about 12 to 18

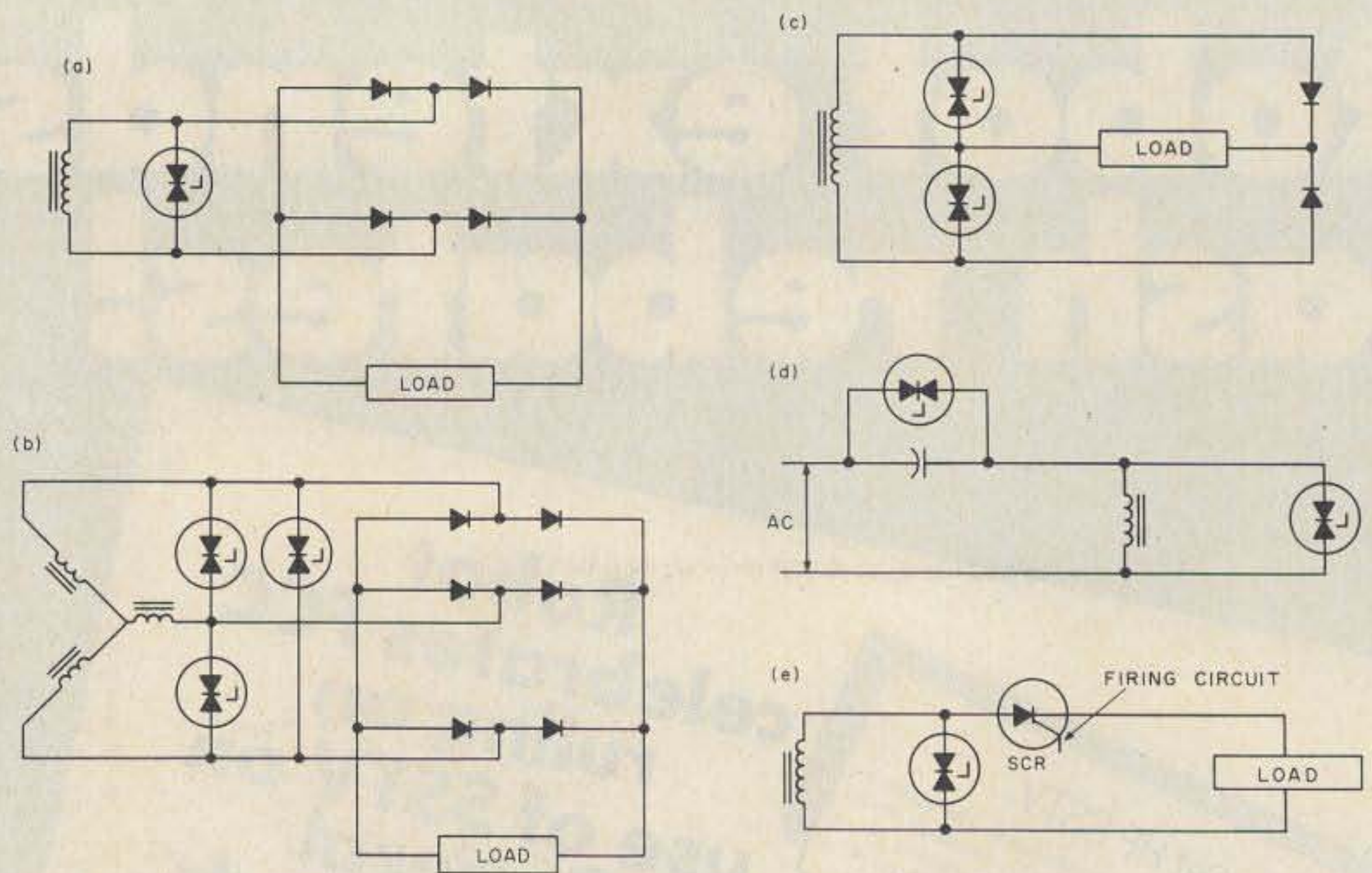


Fig. 10. Various EMP protective circuits for several typical circuits.

inches below the surface, using 1/2-inch copper tubing. The approach could get very expensive at today's copper prices but would provide an undisputably super ground for your vertical. Be sure to connect the outside of your antenna feed cable shields to the ground. Any control cables going up the tower should be shielded in threaded conduit so there is a perfect conductive shield all along the line.

A particularly sensitive part of an antenna circuit is

a balun at the antenna feed-point. The best way to protect a balun is to provide "zero reaction time" gas-gap arrestors in parallel with all balun capacitors and inductors. Be sure to have the breakdown voltage of the gas gap higher than that which you would expect under normal operations, even under unusually high swr conditions. Gaps can have breakdown voltages ranging from 220 volts to 30 kV and have current ratings ranging from 3,000 Amps on up.

The amount of time that any one gap arcs over is a factor to be considered when selecting the gap. Almost any gap can sustain a large number of low-current arc-overs, but only a few very-large-current arc-overs during its life. The specifications for each gap should be consulted if it is also to handle lightning-arresting chores in addition to EMP protection. Also, most gaps capable of EMP protection are labeled as such.

The characteristic capacitance of each gap is of

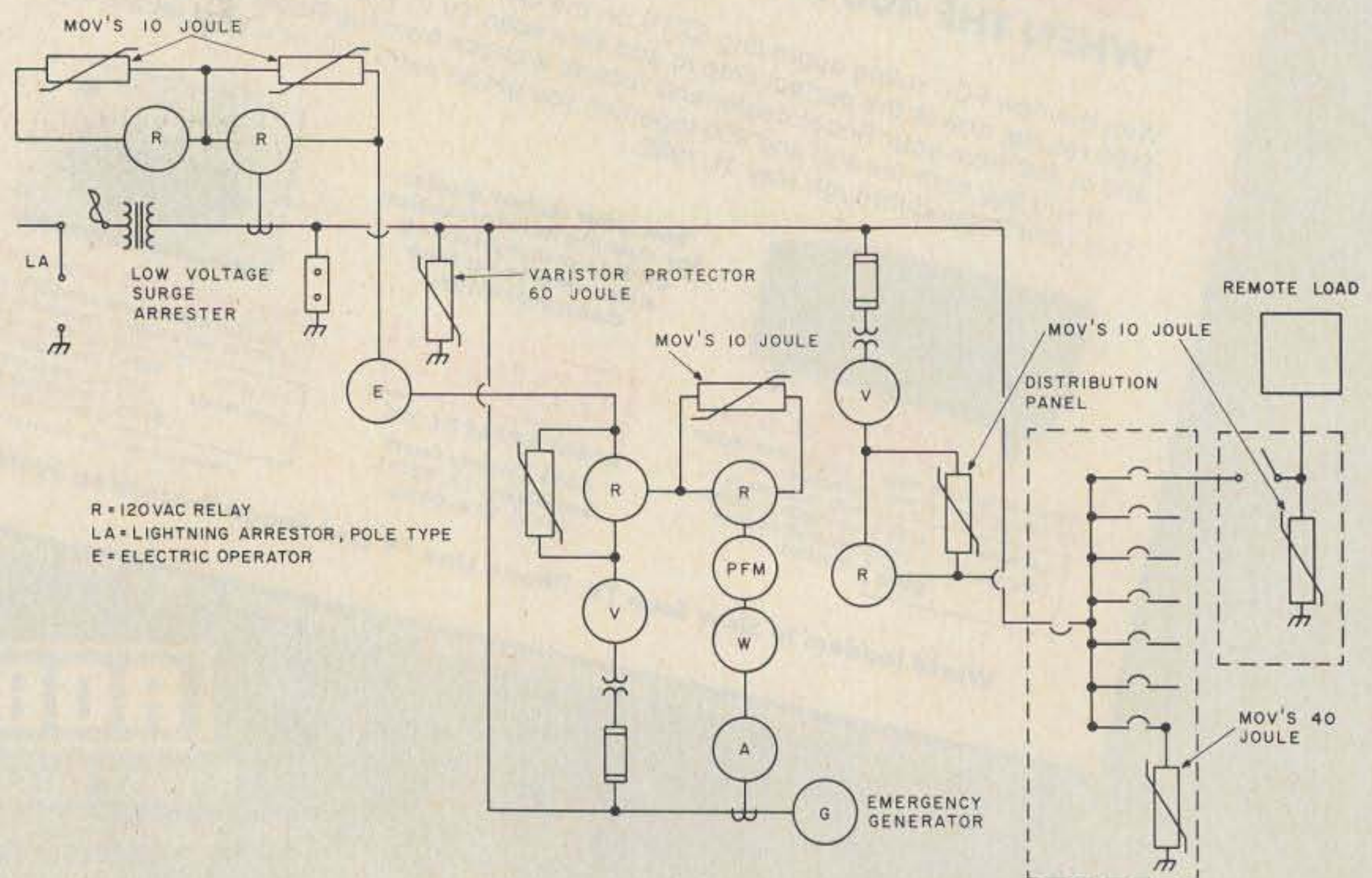


Fig. 11. Full-blown EMP protection for supplying power to communications equipment.



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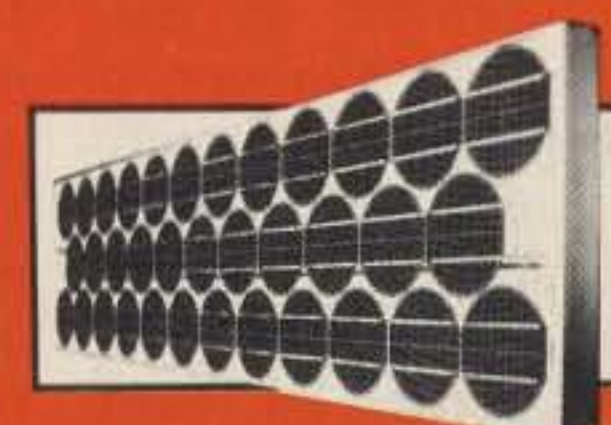
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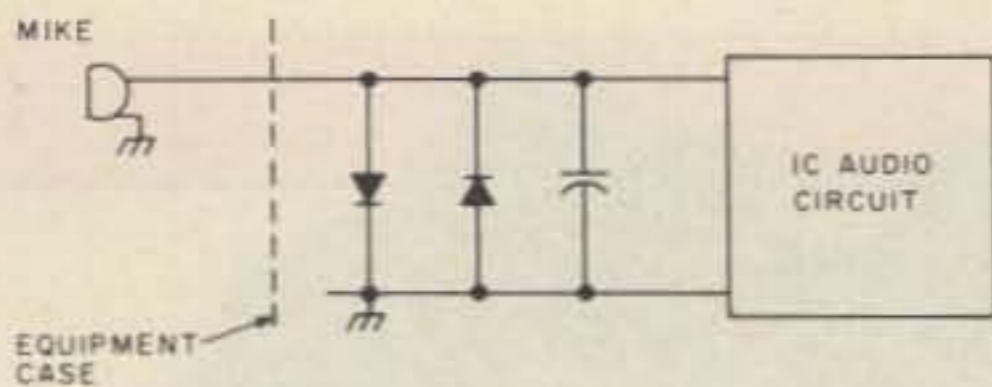


Fig. 12. Switching diodes may be used to protect very short wires. Use 1N3653s and a 0.1- $\mu$ F, 500-volt capacitor.

considerable importance in rf circuits since the inter-electrode capacitance between gap electrodes can cause additional capacitance to be put into the circuit along with the gas gap. This capacitance can be on the order of 2 to 15 pF or more, depending on the type of gap. The capacitance can be reduced by connecting two gaps in series. If you use that approach, be sure to put a 1-megohm or higher resistor (about 1 Watt) across each gap to equalize the voltage between gaps. Keep in mind, too, that connecting two gaps in series roughly doubles their breakdown voltage. An example of the use of gas gaps in an antenna balun is shown in Fig. 2.

At the transmitter or receiver, you may use a gas gap or tee protector as shown in Fig. 3. The diode shown here is a silicon type. While this diode has a fast reaction time, it may not be able to sustain the needed current, and should be preceded by a gas gap at a point closer to the antenna. Fig. 4 shows a gas gap connected in a transmitter circuit.

If you want to go first class and prepare the entire shack (Fig. 5), you could be in for a very expensive project, which may not be necessary if you can shut down your equipment as discussed above. However, if you wish to take that step, the FEMA recommends that the shack should be completely encased in 18- to 26-gauge galvanized sheet metal! To provide complete protection, the treatment includes the door and ventilation facilities. The

sheet metal should be folded at the seams and soldered, with a strip of tinned-metal tape covering the seam.

Telephone landlines should be brought into the shack via 50 to 300 feet of conductive conduit which is welded to the enclosure at the point of entry. The lines should be terminated in gas gaps, metal-oxide varistors, or both. Fig. 6 shows an example. Even your lighting system should have MOV protection as shown in Fig. 7.

Ac power supply lines should have MOVs at all critical points. FEMA recommends that MOV ratings should exceed the stored inductive energy of the preceding transformer and also should exceed the no-load transformer current. Typical varistors have ratings of 40 joules (some are in the range of 10 to 200 joules) and should be installed at 40 joules per phase of the ac line. Four 10-joule varistors connected in parallel will provide the needed 40-joule protection. Electrical distribution boxes and control boxes, of course, should be thoroughly shielded. FEMA recommends that doors and openings should be fitted with rf-shielding gaskets and conductive epoxy.

Don't forget the ventilation system, where all motor wires and switches should be thoroughly shielded and protected with MOVs. Some additional circuit protection approaches may be seen in Figs. 8 through 12.

Of particular importance is the emergency generator to be used. All important

#### EMP Protection Equipment Sources

Some EMP protective devices are not easily obtained. I have found that even a local distributor cannot always obtain information about them. Following is an updated list of sources. Those with asterisks (\*) have expressed their interest in selling the equipment by sending me information when I specifically requested information about EMP protection.

*C. P. Clare Co. 3101 West Pratt Avenue Chicago IL 60645	Gas gaps and other transient protectors
Dale Electronics, Inc. Box 609 Columbus NE 68601	Gas gaps and other transient protectors
*Emerson and Cuming, Inc. 869 Washington Street Canton MA 02021	Conductive adhesives Rf gaskets Rf shielding
*Fischer Custom Communications Box 581 Manhattan Beach CA 90266	Coaxial tee protectors
General Electric Company Electronic Comp. Sales Operation 1 River Road Schenectady NY 12306	Metal-oxide varistors (MOVs)
General Semiconductor Industries 2001 W. Tenth Place Tempe AZ 85281	Gas gaps and other transient protectors
*Joslyn Electronics Systems 6868 Cortona Drive Goleta CA 93017	Gas gaps and other transient suppressors
Lectro Magnetics 6056 W. Jefferson Blvd. Los Angeles CA 90016	Rf shields
E. A. Lindgren and Associates 4515 N. Ravenswood Avenue Chicago IL 60640	Rf shields
Ray Proof Corporation Keeler Avenue Norwalk CT 06856	Rf shields
*Shielding Technology, Inc. (Division of Chomerics) 970 New Durham Road Edison NJ 08816	Conductive adhesives
Technical Wire Products 129 Dermody Street Cranford NJ 07016	Rf gaskets and shielding
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wiring should have MOV protection. Shielded conductors should be used for best results and the shields should be grounded. ■

#### Acknowledgement

The basis for Figs. 1 through 6 and 8 through 11 is *EMP Protective Measures*, Defense Civil Preparedness Agency, 1976.



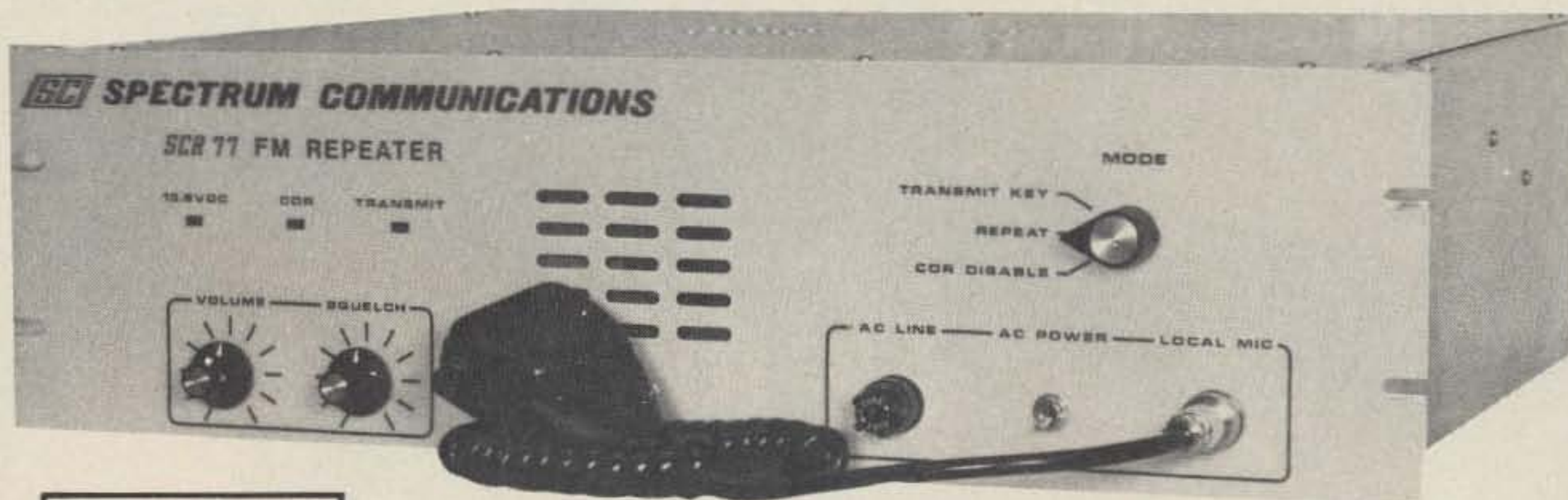
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88.5	697	156.7	2500
85.4	1700	162.2	2550
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77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
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A different form of this mod was described in some Amateur-Wholesale Electronics notes concerning

MARS-CAP modification, so I can't take credit for the original idea. I'll first describe how the modification functions, then go through a step-by-step modification procedure.

The resulting front-panel performance is as follows: Select Mode A. With the memory-select switch at OFF, you have simplex operation on the dialed-in and displayed frequency. Selecting memory position 2 will allow you to receive on the frequency stored there, which is displayed as usual. When you transmit, however, the memory internally shifts to the frequency

stored in channel 1. This frequency is displayed while transmitting, and the display shifts back to your channel 2 receive frequency when the mic button is released.

Channels 3 and 4 work the same, with channel 4 functioning as the receive channel, switching automatically to the frequency stored in channel 3 on transmit. If either channel 1 or 3 is selected, simplex operation on those channels is the result. All that for only two diodes!

Here's how it works: On transmit in the unmodified rig, a transmit oscillator is

diode-switched on by +9 volts from the front panel MODE switch. We locate the wire which runs to the "A" oscillator position (which has no crystal installed) and run switching diodes from there to two places.

The first diode goes to the simplex crystal position, activating it on transmit. The second diode goes to one of the two memory-select lines (A0 and A1) which select the memory channel. In an unmodified rig, the same memory frequency is used on both receive and transmit. If you trace out the schematic,

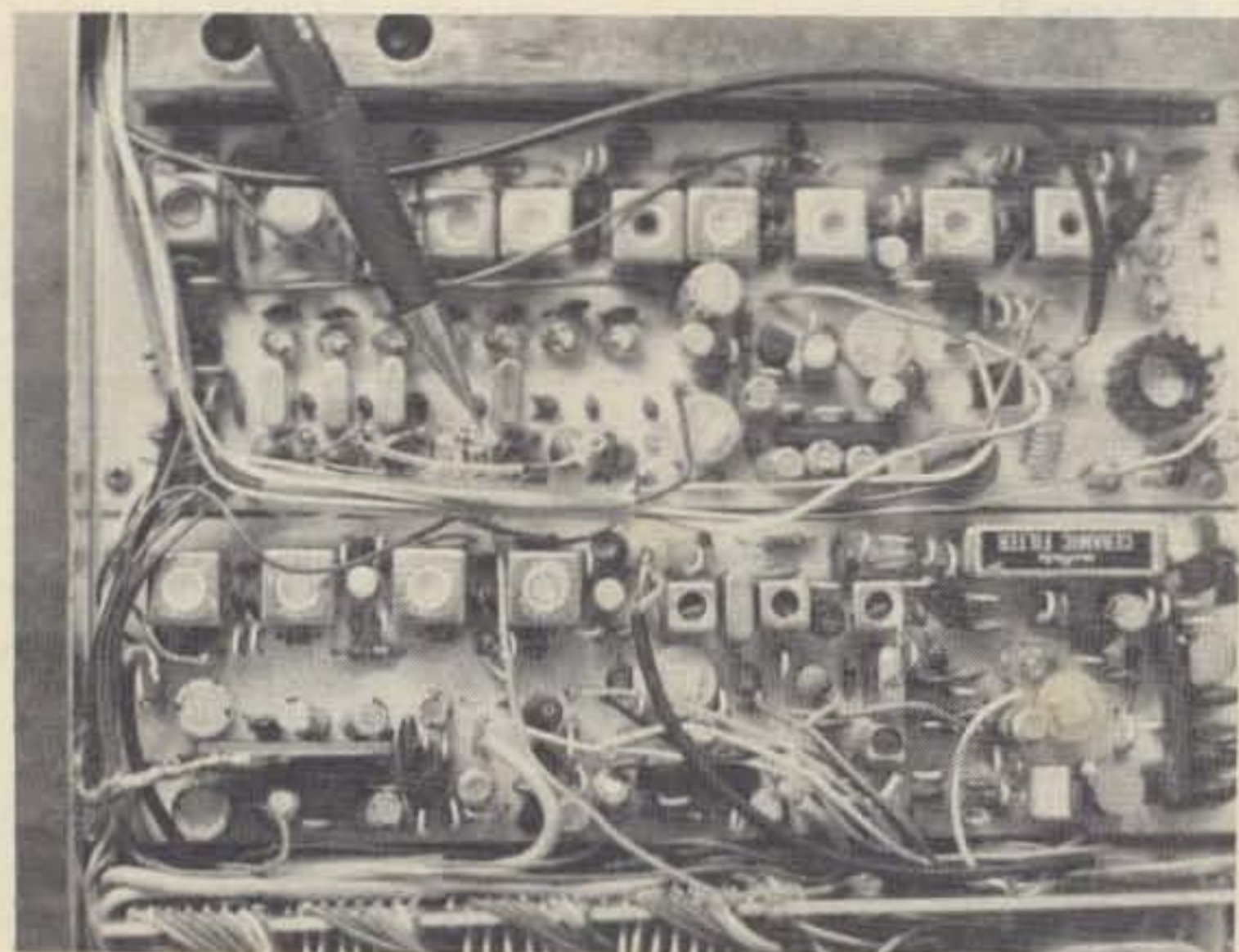


Photo A.

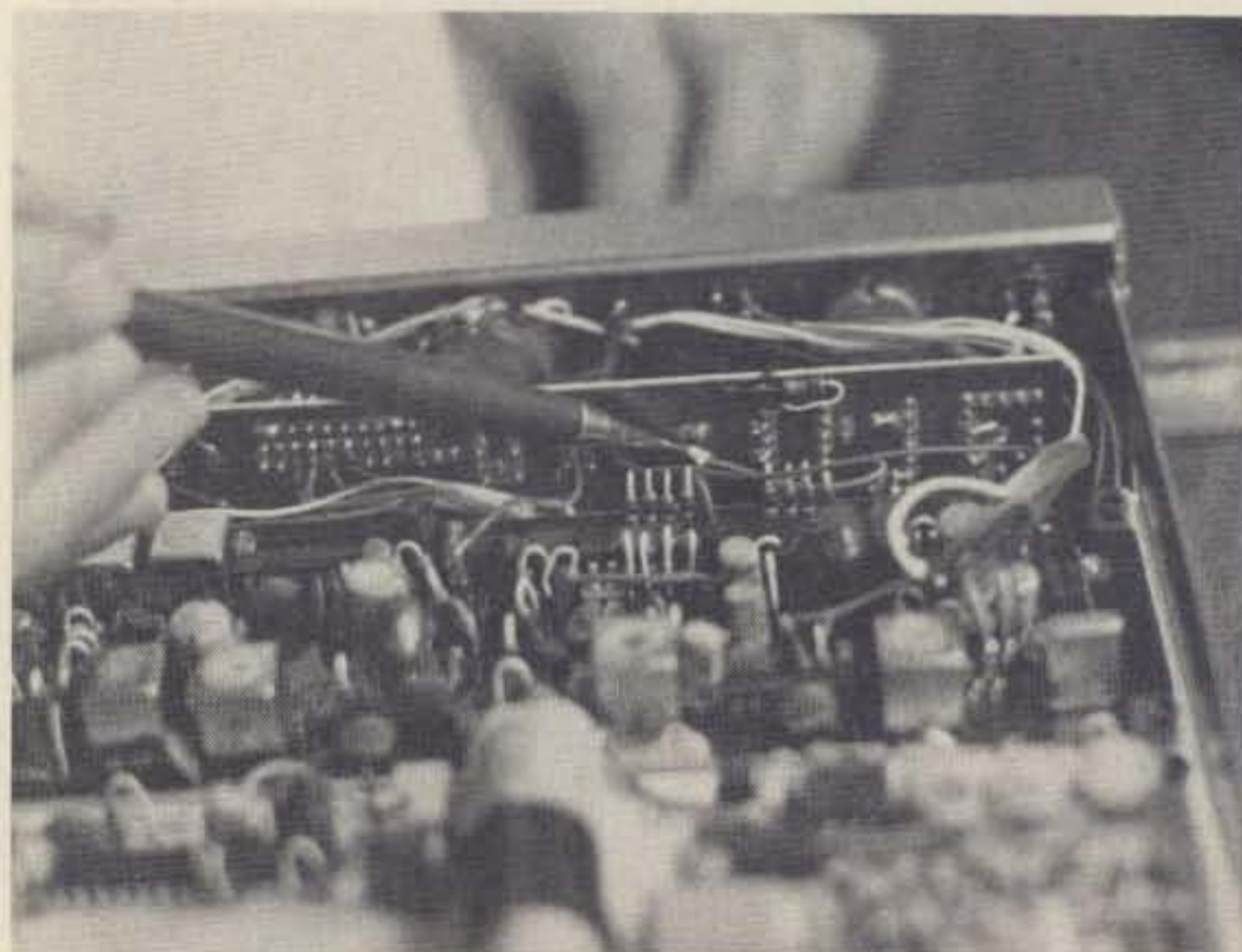


Photo B.



you will see that in the original configuration when memory position 2 is front-panel selected, +9 volts is routed through this memory switch to memory-select line A1. Or, if memory position 3 is selected, A0 is taken high. Memory position 1 requires both A0 and A1 to be high, and position 4 requires neither to be high. If we modify things to make A0 high on transmit only, then memory position 4 on receive becomes 3 on transmit, and 2 becomes 1 on transmit. This switching is done with diodes to avoid interfering with other functions.

To perform this mod, remove both top and bottom covers from the rig. With the rig right side up, locate the three crystals on the transmitter board. (See Photo A and ignore the fourth crystal which I installed for another offset.) A terminal post corre-

sponds to each crystal position. A yellow wire is connected to the first unused crystal position, which is the fourth one in from the outside edge of the board. The pencil in the photo is touching this terminal.

Note that this wire is connected to the "A" MODE switch position and is switched to +9 volts on transmit. Remove the wire from this terminal post. You will run two diodes from this yellow wire, and you will need to mechanically secure this junction somehow. I slipped a piece of spaghetti over the terminal and tied the wire/diodes to it. However you do it, the first diode is soldered from the yellow wire to the first crystal position's terminal (the one with the brown wire). The diode points at the brown wire (cathode to brown wire) and will activate the simplex oscillator on transmit.

The second diode's anode is also soldered to the yellow wire. At this point, the yellow wire should form a "flying tie point" with the two diode anodes. Attach the cathode (point) of the second diode to a length of hookup wire. Route the free end of the wire toward the front of the radio to the control board and connect it to the A0 pad. This control board is accessible from the bottom of the radio and is located near the front panel. See Photo B. The pencil points to pad A0. The wire attached to the pad is the one I added for this mod.

The A0 and A1 pads are designated as such on the component side of the board and have white/brown (A0) and white/black (A1) wires attached to them on the component side. This completes the modification.

Verify that the rig will operate now as described earlier. This mod is totally "safe" in that the rig can't be harmed by incorrect front-panel switch settings. MODE switch positions B and C are still available for nonstandard offset crystals if desired. The rig's operation in all other respects is unaffected.

The only problem I encountered was that the simplex transmit oscillator didn't function until the yellow wire and diodes were isolated from the fourth oscillator terminal as I have described. If you feel like experimenting, leave the yellow wire connected and solder the diodes directly to the terminal. If it works (if the transmitter puts out power), then you win. If not, then isolate the wire/diodes as I described. Please send an SASE if you have any questions. ■

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# Building for Beginners

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Paul M. Danzer N111  
2 Dawn Road  
Norwalk CT 06851

I have authored several short construction articles in the past year or two and each time their publication was followed by a flurry of letters asking for help in selecting parts and building the circuit. This mail suggests that a number of hams without very much electronic construction experience would still like to home-brew their own.

For this reason, I have put together a set of suggestions and hints which an-

swer the most commonly asked questions. The next time you see a circuit or gadget described in 73 or elsewhere, don't be shy—go ahead and build it! You'll be delighted with the results.

### Where Can I Get the Parts?

The most critical part of building anything these days is obtaining the parts. Years ago, the corner radio store carried almost anything you wanted, and if you lived in a metropolitan area you could always go down to "radio row" where there was a cluster of such

stores. Today, your best bet is either the mail-order ads in the back of this magazine or the Radio Shack chain of stores. Radio Shack carries a line of the most commonly used parts and has stores scattered throughout the country.

The mail-order advertisers in the back of this magazine usually list common parts and prices for immediate order. Most of them offer catalogs, either free or for the postage, and are geared up to ship your order within a day or two after receipt. They have been advertising for many

years, and the acceptance of their ads by 73 on a continuing basis shows that they deal fairly with their customers.

Try to take advantage of the "two-for" offers. Even if you have no immediate use for the extra parts, keep them around and you will probably find a use for them in some future construction project.

### Resistors and Capacitors

Unless the magazine article states otherwise, use half-Watt resistors. They are most commonly available, and if a higher wattage is needed, the article will say so. If you are squeezed for space, quarter-Watt units can be used—again, as long as the article says nothing to the contrary.

Don't worry about the seemingly oddball values specified. Resistors generally come with 20%, 10%, and 5% tolerances. Using 10k Ohms as an example, Fig. 1 shows the relationship between the standard values and these tolerances. Today, most people use 10% values primarily because they are the most commonly available. If the

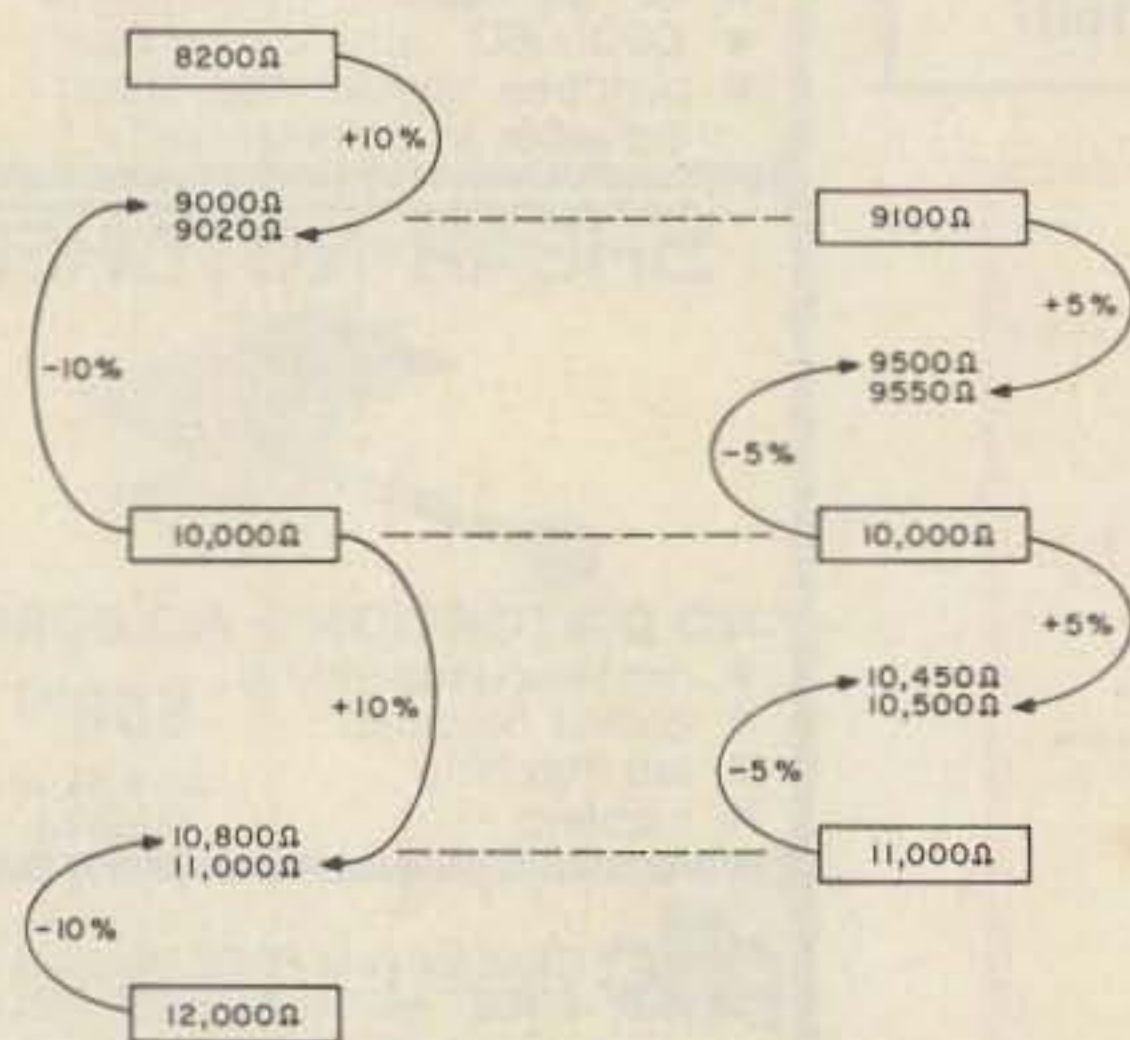


Fig. 1. Standard resistor values. Those in boxes are standard commercially-available resistors.

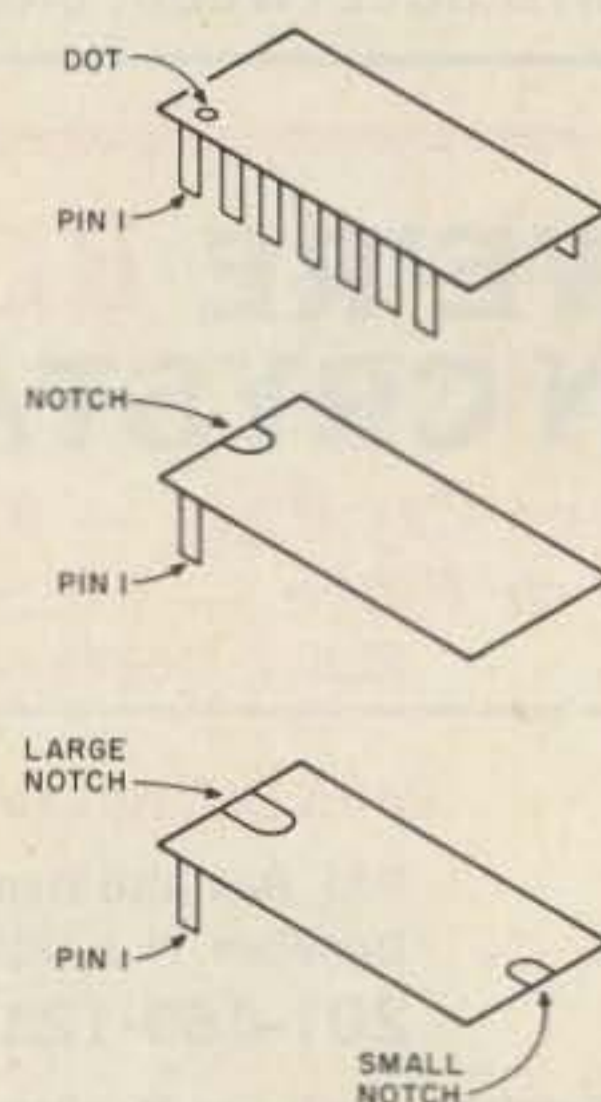


Fig. 2. IC pin locations.



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article does not say anything else, you might stick to 10%. You can always use a resistor with a better tolerance (10% instead of 20%, or 5% instead of 10%). If you need 5% and can find only 10%, buy a handful of 10% resistors and check them with an ohmmeter to select one that falls within  $\pm 5\%$  of the value required.

Capacitors have both a value and a voltage rating. You can always use a cap that has a voltage rating higher than the amount needed. For most capacitors, you must stick to the value needed but you can always use the larger-than-specified electrolytic cap when it is used for bypassing or filtering a power supply voltage. Just be careful to wire it in with the polarity shown in the schematic.

### Transistors and FETs

Generally, you will have to stick to the type specified in the article. Substitutes can be used and you can pick a substitute by looking at the substitution guide printed by a number of suppliers and distributors. Radio Shack, GE, and Motorola all have hobby

lines of transistors and substitution guides where you can look up the device you want; the guide will give you their substitute number. When you do substitute, be careful of the connections. Often a substitute will be very close to the original part electrically but will have a different mechanical package and/or lead arrangement.

### Integrated Circuits

Let's assume that the circuit you are building uses a very common amplifier known as the 741. There are perhaps twenty versions of this amplifier, with twenty different part numbers. Each of the part numbers includes the digits 741, with the rest of the digits telling you the temperature range and mechanical package. For most uses we don't have to be concerned about the temperature range, but the pin numbers for connecting to the amplifier are very much of interest. Compare the pin numbers of the amplifier as shown in the schematic with the pin numbers of the actual part you buy.

Occasionally, the article will specify an amplifier such as the 741 and show it as a single amplifier in an 8-pin package. You might be able to obtain only a dual 741 or two 741 amplifiers in a 14-pin package. This is perfectly OK; just ignore the second amplifier.

Integrated circuits are available most commonly

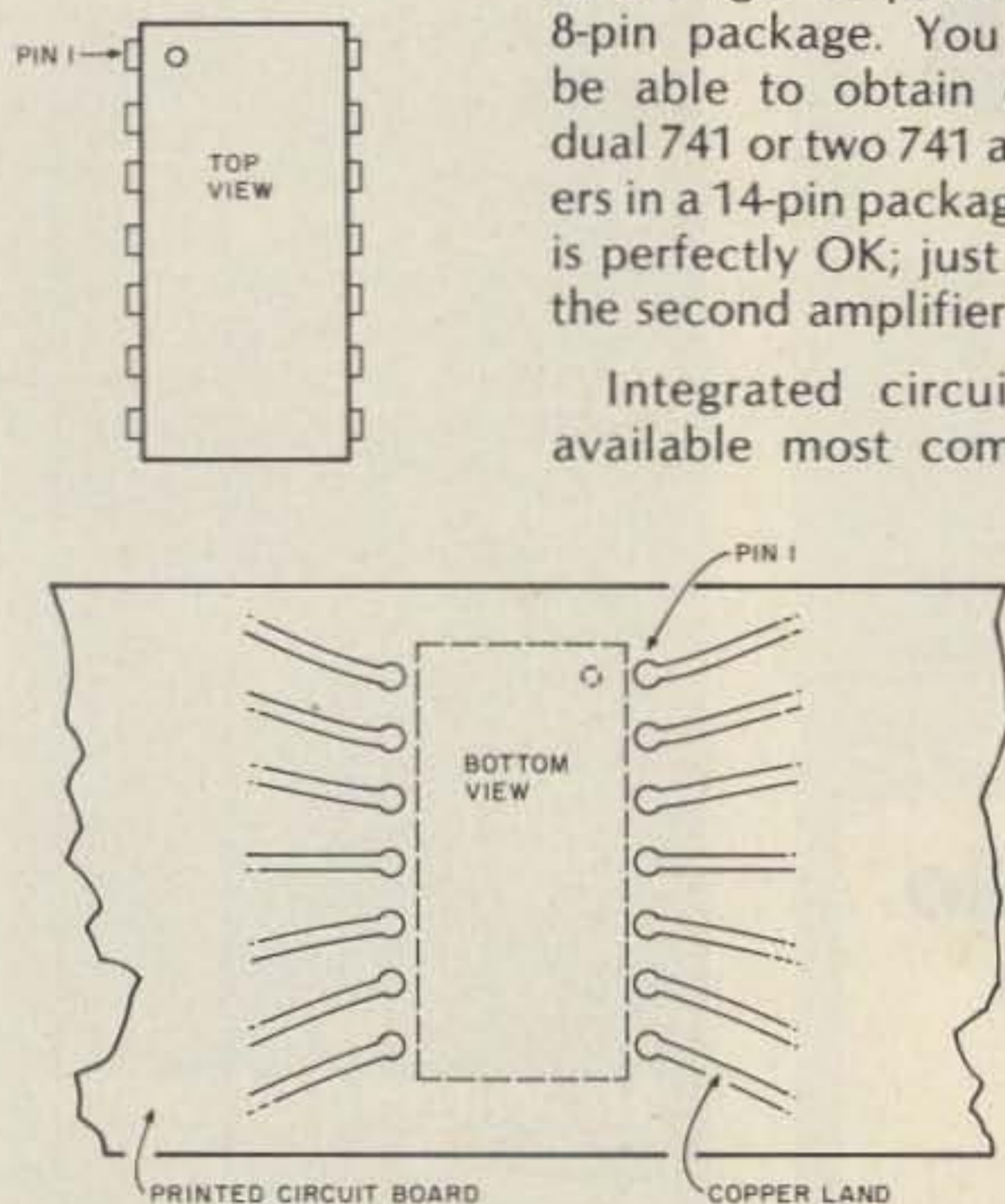


Fig. 3. Pin 1 transposition.

in "in-line" packages having 8, 14, or 16 pins. A round dot usually marks pin 1. Sometimes a notch tells you where pin 1 is, and occasionally you have to cope with a dot and two notches. As Fig. 2 shows, the dot takes precedence over the notch, and if there is a notch at both ends of the package, the larger notch tells you where pin 1 is.

Unlike tubes or transistors, the manufacturer's data sheets usually picture integrated circuits from the top. Therefore, when you are wiring them from the underside, remember that pin 1 is now on the other side of the package as seen from the bottom of the circuit board (Fig. 3).

### Diodes

Power-supply-type diodes have both a current rating and a voltage rating. You can substitute any diode which has a rating equal to or greater than the original numbers. Small signal diodes used as switches usually can be substituted for at will. Most ham circuits use a maximum of 12 volts (sometimes labeled 13.6 volts if the equipment is for mobile use). Therefore, if the circuit calls for a small signal silicon diode, almost any other silicon diode will do. Fig. 4 shows the most common markings of the diode package.

Zener diodes, used in voltage regulators, have both a voltage rating and a power rating. You must use the voltage rating called for, but you can always use a higher-power-rated diode.

### Power Supply Connections

Fig. 5 shows a simple 2-transistor amplifier. With today's solid-state circuits, usually only one power-supply voltage is used and, as shown in the figure, you simply tie the identically-marked points together and connect them to the voltage required. If the schematic does not show differently, the power-supply return lead (in this case the minus 9-volt lead) is tied back to all of the ground terminals.

### Jacks

Here you can substitute at will. Just remember that the most commonly used jacks have one side exposed and will connect to the chassis (ground) if they are not insulated by wash-

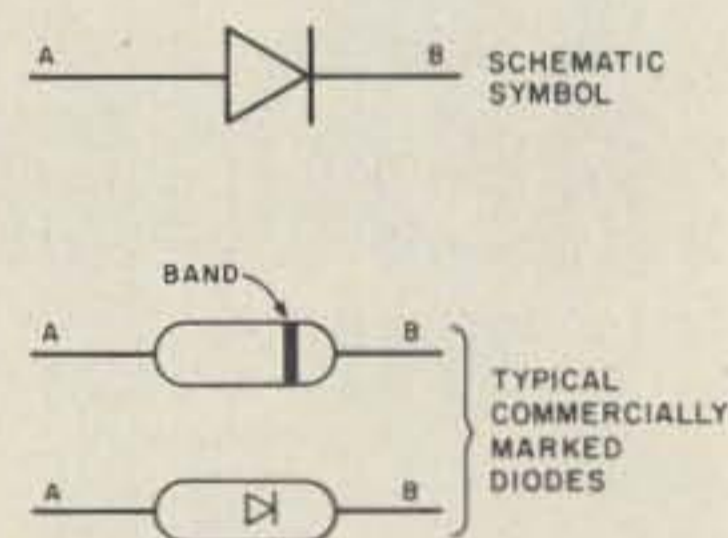


Fig. 4. Typical diode markings.

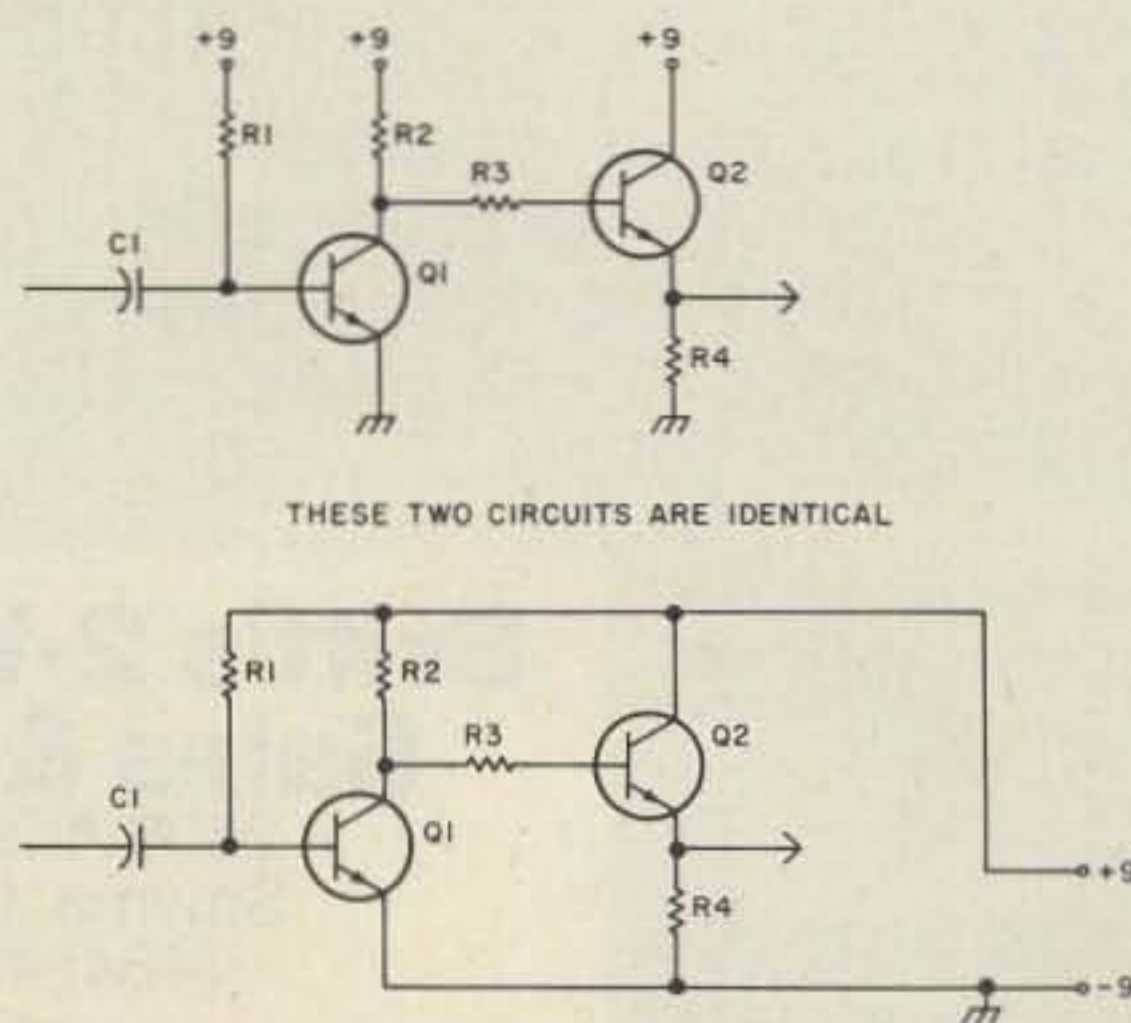


Fig. 5. Power-supply connections.



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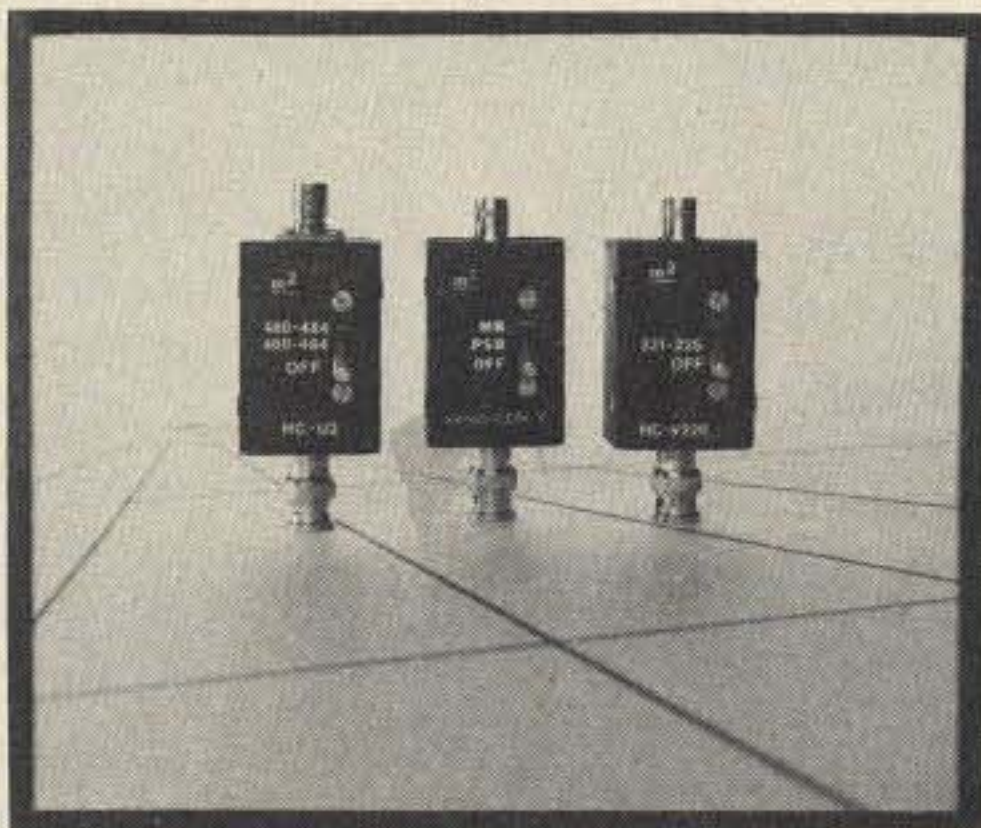
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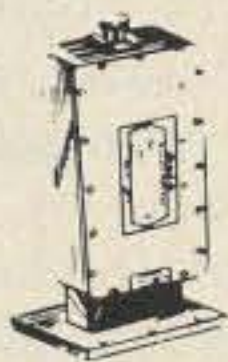
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WIRE GAUGE	DIAMETER IN INCHES
1	289
...	...
20	.032
22	.025
24	.021
26	.015
28	.012
...	...
50	.001

Fig. 6. Wire sizes.

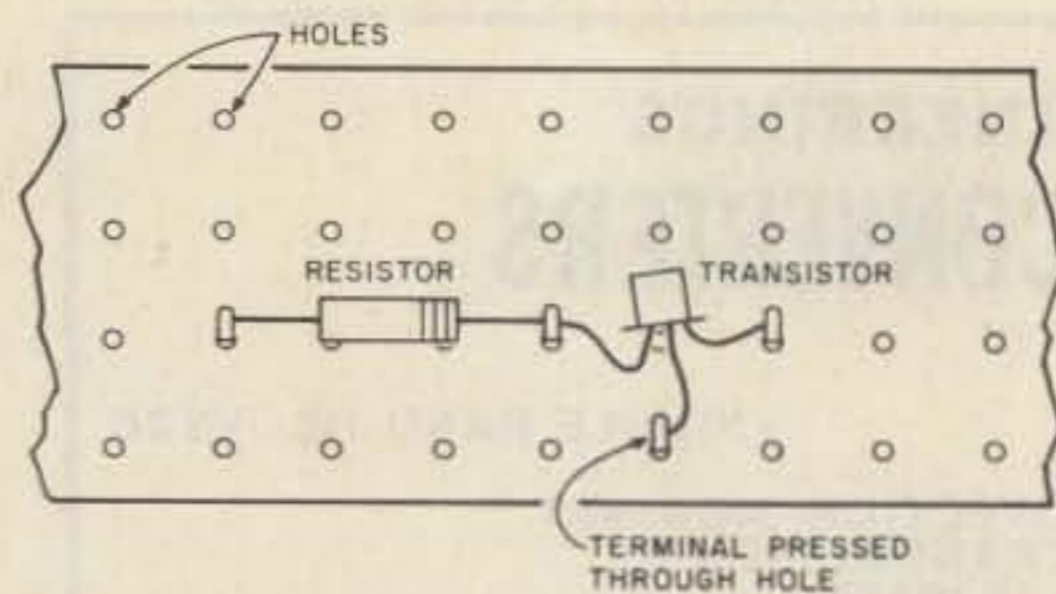


Fig. 7. Use of perfboard.

ers. If you need a two-conductor jack, and one lead is not supposed to be grounded, you will either have to mechanically insulate the outside of the jack from ground or get a three-conductor jack where you use the two inner conductors and ignore the third (grounded) lead.

### Cable

If the circuit you are building is not used at VHF and a piece of coax is called for with a length of 12 inches or less, the coax is being used mainly for its shielding capability. You can safely ignore the impedance and pick a piece of coax on the basis of being able to fit it into your box mechanically.

### Wire

Unless used for high-current leads, most solid-state circuits use just a few milliamperes per stage. Therefore, there is no reason to

use wire sizes larger than number 22 or 24. As shown in Fig. 6, the lower the number the larger the wire diameter. Pick wire which is mechanically convenient. Soft plastic insulation strips very easily and conveniently, but if you have to solder a number of them in close proximity, the plastic tends to melt and burn, generally making a rather unsightly mess.

### Printed Circuit Boards and Breadboards

Some construction articles provide either a PC-board layout or a commercial source for purchasing the board. If a layout is given, you can use the PC-board kits sold by several suppliers to make your own. However, if no board is suggested, you always can use a breadboard-type construction to build the circuit. Most hams have one or more breadboard

circuits, neatly enclosed in a box, which have been operating in their breadboard form for many years. Even if your construction does not come out very neat, the flaws will be hidden by the enclosure you put the circuit in.

One of the simplest construction techniques uses perforated board such as that sold by Radio Shack, Vector, and others. The circuit is laid out just as it appears on the schematic, and every time a connection must be made, a small metal terminal or clip is inserted in a hole and the leads soldered onto the terminal (Fig. 7.).

Alternatively, general-purpose PC boards also are commercially available. They are arranged in a fixed pattern and, as shown by the dotted rectangle, integrated circuits plug in adjacent rows of holes (Fig. 8). A bus-bar system of feeding ground and voltage is used, where one bus is connected

to the supply voltage and jumpered to the IC pin where required. Transistors and other parts can be mounted where convenient. A second bus is used for ground.

Also commonly available are small carrier boards which will allow you to wire up one or two integrated circuits (Fig. 9). Other parts are jumpered from one terminal to wherever required.

Generally speaking, sockets or moxex<sup>®</sup> pins are a good idea for mounting integrated circuits. If you do have a problem, you can now unplug the IC and test or substitute without a massive and messy unsoldering job.

### Plan It Out and Then Build

Take a careful look at what parts are required and make sure you can obtain them. Plan the layout of parts and decide what you are going to enclose the circuit in and where the jacks, connectors, and controls will be located. Don't hesitate to call for help. Often an experienced ham in the area can offer an immediate solution to your unique problem. But if this does not solve the problem, you can drop the author of the article a note. Enclose an SASE, and help will probably be on its way quite quickly. ■

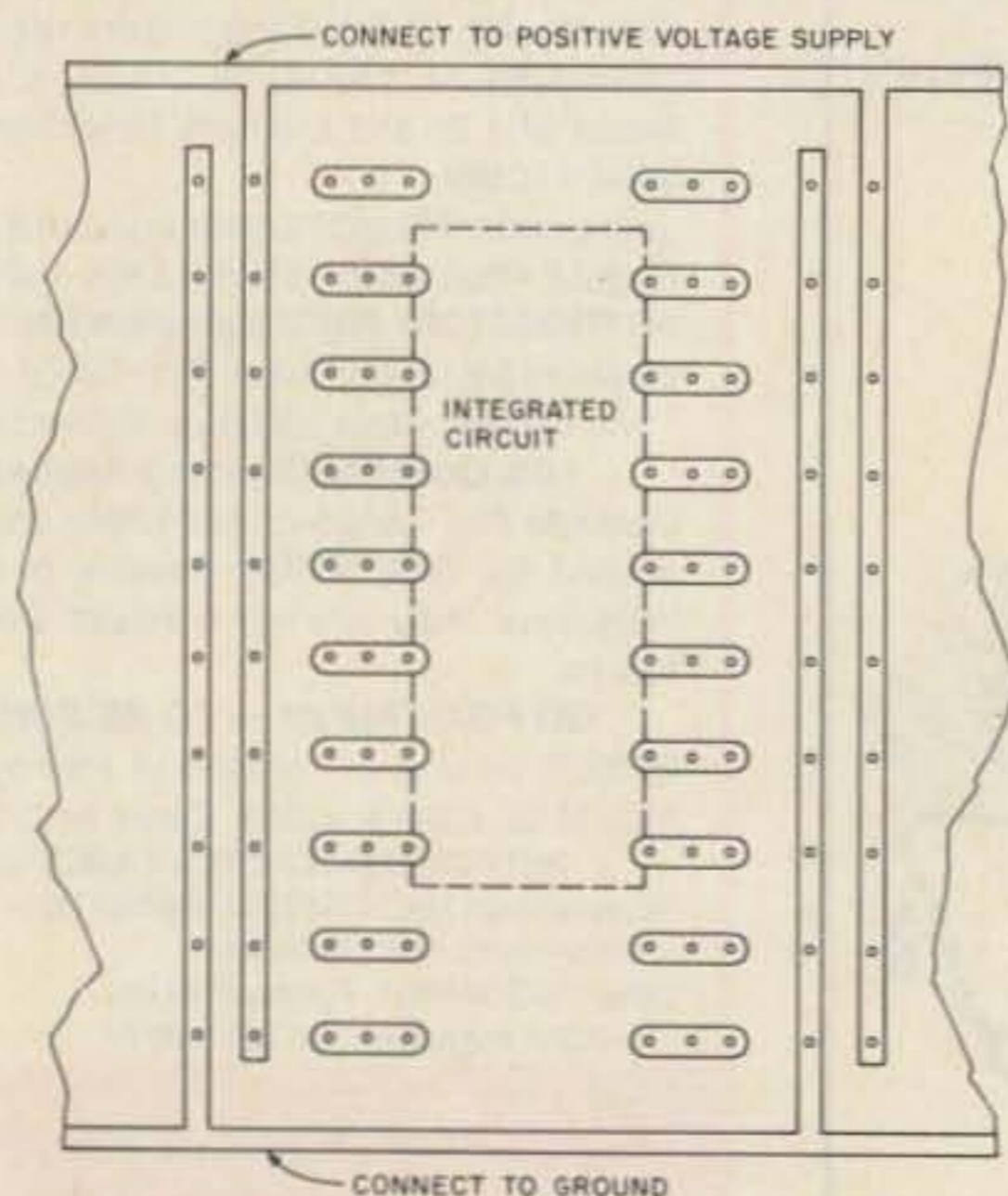


Fig. 8. Commercially-available PC board for breadboarding.

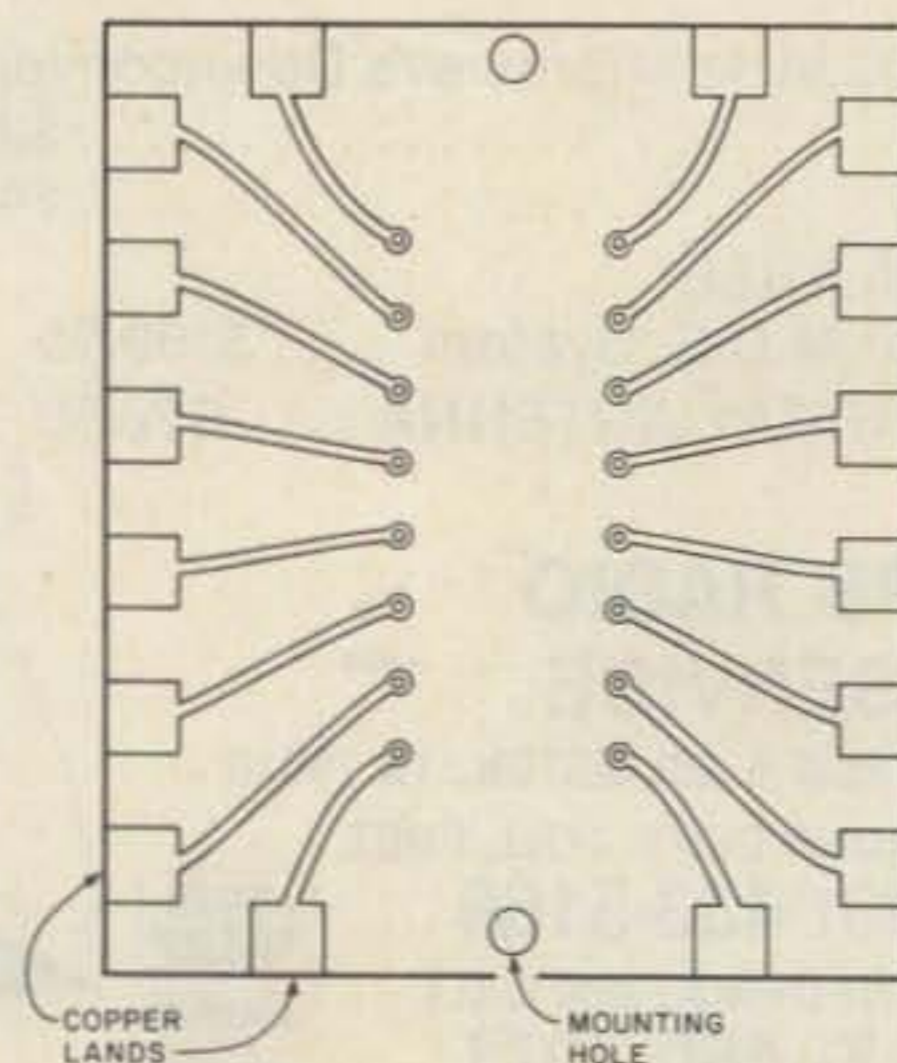


Fig. 9. Single-IC carrier board.



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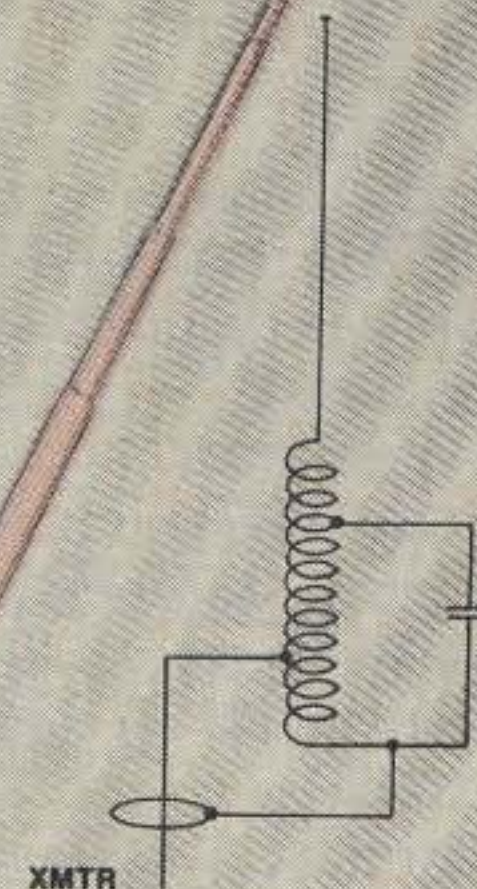
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**Here's Why It Works So Well:**

In order for a 5/8 wave antenna to provide its full apparent gain over a standard 1/4 wave whip, it must not only appear as 5/8 wavelength at 2 meters, but it must also utilize a ground plane. Since you can't always operate your hand-held from a car roof or other metal base. VoCom found a way to emulate the ground plane.

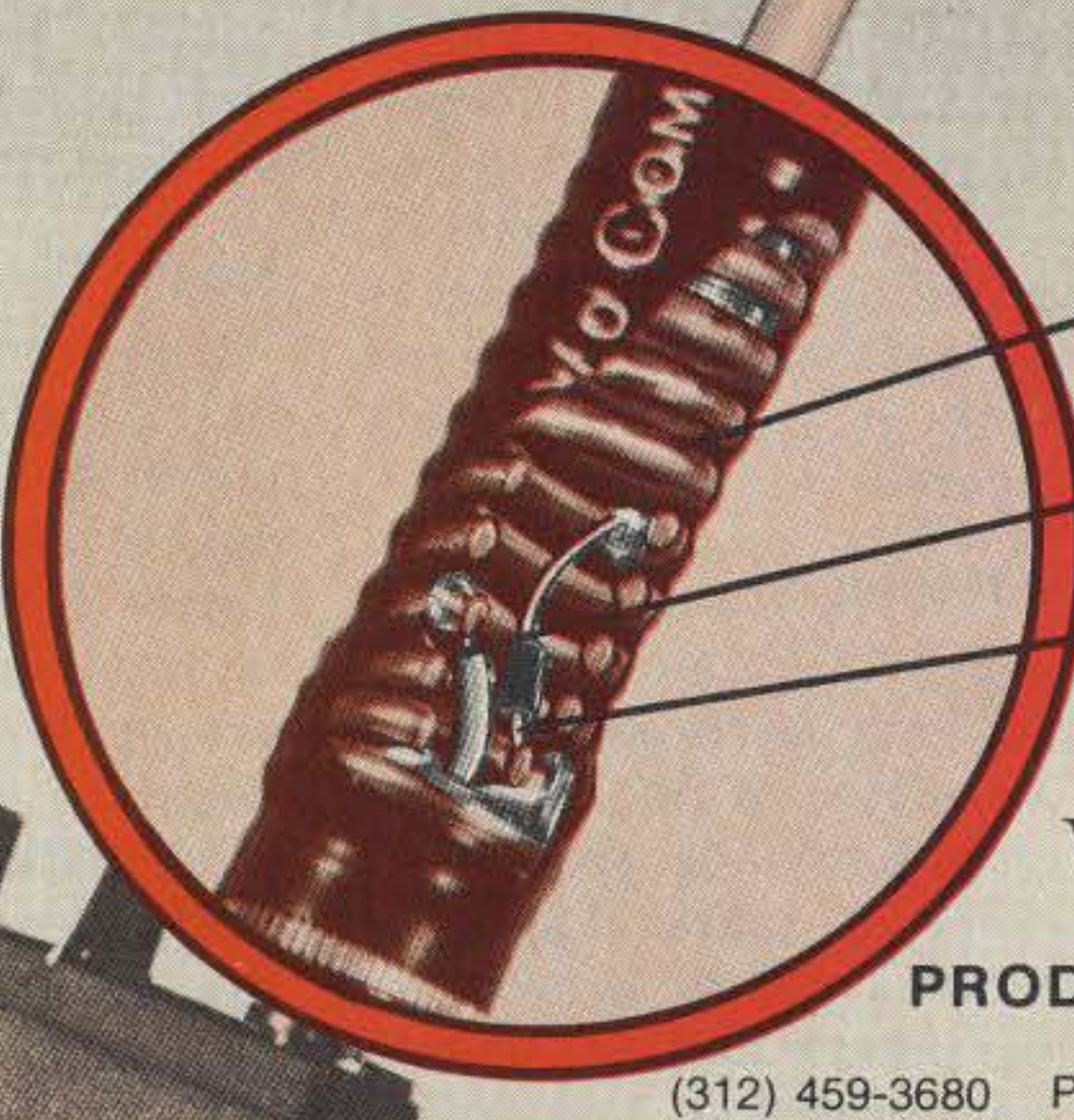
At right is the circuit that does it. The coil that doubles as a base spring is tap fed, and a matched capacitor completes the resonant circuit.

The result is an antenna that, fully extended, displays better than 1.5:1 VSWR across the entire 144-148 MHz band. And, when collapsed, it is the operating equivalent of a rubber duck. (With 8 of the 10 sections extended, it is a 5/8 wave antenna at 220 MHz.)



**How to tell a VoCom 5/8 wave antenna from its imitators:**

this cutaway shows the base spring/coil, its feed tap, and the resonant circuit capacitor. Or you can simply check the VSWR—your transmitter will appreciate the difference.



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# Coping with PC Boards

## — it's not easy to be virtuous

**"A**dmit it. You'd really rather build it. Any idiot can plunk down a charge card."

"Well, yeah. . . ."

"Glenn, if you build it, it will give you pride and experience, and you'll know how to service it yourself."

"Yeah, but. . . ."

"And it wouldn't cost nearly as much, and nobody would have one just exactly like yours."

So, I'm building. And my inner voice was right about everything it said. But there are a few things it *didn't* tell me. I found out the hard way, and I'm telling you so you don't have to "re-invent the wheel," like I had to.

I'm building. But so help me, when I see those full-page, full-color ads and a toll-free number and the sign of the yellow and orange overlapping circles, it's hard to keep at it. I could have any equipment I want for just a phone call and twenty "easy" payments. The path of virtue is harder.

### Designing It

In the first place, I don't know much about vacuum-tube circuits and even less about solid state. For-

tunately, I don't have to. The League<sup>1</sup> publishes *Solid State Design for the Radio Amateur*. It's a "cookbook." It shows three varieties of any circuit you could want—all pre-engineered and tested.

### Redesigning It

Now, even with a cookbook, I can make mistakes. In fact, it's about even odds that I will make a mistake in a one-device gadget. It is far beyond me to put forty "stages" on a board as big as a 73 cover and have them all work. I decided to put each stage on a separate board and plug 'em all into edge connectors. That way if (when!) I make a mistake, I won't have to tear everything up.

I mailed off<sup>2</sup> for some PC board. It took three weeks to get here. They didn't send it until my check cleared.

### Whittling It

PCB is funny stuff. I couldn't trace anything on it. I couldn't find any kind of carbon paper that would make a mark. Finally I rubbed yellow crayon on the copper and was able to trace faint lines. I cut on the

lines and peeled up the unwanted foil in little-bitty strips with a point of a knife. It took half a day. But it worked. I got a nice little 40m CW receiver for my trouble.

### Buying It

For my next project, I just sent off for ready-made custom boards.<sup>3</sup> They were nice, neat, correct, beautiful, and even had the parts placement marked. They worked perfectly. I made a mate for the last project. But I wanted to do these boards myself.

I sent off for ferric chloride.<sup>4</sup> This time I called up and told 'em my card number and they had the stuff delivered to my door in about three days.

### Mixing It

The ferric chloride is a black, gritty powder. I mixed it with hot water in a plastic jug. The water got hotter. The powder that got on my hands turned into a brown goo all by itself and began to sting. I went and washed it off. When I came back, the grit I had spilt on the floor had turned into a nasty glop. That stuff absorbs water right out of the

air! I wiped it up. The floor is now permanently stained several shades of brown, black, green, and gray.

### Etching It

Anyway, now I was ready to begin. Or was I? I cut out a little piece of the high-priced board and drew a circuit on it in ink. I laid it in a plastic dish and poured some of the smelly brown juice over it. An hour later it looked gritty. Two hours later it was covered with a fine black sediment. I rinsed it in the sink and every bit of copper was gone. The thing might still make a banjo pick, but it would not make a circuit.

### Resisting It

I cut out another piece. This time I drew my design with a felt marker. I baptized it for two hours in the ferric chloride soup and, behold!—a printed circuit. The remaining foil was rough and gritty—about half eaten up. But it would do. Now I knew for sure what to do. Very carefully I designed the first board. I felt-marked it and laid it away in the tobacco juice. In the morning there wasn't enough copper left on the



board to tell what it was supposed to have been.

Next I tried crayon. I suppose if crayon were the only resist in the world, we might make a go of it, but we wouldn't like it. It turned out rough and ugly. By now I wasn't trying to make any particular kind of board. I just wanted to see what would get me decent results.

### Cursing It

Oh! I found a lump of etchant I had missed before. I stepped on it bare-foot and stained my sole brown. I said some words that stained my soul deep purple. After I cleaned up the mess, I went to bed, disgusted.

### Dreaming It

Suddenly I sat up. I had dozed off and dreamed I was painting a pattern with a tiny brush. That mimeograph correction fluid! I had a whole case of it! Mimeograph correction fluid corrects by drying into a plastic film. And it comes with a handy little brush built right into the bottle lid. I put on my pants and waddled out into the dark to my store.<sup>5</sup> There it was, cartons and cartons of it. I brought one in and anointed a little rectangle of copper with abstract designs and flooded it with the slop from the jug.

In the morning I rinsed it off and scrubbed it clean at the kitchen sink. Beautiful. My design was perfectly preserved in glittering copper.

### Sharing It

Finally I have found *The Way* to do it. And I will share it with you. Just send a dollar and a double-stamped SASE to Glenn's Trading Post at Poverty Flat, Arizona 85925. I will send you a bottle of genuine Army surplus correction fluid complete with a nice little applicator brush built right into the lid. Guar-

anteed to delight you. Correct your stencils. Paint your nails purple. Make your own PC boards. (Who knows, it may even remove warts.) This is the best stuff since snake oil. You can even see your pencil lines on the foil through the fluid.

### Drilling It

By 'n by I had the first board ready for parts. Nearly ready for parts. Gotta drill it. All my drills are too big. I went to a dozen hardware stores within a hundred miles. The smallest ordinary drill bit is a sixteenth of an inch. It's positively teensy. But the components just fell out of the holes. Even after I soldered them. The best I could do was bend the leads over hard after poking them through the holes. Then they would stay in place long enough to be soldered. But the holes were so large it left a quarter-moon gap around each lead. It didn't look neat. It didn't look professional. If I had wanted a ventilated board, I would have made a pattern of round holes on purpose.

"I need a smaller drill."

"No. You need smaller holes. Or, you need to be less picky."

"All I want is a drill half that size."

"There ain't any in eastern Arizona. You need something else."

"If it drills holes, ain't it a drill bit?"

"Not necessarily."

My wife broke a sewing-machine needle as I argued with the inner voice.

"Honey, get this broken needle out for me, will you, please?"

### Grinding It

I did. A broken-off sewing-machine needle looks a lot like a little-bitty drill bit. I ground a bevel on the notched side of it with a whetstone and it looked a lot more like one. I chucked

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the shank into my hand drill and found it would go through PCB like a hot knife through butter. It made a neat round hole with the foil pushed up around the edge like the rim of a moon crater. And, the hole was too little for a resistor lead. But sewing-machine needles come in different sizes and for a buck at the friendly local notions counter, I had an assortment of drill blanks just the right sizes for component leads.

### Concluding It

You can roll your own printed circuit boards without spending a fortune on special supplies and equipment.

You can draw your pattern right on the copper with an ordinary pencil and erase it until you get it right. You can paint directly on the board with mimeograph correction fluid. You can see your pencil lines right through the purple film.

You can remove it with a fingernail. When you are satisfied with your pattern, a mixture of ferric chloride and water will etch it for you. Plain water will clean it up, with a little scrubbing.

If you can't get the size of drills you need, ready-made, you can make your own out of sewing-machine needles. ■

### Footnoting It

1. American Radio Relay League. Newington, Connecticut 06111.
2. There are a lot of places. I got mine from Fair Radio Sales, Box 1105, Lima, Ohio 45802.
3. Again, there are several sources. Try Circuit Board Specialists, Box 969, Pueblo, Colorado 81002.
4. Meshna, Box 62, East Lynn, Massachusetts 01904. They may be out.
5. Glenn's Trading Post, Poverty Flat, Arizona 85925.





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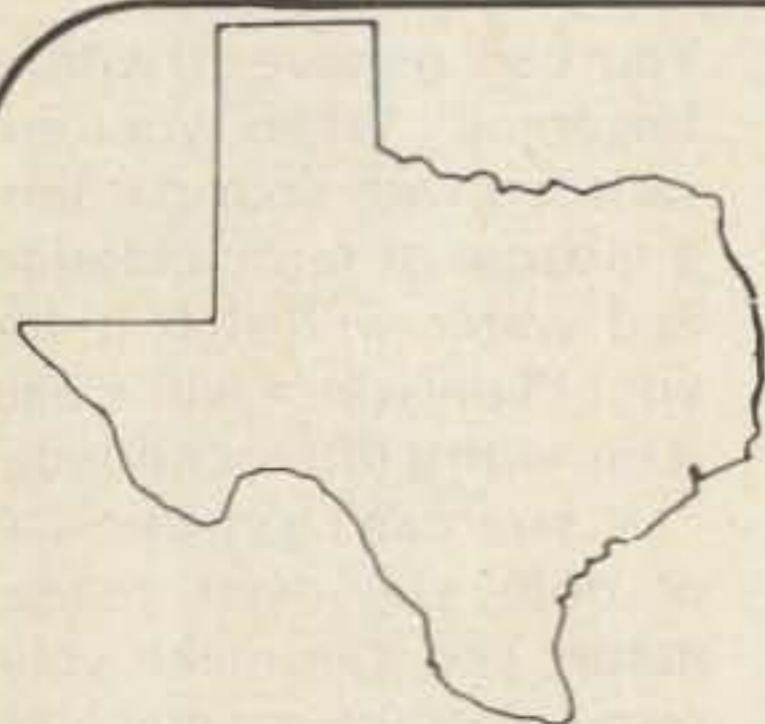
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# 'Lite Receiver IV

## — the second half

J. Richard Christian WA4CVP  
600 Norton Drive  
Satsuma AL 36572

S. F. (Mitch) Mitchell, Jr. WA4OSR  
PO Box 973  
Mobile AL 36601

This is the second part of a two-part article on the 'Lite Receiver IV™.\* In the first installment (May, 1982, 73), we described our philosophy for designing a home-brew receiver that can be easily duplicated. The 'Lite Receiver IV is the culmination of that design philoso-

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

phy. The receiver completes the home-brew system which started with our low noise amplifier (February, 1982, 73) and easy-to-build downconverter (March, 1982, 73).

The first 'Lite Receiver IV installment covered the 70-MHz bandpass filter/i-f amplifier board and the video demodulator board. Also included was an interconnection diagram showing how all of the boards were connected together. In this installment, we describe the audio, automatic frequency control, and metering circuits. For ease of building, printed circuit board layouts

and parts lists are provided. A source is provided for etched and drilled printed circuit boards for those not wishing to "roll their own."

### Dual Audio Board

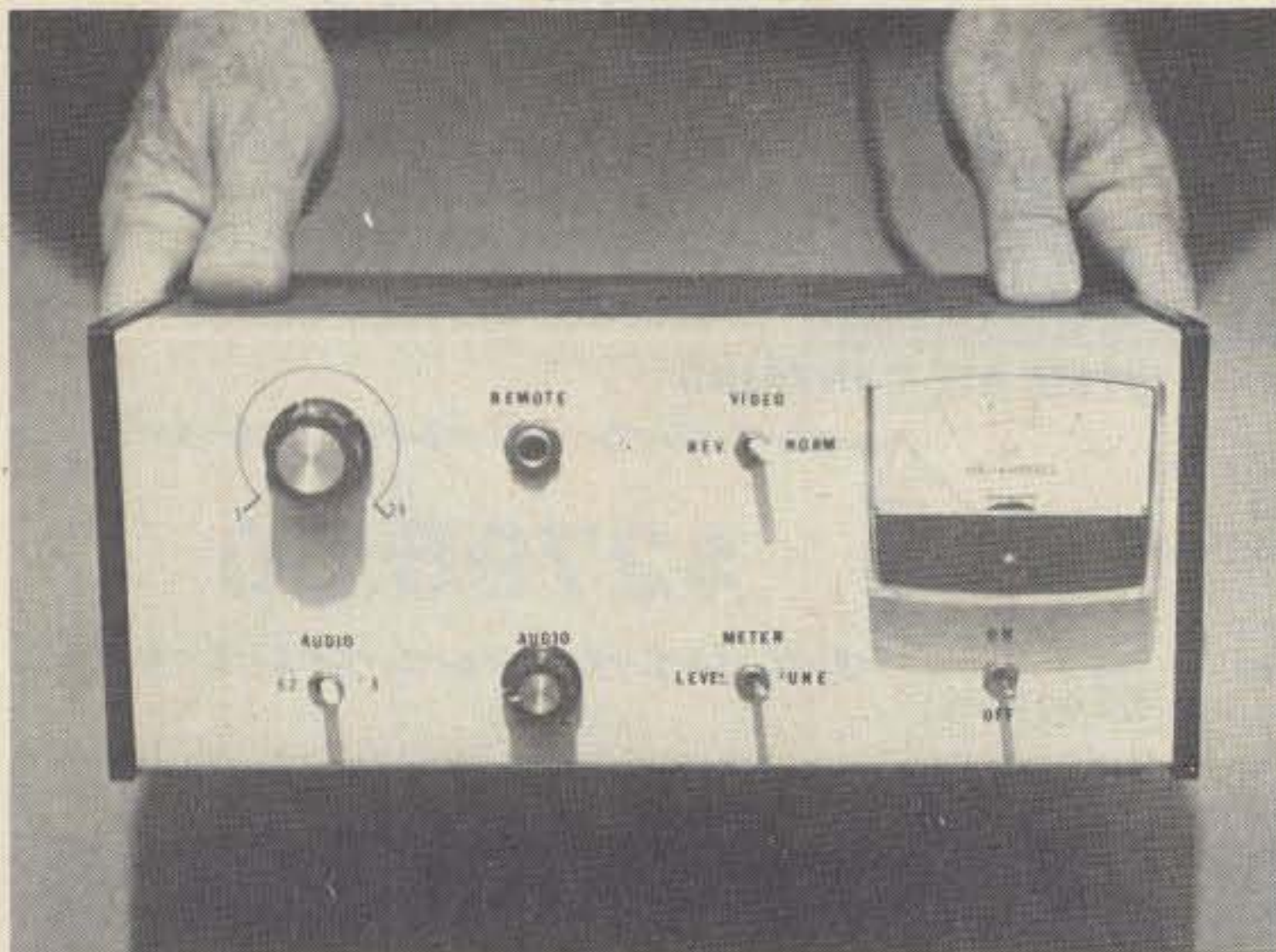
The audio circuit provides for switch selection of either 6.8-MHz or 6.2-MHz audio subcarriers from the satellites. The circuit shown in Fig. 1 is designed around Motorola MC1358 audio decoder ICs; however, RCA CA3065 or National LM3065 ICs can be used as direct replacements. The board can drive a small speaker and has a front-panel audio-level control if the speaker is used

or the audio level from the MC1358s is sufficient to drive most rf modulators. Complete component cost, exclusive of the printed circuit board, should be around \$15.00.

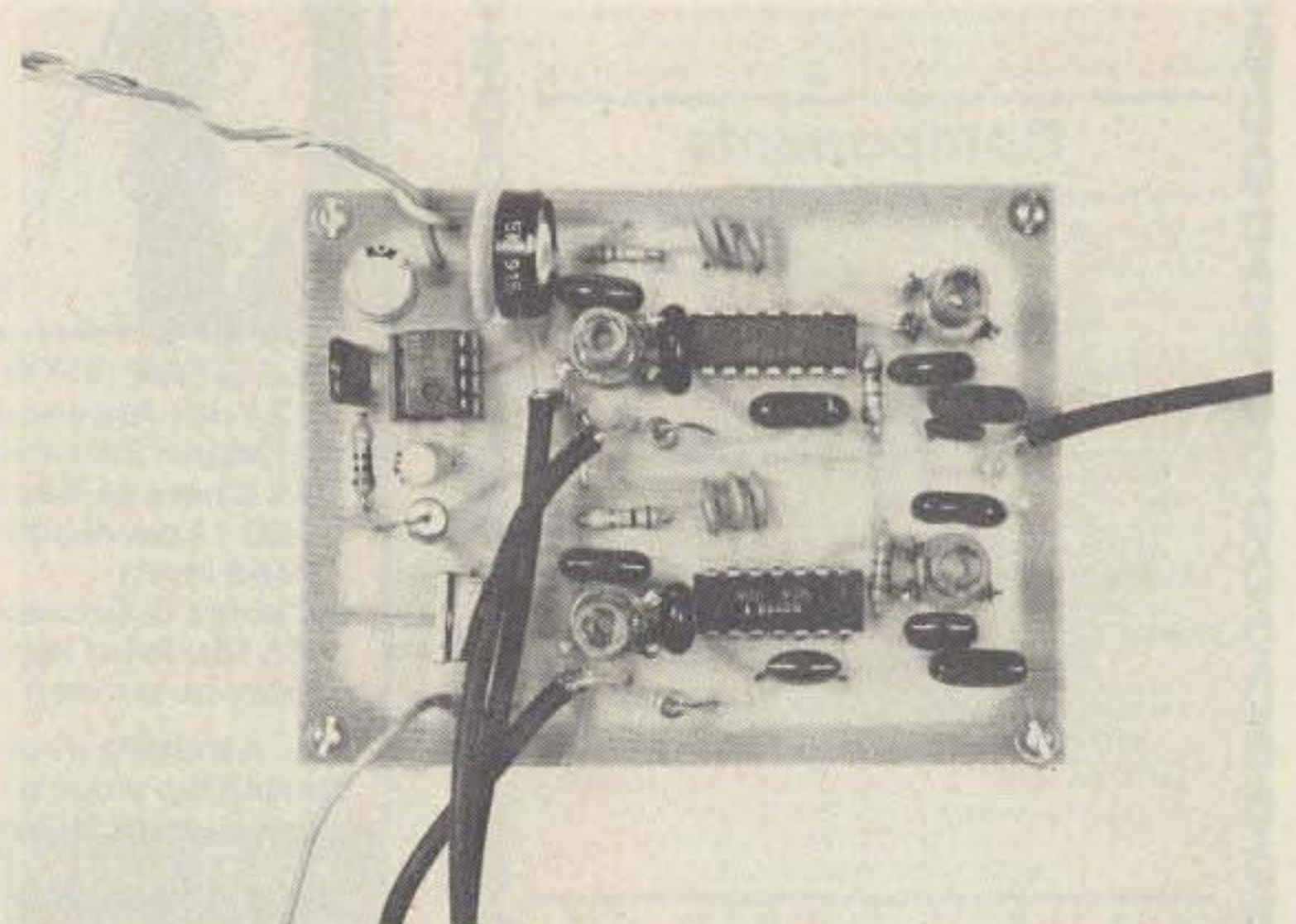
### Construction

The printed circuit board and parts overlay, Fig. 2, make construction simple. We did not use sockets for the ICs; however, there is no reason not to use them with the relatively low rf frequencies involved. The coils are about \$1.00 each from RCA distributors.

When building, you must decide on the options that



Front panel of the 'Lite Receiver IV.



Top view of the 'Lite Receiver's dual audio board.



you want. If you do not plan to use a speaker but need audio only to drive your rf modulator, then the LM386 and its associated components can be eliminated. In that case, the front-panel level control will not be needed, but be sure to install the two 50k-Ohm printed circuit board pots since they control the amount of audio available from the MC1358s. If the LM386 is not installed, the center pole of S1 is connected to a rear-panel jack for connection to your rf modulator. If the LM386 is installed, then the output of the LM386 is connected to the rear-panel jack for connection to a speaker or to your rf modulator. We use the complete circuit as shown so that a small speaker can be used when we carry the receiver out to the antenna to make adjustments.

If you decide that you want the speaker drive capability, replace the two 50k-Ohm PC board pots with 10k-Ohm, quarter-Watt resistors. The 10k-Ohm resistors provide fixed attenuation of the audio level from the MC1358s. The front-panel control is then used for audio level for both the LM386 and your rf modulator.

Note that picofarad-size capacitors are silver mica, with all other capacitors ceramic or electrolytic.

### Tune-Up Procedure

For tune-up, it is necessary to have a signal generator or use a signal off the air. If your signal generator has modulation capability, enable the modulation and tune the output of the generator for 6.2 MHz. Tune L1 for maximum audio level and L2 for best audio (which probably won't be very good because most signal-generator modulation is AM). If the signal generator is CW only, then tune both L1 and L2 for maximum quieting. If the LM386 was

omitted, adjust the 50k-Ohm pot for correct modulation level for your rf modulator.

To tune the 6.8-MHz circuit, simply repeat the above procedure with the signal generator set for 6.8 MHz and tune L3 and L4 as described.

Off-the-air tune-up can be performed using the same procedure as above. However, video will have to be detected by the video demodulator board since the audio is a subcarrier riding on the video signal. If the signal-generator tune-up method is used, it still will be necessary to fine-tune once you have a signal off the air. Simply adjust for best audio quality.

If the LM386 and a speaker are used all the time, be sure to heat-sink the voltage regulator and the LM386. This completes the audio section of the receiver.

### Afc/Metering Board

The afc/metering board gives afc control for the mix-

### PRINTED CIRCUIT BOARDS

Printed circuit boards are available from Martcomm, Inc., PO Box 74, Mobile AL 36601. The dual audio board is \$12.00 and the afc/metering board is \$15.00. Add \$1.75 per order for first class postage.

### DUAL AUDIO BOARD Parts List

- 2 MC1358 ICs. See text.
- 1 LM386 IC
- 1 7812 voltage regulator
- 2 50k-Ohm PC board mount pots. See text.
- 1 10k-Ohm pot, panel mount. See text.
- 1 10-Ohm, 1/4-Watt
- 2 220-Ohm, 1/4-Watt
- 2 10k-Ohm, 1/4-Watt. See text.
- 2 4-pF silver mica
- 2 12-pF silver mica
- 2 27-pF silver mica
- 2 33-pF silver mica
- 7 .01-uF disc ceramic
- 4 .047- or .05-uF disc ceramic
- 1 .05-uF disc ceramic
- 3 1-uF electrolytic
- 1 10-uF electrolytic
- 1 100-uF electrolytic
- 1 SPDT switch, panel mount
- 2 coils, L1 and L3, transformer-sound/i-f, stock number 130120, from RCA PM200 sound board.
- 2 coils, L2 and L4, coil-discriminator, stock number 130121, from RCA PM200 sound board.
- 1 printed circuit board, single-sided, G-10, available from Martcomm, Inc., PO Box 74, Mobile AL 36601.

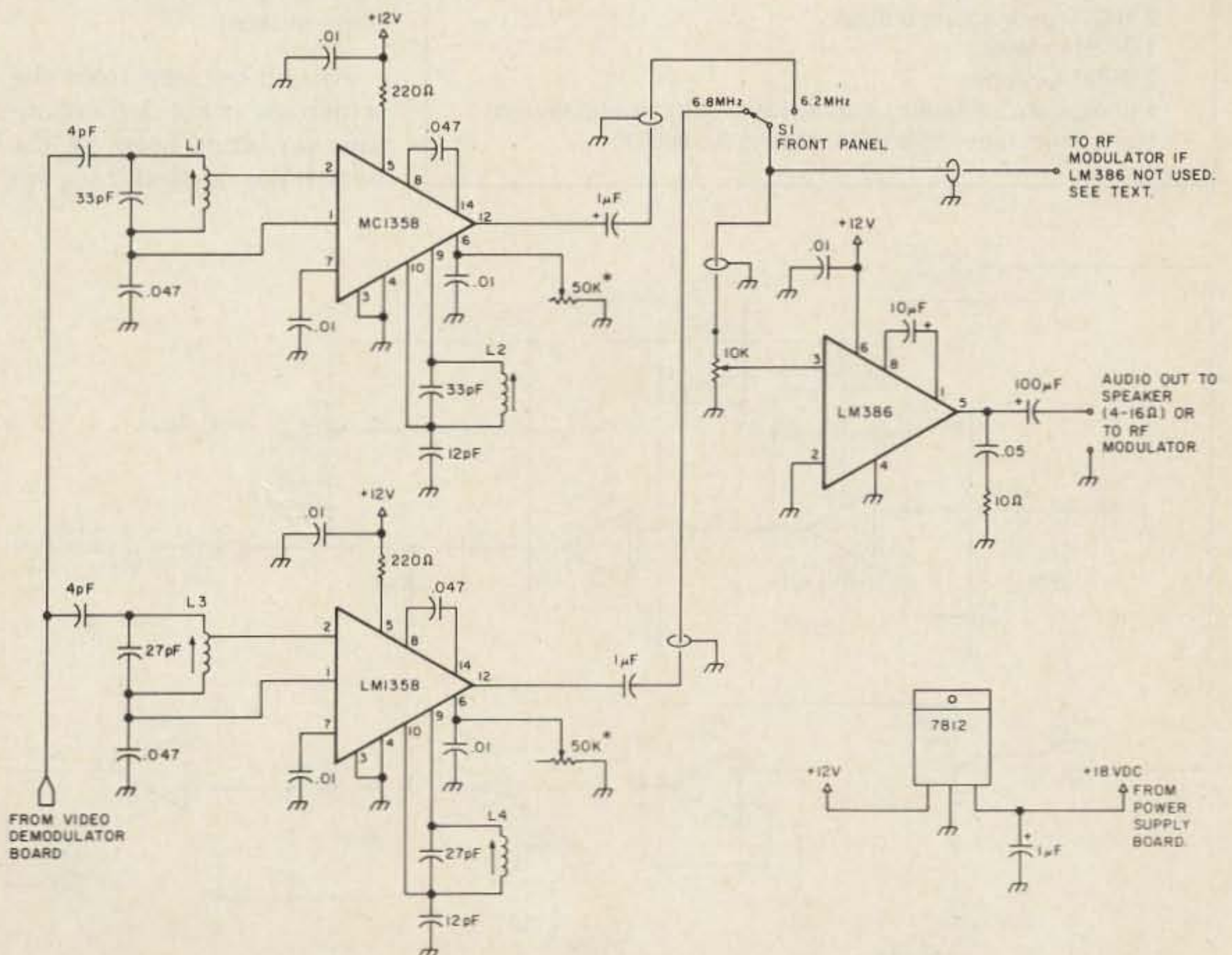


Fig. 1. Dual frequency audio demodulator and amplifier schematic. \*See text. All pF capacitors are silver mica. All others are disc ceramic or electrolytic.



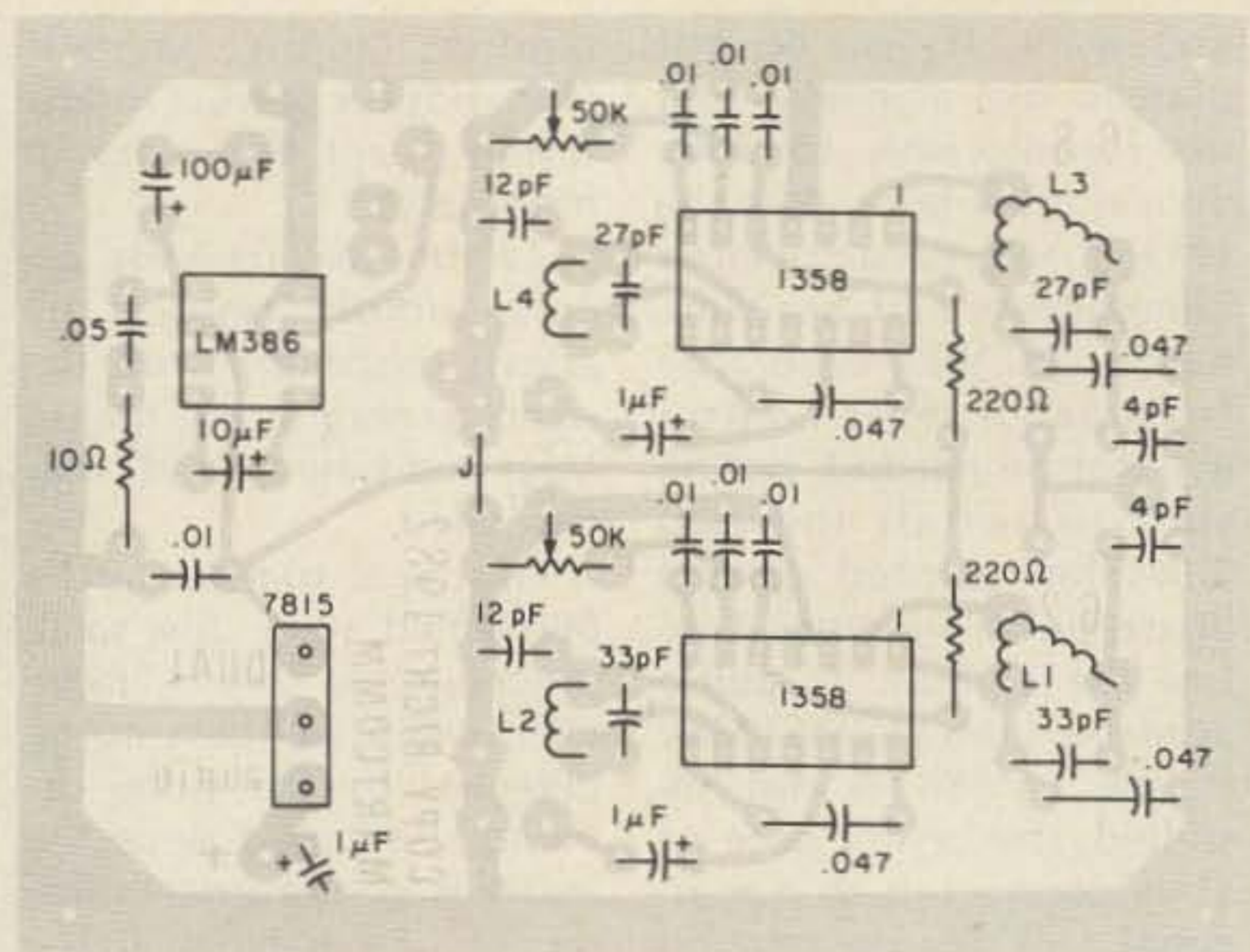
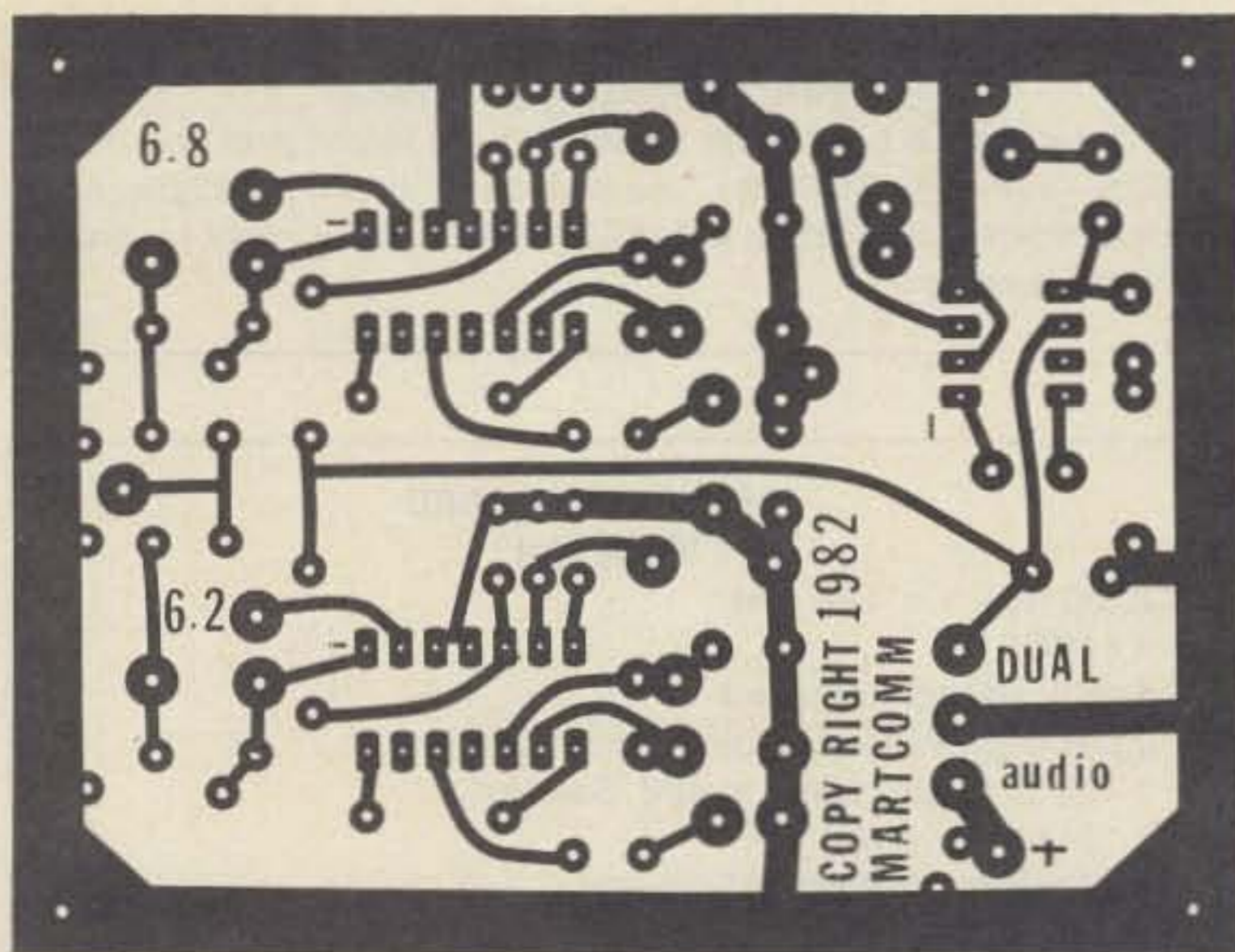


Fig. 2. PC board and parts layout for the dual audio board.

**AFC/METERING BOARD**  
Parts List

- 1 LM324 IC
- 1 1k-Ohm PC board pot
- 2 5k-Ohm PC board pots
- 1 5k-Ohm panel mount pot
- 1 10k-Ohm PC board pot
- 2 1k-Ohm, 1/4-Watt
- 2 2.2k-Ohm, 1/4-Watt
- 6 10k-Ohm 1/4-Watt
- 1 1 megohm, 1/4-Watt
- 3 .01-uF disc ceramic
- 1 .022-uF disc ceramic
- 2 1-uF electrolytic
- 1 47-uF electrolytic
- 2 1N270 germanium diodes
- 1 0-1-mA meter
- 2 SPDT switches
- 1 printed circuit board, single-sided, G-10, available from Martcomm, Inc., PO Box 74, Mobile AL 36601.

er local oscillator (vto) and provides drive for a relative signal-strength meter.

The signal-strength meter is not a necessity for the receiver. Still, meters seem to impress people and we are no exception. It does serve a very useful purpose, however. The meter comes in handy for adjusting your LNA and antenna, and it gives a relative indication of signal to noise for your complete system.

As can be seen from the schematic in Fig. 3, there are four op amps used on the board. We needed three for

the afc circuitry, so one was left over. We decided to put it to use to drive the meter. The 70-MHz output from the i-f filter amp is picked off through a coaxial tee coupled with a .01-uF capacitor. The rf is then fed to a voltage doubler composed of two 1N270 germanium diodes. The dc from the voltage doubler goes to an op amp connected as a non-inverting buffer. The op amp drives a 0-1-mA relative signal-strength meter.

**Afc Circuit**

The automatic frequency control (afc), like the metering circuit, is not an absolute necessity. But it sure is nice to have it lock the vto onto a transponder, as the vto does drift in frequency due to ambient temperature fluctuations.

It was decided to provide for afc with normal or inverted video. There is not much inverted video on the satellites, but occasionally you do run across an "upside-down" transponder. Also, on a single-conversion system such as ours, it is possible to tune in the image of a transponder. But if the video switch is in the "NORM" video position, the afc will "push" the image signal away instead of locking onto it.

Refer to the schematic in Fig. 3. At the afc sample

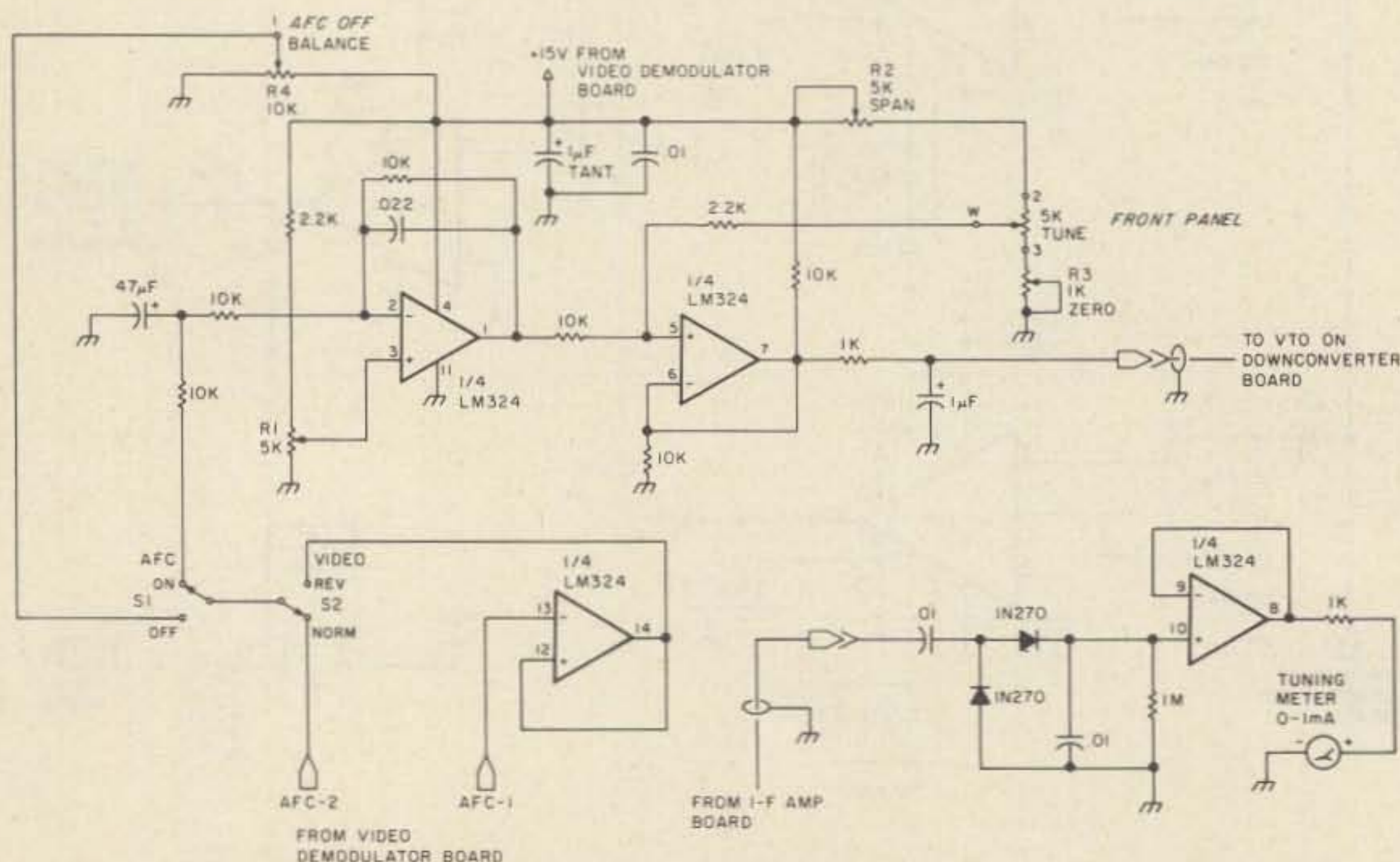


Fig. 3. Afc/metering board schematic.







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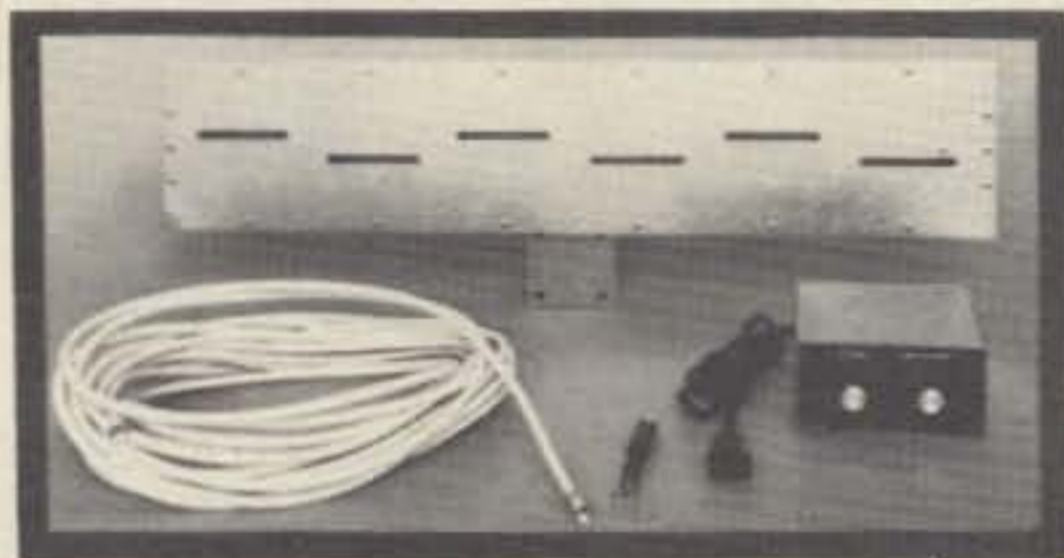
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shielded cable to connect the output of the afc board to the vto. (Usually, the vto will be remotely mounted in the downconverter, located at antenna.) The afc board output is controlling the voltage-controlled oscillator in the mixer, so any stray signal or noise spikes picked up by the cable will result in the vto being "modulated" and will cause it to change frequency with very undesirable effects on the picture.

With the afc switch "ON" and the video switch set to "NORM," the tuning pot will act like a channel switch. As the tuning pot is rotated, the afc will try to hang onto a transponder as long as possible; then, it will "jump" to the next transponder. Because of the "jump," the effect is to "switch" transponders! Finally, adjust the zero pot, R3, to set transponder #1 close to full counter-clockwise position of the tuning pot. Adjust the span pot, R2, to set transponder

#24 close to the full clockwise position of the tuning pot.

Now, with a 0-1-mA meter connected to the meter output, tune in a transponder and impress people.

### Rf Modulator

We have not described the rf modulators that we have tried since we just haven't found a circuit that we are happy with. At present, we are using the rf modulator in our RCA video tape players. The rf modulator therefore costs only four times what the complete 'Lite Receiver IV costs!

### Correspondence

Because of the complexity of the 'Lite Receiver IV, we may not have answered all your questions. We'll be glad to try to answer any questions that you might have if you include a self-addressed stamped envelope and are patient in awaiting a reply. ■

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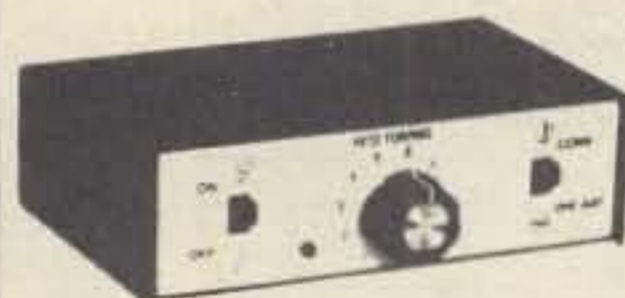
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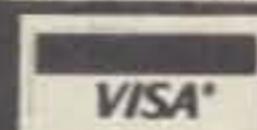
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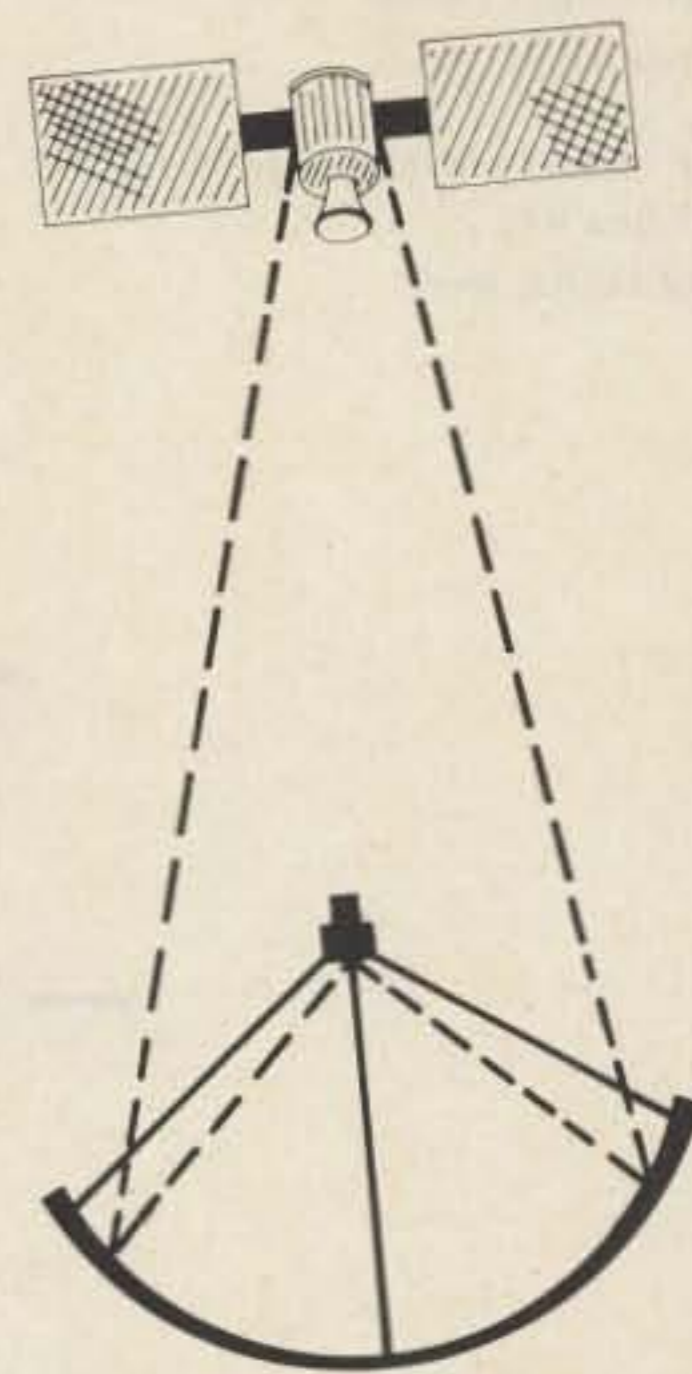
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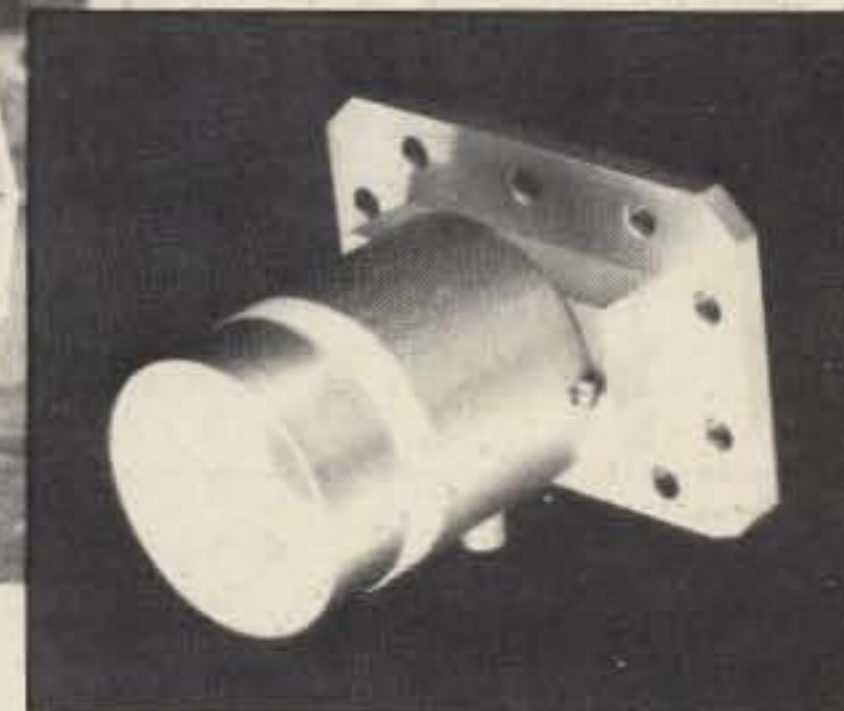
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# TVRO Transducer

## — waveguide-to-coax transition

**T**rans-duc-er (trans-doo'-sar) n. Any device through which the energy of one power system may be transmitted to another

system, whether of the same or a different type.

Now that you know the dictionary definition of a

transducer, let's look at the satellite TV definition: the gizmo that hooks the antenna horn to your LNA.

Simply stated, the trans-

ducer is a section of waveguide  $3/4$  of a wavelength deep with the back closed. The waveguide is a transmission line and has a velocity factor different from that of free space. A signal-pickup probe is installed  $1/4$  wavelength from the back (closed end) and  $1/4$  wavelength from one side of the box. The  $1/4$ -wavelength spacing ensures that any 4-GHz energy that gets past the probe and is reflected from the back of the box to the back side of the probe will be in phase with the signal arriving "head on," since  $1/4$  wavelength from the probe to the back of the box plus  $1/4$  wavelength from the back of the box back to the probe equals  $1/2$  wavelength. The  $1/2$ -wavelength spacing minimizes phase distortion and signal cancellation.

### Two Methods

Our transducer can be built in one of two ways. If you are lucky and can find some 4-GHz copper waveguide, most of the work is already done for you. Just cut off a 2.5" section of the waveguide. Take a scrap piece of waveguide and cut a piece to fit the back of the 2.5" piece. Solder the two pieces to form a box with one end open. Make sure

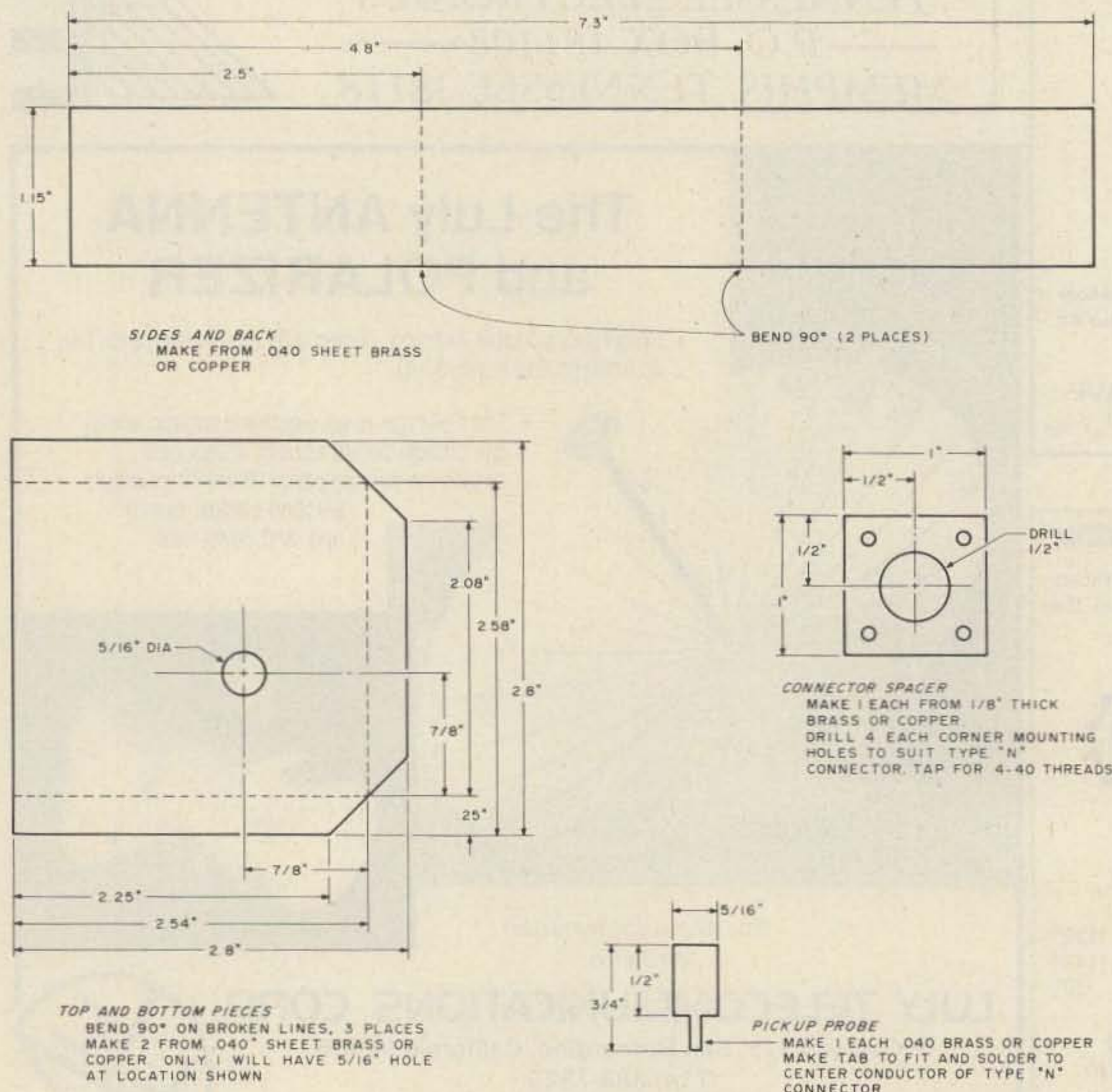


Fig. 1. Parts dimensions and bending instructions.



that no solder gets inside the box. Using the instructions below, prepare and install the 1"-square piece, the probe, and the coax connector. This waveguide method was used to build the transducer in the photo.

If you are not lucky enough to have a friend with a source of waveguide, you will have to "bend" your own. The material needed is .040" brass shim stock or sheet flashing copper. Most large sheet-metal shops have small scraps of such material that can be purchased at a very reasonable price.

Cut the 7.3" x 1.15" piece of material and bend it to a U shape as shown in Fig. 1. Cut two pieces 2.8" x 2.8". (You probably can get the sheet-metal shop to cut the material with their shear for good clean edges.) Bend the edges of the two pieces 90 degrees as shown in Fig. 1.

Drill one 2.8" x 2.8" piece as shown. This piece will be the bottom of the box, so that looking into the front of the box, the probe hole will be in the bottom on the right-hand side. The photo shows how the probe is offset.

Thoroughly clean all

pieces in preparation for soldering. Assemble the three pieces to form the box, and clamp or wire them together. If necessary, slightly bend the U-shaped piece outward to ensure a tight fit when the top and bottom pieces are installed. With a large soldering iron or small propane torch, solder all seams. Be sure that no solder gets inside the box. If any solder gets inside, clean it out; you want a very smooth surface inside the box to minimize interference with the signal energy.

#### Installing the Probe

The 1"-square connector spacer (see drawing) must be made from 1/8" brass or copper. Drill a 1/2-inch hole in the center of the 1" piece. Then, using the type N chassis-connector mounting holes as a guide, drill and tap the piece for 4-40 screws. Sweat-solder the 1"-square plate centered over the 5/16" hole in the bottom of the box (now, transducer!). Cut the pickup probe from .040" brass or copper scrap to the dimensions shown in the drawing. Solder the probe to the center connector of the type N connector. The distance from the connector flange to the end of the probe is 13/16".

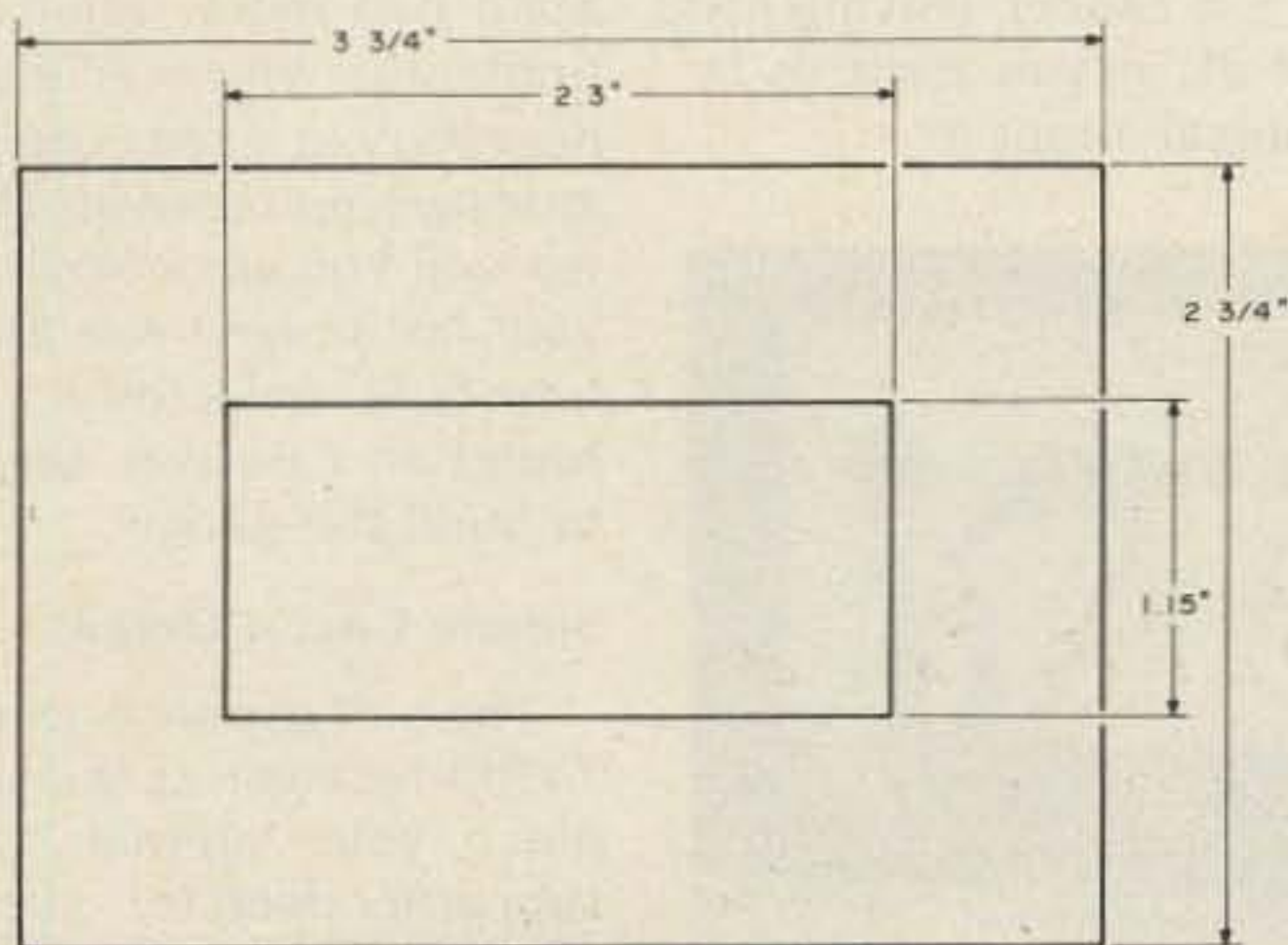
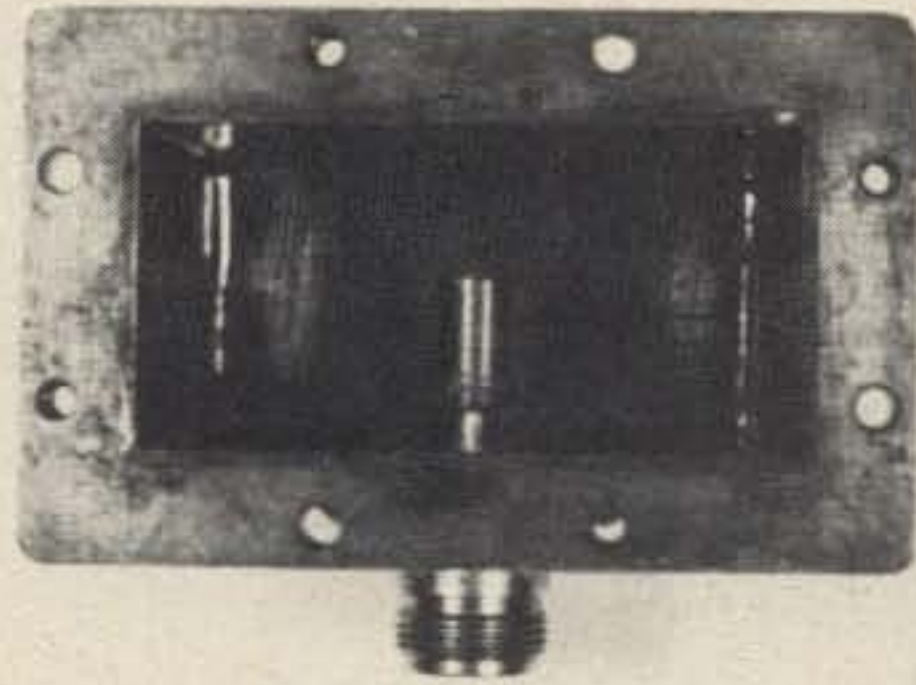


Fig. 2. WR-229 waveguide flange dimensions. Flanges may be purchased or made from sheet brass or copper 1/16" thick or heavier. While not absolutely necessary, some method must be used to mate the transducer to the horn. Solder the flange flush with the transducer.



End view of a transducer made from copper waveguide. Note the clean, smooth interior.

Now install the connector to the waveguide, using 4-40 screws, making sure that the flat side of the probe is toward the front of the waveguide.

#### Connecting to the Horn

After constructing your transducer by the easy or hard method, you still have to mechanically connect it to your antenna horn. This is where a WR-229 waveguide flange comes in real handy. If you don't have access to a WR-229, you can make one from 1/8" brass or copper. Mild steel also could be used, but is more difficult to solder. Refer to Fig. 2 for the dimensions if you have to make your own.

Solder the flange flush to the front of the transducer.

Sand or file off any excess solder for a smooth transition from the flange to the transducer. Drill mating holes in the flange to mate with the flange on your horn. We use .141" hardline coax from the transducer to the LNA. This small coax can be bent easily so that the LNA can be installed directly behind the transducer.

#### Final Comment

We have heard of several people building horns and transducers from double-sided printed circuit board. We have gone the PC-board route, but with very poor results. Stick with the sheet copper or brass and you should get good results with a minimum of trouble. Good transducing! ■

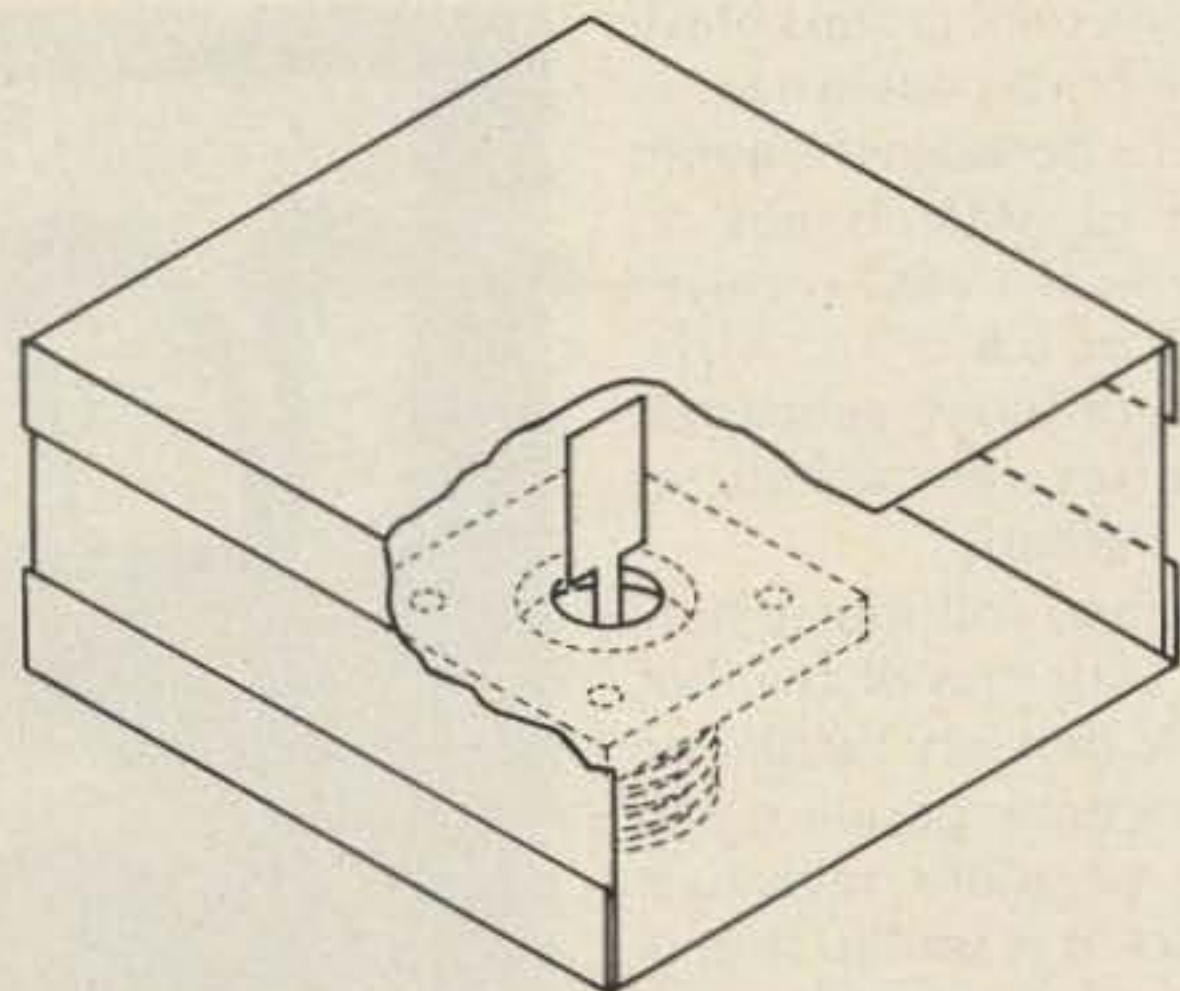


Fig. 3. Three-D drawing of the transducer.



# The MTV Music Box

## — Satellite Central, part VII

**P**art of the fun of TVRO experimenting is searching for new signals. While video is an easy mark, the real gold is sometimes harder to find, especially since new services keep popping up. The "video records" are a good example. Slide by transponder 11 on Satcom 3 (131 degrees west), and you'll find Music Television (MTV), a cable service from Warner Amex.

You may wonder why you are seeing rock groups blasting their brains out in near silence. It's because the audio portion of MTV is not on your typical TVRO receiver outputs of 6.8 or 6.2 MHz. Instead, different subcarrier frequencies were picked. Security? Perhaps.

Rock and roll music may not be your cup of tea, but the MTV delivery technique may become popular and worthy of more investigation since it is sent in stereo. And more important, you can experiment with a neat

trick that mighty Warner never thought of!

### Stereo Trickery

Just having two sound detectors to get stereo isn't enough. You need a decoder, too. Don't bother with a stereo FM-decoder setup because it won't work. MTV combines both channels, L+R, on one subcarrier and sends the difference between the channels, L-R,

on the other subcarrier.

You can hear the sum channel on a 6.62-MHz subcarrier and the difference on 5.8 MHz. All you need to do is a little addition and subtraction with the electronics, and voilà...they separate into left and right! If you add the L+R signal to the L-R signal, the +R and the -R cancel, leaving just L, or 2L, if you want to be technical about it.

Likewise, if you subtract L+R from L-R, you get just 2R. The secret to all the addition and subtraction is a "matrix," which is a short and fancy way of saying two op amps from Radio Shack.

Before you rip the top off your receiver and start tweaking, you should consider an option. Why not build two more sound sections plus whatever else is necessary in a separate box, sparing your receiver? Don't worry if you are a Novice or your last project was an old tube-type Selecto-Jet. I've found an easy way for you to build this gadget.

### Simple Circuit Details

The unit connects to your TVRO receiver at the same place your internal sound subcarrier-detector circuits tap off. Referring to Fig. 1, the detected composite video with audio subcarriers is coupled to two separate subcarrier sound detectors. One detector is tuned to



Photo A. Front view of the Music Box.



6.62 MHz and will give you an L+R output. The other detector is tuned to 5.8 MHz and delivers an L-R output. Each detector output feeds two op amps. I used a TL084 because it is cheap (available at Radio Shack) and works rather well. You get four amplifiers in a single chip. That sure beats the 6SN7 that some of you may remember.

A portion of the L+R detector output feeds the inverting input of the top op amp in the diagram. The L-R detector output feeds the non-inverting input. As in typical op amp fashion, its output is just the difference between the two inputs. So much for the subtraction part of the matrix. Addition is performed in the bottom op amp by summing the L+R and L-R detector outputs into the inverting input. Isolation is superb in this configuration because the inverting input is driven towards ground.

### An Evening Project

The subcarrier-decoder circuits in May's edition of "Satellite Central" will work very well. You can make a PC board for two detectors or use perf-type vector-board and hand-wire the circuit in record time. Or you can even buy some dual-sound-section subcarrier PC boards from one of the 73 advertisers and just stuff 'n solder.

But if you are in a rush (and who isn't, nowadays) or if you are just learning about electronics, I suggest you take the lazy way and simply buy two RCA XL-100 sound-section modules like those described last month. Servicemen call them PM-200s. These little modules are complete TV-set sound sections and simply plug into the popular XL-100. Of course, they are tuned to 4.5 MHz (TV sound), but we can tweak them to the frequencies we want. In fact, we can modify them so that we get pretty

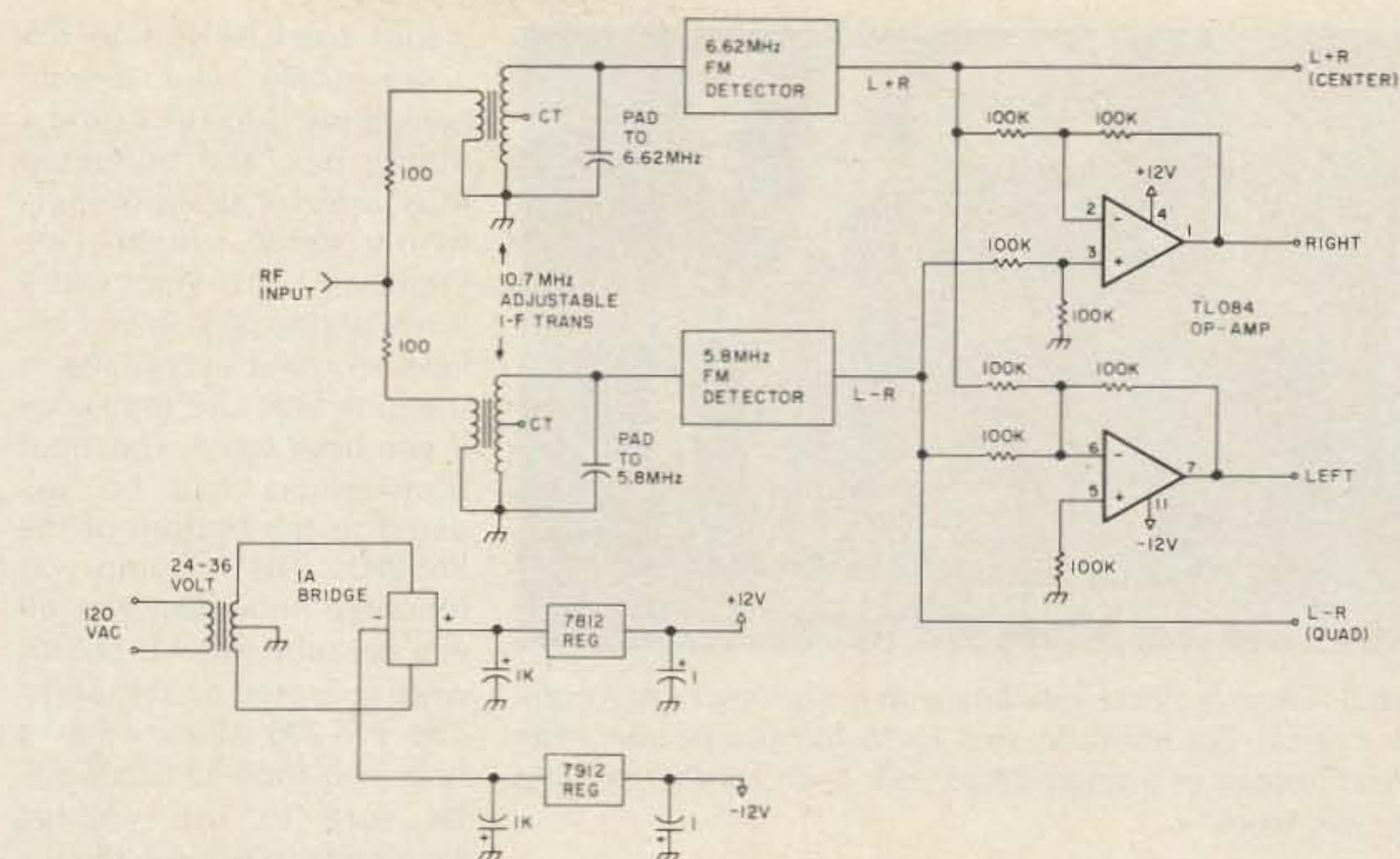


Fig. 1. Two PM-200 subcarrier detectors and a TL084 op amp are all you need to hear MTV satellite stereo.

hi-fi, too. Get two RCA MAA001As from a local RCA distributor. They run about 15 bucks each. You may be socked with a \$3.00 dud charge.

Modification of the PM-200/MAA001A modules is very easy. We simply reduce the values of two capacitors so that we can tune higher than 4.5 MHz and then add two more capacitors to get better sound. Referring to Fig. 2, remove the T299 can and change C290 (82 pF) to 50 pF. Replace the can. Then change C295 (68 pF) to 25 pF. Now the unit tunes from 5.5 to nearly 8 MHz.

Next, solder a .01- $\mu$ F capacitor from pin 13 on the CA3065 IC to a ground trace. This sets the de-emphasis to 75  $\mu$ sec using a resistor inside the chip. Then solder a 5- $\mu$ F (or so) capacitor from pin 8 on the CA3065 to a spare trace. If you don't see a spare trace, then cut the trace from pin 8 on the CA3065 leading out to the edge of the board and solder the cap across this trace cut. Just be sure the cap is polarized (end with + on it) towards the chip. Now you have a dc-blocked output to your amp. We don't use the preamp inside the chip because a quick look at

the distortion specs would drive any audiophile back to AM radio!

Last, solder a 50k PC-type mini-pot from pin 6 on the chip to a ground trace. This is a volume control that we use in the mixing process. You can use larger shaft-type pots and mount them on the front panel, but they are likely to get bumped lat-

er on and will only reduce stereo separation. So why bother?

Depending on your TVRO receiver, you may need an input bandpass filter to cut noise from the video and adjacent audio subcarrier. The input coil (T299) works pretty well, but a cheap 10.7-MHz FM i-f transformer padded down to the proper

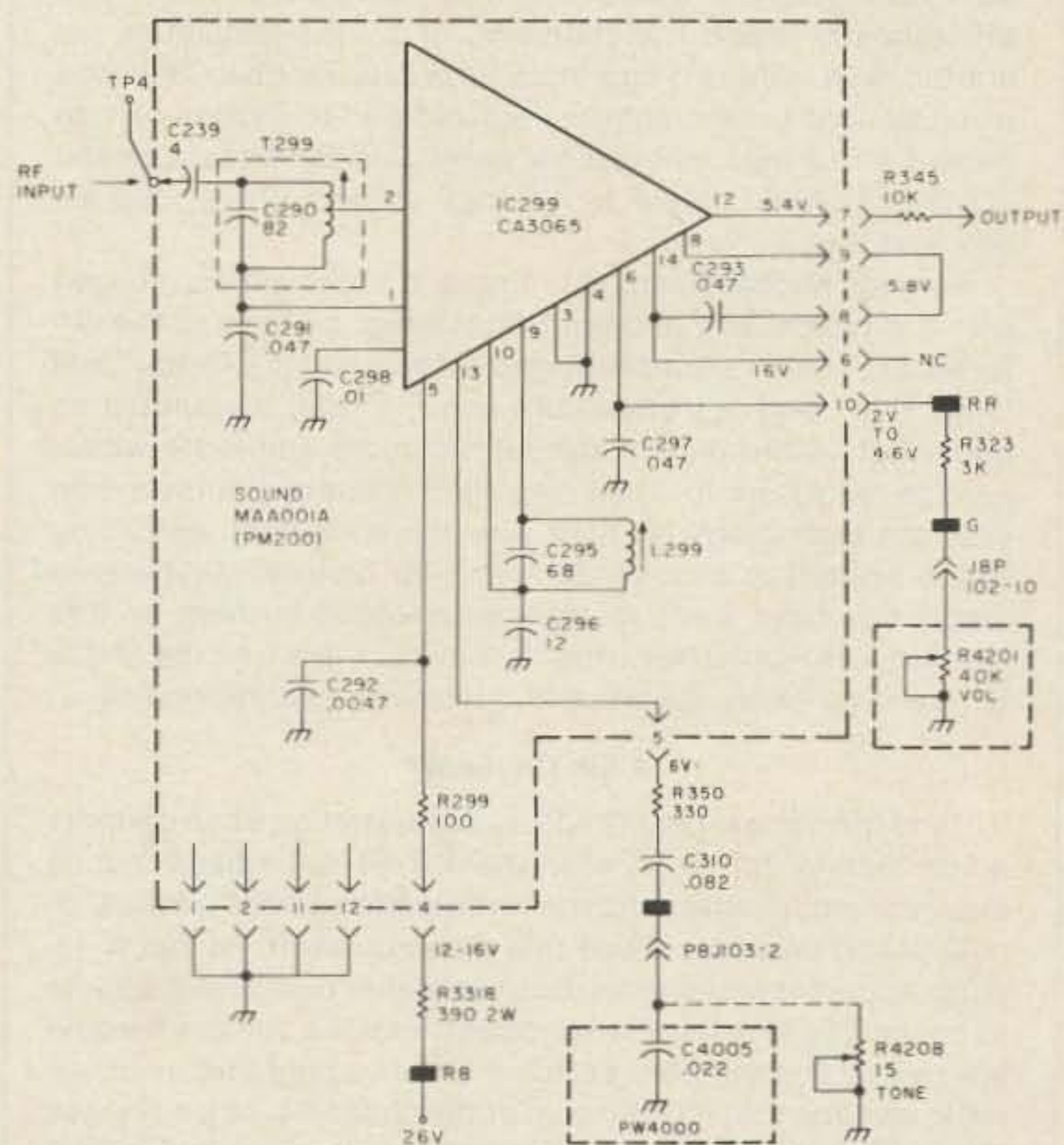


Fig. 2. The RCA PM-200 uses a CA3065 quadrature FM-detector IC for 4.5-MHz audio. The few mods discussed in the text will make it perform very well as a stereo sound decoder.



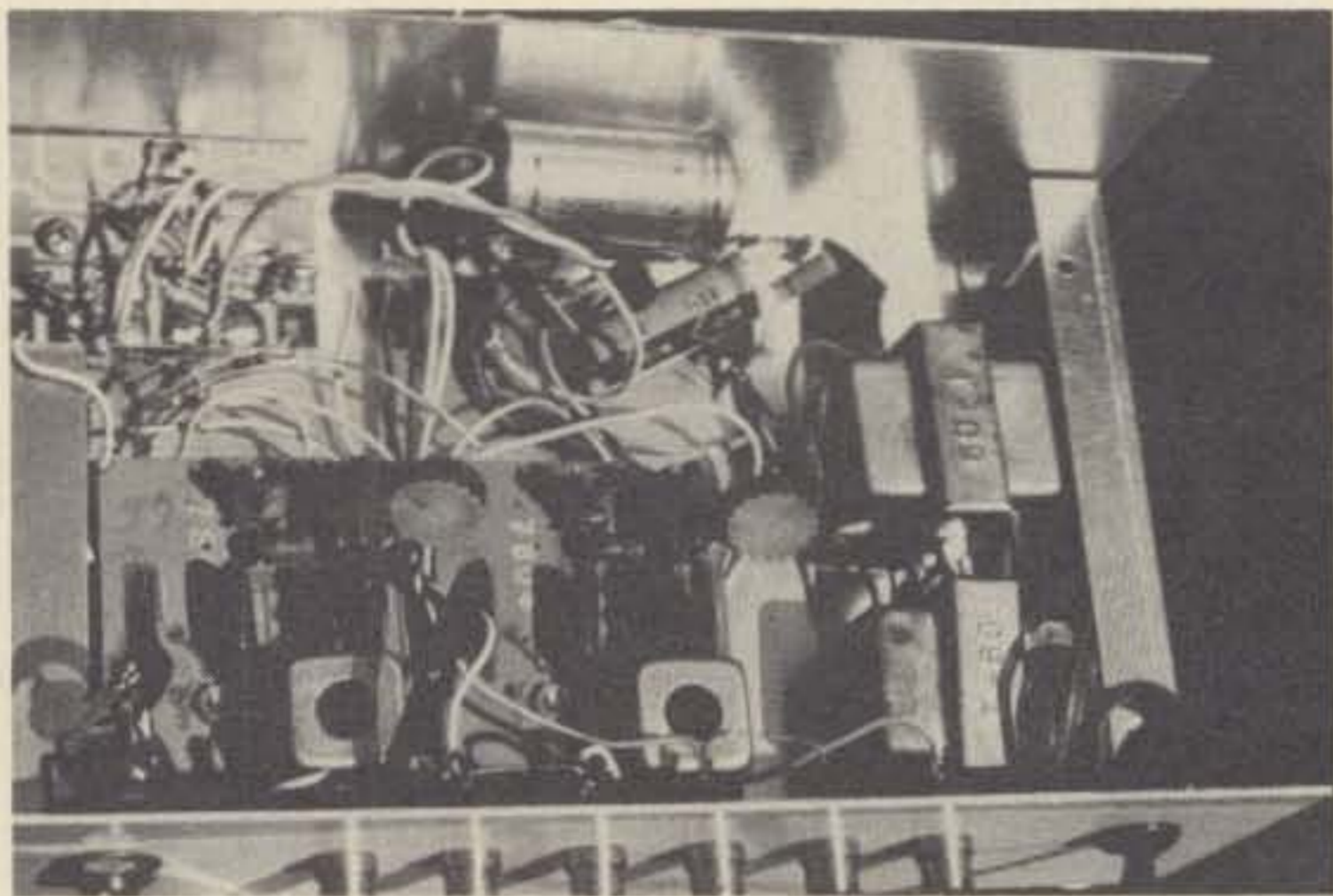


Photo B. Clean out that junk box with this project since nothing is critical. For example, two 12-18-volt transformers can be used instead of a single 24-36 volt. Even another op amp likely will work.

frequency knocks out what little noise is left. Not all transformers are the same, so a gdo or an rf generator will separate the winners from the losers. The second-

ary usually has a center tap.

### Junk Box Jubilee

I decided to take a strictly plain-vanilla approach since I knew my little Music Box

#### WHY QUAD?

Back in the dark ages of stereo, David Hafner of Dynaco was experimenting with techniques to eliminate the so-called "hole in the middle" between left and right channel speakers—see Fig. 3(a). From that effort came a center-channel speaker which was simply the left and right channels combined (L + R) and played 6 dB softer. Then he went one better and suggested a single speaker *behind* the listener to add ambience. Logically, this ambience channel would consist of the difference between the channels, or L - R. Remember, we started with only two channels from tape or disk. This was revolutionary to audiophiles, but old hat to motion-picture people who'd been doing it for years with Cinemascope and 3D. (Funny how simple technology doesn't cross-pollinate now and then.)

Anyway, Michael Gerzon in England improved on the idea with the typical left- and right-front setup by feeding the difference (L - R) to separate speakers located at "left-rear" and "right-rear" and out of phase—see Fig. 3(b). It sounded so good that record people started recording ambience with a reverse matrix setup. Then they tried discrete channels, and you had technology go mad with the consumer wondering which system to choose. So much for history. Most stereo recordings have some ambience imbedded in them, so this technique is worth the extra effort to track down an old amplifier and two small speakers to fiddle with quadraphonics.

#### A 5th Channel?

If the front speakers are widely separated, you can connect a 5th channel to go between them. This will indeed reduce separation but tends to fill the "hole in the middle" effect. Cinema sound processors use this technique with an agc to restore apparent separation. Since a signal that would appear to be located at a point in space between the speakers would have to be coming from both the left and right channels, we must assume that it is the sum of the channels, or L + R—see Fig. 3(c). So feed another amp with the L + R output of the Music Box and place the speaker between left and right speakers.

would soon be lost in the never-ending wire jumble behind my preamp. I used a utility box and mounted RCA jacks for all the outputs to my stereo system. (See Photo A.) The rf input was a lowly phone jack since I believe in using everything in the junk box. Use mini-coax if you have some. The input transformers can be soldered to the bottom of the PM-200s. The op amp was mounted on an experimenter's breadboard. All boards were mounted on standoffs. The PM-200 already has a hole in it for 6-32 hardware. Be sure to use voltage regulators to smooth the ripple. The op amps won't see ripple when running from a bipolar supply, but the little PM-200s want pure dc.

For the most part, construction is not critical other than the suggestion that you use coax to feed the PM-200s. Also, you should use 5%, 1/4-Watt resistors in the op amp matrix (all 100k). While the pots on the detectors can be used to compensate for tolerances, we do want the tune-up process to be easy.

Next, you should modify your receiver. Find the location where the 6.2- and 6.8-MHz detectors connect. This is usually an emitter follower after video detection. Tap in with a dc-blocking capacitor. Then run more mini-coax to a BNC, type F, or RCA jack that you mount on the rear of the receiver. Take your choice. Use what you have. The signal is then patched to the Music Box with still more coax.

#### Tune-Up Hints

There are two ways to make the Music Box play. You can simply set both 50k pots for minimum resistance (that's maximum volume) and tweak the input transformers, the T299 coils, and L299 coils for sound. But knowing which subcarrier you are on may be a trick. Add to that the possibility

that you may have both detectors tuned to the same carrier, and you're sure to see there must be a better way.

Use a signal generator set to 6.62 MHz. Feed it into the unit. Put a scope on pin 9 of the IC on the 6.62-MHz board (L + R) and tune the coils for maximum. Back the generator down below limiting and peak again. Do the same procedure for the other module (L - R), but set the generator to 5.8 MHz.

If the generator can be frequency-modulated by an internal oscillator, set it to  $\pm 75$ -KHz deviation and adjust the L299 coils on each module for the cleanest waveform. Depending on the particular run of PM-200s, you may need a resistor across L299 to lower its Q a small amount. A THD analyzer is a better eyeball if you have one. Without an analyzer, you are stuck with having to use your ear to fine-tune L299 for minimum noise and distortion.

While we're on the subject, don't expect the Music Box to play very well if your system has any sparklies. And narrowing the receiver i-f bandpass doesn't count, despite the picture improvement you'll likely see. It's what you'll hear that really counts. The first time a solid-color field is displayed (wider carrier deviation), you'll see and hear what many call frizzies, the bane of all "near threshold" systems. Even with music, nothing beats a good LNA and a large dish. Nothing.

At this point, you should be able to connect everything and hear pretty good stereo. Use headphones to verify. Some of the music is in mono, so don't worry if your first blast of sound is in the middle of your head. If you used 5% or better resistors on the op amps, you may be finished. Otherwise, the two 50k pots may need adjustment for maximum separation. Tweak either pot for best aural



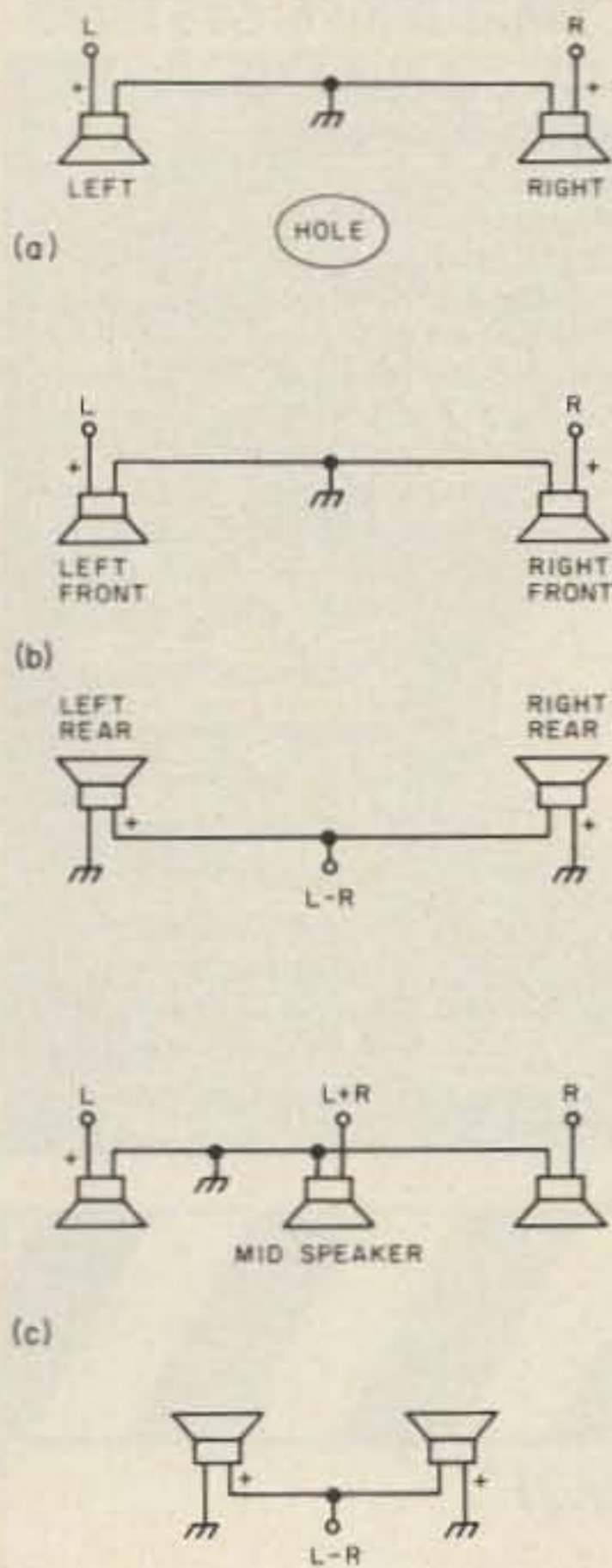


Fig. 3. Evolution of four- and five-channel sound. (a) Stereo, (b) quad, and (c) five-channel system.

separation or connect the Music Box outputs to the horizontal and vertical inputs of an oscilloscope. Without sweep, you can adjust the detector pots for a 45-degree angle trace on the CRT when mono is being transmitted. You'll see a "ball of yarn" display when stereo is being sent. Of course, you can always adjust for the most symmetrical jumble. What else would one do for rock and roll?

Next, connect the speakers. Watch phase because it is everything in a quad set-up. If you are unsure, then first place a 1.5-volt cell momentarily across the voice coil of each speaker and note in which direction the cone moves. Mark the speaker lead with a + when the cell polarity causes the cone to move outward. All this is arbitrary, of course, but serves to give you a reference from which you can work.

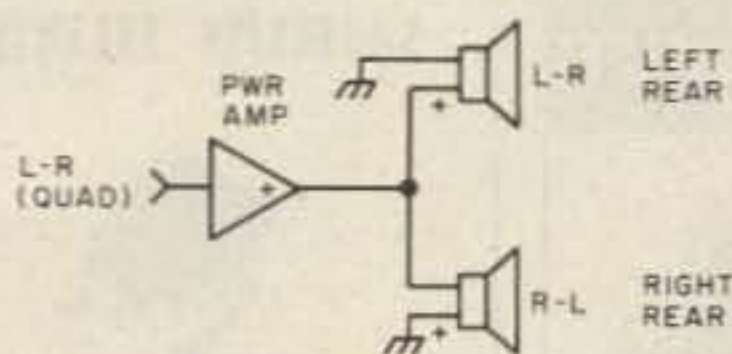


Fig. 4. Hookup for quadraphonic sound.

speakers as shown in Fig. 4. Note that the speakers on the amplifier's output are connected in parallel but out of phase. The L-R goes on the left rear as you face the main speakers. The R-L goes on the right rear. Since the rear speakers will be radiating only ambience, you don't need to use the best that money can buy. Small bookshelf units work fine.

### Music Box Bonus!

Sending the sound tracks in stereo was a pretty good idea. But what the Warner people didn't option was quadraphonic sound (at least until they read this)! And the little Music Box can do it. Quad sound? Yeah... and does it sound neat! And if four channels don't grab you, then how about five channels? It's just sitting up there on the bird waiting for you to snatch it!

For a quick trip into the history behind four- and five-channel sound, see the box. To get quad, just take the Music Box's L-R output, run it through a power amplifier, and connect two

Setting levels for quad is a matter of taste. The ambience effect is very pronounced if the rear levels are high. But the stereo effect is reduced somewhat depending on the room. This is also true of the center channel. Too much level and separation goes away. As a rule, start your adjustments with the center and rear channels about 6 dB softer than the main left and right. And...oh yes...remember the threshold of pain is still +120 dB. But it may be less with rock and roll! ■

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## CORRECTIONS

The British VHF converter project presented in the April, 1982, issue of 73 uses a double-sided printed board. The foil pattern for the board's top (component) side was inadvertently

omitted. It is reproduced here as Fig. 1. Also, the crystal X1, R9, and L4 junction should *not* be connected to ground.

Tim Daniel N8RK  
73 Magazine Staff

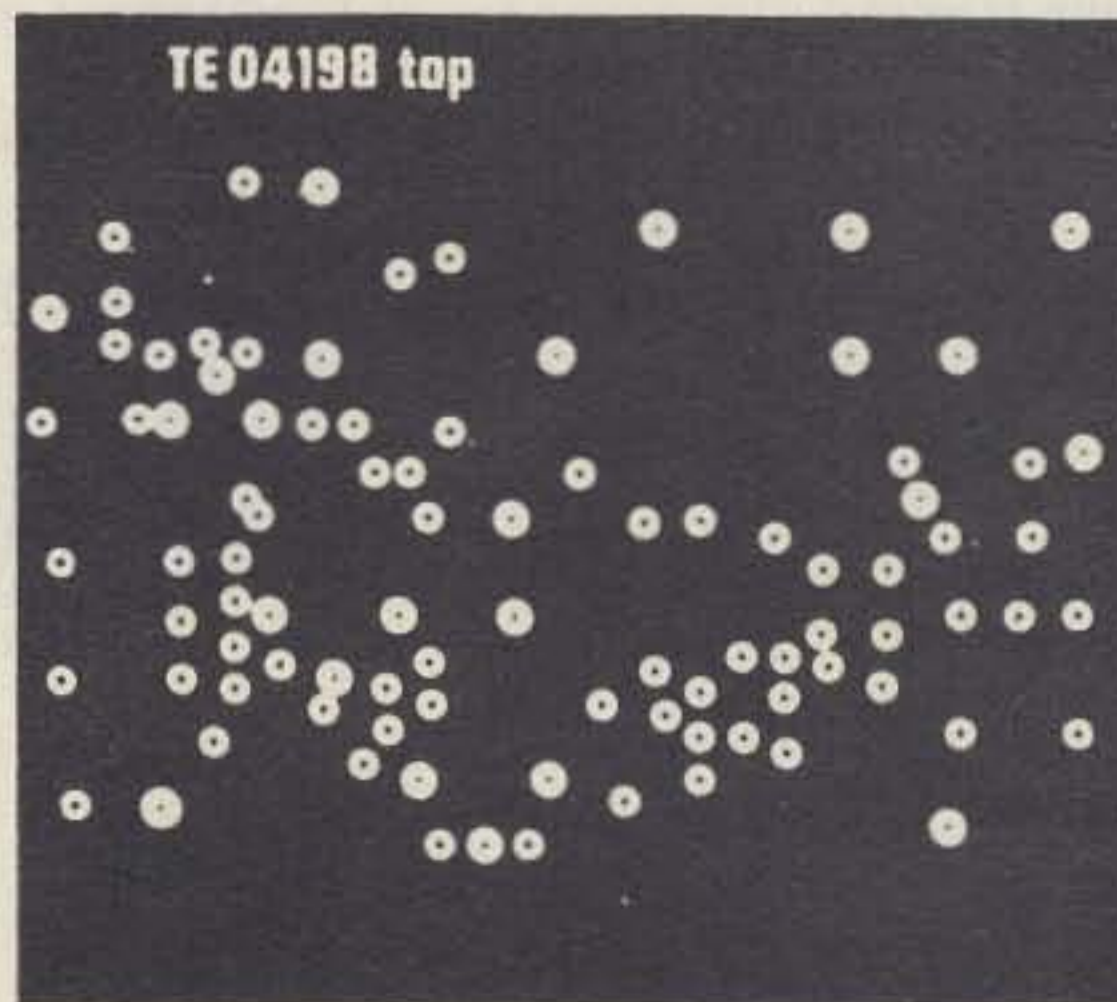


Fig. 1. Foil pattern for top side of the VHF converter PCB.



# N&G

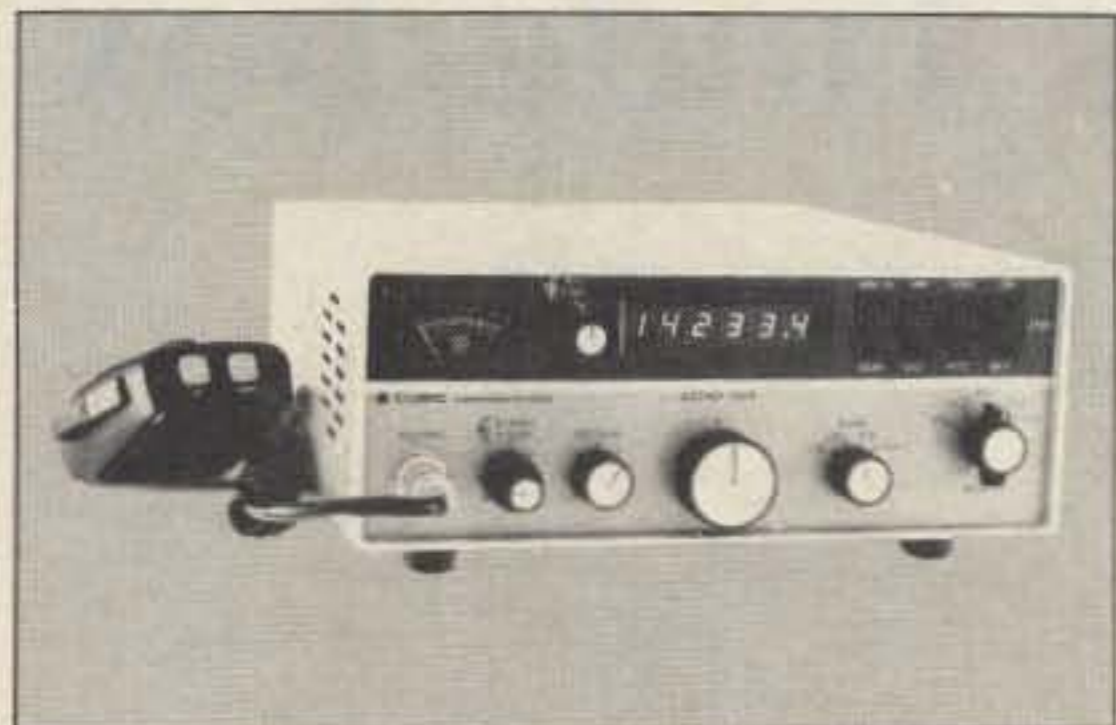
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# Tune In the World's Tinderbox

## — SWLing from Cairo to Kuwait

The assassination of Anwar Sadat, President of Egypt, was simply the latest, at that time, of a whole series of "incidents" in this conflict-torn area. The warfare between Israel and Egypt a few years ago, the fighting between Iraq and Iran, the invasion of Afghanistan by the USSR, and the ever-threatened stability of Saudi Arabia, Kuwait, and other Arab oil-producing states are all part of the turbulent Middle East scene. For a clear-cut, direct, day-by-day picture of this explosive part of the world, listen to your shortwave radio. All the countries mentioned above, plus others, have daily programs in English that can usually be

heard well in North America. And you will find it interesting to compare the different viewpoints of these nations.

Radio Cairo from Egypt usually has a pretty good signal into North America. Its English programs can be heard at 2215-2345 GMT on 9805 kHz and at 0200-0330 GMT on 12.000 and 9.465 kHz. A 250-kW and a 100-kW transmitter are all the station has. Its programs always open with the sound of chimes (sounding suspiciously like Big Ben in London) and the words from a woman announcer: "This is Cairo, this is Cairo." Following this is a ten-minute news program. Then comes a regular pattern of music

followed by a discussion of some timely topic, usually related to the Middle East. The music is Middle Eastern, reminiscent of Egyptian belly-dancing scenes in old movies. The music goes on for about ten minutes and then for 15 minutes you hear talk. Then back to the music, and so on. This is the regular daily program format. However, like the good broadcasters they are, Radio Cairo is not afraid to break out of the mold if the occasion calls for it.

If you had been listening to Radio Cairo on the evening that Sadat was killed, as I was, you would have been in for a most interesting experience. As soon as the official announcement of

Sadat's death had been made, Radio Cairo discarded its regular format and put on a fascinating program about the late president. They covered his rise to fame and his accomplishments while president, and then switched to a report on the background of his successor, Hosni Mubarak.

To me, this was shortwave radio at its best. Such experiences give the listener the opportunity to go to the sources of major stories, wherever in the world they take place, and to get on-the-spot coverage that is usually way ahead of your local radio or TV news report.

Perhaps the most extensive broadcasting job in the





Middle East is done by Israel. Kol Israel, the voice of Israel's External Service, beams some six hours of English-language programs into North America, many of them very popular with regular listeners.

Broadcasting in Israel goes back to the days when the British ruled Palestine under a League of Nations mandate. They formed the Palestine Broadcasting Service (PBS) back in 1936 and put out programs in English, Hebrew, and Arabic. The present Kol Israel took its bow on the first day of Israel's independence, carrying Prime Minister David Ben-Gurion's original Declaration of Independence speech *live* on May 14, 1948, from the Tel Aviv Municipal Museum. The Hebrew broadcasting staff of the PBS joined up with those who had been broadcasting for the Jewish underground to form a nucleus for the original Kol Israel organization.

In 1965, a Broadcasting Authority Law was enacted that gave Kol Israel the same status that is enjoyed in Great Britain by the BBC. That is, it is administered by a Board of Governors acting as an independent body outside of direct government control. The executive head is the Director-General who is appointed by the government for a five-year term.

About two-thirds of the Israel Broadcasting Authority's budget is revenue from license fees of domestic listeners and TV viewers. The remainder comes from fees charged advertisers for commercials on domestic radio and TV. The External Service also gets direct grants from the government.

Kol Israel has a strong signal into North America with four 300-kW transmitters aimed at our shores. Broadcasts in English can be heard in the mornings, afternoons, and evenings. The last is the best time for reception, al-

though afternoons generally also are good. Mornings at 1200-1230 GMT are usually not the best for reception.

In the evenings, listen from 0000 to 0030 GMT, 0100 to 0130 GMT, and 0200 to 0225 GMT on one of the following frequencies: 15.583 kHz, 11.640 kHz, or 9.815 kHz. Also listen from 0500 GMT to 0515 GMT on 15.105, 11.960, 11.638, or 9.815 kHz.

In the mornings at 1200, try for Kol Israel programs on 21.760, 21.495, or 17.612 kHz. Sometimes the reception at this hour is unusually good, but it is problematical, unlike the other times of broadcast.

From 2000 to 2030 GMT on 12.025, 11.960, 9.815, and 11.638 kHz, reception is usually strong. So, too, is it from 2230 to 2300 GMT on 11.960, 11.638, and 9.815 kHz.

All Kol Israel programs begin with a five-minute news summary and then go into their regular programming, which is different each day.

*Sundays.* "Calling All Listeners" is Radio Israel's popular DX program which gives up-to-date information on frequency changes for stations in the Middle East and also Kol Israel program details for the week. This program extends into Monday GMT times (0100, 0200, etc.).

*Mondays.* "Program Parade" gives forthcoming program details, and then comes "This Land," which is particularly aimed at people interested in touring Israel. Following this is "Spectrum," which reviews Israeli scientific developments.

*Tuesday.* "Israel Mosaic" gives the listener interesting facts about life in that country. "Pop Sound" offers music, and then comes "Personally Speaking," a program with guest commentators.

*Wednesdays.* "Israel Forum" is the big program

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Ministry of Information  
Riyadh  
Kingdom of Saudi Arabia

Radio Cairo  
PO Box 1186  
Cairo, Egypt

Radio Baghdad  
Iraqi Broadcasting  
Salibiya  
Baghdad, Iraq

Kuwait Broadcasting  
PO Box 397  
Kuwait

UAE Radio  
Dubai  
PO Box 637  
Abu Dhabi  
United Arab Emirates

of the day and offers the listener some lively discussions about people and politics.

*Thursdays.* "Time Out" offers interesting feature stories about life in Israel.

*Fridays.* "Music from Israel."

*Saturdays.* "Israel This Week" is a review of current events of the past six days.

Compared to Israel, the other Middle East broadcasters are, for the most part, inferior. While some have good signals, they are not on the air very much and their programming is, by comparison to Kol Israel, somewhat crude. However, if you are not listening just for enjoyment, as you might with the BBC or other Western stations, but to get information and various viewpoints, these other Middle East stations do give you that.

Radio Kuwait is an interesting station to listen to. This little country—about the size of Israel but with only half as many people—has some 15% of the world's oil reserves. Oil pays for just about everything there—free medical care, education, and social security. Best of all, there are no taxes!

Kuwait, as might be expected, has modern Western technology working for it, and this includes shortwave transmitters in which there are four 250-kW and two 500-kw units. They have a pretty good signal into the US from 1800 to 2100 GMT every day. They use only one frequency—11.675 kHz—but the equipment is good enough to make this almost always a good one for receivers here in this country.

A typical program from Kuwait goes like this:

- 1800 GMT—Station Identification; music (Arab style);
- 1830 GMT—15-minute talk on some current event in the Middle East by young lady;
- 1845 GMT—More music;
- 1900 GMT—Western-style music;
- 1930 GMT—Review of the week;
- 2000 GMT—Music (Arabic); and
- 2030 GMT—Discussion of economics by a man.

Listening to Radio Kuwait is similar to sticking with Radio Cairo. It's not easy to stay glued to the receiver on stations like these unless something special is happening in the area. This, of course, is very likely these



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days, with the Middle East set to have an explosion of some kind at any time. Thus, it makes sense to know where to find stations like Radio Kuwait on your dial and to check into them from time to time.

A real disappointment is Saudi Arabia. Here is one of the largest Middle East countries, with a population of 9,290,000 and geographically a quarter the size of the US. Like Kuwait, it is oil-rich. Unlike Kuwait, which has a literacy rate of over 60%, Saudi Arabia has a rate of only 15%.

The Saudis have three shortwave transmitters—a 50-, a 100-, and a 350-kW. They should spend a couple of bucks and buy more or better ones. Reception is not very good here in the US. They broadcast from 1800-2100 GMT on 11.856 or 7.210 kHz.

When you do tune them in, the program starts with a

man saying, "This is Radio Jeddah, the broadcasting service of the Kingdom of Saudi Arabia." The program that follows is a mixture of Middle Eastern music and talk, the latter primarily explaining positions on oil prices, purchases of modern arms from the US, etc. Again, while not the most entertaining station to listen to, it could be of great interest should some event take place in that part of the world.

A much more intriguing station to listen to is UAE Radio in Dubai, in the United Arab Emirates. Here is a little country that I had never heard of before becoming a shortwave radio listener. It has a population of less than a million people and is roughly the size of Maine. However, oil revenues give the UAE one of the highest per capita gross national products in the world. This little country was a British protectorate

until 1971—another reason for its obscurity.

From a broadcasting standpoint, UAE Radio is a pleasant surprise. It has three 300-kW transmitters which seem to reach us here in North America extremely well. Its English programs can be heard twice daily, at 0330-0357 GMT on 17.775 and 9.590 kHz, and from 1610-1650 GMT on 21.695 and 17.710 kHz.

After station identification by a young lady who sounds as though she has been educated in London, England, UAE Radio offers not the news, as is the usual shortwave broadcasting technique, but a feature story. Recently, for example, it had an interesting 15-minute talk on the history of the trade of that geographical area with China during the time of the Crusades. Following this came ten minutes of music—not Arabic music, but the kind we hear on US FM "beautiful music" stations. After this came the news.

News is done in BBC style. That is, first they give you the headlines, then the detailed stories, and then a repeat of the headlines. You can see the British influence in their broadcasting. With the exception of Israel, UAE Radio appears to be the most westernized of all the Middle East stations.

Another pleasant surprise in Middle East stations is Radio Baghdad from Iraq. This station also has very good programs, and even though it is reported to have only a single 250-kW transmitter, it comes in with a pretty strong signal to North America. A typical program starts with 15 minutes of news followed by about five minutes of music (Arab style). Next comes a five-minute editorial (perhaps on the war with Iran and why they are fighting), followed by more music. Then another talk and more music.

While it may sound rather boring, the fact of the matter is that the talks are well thought out and very well delivered. It is good listening if you are at all interested in what is going on in the Middle East.

Iraq is not a large country (a little bigger than California in size and with a population of 12,000,000), but it is one of the key nations in the area and, unlike some, has a pretty good record for stability. In other words, its attitudes and thinking will be important in future developments in the Middle East. You can hear Radio Baghdad every day at 2130-2225 GMT on 9.745 kHz and at 0300-0335 on 21.585 kHz.

The other countries in the area are an "iffy" proposition as far as reception is concerned. Iran, three times the size of Iraq in both population and area, can often be heard at 1930-2030 GMT on 9.022 kHz. Programs are not exactly award winners, but you do get the Iranian point of view.

Afghanistan can usually be heard at 1900-1930 GMT on 15.077—but not very well. Algeria can sometimes be heard at 2100-2130 GMT on 25.700 or 15.215 kHz. Some listeners have heard Lebanon on 11.790 or 11.860 kHz at 0230-0300 GMT. DX-ers have caught additional Middle East countries, but not with programs in English.

However, for those of you who want to keep up with what is going on in that part of the world, you have a pretty wide choice of stations with good signals and fairly good programs—Israel, Egypt, UAE Radio, Kuwait, and Iraq. This assortment gives you a good balance of opinions. After a few months of listening to this array of programs, you'll be the best-informed guy or girl on the block about the Middle East. ■



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# Are You Ready for 900 MHz?

This article is based on a paper given at the 27th Annual VHF Conference, Western Michigan University, Oct. 17, 1981, Kalamazoo MI.

Since the proposal and decision to allocate the 902-928-MHz segment of the UHF spectrum to the Amateur Service,<sup>1</sup> VHF/UHF enthusiasts and experimenters have wondered how best to utilize this new resource and what equipment would be needed to communicate efficiently on it. This article will address those topics and will propose a band plan for the amateur community based on experience with other VHF/UHF bands and proven radio-frequency design techniques.

## History

Recent use of the frequency spectrum from 902-928 MHz in the United States has been for radio-frequency heating, i.e., the Industrial, Scientific and Medical (ISM) service. Early commercial and consumer microwave ovens used this wavelength, although most now have changed to 2450 MHz for improved performance at this higher frequency.<sup>2</sup> Most ISM heating devices (typically magnets) are tuned to a center frequency of 915 MHz and, with their pulsed power operation, generate considerable amounts of energy in the form of sidebands. Thus, guard bands of plus and minus 13 megahertz about the center frequency were adopted to minimize interference with services in immediately adjacent allocations.

**Warning:** The 915-MHz frequency was originally chosen for its heating effects on substances with high water content such as food and, unfortunately, human flesh!

The ISM service will share the new amateur allocation on a secondary, non-interference basis as the proposals now stand. Both services will share the band with Government Radiolocation (radar), which will have primary status (this is the case in many UHF/microwave amateur bands). In addition, other restrictions provide that the new band will not be available to the Amateur Satellite Service and that it may be susceptible to interference by Automatic Vehicle Monitoring (AVM) systems pending consideration by the Federal Communications Commission.<sup>3</sup>

## Propagation

The new UHF allocation has shown in commercial land mobile tests that it behaves much as expected—attenuation by natural ob-

jects such as trees and earth will be greater than on 450 MHz, necessitating increased effective radiated power. However, in urban areas, because of the much shorter wavelength, its specular reflection allows much better coverage in areas forested by tall buildings and tunnel structures.<sup>4</sup>

Much research has already been accomplished by the commercial community in its quest to proliferate the cellular mobile radiotelephone services into the 825-to-890-MHz area. Several excellent articles have appeared documenting extensive tests that have been performed in a variety of areas (mostly metropolitan) around the United States.<sup>5,6,7</sup> The operational characteristics of amateur mobile FM voice should parallel these results quite closely.

One area of concern in using the new 33-centimeter band for mobile communication is the rate of signal cancellation and addition (mobile flutter). At two meters, the same phenomenon that causes lost

words during transmissions will, at 900 MHz, add a low-frequency buzz to demodulated audio. At speeds of 30 to 60 miles per hour, the frequency of this tone will be approximately 80 to 160 Hz for a transmission frequency of 915 MHz. Although this is not a problem for voice intelligibility (it can be filtered out by appropriate audio high-pass filtering), it does cause the present continuous tone sub-audible squelch (CTSS), known more popularly by its trade name, Private Line,<sup>8</sup> to malfunction by un-squelching a receiver when there is actually no transmitted CTSS tone. Thus, different selective-signaling methods, perhaps tone burst or digital squelch composed of a short duration serial-bit stream at the beginning of each transmission, would be required for reliable operation.

## Hardware

Equipment for communicating at 900 MHz is another area where the commercial communications services are helping almost as much as when they dumped thousands of old VHF high-band transceivers on the amateur market in the late 1960s. Although it will be many years before the new cellular radios will be available as surplus, the components and technology used in these transceivers will be produced in mass quantities for the many tens of thousands of

- 902.0 MHz — CW/SSB
- 902.6 MHz — FM voice/RPT  
(mobile receive, RPT transmit)
- 906.0 MHz — ATV Channel A
- 912.0 MHz — ATV Channel B
- 918.0 MHz — ATV Channel C
- 924.0 MHz — FM voice/RPT  
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*The band plan proposed by WB4LNM in October, 1981, for 902-928 MHz.*





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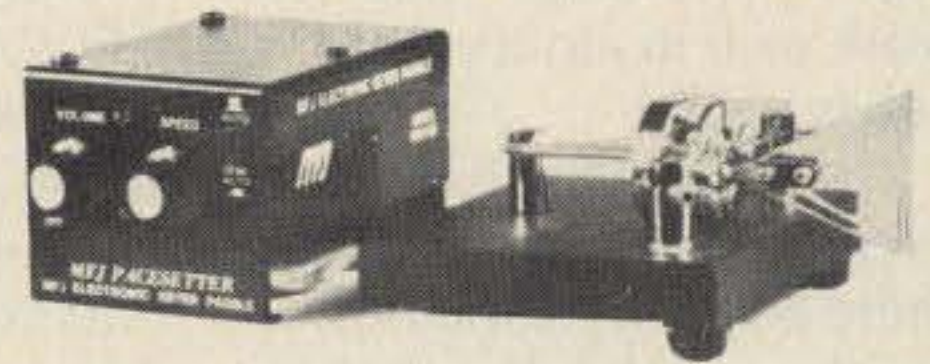
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mobile radiotelephone users that are expected to populate the adjacent commercial band in the next few years. Several semiconductor manufacturers already are producing components that will work well in amateur transceivers.<sup>9,10,11</sup>

For those who don't want to build down to the basics, there are also hybrid power-amplifier modules that require little more than application of proper drive signals, power-supply voltages, and heat sinking.<sup>12</sup> These would be suitable for FM, PM, or CW operations, and require only 250 milliwatts of input energy for 7.5 or 20 Watts output.

Receiver designs will be of the same general superheterodyne style we are accustomed to, but with significant differences in the construction of the rf amplifier and first mixer stages. To enhance selectivity, small cavity resonators or helical resonators will be used for their low-loss characteristics and their physical size, which will reach manageable proportions at this wavelength. Gallium arsenide field-effect transistors, once expensive devices for commercial and military systems, will be employed to minimize noise figures when used ahead of Schottky diode double-balanced mixers known for their inherent excellent wide dynamic range. The cost of these mixers continues to decrease as they are used in more and more communication systems. Several manufacturers already offer, in small quantities, pre-assembled mixer modules that work to 1 GHz for under ten dollars.

Building at 900 MHz will introduce the newcomer to a different attitude toward the components he uses. The rules here are, "the only good leads are no leads," and, "it may look like a capacitor to you but what

does it look like to the circuit?" At this frequency, a one-eighth-inch lead of #22 AWG wire on a 270-picofarad disc capacitor exhibits an inductive reactance larger than the capacitive reactance of the capacitor. Thus, the capacitor at this frequency is actually acting as an inductor.

Chip capacitors, capacitors with no leads at all, are frequently used where this effect becomes a problem. Although they are reasonably expensive, their price can be expected to decrease since the production process for manufacturing them is automated and they are now being used in the computer industry to help digital devices comply with stringent new radio frequency interference regulations.

One of the toughest problems to tackle will be that of frequency stability, especially in mobile and portable equipment. Consider a typical transmitter crystal of frequency 33.4074 MHz (902 MHz divided by 27), with a tolerance of 0.001% over the extremes of temperature, shock, and voltage. This crystal could exhibit a drift of 9 kHz at 902 MHz and still be within specification. If the new amateur band were to follow the normal 25-kHz channel spacing and 13-kHz occupied bandwidth used on 450 MHz, it is obvious that the communications system would suffer great degradation in both adjacent channel selectivity and demodulation distortion if this crystal were used.

Several ingenious ideas have been proposed to alleviate this stability problem, or at least to transfer the problem to a station capable of maintaining an accurate frequency standard.<sup>13</sup> If the mobile transmitters were designed to operate in full duplex mode, the signal received from the repeater (assumed to be stable and

accurate) could be used as a reference to which the mobile transmitter could be frequency-locked. Since the vast majority of vehicular operation on this band will most certainly be tied to repeater systems, this method represents a very cost-effective solution. The band plan suggested later in this article was developed with this concept in mind.

Another positive aspect of a full duplex system is that it will allow the operator to gain immediate knowledge of how well he is communicating with the retransmission site, because he will be able to listen to his own signal as it is retransmitted (perhaps at reduced volume in the receiver to prevent audio feedback).

Antennas for the 33-cm band will be small enough to be built easily with simple hand tools and mounted on masts no larger than small television antennas. A fourteen-element parasitic yagi-uda array, which magnifies a transmitter's power 16 times, occupies a space of only 6.5 by 28.5 inches. Corner reflectors, which have never been widely used by amateurs at lower frequencies, are easily constructed and offer a decent amount of gain and fairly wide bandwidth. Of course, for those who can afford the price (and have no neighbors), a four-meter diameter parabolic dish gives about 27 dB gain and can be used on the higher microwave bands as well.

### Using It

Many different ideas, amateur conventions, and technological factors were considered when attempting to formulate a band plan that would serve all the needs of the amateur fraternity. The following plan is the distillate of those components.

One aspect of the hobby that appears to be in a

growth mode is that of fast-scan television and computer-generated video. On the 70-centimeter band, the wide, buzzing video carriers are not well received (more accurately, not welcome) near the weak-signal satellite downlink subband from 435-438 MHz. This has prompted ATV, in several metropolitan areas of the country, to move to 23 cm in search of usable spectrum. However, the expected allocation of 1260-1270 MHz to the amateur satellite service,<sup>1</sup> coupled with the recent removal of amateur operating privileges from 1215 to 1240 MHz for military navigational satellite systems (NAVSTAR, GPSS),<sup>2</sup> as well as the difficulty of generating healthy amounts of power at 23 cm, makes this band less than desirable for fast-scan television.

I am proposing, therefore, that three 6-MHz-wide standard video channels (with multiplexed FM voice if desired) be centered in the proposed band plan. Since these three channels would be broadcast standard video format and frequency spacing, only one local oscillator per down-converter would be needed to mix all three down to contiguous VHF or UHF broadcast channels for display on a standard unmodified television receiver.

For the FM crowd, the band plan proposes 128 new FM channel pairs spaced at 25 kHz, with the transmission and reception frequency difference (split) at 21.4 MHz. This would allow use of relatively inexpensive monolithic crystal filters at an intermediate frequency of 21.4 MHz and the frequency-locking of transmitters to received pilot carriers from repeaters. Although this is an extremely low first i-f for a radio of this type, a judicious mix of image-cancelling mixer technology and low-loss



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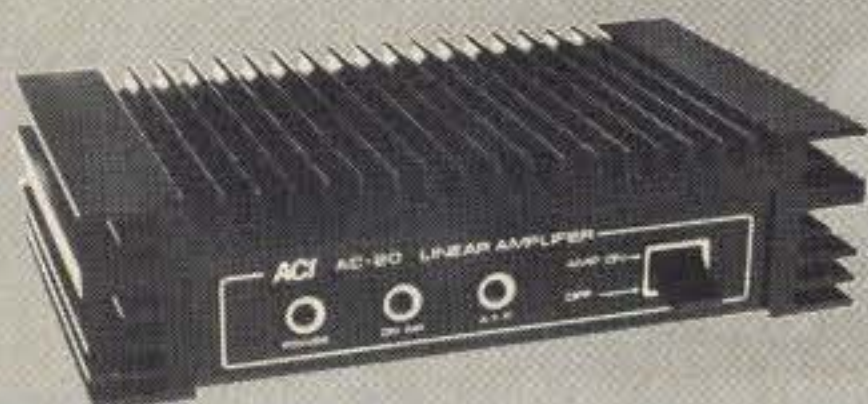


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Space has been reserved at the lower end of the band

for weak-signal modes, SSB, and CW, as is common on the lower VHF and UHF bands. This 600-kHz swath allows for many 3-kHz sideband voice channels for tropospheric-scatter, moon-bounce, and meteor-scatter experiments. Initial experiments may be carried out with little more than a returned 451-451.30-MHz commercial FM transceiver driving a varactor doubler for CW transmission. From past experience with both listening and operating on the other bands above 30 MHz, this will provide plenty of weak-signal spectrum space for the foreseeable future.

### Conclusion

Techniques and equipment for the new amateur band from 902-928 MHz have been discussed. A band plan which tries to serve all users in the amateur community has been proposed. Particular emphasis

has been placed on the need for fast-scan television transmission spectrum since it appears that ATV mode has been nudged out of other regions of the amateur spectrum. It is hoped that the discussion of the new UHF band will entice you to build or buy equipment and operate this frequency range no matter what your special interest is. With 26 MHz of spectrum, there is room for everybody! ■

### References

1. Proceedings of the 1979 World Administrative Radio Conference.
2. "Microwave Ovens—Revolution in Cooking," D. R. McConnell, *Electronics World*, August, 1970.
3. "Happenings" column, W. D. Clift, *QST*, September, 1981.
4. *Microwave Mobile Communications*, W. C. Jakes, Jr., Wiley-Interscience, 1974. ISBN 0-471-43720-4.
5. "What Happens When 900 MHz Takes to the Hills," F. A.

Barton, G. A. Wagner, *Communications Magazine*, March-April, 1974.

6. "Some Characteristics of Mobile Radio Propagation at 836 MHz in the Philadelphia Area," D. M. Black, D. O. Redudink, *IEEE Transactions on Vehicular Technology*, May, 1972.
7. "Examination of the Feasibility of Conventional Land Mobile Operation at 950 MHz," *FCC Research Division Report R-7120*.
8. Private Line: registered trademark of Motorola Communications Products, Inc., Schaumburg, Illinois.
9. "Rf Selector Guide and Cross Reference," Motorola Semiconductor Products, Inc., Phoenix, Arizona.
10. "Rf Communications Products," TRW RF Semiconductors, Lawndale, California.
11. *Data Sheets*, Communications Transistor Corporation, Inc., San Carlos, California.
12. *Data Sheets MHW820, MHW808*, Motorola Semiconductor Products, Inc., Phoenix, Arizona.
13. "'Logical' Design Relaxes Tough Crystal Standards," S. J. Lipoff, *Microwaves Magazine*, August, 1977.

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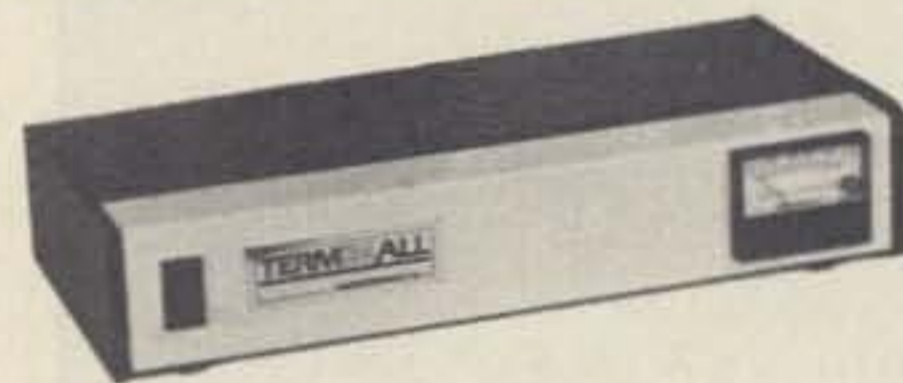
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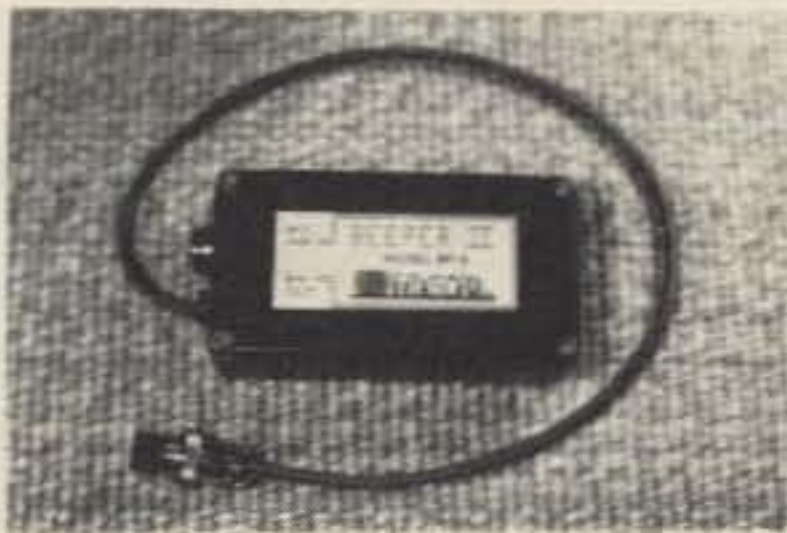
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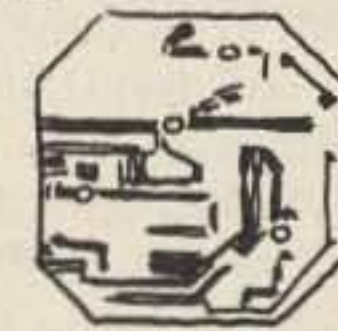
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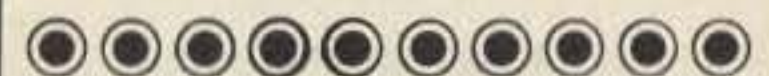


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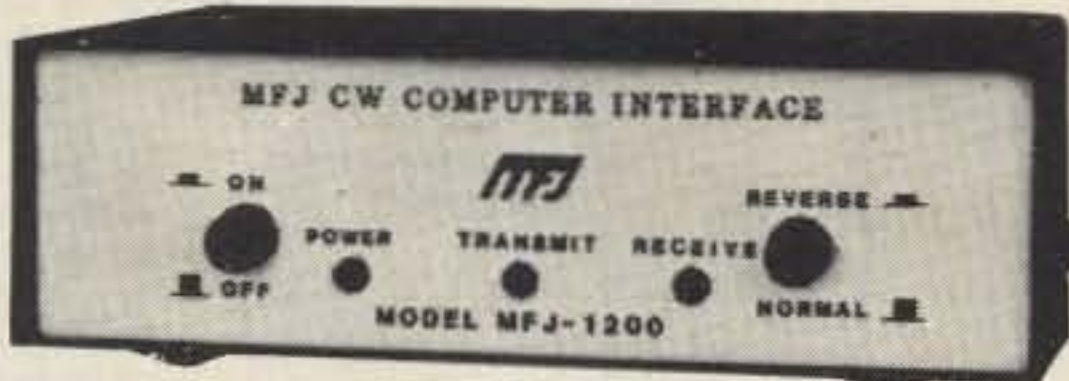
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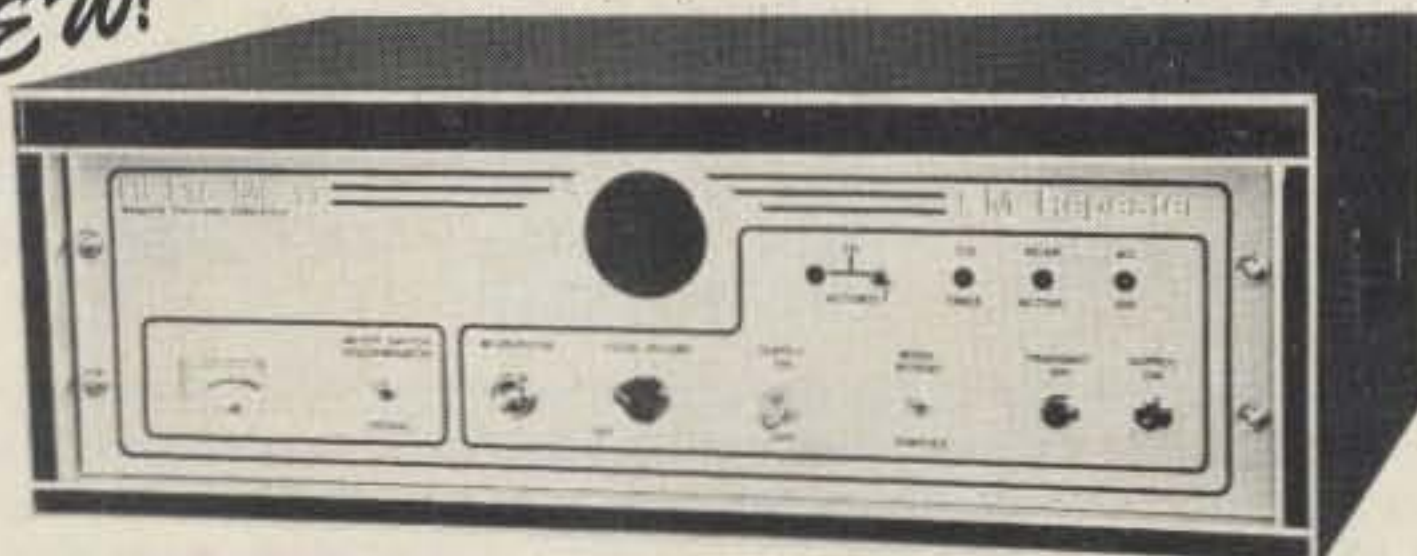
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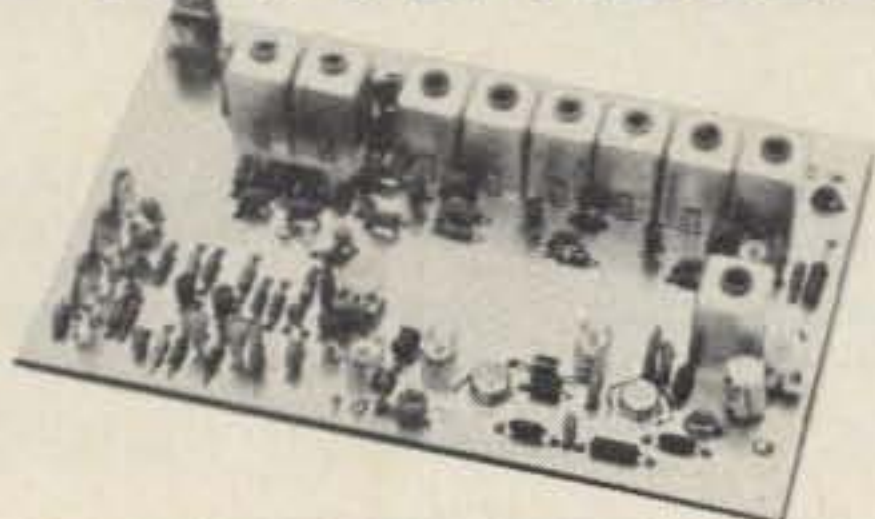
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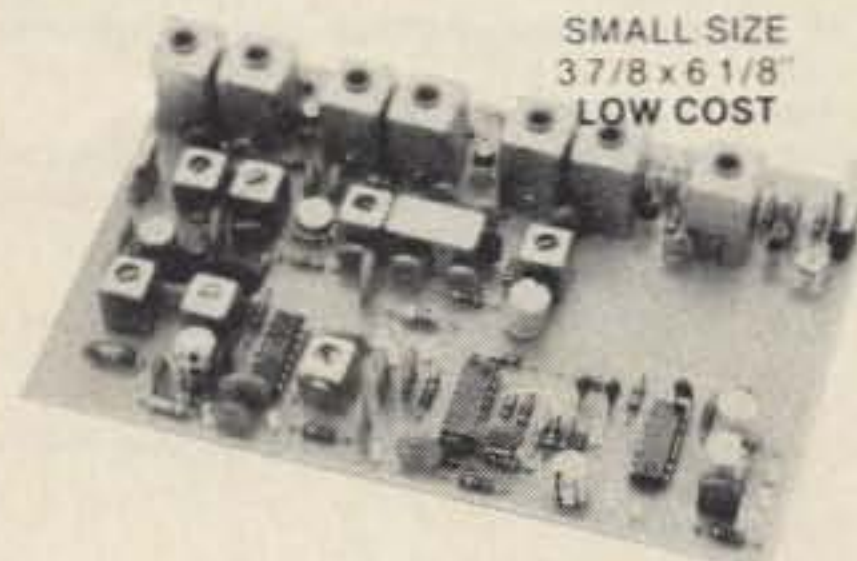
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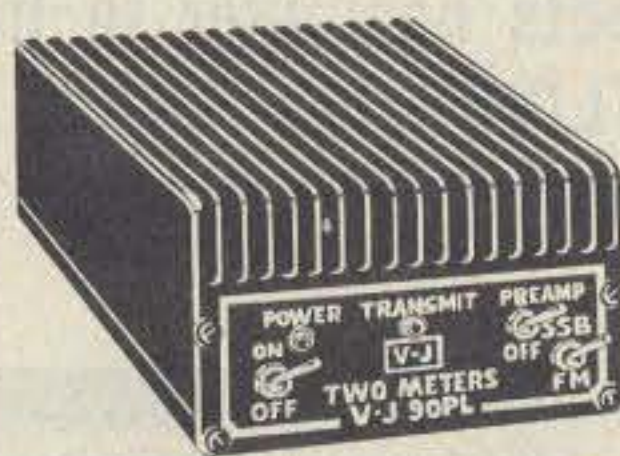
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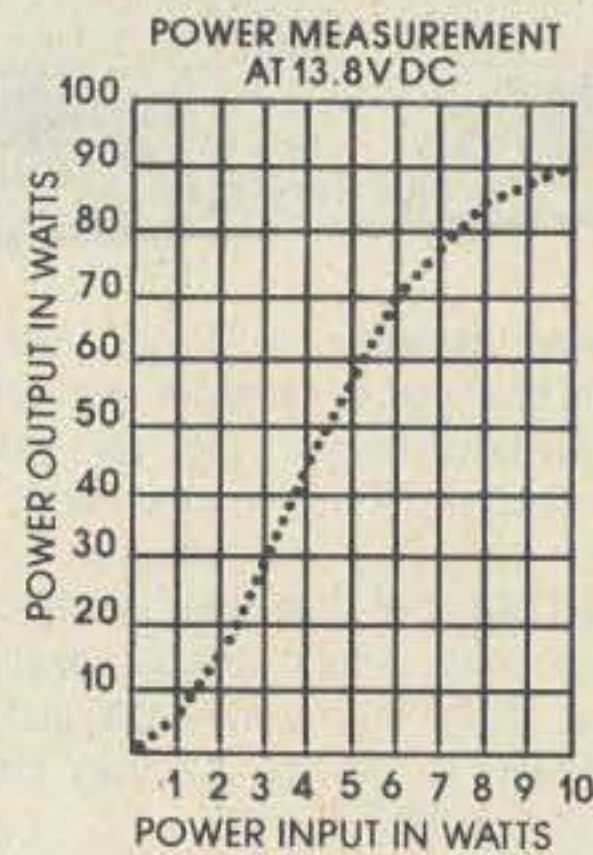
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# Crime-Stoppers' Textbook

## —rules of thumb for would-be gumshoes

Robert C. Diefenbach  
2402 Lauderdale Drive, NE  
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No one seemed to notice the tan car that stopped at the quiet corner only long enough to drop off a tall, casually dressed young man. As the car drove unhurriedly away, the young man began walking past the neatly trimmed yards looking—carefully looking—at each house as

he passed. No one seemed to notice.

But the driver of the car with amateur radio tags did notice, and a few minutes later also noticed the same tan car stopped in the shade of a clump of low pine trees in a nearby church parking lot. The car's hood was raised. Its driver, standing in front with one foot resting on the bumper, was making some unseen adjustment to the

idling engine. He appeared impatient as he glanced at his wristwatch.

Driving past the parking lot, the ham noted the dented left front fender on the tan car and the driver's blonde hair and blue football-style jersey. And more. By the time he pulled his car to an easy stop midway down the next block and reached for the microphone clipped to the dashboard, he knew exactly what he would say to the police dispatcher.

It took only moments to place the call through the repeater phone patch.

The dispatcher's voice was crisp. "Police emergency."

"I want to report a suspicious car and persons on Thomason Drive. I suspect they are planning a burglary."

"Stand by."

There was nothing remarkable about this series of transmissions or others like it, heard infrequently on the amateur and business radio bands, except that they are heard very infrequently in proportion to the potential criminal activities witnessed by drivers of radio-equipped vehicles. Law-enforcement agencies wish fervently that there were more civilian radio exchanges like this one. They need all the help they can get.

There are only 2.1 full-time law-enforcement officers per 1000 US citizens, according to the latest

figures released by the Federal Bureau of Investigation. These men and women do their best in the face of an alarming increase in serious crime, but they are, as a group, vastly overworked. Since 1971, property crimes (burglary, larceny-theft, and motor-vehicle theft) have shot up 54 percent nationally. Violent crimes (murder, forcible rape, and aggravated assault) have risen 60 percent. In just one year, from 1979 to 1980, burglaries and robberies rose 14 and 18 percent, respectively.

As federal, state, and local governments tighten their belts in the current wave of budget and tax revisions, there is not likely to be much—if any—increase in the number of professional crime fighters in most jurisdictions. There is a clear and growing need for appropriately-controlled civilian involvement.

Special Agent Edward J. Tully of the FBI points out that "there has been a tendency for civilians to forget their responsibility for effective law enforcement. Clearly, police departments cannot do the job alone." Tully is acting academic dean of the FBI Institute in Quantico, Virginia, where police officers from cities of all sizes are trained alongside federal and state agents and policemen and -women. "Citizens with access to mobile two-way



B.M. Gray II.



radios, or ham radio operators, can be of significant assistance," he said.

Sanford H. Smith, a leading national figure in public-safety communications, agrees wholeheartedly. "The present trend in our country is towards self-help. Increased citizen involvement in law enforcement is a natural part of that trend." Mr. Smith is Director of Communications for the city of Greensboro, North Carolina, president of the Land Mobile Communications Council, and immediate past-president of the Associated Public Safety Communications Officers, Inc. "When we feel we have done something for our community and our fellow men, there is a huge personal reward," he adds.

When the FBI and any other law-enforcement agency solicit civilian help, they are definitely not suggesting that the civilians "play policeman." That is the very last thing authorities want and is probably the best way a civilian could pick to become a part of the *problem* instead of the *solution*! What is wanted and needed is responsible, reliable observation and reporting of potential or actual criminal activities, and NOT vigilantism or other unauthorized direct involvement.

Professionals in law-enforcement communications—"sworn" officers and civilians alike—agree that radio-equipped volunteer observers' reports are valuable. They stress that these reports are more valuable when the observers have been trained, even minimally, by their local police departments.

The concept is endorsed by The Crime Prevention Coalition, a group of almost 50 prestigious national organizations whose combined efforts are behind the multimillion dollar "Take a

Bite Out of Crime" advertising campaign. B.M. Gray II, Director of Crime Prevention, says, "Surveillance by drivers of two-way radio-equipped vehicles could be one of the most useful citizen involvements in preventing crimes, particularly street crimes, from occurring. Drivers whose radios give them the ability to notify and communicate with the police without leaving their vehicles—whether amateur radio hobbyists or commercial drivers—can be a definite asset."

Why the need for training? It sounds simple enough: If you see something unusual or suspicious, call the police. That's the basic idea, all right. But when *is* something unusual or suspicious? *What* should be reported. *How* should it be reported? Police-directed training is the most reliable source for answers specific to each community's needs and resources.

Most police departments are anxious to work with local citizens who express interest in helping them. A letter to the office of the Chief of Police, volunteering to help and asking to be trained, is a good way to start. You might attach a copy of this article as a way of introducing the subject.

The amount of training police departments can provide—from informal advice through classroom presentations—varies widely, depending upon the resources available. Understandably, most departments will devote more attention to training requests that represent bigger potential payoffs—larger numbers of reliable radio-equipped observers on the streets. Several ham radio clubs or repeater groups, or the owners of several smaller firms which operate radio-equipped vehicles, can effectively combine their initial contacts with the police.



Sanford H. Smith.

### What Is Unusual or Suspicious?

Deciding what is unusual or suspicious enough to report to the police calls for subjective, case-by-case judgment. It is easy to err in either direction: reporting inconsequential observations or failing to report meaningful ones. Detective Jerry Jaquenta KA4NIA of the Boca Raton, Florida, Police Department burglary squad, voices the opinion of most law-enforcement professionals. "We would far rather get a dozen or more false alarms—calls reporting what turn out to be entirely innocent events—than risk missing the one call that does involve crime. If there is reasonable doubt, *call!*"

Detective Jaquenta lists these examples among observations he thinks should be reported: persons—such

as obviously truant students—who are obviously out of place where they are observed, perhaps with a screwdriver or gloves sticking out of a pocket, someone knocking at the front door and moving to the rear of a house when there is no answer, and occupied cars or trucks parked in concealment.

"But don't be guided only by a person's appearance," cautions Sanford Smith. "It is a subject's actions that will usually tip off a good observer." Persons who seem to be hiding, or showing nervousness while loitering, are high on Smith's list of significant observations.

"Any sort of violence should be reported quickly," adds David N. Wise N8CNY, veteran chief of the Michigan State Police Department's twenty-





David N. Wise N8CNY.

seven communications dispatching locations. "Whether it is as obviously criminal as a robbery or only potentially so—as in a street-corner shoving match that looks as if it could become a fistfight—let the police know. But," he emphasizes, "do it from a safe distance!" Exposing yourself to danger or violating the law yourself—for example, following a speeding car—isn't just foolhardy. It is dumb!

Police dispatchers, particularly in smaller jurisdictions, soon learn whether regular callers are reliable observers or merely busybodies. If you remember the old tale about crying wolf, you will agree that it is best not to get the latter reputation.

#### What Should Be Reported?

Public-safety communications expert Sanford

Smith lists these four components of an observation report, in the order in which they should be given to a police dispatcher.

- *What is being reported?* Tell the dispatcher immediately. A robbery in progress? A suspicious person or vehicle? An accident? A fire? A potential suicide? Knowing what the basic problem is, the dispatcher can decide what public-safety resources may be needed. Radio operators should know that most police departments would rather get several radio reports of a serious traffic accident than not receive any because each passing radio-equipped observer assumed someone else had reported it.

- *Where is it happening?* Give as accurate a location as possible. Include street names, nearby intersections, building numbers,

and easily-recognized landmarks.

- *Who and where are you?* The radio or telephone link between you and the police could somehow be broken. Give the police dispatcher your name, exact location, and a way that he or she can get back in touch with you if you are disconnected. This is especially important in bigger cities where several dispatchers are on duty at a time. Calling back after disconnecting, you may get another dispatcher and have to start your report all over again.

Ham radio operators, and others who can talk to the police directly through repeater phone-patch facilities, are not so easily re-contacted if the patch times out or the connection breaks some other way. Hams should ask for help from another amateur monitoring the frequency from a location with a telephone, and that telephone number should be given to the police dispatcher. If no one else is on frequency, think of some other way the communications link might be re-established if it breaks. Be sure that you and the police department both understand how the re-contact will be made.

If the report is being made through a taxi, delivery service, or other business radio dispatcher, that business dispatcher's phone number should be given to the police dispatcher.

Some law-enforcement agencies will insist on recording your identity—as much to discourage anonymous nuisance calls as to add to their record. Others will ask your name, but treat your report with equal seriousness whether you give it or not. While some radio operators may shrink from getting involved in an incident they observe by identifying themselves, they should realize that by giving their names they are

assuring the police that they believe in the accuracy of their report.

- *What are the details?* Your eyes may fool you. Simply being able to see all of the details that occur during an exciting, stressful event can be difficult. Under these circumstances we are all subject to a physical phenomenon called tunnel vision. As we concentrate intently on what is going on in the center of our visual field, we actually lose a great percentage of our peripheral—or side—vision. Being aware that this may happen to you will help you prepare to overcome tunnel vision by making a conscious effort to look around the central action for important details.

When describing persons, follow this standard sequence. Leave out any item you do not know.

1. Name
2. Sex
3. Race
4. Age
5. Height
6. Weight
7. Hair
8. Eyes
9. Complexion
10. Physical characteristics: marks, scars, limp, etc.
11. Clothing, from head to foot: hat, shirt, coat, trousers, socks, shoes.

When describing vehicles, start with the color or colors, then give the make, model, and as many giveaway markings—accessories, damage, etc.—as you can. The license number or any part of the number can be very helpful to the police. But stolen tags are commonly used by criminals, so an accurate description of the vehicle itself is just as important.

#### How Should It Be Reported?

To be useful, reports must be made calmly, clearly, and objectively. That may not seem too difficult when you are describ-



### Legal Issues In Civilian Surveillance

Does a radio operator step onto dangerous legal ground by making reports to the police? Can he or she be sued for slander? For false arrest? Not if the reports are *accurate*, according to Lewis J. Paper, former Associate Counsel of the Federal Communications Commission, now in private practice in Washington, DC. "It would be difficult," he says, "to conceive a situation where simply reporting—*accurately* reporting—what is observed could expose the observer to any liability."

Attorney Paper recommends that as soon as possible after making any direct or indirect verbal report to the police, radio-equipped observers should make a personal written record of everything seen and said concerning the event, and then save the record. If made while memory is still fresh, this document can be very helpful later if you are ever called as a witness in any court action that ensues. You can be subpoenaed by either the prosecution or defense. Your record itself will probably never be called into evidence. But if there is—and there frequently is—a long delay between the event and a trial, it will protect you against a lessening or loss of memory that could occur before you are asked to testify.

"Although most states' slander laws vary in detail," says Mr. Paper, "generally a charge of slander must be based on reporting information which the reporter *knows or should have known* was false. A written record—by its very existence—will help minimize any risk that you will be accused of intentionally lying."

Provided you have accurately reported your observations, according to Mr. Paper, you have no liability if the police are charged with false arrest after detaining someone as a result of your report. "In making the arrest the law-enforcement agency assumes the responsibility and any liability for that arrest," he says.

Like every other authority contacted in connection with this article, Mr. Paper quickly and firmly points out that volunteers must remember that they can expose themselves to liability for violations like trespass and assault by acting as if they have powers which, *without specific legal authority*, they don't have! ■

ing a minor auto accident on the freeway. But it is difficult when actual crime or violence is concerned. Even police officers have had difficulty making proper radio transmissions under emotionally stressful circumstances. Here are some tips from the experts:

- Think about what you are going to say before you transmit. Even if it means a short delay, compose your message mentally to be sure it is accurate, concise, and in the sequence that will be the most helpful to the police dispatcher.

- Keep your transmissions short. Break frequently to allow the person on the other end to interrupt.

- Control your voice. When excited or upset, many people tend to speak

faster and to raise the volume and pitch of their voices. The combination makes for hard-to-copy radio transmissions. Listen to yourself. Keep your voice as close to normal as possible.

- Avoid subjective words. Be specific in describing what you see. The dispatcher doesn't know what you think "a bad fight" is or what "a whole bunch" of injured motorists means.

- Speak plain English! Leave the "ten-this" and "ten-that" and other supposed-to-be police jargon to the TV heros. The few seconds you think you might save by using jargon is not worth the risk of being misunderstood.

- Stay at your radio. Except to render whatever aid



Detective Jerry Jaquenta KA4NIA

you can to an injured person, you can be more helpful by being keeping a communications line open between the police and whatever action you are observing.

Don't forget the important don'ts: *Don't* expose yourself to danger! *Don't* play cop! In the process of trying to assist the police, *don't* violate any laws yourself. ■

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Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received at 73 Magazine by the first of the month, two months prior to the month in which the event takes place.

## SEASIDE OR JUN 4-6

The North Coast Repeater Association and the Oregon Tualatin Valley Amateur Radio Club will hold their Oregon State Ham Convention on June 4-6, 1982, at the Seaside Convention Center, Seaside OR. Hours are 12:00 noon to 5:00 pm on Friday, 8:00 am to 9:30 pm on Saturday, and 8:00 am to 2:00 pm on Sunday. Registration is \$5.00 per single, \$7.00 per couple, and \$1.00 for children. Seminars will include receiver design, construction, satellite earth stations, contests, and many others. The banquet speaker will be a NASA Space Shuttle astronaut and master of ceremonies will be Mel Ellis K7AOZ, Vice Director, ARRL Northwest Division. The banquet cost is \$12.50 per person. Talk-in on 146.52 and 145.45 (-600). For more information, write Doc McLendon W7GWC, PO Box 920, Seaside OR 97132.

## SAN DIEGO CA JUN 4-6

The San Diego County Amateur Radio Council and the San Diego Computer Society will hold Hamcomp 82 on June 4-6, 1982, at the Town & Country Convention Center, San Diego CA. Registration is \$7.00 and the Saturday evening banquet featuring speaker Roy Neal K6DUE is \$15.00. There will be technical sessions all day Saturday, ham and computer booths, many prizes and awards (including a main prize of an Osborne 1 computer), an ARRL forum, a ladies' luncheon, Sunday morning breakfasts, and ham and computer sessions every hour. The final event on Sunday at 1:00 pm will be a T-hunt on 146.76 MHz. Talk-in on .04/.64, .75/.15, and 222.94/224.54. For registration forms, write Hamcomp 82, PO Box 81537, San Diego CA 92138.

## LOVELAND CO JUN 5

The Northern Colorado Amateur Radio Club will hold its annual Superfest on June 5, 1982, from 8:00 am to 4:30 pm in the McMillen Building at the Larimer County Fairgrounds, Loveland CO. Admission is \$3.00 and will include a swap table. There will be exhibits, technical talks, a code contest with prizes, an auction, a swapfest, and drawings for many prizes, including a synthesized 2-meter handheld. Special activities are planned for non-hams, especially the kids. For further information, contact Gene Bellamy WD0DRM, 3124 West 6th Street, Greeley CO 80631.

## ST PAUL MN JUN 5

The North Area Repeater Association will hold a swapfest and exposition for radio amateurs and computer hobbyists on June 5, 1982, at the Minnesota State Fairgrounds, St. Paul MN. Admission is \$3.00 and free overnight parking for self-con-

tained campers will be available on June 4th. There will be exhibits, booths, and prizes. Talk-in on .25/.85 and .16/.76. For more information or reservations, write Amateur Fair, PO Box 30054, St. Paul MN 55175.

## GRAND RAPIDS MI JUN 5

The Independent Repeater Association will hold its annual Grand Rapids Festival Swap & Shop on Saturday, June 5, 1982, from 8:00 am to 3:00 pm at the Kentwood Field House, just south of 60th Street on Kalamazoo Avenue. Admission is \$3.00; eight-foot tables are \$7.00 or \$4.00 for half-size. There will be prizes and refreshments. For more information or dealer reservations, write IRA Swap, 562 92nd Street SE, Byron Center MI 49315, or call (616)-455-2926.

## GUELPH ONT CAN JUN 5

The Guelph Amateur Radio Club (VE3ZM) will hold the 7th annual Central Ontario Amateur Radio Flea Market on Saturday, June 5, 1982, from 8:00 am to 4:00 pm at "Regal Hall," 340 Woodlawn Road West, corner of Woodlawn and Hanlon Parkway (Hwy. #6), Guelph ONT. Admission is \$2.00 and children 12 years old and under will be admitted free. Vendors' admission is an additional \$3.00 and a quantity of 3' x 8' tables are available at \$5.00 each. Vendors will be admitted from 6:00 am on. There will be commercial displays, surplus dealers, computer software and hardware, and indoor and outdoor displays. The refreshment concession will open at 12:00 noon. For further information, contact Bob Lacombe VEB1YE at (519)-843-4618 or Rocco Furfaro VE3HGZ at (519)-824-1157.

## FAIRBANKS AK JUN 5

The Arctic Radio Club of Fairbanks AK will hold a hamfest on June 5, 1982, at the Kiwanis AG Hall at the Tanana Valley Fairgrounds. The doors will open at 8:00 am and there will be a \$5.00 fee for all sellers. Features will include door prizes, a raffle, a left-footed key for a code contest, and an ole'-fashioned pot luck dinner. The Alaska QSL bureau will be there as well as an ARRL representative. For further information, contact Herb Walls KL7JLF, PO Box 1625, Fairbanks AK 99707.

## CHELSEA MI JUN 6

The Chelsea Swap and Shop will be held on Sunday, June 6, 1982, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Donation is \$2.00 in advance or \$2.50 at the gate. Children under 12 and non-ham spouses will be admitted free. Talk-in on 146.520 simplex and 147.855 (Chelsea repeater). For more info, write to William Altenberndt WB8HSN, 3132 Timberline, Jackson MI 49201.

## MANASSAS VA JUN 6

The Ole Virginia Hams Amateur Radio Club, Inc., will hold the eighth annual Manassas Hamfest on Sunday, June 6, 1982, at the Prince William County Fairgrounds, Route 234, Manassas VA. Admission is \$4.00 per person; children under 12 will be

admitted free. Gates will open at 8:00 am. In addition to the admission fee, there will be a \$3.00 fee for tailgating and the flea market spaces. Gates will open at 7:00 am for tailgating setup. Features will include ladies' programs, children's entertainment, CW proficiency awards, QSL bureaus, food and refreshments, and many prizes. Talk-in on 146.37/146.97 (W1CRO) and 146.52. For additional information, write Jim Lascaris WA2QEJ, 11053 Camfield Ct., Manassas VA 22110.

## MILTON PA JUN 6

The 11th annual Milton Amateur Radio Club hamfest will be held on June 6, 1982, from 8:00 am to 5:00 pm, rain or shine, at the Allenwood Firemen's Fairgrounds located on US 15, 4 miles north of Interstate 80. Advance registration is \$2.50; at the gate, \$3.00; XYLs and children will be admitted free. There will be a flea market, an auction, contests, cash door prizes, and a free portables and mobile FM clinic. An indoor area will be available as well as food and beverages. Talk-in on .37/.97, .025/.625, and .52. For further details, contact Jerry Williamson WA3SXQ, 10 Old Farm Lane, Milton PA 17847, or call (717)-742-3027.

## ROME NY JUN 6

The Rome Radio Club, Inc., will hold the 30th annual Rome Ham Family Day on Sunday, June 6, 1982, at Beck's Grove, Oswego Road, Rome NY. Features will include door prizes, an early brunch, a buffet-style dinner, a flea market, educational and scientific presentations, and overnight parking for campers, as well as fly-in capabilities. Talk-in on .28/.88 and 146.55.

## HUMBOLDT TN JUN 6

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, June 6, 1982, at a new location: Bailey Park, North 22nd Avenue, Humboldt TN. Tickets are \$2.00 each, with no additional charge for the flea market. There will be prizes, light lunches, and ladies' and children's activities. Talk-in on 146.37/.97. For more information, contact Ed Holmes WA1GW, 501 North 18th Avenue, Humboldt TN 38343.

## DEAL NJ JUN 6

The Fort Monmouth ARC and Haverim will hold the Jersey Shore Hamfest and Electronics Flea Market on June 6, 1982, from 9:00 am to 4:00 pm at the Jewish Community Center, 100 Grand Avenue, Deal NJ. Admission is \$3.00 per person; XYLs and children under 12 will be admitted free. Outdoor tailgating is \$2.00 per space and indoor space is \$5.00 per 8-foot table. Door prizes and refreshments will be available. Talk-in on 147.045 +.6, 146.775 -.6, and 146.52.

## MAYVILLE ND JUN 6

The Goose River Amateur Radio Club will hold its annual hamfest on Sunday, June 6, 1982, at the city park, Mayville ND. In case of inclement weather, the festivities will be held in the Mayville Armory. Registration begins at noon and the charge is \$1.00. All registrants will be eligible for the many door prizes. The grand prize is a Heathkit SA2060 Super Tuner. Camping facilities will be available for those who desire to beat the rush. Talk-in on .31/.91. For further information, please contact Mary Carlson, RR 2, Box 47, Hatton ND 58240.

## MIDLAND MI JUN 12

The Central Michigan Amateur Repeater Association will hold its eighth annual hamfest on June 12, 1982, from 8:00 am to 4:00 pm in the "Great Hall" of the Valley Plaza Complex, just off US Rte. 10 in Midland MI. Tickets are \$3.00; children under 12 will be admitted free. Talk-in on 146.67/.07 and 146.52. For additional information, contact Carol Hall WD8DQG, 4651 Cardinal Drive, Mt. Pleasant MI 48858, or call (517)-772-0363.

## STATEN ISLAND NY JUN 12

The Staten Island Amateur Radio Association will hold its flea market on June 12, 1982, from 9:00 am to 3:00 pm, at All Saints Episcopal Church, Staten Island NY. To get to the church, take interstate 278 to the Victory Boulevard exit, proceed east on Victory Boulevard for 1/2 mile to Crystal Avenue, and turn left on Crystal Avenue. There will be no admission charge for buyers, a \$3.00 per space charge for sellers (bring your own tables), and a \$1.00 charge for electricity. Refreshments will be available. A raffle will be held at 1:00 pm and the winner will have a choice of an Icom IC-4AT or a Bearcat 20/20. Talk-in on 146.52 and 146.28/.88. For additional information, send an SASE to George Rice, Jr. WA2AMJ, 480 Jewett Avenue, Staten Island NY 10302.

## TORRINGTON CT JUN 12

The CQ Amateur Radio Club of Torrington CT will hold a ham radio flea market on June 12, 1982, from 9:00 am to 5:00 pm at the Drop-In Center, East Albert Street, Torrington CT. The admission fee of \$2.00 includes a chance for a door prize. A seller's indoor table is \$5.00 each and tailgating space is \$2.00 each. There will be a raffle featuring a personal microcomputer kit as first prize, a portable radio cassette recorder as second prize, and an MFJ clock as third prize. You need not be present to win. Talk-in on 146.25/.85, 147.84/.24, and 146.52. For tickets, table reservations (before June 8, 1982), or more information, contact Sebastiano Albani KA1FVM, 76 Pythian Avenue, Torrington CT, or call (203)-489-2945; Ron Brook KA1AFN, 213 East Pearl Street, Torrington CT, or call (203)-482-2764; or the CQ Club, PO Box 692, Torrington CT 06790.

## GRANITE CITY IL JUN 13

The 53rd year anniversary celebration and annual hamfest of the Egyptian Radio Club, Inc. (W9AIU), will be held on Sunday, June 13, 1982, at their club grounds near Granite City IL.

## QUEENS NY JUN 13

The Hall of Science Amateur Radio Club will hold its annual indoor/outdoor, rain-or-shine hamfest on Sunday, June 13, 1982, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th Street (1 block from Queens Boulevard), Kew Gardens, Queens NY. Sellers' donations are \$3.00, buyers' donations are \$2.00, and XYLs and children will be admitted free. Talk-in on 145.520. For additional information, contact Thomas Doyle KA2DTB, 135-14 125th Street, South Ozone Park, Queens NY 11420, or phone (212)-738-8887.

## WILLOW SPRINGS IL JUN 13

The Six Meter Club of Chicago, Inc., will hold its 25th annual ARRL-affiliated hamfest on Sunday, June 13, 1982, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of downtown Chicago). Ad-

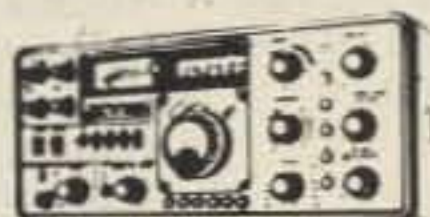


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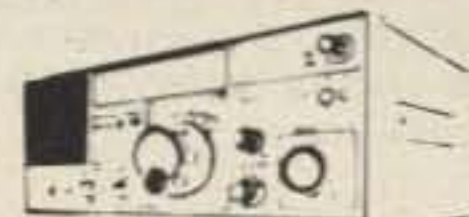
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Panasonic RF-2200 MB-SW-FM	\$159.00
Sony ICF-2001 Digital, Compact	\$299.00
Sony ICF-6500 (New) Digital	\$199.00
Palomar Loop Amp/Ant.	\$77.50/\$59.95
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SSM-2 Commercial S.S. Ball	\$14.00	
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RG-213 Coax, Mil. Spec	28¢/ft.
Mini-8 Coax 95% Shield	12¢/ft.
Rotor Wire 8 Conductor	16¢/ft.
4 Conductor	7.5¢/ft.



vance registration is \$2.00; at the gate, \$3.00. There will be a large swapper's row, displays, an AFMARS meeting, refreshments, plenty of parking space, picnic grounds, and prizes, including a first prize of a color TV. Talk-in on 146.52 or .37/.97 K9ONA/R. For advance tickets, contact Val Hellwig K9ZVW, 3420 South 60th Court, Cicero IL 60650.

**SANTA MARIA CA  
JUN 13**

The Satellite Amateur Radio Club will hold its annual bar-b-q/swapfest on June 13, 1982, at the Union Oil picnic grounds, just south of Santa Maria CA. Admission is free for the swapfest; dinner tickets are \$7.50 for adults and \$3.50 for children 6 to 12 years of age; prize tickets are \$1.00 each. Swap tables are \$2.50 for each area. There will be prizes, contests, and a Santa-Maria-style bar-b-q. Talk-in on 146.34/94. For tickets or more information, write Santa Maria Swapfest, PO Box 2616, Orcutt CA 93455.

**BELLEFONTAINE OH  
JUN 13**

The Champaign Logan Amateur Radio Club, Inc., annual hamfest and flea market will be held on Sunday, June 13, 1982, at the Logan County Fairgrounds, Bellefontaine OH. Tickets are \$1.50 in advance and \$2.00 at the door. Tables are \$3.00 in advance. Gates will open at 7:00 am and prize drawings will be held every hour starting at 9:00 am. The major prizes of \$200, \$100, and \$50 will be drawn at 3:00 pm; you need not be present to win. Talk-in on 147.60/00 W8EBG/R. For more information, tickets, or tables, contact M. A. (Bud) Griswold W8JXM, PO Box 301, Urbana OH 43078.

**HUNTINGTON WV  
JUN 13**

The Tri-State Amateur Radio Association will hold its 20th annual Huntington Hamfest on Sunday, June 13, 1982, from 9:00 am to 3:00 pm at Camden Park, off Route 60 West, Huntington WV. Registration is \$3.00 per person and children under 12 will be admitted free. Spaces are \$3.00 each for the flea market and 6-foot commercial dealers' tables are \$5.00 each. Setup time is 6:00 am to 9:00 am. Overnight space will be available for self-contained RVs. Talk-in on 146.04/64 and 146.52/52. For further information, send an SASE to TARA, Inc., PO Box 4100, Huntington WV 25729.

**SAGINAW MI  
JUN 13**

The Saginaw Valley Amateur Radio Association will hold its new Electronic Hobby Expo on Sunday, June 13, 1982, at Bridgeport High School, off I-75, exit 144 west. Doors will open at 8:00 am. Adults' tickets are \$1.00; kids will be admitted free. Trunk sales are \$2.00 and all tables are \$5.00. Features will include displays and demonstrations for the whole family, major prizes totaling \$400.00, and hourly drawings. Talk-in on 147.24 and 146.52 (K8DAC). For more information, table reservations, or tickets, send an SASE to SVARA/EHE-82, 50 Durand Court, Saginaw MI 48602.

**MONROE MI  
JUN 13**

The annual Monroe County Radio Communications Hamfest will be held on June 13, 1982, from 8:00 am to 3:00 pm at the Monroe Community College, Raisinville Road, Monroe MI. Tickets are \$2.00 at the gate, \$1.50 in advance, and XYLs and children will be admitted free. Plenty of table space and free parking will be available. Featured will be contests, auctions, and

displays. Talk-in on 146.13/73 and 52. For additional information, contact Fred Lux WD8ITZ, PO Box 982, Monroe MI 48161, or call (313)-243-1088.

**AKRON OH  
JUN 13**

The 15th annual Goodyear ARC Hamfest will be held on Sunday, June 13, 1982, from 10:00 am to 5:00 pm at Goodyear Wingfoot Lake Park, near SR224 and 43, east of Akron OH. Family admission is \$2.50 in advance and \$3.00 at the gate. Flea market spaces outside are \$1.00 and dealers' tables inside the shelter are \$5.00 (advance reservations are suggested). There will be picnic tables, a concession stand, and free parking available. Prize drawings will be held throughout the day with grand prize drawings at 4:00 pm. Talk-in on 146.04/64. For further information, advance sales tickets, and shelter house reservations, send an SASE to Don Rogers WA8SXJ, 161 S. Hawkins Avenue, Akron OH 44313.

**PHILADELPHIA PA  
JUN 14**

The Phil-Mont Mobile Radio Club will host the amateur radio segment of the International Conference on Communications on Monday, June 14, 1982, from 7:00 pm to 10:00 pm, at the Franklin Plaza Hotel, 17th and Race Streets, Philadelphia PA. The session is free and all radio amateurs are invited to attend. For additional information, contact Jacob S. Kovalchek, Jr. AK2I, 1228 Heartwood Drive, Cherry Hill NJ 08003, or phone (603)-428-5924.

**DUNELLEN NJ  
JUN 19**

The Raritan Valley Radio Club will hold its 11th annual hamfest and flea market on June 19, 1982, from 8:30 am to 4:00 pm at Columbia Park, Dunellen NJ. There will be door prizes and a snack bar. Admission is \$3.00 for sellers and \$2.00 for lookers. Talk-in on 146.625/025 (W2QW) and 146.52 direct. For further information, call Bob KB2EF at (201)-369-7038.

**PAYETTE ID  
JUN 19-20**

The Voice of Idaho Amateur Radio Club and the Treasure Valley Radio Association will hold the fifth annual Treasure Valley Hamfest on June 19-20, 1982, from 9:00 am Saturday to 3:00 pm Sunday at the Mini-dome, Payette ID. Registration includes breakfast, dinner, and prize tickets, and is \$15.00 in advance and \$20.00 at the door. Features will include swap tables, dealers, transmitter hunts, special activities for ladies and children, games, contests, prizes, a cocktail party on Sunday, a picnic and banquet on Saturday, and a breakfast on Sunday. Talk-in on 147.84/24 (WB7NSE/R), 147.72/12 (K7OJI/R), and 146.52. For more information, contact Samuel K. Sower N7DOV, 1909 Grant Street, Caldwell ID 83605, or phone (208)-459-8132.

**MOORHEAD MN  
JUN 19-20**

The ACE Radio Club will hold its first radio and computer flea market on June 19-20, 1982, beginning at 8:00 am at the Moorhead Centennial Arena, Moorhead MN. Talk-in on 146.970. For complete detailed information, send an SASE to ACE, PO Box 452, Moorhead MN 56560.

**LANCASTER OH  
JUN 20**

The Lancaster and Fairfield County Amateur Radio Club will hold its annual Lancaster Hamfest on June 20, 1982, from 9:00 am to 5:00 pm at the Fairfield County

Fairgrounds, Lancaster OH. Tickets are \$2.00 in advance or \$3.00 at the door. Flea-market tables will be available or bring your own. There will be hourly drawings, refreshments, and plenty of free parking. Talk-in on 147.03/63 or 146.52. For additional information or advance tickets, write Box 3, Lancaster OH 43130.

**CROWN POINT IN  
JUN 20**

The Lake County Amateur Radio Club will hold its 10th annual Dad's Day Hamfest on June 20, 1982, at the Industrial Arts Building at the Lake County Fairgrounds, Crown Point IN. Prizes will be featured and all events will be held indoors. Tickets are \$2.50. Talk-in on 147.84/24 or .52. For advance tickets, mail check to Lake County ARC, c/o Walley Kozol KA9FDC, 624 N. Rensselaer Street, Griffith IN 46319.

**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.

**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.

**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 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



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checks payable to Batavia Hamfest, c/o Gram, Inc., Box 572, Batavia NY 14020.

#### 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.

#### 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.

#### BOWLING GREEN 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.

#### CANTON OH JUL 18

The Tusco Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) 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, con-

tact Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

#### 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).

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

#### 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.

#### 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 Schaffner Drive, West Homestead PA 15120.

#### 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.

#### 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.

#### 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.

#### 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 market 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.

#### AUGUSTA ME SEP 10-12

The Augusta Emergency Amateur Radio Unit will hold the ARRL-approved Northeast Area Hamfest on September 10-12, 1982, at Windsor Fairgrounds, located just off Route 17, 10 miles east of Augusta ME. Facilities for campers will be available. Activities will include a flea market and regularly scheduled speakers and demonstrations, as well as the usual events. Talk-in on 146.22/.82 and 3940.

#### ADRIAN MI SEP 26

The Adrian Amateur Radio Club will hold its 10th annual hamfest on Sunday, September 26, 1982, at the Lenawee County Fairgrounds, Adrian MI. Talk-in on 146.31/.91 (W8TQE). For tickets, tables, and more information, contact the Adrian Amateur Radio Club, Inc., PO Box 26, Adrian MI 49221.

#### NEW LONDON NH SEP 26

The 6th annual Connecticut Valley FM Association Hamfest/Flea Market will be held on Sunday, September 26, 1982, from 9:00 am to 5:00 pm, at King Ridge Ski Area, New London NH. Adult admissions are \$2.00, a flea-market setup is \$5.00, and children under 16 will be admitted free. King Ridge will have the food concession. For more information, contact Francis Callahan KA1BWE, Box 173, East Wallingford VT 05742.

#### CHICAGO IL OCT 17

The Chicago Citizens Radio League will hold its first annual hamfest on October 17, 1982, at the North Shore American Legion Post, 6040 N. Clark, Chicago IL from 7:00 am to 4:00 pm. Due to limited table space, table reservations must be made in writing to Fred Marlette KA9FUO 1851 W. Chase, Chicago IL 60626.

## HAM HELP

I would appreciate hearing from anyone who has made any modification to the Kenwood TR-7500 2-meter FM transceiver.

R. L. Rabenstein WB3JJG  
2904 W. Pine Avenue  
Altoona PA 16601

I am looking for information regarding the serial numbers on Vibroplex units and the year of their manufacture.

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**C.L. Gantz, Jr.**  
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I am in need of a tube-specification manual which covers receiving and transmitting types.

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I am in need of some donated QSL cards.

**Gary Mitchell KH8AC**  
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Pago Pago, American Samoa  
96799

I am in need of schematics and parts lists for the power supply and tape reader of an NCR Model 400-500 Teletype® (power supply schematic no. 095-0009500 and tape reader Model GE 4APTR61G002, serial no. 5628). Have copier or please advise.

Also needed is a dial plate (or copy) for the Philco AM/SW Model 41-250 radio, Code 121.

**H. W. Wallmeier**  
700 W. 7  
Washington MO 63090

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

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

I need a schematic and manual for a Gonset G151 FM Communicator.

**Mark Rethemeyer**  
1531 Belmont  
Kansas City MO 64126

I need a schematic, and service and upgrade information for the Sommerkamp FTdx-150 transceiver.

**Charles Wendler K2BOZ**  
58 South Airmont Rd.  
Suffern NY 10901

I would like to correspond with hams who have operated with or are operating with a Hallicrafters FPM300. I am interested in troubleshooting an existing problem and in learning about any modifications which can be done on this rig.

**Neil F. Haeger WD6CVA**  
14402 Cartela Dr.  
La Mirada CA 90638

I am looking for a model DD-1C Spectronics frequency readout for my Collins 75S-3 receiver.

**R. E. Foltz W7JQO**  
PO Box 2126  
Sedona AZ 86336

I need the service manual for the Clegg "99'er" 6-meter transceiver along with any information on home-brewing a suitable vfo and FMing the unit. I will pay for postage and copying.

**Kevin Van Zuilen KA9GWB**  
205 Lehman St.  
Berne IN 46711

I am looking for a schematic for an SBE VHF power amplifier, model SB-1PA.

**Lennox Bodman K1NBG**  
29 Mt. Vernon St.  
Gardiner ME 04345

I need a service manual and schematic for a Phillips Telecommunications receiver type BX 925A/09 NR BC 8380/SO502.

**Mark A. D'Ornellas 8R1Y**  
110 Barrack St.  
Kingston, Georgetown  
Guyana

I need schematics, technical manuals, and crystal information for an AN/VRC-52 radio set (T-891/VRC-52 and R-1146/VRC-52). I will pay any reasonable charges for copying and postage, or will copy and return.

**John Wilson KC1P**  
15 Kennedy Rd.  
Cambridge MA 02138

I would like to hear from hams who use the Exidy Sorcerer for ham applications of any nature.

**John Stover N9AMC**  
1521 Medora St.  
South Bend IN 46628

I would like to convert a model 1-636 Royce SSB/AM 23-channel CB radio for use on the 10-meter band. Any information on how to do this would be helpful.

**Lyle G. Plum WB7PXQ**  
3807 East Emile Zola  
Phoenix AZ 85032

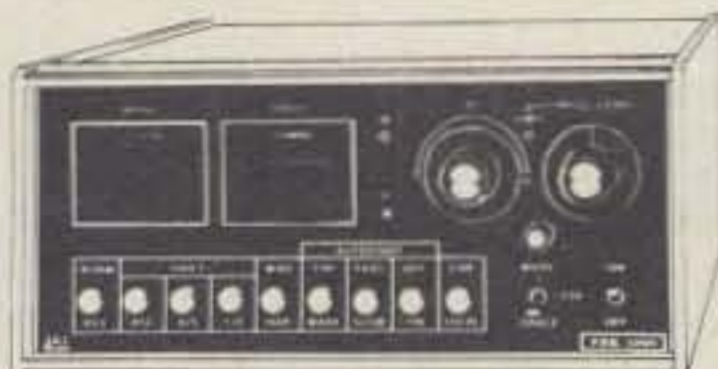
I need a schematic and manual for a Hammarlund HQ 100 receiver. All costs will be gladly paid.

**Patrick J. Chivington W8JIB**  
1478 Grace Ave.  
Lakewood OH 44107

I need a schematic and any technical advice for keyboard assembly 055-13-02-70REV by Incoterm Corp., particularly for RTTY. All reasonable expenses refunded.

**W. G. Mott G4KLP**  
2 London Bridge  
London, SE1 9RB  
England

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# HAM HELP

I am looking for active Radio Shack TRS-80 and Sinclair ZX-81 computer user's nets. I am interested in when these nets meet and the frequencies they meet on. I am also interested in the locations of the following aircraft and marine beacons (all frequencies in kHz): A-320, BNO-396, BNU-396, COR-206, EBY-391, FR-355, GWF-282, HMM-410, INE-521, LYI-415, MF-371, NO-351, OT-376, PNA-392, QQ-401, RD-410, SL-288, TA-390, UNB-388, VI-220, XSD-278, and ZP-368.

**Gary Payne KE6CZ**  
1347 E. Dakota  
Fresno CA 93704

I need a manual for the Beckman-Berkley model 7751 frequency counter and a 1000-kHz, 115-V ac crystal oven for same. I am also looking for the manual for the 312B4 Collins speaker console. I will purchase outright or copy and return.

**Bill Neilsen WB4APC**  
Rt. 2, Box 253E  
Radcliff KY 40160

I would like to obtain a motor-divider PC board number 1A2 for a GXC5 military FAX unit. A schematic and/or manual for this would be handy.

**Al Cikas KA9GDL**  
2112 Stonehenge  
Springfield IL 62702

I need schematics or any information for the Hammarlund HQ110, Hammarlund HQ180, and Hammarlund HX500 transmitter. I also need information on the Teletype® 28RO teletype machine and the Gonset G-50 6-meter Communicator, and instructions on how to convert the Communicator to FM.

**Tom Blessing**  
294 Helen Ave.  
Xenia OH 45385  
(513)-372-9341

I would like to use my TRS-80 Model I for SSTV work and would like to get in contact with anyone who has information on how to do this.

**Dale Clark N9APX**  
40194 N. Glendale  
Zion IL 60099

I am looking for:

- the instruction booklet for using the Johnson transceiver tester
- information on how to convert the Heathkit SB310 receiver for 10- and 15-meter band coverage
- information on how to modify the Heathkit SB102 for more sophisticated operation

I will copy and return or forward payment for the above.

**Robert Ross VE3LPJ**  
4 Meadowlane Dr.  
Brampton, ONT L6W 2R4  
Canada

Is there a reader of 73 who can write an article about the Japanese radio-intercept training program that took place at the Eastern Signal Corps Training Center in Ft. Monmouth NJ in 1944?

**Gordon E. Hopper**  
75 Kendall Ave.  
Framingham MA 01701

I am interested in the 1750-meter band and would enjoy hearing from someone who is/was using this frequency. I am interested in learning about receiver conversion and transmitter design, as well as activity on this band.

**Rex Faulkner N4EYE**  
3413 Covington Dr.  
Augusta GA 30909

An amateur in the Ivory Coast is looking for a RTTY program and interface to use with the Atari 800 computer. Can anyone help me to help him?

**Fred Trick, Sr. KB9UB**  
Zetfred Company  
PO Box 265  
North Manchester IN 46962

Wanted: Robot Model 70 SSTV monitor, regardless of condition.

**Dante Ventriere KA4JRE**  
17831 NW 81 Ave.  
Hialeah FL 33015

Wanted: amateur radio QSL cards prior to 1930 for old-time display.

**Dave Noon VE3IAE**  
19 Honeysuckle Cr.  
London, Ontario  
Canada N5Y 4P3

I am looking for a schematic, service manual, and connections for a Motorola Twin V Trans-type CC 3006 6/12-volt radiophone, model W43GGD-2. I am also looking for information on the BC733F radio receiver. I will pay all costs for postage and handling.

**William Pence**  
800 Old Stage Rd.  
Cave Junction OR 97523

I need a schematic or any other information on the model 300/600 digital counter sold by Crescent Wire and Cable Company, circa 1976.

**Harold May**  
428 Phillipa  
Hinsdale IL 60521

I need a schematic and operating manual for a Knight KG-2100 dc oscilloscope.

**Joe Bische KA4HAG**  
3412 29th St. W.  
Bradenton FL 33505

Our club is in dire need of a service manual for a Johnson Thunderbolt linear amplifier, catalog # 240-353.

**Ronald Daly WB0ZNI**  
Hot Springs  
Amateur Radio Club  
Box 385  
Hot Springs SD 57747

I need schematics for the 2-meter Edgcomm mobile radios 25A and 3000A. I will pay copy costs and postage.

**Rudolph Fallang KA7DTA**  
717B SE 6th  
College Place WA 99324

I am looking for a DG-5 digital display and a DS-1A dc-dc converter for a Kenwood TS-520S. Please state condition and price, including shipping.

**John P. Iorio WD4MWH**  
5228 Longview Dr.  
New Port Richey FL 33552

I am looking for a Vocaline AT-30 420-MHz transceiver. These units are very old, but I am sure that one can be found.

**Allen Harris**  
3047 Worden St.  
Muskegon MI 49441

I am in need of a source for stainless spring rod in pieces that are five feet long and no more than 1/8" in diameter. Tapered replacement CB whips are not quite long enough.

**Stan Hockman KA4DSK**  
638 Flager Blvd.  
Lake Park FL 33403

I need a schematic diagram for a Collins 651S general-coverage receiver. I will pay for the copies and postage.

**Tom Kormanik**  
14114 St. Marys Ln.  
Houston TX 77079

I am looking for a Hallicrafters SX-73 or SX-73A receiver. I would like to use the receiver for DXing the 540-1600-kHz broadcast band.

**John Creque**  
1121 Berdan Ave.  
Toledo OH 43612

I am looking for a schematic and service manual for the model 33 Sideband Engineers transceiver. I would also like some information on how to convert this rig for CW use.

**Ka Kanana**  
158 SW Oaklyn St.  
Palm Bay FL 32905

I am returning home from Germany to the Rome/Cartersville, Georgia, area. Any job information for a First Class Radiotelephone and amateur Extra class licensee commencing in August would be most appreciated.

**B. G. Echols, Jr.**  
WA2NYR/DA2EJ  
University of Maryland  
Jaeger Kas., Bldg. 26  
APO New York NY 09162

I would like to get a Novice license. Are there any nearby hams that could help me on my days off? An hour every other weekend would be a great help.

**Robert Good**  
Box 86  
Overbrook KS 66524  
(913)-665-7483

I need a service manual and schematic diagram for a Motorola T41GGV series "Twin V" transceiver. I will pay reasonable copying costs or copy and return.

**Jeffrey Miller WD4SMA**  
2112 Natahoa Court  
Falls Church VA 22043

I am looking for manuals and specification sheets for Hallicrafters SX101 and SX42 receivers. I will buy your originals or pay for copying.

**Bob Allie**  
736 Pine St.  
Central Falls RI 02863



# CORRECTIONS

The TVRO filter/amplifier and demodulator circuit boards shown in "Lite Receiver IV," May, 1982, are double-sided. The foil patterns for the component

(top) sides of these boards are given here as Figs. 2 and 3.

J. Richard Christian WA4CVP  
Mobile AL

Please note the following information:

- The coaxial collinear described in "Omni-Gain," an article in the May issue of 73, is incorrectly shown in Fig. 3. The  $\frac{1}{4}$ -wave stub should be shorted at both ends, as described in the text.
- A complete kit of parts for the "Fun-Amp" featured in the May, 1982, issue is available from Radiokit, Box 4115, Greenville NH 03048 for \$37.95.

Tim Daniel N8RK  
73 Magazine Staff

The printed circuit board layout for "Home-Brew a TVRO Downconverter," March, 1982, should have included both sides. The top and bottom of the board should be etched as shown here in Figs. 4 and 5.

Also, the three coupling capacitors shown in the parts placement diagram should be 50-pF disc ceramics, not the .01-uF ones shown.

S. F. Mitchell WA4OSR  
Mobile AL

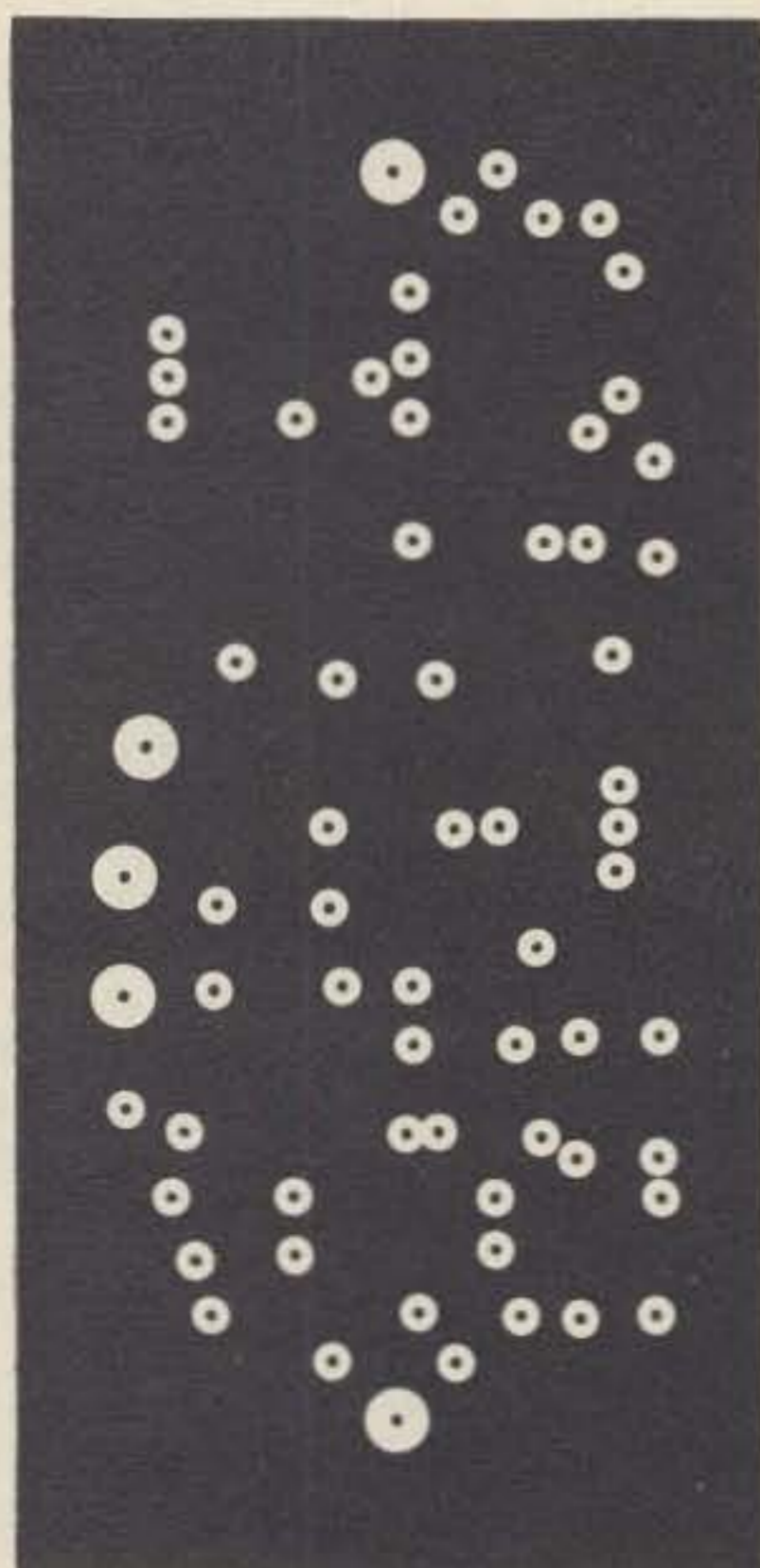


Fig. 2. Foil layout for top side of the filter/amplifier board.

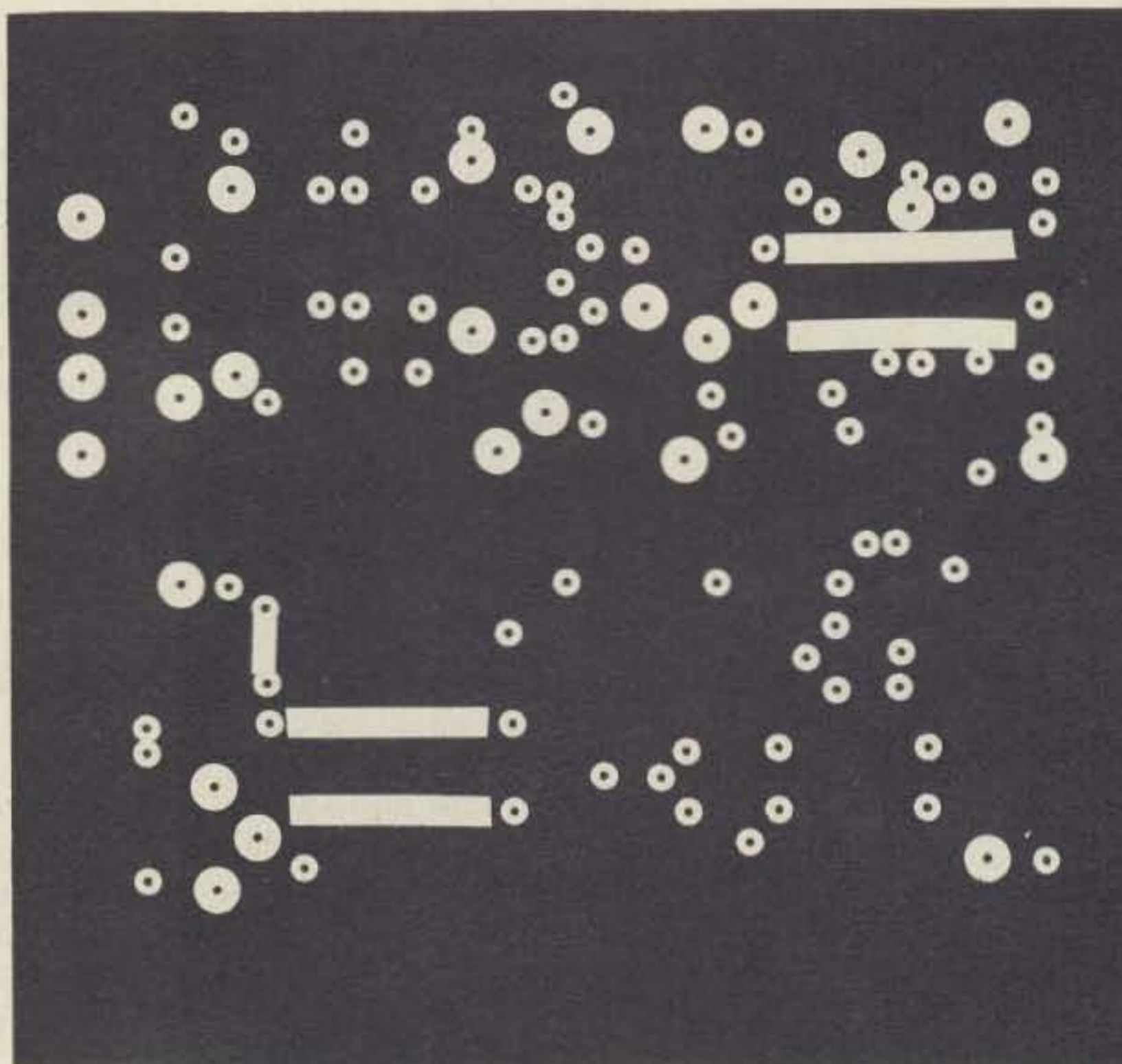


Fig. 3. Foil layout for top side of the demodulator board.

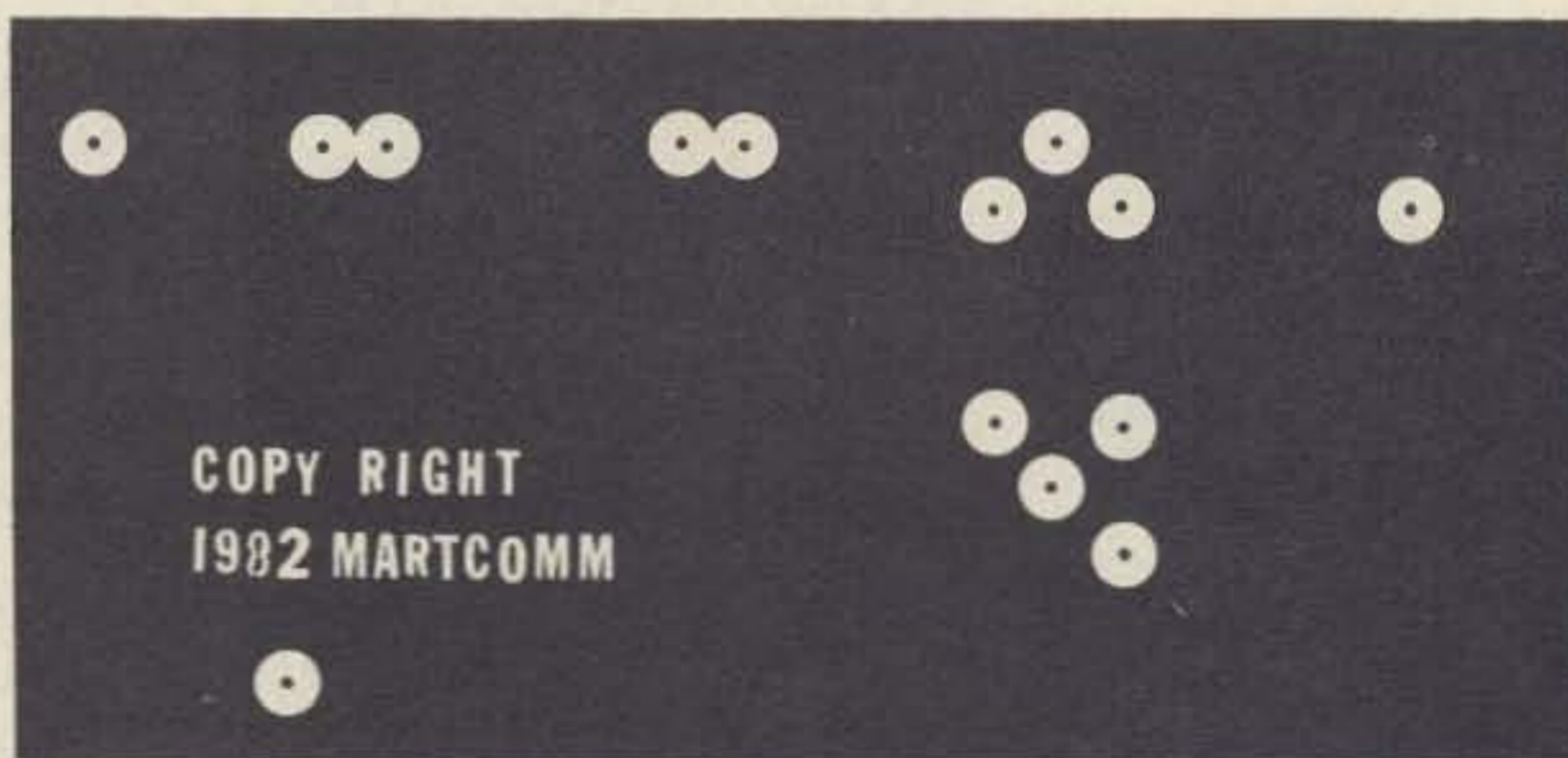


Fig. 4. Top side of double-sided circuit board.

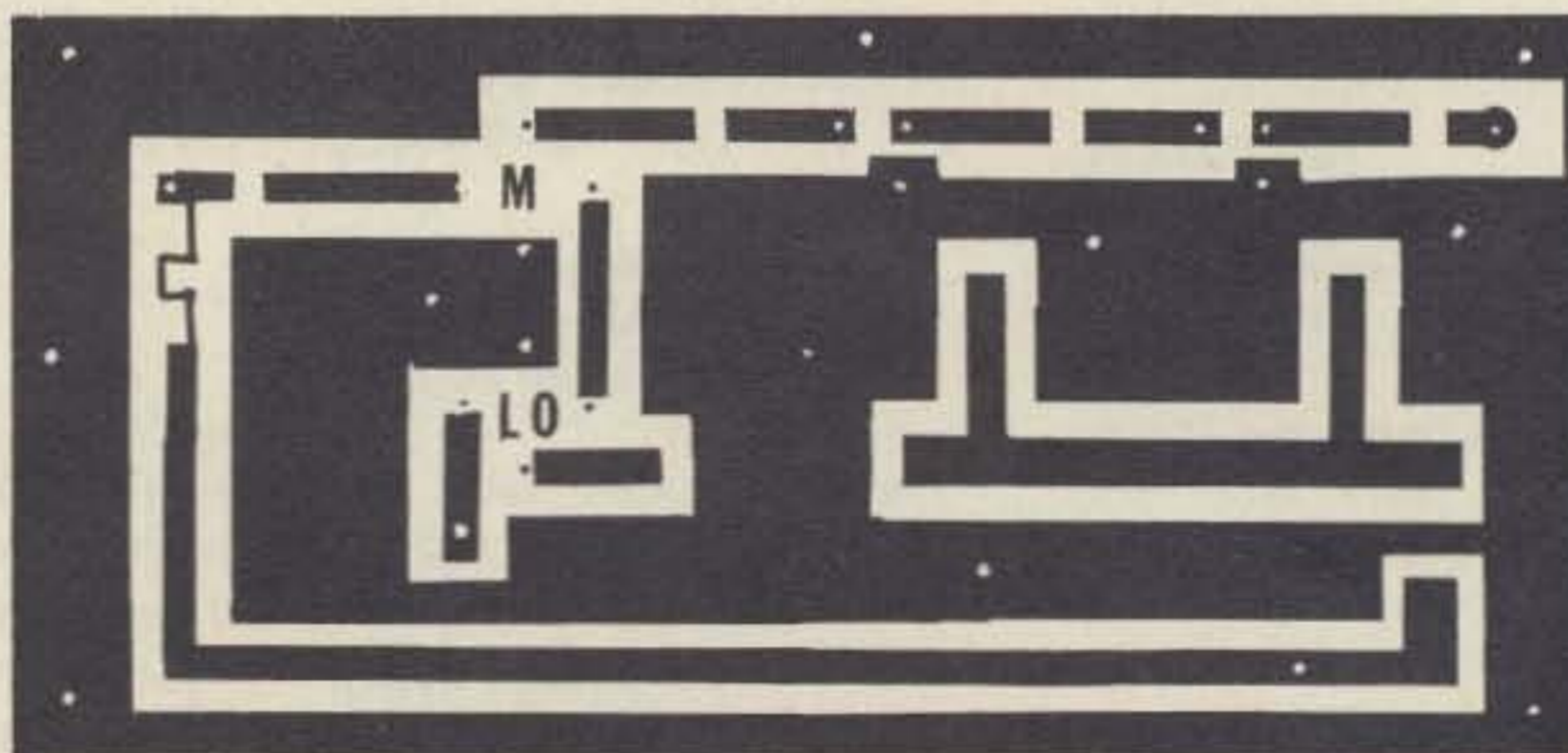


Fig. 5. Bottom side of downconverter circuit board.



# SATELLITES

## BEYOND PHASE IIIB

With the Phase IIIB launch still set for early July, there are now increasingly bright prospects for geosynchronous launch opportunities for amateur satellites. It appears that there may be two such possibilities by the end of 1985. The first of these is a test flight of a vehicle designed for launching a new US defense satellite. The second is a test launch of a new European Space Agency (ESA) vehicle called Ariane 4.

In both cases, the available payload is enormous by amateur satellite standards: 1200 pounds for the US launch and 4400 pounds for the ESA flight. Needless to say, AMSAT officials on both sides of the Atlantic are pursuing these unique opportunities. It has been suggested that the time may be at hand for AMSAT to coordinate its activities with other amateur space groups, in order to make full use of the large payloads. It may well be a case of "use it or lose it."

## SPACEWEEK: JULY 16-24

The week of July 16-24 marks the 13th anniversary of the Apollo 11 flight, during which man first set foot upon the moon. "Spaceweek" is a national celebration to commemorate this historic event and to demonstrate public support for space exploration. Activities include exhibits, lectures, and a petition drive to show our leaders in Washington DC that Americans really do favor an active role in space for the United States.

Spaceweek activities in each local area are organized by volunteer groups. The *Spaceweek Handbook*, which tells how to conduct a local Spaceweek, is available from the group's headquarters for a \$10 donation. Write to Spaceweek National Headquarters, PO Box 58172, Houston TX 77258.

The above information is courtesy of *AMSAT Satellite Report*, PO Box 27, Washington DC 20044.

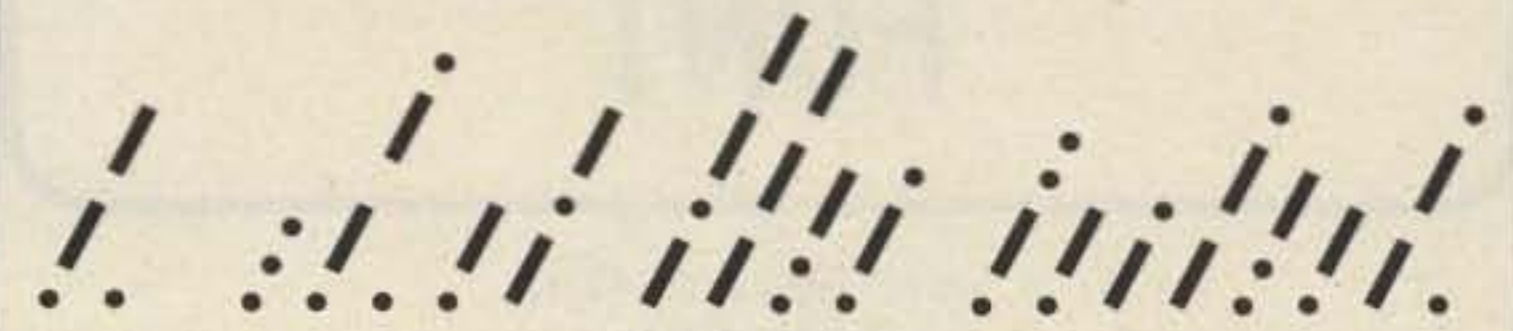
### OSCAR 8 Orbital Information for June

Orbit #	Date	Time (GMT)	Eq. Crossing (Degrees West)
21603	1	0102:51	81.9
21617	2	0107:22	83.0
21631	3	0111:53	84.2
21645	4	0116:24	85.4
21659	5	0120:55	86.5
21673	6	0125:26	87.7
21687	7	0129:57	88.8
21701	8	0134:28	90.0
21715	9	0138:59	91.2
21729	10	0000:19	66.5
21742	11	0004:50	67.7
21756	12	0009:21	68.8
21770	13	0013:52	70.0
21784	14	0018:23	71.2
21798	15	0022:55	72.3
21812	16	0027:26	73.5
21826	17	0031:57	74.6
21840	18	0036:28	75.8
21854	19	0040:59	77.0
21868	20	0045:30	78.1
21882	21	0050:01	79.3
21896	22	0054:32	80.4
21910	23	0059:03	81.6
21924	24	0103:34	82.8
21938	25	0108:05	83.9
21952	26	0112:36	85.1
21966	27	0117:07	86.2
21980	28	0121:38	87.4
21994	29	0126:09	88.6
22008	30	0130:40	89.7

### OSCAR 8 Orbital Information for July

Orbit #	Date	Time (GMT)	Eq. Crossing (Degrees West)
22022	1	0135:11	90.9
22036	2	0139:42	92.0
22049	3	0001:03	67.4
22063	4	0005:34	68.6
22077	5	0010:05	69.7
22091	6	0014:36	70.9
22105	7	0019:07	72.0
22119	8	0023:38	73.2
22133	9	0028:09	74.4
22147	10	0032:40	75.5
22161	11	0037:11	76.7
22175	12	0041:42	77.8
22189	13	0046:13	79.0
22203	14	0050:44	80.2
22217	15	0055:15	81.3
22231	16	0059:46	82.5
22245	17	0104:17	83.6
22259	18	0108:48	84.8
22273	19	0113:19	86.0
22287	20	0117:50	87.1
22301	21	0122:21	88.3
22315	22	0126:52	89.4
22329	23	0131:24	90.6
22343	24	0135:55	91.8
22357	25	0140:26	92.9
22370	26	0001:46	68.3
22384	27	0006:17	69.5
22398	28	0010:48	70.6
22412	29	0015:19	71.8
22426	30	0019:50	72.9
22440	31	0024:21	74.1

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# FUN!

John Edwards KI2U  
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Glendale NY 11385

## LOGIC PUZZLES

Recently, on a day when 15 meters was dead and I had nothing else to do, I pulled out my Dover Books catalogue and began thumbing through its pages. For those of you not acquainted with this firm, Dover is a company specializing in all types of quality paperback reprints priced from about one to five bucks. Within the pages of their catalogue, you can find books on subjects ranging from dying cloth with crushed insects, to the complete engravings of Albrecht Dürer. They also have a selection of old-fashioned postcards that can be made into fantastic QSLs.

At any rate, I'm plowing my way through this catalog and what should I see listed but a book by Hiram Percy Maxim. Yes, *the Hiram Percy Maxim*. As I mentioned in a column back in 1980, among HPM's many accomplishments was an autobiography entitled *A Genius in the Family* (later made into the 1946 movie *So Goes My Love*, starring Don Ameche and Myrna Loy). Well, it seems that Dover has dusted off this mighty tome and is offering it to an anxious public for the tantalizing sum of \$1.50.

If you're interested in ordering a copy (and should any *real* ham be without one?), you'll find it on page 52 of the 1981-82 catalogue listed between *The Handbook of Pictorial Symbols* and *Obedience Training For Your Dog*. To order, write to Dover Publications, 180 Varick Street (slightly south of the FCC), New York NY 10014, and ask for book 20948-2. Be sure to add 70¢ for handling. I can hardly wait to see the faces on the people at Dover when they suddenly get a few hundred requests for a book by Hiram Percy Maxim.

Last January's logic puzzle in the Reader's Corner seems to have struck a responsive chord. In fact, since the puzzle appeared, I've received over two dozen letters asking for more problems devoted to logic and reasoning. Since FUN! always aims to please its readers, this month we're dedicating the entire column to logic games. These puzzles are by far some of the most complex riddles ever published in FUN!, so be sure to keep a glass of ice water or some other suitable refreshment nearby. We don't want to burn out any brains.

### ELEMENT 1—THE REPEATER COUNCIL

The Northern South Dakota Repeater Council has a highly involved system of repeater group representation. According to the rules of the council, each repeater is represented by four members, but because of overlapping repeater club memberships the following complications exist:

- Each person on the council is simultaneously the representative of two different repeater groups.
- Every pair of repeater clubs has one representative in common.

In this maze of conflicting allegiances, the NSDRC accomplishes little in the way of frequency coordination, which isn't unusual for a group of this sort. Nevertheless, the council's organization presents an interesting puzzle, which is: *How many repeater clubs are represented on the NSDRC and what are the total number of representatives?*

### ELEMENT 2—THE JAMMER

A recent murder case involved the homicide of an alleged repeater jammer. In one order or another, six hams, Walt, Jimmy, John, Bob, Nat, and Harvey, were the victim, the murderer, the witness, the policeman, the judge, and the hangman. Here are the facts of the case: The victim had died instantly from the effect of a close-range gunshot wound. The witness did not see the crime committed, but testi-

fied to hearing an altercation followed by a shot. After a lengthy trial, the murderer was convicted, sentenced to death, and hanged.

- Nat knew both the victim and the murderer.
- In court, the judge asked Walt to give his account of the shooting.
- Harvey was the last of the six to see Jimmy alive.
- The policeman testified that he picked up John near the place where the body was found.
- Bob and Harvey never met.

*What role did each ham play in this tragic story?*

### ELEMENT 3—DXCC COUPLES

Many husbands and wives are avid DXers. One afternoon, Stan, Frank, and Joe, along with their wives, whose names in random order are: Susan, Wilma, and Diane, got together to compare their DXCC totals.

- Diane, Wilma, Susan, and Frank have 206, 202, 200, and 194 countries respectively.
- Stan and Joe have 198 and 196 countries, but for some time they couldn't tell who had made which since they both had bad memories and lost their copy of QST.
- When the fellows finally found the QST, it turned out that two of the couples had the same total.
- Frank's wife has more countries than Stan's wife.

*What is the name of each man's wife, and how many countries do Stan and Joe have confirmed?*

### ELEMENT 4—CENSORED MULTIPLICATION

The following example of multiplication has been attacked by the "Math Censor." He's taken most of the digits in this problem and replaced them with x's. It's up to you to restore the problem to its correct form. (Note: The 4s, 5s, and 6s remaining are not necessarily the only digits of those values in the example.)

$$\begin{array}{r}
 6 \times x \\
 \times x x \\
 \hline
 x x x \\
 \times x x x \\
 \hline
 x x x x \\
 \times 5 \times 5 \\
 \hline
 x \times 5 \times 4 \times
 \end{array}$$

*Uncensor those digits!*

### ELEMENT 5—THE ORGANIZATION

Six hams: John, Mary, Carl, Stan, Harry, and Dick, are the only people interested in running for the offices of president, first vice president, and general manager of a certain national organization.

- John won't be an officer unless Harry is president.
- Mary won't serve if she outranks Carl.
- Mary won't serve with Dick under any conditions.
- Carl won't serve with both Harry and Dick.
- Carl won't serve if Dick is president or Mary is general manager.
- Stan won't serve with Carl or Harry unless he outranks them.
- Harry won't be first vice president.
- Harry won't be general manager if Stan is an officer.
- Harry won't serve with John unless Dick serves too.
- Dick won't serve unless either he or Carl is president.

*How can the three offices be filled?*

### THE ANSWERS

*Element 1:*

There are ten persons representing five repeater groups.

*Element 2:*

Walt was the policeman, Jimmy the murderer, John the witness, Bob the victim, Nat the judge, and Harvey the hangman.



**Element 3:**

Stan is married to Diane, Frank is married to Wilma, and Joe is wed to Susan. Stan has 198 countries and Joe 196.

**Element 4:**

```

      6 4 5
      7 2 1
      ---
      6 4 5
    1 2 9 0
  4 5 1 5
  ---
  4 6 5 0 4 5

```

**Element 5:**

Carl is the president, Mary the first vice president, and Harry the general manager.

**SCORING**

**Element 1:**

Twenty points.

**Element 2:**

Twenty points.

**Element 3:**

Twenty points.

**Element 4:**

Twenty points.

**Element 5:**

Twenty points.

Let's get logical.

1-20 points—Scatterbrain.

21-40 points—Utterly confused.

41-60 points—Room temperature IQ.

61-80 points—Computer-like.

81-100 points—Mr. Spock.

The following amateurs were missing from last month's list of those solving January's Reader's Corner. *Found 1 solution:* Ed Larose KS5V, John Hufschmid KI9J, Bob Kendall VE4ZH, and Marien Kendall XYL-VE4ZH.

# DX

Chod Harris VP2ML  
Box 4881  
Santa Rosa CA 95402

## COMBATting THE SUMMER DOLDRUMS

Doldrums. A state of inactivity, stagnation, or slump; a spell of listlessness. What the bands do in the summer. The pits. What do the enthusiasts of the various bands do during the summer doldrums?

The high level of atmospheric noise (QRN) ruins the lower frequencies for most DX. The 160-meter specialist disconnects the rig and spends the summer nights sleeping, dreaming of living on a mountain of copper plate. His days are filled designing the perfect ground and wondering if his neighbors

will notice those copper wires in their swimming pools.

The 80-meter enthusiast splits his time between repairing winter-damaged wire antennas and checking the noisy sunrise and sunset openings for some other masochistic DXer. The pickings on the band are poor. There are too many leaves on the trees to shoot the arrow through the branches and haul the antenna up anyway. Maybe there's a baseball game on the tube.

The 40-meter DXer paces off his imaginary 2-element monobander in the back yard for the fifteenth time. No matter where

he places the tower, the elements will hang over his neighbor's yard. That neighbor, of course... is the one who has never been very friendly since that incident with the TV set. It looks like another season with the inverted vee. Maybe a reflector element hung between that light post and the fence...

Twenty meters stays open, after a fashion, all summer. The high absorption and occasional-

ly high noise level combine with amateurs pushed down from the higher bands so conditions are hectic. But it is possible to make contacts outside your continent. Antenna work can wait until the winter proves that the beam really is too big and blows it over.

Fifteen meters flashes with occasional excitement; it's probably the best band to watch carefully during the month. The



The Catholic church overlooking Main Street, Easter Island. Antennas mark CE0AE.



Father Dave Reddy, O.F.M., CE0AE. The Chilean flag has flown over Father Dave for years.





CE0AE as most of the amateur population sees (hears?) him. Father Dave's 5BWAS sits above the list of countries needed, the latter always at hand.

band opens toward the sun in the morning, often very rapidly. The most distant stations fade rapidly as the MUF climbs, but the shorter path DX stays strong for hours. The sunrise and sunset hours at the DX location remain the best bets.

Ten meters suffers badly from the summer doldrums. But the changeable ionosphere does give the band a little pizzazz once in a while. 15 meters provides a good predictor of 10-meter band openings. As 15 meters shortens up (the more distant stations lose signal strength, the closer stations improve), 10 might be opening in that direction. A rapid shortening of 15 suggests tuning to 10 and trying a few CQs. The first few stations on the newly opening band get the best DX.

Six-meter fans are finding F2 propagation scarce, but the always-exciting E-skip keeps the summer interesting. Solar flares liven the band a couple of times during the summer, but the real excitement awaits the return of shorter days.

DX activity and the overall level of effectiveness of the bands do indeed drop during the middle of the summer. The increase in solar radiation during the longer days increases the absorptive properties of the ionosphere much more than the refractive ones. The signals aren't escaping into space as they do when the maximum usable frequency is low. Our radio waves are being absorbed by the same ionosphere which permits long-distance communications in the first place.

But a few bright spots shine through the murky bands. The declining sunspot cycle flashes

with a fickleness which strikes terror in many a propagation forecaster. A sudden solar flare can produce the most incredible long-path openings one night, and drive the absorption so high the next day that you can't work across the block. But favorable conditions as the flare just starts make up for the crummy conditions the next day or two.

Take advantage of these transient gifts to the dedicated DXer by checking the bands at least twice a day. Monitor WWV on a couple of different frequencies, if possible, until you can tell when conditions are a little strange, a little wilder than normal. Try some of those long-path directions and times. Most superb band conditions pass unexploited because "everyone knows the band isn't open then!"

Another encouraging aspect of the summer doldrums is the occasional cool breeze of good conditions. The level of absorption varies daily and frequently drops low enough to permit some good DXing. Again, daily or twice daily monitoring and occasional transmitting ensure catching these openings.

But during these months of perfect weather, between the occasional flashes of real excitement on the bands, this writer's attention begins to wander. I start to think how some of the South American amateurs are contending with the winter storms, amateurs such as our 73 profile: CE0AE.

When a visitor walks slowly up the wide, dusty main street, he looks toward the church square, drawing attention from the crumbling walls and rust-

stained roof of the church itself.

But what is that sticking up above the roof of the church? It looks like... it is! A multiband vertical, with radials strung out just over the roof line. An RG-58 feedline runs off the back of the church and crosses over a long-neglected garden to a tiny house, overrun with vines and cats. A garden gate hangs from a strap of rubber tire under a collapsing grape arbor. The person who lives here has interests other than gardening.

Indeed, a telltale crackle from the window on your right hints at the avocation of the long-time resident: That smooth CW radiates from the fist of Father Dave CE0AE, on Easter Island, in the Pacific.

Father Dave Reddy, O.F.M., landed on this remote rock, thousands of miles from any other inhabited land, on the recommendation of Father Sebastian, the former Catholic priest of Easter Island. Father Sebastian, widely recognized as the father of modern archeology on Easter Island, as well as father of his flock, interviewed Father Dave in the United States shortly before the former's death. Soon thereafter, Father Dave embarked on the fulfillment of a longtime dream: operating ham radio from the South Pacific. He left the seminary in Buffalo, New York, where he had been teaching, for Santiago, Chile, to learn Spanish.

His arrival in Chile (the country which controls Easter Island) was untimely. Leftist leader Allende rode to power on the back of anti-American slogans, and Father Dave could not get the necessary permission to assume his role as the spiritual leader of Easter Island.

Although the journey was neither short nor straight, Father Dave did finally arrive on Easter Island, with built-in status as one of the leaders of the tiny island. His predecessors in the role of Pastor of Isla de Pasqua helped forge a nucleus of "Who's Who" on Easter Island along with the Governor, Mayor, and heads of the small military units on the island. Father Dave rapidly forged another reputation as an active and congenial amateur radio operator, CE0AE.

Today, Father Dave welcomes visitors with the same friendly cheer so well known to his on-the-air contacts. His

hearty laugh and ever-present smile and good humor provide a welcome touch of the States in this remote corner of the world. His Long Island twang, which strongly colors his Spanish, betrays his New York heritage. The visitor suspects he welcomes the chance to speak English other than "59 100."

It is hard to say which of the items I brought from the United States Father Dave most appreciated: the spark plugs and replacement gearshift knob for his jeep, the diodes to repair a seldom-used Collins 30L1 amplifier, or the two big jars of chunky peanut butter. I suspect the last. The food on Easter Island is monotonous and expensive, and the passing of the plate at the Sunday service permits few luxuries.

The presence of amateur radio visitors promised another bright spot in the slow life on Easter Island. Father Dave welcomed the assistance of the visiting amateurs in improving his antenna farm, heavily damaged by the storms which sweep in from the northwest. Spare parts and tower-climbing ability are scarce in Easter Island, but the generosity of his amateur visitors and a little help from some passersby left CE0AE with a credible set of skyhooks.

Father Dave divides his time on the Isla de Pasqua between his church, DXing, and his Boy Scout troop, one of two on Easter Island. On Chile's Constitution Day, he organized the Scouts into the parade, then raced to join the other island authorities in the viewing stand. The Scouts themselves quickly joined the viewers at the side of the parade route as soon as they passed the viewing stand. There simply aren't enough people on the entire island to both have a parade and have people watching it. Everyone serves double duty.

A good time to work CE0AE is during a contest. He lets few pass without at least a few contacts. He claims a *laissez faire* attitude toward amateur radio contests, but his actions suggest a more positive attitude toward their periodic madness. When his 10-meter signal appeared to be interfering with the public address system in his neighboring church, Father Dave would hear none of any suggestion that the visiting amateur curtail operations during



the Sunday service. "Nonsense! You go right ahead and operate. I'll turn off the church mike and talk louder." And he did!

While Father Dave often can be found in contests, he admits he prefers DXing to contesting. Easter Island lies south of the tropics, and the band conditions are not as uniformly superb as in the West Indies or other more northerly islands in the Pacific. So band openings to the heavy amateur concentrations in the Northern Hemisphere are shorter and not as strong as those enjoyed by his competition in the tropics. And the absolute lack of any local contacts makes serious contesting difficult. Easter Island is no place to go to win an amateur radio contest, despite the extra 20 dB the CE0 callsign imparts.

"Besides," Father Dave reminds his visitors, "Sunday is my busiest day."

Father Dave shows some of the signs of the hard-core DXer: His greatest fear is that he won't get on the Honor Roll before Easter Island loses its status as a separate country.

Easter Island no longer a separate country for DXCC? Father Dave explains, "Continental drift is sweeping Easter Island toward mainland Chile at the rate of 2 inches per year. We'll

be within 225 miles of Chile and lose our status as a separate country in only 70 million years. I hope I can work the last 47 countries I need before then."

How can you increase your chances of working Father Dave next time he shows up on 15 meters? Maybe you should review the phonetics for your callsign.

### CHOOSING YOUR PHONETICS

(This part of the column is for phone operators only; we'll get to the CW crowd in another column.) Proper choice of phonetics can spell the difference between success and failure in DX pileups. How do you choose the most effective phonetics for your callsign?

Think about why you use phonetics: The purpose is to reduce ambiguity. So many letters sound the same in the English language: b, d, e, t, p, g, c, v, z. Even under perfect conditions, most DX stations confuse state-side calls. In the confusion of a typical phone pileup, these letters are impossible to tell apart. So you turn to phonetics.

You want the DX station to recognize (and come back to) your callsign, and hopefully before he comes back to someone else's. So your phonetic callsign should be unique, it should reduce confusion, and it should be

easy to copy through the pileup. Does your phonetic call meet these objectives?

### THE CHOICES

The first place to look for phonetics is the standard list found in any amateur radio handbook or training manual. This standard list is remarkably good, but it does have a few problems for DXers. One example: After making thousands of contacts as WA1SQB, I would like to personally throttle the idiot who picked "sierra" for S. Sierra is C. I still hear sierra and write C. "Sugar" gets through as well as sierra, without the ambiguity.

Short phonetics punch through pileups faster than long ones. The amateur who uses short, punchy phonetics can get his call in twice as often as the ham who uses longer ones. Guess who works more DX? "Fox" is vastly preferable to "Florida." And the DX station can fall asleep or, worse, work someone else, while I struggle with "Washington American One Santiago Quebec Bolivia Portable Victoria Portugal Nine."

Which brings us to another possible source of phonetics—place names. Place names make long phonetics, usually

too long for pileup situations. But they can be used to good advantage in poorer conditions or to confirm a callsign. All place names share a common disadvantage as phonetics, however. Upon occasion they cause more confusion than they eliminate! Witness my callsign above, and the DX station answers, "The station in Bolivia, stand by. The Portuguese station, go ahead!"

One well known contester turned this problem into an advantage. WA1KID would often break through pileups with "WA1KIDelaware." Ethical DXers frown on such use of deceptive phonetics, however, and you will quickly find this practice leads to more harm than good.

A final hunting ground for possible phonetics: "cute" or catchy phonetics. Such as Black White Yellow, or Whiskey One No Good. Or the famous Cute Enema Seashore. Topical phonetics fall into this same category. When the race horse Seattle Slew won the Triple Crown of racing, K7SS tried Seattle Slew for phonetics.

How do you choose the best phonetic from this assortment? We'll examine how you "fine-tune" your individual phonetic for your voice and station next month.

## LETTERS

### THE LAST TRAGEDY

Shortly after the article "The Father of FM" (February, 1982) appeared, I thought I'd look-see for myself. Perhaps a few pictures would be in order. Sure would be nice to add to the club history (the Major Armstrong Memorial Radio Club, Alpine, NJ, on the site of the tower described in his later experiments). Several passes were made to find the location, and at last I found it hiding ingloriously behind a huge apartment, the number, 1032, hidden under many coats of paint and hard to distinguish.

There above me on the hill to the east she stood, empty, burned, and blackened, overgrown with weeds and unattended flora, alone, abandoned, ut-

terly destroyed. Though windows below were boarded, the door swung freely in the winter wind; a foreboding feeling crept over me as I entered.

Local youths, it appeared, had added their mark to the already sickening sight. Fearfully I entered, as one would an unknown tomb, feeling the evil of such a deed. Slowly, I climbed to the room where it all began, up the main stairs which, under the paint removed by the heat, showed a lovely balustrade—the kind so many are now restoring back to the way they used to be.

If only it had had a chance, it too could have been restored as have been the homes of many of America's lesser heroes, but the shame of the Bronx has reached a few miles north into Yonkers.

There before me was the room—the one with the three windows—where it began. The sounds of those words rang in my head and lifted up into the sky above. Open into the

universe. Another tragedy in the tale of Major Armstrong unfolded before me and you.

And so the last tragedy in the life of Major E. H. Armstrong passed one cold December 16,



1032 Warburton Ave., Yonkers, at present. For "then," see p. 51 of the February, 1982, issue.



1981, shortly after 8:00 am, carried by the heat and smoke into eternity.

God bless his memory.

**Art Bonte W2ZYC**  
New Milford NJ

#### SIX-METER NETS IN DC

The Metropolitan Communications Network Radio Club of the greater Washington (DC) area operated a repeater on six meters (52.250 MHz in; 53.250 MHz out). We would like to have repeater clubs operating six meters anywhere along the eastern seaboard contact us to establish some linkage and exchange experiences. The six-meter FM net meets Saturday at 1900 hours local time. We also have a six-meter AM net which meets Sundays at 0900 hours local time on 50.4 MHz. Sunday at 1900 hours local time we have a six-meter sideband net which meets on 50.125 MHz.

**Robert Sporn WA3GGO**  
Corresponding Secretary  
9927 Cottrell Terrace  
Silver Spring MD 20903

#### WRITE FOR RIGHT HAMS

As a regular reader of your excellent publication, I enjoy reading your often-controversial editorial comments and the letters page, but I have now been forced to write on behalf of the large number of amateurs outside the US without whom there would be no DX. It seems that all your comments do not take any account of the very important international-contact part of our great hobby. Please bear in mind that you are no more a representative of the radio amateurs than is the editor of the *Washington Post* or the *London Times* of their respective readerships, and please take us DX operators into account.

I would also like to comment on some aspects raised in your issue of March, 1982. Concerning your promotion of a no-Morse license, I am definitely against this, especially as we in Britain have had a no-Morse VHF license for some years. As I operate both in the US and at home on both the VHF and HF bands, I have noted that despite the much larger number of US amateurs, you have a much smaller proportion of lids. Have you ever listened to the London

repeaters? Also, the operating standards of US amateurs to me are much higher than the average, especially on CW. I am sure that this difference is a result of your Novice system, that I would like to see copied in the UK.

This brings me to my next subject of emergency communications, although nobody can fault your suggestion for a national data network (international?) for traffic handling. I believe that once main power supplies have gone, as they certainly will in a conflict, we will be back to CW. I believe that we should propagate some return to basic, but modern, technology in amateur radio coupled with CW operating so that in the final emergency we amateurs can salvage some communications from the remains.

**Andy Hewitt G3SVD/W4**  
Thatcham, Berkshire, England

*I can see you've never tried our repeaters in New York or Los Angeles. I monitor the London repeaters when I'm there...no comparison to the antics we are able to generate. Andy, where are we going to get all those CW rigs? Most of the SSB and FM ham gear these days can operate from a car battery as well as the mains. A large part of the emergency gear is mobile and hand-held equipment anyway. I can just see us all sitting there with a hand key sending messages via our handle-talkies. Perhaps some forward-looking firm will come out with a hand-key kit to provide keys which will screw on to our HTs in case of emergency need. We could even have the code printed on it for those of use who have forgotten the code.—Wayne.*

#### A RIGHT HAM WRITES

I think that you ought to write a couple of things about Novices. I'm 12 years old and I'm a Novice. I see a lot of articles on things pertaining to General class hams but nothing about us Novices. Thanks for your time. I think your magazine is great!

**Eric Farwell EF2XJI**  
Miami FL

*Eric F., you are absolutely right! Let's see some more articles to help our Novices understand more of what is going on. We need to get them interested in simple antennas and how they*

*work, introductions to some of our more exciting activities such as traffic handling, SSTV, ATV, RTTY, certificate hunting, contests, and so on.—Wayne.*

#### NO MORSE A NO NO

I am writing in disagreement with your feelings about CW. Evidently you don't operate CW. I operate CW and enjoy it. I am 14 and was first introduced to ham radio when I was 11. I was attracted to ham radio because of CW; it seemed interesting. I was not scared off by CW when I was a newcomer. I work lots of CW. I do also work SSB and enjoy it, too. CW is *not* (for most) just "the usual garbage of name, location, signal strength..." etc., as you stated in an answer to a letter in the April, 1982, issue. I'm a ragchewer and do mostly that, though I do some DXing and contesting. I don't just give my name, QTH, etc. I talk about my family, the day, school, my future, electronics, etc. CW is fun and rewarding. CW is the root of ham radio. CW is what makes ham radio special. I am completely against "no-code" licenses; the last thing I want to hear is ham radio sounding like the Chicken Band (CB). So my conclusion is that CW is fun and thoughts are expressed on CW.

**Eric Lassiter KA4KEG**  
Danville VA

*Hey, Eric L., I'm glad you've found some chaps on CW who will give you more than the usual dull routine. That's great! Not that I can in any way single out CW for that crime. It's all too prevalent on our repeaters, and certainly not unknown on our DX bands. And I don't know of anyone who wants to have our ham bands sounding even more like CB than they do, so stop fretting about that. Perhaps I put more trust in the intelligence it takes to understand radio theory than I do in the skill it takes to copy code. I do know that you would be hard put to point out any of the more serious offenders on our bands as being good technicians. I tend to gravitate more toward hams with technical backgrounds, and to find them the most sincere and fascinating of all hams.—Wayne.*

#### NO CODE A YES YES

Sir, I sincerely applaud you for your editorial in the March, 1982,

*73 Magazine.* I find your logic in a no-code ham ticket as being beyond reproach and agree wholeheartedly with your comments. Do not give up on this, as you will prevail.

One of the most frustrating experiences I have had has been wanting to get a ham license and to do experimentation in communications. As a result of this frustration, I turned to CB radio. Most everyone knows there is a problem on 11 meters, but fads have a way of fading away, leaving only those that are sincere. The only drawbacks in my getting into ham were two items, one a myth and the other what now should be a legend, to wit: you had to spend a lot of money on equipment, and code. As has been evidenced, you can get on the air in a respectable manner without having to sell the wife and kids.

The other item, code, is rhetoric used by the elitists to keep it all to themselves.

Selfish and unconcerned as to the future of ham radio: "I had to do it, so should you," attitudes. If we were to use the logic many hams profess, we'd still be in knickers until manhood, women would not be able to vote (hmmm), and we would have legal slaves. Trying to keep code as a requirement is analogous to keeping a person on a respirator who has suffered "brain death."

I cannot for the life of me find any logic in the license requirements for code. 5 wpm, Novice, CW only; Technician, CW and phone on some VHF; 13 wpm for General and Advanced for... phone privileges? Like putting the cart before the horse, bass backwards. In any case, code should be like blacksmithing, an art of an outdated requirement. Those who want it, do it; those who don't, won't. Code, like saving string, serves no useful purpose but you keep hanging on to it.

We need technical innovations and experimentation by those who sincerely want it while, on the other hand, providing a hobby to many. I am trying to get our local Community College to carry a non-credit course in the aspects of ham technology. So far no luck, but I will continue to try. I feel that we as Americans need to recapture the reputation for being leaders in technological advancements rather than also-rans. To do this,



we must take down our self-imposed barriers and "motivate, not frustrate" (a good anti-code slogan) new blood into ham.

I'll learn the code in order to upgrade, but I will then drop it like a bad habit. I guess that means some people will label me as a lid or other terms they put on those who want to move forward, not stay in the past. If people would sit down and unemotionally analyze the no-code proposals, using reality, and not negatively speculate on what would happen, only positive things could come about. For those who cannot follow the rules and regulations as set down, what we need is stronger enforcement of the rules, not outdated requirements such as code.

FCC has its heart and hands full in light of the budget cuts, etc. It needs help in enforcement of the rules. This could be accomplished by the use of hams themselves. Testing could be done on a local level by a group or club of hams. In my case, I would have to go to Long Beach, California, to upgrade. This would cause me to miss two days of work. Or, glory be, I could wait to see if the field office will have enough money to make a trip maybe 2-3 times a year to come to where I live.

Using local hams to upgrade future hams would also instill pride. It wouldn't take long to find out which groups are upgrading really qualified hams, as the proof is in the pudding. Nothing wrong in taking pride in knowing that your pupils have been properly supervised, instructed, and motivated in the correct methods and knowledge. However, the clout is in the hands of the diehards who insist on being outdated in putting political pressures on those who can change the code requirement. Until these "chosen" pass away to that great shack in the sky, I am afraid that the code will remain, regrettably.

There are so many positive aspects to dropping the code; if only those who wish to hold on to the past would take a *positive* view. Let's move ahead and become the leaders of advancements, not the sleeping giants that we are.

**Frank J. Ward KA7LXT  
Tempe AZ**

*Troublemaker.—Wayne.*

## HANG HI OL' YAGI

Even I can remember the time when one needed a yagi or a quad to work DX, the thrill of breaking a pileup, the sophistication of dual vfo's, tail-ending, and all the rest of that good stuff. To the new breed of ham, this sounds like weird talk indeed. The new DXer thinks you're out of the band when he hears about stacking five-over-five on a 180-foot tower. Who needs it? And he's right! These tales of working DX with yagis and amplifiers sound like echoes of the past, like the mumblings of bearded Honor Rollers about the gud ol' days. The new DXer knows where it's at. . .you won't find him staying up half the night in the hope of catching a rare one while the rest of the world sleeps. He's not going to spend hours calling CQDX in the hope of finding a rare bird. Hell no, he'll tune in to a DX net, of which there are now more than thirty. He'll get in line and work the rare ones without any fuss. "Like a telephone call," says one list-taker. "No cuss'n and scream'n."

We old goats have been taken in by the manufacturers, i.e., we were told it was necessary to have a beam and an amplifier if one wanted to be a successful DXer. Well, it took me five years to discover that all one needs today is a worry-free dipole and a barefoot transceiver and you can work the world.

Like an archaeological relic, a dinosaur crying out for a mate, I called CQDX today for twenty minutes on 15 meters and nothing came back. There I was with a fortune tied up in amplifiers and towers, yagis at 150 feet, and two-inch heliax. Nothing came back, so I spun up the band and there they were, twelve of them, all 5 and 9, and all semi-rare: D68, ZD7, EA8, EA9, 7Q7, 3V8, JW, and more, all sitting like clay ducks in a shooting gallery. One after another they came back to the squeaky off-frequency signals with 4 and 3 reports. (The callsigns were handed out by the control station to the DX station. Reason: speed and efficiency, of course, of course!) And what's more, everybody was happy. The gud ol' list takers stood by for the indoor dipoles and verticals. Only one guy failed to get his report, and

he was using a mag-mounted Hustler whip on his rig in the basement. . .he said he would wait for propagation. (Gud man!)

We with the mile-high yagis and maximum-limit amplifiers are anachronisms, incongruities at this point of time. Down will come those relics of the past and up will go the trouble-free dipole or vertical, and out will go the amplifier. That stuff belongs with chrome-laden, 6-litre guzzler automobiles and 25-cent-a-gallon gas. Get with it, DXers, you're showing your age! Pileups are on their way out, the way individuality is out and organization is in. CU on the lists.

**Don Newlands VE3HGN  
Colborne, Ontario, Canada**

*You don't have to be an old-timer to remember the days when men were men and the endorsement sticker belonged to the strong and the quick. But now the demand for DX is way ahead of supply. A DL can raise a huge 10-meter pileup on a weekday afternoon. Rare ones who prefer to avoid the melee turn to lists. What to do? Try contesting, where the big station is worth the trouble. There's still a place for your 8877s, Don.—WB8BTH.*

## IT DOESN'T COMPUTE

The basic reason for not renewing my subscription to *73 Magazine* is because I feel that Wayne Green is using it to further the use of computers and associated software for communications between hams. This, I feel, reduces the human touch involved in everyday hamming. Taking away the personality of the ham and replacing it with machinery will indeed make everyone bored with the hobby. This leads to reduced growth, which is the opposite of that which Wayne is trying to achieve.

We do need growth in our hamming hobby. This will not be denied. But to substitute computers for the personal touch is not going to hack it. Contesters, DX hunters, county hunters, and rag-chewers thrive on the personal satisfaction that comes from doing it themselves. From learning a new language—Morse code—to building their own projects, no matter how simple or complex, each and

every ham has his goal within sight and obtainable. It only depends on his ability and determination to do so.

Wayne professes that involvement with computers will revolutionize the hobby. He is absolutely correct. It will do what he wants. It will have hams all over the world making contests no more complicated than picking up the phone and dialing across the states. If that's what hams want, then why are they spending their money on better antennas, higher towers, new radios, or any other gadget that they think will make their contacts better or stronger than anyone else's? Why don't they spend it on computers and software and take all the grief out of hamming?

Computer hamming will eliminate personal satisfaction, which will in turn eliminate the desire to be an amateur radio operator.

**Jim Ory WD9ATJ  
Plainfield IL**

*By golly, Jim, you are probably right! We just may be able to make it so amateur radio can be enjoyed by people who haven't the kilobucks to put up monster beams and run 10,000 Watts, as you seem to prefer. We might even be able to cut back on those fun pileups which have chased most of the DX operators off the air from rare countries. But just maybe the nuts who think a new country is worth getting killed for can be silenced off into ever more complex automatic country working, thus leaving the bands more open for getting to really know some of the DX operators. You know, the FCC was opposed to letting computers into amateur radio, too. It apparently never occurred to them that, like a typewriter or a Teletype® machine, there has to be an operator. . .a live person. . .behind each computer. The computer is just another means of communicating, little different from CW, RTTY, and so on. It turned out that the FCC chaps had virtually no understanding of the situation and were acting normally. . .fighting any efforts by hams to experiment and perhaps provide the world with some progress. Obviously, Jim, you've managed to arrive at your convictions without taking the time to ask anyone involved with*



computers about the real skinny. Find out what you are talking about first...then think it over...then, and only then, go on record. Remember, Jim, that when I write something I know I will be faced with about 200,000 skeptics, each one more interested in blowing a hole in my reasoning than in agreeing with me...so I have to be darned sure I have the background to know what I am writing about. Jim, I'm ready to stand up in front of any assemblage of hams and discuss Morse code, its pros and cons. I've been at that for some thirty years now...and, as I've said, it has been quite a few years since I've heard anything new. Jim, you haven't the slightest idea of what computers may do to hamming since you haven't tried them...and apparently don't know anyone who has.—Wayne.

### THE GREAT GRATER

So Wayne the Grate (just a small pun) has again taken up the Holy Grail, this time in the

form of abolishing the code requirements for ham licenses.

I admire you for the courage of your convictions, Wayne, but there are more than a few of us out here who have strong objections to a no-code license, myself included.

I am a newer ham (since 1977), an electronics engineering technician, own my own personal computer, and am an active member of the Tucson Amateur Packet Radio Club. I only say this in order to dispel any idea that I am of the "fraternity" that dislikes the introduction of new technology into ham radio.

When I received my ham license in the mail, I felt something that I'm sure no CBER has felt when his permit arrived. That feeling is a sense of accomplishment. I earned this license, and it is that feeling that binds me together along with the majority of other hams. A "cut above," if you will. The day that bond is gone is the day that the Amateur Radio Service ceases to exist. All remaining motivating factors will be self-

centered, and no longer will hams work for the "good of amateur radio."

But that is not why I write this letter. I enjoy your magazine very much, Wayne, but a couple of things disturb me. First of all, your "Holy Grail" editorials tend a bit toward ranting and raving. That can't be good for the blood pressure or the digestion. I also have noticed that your replies to the letters protesting your editorial views are usually longer than the letters themselves. My psychologist friend has some interesting things to say about that. In short, take it easy, Wayne. This would be a pretty dull hobby sometimes if it were not for cage-rattlers like you, so try to rattle softer, so that you may rattle longer.

**Dave Barnhart WB7OBG  
Glendale AZ**

*Dave, I enjoyed your letter. But you should understand that no matter how much the cages rattle, I'm sitting here grinning. My blood pressure is fine...I give heart attacks, I don't get 'em. I'm happy that I give the impression*

*that I'm real serious about all this. Oh, I do think that it is high time to dump the code as a means of keeping enthusiasts out of the hobby...and to supplant it with a technical exam which can't be totally thwarted by the Bashes and other cheating systems. If you read the license study manuals I put out, you'll see what I think is best...simple theory explanations which anyone can understand. Fortunately, I have reason and psychology on my side...and just an interest in getting things improved, not an overwhelming zeal. Zealots are not open to alternative ideas and get all emotionally involved in what they are doing. Oh, I don't expect Morse code to get dumped quickly...perhaps some experiments with this on 220 MHz, as I proposed to the FCC about thirteen years ago, to see if we can make the change from a filter of a very slight skill (code) to a not-much-more-difficult technical test...without the universal cheating via Bash. My letter answers are long, at times, so I can clarify misconceptions.—Wayne.*

## CONTESTS

Robert Baker WB2GFE  
15 Windsor Dr.  
Atco NJ 08004

**JEFFERSON DAVIS DAY  
QSO PARTY**  
Contest Period:  
1500 to 2400 GMT June 5

The Pennyroyal Amateur Radio Society is offering attractive certificates for contacts made during this year's annual event. Suggested frequencies are 3730, 3940, 7260, 14310, 21410, and 28610. Requests for certificates or more information should be addressed to Pennyroyal Amateur Radio Society, PO Box 1077, Hopkinsville KY 42240.

**WORLDWIDE SOUTH  
AMERICA CW CONTEST**  
Starts: 1500 GMT June 12  
Ends: 1500 GMT June 13

Sponsored by *Electronica Popular* magazine of Rio de Janeiro, Brazil, this contest will be held annually on the second

weekend of June. Use all bands from 80 through 10 meters on CW only; crossband contacts are not valid. Only contacts between South American stations and stations on other continents are considered for scoring. A station may be worked only once on each band. Entry classes include single operator/single band or all bands, and multi-operator/single transmitter (multiband only).

#### EXCHANGE:

RST and consecutive QSO number starting with 001.

#### SCORING:

Each QSO counts 2 points. Contacts between South American stations count only as multipliers, not as QSO points. For South American stations, the multiplier is the number of different countries worked on each band. For others, the multiplier is the number of different South American prefixes worked on

each band. The final score is the sum of QSO points multiplied by the sum of multipliers.

#### AWARDS & ENTRIES:

Certificates will be awarded to the three top-scoring stations

in each class and to the top scorer in each country. A separate log for each worked band must be sent no later than July 31st to WWSA Manager, PO Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

## CALENDAR

JUN 5	Jefferson Davis QSO Party
JUN 12-13	ARRL VHF QSO Party
JUN 12-13	Worldwide South America CW Contest
JUN 19-20	Summer SMIRK Party
JUN 26-27	ARRL Field Day
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 21-22	SARTG Worldwide RTTY Contest
AUG 21-22	A5 Magazine FSTV UHF Contest
SEP 11-12	ARRL VHF QSO Party
SEP 11-12	European DX Contest—Phone
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

\* Note date change.



# RESULTS

**73 MAGAZINE  
40-METER SSB CONTEST  
—Claimed Scores—  
(Callsign, QTH, QSOs, Total Contest Score)**

**W/VE Single Operator**

VE5DX	Sask.	972	113,240
W9RE	IN	851	105,148
N3AMK	PA	771	99,180
KK9A	IL	856	87,440
KA1XN	MA	761	63,358

**DX Single Operator**

YU5ANE	Venezuela	359	65,880
CN8CO	Morocco	361	61,008
H44SH	Solomon Is.	291	37,765
LA5YF	Norway	221	32,319
JA2BAY	Japan	205	28,470

**W/VE Multi-Operator**

N9NB	IN	1098	112,965
KD4TQ	KY	972	95,432
VE2ZP	Que.	704	86,355
KJ9D	IN	681	77,868
N4BAA	FL	645	66,392

**DX Multi-Operator**

I4YNO	Italy	672	128,800
I5MPK	Italy	590	107,334

**80-METER SSB CONTEST  
—Claimed Scores—**

**W/VE Single Operator**

KQ2M	NY	510	60,606
N7DF	UT	700	57,642
K0CS	MO	552	51,435
WB2DHY	NY	346	42,510
VE5XK	Sask.	672	42,222

**DX Single Operator**

CN8CO	Morocco	441	67,032
C6ADV	Bahamas	296	21,488
HI8GBG	Dom. Rep.	149	17,052
OK1MSM	Czech.	165	16,640
HI8GB	Dom. Rep.	145	14,484

**W/VE Multi-Operator**

N9NC	IN	793	57,652
VE2ZP	Que.	567	42,387
N4BAA	FL	421	36,480
W4CN	KY	564	35,441
KF2X	NY	413	25,488

**DX Multi-Operator**

I5MPK	Italy	191	22,184
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**40/80-METER COMBINED CONTEST  
—Claimed Scores—**

**W/VE Single Operator**

N7DF	UT	1188	180,040
KC4OV	TN	931	147,686
K8AKY	MI	880	141,885
N8ATR	OH	788	104,967
KC8JH	OH	735	100,250

**DX Single Operator**

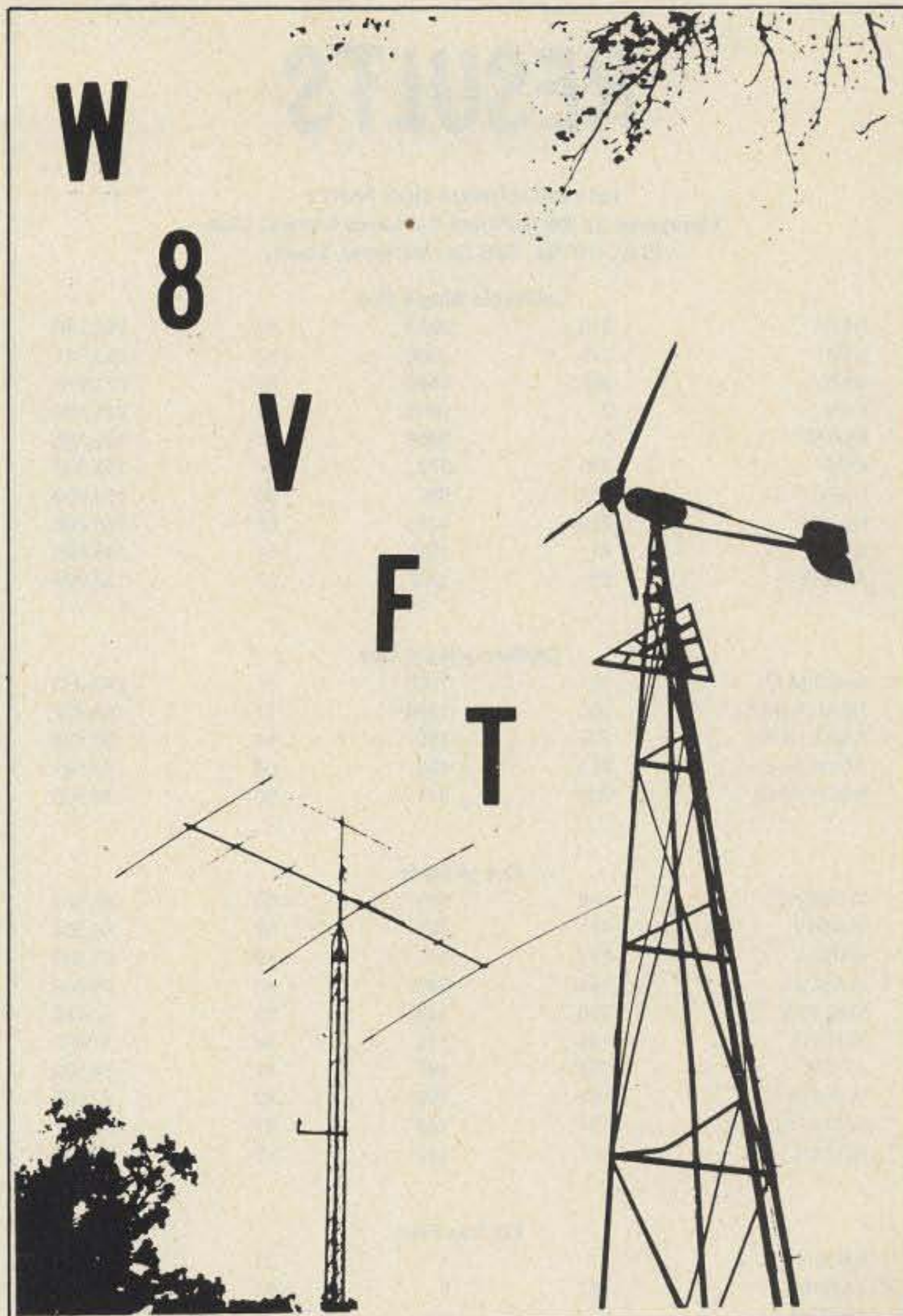
CN8CO	Morocco	802	256,908
H44SH	Solomon Is.	360	71,082
JA1ELY	Japan	196	26,642
VK5BW	Australia	170	17,384
DL8UI	W. Germany	92	8,544

**W/VE Multi-Operator**

N4BAA	FL	1066	205,076
KF2X	NY	978	161,604

**DX Multi-Operator**

VE2ZP	Que.	1271	249,996
I5MPK	Italy	781	234,136



**QSL OF THE MONTH: W8VFT**

Sometimes, the design of a QSL card can capitalize on the unusual aspects of your station. It worked for W8VFT and his wind-powered setup. In fact, as the back of the card explains, W8VFT's entire homestead is powered by the wind generator shown on the card!

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

**SUMMER SMIRK PARTY  
CONTEST**

**Starts: 0000 GMT June 19  
Ends: 2400 GMT June 20**

Sponsored by the Six-Meter International Radio Klub (SMIRK). No crossband contacts, multi-operators, or partial contacts. Check logs or dupe sheets are not needed.

**EXCHANGE:**

SMIRK number and ARRL section, foreign state, province, prefecture, or country. Count ARRL sections in the 48 US states only; KH6 and KL7 count as countries. Washington DC counts as a section as well.

**SCORING:**

Count 2 points for each SMIRK contact, 1 point for non-SMIRK QSOs. Add QSO points and multiply by number of ARRL sections, foreign states, provinces, and countries worked for final score.

**AWARDS:**

Trophies for high-score SMIRK in two divisions: US/Canada and foreign. Certificates for high score in each ARRL section and foreign state, province, prefecture, or country.

**ENTRIES:**

Entries must be submitted on 73 Magazine • June, 1982 105



# RESULTS

1981 CALIFORNIA QSO PARTY  
Sponsored by the Northern California Contest Club  
(Call, CW Qs, SSB Qs, Multiplier, Score)

California Single Ops				
N6TR	310	2063	58	293,248
N6BT	325	1998	57	283,347
N6BV	282	1488	58	221,676
A16V	0	1855	58	215,180
K6HNZ	0	1659	57	189,126
K16O	330	972	57	167,238
N6PE	362	882	56	159,600
N6QW	270	933	58	155,208
AA6G	41	1227	57	146,889
AA6RX	89	1085	57	138,909

California Multi-Ops				
AJ6O(M-M)	151	1908	57	243,333
N6AHA (M-S)	105	1298	57	165,927
K6AA (M-S)	274	455	54	93,528
K6YA (M-M)	259	400	53	83,581
KS6H (M-S)	300	341	50	79,100

Out of State				
WD0EWD	168	501	54	81,324
WA0AVL	171	497	52	78,364
N4BAA	141	312	49	51,303
WA5DJK	154	249	48	46,080
WB5YXK	178	149	45	37,440
W1GNR	189	113	44	34,892
K7GM	156	187	41	34,522
W3HDH	152	166	42	33,096
WA1FCN	131	149	47	32,477
KD4XR	0	342	47	32,148

DX Top Five				
SM3DXC	41	1	33	4,125
JA1OP	46	0	23	3,174
JR7TJP	0	53	26	2,756
PY1NEZ	0	61	20	2,440
LU6EF	19	24	21	2,205

the fall, 1981, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Send

log requests, and entries post-marked by July 11th, to Spencer F. Ritchie KA2MHT/5, 5122 Sagamore, San Antonio TX 78242.



## NEWSLETTER CONTEST WINNER

After a three-month hiatus, I was called upon again to choose a winner for 73's monthly newsletter contest. As usual, I put the task off until the last minute. This time, I was lucky; a "winner" jumped out at me. If you have an opportunity to read this month's choice, *The Log*, published by the Northern Ohio Amateur Radio Society, you'll see why.

The NOARS newsletter is not a one-man show. A rather impressive-looking masthead lists 25 names of officers, editors, and committee chairmen. The theory that many hands, working together, make for a light load applies here. *The Log's* first page is rounded out by "Inside This Issue," a series of vignettes that make you want to turn the page and start reading.

NOARS editors KA8JRI and N8DNA make sure that there is something for everyone. They include reports for award chasers, the contest crowd, DX hounds, traffic handlers, and Novices. An historical series, "In the Beginning," will appeal to all the readers. A more somber *Log* feature is the "Silent Key" section, which incorporates the QSL cards of deceased members as part of a brief memorial.

In addition to their monthly newsletter, NOARS members receive an annual membership roster and a calendar that has the dates for club activities and operating events clearly marked. All this helps to convey the image of a lively, enthusiastic club.—N8RK.

# AWARDS

Bill Gosney KE7C  
Micro-80, Inc.  
2665 North Busby Road  
Oak Harbor WA 98277

## CERTIFICATE HUNTERS CLUB

All awards are issued to both licensed amateurs and SWLs on a heard basis.

Requests for band, mode, and power endorsements must be made at the time of your original application and must be correctly indicated on your log extract.

A verified log should be sent in lieu of QSLs. Have your log

certified by a local radio club official, two licensed amateurs, or a notary public. Copies of your cards will be accepted in lieu of certification.

●WTP—Work The Pacific. The basic award is issued for confirmed contact with at least 30 countries in the Pacific area as set forth by the WTP country list. Gold seal: A gold seal is applied when 50 or more confirmations are achieved. Award application fee is \$3.50 or 12 IRCs; overseas, add \$1.00 or 3 IRCs; gold seal after original application, \$1.00 or 3 IRCs.

●WTC—Work The Caribbean. The basic award is issued for confirmed contact with at least 20 countries in the Caribbean area as set forth by the WTC country list. Gold seal: A gold seal is applied when 30 or more confirmations are achieved. Award application fee is \$3.50 or 12 IRCs; overseas, add \$1.00 or 3 IRCs; gold seal after original application is \$1.00 or 3 IRCs.

●Gold Seal Plaques. If desired, plaques are available for the WTP and WTC award series. When requested at the time of original application, your award is mounted on a walnut-grain 13" x 16" plaque, for \$25.00. (Overseas, add \$7.50 postage/insurance.) When requested after your original application, an engraved 4 x 6

solid walnut plaque denoting your accomplishment is available for \$20.00. (Overseas, add \$3.00 postage/insurance.)

●A-1—Operator's Certificate of Merit. Issued free of cost by the IARS/Certificate Hunters Club to amateurs observed displaying a high level of achievement in various areas of amateur radio. The award is also issued upon receipt of three nominations from three different amateurs in three different geographical locations. So, if you feel that an amateur should receive this honor, get out your pen and give us the details in writing. You do not have to be a member of the club or a holder of the award to nominate.

●County Awards. Issued in multiple classes for the differ-



ent numbers of counties confirmed, in 14 states. GCR apply; fee is \$3.50. The awards measure 8½" x 11" and are printed on a fine parchtone bond. Other county awards will be made available as demand requires.

● 10 K and 20 K Awards. Issued for confirmed contact with 10 or 20 different locations outside the United States operating with a W, K, or N prefix. Award fee is \$2.00 and band and mode endorsements are available.

● Work A-1s. Requires applicant to work A-1 operator certificate holders of any radio organizations issued for WAC, WAZ, WAS, WPX and DX(CC). All rules are the same as they are for the regular award. Award fee is \$2.00 and band and mode endorsements are available.

For applications and additional information, send an SASE to the CHC Manager, Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

#### WORKED ALL VE

Sponsored by the Nortown Amateur Radio Club of Willowdale, Ontario, the WVE Award requires the applicant to work two different stations on two different bands in the eight sections, VE1 through VE8. All contacts must have been made from an area within a radius of 150 miles of one point on and after January 1, 1939.

A sworn affidavit and certification by a local radio club official must accompany your application. Also, be sure to send all sixteen QSL cards, two from each section, along with \$1.00 and sufficient return postage for the return of your cards. Address your application to the Nortown Amateur Radio Club, Box 146, Station A, Willowdale, Ontario, Canada M2N 5S8.

The Nortown organization also sponsors the WACAN (Worked All Canada) Award. Here the applicant must work two different stations on two different bands in each of the following twelve areas: VE1 (PEI), VE1 (NS), VE2, VE3, VE4, VE5, VE6, VE7, VY1 or VE8, VO1, and VO2.

All contacts must have been made on or after January 1, 1949, and a 150-mile rule applies, as mentioned for the WVE Award.

Send your list of contacts and QSL cards, with \$1.00 and sufficient funds for the return of your

confirmation cards, to the Nortown ARC.

#### TRANS-CANADA AWARD

The Canadian DX Association writes to tell us about their very beautiful award. To qualify, you must work each of the eight VE call areas, with five contacts in each area. In addition to that, another five stations must be worked in VO1 and/or VO2; one VE0 maritime mobile station must be contacted. One of the five VE8 contacts required must be from the Yukon Territory and one must be from one of the off-shore islands of the Northwest Territories. In short, a total of 46 contacts must be made to meet the minimum requirements.

#### WAC 2-80 AWARD

Sponsored by the Metro Amateur Radio Club of Downsview, Ontario, the Worked All Canada 2-80 Award was originated in November, 1972. All contacts and confirming cards must be dated on or after that date.

To qualify, the applicant must submit QSL cards to verify two-way contact with one station possessing a two-letter call in each of the twelve Canadian sections. Are you wondering what the 2-80 stands for? Well, it means all contacts must be made with stations *only* with two-letter calls, and these contacts *must* be made only on 80 meters. Required sections include VO1, VO2, VE1 (PEI), VE1 (NB), VE1 (NS), VE2, VE3, VE4, VE5, VE6, VE7, and VE8. There are no mode restrictions, but endorsements will be granted at the time of applications if all contacts were made on a specific mode of operation.

Contacts must be made using your own equipment from one location or from within 150 miles of it and within the same section.

To apply for this award, enclose \$2.00 and sufficient postage for the return of your award and the required confirmation cards. Address all your correspondence to the Metro ARC, PO Box 352, Downsview, Ontario, Canada M3M 3A6.

#### ALL NOVA SCOTIA COUNTIES

The Nova Scotia Amateur Radio Association is proud to announce the WANS Award, which requires the applicant to work fifteen of the eighteen counties in Nova Scotia, Canada, or fourteen of the eighteen counties

plus a contact with Sable Island.

There is no charge for this award, but applicants are asked to send QSL cards and log data along with sufficient postage for their safe return. Address your application to Mrs. Christine Weeks VE1AKO, PO Box 47, Rural Route 1, Cleveland, Nova Scotia, Canada B0E 1J0.

The Halifax Amateur Radio Club also sponsors a Worked All Nova Scotia Counties Award which states that maritime provinces must contact seventeen of the eighteen counties in the province, while at the same time they must contact ten counties on a second band or series of bands. In all cases, Sable Island can be used as a substitute.

To qualify, all contacts must have been made on or after January 1, 1977, and the application should be sent directly to the Halifax ARC, PO Box 663, Halifax, Nova Scotia, Canada B3J 2T3. There is no charge for this award, but the applicant must supply sufficient postage for the safe return of confirmation cards.

#### DIPLOMA OF THE FRENCH AMERICAS

From Quebec City, Canada, comes word about the French Americas Award which requires stations in Europe, Africa, North, and South America to work at least two FP8 stations, two FY7 stations, and either an FS7 or FM7 station. Applicants in Asia or Oceania must work only a single contact from the areas of FP8, FY7, and FS7 or FM7.

There appear to be no date restrictions, and applicants may have their list of contacts verified by a local radio club official and sent, along with an awards fee of \$1.00 or seven IRCs, to Alex Desmeules VE2AFC, PO Box 382, Quebec City 4, Canada.

#### QUEBEC CITY AWARD

Speaking of Quebec City, Quebec, the local amateur radio fraternity sponsors the Quebec City Award for American and Canadian stations which make a minimum of five station contacts in Quebec City.

You may address all correspondence to the Radio Club of Quebec, PO Box 332, Upper Town, Quebec City, Quebec, Canada. The award fee is \$1.00 or seven IRCs.

#### WORKED ALL SASKATCHEWAN PROVINCE

The Regina Amateur Radio Association is pleased to announce the WASP Award which requires the applicant to accumulate a total of 100 points to qualify. Members of the Regina organization count 10 points each to a maximum of five contacts made with members of the group. Contacts with other Regina amateurs score five points, while contacts with other Saskatchewan amateurs count two points. There must be a minimum of ten QSOs made. Send your list of contacts along with your confirmed QSLs and \$1.00 to RARA Club VE5NN, 2827 Abbott Road, Regina, Saskatchewan, Canada S4N 2J9.

#### STONEHENGE USA

The Tri-City Amateur Radio Club will operate a special event station Saturday, June 12, 1982, from the replica of Stonehenge located near Maryhill, Washington. W7VPA will operate from 1600 to 0100 UTC on or near the frequencies of 3.900, 14.290, 21.390, 28.690, and 146.52. An attractive certificate will be awarded. Send QSL info and \$1.00 to W7VPA Special Event, PO Box 73, Richland WA 99352.

#### HOMEWORK NET

Are you a teenager? Or still think you are? Then the Homework Net is for you, operating on 7.250 phone every Saturday from 2100 to 2200Z. It is designed for, but not limited to, teenagers. This net is looking for young amateurs who wish to make new contacts with people who have similar interests. So take a break from your homework and join us on our informal Homework Net—Diane WD9DNQ and Scott KC0NF.

#### WATERLOO DAYS

The N. E. Iowa Radio Amateur Association will operate special event station W0MG in conjunction with activities celebrating My Waterloo Days, on June 12-13. Activity will take place from Waterloo, Iowa, and will be on 7.240, 14.290, and 21.370. Special informative commemorative QSL card for SASE to: NEIRAA, PO Box 92, Waterloo IA 50704.

#### DUNGEONS AND DRAGONS

New! A 10-meter Dungeons and Dragons Net at 28.720



± QRM. Saturdays promptly at 1500 GMT. To save us time and grief, please be ready with your character, rank, dice, and all of the necessary info. Net control is KA9JOX. If you don't hear anyone at 28.720, check 28.820. If still nothing is heard, the net has been canceled because of poor turnout or other reasons and will resume the next week at the same time and place. If you wish to participate regularly, please write me so you can get a chance to be a DM or net control. Address: Michael Frost KA9JOX, Box 1008, Riverside IL 60546.

### FORT DELAWARE

Fort Delaware, on Pea Patch Island, Delaware, will be the site of a mini-expedition by Wilmington area hams on the weekend of June 5 and 6, 1982.

This will be the first HF amateur operation from the fort in the middle of the Delaware River where, during the Civil War, many thousands of Confederate prisoners of war were held. The fort is now a state park.

Equipment will be limited to one transceiver fed by a small generator carried to the island by a small boat. Operations will be in the General segments of

the HF bands, daylight hours only, with each operator using his own call and the Fort Delaware identifier. Members of the Independent Amateur Radio Group of Delaware will be Rick KB3PD, Allen KB3HZ, Dwight N3ARU, Ned N3ARV, and Doug N3ACU. Commemorative QSL cards will be issued to contacts supplying SASEs.

For more information, contact the Independent Amateur Radio Group of Delaware, 400 Fifth Ave., Millcreek, Wilmington DE 19808.

### NOARS AND USS COD

Once again, signals will be radiating from the submarine *USS Cod*. Members of the Northern Ohio Amateur Radio Society will be operating from this proud WWII warship during the months of June, July, and August, using the call K8KRG. The *USS Cod* is on permanent display in Cleveland, Ohio. Operations will begin on Memorial Day and run every weekend (with the exception of Field Day weekend) until Labor Day.

An attractive certificate will be awarded for two-way contacts from the ship upon receipt of QSL card and \$.50 for postage. Look for operations in the

lower part of the General bands, 10 through 80 meters, on the weekends of June 5-6, July 17-18, and August 7-8; we will be operating 40-meter Novice band at 7.125. Send QSLs to Donald L. Winner WD8RZG, 8927 Torrance Ave., Brooklyn OH 44144.

### NORFOLK TRICENTENNIAL

The city of Norfolk, Virginia, will be celebrating its tricentennial this year. As part of the "Harborfest" celebration on June 11-14, the Tidewater area amateur clubs will join together to operate a Harborfest-Tricentennial special event station. The amateur call W4NV will be used, and special QSL certificates will be sent to all contacts made who send a large (8" x 10") SASE. The station will operate 24 hours each day in the 80-through 2-meter bands and will work CW and SSB.

For further information, please contact Bill Verebely KC4YX, 3101 Petre Road, Chesapeake VA 23325.

### LARGEST TRAIN ROBBERY

The Libertyville and Mundelein Amateur Radio Society (LAMARS) will operate W9HOQ from Rondout, Illinois, near the site of the largest train robbery

in United States history. Approximately three million dollars in negotiable instruments and jewelry were confiscated during a brief stopover and all participants were apprehended within six months. Frequencies: phone—7.260, 14.290, 21.375; CW—7.125, 21.150. Time: from 0000Z 12 June until 0000Z 13 June. Certificate for a large SASE to: KB9BR or "Big Robbery," Box 656, Libertyville IL 60048.

### STAR-SPANGLED BANNER SPECIAL EVENT STATION

WB3KUH will operate a special event station from Fort McHenry, Baltimore, Maryland—the birthplace of *The Star-Spangled Banner*—on June 12 and 13, 1982. Operation will commence at 1600 GMT. Operation will be within the first 25 kHz of the General and Advanced bands. Both SSB and CW will be used. Novice operation is also expected. Operation will be on 20, 15, 40, 2, and 6 meters.

Stations desiring a special certificate from the event station can obtain one by sending an SASE and their QSO number to Donald Oakjones WB3KUH, 1806 Willann Road, Rosedale MD 21237.

## HAM HELP

*We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time away from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print (neatly!), double spaced, your request on an 8½" x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.*

I am interested in corresponding with hams who have or had any late-model Hallicrafters

equipment, specifically the SR2000 Hurricane transceiver, HA20 vfo, and P2000 power supply/speaker. I am interested in operational notes, modifications reviews, and comparisons.

I would also like to obtain information on the history of Hallicrafters equipment, particularly post-1958. (I already have a copy of the *Ham Radio* article, "The Hallicrafters Story".)

And does anyone have manuals and schematics for a Heathkit IG-72 audio generator and AT-1 transmitter, Hallicrafters S38E receiver, and Eico's 1078 ac power supply, 239 TVM, and Model 315 signal generator? Write before sending.

**Robert Gagne**  
143 Millville St.  
Salem NH 03079

I would like to hear from anyone who served at the Naval Radio Station NSS, Annapolis MD, from 1942 to 1946.

**Laurence E. Hoepfer N7BJT**  
Box 334  
Columbia Falls MT 59912

I need a schematic for a Hickok Model 19XD signal generator.

**Sherman Banks N4CXF**  
Rt. 1 Youngs Mill Rd.  
Kingston GA 30145

Has anyone interfaced an Atari 400/800 to a rig for sending and receiving CW? Is software available?

**John S. Lee KA4EPR**  
12341 Dickinson Dr. W303  
Coral Gables FL 33146

I am in need of information about the WWII Navy Model MBM radio.

**Tony Grogan WA4MRR**  
5 Rollingwood Dr.  
Taylors SC 29687

I would like to contact anyone who is using the Texas Instru-

ments TI-99/4 home computer to send and receive RTTY, CW, and SSTV.

**Miguel Binstok LU1DIU**  
PO Box 012592  
Miami FL 33101

I would like to hear from owners of the code reader made by Microcraft. I need data on how well it works, QRM, etc.

**Berand G. Kirschner WB0YCO**  
1440 Grand Ave. #11  
St. Paul MN 55105

I would like to "marry" my Johnson Invader 200/2000 with a receiver that has a 5.0-5.5-MHz vfo so that I get transceiver-type information. Can anyone help?

**Arthur Ford W2HAE**  
552 Hillside Ct.  
Melbourne FL 32935

I need a copy of the schematic for a Hallicrafters S-107 Mark II receiver, built approximately 1961.

**Sheldon Daitch WA4MZZ**  
Box 8091  
Greenville NC 27834



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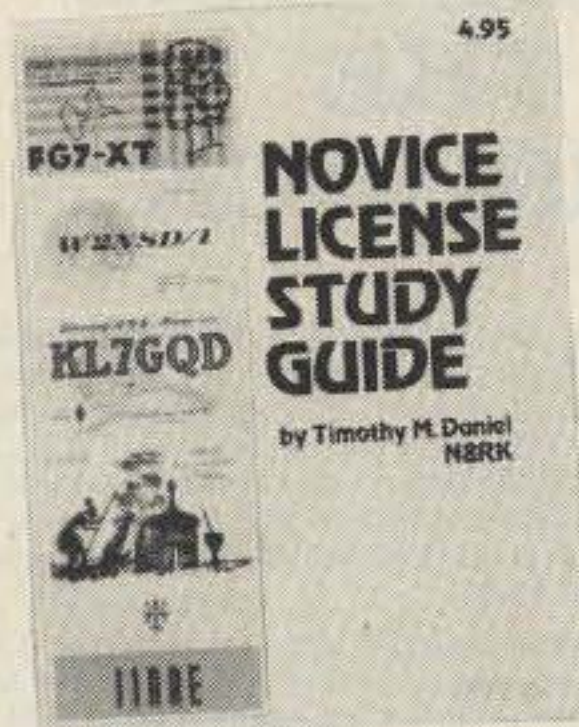
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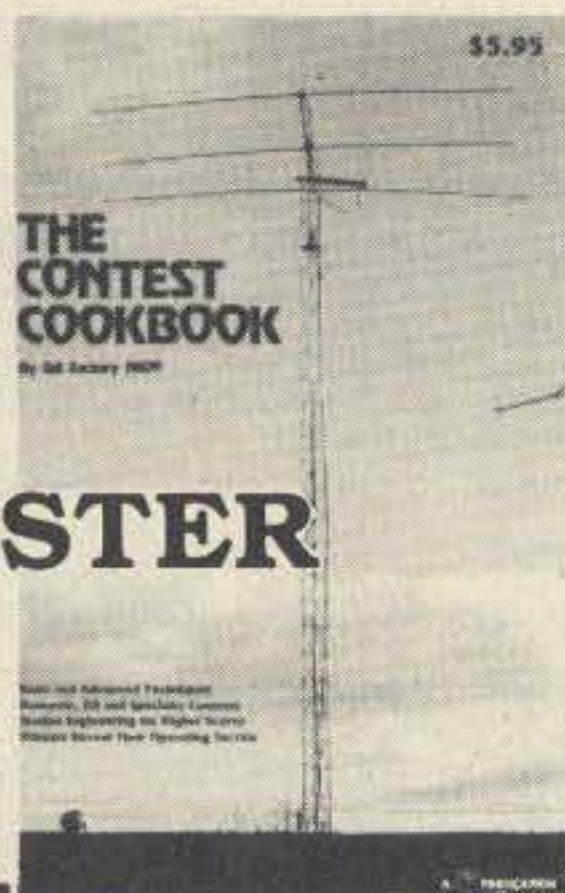
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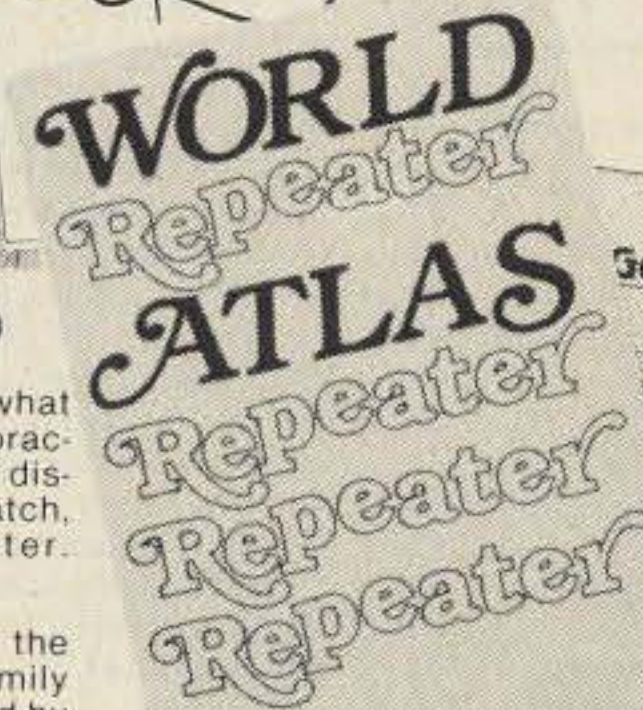
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improve 73 and our other publications. With our mountains to climb, he could easily take off about fifty to seventy-five pounds and get into fighting trim to help amateur radio get back into a growth mode. What say there, Harry? I know he's always been a very big fan of mine, so let's see what happens.

### WHAT'S THAT CLOUD?

Is that a nuclear blast cloud rising over New Hampshire? No, the work on our nuclear power generator seems to have been halted. A clipping sent in from a North Carolina paper (where they put much stock in these things) gives us a hint. It seems that there are more cigarettes per person sold in New Hampshire than in any other state. About 254.4 packs for every person... including the kids.

Now before you get the idea that my own efforts to stem the tide of smoking by not hiring smokers is totally ineffective, I should point out that New Hampshire has a lower tax on cigarettes than other states. The result is that Massachusetts (called taxachusetts) people come up here in swarms to buy cigarettes and liquor, both of which are a bargain in New Hampshire.

The gas stations along the border do a land-office business in cancerettes, helping substantially to stamp out life in the great commonwealth just south of us. Liquor is sold in state liquor stores, thus giving us a cut of the action towards lowering taxes. Indeed, we are the lowest taxes state, with no sales tax and no personal income tax.

The only serious problem we have is the air pollution along the Massachusetts border from all those cigarettes.

### NO NEWS VS. GOOD NEWS

The recent purchase of *The Daily News* in New York brought back memories of my first visit to *The News*, back in 1938. When I visited *The News* along with my high school class (we often went on field trips to see businesses), little could I have imagined that in ten years I would be working for WPIX, *The News*' television station. Heck, in those days television was a new invention which was being shown at the New York World's Fair. The sets for receiving the few broadcasts were prohibi-

tively priced. In 1938, I was just barely getting going in amateur radio, having been involved for about a year.

*The Daily News* plant was modern then, with new high-speed presses and row upon row of Linotype machines. The Linotype operators delighted my classmates by making up our names in type slugs and tossing them to us, burning our hands with the hot lead while they laughed.

Hitler was raising hell in Europe and war was brewing. Despite the barrage of propaganda, war was not real to us and it never even occurred to me that before long I might be going to war on a submarine in charge of maintaining and operating all of the complex electronic equipment.

After the war... and after college... having avoided entrapment by large corporations (a fate suffered by most college graduates which dooms them to mediocrity of income for life), I found myself in broadcasting. First I tried radio engineering and announcing. Then, when a spot opened at WPIX for an engineer, I made contact through an old friend Bob Sullivan, who worked as a feature writer for *The Sunday News*.

Bob, a friend of the family, had quite an influence on my life. It was he who introduced me to classical music when I was about seven. He also was a Gilbert and Sullivan nut, which I became, too. I maybe got even by exposing him to country and western, which took with him.

Before we could put WPIX (channel 11) on the air, we had to get some experience. In 1948, there were no unemployed television cameramen to hire. *The News* rented studio space a few blocks from their 42nd street skyscraper at Reeves Sound Studios. Buzz Reeves is reasonably well known today for his incredible contest station. I think they use the call N2AA. Buzz was one of the wealthy hams I talked with when I was looking to start *73 Magazine*. Wisely, he was not interested.

When the studios were finished in *The News* building, we moved to there and finished getting ready to go on the air. We learned to use the cameras, to fix them while operating, to handle the mike booms, and to cope with the various unions which have a vice-like control of New

York. The inaugural ceremonies were in the lobby of the building, with me as the cameraman.

It didn't take long before I was nosing around the top floor of the skyscraper, looking for a place for a small ham station. I found an unused room and soon had permission to use it and put an antenna on the roof of the building. I brought up my SCR-522, which was state-of-the-art in those days. Imagine, crystal control! Twenty Watts! Then I put one of the Bill Hoisington (W2BV) 16-element beams up and found myself with a whale of a signal. I could work anything from central Connecticut on down almost to Philadelphia, including all of Long Island. I made thousands of contacts. Hams are still bringing my old *News* building QSL cards to hamfests to flash at me.

Being young and foolish (as differentiated from old and foolish), I wanted to put my beam in the best possible location on the roof of the building. I wanted it out in the open so that I would have a good signal in all directions. Well, the *only* really good place for it was mounted on top of a parapet. I have to admit that I was a bit shaky about climbing out on it to set up the rotator and beam. I had to skinny out about fifty feet, with a 25-story drop on one side and about six stories on the other. Just to help matters, it was windy. It is *always* windy on top of a 37-floor building.

My stint atop *The News* building had lasting repercussions. It was while operating from this aerie that I began wondering what those strange beedle-beedle signals were on the high end of the band. I started asking around and was led to John Williams W2BFD out in Woodside, Queens. John was playing around with radio Teletype®. Being an unrepentant experimenter, I was quickly hooked on RTTY.

John was the father of ham RTTY. He got a lot of us hooked on it in the late 40s. My downfall, if you like to think of it as that, came when I went to work for WXEL, a television station in Cleveland. I was hired on as a television producer and director. They had a mimeo machine, which was a fairly rare item in those days. Within a few days, I managed to get the first issue of

a *RTTY Bulletin* out for the few hundred RTTY experimenters. I almost ruined the mimeo machine in the process, but I was started. The *Bulletin* grew into *Amateur Radio Frontiers* and kept going on almost a monthly basis until I became editor of *CQ* in January, 1955.

*The News* has changed remarkably little in the last thirty years, which probably is why it was recently put up for sale. The gradual closing of one New York paper after another, often in the wake of strikes, has kept the papers from making much money. That and union opposition kept *The News* from modernizing their equipment. I wouldn't be surprised if they still had some of those old Linotype machines being used to set hot slugs of type. I should get back for a visit and see if any of the old television crew are still there.

Bill Hoisington's fire tower eventually blew down in a storm and he found himself fired from the firm he had worked with for years. The main reason for letting him go seemed to be that he was getting too close to retirement pension age. He went into business writing a long series of simple VHF and UHF construction projects for 73. He moved to Peterborough (as K1GCLL) to make this simpler. Following a divorce and some serious ill health, Bill moved to the Philippines and got remarried. He seems to be living happily ever after there, still working on simple home VHF projects.

You know, one of the odd things about operating from the top of a skyscraper or a mountain is that when the two-meter band begins to open, it is the stations on the ground which hear the skip signals first. I would hear New York stations working down into Virginia and North Carolina for an hour or more without being able to hear a whisper of the southern chaps. Then, when the DX was starting to work on up into Connecticut, I would start hearing them and be able to make contact. My elevation had little benefits for that type of contact. There *are* drawbacks to skyscrapers and mountains.

Well, I hope that the new owners of *The News* will modernize it and keep it going. I enjoyed my working there and will never forget the excitement of DXing from that spot.



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 Maximum power(PL-259 model) 30 watts

**MECHANICAL SPECIFICATIONS**

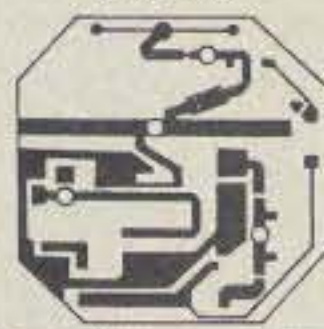
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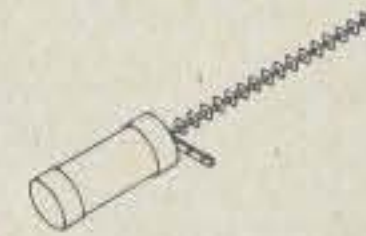
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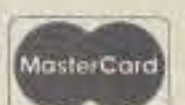
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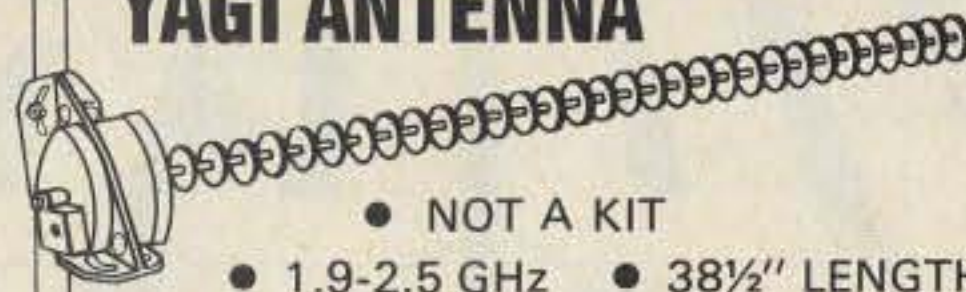
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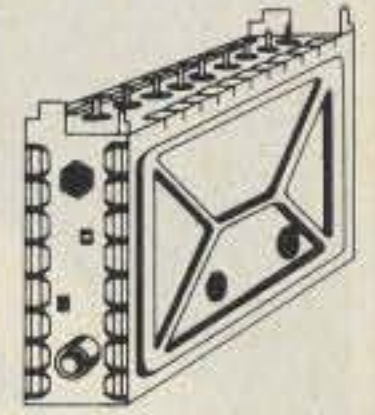
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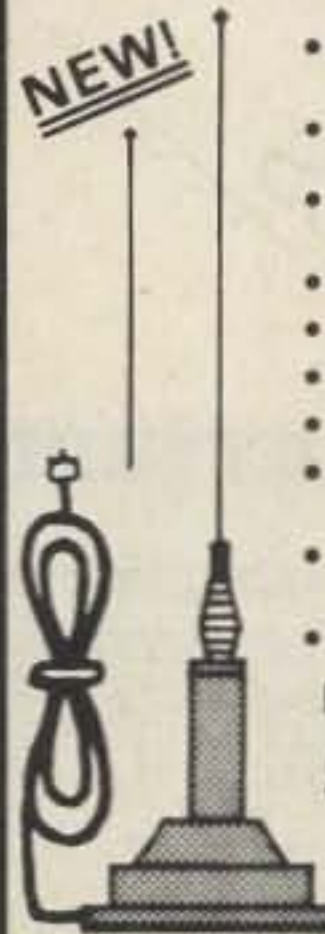
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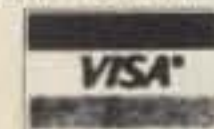
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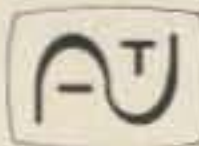
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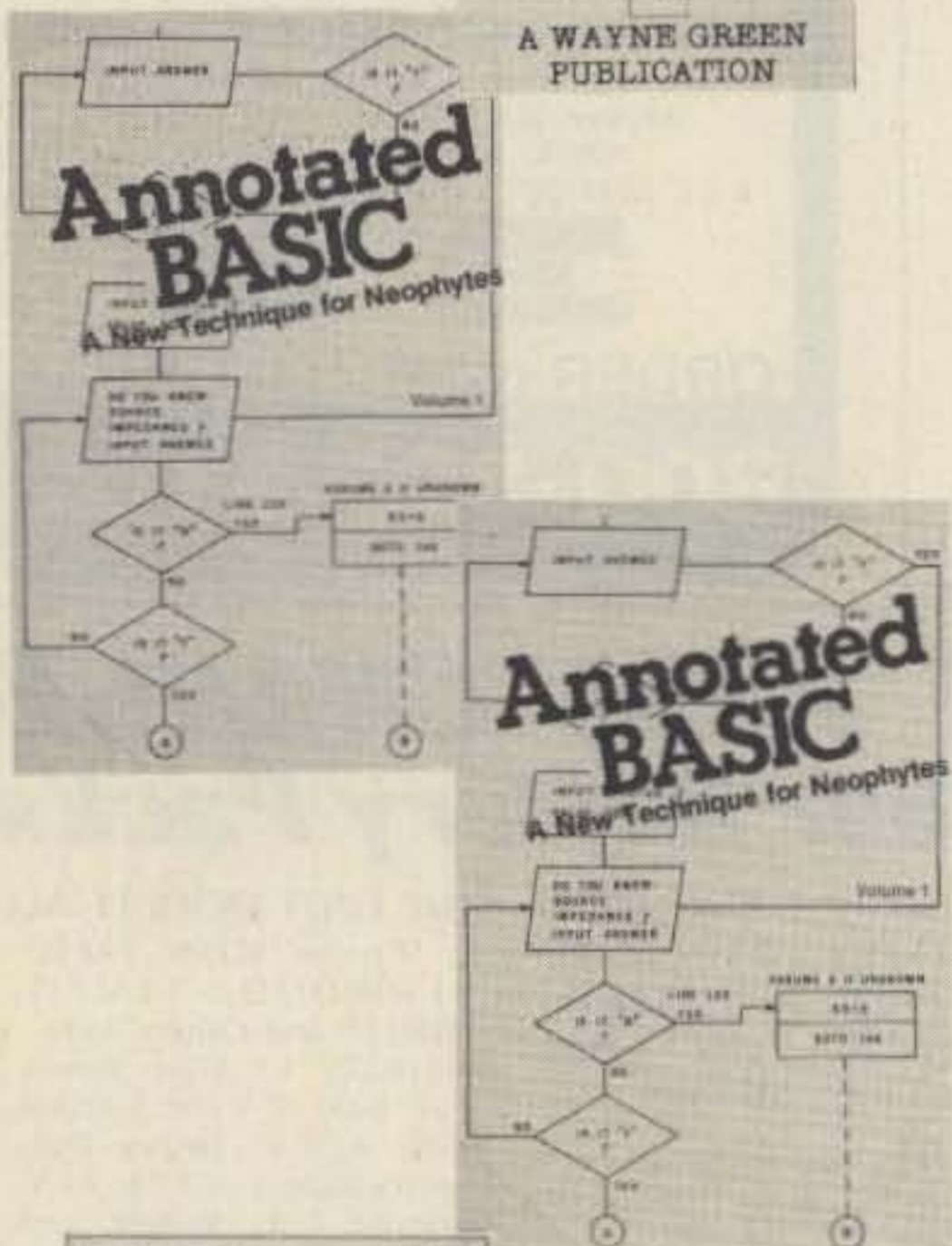
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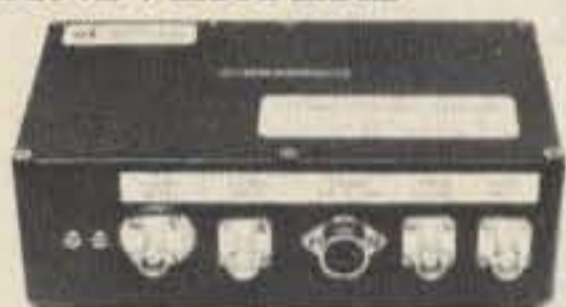
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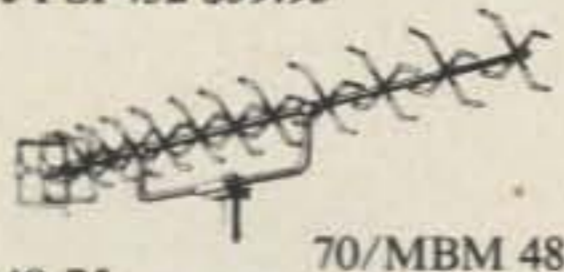
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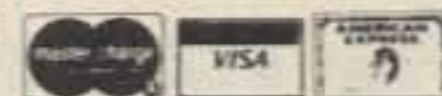


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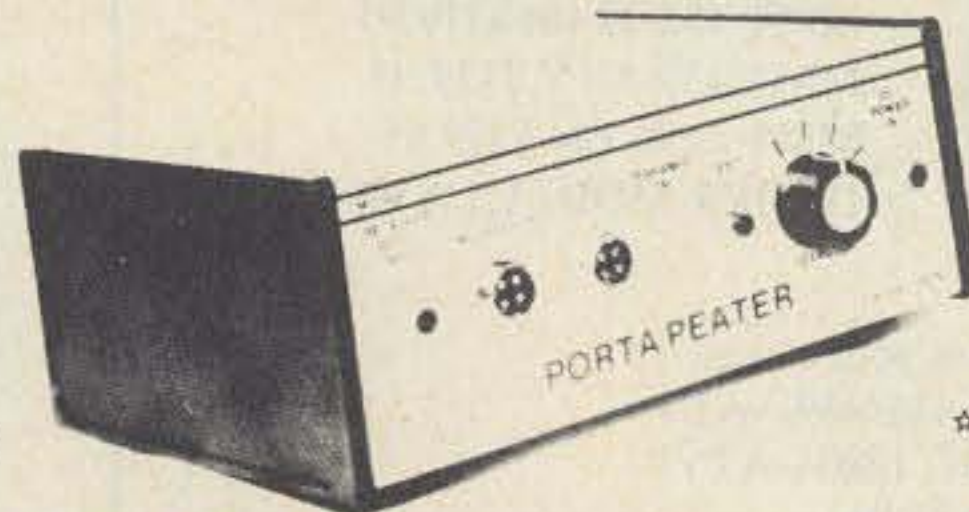
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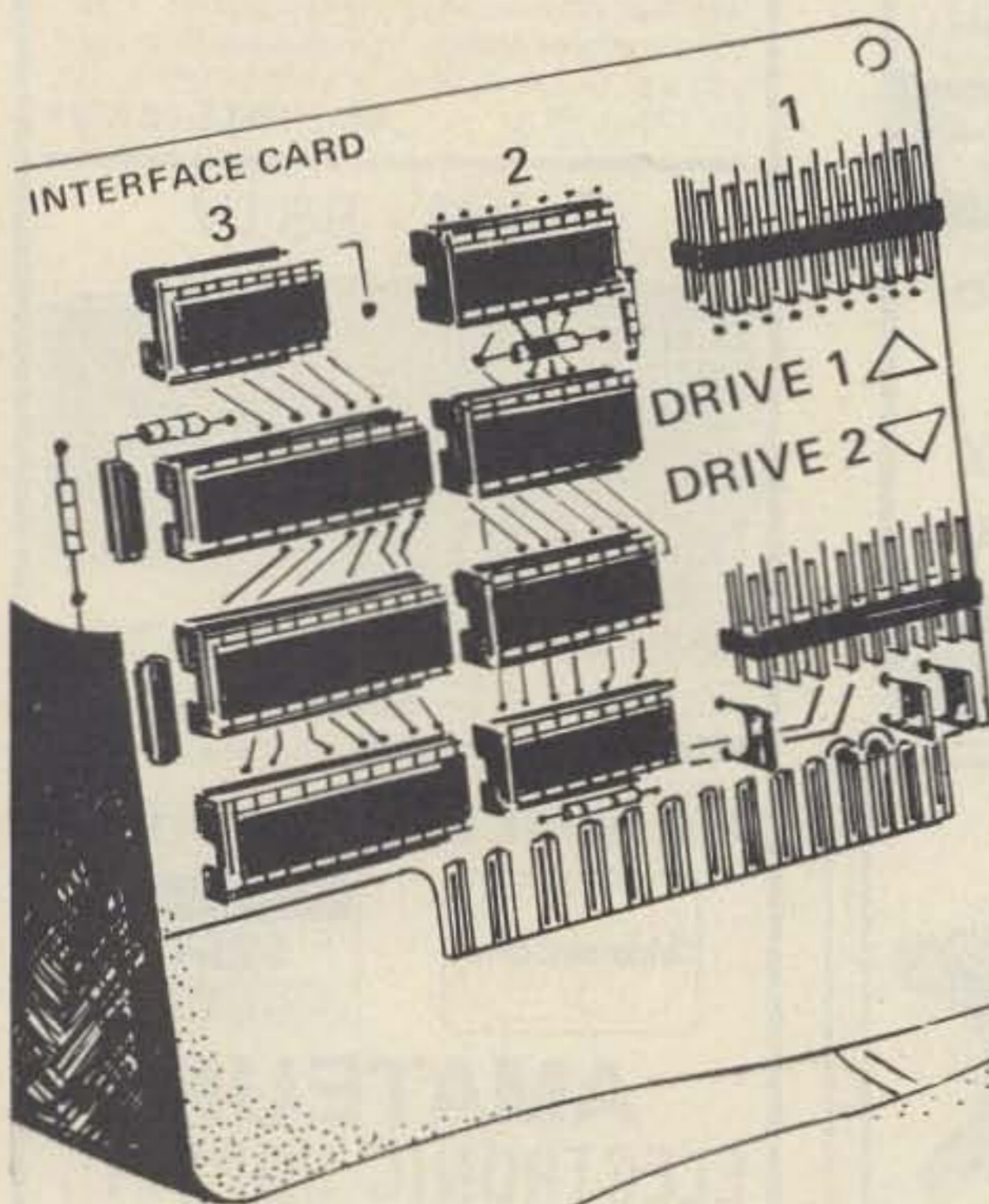
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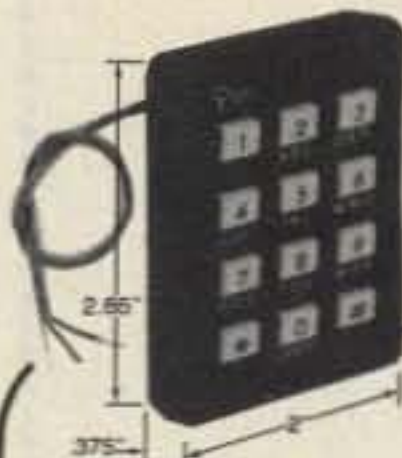
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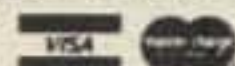
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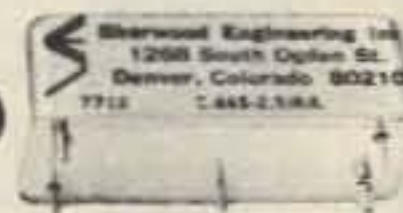
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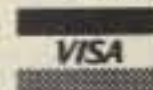
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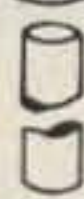
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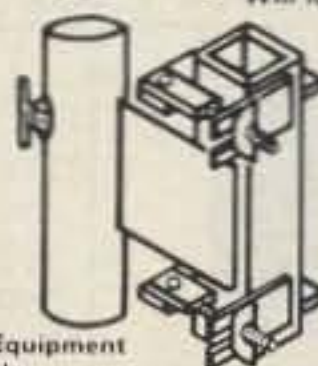
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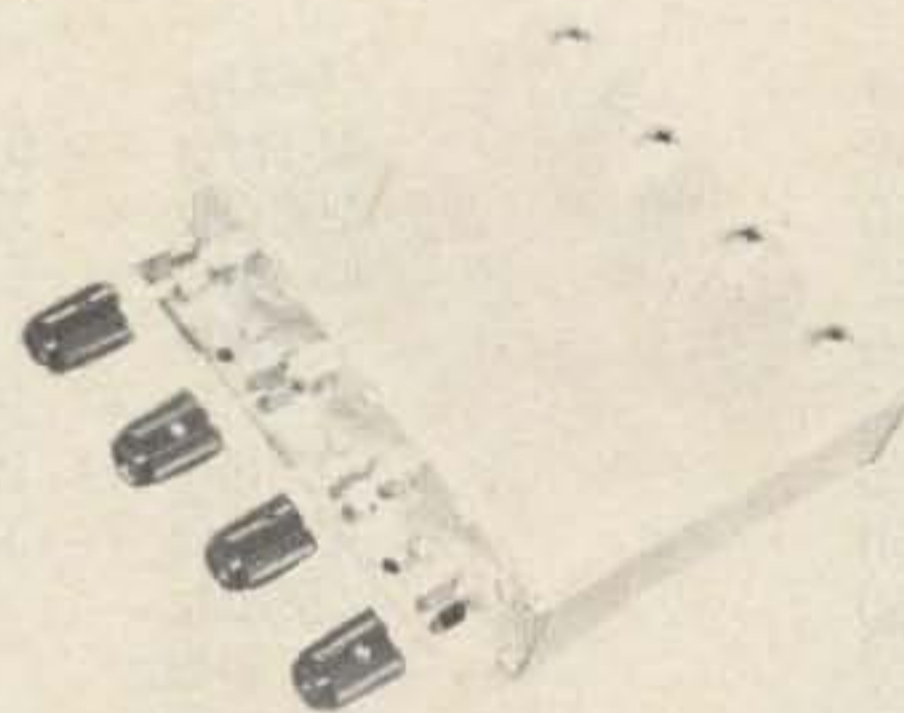
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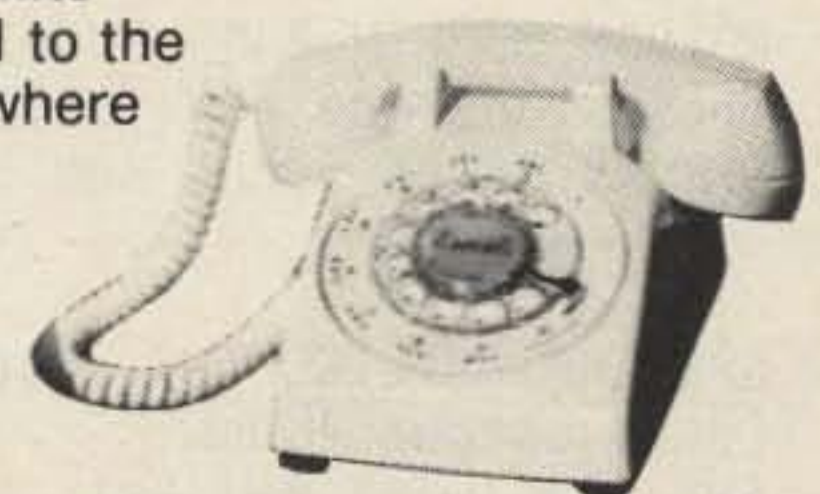
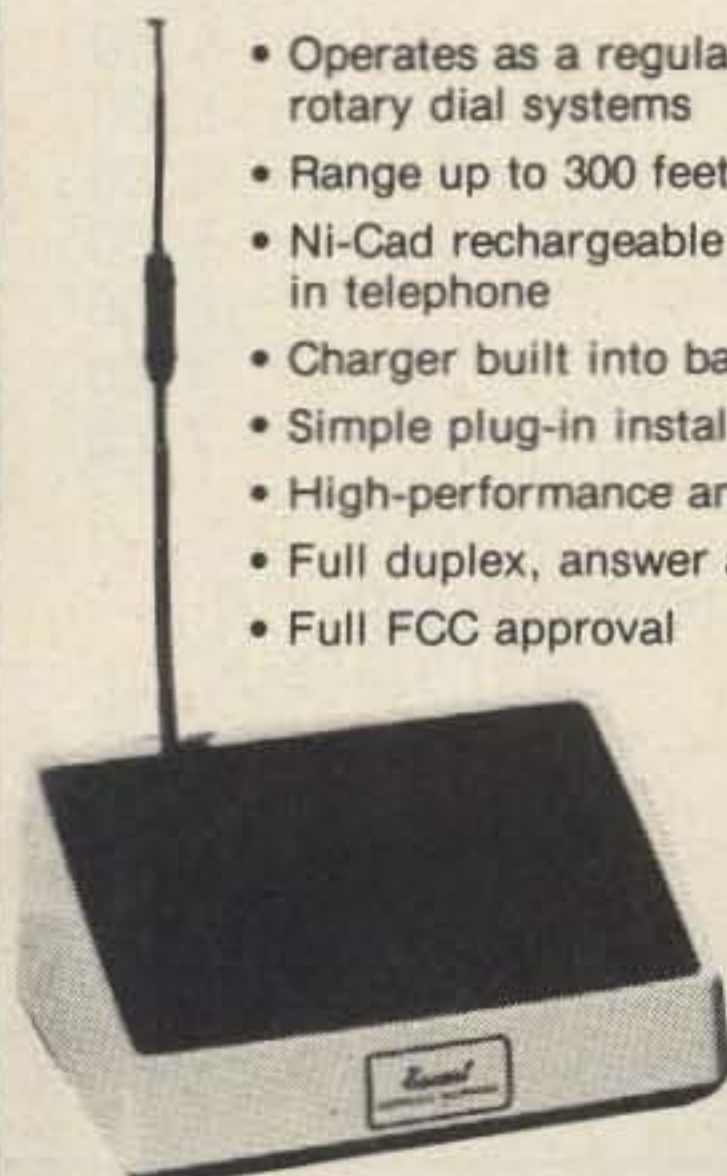


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Transducer Power Gain at Vce=18v,Ice=60ma,F=2GHz.	3dBmin,4dBtyp
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## Motorola RF Power Amplifier Modules

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Output Power	20watts	30watts	13watts	20watts
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SSB Conversion Loss 4.9dB Typ. 6dB Max. fR 3.7 to 4.2GHz  
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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

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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
TO-3	TO-3	TO-100/TO-116	TO-220/TO-3
\$4.50	\$5.75	\$1.00 \$1.25	\$1.17 \$2.00

## P & B Solid State Relays Type ECT1DB72

5VDC Turn On 120VAC Contact 7Amps  
 20Amps on 10"x10"x.062" Alum.Heatsink with  
 Silicon Grease \$5.00

\*May Be Other Brand Equivalent

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# "MIXERS"

## WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	\$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz	
	8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above	
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.

PRICE \$7.50

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# "SOCKETS AND CHIMNEYS"

## EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	\$ POR	SK626	Chimney	\$ 7.70
SK406	Chimney	35.00	SK630	Socket	45.00
SK416	Chimney	22.00	SK636B	Chimney	26.40
SK500	Socket	330.00	SK640	Socket	27.50
SK506	Chimney	47.00	SK646	Chimney	55.00
SK600	Socket	39.50	SK711A	Socket	192.50
SK602	Socket	56.00	SK740	Socket	66.00
SK606	Chimney	8.80	SK770	Socket	66.00
SK607	Socket	43.00	SK800A	Socket	150.00
SK610	Socket	44.00	SK806	Chimney	30.80
SK620	Socket	45.00	SK900	Socket	253.00
SK620A	Socket	50.50	SK906	Chimney	44.00

## JOHNSON TUBE SOCKETS

124-115-2/SK620A	Socket	\$ 30.00	124-113	Bypass Cap.	\$ 10.00
124-116/SK630A	Socket	40.00	122-0275-001	Socket	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<sub>0</sub>), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +/-0.05 volts @ 55mA, Max.

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# "TUBES"

TUBES	PRICE	TUBES	PRICE	TUBES	PRICE
2E26	\$ 4.69	5721	\$200.00	8462	\$100.00
2K28	100.00	5768	85.00	8505A	73.50
3B28	5.00	5836	100.00	8533W	92.00
3-500Z	102.00	5837	100.00	8560A	55.00
3-1000Z/8164	300.00	5861/EC55	110.00	8560AS	57.00
3CX1000A/8283	200.00	5876A	15.00	8608	34.00
3X2500A3	200.00	5881/6L6	5.00	8624	67.20
4-65A/8165	45.00	5894/A	45.00	8637	38.00
4-125A/4D21	58.00	5894B	55.00	8647	123.00
4-250A/5D22	68.00	6080	10.00	8737/5894B	55.10
4-400A/8438	71.00	6083/AX9909	89.00	8807	1000.00
4-400C/6775	80.00	6098/6AK6	14.00	8873	260.00
4-1000A/8166	300.00	6115/A	100.00	8874	260.00
4CS250R	69.00	6146	6.00	8875	260.00
4X150A/7034	30.00	6146A	6.50	8877	533.00
4X150D/7035	40.00	6146B/8298A	7.50	8908	12.00
4X150G	50.00	6146W	14.00	8916	1500.00
4X250B	30.00	6159	11.00	8930/X651Z	45.00
4CX250B/7203	45.00	6161	70.00	8950	10.00
4CX250F/7204	45.00	6291	125.00		
4CX250FG/8621	55.00	6293	20.00	6BK4C	5.00
4CX250K/8245	100.00	6360	4.00	6DQ5	4.00
4CX250R/7580W	69.00	6524	53.00	6FW5	5.00
4CX300A	99.00	6550	7.00	6GE5	5.00
4CX350A/8321	100.00	6562/6794A	25.00	6GJ5	5.00
4CX350FJ/8904	100.00	6693	110.00	6HS5	5.00
4X500A	100.00	6816	58.00	6JB5/6HE5	5.00
4CX600J	300.00	6832	22.00	6JB6A	5.00
4CX1000A/8168	300.00	6883/8032A/8552	7.00	6JM6	5.00
4CX1500B/8660	300.00	6884	46.00	6JN6	5.00
4CX3000A/8169	300.00	6897	110.00	6JS6B	5.00
4CX5000A/8170	400.00	6900	35.00	6JT6A	5.00
4CX10000D/8171	500.00	6907	55.00	6KD6	5.00
4CX15000A/8281	700.00	6939	15.00	6K66/EL505	5.50
4E27/A/5-123A/B	40.00	7094	75.00	6KM6	5.00
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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		
813	38.00	7984	12.00		
4624	100.00	8072	55.00		
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		

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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	<b>HEWLETT PACKARD OSCILLOSCOPES</b> PRICE	
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	<b>TEKTRONIX</b>	
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		

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**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.

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**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.

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**PRICES:** Prices are subject to change without notice.

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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**

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 Freq. Coverage 8 to 12.4GHz, Output (Min.) 100mW, Bias  
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**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		
Frequency Range	Model UTO-504	UTO-511
Gain	5 to 500 MHz	5 to 500 MHz
Noise Figure	6dB	15dB
Power Output	11dB	2.3dB to 3dB
Gain Flatness	+ 17dB	- 2dB to - 3dB
Input Power Vdc	1dB	1dB
mA	+ 24	+ 15
	100	10
	PRICE \$70.00	PRICE \$75.00

HEWLETT PACKARD MIXERS MODELS		
Frequency Range	10514A	10514B
Input/Output Frequency L & R	2MHz to 500MC	2MHz to 500MC
	200KHz to 500MC	200KHz to 500MC
	X DC to 500MC	DC to 500MC
Mixer Conversion Loss (A)	7dB	7dB
(B)	9dB	9dB
Noise Performance (SSB) (A)	7dB	7dB
(B)	9dB	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**

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WIDEBAND AMPLIFIER MODULE.**  
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 Max. dB., DC Supply Voltage - 28vdc, RF Voltage Input  
 + 70dBmV **PRICE \$29.99**

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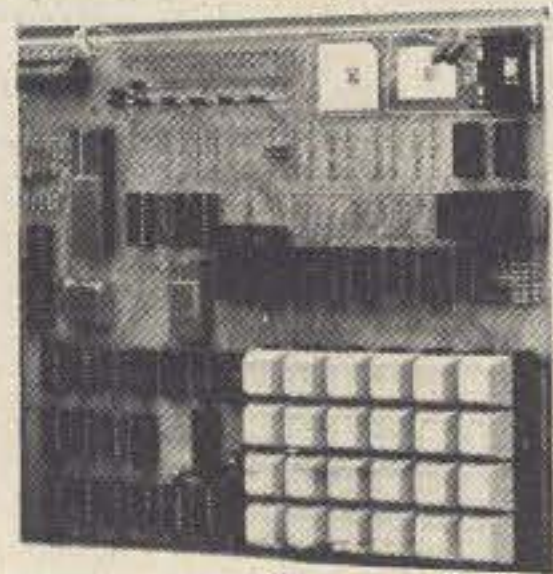
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7404N	LM320K-5	1.35	CD4020	95	8T98	99	3341	Complete Set	9.30
7410N	LM320K-12	1.35	CD4021	1.10	<b>MOS MEMORY RAM PROM</b>				
7414N	LM320T-5	85	CD4022	28	2101-1	1.95	1702A	4.50	
7420N	LM320T-8	85	CD4023	25	2102-1	85	2532	17.50	
7430N	LM320T-12	85	CD4024	75	2102AL-4	1.25	2708	2.95	
7442N	LM320T-15	85	CD4025	23	2102AN-2L	1.65	2716T	8.50	
7445N	LM320K-5	4.85	CD4026	1.65	2104A-4	4.95	2716 5 Volt	5.50	
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7448N	LM339N	99	CD4028	80	2111-1	2.99	2732	16.50	
7474N	LM340K-5	1.35	CD4029	95	2112-2	2.99	2758	7.49	
7475N	LM340K-8	1.35	CD4030	45	2114	2.24	8741A	39.95	
7485N	LM340K-12	1.35	CD4040	95	2114C 4500ns	2.50	8748-8	34.95	
7489N	LM340K-15	1.35	CD4042	75	4116 200ns	2.30	755A	49.95	
7490N	LM340K-24	1.35	CD4043	85	84116 200ns	15.40	NB2523	2.95	
7495N	LM340T-5	75	CD4044	85	MMS280	3.00	NB25123	3.95	
74100N	LM340T-8	75	CD4046	95	MMS321	9.95	NB25126	5.75	
74107N	LM340T-12	75	CD4049	45	MMS330	5.94	NB25129	4.75	
74123N	LM340T-15	75	CD4050	55	P51011	8.95	NB25131	4.95	
74125N	LM340T-18	75	CD4051	95	4200A	11.50	NB25136	8.75	
74145N	LM340T-24	75	CD4060	1.42	4200B	3.50	NB25137	8.75	
74150N	LM350	5.50	CD4066	71	4100	10.00	DM8577	2.90	
74151N	LM377	2.29	CD4068	39	416	2.50	8233	3.50	
74154N	LM380N	1.00	CD4069	35	TMM2016	16.95	CONNECTORS		
74157N	LM381	1.60	CD4070	35	HMB116	16.50	30 pin edge	2.50	
74161N	LM382	1.60	CD4071	30			44 pin edge	2.75	
74162N	LM709H	69	CD4072	30			86 pin edge	4.00	
74163N	LM723H-N	49	CD4073	35			100 pin edge	3.95	
74174N	LM733N	85	CD4075	30			100 pin edge w/w	4.95	
74175N	LM741CH	35	CD4076	95			IC SOCKETS		
74190N	LM741N	35	CD4078	30			Solder Tin Low Profile		
74192N	LM747H-N	75	CD4081	30			Pin Top Pin Top		
74193N	LM748N	50	CD4082	30			CT7010	8.95	
74221N	LM1305N	1.75	CD4116	47			CT7015	8.95	
74298N	LM1304	1.10	CD4490	5.50			MMS375AA-N	3.90	
74365N	LM1305	1.27	CD4507	99			MMS375AG-N	4.90	
74366N	LM1307	1.10	CD4508	1.95			725	16.20	
74367N	LM1310	2.75	CD4510	95			725T	16.20	
	LM1458	5.50	CD4511	94			728T	7.50	
	LM1812	8.25	CD4515	2.25			7208	15.95	
74LS00N TTL	LM1889	2.49	CD4516	1.10			7209	4.95	
74LS02N	LM211	1.75	CD4518	1.25			MICROPROCESSOR		
74LS04N	LM2902	2.25	CD4520	1.02			6502	14.55	
74LS08N	LM3909N	59	CD4527	1.51			6502A	6.95	
74LS09N	LM3909N	59	CD4528	1.25			6502A	9.50	
74LS10N	LM3909N	59	CD4553	3.50			6504	6.95	
74LS13N	MC1458V	50	CD4566	2.45			6522	8.75	
74LS14N	NE555N	1.30	CD4583	2.35			6530	9.50	
74LS20N	NE555V	39	CD4585	95			6532	14.95	
74LS22N	NE556A	65	CD40192	3.00			6551	11.85	
74LS28N	NE565A	1.00	74C00	3.05			6800	5.70	
74LS30N	NE566V	1.50	74C04	3.5			6802	11.95	
74LS32N	NE567V	1.90	74C10	39			6820	4.95	
74LS33N	NE570B	4.75	74C14	75			6850	3.50	
74LS36N	78L05	60	74C20	35			8080A	3.95	
74LS74N	78L08	60	74C23	35			8085A	8.50	
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74LS107N	75492CN	55	74C90	1.25			Z80 CTC	5.95	
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74LS113N			74C154	3.25			Z80 DART	18.25	
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74LS157N	8750CJ	13.95	74C906	6.00			Z80 S10/1	28.95	
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			74C927	82.12			1802E plus	17.95	
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## RCA Cosmac 1802 Super Elf Computer \$106.95

The Super Elf is a small single board computer that does many big things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily expanded with additional memory, Full Basic, ASCII Keyboards, video character generation, etc. ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The Super Elf includes a ROM monitor for program loading, editing and execution with SINGLE STEP for program debugging which is not included in others at the same price. With SINGLE STEP you can see the microprocessor chip operating with the unique Quest address and data bus displays before, during and after executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 video graphics chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a speaker system included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key HEX keyboard includes 16 HEX keys plus load, reset, run, wait, input, memory protect, monitor select and single step. Large, on board displays provide output and optional high and low address. There is a 44 pin standard connector slot

## Super Expansion Board with Cassette Interface \$89.95

This is truly an astounding value! This board has been designed to allow you to decide how you want it optioned. The Super Expansion Board comes with 4K of low power RAM fully addressable anywhere in 64K with built-in memory protect and a cassette interface. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the Super Elf. The board includes slots for up to 6K of EPROM (2708, 2758, 2716 or TI 2716) and is fully socketed. EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor \$19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate pro-

## Quest Super Basic V5.0

A new enhanced version of Super Basic now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function Super Basic by Ron Cener including floating point capability with scientific notation (number range  $\pm 17E^{30}$ ), 32 bit integer  $\pm 2$  billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including re-number and essentially unlimited variables. Also, an exclusive user expandable command library. Serial and Parallel I/O routines included. Super Basic on Cassette \$55.00.

for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for all IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. Compare before you buy. Super Elf Kit \$106.95, High address option \$8.95, Low address option \$9.95. Custom Cabinet with drilled and labelled plexiglass front panel \$24.95. All metal Expansion Cabinet, painted and silk screened, with room for 5S-100 boards and power supply \$57.00. NiCad Battery Memory Saver Kit \$6.95. All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for \$12.00 per 12 issues. Single issues \$1.50. Issues 1-12 bound \$16.50.

Moews Video Graphics \$3.50, Games and Music \$3.00, Chip 8 Interpreter \$5.50, Starship 4K cassette \$14.95. Exciting and challenging space game. Complete manual included.

## Free 14 page brochure of complete Super Elf system.

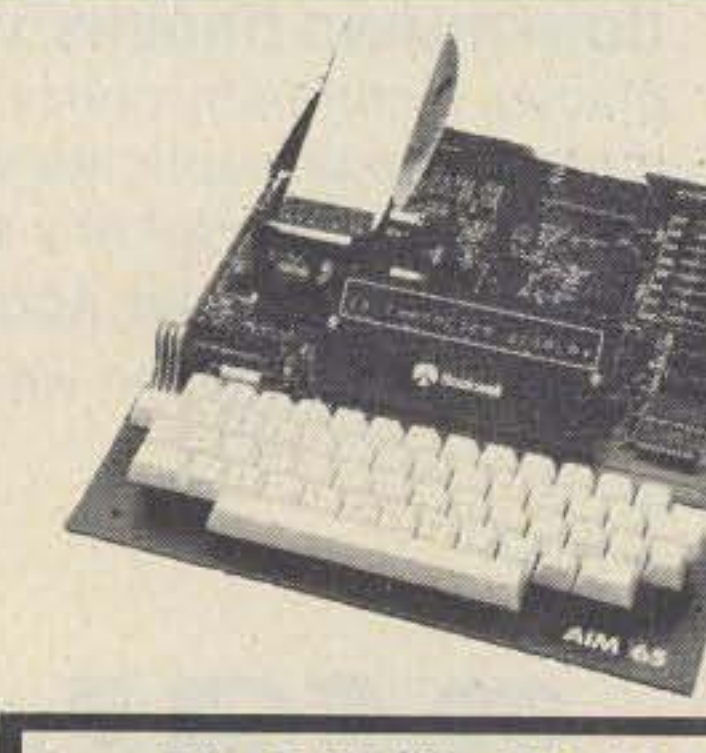
gram bugs quickly, then follow with single step. If you have the Super Expansion Board and Super Monitor the monitor is up and running at the push of a button.

Other on board options include Parallel Input and Output Ports with full handshake. They allow easy connection of an ASCII keyboard to the input port. RS 232 and 20 ma Current Loop for teletype or other device are on board and if you need more memory there are two S-100 slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. Parallel I/O Ports \$9.85, RS 232 \$4.50, TTY 20 ma I/F \$1.95, S-100 \$4.50. A 50 pin connector set with ribbon cable is available at \$18.95 for easy connection between the Super Elf and the Super Expansion Board.

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

## Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char alphanumeric display ROM monitor, fully expandable. \$419.00. 4K version \$449.00. 4K Assembler \$35.00. 8K Basic Interpreter \$65.00. Special small power supply 5V 2A 24V 5A assem. in frame \$59.00. Molded plastic enclosure to fit both AIM 65 and power supply \$52.50. AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. \$559.00. 4K \$579.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor \$1295.00. RAM Board Kit (16K, \$195) (32K, \$215). VD640 Video Interface Kit \$119.00. A&T \$149.00. Complete AIM 65 in thin briefcase with power supply \$518.00. Special Package Price: 4K AIM, 8K Basic, power supply, cabinet \$629.00. AIM 65/KIM/SYM/Super Elf 44 pin expansion board, board with 3 connectors \$22.95.



## Super Color S-100 Video Kit \$129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. Dealers: Send for excellent pricing/margin program.

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PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) \$19.20, Kit (P/N 210A) \$119.55.

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) \$15.65, Kit (P/N 120A) \$69.95.

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RS-232/TTL INTERFACE Bidirectional, requires  $\pm 12V$ . Kit (P/N 232A) \$9.95.  
RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) \$14.95.

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Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity \$37.50 (with timer \$69.50). 6 PROM capacity OSHA/UL version \$78.50 (with timer \$108.50).

**NiCad Battery Fixer/Charger Kit**  
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16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board \$28.50. Full Kit \$99.00. Monitor \$20.00. Power Supply Kit \$35.00. Tiny Basic \$30.00.

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## 9 DIGITS 600 MHz \$129<sup>95</sup> 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 \$99<sup>95</sup> WIRED



**SPECIFICATIONS:**

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

**PRICES:**

CT-70 wired, 1 year warranty	\$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95



## 7 DIGITS 500 MHz \$79<sup>95</sup> WIRED

**PRICES:**

MINI-100 wired, 1 year warranty	\$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

**SPECIFICATIONS:**

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

## 8 DIGITS 600 MHz \$159<sup>95</sup> 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 \$99<sup>95</sup> 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:	0.1 uA 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

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### ACCESSORIES

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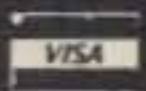
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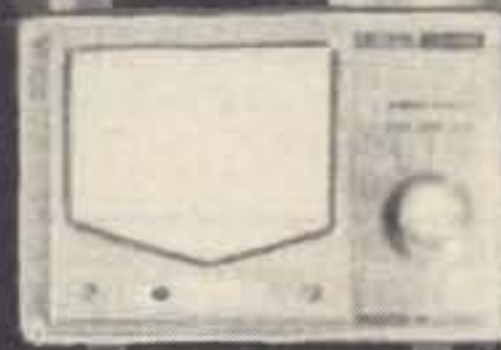


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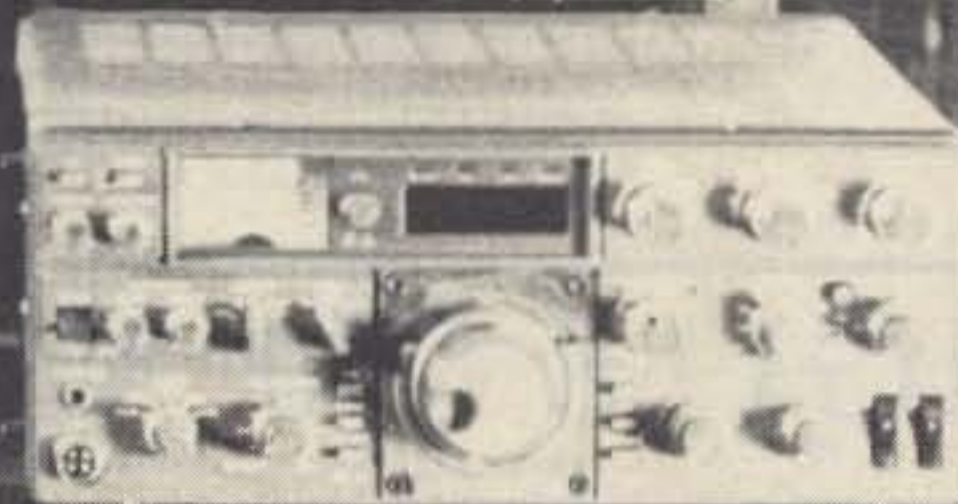
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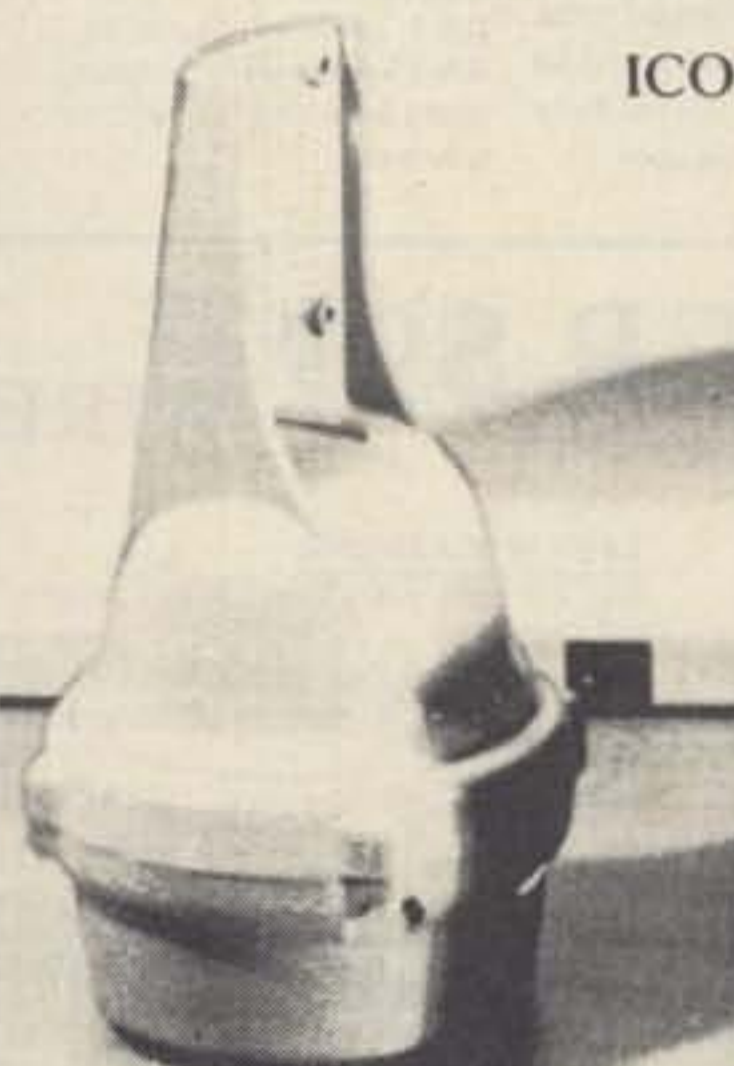
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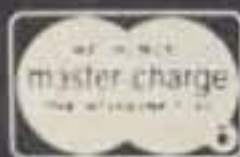


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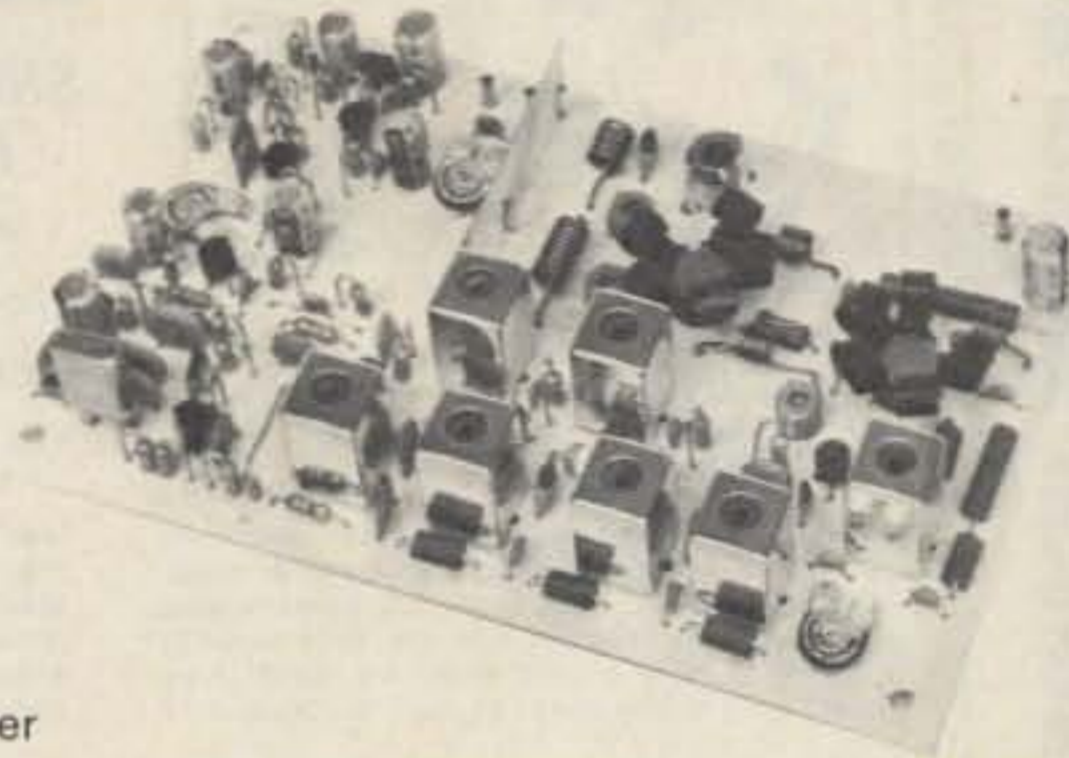
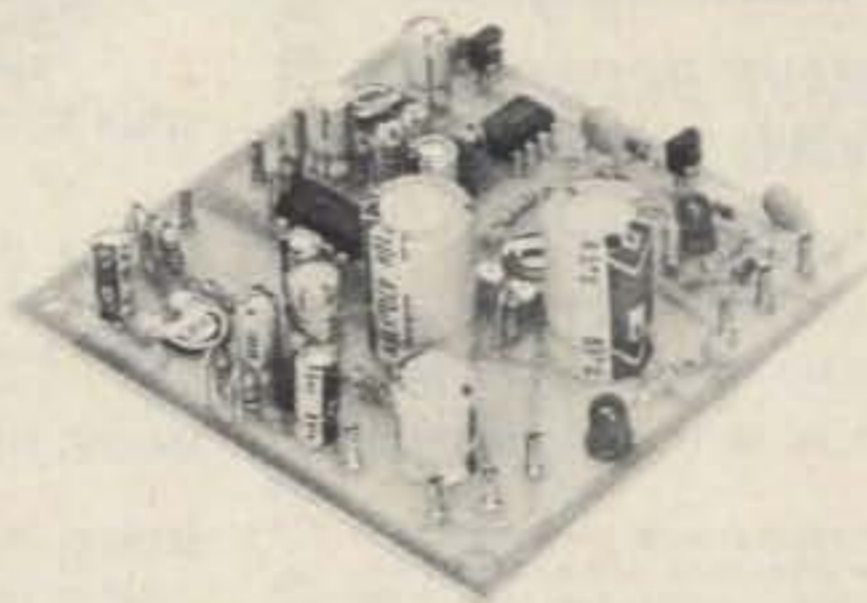
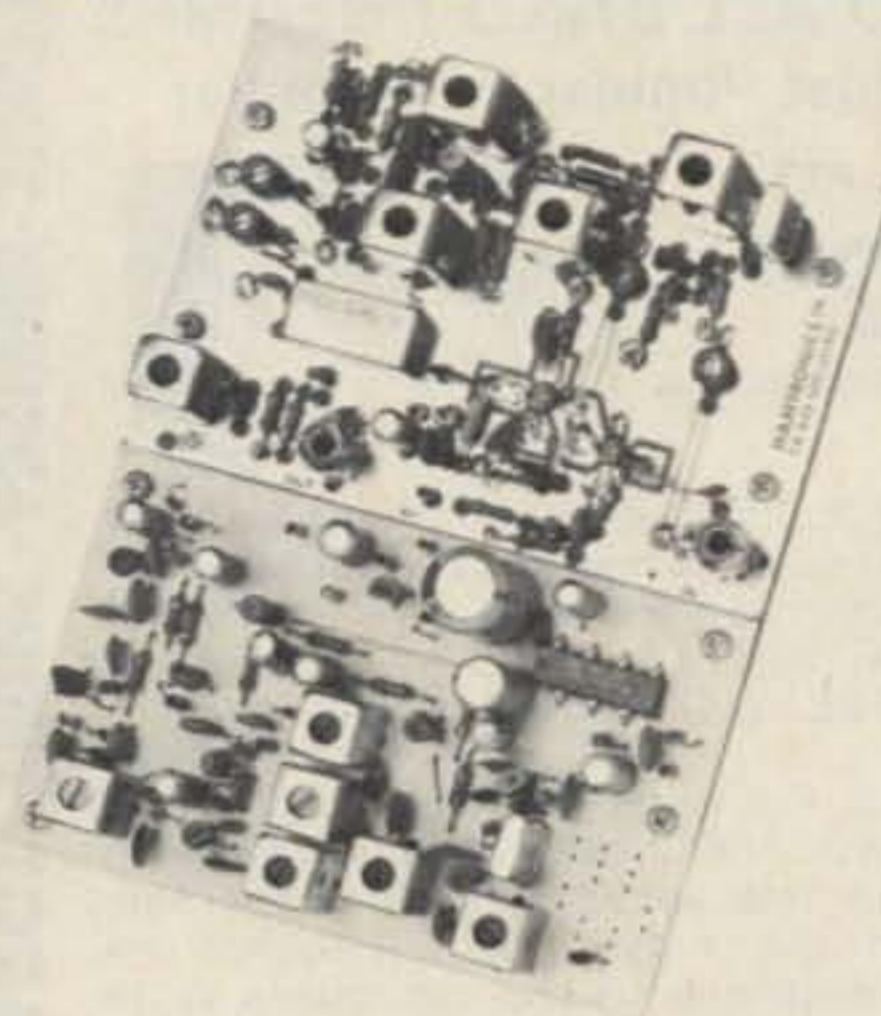


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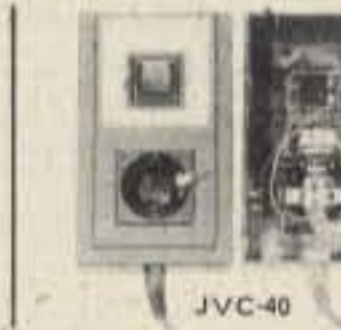
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**FEATURES:**

- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2" w x 5-1/16" L x 2" H

**JE215 Adj. Dual Power Supply Kit (as shown)** . . . **\$24.95**  
(Picture not shown but similar in construction to above)

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DPE214	Priority Interrupt Control	5.95	DAC1001LCN	10-Bit D/A Conv. Micro. Comp. (0.25%)	11.95
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DPE226	Bus Driver	3.49	DAC1027LCN	12-Bit D/A Converter (0.25% Lin.)	5.95
DPE228	System Controller/Bus Driver	4.95	DAC1227LCN	12-Bit D/A Converter (0.25% Lin.)	1.75
DPE238	System Controller	5.95	CD4611N	1-Ch. Channel Multiplexer	1.19
INS8243	I/O Expander for 48 Series	9.95	AY-5-101	3K BAUD UART	6.95
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DPE293	Octal Latched Peripheral Driver	5.25			

6800/6800 SUPPORT DEVICES		MICROPROCESSOR CHIPS			
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MC6803	Peripheral Inter. Adapt (MC6800)	7.49	3601	MPU	36.95
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			TMS9901JL	MPU—32-Bit	20.95

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CDP1802	CPU	TMS2716	32K EPROM (4V, +5V, +12V)	5.95
3601	MPU	2732 (Intel) (2732T)	32K EPROM (Single +5V)	8.95
ICM261AOC	CPU—4-Bit Slice (Com. Temp. Grade)	2732 (Intel) (2732T)	32K EPROM	17.95
MC6800	MPU w/Clock (8K Bytes Memory)	2708	8K EPROM (48V) (Single +5V)	7.49
INS805N-4	MPU—8-Bit (8MHz)	2704Q	8K EPROM (Hitachi HV48704)	49.95
INS805N-4	CPU—5-Bit Chip (8-Bit Bytes RAM)	5201	2048 PROM	14.95
INS807N-4	CPU—54 Bytes RAM	8252(74S188)	32x8 PROM (Open Collector)	3.95
INS807N	CPU—Basic Micro Interpreter	82515	4096 Bipolar PROM	14.95
9608	CPU	82523(74S188)	32x8 Tri-State Bipolar PROM	3.95
TMS9901JL	MPU—32-Bit	82526	8K PROM	16.95

SHIFT REGISTERS		ROM'S		
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MM590H	Dual 100-Bit Dynamic			
MM590H	Dual 54-Bit Accumulator			
MM590H	56-Bit Dynamic			
MM590H	104-Bit Dynamic/Accumulator			
MM590H	56/52-Bit Dynamic			
MM590H	Octal 10-Bit			
MM590H	Octal 10-Bit			
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2400-2	2	12	8 pin	.75 - 10/ 6.95	2400-7	7	1234567	14 pin	1.19 - 10/ 10.95
2400-3	3	123	8 pin	.89 - 10/ 7.95	2400-8	8	12345678	14 pin	1.29 - 10/ 11.95
2400-4	4	1234	8 pin	.99 - 10/ 8.95	2400-9	9	123456789	14 pin	1.39 - 10/ 12.95
2400-ABCD	4	ABCD	8 pin	.99 - 10/ 8.95	2400-10	10	0123456789	20 pin	1.49 - 10/ 13.95
2400-5C	5	C54321	14 pin	1.09 - 10/ 9.95					

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Expand your 4K TRS-80 System to 16K  
Kit comes complete with:

- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (\*ns)
- Documentation for conversion

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**Datanonic 74-Key Keyboard**  
Uses EA 20134 Chip (Electronic Arrays). Size: 16 1/4" L x 5 1/2" W x 1-3/8" H. White, black, blue, grey key caps. (No Data Sheet) —

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Uses AMI SW2050K Chip. Size: 16-3/8" L x 5 1/2" W x 1-5/8" H Metal Frame. Light & dark grey key caps. (No Data Sheet)

**Part No. KB69SD12-2** ..... **\$19.95 ea.**

## Boschert Multi-Voltage Power Supply

5VDC, 12VDC and 24VDC



**FEATURES:** Voltages: 5VDC @ 25amps, 12VDC @ 4amps, & 24VDC @ 4amps. Reg. Load +5V out ±1%, +12 & 24V out ±5% (20-100% load). Overvolt & overcurr. protection. 115 or 230VAC input. WL 4 lbs. Size: 4.95" x 2.50" x 15.00".

\*Total average output shall not exceed 200 watts.

General Description: The "Boschert" Power Supply was originally designed for application with ITT Advance Terminal Controller (ATC). This open frame switching power supply provides user with high current requirements common in use with computer systems. Its compact size provides versatility for mounting into electronic enclosures. Each supply has 6 threaded fasteners (penn nut type) for mounting. Specification requirements to be used with ATC enclosed.

**Part No. 200-3010** ..... **\$69.95 each**  
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FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3 1/2" H x 8 1/4" W x 8 3/4" D

**JE600/DTE-HK** (After assembled as pictured above) ..... **\$99.95**

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**K19** 19-Key Keyboard (Keyboard only) ..... **\$14.95**

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The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters. Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, GAM. TEL-COM Inc. Communications & Electronics. 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.

## Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN and W8RP behind the counter. Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104, 668-8696.

## Hudson NH

New England's Distributor and Authorized Service Center for all Major Amateur Lines. Tufts Radio Electronics, Inc., 61 Lowell Road, Hudson NH 03051, 883-5005.

## Somerset NJ

New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventory of new and used specials. Most major brands in stock. Complete service and facilities. Radios Unlimited, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873; 469-4599.

## Syracuse-Central NY

HAM-BONE RADIO SAVES US LOT OF \$\$\$ on all Icom, Ten-Tec, Hygain & Kantronics Gear. Fast, Dependable Service Before & After the Sale! Service is Our Main Business! Need Cash-Ham-Bone will sell your gear for 10% commission. 3206 Erie Blvd. E., Syracuse 13214, 446-2266.

## Philadelphia PA/ Camden NJ

Waveguide & Coaxial Microwave Components & Equipment. Laboratory Grade Test Instruments, Power Supplies, Buy, Sell & Trade all popular makes—HP, GR, FXR, ESL, Sorensen, Singer, etc. Lectronic Research Labs, 1423 Ferry Ave., Camden NJ 08104, 541-4200.

## Amsterdam NY UPSTATE NEW YORK

Kenwood, ICOM, Drake, plus many other lines, Amateur Dealer for over 35 years. Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010, 842-8350.

## Syracuse-Rome-Utica NY

Featuring: Kenwood, Yaesu, ICOM, Drake, Ten-Tec, Swan, DenTron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products. You won't be disappointed with equipment/service. Radio World, Oneida County Airport-Terminal Building, Oriskany NY 13424, 337-0203.

## Columbus OH

The biggest and best Ham Store in the midwest featuring quality Kenwood products with working displays. We sell only the best. Authorized Kenwood Service, Universal Amateur Radio Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.

## Bend OR

Satellite TV. Known brands. Call today for more information and inquire about our dealer program. WESPERCOM, P.O. Box 7226, Bend OR 97708, 389-0996.

## Scranton PA

ICOM, Bird, Cushcraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, CDE, AEA, Vibroplex, Ham-Key, CES, Amphenol, Sony, Fanon/Courier, B&W, Ameco, Shure. LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.

## Dallas TX

Dealer in Used Computer Hardware & Electronic Parts. Special on Daisy Wheel Printers, Xerox Word Processing Equipment, Dual Card Printers and Display Systems. Catalog \$1.00. Rondure Company (The Computer Room) Dept. 73, 2522 Butler St., Dallas, TX 75235, 630-4621.

## San Antonio TX

Amateur, Commercial 2-say. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard, Vibroplex, Midland, Henry, Cushcraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. Appliance & Equipment Co., Inc. 2317 Vance Jackson Road, San Antonio TX 78213, 938-3350.

## Vienna VA

The Washington metropolitan area's leading supplier of the latest in Amateur Radio and Test Equipment. On your next trip to the Nation's Capital, stop by and see us. Electronic Equipment Bank, Inc., 516 Mill St. N.E., Vienna VA 22180, 938-3350.

## DEALERS

Your company name and message can contain up to 25 words for as little as \$150 yearly (prepaid), or \$15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the August '82 issue must be in our hands by June 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

# PROPAGATION

J. H. Nelson  
4 Plymouth Dr.  
Whiting NJ 08759

## EASTERN UNITED STATES TO:

	GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14	
ARGENTINA	21	21	14A	14	14	7	14	21	21	21	21A	21A	
AUSTRALIA	21	14A	14	14	7	7B	7	7	7B	7B	14	14A	
CANAL ZONE	21	14A	14	14	14	7	14	14	21	21	21	21	
ENGLAND	14	7A	7	7	7	14	14	14A	21	14A	14A	14	
HAWAII	14A	14	14	14	7	7	7	14	14	14	14	14	
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14	
JAPAN	14	14	14	7B	7B	7B	7B	7B	14	14	14	14	
MEXICO	14	14	14	14	7	7	14	14	14	14	21	21	
PHILIPPINES	14	14	14B	7B	7B	7B	7B	7B	14	14	14	14	
PUERTO RICO	21	14	14	14	7	7	14	14	21	21	21	21	
SOUTH AFRICA	14	7B	7B	14	14	14	21	21	21A	21A	14	14	
U. S. S. R.	14	7A	7	7	7	14	14	14	14	14	14	14	
WEST COAST	14A	14	14	7A	7	7	7	14	14	14A	14A	21	

## CENTRAL UNITED STATES TO:

ALASKA	14	14	14	14	7	7	7	7	7A	14	14	14	
ARGENTINA	21	21	14A	14	14	7	14	21	21	21	21A	21A	
AUSTRALIA	21	21	14	14	14	14	7	7	7B	7B	14	14A	
CANAL ZONE	21	14A	14	14	14	7	14	14	21	21	21	21	
ENGLAND	14	7	7	7	7	7	7	14	14	14	14A	14	
HAWAII	14A	14A	14	14	7A	7	7	14	14	14	14	14	
INDIA	14	14	14	7B	7B	7B	7B	7B	14	14	14	14	
JAPAN	14	14	14	14	7B	7B	7B	7B	14	14	14	14	
MEXICO	14	14	14	14	7	7	7	14	14	14	21	21	
PHILIPPINES	14	14	14	14B	7B	7B	7B	7B	14	14	14	14	
PUERTO RICO	21	14	14	14	7	7	14	14	14A	21	21	21	
SOUTH AFRICA	14	7B	7B	7B	7B	14B	14	14	14	14	14	14	
U. S. S. R.	14	7A	7	7	7	7	7	14	14	14	14	14	

## WESTERN UNITED STATES TO:

ALASKA	14	14	14	7A	7	7	7	7	7A	14	14	14	
ARGENTINA	21	21	14A	14	14	7	14	21	21	21	21A	21A	
AUSTRALIA	21A	21A	21	14A	14A	14	14	7	7B	7B	14A	21	
CANAL ZONE	21	14A	14	14	14	7	14	14	21	21	21	21	
ENGLAND	14	7	7	7	7	7	7	14B	14	14	14	14	
HAWAII	21A	21A	21	14A	14	14	14	14	14A	14A	21	21	
INDIA	14	14	14	14	7B	7B	7B	7B	14	14	14	14	
JAPAN	14	14	14	14	14	14B	7	7	14	14	14	14	
MEXICO	14	14	14	14	7	7	7	14	14	14	21	21	
PHILIPPINES	14A	14	14	14	14B	14B	7B	7B	14	14	14	14A	
PUERTO RICO	21	14A	14	14	7	7	14	14	14	14A	21	21	
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14B	14	14	14	14	14	
U. S. S. R.	14	7A	7	7	7	7	7	7B	14	14	14	14	
EAST COAST	14A	14	14	7A	7	7	7	14	14	14A	14A	21	

First letter = day waves Second = night waves  
A = Next higher frequency may also be useful  
B = Difficult circuit this period F = Fair G = Good  
P = Poor \* = Chance of solar flares; # = of aurora

## JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G/F	2 G/F	3 G/G	4 G/G	5 G/G
6 G/G	7 G/F	8 G/G	9 G/G	10 G/G	11 G/G	12 G/G
13 G/G	14 G/G	15 G/G*	16 F/F*	17 F/P	18 F/F	19 G/G
20 G/G	21 G/G	22 G/F	23 G/G	24 G/G	25 G/F	26 G/G
27 G/G	28 G/F	29 G/G	30 G/G			



# FT-230R: QUITE A SIGHT! (AND EASY TO SEE, TOO!!)

Sporting an all-new Liquid Crystal Display, the FT-230R is Yaesu's high-performance answer to your call for a very affordable 2 meter mobile rig with an easy-to-read frequency display! The FT-230R combines microprocessor convenience, a sensitive receiver, a powerful yet clean transmitter strip, and the new dimension of LCD frequency readout. See your Authorized Yaesu Dealer today — and go home with your new FT-230R!



SALE SUBJECT  
FCC CERTIFICATION

- LCD five-digit frequency readout with night light for high visibility day or night.
- Two VFOs for quick QSY across the band.
- Ten memory slots for storage and recall of favorite channels.
- Selectable synthesizer steps (5 kHz or 10 kHz) in dial or scanning mode.
- Priority channel for checking a favorite frequency for activity while monitoring another.
- Unique VFO/Memory Split mode for covering unusual repeater splits.
- Up/Down band scan plus memory scan for busy or clear channel. Scanning microphone included in purchase price.
- Full 25 watts of RF power output from extremely compact package.
- Built-in automatic or manual tone burst.
- Optional synthesized CTCSS Encode and Encode/Decode boards available.
- Lithium memory backup battery with estimated lifetime of five years.
- Optional YM-49 Speaker/Microphone and YM-50 DTMF Encoding Microphone provide maximum operating versatility.

FT-208R  
FM Handheld  
2 Meters

FT-708R  
FM Handheld  
70 cm

**And don't forget! Yaesu has a complete line of VHF and UHF handheld and battery portable transceivers using LCD display!!!**

FT-290R - 2 Meters  
SSB/CW/FM Portable

FT-690R - 6 Meters  
USB/CW/AM/FM Portable



Price and Specifications Subject To  
Change Without Notice or Obligation

**YAESU**  
*The radio.*



482



**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  $\mu$ 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  $\pm 9.9$  kHz receive frequency shift.
- **Eight memory channels.** Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").** NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.** Allows independent adjustment of the low and/or high frequency slopes of the IF passband, for best interference rejection.
- **CW VBT and pitch controls.** CW VBT (Variable Bandwidth Tuning) control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.** 100-kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.** Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.** 120, 220, or 240 VAC, switch selected (operates on AC only).

- **Fluorescent tube digital display.** Fluorescent tube digital display has analog type sub-scale with 20-kHz steps. Separate 2 digit display indicates RIT frequency shift.
- **RF speech processor.** RF clipper type processor provides higher average "talk-power," plus improved intelligibility. Separate "IN" and "OUT" front panel level controls.
- **One year warranty.** The TS-930S carries a one year limited warranty on parts and labor.
- Other features:**
  - SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.
- Optional accessories:**
  - AT-930 automatic antenna tuner.
  - SP-930 external speaker with selectable audio filters.
  - YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
  - YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
  - YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
  - MC-60 (S-8) deluxe desk microphone with UP/DOWN switch.
  - TL-922A linear amplifier.
  - SM-220 station monitor.
  - HC-10 digital world clock.
  - HS-6, HS-5, HS-4 headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220



Specifications and prices are subject to change without notice or obligation.