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73 MAGAZINE
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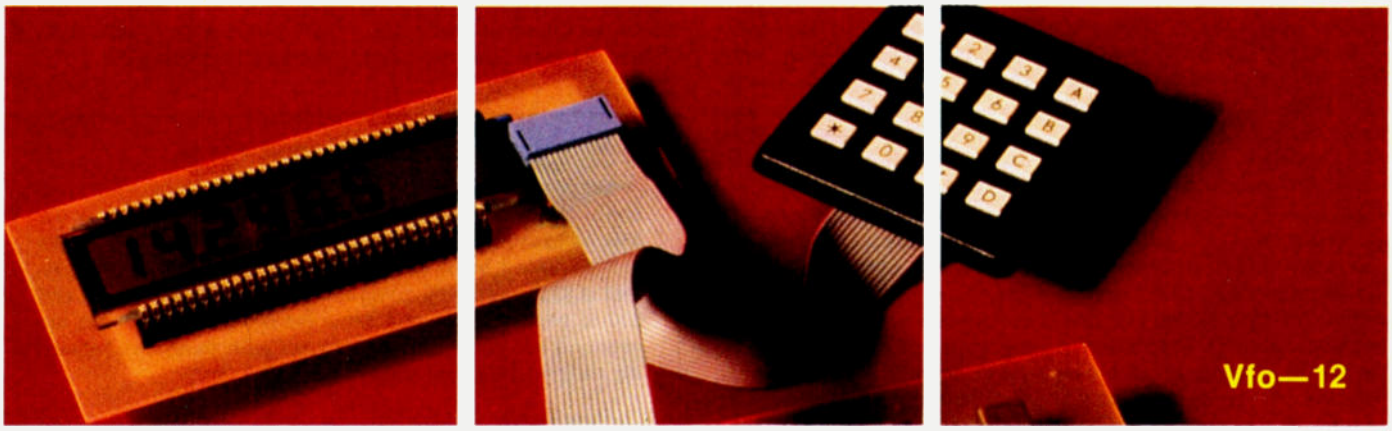

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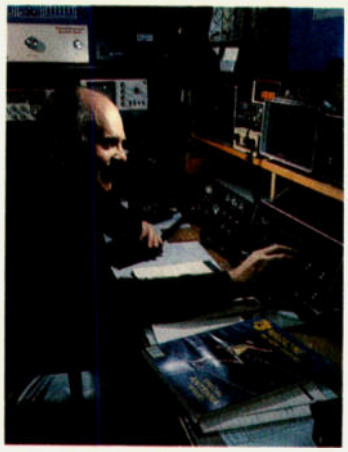
NEVER SAY DIE
editorial by Wayne Green



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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73-BB/82

Good Mar. 1 through Jun. 15, 1982.

At 15, I was busily bootlegging on 40-meter CW with my Hallicrafters SX-19 receiver and a homemade 6L6 rig. I was pretty good at the code, but every time I'd go down to take my license exam, I'd go into a total panic and flub it. I think the only reason I ever passed was that one day I went along with a friend who was being examined. I hadn't practiced or even studied for the written test. Once we got there, since the test was free, I said what the hell and sat down.

The code came through, sounding like five words per minute. I got good copy. My buddy, who had been whipping off 15 per the night before, had an almost empty page. I got my ticket and he never did get his. Pity, for he became a well-known electronic engineer. Panic.

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. DX is relative, of course, once you get into the hobby. My contacts across town on 112 megs were as much fun as working Swaziland 30 years later.

As a jaded old-time ham, you may not find much excitement in whipping out an HT and making a contact with some friend fifty miles away, but I'll bet that a lot of youngsters would find it fantastic. Oh, they're familiar with CB. . .but it is never like this.

If CB had been around when I was a kid, would I have been side-tracked into it? Undoubtedly. Would my eventual disillusionment with CB stop me from getting into amateur radio? I 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 technical test totally bypassed by the Bash books, there are few barriers.

I learned the Morse code one evening while getting dressed to go to a Boy Scout meeting. I'd put it off until the last minute, as usual, and had to demonstrate my code ability at the meeting. Within one hour, I learned the letters and was doing at least five words per. I was 14 at the time.

To digress, as usual, my enthusiasm for getting rid of the Morse code test for a ham license and replacing it with a

Continued on page 121

Well. . . I Can Dream, Can't I?

by Bandel Linn K4PP

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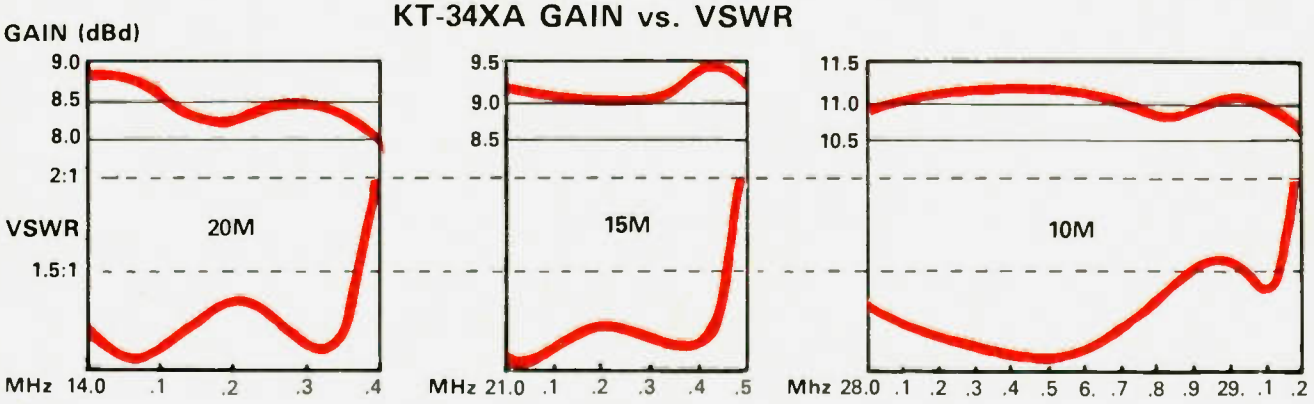
KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart below shows the remarkable performance qualities of the KT-34XA.

KT-34XA GAIN vs. VSWR



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Tim Ahrens WA5VQK
Microcomponent Applications Engineer, Motorola
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Build This Digital Vfo

— a microprocessor makes it simple

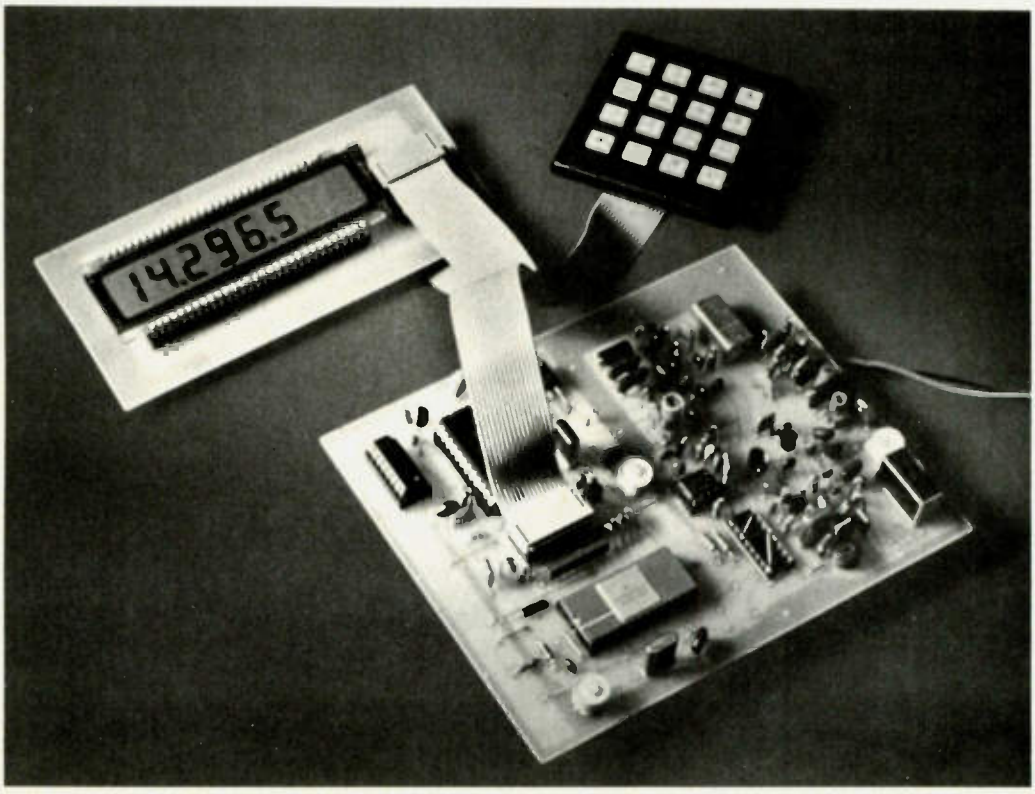
Ed. Note: The MC6805T2L2 microprocessor IC used in this project must be ordered directly from Motorola. Send a money order only (no checks) for $11.50, payable to Motorola, to: Tim Ahrens, Motorola, 3501 Ed Bluestein Blvd., Austin TX 78721, Attention: Mail Stop L-2787.

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 around 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.

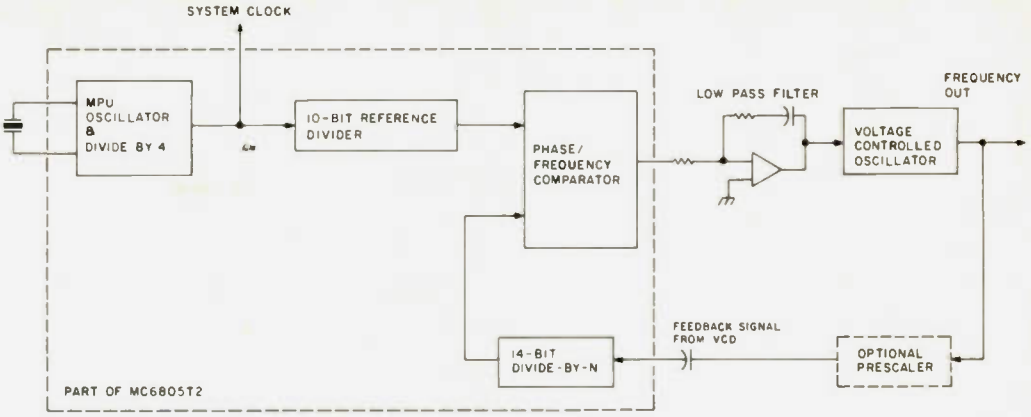


Fig. 1(a). Block diagram of synthesizer on MC6805T2 MCU chip.

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 followed using the "down" key.

To set the time, press "recall" followed by "memory." At this time, the display will show EEEEEE, 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

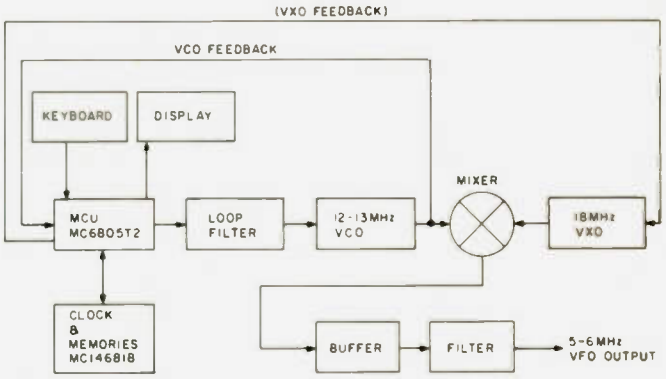


Fig. 1(b). Block diagram of entire microprocessor-controlled vfo.

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-summing 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 postpaid 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.

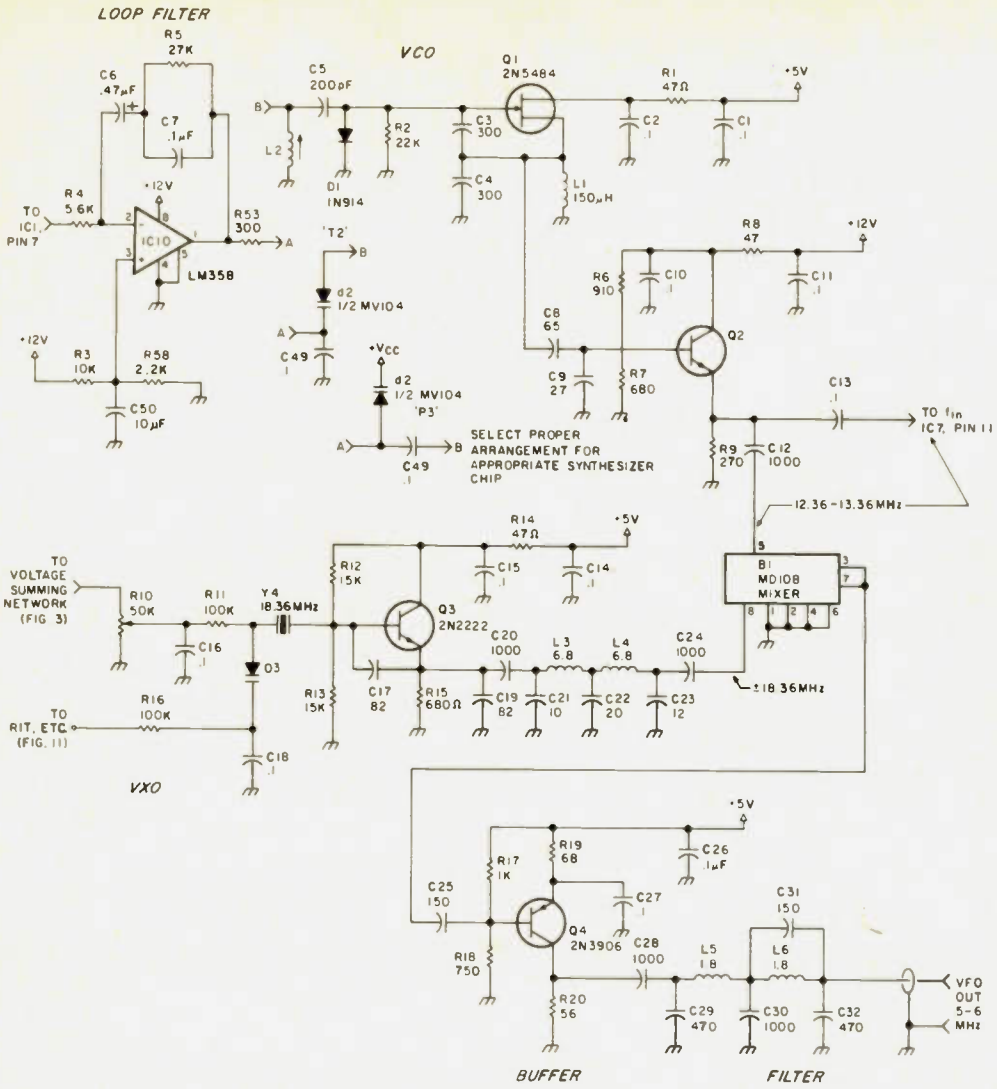


Fig. 2. Rf circuitry of vfo.

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 several 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/pulldown 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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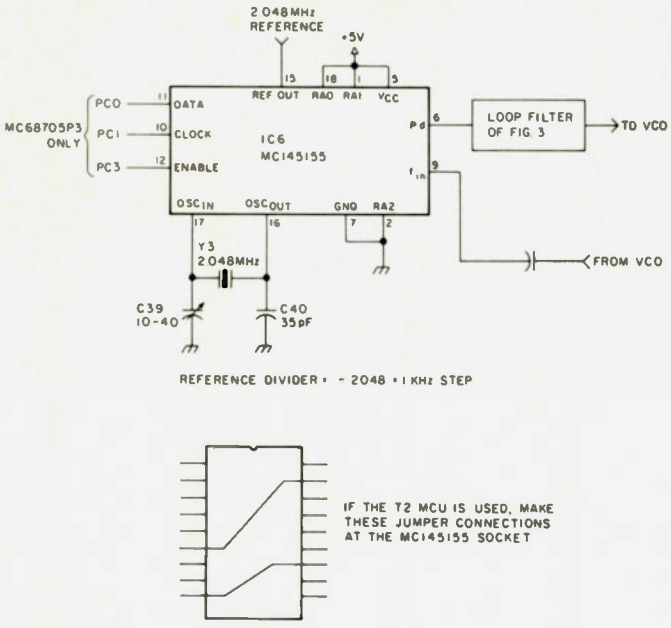

Fig. A. Using the MC145155 CMOS synthesizer.

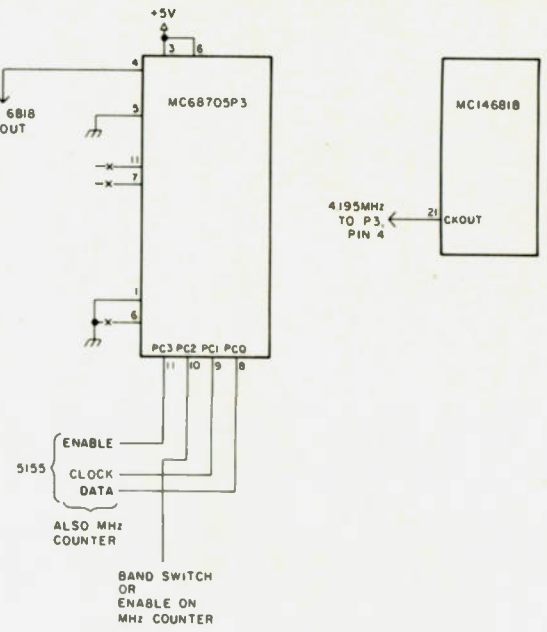

Fig. B. 6805 T2 vs. P3 differences.

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.

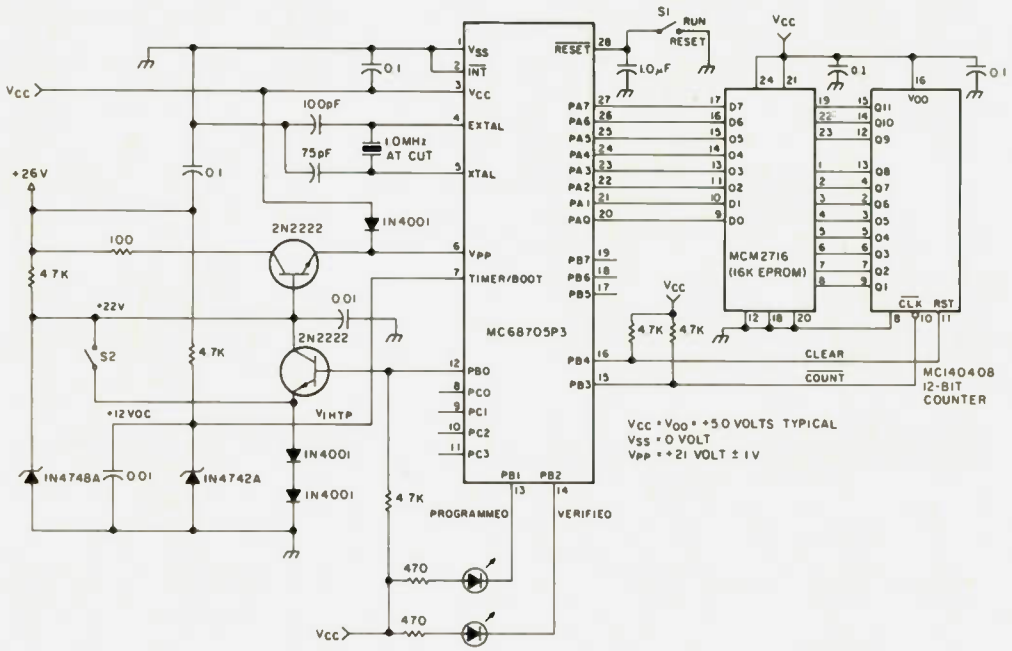

Fig. C. Programmer for the P3.

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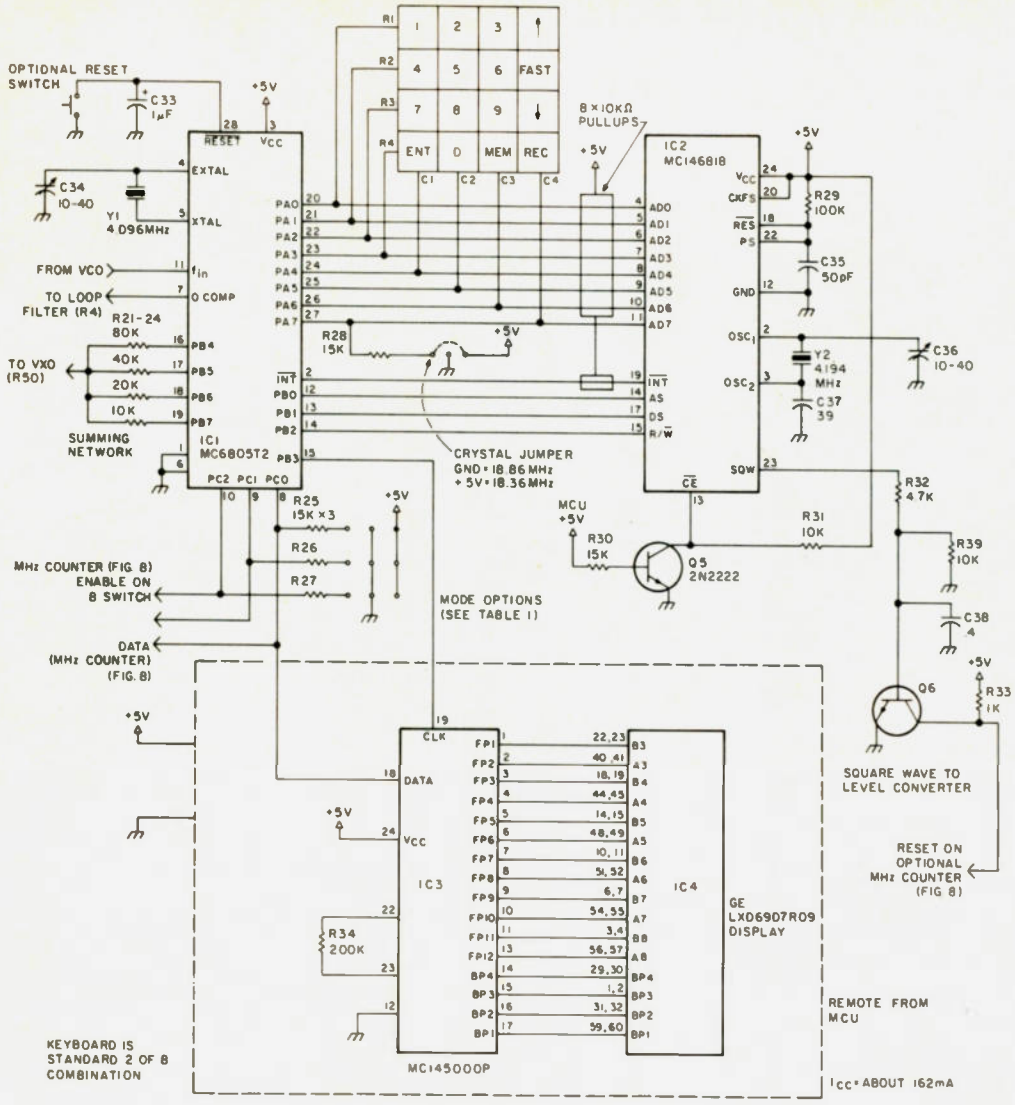
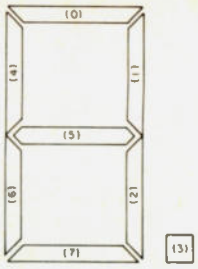


Fig. 3. MCU and peripherals.



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.

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.

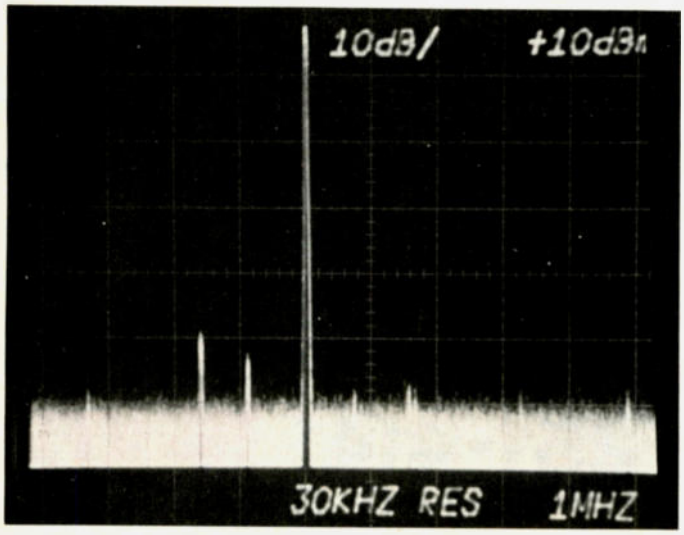


Fig. 4. Vfo output displayed on spectrum analyzer.

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.

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

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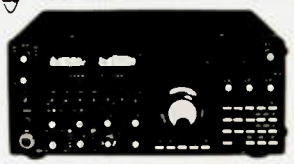

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My spy at the Japanese factories, Tang In Stead, is back on my good side. If you have followed his doings, you will recall that he leaked the info on the new Kenwood TS-840s three months ago. Well take those three months, which is 90 days, add that 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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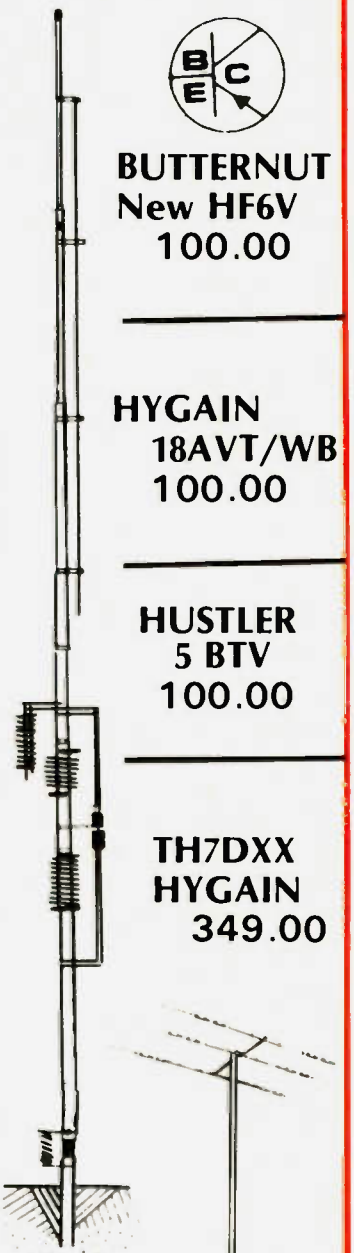

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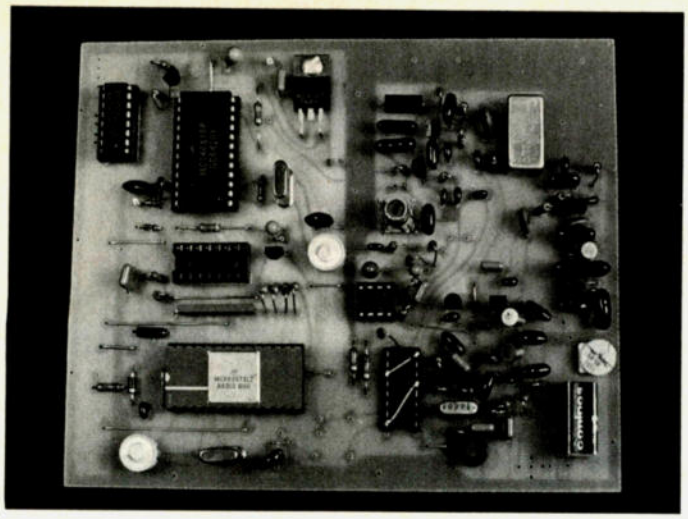

Main circuit board, using the MC6805T2L2 MPU. If the alternate "P3" MPU is used, then the socket with jumpers at lower center would be replaced with an MC145155P synthesizer chip. The empty socket at left is for the plug-in cable to the keypad. At upper right is a metal can containing the double-balanced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

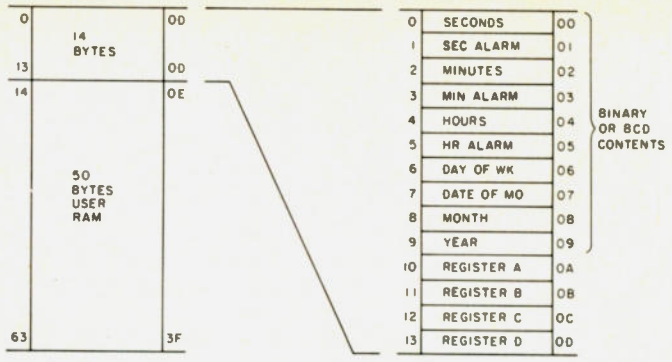

Fig. 6. Registers of the MC146818 clock chip.

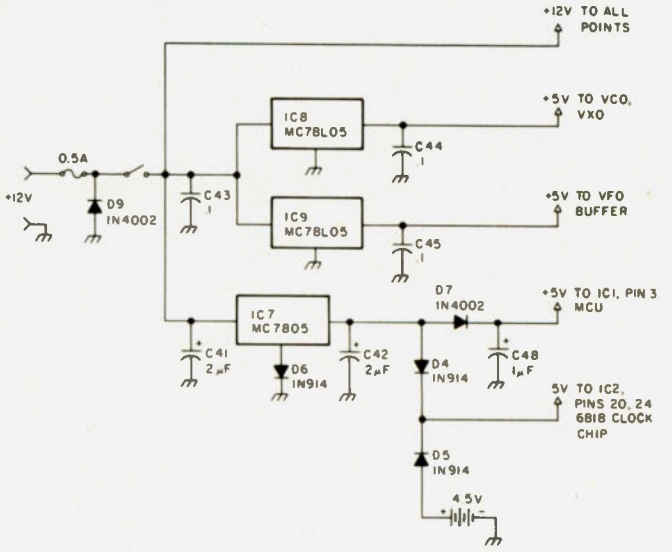

Fig. 7. Power supply. The regulated 12 V dc which drives this supply can often be derived from your transceiver. Otherwise, a simple 12-V-dc, 1-A source should be constructed.

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 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 4 × 4 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 case, I chose to "multiplex" the data lines for the clock on the same I/O lines as those required for the keyboard.

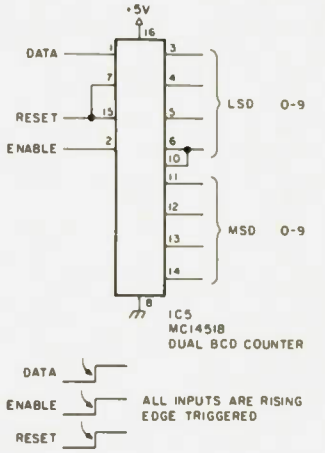

Fig. 8. MHz-counter option.

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

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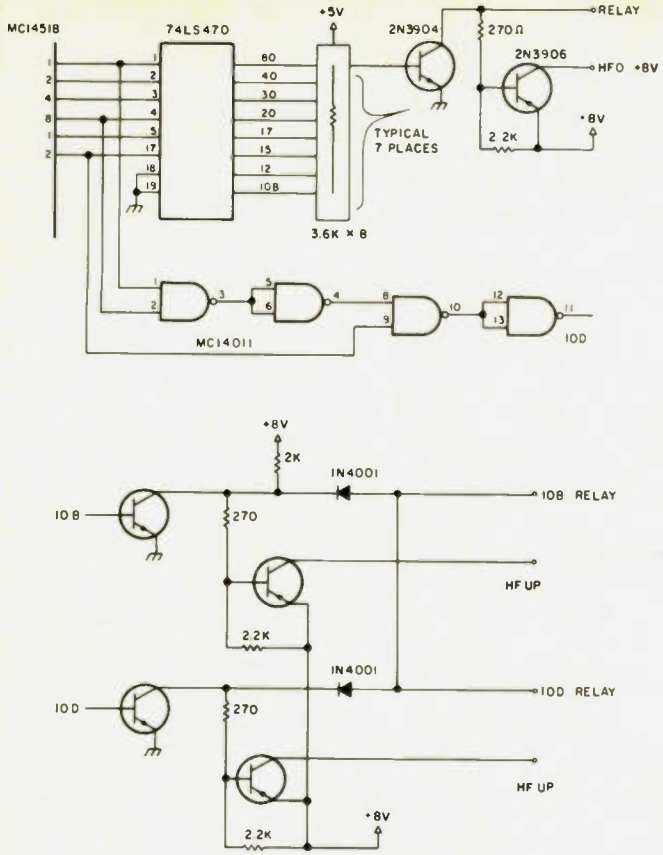


Fig. 9(a). This circuit provides automatic bandswitching for the FT-707. Alternative connections may be required for the FT-107 or other radios. Be sure to place the FT-707 bandswitch in the unused position when this hardware is connected.

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 reconfigured for inputs from the keyboard. The actual transfer time is so short (< 300 μs) 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 reconfigured 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 μs) 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-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.

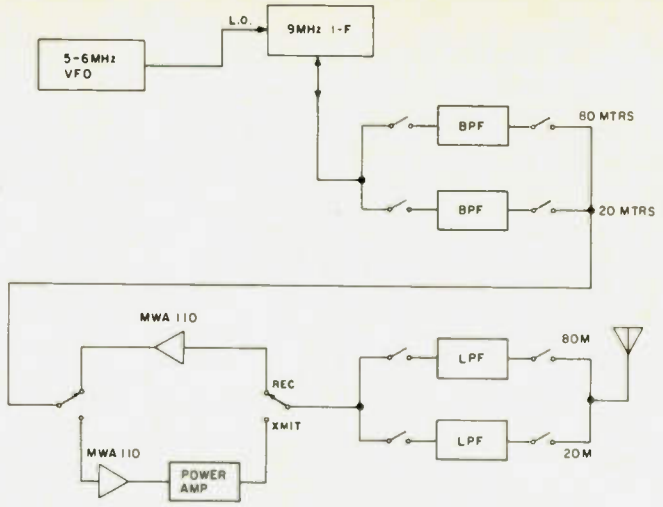


Fig. 10. Block diagram of a complete single-conversion transceiver controlled by the microprocessor vfo.

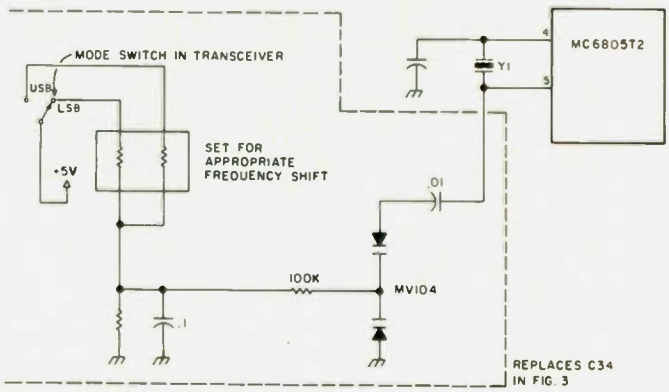


Fig. 11. Mode switching for rigs which display actual operating frequency (not carrier frequency).

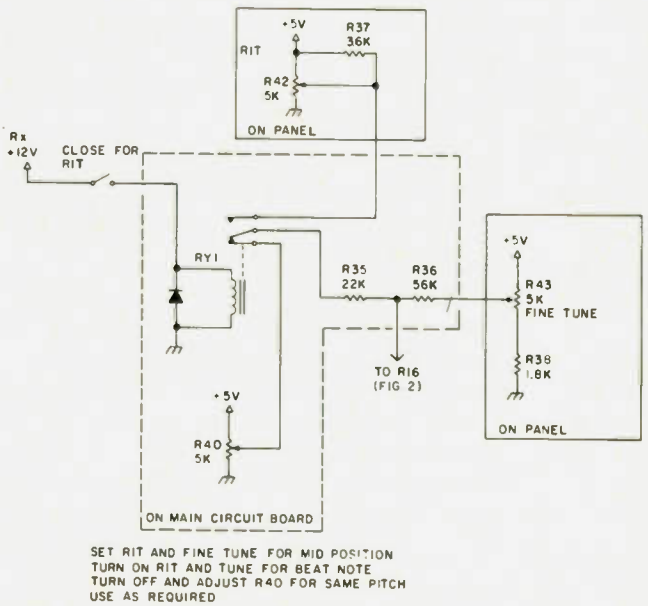


Fig. 12. Adding RIT and fine tuning to the vfo. Most of these components mount on the main circuit board.

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.

Parts List

Component	Value (Ω)	Quantity
R1,8,14	47	3
R2,35	22k	2
R11,16,29	100k	3
R4	5.6k	1
R6	910	1
R7,15	680	2
R9	270	1
R10	50k pot (small)	1
R12,13,15,26, 27,28,30	15k	7
R17,R33	1k	2
R18	750	1
R19	68	1
R20	56	1
R21	82k	1
R22	39k	1
R23	20k	1
R24,31,39, 44-51,3	10k	12
R32	4.7k	1
R34	200k	1
R36	56k	1
R37	3.6k	1
R38	1.8k	1
R40,41,42	5k pot (2 panel, 1 PCB)	3
R5	27k	1
R43	10 meg	1
R53	300	1
R58	2.2k	1
L1	150 μH	1
L2	1-2 μH (13 turns #28 ¼" form)	1
L3,4	6.8 μH	2
L5,6	1.8 μH	2
B1	MD108 double-balanced mixer	1
Y1	4.096 MHz	1
Y2	4.194 MHz	1
Y3	*2.048 MHz	1
Y4	18.36 or 18.86 MHz	
RY1	Relay (RIT)	1
C1,2,7,10,11,13,43, 44,14,15,16,18,26, 27,45,46,49	.1 μF	17
C3,C4	300 pF	2
C5	200 pF	1
C6	.47 μF	1
C8	65 pF	1
C9	91 pF	1
C12,20,24,28,30	1000 pF	5
C17,19	82 pF	2
C21	10 pF	1
C22	20 pF	1
C23	12 pF	1
C25,31	150 pF	2
C29,32	470 pF	2
C33,47,48	1 μF	3
C34,36	10-40 var.	2
C35	50 pF	1
C37	39 pF	1
C38	.47 μF	1
C39	*10-40 pF	1
C40	*39 pF	1
C41,42	2 μF	2
C50	10 μF	1
Q1	2N5484	1
Q2,3,5,6	2N2222	4
Q4	2N3906	1
D1,4,5,6	1N914	4
D2	MV104	1
D3	MV830	1
D7,9	1N4002	2
IC10	LM358	1
IC1	*MC6805T2 or 68705P3	1
IC2	MC146818P	1
IC3	MC145000P	1
IC4	GE Display	1
IC5	MC14518P	1
IC6	*MC145155P	1
IC7	MC7805	1
IC8,9	MC78L05	2

*denotes MC68705P3 option.

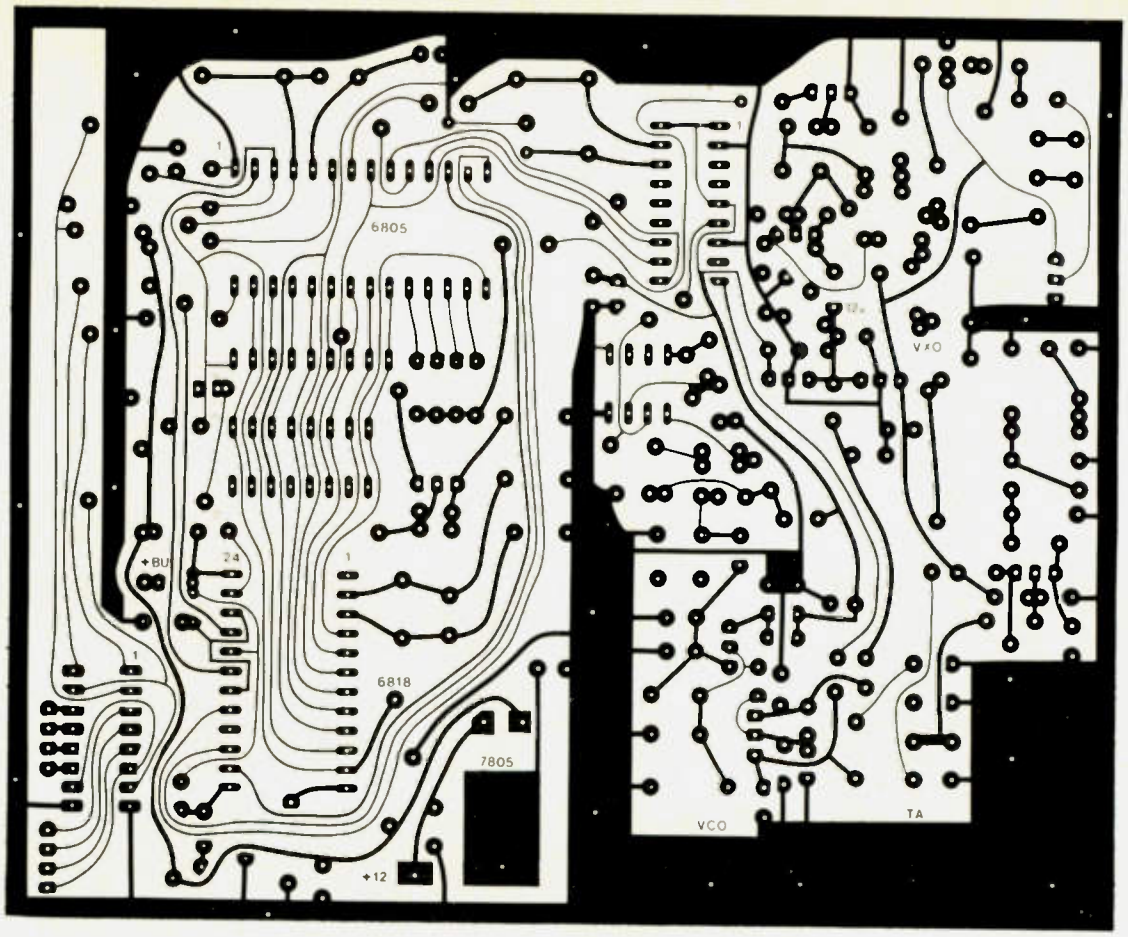


Fig. 13. Main vfo PC board (foil side).

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 incremental 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-

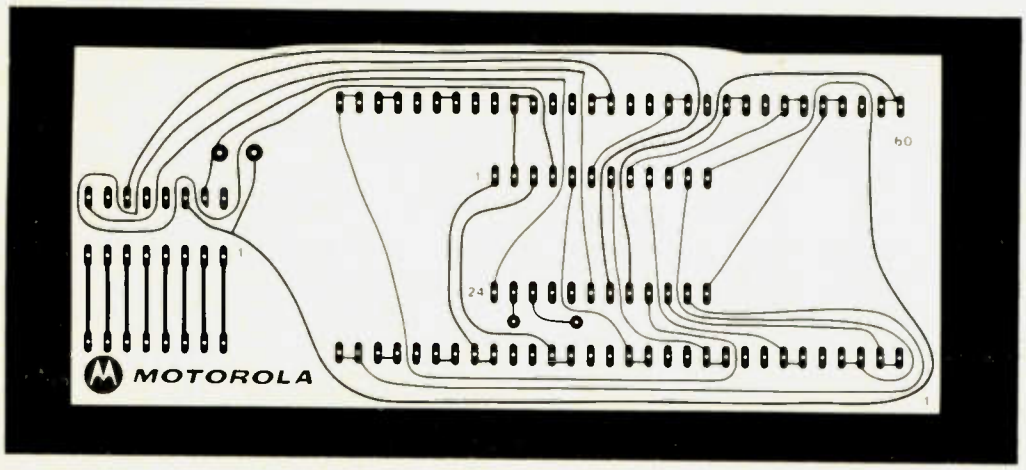


Fig. 14. Display PC board (foil side).

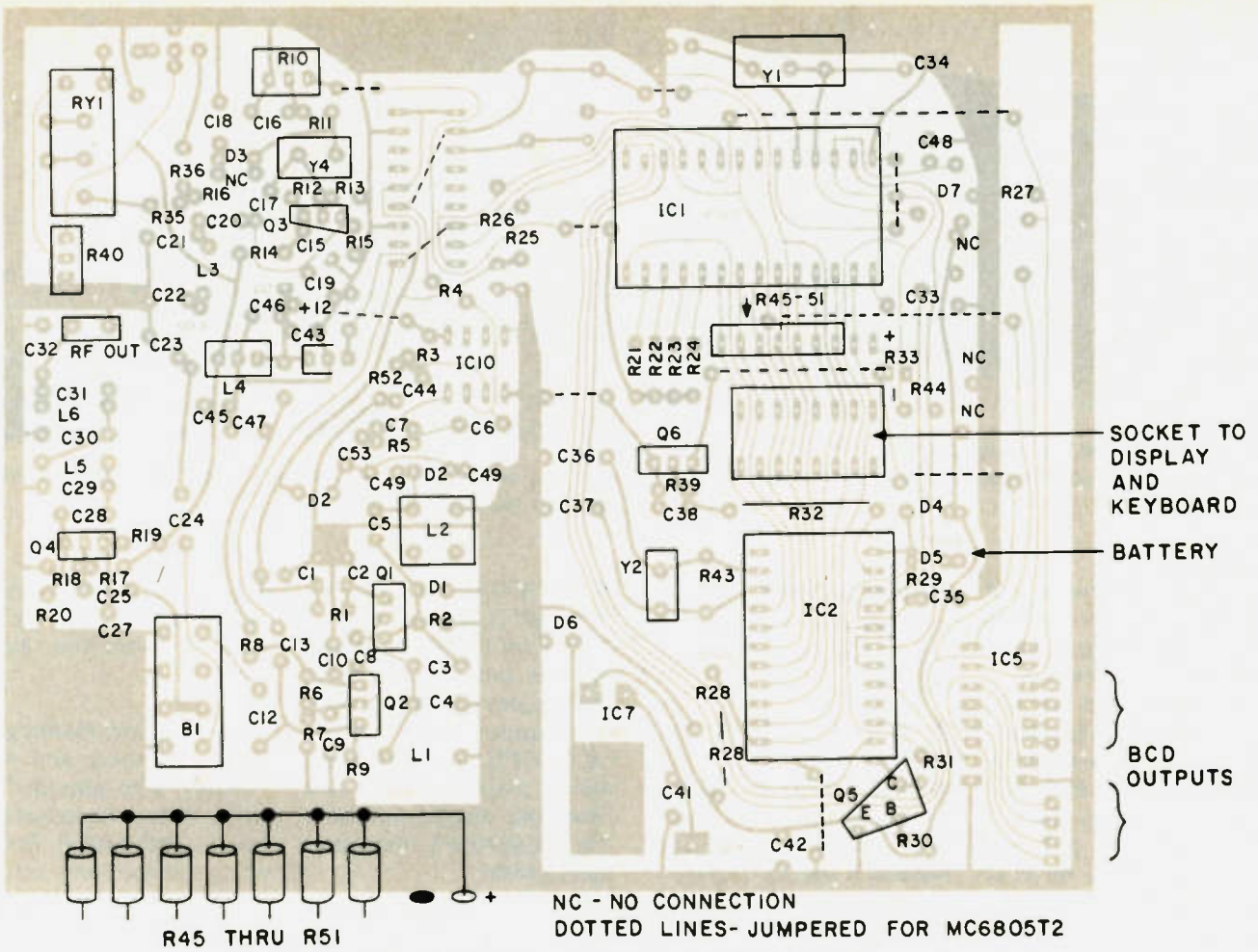


Fig. 15. Component placement, main board.

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 properly 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-

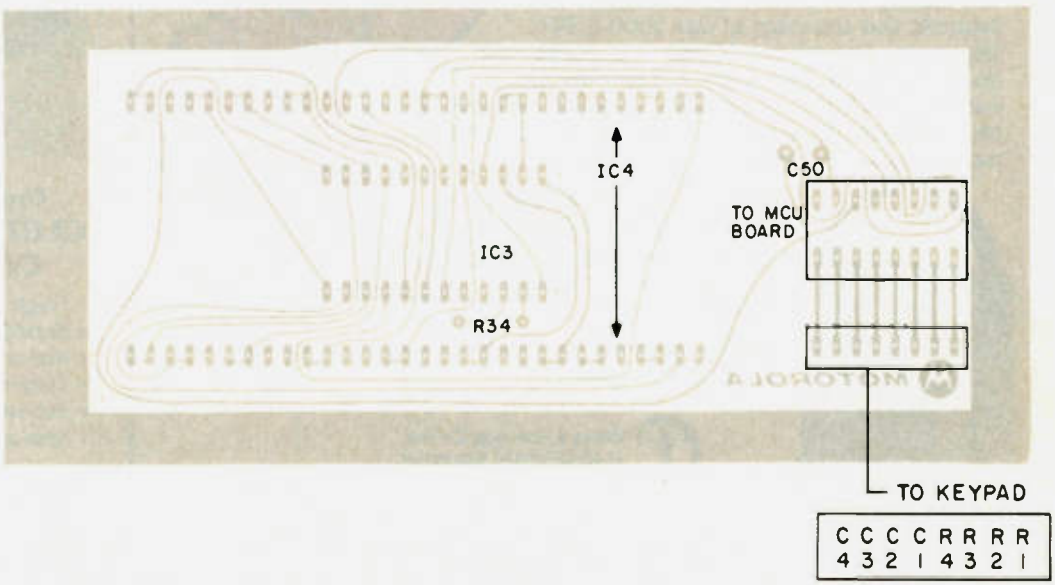
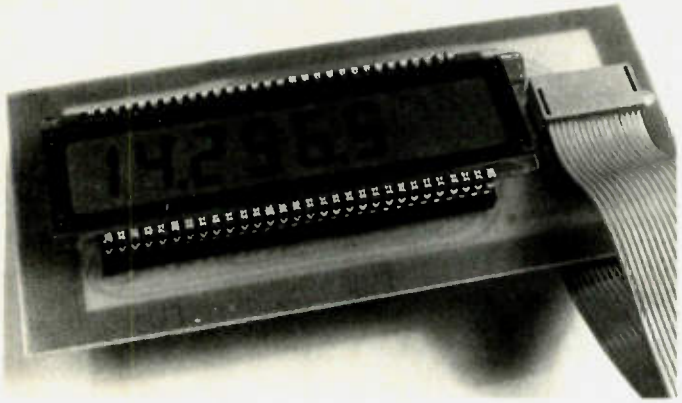
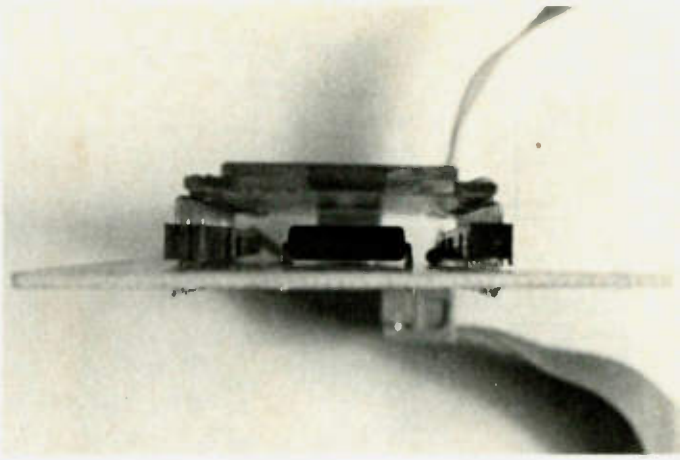


Fig. 16. Component placement, display board. Driver chip fits under display unit, on the same side of the board. Display unit is elevated above the board by segments of high-profile IC sockets (see photos).



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:

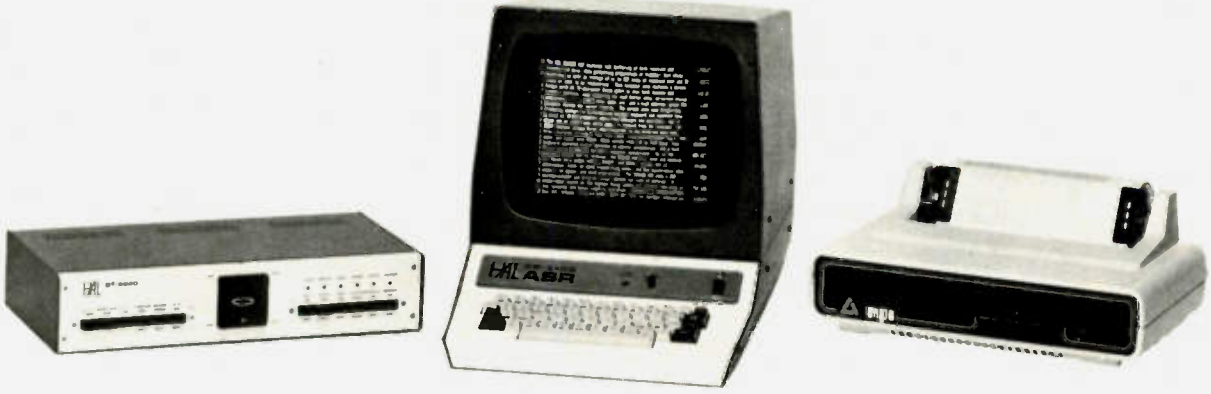
- MC6805T2L2—$12.00-15.00
- MC68705P3—$50.00 (not needed if the T2 is used)
- MC145155—$7.32 (not needed if the T2 is used)
- MC146818—$10.00
- MC145000—$12.49
- 8-digit LCD—$26.40

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. ■

REGAL RTTY



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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.

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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 crisis-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).

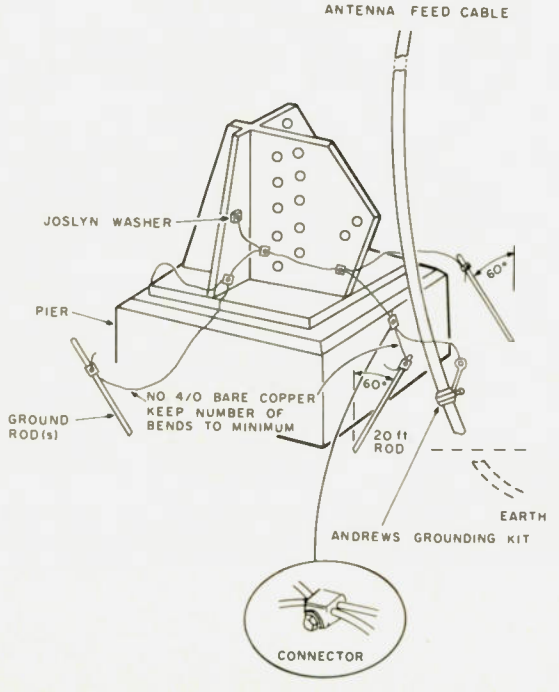

Fig. 1. Recommended ground connections at tower base.

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

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.

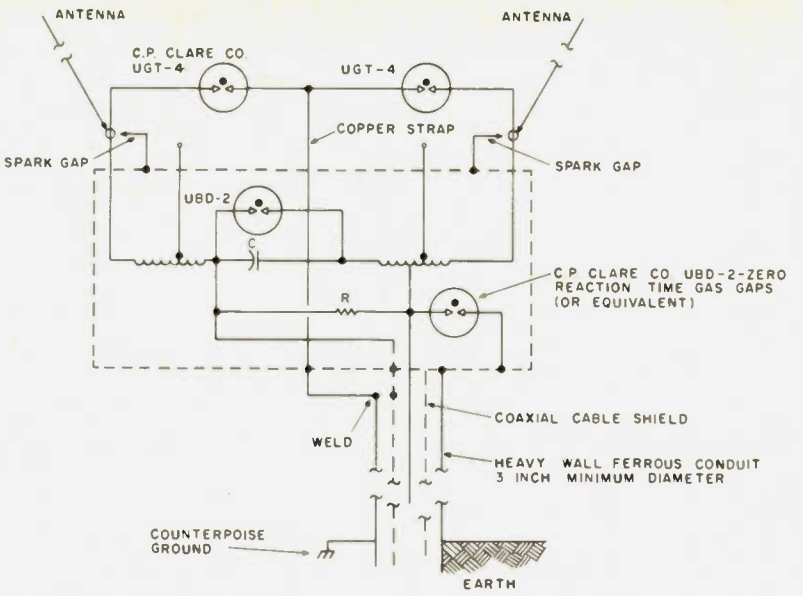

Fig. 2. Suggested use of gas gaps in an antenna balun. Note that this approach uses a thick-wall conduit around the coax.

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

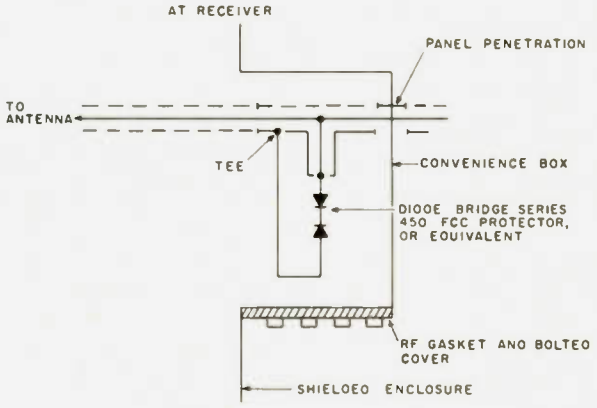

Fig. 3. Coaxial tee protectors used in a receiver circuit.

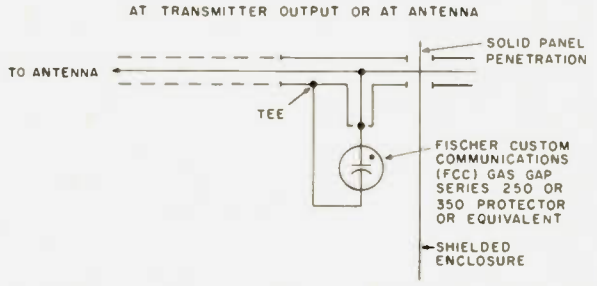

Fig. 4. Coaxial tee protectors shown in a transmitter circuit.

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

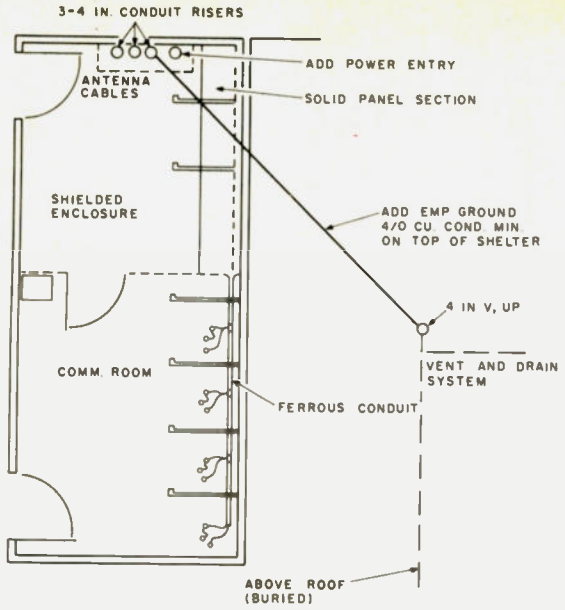

Fig. 5. Suggested layout for communications room with remote operation of equipment.

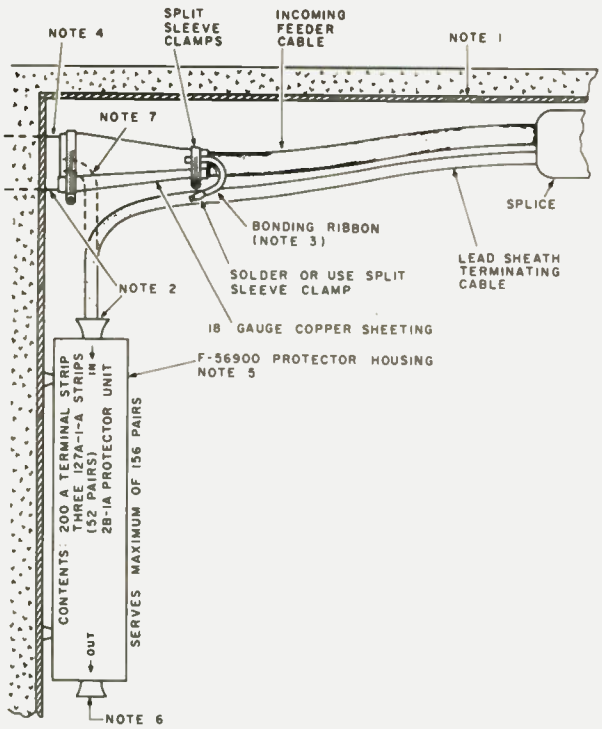

Fig. 6. This is one recommended method of protecting a telephone cable system against EMP transients. Note the heavy emphasis on shielding. The numbered notes refer to detailed construction specifications.

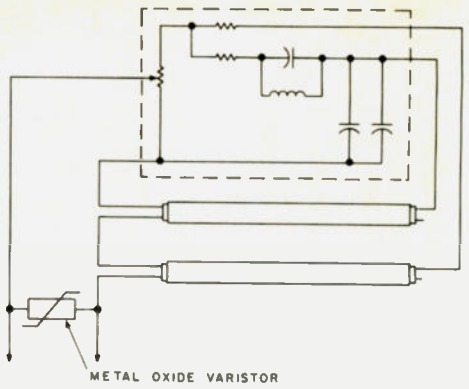

Fig. 7. This is a typical varistor installation applied to a fluorescent lighting circuit.

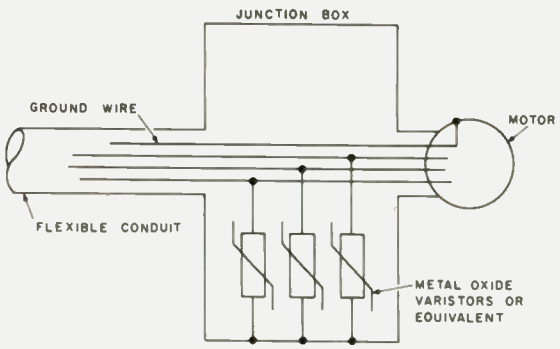

Fig. 8. This is a suggested circuit for EMP protection of a 3-phase, 4-wire motor using metal-oxide varistors (MOVs) connected between each hot wire and ground.

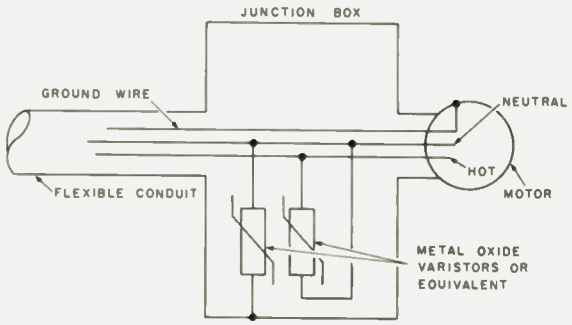

Fig. 9. Single-phase motor protection using MOVs between hot wires and ground.

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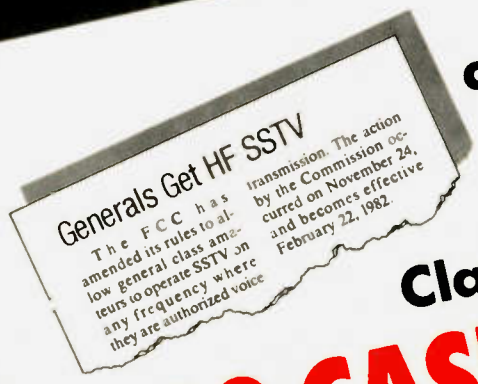
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could be a problem with any wire coming into your home. Since the EMP energy in long overhead wires can be extremely hazardous, be sure people stay away from these wires during a time of possible attack.

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 inches below the surface, using ½-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 feedpoint. 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

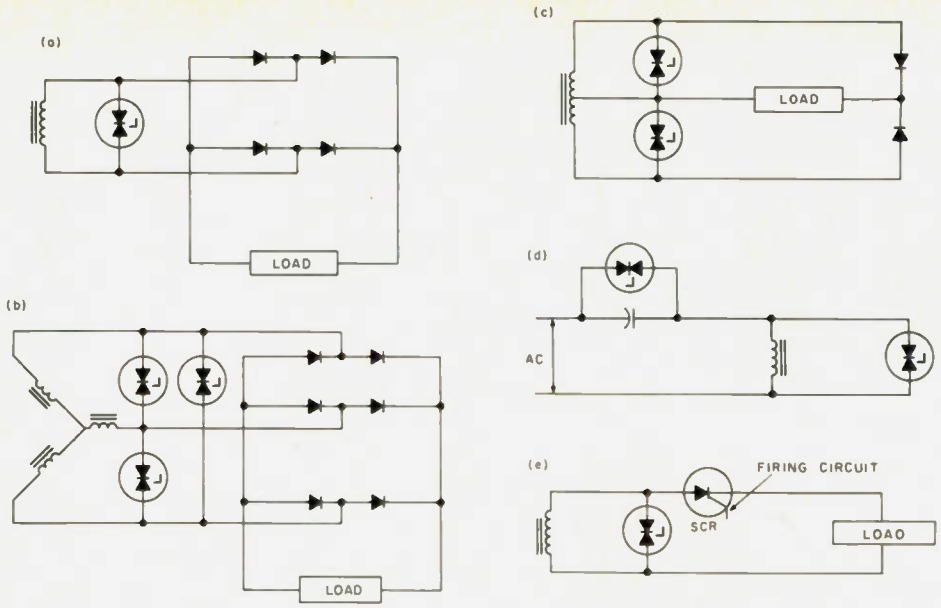

Fig. 10. Various EMP protective circuits for several typical circuits.

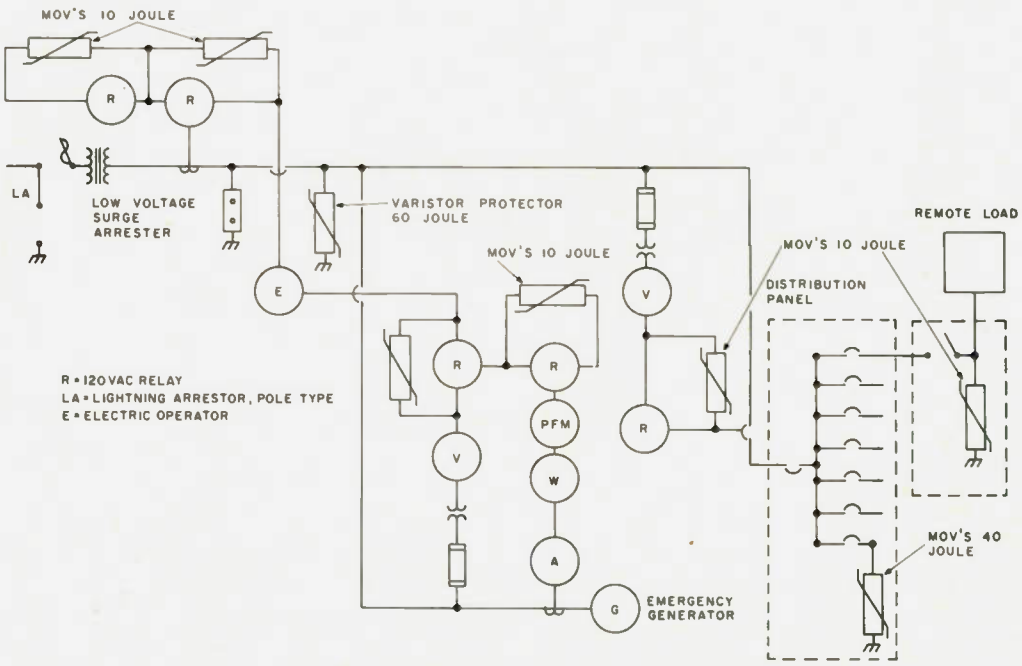

Fig. 11. Full-blown EMP protection for supplying power to communications equipment.

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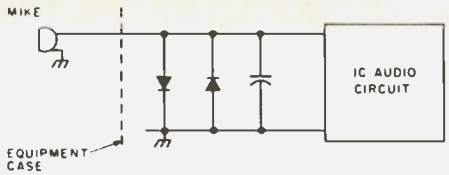

Fig. 12. Switching diodes may be used to protect very short wires. Use 1N3653s and a 0.1-μF, 500-volt capacitor.

considerable importance in rf circuits since the interelectrode 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 wiring should have MOV protection. Shielded conductors should be used for best results and the shields should be grounded. ■

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
*Technit (EMI Shielding Division) 320 North Nopal Street Santa Barbara CA 93103	Rf gaskets and shielding
Topatron, Inc. Box 967 Costa Mesa CA 92627	Rf gaskets and shielding
Transtector Systems 532 Monterey Pass Road Monterey Park CA 91754	Transient suppressors

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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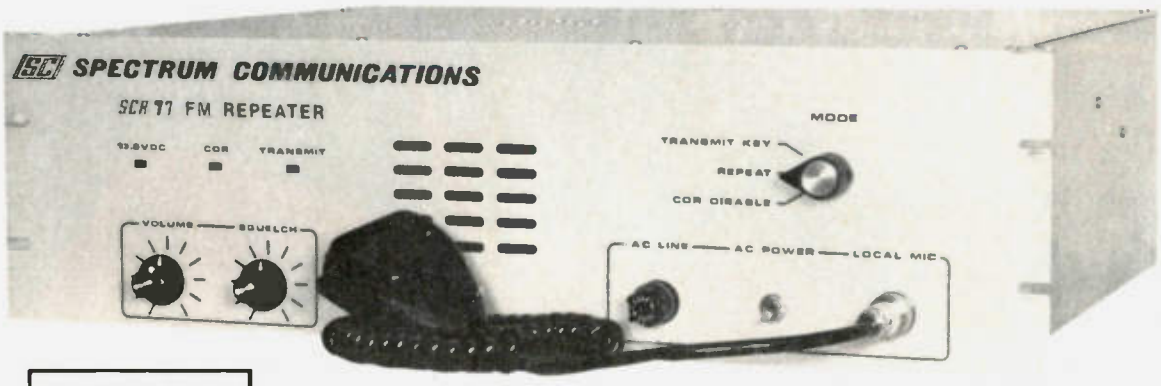

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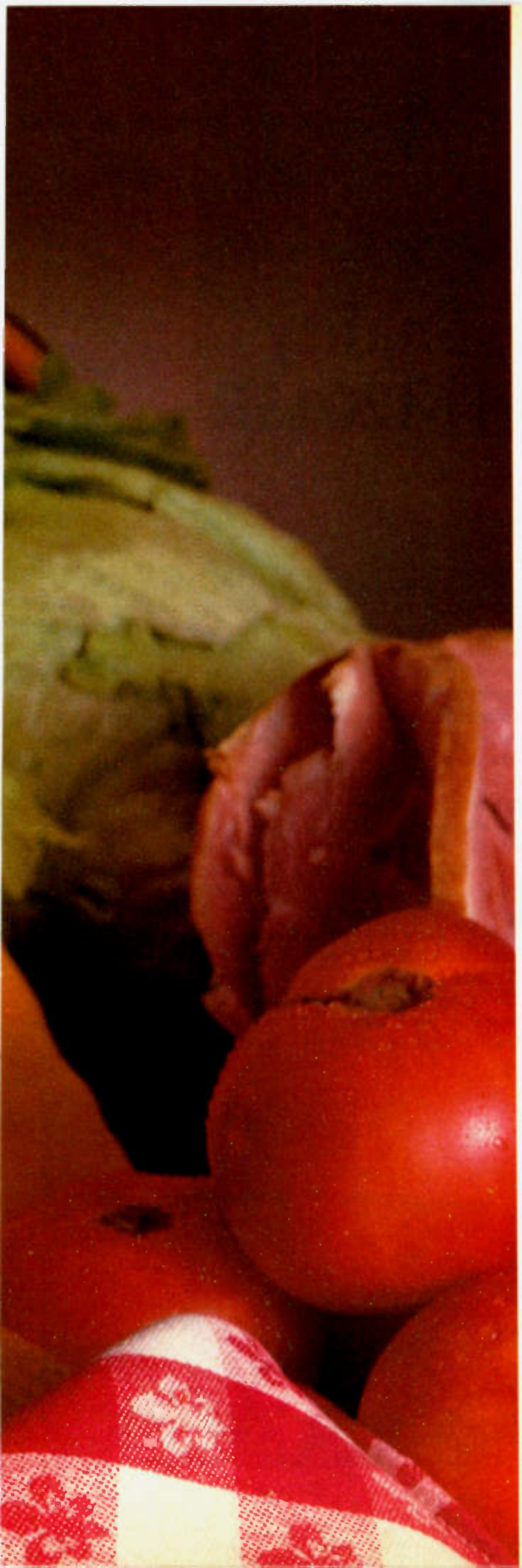

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79.7 SP	103.5 1A	136.5 4Z	179.9 6B
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A different form of this mod was described in some Amateur-Wholesale Electronics notes concerning MARS-CAP modification, so I can't take credit for the original 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,

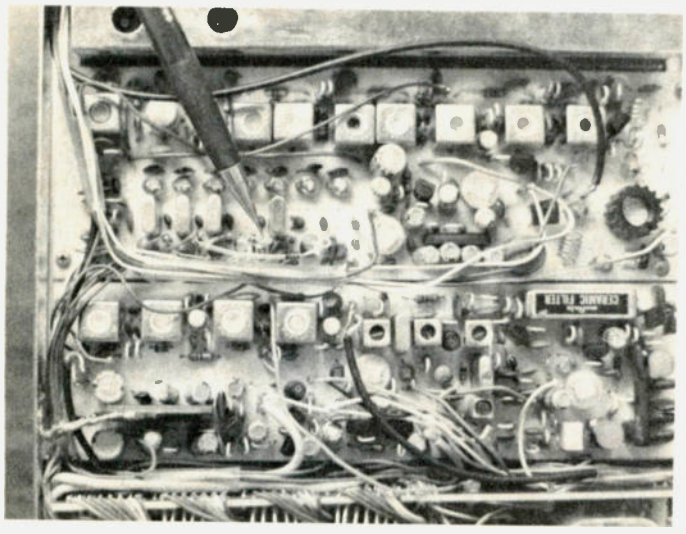

Photo A.

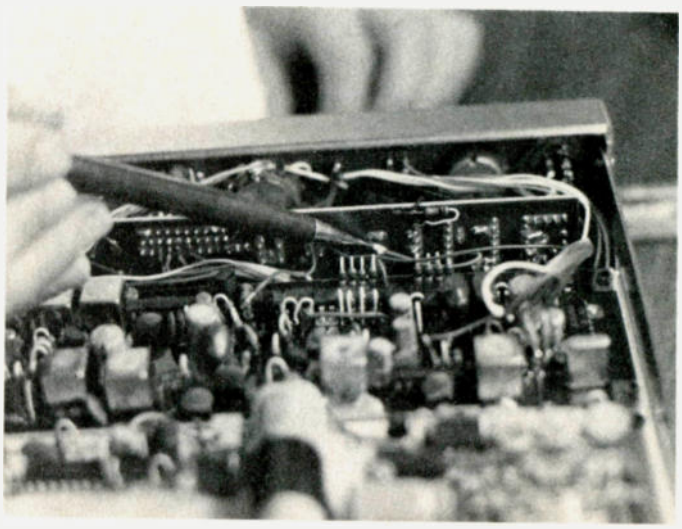

Photo B.

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, AØ is taken high. Memory position 1 requires both AØ and A1 to be high, and position 4 requires neither to be high. If we modify things to make AØ 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 corresponds 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 AØ 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 AØ. The wire attached to the pad is the one I added for this mod.

The AØ and A1 pads are designated as such on the component side of the board and have white/brown (AØ) 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. ■

↙See List of Advertisers on page 114

Building for Beginners

—happiness is a hot soldering iron

Paul M. Danzer N1II
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 answer 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

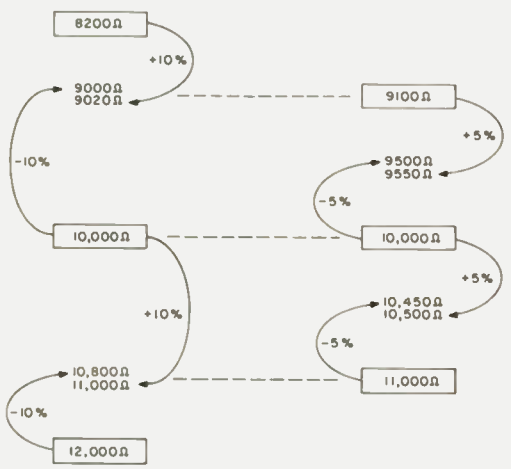

Fig. 1. Standard resistor values. Those in boxes are standard commercially-available resistors.

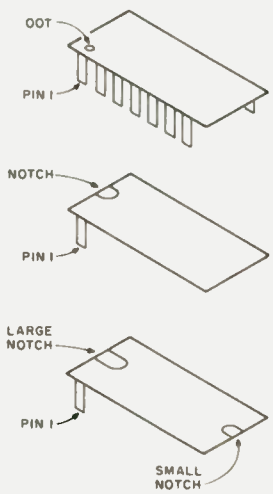

Fig. 2. IC pin locations.

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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 ±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.

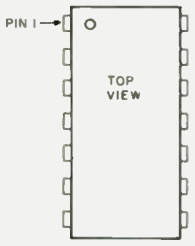
Integrated Circuits

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 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).



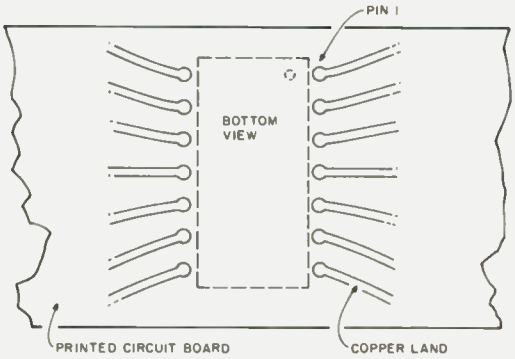


Fig. 3. Pin 1 transposition.

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-

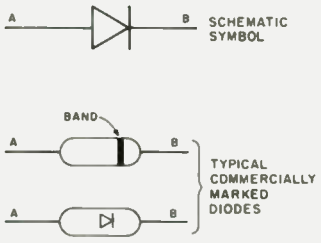


Fig. 4. Typical diode markings.

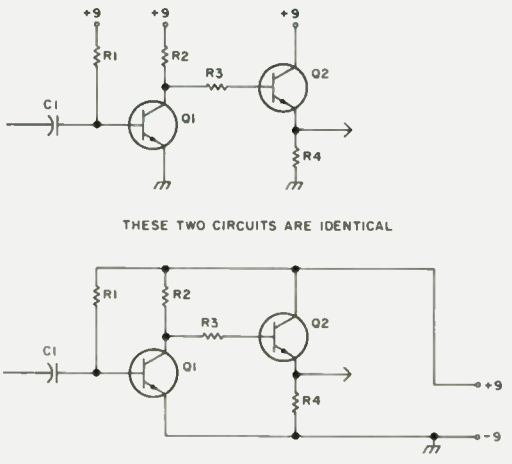


Fig. 5. Power-supply connections.

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

Fig. 6. Wire sizes.

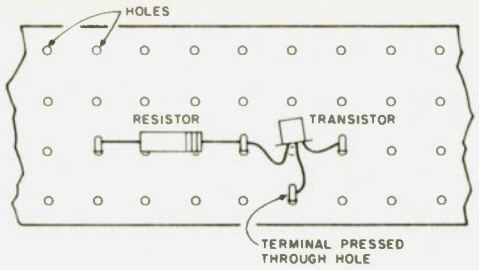

Fig. 7. Use of perfboard.

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 molex® 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. ■

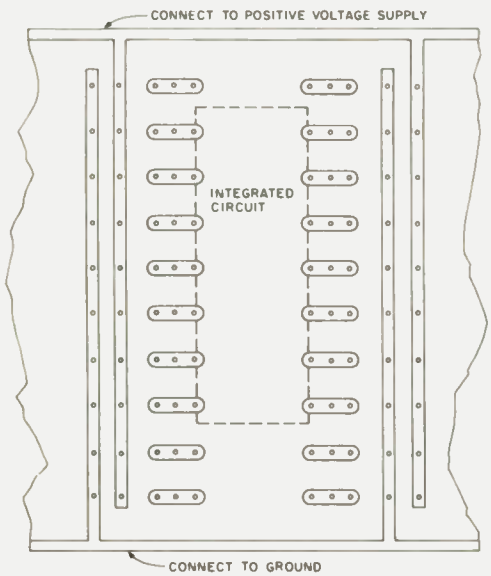

Fig. 8. Commercially-available PC board for breadboarding.

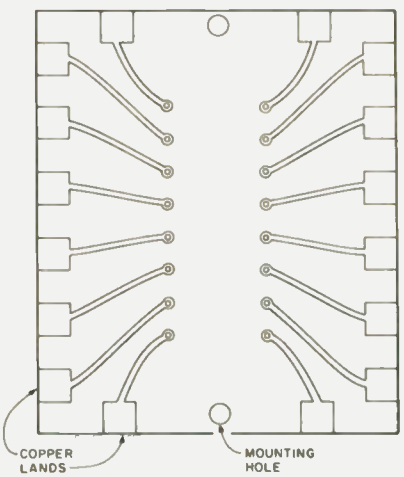

Fig. 9. Single-IC carrier board.

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Glenn Jacobs KC7M
Poverty Flat AZ 85925

Coping with PC Boards

— it's not easy to be virtuous

"Admit 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. Fortunately, I don't have to. The League[1] 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[2] 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.[3] 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.[4] 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 barefoot 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.[5] There it was, cartons and cartons of it. I brought one in and annointed 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 gen-u-ine Army surplus correction fluid complete with a nice little applicator brush built right into the lid. Guaranteed 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 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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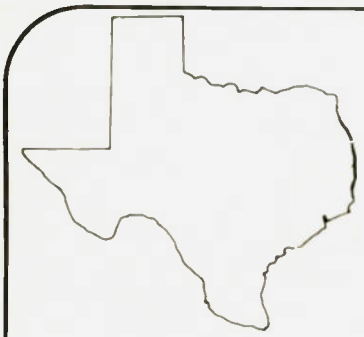

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'Lite Receiver IV

— the second half

J. Richard Christian WA4CVP
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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 philosophy. 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

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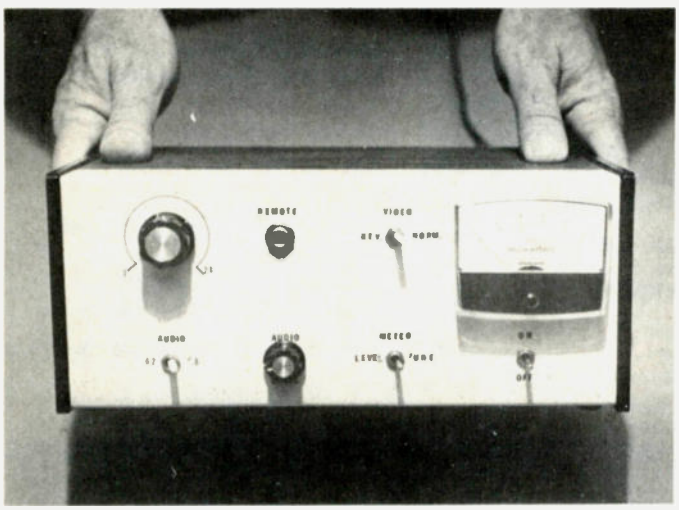
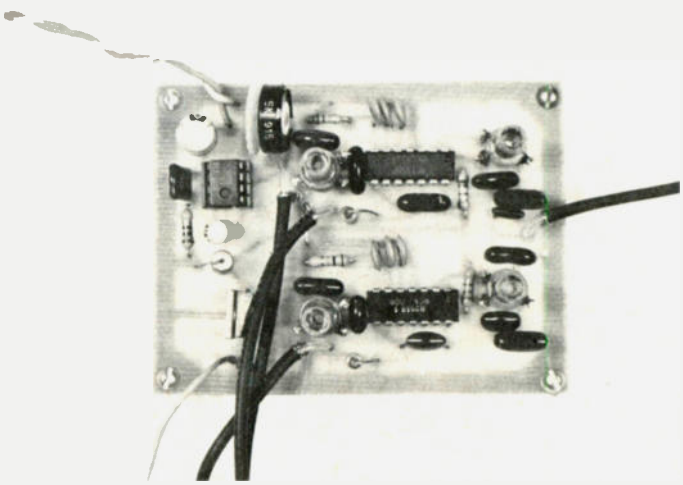


Front panel of the 'Lite Receiver IV.



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, ¼-Watt
2 220-Ohm, ¼-Watt
2 10k-Ohm, ¼-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.

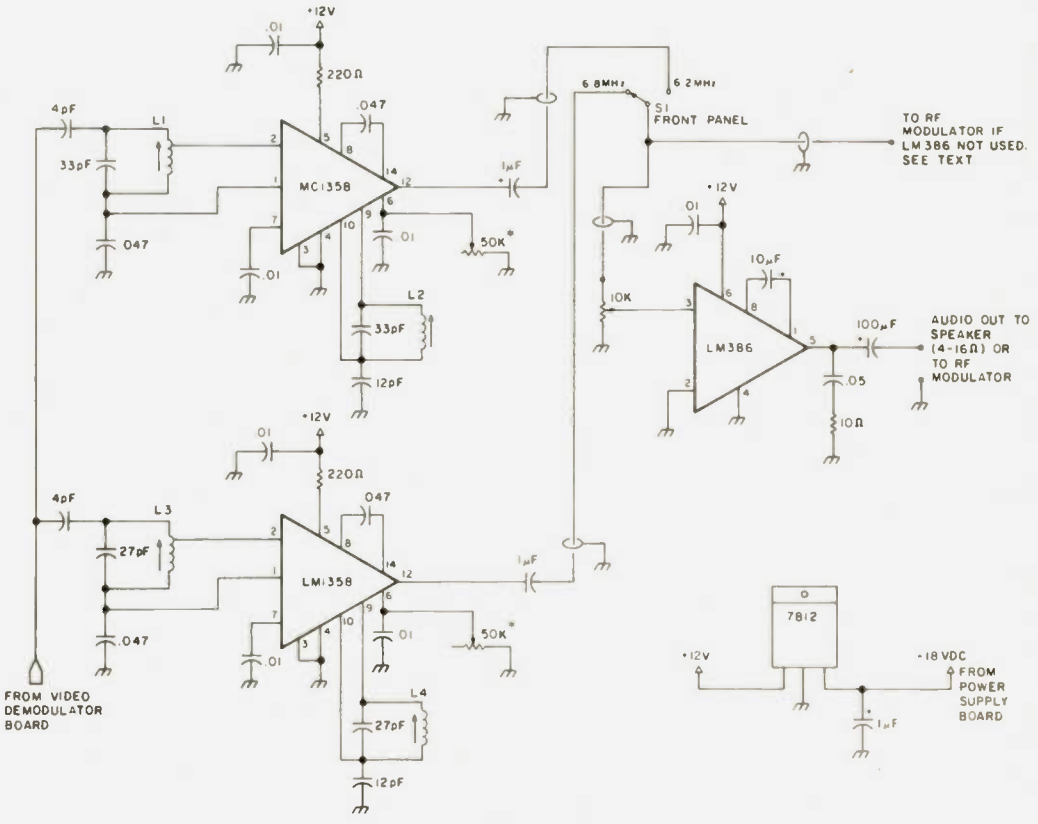


*Fig. 1. Dual frequency audio demodulator and amplifier schematic. *See text. All pF capacitors are silver mica. All others are disc ceramic or electrolytic.*

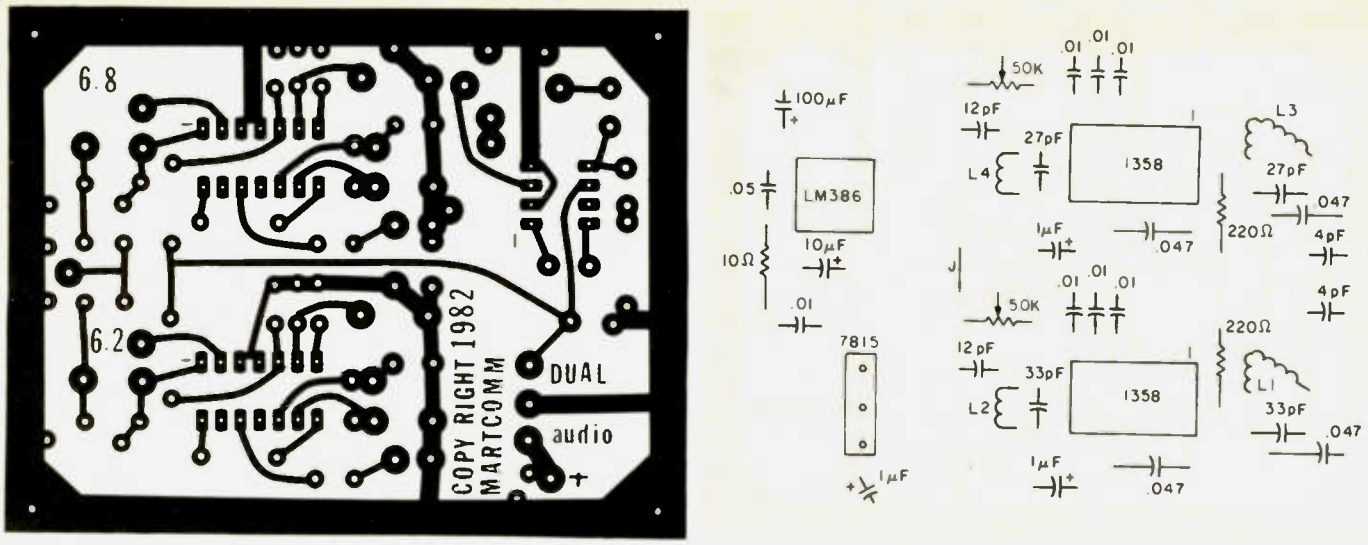


Fig. 2. PC board and parts layout for the dual audio board.

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, ¼-Watt
2 2.2k-Ohm, ¼-Watt
6 10k-Ohm ¼-Watt
1 1 megohm, ¼-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.

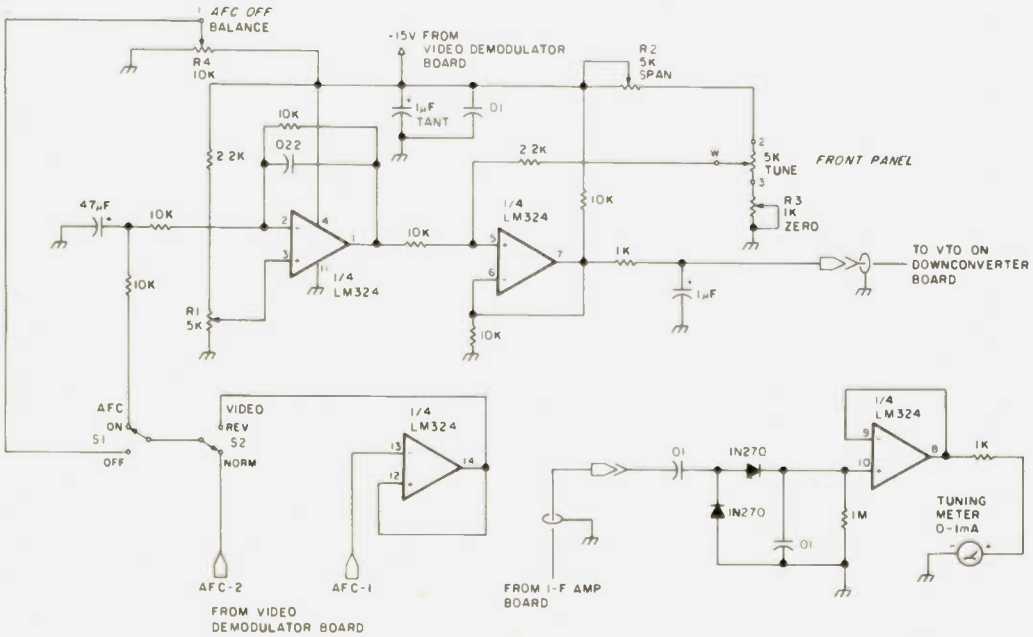


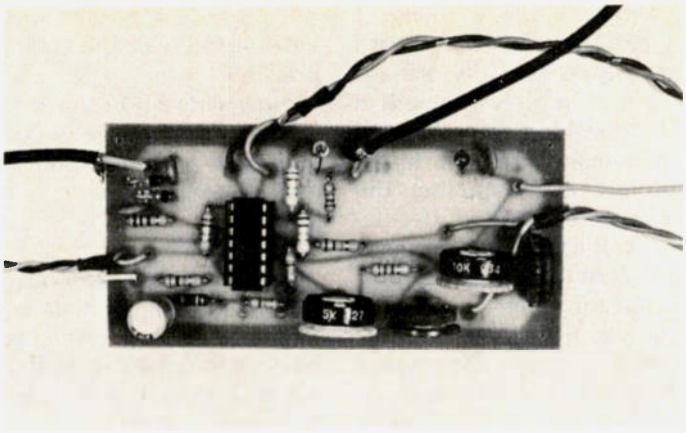
Fig. 3. Afc/metering board schematic.

Afc Circuit

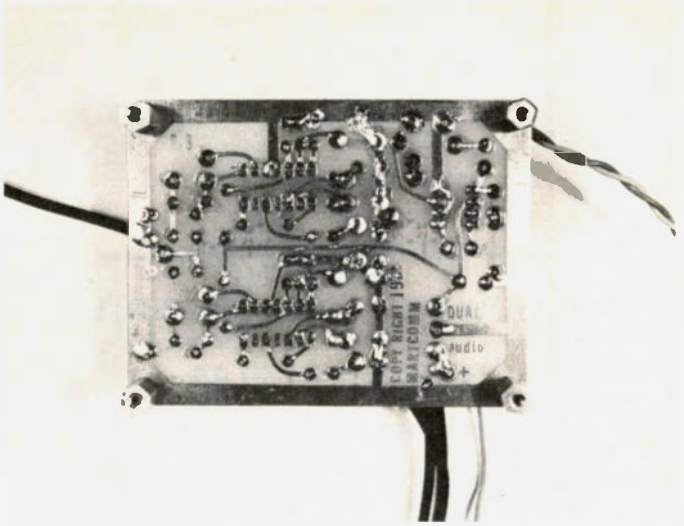
The automatic frequency control (afc), like the metering circuit, is not an absolute necessity. But it sure is nice to have it lock the vto onto a transponder, as the vto does drift in frequency due to ambient temperature fluctuations.

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



The 'Lite Receiver's afc/metering board.



Bottom view of the dual audio board.

point, AFC-2, we are not detecting a peak or a null, but instead a dc level which is compared to a reference signal at pin 3 of the LM324 quad op amp. The first op amp in the chain is wired as a non-inverting voltage comparator. Its output is summed with the transponder tuning pot voltage to supply the tuning voltage for the vto in the downconverter (mixer). A span pot, R2, and a zero pot, R3, are provided to calibrate the transponder tuning pot, since vtos have different voltage-to-frequency ratios.

The third op amp is used as an inverting buffer for inverted video. As can be seen on the schematic, the video normal/reverse switch is a double-pole, double-throw switch. This switch reverses the afc action when you switch from normal to inverted video. Also, provision was made to turn the afc off but not change the transponder tuning pot calibration. R4 sets the afc reference level the same as the afc voltage of a properly tuned transponder when the afc is switched off.

Construction

A printed circuit board layout and parts overlay are shown in Fig. 4. There is nothing critical about the construction of this board. Just use good soldering technique and keep components flat against the printed circuit board. Use an IC socket for the LM324 since tune-up of the board is done before the LM324 is installed. Do not connect the tuning pot wiper to point "W" on the PC board yet.

Tune-Up

Connect the tuning-pot wiper to the vto at this time. Connect the AFC-1 and AFC-2 points to the video demodulator board. Connect to the +15 volts regulated and dc ground return on the video demodulator board. Set the video switch to "NORM" and the afc switch to "ON."

With the LM324 unplugged, test for +15 volts at pin 4 of the LM324 socket. Tune in a transponder and measure the voltage at pin 2 of the LM324 socket. Move the meter probe to pin 3 on the socket. Then, using R1, set the pin 3 voltage to equal the pin 2 voltage. Now switch the afc switch to the "OFF" position. With the afc switched "OFF," set the pin 2 voltage with R4 to the same voltage as with the afc switch "ON." Now, remove power and plug or solder in the LM324. Connect the tuning-pot wiper to point "W" on the afc board, and connect the afc board output (marked vto) to the vto. Be sure to use coax or well-

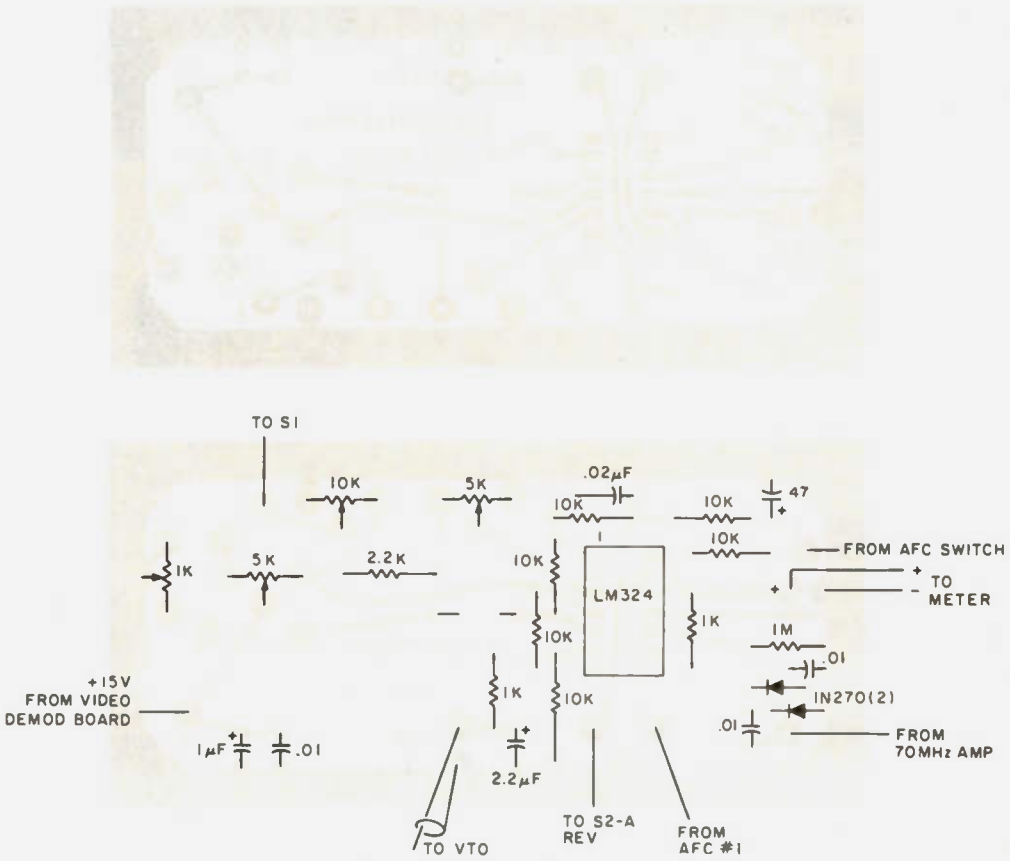


Fig. 4. PC board and parts layout for the afc/metering board.

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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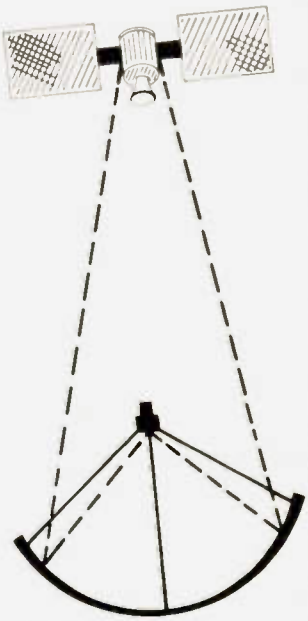

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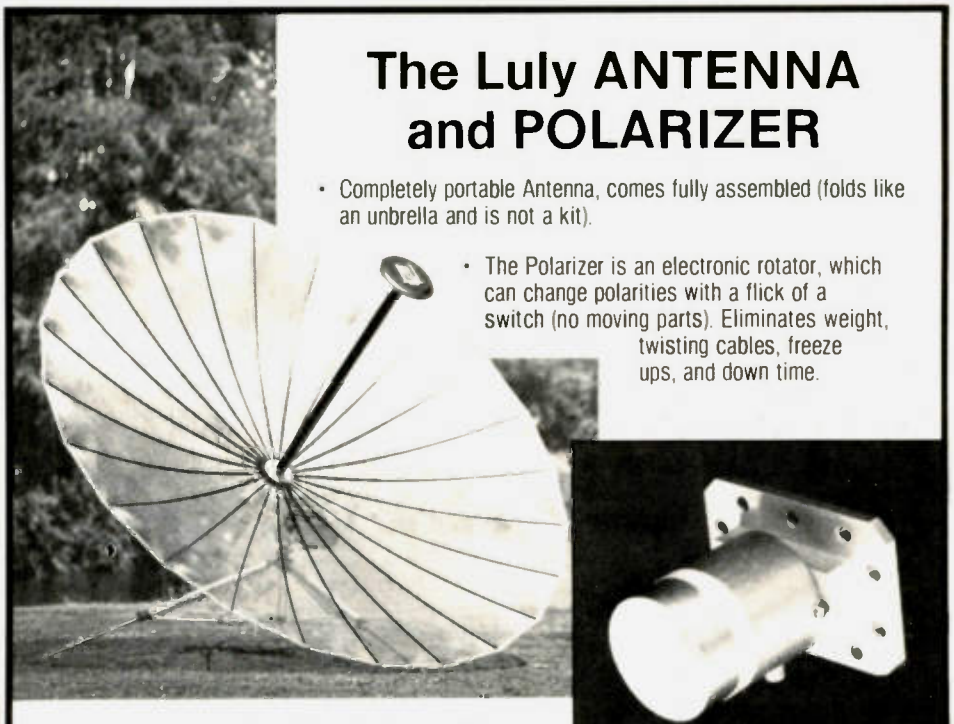

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TVRO Transducer

— waveguide-to-coax transition

Trans-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 transducer 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.

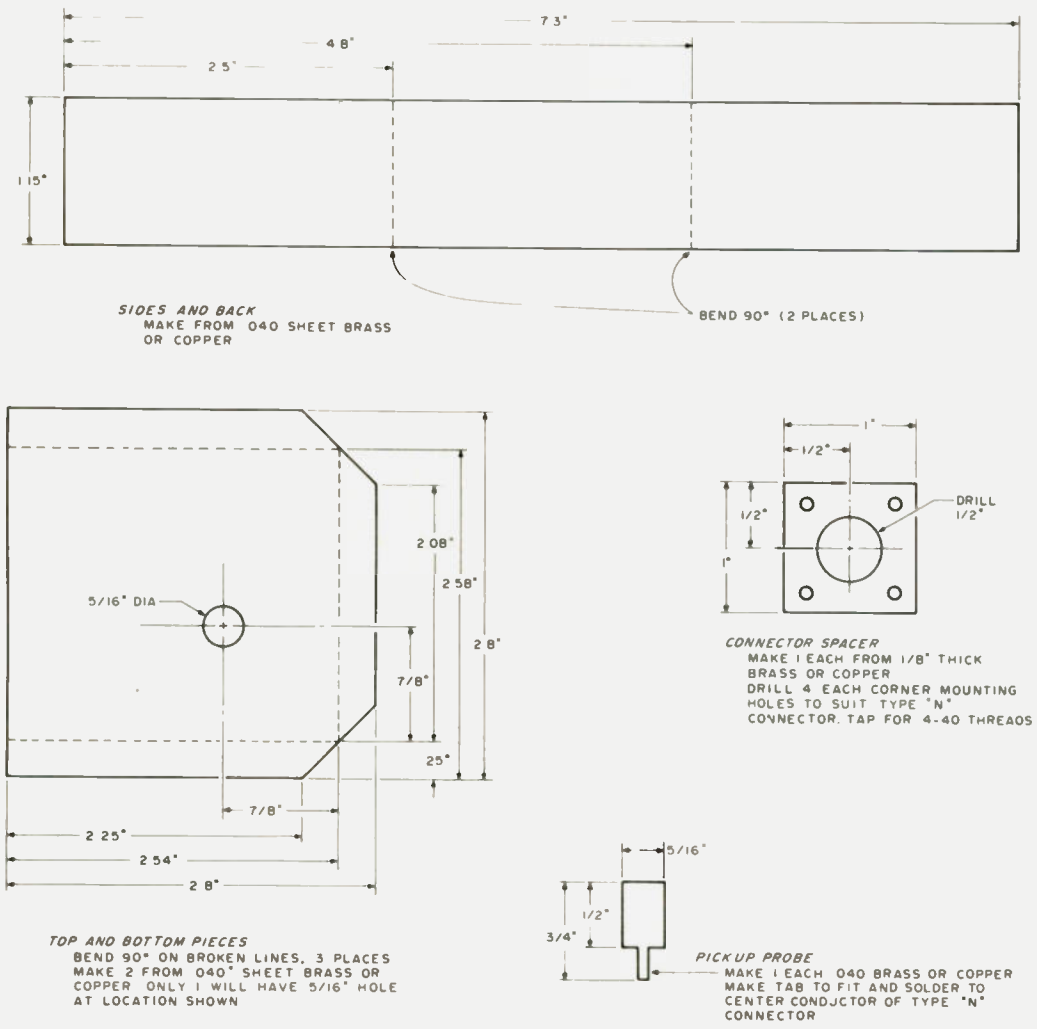


Fig. 1. Parts dimensions and bending instructions.

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

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" × 1.15" piece of material and bend it to a U shape as shown in Fig. 1. Cut two pieces 2.8" × 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" × 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".

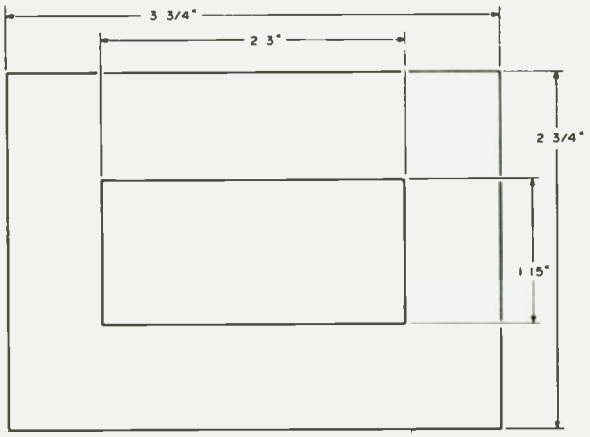
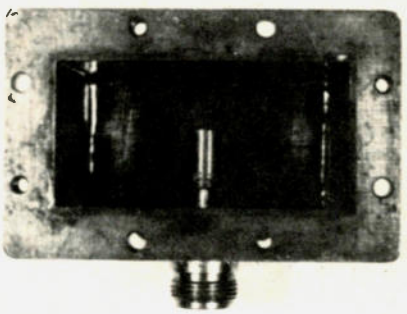


Fig. 2. WR-229 waveguide flange dimensions. Flanges may be purchased or made from sheet brass or copper 1/16" thick or heavier. While not absolutely necessary, some method must be used to mate the transducer to the horn. Solder the flange flush with the transducer.



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! ■

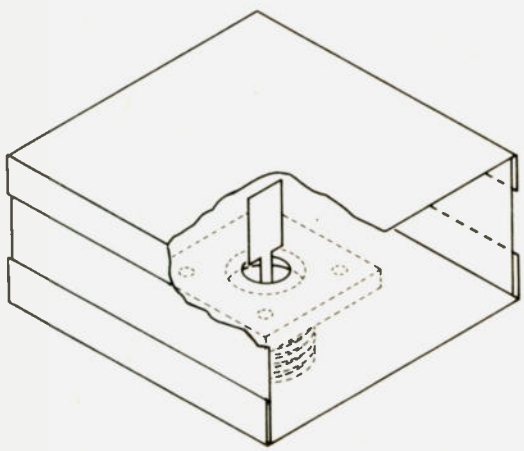


Fig. 3. Three-D drawing of the transducer.

Stephen Gibson
PO Box 38386
Hollywood CA 90038

The MTV Music Box

— Satellite Central, part VII

Part 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.

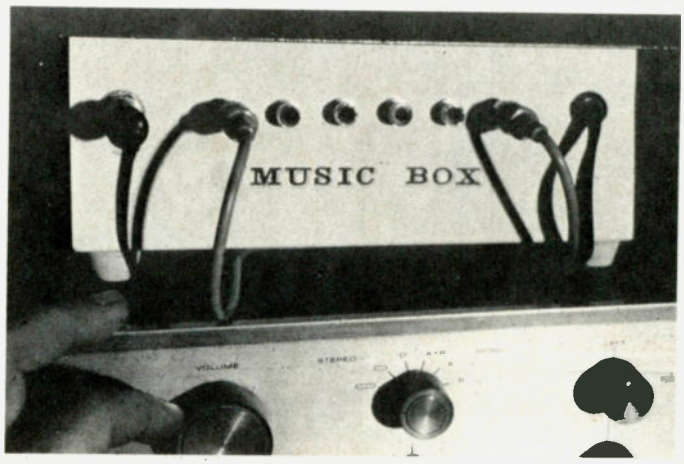


Photo A. Front view of the Music Box.

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

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.

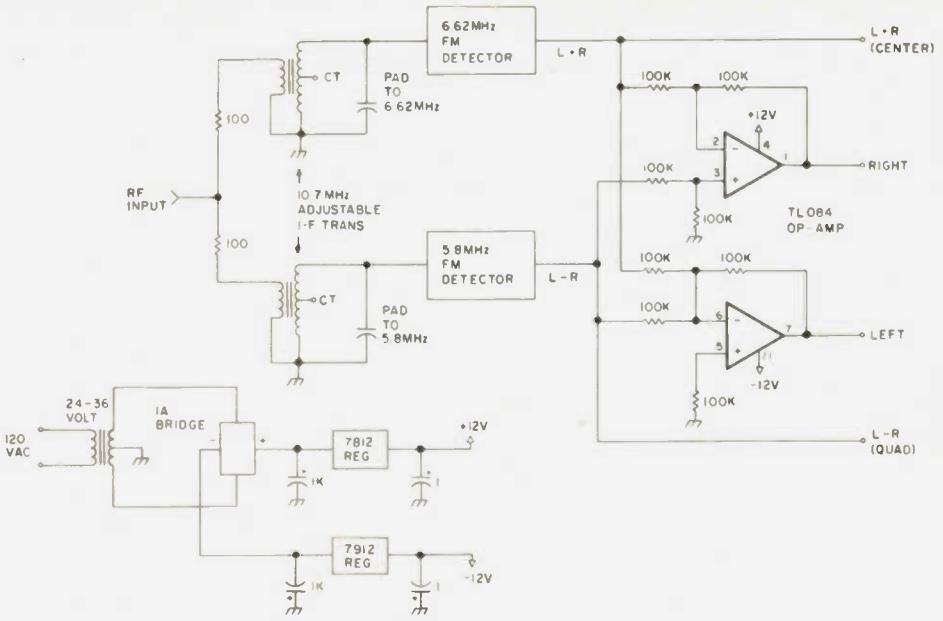


Fig. 1. Two PM-200 subcarrier detectors and a TL084 op amp are all you need to hear MTV satellite stereo.

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 vectorboard 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 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-μF capacitor from pin 13 on the CA3065 IC to a ground trace. This sets the de-emphasis to 75 μsec using a resistor inside the chip. Then solder a 5-μF (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 later 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

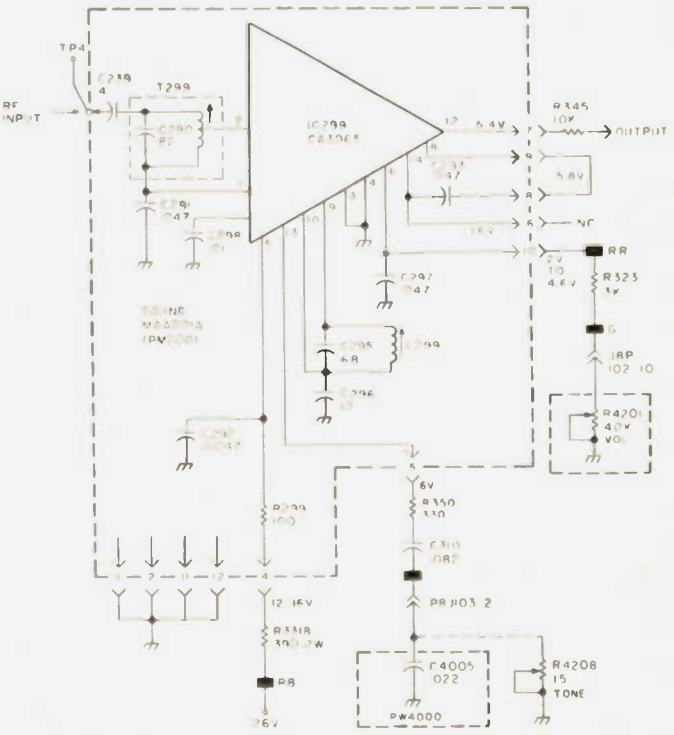


Fig. 2. The RCA PM-200 uses a CA3065 quadrature FM-detector IC for 4.5-MHz audio. The few mods discussed in the text will make it perform very well as a stereo sound decoder.

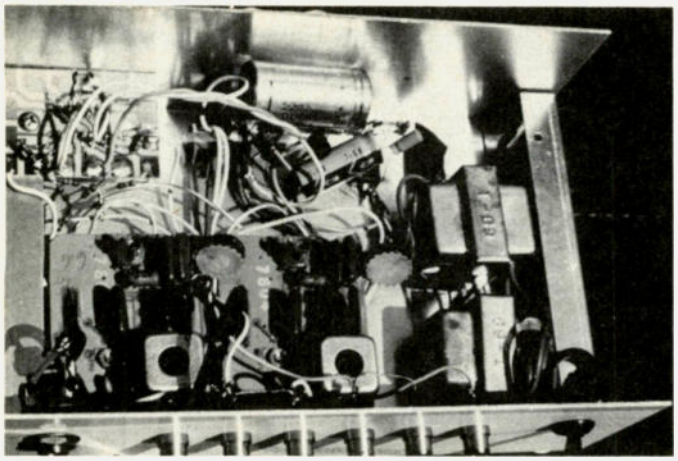


Photo B. Clean out that junk box with this project since nothing is critical. For example, two 12-18-volt transformers can be used instead of a single 24-36 volt. Even another op amp likely will work.

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 secondary usually has a center tap.

Junk Box Jubilee

I decided to take a strictly plain-vanilla approach since I knew my little Music Box 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%, ¼-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 ±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

WHY QUAD?

Back in the dark ages of stereo, David Hafler 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.

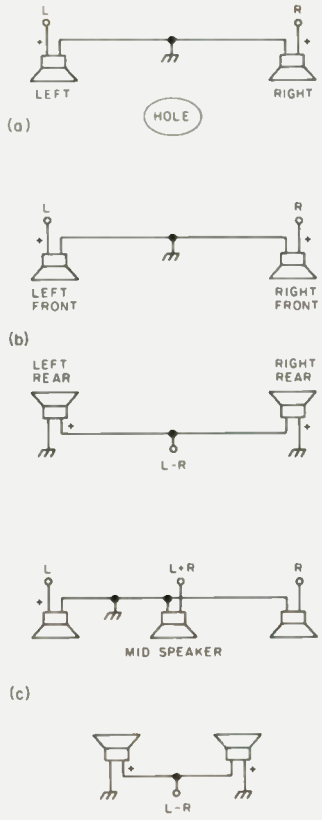


Fig. 3. Evolution of four- and five-channel sound. (a) Stereo, (b) quad, and (c) five-channel system.

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 setup. 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.

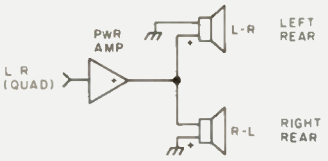


Fig. 4. Hookup for quadraphonic sound.

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 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.

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! ■

✓See List of Advertisers on page 114

HAM HELP

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8227 Rolling Stone Lane
Ooltewah TN 37363

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**

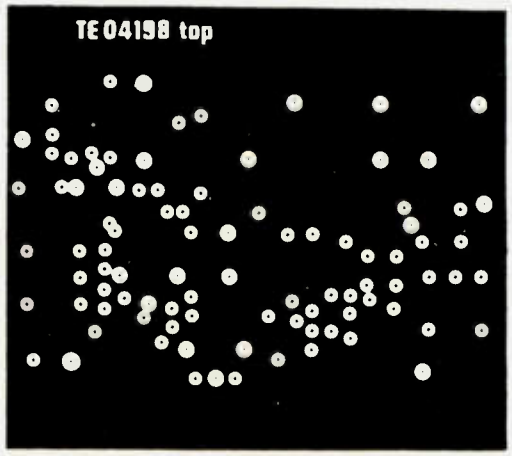

Fig. 1. Foil pattern for top side of the VHF converter PCB.

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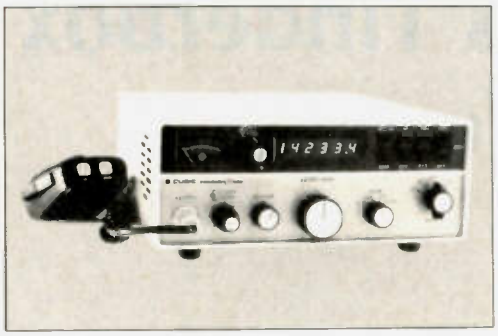

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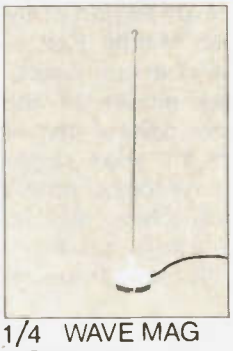

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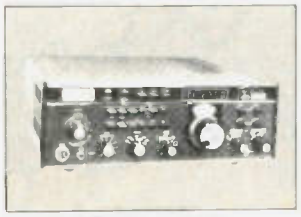

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Tune In the World's Tinderbox

—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, although 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 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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Radio Afghanistan
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Voice of Islamic Republic
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Israel Broadcasting Authority
PO Box 1082
Jerusalem, Israel

Broadcasting Service of the
Kingdom of Saudi Arabia
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

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. ■

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

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


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

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

†Based on a comparison of suggested retail prices.

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

With PLL Quartz Synthesized Tuning and Digital Frequency Readout.

Panasonic
just slightly ahead of our time.

TUFTS ELECTRONICS

61 Lowell Rd., Hudson, N.H. 03051

9-6 Daily (603) 883-5005 12-5 Sunday

....TOWERS....ROTORS....ANTENNAS....COAX....HF XCVRS.... Over 1000 different amateur radio items are listed on these two pages, and most of them are in stock ! Open SEVEN DAYS every week and NO SALES TAX in New Hampshire. You'll find that our DISCOUNT PRICES are hard to beat and our FRIENDLY SERVICE is second to none. We're only 30 mins from Rte 128 in BOSTON via Rte 3, and only 45 Mins from LOGAN International Airport in . If you cannot visit us then try our FAST mail order service. Most mail and PHONE orders are shipped in one day. Send $1 for our ENLARGED CATALOG, free with orders.

DISCOUNTS - FREE CATALOG - EXPORTS - PACKAGES

ALLIANCE MFG

Item	Description	REGULAR	SALE
HD-73	DUAL SPEED AMATEUR ROTOR METERED	139.95	109.50
U-100	TV ROTOR (AZ/EL ROTOR FOR OSCAR)	52.95	43.50

ALPHA AMPS

Item	Description	REGULAR	SALE
76A	TWO 8874 TUBES 1.5KVA HEAVY DUTY XFMR	1985.00	1699.50
76PA	THREE 8874 TUBES 1.5KVA HEAVY DUTY XFMR	2395.00	2049.50
76CA	THREE 8874 TUBES XTRA HD XFMR	2695.00	2299.50
374A	2+ KW 76A CHASSIS NO HANDS TUNING	2595.00	2199.50
78	THREE 8874 TUBES AND NO HANDS TUNING	3495.00	2995.50
77DX	ONE 8877 TUBE 3KW PEP INPUT NO TIME LIMIT	5450.00	4499.50

AMPHENOL CONNECTORS

Item	Description	REGULAR	SALE
PL-259/5	5 PCS PL-259 FOR RG8U/11/213 ETC		4.50
UG-175-10	10 PCS ADAPTER FOR PL-259 FOR RG-58U		3.50
UG-176-10	10 PCS ADAPTER FOR PL-259 FOR RG8X&59U		3.50
83-1J	(PL258) DOUBLE FEMALE SO-239		2.50
83-877	PL-259 TO PL-259 (DOUBLE MALE)		3.50
83-1F	(UG363) SO239 TO SO239 BULKHEAD MOUNT		3.50
83-1AP	(UG646) ELBOW SO-239 TO PL-259		3.50
83-1T	(M358) TEE PL-259 TO TWO SO-239		3.50
83-1R/5	5 PCS SO-239 PANEL RECEPTACLES		6.50
83-878/5	5 PCS SO-239 SINGLE HOLE MOUNT RECPT		7.50
31-2/5	5 PCS (UG88) BNC PLUG FOR RG-58U		9.50
31-12/5	5 PCS (UG260) BNC PLUG FOR RG-59U		10.50
31-817	(UG447) BNC FEMALE PANEL RECEPTACLE		3.50
31-236/5	5 PCS (UG625B) BNC SINGLE HOLE RECPT		6.50
82-61	(UG21B) N MALE FOR RG8U		4.50
82-63	(UG23B) N FEMALE FOR RG-8U		5.50
82-24	(UG58) N FEMALE PANEL RECEPTACLE		3.50
82-65	(UG29A) N DOUBLE FEMALE		5.50
82-100	(UG57B) N DOUBLE MALE		7.50
82-64	(UG27A) N ELBOW MALE TO FEMALE		9.50
82-102	(UG17B) N TEE ONE MALE TO TWO FEMALE		13.50
31-218	(UG491A) BNC DOUBLE MALE		4.50
31-219	(UG914B) BNC DOUBLE FEMALE		3.50
31-9	(UG306) BNC ELBOW MALE TO FEMALE		5.50
31-8	(UG274) BNC TEE ONE MALE TO TWO FEMALE		7.50
4900	BNC PLUG TO N PLUG ADAPTER		12.50
31-217	BNC PLUG TO N JACK ADAPTER		6.50
2900	(UG255) BNC MALE TO SO-239		4.50
31-216	(UG201) BNC FEMALE TO N MALE ADAPTER		5.50
31-28	BNC FEMALE TO PL-259 ADAPTER		3.50
4400	(UG146) N MALE TO SO-239 ADAPTER		7.50
14000	(UG83) N FEMALE TO PL-259		8.50
83-10	SO-239 TO MOTOROLA OR RCA PLUG		2.50

ANTECK ANTENNAS

Item	Description	REGULAR	SALE
MT-1	ALL BAND MOBILE ANTENNA 80-10 METERS	139.95	122.50

ASTRON CORP

Item	Description	REGULAR	SALE
RS-4A	4AM 12VDC REGULATED SUPPLY	45.95	45.50
RS-7A	7 AMP 12VDC REGULATED POWER SUPPLY	64.95	59.50
RS-12A	12 AMP 12VDC REGUILATED POWER SUPPLY	89.95	82.50
RS-20A	20 AMP 12 VDC REGULATED POWER SUPPLY	115.95	99.50
RS-20M	20 AMP 12VDC REG POWER SUPPLY METERED	137.95	124.50
RS-35A	35 AMP 12VDC REGULATED POWER SUPPLY	174.95	149.50
RS-35M	35 AMP 12VDC REG POWER SUPPLY METERED	194.95	174.50
RS-50A	50 AMP REGULATED 12VDC SUPPLY	253.95	229.50
VS-20M	20 AMP SUPPLY WITH DUAL METERS	162.95	147.50
VS-35M	35 AMP SUPPLY WITH DUAL METERS	222.95	199.50
12-115	SOLID STATE INVERTER 12VDC TO 117AC 200W	73.95	64.50

B&W LOADS AND WATTMETERS

Item	Description	REGULAR	SALE
374	DUMMY LOAD WATTMETER TO 300MHZ 1500WATTS	235.00	213.50
334A	DUMMY LOAD WATTMETER TO 300MHZ 1000WATTS	195.00	182.50
333	DUMMY LOAD WATTMETER TO 300MHZ 250WATTS	109.95	109.50
384	DUMMY LOAD TO 300 MHZ 1500 WATTS	99.50	99.50
371-1	SW ANTENNUATOR 10B STEPS TO 610B 250MHZ	67.50	67.50
381-C	ELECTRONIC T/R SWITCH 115VAC	99.50	99.50

B&W COAX SWITCHES

Item	Description	REGULAR	SALE
375	SIX POSITION AUTO/GROUND UNUSED POS	22.50	22.50
376	5 POSITION SIXTH POS GROUNDS ALL POS	22.50	22.50
377	110 VAC ANT CHANGEOVER RELAY	25.00	25.50
590	5 POSITION NON GROUNDING	22.75	22.50
5900	5 POS AUTO-GROUND UNUSED POS	22.75	22.50
593	3 POS WITH AUTO-GROUND UNUSED POS	19.95	19.50
594	2 POLE 2 POSITION	22.00	22.50
595	6 POS WITH AUTO-GROUND ALL UNUSED POS	24.50	24.50

BEARCAT

Item	Description	REGULAR	SALE
BC-350	7 BAND 50 CHANNEL INCLUDES AIRCRAFT	399.95	399.50
BC-300	7 BAND 50 CHANNEL INCLUDES AIRCRAFT	549.95	375.50
BC-210XL	6 BAND 18 CHANNEL W/SEARCH & HOLD	349.95	229.50
BC-100	HANDHELD 8 BAND 16 CHANNELSYNTHESIZED	449.00	329.50

BENCHER

Item	Description	REGULAR	SALE
BY-1	IAMBIC PADDLE HEAVY BLACK BASE	42.95	39.50
BY-2	DELUXE IAMBIC KEY HEAVY CHROME BASE	52.95	49.50
ZA-1A	BALUN 3.5-30 MHZ		17.50
ZA-2A	BALUN 14-30 MHZ WITH HOW FOR 2" BOOM		21.50
XI-2	AUDIO CW FILTER	69.95	64.50
AP-1	ACCESSORY POWER SUPPLY 12VDC		9.50

BIRD ELECTRONICS

Item	Description	REGULAR	SALE
#43	WATT METER SPECIFY SO-239 OR TYPE N	151.00	149.50
4431	WATTMETER W/VARIABLE RF TAP	259.00	249.50
2-30 MHZ	ELEMENTS SPECIFY POWER AND FREQ	58.00	57.50
25-1000MHZ	ELEMENTS SPECIFY POWER AND FREQUENCY	47.00	46.50
CC-1	CARRYING CASE FOR #43	29.00	28.50
4360	2-30 MHZ 2KW WATTMETTER	99.00	94.50
4362	VHF AMATEUR WATTMETER	99.00	89.50

the indispensable **BIRD 43** THRULINE WATTMETER

Power Range	Frequency Bands (MHz) 2-30	25-60	100-250	200-500	400-1000
5 watts		5A	5C	5D	5E
10 watts		10A	10C	10D	10E
25 watts		25A	25C	25D	25E
50 watts	50H	50A	50C	50D	50E
100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
500 watts	500H	500A	500C	500D	500E
1000 watts	1000H	1000A	1000C	1000D	1000E
2500 watts	2500H				
5000 watts	5000H				

cushcraft CORPORATION

CUSHCRAFT HF ANTENNAS

Item	Description	REGULAR	SALE
A3	3 ELEMENT TRI-BAND BEAM 10 15 & 20	229.95	179.50
A4	4 ELEMENT TRI-BAND BEAM 10 15 & 20	299.95	219.50
A3SK	STAINLESS STEEL HARDWARE FOR A3	42.95	32.50
A4SK	STAINLESS STEEL HARDWARE FOR A4	49.95	37.50
A743	7 & 10 MHZ ADD ON KIT FOR A3	79.95	59.50
A744	7 & 10 MHZ ADD ON KIT FOR A4	79.95	59.50
AV3	14 21 28MHZ TRAP VERTICAL ANTENNA	59.95	44.50
AV4	7 14 21 28MHZ TRAP VERTICAL ANTENNA	119.95	89.50
AV5	5 BANDS TRAP VERTICAL ANTENNA	129.95	97.50
R3	14 21 28 MHZ RINGO VERTICAL	299.95	199.50
20-4CD	20 METERS 4 ELEMENT BEAM	339.95	242.50
20-3CD	20 METERS 3 ELEMENT BEAM	239.95	179.50
15-4CD	15 METERS 4 ELEMENT BEAM	139.95	104.50
15-3CD	15 METERS 3 ELEMENT BEAM	129.95	97.50
10-4CD	10 METERS 4 ELEMENT BEAM	119.95	89.50
10-3CD	10 METERS 3 ELEMENT BEAM	99.95	74.50

CUSHCRAFT 2 METER ANTENNAS

Item	Description	REGULAR	SALE
32-19	144-146 MHZ 19 ELEMENT	109.95	82.50
214B	144-146 MHZ 14 ELEMENT	89.95	67.50
214FB	144.5-148 MHZ 14 ELEMENT BEAM	89.95	67.50
228FB	2 214B WITH HARDWARE AND HARNESS	269.95	198.50
A147-4	4 ELEMENT END MOUNT BEAM	32.95	24.50
A147-11	11 ELEMENT BEAM	49.95	37.50
A147-20T	20 ELEMENT 10 VERT 10 HORZ FOR 144/147	79.95	59.50
A147-22	TWO A147-11 WITH HARDWARE AND HARNESS	139.95	104.50
ARX-2B	RINGO RANGER 134-164 MHZ	49.95	37.50
A144-10T	144MHZ 10 ELEMENT TWIST ANTENNA	59.95	44.50
A144-20T	145 MHZ 20 ELEMENT TWIST ANTENNA	89.95	67.50
A14T-MB	MTG KIT FOR 2 TWIST ANTENNAS	29.95	22.50
A144-7	144MHZ 7 ELEMENT BEAM	36.95	27.50
A144-11	144 MHZ 11 ELEMENT BEAM	49.95	37.50
DX-120	144MHZ 20 ELEMENT COLINEAR	79.95	59.50
DX-1BN	1 TO 1 BALUN FOR DX-120		20.50
DXK-180	STK KIT FOR 4 DX-120	349.95	225.50
DXK-140	STK KIT FOR 2 DX-120	199.95	149.50
PD-2	POWER DIVIDER 2 BOOMERS		29.50
PD-4	POWER DIVIDER 4 BOOMERS		36.50
A14-BK	STK KIT FOR 2 147-4		24.50
A14-VPK	AS ABOVE VERTICAL		34.50
A147BK	STK KIT FOR 2 147-11		24.50
A147-VPK	AS ABOVE VERTICAL		34.50
A11-BK	STK KIT FOR 2 144-11		24.50
A17-BK	STK KIT FOR 2 144-7		24.50
ADK-144	STK KIT FOR 4 A144-11	179.95	134.50

CUSHCRAFT 50/220/430 ANTENNAS

Item	Description	REGULAR	SALE
220B	220-223 MHZ 17 ELEMENT BEAM	99.95	74.50
617-6B	6 ELEMENT 1.7 WAVELENGTH BEAM 6 METERS	239.95	182.50
A220-7	220-225 MHZ 7 ELEMENT BEAM	36.95	32.50
A220-11	220-225 MHZ 11 ELEMENT BEAM	46.95	39.50
A449-6	449 MHZ 6 ELEMENT BEAM	32.95	28.50
A449-11	449 MHZ 11 ELEMENT BEAM	44.95	37.50
ARX-220B	220-225 MHZ RINGO RANGER	49.95	41.50
ARX-450B	450-470 MHZ RINGO RANGER	49.95	41.50
A432-20T	432 MHZ 20 ELEMENT TWIST BEAM	59.95	50.50
A50-3	50 MHZ 3 ELEMENT BEAM	59.95	50.50
A50-5	50 MHZ 5 ELEMENT BEAM	79.95	66.50
A50-6	50 MHZ 6 ELEMENT BEAM	109.95	92.50
A430-11	432 MHZ 11 ELEMENT BEAM	44.95	37.50
DX-220	220 MHZ 20 ELEMENT COLINEAR	69.95	58.50
DX-420	432 MHZ 20 ELEMENT COLINEAR	59.95	50.50
AR-6	50-54 MHZ RINGO VERTICAL	49.95	41.50
AR-10	29.6 MHZ RINGO VERTICAL	49.95	41.50
A50-10	10 ELEMENT SIX MTR BEAM	109.95	92.50
A449-BK	SKING KIT FOR 2 449-6 OR 449-11		24.50
A21-BK	STK KIT KFOR 2 A220-11		24.50
A535-BK	STK KIT FOR 2 A50-3 OR A50-5		24.50
A561-BK	STK KIT FOR 2 A50-6 OR A50-10	29.95	26.50
A41-BK	STK KIT FOR 2 A430-11		24.50
ADK-444	STK KIT FOR 4 A430-11	139.95	113.50
A220-VPK	STK KIT VERTICAL FOR 2 A220-11		34.50
A449-VPK	STK KIT VERTICAL FOR 2 A449-6 OR -11		34.50
AMS-220	220 MHZ MAGNETIC MOBILE ANT	39.95	34.50
ARX-220	220 MHZ RINGO RANGER	44.95	39.50
DX-2BN	1 TO 1 BALUN FOR DX-120		22.50
ATS-220	TRUNK LIP MOUNT 220 MOBILE ANT	39.95	29.50
A14T-MB	TWIST MOUNTING BOOM AND BRACKET		29.50
AR-220	220 MHZ RINGO		29.50
ARB-220K	CONVERTS AR-220 TO ARX-220B	21.95	14.50
ARB-450K	CONVERTS AR-450 TO ARX-450B	21.95	14.50
PD-222	POWER DIVIDER FOR 2 220B		26.50
PD-224	AS ABOVE FOR 4 220B		36.50
DXK-480	STK KIT FOR 4 DX-420	169.95	129.50
DXK-440	STK KIT FOR 2 DX-420		89.50

DAIWA

Item	Description	REGULAR	SALE
CNA-2002	AUTOMATIC ANT TUNER 80-10 MTRS 2KW PEP	499.98	410.50
CNW-518	MANUAL VERSION OF CNA-2002		299.50
CN-520	SWR/PWR METER CROSS NEEDLE 160-6 MTRS		69.50
CN-540	SWR/PWR METER CROSS NEEDLES 6&2 MTRS		79.50
CN-550	SWR/PWR MTR CROSS NEEDLE 144-250 MHZ		89.50
AF-306	AUDIO ACTIVE FILTER		59.50
RF-670	PHOTO COUPLER MIC COMPRESSOR		79.50
RM-940	REMOTE MOBILE MIC		79.50
CN-620B	160-2 MTR SWR/WATT METER DUAL NEEDLE	155.75	124.50
CN-630	140-450 MHZ SWR/WATT METER DUAL NEEDLE	183.75	147.50
CN-720B	CN-620B W/LARGE METER BOTH GO TO 2 KW	218.75	175.50
CS-201	2 POS COAX SWITCH 2KW 500MHZ	28.88	23.50
CS-401	4 POS COAX SWITCH 50 DB ISOLATION	89.25	71.50
RF-440	RF SPEECH PROC METERED GAIN AND OUT CNTL	178.50	142.50

CORNELL- DUBILIER ROTORS

Item	Description	REGULAR	SALE
CD-45	8.5 SQ FT WIND LOAD IN TOWER INSTALL	113.70	102.50
HAM-IV	15 SQ FT WIND LOAD AREA INTOWER INSTALL	226.25	183.50
T2X	30 SQ FT WIND LOAD AREA IN TOWER INSTALL	318.75	243.50
51472-10	LOWER MAST SUPPORT (CD45)		8.50
51467-10	LOWER MAST SUPPORT (HAM-IV/T2X)		32.50

COBRA CB

Item	Description	REGULAR	SALE
19GTL	DIGITAL LED CHANNEL DISPLAY	89.95	74.50
25GTL	DIGITAL/RF GAIN/NOISE BLANKER	129.95	113.50
29GTL	DIGITAL/DYNAMIKE/DELTA TUNE/DELUXE	174.95	140.50
146GTL	AM/SSB/RF GAIN/ VOICE LOCK	209.95	173.50
148GTL	AM/SSB/DYNAMIKE/ANL/NOISE BLANKER	249.95	208.50
142GTL	AM/SSB BASE/DYNAMIKE/VOICE LOCK	259.95	216.50
2000GTL	AM/SSB BASE W/FREQUENCY COUNTER	549.95	441.50
47XLR	IN DASH CB/AM/FM/FM STEREO PUSH BUTTON	229.95	185.50
50XLR	IN DASH CB/AM/FM/STEREO &CASSETTE	329.95	269.50
66GTL	REMOTE HIDE-AWAY CB RADIO	209.95	173.50
CK6306	6 FOOT EXT CABLE FOR 66GTL		29.50
CK6318	18 FOOT EXT CABLE FOR 66GTL		34.50
DC CABLE	REPLACEMENT DC CABLE FOR COBRA MOBILES		2.50
HAND MIC	REPLACEMENT HAND MIC 4 OR 5 PIN		19.50

COAX CABLES

Item	Description	REGULAR	SALE
503	3 FT RG-58U W/PL-259 BOTH ENDS		3.50
515	15 FT RG-58U W/PL-259 BOTH ENDS		5.50
520	20 FT RG-58U W/PL-259 BOTH ENDS		6.50
550	50 FT RG-58U WITH PL/259 BOTH ENDS		12.50
575	75 FT RG-58U W/PL-259 BOTH ENDS		16.50
5100	100 FT RG-58U W/PL-259 BOTH ENDS		21.50
803	3 FT RG-8U W/PL-259 BOTH ENDS		5.50
825	25 FT RG-8U W/PL-259 BOTH ENDS		15.50
850	50 FT RG-8U W/PL-259 BOTH ENDS		26.50
875	75 FT RG-8U W/PL-259 BOTH ENDS		29.50
8100	100 FT RG-8U W/PL-259 BOTH ENDS		39.50
8C-100	100 FT 8 CON ROTOR CABLE (SPECIFY LENGTH)		34.50
8C-100H	100 FT 8 COND ROTOR CABLE HEAVY		45.50
8X-100	100 FT RG-8X (AVAIL 100 FT AND UP)		22.50
8214-100	BELDEN 8214 HI/QUALITY RG-8U		55.50
59U-100	100 FT RG-59U COPPER BRAID		18.50
RG-8U-100	100 FT 8U FOAM COPPER BRAID GOOD QUALITY		44.50
RG-213-100	50 OHM COAX 100 FT LENGTH HI QUALITY		46.50
450-100	450 OHM XMISSION LINE 1 KV 100 FT OR UP		14.50

DRAKE

RL DRAKE

Item	Description	REGULAR	SALE
TR7A	DIGITAL HF XCVR 160-10 W/GEN COVG RCVR	1699.00	1499.50
R7A	0-30 MHZ DIGITAL SYNN RCVR	1698.95	1449.50
SP-75	SPEECH PROCESSOR	159.95	157.50
CW-75	ELECTRONIC KEYER		79.50
P-75	PHONE PATCH		79.50
NB-7	NOISE BLANKER FOR TR-7		90.50
SL-300	300 HZ CW FILTER		59.50
SL-500	500 HZ CW FILTER		59.50
SL-1800	1800 HZ RTTY FILTER		59.50
SL-4000	4KHZ AM FILTER		59.50
SL-6000	6000 HZ AM FILTER		59.50
AUX-7	AUX RANGE PROGRAM BOARD FOR TR-7		45.50
WARC-7	WARC BAND KIT FOR TR-7		24.50
FA-7	FAN FOR TR-7/PS-7/DL-1000		29.50
RV-7	REMOTE VFO FOR TR-7	195.95	186.50
MS-7	SPEAKER FOR 7-LINE		49.50
MMK-7	MOBILE MOUNT FOR TR-7		49.50
7073	DYNAMIC MOBILE MIC FOR TR-7		29.50
7077	DYNAMIC DESK MIC FOR TR-7		49.50
7037	TR-7/R-7 SERVICE KIT		50.50
7804	SERVICE MANUAL FOR TR-7		35.50
7805	SERVICE MANUAL FOR R-7		35.50
R-7/TR-7	CABLE INTERFACE KIT		29.50
NB-7A	NOISE BLANKER FOR R-7		90.50
RP-700	RCVR FRONT END PROTECTOR		90.50
MN-75	200W 160-10 METER TUNER	259.95	240.50
MN-2700	2KW 160-10 METER TUNER	349.00	325.50
B-1000	4/1 BALUN FOR TUNERS		29.50
CS-7	REMOTE CONTROL ANT SWITCH	169.95	166.50
WH-7	2000 KW HF WATTMETER	129.95	127.50
DL-300	300 WATT DUMMY LOAD		26.50
DL-1000	1000 WATT DUMMY LOAD		53.50
PS-7	POWER SUPPLY FOR TR-7 110/220V	299.00	277.50
PS-75	POWER SUPPLY FOR TR-7 110/220V	199.00	190.50
L-7	160-15 2KW AMP & PS	1019.00	984.50
L-75	160-15 1.2KW AMP & PS	699.95	650.50
3-500Z	TUBE 12 NEEDED FOR L-7) (1 FOR L-75)		120.50
7000E	KEYBOARD COMMUNICATIONS TERMINAL	1095.00	899.50
TR-5	TRANSCEIVER 160-10 MTRS SOLID STATE	1099.00	992.50
NB-5	NOISE BLANKER FOR TR-5		90.50
TR-930	9" BLACK AND WHITE VIDEO MONITOR		195.50
1549	SURGE SHUNT FOR ANT LINE ON RCVRS&XCVRS		24.50
DMM	AUTO RANGING LCD 3 1/2 DIGIT MULTIMETER	95.95	89.50

DRAKE TVI FILTERS

Item	Description	REGULAR	SALE
LF-2	TWO RECP AC LINE FLTR/TRANSIENT SUPPRESSOR		39.50
LF-6	AS ABOVE SIX RECEPTICALS		59.50
TV-42	100W LOW PASS FILTER FOR TRANSMITTERS		14.50
TV-3300	1000W LOW PASS FILTER FOR TRANSMITTERS		29.50
TV-300	300 OHM HIGH PASS FILTER FOR TV SETS		14.50
TV-75	75 OHM HIGH PASS FILTER FOR TV SETS		14.50

RL DRAKE TVRO

Item	Description	REGULAR	SALE
ESR-24	EARTH STATION RECEIVER	745.00	645.50
SC/ESR	SINGLE CONVERSION DOWN CONVERTER FOR ESR	250.00	225.50
SPH-24	SPLASH PROOF HOUSING FOR DOWN CONVERTER		60.50

KANTRONICS

Item	Description	REGULAR	SALE
FIELD DAY II	CODE/RTTY/ASCII READER	449.95	399.50
FIELD DAY SWL	SHIELDED VERSION FOR SWL	474.95	426.50
MINI-READER	COMPACT MINI/READER FOR CW/RTTY/ASCII	289.95	241.50
SIGENFOR	SIGNAL ENFORCER DUAL AUDIO FILTER	169.95	159.50
VARIFILT	VARIFILTER HIGH QUALITY AUDIO FILTER	119.95	109.50
INTERFACE	RTTY/ASCII/CW TRANSCIEVER TO COMPUTER	189.95	165.50
MICRO-RTTY	RCV RTTY&SENDS RTTY W/ANY CW KEYER	299.95	264.50
CLOCK	24 HOUR LARGE 12" FACE 110VAC		34.50
HAMSOFT	APPLE SOFTWARE FOR CW/RTTY/ASCII XCV		29.50
INTERFACE	HARDWARE FOR HAMSOFT PROGRAM	189.95	174.50

HUSTLER

HUSTLER

Item	Description	REGULAR	SALE
3-TBA	THREE ELEMENT TRI-BAND BEEAM 10-15-20	329.95	220.50
4-BTV	4 BAND TRAP VERTICAL 10-40 METERS	127.95	97.50
5-BTV	5 BAND TRAP VERTICAL 10-80 METERS	167.95	119.50
BSLT-144A	5/8 WAVE 2 MTR TRUNK LIP ANTENNA	49.95	37.50
CG-144	2MTR COLINEAR ANT 3/8 24 STUD	37.95	30.50
CGT-144	7 MTR COLINEAR WITH TRUNK LIP MOUNT	59.95	45.50
CGT-220	220MHZ COLINEAR WITH TRUNK LIP MOUNT	57.95	44.50
G6-144B	6DB GAIN BASE STATION COLINEAR 2 MTRS	114.95	87.50
G7-144B	7 DB BASE COLINEAR ANT FOR 2 MTRS	167.95	123.50
BCM-1	MOBILE BUTTER MOUNT 3/8 X 24 THREAD		12.50
MM-1	MOBILE COWL MOUNT 3/8 X 24 THREAD		12.50
MO-1	54" MAST FOR FENDER MOUNT HF ANTENNA	28.95	23.50
MO-2	54" MAST FOR BUMPER MOUNT HF ANTENNA	28.95	23.50
RM-10	10 METER RESONATOR		13.50
RM-11	11 METER RESONATOR		13.50
RM-15	15 METER RESONATOR		13.50
RM-20	20 METER RESONATOR		18.50
RM-40	40 METER RESONATOR		21.50
RM-40S	40 METER HIGH POWER RESONATOR	29.95	24.50
RM-75	75 METER RESONATOR		22.50
RM-75S	75 METER HI POWER RESONATOR	46.95	35.50
RM-80	80 METER RESONATOR		22.50
RM-80S	80 METER HI POWER RESONATOR	46.95	33.50
SSM-1	COMMERCIAL STAINLESS STEEL BALL & SPRING	39.95	31.50
SSM-2	COMMERCIAL STAINLESS STEEL BALL MOUNT	22.95	18.50
SSM-3	COMMERCIAL STAINLESS STEEL SPRING	21.95	17.50
3-BTV	3 BAND VERTICAL 10-15-20 METERS	79.95	60.50

JANEL LABORATORIES

JANEL PREAMPS

Item	Description	REGULAR	SALE
QSA-5	2 METER LOW NOISE AUTO/SWITCH FOR XCVRS		41.50
QSA-6	SIX METER VERSION OF ABOVE		43.50
PM-1	2 MTR PREAMP MODULE 2DB MAX NOISE FIG		16.50
30PS	10 METER PREAMP 2DB MAX NOISE FIGURE		21.50
50 PS	SIX MTR PREAMP AS ABOVE		21.50
144PS	2 MTR PREAMP AS ABOVE		21.50
220PS	220 MHZ VERSION PREAMP AS ABOVE		21.50
432PK	432 VERSION PREAMP AS ABOVE		37.50
432PL	1 DB MAX NOISE FIG 432 MHZ ORDER BY FREQ		63.50

JW MILLER FILTERS

Item	Description	REGULAR	SALE
C-514T	2KW PEP LOW PASS 75DB ABOVE 41MHZ	46.50	29.50
C-508L	3 SECTION LC POWER LINE FILTER 5AMP MAX	19.00	11.50
C-509L	5 SECTION AS ABOVE 5 AMP MAX	34.65	20.50
C-515-L1	5 SECTION 15 AMP AS ABOVE	96.00	59.50
C-516-L2	AS ABOVE 220 VAC	96.00	59.50
C-513-T1	75/300 OHM HIGH PASS FILTER FOR TV	18.50	11.50
C-513-T2	AS ABOVE 75/75 OHMS	18.50	11.50
C-513-T3	AS ABOVE 300/300 OHMS	18.50	11.50

KENWOOD

TRIO-KENWOOD

Item	Description	REGULAR	SALE
TS-830S	160-10 METER RIG NOTCH VBT IF SHIFT WARC	949.95	839.50
TS-530S	160-10 METER RIG DIG DISPLAY IF SHIFT	739.95	649.50
VFO-230	REMOTE DIGITAL VFO WITH MEMORIES	309.95	280.50
VFO-240	REMOTE ANALOG VFO	169.95	159.50
SP-230	EXTERNAL SPEAKER WITH SELECTABLE FILTERS		71.50
AT-230	ANTENNA TUNER SWR/RF POWER METER ANT/SW	194.95	179.50
TS-130S	80-10 MOBILE XCVR WARC SPEECH PROCESSOR	719.95	639.50
TS-130SE	REMOTE VFO FOR TS-130	699.95	619.50
DFC-230	DIGITAL FREQ CONTROLLER W/MEM FOR TS-130	289.95	239.50
SP-120	EXTERNAL SPEAKER		41.50
AT-130	ANTENNA TUNER FOR TS-130	144.95	138.50
MB-100	MOBILE BRACKET FOR TS-130		29.50
PS-30	BASE SUPPLY FOR TS-130 13.8V 20AMPS	144.95	134.50
R-1000	COMM RCVR DIGITAL DISPLAY 200KHZ-30MHZ	499.95	399.50
R-600	EXTERNAL SPAKER FOR R-1000	399.95	311.50
TL-922A	160-15 METER LINEAR AMP 2 KW PEP	1229.95	1082.50
SM-220	STATION MONITOR 10MHZ SCOPE	359.95	325.50
YG-455C	500 HZ CW FILTER FOR TS-830 (455 IF)		89.50
YG-455CN	250 HZ FILTER		113.50
YK-88C	500HZ CW FILTER TS-830/530/130(8.83 IF)		62.50
YK-88CN	270 HZ CW FILTER		62.50
YK-88SN	1.8KHZ SSB FILTER FOR TS-530/130		62.50
MC-30S	500 OHM HAND MIC		29.50
MC-35S	50K OHM HAND MIC		29.50
MC-50	HI-LO IMPEADENCE DESK MIC 4 PIN PLUG		47.50
PC-1	PHONE PATCH		62.50
DM-81	GRID DIP METER		103.50
HC-10	DIGITAL COMPUTERIZED WORLD CLOCK		103.50
HS-5	DELUXE HEADSET		41.50
HS-6	LIGHT WEIGHT HEADPHONES	29.95	29.50
RD-20	50 OHM RF DUMMY LOAD 500 MHZ 50 WATTS	19.95	19.50
TS-660	15/10/6 MTR XCVR DIGITAL SOLID STATE 10W	669.95	589.50
VOX-4	VOX/SPEECH PROCESSOR	54.95	54.50
YK-88A	AM FILTER 6 KHZ		49.50
FA-4	FAN FOR TS-130SE		19.50
MC-60N4	DYNAMIC BASE MIC DELUXE 4 PIN		69.50
MC-60S8	DYNAMIC BASE MIC DELUXE 8 PIN		74.50
RD-20	DUMMY LOAD 50W INT 20W CONTINUOUS		19.50
VFO-120	REMOTE VFO FOR TS-130	164.95	159.50
KPS-21	BASE STA 12VDC SUPPLY 21AMP INT		124.50
SP-100	EXTERNAL SPEAKER FOR R-1000/R-600		47.50
SP-40	COMPACT MOBILE SPEAKER		25.50
MC-46	16 KEY AUTOPATCH MIC UP/DOWN BUTTONS		49.50
KB-1	FLYWHEEL-EFFECT TUNING KNOB FOR TS830/530		17.50
BS-8	SM-220 PAN DISPLAY MODULE FOR TS830/820/180		79.50
BS-5	SM-220 PAN DISPLAY MODULE FOR TS520 SERIES		79.50

KENWOOD VHF

Item	Description	REGULAR	SALE
TR-7850	2MTR FM 40 WATTS 15 MEM PRIORITY	449.95	369.50
KPS-7	AC SUPPLY FOR TR-7800 TR-8400 12VDC 7 AMP		83.50
KPS-12	AC SUPPLY FOR FOR TR-7850 12 VDC 12 AMPS		94.50
TR-9130/T	2MTR SSB/CW/FM SCAN MEMORY 25 WATTS	549.95	489.50
TR-9130	AS ABOVE W/O TOUCH TONE MIC	529.95	469.50
SP-120	EXTERNAL SPKR FOR TR-9000/9130		41.50
BO-9	MEMEORY BACK UP POWER SUPPLY FOR TR-9000		42.50
TR-8400	70CM SYNN 5 MEM SCAN 10 WATTS FM	499.95	439.50
TR-7730/T	COMPACT 25W 2 MTR 5 MEM SCAN TTMIC	349.95	316.50
MC-46	16 KEY TOUCH TONE MIC		49.50
TR-2500	2 MTR FM HAND-HELD	329.95	299.50
ST-2	BASE SUPPLY AND CHARGER FOR 2500		89.50
MS-1	MOBILE SUPPLY CHARGER FOR 2500		42.50
PB-25	NI-CD BATTERY PACK		34.50
SMC-25	SPEAKER MIC FOR 2500		34.50
LH-2	DELUXE LEATHER CASE FOR 2500		37.50
BH-2	BELT HOOK FOR TR-2500		4.50
WS-1	WRIST STRAP FOR TR-2500		2.50
BH-1	BATTERY CASE FOR TR-2500		4.50
VB-2530	25W RF AMP FOR TR-2500		99.50
BC-5	MOBILE QUICK CHARGER FOR TR-2500		39.50

ICOM

ICOM

Item	Description	REGULAR	SALE
IC-2KL	15-160 MTR SOLID STATE LINEAR 2KW	1795.00	1597.50
IC-251A	2MTR AC&12VDC FM SSB CW 10WATT XCVR	689.00	589.50
IC-451A	UHF XCVR AC & 12VDC SPEC FREQ	899.00	798.50
IC-551	6 MTR 10W SYN AC & 12VDC	479.00	399.50
IC-551D	6 MTR 80 WATTS 12V W/EX-107 & EX-108	699.00	599.50
IC-551D/PS-20	551D AND AC SUPPLY	928.00	779.50
IC-720A	9 BAND XCVR GEN COVG RECV 12VDC	1349.00	1199.50
IC-720A/PS-15	720A AND AC SUPPLY	1498.00	1299.50
IC-730	10-80 MTR 100 WATT HF XCVR 12VDC MIC	829.00	699.50
IC-22U	2MTR FM 10W 800CH SYN 12VDC	299.00	282.50
IC-25A	2MTR FM 25 WATT SYN TTN MIC 12VDC	349.00	319.50
IC-290A	2 MTR MOBILE SSB FM CW MEM TTN MIC	549.00	479.50
IC-560	6MTR MULTIMODE MOBILE XCVR	489.00	435.50
IC-2A	2 MTR WALKIE W/NICD BATT &CHGR	239.50	226.50
IC-2AT	IC2A WITH TOUCH TONE	269.50	239.50
IC-202S	2 MTR SSB PORTABLE	279.00	239.50
IC-402	430MHZ SSB PORTABLE	389.00	339.50
IC-502	6 MTR SSB PORTABLE	239.00	199.50
PS-15	AC SUPPLY FOR 720A	149.95	143.50
PS-20	AC SUPPLY FOR 551D	229.00	218.50
ML-1	10 WATT LINEAR FOR IC-2A		89.50
BC-30	BASE RAPID CHARGER FOR IC-2A		69.50
BP-2	425MA AT 7.2V NICD		39.50
BP-3	250MA NICD		29.50
BP-4	ALKALINE CASE FOR IC-2A		12.50
BP-5	425 MA 10.8V NICD FOR IC-2A		49.50
SP-3	BSE STATION SPEAKER		49.50
PHONE PATCH	PHONE PATCH FOR HF SPECIFY	139.95	130.50
CF-1	COOLING FAN		45.50
DC-1	DC OP PACK FOR IC-2A		17.50
FL32	CW FILTER FOR 720A		59.50
HM-9	SPEAKER MIC FOR IC-2A		34.50
HM-10	SCANNING MIC		39.50
LEATHER CASE	LEATHER CASE FOR IC-2A		34.50
SM-2	DESK MIC 4 PIN		39.50
SM-5	8 PIN BASE MIC		39.50
IC-3AT	220MHZ VERSION OF IC-2AT	299.95	269.50
IC-4AT	440MHZ VERSION OF IC2AT	299.95	269.50
AH-1	80-10 MTR AUTO BANDSWITCH MOBILE ANT OF 720A	289.00	257.50
CP-1	CIG LIGHT CORD FOR IC2AT OR DC-1		9.50
IC-3PS	AC SUPPLY FOR PORTABLES 202/402/502		94.50
EX-106	FM OPTION FOR 551 OR 551D	125.00	125.50
EX-107	VOX OPTION FOR IC-551		54.50
EX-108	PASS BAND TUNING OPTION FOR 551	105.00	[illegible]
FL-30	PASS BAND TUNE XTAL FILTER FOR 730		59.50
FL-34	AM FILTER FOR 720A		49.50
FL-44	455KHZ 1.8KHZ SSB FILTER FOR 730	159.00	148.50
FL-45	500CY CW FILTER FOR 730		59.50
EX-202	CW AUDIO FILTER FOR 730 150HZ 6DB		39.50
AT-100	100WATT AUTOMATIC TUNER	349.00	314.50
AT-500	500 WATT AUTOMATIC ANTENNTUNER	449.00	422.50

FLUKE DMM'S

Item	Description	REGULAR	SALE
D-800	SIX FUNCTIONS .5% LCD HANDHELD METER	125.00	119.50
D-802	.1% ACCURACY AND CONDUCTANCE (1/R)	189.00	169.50
D-804	ABOVE PLUS LOGIC/TEMP/PEAK HOLD/AUDIBLE	249.00	217.50
D-810	BENCH/PORTABLE LCD 7 FUNC 31 RANGES .1%	269.00	234.50
D-811	ABOVE WITH NICAD PATT PACK INSTALLED	309.00	261.50
A81-115	BATTERY CHARGER /ELIMINATOR FOR 800'S		20.50
C90	SOFT CARRY CASE FOR 800'S		10.50
801-600	CLAMP ON CURRENT PROBE 2 AMP TO 600 AMP		95.50
80K-40	HIGH VOLTAGE PROBE 40K VAC AT 60HZ		80.50
81RF	RF PROBE 100 KHZ TO 100 MHZ		45.50
80J-10	10 AMP (20 AMP MOMENTARY) CURRENT SHUNT		30.50
80T-150C	TEMP PROBE 150 CENT		120.50
80T-150F	TEMP PROBE 302 FAH		120.50
Y8205	SOFT CARRY CASE FOR D810/D811		35.50

ROHN FOLDOVERS

Item	Description	REGULAR	SALE
FK2548	48 FOOT 25G FOLDOVER TOWER	945.00	749.50
FK2558	58 FOOT 25G FOLDOVER TOWER	1050.00	849.50
FK2568	68 FOOT 25G FOLDOVER TOWER	1155.00	899.50

hy-gain

HY-GAIN ANTENNAS

Item	Description	REGULAR	SALE
TH3JRS	3 ELEMENT TRI-BAND 750WATT PEP	224.95	168.50
HQ-2S	HY-QUAD 2 ELEMENT QUAD TRI-BANDER	349.95	247.50
TH5DXS	5 ELEMENT TRI BANDER	319.95	232.50
THMK3S	3 ELEMENT TRI-BANDER	289.95	210.50
TH7DX	SUPER THUNDERBIRD 6 ELEMENTS TRI-BAND	499.95	352.50
TH2MK3S	7 ELEMENTS TRI-BANDER	189.95	142.50
DB10/15AS	3 ELEMENT 10 15 METERS BEAM	218.95	164.50
203BAS	3 ELEMENT 20 METER BEAM	169.95	127.50
153BAS	3 ELEMENT 15 METER BEAM	99.95	82.50
103BAS	3 ELEMENT 10 METER BEAM	79.95	66.50
105BAS	5 ELEMENT LONG JOHN 10 METER BEAM	169.95	127.50
155BAS	5 ELEMENT LONG JOHN 15 METER BEAM	239.95	179.50
205BA	5 ELEMENT LONG JOHN 20 MTR BEAM	105BAS	239.50
204BAS	4 ELEMENT 20 MTR BEAM	309.95	225.50
402BAS	2 ELEMENT 40 METER BEAM	269.95	196.50
18TD	PORTABLE TAPE DIPOLE 10 THRU 80 METERS	99.95	89.50
2BDQ	TRAP DOUBLET 40 AND 80 METERS	59.95	56.50
5BDQ	TRAP DOUBLET 10 THRU 80 METERS	124.95	109.50
18HTS	HY-TOWER 10 THRU 80 METER VERTICAL	474.95	335.50
14RMQ	ROOF MTG KIT FOR VERTICALS	37.95	34.50
12AVQS	TRAP VERTICAL 10 THRU 20 METERS	55.95	53.50
14AVQ/WBS	TRAP VERTICAL 10 THRU 40 METERS	73.95	69.50
18AVT/WBS	TRAP VERTICAL 80 THRU 10 METERS	129.95	99.50
TH6/TH7	UPDATE KIT FOR TH6DXX TO TH7DX	199.95	149.50

HY-GAIN CRANK-UP TOWERS

Item	Description	REGULAR	SALE
HG-52SS	52 FT SELF SUPPORT 9 SQ FT 50 MPH	990.00	819.50
HG-50MT2	50 FT SIDE SUPPORT 6 SQ FT 50 MPH	825.00	678.50
HG-35MT2	35 FT SIDE SUPPORT 9.5 SQ FT 50 MPH	600.00	499.50
HG-37SS	37 FT SELF SUPPORT 9 SQ FT 50 MPH	700.00	579.50
HG-54HD	54 FT SELF SUPPORT 16 SQ FT 60 MPH	1650.00	1349.50
HG-70HD	70 FT SELF SUPPORT 16 SQ FT 60 MPH	2850.00	2289.50
HG-33MT2	33 FT SIDE SUPPORT 6.5 SQ FT 50 MPH	750.00	619.50

HENRY POWER AMPS

Item	Description	REGULAR	SALE
1KD-5	1200 WATTS 80-15 MTRS USES 3-500Z TUBE	695.00	635.50
2KD-5	2KW 80-15 MTR AMP USES TWO 3-500Z	949.00	870.50
2K CLASSIC	HEAVY DUTY 2KW AMP 80-15 METERS	1295.00	1189.50

BROAD BAND FOLDED DIPOLE

BARKER & WILLIAMSON'S MODEL 370 15 B&W

B & W's Broad Band Folded Dipole ... bands including the new ... Also covers CAP frequencies ... frequency from 3.5 - 30 MHz. Being used throughout the world. Total length only 90 feet ... 19 inches. SWR less than 2 ... construction for long life. Can be used as a flat top, inverted V or sloper. Also available ... Power handling capability ... completely assembled with ... 239 connector. Terminated with ... each end. Patent Pending.

Price $149.50

MFJ ENTERPRISES INCORPORATED

MFJ

Item	Description	REGULAR	SALE
959	RCVR PREAMP AND PRESELECTOR 1.6-30 MHZ	89.95	83.50
1040	RCVR PRESELECTOR 1.8-54MHZ MOSFET PREAMP	99.95	93.50
950	RCVR ANT TUNER 1.6-30MHZ DUAL INPUT	59.95	55.50
525B	RF SPEECH PROCESSOR VU METER	119.95	111.50
624	PHONE PATCH WITH VU METER	59.95	55.50
321	SATELLITE CONVERTER W/PREAMP	99.95	93.50
312	POLICE/FIRE/WEATHERBAND CONVERTER	59.95	55.50
308	SHORTWAVE CONVERTER 8 BAND TO AM RADIO	79.95	74.50
262	50 OHM LOAD 1KW AIR COOLED	49.95	46.50
260	AS ABOVE 300 WATTS	26.95	26.50
250	OIL FILLED 2KW DUMMY LOAD	29.95	29.50
812	SWR/WATT METER 14-170 MHZ	29.95	29.50
814	HF WATTMETER 2KW READS SWR DIRECTLY	49.95	46.50
102	24 HOUR DIGITAL CLOCK	32.95	32.50
200BX	CRYSTAL CALIBRATOR	29.95	29.50
CPO-555	CODE PRATICE OSCILLATOR	19.95	19.50
202	RF NOISE BRIDGE	54.95	51.50
40T	40 MTR QRP TRANSMITTER	29.95	29.50
40V	COMPANION VFO FOR 40T	29.95	29.50
1107	8 SOCKET RFI FILTERED POWER STRIP	79.95	74.50
1106	12 SOCKETS ONE FILTER FOR ALL	59.95	55.50

MFJ FILTERS

Item	Description	REGULAR	SALE
752B	DUAL TUNABLE SSB/CW ACTIVE FILTER	89.95	83.50
721	SUPER CW/SSB FILTER 2 WATT AMP	59.95	55.50
720	DELUXE SUPER CW FILTER	39.95	37.50

MFJ KEYERS

Item	Description	REGULAR	SALE
406	DELUXE KEYER DOT AND DASH MEMORY	69.95	65.50
410	CURTIS KEYER PLUS CODE GENERATOR	129.95	121.50
481	GRANDMASTER MEMEORY KEYER 2 50 CH MSGS	89.95	83.50
484	AS ABOVE UP TO 12 MSGS UP TO 100 CH MSGS	139.95	130.50
496	SUPER KEYBOARD 11/256 CH BUFFER & MEM	339.95	279.50
53	AFSK PLUG IN MODULE FOR 496		39.50
54	LOOP KEYING PLUG IN MODULE		29.50
61	CLOCK MODULE FOR 496		29.50
1200	CW COMPUTER INTERFACE	69.95	66.50

MFJ ANTENNA TUNERS

Item	Description	REGULAR	SALE
989	3KW/ROLLER INDUCTOR/300W LOAD/MTR/BALUN	319.95	263.50
949B	300W TUNER/SWR WATTMTR/LOAD/ANT SW/BALUN	139.95	126.50
941C	300W TUNER/SWR WATTMTR/ANT SW/BALUN		89.50
944	300W TUNER/ANTENNA SWITCH		79.50
901	VERSA TUNER/COAX/RDM WIRES/BALANCE LINES		54.50

BENJAMIN MICHAEL

Item	Description	REGULAR	SALE
173DM	24 HOUR DUAL CLOCKS LED WALNUT CASE	69.95	67.50
173B	LCD 24 HOUR CLOCK	34.95	32.50

MICROLOG CORP

Item	Description	REGULAR	SALE
ATR-6800	SYSTEM 9"MON CABLES APPLICATION MODULES	2495.00	2152.50
ACT-1	KEYBOARD RTTY/CW/ASCII MEMORY SPLT SCREEN	995.00	877.50

DISCOUNT CATALOG

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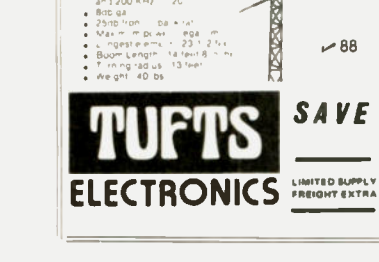

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START WITH THE FANTASTIC ATR-6800 SYSTEM FOR RTTY/CW . . .

PLUS!

"BASIC" COMPUTER LANGUAGE	— Write and load programs in easy to use "BASIC".
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COMMUNITY MAILBOX	— Enter, store, replay, delete etc. individual messages remotely.
+	
CONTEST DUPE SHEET	— Did you work him or not? When? etc. or use for personal station log.
+	
MESSAGE EDITOR	— Create perfect message quality text with editing capabilities.
+	
24K BATTERY-BACKED MEMORY	— Never lose your MAILBOX, station LOG, DUPE sheet or program. 24K = 24576 characters.

= The most complete communications system available today (or for years to come!)

With the addition of this one internal multi-function board and basic module to your ATR-6800, ALL of the above features are available, as well as the superior RTTY/CW performance in one attractive RFI PROOF package.

Factory installed for $599, contact us for scheduling at 18713 Mooney Dr., Gaithersburg, Md. 20879. Tel. 301-258-8400. ATR-6800 with 9" video $2,495.

↩51

MICROLOG

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Confidential Frequency List

New 5th edition by Perry Ferrell

Bigger and better than the world-acclaimed 4th edition, this new book has 30% more stations listed, more than 7500 operating between the international broadcasting and amateur radio bands, spanning 4-28 MHz. Listings by both frequency and callsign reflect present and post-WARC assignments. Complete list of Coastal CW stations plus Embassy, Aeronautical, Military, Time Sigs, Feeders, VOLMET, FAX, INTERPOL, etc. New details on scheds, emergency channels, alternates, and never-before-published IDs.

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MFJ CW/SSB/Notch Filters

MFJ-722 ALL MODE audio filter for CW/SSB has tunable 70 dB notch, no ring 80 Hz CW bandwidth, steep SSB skirts (18 poles total), 2 watts for speaker plus more.

All mode versatility:
razor sharp CW and steep-skirted SSB filtering with tunable notch eliminates QRM.

$69.95

New super-selective filter. The new **MFJ-722** "Optimizer" offers razor sharp, no ring CW filtering with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), steep-skirted SSB filtering, and a 300-3000 Hz tunable 70 dB notch filter with adjustable bandwidth.

The 8-pole (4 stage) active IC filter gives CW performance no tunable filter can match (80 Hz bandwidth gives -60 dB reponse one octave from center and up to 15 dB noise reduction). The 8 pole SSB audio bandwidth is optimized for reduced sideband splatter and less QRM (375 Hz highpass cutoff plus selectable lowpass cutoffs at 2.5, 2.0 and 1.5 KHz, 36 dB/octave rolloff). Measures 5x2x6".

New Model MFJ - 723, ($49.95), is similar to the 722 but is for CW. Has a 60 dB notch tunable from 300 to 1200 Hz. Measures 4x2x6".

Other models: MFJ - 721, $59.95. Like 722, less notch. **MFJ - 720, $39.95.** Like 723, less notch.

Versatile, all models plug into the phone jack, provide 2 watts for speaker or can be used with headphones. All require 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

Order from MFJ and try it-no obligation. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

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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,[1] 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.[2] Most ISM heating devices (typically magnetrons) 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, noninterference 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.[3]

Propagation

The new UHF allocation has shown in commercial land mobile tests that it behaves much as expected—attenuation by natural objects 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.[4]

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.[5,6,7] 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 subaudible squelch (CTSS), known more popularly by its trade name, Private Line,[8] to malfunction by unsquelching 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
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906.0 MHz – ATV Channel A
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924.0 MHz – FM voice/RPT
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927.4 MHz,
928.0 MHz – Control Links, Packet Transmissions

The band plan proposed by WB4LNM in October, 1981, for 902-928 MHz.

✓See List of Advertisers on page 114

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.[9,10,11]

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.[12] 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, preassembled 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.[13] 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,[1] coupled with the recent removal of amateur operating privileges from 1215 to 1240 MHz for military navigational satellite systems (NAVSTAR, GPSS),[3] 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 downconverter 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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front-end filtering will provide good image rejection and sensitivity.

The portable equipment receive band is placed at the low end of the new spectrum, causing the image frequencies to be thrown into the avionics (DME, TACAN) band instead of the new cellular radiotelephone band. Since the smaller mobile transceivers have less room for cavity filters, that can be implemented more easily in fixed-retransmission sites. The ATV repeater-output spectrum is also located at the same end of the band as the FM voice repeater so that the two types of repeaters can be easily co-located. Point-to-point service for low-band repeater linking, packet-transmission techniques, and radio-command systems would be placed at the high end of the band.

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, moonbounce, 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! ■

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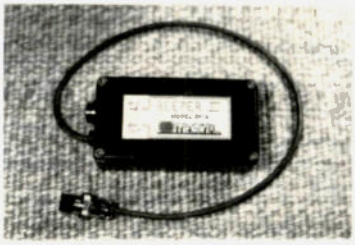

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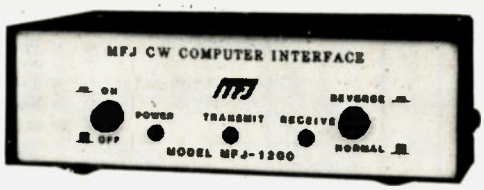

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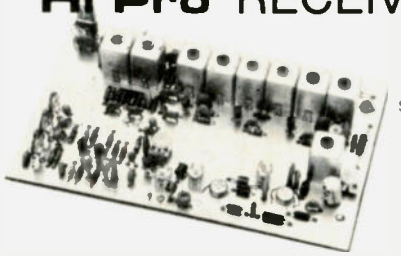

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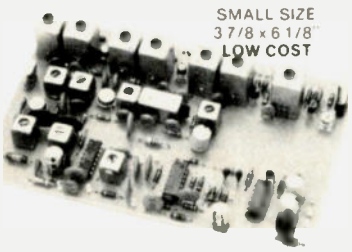

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Crime-Stoppers' Textbook

—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.

B.M. Gray II.

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

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 give-away 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 liablility."

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! ■

Detective Jerry Jaquenta KA4NIA

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 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. ■

SOCIAL EVENTS

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-contained 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 VE8IYE 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 W4IGW, 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 ½ 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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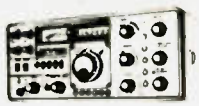

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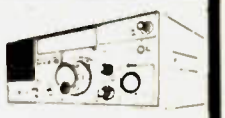

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ARX-2B 134-164 MHz Ringo Ranger II	$34.00
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CDE 45 Rotor	$92.00
Alliance HD-73 Rotor	$92.00
Alliance U100 Rotor	$42.00
RG-8/U Foam Coax 95% Shield	24¢/ft.
RG-213 Coax, Mil. Spec	28¢/ft.
Mini-8 Coax 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 K9ZWV, 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.

BELLEFOUNTAINE 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, Bellefountaine 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 Sideband-er'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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Service manuals ..... ea. 35.00
1982 World Radio/TV Handbook 16.50

L-7 2kw PEP linear w/tubes $1400.00

L-75 1.2kw PEP linear w/tube $854.95

MN-75 200w, 160-10m antenna tuner $259.00

MN-2700 1 kw, 160-10m antenna tuner $349.00
B-1000 4:1 balun-MN-75/MN-2700 ..... 29.95

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DL-300 300w dry dummy load $26.95
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Outside Nev. 1-800-634-6227

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5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside ILL. 1-800-621-5802

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, contact 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, Vickesburg 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 Schauffler 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 Teltzel 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.

Richard Randall K6ARE
1263 Lakehurst Rd.
Livermore CA 94550

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- **FULL-BAND SCAN:** All channels may be scanned in either "busy" or "vacant" mode. This is especially useful for locating repeater frequencies in an unfamiliar area. AUTO RESUME. COMPARE!
- **INSTANT MEMORY-1 RECALL:** By pressing a button on the microphone or front panel, memory channel 1 may be recalled for immediate use.
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HAM HELP

A while back, Poly Paks was selling a surplus keyboard, minus the keytops, made by C. P. Clare and Co. for Burroughs Corp. If anyone has one of these boards or extra keyswitches, I would like to buy them.

Ralph Alexander WB5ORH
Box 236
Lefors TX 79054

I recently purchased a Hammarlund Model SP-600 and a Hammarlund HC-10 converter (less hookup adapter). I will pay for manuals or any information, copies, postage, etc., regarding these two units and their compatibility. I am also in need of an adapter for the HC-10.

C.L. Gantz, Jr.
515 E. Fulton St.
Lancaster PA 17602
(717)-393-1262

I am in need of a tube-specification manual which covers receiving and transmitting types.

Larry Schad
Box 332
Afton IA 50830

I am in need of some donated QSL cards.

Gary Mitchell KH8AC
PO Drawer 909
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 KØEDA
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 055-13-02-7OREV by Incoterm Corp., particularly for RTTY. All reasonable expenses refunded.

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

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 Phillippa
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 Edgecomm 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

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 ¼-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

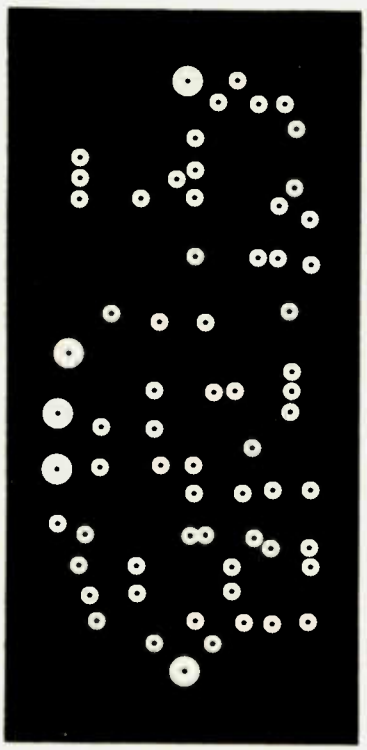


Fig. 2. Foil layout for top side of the filter/amplifier board.

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

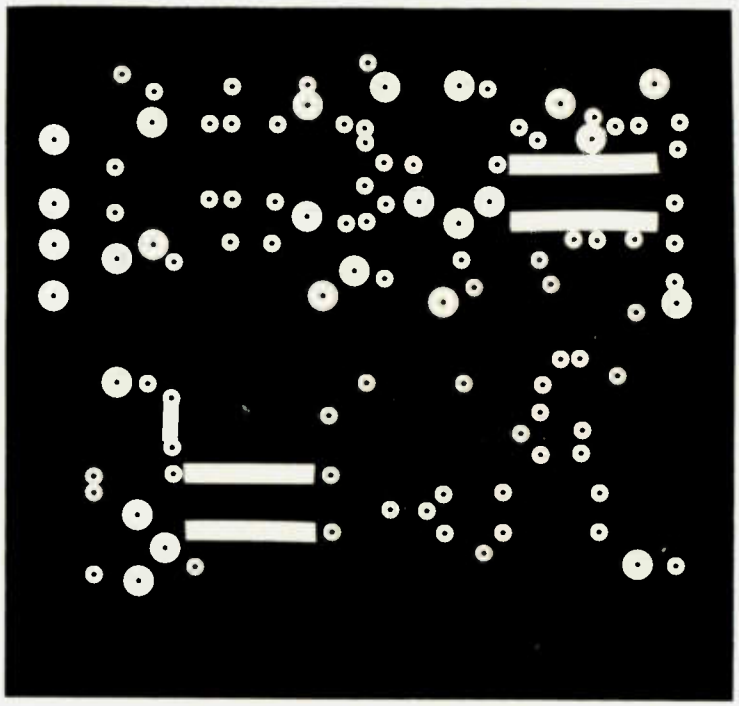


Fig. 3. Foil layout for top side of the demodulator board.

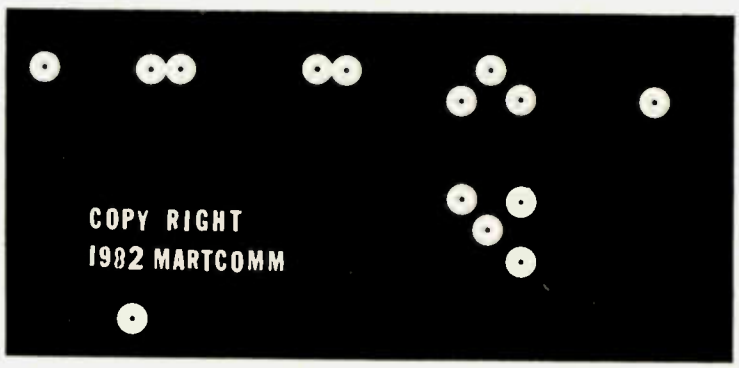


Fig. 4. Top side of double-sided circuit board.

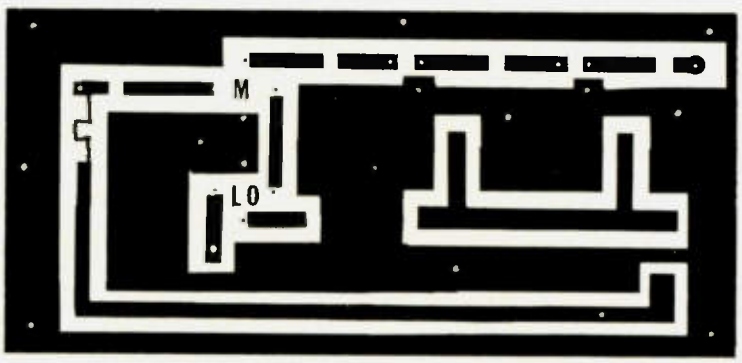


Fig. 5. Bottom side of downconverter circuit board.

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 informaton 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
21728	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

↙See List of Advertisers on page 114

FUN!

John Edwards KI2U
78-56 86th Street
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 Pictoral 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 testified 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.)

```
      6 x x
      x x x
      -----
      x x x
    x x x x
  x 5 x 5
  ---------
  x x 5 x 4 x
```

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:

```
   645
   721
  ----
   645
  1290
 4515
------
465045
```

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?

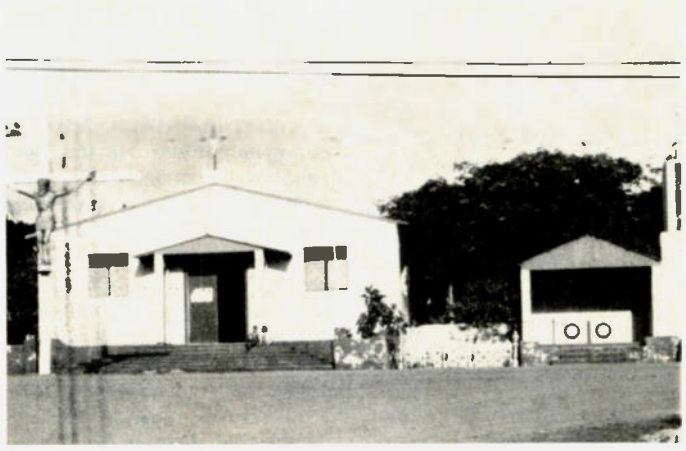
The high level of atmospheric noise (QRN) ruins the lower frequencies for most DX. The 160-meter specialist disconnects the rig and spends the summer nights sleeping, dreaming of living on a mountain of copper plate. His days are filled designing the perfect ground and wondering if his neighbors will 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 occasionally 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 stateside 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, utterly 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 heros, 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 handie-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 whole-heartedly 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 ackwards. 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 langauge—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 siphoned 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	*7,052
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

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

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
AI6V	0	1855	58	215,180
K6HNZ	0	1659	57	189,126
KI6O	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 postmarked 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" × 16" plaque, for $25.00. (Overseas, add $7.50 postage/insurance.) When requested after your original application, an engraved 4 × 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" × 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 offshore 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″ × 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" × 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 Instruments 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 WB0YCQ
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

✓See List of Advertisers on page 114

RADIO BOOKSHOP

FOR THE NOVICE

NEW, UPDATED EDITIONS OF OUR FAMOUS NOVICE LICENSE STUDY GUIDE AND NOVICE STUDY TAPES

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FOR YOUR HAMSHACK

● **QSL CARDS**—*73* turns out a fantastic series of QSL cards at about half the cost of having them done elsewhere because they are run as a fill-in between printing books and other items in the 73 Print Shop. 250 Style W—QW0250—for $8.95*; 500 Style W—QW0500—for $13.95*; 250 Style X—QX0250—for $8.95*; 500 Style X—QX0500; 250 Style Y—QY0250—for $8.95*; 500 Style Y—QY0500—for $13.95.* Allow 6-12 wks. for delivery.

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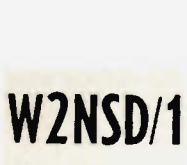

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"GENESIS"

5 WPM—CT7305—This is the beginning tape for people who do not know the code at all. It takes them through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way using the newest blitz teaching techniques. It is almost miraculous! In one hour many people—including kids of ten—are able to master the code. The ease of learning gives confidence to beginners who might otherwise drop out.

"THE STICKLER"

6+ WPM—CT7306—This is the practice tape for the Novice and Technician licenses. It is made up of one solid hour of code, sent at the official FCC standard (no other tape we've heard uses these standards, so many people flunk the code when they are suddenly—under pressure—faced with characters sent at 13 wpm and spaced for 5 wpm). This tape is not memorizable, unlike the zany 5 wpm tape, since the code groups are entirely random characters sent in groups of five.

"BACK BREAKER"

13+ WPM—CT7313—Code groups again, at a brisk 14 per so you will be at ease when you sit down in front of the steely-eyed government inspector and he starts sending you plain language at only 13 per. You need this extra margin to overcome the panic which is universal in the test situations. When you've spent your money and time to take the test, you'll thank heaven you had this back-breaking tape.

"COURAGEOUS"

20+ WPM—CT7320—Code is what gets you when you go for the Extra class license. It is so embarrassing to panic out just because you didn't prepare yourself with this tape. Though this is only one word faster, the code groups are so difficult that you'll almost fall asleep copying the FCC stuff by comparison. Users report that they can't believe how easy 20 per really is with this fantastic one hour tape.

"OUTRAGEOUS"

25+ WPM—CT7325—This is the tape for that small group of overachieving hams who wouldn't be content to simply satisfy the code requirements of the Extra Class license. It's the toughest tape we've got and we keep a permanent file of hams who have mastered it. Let us know when you're up to speed and we'll inscribe your name in 73's CW "Hall of Fame."

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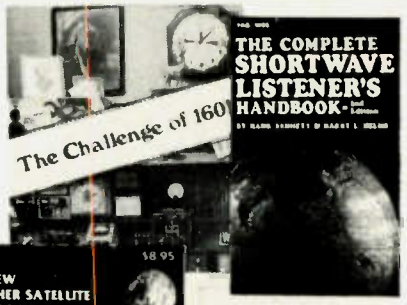

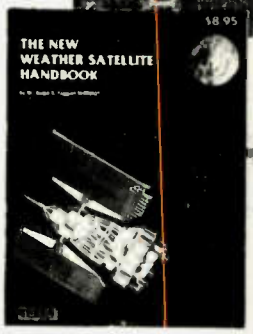

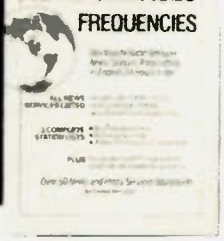

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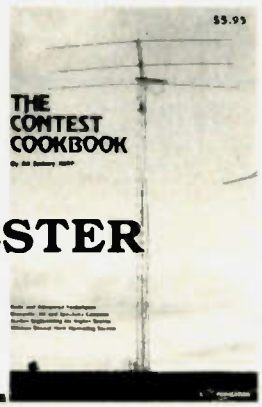
FOR THE CONTESTER



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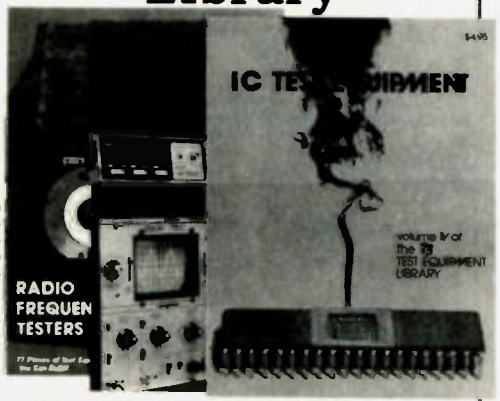

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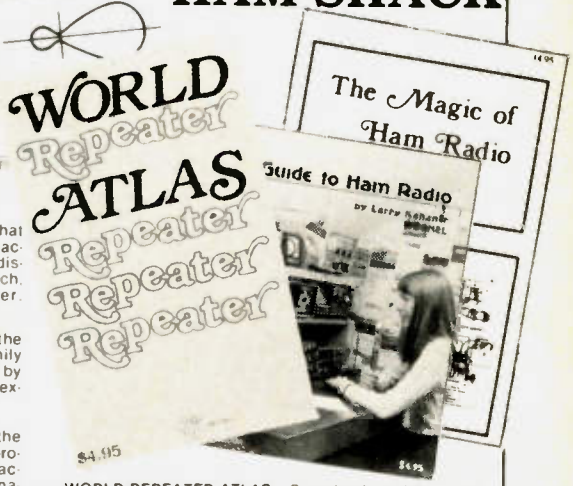

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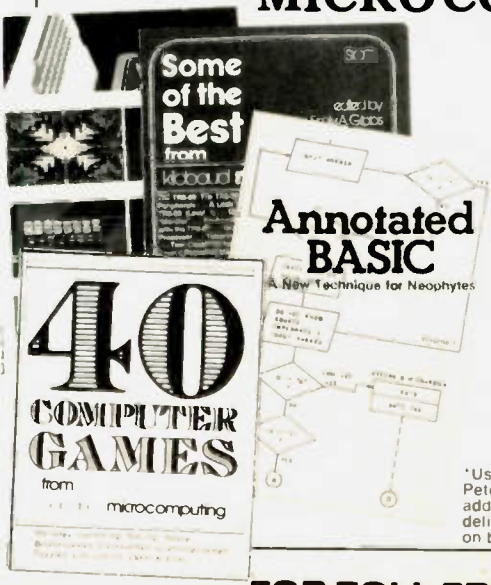

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20	All Electronics	47
*	Amateur Electronic Supply	91, 109, 135
5	Amateur-Wholesale Electronics	93
461	Amateur-Wholesale Electronics	131
334	Amidon	41
97	AMP-Letter	143
*	Antenna Bank	89
63	Antenna Specialists	15
71	Applied Invention	51
121	ARCO Solar, Inc.	35
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*	Atlanta Hamfestival	75
130	Auto Connect	143
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12	Bullet Electronics	142
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*	Code Quick	142
28	Communications Center, NE	158
382	Communications Concepts, Inc.	140
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145	Cover Craft	47
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323	Fox-Tango Corp.	45
116	Friedsam TV Hardware	64
149	G & R Design Inc.	131
143	GLB Electronics	129
*	Gilfer Shortwave	73
417	Gotham Antenna	81
132	Grand Systems	141
86	H & R Communications	51
345	Hal Communications	21, 27
31	Hal-Tronix	35
*	Ham Radio Center	145
*	Ham Radio Outlet	3
33	Hamtronics, NY	159
460	Handi-Tek	141
129	Harvey	97
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127	Heil Sound Ltd.	63
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474	IIX Equipment	143
480	IIX Equipment	119
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78	Independent Crystal Supply Co.	141
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27	Iscan Engineering	141
72	JDL Industries	125
25	JJT Distributing	142
38	Jameco Electronics	161
*	KLM Electronics	9
81	KDK Distributing	17
*	Kantronics	109
*	Kenwood	Cov IV, 7, 115
4	Lacue Communications Electronics	131
481	Lance Johnson Engineering	119
475	Larsen Antennas	120
452	Lewis Construction Co.	63
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482	MCM Communications	120
47	MFJ Enterprises	73, 75, 77, 79, 81, 83
48	MHz Electronics	146-155
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45	Madison Electronics Supply	19, 80
46	Maggiore Electronic Lab	81
134	Martin Engineering	83
476	Martin Engineering	120
139	Memphis Amateur Radio	128
49	Micro Control Specialties	110
483	Micro Control Specialties	120
136	Microwave Filters Co.	51
51	Microlog	72
50	Microcraft Corp.	109, 134
52	Mid-Com Electronics	128
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*	Monitoring Times	68
*	Mor-Gain	87
123	N & G Distributing	65, 110
318	National Communications Group	130
485	National Communications Group	116
412	Nemal Electronics	140
107	North Coast Microwave	57
137	Nuts & Volts	143
*	*Orbit Magazine*	136
*	P. C. Electronics	126, 131
113	Pacific One Corporation	41
*	Palomar Engineers	4, 119
380	Panasonic	69
404	P. B. Radio Service	45
421	Phillips Tech Electronics	64
300	Pipo Communications	141
96	Power Gain Systems	21
459	QRO Engineering	125
60	Quest Electronics	156
138	RF Products	126
117	RSE Hamshack	80
21	R. W. D., Inc.	80
315	Radio Activity	64
61	*Radio Amateur Callbook*, Inc.	4
397	Radio World	134
105	Radios Unlimited	82
454	Radiokit	131
62	Ramsey Electronics	144, 157
147	Randall Sherman	143
133	Rivendell Associates	125
477	Rivendell Associates	120
54	Robot Research	33
418	Rolin Distributors	41
376	SMP	56
65	S-F Amateur Radio Service	135
333	Sentry Mfg. Co.	125
*	Sherwood Engineering	141
*	73 Magazine	
	Books	111-113, 132, 138, 139, 140
	Dealers Ad	139
	Moving	136
	Subscription	137, 140
	University Microfilm	140
148	Shaver Radio, Inc.	141
*	Simple Simon Electronics	127
433	Skytec	141
*	Spectronics, Inc.	135, 160
68	Spectrum Communications	37
436	Spectrum International, Inc.	133
487	Spectrum International, Inc.	118
69	Surplus Electronics Corp.	140
135	TEM Microwave	57
109	Tennessee Electronics	57
328	Texas Microtronics	63
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449	The Ham Shack	134
57	The Tuned Antenna Co.	129
76	Trac Electronics	82
104	Trionyx Industries, Inc.	126
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*	Universal Communications	50
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*	Van Gorden Engineering	21
311	Vanguard Labs	140
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A 73's technical articles are
- Too difficult
- 2 Just right
- 3 Too simple

B Which statement best describes the number of construction articles in each issue of 73?
- 1 Too many
- 2 On the average just the right amount
- 3 Not enough

C Which of the following best describes your feelings about a typical homebrew article in 73?
- 1 Easy to understand and build
- 2 Challenging but I could handle it
- 3 Very tough I wouldn't try it
- 4 I don't like construction articles

D What are your hobbies and leisure activities? Check all that apply
- 1 Animal breeding/grooming
- 2 Astronomy
- 3 Audiovisual entertainment
- 4 Aviation
- 5 Boating
- 6 Cars
- 7 Collecting
- 8 Community activities
- 9 Computers
- 10 Cooking
- 11 Crafts
- 12 Creative arts
- 13 Electronic technological activities
- 14 Games
- 15 Gardening
- 16 Model Building
- 17 Photography/cinematography
- 18 Sports & outdoor activities
- 19 Travel
- 20 Other

E What types of advertising (besides ham radio equipment) would you like to see in 73? Check all that apply
- 1 Computer hardware
- 2 Computer software
- 3 Business products
- 4 Consumer products
- 5 Toys
- 6 Hobby equipment
- Other

F How do you like 73's coverage of satellite TV?
- Love it, give us more
- 2 Some is okay, but you have gone too far
- 3 Hate it, try something else
- 4 Don't care

G If you could choose one mode of operating, what would it be?
- 1 Two meter FM
- 2 Phone
- 3 CW
- 4 RTTY SSTV or other spec ial modes

H Which one of the following activities do you enjoy the most?
- 1 Magcheving
- 2 Operating in a contest
- 3 Working DX
- 4 Building a homebrew project

I How do you like published reviews of new amateur gear?
- 1 I read them and find the information useful
- 2 I read them but don't let them influence my buying
- 3 I don't read them

J If you were an editor of 73 you would (check all that apply)
- 1 Publish more general interest articles
- 2 Include more monthly columns
- 3 Print more construction articles
- 4 Keep the magazine just as it is now

K What is your primary source of information about amateur radio equipment? Check one only
- 1 Magazines
- 2 Books
- 3 Hamfests
- 4 Stores
- 5 Friends
- 6 Other

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3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
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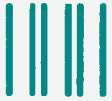

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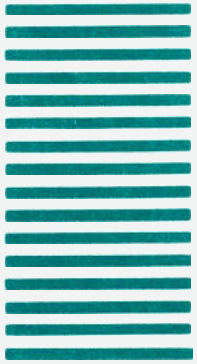

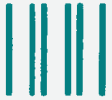

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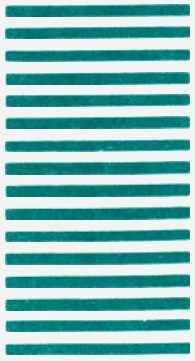

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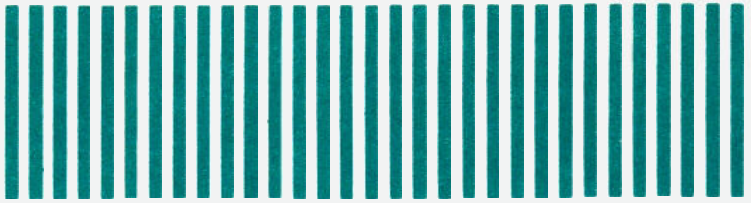

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REVIEW

KENWOOD TR-2500 HAND-HELD

I have been using hand-held two-meter transceivers since 1976. I started out with a Wilson 1405, went to the smaller Wilson MK II, and then saw the advertisement for that "do everything" Yaesu FT-207R. I had to have one!

A few months ago, I saw an advertisement for the Kenwood TR-2500. There was that old feeling again—I had to have one!

I sold my Yaesu at the first opportunity (which didn't take long). Then I called the local radio store and sadly found out that Kenwood was not yet shipping the 2500 (shades of my Yaesu purchase several years before). Both my budget and the Kenwood delivery schedule were not ready for several months. It seemed like forever! I began to wonder if I might have made a mistake. The Yaesu sure had been good. To make a long story short, the TR-2500 finally came.

The first thing I noticed about the radio was its size. It feels like it was made to be carried around. I haven't actually put it next to an Icom IC-2A yet, but that is the size range it is in.

Memory Backup

The lithium-battery memory backup is a pleasant change. No more programming the memories every time I turn it on. Speaking of batteries, the TR-2500 runs quite a long while on a battery charge. Although it's only a 400-mAh pack, the radio is fairly easy on it. I've found myself adopting new battery habits, too. The Kenwood starts flashing its transmit LED when the battery is about depleted (it flashes in the receive mode, too). It's nice to have a few minutes warning before the radio is completely dead. Several minutes is plenty of time to say 73 or to grab a charged battery pack. Now, I just run my battery all the way down and then take the five seconds to slip on a fresh pack; you don't even have to turn the radio off! I suspect the nicads will have a longer life if they are fully cycled.

The TR-2500 program features are super! I don't have to scan all of the band—only the part I am interested in. The audible beeps that sound when a function key is hit are also quite helpful. The auto-resume for scanning is a "have to have" item, and with the ten-channel memory I can store all the frequencies I need. This little radio just about does it all.

The one thing I might have wanted in the TR-2500 was extended frequency coverage for MARS. I mentioned this in the comments section of the buyer questionnaire included with the radio. I was quite impressed when I received an envelope from Trio-Kenwood a week later. It contained a simple modification to allow the TR-2500 to operate in the 141.000- to 150.995-MHz range. Now, that is being responsive to the consumer! A copy of the modification instructions accompanies this review.

The excellent engineering that was put into the TR-2500 is extended also to the optional accessories. The speaker/microphone is sturdy as well as very functional. The clip on the back has already proven useful while working on a local repeater antenna project. I could talk with just a push by my collar, and listen hands-free.

Accessories

The mobile stand is a very attractive accessory, providing both power and battery charging. You can also charge a spare battery. Another example of fine human engineering is the mobile stand's small light that illuminates the radio keyboard; it's even tinted green to match most auto dash lights.

The base stand is equally well thought out. Besides power for the radio, it also provides a fast (one to one-and-a-half hour) charge for batteries. The battery pack has a built-in heat-sensing device that triggers at 40° C. According to Kenwood, this happens when the battery is at a 90% charge. The base stand then automatically switches to a trickle charge rate. If one only wants to trickle charge, this can be accomplished by turning on the charge switch before turning on the power switch.

Kenwood provides threaded holes in the radio case for the belt clip, a wrist strap, and a rubber earphone-jack protector. There are, of course, extra battery packs available, and even an empty battery case for throw-away alkaline batteries.

Just to be fair, I need to list my negative findings.

- The case doesn't impress me as being as sturdy as those of the FT-207R and the previous Wilson radios.
- The squelch sounds a little "soft."
- The speaker doesn't sound quite as good as the Yaesu, probably because it's smaller.

I adapted rather quickly to the differences, though, and now don't even notice them.

Multi-Purpose Radio

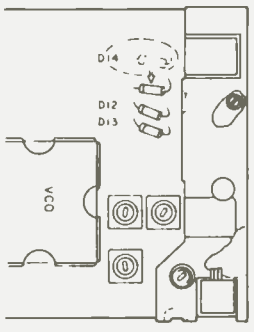
This Kenwood TR-2500 is the only two-meter radio I own. At work, I can set it on my desk and listen quietly to what is going on. In the car, I hook up to the outside antenna, with a 25-Watt amplifier between, and it works beautifully. At home, I only need to hook to the outside antenna if I'm trying to hit one of the "far away" machines.

If any of you out there in radio

TR-2500 MARS CONVERSION

The TR-2500 is supplied to operate between 143.000 and 148.995 MHz. Frequency coverage may be expanded to 141.000 to 150.995 MHz.

1. Slide off the battery pack.
2. Remove three small Phillips head screws from the rear cover.
3. Remove four countersunk Phillips screws from the case bottom.
4. Remove the rear case, remove the PTT lever and set aside.
5. Desolder the backup battery top (negative) lead.
6. Remove four small countersunk Phillips head screws, two on each side, securing top to bottom frame halves.
7. Remove two small Phillips screws from the top panel. Use a flat blade screwdriver to pry up the panel. All four knobs will lift with the panel, as well as the black Offset mask.
8. Swing the front away to the right and unplug the speaker and mic lead from the RX TX unit. Do not over extend the flex circuits.
9. Remove the felt insulation sheet from the PLL rear.
10. Carefully desolder D14. Use a low-power, fine-tipped iron and wick material, or a vacuum desoldering machine. Do not pull out the through hole material, burn the PCB, or overheat and lift the foil. Clear the adjacent empty holes and move D14 to this new location. Solder sparingly and do not create a solder bridge.
11. Replace the felt insulation on the PLL unit.
12. Reinstall the PLL assembly. When reassembling, be sure to replace the black Offset switch mask under the top panel.
13. Reverse steps eight through one to reassemble. When resoldering the backup battery (step five), be sure not to short the battery to the chassis or adjacent shielded compartment.
14. The TR-2500 will now operate anywhere between 141.000 and 150.995 MHz, with any split. Please be sure you are authorized to operate out-of-band before transmitting. The display will show a small zero at 151 MHz in the MHz position. All other frequencies will display normally.



TR-2500 MARS conversion (top view).

land have been toying with the idea of trading up to one of the newer hand-held radios or getting a first one, I would strongly recommend taking a look at this year's crop. If the rest of them are anything like the Kenwood, and I suspect they all are very good, you will find them just as capable as their larger counterparts. Try one—you'll like it!

For more information, contact *Trio-Kenwood Communications, PO Box 7065, Compton CA 90224.*

Oscar Staudt WB5GCX
Guthrie OK

NCG 15M 15-METER SSB/CW QRP TRANSCEIVER

At the time that I received the NCG 15M 15-meter SSB/CW QRP transceiver for review, I had just finished reading an enthusiastic review of its predecessor, the NCG 15SB, and I wondered how the 15M would match up to it. I expected an improved model and set out to see if this was the case.

Careful unpacking of the 15M yielded a U-shaped mobile bracket and the necessary hardware to mount the rig under the car dash, a hand-held Hi-Z microphone, a mike hanger with an adhesive backing, a 12-V power cord with a 5-Amp fuse, and the rig with its operating manual.

Features of the NCG 15M

The NCG 15M is housed in an attractive metal cabinet, measuring 9″ × 2-5/8″ × 8-1/8″, and the rig weighs 5-1/2 lbs. On the right side of the front panel is the tuning dial, and just to the upper left of the dial is the three-digit LED frequency readout, displaying the frequency from 0 to 999 kHz in 1-kHz steps. I found the display to be bright enough for most operating situations.

Below the readout are two push-button switches positioned side by side. One activates the "Delta F" (receiver incremental tuning) control and the other is the noise blanker. The blanker does a very effective job of reducing engine noise, and will actually clip the received signal if the engine noise is strong enough.

The Signal/Rf Out meter is located to the left of the readout, and next to the meter is the Delta F tuner. This control will tune approximately ± 4 kHz from the original receiver frequency. A modification is given in the manual to convert the Delta F tuner into a fine tuner for both receive and transmit.

Below the Delta F control is the Hi/Lo Rf output selector and the mode selector. The output selector allows for 10- or 2-Watt operation and the mode switch selects CW or sideband. The transmit indicator LED in the upper left-hand corner of the rig will light when the rig is in the CW mode, whether or not the rig is keyed, which can be misleading. The key jack is on the back panel of the rig.

The antenna input is 50 Ohms, and the power input is 13.8 V dc.

Specifications and Testing Results

The testing results matched or exceeded the specifications given for the NCG 15M. Ratings for carrier suppression and spurious radiation were given at more than 40 dB and less than – 50 dB respectively. Test results showed at least 43 dB for the carrier suppression and – 60 for the spurious radiation. These were single tone tests (not mentioned in the manual). Testing for image emissions showed suppression in excess of 60 dB.

The rating for sensitivity was given as "more than S/N 10 dB at – 6 dB input." Assuming that the input is the rating for the incoming signal (unamplified), this rating is meaningless since the average signal received is – 100 dB or less. Testing results showed more than 10 dB signal/noise at – 108 dB input.

Selectivity for sideband was tested at – 60 dB and was less than ± 3 kHz as rated by the manual. Power out was measured at 10 W PEP high/2 W PEP low for sideband, and 10 W high/2 W low for CW.

On-the-Air Experiences

With 10 Watts PEP fed into a dipole strung in the attic, I was ready to do some sideband operation. I immediately hooked up with KQ4F in Jacksonville, Florida, who reported a signal weak but with excellent audio quality. As the band was on the verge of closing down completely for the evening, this was encouraging news. The next evening brought a variety of contacts on phone; many from the States, a few from South America, and an OH6 from Finland with reports ranging from 55-6 to 59. I was amazed at the reports that I was receiving. On sideband, the sensitivity and selectivity of the NCG 15M easily ranks with rigs three or four times the price.

The NCG 15M transceiver.

The next day brought some early morning CW operation and I worked five European countries over the space of one half hour, until QRM made conditions impossible. I received excellent signal reports from most of my contacts, but the selectivity on CW was not narrow enough to compete with more than just a light amount of QRM and I was not able to operate as long on CW as I would have liked. This problem can be eased with the installation of any good-quality audio filter.

The main question: How does the NCG 15M perform running mobile? The results were excellent. Using a Firestik CB antenna and an antenna tuner, I went out one afternoon and managed to make 7 contacts with this less-than-optimum antenna arrangement. I have spoken with several hams in the midwest who have worked better than 40 countries with the NCG 15M and a Hustler antenna while driving to work.

Several NCG 15M owners whom I have been in contact with have converted a top-loading CB antenna into a 15-meter antenna with a good deal of success. It's a simple conversion:

Loosen the set screw on the upper part of the coil on the top-loading antenna and remove the whip (approximately 1 foot). Obtain another whip at least 2-1/2 feet long. This will replace the original whip. Trim this whip in 1/4-inch increments until an optimum match is obtained. The result is a broadband 15-meter antenna which costs about $15-$20 and about 30 minutes of your time. I was quickly inspired to do my own conversion and have already worked several countries running mobile QRP.

I was pleased to find that there was a protection circuit for the transistor finals built into the rig; the power out drops substantially with high swr. I had ample opportunity to check this out with my first mobile antenna installation!

The only real fault that I found with the 15M is the backlash in the main tuning. The main tune is not too difficult to use when the radio is in the shack, but it makes mobile operation a real challenge. The manual gives instructions on how to convert the Delta F control to a fine tune to compensate for the rough main tuning. This works well since the fine tune follows the main tune in step, i.e., if the fine tune is 4 kHz off from the main tune, and the main tune is set to a new frequency, the fine tune will still be 4 kHz off from the new main-tune frequency.

Conclusions

The NCG 15M was a real pleasure to use. The sensitivity for both modes and selectivity on phone were comparable to many transceivers sold at more than three times the price of this $300 rig. Although a little more expensive than the NCG 15SB, the 15M matches up to any area—and its tuning system is far superior.

For those who have been thinking about 15-meter mobile or just plain QRP work, you will

find this rig to be well worth the money. It has provided me with hours of enjoyable low-power operation which I hadn't thought possible. It has much of the sophistication of more expensive rigs, yet is simple to operate. The NCG 15M is an outstanding value any way you look at it.

For more information, contact *National Communications Group, 1275 N. Grove St., Anaheim CA 92806.* Reader Service number 485.

Bryan Hastings KA1HY
***73 Magazine* Staff**

HEATHKIT SA-5010 KEYER

In case you haven't noticed, Heathkit® has taken a renewed interest in producing amateur radio equipment. In fact, it could be said that the gang in Benton Harbor is more than making up for lost time—in quality, as well as quantity. What's most interesting is that the new products are obviously designed by hams, for hams. Heath didn't just call up their engineers in the stereo and computer department and say, "Hey fellas, whip us up some ham gear when you get a chance, okay?" No, these products were *planned.* To see what this latest generation of Heathkit ham gear is like, *73* obtained a μMatic memory keyer. The following is what I discovered.

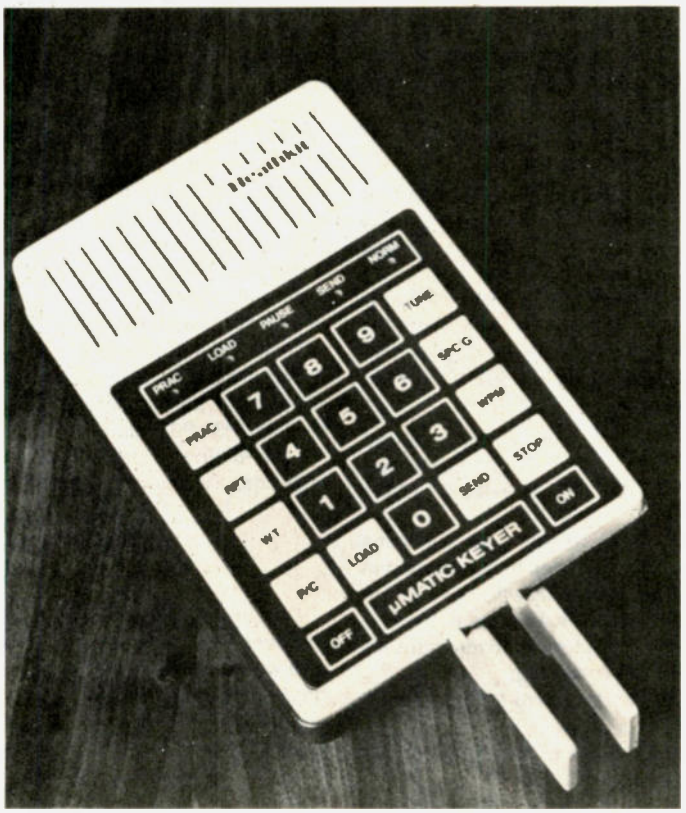
The Features

The μMatic keyer is a compact unit measuring 4-1/8" wide, 6" deep, and 1-5/6" high. It weighs in at a hefty 1 lb. 14 oz., thanks to a cast aluminum base. It requires 11-16 V at 200 mA, and an optional wall transformer is available. There should be no keying problems with most transmitters, since positive keying at 250 V at 100 mA and negative keying at – 200 V at 40 mA are accommodated. There are separate phono jacks for positive and negative keying on the rear panel, so no internal wiring changes are needed when switching from, say, an Icom 730 to a Kenwood 520S.

A set of removable capacitive touch paddles plugs into the front of the unit, and a keyboard-entered command swaps the inputs for left-handed users. When the paddles are not in use, they can be safely stored in a slide-out tray in the keyer base. A jack is provided on the rear panel for those who prefer external paddles.

All commands are entered via the 22-key flush-mount membrane keyboard, which sports 10 numeric and 23 single-function switches. Pressing the "TUNE" switch, for example, locks the output and sidetone on until another button is pressed or a paddle is touched. Speed is keyboard-selectable from one to 99 wpm, and weighting and spacing are variable. If the user attempts to enter an incorrect command, the sidetone emits a distinctive dual-pitched warble.

Rounding out our tour of basic features is a built-in sidetone and speaker with trimpot-adjustable volume and pitch. While it is not possible to completely silence the sidetone with its volume control (helpful when using a rig with its own sidetone), plugging a dummy plug into the rear-panel headphone jack accomplishes the same thing. Since I can't imagine ever wanting to plug a headphone into the keyer, I'll probably replace the jack on our unit with a miniature SPST switch to turn the sidetone on and off.



The Heathkit SA-5010 μMatic Keyer. (Photo by KA1LR/4)

Thanks for the Memories

There are up to ten buffers for storing text or commands. The buffers are soft-partitioned and will hold a total of 240 characters. The ability to store commands as well as text in memory permits such luxuries as automatic speed changes and programmed pauses in buffer-stored messages. A repeat key which allows a message to be sent up to 10 times helps make the most of available memory. Memory contents and last-selected speed, spacing, weighting, and repeat count are retained with an internal battery backup circuit whenever the unit is disconnected from its power supply. The three miniature S-76 batteries are claimed to last about a year (and longer if the keyer is left connected to power most of the time).

Like several other keyers, the μMatic does not load in real time. If you pause for several seconds between words, only a normal wordspace will be inserted in the memory. If the P/C key is pressed while loading a buffer, the keyer will pause at that point when sending the message, allowing you to insert serial numbers, reports, or other text with the paddles. When less than 20 characters of memory space are left, the μMatic warns its user by dropping its sidetone pitch considerably. When it runs out of space completely, the μMatic gives a warning warble, stores the last character entered, and returns to the normal mode.

Heath has included a couple of innovations in error correction to simplify buffer loading. Characters longer than six dots and dashes are simply ignored. If several or more dots are sent, the computer not only ignores the character, but deletes the previous character from the buffer as well. This is one of the best error-fixing routines I have seen.

Code Practice Mode

For the ham seeking to improve his or her ability to copy code, the μMatic keyer includes a very sophisticated code trainer. It sends random code groups in your choice of letters only, letters and numbers, or letters, numbers, and punctuation. We won't go into the details here. Suffice it to say that there are 6400 different yet repeatable practice sequences available. Since you work at any speed you wish, and there are too many sequences to memorize, I judge the μMatic to be superior to cassettes as a learning tool.

Inside the μMatic Keyer

Our kit-builder took 11 hours working at a leisurely pace to finish the kit, and reported only a couple of minor problems in construction and no errors in the manual. The μMatic was rated as an enjoyable and very easy-to-build kit. Virtually all of the circuitry is on the single main board which, in the Heathkit tradition, is silk-screened with component values, placement, and polarities. It's pretty hard to install a part incorrectly! There is a second small board which holds the status LEDs and their dropping resistors. Building is greatly simplified by the 22-switch keypad which connects to a socket on the main circuit board with a ribbon cable. All ICs are socketed, and there are ample warnings about the dangers of static electricity while handling delicate CMOS packages.

Problems? The final case assembly is not quite up to the elegant standard set by the rest of the unit. The military precision found everywhere else is inexplicably lost here. Specifically, the small LED status display board is merely stuck to the top panel with double-sided adhesive tape. Two standoffs designed to keep the board level

unfortunately also keep the LEDs in our sample from going as deep into their mounting holes as they should, which causes the display to be rather dim. And because of the number and thickness of wires going to the LED board and the rear panel switches, the two case halves must be forced together during assembly. One always wonders exactly which components are taking the strain of such force. I would prefer a more reassuring mounting scheme here for no other reason than peace of mind. Also, the leads of the main five-volt regulator were too short to plug reliably into the connector provided, no matter how they were bent or cajoled. Rather than risk a flaky connection to this vital component, our builder elected to discard the socket and solder directly to the leads.

Fortunately, none of these problems affected the reliability or usefulness of the keyer. I submitted it to a rather severe torture test, dropping it several times, and banging it repeatedly and forcefully on various hard surfaces. No problems appeared.

Actually, I anticipate that the μMatic will be a highly reliable product. One reason is its impressively low parts count. Control is provided by a custom 3870 single-chip microprocessor and ROM package, clocked with a 3579.545-kHz crystal. Two CMOS 5105 RAM chips store the buffer contents and command functions. A fair percentage of the unit's parts are devoted to the sophisticated power and backup-power switching circuitry, which includes an automatic shut-off feature. Bypass capacitors are used liberally at any point where there is potential rf leakage, and the power input circuit is protected against reverse polarity. Importantly, all components (including the two voltage regulators) run very cool.

In Use

Obviously, Heath has had the benefit of being able to examine several earlier generations of memory keyers. They did their homework well, and have solved just about every problem that cropped up in them. For example, the ability to correct errors while loading text into a buffer is very helpful, as is the CMOS memory and its battery backup. I still get a kick out of plugging the keyer in after a couple of weeks without use, and finding our painstakingly-entered messages still there!

A great deal of thought seems to have gone into the means of accessing the keyer's features. Manufacturers of memory keyers are currently divided into two camps: those who favor a separate switch or knob for each function and others who use a universal keypad, with which we enter numeric codes to accomplish specific tasks. I tend to favor the keypad system, although I sympathize with hams who have a hard time remembering the codes for specific functions. Heath's approach was to take the best of both worlds, bypassing each method's weaknesses. The μMatic has the precise resettability of keypad units coupled with the ease of use of the knobs and switches brigade. And for hams who still get confused from time to time, there is an easy-to-understand operating guide on the bottom of the unit.

One question frequently asked is, "How do you like the capacitive touch paddles?" Well, I really didn't expect to like them, but was pleasantly surprised when the kit was finished. They aren't bad at all. They are infinitely superior to the paddles that were attached to Heath's earlier keyers. I still prefer a good pair of mechanical paddles (like our trusty Bencher), but in many situations, the touch paddles are a welcome feature. With the paddles stored in their little tray, the μMatic is so portable that it can often be found in the glove compartment of my rolling ham shack. I suspect that many hams will be satisfied with the simplicity and portability of a self-contained unit like Heath's SA-5010 μMatic keyer.

I am especially pleased to see attractive, state-of-the-art equipment available from Heathkit, and at the price of $97.95, building the μMatic keyer is truly worthwhile!

For more information contact the *Heath Company, Benton Harbor MI 49022.* Reader Service number 486.

Paul Grupp KA1LR/4
Casselberry FL

MMS 2 ADVANCED MORSE TRAINER

The Morse Talker by Microwave Modules (reviewed in January, 1982) was quite an amazing box. It sent randomly generated code characters and then, using a speech synthesizer, read back to you what was sent.

Well, these folks have managed to go one step further with their new Advanced Morse Trainer, model MMS 2. This new version of the Morse Talker not only tells you what it sent, it tells you what *you* sent as well. Hook up a key and send to the Trainer. After one, five, or fifty characters you will be told what you sent and how fast you sent it. The MMS 2 has all the other features of the Morse Talker except for a different, and to my mind more useful, speed range of 6 to 32 wpm rather than 2 to 20 wpm.

The unit can handle speeds in excess of 40 wpm. The speed readout, which is also voice-synthesized, says "20 wpm" no matter how much higher the speed may be. The MMS 2 recognizes only letters and numerals; if you try to send it punctuation, you will be awarded with the best Bronx cheer this side of the polo grounds.

Although the ability to check sending accuracy might seem like an important one (particularly if you've spent some time recently listening to the CW segments), in use, the MMS 2 leaves something to be desired. It's not that it doesn't copy well—it copies *too* well. The Morse Trainer was able to copy CW that I wouldn't put on the air. It was able to copy even my palsied bug sending, and that's a fist I wouldn't let even a Novice hear!

The CW decoding algorithm used in the MMS 2 would be ideal in a Morse reader, but is entirely too forgiving to serve as a critical sending evaluator. An experienced ham's ears do a much better job.

All in all, the Advanced Morse Trainer represents a significant leap forward in technology. Whether it's a useful leap is another question.

The price class of the Advanced Morse Trainer is $295. For further information, contact *Spectrum International, Inc., Box 1084S, Concord MA 01742.* Reader Service number 487.

John Ackermann AG9V
***73 Magazine* Staff**

HAM HELP

Does anyone have a manual or schematic for an Andrea Radio Corporation Model R-395-PRD-1 World War II direction-finder?

Stan Richardson AC5A
PO Box 65
Flynn TX 77855

I would like to hear from anyone who can help me increase the selectivity and dynamic range of my DX-302 shortwave receiver.

Rob Leonard
Len's Ave.
Dayville CT 06241

I wish to thank all the hams who responded to my request in Ham Help and who did not furnish a return address in their reply! I still need service manuals for the following:

- a model DO-16-N GE low-band base station
- a GE "TPL" low-band mobile manual, #LBI-3407
- a GE "TPL" noise-blanker adapter, model 4EZ14B10 Rev. C
- an ac "Spark Plug," model CVT-1 (a.k.a. Delco Achieverfone)
- a Utica "Uticom" base station
- a Motorola P33AAM-1001AM manual, #68P81005A4OE

I also need the following:

- an rf amp and mixer board for a Pye Cambridge type FM 10D, "A" or "B" band
- a control head and cable for a GE MASTR II (6 or 8 freq.)
- Motorola NU-138 nicad or NU-140 ac power supplies for the old "P31-P33" series HTs

I am willing to pay a reasonable cost for any of the above.

Barry Fuerst
218 Flournoy St.
Oak Park IL 60304

I am interested in becoming a member of Army or Navy MARS and would be very interested in hearing from anyone who could supply me with details about joining.

Robert Cann W4GBB
1060 Lochwood Dr.
Richmond VA 23233

NEW PRODUCTS

GINPOLE

The IIX GP-81 ginpole features all welded construction, full zinc plating, and is designed to fit all popular tower sizes. A kit version (buyer purchases a pipe locally) costs $129.50, while the complete assembly sells for $159.50. These antenna accessories and further information are available from *IIX Equipment, PO Box 9, Oak Lawn IL 60456; (312)-423-0605.* Reader Service number 480.

MICRO-CONTROLLED TRANSCEIVER

The Santec ST series of radios (both the 2-meter and the 440-MHz versions) are the first units to incorporate digital clocks within the radio's control program. The ST offers 10 memories to store both frequency information and the transmitter offset for repeater operation. Bandscan is handled by a manual mode for single stepping, a search mode which automatically finds the first busy frequency, and a scan mode which steps through the band, pausing at each busy channel to monitor the conversation.

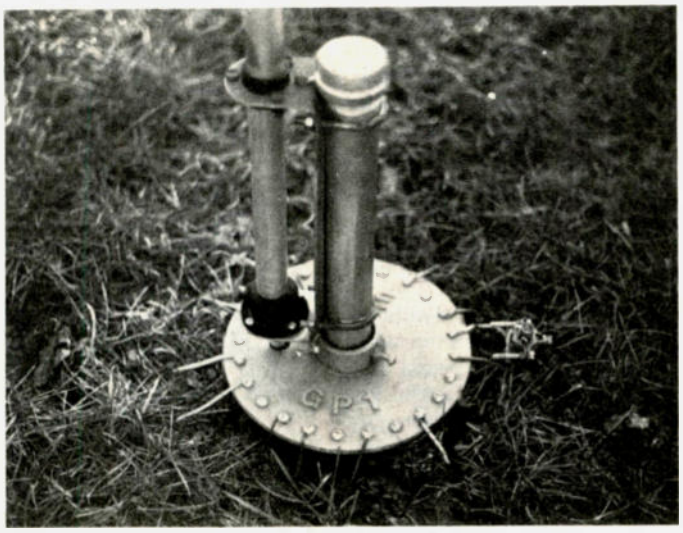
The ST-144/uP provides MARS/CAP frequency coverage down to 142.000 MHz and up to 149.995 MHz. There are three selectable power levels: 100 mW, 1 W, and a full-rated 3.5 W. A large liquid-crystal display and a 16-key control pad are among some of the other ST-144 features. The two-meter version lists for $359. For more details, contact *Encomm, Inc., 2000 Avenue G, Suite 800, Plano TX 75074.* Reader Service number 484.

Encomm's Santec ST series of micro-controlled transceivers.

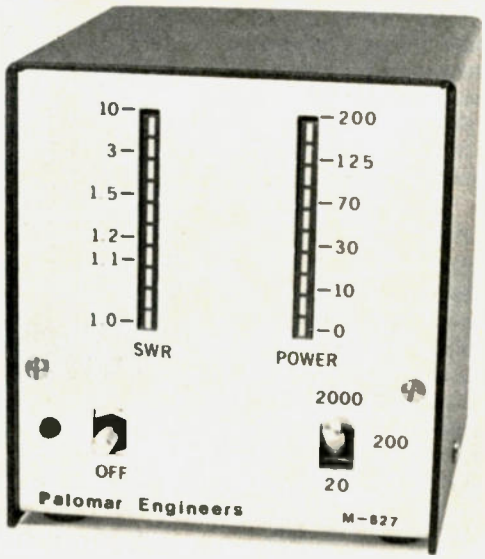
24-HOUR WALL CLOCK

The Benjamin Michael Industries Model 973A clock features quartz accuracy and a 12" dial for excellent visibility. A unique dial face helps to eliminate interpretation errors often associated with 24-hour clocks, and battery operation eliminates the need for a power cord. The Model 973A clock lists for $59.95. For more information, contact *Benjamin Michael Industries, 65 E. Palatine Rd., Suite 105, Prospect Heights IL 60070; (312)-459-5760.* Reader Service number 479.

The Benjamin Michael 24-hour clock.



The Lance Johnson Engineering GP-1.



The M-827 swr meter from Palomar Engineers.

AUTOMATIC SWR METER

Palomar Engineers introduces the new M-827 swr meter. This new meter computes swr automatically and displays it on a light bar. A second light bar displays power.

The frequency range of the M-827 swr meter is 1-30 MHz. Power ranges are 20, 200, and 2000 Watts. The swr scale is 10:1 with a logarithmic response. The M-827 swr meter sells for $97.50. For further information, write to *Palomar Engineers, 1924-F W. Mission Rd., Escondido CA 92025.*

GROUND PLANE BUSS

Lance Johnson Engineering has developed the GP-1, a 24-point buss that allows you to connect a large number of radials to the base of your antenna in a neat and efficient manner. The cast "alumaloy" disk attaches to masts up to 2 inches in diameter and has a convenient opening for feedline routing. The GP-1 is priced at $24.95 and is sold by Lance Johnson Engineering. For more information, contact *Lance Johnson Engineering, PO Box 7363, Kansas City MO 64116.* Reader Service number 481.

COMPACT ANTENNA

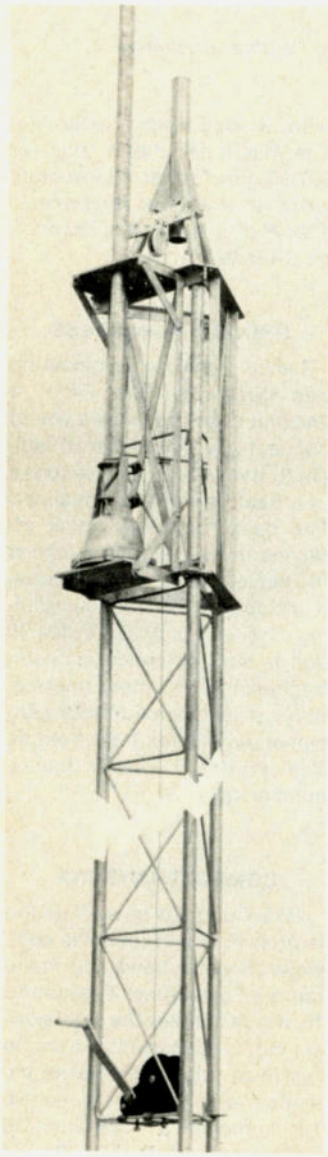
Bilal Company now offers the Isotron 15. It will cover the complete 15-meter band and maintain a 2:1 or less swr. The Isotron 15, which handles the legal power limit, is supported on a single length of tubing, giving the antenna a total length of 21 inches. The principle of operation is similar to that of the 80-, 40-, and 20-meter models. The Isotron 15 sells for $32.95. For more infor-

mation, contact *Bilal Company, S.R., Florissant CO 80816.*

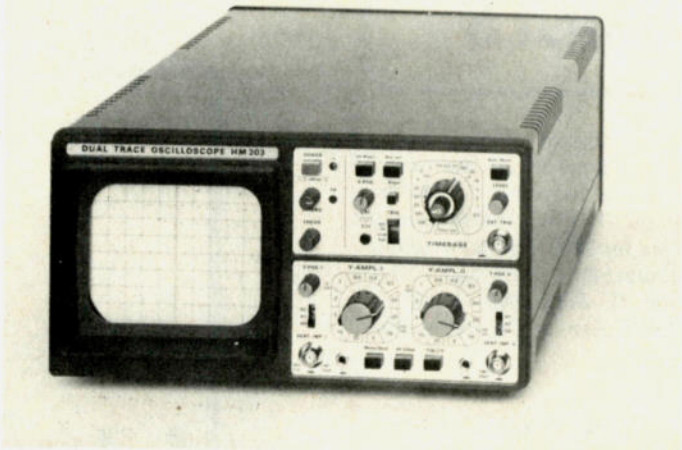
TOWER AID

The Hazer is an antenna tower accessory which follows the tower and carries the antenna. When desired, the Hazer is lowered to the ground, allowing antennas to be repaired or replaced. By means of a winch, the Hazer is elevated to the top of the tower.

The Martin Hazer is made of 6160 aluminum and is designed for the Rohn 25 tower. It comes complete with winch, cable, hardware, and instructions. Priced at $359.95, the Hazer is available from Martin Engineering. For more information, contact *Martin Engineering, Box 253, Boonville MD 65233; (816)-882-2734.* Reader Service number 476.



The Hazer from Martin Engineering.



Hameg's dual-trace oscilloscope.

20-MHZ SCOPE

Hameg has started to distribute the HM203, a 20-MHz dual-trace oscilloscope. The 203 features 5-mV/cm to 20-V/cm vertical sensitivity, 18 calibrated sweep speeds, a ×5 sweep magnifier, and external triggering.

The HM203's compact size, 28 × 14 × 38 cm, makes it suitable for either home or field applications. Accessories include a component tester and carrying case, while two ×1/×10 probes are included in the purchase price. The HM203 has an introductory price of $529 and is manufactured by Hameg, Inc. For more information, contact *Rivendell Associates, Warner Hill, Derry NH 03038; (603)-434-5371.* Reader Service number 477.

ELECTRONIC KEYER

Daiwa has introduced a precision electronic keyer, the DK210. Features include semi-automatic, automatic, and tune modes, as well as dot/dash memories. An LED speed indicator gives an instant readout of the DK210's 8- to 50-wpm capability. There are two types of solid-state keying outputs to suit almost any transmitter. A variable-frequency sidetone monitor is also included.

The keyer is available without the speed indicator as the Model DK200. The suggested list price for the DK210 is $99; for the DK200, $82.50. For more details, write or call *MCM Communications, 858 E. Congress Park Dr., Centerville OH 45459; (513)-343-0031.* Reader Service number 482.

CONTEST-LOGGING PROGRAM

Compu-Log, a fully-computerized logging system, offers a printed, scored, and duped log, complete with dupe sheet. Confirmation of contacts can be printed on address labels in alphabetical order by callsign, for attachment to your QSL cards. In addition, many valuable contest and operator statistics can be printed.

Compu-Log is written for the TRS-80 Model I with 48K memory, at least one disk drive, and the Epson MX-80 printer. Modified versions for other printers and the TRS-80 Model III can be created. Versions of Compu-Log for the *CQ* Worldwide DX Contest and ARRL DX Contest are available now. Compu-Log sells for $69.95. For more information, contact *Contest Software, Peter Chamalain W1RM, Savarese Lane, Burlington CT 06013.* Reader Service number 478.

REPEATER POWER AMPLIFIER

A new line of continuous-duty power amplifiers for repeater service has been introduced by Micro Control Specialties. Three different models in the new PA-75 series serve the popular repeater frequencies of 144-148, 220-250, and 420-450 MHz.

Each model in the series provides 75 Watts output with 10 to 15 Watts of drive from a repeater or base station. The PA-75 also includes a 3-section harmonic filter, ac power supply, front-panel fuse access, and metering in a rack mount package.

The two-meter version of the PA-75 has a suggested retail price of $580. For more information, contact *Micro Control Specialties, 23 Elm Park, Groveland MA 01834; (617)-372-3442.* Reader Service number 483.

MOBILE RADIO MOUNT

Larsen Antennas' QUIK-Change radio mount system allows interchangeable use or easy removal for protection against theft. Transfers take only minutes and radio malfunctions can be checked quickly with replacements installed in any vehicle equipped with the Larsen mount.

There are no manual connections—just a simple latch release that disconnects the positive power lead, then the ground, speaker leads, and antenna connection. Reinsertion connects the positive power last to protect the radio. The QUIK-Change radio mount has a suggested user price of $42.00.

For more information, contact *Larsen Antennas, PO Box 1799, 11611 NE 50th Avenue, Vancouver WA 98668.* Reader Service number 475.

The Daiwa DK210 electronic keyer.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

real technical entry exam has nothing to do with opening any floodgates for CBers. . .it has to do with closing the gates to people who want to cheat to get in. . .with the connivance of Dick Bash and his theory bypass system. This is *supposed* to be a technical hobby.

I sympathize with hams who are all wrapped up with the code. I think that operating CW could easily be far more important if the code were made into an accomplishment of honor. I'd like to see a code-copying contest at every hamfest and convention, with certificates for the shack wall to prove competence. Then we could really be proud of such an ability. Then it would be worthwhile to practice and get good at the code. There is little honor in doing something you *have* to do.

Getting back to the teenagers . . . how are we going to get them involved with amateur radio? Will it help if we bring groups of them into some of our better ham shacks and expose them to the hobby? That, along with a shortwave radio, got me hooked. You know, someone not long ago dug out one of my SWL cards from the late 30s and sent it to me. Yup, I had a ball sending out SWL cards to some of the hams I heard on 20m. . . and had a fair collection of cards built up. Someone stole the box of them not long ago. . . probably for the old stamps on them. I suppose I shouldn't beef, for almost everything of any value that I've owned or has been handed down to me has been stolen by now long-gone employees. That's one of the drawbacks of living at work, I suppose.

What has worked for you in getting teenagers interested in hamming? So few have come into the hobby in the last twenty years that we may have to really dig back into our memories to remember what magic turns an annoying kid into a bothersome young ham. If you have any ideas, please pass them along so that we can spread the news. We are in desperate need of a whole new generation of hams and might as well get started with it.

I had the fun of going back to that old W1CUN ham shack right after WWII and setting up there for the summer of '46 with my own station. We didn't have any power at the farm. . . still don't to this day. . . so I had to find a place to set up where there was power available. I also inherited a bunch of Harry's old *QST*s from the 30s. Lost them at *CQ* when I got fired and they refused to give 'em back. They still have 'em.

Bethlehem has almost faded away. The thousands of summer visitors of the 20s and 30s began to stay away in the 40s and 50s, finding more exciting places to go for vacations. Now it's Europe and the Caribbean, not Bethlehem. Most of the hotels are gone and the rooming houses boarded up. The old Colonial theater is still there. . . reminding me of when I had a season pass for it every year which I got from the owner, Jack Eames. Now *there* was a chap to know. . . with his houseboat on Partridge Lake, his Chris-Craft boat, and camp. It seemed like he owned half of nearby Littleton. I used to walk my bike up to Bethlehem to see the movie. . . get a sundae at Parker's Drug Store and then ride all the way back down the hill the three miles to the farm on my bike—no hands.

When I see some of the old movies on television, it reminds me of those days. Now Harry is gone. . . his mother Mamie and Johnny Macauley are gone and the Valley View is there, but with a new name. I drive by every now and then to look at our old ham shack. It's still there, looking not much different than it did 50 years ago when I had my first introduction to hamming. I don't dare stop for a meal. That would be too much for me. . . bringing back memories of Mamie's fantastic pies and Johnny's great cooking.

COPING WITH EMERGENCIES

Whenever we want to justify our interest in amateur radio, we have only to consult the rules and regulations (97.1) to see how we measure up. I'm a firm believer in paying for my share of what I enjoy. . . and I expect others to similarly pay up.

One way that every amateur can help pull his (or her) share of the load has to do with helping in emergencies. 97.1a: "Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications."

Before you and I are going to be of much help in emergencies, we are going to have to recognize some fundamental factors. First, we aren't of much value all by ourselves. To be of value, most of the time we must cooperate and coordinate with others. Then we must prepare for emergencies. This means both with the needed equipment and supplies, and with personal training experience.

The main interest of the Amateur Radio Subcommittee of the National Industry Advisory Committee (NIAC) is with developing our capabilities to cope with emergencies. At the most recent meeting, in late March, I reported on the development of emergency communications plans. It's a rather long report, but since the report needed to be able to stand by itself without reference to past reports or other literature, and since it had to be understandable to nonamateurs, there was no way to cut it down without a possible loss of understanding.

Before I get into a discussion of the ways amateur groups can get started in developing emergency communications capabilities, I'll let you read the report. That should explain what I have in mind. . . and give you a good idea of where we are right now and where we are heading.

REPORT:
National Industry Advisory Committee
Amateur Radio Subcommittee
(March 26, 1982)

Emergency Organization Plans

Amateur radio has been only a slightly tapped resource to help our country cope with emergencies. If we are going to take better advantage of this enormous resource, we must consider a wide variety of factors. We should objectively view the present situation of the hobby with respect to growth, capabilities, and ways of coordinating this diverse group for more effective dealing with emergencies. Perhaps even more important is for us to envision a possible and probable future emergency communications goal and help amateur radio work toward this goal.

Before looking into the future, let's see what can be done in the present to lay the foundation for both a short-range improvement in the ability of amateurs to cope with emergency situations and for the world of 1990 and perhaps 2000. With an estimated 200,000 amateurs with communications capability, there is much we can do to step up our ability to provide emergency communications.

I propose that the coordination of emergency communications systems be done by amateur radio and repeater groups. Individuals are seldom of value in emergencies, except as they are able to cooperate with others to provide a system or network to solve communications problems. Thus it seems natural for us to turn to our already organized amateur radio groups. There are over 3,000 clubs listed in the *Callbook* as licensed, plus approximately 5,000 repeater groups with an unknown overlap on the clubs with licenses. This is more than adequate for the development of an effective communications system.

The first step, I suggest, is to acquaint these groups with the scope of their responsibility. Clubs, like individuals, tend to take the path of least resistance, so unless plans are developed and made clear to them, along with their responsibility for cooperation, most groups will tend to ignore their potential and continue unchanged.

There is much this committee can do to provide these amateur radio groups with information and inspiration. They will want to have an understanding of the various types of emergencies and how they should best cope with each. They will want guidance and leadership on a chain of command in various types of emergencies. It became obvious at the recent NIAC Executive Committee meeting that none of the NIAC subcommittees is clear about this business of knowing exactly who is in command in emergency situations.

Speaking of the other NIAC subcommittees, I must say that it was quite clear that there was a high spirit of cooperation from all of them shown at the Executive Committee meeting. This is most important since it is amateur radio which is perhaps the only common denominator. It will be up to us amateurs to set up and coordinate communications not only with other amateurs, but between many of the other radio services. If you think of this in terms of a true national emergency such as a nuclear attack, this is an awesome responsibility. Yet there is no other radio service which could even hope to cope with a situation of this magnitude.

As a first step, I propose that our committee set goals for amateur radio groups which can be attained immediately. This would include the setting up of a chain of member-to-member communications which would enable each group to assemble, either over the air or in person, for direction. Then there would be an inventorying of emergency equipment and supplies to prevent confusion when these are suddenly needed. Groups should know what they have available in hand transceivers, in emergency power units, in shortwave transceivers, in portable antennas, in

mobile equipment, in supplies of fuel and food, scanners, radios for communications with other services, and so forth.

These groups should perhaps initiate contact with other local radio users such as two-way, CB, doctors, etc. Plans can be made with local radio and television stations for the possible feeding of information or command directions, should that be necessary.

It is in looking toward future communications techniques that we begin to see some of the almost unbelievable possibilities which open to amateur radio. The current interest in digital electronics lays open for us not only high speed error-free digital communications, but also exciting developments in automatic identification of stations along with selective calling via computer-controlled receivers. Microelectronics enables these circuits to be put on a chip a fraction of an inch square.

If these technical developments can be made, we can see emergency communications systems of the future with individual operators typing messages into tiny handheld digital typewriters. These gadgets would be plugged into our radio transceivers, allowing network control stations to automatically poll each of the stations in the group for messages. The messages would then be sent at about 8,500 words per minute with an error-correcting code and passed along by computer to the addressee, whether that be via a repeater, direct, or even via a shortwave link to some other part of the country.

An encoding of the words in the message, again all done electronically via a microelectronic chip, would enable messages to be sent at about 26,000 words per minute and to be received (or sent) in any language. Indeed, there are many exciting technological developments ahead which radio amateurs could invent and pioneer . . . if. As things stand at present, the probability of these developments being made seem sadly remote. There are two major changes which need to be made before we can expect to see amateurs again stepping to the front in pioneering new modes of communications.

The first obstacle is an easy one to surmount, the second is formidable. First, we must have the full cooperation of the FCC to again allow amateurs to experiment freely and without the restrictions which have forced us to stay many years behind the cutting edge of communications. Amateurs have shown, time and again, that they are well able to be self-determining. This preventing of experimentation and pioneering over the last few years has not been in the interests of either amateur radio or our country.

It has been so long since radio amateurs provided any new modes of communications that many amateurs today are unaware of our proud history. When I went into commercial television in 1948, I found that many of the people in the industry at that time were "graduates" of the amateur television station in Long Island City. With all due respect to RCA and their early television broadcasts, much of the innovative studio work and programming development was carried on by amateurs.

At about the same time, I became involved with Jack Babkes W2GDG and his pushing of something called narrowband FM. A number of us built the simple modulator to use this new type of phoné and found that it worked. NBFM is now the standard for most VHF communications.

Again at about the same time, John Williams W2BFD was experimenting with amateur radio Teletype® communications. This was restricted to two meters at the time; it took many years to overcome the objections of the ARRL and the FCC before it was allowed to be used on the shortwave bands. The experimental two-meter RTTY repeater set up by W2BFD was forced off the air by the FCC. But before the repeater was silenced, it proved that amateurs within a hundred miles of New York could all communicate via this system and automatic Teletype® equipment.

It was in this same fertile period, not long after WWII, when Don Norregard, an amateur, developed the first practical single-sideband transmitter. Within a few years, amateurs turned from their age-old AM transmitters to these much more efficient SSB systems. Then came Copthorne Macdonald and his slow-scan television, permitting the worldwide transmission of television pictures. And Sam Harris W1FZJ then invented the parametric amplifier.

Amateur radio was growing at about 11% per year in the seventeen-year period after the war until the proposal for what was called "incentive licensing" in 1963. Within one year, the growth of amateur radio stopped and the amateur radio industry shrank 85% in sales. It was at this time that all of the old-time names in the industry disappeared.

Old-timers will remember Hallicrafters, Hammarlund, National, Gonset, Central Electronics, Lakeshore Industries, Multi-Elmac, Harvey Wells, Eldico, etc. Indeed, amateur radio today is about where it would have been by 1965 in terms of growth had not everything suddenly stopped in 1963. This has to do with the second change which is needed if amateur radio is going to again provide our country with new ideas, inventions, and pioneering.

With all due respect to the amateur population, which is aging rapidly, most of the new ideas come from youngsters. Amateur radio has lost a whole generation of youngsters and changes need to be made which will start bringing teenagers back into the hobby. Without them, we will not be able to develop the emergency communications systems we need. A good case can be made for blaming the current loss of our electronic technology to Japan on our lack of a generation of amateurs. Indeed, if the amateur growth had continued at the 11% rate, we would today have over one million engineers, technicians, and scientists in the United States which we do not have at present. This may help to explain the serious lack of technical people for our industry and why our colleges are being picked clean of technical teachers for industry.

Japan took the opposite tack. While we were stopping the growth of amateur radio, they encouraged it with radio clubs in their high schools and a simplified approach to licensing. The result is about two and a half times as many active amateurs in Japan as in the US . . . and with half our population. This is why I see Japanese amateurs in all of the computer and electronic laboratories when I visit Japan.

One of the purposes for amateur radio as stated in our regulations has to do with supplying a source of technically-trained people for use in time of emergency. May I remind you that virtually all of the teachers in the electronic schools during WWII were radio amateurs. Indeed, without the 40,000 amateurs who volunteered for duty, we would have been hard put to train the electronic technicians we needed to operate and maintain our radio, sonar, radar, and other electronic equipment. It was this technological edge which greatly helped speed the end of the war. We used 80% of our amateurs that time. What percentage could we get today, with many amateurs doddering around with walkers? No, we desperately need new blood in amateur radio if we are going to cope with emergencies. We also need it to start feeding the best kind of brains into our troubled electronic industries.

The obvious approach to getting more amateurs is to expose the most susceptible, our teenagers, to the amateur radio hobby and then let nature take its course. Isn't it much better to infect our teenagers with what might be considered the virus of amateur radio? . . . and it is like a virus of the mind . . . and heart. How much better for them . . . and our country . . . if they could be steered towards radio experimenting and operating instead of coin video arcades, pot, punk rock, and gangs helling around. If we can get every high school in the country to establish a ham club, we might just be able to change things.

It wasn't television which stopped the growth of amateur radio. It wasn't CB. We had television all through the 50s and amateur radio never faltered in its growth. CB came along in the 70s and provided us with a temporary influx, mostly of older people. This was not really what we needed. The death of most of the high school radio clubs in 1963-64 stopped most of our influx. Surveys of amateurs during the 11% growth period showed that 50% of all new hams were either 14 or 15 years old. Further, 75% of the new hams were teenagers. Now look at us today! These studies also showed that about 80% of these teenagers went on to careers in electronics or communications. When we cut off the teenagers, we cut off our industry from technical talent.

It is no accident that Japan, with its fast-growing youthful group of amateurs, has taken the lead in electronics technology. Today the innovative developments are coming from Japan instead of the US. Our digital watches, calculators, video recorders, television sets, hi-fi, amateur radio equipment, and so on come, almost entirely, from Japan. Thus, if we want to turn the tide . . . and if we want to develop the emergency communications systems we must have to allow us to cope with any type of emergency . . . we need to concentrate on making amateur radio both attractive and known to teenagers.

In line with this concept, I have arranged to discuss the problems and some proposed solutions with as many of the FCC commissioners as possible. My discussions with Commissioners Washburn, Lawson, Rivera, with Commissioner Ann Jones' administrative assistant Williams, and with Chairman Fowler all were most positive. I found them all genuinely interested in the concepts of freeing amateur radio from past Commission restraints in experimenting and in plans for the possible growth of the service through the attracting of teenagers.

Recognizing the need for the Commission to reduce the cost of the amateur service rather than increase it, I brought up several ideas which could, in the long run, almost cut the cost of the service to the Commission completely. There are three major areas where the Commission has been spending money on amateur radio, licensing, legislation, and monitoring. Much of the work of each of these functions can, I believe, be taken over by amateurs. Further, I believe that the responsibility would be very good for amateur radio, helping us to build more pride in our service and a greater feeling of responsibility for its growth and values.

First, with regard to licensing, I suggest not just a return to managing that function ourselves, but to turning all of the training and examining of candidates for licenses over to radio clubs. Clubs could then both teach the materials needed for each class of license and then examine the students. This would eliminate the need for the Commission to write and disseminate exams. It would also eliminate the use of cheat sheets designed to thwart the Commission's exams.

Technical and rule-understanding exams could be done orally, with candidates demonstrating their ability to go on the air and make a contact. I suggest that examining teams consist of three licensed amateurs as a way of preventing friendships from influencing the outcome. And if clubs were asked to put up a substantial bond or escrow deposit, this would help solve the question of what is a qualifying club and what isn't.

Pending legislation could make it possible for the Commission to again require licensing fees. I favor this, though in moderation. A fee of $10 for a five-year license would comfortably pay for our costs to the Commission if we follow my suggestions. Thus the escrow payments by clubs could be considered prepayments for amateurs they intend to train and license. Each year the club could replenish the fund. If only 2,000 radio clubs put up $1,000 each this would provide a $2,000,000 account. At 15% interest this would amount to $300,000 per year . . . enough to fund the needed coordinating salaries within the Commission.

Another expense which could be more than removed from the Commission has to do with monitoring. It has been this function, by the way, which has been the perennial excuse for not permitting amateurs to experiment with new modes of communications. If we were able to take over this function ourselves, we would no longer have to wait ten or twenty years before being permitted to use even some of the common commercial modes of communications.

Further, considering the enormous body of retired and handicapped amateurs, it would be possible to set up a monitoring system which would not only include all amateur bands, even in remote parts of the country, but would also be able to do routine monitoring of commercial and other bands. This would require coordination between amateur groups and the Commission monitoring facilities. Amateurs will enthusiastically build and operate sophisticated monitoring equipment. With some computer-aided tuning, the run-of-the-mill signals could be ignored and a sensitive net put out for abnormal transmissions.

Such listening groups could alert the FCC monitors to intruders in the amateur or commercial bands, could listen for illegal activities and report them, even up into the microwaves, where little FCC monitoring has yet penetrated. Amateurs, being everywhere, could be organized into a monitoring force far beyond anything the government could envision, even if it had the funds for this growth.

The last area for amateur control is in the changing of our rules and regulations. The Commission has been less than effective in this area, despite the heavy costs involved. Amateurs could, with the cooperation of the Commission, establish a national convention which could meet every two years to discuss and propose rule changes. With representatives from the licensing radio clubs in attendance as delegates, the conference could be run much as the International Telecommunications Union runs theirs. Rule change proposals would be discussed by ad hoc groups, reporting their recommendations to the plenipotentiary for a final ratification and implementation. The FCC would, naturally, be intimately involved in this process as far as communications law and such are concerned. The decisions of the plenipotentiary would be forwarded to the Commission for immediate action.

Those commissioners with whom I discussed this concept were enthusiastic about the way it would save their time, save

a considerable amount of FCC funds, and allow amateur radio to react to change faster

We are entering a world of satellite direct communications, of cellular radio, of widespread computers and their communications needs The future is technologically far beyond what we have had in the past Both amateur radio and our country must be able to keep up and perhaps take on some leadership in this technological race. You've seen the spread of microcomputers, with front-cover articles in *Time* and other such publications. The future is here with us and pushing I suspect that few amateurs today recognize the importance of amateur radio to the future of our country, just as virtually none gave a thought to the ramifications of "incentive licensing" when it was proposed in 1963 Many of us have gotten so used to amateur radio being fun and just a hobby that we have failed to see it in its true perspective Yes, it is fun and a hobby for tens of thousands of amateurs They use it and give little back in return They fight to maintain the Morse code aspect of entry They fight any efforts to make this the technical hobby which our regulations outline so clearly for us They go on the air and rag chew or help fill pileups trying to get a momentary contact with some chap in a remote area of the world . . all for the reward of a certificate.

Yet we also have a small, dwindling, group of builders and experimenters In truth, there are thousands of these hobbyists, as is evidenced by the many pages of ads for parts in our amateur radio publications. We know amateurs are building because they are spending so much money on the parts. We also see the articles that they write about this work, encouraging others to try this aspect of the hobby. If we are able to get amateur radio into a high growth mode, we will find that a growing percentage of the new amateurs will get involved with building and designing equipment This activity seems to be of much more interest to the younger amateurs, who are less intimidated by digital techniques and integrated circuits

One thing should be remembered about amateurs amateurs in *any* field. Most of the real breakthroughs in technology are made by amateurs, not professionals The reason for this is simple You see, government and commercial labs generally can't afford to invest money in projects where there is a chance that they might not work Amateurs can afford to devote their life to projects with virtually no chance of working. Then, every now and then, one of these wild shots pays off. It may take thousands of amateurs to produce one new invention, but the price is worth it

Invention is only part of it Then comes the pioneering. What good is an invention if no one will use it? Until amateurs were able to prove to the military that sideband was better than AM, there was so little demand for sideband transceivers that few were made Amateur equipment was taken aboard SAC planes and tests run resulting in sideband becoming almost universal for military telephone communications Hams have done a first-rate job of pioneering new modes such as sideband, NBFM, slow-scan television, and new types of radio Teletype® communications

If both amateur radio and computer clubs are encouraged in our high schools, I believe we will start seeing a sudden growth of interest in technical careers I've also discussed this concept with Senator Barry Goldwater and found him most receptive to the idea. as well as agreeable to the need for amateur radio to be built up as a resource for our country

With the freedom to experiment and the amateurs to carry it off, the future of an amateur radio emergency service could be bright There are opportunities to tie in amateur networks via commercial channels on satellites as well as on some future amateur radio satellites The development of high-speed digital communications will greatly simplify the handling of emergency messages, allowing them to be handled and routed automatically We need to remember that any emergency system must be in daily common use if it is going to be dependable and operators are going to be comfortable with it when an emergency occurs

It is not difficult to imagine a communications system which would enable an amateur to originate a message anywhere in the world and then have it automatically handled and routed to any other spot on Earth almost instantly If we have the amateurs to do this, I'd say that such a network would be just about inevitable Ten years ago, amateurs had an automatic network which allowed me to stand on a street corner in Las Vegas and talk simultaneously with another amateur in San Diego and one in Phoenix, all via UHF networking, all with my small hand-held transceiver

Amateur clubs, by setting coordinating systems to interconnect all of the different mobile communications systems, will be able to establish a communications network which will be able to reach virtually any person in the country in an emergency It might be that such a system would to some degree act as a deterrent to nuclear attack.

Recommendations

First, I would suggest that NIAC establish a committee to formulate a set of recommended procedures for radio clubs to follow in setting up their ability to furnish emergency communications and coordination

Then, I would suggest that the Amateur Radio Subcommittee of NIAC set up a committee to work with the other NIAC subcommittees toward a goal of coordination of emergency communications. This would include the broadcast service and whatever is needed to make sure that radio and television stations can, if desired, rebroadcast amateur radio communications

I recommend that NIAC continue its work toward implementing the growth of amateur radio via contacts with the FCC commissioners, interested senators and congressmen, and any other avenues open

Fourth, I suggest NIAC set up a committee to work with the Commission toward the goal of cutting FCC costs of administration of the amateur radio service via the establishment of amateur organized monitoring networks. These, when tied in with emergency networks, will be invaluable

Fifth, I recommend that NIAC establish a committee to work on the problem of establishing chains of command for emergencies so local and national groups will know whom to report to whom to obey

My apologies for the length of the report, but I wanted to be sure that the groundwork was properly laid for the report to be read by anyone without having to reference past reports

Respectfully,
Wayne Green W2NSD/1
Chairman, Emergency Action
Subcommittee of NIAC Amateur Radio
Subcommittee. Whew.

THE NEXT STEP

A committee was formed to develop the recommended instructions to help amateur radio clubs to develop their emergency teams. This committee consists of Dave Flinn W2CFP, who is well versed in the problems of emergency operations, Alan Dorhoffer K2EEK, the editor of *CQ*, and me, as the sub-subcommittee chairman. So much for the dangers of making recommendations to government committees.

Since there are a number of clubs which are already involved in setting up emergency communications teams, I'd like to make this a formal invitation for each of the clubs involved to send in a list of what is considered important. I'll take this information and send it to the other committee members so our report will be as complete as possible.

We'll want to know what other groups of communicators you work with. We'll need to know what you have established in the way of an inventory of needed communications equipment and supplies. What about alerting procedures? What about organization? Hierarchy of control? We're interested in setting up what can be considered an instruction manual to help clubs get set up to handle any kind of emergency, from local to regional to national. . . and even international.

NATIONAL POLICY

Our country has gotten terribly behind in both information and implementation of ways to cope with emergencies. The interest in Civil Defense has virtually disappeared. . . yet we have a growing number of groups who are protesting spending money on ways to either ward off attacks or cope with them if they come. I suspect that our strength lies both in our ability to strike back. . . and our ability to survive an attack. Thus, the better organized our emergency communications, the less likely we are to get attacked. . . at least to some extent.

If amateur radio clubs are able to establish an emergency communications system which can work through any type of situation, reaching into every corner of our country, this will be a powerful deterrent in itself. One of the major problems facing an enemy is in trying to destroy the ability of the country to communicate and thus act as a country instead of disconnected and confused groups. Only through amateur radio can such an emergency communications system be established. And this can only be done if *you* accept this need as one which is a personal responsibility of yours.

Yes, we need more hams. We need technical developments. We need more freedom from the FCC. But right now, with what we have, we can make a major start toward the communications system of the future. This is something we can get going on now and have in working shape in a few months. Sure, as we grow and as we are able to bring in more advanced techniques, our system will work better and faster. But we still need a national emergency system upon which to build and grow.

Let's get your club started with this. You may not have a strong ham club in your area, so perhaps this is the time to get one started. Let me know what you are doing. . . and let *QST* and *CQ* know, too. This is a national ham need, not a promotion for any one magazine or group. As you learn and develop, tell others what you've done so that we'll all be able to benefit from what you've learned.

We can make it work and be proud that we are justifying the use of the radio spectrum per 97.1a.

HARRY THROWN OUT!

By golly, the results of the ARRL elections were a surprise. I never thought the board of directors could be so cruel as to not only refuse Harry the job of General Manager of the League, but to just plain throw him out of the whole headquarters organization. That must have come as a terrible blow to him, what with him taking an early retirement from the union in order to get the job and all.

And, hey, they weren't all that much nicer with Baldwin either. Vice President of International Affairs. Now *what* does that mean. . . other than goodbye, Baldwin? Come on, board, have you got no respect? Have you no appreciation for the many years of devotion and loyalty?

Yes, I know, here goes Green criticizing the League again. Well, darn it, if they would do something right I'd be right out there in front with profuse compliments. Mind you, there's no denigration of Sumner involved. It's just that. . . well. . . *you* know.

Say, perhaps Harry can move to New Hampshire. We're always on the lookout for talent to

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 prohibitively 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 K1CLL) 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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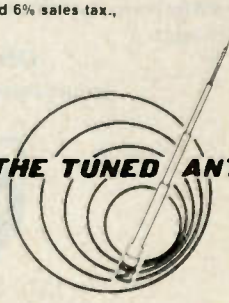

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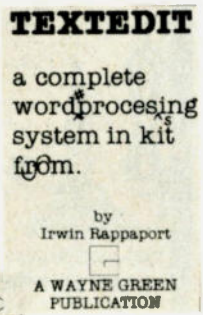

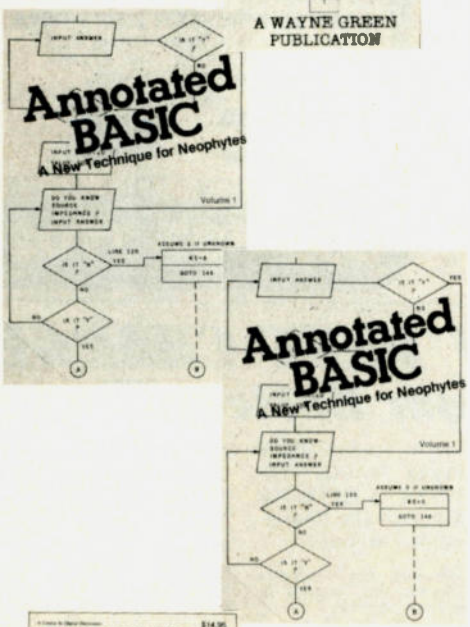

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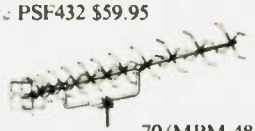

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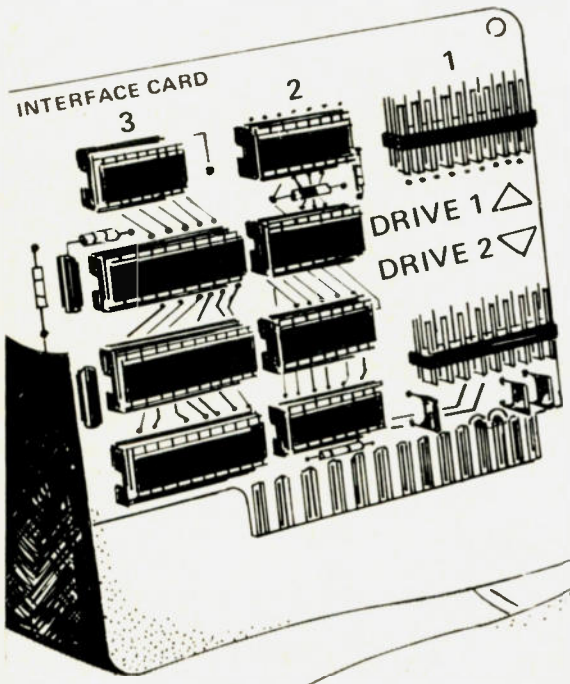

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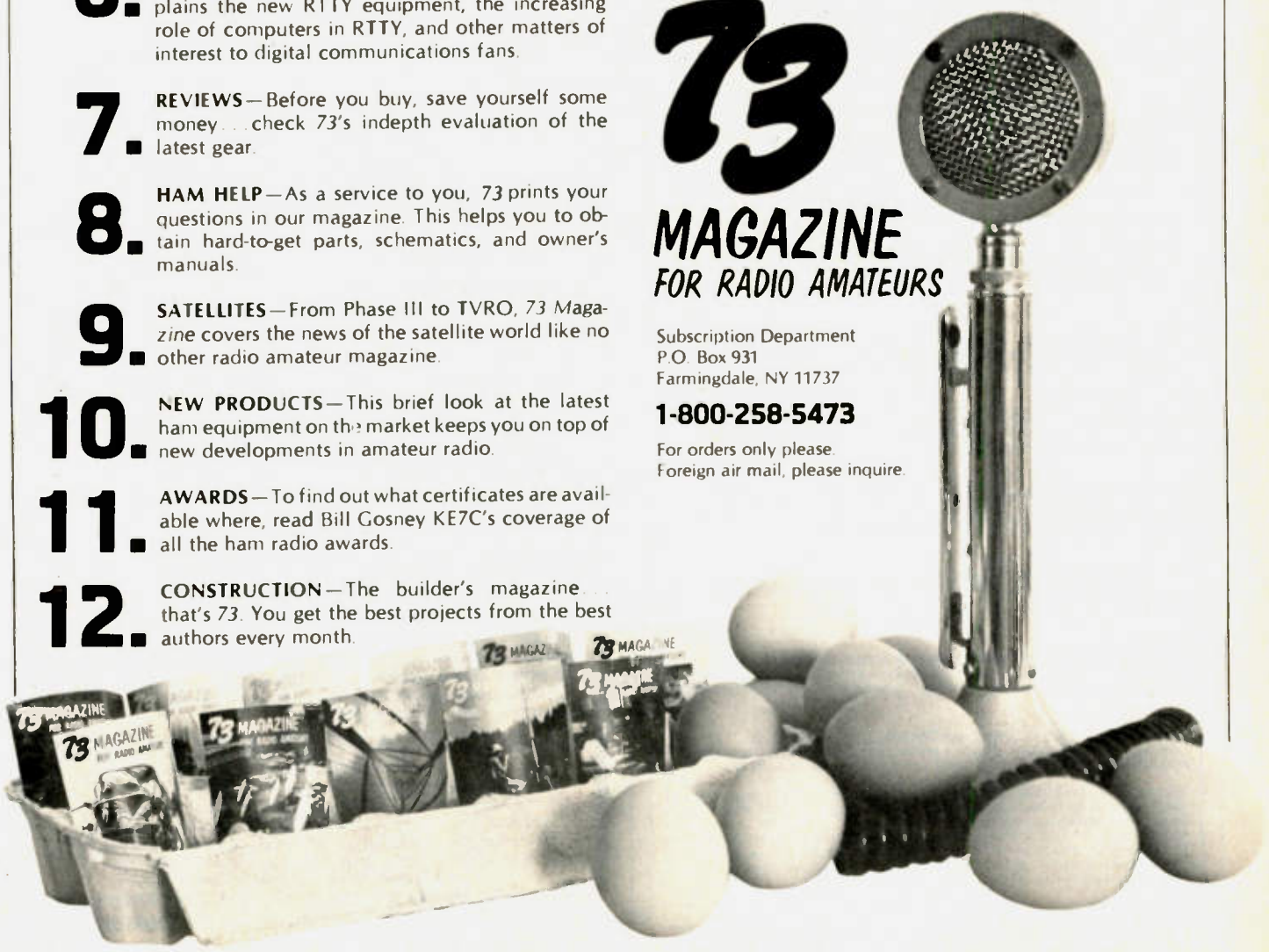

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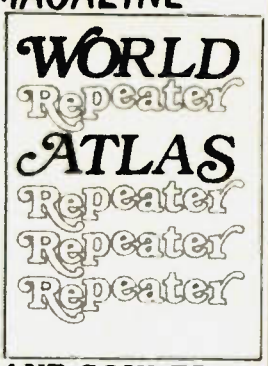

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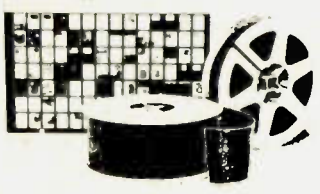

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"First new idea in code study and the darn thing works! So much fun you don't realize how much you're learning."
M.S. Greneda, Miss.

Hundreds of satisfied customers!
You can't lose! Follow each simple step. You must succeed or return the kit for a total immediate refund!

SURGE SHUNT

protects solid state communications equipment from damage caused by high-voltage transients entering the antenna system

These transients usually are caused by atmospheric static discharges or nearby lightning strikes.

The new **Model 1549 Surge Shunt** can be used with both receivers and transceivers having up to 200 watts output. Convenient UHF type coaxial connections are supplied. Price is $24.95

The arrester "pill" element has a long life, but can be easily and economically replaced if necessary.

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572B	$38.00	8156	10.95
811A	$12.00	8643	$72.50
813	$35.00	8673	$72.50
6146B	$6.50	8674	180.00
6360	$4.95	8677(3CS1500A)	450.00
		8908	10.50

E.F. JOHNSON Sockets for 4CX250B & 4-400A ea. $9.95

SEMICONDUCTORS		RF CONNECTORS	
MRF 245/SD1416	$30.00	PL 259	10/$4.95
MRF 454	$18.95	PL 258	10/$8.95
MRF 455	$12.50	UG 175/176	10/$1.60
		UG 255/U	$2.50 ea.
MRF 644/SD1088	$19.95	UG 273/U	$2.25 ea.
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15 minutes to install; scan restarts when carrier drops off; busy switch controls automatic scan on-off; includes module and instructions.

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MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available

FM-3 Kit $14.95
FM-3 Wired and Tested 19.95

Color Organ

See music come alive! 3 different lights flicker with music. One light each for high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC

Complete kit, ML-1 $8.95

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit, VD-1 $7.95

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 $2.95

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 $5.95

CPO-1

Runs on 3-12 Vdc 1 watt out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit $2.95

FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage

FM-1 kit $3.95 FM-2 kit $4.95

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 $6.95

Tone Decoder

A complete tone decoder on a single PC board. Features 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 $5.95

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs

UT-5 Kit $5.95

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit $4.95

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker. Complete kit, SM-3 $2.95

60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma). 1 min./month accuracy. TB-7 Kit $5.50
TB 7 Assy $9.95

CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!

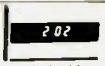
Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 $24.95
Clock with 10 min. ID timer, 12/24 hour, DC-10 $29.95
Alarm clock, 12 hour only, DC-8 $29.95
12V DC car clock, DC-7 $29.95

For wired and tested clocks add $10.00 to kit price
SPECIFY 12 OR 24 HOUR FORMAT

Car Clock

The UN-KIT, only 5 solder connections



Here's a super looking, rugged and accurate auto clock which is a snap to build and install. Clock movement is completely assembled — you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell — assures you of a highly readable display day or night. Comes in a satin finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify)

DC-3 kit, 12 hour format $22.95
DC-3 wired and tested $29.95

Calendar Alarm Clock

The clock that's got it all: 6-.5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup and lots more. The super 7001 chip is used. Size 5x4x2 inches. Complete kit, less case (not available)

DC-9 $34.95

Under Dash Car Clock

12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDS, high accuracy (.001%), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer automatically adjusts display to ambient light level

DC-11 clock with mtg. bracket $27.95 kit
DM-1 dimmer adapter $2.50
Add $10.00 Assy. and Test

Video Terminal

A completely self-contained, stand-alone video terminal unit. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Features are: single 5V supply, XTAL controlled sync and baud rates to 9600, complete computer and keyboard control of cursor. Parity, error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 6416 is 64 char. by 16 lines, with scrolling, upper and lower case alphanum. and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation.

RE 6416 terminal card kit (add $60.00 for wired unit) $189.95
Lower Case option $13.95
Power Supply $14.95
RF Modulator kit $7.95

PARTS PARADE

IC SPECIALS

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301	$ .35
324	$1.50
380	$1.50
555	$ .45
556	$1.00
565	$1.00
566	$1.00
567	$1.25
741	10/$2.00
1458	$ .50
3900	$ .50
3914	$2.95
8038	$2.95

CMOS

4011	.50
4013	.50
4046	$1.85
4049	.50
4059	$9.00
4511	$2.00
4518	$1.35
5639	$1.75

READOUTS

FND 359 4" C.C.	$1.00
FND 507/510 .5" C.A.	1.00
MAN 72 HP7730 .33" C.A.	1.00
HP 7851 .43" C.A.	2.00

TRANSISTORS

2N3904 NPN C-F	15/$1.00
2N3906 PNP C-F	15/$1.00
2N4403 PNP C-F	15/$1.00
2N4410 NPN C-F	15/$1.00
2N4916 FET C-F	4/$1.00
2N5401 PNP C-F	5/$1.00
2N6028 C-F	4/$1.00
2N3771 NPN Silicon	$1.50
2N5179 UHF NPN	3/$2.00
Power Tab NPN 40W	3/$1.00
Power Tab PNP 40W	3/1.00
MPF 102/2N5484	$ .50
NPN 3904 Type T-R	50/$2.50
PNP 3906 Type T-R	50/$2.50
2N3055	$ .80
2N2646 UJT	3/$2.00

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7475	$ .50
7490	$ .50
74196	$1.35

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7208	$17.50
7207A	$ 5.50
7216D	$21.00
7107C	$12.50
5314	$ 2.95
5375AB/G	$ 2.95
7001	$ 6.50

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With info and specs 15/$1.00
6 Hole Balun Beads 5/$1.00

Sockets

8 Pin	10/$2.00
14 Pin	10/$2.00
16 Pin	10/$2.00
24 Pin	4/$2.00
28 Pin	4/$2.00
40 Pin	3/$2.00

Diodes

5.1 V Zener	20/$1.00
1N914 Type	50/$1.00
1KV 2Amp	8/$1.00
100V 1Amp	15/$1.00

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ⅛" center, ¼" leads, bag of 300 or more $1.50

Switches

Mini toggle SPDT $1.00
Red Pushbuttons N.O. 3/$1.00

Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc. 5 for $1.00

Mini 8 ohm Speaker

Approx. 2" diam. Round type for radios, mike etc. 3 for $2.00

Solid State Buzzers

small buzzer, 450 Hz, 86 dB sound output on 5-12 vdc at 10-30 mA. TTL compatible $1.50

Slug Tuned Coils

Small 3/16" Hex Slugs, turned coil, 3 turns 10 for $1.00

AC Outlet

Panel Mount with Leads 4/$1.00

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1.5 uF 25V 3/$1.00	1000 uF 16V Radial $.50	.01 16V disk 20/$1.00
1.8 uF 25V 3/$1.00	500 uF 20V Axial $.50	1.16V 15/$1.00
.22 uF 25V 3/$1.00	150 uF 16V Axial 5/$1.00	001 16V 20/$1.00
	10 uF 15V Radial 10/$1.00	100 pf 20/$1.00
		047 16V 20/$1.00

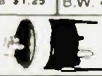
DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma $1.25

Ceramic IF Filters

Mini ceramic filters 7 kHz B.W. 455 kHz $1.50 ea.

Trimmer Caps



Sprague - 3-40 pf Stable Polypropylene .50 ea.

25K 20 Turn Trim Pot $1.00
1K 20 Turn Trim Pot $ .50

Crystal Microphone

Small 1" diameter ½" thick crystal mike cartridge $.75

Mini RG-174 Coax

10 ft. for $1.00

Coax Connector

Chassis mount BNC type $1.00

9 Volt Battery Clips

Nice quality clips 5 for $1.00
½ Rubber Grommets 10 for $1.00

Parts Bag

Asst. of chokes, disc. caps, tant., resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) $1.00 lg. bag (300 pc) $2.50

Connectors

6 pin type gold contacts for mA-1003 car clock module price .75 ea.

Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red 8/$1
Mini Yellow, Jumbo Yellow, Jumbo Green 6/$1

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - .50 each or 3/$1.00

Crystals

3.579545 MHZ	$1.50
10.00000 MHZ	$5.00
5.248800 MHZ	$5.00

AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end

8.5 vdc @ 20 mA	$1.00
16 vac @ 160mA	$2.50
12 vac @ 250mA	$3.00

Audio Prescaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS

PS-2 kit $29.95
PS-2 wired $39.95

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify -10 or -100

Wired, tested, PS-1B $59.95
Kit, PS-1B $44.95

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay

PA-1, 30 W pwr amp kit $22.95
TR-1, RF sensed T-R relay kit 6.95

MRF-238 transistor as used in PA-1, 8-10db gain, 150 mhz $11.95

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay TR-1 Kit $6.95

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V c.t. 1 A and 24 VCT

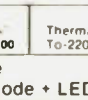
Complete kit, PS-3LT $6.95

OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain

50 for only $9.00 10 for $2.00

Regulators



78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

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Nice precut pces of shrink size 1" x ½" shrink to ¼". Great for splices 50/$1.00

Mini TO-92 Heat Sinks

Thermalloy Brand 5 for $1.00
TO-220 Heat Sinks 3 for $1.00

Opto Isolators - 4N28 type $.50 ea.

Opto Reflectors - Photo diode + LED $1.00 ea.

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. 20 strips for $1.00

CDS Photocells

Resistance varies with light: 250 ohms to over 3 meg 3 for $1.00

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

Special Purchase—The *Escort*® Cordless Telephone!

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

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

QUANTITY	*DEALER PRICE*	*GROSS PROFIT AT $149.95*
1—2 units	69.75 each	*53%*
3—5 units	64.50 each	*57%*
6—11 units	62.50 each	*58%*
12—23 units	60.75 each	*59%*

On all orders of 12 or more, we pay the freight! This is your opportunity to stock up for the Christmas buying season. These are ideal gift items, that will really move out!

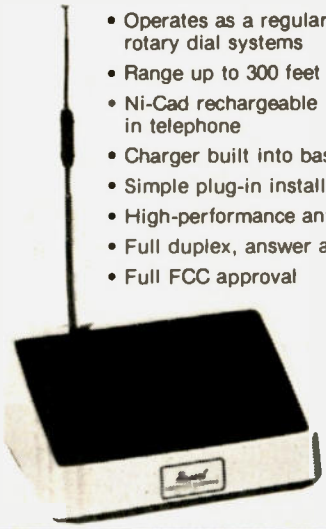
ESCORT MARK III SPECIFICATIONS

VHF DUPLEXERS

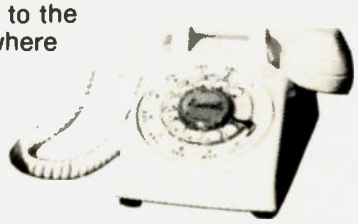
This duplexer was made for RF Harris Mobile Phones and Two Way Radios. These duplexers can be used in any mobile phone or two way radio system, along with having the capabilities to be modified for UHF use. The physical dimensions are 3 3/5" Long, 4 2/5" Wide, and 1 1/10" Deep. The approximate weight is 18 oz./1 lb. 2 oz.. PRICE **$74.99**

- Operates as a regular telephone on touch-tone or rotary dial systems
- Range up to 300 feet
- Ni-Cad rechargeable batteries included in telephone
- Charger built into base transmitter
- Simple plug-in installation!
- High-performance antenna
- Full duplex, answer and dial out
- Full FCC approval

Exactly As Shown



HOW WE CUT THE CORD.
The new Cordless Phone works on a simple, highly sophisticated principle. A small base station plugs into your regular phone jack, and an electrical wall outlet. The base station then transmits any in- or out-going call to the handheld receiver, anywhere up to 300 feet.



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MHz electronics

"FILTERS"

Collins Mechanical Filter #526-9724-010 Model F455Z32F
455KHz at 3.2KHz Wide. $15.00

Atlas Crystal Filters

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5.595-2.7/8/U	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.595-.500/4/CW	5.595MHz/.500KHz wide 4 pole CW	
5.595-2.7/LSB	5.595MHz/2.7KHz wide 8 pole lower sideband	
5.595-2.7/USB	5.595MHz/2.7KHz wide 8 pole upper sideband	
5.645-2.7/8	5.645MHz/2.7KHz wide 8 pole	
9.0SB/CW	9.0MHz/ 8 pole sideband and CW	

Kokusai Electric Co. Mechanical Filter #MF-455-ZL-21H
455KHz at Center Frequency of 453.5Kc Carrier Frequency of 455Kc 2.36Kc Bandwidth $15.00

Crystal Filters

Nikko	FX-07800C	7.8MHz	10.00
TEW	FEC-103-2	10.6935	10.00
Tyco/CD	001019880	10.7MHz 2 pole 15KHz Bw. Motorola #48D84396K01 Thru #48D84396K05	4.00
Motorola	4884863B01	11.7MHz 2 pole 15KHz Bandwidth	5.00
PTI	5350C	12MHz 2 pole 15KHz Bandwidth	5.00
PTI	5426C	21.4MHz 2 pole 15KHz Bandwidth	5.00
CD	A10300	45MHz 2 pole 15KHz Bandwidth (For Motorola Communications equipment)	5.00

Ceramic Filters

Murata	BFB455B	455KHz	$ 2.40
	CFM455E	455KHz +- 5.5KHz	6.65
	CFM455D	455KHz +- 7KHz	6.65
	CFR455E	455KHz +- 5.5KHz	8.00
	CFU455E	455KHz +- 1.5KHz	2.90
	CFU455G	455KHz +- 1KHz	2.90
	CFW455D	455KHz +- 1KHz	2.90
	CFW455H	455KHz +- 3KHz	4.35
	SFB455D	455KHz	2.40
	SFE10.7	10.7MHz	2.67
	SFG10.7MA	10.7MHz	10.00
Clevite	TO-01A	455KHz	5.00
	TO-02A	455KHz	5.00
Nippon	LF-B4/CFU455I	455KHz +- 1KHz	5.80
	LF-B6/CFU455H	455KHz +- 1KHz	5.80
	LF-C18	455KHz	10.00
Tokin	CF455A/BFU455K	455KHz +- 2KHz	4.80
Matsushira	EFC-L455K	455KHz	7.00

ROTRON MUFFIN FANS Model Mark 4/MU2A1
These fans are new factory boxed 115vac at 14watts 50/60cps. Impedance Protected-F
CFM is 88 at 50cps and 105 at 60cps. $ 7.99

SPECTRA PHYSICS INC. Model 088 HeNe Laser Tubes.
Power output 1.6mw. Beam Dia. .75mm. Beam Dir. 2.7mr. 8Kv starting voltage
68K ohm 1watt ballast 1000vdc +-100vdc 3.7ma. TUBES ARE NEW $59.99

"AMPLIFIERS"

AVANTEK LOW NOISE AMPLIFIERS

Models	UTC2-102M	AP-20-T	AL-45-0-1	AK-1000M
Frequency Range	30 to 200MC	200 to 400MC	450 to 800MC	500 to 1000MC
Noise Figure	1.5dB	6.5dB	7dB	2.5dB
Voltage	+15vdc	+24vdc	-6vdc @ +12vdc	+12vdc @ -12vdc
Gain	29dB	30dB	30dB	25dB
Power Output	1dB Gain +7dBm	1dB Gain +20dBm	1dB Gain -5dBm	1dB Gain +8dBm
Price	$49.99	$49.99	$49.99	$69.99

Mini Circuits Double Balanced Mixers

Model RAY-3
Very High Level (+23dBm LO) 70KHz to 200MHz LO,RF,DC to 200MHz IF
Conversion Loss,dB One Octave From Band Edge 6Typ./7.5Max. Total Range 6.5Typ./8Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 55Typ./45Min. Mid. Range (LO-RF/LO-IF) 40Typ./30Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 30Typ./25Min.
Price $24.99

Model TSM-3
Standard Level (+7dBm LO) .1MHz to 400MHz LO,RF,DC to 400MHz IF
Conversion Loss,dB One Octave From Band Edge 5.3Typ./7.5Max. Total Range 6.5Typ./8.5Max.
Isolation,dB Lower Band Edge To One Decade Higher (LO-RF/LO-IF) 60Typ./50Min. Mid. Range (LO-RF/LO-IF) 50Typ./35Min. Upper Band Edge To One Octave Lower (LO-RF/LO-IF) 35TYP./25Min.
Price $11.99

Hewlett Packard Linear Power Microwave RF Transistor HXTR5401/35831E

Collector Base Brakedown Voltage at Ic=100ua	35volts min.
Collector Emitter Brakedown Voltage at Ic=500ua	30volts min.
Collector Cutoff Current at Vcb=15v	100ua max.
Forward Current Transfer Ratio at Vce=15v,Ic=15ma	15min,40typ,125max
Transducer Power Gain at Vce=18v,Ice=60ma,F=2GHz.	3dBmin,4dBtyp
Maximum Available Gain at Vce=18v,Ic=60ma,F=1GHz/F=2GHz	14dB typ,8dB typ
Price $29.99	

Motorola RF Power Amplifier Modules

Model	MHW612A	MHW613A	MHW710	MHW720
Frequency Range	146 to 147MHz	150 to 174MHz	400 to 512MHz	400 to 470MHz
Voltage	12.5vdc	12.5vdc	12.5vdc	12.5vdc
Output Power	20watts	30watts	13watts	20watts
Minimum Gain	20dB	20dB	19.4dB	21dB
Harmonics	-30dB	-30dB	40dB	40dB
RF Input Power	400mw	500mw	250mw	250mw
Price	$57.50	$59.80	$57.50	$69.00

"TRANSISTORS"

WATKINS JOHNSON WJ-M62 3.7 to 4.2GHz Communication Band Double Balanced Mixer $100.00

SSB Conversion Loss	4.9dB Typ. 6dB Max.	fR 3.7 to 4.2GHz	
	5.5dB Typ. 6.5dB Max.	fI DC to 1125MHz	fL fR
		fI 880MHz	fL fR
SSB Noise Fiqure		fR 3.7 to 4.2GHz	
	4.9dB Typ. 6dB Max.	fI 30 to 1125MHz	fL fR
	5.5dB Typ. 6.5dB Max.	fI 880MHz	fL fR
Isolation			
fL at R	30dB Min. 40dB Typ.	fL 2.8 to 5.35GHz	
fL at I	25dB Min. 30dB Typ.	fL 4.5 to 5.35GHz	
	20dB Min. 30dB Typ.	fL 3.6 to 4.5GHz	
	15dB Min. 25dB Typ.	fL 2.8 to 3.6GHz	
Conversion Compression	1dB Max.	fR Level +2dBm	
Flatness	.2dB Peak to Peak Over any 40MHz Segment of fR=3.7 to 4.2GHz		
Third Order Input Intercept	+11dBm	fR1=4GHz fR2=4.01GHz Both at -5dBm	fL=4.5GHz
Group Time Delay	.5ns Typ. .75ns Max.	fR3.7 to 4.2GHz fL 3480MHz	@ +13dBm
VSWR	L-Port 1.25:1 Typ.	2.0:1	fL 2.8 to 5.35GHz
	R-Port 1.25:1 Typ.	2.0:1	fR 3.7 to 4.2GHz fL fR
	1.4 :1 Typ.	2.0:1	fR 3.7 to 4.2GHz fL fR
	I-Port 1.5 :1 Typ.	2.0:1	fI=100MHz
	1.3 :1 Typ.	2.0:1	fI=500MHz
	1.8 :1 Typ.	2.5:1	fI=1125MHz

SGS/ATES RF Transistors			Motorola RF Transistor	
Type.	BFQ85	BFW92	MRF901	2N6603
Collector Base V	20v	25v	25v	25v
Collector Emitter V	15v	15v	15v	15v
Emitter Base V	3v	2.5v	3v	3v
Collector Current	40ma	25ma	30ma	30ma
Power Dissipation	200mw	190mw	375mw	400mw
HFE	40min. 200max.	20min. 150max.	30min. 200max.	30min. 200max.
FT	4GHZ min. 5GHz max.	1.6GHz Typ.	4.5GHz typ.	2GHz min.
Noise Fiqure	1GHz 3dB Max.	500MHz 4dB Typ.	1GHz 2dB Typ.	2GHz 2.9dB Typ.
Price	$1.50	$1.50	$2.00	$10.00

National Semiconductor Variable Voltage Regulator Sale !!!!!!!!!

LM317K	LM350K	LM723G/L	LM7805/06/08/12/15/18/24
1.2 to 37vdc	1.2 to 33vdc	2 to 37vdc	5, 6, 8,12,15,18,24vdc
1.5Amps	3Amps	150ma.	1Amp
TO-3	TO-3	TO-100/TO-116	TO-220/TO-3
$4.50	$5.75	$1.00 $1.25	$1.17 $2.00

P & B Solid State Relays Type ECT1DB72

5VDC Turn On 120VAC Contact 7Amps
20Amps on 10"x10"x.062" Alum.Heatsink with
Silicon Grease $5.00

*May Be Other Brand Equivalent

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"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min	F=2GHz	dB 2.4 Typ.	MAG	F=2GHz	dB 12 Typ.	$5.30
	F=3GHz	dB 3.4 Typ.		F=3GHz	dB 9 Typ.	
	F=4GHz	dB 4.3 Typ.		F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacutures and described in the Motorola RF Data Book.

10pf	22pf	30pf	40pf	100pf	250pf	1 to 10pcs. .60¢ each
13pf	25pf	32pf	43pf	120pf	820pf	11 to 50pcs. .50¢ each
14pf	27pf	33pf	62pf	180pf		51 to 100pcs. .40¢ each
20pf	27.5pf	34pf	80pf	200pf		

NIPPON ELECTRIC COMPANY TUNNEL DIODES $7.50

		MODEL 1S2199	1S2200
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ration (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

List all Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

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EIMAC TUBE SOCKETS AND CHIMNEYS

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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
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JOHNSON TUBE SOCKETS

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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
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WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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2E26	$ 4.69
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3B28	5.00
3-500Z	102.00
3-1000Z/8164	300.00
3CX1000A/8283	200.00
3X2500A3	200.00
4-65A/8165	45.00
4-125A/4D21	58.00
4-250A/5D22	68.00
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5563A	77.00
5675	15.00

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6293	20.00
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6JB6A	5.00
6JM6	5.00
6JN6	5.00
6JS6B	5.00
6JT6A	5.00
6KD6	5.00
6K66/EL505	5.50
6KM6	5.00
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MODEL 7514 Storage Oscilloscope with a 7A15A and a 7A15AN-11 Amplifier and a 7B50 Time Base.	$3500.00
MODEL 577D1 Storage Curve Tracer with a 177 adapter.	$3233.00
MODEL 577D2 Curve Tracer with a 177 adapter.	$2796.00
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With a 1A1 Dual Trace.	$ 722.50
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INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, United Parcel only.

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95H91DC	350MC Prescaler divide by 5/6	8.50
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Freq. Coverage 8 to 12.4GHz, Output (Min.) 100mW, Bias Voltage (Max.) 14vdc, Bias current (mAdc) Operating 550 Typ. 750 Max., Threshold 850 Typ. 1000 Max. **$39.99**

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Freq Range 60 10 150MC, Insertion Loss 13dB Nominal, Signal Port Imp. 50ohms Nominal, Signal Port RF Power + 10dBm Max., Modulation Port BW DC to 1KHZ, Modulation Port Bias 1ma. Nominal. **$24.99**

AVANTEK CASCADABLE MODULAR AMPLIFIERS

	Model UTO-504	UTO-511
Frequency Range	5 to 500 MHz	5 to 500 MHz
Gain	6dB	15dB
Noise Figure	11dB	2.3dB to 3dB
Power Output	+ 17dB	– 2dB to – 3dB
Gain Flatness	1dB	1dB
Input Power Vdc	+ 24	+ 15
mA	100	10
PRICE	$70.00	$75.00

HEWLETT PACKARD MIXERS MODELS

	10514A	10514B
Frequency Range	2MHz to 500MC	2MHz to 500MC
Input/Output Frequency L & R	200KHz to 500MC	200KHz to 500MC
X	DC to 500MC	DC to 500MC
Mixer Conversion Loss (A)	7dB	7dB
(B)	9dB	9dB
Noise Performance (SSB) (A)	7dB	7dB
(B)	9dB	9dB
PRICE	$49.99	$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 fundamental 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 standard communications bands. Broadband sampling circuits are used to phase lock the oscillator to a high stability reference which may be either an internal self-contained crystal oscillator, external primary standard or VHF synthesizer. This unique technique allows for optimization of both FM noise and long term stability. List Price is $1158.00 (THESE ARE NEW) **Our Price—$289.**

HEWLETT PACKARD 1N5712 MICROWAVE DIODE

This diode will replace the MBD101, 1N5711, 5082-2800, 5082-2835 ect. This will work like a champ in all those Down Converter projects. **$1.50 or 10/$10.00**

MOTOROLA MHW1172R LOW DISTORTION WIDEBAND AMPLIFIER MODULE.

Frequency Range: 40 to 300 MHz., Power Gain at 50MHz 16.6min. to 17.4max., Gain Flatness ±0.1 Typ. ±0.2 Max. dB., DC Supply Voltage – 28vdc, RF Voltage Input + 70dBmV **PRICE $29.99**

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Pack of 6 for $5.00 or 60 Cells, 10 Packs for $45.00
These may be broken down to individual cells.

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7420N	19	LM731T/8	.85	CD4024	75	2102AL-4	1.25	2708	2.95
7430N	19	LM741T/8	.85	CD4025	23	2102AL-2L	1.65	2716TI	8.50
7442N	49	LM3301/15	.85	CD4026	1.65	2104A-4	4.95	2716 5 Volt	5.50
7445N	69	LM1458	1.95	CD4027	.85	8-2716 5 Volt	7.75	8-2716 5 Volt	39.00
7447N	69	LM1496	.59	CD4028	.80	2111-1	.99	2732	16.50
7448N	69	LM1596	.99	CD4029	.95	2112-2	2.99	2758	7.49
7474N	35	LM340K-5	1.35	CD4030	.45	2114	2.24	8741A	39.95
7475N	49	LM340K-8	1.35	CD4035	.85	2147	5.50	8748	39.95
7485N	65	LM340K-12	1.35	CD4040	.95	8748-8	.37	8748-8	34.95
7486N	1.70	LM340K-15	1.35	CD4042	.75	8755A	2.95	8755A	49.95
7490N	.35	LM340K-24	1.35	CD4043	.85	MA7512	15.40	MA7512	2.95
7495N	55	LM340T-5	.75	CD4044	.85	MM5280	.89	MM5213	3.95
74100N	1.00	LM340T-8	.75	CD4046	.95	MM5321	.99	MM5326	5.75
74107N	.30	LM340T-12	.75	CD4049	.45	MM5328	.44	MM5329	4.75
74123N	.55	LM340T-15	.75	CD4050	.55	MM5611	.89	MA7311	4.95
74125N	.45	LM340T-18	.75	CD4051	.95	4200A	.11	MM5738	8.75
74145N	.60	LM340T-24	.75	CD4060	1.42	9168	.30	MM5737	8.75
74150N	1.20	LM340	5.50	CD4066	.71	4116	10.00	DM8578	2.90
74151N	.65	LM377	2.29	CD4068	.39	8T26	.89	MM5740	3.50
74154N	1.25	LM380N	1.00	CD4069	.35	TMM2016	16.95		
74157N	.55	LM381	1.60	CD4070	.35	HM6116	16.50	CONNECTORS	
74161N	.70	LM382	1.60	CD4071	.30			30 pin edge	2.50
74162N	.85	LM384	.59	CD4072	.30	CLOCKS		44 pin edge	2.75
74163N	.85	LM386-N	.49	CD4073	.35	MM5311	4.95	86 pin edge	4.00
74174N	.89	LM389N	.85	CD4075	.30	MM5312	3.90	100 pin edge	3.95
74175N	.65	LM394H	.35	CD4076	.95	MM5314	3.90	100 pin edge wire	4.95
74180N	1.15	LM741N	.35	CD4078	.30	MM5369	1.95		
74192N	.79	LM747H-N	.75	CD4081	.30	MM5841	14.45	IC SOCKETS	
74193N	.79	LM748N	.50	CD4082	.30	MM5865	7.95	Solder Tin Low Profile	
74221N	1.25	LM1889N	1.75	CD4116	.47	CT1010	8.95	PIN 1UP PIN 1UP	
74298N	.85	LM1304	1.10	CD4490	5.50	CT7015	8.95	8 .13 .22 .30	
74365N	.65	LM1305	1.27	CD4507	.99	MM5375AA/N	3.90	14 .14 .24 .40	
74366N	.65	LM1307	1.10	CD4508	1.95	MM5375AG/N	4.90	16 .16 .28 .40	
74367N	.65	LM1310	2.75	CD4510	.95	7205	16.50	18 .20 .36 .58	
		LM1458	.55	CD4511	.94	7201	7.50	20 .29 .40 .49	
74LS00 TTL		LM1812	8.25	CD4515	2.25	7208	15.95		
74LS00N	.25	LM1889	2.49	CD4516	1.10	7209	4.95	WIRE WRAP LEVEL 3	
74LS02N	.25	LM2111	1.75	CD4518	1.25	MICROPROCESSOR		PIN PIN	
74LS04N	.25	LM2900	2.25	CD4520	1.02	6502	6.95	14 55 24 .93	
74LS05N	.25	LM3900N	.59	CD4527	1.51	6502A	9.50	16 57 28 1.00	
74LS08N	.35	LM3905	1.25	CD4528	1.25	6504	6.95	18 67 40 1.59	
74LS10N	.25	LM3909N	.95	CD4553	3.50	6505	6.95	Level 4 wire 20	
74LS13N	.45	LM3914N	.55	CD4566	2.45	6522	8.75		
74LS14N	.99	NE544N	1.30	CD4583	2.35	6510	9.50	AC TRANSFORMERS	
74LS20N	.25	NE555V	.39	CD4585	.95	6530	14.95	FRAME WALL PLUG	
74LS22N	.25	NE556A	.65	CD40192	3.00	6551	14.95	6V 500 ma .54 00 10V 2 amp 57 95	
74LS27N	.35	NE564N	1.00	74C00	.35	6800	5.70	6.3V CT 600 ma 4 60 12V 250 ma 2 95	
74LS30N	.25	NE565N	1.50	74C04	.35	6802	11.95	12V 250 ma 1 95 12V CT 250 ma 3 75	
74LS32N	.55	NE566V	1.00	74C10	.35	6820	4.95	12.6V CT 600 ma 4 95 12V 500 ma 4 50	
74LS38N	.35	NE567N	4.75	74C14	.50	6850	3.50	12.6V CT 2 amps 5 95 12V 1 amp 5 95	
74LS74N	.45	7810T	.60	74C20	.35	8080A	3.95	12.6V CT 3 amp 8 60 12V 2 amp 7 95	
74LS75N	.50	7812T	.60	74C30	.35	8085A	8.50	12.6V CT 8 amp 10 80 6- 9- 12 VDC	
74LS90N	.60	7815T	.85	74C48	1.95	Z80A	6.00	24V CT 100 ma 3 95 300 ma 8 95	
74LS93N	.65	7818T	1.49	74C74	.85	Z80B	18.95	24V CT 600 ma 4 95 9 VDC 500 ma 3 75	
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74LS112N	.45	75494CN	.89	74C93	1.25	Z80 CTC	8.65	2 097152 MHz 3.95	
74LS113N	.45			Z80A CTC	9.65	2 4576 MHz 3.95		DISPLAY LEDS	
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74LS258N	.69	CMOS		74C926	6.95	Z80B CTC	17.95	7520 Quires photocells .39	
74LS367N	.69	CD4000	.25	74C927	6.95	Z80B P10	17.95	TIL311 Hex 9.50	
		CD4001	.35	INTERFACE		8212	3.65	MAN4610 CA .40 .99	
LINEAR		CD4002	.35	8095	.65	8214	3.75	MAN6540 CC .40 1.20	
CA3045	.90	CD4006	.95	8216	.65	8224	2.50	MAN4710 CA .40 .95	
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CA3081	1.80	CD4008	.95	8098	.65	8251	4.75	MAN6640 CC .56 .99	
CA3082	1.90	CD4009	.45	8T09	1.25	8253	8.95	MAN6710 CA .60 .99	
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Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, O.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95**, Kit (P/N 2A) **$51.25**, Assembled (P/N 2C) **$62.95**.

PROTOTYPING BOARD (P/N 7907) **$21.95**.

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20**, Kit (P/N 210A) **$119.55**.

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) **$15.65**, Kit (P/N 120A) **$69.95**.

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required. Bd only (P/N 101) **$11.95**, Kit (P/N 101A) **$42.89**.

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95**.

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95**.

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. No PC board. **$8.95**

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50**. Full Kit **$99.00**. Monitor **$20.00**. Power Supply Kit **$35.00**. Tiny Basic **$30.00**.

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June *Radio Electronics*.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95**. Kit with chassis and all hardware **$51.95**. Add $5.00 shipping. Kit of hardware **$16.00**. Woodgrain case **$10.00**. $1.50 shipping.

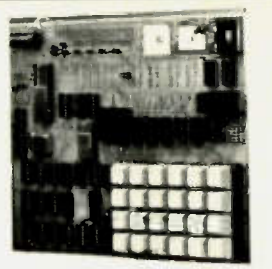
Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer. RS232C interface **$359.00**. Speech IC **$79.95**.

1802 16K Dynamic RAM Kit $149.00

Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00**.

S-100 4-slot expansion	$ 9.95
Super Monitor VI.I Source Listing	$15.00



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 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.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports with full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

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.**

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

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FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

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9 DIGITS 600 MHz $129.95 WIRED

PRICES
CT-90 wired, 1 year warranty $129.95
CT-90 Kit, 90 day parts warranty [illegible]
AC-1 AC adapter [illegible]
BP-1 Nicad pack + AC Adapter/Charger 12.95
OVI Micro-power Oven time base 44.95
External time base input 14.95

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include: three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally, an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40° C. Optional Micro-power oven-0.1 ppm 20-40° C
Power:	8-15 VAC @ 250 ma

7 DIGITS 525 MHz $99.95 WIRED

SPECIFICATIONS:

Range	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40° C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as: three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:

CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES:

MINI-100 wired, 1 year warranty	$79.95
AC-2 Ac adapter for MINI-100	3.95
BP-2 Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40° C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

SPECIFICATIONS:

Range	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display	8 digits 0.4" LED
Time base	2.0 ppm 20-40° C
Power	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double duty!

PRICES:

CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

DIGITAL MULTIMETER $99.95 WIRED

PRICES

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 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

SPECIFICATIONS:

DC/AC volts:	100 uV 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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For high resolution audio measurements, multiplies UP in frequency

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

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Telescopic whip antenna - BNC plug	$ 7.95
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Low pass probe, for audio measurements	15.95
Direct probe, general purpose usage	12.95
Tilt bail, for CT-70, 90, MINI-100	3.95
Color burst calibration unit, calibrates counter against color TV signal	14.95

COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

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ANTENNA SPECIALISTS · AVANTI · ARRL PUBS · AMECO · BASH · BEARCAT · BENCHER · B&W · BIRD · CALLBOOK · COMMUNICATIONS

SONY ICF2001

DIGITAL DIRECT ACCESS SHORT WAVE RECEIVER

- 150KHz -30 MHz + FM BROADCAST
- PLL SYNTHESIZED WITH SCANNING & MEMORY
- AC ADAPTOR INCLUDED
- 1 YEAR SONY U.S.A. FACTORY LIMITED WARRANTY
- AM/CW/SSB
- SURPRISINGLY AFFORDABLE

CALL AND ORDER YOURS TODAY

OUR BEST-SELLING MULTI-BAND!

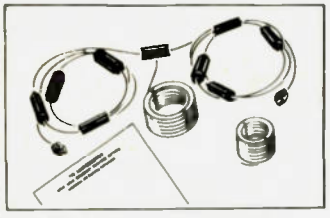
MORGAIN

AS LOW AS $94.50

Add $5.00 for shipping (Cont'l U.S.A.)

- One half the length of conventional half-wave dipoles
- Multi-band, Multi-frequency
- Maximum efficiency — no traps, loading coils, or stubs
- Fully assembled and pre-tuned — no measuring, no cutting
- All weather rated — 1 KW AM, 2.5 KW CW or PEP SSB
- Proven performance — more than 10,000 have been delivered
- Permit use of the full capabilities of today's 5-band xcvrs.
- One feedline for operation on all bands.

80-40HD/A 80/40 Mtr bands (69). . . .	99.00
75/40HD/A 75/40 Mtr bands (66). . . .	94.50
75-10HD/A 75/40/20/15/10 Mtr (66). .	126.95
80-10HD/A 80/40/20/15/10 Mtr (69). .	132.00



Eavesdropper

SHORT WAVE BROADCAST RECEIVING ANTENNA

$59.95 plus $3.00 shipping (Cont'l U.S.)

- AUTOMATIC BANDSWITCHING!
- COMPLETELY WEATHERPROOF!
- COMPLETE, NO ASSEMBLY NEEDED!
- 60, 49, 41, 31, 25, 19, 16, 13 & 11M BANDS!

All the world's shortwave broadcast bands are yours with the Eavesdropper All-Band antenna. Individually tuned traps make the Eavesdropper work like seven separate antennas, each tuned to a different international broadcast band. Also covers 11 and 60M bands as well. Its 100 foot, 72 ohm balanced feedline provides an exact match to the antenna on every band. Comes completely assembled, and ready to install with 50 ft. of 450 lb. test nylon rope. Overall length 42'10". Wire #14 copper. Bandswitching. Automatic. Impedance to rcvr. 50-75 ohms balanced.

Only $59.95

AMECO ALL-BAND PREAMP!

Our Most Popular Preamplifier

MODEL PLF-2

$52.95 plus $3.00 shipping

MODEL PLF-2...Improves weak signals as much as image and spurious rejection of most receivers. Direct switching to rec. or preamp. Includes pwr. supp. 117 VAC wired & tested. **$52.95**

MODEL PLF-2E...240 VAC 50-60 Hz operation. **$57.95**

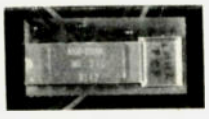
MODEL PT-2...For transceiver use. Continuously tunable from 6 to 160 meters. Features dual-gate FET transistor amplifier for improved receiver sensitivity and low noise figure. Requires no transceiver modifications and can handle up to 250W transceiver output, 117 VAC 60 Hz. . . . **$79.95**

MODEL PT-2E...240 VAC 50-60 Hz operation **$84.95**

TRANSCOM

PROGRAMMABLE SUB AUDIBLE TONE ENCODER FOR ICOM HANDHELDS.

NEW!



$29.95 Plus $2.00 shipping and handling

- ONLY 1.1" X 55" X .2"
- PRESET OUTPUT LEVEL FOR IC2A
- LOW TONE DISTORTION LESS THAN 1% THD
- TONE STABILITY ± .2% Hz FROM -20C TO +70C
- 1 YEAR LIMITED FACTORY WARRANTY
- 5VDC POWERED

ICOM

WE'VE SOLD FM GEAR FOR 14 YEARS & IN OUR OPINION ICOM IS... "SIMPLY THE BEST"

IC2A, IC2AT

OUR MOST POPULAR HAND HELD & THE BEST VALUE AVAILABLE

- COMPACT
- QUALITY CONSTRUCTION
- VERSATILE
- AFFORDABLE
- WIDE RANGE OF ACCESSORIES AVAILABLE

NEW!

IC3AT (220 MHz)
IC4AT (440 MHz)

IC25A

A LITTLE PACKAGE WITH A LOT OF BIG FEATURES...

- 25W OUTPUT
- MEMORIES
- ENCODING MIC
- SCANNING

CALL FOR PRICE & AVAILABILITY

TO ORDER: CALL OR WRITE. MASTER CARD, VISA, MONEY ORDERS, PERSONAL CHECKS TAKE 3 WEEKS TO CLEAR, ACCEPTED. **INTERNATIONAL ORDERS WELCOME,** PLEASE REQUEST PRO FORMA INVOICE.

HOURS: MON. THRU WED. 9:30-6:00, THURS-FRI. 9:30-8:00, SAT. 9:30-3:00

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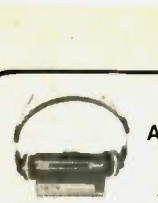
SPECTRONICS, INC.

1009 GARFIELD ST. OAK PARK, IL. 60304

PHONE (312)848-6777

UTIC MINI STEREO AM/FM RECEIVER WITH HEADPHONES



For Joggers, Cyclists, Skaters & Sports Events!

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅛" x 4⅛" x 1". Wt. 6 oz.

Model 2830 List Price $89.95 ..... **$34.95**

SPEAKERS

	1	2-9
Part# A0201	1.25	.99

2¼" Round — 8 Ohm .25 Watt (4" Leads) Size: 2¼" x ⅞"

	1	2-9
Part# SF-25016	1.39	1.25

2½" Square — 16 Ohm .25 Watt (4 mount. holes) Large Ceramic Magnet Size: 2⅝" x 2⅝" x ⅞"

National Semiconductor

RAM SALE

STATIC RAMS

MM2114N-2 4K (200NS) ..... **$2.49 each**
(8 EACH $16.95/lot) (100 EACH $195.95/lot)

MM2114N-2L 4K (200NS) Low Power .... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)

MM2147N 4K (70NS) ..... **$4.95 each**
(8 EACH $34.95/lot) (100 EACH $419.95/lot)

MM6116P-4 16K (200NS) ..... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1195.00/lot)

DYNAMIC RAMS

MM4164N-20 64K (200NS) ..... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1195.00/lot)

MM5290N-2 16K (150NS) 4116 ..... **$2.95 each**
(8 EACH $18.95/lot) (100 EACH $225.00/lot)

MM5290N-4 16K (250NS) 4116 ..... **$1.95 each**
(8 EACH $14.95/lot) (100 each $175.00/lot)

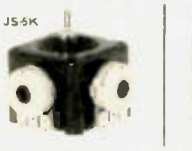
EPROM Erasing Lamp

- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11EL Replacement Bulb $16.95

UVS-11E **$79.95**

JOYSTICKS



JS-5K	5K Linear Taper Pots $5.25
JS-100K	100K Linear Taper Pots $4.95
JVC-40	40K (2) Video Controller in case ... $4.95

MUFFIN® FAN

The dependable, low cost, largest selling fan for commercial cooling applications.

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth. Weight - 17 oz.
- acoustical rating as low as NC-38
- more than 10 yrs. cont. duty at 10°C
- impedance protected
- for ambients to 70°C
- UL yellow card recognized & CSA approved

115V, 50/60Hz, 14 Watts, 105cfm — Ultrasonically cleaned & tested.

MU2A1 .... **$9.95 ea.**

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

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)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5, ±9 & ±12V. $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A	CPU	4.95
DP8212	8-Bit Input/Output	3.75
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	9.75
DP8253	Prog. Interval Timer	8.95
DP8255	Prog. Peripheral I/O (PPI)	5.95
DP8257	Prog. DMA Control	9.95
DP8259	Prog. Interrupt Control	9.95
DP8275	Prog. CRT Controller	29.95
DP8279	Prog. Keyboard/Display Interface	9.95
DP8303	System Timing Element	6.95
DP8304	8 Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95
DP8309	Octal Latched Peripheral Driver	5.25
DP8311	Octal Latched Peripheral Driver	5.25

6800/6800 SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	14.95
MC6810AP1	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	17.95
MC6830L8	1024x8-Bit ROM (MCM2A28)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6882	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus Trans. (MC8T26)	2.28

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	11.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	13.95
CDP1802	CPU	16.95
2650	MPU	16.95
IQM2901AQC	CPU - 4-Bit Slice (Com. Temp. Grade)	28.95
MC54602	MPU w/Clock (65K Bytes Memory)	11.95
INS8035N-6	MPU—8-Bit (6MHz)	7.95
INS8039N-6	CPU—Sgl. Chip 8-Bit (128 bytes RAM)	9.95
INS8040N-6	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
P8085	CPU	9.95
TMS9900JL	MPU - 16-Bit	39.95

1173AN 1 30 Tune Musical MPU Chip 8.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM510H	Dual 64-Bit Accumulator	.50
MM1402N	256-Bit Dynamic	2.95
MM5011N	1024-Bit Dynamic/Accumulator	1.95
MM5016N	500/512-Bit Dynamic	1.95
MM5024N	Octal 20-Bit	9.95
MM5035N	Octal 80-Bit	9.95
2504V (1404A)	1024-Bit Dynamic	1.95
2518N	Hex 32-Bit Static	3.95
2522V	Dual 128-Bit Static	2.95
2524V	512-Bit Dynamic	.99
3341PC	Fifo (Dual 80)	6.95

DATA ACQUISITION

DC10	Mostek DC/DC Convert. -5V to 9V	12.95
MCM709P	Floppy Disc Read AMP System	4.95
MC1408L7	7-Bit D/A Converter (DAC080/LCN)	4.95
MC1408L8	8-Bit D/A Converter (DAC0808LCN)	5.75
AF100-1CN	Universal Active Filter 2.5%	5.95
AF121-1CJ	Touch Tone Low Band Filter	19.95
AF122-1CJ	Touch Tone High Band Filter	19.95
LM308CH	Super Gain Op Amp	1.15
LM334Z	Constant Current Source	1.30
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp. Comp. Prec. Ref. (.5ppm/C°)	5.00
ADC0804LCN	8-Bit A/D Converter (½ LSB)	4.95
DAC0808LCN	8-Bit D/A Converter (0.78% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0811CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1000LCN	10-Bit D/A Conv. Micro Comp. (0.05%)	13.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1027LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.19
AY-5-1013	30KC BAUD UART	6.95

RAM'S

1101	256-x1 Static	1.95
1103	1024-x1 Dynamic	.99
2101 (8101)	256-x4 Static	3.95
2102	1024-x1 Static	1.75
2TL02	1024-x1 Static	1.95
2111 (8111)	256-x4 Static	3.95
2112	256-x4 Static MOS	4.95
2114	1024-x4 Static 450ns	7.25
2114L	1024-x4 Static 450ns Low Power	7.49
2114-2	1024-x4 Static 200ns	7.95
2114L-2	1024-x4 Static 200ns Low Power	7.95
74S200	256-x1 Static	6.95
4116N-4 (UPD416)	16K Dynamic 250ns (MM5290N-4)	1.95
4164N-3	64K Dynamic 200ns	14.95
MM2147N	4096-x1 Fast 70ns	4.95
5101	256-x4 Static	7.95
MM5261	1024-x1 Dynamic Fully Decoded	.99
MM5262	2K-x1 Dynamic	.49
MM5280/2107	4096-x1 Dynamic	4.95
MM5290N-2 (4116)	16K-x1 Dynamic 150ns (UPD416C-3)	2.95
MM5298J-3A	8K Dyn. 200ns (lower ½ of MM5290J)	1.95
MM6116-4	16K (2K-x8) Static 200ns	14.95
82S25	64-Bit RAM (16-x4C)	3.49
UPD414(MK4027)	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	9.95
TMS4045	1024-x4 Static	9.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	2.95
TMS2716	16K EPROM (+5V, +5V, +12V)	9.95
2716(Intel(2516)TI	16K EPROM (Single +5V)	8.95
2732Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
5203	2048 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	3.95
82S115	4096 Bipolar PROM	14.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	3.95
82S185	8K PROM	16.95

Over 30 More PROMS Listed in Our Catalog —

ROM'S

2513(2740)	Character Generator (Upper Case)	9.95
2513(3021)	Character Generator (Lower Case)	9.95

NMOS READ ONLY MEMORIES

MCM66710P	128x8x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x8x7 Math Symbol & Pictures	13.50
MCM66750P	128x8x7 Alpha, Control Char, Gen.	13.50

MICROPROCESSOR MANUALS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2656	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (SMZ)	3.50
DS0026CN	Dual MOS Clock Driver (SMZ)	3.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM5817N	Microprocessor Real Time Clock	8.95
MM5314N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64 Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64 Digit RAM & Direct LED Drive w/IN Bus Int.	7.49
COP470N	32-Seg. VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9560	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (36 keys)	7.95
HC922	Keyboard Encoder (36 keys)	5.49
HC923	Keyboard Encoder (20 keys)	5.75
MM5740N	Push Button Pulse Dialer	7.95
MM5299N	98/144 Key Serial Keyboard Encoder	8.95

2400-10

EECO Rocker DIP Switch — "Mini-Dip™" 2400 Series
THE MOST UNIQUE DIP SWITCH AVAILABLE!

MINI-DIP is designed to retrofit all major brands of Dip switches. Unique features include locking rod design to prevent accidents, actuation and gold self-wiping contact. One-piece housing and press-fit terminals prevent contamination. 2-10 station Form "A" and 1-5 station Form "C".
• Terminals on .100 x .300 (2.54 x 7.62) centers • PCB or dip socket mountable • Positive cleaning/wiping action with gold contact • Total seal and bottom seal

Part No.	Pos.	Configuration	Socket	Price
2400-2	2	12	8 pin	.79 - 10/ 6.95
2400-3	3	123	8 pin	.89 - 10/ 7.95
2400-4	4	1234	8 pin	.99 - 10/ 8.95
2400-ABCD	4	ABCD	8 pin	.99 - 10/ 8.95
2400-5C	5	C5432	14 pin	1.09 - 10/ 9.95
2400-6	6	123456	14 pin	1.09 - 10/ $ 95
2400-7	7	1234567	14 pin	1.19 - 10/10.95
2400-8	8	12345678	16 pin	1.29 - 10/11.95
2400-9	9	123456789	18 pin	1.39 - 10/12.95
2400-10	10	0123456789	20 pin	1.49 - 10/13.95

GRAB BAG SPECIALS

GB180 100 pieces Robot/Slot Car Gears, Shafts, Wheels, Motors $9.95

CAPACITORS

Part No.	Description	Price
GB100	100 each Ceramic Disc (Typ. 1mf)	$2.00
GB101	60 each Mylar	4.00
GB102	Electrolytic	4.00
GB103	40 each Tantalum (Tubular & dipped)	4.00
GB176	40 each Polyester Metal Film 1000pf @ 100-600V	4.00

INTEGRATED CIRCUITS

GB108	60 each TTL Series marked 7400, 7474, 74123 etc.	$4.00
GB109	30 each Linear marked LM301, 307, 741, 380 etc.	4.00
GB148	30 each 8 pin marked RC4136, 1310, 4136, etc.	4.00
GB180	20 each 8pin Resistor Network marked 2510, 2518, 2632, 2533 etc.	4.00
GB157	50 each DTL Series marked 930, 946, etc.	3.00
GB188	8 pcs. Positive Voltage Regulators (TO-3 case) 7805, 08, 12, 15, 18, 24 etc.) Linear marked	4.25
GB189	8 pcs. Negative Voltage Regulators (TO-3 case) 7905, 08, 12, 15, 18, 24 etc.) Linear marked	4.00
GB170	25 each Assorted NAND TTL Series	4.00
GB172	10 pcs. 78M Positive Volt. Reg. (TO-5 case) (78M05, 8, 12, 15, 20, 24 etc.) Linear marked	5.00

LEDS — LAMPS — READOUTS

GB110	100 each Assorted LEDs (colors & sizes)	$5.00
GB111	40 each NE-2 Neon Type Lamps	3.00
GB112	20 ea. Multiple Readouts, assortment, some common cathode & some common anode	4.00
GB152	60 each 7 Segment Displays with resistors and data	5.00

POTENTIOMETERS

GB133	30 each Miniature Trimmers (100 ohm-1 Meg)	$4.00
GB134	24 each 3/8" square single turn PC Mount potmeter - 10 pcs. 50-1 meg, 10 pcs. 100-1 meg	3.00
GB135	24 each 3/8" square single turn PC Mount potmeter - 11 pcs. 50-1 meg, 13 pcs. 100-1 meg	3.00
GB136	24 each 3/8" square single turn PC Mount potmeter - 100-1 to 5 Meg marked	3.00
GB173	100 ea. 3/8" sq. Single Turn PC Mount Trimmers (Vert. & Horiz.)	8.00
GB174	25 ea. 1" square Single Turn PC Mount Trimmers (100 ohm-2 Meg)	2.00

DIODES

GB171	60 each Assorted Semiconductor Diodes (1N34, 1N48, etc.)	$2.00
GB107	100 each Silicon Rectifiers (1A-1000V)	1.95
GB164	200 each Assorted Switching Diodes & Rectifiers	2.95
GB175	100 ea. 1 amp. 3 zener diodes (3.3V-33V)	4.00

RESISTORS

GB116	200 each 1/4 watt resistor assortment	$2.00
GB117	200 each 1/2 watt resistor assortment	3.00
GB118	30 ea. 5W+ Wound & 10, 20W (1 1/2 dia.)	4.00
GB184	100 each 1 and 2 watt resistor assortment	2.00
GB178	500 each 1/4, 1/2, 1 watt metal/oxide/wirewound resistors	4.00

SWITCHES

GB120	25 each Miniature slide	$2.00
GB122	20 ea. Rotary switches with index and magnet - glass tube	5.00
GB166	40 each toggle switches, subminiature	10.00
GB179	20 each Dip Switches (see page above)	9.95

HARDWARE

GB139	40 each Terminal Strips	$2.00
GB166	48 Threaded spacers and studs - assort. (2 sizes)	2.00
GB140	150 each Spacers, standoff, insulators - metal, nylon, and plastic	3.00
GB141	200 ea. Machine Screws and Spacers - nylon and metal	2.00
GB142	60 ea. Chassis mounting fuse holders and grommets	2.00
GB144	200 each solder lugs, hardware, misc.	2.00
GB145	100 each Lugs - crimp on (some insulated)	2.00
GB146	100 each Grommets, cord strain reliefs and misc. items	3.00
GB147	500 each Hardware - nuts, bolts, screws, lugs	5.00
GB168	48 Threaded spacers and studs - assort. (2 sizes)	2.00
GB187	200 pcs. sheet metal and metal tapping screws	2.00
GB188	200 pcs. angle bkts., clips, misc. hdwr. etc.	3.00
GB189	100 pcs. nylon and metal spacers (3/8")	3.00
GB180	100 pcs. Robot Slot Car gears, shafts, wheels, motors	9.95

MISCELLANEOUS

GB123	30 each Hex Socket Assortment (4 sizes)	$3.00
GB124	6 each assorted wire wrap tools & sockets	5.00
GB138	50 each Open Terminals (1, 1 Sm. & 1 Lg. sizes)	2.00
GB127	100 each Terminals - phono and banana	2.00
GB128	30 each Tactile Cams - nylon and steel	4.00
GB129	50 each Phillips Screwdriver (LP1)	4.00
GB130	1 each Tape Drive - 8V motor with reel hubs, idler head and 2 cassette cases (no amplifier)	5.00
GB131	30 each 8-40 Allen Tuning Tool - long and short	4.00
GB137	50 each Ohm vs. Temperature Coefficient wire wirewound	3.00
GB138	2 each Speakers, 2½" dia., 8 ohms, 1/4 watt	1.95
GB155	100 each 4N and 4N-series capacitors - assorted values & voltages	3.00
GB160	Breadboard	2.00
GB161	Breadboard with 56 jumper wires	4.00
GB162	200 each 1" Silicon Rectifiers, Assorted Voltages	3.00

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢
Send 88¢ Postage for your *FREE* 1982 JAMECO CATALOG
Prices Subject to Change

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Mail Order Electronics - Worldwide

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BOOKS

National Semiconductor — Intersil — Intel

30001	National CMOS Data Book (640 pages) 74C, CD4000, and A/D Converters	$6.95
30002	National Interface Data Book (704 pages) DP, DS8000, DS3600, DS75000, etc.	$6.95
30003	National Linear Data Book (1376 pages) LM, LF, ADC, DAC, LH Series	$11.95
30004	National Series 80 — Board Level Computer (224 pages)	$4.95
30005	National TTL Logic Data Book (624 pages) 7400, LS, L, H, S, and DM8000 Series	$8.95

30006 Above (3) 30001,3,5 as set $24.95/lot

010400	Intel Component Data Catalog — Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$14.95
205610	Intel Peripheral Design Handbook — Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$9.95

AC and DC Wall Transformers

With Universal Plug and 9V Battery Snap

Selective voltages: 6,9,12VDC. Polarity selection (+/-), six-foot line from adapter to plugs — six-inch line from adapter to battery snap. 120V/60Hz, 300mA

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA (batt. charger)	$1.95
DC6912 (above)	120V/60Hz	6,9,12VDC 300mA	$9.95
DV9200	117V/60Hz	9VDC 200mA	$3.25
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95

CONNECTORS

DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
D20418-2	Screw Lock Hdwr. (2) DB25S/P	2/$.99
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K
Kit comes complete with:

- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (*ns)
- Documentation for conversion

TRS-16K2 *150ns 19.95
TRS-16K3 *200ns 16.95
TRS-16K4 *250ns 14.95

KEYBOARDS

Datanectics 74-Key Keyboard

Uses EA 20134 Chip (Electronic Arrays). Size: 16¾"L x 5¼"W x 1-3/8"H. White, black, blue, grey key caps. (No Data Sheet) —

Part No. KB354 ..... **$29.95 ea.**

Micro Switch 69-Key Keyboard

Uses AMI SW2053K Chip. Size: 16-3/8"L x 5¼"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. Wt. 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 (pem nut type) for mounting. Specification requirements to be used with ATC engaged.

Part No. 200-3010 ..... **$69.95 each**

— MANY OTHERS AVAILABLE • WRITE FOR INFORMATION —

JE600 Hexadecimal Encoder Kit

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: 3½"H x 8¾"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) .. **$59.95**

K19 19-Key Keyboard (Keyboard only) **$14.95**

DTE-HK (case only — 3½"H x 8¾"W x 8¾"D) **$44.95**

↙See List of Advertisers on page 114

DEALER DIRECTORY

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The Southwest's most progressive communications company stocking Kenwood, Icom, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego, 827-5732 (Reno NV).

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.

San Diego CA

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San Jose CA

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Smyrna GA

For your Kenwood, Yaesu, ICOM, Drake and other amateur needs, come to see us. Britt's Two-Way Radio, 2506 N. Atlanta Rd., Smyrna GA 30080, 432-8006.

Preston ID

Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.

Terre Haute IN

Your ham headquarters located in the heart of the midwest. Hoosier Electronics, Inc., #9 Meadows Center, P.O. Box 3300, Terre Haute IN 478003, 238-1456.

Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters. Whistler radar detectors. Bearcat, Regency, antennas by Larsen, Wilson, Hustler, CAM. TEL-COM Inc. Communications & Electronics, 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.

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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.

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Waveguide & Coaxial Microwave Components & Equipment. Laboratory Grade Test Instruments, Power Supplies. Buy, Sell & Trade all popular makes—HP, GR, EXR, ESI, Sorensen, Singer, etc. Lectronic Research Labs, 1423 Ferry Ave., Camden NJ 08104, 541-4200.

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Kenwood, ICOM, Drake, plus many other lines, Amateur Dealer for over 35 years. Adirondack Radio Supply, Inc., 185 West Main Street, Amsterdam NY 12010, 842-8350.

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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

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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.

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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	7G	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	7	14	14	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	14	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			

Reader Service for facing page ↙83→

FT-230R: QUITE A SIGHT! (AND EASY TO SEE, TOO!!)

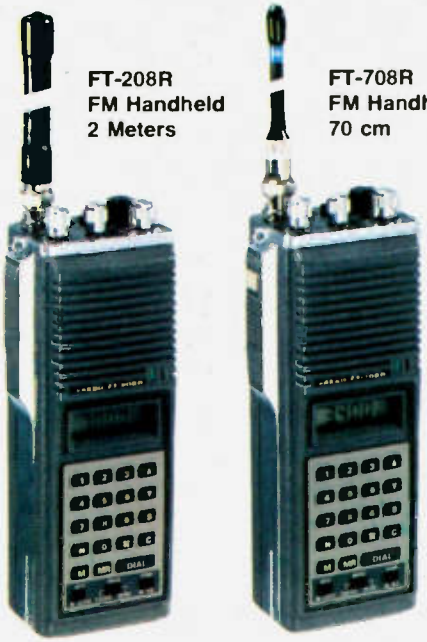
Sporting an all-new Liquid Crystal Display, the FT-230R is Yaesu's high-performance answer to your call for a very affordable 2 meter mobile rig with an easy-to-read frequency display! The FT-230R combines microprocessor convenience, a sensitive receiver, a powerful yet clean transmitter strip, and the 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

YAESU
The radio.

Price and Specifications Subject To Change Without Notice or Obligation

482

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Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 • (513) 874-3100

NEW

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz - 30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC, 30, 17, and 12 meter bands, on SSB, CW, FSK, and AM. Features 150 kHz - 30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch changes in 1-MHz steps. A new, innovative, quadruple conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuit with cooling fan, SWR/Power meter built-in.
- **Automatic antenna tuner, built-in.**
  Available with AT-930 antenna tuner built-in, or as an option. Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for maximum flexibility, coupled with smooth, quiet operation. Switchable to semi-break-in.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz receive frequency shift.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slopes of the IF passband, for best interference rejection.
- **CW VBT and pitch controls.**
  CW VBT (Variable Bandwidth Tuning) control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100-kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Fluorescent tube digital display has analog type sub-scale with 20-kHz steps. Separate 2 digit display indicates RIT frequency shift.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," plus improved intelligibility. Separate "IN" and "OUT" front panel level controls.
- **One year warranty.**
  The TS-930S carries a one year limited warranty on parts and labor.

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- MC-60 (S-8) deluxe desk microphone with UP/DOWN switch.
- TL-922A linear amplifier.
- SM-220 station monitor.
- HC-10 digital world clock.
- HS-6, HS-5, HS-4 headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street,
Compton, California 90220

KENWOOD
...pacesetter in amateur radio

Specifications and prices are subject to change without notice or obligation.