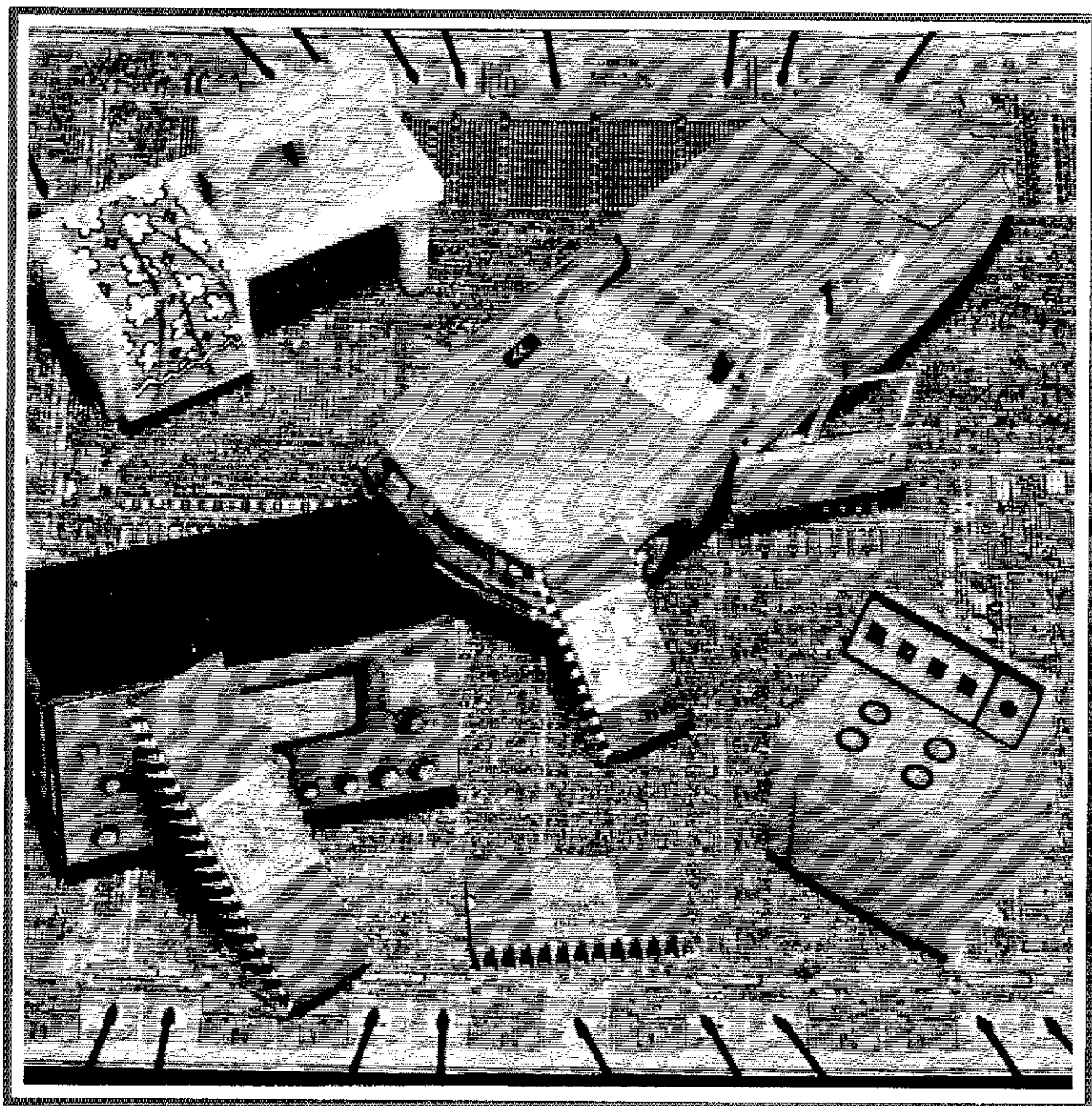


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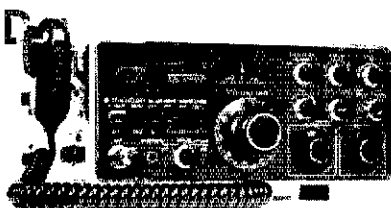
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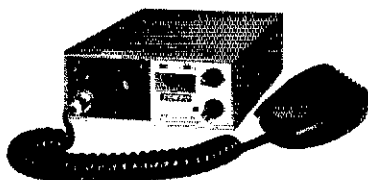
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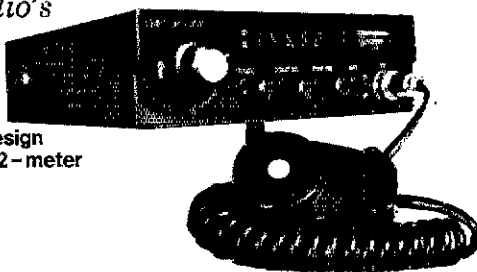
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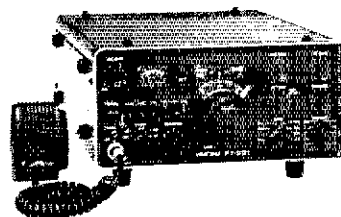


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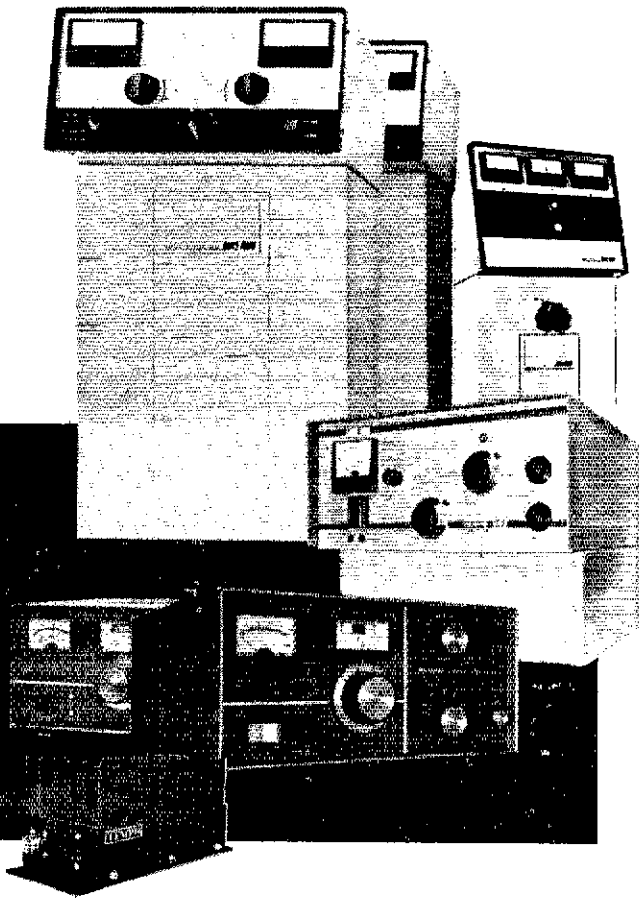
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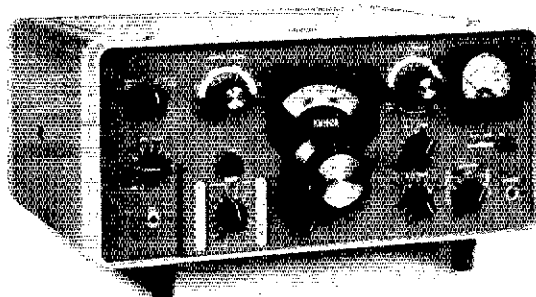
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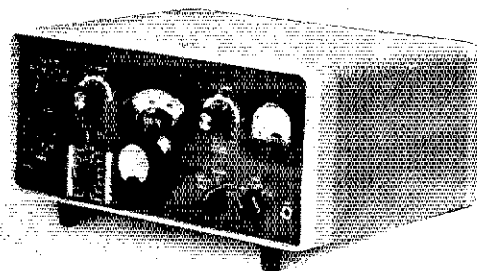
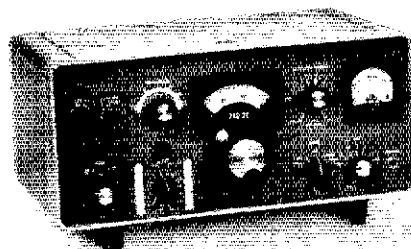
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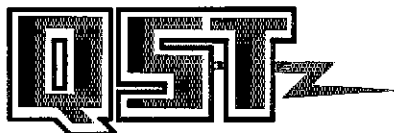
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Volume LX Number 8

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THE COVER

Microprocessors — the mini-brain. Find out how they "play" by following the series starting in this issue on page 11.



Contents

Technical

- 11 Meet the Microprocessor, Part 1 William L. Thomas, WB6FGR/9 and Stephen E. Belter, WN9SGP
- 15 Another Look at Reflections, Part 7 M. Walter Maxwell, W2DU/W8KHK
- 24 Designing Small Vertical Antennas D. J. Kozakoff, W4AZW
- 26 That's a Big 12 Volts Charles Carroll, W1GQO
- 28 A Unique Digital Mixer Jeffrey L. Gnass, KH6HJZ
- 32 Rid Your Model 28 TD of Distortion John Sheetz, K2AGI
- 34 Loops vs. Dipole — Analysis and Discussion D. K. Belcher, WA4JVE and P. W. Casper, K4HKX
- 38 Technical Correspondence

Basic Radio

- 21 An RF-Sensed Antenna Changeover Relay Doug DeMaw, W1CER and Jay Rusgrove, WA1LNQ

General

- 45 S.R.O. at Your Next License Class Don Keith, WA4BDW
- 52 Once Upon a Time . . . Ron Koczor, K9TUS
- 53 Radio Foxhunting in Europe, Part 1 Nicolai Holter, LA5CH
- 58 Put the Ham in the Closet Jerry Woods, WN5POQ
- 59 The Value of Special-Events Stations Lowell G. Croysdale, W5UCY

Operating

- 79 Frequency Measuring Test Ellen White, W1YL
- 80 Results, 29th ARRL VHF Sweepstakes Jim Cain, WA9AUM
- 84 VHF-QSO Party

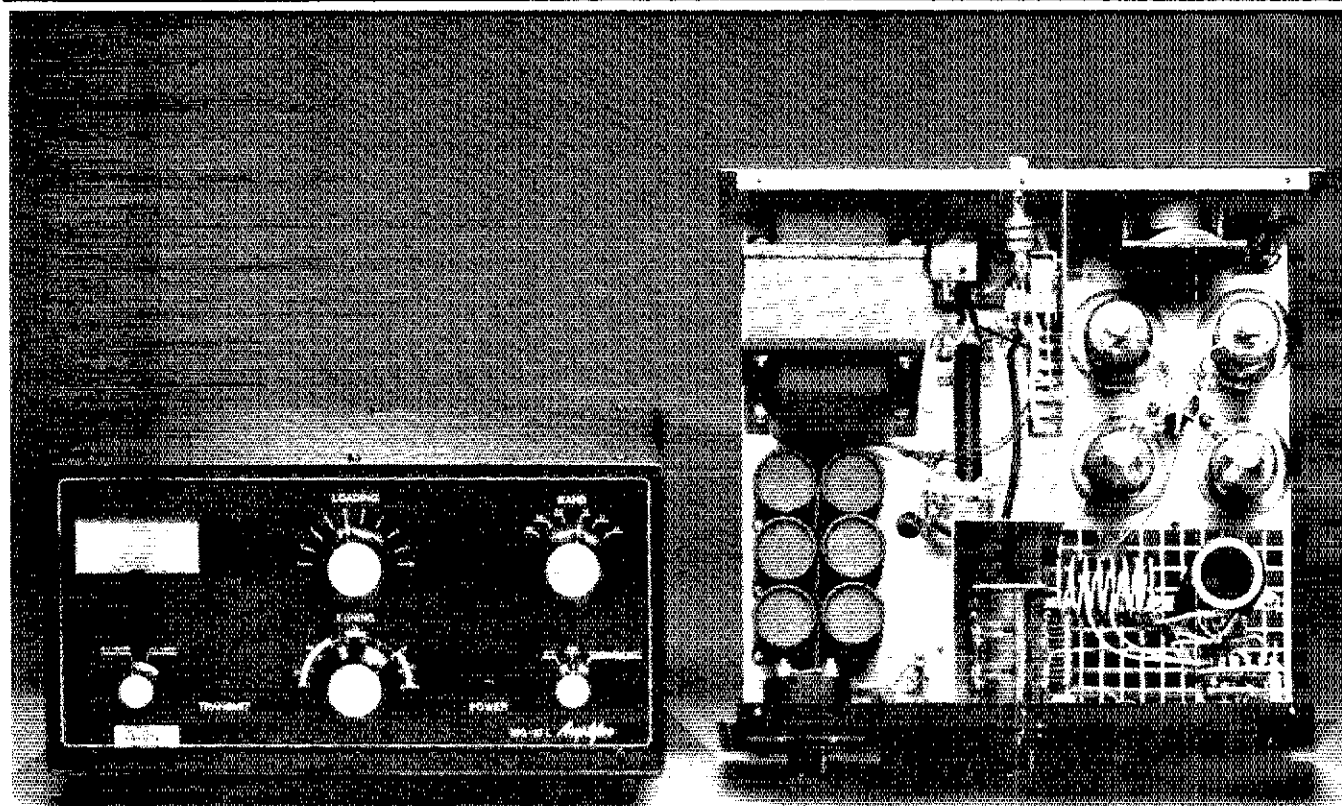
Organizational and Regulatory

- 9 Time for Another Breakthrough
- 48 One Shoe Drops . . . Perry F. Williams, W1UED
- 61 Moved and Seconded . . .
- 64 Novices, "Experimenters" for Canada?
- 69 Report from Cyprus: Amateur Radio Alive and Well

Departments

- | | | | |
|----|--------------------|----|------------------------|
| 66 | Coming Conventions | 86 | Operating Events |
| 68 | Correspondence | 85 | Operating News |
| 39 | Feedback | 40 | Product Review |
| 71 | FM Repeater News | 77 | Public Service |
| 66 | Hamfests | 74 | QSL Bureau |
| 64 | Happenings | 63 | Silent Keys |
| 43 | Hints & Kinks | 88 | Station Activities |
| 72 | How's DX? | 47 | Washington Mailbox |
| 69 | International News | 75 | The World Above 50 MHz |
| 9 | It Seems to Us | 70 | YL News & Views |
| 10 | League Lines | 63 | 25 & 50 Years Ago |

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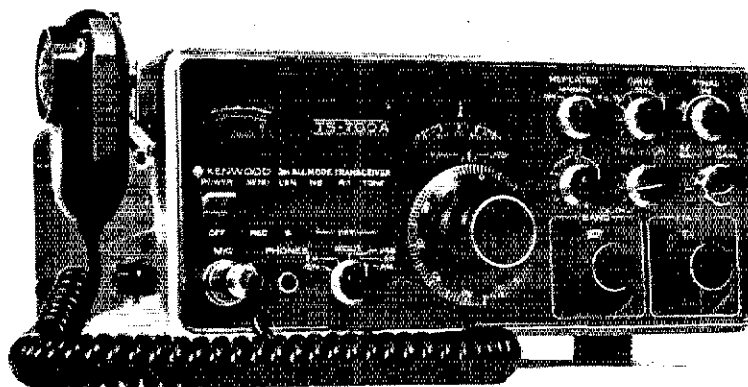
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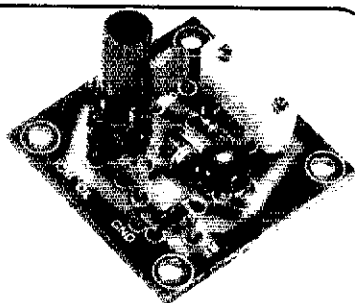
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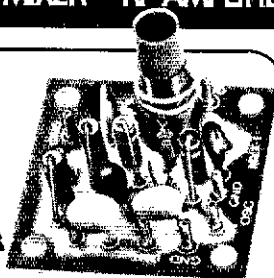
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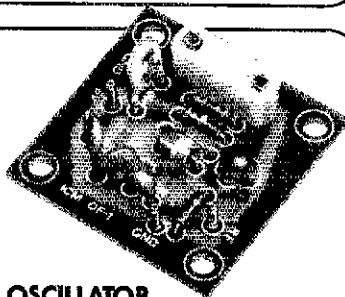
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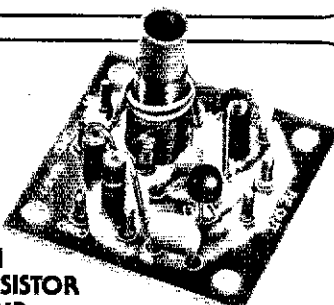
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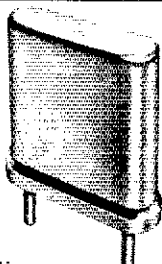
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THE AMERICAN RADIO RELAY LEAGUE, INC.



The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisites, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

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"It Seems to Us..."

Time for Another Breakthrough

We amateurs pride ourselves on the efficient use that we make of the spectrum allotted to us. Some of our efficiencies come from our operating practices, some from our use of advanced techniques.

It has always been so, and there are a number of outstanding examples. In the earlier days of amateur radio, the shift from spark to cw not only made communication over greater distances possible, but also effectively increased the number of stations that could occupy a given band of frequencies, because each station took up a narrower slice of the spectrum. It was a technique adopted by amateurs not because they were regulated to do it, but because they found through their own experience that it was the most efficient way to operate.

To a lesser degree, the shift from unfiltered to filtered power supplies further increased the efficiency with which amateur cw stations utilized their spectrum.

The next major breakthrough of consequence was the shift from double-sideband to single-sideband phone, in the 1950s, again substantially increasing the efficiency with which amateurs used their portion of the spectrum and, again, done voluntarily. To be perfectly honest, amateurs were probably less conscious of the spectrum-saving advantages of ssb than they were of the fact that that type of phone operation provided easier and more efficient phone communication, particularly in working DX.

Amateur radio throughout the world

is growing and even in the United States, where the total number of amateurs has remained more or less constant for several years, we find signs of growth once again. By 1980 there will be upwards of a million amateurs throughout the world and by the year 2000 the total number of amateurs worldwide could well exceed two million. Regardless of our possible success at WARC-79, the bands are going to be crowded, especially as the percentage of amateurs using phone grows ever larger.

It's time for another breakthrough.

We need another spectrum-saving development that will help to accommodate the growth that we foresee. What will this breakthrough be? It seems to us that it has to be some sort of speech processing which will permit the transmission of amateur phone signals in a bandwidth no greater than half of what we experience at the present time. The next question is — is such a solution technically possible?

The answer seems to be yes. Since writing the previous paragraphs and while on a recent West Coast trip, this writer listened to a demonstration of a system developed by an engineer out that way, in which a phone signal of approximately 3500 hertz was reduced to some 1800 hertz on-the-air bandwidth, all the while retaining excellent clarity. Furthermore, it appears that the circuitry to accomplish this wizardry will not be expensive. (Would you believe less than \$25?) We hope that before long an article in *QST* will tell us how to proceed. QRX. — W1RU

League Lines...

In case the Viking I spacecraft Mars landing has been delayed again since it was re-scheduled for July 17, N6V will be rescheduled to be on the air 24 hours prior to the new landing schedule. SSTV was added in July to N6V station capability with primary on 20 meters between 14230 and 14245 kHz, from 2300Z to 0300Z, with 128 and 256 line scan to be used. Viking Status Reports may be secured by calling (213) 354-4213.

New Emergency Communications Advisory Committee members are Delf A. Norona, WA8NDY, and William A. Sencabaugh, K1UAQ. William E. Mixon, K5SVD is the new Committee Chairman. ECAC roster now includes K5SVD Chairman, K1UAQ, WB2EDT, W3PST, WA4PBG, W4WHN, W6INI, W7IEU, WA8NDY, W9QBH, WØPB and VE5CU.

A new addition to the vhf Repeater Advisory Committee is George A. Davis, VE3BBW. VRAC roster: W5NSQ Chairman, W1GXT, WA2GCX, K3GEG, K4DSN, W6GO, WA7WMC, W8GRG, K9LSB, KØTVO, VE3BBW, WØBWJ Board Liaison and W1ICP Staff Liaison.

A new League membership service: A recording system is now interconnected to the Headquarters telephone (203-666-1541) to accept messages after normal business hours (7:30 - 5:30 Monday through Friday) thus allowing members and nonmembers alike to take advantage of reduced night-time telephone rates (see page 127). We'd be glad to respond to a simple request or a simple question in the next business mail.

Although we're not supplying a form for you to fill out, we would like to conduct an impromptu survey on the amount of RFI/TVI that exists. If you have this problem, drop us a postcard or letter and please note what sort of equipment it is occurring with -- i.e., TV set, hi-fi, electronic organ, etc., and whether or not you have successfully attempted to make a fix.

Hey you lawyers/hams! Would you like to use your skills to help the hobby? Send your business card and your call to ARRL General Counsel Robert M. Booth, Jr., W3PS, 1302 18th St., NW, Washington, DC 20036.

It's here! ARRL's jazzy new beginner information package, "Tune In the World with Ham Radio" -- see page 126 for more info.

Reminder to radio clubs wishing to spread the word about amateur radio by donating a complete set of League publications to the local library: We've got a deal for you! Your club can get a complete set of ARRL publications for this purpose at half price. Three conditions: (a) Yours must be an ARRL affiliated club, (b) It must send with the order a letter from the local library agreeing to display and circulate the manuals, and (c) \$25.00 with order.

Don't forget your new privileges, Techs. Since FCC action on Docket 20282 took effect July 23, you can get on cw in the 3700-3750, 7100-7150 kHz and 21.1-21.2, 28.1-28.2 MHz Novice bands. VFOs are okay and the power limit in those segments is now 250 watts DC input for everyone, be he Novice or Extra. The whole story is in "One Shoe Drops..." this issue.

Your hamfest wasn't listed in the Hamfest Calendar? QST deadlines range from the 10th to the 15th two months prior to the date of issue for most items: i.e., August 10-15 for the October issue.

A plaque and a \$50 prize are being offered to the writer of the best article about ham radio published in an American non-ham publication during 1976. Articles will be judged on how well they attract non-hams to ham radio. Photostats of articles with the name and date of the publication should be sent to Ray Collins, WA2GBC, Harter Road, Morristown, NJ 07960. All entries must be submitted with an s.a.s.e. by Jan. 31, 1977.

California to Hawaii on vhf, again! In a repeat performance of three summers ago, a tremendous tropospheric duct formed to propagate signals between the Coast and the Islands on June 28-29. Once more, K6DYD's daily ritual of checking band conditions was the tip-off. As in the Field Day opening, vhf has surprises awaiting those who use it!

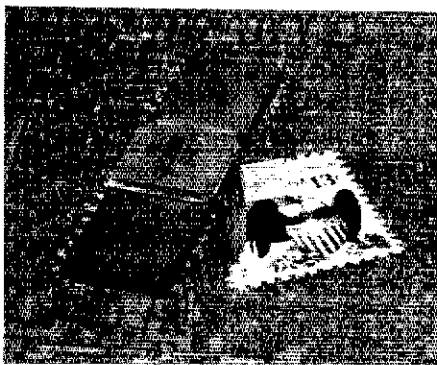
Meet the Microprocessor

Part 1: The first of a three-part series designed to introduce QST readers to microprocessors.

By William L. Thomas,* WB6FGR/9 and Stephen E. Belter,** WN9SGP

What? You haven't heard about microprocessors and microcomputers? If you have, then you probably know already that these small computers have become commonplace in just the last two years, in everything from calculators and cash registers to electric stoves and sewing machines. In the very near future, they will be found controlling everything, from the heat in your house to the rig in your shack! The impact of the microprocessor on our way of life is just beginning to be felt. A data-processing unit on a single integrated circuit, with its peripheral devices, altogether called a microcomputer, will influence our surroundings in many ways still to be determined. At the present, microprocessors are generating a boom in the semiconductor industry which by 1980 will cause direct sales of 350 to 500 million dollars. The sales of supporting circuitry are hard to predict, but will certainly develop into a major market.

Currently, microprocessors are being incorporated into a wide variety of both industrial and consumer products. A few examples are calculators, test equipment, navigation systems, typewriters, cash registers, electric stoves, microwave ovens, sewing machines, industrial-process control, and even a bar which automatically mixes drinks! In addition, the automotive industry is seriously investigating the use of microprocessors in automobiles. These devices are being incorporated into a few models now, but could show up in all cars as early as



The microprocessor chip and the package it is mounted in. An idea of their size can be gained from the U.S. postage stamp shown here. (Motorola Semiconductor Products photo)

1979. It seems inescapable that, in the future, people in all walks of life will be using microprocessors.

As in the advent of any new technique, amateur experimenters will undoubtedly contribute a great deal to the current state of the art. At the present, quite a hobby-oriented industry is developing. Experimenter publications are filled with a multitude of microprocessor-oriented products. Also, there are newsletters and magazines published solely for the microprocessor experimenter.

These articles will help to prepare a person who has no prior knowledge in the microprocessor area with the basics necessary to cope with the "mystery" of these devices. Remember that everyone who is currently experimenting with microprocessors had to start from humble beginnings, and that at one time

getting an amateur license seemed an impossible goal to most of us!

Amateur Radio Applications

There are a myriad of amateur radio applications for microprocessors. Some possible uses are mentioned below, but the surface has just been scratched in developing applications. The microprocessor is very appropriate for small-scale control systems. This could include repeater-control operations such as changing modes, i-d-ing, and phone-patch operations. Antenna tracking for either EME or Oscar operation seems another likely application. Microcomputers could simplify the design, minimize the hardware, and improve the reliability of remote-controlled stations, where the control signals for transmit, receive, frequency readout, band changing, antenna rotating, antenna positional readout, and even the audio signals, can be put in digital form.

Another area for microprocessor applications is slow-scan television. The major problem with slow scan is the time required to send the entire picture. However, if the most recent picture is stored at the receiving end and only the portion of the picture which is different is transmitted, much faster picture rates can be obtained. This may even lead to limited motion capabilities for slow-scan systems. The microprocessor is a natural device to control this process, and current work is being done in this area.

In the area of contest operation, computers have previously been used to assist in logging operations. Unfortunately, these have generally been used after the contest; but with microprocessors, logging systems can be built

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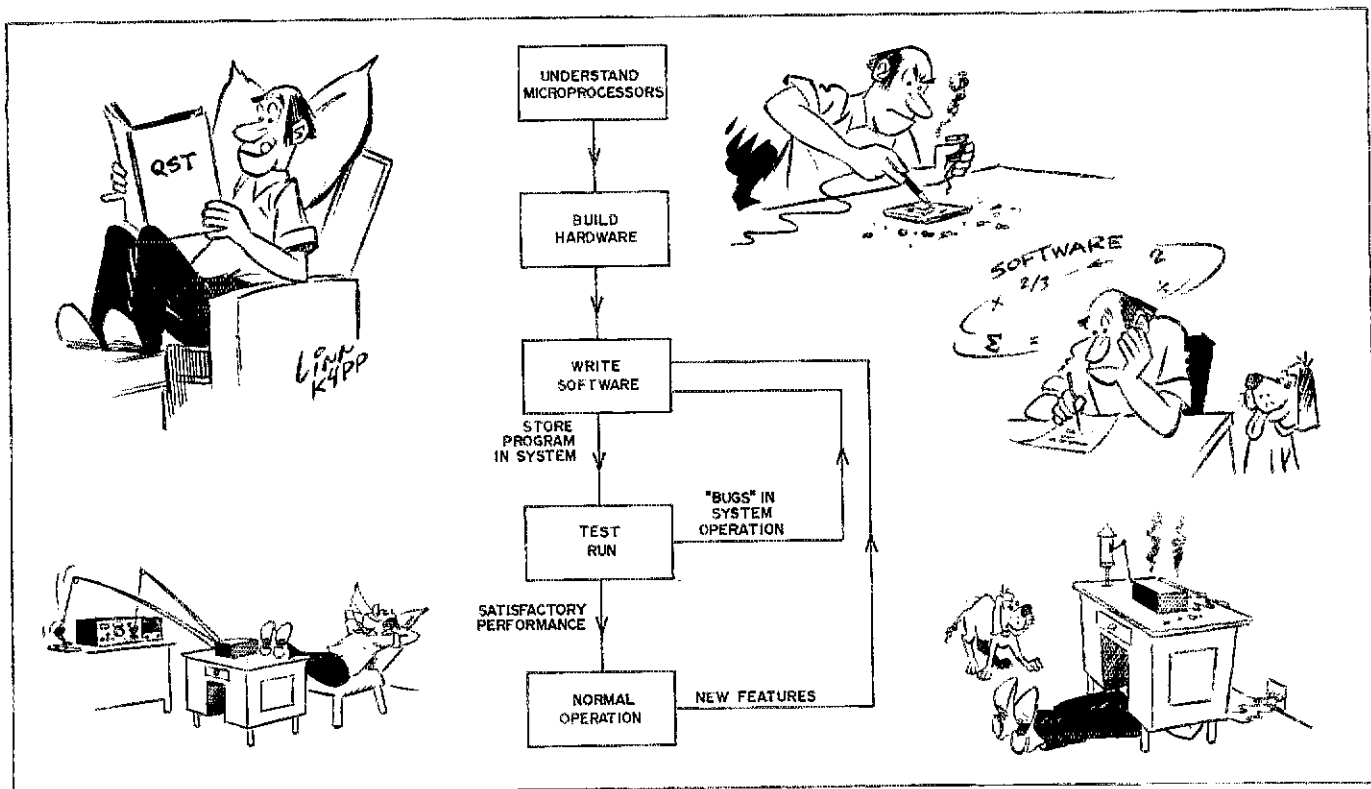


Fig. 1 — The steps required to put a microprocessor system together. Note that a majority of the time is not spent on the construction phase of the project.

to be used during a contest. A similar idea has been discussed previously in an article¹ which used a "computer" completely built from scratch, a project beyond the normal scope of amateur construction practices. However, microprocessor units would be within the construction capabilities of amateur radio builders.

Lately there has been considerable interest in both RTTY and Morse code receiving and transmitting devices. A unit for RTTY and Morse transmission featuring character or word-storage buffers is certainly within the capability of microprocessors. A microcomputer could be programmed to teach a budding Novice Morse code, or to help the seasoned ham improve his speed. Communications networks where RTTY repeaters temporarily store and route messages could also be built. As an application example, an adaptive Morse code character detector will be discussed in the third article of this series. As the experience of using microprocessors encourages further amateur experimentation, more applications will certainly be developed. The excitement of discovery will be part of the appeal in using these devices.

What is a Microprocessor System?

What, then, is a microprocessor? Basically, it is a hybrid between *hard-*

ware (digital electronic circuitry such as gates and flip-flops) and *software* (a user-specified arrangement of instructions which control the operation of the hardware). A microprocessor is an integrated circuit. It can recognize a sequence of simple control statements which will cause the electronic circuitry to perform a task. This task can be completely fixed, or it can adapt itself to a previously envisioned set of possible conditions. An important point to note is that the resulting capabilities of a microprocessor-based system will be determined by the thought and ingenuity put by the user into the control sequence or *program*.

Typical steps required to put together a microprocessor-based system are illustrated in Fig. 1. The first step is to build a general hardware system based around the microprocessor, including input and output lines, indicating devices, control switches, and so on. If this step is carefully considered before the wiring is started, the hardware construction phase need only be done once.

Next, the software (program) must be written. Then the program is stored in the hardware and a test run is performed. The chances are very good that the system will not perform properly the first time (it will have *bugs* or mistakes in it) and that a return to the software writing stage will be necessary. This is an important point because the *software* is reworked, *not* the hardware.

If, at a later date, the user wishes to change the features of the system, it is merely necessary to go back to the software writing stage. This type of system is very flexible.

Numbers, Numbers, Numbers . . .

The most basic piece of information that digital computers work with is called a *bit*. A bit may only have one of two possible values, "1" or "0." These values may be associated with "on" or "off," "true" or "false," "5 volts" or "0 volts," and even "key down" or "key up." All of the information processed by a computer must be represented as a combination of bits.

Normally, a microprocessor will work with at least four bits at a time. It is most convenient to think of this group of bits as a number, either a *binary*, *octal*, *decimal*, or *hexadecimal* number. Table 1 shows the correspondence between these four types of numbers for the decimal numbers 0 through 16. The decimal number system is the system with which we are all familiar. Octal numbers (base 8) and hexadecimal numbers (base 16) separate the binary bits into groups of 3 and 4 bits respectively. For example, the binary number 10111001101₂ can be written 10 111 001 101₂, or in octal 2715₈. Similarly, 101 1100 1101₂ becomes the hexadecimal number 5CD₁₆.

We can think of a microcomputer as being built from four basic elements:

¹ Dodd, "The Contester," QST, February, 1975.

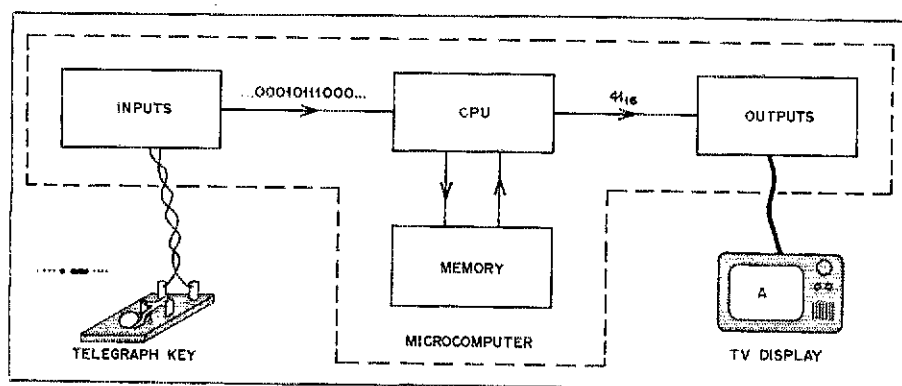


Fig. 2 — A block diagram of a microcomputer system used to decode Morse code. The microprocessor is the block marked CPU.

- 1) Inputs
- 2) Central processing unit (CPU) or microprocessor (μP)
- 3) Memory
- 4) Outputs

For example, Fig. 2 shows a block diagram of a microcomputer system being used to decode Morse code. The inputs decide whether the key is up or down and pass this information, in the form of binary bits, to the microprocessor or CPU. The CPU uses this information along with the program, stored as numbers in the memory, to decide what character is being received. It then produces a number which is passed to the outputs.

Since the microprocessor can only work with numbers, it uses numbers to represent characters. In the diagram, the letter *A* is represented by the hexadecimal number 41_{16} . The TV display takes this number and converts it to the character *A*.

The Building Blocks

Let's take a closer look at the operation of each of the four major blocks in Fig. 2.

The job of the inputs and outputs is to *interface* the microcomputer with the outside world. The input to the com-

puter may be a telegraph key, a typewriter keyboard, or a voltage corresponding to SWR on a piece of coax. The input block must convert these signals to numbers composed of bits. Remember that the CPU can work only with numbers.

The output block performs just the opposite task. It takes the numbers produced by the microprocessor and produces some desired output, for example, the printing of letters on a teleprinter or controlling the rotor on an antenna.

This input and output process, which is done by the interface circuitry, is commonly referred to as *I/O* for input/output. The number of devices or signals which can be connected to a microcomputer through the input and output blocks is limited only by the task to be performed by the final system and the imagination of the designer. Because of the similarity of their functions, we will group the inputs and outputs into a single I/O block.

The memory block normally performs two distinct tasks: It holds or remembers the series of instructions making up the program, and it holds or remembers numbers produced by the CPU which will be needed for later

calculations. The former is referred to as *program memory*, the latter as *data memory*.

In general, each *memory location* will hold several bits of information. A typical memory bank will have several thousand locations. Each location may be referred to by its *address*. This can perhaps be best explained using the analogy of post office boxes, as shown in Fig. 3. In this example, our memory has 16 locations, or boxes, numbered 0 through 15. Each box contains a number composed of 8 bits. Note that location 12 contains "01011100" or $5C_{16}$ in hexadecimal notation.

The CPU can *read* a number from memory by specifying the address or location where that number is stored. Most types of memory will allow the CPU to *write* numbers into memory also. In this case, the microprocessor gives the memory two numbers: The first is the address where the data is to be written or stored, and the second is the data or number to be saved.

The central processing unit (CPU) or microprocessor (μP) is that portion of the microcomputer which makes decisions and performs arithmetic computations. Various microprocessors differ in their internal structure and operation, but for the purposes of our discussion, we will use the simple architecture shown in Fig. 4. The clock-and-timing circuits control the sequence of events required to *execute* an instruction from memory. Although it is very important to the internal logic, we will not worry about the details of its operation.

The *program counter* (PC) is a register which holds the address of the program memory location where the next instruction to be executed is contained. The number in this location is

Fig. 3 — A memory can be considered as a bunch of mailboxes, each holding a number. The contents of location 3 is the value zero.

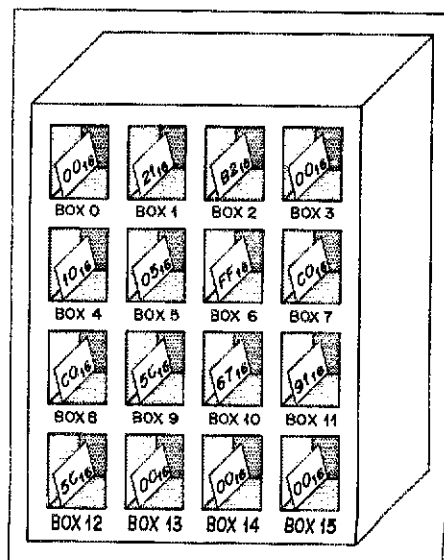


Table 1

The four typical number systems used by digital computers.

BITS	BINARY	OCTAL	DECIMAL	HEXADECIMAL
00000	0 ₂	0 ₈	0	0 ₁₆
00001	1 ₂	1 ₈	1	1 ₁₆
00010	10 ₂	2 ₈	2	2 ₁₆
00011	11 ₂	3 ₈	3	3 ₁₆
00100	100 ₂	4 ₈	4	4 ₁₆
00101	101 ₂	5 ₈	5	5 ₁₆
00110	110 ₂	6 ₈	6	6 ₁₆
00111	111 ₂	7 ₈	7	7 ₁₆
01000	1000 ₂	10 ₈	8	8 ₁₆
01001	1001 ₂	11 ₈	9	9 ₁₆
01010	1010 ₂	12 ₈	10	A ₁₆
01011	1011 ₂	13 ₈	11	B ₁₆
01100	1100 ₂	14 ₈	12	C ₁₆
01101	1101 ₂	15 ₈	13	D ₁₆
01110	1110 ₂	16 ₈	14	E ₁₆
01111	1111 ₂	17 ₈	15	F ₁₆
10000	10000 ₂	20 ₈	16	10 ₁₆

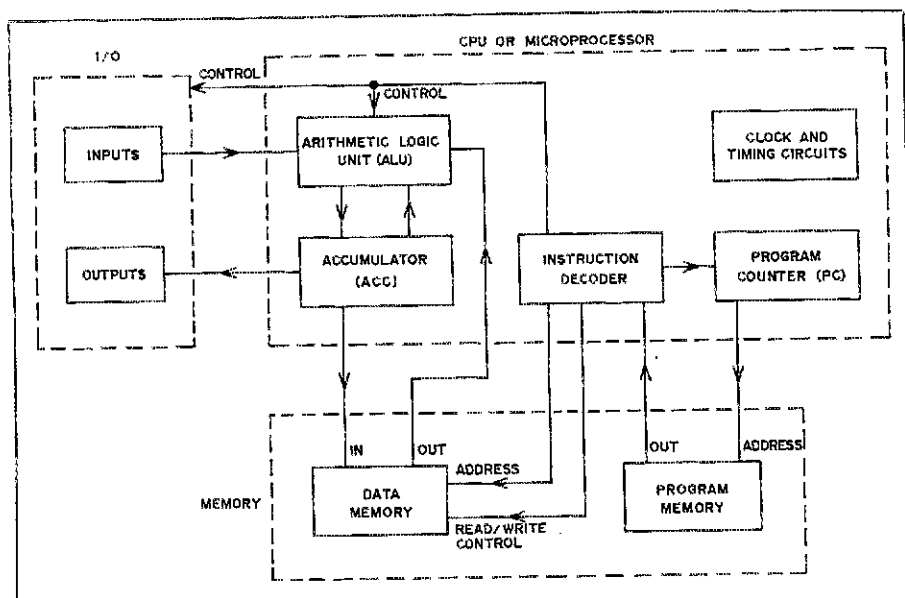


Fig. 4 — The architecture of a typical microprocessor showing the five major components.

decoded by the instruction decoder which then controls the operation of the arithmetic logic unit (ALU), PC, I/O, and data memory.

The arithmetic logic unit actually performs all the operations on numbers which are done by the CPU. The result of the ALU operation is stored in a register called the *accumulator* (ACC).

Typical Instruction Execution

Most of the microprocessors currently on the market have between 30 and 100 different instructions which they recognize. In order to show the interaction of the various components shown in Fig. 4, let's follow the execution of three typical instructions. For the sake of discussion, we will use the memory contents shown in Table 2.

1) *An I/O instruction:* Suppose the program counter contains the decimal number 25. At the beginning of an *instruction cycle*, the number 25 will be sent from the PC to the program memory as an address. The program memory will respond by sending 15, the number stored in location 25, to the instruction decoder. The instruction

decoder looks at this number to decide what the microprocessor is being instructed to do.

If, for example, the instruction 15 means to read input 5, the instruction decoder would cause the value (0 or 1) of input line 5 to be transferred to the accumulator through the ALU. (Input line 5 could be connected to a telegraph key.) Finally, the instruction decoder will add 1 to the contents of the PC, so that the program counter points to the next instruction.

Anytime the instruction decoder receives a 15 from the program memory, it will do the same thing: Read the value of input line 5 into the ACC and increment the PC by 1.

2) *An ADD instruction:* Suppose location 26 of the program memory contains a 48. After executing the input instruction outlined above, the PC will point to address 26. Assume 48 means add the contents of data-memory location 8 to the accumulator.

The instruction decoder sends an 8 on the address lines to the data memory. It also indicates to the memory that a read operation is to be per-

formed. The data memory then returns the contents of location 8 to the ALU. Finally, the instruction decoder signals the ALU to add the number in the ACC to the number coming from the data memory. This sum is then stored in the accumulator and the PC is incremented by 1.

3) *A conditional jump instruction:* This is the instruction that makes the microcomputer a powerful tool, because it allows the CPU to make a decision. Suppose locations 27 and 28 of program memory are 30 and 16 respectively. After executing the ADD instruction, the next instruction to be decoded will be 30. Assume the 30 tells the instruction decoder the following: a) If the ACC equals zero, take the contents of the next location in program memory, and store it in the PC; b) If the ACC is not zero, add 2 to the PC.

In other words, this instruction will cause the CPU to *jump* to a different part of the program if the accumulator is zero. If the ACC is not zero, the program will continue with the instruction in location 29, a 12 in our example. This is called a conditional jump instruction, because the CPU may choose what group of instructions is to be executed next, depending on the condition of the accumulator.

To illustrate the two possible outcomes, consider all three instructions as a small program. Starting at location 25, if input line 5 had a 1 on it, the ADD instruction would leave the accumulator equal to zero. Therefore, the *CONDITIONAL JUMP* stored in locations 27 and 28 would leave a 16 in the program counter. On the other hand, if the input on line 5 was 0, the result of the ADD would be a -1 in the ACC, and the jump instruction would leave the PC equal to $27 + 2 = 29$. Hence, the program will start executing at program-memory location 16 if the input is a 1, or continue executing at location 29 if the input is a zero. If a telegraph key was connected to this input line, locations 25 through 28 would cause different parts of the program to be executed, depending on whether or not the key was up or down.

In this part of the series we have given you an idea of the possible uses for a microprocessor, what a microcomputer system contains, and a very brief idea of how it works. In Part 2 we will talk in greater detail about programming and include a glossary of terms. A brief description of an adaptive Morse code decoder and repeater controller, along with suggestions for choosing and building a hobbyist's microcomputer set-up, and a list of microprocessor manufacturers will comprise Part 3, the concluding part. Part 2 of this series will appear in a subsequent issue of *QST*.

Table 2

A possible sequence of instructions and data in the memory of a microcomputer.

PROGRAM MEMORY		DATA MEMORY	
LOCATION	CONTENTS	LOCATION	CONTENTS
—	—	—	—
24	10	7	5
25	15	8	-1
26	48	9	0
27	30	—	—
28	16	—	—
29	12	—	—
—	—	—	—
—	—	—	—
—	—	—	—

Another Look at Reflections

Part 7: My Transmatch really does tune my antenna.[†]

By M. Walter Maxwell,* W2DU/W8KHK

The birth of this series touched off a bombshell aimed at SWR misconceptions, emitting shock waves impacting on novices and old-timers alike. The myth believers among them were caught with their feed lines dangling at 1.05:1 — and with the low-viswarmaniacs screaming at them to “Get that SWR down!” and Maxwell shouting “If ya do, it’ll kill ya!” They didn’t know whether to burn their noise bridges behind them or to lock their VFOs on the resonant frequency of the antenna. Probably the misconception causing the greatest shock of all concerns reflection loss — the “lost reflected power” excuse offered by low-viswarmaniacs in defense of their insistence on low values of SWR on the feed line. This misconception was blasted to extinction by explaining the concept of conjugate matching in an unusual way — from the viewpoint of reflections and wave action on the line. From this viewpoint (which involves both reflection loss and reflection gain), the conjugate match concept emerged as a basis for understanding the lost-reflected-power myth. However, while reflections from this series show that the blast dispelled the myth for many readers, some are apparently jousting for another round. So let’s take aim for the seventh round by reiterating a basic principle of matching, after which we’ll contemplate some enticing aspects of line-matching networks. In this part we will see in an intriguing way how transmitters are matched to mismatched feed lines by the pi-section network (Fig.

12), or by an external network (Fig. 11).

The principle that maximum efficiency is obtained when a feed line is perfectly matched to an antenna — no reflections on the feed line, and a 1:1 SWR — is so well known it hardly needs repeating. Even so, it is recited in practically every good textbook on the subject. So it is important to appreciate that no statement in this series violates this principle, nor suggests any disagreement with it whatever. The misconceptions we are attempting to clarify concerning lost reflected power stem simply from misuse of the perfect-match principle in its practical applications.

Ironically, textbooks may be a bit responsible for this misuse. While extolling the virtues of the perfect match, many authors fail to explain how much (or how little) one loses when the load is mismatched, if compensated with the conjugate match. Those authors generally present the case for the ideal load match in terms of single-frequency operation, and practically ignore the unique, multifrequency operations of the radio amateur. We have frequency bands, not single, specific frequencies — and we want to operate our VFOs anywhere within those bands. Since the antenna impedance changes as we change frequency, relaxation of any antenna/feed-line matching restriction is necessary if we are to enjoy such operating freedom. Although many engineering texts discuss loss versus load mismatch, few textbooks discuss multifrequency antenna-matching situations where conjugate matching usually exists. Consequently, an overly rigorous application of the perfect-load matching principle has unwittingly been thrust upon us by dozens of misleading statements appearing in various amateur journals. Add to this a prevalent misconception of pi-network loading principles. Result? The “lost reflected power” syndrome and the mania for low SWR. Thus, providing guidance for the ama-

teur concerning match quality and efficiency in his multi-frequency operation is the primary purpose of this series.

For example, the graph in Fig. 9, Part 6, displays transmission loss in dB versus SWR for various values of line attenuation. This graph shows that maximum efficiency is indeed obtained with a perfect match. On the other hand, it also provides dramatic evidence that when using conjugately matched, low-loss feed line, the difference between having either a perfect load match or a moderately high SWR is practically insignificant in terms of power transferred to the antenna. In other words, through the use of conjugate matching, the antenna accepts the maximum available power from the transmitter, even when the feed line and antenna are mismatched, and with the antenna off resonance.³¹ The conjugate match allows us to tolerate this load mismatch because the reflection loss caused by the mismatch is compensated by reflection gain provided by the conjugate match. Consequently, the transmitter is properly coupled to its desired load impedance and the reflected power is conserved. Underlying these intrinsic characteristics of the conjugate match is *system resonance*, which compensates for the effect of the off-resonant state of the antenna.

For the myth believer who is still unconvinced of the wondrous compensating powers of conjugate matching, let me quote Everitt on the Maximum Power-Transfer Theorem from classical network theory (Ref. 17, page 49).[‡] Its relation to feed-line antenna matching is indicated in the parentheses: “The maximum power will be absorbed by one network (the antenna) from another (the feed line) joined to it at two terminals, when the impedance of the receiving (load) network (the

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†Previous parts of this series appeared in *QST* for April, June, August and October, 1973, and for April and December, 1974.

‡This and all subsequent references in italics refer to the bibliography which appeared at the end of Part 1 of this series; supplemental listings appear at the ends of Parts 3, 5, 6 and at the end of this part.

³¹Remember, *impedance mismatch* does not cause current to flow on the outside of the coaxial feed line. (See Part 5, *QST*, April, 1974, p. 27.)

antenna) is varied, if the impedances of the two networks at the junction are conjugates of each other." (Everitt then presents the proof.)

The expressions in Eqs. 12 and 13 (plotted in Fig. 9, Part 6) illustrate this theorem for the case where a feed line is the sending network. These expressions show that when the networks are conjugately matched, meaning the transmitter is tuned to the line, (1) there is no loss at the terminals joining the networks, (2) there is no loss in the sending network, the feed line, when that network attenuation is zero, and (3) if the sending network has attenuation other than zero, the transmission loss results only from the attenuation. For further discussion the reader is referred to Part 2, p. 21, Part 4, p. 25, and Part 5, p. 163, of this series.

The wave action through which conjugate matching and reflection gain are achieved was illustrated in Part 4 using the stub form of matching to develop the wave action. The stub form was used for the illustration because it is easy to visualize. But since it's not a practical form to use if frequent changes in frequency are contemplated, let's see how conjugate matching is performed using devices which are easily adjusted to perform at any desired frequency. Such devices are the Ultimate Transmatch (Ref. 41), a T network, L, pi, and other types of networks. We will see that these devices can perform the matching function at the *input* of a feed line, and that the feed line can be of *any* length. We will also see how, in some instances, line-input matching is performed by the transmitter tank circuit itself.

Match at the Line Input

Before going further the reader may ask, "Why match at the *input*?" The answer is that without matching at the feed-line input we have very little operating flexibility. In the absence of a line-matching network we are restricted to operating in a narrow portion of a band (especially 80 meters) unless effective measures for broadbanding the antenna itself have been taken. We are restricted because, as we deviate from the antenna-resonant frequency, the resulting increase in feed-line/antenna impedance mismatch is transferred to the line input as an increased transmitter/feed-line impedance mismatch. As a result, the transmitter load impedance varies beyond acceptable limits; the transmitter fails to load properly, and it can be damaged by overloading or by arc-overs caused by underloading. These phenomena (plus an unawareness of the remarkable performance capabilities of line matching) are largely responsible for the traditional low SWR mania. On the other hand, simple im-

pedance matching at the feed-line input provides stupendous improvement in operating flexibility because the matching network compensates for the impedance changes at the feed-line input, and provides the correct load impedance for the transmitter at whatever frequency we select within an entire band. Correct load impedance is obtained by simply adjusting the network, conveniently located at the operating position.

So the next question is, "Why not broadband the antenna and avoid having to retune a matching device when changing frequency?" The answer is that we can, but only to a limited degree. This is because, for example, broadbanding techniques which would permit coupling the average amateur transmitter directly into the feed line over the entire 80-meter band (with no adjustments other than retuning the transmitter) are not practical in the average amateur situation. This includes the coaxial dipole (sometimes called a "double bazooka") which, contrary to prevalent opinion, fails to deliver any significant bandwidth improvement over a simple dipole when it is fed with the usual 50-ohm feed line. While this statement may appear a bit incredible, a revealing analysis by the writer appears in *Ham Radio* for August, 1976 (Ref. 62).

An explanation of how either a final tank network or an external line-matching network performs conjugate matching from the viewpoint of reflections is really a continuation of Part 4. However, to dramatize both the availability and the advantages of matching at the feed-line input, we digressed in Parts 5 and 6 to highlight some of the wrong reasons for using low SWR. These reasons show that, in the mania for obtaining low SWR on the feed line, we have often put misplaced emphasis on matching at the wrong end of the line. As stated previously, the principles of wave reflection found in stub matching are also applicable to other matching schemes, such as series quarter-wavelength transformers, L, T, pi networks, and so on. Since some of the concepts we will be discussing were presented in detail in Part 4, you may wish to refer again to that section.

The Intermediate Role of the Quarter-Wavelength Transformer

How many remember the "Johnson Q Match"? And how many have used a quarter-wavelength section of 70-ohm line to match a 100-ohm resistive load to a 50-ohm feed line? Both are examples of series $\lambda/4$ transformers. In addition to requiring an electrical length of 90 degrees, impedance matching is accomplished in these transformers because of a specific relationship between

their characteristic impedance Z_c and the impedances being matched. To perform the matching, the transformer impedance Z_c must have a ratio relative to its input impedance Z_i which is the inverse of the ratio relative to its output impedance Z_o e.g.,

$$\frac{Z_i}{Z_c} = \frac{Z_c}{Z_o} \quad (\text{Eq. 14})$$

In other words, the impedance required of the transformer is the geometric mean value of the two impedances being matched, stated simply by the well-known expression

$$Z_c = \sqrt{Z_i \times Z_o} \quad (\text{Eq. 15})$$

Both the impedance and the length of the $\lambda/4$ transformer play important roles in clarifying the principles underlying all forms of line-matching networks. Since these roles are not generally well understood, let's examine them.

It was shown in Part 4 that reflections play a necessary role in impedance-matching operations. We saw that conjugate matching is obtained by canceling the reflections from a load mismatch by wave interference. The interference is set up by new, separate reflections generated by a separate mismatch introduced at a desired matching point. The mismatch introduced at the matching point is tailored to complement the load mismatch, so that the new reflection will have the same magnitude and opposite phase (at the matching point) as the reflection generated by the load mismatch. The reflection generated by this complementary mismatch is called either a complementary, or a canceling reflection. In stub matching, the complementary mismatch is introduced by the stub. While investigating complementary reflections generated by stubs, we observed the wave action through which the $\lambda/4$ transformer performs the matching (Part 4, Table 1 and Fig. 7D). While analyzing the effects of using various stub and transformer lengths in matching a resistive load to various feed lines having different values of impedance, we found that when the feed-line impedance is equal to Z_i (relative to transformer impedance Z_c and load impedance Z_o in Eqs. 14 and 15), the transformer length became 90 degrees, and the stub length became zero. In this case the complementary reflection is generated by the mismatch appearing at the junction of the feed line and the transformer. This mismatch results from the abrupt change in impedance (Z_i to Z_c) encountered by the forward wave as it propagates out of the feed line (Z_i) into the transformer (Z_c). This mismatch is complementary to the resistive load

mismatch in magnitude because the ratio between the feed line and transformer impedances (Z_l/Z_c) is the same as between the transformer and load impedances (Z_c/Z_o). Thus the reflections generated by both load mismatch and transformer-input mismatch are equal in *magnitude* (as required to obtain perfect cancellation), because both mismatches are equal in magnitude.

Since the input and output mismatches are physically separated by 90 degrees, they are also complementary in relation to the *phase* of the reflections appearing at the matching point (also required for cancellation). The wave reflected by the input mismatch has zero distance to travel relative to the matching point. But the 90-degree separation results in a travel of 180 degrees for the wave reflected by the load mismatch — 90 degrees from the input to the load, plus the 90-degree return trip. Thus the load-reflected wave arrives at the matching point with a 180-degree phase difference relative to the input-reflected wave. We now have two complementary reflected waves — equal in magnitude and opposite in phase at the matching point. Consequently the two waves mutually cancel, resulting in total reflection of both waves into the transformer to propagate in the forward direction, as explained in Part 4. The voltage and current components of both re-reflected waves are in phase with their corresponding components of the source wave; hence a conjugate match appears at the transformer input, all of the power reflected from the load mismatch which reaches the transformer input is again on its way to the load, and no reflected wave appears on the feed line.

This $\lambda/4$ -transformer matching action deserves serious study. Why? Because it provides an intermediate step in understanding how matching can be achieved at the input of a line transformer of *any random length*, and which may have *any impedance* for its terminating load, such as the complex impedance $Z_a = R_a + jX_a$ of a mismatched, off-resonant antenna. And this line transformer is none other than the feed line so many strive to operate with no reflections by simply restricting its load to a matched, resonant antenna!

Input Line-Matching Networks

Now let's examine external line-matching networks (such as the Ultimate Transmatch) from the viewpoint of conjugate matching with reflections. Referring to Fig. 7D of Part 4, we replace the 90-degree transformer (T) with the combination of an adjustable network and a line of *random length* to connect the mismatched load (antenna) to the network. This arrangement is

shown in Fig. 11. The line connecting the network to the antenna will now be called the "transformer line." The line connecting the transmitter to the network is the "feed line," as before. The matching point is defined as the junction of the feed line and the input of the network.

In a manner which will be explained later, the transformer line (which can have *any* value Z'_c) transforms the complex antenna impedance $Z_a = R_a + jX_a$, to a second impedance $Z_2 = R_2 + jX_2$ at the transformer-line input. The network then transforms Z_2 to a third impedance $Z_3 = R_3 + jX_3$ at the matching point. When the network is correctly adjusted, Z_3 is a pure resistance equal to the feed-line impedance Z_c . ($Z_3 = R_3 + j0 = Z_c$) Thus the antenna impedance Z_a is conjugately matched to the feed-line impedance Z_c , which is a proper load for the transmitter (Ref. 17, p. 243). Without the network the transmitter load would be impedance Z_2 , well known for deviating far beyond the range of matching capability for most transmitters. However, by adding the network we obtain the conjugate match by simply adjusting the network to transform R_2 to equal the feed-line impedance Z_c at the matching point, and to cancel any transformer-line reactance X_2 to zero at the matching point.

Let's now examine the transformation of impedance Z_2 more closely. The variations of resistance R_2 and reactance X_2 of impedance Z_2 are dependent on three different factors: Antenna impedance Z_a , and both the length and the impedance Z'_c of the transformer line. A study of Part 4, pages 27-28, will show that for given antenna and transformer-line impedances, a length of line can be found that will make $R_2 = Z_c$, but will yield reactance X_2 which requires canceling to obtain a match (for example, with a stub as shown in Fig. 7A or 7B). Another length can be found that will make X_2 become zero, but now R_2 will not equal Z_c (still no match). There is *no* length that will yield $Z_2 = R_2 + j0 = Z_c$. This situation illustrates the typical, endless cat-and-mouse game we play in trying to load the transmitter by changing line lengths. A fanciful solution to this problem would be a line of variable length, plus a device for dumping the unwanted reactance. So how can we possibly solve the problem using a fixed, random-length line? Because, as we now discover, the line-matching network is a star performer! We know from elementary transmission-line theory that a transmission line is made up of an infinite number of tiny distributed series inductances and shunt capacitances, so it should not be surprising that we can adjust the electrical length of a line of a

given physical length by adding lumped inductances or capacitances. Indeed, by a proper selection and adjustment of reactances arranged in an appropriate L , T , or π configuration we can simulate a line having *any desired electrical length* without specifying any physical length whatever (Refs. 8-13; 19, p. 115; 21; 22; 24; 30; 31; 41; 61; 63).

When a matching network is adjusted to obtain a conjugate match between the antenna and feed-line impedances, it performs the following two feats. First, it creates the effect of stretching the electrical length of the transformer line to make it reach the matching point, so that the resistance R_2 (at the input of the physical transformer line) is transformed to $R_3 = Z_c$. And second, it introduces reactance $-X_3$ to cancel the stretched-transformer-line reactance X_3 appearing at the matching point, in the same manner as a stub would perform in stub matching.

The introduction of reactance $-X_3$ at the matching point constitutes a complementary mismatch which generates a canceling reflection having equal magnitude and opposite phase relative to the reflected wave arriving at the matching point from the mismatched antenna. The matching network has thus provided the proper *overall* transformer length to obtain both the desired transformation of the resistance component, and a canceling-phase relation between the load-reflected wave and the canceling reflected wave. And in addition, the network has provided the complementary mismatch ($-X_3$) which generated the canceling wave. Consequently, the network has also transformed a dream into reality by conjuring up the fanciful variable-length line and means for dumping the unwanted reactance.

An ideal setup for observing the action while performing the tuning adjustments of the network includes an rf ammeter in the transformer line to indicate line current (a meter in each conductor if using balanced, two-wire line), and a dual-meter reflectometer to indicate forward and reflected power simultaneously in the feed line. It is important that the reflectometer be adjusted initially to indicate zero reflected power with the feed line terminated in a pure resistance equal to the feed-line impedance. The tuning adjustments are complete when we obtain maximum current in the transformer line simultaneously with maximum forward and zero reflected power in the feed line. Of course, because of standing waves on the transformer line, we will obtain different values of line current depending on where along the line the ammeter is inserted. However, our only interest is in seeing *changes* in

relative current to indicate when maximum network output occurs during the tuning adjustments; thus neither absolute line current, nor where the meter is inserted, is important.

The simultaneous indication of maximum current in the transformer line and zero reflected power in the feed line denotes four significant factors for comparing the wave actions involved in conjugate matching with a line-matching network and matching with the $\lambda/4$ transformer described earlier. First, proper network adjustment establishes the complementary mismatch between the feed-line termination and the network input which produces the canceling reflection at the matching point. Second, at the matching point the canceling reflection is equal in magnitude and opposite in phase relative to the load-mismatch reflection. Third, the canceling reflection and the load-mismatch reflection nullify each other at the matching point. Consequently, a purely resistive impedance equal to the feed-line impedance Z_c appears at the network-input terminals, while reflections and a standing wave remain on the transformer line. And fourth, observing the transformer-line current rising to maximum while the reflected power in the feed line drops to zero provides visible evidence that the power reflected from the load mismatch is indeed re-reflected by the complementary mismatch at the matching point.

Incidentally, it is good practice to have an ammeter permanently

connected in the transformer line. Here's why. If your matching network effectively comprises more than one L -section, you can generally obtain a match (zero reflected power in the feed line) with several different combinations of network L and C tuning. However, minimum network loss (which corresponds to highest maximum transformer-line current) usually occurs while using the maximum C and minimum L at which a match can be obtained. Monitoring transformer-line current during tune-up lets you select the L - C combination yielding the highest output line current; it also ensures against inadvertently obtaining an L - C combination which gives a false indication of a match, but yields little output and instead heats the network inductance. To ensure quick resetability and to minimize on-the-air tune-up time, L and C settings for the best combination should be logged whenever the network is tuned to a new frequency. The transmitter should be tuned initially into a dummy load, then the network tuned into the antenna using the lowest power at which the reflectometer provides a satisfactory indication.

Tank Circuit Line Matching

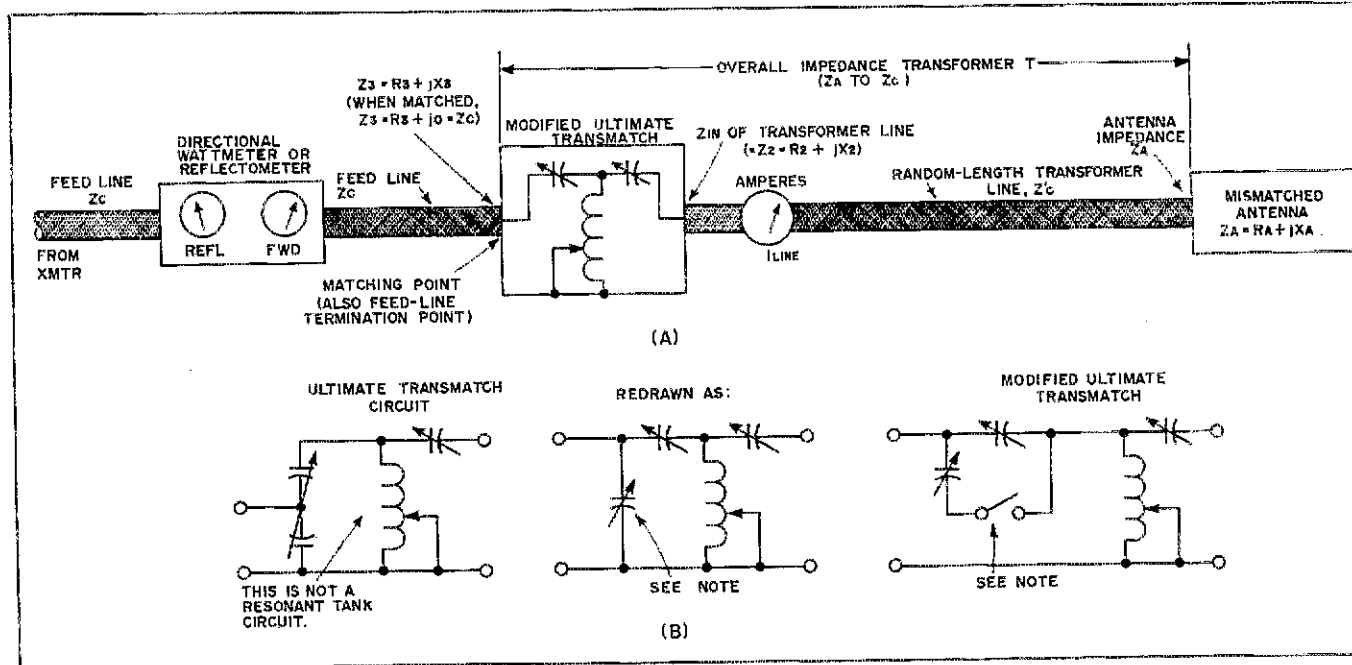
Let's now examine the case where the final amplifier tank circuit performs the line-matching function. To differentiate from the external network we will call this network the "tank network." Comparing Figs. 11 and 12, we see that, in general, the transformations of

impedance from Z_a to Z_3 are identical whether using the tank network or the external network. The principal difference is the range of the transformations performed by the two networks. With the external network, impedance Z_2 is transformed to a value of Z_3 , matching the feed-line impedance Z_c . When the tank network is used alone, impedance Z_2 is transformed to match directly the load impedance Z_L of the generator. Now a requirement for a generator (tube or transistor) to deliver its maximum available power into a load (the loaded tank circuit) is for it to see an impedance which we call the *optimum load impedance*, Z_L (not the same as internal impedance, Z_p). In practice, impedance Z_L is usually resistive, so that $Z_L = R_L + j0$. Thus the generator is properly loaded when it sees impedance $Z_3 = R_L + j0$ (which is $R_3 + j0$) looking into the tank network. The generator is underloaded with R_3 larger than R_L , overloaded with R_3 less than R_L , and it will have higher than normal dissipation if Z_3 contains any reactance X_3 .

When using the tank network alone to perform the matching, the impedance value of Z_3 is determined by two factors: The impedance value of Z_2 loading the network, and the impedance transformation ratio of the network. The transformation ratio is somewhat variable (using the tuning and loading capacitors, $C1$ and $C2$), providing a range of impedance-matching capability. This matching range allows impedance Z_2 to be any value which the network can transform to the impedance Z_3 .

Fig. 11 — Conjugate matching with a Transmatch or other matching network external to the transmitter. The impedance of the feed line, Z_c , is usually 50 or 75 ohms in most amateur applications, but the impedance of the transformer line, Z' , may be any value, and may be of open-wire or coaxial type. The matching network at A is a

modified Ultimate Transmatch (Ref. 41), as shown at B. NOTE: In the redrawn circuit at B (center) the shunt input capacitor is not needed to obtain a match, and the capacitor range may be increased by reconnecting as shown at the right.



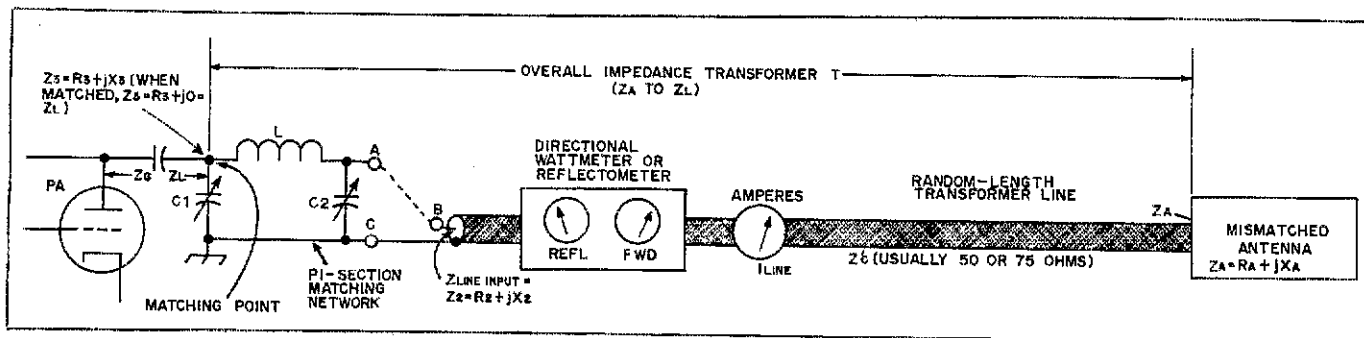


Fig. 12 - Conjugate matching with the transmitter final-amplifier tank circuit. Z_L is defined as the optimum load impedance of the generator — the impedance into which the generator delivers its maximum available

power. This impedance must not be confused with the internal impedance of the generator, Z_g ; they are not the same.

$R_L + j0$ by adjusting the tuning and loading controls.

Now we can summarize the principal operating conditions involving transformation of antenna impedances to the optimum load impedance for the generator.

Case 1

Antenna impedance $Z_a = R_a + j0$ (resonant) is matched to the transformer line, and the tank network is used alone — no external matcher: Here antenna impedance Z_a equals the impedance of the transformer-line, Z_c , the SWR on the line is 1:1, and impedance Z_2 is equal to the line impedance. If the transformer-line impedance Z_c is the commonly used 50 ohms, the tank network yields the proper generator-loading $R_L + j0$ with the same tank adjustment settings as obtained when tuning up with a 50-ohm dummy load.

Case 2

Antenna is operated somewhat off resonance. Its impedance $Z_a = R_a + jX_a$ yields a mismatch to the transformer line so as to transform Z_a to an impedance Z_2 that is within the matching range of the tank network (for transformation to $Z_3 = R_L + j0$). Again the tank network is used solo.

Case 3

Antenna operated off resonance beyond matching range of tank network. Here the tank network is used in conjunction with an external network. An impedance $Z_3 = R_L + j0$ cannot be obtained with the tank network alone, and the generator would be either underloaded, overloaded, or reactively loaded. We remedy this situation by inserting an external line-matching network (as in Fig. 11), which transforms impedance Z_2 to an impedance Z_3 that is within the range the tank network can transform to $R_L + j0$.

Case 1 needs no comment, so let's refer to Fig. 12 and examine the action in the tank network as it performs the matching function under the conditions of Case 2. As stated earlier, when our

generator is the commonly used Class AB, B or C amplifier, its optimum load impedance Z_L and its internal impedance Z_g are not the same. Although the explanation is beyond the scope of this article, it can be shown that Z_g effects only a light, high-impedance loading on the input of the tank network. Thus the input of the network (the matching point) is practically open circuited to energy traveling toward the generator. Consequently, waves reflected from a mismatched antenna (which cause impedance Z_2 to deviate from Z_c) enter the network at its output terminals and become almost totally reflected on arrival at the open-circuited input. When the network is tuned to resonance, voltage and current components of the reflected waves are reflected in phase with the corresponding source-wave components emanating from the generator. Thus the generator sees a resistive load $Z_3 = R_3 + j0$, and the reflected power adds to the generator power. This is why a directional wattmeter (or reflectometer) indicates a higher forward power than the generator is actually delivering when reflections are present on the transformer line. (See Part 4.)

Adjustment of capacitance C2 (the loading-control capacitor) to the value which provides optimum generator loading adjusts the network to transform R_2 to $R_3 = R_L$. When R_2 changes, following a change in antenna impedance Z_a , C2 can then be varied to modify the network transformation ratio to transform the new value of R_2 to $R_3 = R_L$. The tuning capacitor, C1, is then readjusted to return the network to resonance and we again have optimum generator loading. The range of R_2 values which can be transformed to $R_3 = R_L$ by varying C2 is determined by the design parameters of the network (Refs. 4, 63, 64). However, when the line input impedance Z_2 loading the network contains reactance X_2 , this reactance shifts the available range of capacitance provided by the loading-control capacitor, C2. This shift occurs because reactance X_2 appears in parallel

with the loading capacitor reactance. Consequently, for a proper setting of the loading capacitor where $X_2 = 0$, a capacitive X_2 increases the effective capacitance C2 (decreasing loading), while an inductive X_2 decreases C2 (and increases loading). Thus, to obtain a proper loading when X_2 is present, the setting of the loading-control capacitor must be shifted from the $X_2 = 0$ position to compensate for the additional line-reactance X_2 . Providing R_2 is within the matching range, proper loading will be attainable as long as X_2 doesn't exceed the value which the loading-control capacitor range can accommodate to maintain the value of C2 required to transform R_2 to $R_3 = R_L$.

If reactance X_2 is too large for the loading capacitor to compensate, we have conditions as described in Case 3. However, there are simple remedies for this condition if R_2 is within matching range of the tank network, but X_2 is not. Here we can simply add a compensating reactance in series with the rf output (between points A and B in Fig. 12) which cancels the line reactance X_2 . On the other hand, if the resistance component R_{2P} of the equivalent parallel-circuit of impedance Z_2 is within the matching range, the compensating reactance should be added in shunt across the rf output (between points A and C). Whether the compensating reactance should be capacitive or inductive can be determined experimentally by trying first one kind or the other to see whether loading is improved or worsened. The correct kind and value of compensating reactance has been found when proper loading can be obtained with a convenient setting of the loading-control capacitor. An excellent discussion of this subject by Grammer appears in the literature (Ref. 4, Part 3). When using this matching technique with the tank network alone, an adjustment of transformer line length can be of great assistance in obtaining values of impedance Z_2 which are most favorable to the matching range of the network. This

subject of impedance transformation versus line length will be discussed in a later installment in this series of articles.

When operating under the conditions of Case 2, tuning up into a dummy load requires special care; it can be troublesome since the actual load often differs widely from the dummy-load value. If the tank network is first tuned into the dummy load and then switched to the transformer-line input impedance Z_2 (Fig. 12), the tank network must be *retuned* to the new impedance Z_2 ! Failure to retune to the actual operating impedance Z_2 after tuning up into the dummy load results in an improper load impedance Z_3 for the generator — it is no longer $Z_3 = R_L + j0$ because the tank-network loading has changed. Without retuning, the generator is then either underloaded, overloaded or reactively loaded. In addition to the possibility of damaging the amplifier if operated in this mistuned condition, you also lose power! Because of this mistuning, the generator *delivers less power* by the amount of the reflection loss resulting from the line mismatch, as shown in Part 6, Fig. 9, on the curve labeled "Reflection Loss Without Conjugate Match" at the appropriate SWR ordinate. For example, if the line SWR were 3:1, the generator output drops by 25 percent while it sees the improper load. On the other hand, retuning the network to the actual operating imped-

ance Z_2 establishes a conjugate match that restores the proper generator load impedance $R_L + j0$, and the generator again delivers its maximum available power. (See Part 6, pp. 14-15.)

But you ask, "How do we determine when proper loading is obtained, or that impedance Z_2 is within the matching range of the network?" The answer is simply by completing a normal tuning and loading operation in which you can obtain the same plate-current, plate-current dip (and screen-current) readings as those obtained with the dummy load. However, tuning- and loading-control settings, and the relative power (output voltage) will generally differ from those obtained with the dummy load, depending on how much Z_2 differs from 50 ohms. If normal plate current (and dip) cannot be obtained with any setting of the loading capacitor, Z_2 is outside the matching range and we have conditions as defined in Case 3. If proper loading cannot be obtained using the simple series or shunt reactance compensating technique described earlier, then a more complex network is required. However, I would like to emphasize that *any* value of $Z_2 = R_2 + jX_2$ can be transformed to a suitable value for loading the tank network by selecting a proper network configuration (Refs. 19, p. 115; 30; 61).

The range of impedances Z_2 which the tank network will transform to the

value equal to the generator impedance $Z_L = R_L + j0$ raises an interesting point concerning the tuning procedure for the external network. The usual practice is to tune the tank network with the dummy load, and then switch in the external network and antenna and tune for zero reflected power in the feed line (not the transformer line). This procedure should be followed if there is a filter in the feed line. However, in the absence of a filter, it is necessary to adjust the external network only for an input impedance Z_3 which will bring it within the matching range of the tank network. This can be a time-saving feature when changing frequencies during contest operation! If both tank and external networks are adjusted for optimum match at midrange of the intended frequency excursions, only the tank network needs retuning with changes in frequency, providing the frequency excursions are within the range in which the external network yields a load impedance that the tank network can transform to $R_L + j0$.

Part 8 of this series will appear in a subsequent issue of *QST*. QST

Bibliography Supplement

- 62) Maxwell, "A Revealing Analysis of the Coaxial Dipole Antenna," *Ham Radio*, August, 1976, p. 46.
- 63) Gray and Graham, *Radio Transmitters*, McGraw-Hill Book Company, 1961, pp. 115-133.
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Strays

A GOOD IDEA

□ A good idea and a friend with sharp eyes paid off recently for Gerry Swetsky, WB9EBO.

His shack was broken into while he was presenting a program at a radio club, and his loss was substantial — a Drake T4XB no. 16869, R4C no. 18897, Kenwood TS520 no. 040600, Standard SRC826M no. 203066, RP MFA22 no. 000133, and other smaller items.

After routinely reporting the theft to the local police, he replaced his gear and all but gave up hope of recovering the stolen merchandise. He did ask his friends to keep an eye out for his lost gear, however, and one of them, Jim Moss, WB9AJZ, spotted two suspicious-looking items at a Hamfesters' picnic near Chicago nearly six months after the theft. "Hey, Gerry," he said after tracking down his friend, "there's a fellow in the center aisle selling a Standard 826 and an RP synthesizer,

and the serial numbers have been removed from both of them." Gerry recognized his stolen equipment immediately and asked that it be impounded while waiting for the police.

After hearing the story, a sheriff's policeman had a question. "But can you positively identify the equipment as yours if the serial numbers have been removed?" Gerry had an answer: "Yes. I engraved my call on the inside of the synthesizer. Unless the thieves looked inside the rig, it should still be there."

The RP was opened, a rubber shock pad lifted, and there, bigger than life, were the letters EBO engraved in the cover.

So there you are — one happy ham who got back part of a rig he had given up for lost, and one very anguished seller who is out a substantial sum because he bought equipment without serial numbers at a previous hamfest, paid cash for it, and has no idea who sold it to him.



Promoting Amateur Radio: Popular TV and motion picture star Dick Van Dyke has recorded a new series of public-service announcements for broadcast radio use. The short spot announcements highlight the excitement of amateur radio and invite requests to ARRL for more information. A Canadian version has also been prepared. Credit for the project goes to Southwestern Division PRA Lenore Jensen, W6NAZ, and Byron Paul, WA6RNG. Mr. Van Dyke's partner and manager. Tapes for broadcast are available from Headquarters.

An RF-Sensed Antenna Changeover Relay

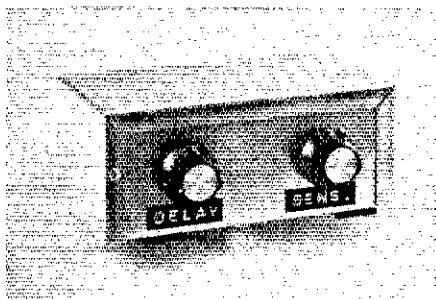
Flick of the switch, sir? Not with this system — it's automatic!

By Doug DeMaw,* W1CER and Jay Rusgrove,** WA1LNQ

One subject that can be confusing for the newcomer to amateur radio is that of antenna-changeover systems. Several systems have been devised over the years and most can be classified into three or four main categories. Before delving into a discussion on these systems, a brief look at the simplest method of all might be in order, that is, no antenna changeover at all. With this setup two separate antennas are used, one for the transmitter and one for the receiver. This system is impractical for the most part since duplicate antennas would be required for each band of operation. There are instances, however, when separate antennas with different directive patterns can be used to an advantage, as in the case of specialized receiving antennas. Generally speaking, most stations use the same antenna for transmit and receive purposes, so this is more the exception than the rule.

Several antenna-changeover systems, designed to transfer a single antenna from the receiver to the transmitter, are shown in Fig. 1. At A, a manual switch is used to transfer the antenna connection. This scheme is simple and works well, but is not without several drawbacks. Good-quality, high-power rf switches are often costly and hard to locate and, of course, the operator is required to switch manually from receive to transmit.

One of these problems was eliminated with the advent of the coaxial relay. These relays were, in most cases, mounted external to the transmitter and receiver with connecting cables running to and from the unit, as shown in Fig. 1B. Many of these relays were rated for a kilowatt, a-m signal, and maintained



the 50-ohm line impedance. The voltage needed for the relay field was switched on or off with a low-power toggle or foot switch. Alternatively, the transmit-receive switch might be located on the front panel of the transmitter with control voltage or a normally open or closed circuit available at a socket on the rear apron. Several extra sets of relay contacts were usually furnished with the relay to perform various functions, including that of muting the station receiver during transmit periods. Although this system of antenna transfer represented an improvement over the previous setup, it was still necessary for the operator to switch the antenna manually via the relay-control switch.

It's been said that laziness is the mother of invention and so it seemed natural that a more automatic system be developed. The relatively modern scheme at Fig. 1C has the transfer relay built into the transmitter. This system is quite popular and is used by most commercial manufacturers of amateur equipment that offer a separate transmitter and receiver. When the key is pressed the relay activates automatically and switches the antenna to the transmitter. A variable-length delay is usually

included to hold the relay closed, thereby keeping the antenna connected to the transmitter during code characters. After the last group of code characters is sent, the relay will remain closed for a second or two — the amount of time controllable. When the relay deactivates, the antenna is reconnected to the receiver.

Unfortunately, some amateurs who build their own equipment or purchase transmitters and receivers of different manufacture, sometimes resort to switching methods A or B. These setups, of course, do not include the automatic features of system C. The circuit described here and shown in simplified form in Fig. 1D was designed with this in mind. Basically, this system detects the presence of rf at the output of the transmitter and immediately breaks the antenna connection to the receiver. At the same time the antenna connection to the transmitter is made. One of the features of this system is that no modifications to either the transmitter or receiver are required.

Circuit Description

R1 of Fig. 2 serves as an rf-voltage divider to permit the circuit to be used with transmitters of various power-output amounts. Rf energy is routed through C1 to the base of broadband amplifier Q1. The amplified hf-band energy is supplied to a voltage-doubler (CR1 and CR2) through a broadband toroidal step-down transformer, T1. The rectified rf voltage at the output of CR1 and CR2 is filtered by means of RFC2, C5 and C6. This prevents unwanted rf from reaching U1 and affecting its performance.

C6, R7 and R6 comprise a timing network (variable) which governs the

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**Novice Editor, QST

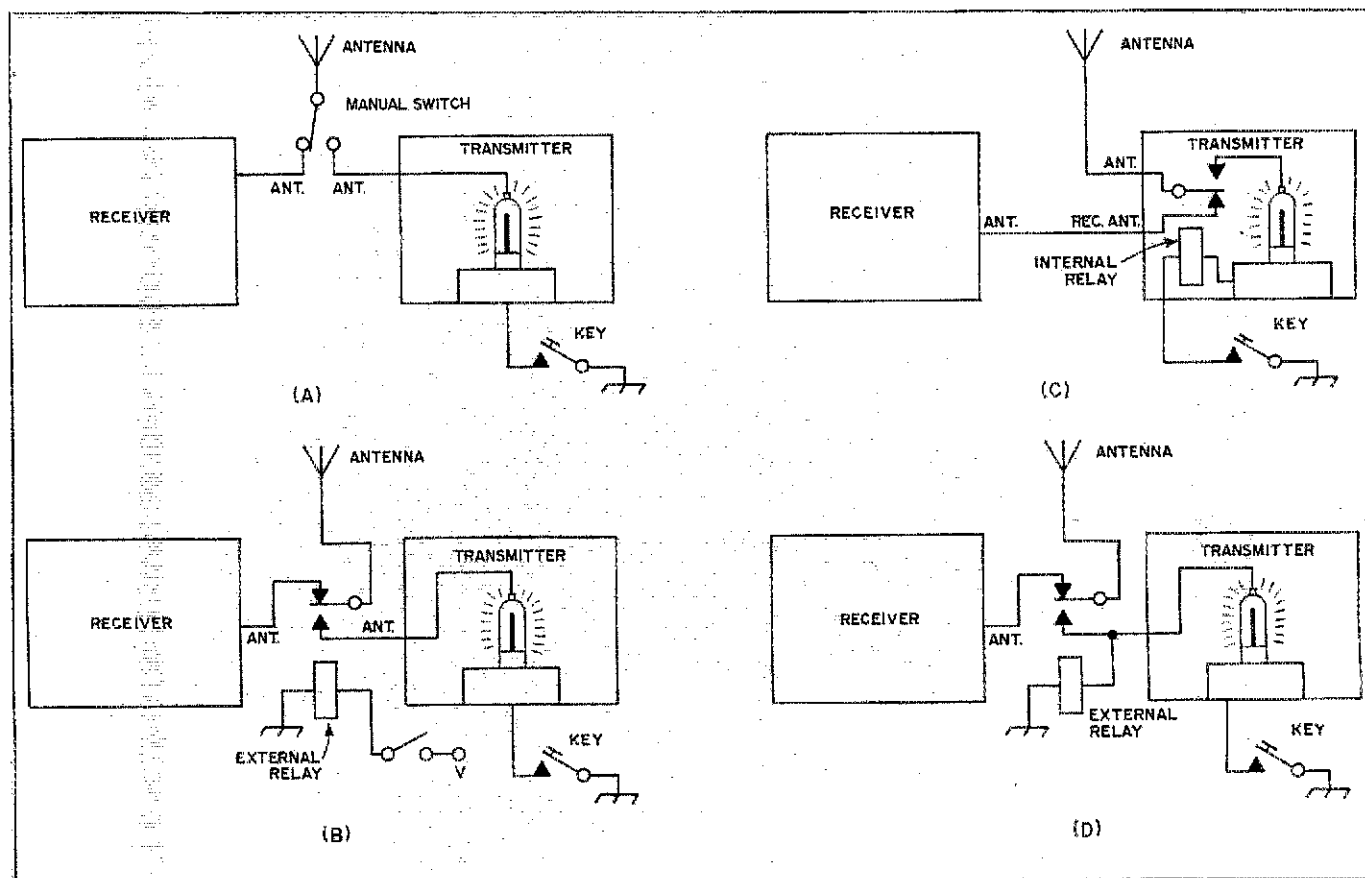


Fig. 1 — Shown here are several different antenna-changeover systems in block diagram form.

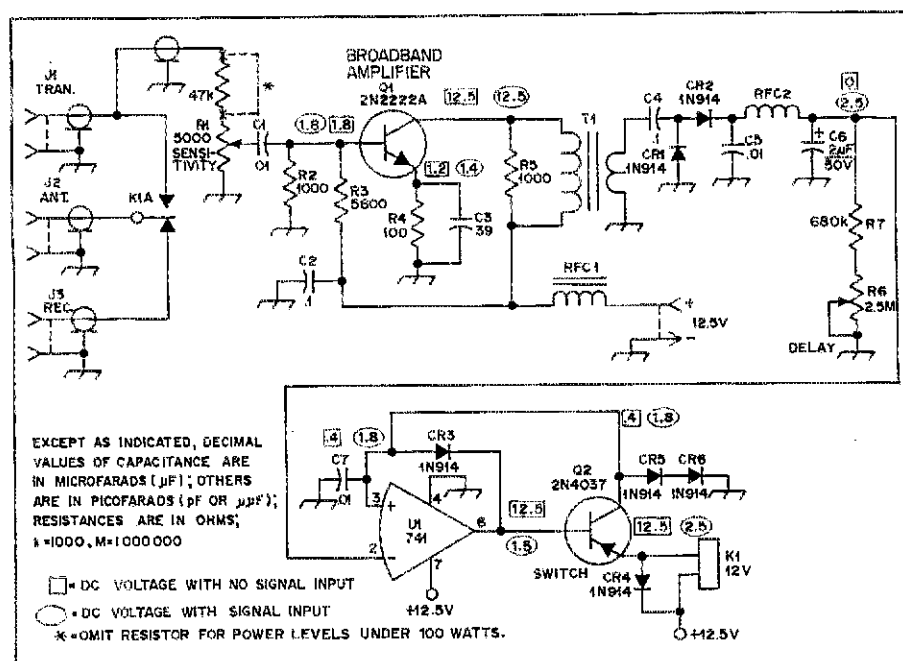


Fig. 2 — Schematic diagram of the rf-sensed antenna-changeover relay. All resistors are half-watt composition type. Capacitors are disk-ceramic unless noted otherwise. Component numbers not appearing in the parts list are for identification purposes only.

J1, J2 — Connector, SO-239.

J3 — Connector, phono-type.

K1 — Dpdt relay, 5-ampere contacts, 12-volt field.

R1 — Linear potentiometer, 5000 ohms.

R2 — Linear potentiometer, 2.5 megohms.

RFC1, RFC2 — Rf choke, 42 turns no. 28

enam. wire on an Amidon FT-50-43 core.

T1 — Broadband transformer. Primary: 25 turns no. 28 enam. wire on an Amidon

FT-50-43 core; secondary: 5 turns no. 28 enam. wire wound over primary winding.

U1 — Op amp, 741.

hold-in time of the relay, K1. The smaller the resistance amount at R6, the shorter will be the time delay.

U1 functions as an inverting amplifier. When the input dc voltage at pin 2 increases, the output dc voltage at pin 6 decreases. The output voltage causes the base of relay driver Q2 to be forward biased negatively when it drops below approximately 1.4 volts. Diodes CR5 and CR6, by virtue of their combined barrier voltages (0.7 V each), establish the 1.4-V fixed bias level. Without the diodes, Q2 would conduct sufficiently to prevent the relay from dropping out during no-signal periods. CR4 is used to suppress transients caused by the field coil of K1. When no rectified rf reaches U1, Q2 is cut off because of the high positive base voltage it receives from U1, and the relay contacts to the transmitter are open.

Construction

In Fig. 3 is a suggested printed-circuit board layout showing the foil pattern and parts placement. R1 and R6 may be circuit-board-mounted potentiometers if the builder desires, as the board layout was designed to accommodate such units. Potentiometers of this type are entirely suitable if the builder does not anticipate frequent changes in power levels and length of delay, as

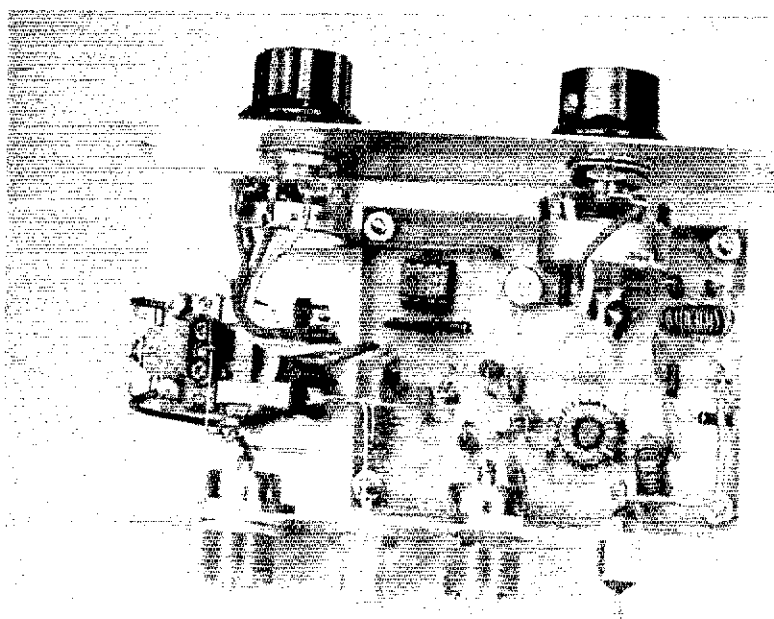
these controls must be readjusted for such changes. If the builder is interested in having access to these controls, panel-mounted potentiometers can be used at the front apron, in which case wires will have to be run from the circuit board to the controls.

Our finished model was housed in a 5 X 3 X 2-inch aluminum Minibox. R1 and R6 were mounted on the front panel and Kurz-Kasch knobs were placed on the control shafts to dress up the appearance of the finished product. CR4 is attached directly to the relay terminals. The rear panel supports the terminals for the transmitter, antenna, receiver antenna and power supply. SO-239 connectors were used for the transmitter and antenna connections, and a phono connector was employed for the receiver antenna. Any type of connectors may be substituted to match those used in the builder's station. The power-supply lead is brought out through a feedthrough capacitor. This type of feedthrough is not necessary: A simple feedthrough insulator or wire could be used instead. In our case, the capacitor lead served as a convenient tie point during preliminary testing of the unit.

Operation

Connect the antenna, transmitter, receiver antenna lead and the power-supply connections to the appropriate terminals. Set R6, the time-delay control, to its minimum delay position (ccw) and the sensitivity control to its midrotation position. While keying the transmitter, decrease the setting of the sensitivity control to a point just above that where the transmitter no longer makes the relay energize. Once this has been set, it may be left in that position until a moderate change in power level has been made. The delay control should then be adjusted for the length of delay desired. The circuit shown has been tested from 1.8 to 30 MHz and at dc power input levels up to and including 1000 watts..

457



This photograph shows the inner layout of the antenna-changeover relay. Wiring or placement of circuit board and other components is not critical.

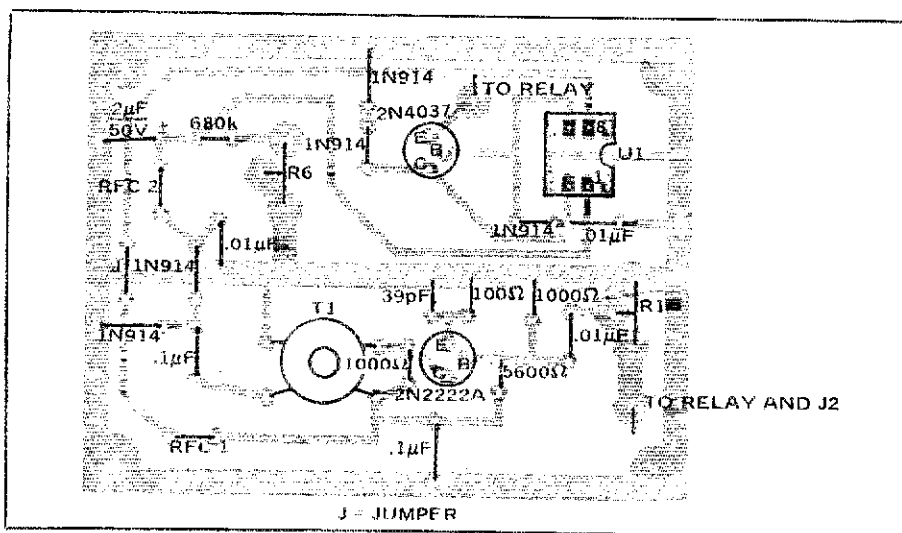


Fig. 3 - Circuit-board etching pattern for the changeover relay. The pattern is shown at actual size from the foil side of the board with gray areas representing copper. Decimal-value numbers alone represent capacitance in microfarads. Whole-number values with no units represent resistances in ohms; k = 1000. J = wire jumper. All components are mounted on the nonfoil side of the board. K indicates the cathode of a diode.

Strays

A GREAT IDEA!

More than 200 children with multiple sclerosis and muscular dystrophy enjoyed a picnic in Laurel, MD, recently with the help of WA3YNJ and WA3SKO of the Green Mountain Repeater Association, Greenbelt. With the cooperation of the Maryland National Guard, the buses carrying the kids from Washington were followed so that emergency help could be called if

needed. The GMRA members were pressed into primary mobile radio communication duty when the Guard's radio system broke down. Luckily, that was the day's only emergency, and a good time was had by all.

The Over-Forty Novice Club offers camaraderie, incentive, a certificate and a membership card for those who qualify. For further information, contact O.F.N.C., P. O. Box 622, Carson City, NV 89701.

In traveling quite a lot during the year I observe many mobile antennas which have either two-meter or CB capability. It would be interesting if those who use two meters were able to QSO on simplex while in transit. The available "52" channel is often busy, whereas another channel, such as "55", would be satisfactory and useful for emergencies. Such communication would be comparable to the seemingly enjoyable use of the CB band. A signal by the double flash of the headlight could indicate the desire to communicate on two meters at the designated frequency. — WA2DEW

Designing Small Vertical Antennas

How about a guide to efficient antenna design? Here is information to jolt your interest.

By D. J. Kozakoff,* W4AZW

What's your antenna gain? This is a question frequently asked, but for the most part ignored when talking about mobile antennas. Many times erroneously confused with directivity, antenna gain implies knowledge of the efficiency of the antenna. Expressed mathematically, the antenna gain is equal to the directivity times the efficiency. Estimation of best-case antenna efficiency is actually quite simple with the formulas and graphs presented in this article. A good understanding of the relation between matching-coil Q , antenna impedance, and overall efficiency will provide one with the tools for optimizing his mobile-antenna gain.

Antenna Impedance

Although the feedpoint impedance of mobile antennas is, in fact, related to the ground plane and geometry provided by the automobile body, a good "first order" approximation is provided by looking at the feedpoint impedance of electrically small verticals over an ideal ground plane. In the real world, ground-loss resistance associated with the nature of the soil in the vicinity of the antenna may constitute an appreciable portion of the resistance appearing at the feedpoint of the antenna at the lower ham bands.¹ Since little information is available on values of resistance to be expected in practice, this loss will be ignored for the purpose of studying the theoretical efficiency of the ideal case as a function of the parameters we have some control over, such as the Q of the matching coils. Thus, the efficiencies presented represent an "upper bound" on the highest efficiency that

can be obtained under ideal conditions.

The formulas for feedpoint impedance of dipole antennas as a function of their electrical length are provided in chapter 3 of the *Antenna Engineering Handbook*² by Jasik. Since the feedpoint impedance for a monopole antenna over an ideal ground plane is exactly half that of a similar dipole, these equations are directly applicable. Thus, for a vertical antenna equal to, or less than, a quarter-wavelength, the resistive part of feedpoint impedance, R_a , is approximately related to the electrical length of the antenna, P , in radians, by the following relation:

$$R_a = 12.4 P^{2.17} \quad (\text{Eq. 1})$$

The reactive component of antenna feedpoint impedance, X_a , is given approximately by the following formula:

$$X_a = \frac{60 [\ln(2L/r) - 1] \cot P}{1.85 e^{1.55 P}} \quad (\text{Eq. 2})$$

where r is the radius of the radiating element and L is the length in inches.

From these equations it is seen that for antenna length shorter than a

quarter-wavelength (P less than $\pi/2$), the feedpoint impedance looks like a resistor and capacitor in series. The value of the resistance decreases and capacitive reactance increases with decreasing frequency. For example, a 102-inch vertical with radius $r = 0.1$ inch was considered. The equations for feedpoint impedance were used to calculate the values corresponding to operation on the five ham bands ranging from 160 to 80 meters. The results are presented in Table 1. The parameter Q_a in that table is the Q of the antenna and defined by $Q_a = X_a/R_a$, with X_a and R_a determined by equations 1 and 2. The Q of the antenna will be used later to estimate antenna efficiency.

While equations 1 and 2 may appear a little complicated at first, they can be solved for other antenna length-to-diameter ratios with little difficulty, with the help of log and trig tables. One may then compile a revised table similar to Table 1 for his particular antenna and, following the mathematical development carefully, may derive applicable results. However, several points should be mentioned here. For fixed antenna length, to a first-order approximation, increasing the antenna

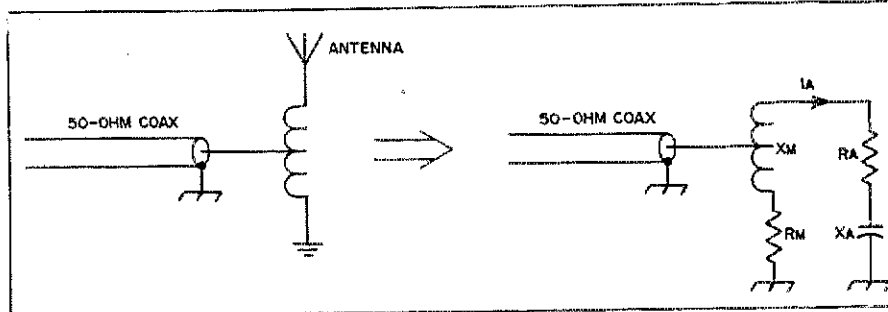


Fig. 1 — Estimating expected matching efficiency for a simple loading coil at the base of an antenna. See text.

¹This and subsequent footnotes will appear on page 25.

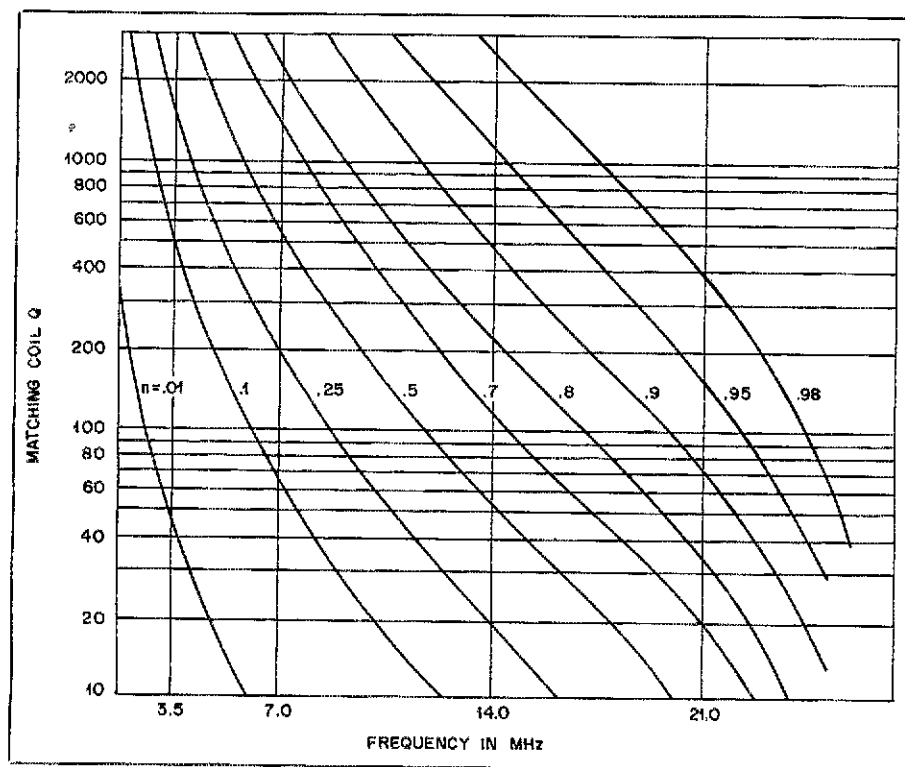


Fig. 2 — The solution of Equation 5 using the antenna Q_s computed previously for a 102-inch vertical antenna converted to a graphical form. See text for details.

diameter does not change feedpoint resistance but only decreases the capacitive reactance. The decrease is logarithmic and as such the reactance does not decrease rapidly with increasing diameter. The antenna length L is the major factor since the electrical length is directly related to the physical length. Antennas with length L shorter than 102 inches will, in general, have lower efficiency. Thus, the 102-inch antenna constitutes a good standard of comparison for other mobile antennas.

Matching Network Efficiency

For electrically small antennas where the reactance is capacitive it is necessary to cancel out the capacitive reactance and transform the resistance to 50 ohms. This is normally accomplished by use of an L , T or π -matching network or by a loading coil at the antenna base.³ As an alternative to base loading, center loading results in slightly higher matching efficiency. In any case, whatever matching technique is employed, a good engineering estimate of expected matching efficiency can be obtained on the basis of a simple loading coil at the base of the antenna as illustrated in Fig. 1. The power radiated, P_r , is related to the antenna base current, I_a , as indicated in that figure by the following formula:

$$P_r = I_a^2 R_a = I_a^2 X_a / Q_a \quad (\text{Eq. 3})$$

The power loss in the loading coil, P_m , is approximately:

$$P_m \approx I_a^2 R_m = I_a^2 X_m / Q_m \quad (\text{Eq. 4})$$

where R_m , X_m and Q_m are the resistance, inductive reactance and Q , respectively, of the matching network. Since one function of the matching coil is to cancel the capacitive reactance of the antenna, X_m is approximately equal to X_a . From equations 3 and 4, and recognizing that the sum of radiated and dissipated power is the power delivered by the transmitter, we can now write a formula for the antenna efficiency as related to the Q_s of both the antenna and the loading coil:

$$\begin{aligned} \text{Efficiency} = \eta &= P_r / (P_r + P_m) \\ &= Q_m / (Q_m + Q_a) \quad (\text{Eq. 5}) \end{aligned}$$

It was found that the solution to equation 5, using the antenna Q_s computed previously for a 102-inch vertical antenna, could be put into a convenient graphical form. The graph is presented in Fig. 2. To illustrate use of this simple graph, the following sample problem is given.

Sample Problem

It is desired to construct a 40-meter matching network for the 102-inch vertical antenna and obtain an overall antenna efficiency of 50 percent. What are the minimum coil Q_s which must be used in the matching network? Solution: Look up intersection of 7-MHz vertical line and the curve corresponding to $\eta = 0.5$, read $Q = 600$.

If loading coils of $Q = 300$ were available, we would estimate efficiency as follows: Look up intersection of

7-MHz vertical line and horizontal line through $Q = 300$. The nearest curve which goes through that point corresponds to the curve of $\eta = 0.35$, or 35-percent efficiency.

We once again stress that, particularly at the lower ham bands, the efficiencies presented are a best case or upper bound on actual achievable efficiency because of the ground-resistance term in the equations which introduce additional losses.

Table 1 — Resistive and Reactive Part of Antenna Impedance in Ohms ($L = 102'$, $r = 0.1''$).*

BAND	P	R_a	X_a	Q_a
80 meters	0.2	0.4	-1957.1	4892.8
40 meters	0.4	1.6	-936.1	585.1
20 meters	0.8	7.4	-379.4	51.3
15 meters	1.2	17.0	-142.6	8.4
10 meters	1.6	39.5		0.

Conclusions

It is evident from the equations that matching efficiency is closely related to the unmatched antenna impedance, hence antenna Q . The further removed from 50 ohms to start with, the lower the efficiency of the matched antenna. In antenna design, center inductive loading and capacitive top loading are two techniques employed for increasing the unmatched antenna radiation resistance. The equations developed further support the view that the higher the Q of the matching-network coils the higher the matched antenna efficiency. Silver-plating of coils to reduce ohmic losses and choice of optimum shape factor for loading coils are methods for increasing these Q_s . In some experimental applications, cryogenic cooling of the loading coils to a superconducting state has also been tried.

As far as the practical side of the picture, high Q_s imply narrow bandwidths which necessitate retuning of the antenna as we move across the band. As such, this does not present a serious problem, particularly if the ability to tune the antenna can be achieved by remote control, i.e., from the driver's seat. QST

Footnotes

¹ *The Radio Amateur's Handbook*, forty-fifth edition, ARRL, 1967.

² *Antenna Engineering Handbook*, Henry Jasik, McGraw Hill, 1961.

³ *Electromagnetic Waves and Radiating Systems*, Edward C. Jordan, Prentice Hall, 1950.

*[Editor's Note: Values of R_a are taken from referenced literature, rather than from Eq. 1 which is only an approximation.]

That's a Big 12 Volts

QRPers and FMers, turn on! Twelve volts at 10 amps should handle it.

By Charles Carroll,* W1GQO

Now that you have that nice new fm transceiver tucked away under the dashboard, what are you going to do when you want to operate from inside the house? The obvious answer would be to buy another rig for the house. Well, for most of us that idea would get about as far as mentioning it to the XYL! So now we're back to having one transceiver doing double duty. The only problem is where are we going to obtain 12-volts dc in the house. This power supply will be more than adequate to handle that transceiver and even a small amplifier. Under full load this power supply is capable of providing 12 volts at 10 amperes. For the "transistor person" this power supply makes numerous additions possible to the test bench or the operating position.

Circuit Description

The heart of this supply is the National LM305 voltage regulator. Available in the 8-lead TO-5 metal case or the 10-lead flat package, this regulator has many possible uses and modes of operation. With proper adjustment of component values it is possible to have the output range cover from 4.5 to 40 volts.

When this supply was built, a series combination of three filament transformers was used. Each transformer was capable of supplying 6.3 volts under a 10-ampere load. This combination of transformers, rectifiers and filter capacitor supplied approximately 18 V dc under full load. Due to the voltage drop across the regulator and pass transistors,

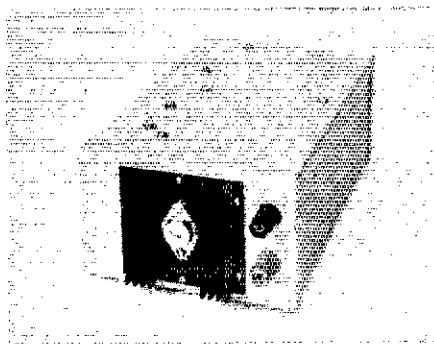


Fig. 1 — Schematic diagram of the power supply. Numbered components not appearing in the parts list are for identification purposes only.

CR1 - CR4, incl. — Silicon, 12 A, 50 PIV.

HEP R0130 or equivalent.

Q1 — 2N2905 transistor.

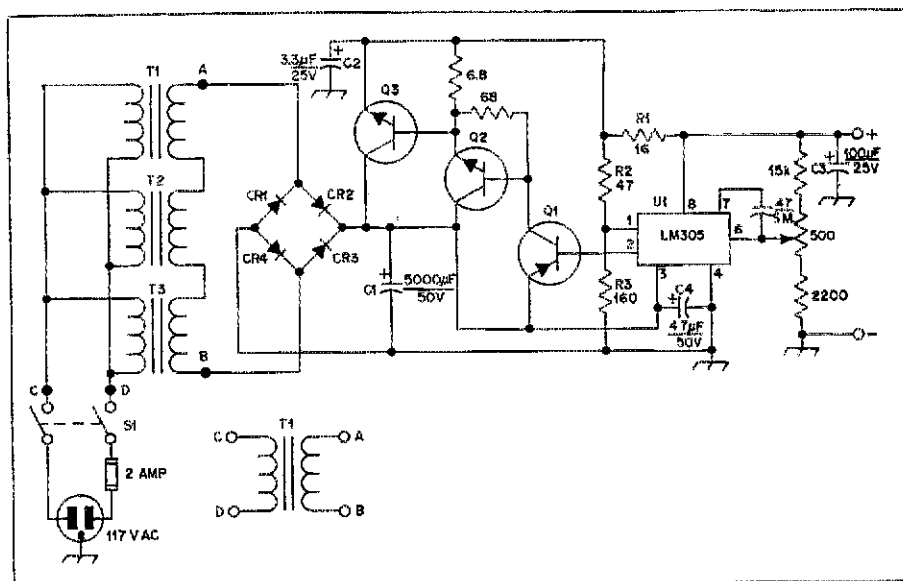
Q2 — 2N3445 transistor.

there must be at least a 4-volt differential between the input to the regulator and the output voltage.

The regulator and external components (R1, R2, and R3) are configured to provide foldback-current limiting. With the output shorted, the output voltage would normally decrease as the current increases. Using foldback-current limiting, as the output voltage decreases (during a short circuit), the current supplied will also decrease. This enables the designer to

Q3 — 2N3772 transistor.

T1-T3, incl. — Filament, 6.3 V at 10 A.
Essex Stancor P-6464 or equivalent.



*Editorial Assistant, QST

decrease the size of the heat sink required for a short-circuited condition. For the person who wants to change the regulator to fit his particular needs, a complete discussion of foldback-current limiting and the necessary formulas for determining the component values are included in the National Semiconductor application literature, AN-23.¹

Though the regulator would normally have two fixed-value precision resistors in place of the potentiometer and resistors, the method shown was used to allow for component tolerances and aging. This combination permits the output to be varied from approximately 11.2 to 14.1 volts. The bypass capacitors are included to prevent oscillations and output noise. C4 can be eliminated if the main filter capacitor is located physically close to the regulator board.

Construction

The amateur is encouraged to build this power supply into any enclosure that suits his fancy. There isn't any feature that warrants having to copy the author's model, bolt for bolt. As mentioned previously, there were three individual transformers combined to provide enough voltage for the regulator. They can be replaced with any transformer that meets the voltage and current requirements. If a single transformer is not used, the individual secondaries will have to be connected so they are *aiding* and not *bucking*. To do this, temporarily tie two secondaries in series and apply power. If they are connected in the correct phase relationship, the ac voltage read across the two remaining leads should be approximately 12.6 volts. Continue this procedure until the proper combination of leads has been determined.

The last pass transistor (Q3) was mounted on a heat sink procured at the local Radio Shack store. Under full load, during extended periods of opera-

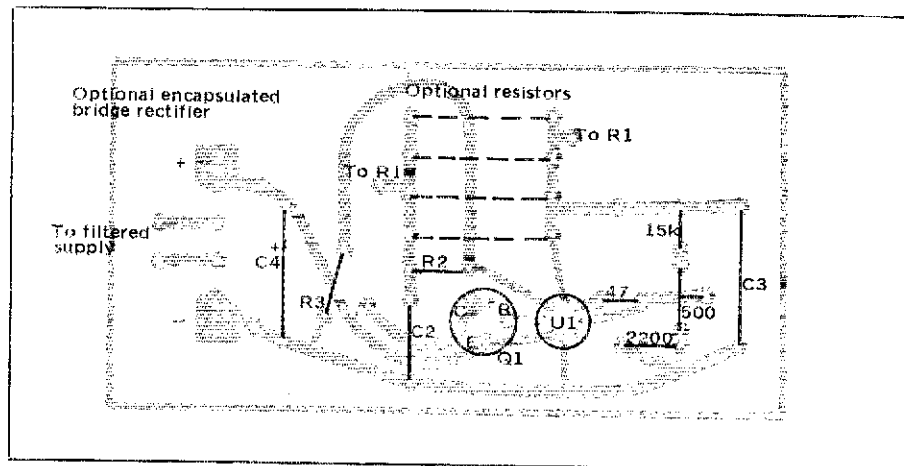


Fig. 2 — Etching template for the printed-circuit board. The two boxed-in areas are for the optional components as discussed in the text. The pattern is shown at actual size from the foil side of the board, with gray representing copper. The components with values are those not numbered on the schematic.

tion, the heat sink was warm to the touch. Though not obvious by the photograph, the heat sink was attached to the bare metal of the chassis. Prior to painting the chassis, the area that would be occupied by the heat sink was shined with steel wool and then masked off. This allowed the chassis to assist the heat sink, after final assembly, in dissipating the heat. A layer of heat-conductive silicone grease was applied between the chassis and the heat sink. Transistor Q2 was mounted on a large piece of aluminum inside the container. This piece of aluminum was attached to the same bolts that hold the heat sink to the chassis. Considering the current flowing through that transistor, there is no detectable change in temperature with this type of heat sink.

As will be obvious by examining the pc-board template, there are extra connections and pads on the board. This layout was developed to be universal for several power supplies. It is possible, for smaller supplies, to include an encapsulated bridge rectifier (Radio Shack 276-1146) on the pc board. The current-limiting resistor (R1) could also

be installed on the board. Up to four resistors could be used in this application. The resistors across the base-emitter junction of the pass transistors are mounted on the transistor leads, not on the pc board. The current-limiting resistor, R1, is made by winding 9.7 feet of no. 22 enameled wire on a 10,000-ohm two-watt resistor. If greater accuracy is desired, a bridge could be used to measure the resistance.

Operation and Adjustment

The only adjustment in the power supply is that which sets the output voltage. After ensuring that the supply is functioning properly, the voltage can be set to the desired level. Prior to using the supply with equipment, a test load could be applied. This should show if there are going to be problems. It might be well to note that, if substitute transistors are used for the pass elements, the current that can be supplied while short-circuited might be different. The current gain of the substitutes could be higher and, therefore, with the indicated values of R2 and R3 the short-circuited current will be higher.

QST

Strays

IF THE FCC DON'T GET YA, THE EPA WILL

Found in *Engineering & Safety Service NEWS BRIEFS*: "A specially built radiation-monitoring van, developed and manned by EPA scientists, will check the intensity of broadcast radiation from uhf and vhf television and fm radio transmitters in New York City as

well as seven other eastern and mid-western cities over the next two years. Studies will be completed by next October in the first phase of the EPA's analysis of environmental levels of radio and microwave radiation in urban areas of the United States."

Conceivably, you may find an EPA official at your door asking you to reduce your uhf transmitter power to an

environmentally safe level.

Pollution? We wouldn't hear of it. — K8OCL

NOVICE NET

□ Scott Persson, WN0QPP, who is starting a Novice Worked-All-States Network, asks that hams keep 7130 kHz clear at 0200 UTC on Sundays so members can use it. NWSN membership is free but not a prerequisite for using the net.

A Unique Digital Mixer

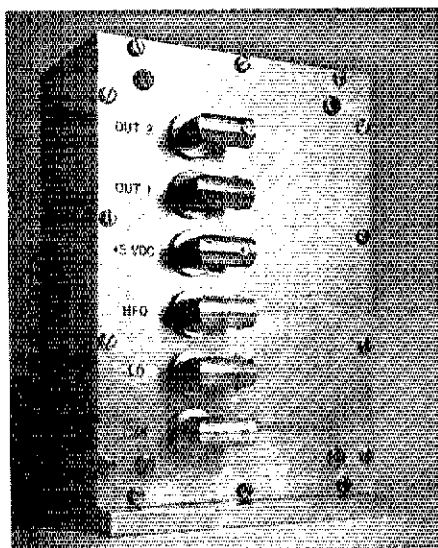
Dial calibration bothering you? Use this mixer and your frequency counter to eliminate that problem.

By Jeffrey L. Gnass,* KH6HJZ

Not even the smoothest dial mechanism will aid in the interpolation of the little spaces between the frequency marks on your dial. The obvious answer, nowadays, is the frequency counter. Why not combine an inexpensive, yet effective, mixer system with an external counter to provide a receiver frequency readout. Here's how. A simple, untuned mixer is used as part of the configuration for displaying the frequency of an hf receiver.

As shown in the block diagram of Fig. 1, the receiver oscillators, $f(LO)$ and $f(HI)$, are mixed together; the digital mixer output is equal to $f(HI)$ minus $f(LO)$ when displayed on a frequency counter.

Although the external frequency counter is required to have a maximum



The author's completed mixer system.

counting ability of $f(HI)$, this digital mixer overcomes some of the shortcomings of other digital mixing methods. The most notable example is the type D flip-flop mixer, where the minimum frequency of $f(LO)$ may not be less than 75 percent of $f(HI)$; otherwise the output will be ambiguous due to the mixer response to harmonically related frequencies. While the digital mixer described overcomes this limitation, its operation may be more analogous to that of an asynchronously keyed burst generator. Additionally, this mixer will give an unambiguous output with $f(LO)$ ranging from zero to approximately 48 percent of $f(HI)$.¹

Circuit Description

The operation of the basic digital mixer is explained with the use of Fig. 1. With FF1 cleared, the Q output of FF2 high, and no $f(LO)$ input, the next low-to-high transition of $f(HI)$ will not cause FF2 to change state and output gate G2 will remain enabled. Thus, $f(HI)$ will propagate through inverter G1 and, subsequently, to the output. This establishes the minimum frequency limit of $f(LO)$, which of course is zero.

Now, allowing $f(LO)$ to be greater than zero and within the range mentioned, the following circuit description emerges. If the output of reset gate G3 is high, FF1 cleared, and the Q output of FF2 high, FF1 will toggle on the next low-to-high transition of its clock input. Since the D input of FF2 will be high after FF1 toggles, FF2 will also

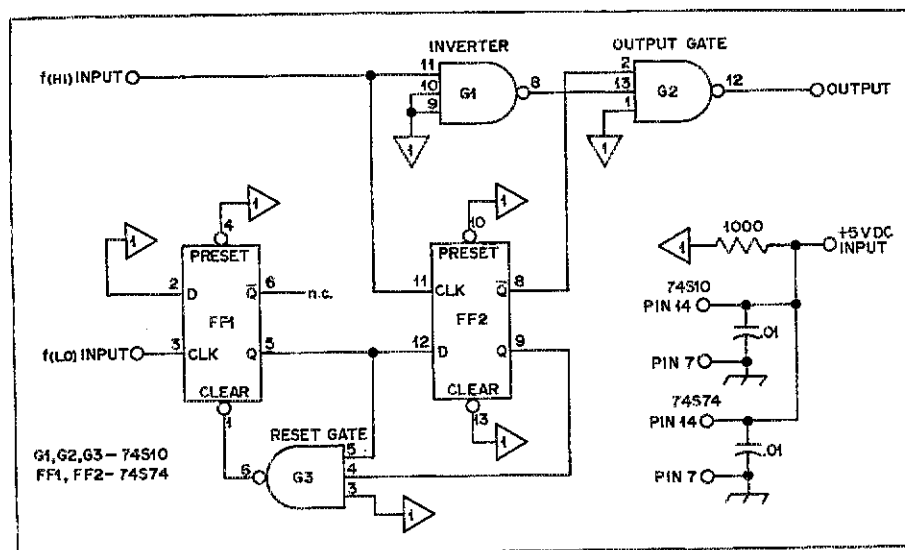


Fig. 1 — Diagram of the individual mixer.

¹ [Editor's Note: It is important to note the requirement of the relationship between $f(LO)$ and $f(HI)$. A copy of this mixer was built in the ARRL laboratory and performed nicely within these frequency limitations. The potential builder should compute all the difference frequencies for his particular equipment to ensure complete operation of the mixer.]

toggle on the succeeding low-to-high transition of its clock input. Once FF2 has changed state, its Q output, now being low, will disable output gate G2. The Q output of FF2 will be high, and with the high from the Q output of FF1, reset gate G3 will clear FF1. Subsequently, the next $f(HI)$ pulse that toggles FF2 will again enable output gate G2. Because $f(HI)$ is inverted through gate G1, yet delayed by an amount less than the clock-to-output propagation delay of FF2, the clock pulse which enabled output-gate G2 will have been inhibited from the output. In effect, FF1 serves only to hold each pulse of $f(LO)$ until it has been recognized by FF2, then FF1 is immediately cleared. In this manner, for each clock pulse of $f(LO)$, only one clock pulse of $f(HI)$ is removed from the output. The timing diagram (Fig. 3) further clarifies this circuit description.

As the maximum frequency of $f(HI)$ is limited by propagation delay times, the minimum period of $f(HI)$ can readily be calculated from: $t_{period}(\text{minimum}) = t(PLH)$ of FF2 output from clock + $t(PLH)$ of G3 output from input + $t(PLH)$ of FF1 output from clear + $t(SETUP)$ of FF2. The terms $t(PLH)$ and $t(PHL)$ are the propagation delay times from low-to-high level and high-to-low level, respectively. Using Schottky TTL propagation delay times results in a typical minimum period of 20 ns or correspondingly, 50 MHz. Circuit operation at these frequencies has been realized in practice.

Although only Schottky TTL logic has been used in a working model, construction with Motorola's MECL III series of high-speed logic would extend circuit operation into the 200-MHz region. Because MECL III logic edge speeds dictate strict pc-board construction practices in maintaining pulse fidelity, a practical approach might incorporate the more tolerant MECL 10,000 logic family. The small loss of circuit speed over MECL III would be

A top view of the completed circuit board. Note the author's method of making isolated areas by etching away small amounts of the top foil.

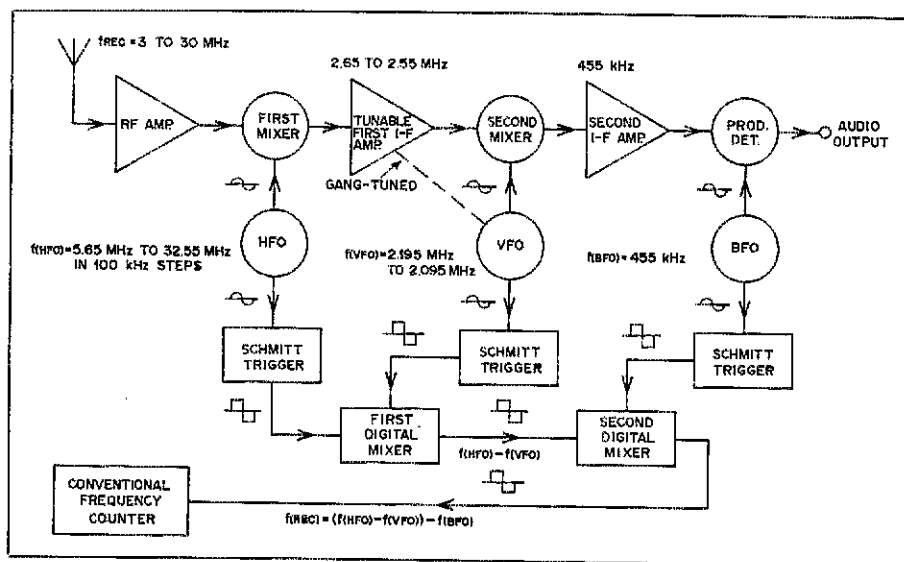
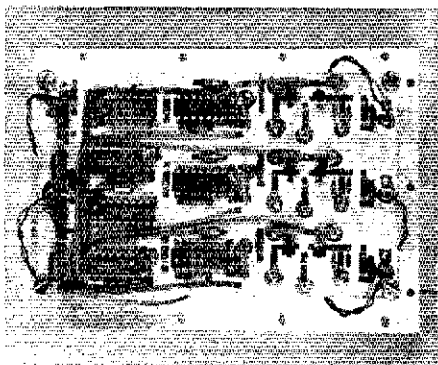


Fig. 2 — Block diagram of the application of the basic digital mixer.

outweighed by the more lenient circuit layout.

Circuit Application

Because application of this digital-mixing concept was employed with a double-conversion receiver, two mixers were needed to obtain an output frequency representative of the received frequency, $f(REC)$. The configuration shown in the block diagram illustrates this application.

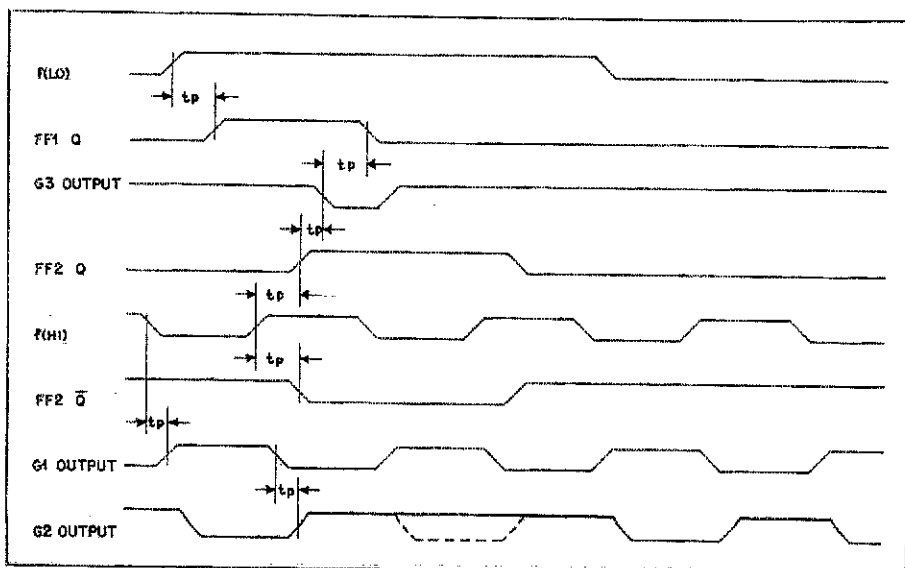
To realize the full mixer capabilities when operated in tandem with another mixer, the two highest frequencies, $f(HFO)$ and $f(VFO)$, are subtracted in the first mixer. This output, $f(HFO) - f(VFO)$, is applied to the second mixer where the lowest frequency, $f(BFO)$, is subtracted, resulting in the receiver fre-

quency; $f(REC) = [f(HFO) - f(VFO)] - f(BFO)$.

A subtle advantage of this mixing scheme is the absence of a strong component at $f(REC)$ in the mixer's output. This greatly reduces the chances of receiver desensitization or overload by signal leakage back into the receiver front end. Through a spectrum analysis of the mixer output, the presence of a low-level component at $f(REC)$ was found, yet elaborate shielding techniques are not required in confining this signal.

Although the author's receiver is home-built, covering the full hf spectrum from 3 to 30 MHz, this mixing method can be employed with many commercially built receivers. For instance, the oscillator relationships of the

Fig. 3 — The operation of the mixer can be understood using this timing diagram and the schematic.



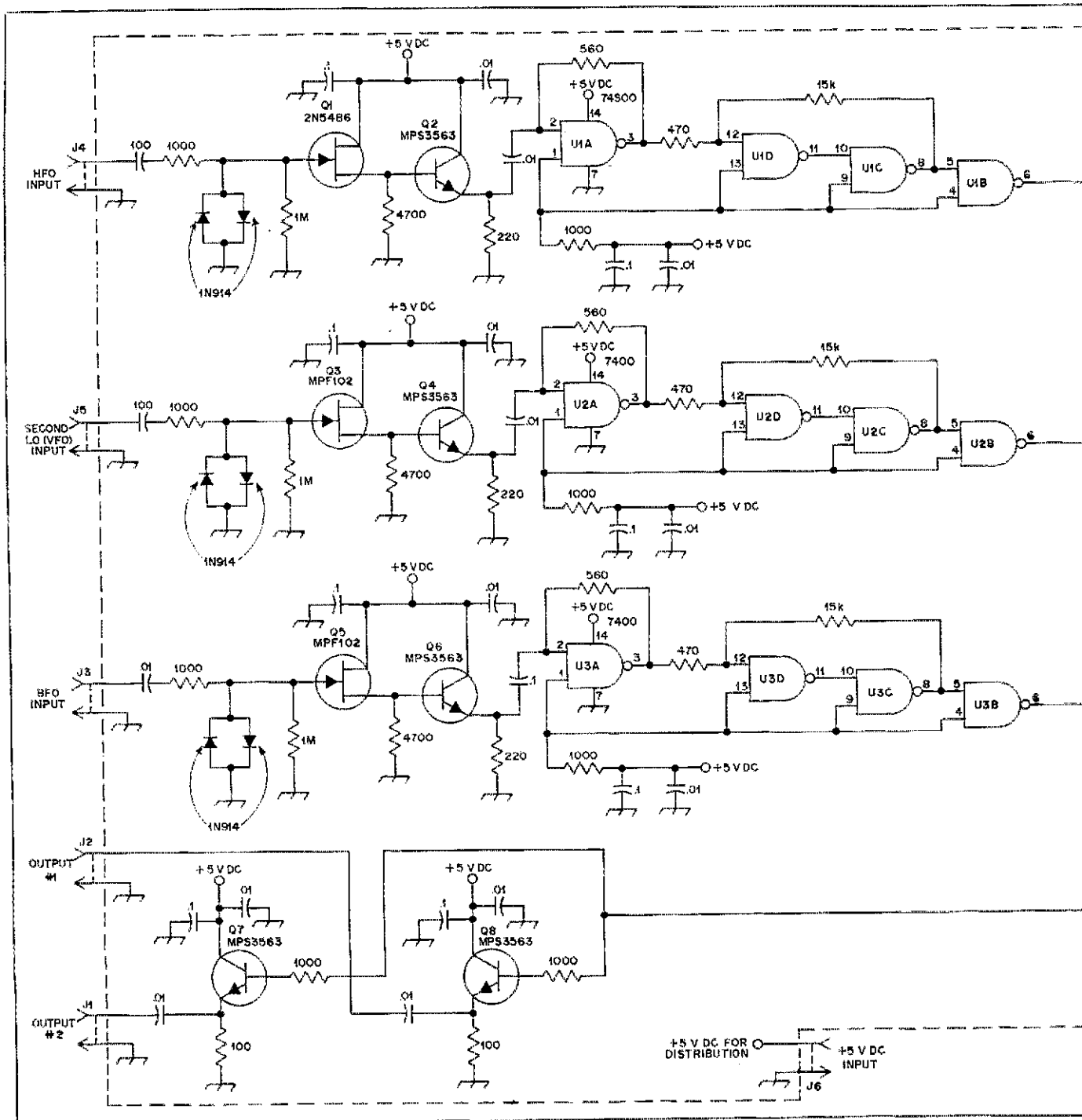


Fig. 4 - Schematic diagram of the complete mixer to be used in conjunction with a double conversion receiver.

Collins S-line would be compatible with the mixer capabilities as previously outlined in the circuit description. Furthermore, since there are no tuned circuits to be maintained, band switching is eliminated. This allows freedom in physically locating the mixer as a "black-box" unit with no mechanical interconnections.

Even though this article was not intended to be a step-by-step construction procedure, a full schematic of the mixer used with the receiver is included. If a high-impedance input is used on the

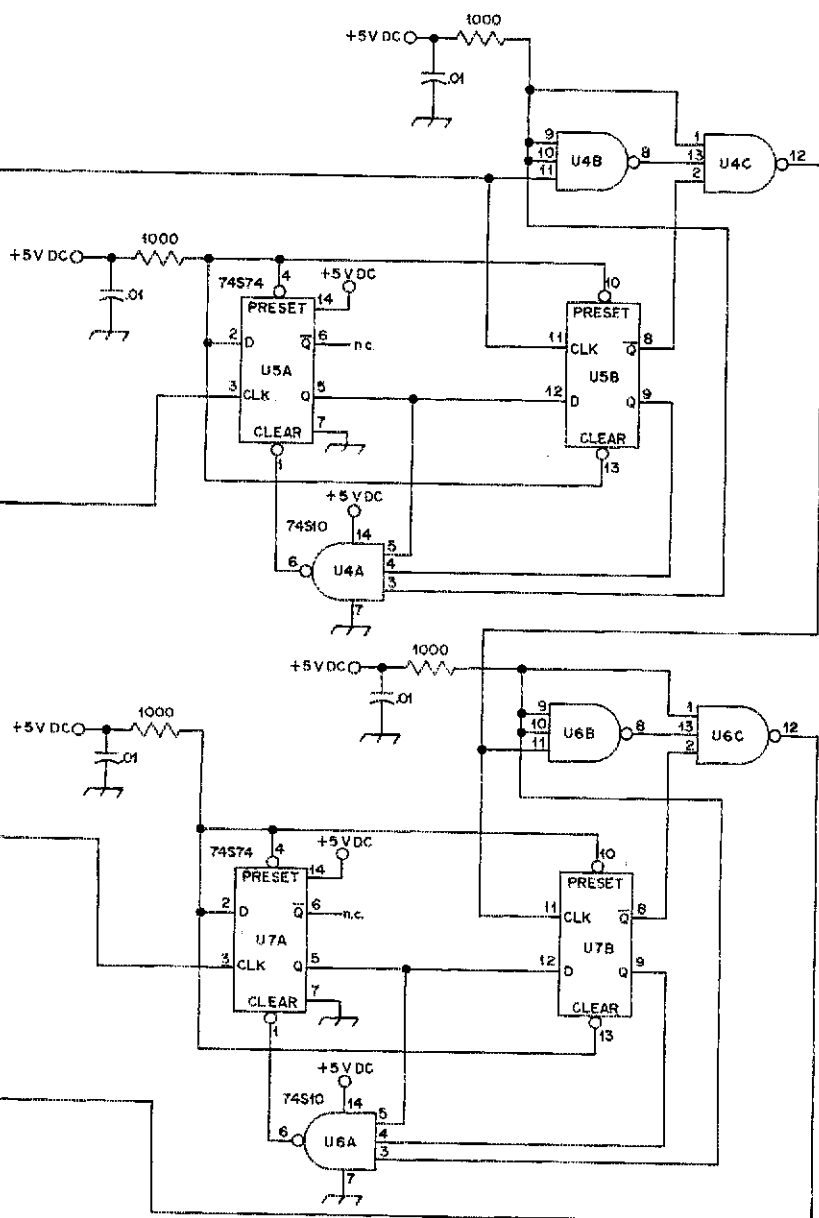
frequency counter, it should be terminated with 50 ohms to minimize pulse reflections. On the other hand, should the mixer circuitry be incorporated in a frequency counter, the output driver transistors would be unnecessary.

Printed Circuit-Board Construction

A double-sided pc board is used, the bottom containing all signal paths, excluding the four jumpers, and some circuit ground and B+ distribution. The top of the board is reserved for circuit ground, while the remaining B+ is

"hard-wired" over this ground plane. Configured in this manner, a three-layer pc board is simulated with the ground plane isolating the power distribution and signal interconnections. The B+ wiring is effectively a wire-over-ground transmission line. This, together with the generous application of ceramic disc by-pass capacitors, produces a low impedance power distribution arrangement and is most effective in reducing power-supply noise. This method has been very successfully employed with numerous high-speed logic circuits pre-

Strays



CAPACITORS—CERAMIC DISCS
RESISTORS—1/4 WATT, 10%, CARBON COMPOSITION

viously constructed by the author.

Eyelets are installed to interconnect component grounds between the top and bottom sides of the pc board and are also used where input/output leads interface to the board. All eyelets should be soldered to both sides of the board to assure a sound electrical connection. This is customarily done before any components are installed. Molex sockets are used for the ICs, the respective ground pins of each socket being soldered to both sides of the pc board. Between each connector and the

pc board is a twisted-pair line. The line is made of no. 26 AWG, wound at 30 turns per foot.

QST

Table 1

Parts List

- Q1 — 2N5486
- Q2, 4, 6, 7, 8 — MPS3563
- Q3, 5 — MPF102
- U1 — SN74S00
- U2, 3 — SN7400
- U4, 6 — SN74S10
- U5, 7 — SN74S74

All diodes are type 1N914.



Vlf operation? This sign outside of the WKDC studios in Elmhurst, IL, seems to indicate such. According to reports, the sign has been like that for the past three years and is still uncorrected. Does their chief engineer know? Of course, if they really are operating that low and you are an advertiser paying good money for commercials where there is no audience, that really Hz! (WB9EBO photo)



Members of the Gulf Coast Amateur Radio Club show two interested students some of the material the club donated recently to the New Port Richey Public Library, West Pasco County, FL. Two club members donated ARRL library packets, another a 10-year collection of QSTs and others contributed individual books and manuals. The project was spearheaded by WB4IDT to meet increasing demand for information about amateur radio. (WA4WBM photo)

Rid Your Model 28 TD of Distortion

Getting reports of poor copy from your model 28? Timing distortion in the keying contacts may be the problem.

By John Sheetz,* K2AGI

The Teletype Corp. model 28 transmitter distributor can produce large amounts of timing distortion in the output signal if it is out of adjustment. (A model 14 TD does not have this characteristic.) This is technically known as telegraph distortion. The adjustment to eliminate this distortion is usually made with the aid of a telegraph-distortion measuring set. Since most amateurs do not have such a test set, other means must be used to adjust the model 28 TD properly. By the way, there are two basic types of model 28 TDs. The most common is known as a single-contact TD and the other is known as a multi-contact TD. This procedure applies only to the single-contact type. The only test equipment required is an ordinary oscilloscope.

Prepare three loops or long pieces of tape as follows: One with all Vs, one with all Xs and one with alternate VXXVXXVX. Don't put any other codes in the tape such as carriage returns, line feeds or letters. Arrange an ordinary 60-milliampere loop supply as shown in Fig. 1. A one-watt resistor of less than 100 ohms should be placed across the input terminals of the oscilloscope. The value is not critical; I used 56 ohms. Note that the high side of the vertical input to the oscilloscope goes toward the negative terminal of the loop supply. The TD is simply connected in series in the normal manner. Make sure that no selector magnets are in the loop.

Remove the front wrap-around cover from the TD by gently springing the sides outward and sliding it forward. With the cover off, you will see three hex-head screws in a horizontal row on

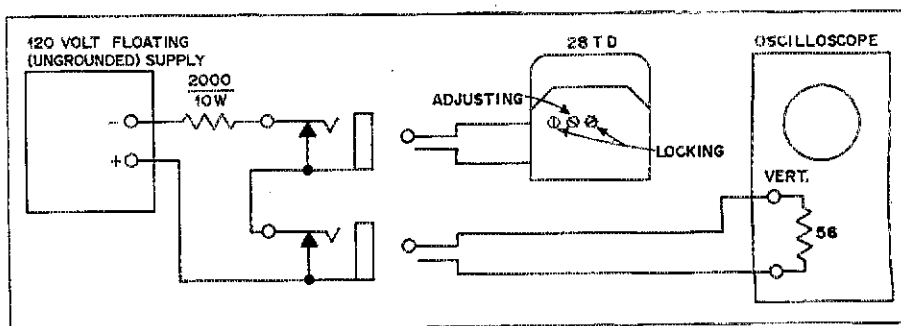


Fig. 1 — Connections for observing TD timing adjustments. The plug from the TD may be replaced with one from the keyboard for making keyboard-contact adjustments. There must be no selector magnets in the loop. Note that the high side of the scope input is connected toward the negative terminal of the power supply output.

the left front, as sketched in Fig. 1. The center screw will be found to be sloppy-loose and the other two will be tight. The center screw is an eccentric adjusting screw which aids in carefully moving the transmitting contact box left and right. This box is locked in position by the two outer screws. These screws should be loosened just enough to enable the center screw to turn with some resistance. A screwdriver may be used to adjust the screws, but a socket-type driver is a little less likely to slip off the screw while you are making the adjustment.

With the tape loop of continuous Vs running in the TD, adjust the oscilloscope to produce a display as shown in Fig. 2A. Adjust the scope for about 4 divisions in height and 10 divisions in width, as shown in the photograph. (This will be about 4.4 ms per division at 60 wpm.) Precision in this adjustment is not necessary. The internal sync on the oscilloscope should be set to start

the sweep at the leading edge of the short pulse. The sweep repetition rate will be low, about 6 sweeps per second. The horizontal gain should be advanced so that the positive-going pulse nearly fills the screen. Note that the top of the pulse is actually zero volts and the bottom line is about -3.3 volts if you are using a 56-ohm resistor. Don't worry if the top or bottom of the trace is not flat. We are only interested in the vertical transitions.

Now change the tape loop to the one with continuous Xs. You should see the pattern shown in Fig. 2B. Slightly loosen the locking screws and turn the adjusting screw to center the down-going transition. The idea here is to place the down-going transition halfway between the two up-going transitions. This is done by carefully turning the center screw. The side screws should be tight enough to hold the box in position when the center screw is released.

Now comes the precision part of the

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adjustment. Replace the tape loop with one containing alternate Xs and Vs. The pattern on the scope will appear as shown in Fig. 2C, and will have a low flicker-rate. You will have to study it carefully to recognize what you are looking for. Adjust the center screw to open the bottom gap on the right and then carefully readjust it until the gap just closes. As you carefully rock the center screw back and forth, you can observe the detail in the lower right corner of the display. A short, bright line will be going off to the right on the bottom on every other sweep. By turning the screw you will be able to create a gap between the left end of this line and the vertical line on the right. This gap should be brought just to a close. It is difficult to tell when the moving line on the right overlaps the line to its left, so you must move the line to the right until the gap just opens and then back to the left until it is just closed. The vertical line in the center of the screen will also be moving right and left with adjustment of the screw, but don't be concerned with its position. If your scope has a nonlinear sweep, this line may be off center, but that will not affect the accuracy of the adjustment.

Typical displays during this adjustment are shown in Fig. 3. When you are satisfied with the final adjustment, carefully tighten the two outer screws and recheck the pattern to see that it has not changed. You now have zero distortion in your TD.

Keyboard Contact Adjustment

The model 28 keyboard uses an identical type of signal generator and may be adjusted in the same way as a TD by manually typing the required letters. For steady Xs or Vs, use the repeat key.

Note: Do not try these adjustments with any selector magnets in the loop. If you want to see how much distortion a selector magnet will introduce, try plugging one in after you have the TD all set. Also, do not try this adjustment with a low voltage supply or you will see what microscopic amounts of dirt can do to the contacts of the TD. If you have an unstable or erratic display on the scope, a possible cause is dirty or pitted contacts on the TD. These can be cleaned with a standard relay-contact burnishing tool. If you take the cover off the contact box, you will see two contact pairs. The pair on the right is the only one that is doing anything in the loop circuit.

With a calibrated or a good, stable, linear oscilloscope you can read the percent distortion in any loop circuit. Fig. 3 shows 5-percent marking bias at A, zero distortion at B, and 5-percent spacing bias at C. The maximum possible bias, 50 percent, would move the

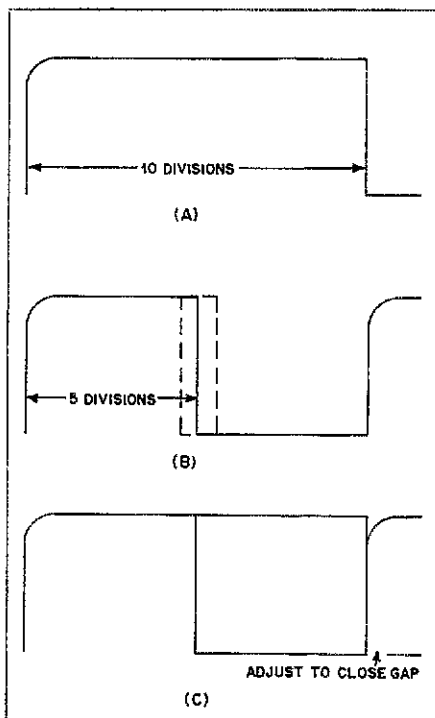


Fig. 2 — Oscilloscope presentations for (A) continuous Vs, (B) continuous Xs, and (C) alternate Vs and Xs.

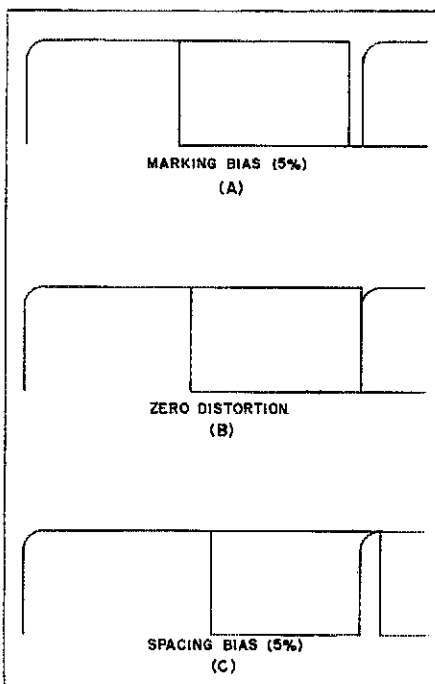
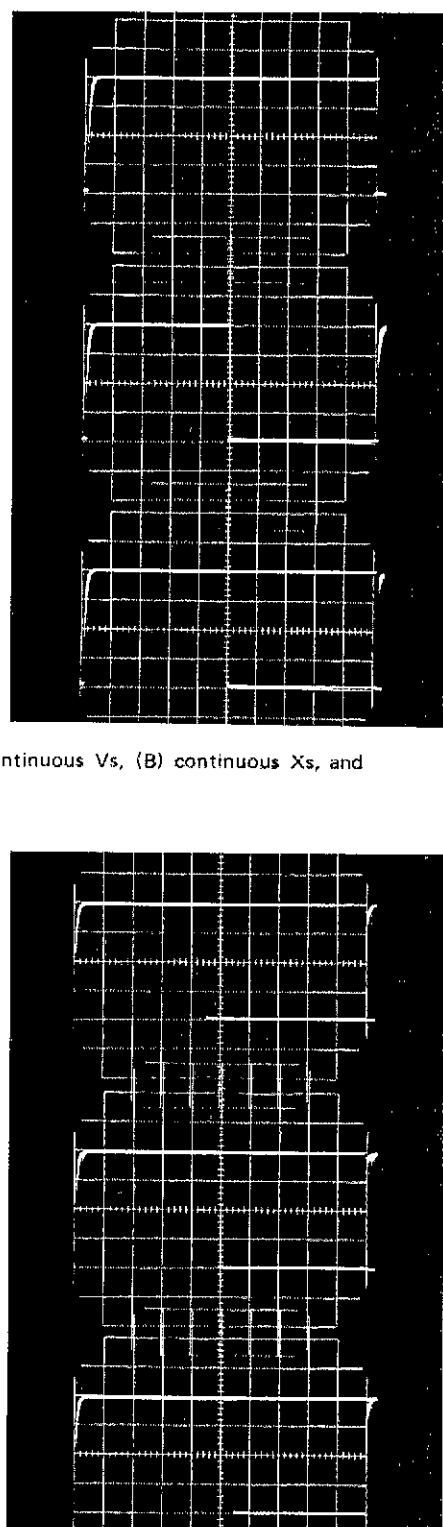


Fig. 3 — Final adjustment will cause the pattern to vary as illustrated here. The down-going lines are not very visible, so the bottom trace on the right must be used for precision adjustment (see text). Percent distortion in a loop circuit can also be read, as indicated.

vertical center line all the way to the left or right side.

If your TD or keyboard was badly out of adjustment and you had previously set the range finder on your printer using the TD or keyboard as a signal source, you had better go back and readjust the range finder again. If



you plan to incorporate this test system into your regular loop circuit, watch out for voltages above ground; your scope chassis might be connected to a high voltage point. An opto-coupler and some auxiliary circuitry to furnish a voltage signal to the scope would provide the safest arrangement.

Loops vs. Dipole — Analysis and Discussion

This computer analysis shows how the quad earned its reputation as an outstanding DX antenna.

By D. K. Belcher,* WA4JVE and P. W. Casper,** K4HKX

Over the years there have been many claims pro and con regarding the performance of full-wave loop antennas. Loops in diamond, square, circular, and hexagonal shape have been described. Unfortunately for prospective users, most of the comparisons have not been very analytical. Relative performance claims have often been based on differing models, assumptions, and measurement techniques. The loop's gain over a dipole is one fact about which there is disagreement. Lindsay¹ reported 2 dB, while Orr² reports 1.4. There have been other figures in between these two numbers.

A computer study of the loop-dipole question revealed that the disparity apparently results from the model chosen. If the current maxima are farther apart, as in a circular or diamond-shaped loop, the higher gain figure results. Our model attains the 2-dB figure, since more rigorous analytical and empirical information is available on that configuration.

Another curiosity concerns the loop's reputation as a good DX antenna. It does not seem reasonable to attribute this to a mere 1.5 to 2 dB of gain, which is barely distinguishable to the human ear, and Lindsay claims that the vertical angle of radiation is "essentially the same." Having the various contradictory facts, the authors decided to perform an

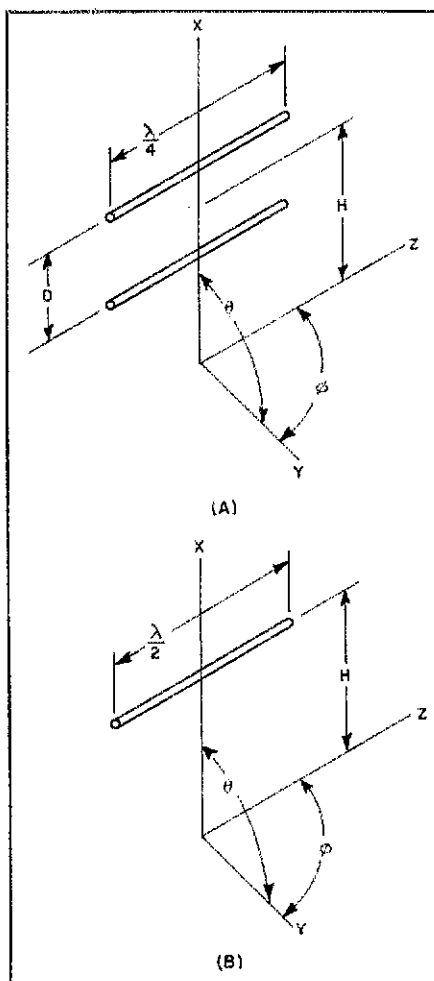


Fig. 1 — Models used for the computer survey of the loop (A) and dipole (B) antennas.

analysis rigorous enough to uncover some of the misconceptions.

Information available to date has not extensively considered loops above ground, in direct comparison with dipoles above ground. Actually this is the *only* situation to consider, since with all ground-based hf antennas this is the case.

Simplified Theory

In order to model the loop antenna, only the major radiation component (horizontal) is considered. Fig. 1 shows the model for both the full-wave loop and the half-wave dipole. In the analysis the height above ground, H , is assumed to be that of the geometric center of the loop elements. Ground is considered ideal.

The computer analysis proceeds as follows:

- 1) The current in all elements is defined.
- 2) The radiation field is examined point by point in all space.
- 3) The drive currents in all antenna elements are adjusted so that the total radiated power from the antenna systems is equal.
- 4) The fields of both antennas are then plotted on the same graph for one height.
- 5) Other pertinent data are extracted from the field plots.

Analysis Results

The comparative horizontal patterns of the loop and dipole are shown in Fig. 2. The plot represents horizontally po-

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¹ This and subsequent footnotes will appear on page 37.

larized E-field intensity only, as it varies with azimuth angle. The loop is known to have small vertically polarized side lobes, but all vertically polarized components were omitted from the analysis and will not be discussed. As is apparent from the figure, the dipole has a slightly narrower 3-dB beam width, approximately 78° , compared to 85° for the loop.

Fig. 3 shows the comparative free-space vertical patterns for both antennas. The dipole has the familiar isotropic pattern, whereas the loop has a "peanut" pattern resulting from some vertical-direction phase cancellation in the plane of the loop. The E-field intensity amplitudes shown on the graph may be directly ratioed for a true indication of relative power radiated at any vertical angle. For example, if the E-field values for zero degrees are taken, the maximum power gain of the loop over the dipole is found to be

$$G_{max} = 10 \log \frac{(E_{loop})^2_{max}}{(E_{dipole})^2_{max}} = 10 \log \frac{(1.0)^2}{(0.8)^2}$$

$$G_{max} = 1.94 \text{ dB}$$

This compares favorably with the 2-dB free-space gain figure reported by Lindsay for the circular loop, and substantiates that the simplified loop model used in the computer analysis approximates the correct free-space performance. Theoretical free-space conditions are interesting for examining ideal element radiation pattern comparisons but of primary interest to amateurs operating the hf bands are the effective patterns in the presence of ground.

Figures 4A through 4I show what happens when loops and dipoles are suspended at various elevations above perfectly conducting earth. At a quarter-wave above ground (Fig. 4A) the dipole radiates maximally straight up. The loop at the same height is better, giving a peak at about 45° and radiating substantially greater power than the dipole at lower angles. But by the standard way of comparing antenna gains (ratio of lobe peaks) we see that the dipole radiates a slightly stronger E-field straight up than the loop does at 45° , resulting in a loop-to-dipole gain (G_{max}) of -0.31 dB. As the elevation increases, the lobe angles decrease and a vertical null begins to form until at $\lambda/2$ above ground (Fig. 4C) a complete vertical null exists. At this elevation there is little difference between the peak lobe angles for either antenna (30° dipole vs. 27° loop), and the difference becomes even less as the height increases (Figs. 4D through 4I, and Fig. 5A). Continuing above $\lambda/2$, another vertical

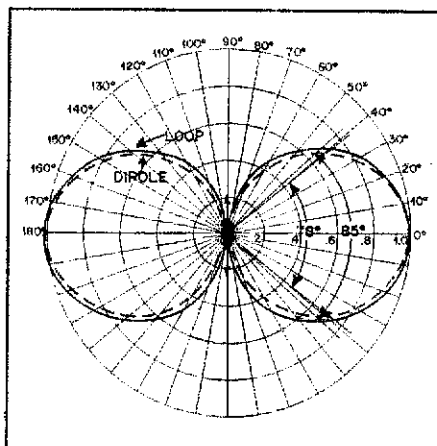


Fig. 2 — Normalized horizontal patterns for the loop and dipole antennas, all heights. For this and all following patterns, the solid line is for the loop.

direction lobe forms, grows, splits, and nulls by 1.0λ (Fig. 4G), and this process just continues with more height.

It is interesting to note that the G_{max} loop gain over a dipole does not become significant until $3/4 \lambda$ above ground, where it is up to 1.89 dB (Fig. 4E). Fig. 5B shows how G_{max} varies with height, first nearing the free-space figure at $3/4 \lambda$ and seesawing on up with more height. This figure shows that the 2-dB gain of the loop over a dipole does not become available until the elevation gets to $3/4 \lambda$, but the reputation of the loop is for exceptional performance over a dipole especially at low elevations. This advantage does in fact exist if one ignores the lobe peaks and compares only the absolute field intensities radiated at each angle.

Using Figs. 4A through 4I to obtain relative field intensities radiated at various vertical angles, we get the set of

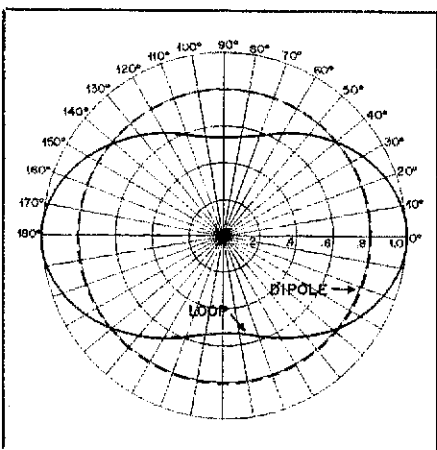


Fig. 3 — Free-space vertical patterns for both antennas. Maximum loop gain is 1.94 dB.

curves plotted in Fig. 5C. At an elevation of only $\lambda/4$ it is evident that up to 3-dB more power is radiated at low angles by the loop than by the dipole. The reader is cautioned that this curve says nothing about where the lobe peaks are, but merely gives an indication of how much power the loop radiates at any specific vertical angle relative to a dipole at the same height. Heights of $3/8 \lambda$, $3/4 \lambda$, and $7/8 \lambda$ are also seen to be good for maximizing the low-angle advantage of the loop, whereas at $\lambda/2$, $5/8 \lambda$, and 1.0λ the gain is small but still significant.

As the figures have shown, the comparative performance of a loop vs. a dipole can vary rather widely with elevation. As every frustrated antenna engineer knows, the effective elevation of any antenna in the presence of objects such as houses, trees and power lines, and with varying ground conductivity, can be quite different from physical elevation. The most significant conclusion that can be drawn is that *effective* elevation is *likely to differ* from the physical height. Therefore, it would be a mistake for the amateur to place too much emphasis on achieving a precise elevation to realize a specific vertical pattern, unless true ground is known.

Conclusions

With real-world exceptions as they are, it is nevertheless possible to draw several meaningful general conclusions from the theoretical curves that have been presented here:

1) A full-wave loop antenna has a low-angle advantage over a dipole at all elevations. It is therefore a more effective DX antenna.

2) At angles below 10° the gain of the loop over the dipole never goes below 1.0 dB and may range up to 3 dB.

3) If the effective ground elevation of a particular installation is known with confidence, it may be predicted that $\lambda/2$ is particularly bad elevation for a loop in terms of advantage over a dipole.

4) The loop has a slightly broader horizontal pattern, but the difference is so small to be of little significance.

5) The vertical lobe peak angles are substantially different up to $\lambda/2$ height, and track closely at higher elevations.

Unsubstantiated (But Probably True) Observations

1) In all real-world situations, the loop is somewhat unbalanced between top and bottom currents which causes the vertically polarized components of radiation to be greater.

2) This vertically polarized component may be a substantial reason for the loop's added advantage, especially during periods of marginal band conditions.

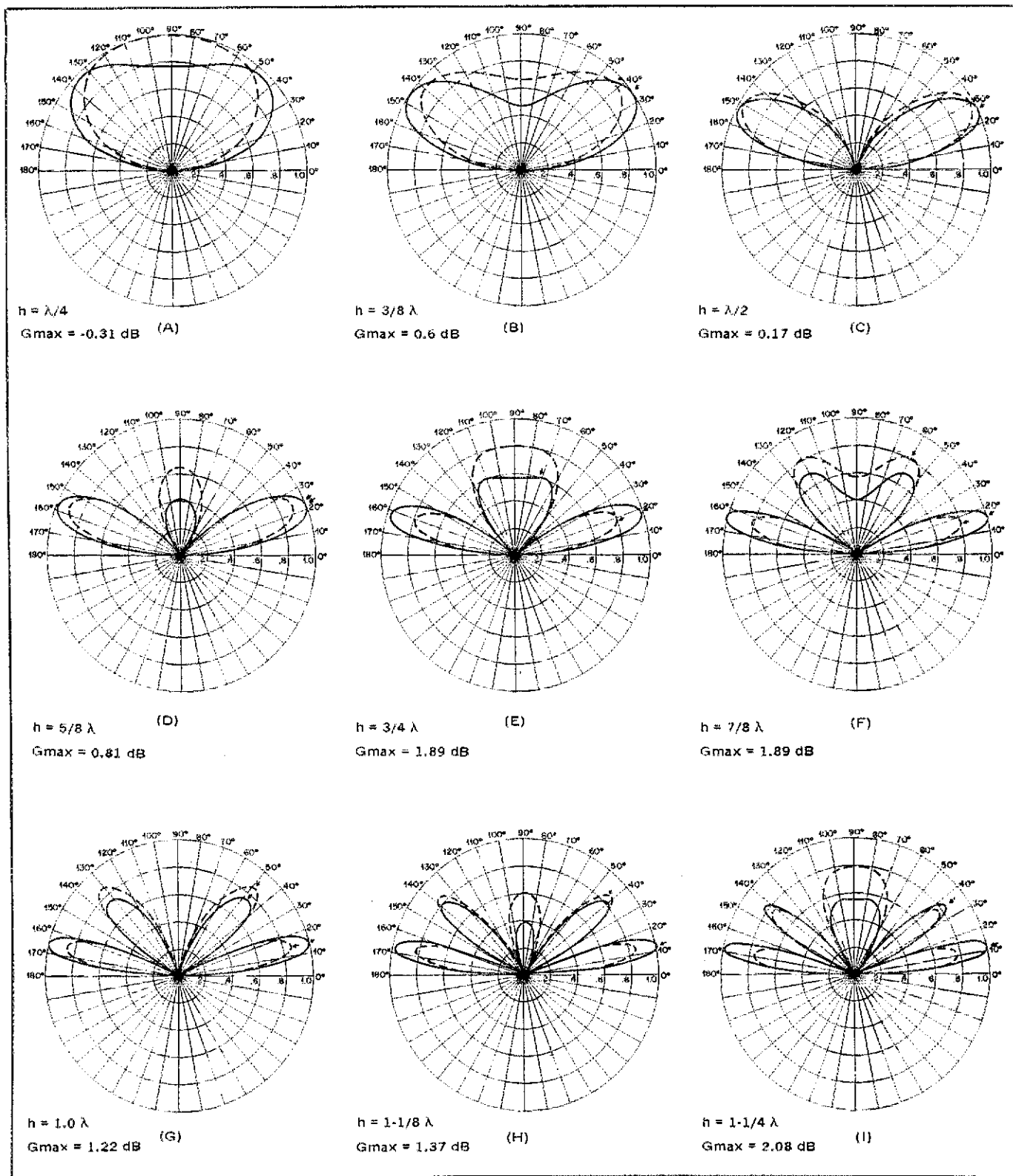


Fig. 4 — Vertical patterns and gains for the loop over the dipole antenna at various heights above perfectly conducting ground. Loop curves are solid lines. At low heights the gain for the loop is low and the radiation angles are high for both antennas, but the loop is

superior in every case. Substantial improvement for the loop appears first at $3/4 \lambda$, where its gain approaches the free-space value and its radiation angle drops below 20° for the first time.

3) Two vertically stacked half-wave dipoles have the potential to outperform the loop.

4) A one-wavelength horizontally polarized loop may have more gain in

the diamond configuration than in the square. This is due to the current centers being separated by different distances and could account for the diversity of gains reported. Perhaps

some interested reader would care to analyze this possibility further.

Detailed Theory

The horizontal electric field inten-

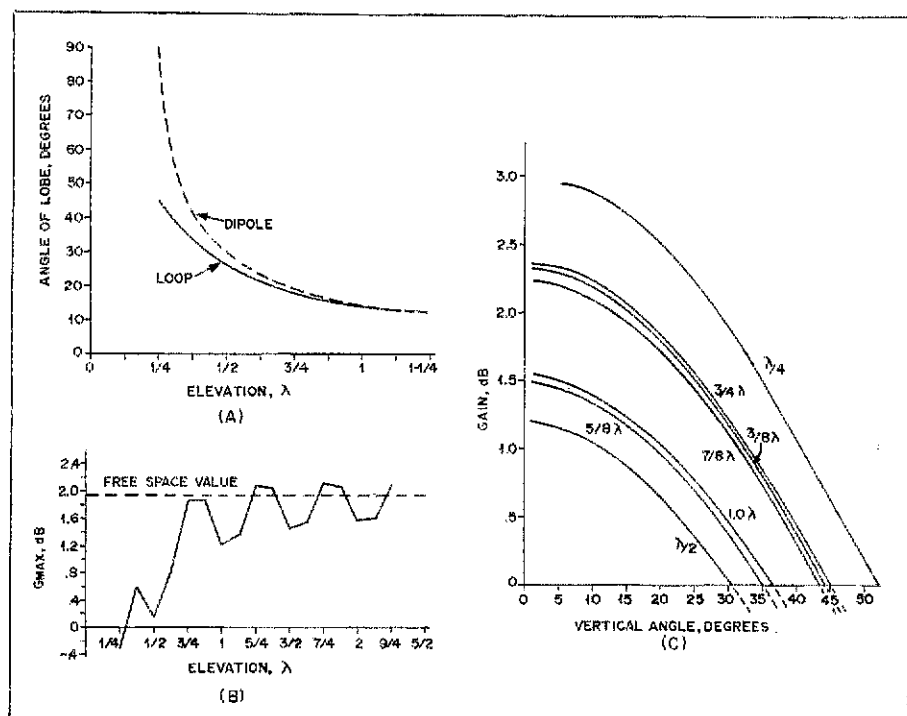


Fig. 5 — Comparisons of the performance of the loop and dipole in several categories of interest to the amateur. The vertical angle of the lowest lobe for the two antennas is given in A. Gain of the loop over the dipole at heights up to $2\frac{1}{4}\lambda$ is shown in B. Gain for the loop over the dipole at vertical angles up to 50° is given for various heights in C.

sity $E(\theta, \phi)$ can be defined by the methods in step 4 of the computer analysis as

$$E_{D,I}(\phi, \theta) = \left[\frac{K_1 \sin \phi}{2K_2} + \frac{\cos(\pi/2 \cos \phi)}{2K_2 \sin \phi} \right]$$

$$\cos \left(\frac{D \cos \theta}{2} \right) \cdot \cos \left(\frac{2H \cos \theta + \pi}{2} \right)$$

where $K_1 = 1$ for loop, 0 for dipole
 $K_2 = 1$ for loop, $1/2$ for dipole
 $H = 0$ for free space

The equation is valid for both the loop and dipole antenna. Note from the model that $H > D/2$ in order to keep the bottom loop element above ground. D is 0.318λ to approximate Lindsay's model.

After calculating the electric field intensity at all points in a $1/8$ sphere, the total radiated power is computed for each case at unit radius and unit space impedance, since the ratio of the absolute power is important.

$$P_{I,D} =$$

$$\int_0^{\pi/2} \int_0^{\pi/2} E_{I,D}(\phi, \theta)^2 \sin \theta d\theta d\phi$$

The field intensity is then normalized by the expression

$$E_I(\phi, \theta) = E_I(\phi, \theta) \sqrt{\frac{P_d}{P_I}}$$

For ease of plotting, all field intensities are again normalized to a maximum value of 1.0.

$$E_I(\phi, \theta) = \frac{E_I(\phi, \theta)}{\max \{E_{I,D}(\phi, \theta)\}} \quad \text{and}$$

$$E_D(\phi, \theta) = \frac{E_D(\phi, \theta)}{\max \{E_{I,D}(\phi, \theta)\}}$$

The gain of the loop over the dipole can then be expressed as

$$G_{max} = 20 \log \left(\frac{E_I(\phi, \theta)_{max}}{E_D(\phi, \theta)_{max}} \right)$$

Footnotes

¹ Lindsay "Quads and Yagis," *QST* for May, 1968.

² Orr, "Antennas," *CQ* for January, 1974.
 Orr, *All About Cubical Quad Antennas*, Radio Publications, Inc., second edition, 1971, p. 16.
 Kraus, *Antennas*, McGraw Hill Book Co., 1950.

Strays

POWDER PUFF DERBY

□ The W8GQN Straits Area Radio Club provided communications for the recent annual Powder Puff Derby, a four-day race of female fliers. Club members manned a van set up at the terminus of the race, the Boyne Falls, MI airport, that kept the principals in touch with intervening check points between the starting point, Riverside, CA, and Boyne Falls. On a sunrise-to-sunset duty schedule divided into three shifts, operators worked in pairs, using 20, 40 and 80 meters. The traffic count totaled 708.

Since one of the feminine fliers was Mrs. Charles Schulz, wife of the Peanuts cartoonist, the Derby attracted national attention in a unique way. Adding to the fun were a stuffed Snoopy and his little bird pal, Woodstock, who flew in one plane, while the pilot of another dressed as the Red Baron.



Shown kneeling in front of their rig at the Boyne Falls airport are: A guest, W8RPN, W8OTO and W8AYZ. Standing are: W8BTN, W8HKL, W3GTC (national chairman, Powder Puff Derby Communications Group), and Robert McKown, club secretary. Other operators included WA4JLE/8, W8BTX, W8OAF, W8IAR, K8AEA, W8HSL and W88RH.

STOLEN EQUIPMENT

□ ICOM IC22A, Serial No. 3408246, with N150-3731-8145 scratched on back and on chassis. H. M. Neben, 1401 Willow St., Western Spg., IL 60558.

□ Stolen from auto April 13 in Park Ridge, IL. Swan 350, Serial No. C110102. Bernard Flathau, K9QMH, 2221 Glenview Ave., Park Ridge, IL 60068.

□ IC230, Serial No. 6273. Contact Mobile City Police, report M-76-03-1097 or Calvin Puckett, W4YXO, 5375 Timber Line Ridge, Mobile, AL 36609.

□ Regency HR-212, Serial No. 24-01202, with damage to case and mounting insert caused when removed from car. John Johnston, K3BNS.

Technical Correspondence

DESIGNING TRAP ANTENNAS

A recent paper by Hall¹ was devoted to a study of dipole antennas which are less than 1/2-wavelength long. Calculations were presented which specified the inductance needed to establish resonance in antennas of this kind. This work is very timely, due to the current interest in the lowest amateur bands, as well as the increasing popularity of economical hand-held calculators. In studying Hall's paper, I noted that his inductance formula is easily extended to include the design of traps as the loading impedance. Not only does this allow multiband dipole or monopole antennas to be designed, but it leads to some versatility in the realization of loading elements for single-band configurations.

For a single-frequency antenna of total length A ft., with loading coils in each leg B ft. from the center, and a wire diameter of D inches, Hall gives the required net loading inductance as

$$L_{\text{coil}} \mu\text{H} = \frac{10^6}{68\pi^2 f^2} \left\{ \frac{1}{X} \left[\ln \frac{24X}{D} - 1 \right] \times \left[\left(1 - \frac{fB}{234} \right)^2 - 1 \right] - \frac{1}{Y} \left[\ln \frac{24Y}{D} - 1 \right] \times \left[\left(\frac{Yf}{234} \right)^2 - 1 \right] \right\} \quad (\text{Eq. 1})$$

with

$$X = \left(\frac{234}{f} - B \right) \quad Y = \left(\frac{A}{2} - B \right)$$

where f is in MHz. The equation is rewritten slightly from the form originally presented for compatibility with hand calculators with several memory banks, e.g., the writer's HP-45.

If a parallel L - C combination is substituted as the series loading element in an antenna, the impedance of the resulting "trap" is

$$Z_t = \frac{j \left(\frac{L}{C} \right)}{\frac{1}{\omega C} - \omega L} \quad (\text{Eq. 2})$$

where $\omega = 2\pi f$

The resonant frequency of the trap is defined by a zero in the denominator of Eq. 2. At lower frequencies where the reactance of the capacitor exceeds that of the inductor, the

net impedance of the trap is inductive. If we define f' as the resonant frequency of the trap and ask that the net inductive reactance of the trap at the lower frequency, f , equal that of L_0 as given in Eq. 1, the required components for the trap are easily shown to be

$$L_T = L_0 \left[1 - \left(\frac{f}{f'} \right)^2 \right] \quad (\text{Eq. 3})$$

$$C_T = \frac{1}{\omega'^2 L_T} \quad (\text{Eq. 4})$$

where $\omega' = 2\pi f'$

A two-band trap antenna is designed by choosing the resonant frequency of the inner part of the antenna (i.e., $2B$) to coincide with f' . For example if f' is 7 MHz, B is 32 ft. If A is chosen as 106 ft. and f is 3.7 MHz, we arrive at $L_T = 10 \mu\text{H}$ and $C_T = 50 \text{ pF}$. This is merely the popular W3DZZ design.² The inner portion of this antenna could now be replaced by any loaded, shortened structure which is still resonant at f' . Repeated application of this method would lead the way to trap antenna designs for an arbitrary number of frequencies.

The use of traps as loading impedances is not limited to multiband designs. From Eq. 3 we see that the trap inductance, L_T , is less than that required without the capacitor. We can take advantage of this by choosing more practical inductor values. For example, Hall described an antenna for 1.8 MHz which used loading coils of about 60 μH . If an equivalent trap with $f' = 2.5$ MHz were used in its place, the required coil would only be 30 μH , a more easily realized value. A short piece of coaxial cable could serve as the capacitor. Antennas of this kind will exhibit a reduced bandwidth when compared to those with pure inductive loading.

Using K1PLP's work as a basis, the design of loaded single-band dipoles or trap multiband dipoles is almost trivial. It's frustrating that suitable high structures upon which these antennas can be suspended do not come as easily. — Wes Hayward, W7ZOI, 7700 S.W. Danielle Ave., Beaverton, OR 97005.

SSB SPEECH PROCESSING REVISITED

I have read with great interest the more recent articles on speech processing which have appeared in *QST*.^{3,4} The authors are to be congratulated for their presentations. These articles prompted me to revisit speech processing. Reference is further made to "Ordinary and Processed Speech in SSB Application" that appeared in the January, 1969, issue of *QST* and to the ARRL SSB Manual.⁵ The following comments are offered.

When utilizing speech processing techniques, not only is one interested in increasing the ratio of transmitted average power to peak-envelope power, but also in how the received signal "plays" to the operator at the receiving site. The objective, of course, is ultimately to improve intelligibility at the far end. From a technical point of view, to simply increase one's transmitted average power or "talk power" at the transmitter, with no improvement in intelligibility at the receiver, would certainly accomplish very little to nothing.

The main consideration, in the final analysis, must be the effective signal-to-noise ratio at the receiver. That's why the average sideband power at the receiver with processing (defined as S_{av} in ref. 5) and equivalent noise power (defined as D) produced by distortion products of a processor are so important. They are both functions of processor limiting, and intelligibility can be maximized for a given level of receiver noise power from all other sources (defined as N). Since the average sideband power at the receiver without processing (defined as S_{0av}) and average noise power N are considered equal bases for these analog systems, it must be concluded that the best method of speech processing is the one that maximizes the ratio of S_{av}/D .

The "Quasi-Log" processor (ref. 3) is a member of the af clipper family. It undoubtedly is a very well designed, effective band-limited af clipper. Remember, however, that harmonic distortion (HD) and resulting intermodulation (IM) products are generated and transmitted within the processor passband. With voice dynamics, severe HD and IM products are generated, even though an analysis may show some variations in harmonic structure with heavy logarithmic ("soft") vs. idealized limiting. Filtering action in the stop-band areas of the filters would only eliminate excessive transmitter signal bandwidth (assuming levels are set correctly).

Proper filtering with clippers does play an important role in predicting the ratio of increased transmitted ssb average power to peak-envelope power. With a passband of 300-2700 Hz and 20 dB of af clipping, as in the Quasi-Log processor, the increase in transmitted average to PEP power was predicted to be approximately 10.2 dB. As may be determined from Fig. 1, the resulting in-band equivalent noise power D , generated on the transmitted signal by the HD and IM distortion products, masks and degrades the received intelligibility at the receiver to approximately 4-5 dB improvement (5 dB with 20 dB of clipping). Rf clipping that produces about the same increase in the ratio of transmitted average power to PEP results in approximately 8-dB improvement in intelligibility at the receiver.

A transmitter output waveform when utilizing the Quasi-Log processor is shown in Fig. 3D of that article. My estimation is that

¹ This and subsequent footnotes will appear on page 39.

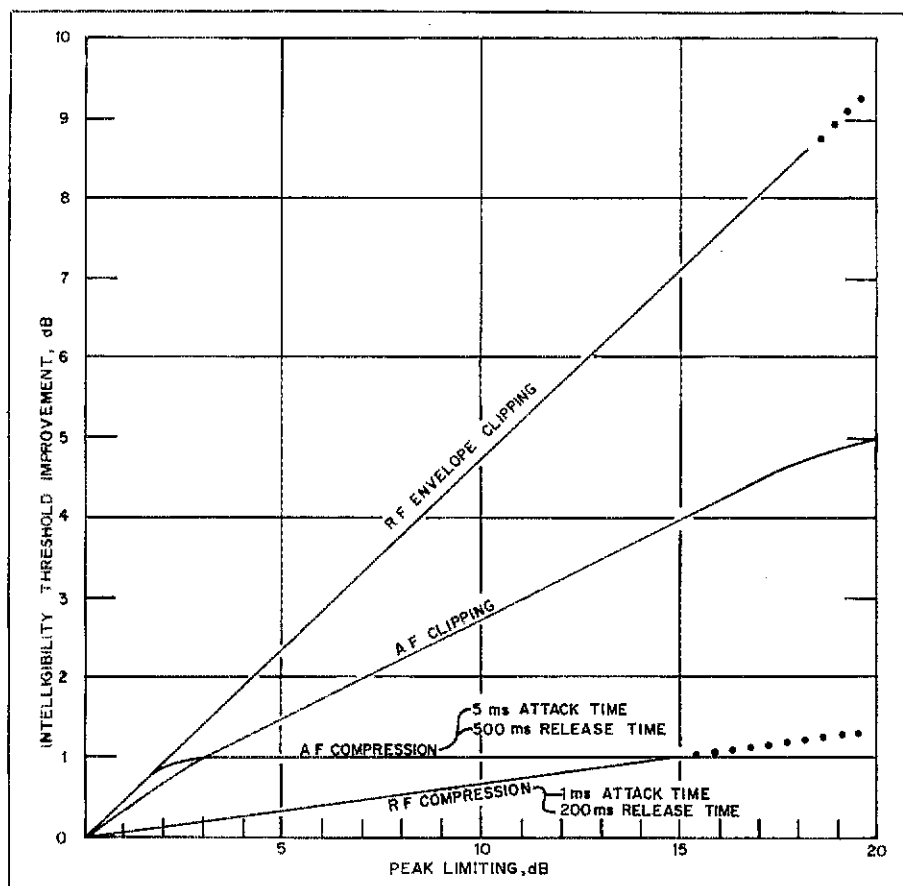


Fig. 1 — Comparison of effectiveness of simple speech processing techniques applied to ssb transmission. Typical compression and release times are indicated (from *QST*, January, 1969, p. 19).

approximately 20 dB of clipping is employed. In that Fig. 3C, the rf clipping looks to be somewhere between 12 and 15 dB. My point is that a properly operated rf clipper can surely present a very similar, filled in, output waveform such as that in Fig. 3D, with greater effectiveness at the receiver. Equivalent noise power D is less with the rf clipper in, as fewer "in-band" distortion products (mostly odd-order intermodulation) are generated for a

given amount of clipping. The result is a higher quality signal than that obtained from af clipping. These are the reasons that rf processors "sound better" and are more effective than af processors. The curves of Fig. 1 here depict the improvement rather effectively.

Thus, in considering the above two methods, one can address himself to two general areas of concern; (1) modification of

the ssb output waveform for increased average power at the transmitter (which includes maintaining minimal bandwidth commensurate with good operating practices), and (2) the resulting increased effective signal-to-noise ratio presented to the receiver. Considering the modified transmitted output only is to address oneself to part of the total problem. As was described, both methods can accomplish this task about equally. But when one considers and includes effective signal-to-noise ratios in the communication problem, then from a technical point of view, af processing falls short of rf processing in ssb communications. Here now is where one's personal value judgments are made. Any trade-offs, e.g., performance, cost, complexity, simplicity, inline, inboard, outboard, etc., etc., are up to the individual.

In conclusion, it seems there has been and is still misuse of speech processing devices on the amateur bands. Some of the units that hit the market did not remain around long, whatever the reason. Some problem areas were the amateurs', some were the manufacturers'. Although speech processing is not a panacea, those who are operating well-designed devices (be they af or rf) in a proper manner are finding the results more than satisfying. Experience over the years has shown that with even moderate rf clipping incorporated, from normal low-noise operating conditions (i.e., high received signal levels, S9 plus) to heavy clipping in near-marginal high-noise conditions (i.e., low received signal levels), reports of a superlative nature are produced — Hal Collins, W6JES, 1674 Labrador Dr., Costa Mesa, CA 92626. **QST**

Footnotes

- ¹ Hall, "Off-Center-Loaded Dipole Antennas," *QST*, September, 1974.
- ² Buchanan, "The Multimatch Antenna System," *QST*, March, 1955.
- ³ Myers, "A Quasi-Logarithmic Analog Amplitude Limiter with Frequency Domain Processing," *QST*, August, 1974.
- ⁴ Kaufmann and Kopec, "A Homomorphic Speech Compressor," *QST*, March, 1976.
- ⁵ Collins, "Ordinary and Processed Speech in SSB Application," *QST*, January, 1969. Also *Single Sideband for the Radio Amateur*, ARRL, 1970, p. 217.

Feedback

□ The Rosenberg listed on page 62 May, 1976 (Feb. FMT results), is none other than W9PBI. John forgot to note his call on his original entry. For some mysterious reason W1DDO's entry was omitted from the report (and we did indeed receive one from Bob!). To set the record straight Bob averaged 11.542 ppm. That 1.5 ppm listing belongs to W4RHZ (and not W4THZ, as shown — sorry Joel). Going back further, to the Feb. report of the Nov. 1975 *QST*, that 15.2 ppm goes with K4CFV (not K4CVF, as printed).

□ G-o-l-l-e-e, we can't believe this really happened! Somewhere along the way in constructing the power supply for the digital voltmeter/frequency counter for "Learning to Work with Integrated Circuits" (January, 1976 *QST*) we picked up incorrect basing information for Q1. This is the pass transistor in the 12 V regulator section. In the sketch in Fig. 1, p. 29, the emitter and the base leads are shown reversed from their correct identification and, as shown in the photo of Fig. 2,

Q1 is installed backwards. (The parts callout of Fig. 2 shows the correct connections). To correct this error in your instrument, remove Q1 from the board, turn it 180°, and reinstall it. This should allow U1, the regulator IC, to operate at a much cooler temperature. — K1PLP and WA6GVC

□ The W7ZOI article for the June *QST*, 1976, did not contain some construction data. T1 is wound on an FT-50-72 toroid, with 50 turns of No. 30 wire for the primary and 7 turns of No. 26 wire for the secondary. L1 has 65 turns of No. 26 wire on a T68-2 toroid core. L2 contains 18 turns of No. 22 wire on a T50-2 toroid core. The iron cores are supplied by Amidon, Palomar Engineers, or Whitehouse and Co. (see *QST* ads). The FT-50-72 core is supplied by Amidon, and is a ferrite one. The Fig. 5 equation has an error, C' equals C prime squared, rather than C'^2 as given. All other terms are correct. C prime should be chosen to be greater than $2C_{jk}$.

Strays

STOLEN EQUIPMENT

- Taken from locked auto parked in residence driveway on May 12. Ultra-Com 25, Serial No. 080213, enscribed in two places with NC driver's license no. 2067134. Contact NC Police Dept. or Earl D. Fox, W4DWR, 318 W. Montcastle Dr., Greensboro, NC 27406.
- Stolen from parked auto. ICOM IC-22A, Serial No. 1216 with Motorola mic; Realistic PRO-11 scanner, Serial No. 08370930; Sanyo FT-867, Serial No. 87661611; Realistic MPA-10 PA amplifier, Serial No. not given. Contact Stephen E. Martin, WA3SAD, 12115 Northwood Dr., Upper Marlboro, MD 20870 or Prince Georges County Police, Bowie, MD, case no. 75-233-163.
- Heath — HW 202 with name and social security no. etched several places inside case. Billy Monteer, WA1VPO, 3302 East Bay Village, Middletown, RI 02840.

Product Review

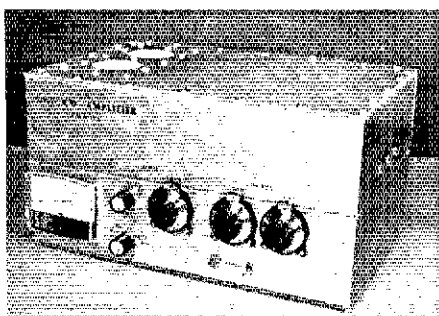
ARCOS 432-MHz Transmitting Converters and Amplifiers

A versatile system for transmitting on 432 MHz at various power levels is offered by ARCOS (Amateur Radio Component Service). Output levels from 4 or 5 watts (transmitting converter only) to better than 1 kW PEP can be obtained with different combinations of equipment.

This review will concern itself for the large part with the amplifiers, since they represent a somewhat unusual item for the amateur market. High-powered amplifiers for frequencies through 30 MHz are available from many suppliers. Amplifiers for 50 or 144 MHz can be obtained from a few outlets and from some surplus houses. Until recently, anyone wishing to operate at 432 MHz found that the equipment was limited either to that which could be built from published information or to one or two surplus rigs (which often were beasts to modify).

The ARCOS 432-MHz amplifiers are based directly on a design by K2RIW (*QST* for April, 1972) with some innovations necessary to provide a reasonably compact and convenient assembly. W2GN, Fred Merry, (president of ARCOS) has been very responsive to the suggestions of many users of ARCOS equipment and has used these bits of information to improve and upgrade the amplifiers for greater reliability and performance. There have been some glitches in the performance of 'RIW type amplifiers — especially those constructed by amateurs "on their own" without the benefit of a proper kit of parts. This is not to say that the early ARCOS equipment was immune, however. The most persistent bug has been a type of oscillation, not fully understood, that occurred with a combination of Class C biasing and high drive levels. Tests and bias-circuit changes were tried by many amateurs and, while there were improvements noticed, one could not be sure that a complete cure had been found.

An observation made by this reviewer, and confirmed by W2GN and others, was that the amplifiers were not subject to this particular malady when operated in the Class AB₁ or AB₂ bias range, as long as proper drive levels were observed. It is possible to make almost any amplifier unhappy if too much drive is applied, causing internal structures to overheat. The amplifier used for the purpose of this report has been operated over a period of several months, for many EME contacts by W1SL, without any signs of the aforementioned problem. Driving power was usually 25 to 28 watts, cw. Power output was almost always between 600 and 700 watts, occasionally a bit higher during driver-tweaking sessions. Stability of output from the beginning of a transmission to the end has been excellent; if the filament voltage had been applied long enough to get the cathode and grid structures and the surrounding metal circuit components up to a reasonable temperature, there was no need to adjust either the input or output controls. This is in large part because of the excellent air-flow



path inherent in the design, and to some extent because a blower of adequate size is recommended by (and available from) ARCOS.

Components and Assembly

One of the first things noticed upon inspecting the kit is that quality parts and good workmanship prevail. As an example, the aluminum chassis used for enclosures have welded corners and an ample number of captive nuts — very necessary to provide an rf-tight assembly. The importance of good rf-shielding cannot be overemphasized here. Preventing unwanted paths between output and input is a minor consideration when compared to the hazard of radiation from an amplifier of this power level and frequency range. A slot which is 4 to 5 inches long can release a dangerous amount of energy when the tubes inside the box are operating at 500 to 1000-watts input.

The finish (iridite) on the chassis, the good mechanical fit between the many parts, the clear photographs and drawings, all show that considerable thought went into the production of these kits. Where the assembly of a particular item can be tricky, a large drawing is provided to help get things right.

Since the review model was provided in completely assembled form, a nut-and-bolt

rundown of the assembly process will not be included here. However, careful inspection of the completed amplifier and of the instruction manual leads to the conclusion that no problems will be encountered. Length of time needed for building the kit should not be a consideration; care is the watchword when working with this power level.

Variations

Several combinations of equipment are available. Starting at the top is the 1-kW amplifier. This is either a stand-alone "box" assembly as shown in the photograph, or a panel-mounted version. An identical amplifier assembly, but with a smaller power supply, can be obtained for service of 300 to 500 watts. A popular package is this lower-power amplifier with a transmitting converter (available from ARCOS) that can be mounted to the side of the amplifier. This combination can be mounted behind a panel if desired. Tubes for the higher-powered amplifier should be the 4CX250B or 4CX250R. The 400-watt version can use either these or the less expensive 4X150. A versatile combination would be to use the transmitting converter to drive an amplifier with 4X150s, and feed this into a last stage using 4CX250Rs. Thus the first two stages would provide ample power for access to Oscar 7B, or for local work; the "biggie" would have the necessary punch for EME or tropo DX efforts.

Two power supplies are available. One will handle the amplifier at an output level of 400-watts cw. It can be obtained with a low-voltage supply, for powering the transmitting converter, incorporated as an extra feature if desired. The top-of-the-line supply, a real "bulldog" as Fred aptly puts it, will handle a full 1-kW output on cw, 2 kW PEP. This is a compact supply (17 x 10 x 10 inches) with bias, screen, and filament voltages as necessary but is no lightweight; it tips the scales at 80 lbs.

Transmitting Converter

The first kits and rigs that were marketed by ARCOS included a transmitting converter manufactured by Carmichael Communications. Before things really began to move, however, the company discontinued the line, much to the consternation of many uhf enthusiasts. Undaunted, W2GN picked up the ball and is making his own version of the converter available, either separately or as part of a package. Based on a common design that uses a 6939 tube as a mixer and another as an amplifier, the converter accepts 28-MHz input to provide 3 to 5-watts output. The local-oscillator chain is solid-state, and has an output jack for provision to feed the 404-MHz injection energy into a receiving converter of the user's own design.

This converter/amplifier combination makes a good package for working through Oscar 7, mode B, as witness the many contacts made by W1AW (AC1AW) during the spring and early summer of this year. Fred



This collection of parts in the amplifier kit can be turned into a 432-MHz amplifier by anyone who is reasonably adept with ordinary hand tools. A panel-mounted version is available, as is a transmitting converter to drive the amplifier.

Table 1

DRIVE W	P _O W	E _p V	I _p mA	I _{SG} mA	I _G mA
8	190	1750	370	0	0
16	530	1750	620	0	0
20	730	1750	750	4	*
24	900	1750	830	10	*
30	1000	1730	910	15	*

Note: Amplifier adjusted for best output at highest power level and not retuned for lower drive. * = grid current slightly negative; this condition will vary depending upon loading and plate tuning. For this test, bias was adjusted for plate idling current of 100 mA, screen voltage was 360.

(W2GN) has also attracted crowds wherever he demonstrates his mobile Oscar-working setup that uses the same lineup.

A complete listing of the price classes for the various combinations of exciter/power supply/amplifier would be impractical here. However, a sampling shows the transmitting converter at \$155 (less tubes), the 2-kW supply at \$525, the 1-kW supply at \$250, the amplifier kit (less tubes) \$340, or the amplifier assembled and tested at \$490 without tubes. There are several variations available, as well as individual parts for the more ambitious do-it-yourselfer. You can write to ARCOS for a list, but do Fred and yourself a favor and send an s.a.s.e. to speed up the reply. Address: ARCOS, Box 546, East Greenbush, NY 12061. — WISL

ARCOS UHF kW Amplifier

Dimensions (HWD): 6-1/4 X 12 X 8-1/4 inches.

Power input: See Table 1.

Power output: See Table 1.

Cooling: Forced air; 300-350 CFM blower recommended (available from ARCOS).

Power requirements: 2000 V dc, 1A; 360 V dc, 50 mA; 6.0 V ac (adjustable), 6 A; bias adjustable from 0 to -120 V dc. A suitable supply is available from ARCOS.

Tubes required: Two each 4X150A, 4CX250B or 4CX250R

Tuning range: Approximately 415 to 440 MHz.

Price class: \$340 for the amplifier kit without tubes. 4CX250R tubes available at \$94 a pair.

Manufacturer: Amateur Radio Component Service, 35 Highland Dr., East Greenbush, NY 12061.

MICROCOMM UHF MODULES

Getting to uhf and microwave frequencies via the modular assembly route is a concept that has been touted by several of the more active builders, experimenters and operators during the last two or three years. The idea has much merit when one considers that the state of the art is changing on an almost daily basis. By having the sections of a receiver or transmitter in separate enclosures or boards, it is easy to slip in a new design that incorporates the latest device available. Testing and troubleshooting are made easier, perhaps doubly so,

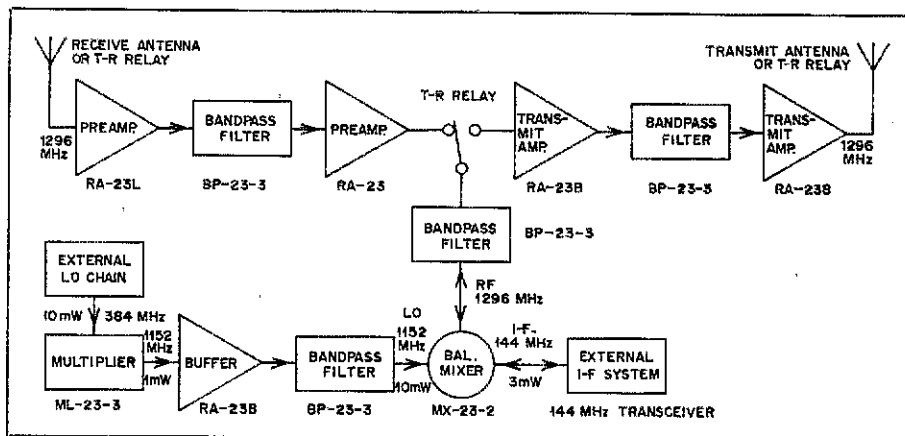


Fig. 1 — A functional block diagram of a 1296-MHz station using Microcomm components. Only a local oscillator and multiplier, along with a source of 2-meter ssb or cw, need be provided by the user.

since the interconnecting system utilizes an impedance common to much instrumentation in both amateur and commercial systems.

Operators and experimenters will find the Microcomm line of equipment a welcome addition to their station. There is something attractive about a well-made piece of equipment that can be plugged in and used without a lot of fuss and feathers. If you want to try designs of your own, it is nice to know that the next stage (mixer, amplifier, filter) is one of measured and stable performance so that you are evaluating *your* device, not the entire system.

The functional block diagram illustrates the building-block scheme suggested by Paul Shuch, WA6UAM, of Microcomm. Many of the design ideas for the modules have been described in *Ham Radio* magazine. Improvements and suggestions keep him busy, however, so that new designs are always being checked out in the lab. A case in point — the diode-switch board, shown in the photograph, will not be described here because there are some new ideas in the works which could well result in a different board layout with improved performance. Now for a look at the individual boards.

MX-23-2 Balanced Mixer

A good start in a 1296-MHz receiving or transmitting station would be the mixer. With the aid of some local-oscillator injection, this

module will enable you to hear (or transmit) a signal and provide the basis for much experimenting or local contacts. The MX-23-2 mixer is of the ring hybrid or "rat-race" type, much described in microwave literature for many years. The Microcomm circuit is optimized to use 144 MHz as an i-f for either transmitting or receiving.

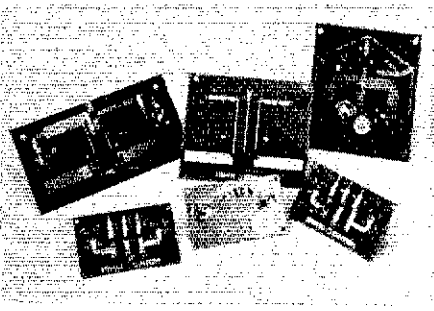
Conversion loss in the mixer is approximately 7 dB. Isolation between the rf to local oscillator ports is better than 20 dB. From the i-f to rf ports and the local oscillator to i-f ports the isolation is 15 dB or better. Local oscillator injection level should be between +5 and +15 dBm. Output power for transmitting will be on the order of 0.5 mW. Receiving noise figure should be in the vicinity of 9 to 10 dB.* Price class for the mixer is \$26.

ML-23-3 Diode Multiplier

A parallel requirement for the mixer is a source of local oscillator injection energy. Microcomm offers a diode multiplier that will provide 1152-MHz output to mix with a 2-meter signal for either receiving or transmitting. Input level from a 384-MHz oscillator and multiplier chain (user-provided) should be near 10mW. Output from the diode multiplier will then be approximately 1 mW. An amplifier should be used to bring this up to a suitable level for the mixer. Two poles of output filtering on the module help clean up the output spectrum and thus avoid degrading the noise figure of the mixer. Another use for the multiplier module is as an excellent weak-signal source for receiver or antenna alignment; simply change the frequency to provide an output at 1296 (or whatever) MHz. Price class is \$15.

RA-23 Preamplifier

There are four versions of this amplifier available, each with a specific designator and purpose. Of great interest to many experimenters would be the RA-23L, optimized for best noise figure. It utilizes the MRF-901 device, providing a noise figure of 3 dB* and a gain of approximately 10 to 12 dB. This would be a good choice for a first stage in a receiving system. For the second stage, a model RA-23 would suffice. It offers 12-dB



gain at a noise figure of 3.3 dB. The model RA-23B amplifier is biased to provide better large-signal handling ability, such as linear amplification of the output from the 1152-MHz multiplier, or the output of the mixer when transmitting. For even higher signal levels, an RA-23D should be used. It will handle input signal levels up to approximately 10 mW (if diode limiters are added).

All of the amplifier modules require 12-V dc for operation. Price class: RA-23, \$40; RA-23B, \$42; RA-23D, \$45; RA-23L, \$45.

BP-23-3 Band-pass Filters

Frequency-multiplying and mixing circuits are, by their very nature, producers of many products, most of which are unwanted and do the overall system performance no good, to say the least. Microcomm has a filter to help "sanitize" the spectrum throughout the receiving or transmitting process. It has 3 poles of filtering to offer better than 30 dB of off-frequency rejection. The 20-dB bandwidth is approximately 300 MHz, with an insertion loss of 1 dB. It also shows a 3-dB bandwidth of 150 MHz, and a Q_L of approximately 8.5. There is a two-pole version available that has 20 dB of rejection at a bandwidth of 570 MHz.

Both versions of the filter are tunable over the range of 1100 to 1500 MHz, thus making them suitable for use at either the injection frequency (1152 MHz) or at the signal frequency (1296 MHz) anywhere in the system. Input and output impedance is 50 ohms. Price class is \$13.

Connectors

With the exception of the i-f output port on the mixer, the Microcomm modules all use SMA connectors. These small units are well suited for low-loss applications at this frequency and power level. If obtaining mating connectors is a problem for the buyer, Microcomm will furnish them at cost (\$2.05 each) if ordered with a module. Separate connector orders will require an additional \$1 each for handling. The connectors are designed to fit RG-55, 58, 141, 142 or 223/U coaxial cable.

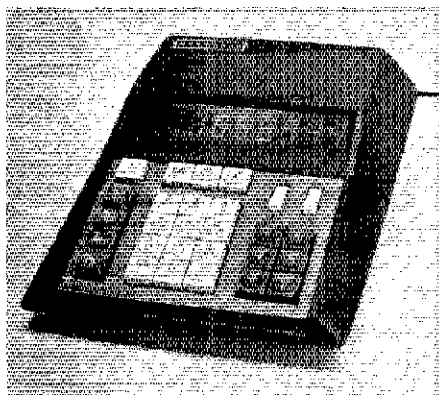
Other Products

Not being one to stand by and watch things happen, Paul is adding items to the list even as this is being written. Among things that are in the works are an improved diode switch, as mentioned before, and 432-MHz preamplifiers. He has also produced some programs for you HP-25 calculator buffs — four packages covering the design of amplifiers, microstripline, for calculating impedance matches and for reflection terms. These programs are available at \$2 each. If you would like more information on any of the Microcomm products, or to receive word on new products, send an s.a.s.e. to Microcomm, 14908 Sandy Lane, San Jose, CA 95124. — WISL

*[Editor's Note: Precise measurement of noise figures at uhf requires equipment that is beyond the reach of most amateurs; the ARRL laboratory and WISL's workshop are no exceptions. Comparison readings made on these modules using various HP and ALL noise-figure meters, produced no conclusive numbers with an accuracy of better than 0.3 dB. A more accurate method, utilizing a hot and cold source, was not available. Therefore, considering the variations in readings obtained, and after doing some listening tests, the conclusion is that the numbers given for noise figure are good "ball-park" specifications that fit the average devices.]

THE HEATH IC-2100 ELECTRONIC SLIDE RULE

What with all the pocket calculators available these days one would wonder why a review on another one? The answer is simple — this is not a pocket calculator. Probably most amateurs, such as this reviewer, have pocket-size calculators. However, in our case, the one that



gets the most use is not the pocket calculator but the "desk"-size Heath ESR (Electronic Slide Rule). Don't misunderstand, our battery-powered small calculator is great to use on some occasions. But the one that is best for our purposes is the Heath "computer" which is installed at the desk where most work is done. (We also find as one gets older the large display tubes with letters more than 1/2 inch high are much easier to read.)

The Heath Model IC-2100 ESR duplicates nearly all slide-rule functions and automatically locates the decimal point, and with greater accuracy. In addition to the standard arithmetic functions (+, -, ×, ÷) with chain (series) operation in all modes, the ESR will compute A^x , $\sqrt{x}$, $1/x$, e^x , $\ln x$, $\log x$, $\sin x$, $\cos x$, $\tan x$, $\arcsin x$, $\arccos x$, $\arctan x$, and π .

Other significant features include the following: Angular computations in degrees or radians, automatic clear when turned on $\sqrt{}$, a key to clear an incorrect entry and/or the complete computation. Two register keys ($X \leftrightarrow Y$ and $X \leftrightarrow M$) allow the display register (x) to be interchanged with the working register (y), and the display register (x) to be interchanged with the memory register (m).

The kit can be wired in two evenings. There are two circuit boards, one that holds the display tubes and primary circuitry, while the other holds the keyboard. The keyboard consists of 26 keys plus two switches. The readout uses an eight-digit display, with seven-segment tubes. As mentioned earlier, the display is easy to read because of the large size of the digits.

Either of two line voltages can be chosen during construction, 120 or 240 volts. Power consumption is five watts. The ESR measures 9-5/8 inches long, 7 inches wide, and 2-1/4 inches high. Its price class is \$80. — WJPC

MK-75 ELECTRONIC KEYS WITH REPROGRAMMABLE MEMORY

One of the problems with new equipment is that of not having sufficient input from the "field" to aid the design. There's no doubt that the people at Brown and Simpson had all the correct information when they designed the MK-75. In addition to having a very attractive appearance it contains some unusual and worthwhile features useful for the contestor or even the casual operator.

The first feature which might strike you is that the keyer has a weight control. Being a cross between the Accu-Keyer¹ and the TO², a weight control has been incorporated in this portion of the unit. Iambic operation, automatic letter-and-word space and self-completing characters are other features found in the keyer. A built-in oscillator, with tone and volume controls, acts as a monitor.

The reprogrammable memory incorporates a new method of storing the information. This effectively increases the length of the messages that can be stored. Another interesting feature: When a message is being sent, tapping the dot side of the paddle will stop the message instantly, or tapping the dash side will stop the message at the end of the next word. For Sweepstakes enthusiasts, the insert function is a "natural." By using the insert feature it is possible to create a pause in a message so that a sequential number can be added. After the number has been inserted, the message will restart automatically. The edit function allows the operator to make corrections to portions of a message without reprogramming the entire message. A little time with the user's manual and the MK-75 will reveal all the features that are available.



The MK-75 was used at W2PV during the second cw weekend of the ARRL DX Competition. Its operation was flawless, even with several kilowatt amplifiers being run simultaneously. It is felt that the MK-75 would be a useful addition to the station of any cw operator. In the \$350-price class, the MK-75 is available from Brown and Simpson Engineering, Scarborough, Ontario, Canada. M1N 3K9. — WJGQO

Footnotes

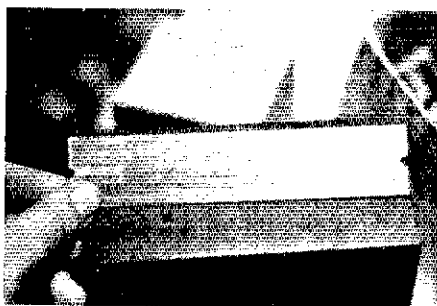
¹ Garrett, "The WB4VVF Accu-Keyer," *QST*, August, 1973.

² Opal, "The Micro-TO Keyer," *QST*, August 1967.

Hints and Kinks

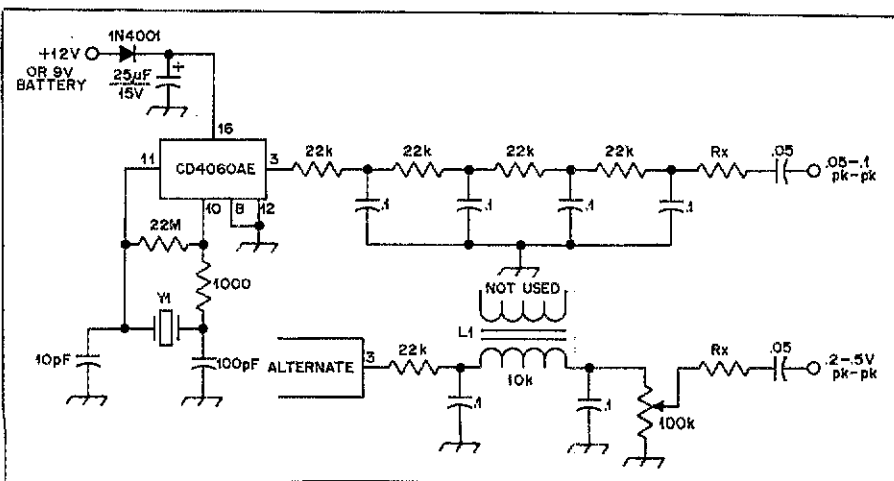
OPEN-WIRE-SPREADER SOURCE

An excellent source of spreaders for open-wire feed line is fiberglass battens made for sailboats. The raw fiberglass comes in 10 or 12-foot lengths and sells for 70 cents per foot from Hard Sails, Inc., Islip, NY. It may be cut to size and drilled very easily. The finished product is quite strong and an excellent insulator. — *Bob Fischer, WB2EUH*



P/L TONE GENERATOR

The following circuit is an unusual method for generating a subaudible tone, commonly known as P/L, Channel-Guard, CTCSS, etc. The circuit is unusual in that a 2235-kHz crystal is used with a counter chip to produce a 136.5-kHz tone. The signal from the oscillator is divided down by 14 flip-flops to produce the low-frequency square-wave output on pin 3 of the IC. The square wave is then put through several stages of low-pass filtering to develop a sine wave. The P/L tone should be introduced into the transmitter just after the deviation control. Since most audio is cut off in the low-frequency ranges, it is necessary to inject the tone after any audio processing. Two output filters are shown. It will be necessary to select the filter that performs best with a particular rig. For other P/L tones, use crystals that are 16,384 times the desired frequency. — *Edward Gellender, WB2EAV and Manny Marcel, WB2BON*



HUM IN THE SB102

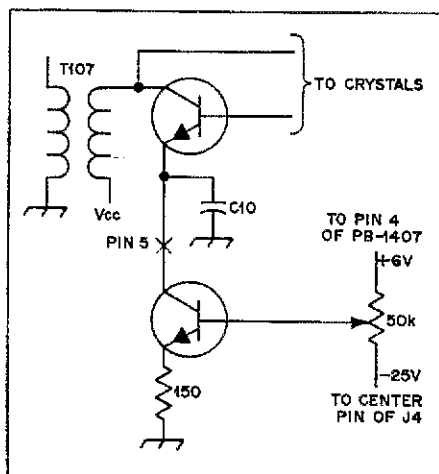
A slight but annoying ac hum in the receiver audio amplifier has been characteristic of some SB102s, including my own. The hum is most noticeable with the af gain at minimum. Conventional methods such as tightening circuit-board screws, adding capacitance across the B+ line, and so forth, were tried unsuccessfully on my own receiver. A simple remedy was discovered however, which has worked for me and at least one other owner.

Disconnect the red harness cable from between C308 and the af gain control and run either the same cable (out of the harness) or another well-shielded cable *directly* between the two points, grounding the shields at both ends. This completely eliminates that particular source of hum pickup, which is apparently from the adjacent filament lines in the harness. Before performing the alteration, this source can be confirmed by a simple test. Using a short screwdriver, alternately short to chassis ground each end of the cable (both ends are protected by dc blocking capacitors). The hum will remain when the audio-control side of the cable is grounded, but will disappear when the near side is grounded. — *John Sims, WB6NGF*

THE YAESU FL-101

The Yaesu FL-101, when using full break-in with the T-R switch in the ARRL *Handbook*, operates beautifully except for an annoying backwave that will mask weak signals. The finals and the driver are grid-block keyed. To correct the backwave problem, I decided to key an additional stage. The heterodyne oscillator was selected because of the construction of the unit and convenience.

- 1) Remove PB-1407 from its socket.
- 2) On the socket, disconnect the ground lead from pin 5.
- 3) On PB-1407 use a sharp-edged knife and slice through the foil leading to pin 5. Drill a small hole at the top of the pin 5 foil.
- 4) Remove R7 and jumper pin 5 to the emitter of Q3 with a small insulated wire.



5) Mount a 50-kΩ potentiometer on top of the chassis. I taped this in to prevent damage and to preserve trade-in value. One side of the potentiometer goes to pin 4 of PB-1407 and the other to the center pin of J4, which is the key input.

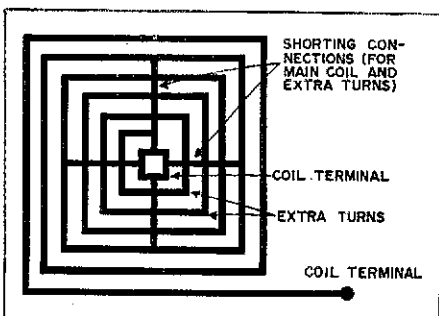
6) Underneath the chassis, wire a transistor as shown in the diagram. I used a 2N2222A with long leads.

7) Adjust the 50-kΩ potentiometer to remove the backwave. The Yaesu FL-101 will now operate beautiful QSK, as there was never any hash and now no backwave. — *Max Cornell, WAØSIG*

DESIGN OF PRINTED CIRCUIT COILS

The fabrication process of printed circuit components results in essentially fixed device parameters. Considerable variation in the inductance value of coils occurs as a result of spacing, plating thickness, and the physical relationship of the component placement and the location of the circuit ground plane. The fixed printed coil must be trimmed in order to obtain the desired inductance value.

One solution to this problem is shown in the diagram. A spiral-like coil is printed with several extra turns which increase the realizable coil inductance; shorting connections are also included to reduce the inductance. The shorting connections not only short the extra



turns, but also short out several turns of the main body. Coil tuning is accomplished with relative ease by removing the shorts until the desired inductance is obtained.

Approximate printed coil lengths and fabrication parameters are obtained by calculation from circuit models or experimentally determined design curves. After the approximate coil dimensions are obtained, the printed coil layout is constructed with the several extra turns and shorting bars. Shorting connections are then removed from the coil until the exact value of inductance is obtained. This procedure calibrates the layout and subsequent photoetching process.

Once the exact coil geometry is obtained, the designer has several options. If there are a limited number of active devices in the circuit, the existing printed circuit art work may be modified by removing the appropriate shorting connections. On the other hand, if the circuit contains a large number of active devices, individual coils may be trimmed to account for differences in active device parameters. The former approach was used in a phased-array receiver. Nineteen coils of values from .05 to 0.1 mH were used in a variety of circuits such as delay lines, hybrids, and amplifiers. For the larger coils a tolerance of plus or minus two percent was obtained, and a tolerance of plus or minus one percent was obtained for the smaller coils. The cost per coil was very competitive with commercially available fixed or tuned devices. In addition, the other advantages of the printed wiring approach are obtained at minimal cost. — NASA Tech Brief 69-10665

A CW MONITOR FOR THE SWAN 270

The ability to hear what one is sending on cw transmissions is usually a great aid. If you are one of the many owners of the Swan 260, 270, 270B, or for that matter, any transceiver that doesn't have a built-in sidetone, here is a simple, inexpensive audio oscillator, built on a homemade pc board that has more than ample power to drive my headphones and sufficient power to drive my built-in speaker when the room is quiet.

The circuit is an adaptation of one found in the 1973 *Handbook*, p. 12. It uses an NE555 IC timer chip. But instead of a battery, I made a simple rf voltage supply. The output is very clean, and can be varied in both tone and volume to suit your personal preferences.

Because I didn't want to, or was not able to, key the ground side of the speaker, as is shown in the *Handbook*, I resorted to keying the voltage on and off. I had reservations about this, wondering if I might not get a chirpy note, but to my surprise the output is nice and crisp.

The printed-circuit board shown was homemade from a scrap of copper-clad board, about 1 x 1-1/2 inches (25.4 mm x 38.1 mm). I have found that one of the best etch-resistant lacquers available is ordinary fingernail polish. It is cheap, readily available, has a built-in applicator, and is easily removed.

The other components on the board were all from the junk box, but even if purchased new they shouldn't be over \$3. The NE555 cost 99 cents. R1, C1 and R2 determine the pitch, and R3 the volume. I used a miniature

slide switch (mounted on the back panel) to break the voltage lead to the monitor, so it wouldn't "talk" while I was using ssb.

The value of R_3 will have to be determined experimentally if a rig of a different power level is used. The 1200-ohm resistor used here sampled enough power that, after rectification by CR1, gave about 25 volts with no load. When the IC starts oscillating, the voltage drops rapidly. However, it is still in the vicinity of 6 volts, more than enough to power the monitor.

The board is small enough to be placed in any convenient spot. I ran leads to the switch on the rear panel and to the tone and volume controls which I mounted in the ventilation holes, so no other holes were necessary.

This monitor has certainly made cw operation more pleasant for me, and has improved my cw. It was very easy to construct, and gives one a small idea as to the wizardry

contained in just one IC. — Jerry Arnold
WA6MBP

AN ACCURATE STANDARD FOR CALIBRATING FREQUENCY METERS

Digital frequency meters are gradually becoming more common pieces of test equipment for the radio amateur and experimenters. Precise calibration of frequency meters, especially those in kit form, can be a problem since an accurate and stable frequency source is usually not available to the average experimenter. The crystal-controlled secondary frequency standard available to the amateur is not stable enough for precise calibration purposes because they tend to drift slightly with temperature changes.

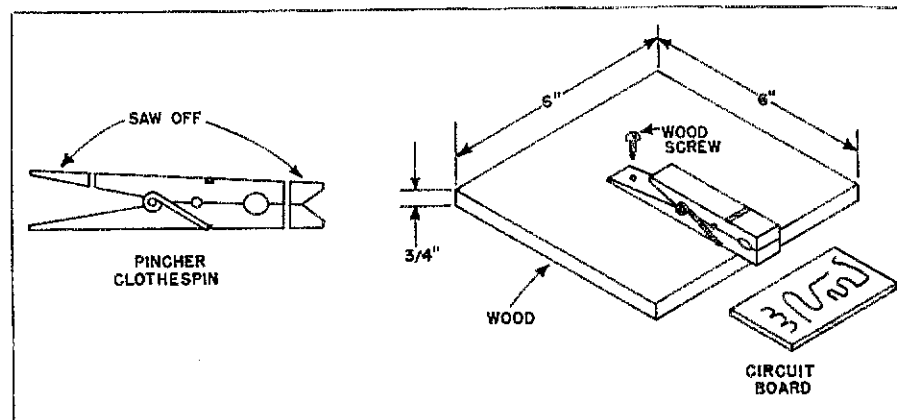
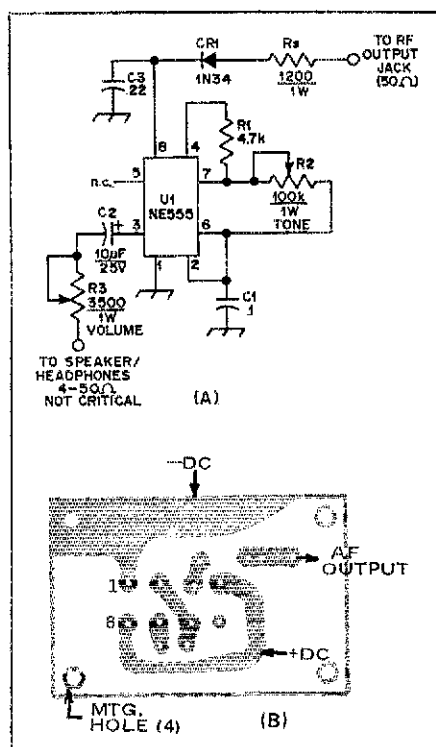
If a color television receiver is available the crystal reference oscillator in the frequency meter can be calibrated by comparing its frequency to that of the color-reference signal broadcast by the major television networks. A TV set tuned to a network color program is a highly accurate and stable reference since the four major television networks all use rubidium reference oscillators to generate their 3.58-MHz color reference signals. Every color TV receiver phase locks to those references.

The calibration process is carried out by coupling the input of the counter, through a low capacitance probe, to the plate of the tube or the collector of the transistor used to regenerate the color subcarrier signal in the TV receiver.

While the TV set is tuned to a station broadcasting a color program, set the calibration adjustment in the counter so that the frequency indicated is exactly 3.579545 MHz. When the counter probe is connected to the color oscillator in the TV set be sure to view the screen to verify that the picture is still in color sync. A rainbow of color bars floating through the picture indicates a loss of color sync. If this should happen decrease the loading of the probe with a series resistor until the screen has a normal color picture. — Stephen Pawlowicz, WA3SDV

CIRCUIT BOARD HOLDER

The holder for small-pc boards, as shown in the Heath HD-1250 manual, is also excellent for holding small cables while soldering. — D. J. H. Grant, K4HHR



S.R.O. at Your Next License Class

A standing-room-only crowd at your next licensing class is no "impossible dream." Sample these double-barreled tips for sure success.

By Don Keith,* WA4BDW

Fact is, a lot of people would like to get into this fantastic hobby dubbed ham radio, but for various good reasons (read excuses), they can't seem to take the first step. Provided a generous segment of the uninitiated has been exposed to the various aspects of our hobby through your club's general PR efforts, the demand should be there. Now, the logical next step is to do something to encourage these folk to take the plunge.

The best way to help is by sponsoring club license classes. And that is easier than you might think, thanks to the new training materials available completely free-of-charge from the ARRL. What I am about to attempt to do is to set forth several ideas we have tried with the Birmingham Amateur Radio Club's successful classes, and briefly explain about the League's new training package. The ideas could be applied by a couple of guys for a neighborhood study group just as well. Most suggestions result from the work of our club training officer, Jerome Tanner, W4BJG, and the professionals at ARRL.

At the Head of the Class

And that touches on step number one, people to run the show. BARC just made the training officer an appointive position and named Jerome to it. Jerome was retired and had a good background in electronics, although extensive knowledge of electronics is by no means required to teach the course. Anyone with an active interest in amateur radio can run the course, thanks to the comprehensive training materials from the League. You may have to coax



A packed house initiated the spring, 1976, Novice licensing class sponsored by the Birmingham (AL) Amateur Radio Club. Over half were curious CB operators lured to the meeting through extensive PR efforts.

and cajole a little, but most clubs have several people with the talent to handle the job. It sure helps to have at least two people to actually do the teaching — one for code and one for technical stuff. Because of the response to our classes, we had to recruit more instructors.

Timing is of utmost consideration, too. Seems like summer would be ideal because school's out, but it doesn't work that way. Vacations, Little League, and the like can drag off many of your students at critical points in their education. For us, early spring and in the fall have worked well. If the FCC visits your area quarterly or biannually, scheduling your classes (especially for Generals and Advanced) to wind up about the time of their examinations may be a good idea.

Decide what night is best for your

area. Here in the Bible Belt, Wednesday nights are for church, our club meets on Thursday nights, most civic clubs meet on Monday nights, and high school football games are played on Fridays. That left Tuesdays for us. Start early, say 7 P.M. or so, and be prompt. A two-hour stint is plenty, and adjourn promptly at 9 P.M. so students can make baby-sitting and pick-up-the-kids plans.

Got your people and time all lined up? Okay, where do you put them? That shouldn't be as much of a problem as you at first think. If you anticipate a large group, talk with the YMCA or YWCA about an auditorium. We have a great working agreement with the Red Cross people here. Our club station is located at the Red Cross in exchange for our help in emergency communications. We have our meetings in their audito-

*462 Ridgewood Ave., Fairfield, AL 35064

rium, as well as our classes. You might tie your classes in with the rapidly expanding community schools all over the country and use a regular school classroom. Vocational schools, junior colleges, and the like are glad to work with groups, too, and usually at no cost. (Remind them who pays for all those unused classrooms.) Be sure to check well in advance and reserve plenty of space so you don't end up with one hundred eager prospects meeting under a tree somewhere.

Of course, if you are planning a smaller neighborhood group, make use of a basement, patio, or even a church room. All you need are a roof, some chairs, maybe a blackboard, and some ac (for the tape recorder and slide projector).

Let Folks Know

Now, to lure the folks there, you gotta advertise! Send public-service announcements to the radio and TV stations. A sample is included in the League's training package. Type it double-spaced on club letterhead, put a telephone number and address on it in case they want to do something more with it, and mail it at least *two weeks* ahead of time. Send it to all the stations in your area regardless of programming. Your press release to the newspapers can be more detailed, but put most important information up front and sort of tail off at the end. This is called "pyramid" style, for obvious reasons. The editor at the paper may, if your release is well written, use it as submitted, just whacking it off to fit the space he has left. Be sure, too, to include the phone number and address of a contact so the editor can get more information for a possible feature story. Again, samples are in the license-class package. You may even send a cover letter with the release suggesting that the paper do a feature on the classes and ham radio in general. Mail it early.

The Birmingham club also has had good results placing an ad in the "Radios and Supplies" section in the classified ads. We also situate signs in parts stores and known CB-radio hangouts. You may try mailing letters to all high schools and colleges in the area, requesting an announcement be posted on a bulletin board. These are all part of the League's package.

One idea we tried this year worked wonders. Because of so many articles in the papers glorifying CB, one of our members wrote letters to the editors, making the point that most of the people flocking to the citizen's band as a hobby were really looking for "ham" radio. And the letter ended with an invitation to attend the next license classes. Also, the League will supply address labels of all associate (un-

licensed) League members in your area for a special mailing to these interested individuals.

These are only a very few suggestions on ways to publicize the license class. The League's promotional packages are specifically designed for just this purpose, and take all the work and guessing out of your public-relations efforts. The use of the new film on amateur radio, *Moving up to Amateur Radio*, and prerecorded radio and TV spots, as well as the cooperative advertising program in connection with retail stores, ensure a complete and painless publicity campaign for your license class. Complete details on all these programs are available from the League.

Now, if you have done a good job of publicizing what it is that your group is undertaking to do, you should be greeted on the evening specified with a smiling mass of humanity, all determined to master the code and the FCC exams in nothing flat and begin modulating by next week. Here's where a little honesty and a little sugar-coating comes in. You must be straightforward with the students and begin by explaining that the Novice test is going to require a small amount of work for the limited privileges. Then assure them that pre-teens routinely pass the exam and that Novices have worked all states, made DXCC, handled traffic, participated in disasters, and so on. Then shift to things they can do as they move up the licensing ladder. Keep it simple! Leave out all those acronyms we take for granted . . . cw, DXCC, ssb, fm, and such phrases as "eighty meters," "QSOing," "working moonbounce and Oscar." Some may be familiar with our jargon, but most will only be confused and decide this mess is even more complicated than they feared. If you don't want two-thirds of your class back home next week watching "Kojak," keep it in common language and don't hit them with too much the first night.

The League's licensing package carries all these details and much more, and includes the slide and tape show, *The Thrill of Amateur Radio*, to introduce some of the various aspects of the hobby while avoiding confusing jargon. The package also gives complete, minute-by-minute instructions and suggestions for using a receiver for demonstrations, as well as a vhf/fm transceiver.

The rest of the first class, as with the rest of the entire course, is again mapped out in complete detail in the League's training package. The timing of the code, rules and theory, and the proper order and mixture thereof are spelled out. These recommendations are the product of professional educators and thousands of hours of experience in

amateur radio instruction. They really work!

The cassettes with the training package handle the code-practice portion of the course without effort on the part of the instructor. He will, of course, need a code-practice oscillator for sending practice, but the perfect spacing, character shaping and pattern of the code course in the licensing package make learning the code a snap, for student and instructor alike.

For student use, the new beginner's materials from the League are perfect for the job. *Tune in the World with Ham Radio* includes a comprehensive but easy-to-read instructional book and a one-hour code cassette. The cassette provides ideal code practice at home and is carefully geared to the classroom instruction of the code. It also includes special practice for the new format of the code test and practice for typical Novice contacts.

How fast your class progresses depends on both the instructor and the average educational level of the class. At any rate, ten or twelve weeks should be plenty for a Novice class if the students are studying and practicing their code at home (as you have encouraged them to do). By keeping the League posted on the progress of your license class, you will receive the code and theory examinations at the end of the course. Complete instructions for the administering of these tests are included with the training package and with the tests. Then, all that remains is completion of the 610s (also in the testing package) and a short wait for the license to arrive from the FCC.

If your class does well and a reasonable percentage passes everything, then rest on your laurels only briefly. These guys will be chomping at the bits to get on with the General class now. So you may as well start planning the General/Advanced thing now. Many people like to bring XYLs, kids, or friends to the Novice classes while they study for General, so we usually run the classes at the same time and in the same building (though the crowd this spring made this impossible; we are in four different sections of town now).

Built into the ARRL's course and the book, *Tune in the World*, are complete instructions on obtaining equipment and assembling a station, information which is normally neglected in amateur radio instruction. Also, ways to get other club members into the act, as individual "Elmers" for the students are included. Finally, both the course and the book include complete operating procedures for the Novices, so they will be knowledgeable and proficient operators their first time on the air.

It appears the CB boom may well turn into the "ham" boom if we hams

play our cards right. We have, for too long, written off the CB types as "red-necks" and of no worth to us or our hobby. That has all changed. Eleven meters has begun attracting a better class of folks, people who would make terrific amateurs. The worthless nerds will drop out, in most cases, but the

valuable people may, also, for lack of encouragement.

I know some of you are saying, "Hell, I didn't have license classes to baby me through to my ticket." Maybe not, but it would be so much easier for our clubs to offer that much-needed assistance to some eager new hams.

It can only improve our hobby, both qualitatively and quantitatively. It can be a lot of fun and satisfaction to be of help to young people (and not-so-young people, too). And thanks to the League's free materials, it's effective and painless. It sure beats sitting around drinking beer and watching "Hee Haw."

QST

Washington Mailbox

Q. Can I let my friend, who does not have an amateur radio license, participate in radio communication from my station?

A. The answer is yes; he is a third party. A control operator must be present to continuously monitor the radio communication to ensure compliance with the rules.(97.79d)

Q. Does that mean that I have to be there, or can someone else, who is licensed, be the control operator?

A. The control operator can be someone other than yourself, provided you have designated him to be the control operator.

Q. Well, that raises another question: What exactly is a control operator?

A. A control operator is an amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emissions from that station.(97.3p)

Q. What does "also be responsible . . ." mean?

A. It means that if the station licensee allows another amateur to be the control operator of his station, and a violation occurs, both the licensee and control operator are equally responsible for that violation, and both can be cited.

Q. Let's get back to my unlicensed friend who is participating as a third party in radio communication from my

station under the supervision of a control operator. Can he tune up the rig?

A. No, an unlicensed person cannot make adjustments which affect the proper operation of the station. However, depending on the capabilities of your station and your willingness to accept responsibility for him, he can use the microphone (even with VOX), keyboard, key, or camera depending on the mode in use.

Q. Can a third party call CQ?

A. No. Third-party traffic is bound by international rules; specifically, the third party is forbidden from communicating with countries that have no third-party agreement with the United States. It is possible that an unlicensed person calling CQ might be answered by an amateur in a country that forbids third-party traffic with the U.S.

Q. Suppose a station licensee who has an Amateur Extra Class license permits the holder of a General class license to be the control operator of his station. Under what privileges can a third party participate in radio communications; that is, can he communicate on band segments reserved to Amateur Extra Class licensees, or is he restricted to the General portions?

A. The control operator can only use the privileges of his license. In this case that would be General privileges. He could only allow the third party to

participate to the limit of the General class license. Likewise, if the station licensee were a General, and the control operator an Amateur Extra, the third party could participate to the limits of the Amateur Extra license provided the proper identification procedures are utilized.

Q. Let's make this a bit more confusing. Can a Novice go to the home of an Amateur Extra Class licensee and operate his station with Amateur Extra privileges?

A. No, not as a control operator; but yes, as a third party. The station licensee, or another Amateur Extra Class licensee designated by him, must be present as control operator. The Novice in this case would be treated no differently than any other party, licensed or not. However, if the Novice operated only on the Novice portions of the bands, and with Novice privileges, he could then be considered the control operator.

QST

[Editor's Note: Even though logging requirements have been considerably eased, it is still required to log the date and time periods that the control operator is someone other than the station licensee, and the log must contain the signature and primary call of that control operator. Also, the name, but not necessarily the signature, of all third parties who participate in radio communication through the station must appear in the log.(97.103b, 1&2)]

[Note: Send your FCC questions to Hal Steinman, K1FHN, ARRL, Newington, CT 06111. Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been approved by FCC staff. Interpretations contained herein concur with those of the Amateur and Citizens Division of the FCC. Numbers in parentheses refer to specific sections of the FCC rules.]

Strays



At the start of Michigan Week (May 15 through 22) — eight days each year when Michigan turns the spotlight on itself — Governor William G. Milliken sent radiograms to the governors of the 49 other states and invited them and their citizens to visit Michigan and enjoy the state's hospitality. The messages were originated from Bill Savage's

station, K8KMQ and relayed through the facilities of the National Traffic System.

K8KMQ, also on the Genesee county Michigan Week Committee, suggested the radiograms in a letter to Milliken.

Impressed with amateur radio's contribution, Governor Milliken plans to call upon Bill, amateur radio and the

NTS to relay other messages from the executive office to individuals around the state and country. — *Michigan Executive Office*

QST Congratulates . . .

George Raymond, K7LET, on his election as senior vice president of Marketing and Community Relations for Blue Cross of Washington and Alaska at the annual Blue Cross Board of Directors meeting. George is also an ARRL Life Member and active Kiwanis Club member.

One Shoe Drops...

First Report and Order on Restructuring

By Perry F. Williams,* W1UED

Last year's big exercise in amateur radio was Docket 20282, the Federal Communications Commission's proposals to restructure amateur radio. It offered up, among other things, the creation of a dual ladder licensing structure, with one track for those interested in vhf and uhf, another for those interested in the hf bands. It would have created a new Communicator class license having no telegraphy privileges and no telegraphy test requirement. Power limits would have been changed from those expressed in plate input to new ones, measured in peak envelope power output. These subjects were controversial, to say the least. None of them has been adopted in the First Report and Order, Docket 20282, issued June 15 and effective July 23, 1976.

"We have closely examined the results of a poll taken by the . . . ARRL which elicited responses from many thousands of . . . members."

What has emerged so far is much less controversial and more acceptable to amateurs generally.

- Full Novice privileges for all Technician class licensees.
- Deletion of the one-year waiting period at the end of a Novice term, before the license can be issued again.
- A limit of 250-watts input power by any station while it is operating in the Novice subbands (a boost for Novices from their traditional 75-watt limit).
- Full credit for examination elements passed on volunteer-administered tests. Conditionals will become Generals when they modify or renew; Technicians (C) will be Technicians.
- Volunteer-administered mail examinations are now available only to Novices and to persons unable to travel

to a Commission examination point because of protracted disability.

The Commission finds itself unable to write a Comprehensive Report and Order on all the issues of the docket, because of time and manpower restrictions caused by the explosion of licensing in the Citizens Radio Service. Thus, the current action is a "First Report and Order"; there may be more orders later on, dealing with those parts of the docket which are not now adopted.

Here are extracts of the Commission's action to date, followed by the full text of the rules which have changed:

4) An estimated 4000 comments and reply comments were filed in this docket. They ranged from postcards to multipage typewritten statements, often with very detailed analyses of our proposals coupled with suggested revisions thereto. All of these comments have been read and carefully considered. Also, in addition to these documents, we have closely examined the results of a poll taken by the American Radio Relay League (ARRL) which elicited responses from many thousands of that organization's members.

5) Because of severe manpower and time restrictions brought about by the recent surge in Citizens Radio Service applications, we are unable at this time to undertake the preparation of a comprehensive Report and Order which would address all of the issues raised in the Notice. We are therefore releasing this First Report and Order in which several matters of importance will be addressed, and we plan to prepare additional Reports and Orders in the future as our work load permits.

6) Firstly, we will address the matter of examinations administered by volunteer examiners. Under the system put forth in the Notice, all licenses obtained in this way, except Novice licenses and licenses granted in those instances where the applicant qualified for a volunteer-administered examina-

tion on the basis of a protracted disability which prevented travel to a Commission examination point, were to be non-renewable. Such licenses were to be temporary, and the licensees would have been required to successfully complete a regular Commission-supervised examination in order to remain licensed. This arrangement would have required all presently licensed Technician (C) and Conditional licensees to undergo re-examination by the Commission. Failure to successfully complete the Commission-supervised examination would have meant that the licensee could not have continued to renew his license upon expiration.

"Because of . . . the recent surge in citizens radio . . . we are unable . . . to undertake . . . a comprehensive Report and Order . . ."

7) As one of the broad objectives in this proceeding, we stated in the Notice that we desired to preclude, or at least minimize, any adverse impact upon presently licensed amateurs. The sentiments in the comments overwhelmingly supported this posture, and we continue to believe it to be the only reasonable course of action. Many comments objected to our "non-renewability" proposal for volunteer-administered examinations as being detrimental to amateur radio in general and excessively burdensome to thousands of licensees who, for valid reasons, did not undertake Commission-supervised examinations. Moreover, inasmuch as the Technician class license program has always been, by Commission intent, based primarily on volunteer-administered examinations, a mass recall of these persons does not now appear equitable. We are in basic agreement with these objections, and have modified our proposal to blunt any ill effects on present licensees. We believe the limited resources available to us can be best utilized elsewhere.

*Assistant Secretary, ARRL

8) However, our experience with the volunteer examination program has shown that it has been abused. Our routine call-in program of Technician (C) and Conditional class licensees has shown that over 90 percent of such persons either fail to appear for re-examination, or if they do appear, fail the examination. Such results tend to confirm the suspicion that some such licensees obtained their licenses fraudulently. We have therefore determined to limit the availability of volunteer-administered examinations to the following categories of applicants:

a) Applicants for the Novice license; and

b) Applicants who show by physician's certification that they are unable to appear at a Commission examination point because of a protracted disability preventing travel.

All applications for mail examinations on the basis of a protracted disability should now be sent to the FCC field office nearest the applicant, rather than to the Commission's offices in Gettysburg, Pennsylvania. Such examinations will be conducted by a volunteer examiner selected by the Commission, or by Commission personnel.

"Inasmuch as the Technician class license program has always been . . . based primarily on volunteer-administered examinations, a mass recall of these persons does not now appear equitable."

9) Persons now holding licenses obtained on the basis of a mail examination will not be adversely affected by this rule change. All such licenses may continue to be renewed, and Rule Section 97.25 is being modified to indicate that examination credit will be given for those elements which were passed without Commission supervision. For instance, a Technician (C) licensee will automatically be given credit for Element 3 should he attempt to obtain a General class license. He would be required only to pass Element 1(B), the 13 wpm telegraphy test. We believe that this "grandfather" provision penalizes no one, and will encourage such licensees to upgrade. Upon application for license modification or renewal, all present Conditional class licensees will be issued General class licenses, and all Technician (C) licensees will be issued Technician licenses. Henceforth, all applicants passing Elements 1(B) and 3 on a volunteer-administered examination will be issued a General class license. The Conditional class will no longer be issued.

10) The elimination of the 175-mile distance eligibility criterion for the Con-

ditional class (now General class) license will not, in our view, impose an undue hardship on those persons sincerely interested in obtaining an amateur license. The number of such applications received is now slight, and the enlargement of the Commission's examination schedule for remote points all but eliminates the usefulness of the 175-mile criterion. With respect to the Technician (C) class license, we do not foresee any significant adverse impact resulting from its elimination. The vast majority of persons seeking that license live within convenient travel distance of a Commission examination point, and our examination policy with respect to the Technician class is now consistent with our policy governing all license classes except Novice. As proposed, we are also deleting the availability of mail examinations on the basis of eligibility criteria set out in 97.27 (c) and (d).

11) A related issue we will address at this time involves the Novice class license. Many thousands of Novice examinations are given each year, and this has been the gateway to amateur radio for over half of all present licensees. We believe the experience of taking the Novice test to be very worthwhile, inasmuch as there is no overlap in the Novice examination questions and the questions found on more advanced examinations. We are therefore amending the Rules to require that all persons entering the Amateur Radio Service, at any level, successfully complete examination element 2 in addition to the other examination elements presently required for the license examination being undertaken. We are also at this time deleting the provision in Section 97.9 (f) which prohibits the issuance of a Novice class license to a person who has held within the prior 12-month period any class of amateur radio license. We believe this provision serves no useful purpose and has prohibited otherwise qualified persons from remaining in amateur radio.

"We . . . have modified our proposal to blunt any ill effects on present licensees."

12) The final matter we will touch on in this First Report and Order involves the privileges available to Technician and Novice class licensees. Until several years ago, it was permissible for a licensee to hold both the Novice and Technician classes of license at the same time. Such dual licensing was subsequently prohibited in Section 97.9 (f), which states that the Novice class license may not be concurrently held with any other class of license. We have received several petitions to lift this

restriction, and in our Notice we proposed to include Novice class privileges in the Technician class license. We are herein adopting that proposal, which was widely supported in the comments. We are also modifying the maximum permissible transmitter power input which Novices, and all other license classes, may utilize when operating on Novice frequencies. We are limiting to 250 watts the maximum power input which may be used by any class of operator transmitting in Novice subbands. We are adopting this change for two reasons; firstly, it will mean that a Novice can buy equipment which will be readily usable and practical when he upgrades to General class and above. Presently, in order to conform to the 75-watt power limit, Novices oftentimes are forced to buy low-power transmitters which they find have limited usefulness outside Novice subbands; and secondly, we see no reason to permit non-Novices to utilize high power in a subband where such power gives them a significant advantage over a license class which is restricted to that subband.

"Examination credit will be given for those elements which were passed without Commission supervision."

13) In view of the foregoing, we are of the opinion that the amended rules as discussed above are in the public interest, convenience and necessity. Accordingly, pursuant to authority contained in Sections 4 (i) and 303 of the Communications Act of 1934, as amended, IT IS ORDERED, that Part 97 of the Commission's Rules IS AMENDED as set forth in the Appendix attached hereto. These amendments become effective July 23, 1976.

APPENDIX

Chapter 1, Part 97 of Title 47 of the Code of Federal Regulations is amended as follows:

1) In Section 97.7, paragraphs (b), (c) and (d) are amended and (e) is added to read as follows:

§ 97.7 *Privileges of operator licenses.*

(b) *General Class.* All authorized amateur privileges except those exclusive operating privileges which are reserved to the Advanced class and/or Amateur Extra Class.

(c) *Conditional Class.* Same privileges as General class. New Conditional class licenses will not be issued. Present Conditional class licensees will be issued General Class licenses at time of renewal or modification.

(d) *Technician Class.* All authorized amateur privileges on the fre-

quencies 50.1-54 MHz and 145-148 MHz and in the amateur bands above 220 MHz. Such licenses also carry the full privileges of the *Novice class* license.

(e) *Novice Class*. Radiotelegraphy in the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial station location is not within Region 2), 21,100-21,200 kHz, and 28,100-28,200 kHz, using only type A1 emission.

2) Section 97.9 is amended to read as follows:

§ 97.9 *Eligibility for new operator license.*

Anyone except a representative of a foreign government is eligible for an amateur operator license.

3) Section 97.11 (b) is amended to read as follows:

§ 97.11 *Application for operator license.*

(b) An application (FCC form 610) for a new operator license, including an application for change in operating privileges, which requests an examination supervised by a volunteer examiner under the provisions of 97.27, shall be submitted to the FCC field office nearest the applicant. Applications for the Novice class license should be sent to the Commission's offices in Gettysburg, PA 17325. All applications should be accompanied by any necessary filing fee.

"A Technician (C) licensee . . . should he attempt to obtain a General class license . . . would be required only to pass Element 1 (B), the 13 wpm telegraphy test."

4) Section 97.23 is amended to read as follows:

§ 97.23 *Examination requirements.*

Applicants for operator licenses will be required to pass the following examination elements:

(a) Amateur Extra Class: Elements 1(C), 2, 3, 4(A) and 4(B);

(b) Advanced Class: Elements 1(B), 2, 3 and 4(A);

(c) General Class: Elements 1(B), 2 and 3;

(d) Technician Class: Elements 1(A), 2 and 3;

(e) Novice Class: Elements 1(A) and 2.

5) Section 97.25 (a) is amended to read as follows:

§ 97.25 *Examination credit.*

(a) An applicant for a higher class of amateur operator license who holds any valid amateur license will be required to pass only those elements of the higher class examination that are not included in the examination for the amateur license held.

6) Section 97.27 is retitled and amended to read as follows:

§ 97.27 *Mail examinations for applicants unable to travel.*

The Commission may permit the examinations for an Amateur Extra, Advanced, General, or Technician class license to be administered at a location other than a Commission examination point by an examiner chosen by the Commission when it is shown by physician's certification that the applicant is unable to appear at a regular Commission examination point because of a protracted disability preventing travel.

"Upon application for license modification or renewal, all present Conditional class licensees will be issued General class licenses and all Technician (C) licensees will be issued Technician licenses."

7) Section 97.28 is retitled and amended to read as follows:

§ 97.28 *Manner of conducting examinations.*

(a) Except as provided by 97.27, all examinations for Amateur Extra, Advanced, General, and Technician class operator licenses will be conducted by authorized Commission personnel or representatives at locations and times specified by the Commission. Examination elements given under the provisions of 97.27 will be administered by an examiner selected by the Commission. All applications for consideration of eligibility under 97.27 should be filed on FCC form 610, and should be sent to the FCC field office nearest the applicant. (A list of these offices appears in §0.121 of the Commission's Rules and can be obtained from the Regional Services Division, Field Operations Bureau, FCC, Washington, DC 20554, or any field office.)

(b) Unless otherwise prescribed by the Commission, examinations for the Novice class license will be conducted and supervised by a volunteer examiner selected by the applicant. The volunteer examiner shall be at least 21 years of age, shall be unrelated to the applicant, and shall be the holder of an Amateur Extra, Advance, or General class operator license. The written portion of the Novice examination, Element 2, shall be obtained, administered, and submitted in accordance with the following procedure:

1) Within 10 days after successfully completing telegraphy examination element 1(A), an applicant shall submit an application (FCC form 610) to the Commission's office in Gettysburg, Pennsylvania 17325. The application shall include a written request from

the volunteer examiner for the examination papers for Element 2. The examiner's written request shall include (i) the names and permanent addresses of the examiner and the applicant, (ii) a description of the examiner's qualifications to administer the examination, (iii) the examiner's statement that the applicant has passed telegraphy element 1(A) under his supervision within the 10 days prior to submission of the request, and (iv) the examiner's written signature. Examination papers will be forwarded only to the volunteer examiner.

2) The volunteer examiner shall be responsible for the proper conduct and necessary supervision of the examination. Administration of the examination shall be in accordance with the instructions included with the examination papers.

3) The examination papers, either completed or unopened in the event the examination is not taken, shall be returned by the volunteer examiner to the Commission's offices in Gettysburg, PA, no later than 30 days after the date the papers are mailed by the Commission (the date of mailing is normally stamped by the Commission on the outside of the examination envelope).

"We are also . . . deleting the provision . . . which prohibits the issuance of a Novice class license to a person who has held within the prior 12-month period any class of amateur radio license."

(c) The code test required of an applicant for an amateur radio operator license, in accordance with the provisions of 97.21 and 97.23 shall determine the applicant's ability to transmit by hand key (straight key or, if supplied by the applicant, any other type of hand-operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive by ear in plain language, messages in the international Morse code at not less than the prescribed speed during a five-minute test period. Each five characters shall be counted as one word. Each punctuation mark and numeral shall be counted as two characters.

(d) All written portions of the examinations for amateur operator privileges shall be completed by the applicant in legible handwriting or hand printing. Whenever the applicant's signature is required, his normal signature shall be used. Applicants unable to comply with these requirements, because of physical disability, may dictate their answers to the examination questions and the receiving code test. If the

examination or any part thereof is dictated, the examiner shall certify the nature of the applicant's disability and the name and address of the person(s) taking and transcribing the applicant's dictation.

8) Section 97.29 is deleted and redesignated as reserved.

9) Section 97.31 (a) is amended to read as follows:

§ 97.31 *Grading of examinations.*

(a) Code tests for sending and receiving are graded separately.

10) Section 97.33 is amended to read as follows:

§ 97.33 *Eligibility for re-examination.*

An applicant who fails a written examination for an amateur radio operator license may not take another written

examination for the same or higher class license within 30 days.

11) Section 97.35 is deleted.

"... We proposed to include Novice class privileges in the Technician class license. We are herein adopting that proposal ..."

12) In Section 97.67 paragraph (a) is amended and (d) is added to read as follows:

§ 97.67 *Maximum authorized power.*

(a) Except for power restrictions as set forth in 97.61 and paragraph (d) each amateur transmitter may be

operated with a power input not exceeding one kilowatt to the plate circuit of the final amplifier stage of an amplifier oscillator transmitter or to the plate circuit of an oscillator transmitter. An amateur transmitter operating with a power input exceeding 900 watts to the plate circuit shall provide means for accurately measuring the plate power input to the vacuum tube or tubes supplying power to the antenna.

(d) In the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial location of the station is not within Region 2) 21,100-21,200 kHz, and 28,100-28,200 kHz, the maximum plate input power which may be utilized is 250 watts.

QST

Strays



□ Nominations sought: The Federation of Eastern Massachusetts Amateur Radio Associations is now requesting nominations for the "Ham of the Year" award for 1976. Only amateurs in the first call district are eligible and the amateur selected will be the top "good neighbor" among hams, the one who has performed an outstanding public service.

Anyone may nominate an amateur radio operator for the honor. The winner of the award will be chosen for the amateur activity which brings the greatest benefit to an individual or group and for the amount of ingenuity and personal sacrifice displayed in performing the service.

Nominating letters should include the candidate's name, address, call and a complete description of the service performed. Letters shall be sent to the chairman of the FEMARA Awards Committee, 28 Forest Ave., Swampscott, MA 01907.

The winner will be presented with a plaque and a cash award at the ARRL New England Convention, Statler Hilton Hotel, Boston, MA on September 11, 1976. — *W1HKG*

□ G13JIM's name really is Jim . . . GM3HAM is not just one, but a whole club of hams . . . GM2CHN is David Niven . . . G8QV was once a Wall of Death rider . . . R. F. Burns is the name of G3OOU . . . The first issued British call to include the letter E was G3AAE . . . G3ZUO is a real Ham . . . The most northerly ham in Britain is GM3KLA, who is 800 miles from the most southerly . . . G3XYL is an XYL and G6YL is a YL . . . "CQ Inn" is the

home of G3KGA . . . G3EBE and G3JZQ are both named H. G. Wells . . . GD3UB's 1951 QSL measures only 3 inches X 1-3/4 inches, but the R.S.G.B. Bureau once handled a card 10 inches X 8-1/2 inches . . . In 1954 GW3ZV's aerial was over 2,000 ft. long (he lives at Rhombic Farm) . . . G3RND and GW8BMK each have five forenames . . . Today's amateur calls GM2BD and G5WA were originally those of the BBC's Aberdeen and Cardiff bc stations . . . G3GFI's name is S. W. Morse . . . Spark is still with us in the form of G3UOX . . . G3KDH was World Speedway Champion of 1949 . . . Shortest-named British ham is Yu (G3ZQT) and the longest Christopherson (G6FC). If one includes hyphenated names, there are several each of 16 letters . . . G3XBR lives at "Hi-Beams" . . . G3SU, licensed in 1938, is a Newham, while G3XPF, of 1968 vintage, is an Oldham . . . G3AKZ attempted to swim the English Channel in 1952 . . . G2HDJ is (and probably has) C.W. Touch . . . GM3UII, whose name is Mainland, lives on an island . . . GW and GC were once the prefixes of Eire and Scotland . . . G3IXA is Doctor Livingstone . . . GM8EIR is named Morse, a means of communication he is not allowed to use . . . G3CC and G5FV both live in Keyingham, Yorkshire . . . G3CY is Sir Martin Ryle; G5OG, Sir Ian Orr-Ewing; G5YN, Sir Evan Nepean, and G5ZG, Sir Roger Hawkey . . . D. C. Watts is G3XWD's name . . . Music lovers should look for G3BVI, G3BIID and G8ACC, Bach, Wagner and Weber, respectively . . . G8HPC, G4AKJ and G4BZT are the Abrahams family, grand-

father, father and son . . . Finally, if it's a Willingham you're seeking, try G3YPW. — *G3IDG*

□ Canadian amateur Alan Hooper, VE0MEA, is keeping the world informed of the progress of the *Norma & Gladys*, a Newfoundland schooner sailing around the world to promote conservation of the sea. Working mainly on 20 meters, Alan joined the cruise well prepared for maritime mobile operation; he learned what to expect at sea from VE3AUM, and had equipment tested by VE3ARS. QSLs may be sent to the CARF QSL Bureau, Box 66, Islington, ON, Canada. — *CARF News Service*

□ Hams interested in joining a WAS net on the 15-meter phone band should contact Dave Ramsey, WB9SKA, 408 W. South, Centerville, IN 47330.

□ The Harrisburg, PA, Amateur Radio Club recently graduated 15 Novices.

HARD TO BEAT

□ One Iowa amateur has made an upgrade schedule which seems hard to beat for a person in his walk of life.

Dr. John Amdor, WB0OLJ, of Massena, IA, received his Novice license on January 17, 1975. In August he passed his General and Advanced examinations at the same time. Then, on April 22, 1976, he passed his Extra. Novice to Extra in 16 months.

A feat like this might not be too difficult for a person engaged in an electronics profession or someone with a lot of time on his hands, but John is a veterinarian. — *W0LFF*

Once Upon a Time . . .

Multi-satellite QSOs? Oscar Control? Visionary predictions boggle the mind. . . .

By Ron Koczor,* K9TUS

Watching TV's token science-fiction program set my mind to speculating. What will amateur radio be like in 1999? As I sunk back into my lounge chair, propped my feet, and sipped my glass of wine, time slipped past and visions of the future appeared.

"This is WF9PLK requesting Oscar-12 access."

"WF9PLK, this is Oscar Control. What is your access code, and please activate your PCM-Identifier."

"My access code is 9214A. PCM-I is on. Confirm?"

"Please stand by. . . WF9PLK, your Oscar-12 access confirmed for 4 minutes. Go ahead."

"Thank you. Break. This is WF9PLK calling CQ DX Oscar, CQ DX Oscar, from WF9PLK. Come in."

"WF9PLK, this is VK4YUI, copy?"

"VK4YUI, this is WF9PLK. Good evening, ol' man. The handle is Sam, and the QTH is Fort Wayne, Indiana. You're a solid 5 by 9. Go ahead."

"OK, Sam. Good morning to you. The name here is Alfie, and the QTH is a sheep ranch near Polabarra. You are also 5 by 9 here. We're running 50 watts to a 10-element Yagi pointed at Oscar 11 over New Guinea. You are my first 9-band contact on 70 cm, so would appreciate a card. WF9PLK from VK4YUI. Go ahead Sam."

"Fine business, Alfie. No problems copying. We are running about the same power to a six-element beam aimed at Oscar 12 over Ecuador. I haven't been operating multi-sat for long, so am pleased to hook up with you. Since 11 and 12 have been up there, 70 cm has been rather crowded around here. But it still beats 20 meters! I've been working

on a slow-scan setup for this band, but have more to. . ."

"This is Oscar Control. You have one minute."

"Well, Alfie, have to terminate. 73 and we'll talk again. VK4YUI, this is WF9PLK clear. So long, Alfie."

"73, Sam. See you later. We also work slow scan here, so will be looking for you. VK4YUI is clear."

"WF9PLK clear. Control, my remaining credit please?"

"This is Oscar Control. Your account contains 64 minutes left for this month. If you have any questions, contact headquarters."

"Thank you. WF9PLK clear and listening."

"This is KM8PLA, QRZ?"

"KM8PLA, this is WF9PLK. Copy?"

"WF9PLK from KM8PLA. You're 5 by 5 in Plato crater. The name's Bob. Go ahead."

"OK Bob. Good evening to you. Name here is Sam, and the QTH is Fort Wayne, Indiana. We're running 2-kW PEP into a 4-element alt-az Yagi. Been trying to hook up with you boys for several months now, but haven't been able to be on when you are high enough above the horizon for signals to get thru. How copy Bob?"

"WF9PLK from KM8PLA. Fine business Sam. Q-5 all the way. OK on the rig. It's doing a fine job up here: We also are running 2 kW into a fixed 12-element Yagi pointed at Earth. We have a set of fixed Yagis here. . . four elements on 80 meters, six on 40, 8 on 20, and 12 on 15 and 10. In addition, we have the 24-foot dish for 70 cm. Takes up a lot of room, but we have plenty of that up here! I've been up here for six months now, and have six more to go before I get back Earthside. I'm a life-support technician and

operate the gaseous recycling plant for the base. . ."

"WC9PRO this is WF9PLK. May have the two-day propagation forecast please?"

"Roger WF9PLK. The satellite monitors indicate no solar flares will occur within the next 72 hours. The muf will reach 23.5 MHz on the 9-band to Europe path, 26.5 MHz on the Africa and South America paths, and 19 MHz on the Asia and Pacific paths. Peak hours will occur at the times given in QST. Forty- and 80-meter long haul will be poor over the next 48 hours. The flare expected at 1900Z on Thursday will be a Class 3 flare, with significant geomagnetic effects. Anything further?"

"This is WF9PLK. Is the Christmas weekend forecast in yet?"

"Negative. Accurate predictions are made only a month in advance. The solar monitor satellites can only extrapolate over one solar rotation period."

"Roger, thank you. This is WF9PLK clear."

"Oscar Control, this is WF9PLK. Our location is 75 miles west of Tulsa Oklahoma, on state road 19. We just came across an overturned truck along the highway. No fire, but the driver is pinned in and is bleeding. Send help."

"This is Oscar Control. Activate your emergency 70-cm beacon. A chopper is on the way from Tulsa EMS and will follow your beacon. Do you need first-aid instruction for the bleeding?"

"Control, our beacon is on. The ident is 9PL. Please advise on the bleeding."

"OK. Proceed as follows. . ."

So the word from the future is: Amateur radio is alive and well! But remember, these aren't predictions, just "visions." Or maybe the effects of the wine and my state of drowsiness. **QST**

*2512 Glenwood Ave., Fort Wayne, IN 46805

Radio Foxhunting in Europe

Part 1: Don't break out the hound nor steed for this hunt. Yet you'll find the heat of the chase equally as challenging as the authentic version.

By Nicolai K. Holter,* LA5CH

Nic Holter, LA5CH, has been active in Scouting for more than twenty years, specializing in the Jamboree-on-the-Air and other radio-scouting activities since 1960. He coordinated the amateur radio and electronics activities at the 14th Boy Scouts World Jamboree in Norway in 1975, for which foxhunting equipment was designed and produced in large quantities. A devoted participant in this sport himself, LA5CH won the 1974 Norwegian Championships in Foxhunting. Nic is the author of a book on the popular European sport.¹

Prepare your receiver with the headsets; orient your map to north; stand by for reception. Now, ten seconds to go . . . wonder if LA5OQ will be on time . . . five, four, three, two, one . . . Ah! There he is: 'MOE MOE MOE DE LA5OQ!' Sounds just like music! Not strong, but well readable. Now, turn receiver for a null signal. Hm . . . Almost pointing north/south in the null position. Then turn receiver 90° and switch on the sense antenna. Note the strength. Swing receiver 180° and compare strength. Strongest signal in the northern direction. All right, plot him in on the map by drawing a bearing line along the ferro of your receiver, and stand by for more fox howls . . .

You are catching your breath after bushwhacking in thick woods in a radio-orientation race; "foxhunt," European enthusiasts call it. A radio direction-finding exercise, combined with physical fitness, cross-country running, map reading and compass orientation — how would that be for a

challenging event at your club's next field day?

Hidden-transmitter hunts using cars have been popular in the United States for a long time, but the marriage with cross-country running became the ham sport that swept European countries in the '50s and '60s. Although some countries have not yet fully joined the game, various district and national meets have been held for many years and there are even regular IARU Region 1 Championships in foxhunting.

OMs, YLs and XYLs of all ages become infected by this virus, although perhaps the younger ham population is most readily attracted by what the sport has to offer. This was clearly demonstrated at NORDJAMB-75, the 14th Boy Scouts World Jamboree in Norway last summer, where some 2800 boys representing 90 countries enthusiastically tried their hands at small-scale foxhunting and earned their Jamboree Foxhunting Certificate.



For that event, the Boy Scout Associations of the host countries, Denmark, Finland, Sweden and Norway, prepared 150 complete, direction-finding receivers and eight QRP transmitters. The latter were equipped with auxiliary automatic keyers. Instructional aids were supplied to cope with an average of 100 boys per hour. It should be pointed out, however, that even one transmitter and a few receivers will do nicely, if you want to create interest in this activity.

What It Is All About

The object of the game is to find hidden transmitters (foxes) in the shortest possible time. Up to five transmitters may be set up at various locations out in the woods. They are usually man-operated and transmit identifying Morse-code signals at predetermined intervals. The hunter must tune in the fox during its transmission by using his small portable receiver. The receiver's antenna is directional, producing a distinct minimum signal in the headset when the fox is pointed toward the transmitter. Recording the bearing on a map, the hunter will have a fair indication of the direction to the fox from where he is standing at the moment. Running to another place and recording a new bearing from there, the hunter obtains an intersection between the two lines (a "fix on the fox") indicating the location of the transmitter. To visit all transmitters in the shortest possible time, map reading and orientation become essentials to the foxhunter. A typical location pattern involving four hidden transmitters is shown in Fig. 1.

The foxes are usually set out so that the shortest course to visit all of them will be in the order of three or four miles. In the present IARU Region 1 rules, the time is recorded until the hunter, after having visited the last fox, reaches a finish line, geographically

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¹ This and subsequent footnotes will appear on page 57.

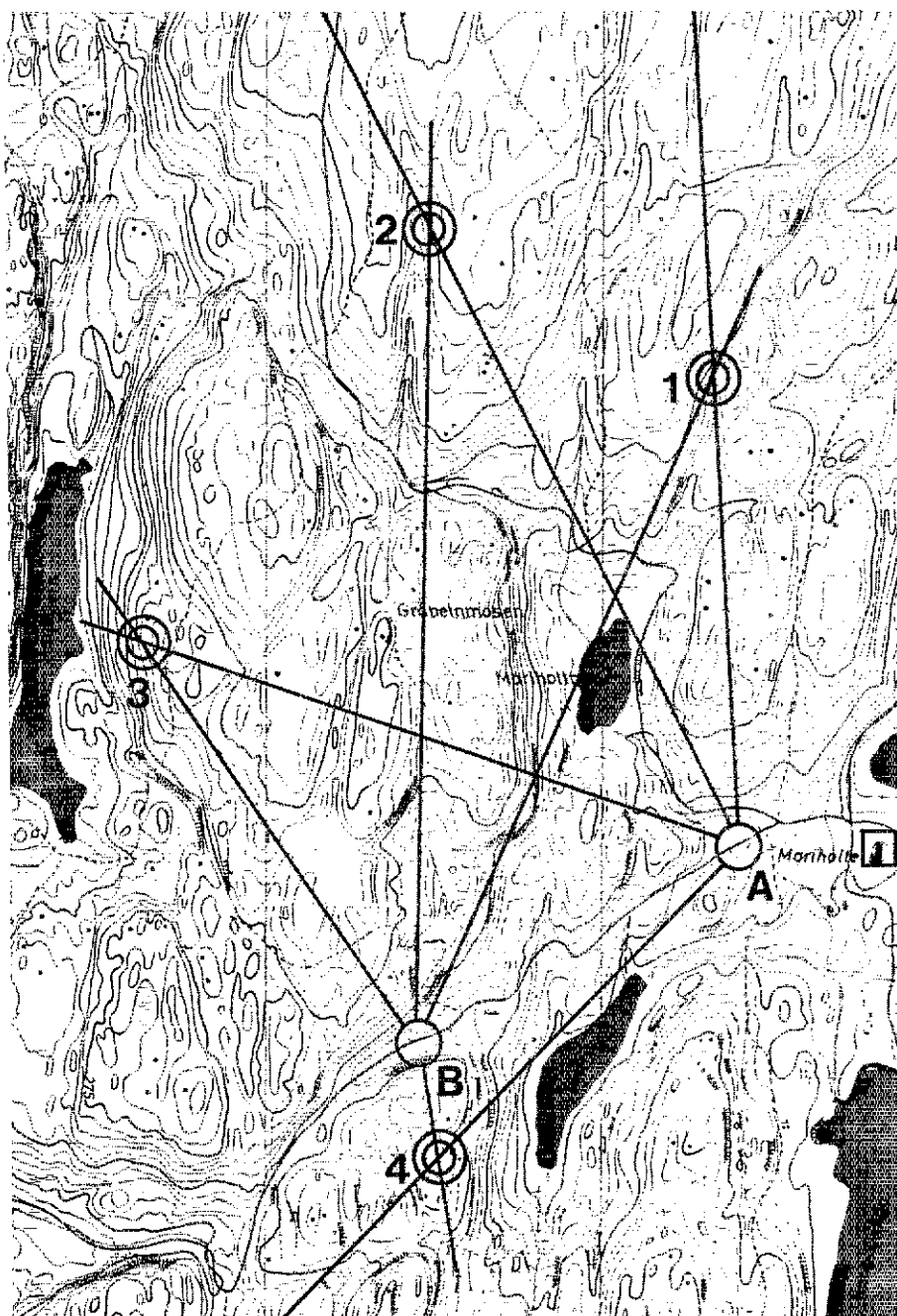


Fig. 1 — A typical hunt situation with four hidden transmitters. During the first transmission period (10-minute cycle), four individual lines of position will be drawn from the hunter's first location (A) along the null bearings to each fox. The foxes are then known to be somewhere on these lines. From another location (B) a second set of position lines will intersect the previous lines. Thus a "fix" for each transmitter is obtained, giving an approximate location for each fox. The foxes should be visited in a special order to save time, and proper map reading and orientation will be essential.

separated from the starting point. A simpler method is to record the time from start until the hunter has visited all foxes and returned to the starting place. The transmitters and their operators are often extremely well hidden, and all that you might see when you are at the site, is a punch, with which you mark your control card. Each punch makes a different symbol, thus proving that the hunter has found all of the foxes. If you have arrived at your last fox and the hunt has no finish line, then you must

actually find the operator and hand in your control card. The results (the time of delivery of each card) will then be transmitted by radio to the headquarters or brought in by the operators when they break up and return to headquarters after their last transmission period.

Transmitters used for foxhunting are normally crystal-controlled and low-powered (less than 10 watts). They operate in international amateur bands: 3.5-3.6 or 144-146 MHz are used in

European countries. Basically the same principles apply for either type of hunt, but equipment and methods for 80-meter hunts are discussed here. Permission to arrange hidden-transmitter hunts is governed by the telecommunications authorities in each country. Normally an amateur radio license is required for operation of the transmitters used. No such requirements are placed on the hunters. It is necessary, however, for the hunter to know the code well enough to be able to distinguish one transmitter from the others. Transmission is usually at 8-12 wpm. A typical transmission plan for a foxhunt, with four transmitters is shown in Fig. 1.

Foxhunting Receivers

Receivers for foxhunting operate on the same principles as those designed for conventional radio direction finding.² For obvious reasons, emphasis is on light weight, small size, low cost, and simple operation. Ideally, anyone who wants to take part should be able to assemble and operate a foxhunting receiver. Early foxhunters used vacuum-tube receivers with external loop antennas. Foxhunters of today use transistorized, small direct-conversion receivers with ferrite-rod antennas similar to the one shown in the photograph.

When properly designed, the ferrite rod (loopstick) makes the receiver highly directional. Such an antenna is a coil wound on two parallel rods of ferrite, the coil serving as the tuning inductance in the first stage of the receiver. The greater the amount of signal striking the long dimension of the ferrite rods, the more intense will be the sound in the earphone. The signal is loudest in two opposite points of a 360° circle and is weak or non-existent in two others. When the ferrite rod is exactly perpendicular to the line to the fox, the maximum signal is induced in the antenna. When the end of the antenna is toward the fox little or no signal is picked up. The ear can sense an absence of sound more sharply than a point of maximum volume. The null, therefore, is the basis for radio direction finding.

As shown in Fig. 2A, the incoming signal nulls, 180° apart, are sharper than the maxima. These will point to the fox and directly opposite. To resolve this the foxhunting receiver is equipped with a nondirectional, vertical *sense antenna* to establish which of the two minimum bearings is correct. When inserted into the circuit, the sense antenna induces a small voltage 90° out of phase with the voltage that the passing radio wave induces in the horizontal ferrite-rod antenna. Thus one lobe of the pattern is enlarged and the other reduced as shown in Fig. 2B. (The voltage from the

vertical sense antenna adds to or subtracts from the ferrod voltage, according to the direction of arrival.) Some experimenting with the length of the sense antenna may be needed to obtain the best difference between the two lobes. At least a 6-dB difference must exist for reliable sensing effect within the practical-signal range.

A foxhunting receiver must be usable over a wide distance range, from some miles to only a few yards. An attenuator may therefore be inserted by a switch, to reduce the signal level to a practical value for direction finding, when the hunter is very close to the hidden transmitter.

Transmission Coding

In training exercises perhaps only one transmitter may be employed at a time. For such purposes it is sometimes keyed automatically, eliminating the need for an operator. This can be achieved simply by having a multi-vibrator key the output stage, and thereby generate a continuous train of dashes. This is quite suitable for exercises in aiming with RDF receivers. Other keying devices may provide selection of different codes (T, M, O, CH, etc.) to facilitate distinction between transmitters operating at the same time but on individual frequencies. If all transmitters are to operate on the same frequency, the automatic keyers must be somewhat more sophisticated and include timing devices as well. The timer must turn on the transmitter to simulate an ordinary foxhunt where each transmits for two minutes in a 10-minute cycle. More complex, automatic systems may involve a centrally located base station to control each of the transmitters via a separate band or channel in some sort of selective calling system. Accurate timing devices with programmed keyers for each transmitter based upon shift register, diode matrix, or semiconductor memory, may also be used.

Simplified Hunts

Simplified training-exercise games have developed from conventional foxhunting. Emphasis is made on simplifying the hunting techniques, minimizing the explanation of the equipment, etc. The sense antenna and the attenuator may be ignored or omitted on the receivers required for these hunts. A background in orientation is not necessary, as no map or compass will be needed, except where a compass may be used to sustain the bearings. Note: Although the transmitters needed for these exercises require very little input power (only 1 watt or so) local radio regulations may restrict opportunities to run some of the types of hunts suggested here.

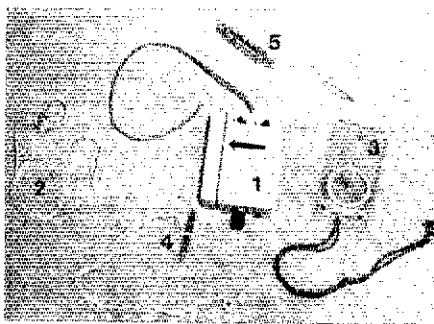


A typical "fox earth." Up to five individual transmitters may be on the air in a foxhunt.

1) *Continuous-Dash Transmission* — This is the simplest exercise. Let the transmitter operate in the automatic mode (send out continuous series of Ts). If sense antennas are not to be used, define that the fox is on *this* side of the road and not on *that* side, since the hunters will have no way of telling, otherwise. Let each hunter tune in the fox on his receiver. Allow hunters to leave for the fox in the direction where they obtain a null, which will be more or less distinctive depending upon terrain and distance. Who will be the first to visit the fox, punch his card, and return?

2) *Interrupted-Dash Transmission* — Same as No. 1 above, but use an operator, well hidden in the bush, who can turn off the transmitter for a short time when he considers the hunters to be "dangerously" close to the hiding place. When they retreat, he will go on the air again for a while. This game challenges the participants to identify various objects and terrain features as reference points while they are able to take bearings, and then use these for continued aiming when transmission ceases.

3) *Interval Transmission With Compass Bearings* — Resembles No. 2 but hunters use compass to sustain their bearings. The fox transmits only for 10 seconds or so every minute, so the hunters have to concentrate more on their compass work, rather than "running after the null."



Complete foxhunter's outfit: (1) direction-finding receiver, (2) earphone, (3) compass, (4) pencil, and (5) whistle.

4) *First-Come, First-Served* — A cruel survival of the fittest. The first one to reach the fox is allowed to switch it off! That fellow might well be the only hunter to return with a punch in his card.

5) *The Identification Game* — As No. 1, but each hunter will, upon his arrival at the fox, switch it into the manual mode, identify himself on the straight key, and switch it back to the automatic mode. Calls, letters, or numbers can be used for individual identification, to the extent local regulations will permit. The hunt leader monitors the fox signals with his own receiver and records the various identifications and the time as they appear on the air. A point here is to identify yourself with the key, without anyone else seeing you do so. It's frustrating to hear that someone else found the fox while you are still searching for it.

6) *Two Barking Foxes* — Two transmitters are on the air at the same time, but on different frequencies. Check that all receivers pick up both signals and explain to the participants how they now must tune in separately, with two different positions of the receiver's tuning knob. Let them decide on their own in which order they want to catch the two foxes. Who will be the first hunter to return with two different punches in his card?

The above is a major step toward real 80-meter foxhunts, in which up to five individual transmitters are operated, usually within 10-minute cycles (one will be on the air for two minutes, another following for the next two etc.). Perhaps the resemblance is even more significant to vhf hunts in the two-meter band, where the foxes are likely to be operated continuously throughout the entire hunt, but on individual channels.

Official Rules of Foxhunting

These rules and recommendations have been approved by the International Amateur Radio Union Region 1 Conference, 1972.

1) Official European Foxhunting Championships may be organized every second year by an IARU Member Society on behalf of IARU Region 1 Division.

2) There will be two foxhunts, both in daylight and entirely on foot, one in the 144-MHz and the other in the 3.5-MHz band. The two foxhunts will be scored separately.

3) A maximum of six competitors may take part from any European nation. The competitions are primarily individual, but team competitions may be scored at the same time.

4) On each hunt there will be four or five foxes, which may be visited in any order.

5) The foxes will transmit in accordance with some of the following programs:

MIN. NO.	ALTERNATIVE 1	ALTERNATIVE 2
1	Fox 1	Fox 1
2	Fox 2	Fox 2
3	Fox 3	Fox 3
4	Fox 4	Fox 4
5	Fox 5	Fox 5
6	—	Fox 1
7	—	Fox 2
8	—	Fox 3
9	—	Fox 4
10	—	Fox 5
11	Fox 1	Fox 1
12	Fox 2	Fox 2
13	Fox 3	Fox 3
14	Fox 4	Fox 4
15	Fox 5	Fox 5
16	—	Fox 1
17	—	Fox 2

Alternative 1 only: 5-minute sending, 5-minute silence.

6) The foxes will operate with a maximum power input of 5 watts. All foxes shall be audible, using normal direction gear (without extra aeriels), at the starting place.

7) On the 3.5-MHz band, foxes will transmit between 3.5 and 3.6 MHz, and on the 144-MHz band between 144 and 146 MHz. Stability of the frequency must be 0.01 percent or better during the competition. Foxes need not transmit at the same frequency.

8) Telegraphy (on 3.5 MHz, A1, on 144 MHz, A2) will be used with a speed of four to six bauds (30-45 letters per minute). The following text is recommended:

FOX NO.	CALL SIGN
1	MOEMOE . . . MOE DE
2	MOIMOI . . . MOI DE
3	MOSMOS . . . MOS DE
4	MOHMOH . . . MOH DE
5	MO5MO5 . . . MO5 DE

The call sign may be omitted, if this is permitted by the telecommunications authority in the organizing country. In other cases it is only transmitted one time per transmission at the end.

9) The total distance start-fox-fox-fox-fox-(fox)-finish shall be in the order of minimum four and maximum six kilometers. The terrain should be mainly forested, with few houses. Power lines, highways, railways, fences, populated areas, etc., shall, if possible, be avoided. Terrain not known to the competitors, including those of the organizing society, should be chosen.

10) The foxes should be located outdoors and should be as well hidden as possible. The polarization of the antennas on 3.5 MHz and 144 MHz shall

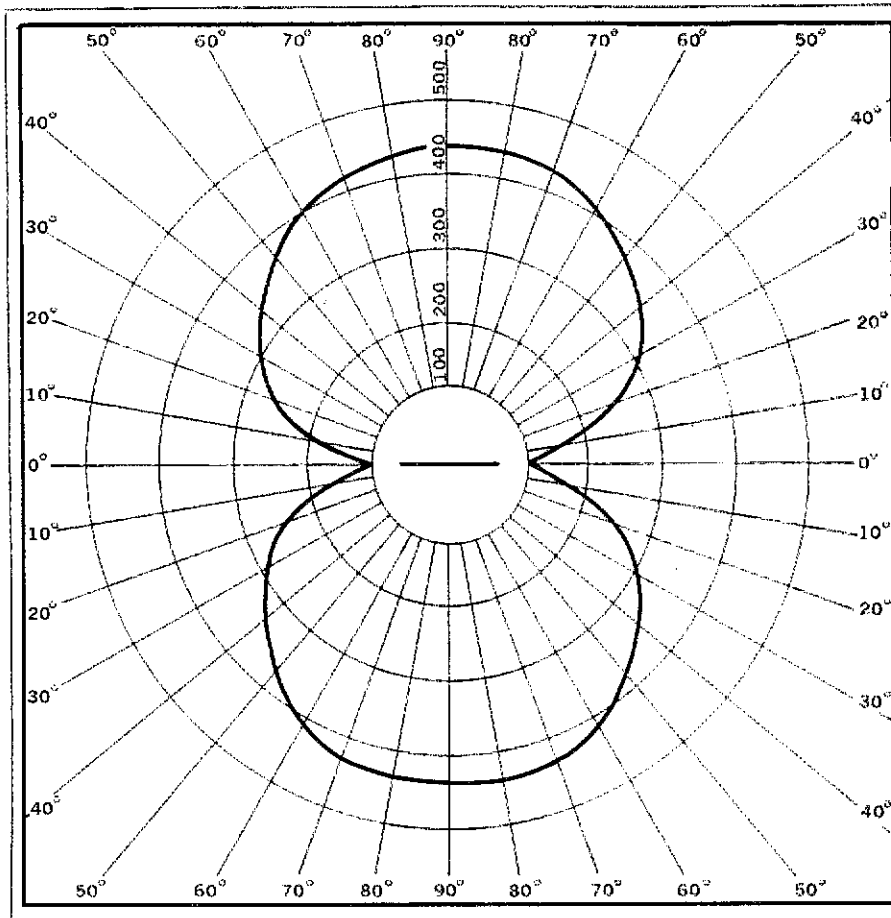


Fig. 2A — Directional loop pattern obtained with the ferrite-rod antenna of the direction-finding receiver. Measurements are performed with a FOX-75 receiver located some 300 meters away from a TX-74 (1-watt) transmitter. Signal levels are in microvolts. Note that the two signal dips for minimum response at 0° bearing (obtained with the ferrid pointed toward the transmitter) are appreciably sharper than the two maximum lobes.

be either vertical or horizontal. The types of polarization used are to be announced by the organizer before the start of the competition. No form of joke with the polarization in order to mislead the hunters is allowed. The foxes must not be placed near power nor telephone lines, highways, railways, fences, houses, etc., and must not be located in populated areas.

11) The competitors start individually every five minutes. Successive starts of competitors from the same country are not permitted. The hunters start at the same time as fox one begins its transmission when five foxes are used, whereas they start after fox four has terminated its transmission if only four foxes are used.

12) The organizing society may decide whether all, or only three or four, foxes shall be visited. If not all are to be visited, it is for the competitor himself to decide which he will exclude. This does not mean that a hunter who has found less than the stipulated number of foxes will be excluded from the list of results. The final score is

determined in the first place by the number of foxes found, and in the second place by the time elapsed between the start and the arrival at the finish line. The duration of the hunting period must be announced by the organizer before the start of the competition, or in the invitation to the competition. The organizers have to check the arrival of the hunters at the foxes in an adequate manner.

Time-recording equipment must have an accuracy of five seconds or better. The start and the finish lines are to be geographically separated. The geographical position of the finish line will be notified to every competitor before starting out.

13) It is strictly forbidden to receive help from other participants or from other persons. Every participant receiving or giving help or information — except in cases of emergency — will be disqualified.

14) Competitors take part in foxhunting at their own risk.

15) An international jury, consisting of a representative from the Executive

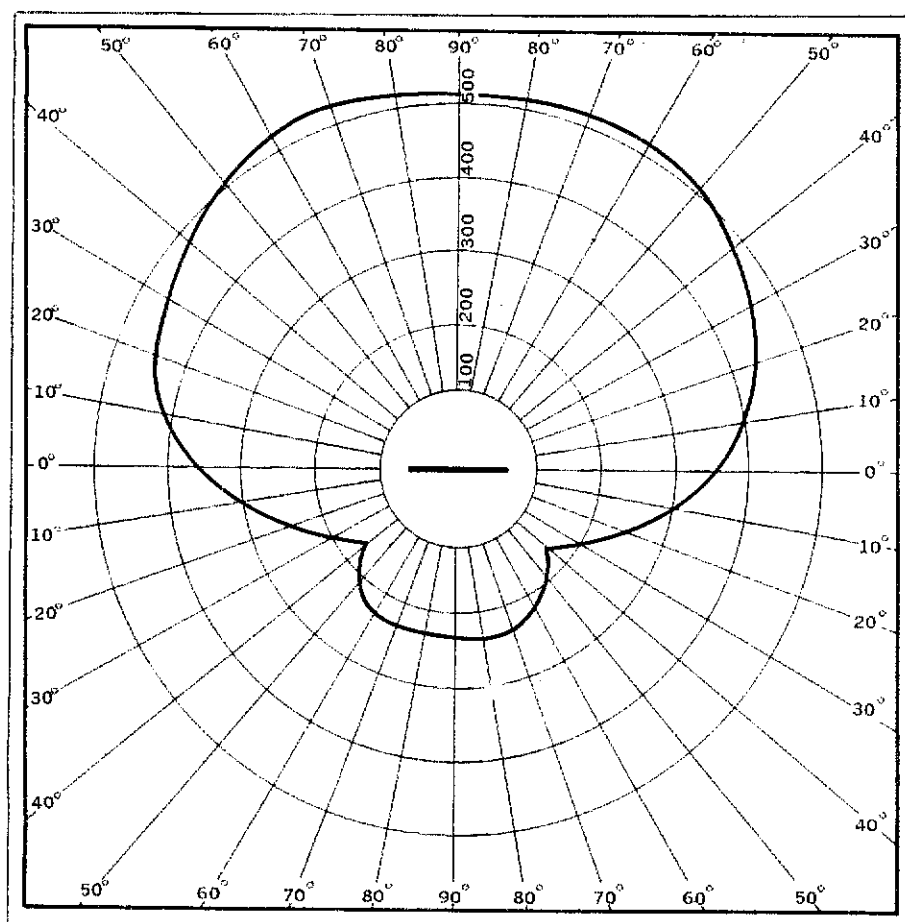


Fig. 2B — Directional pattern of the combination of a ferrod and a sense antenna. One lobe of the pattern is enlarged while the other is reduced. If the difference in signal levels between these two lobes is larger than 6 dB, the human ear will detect that difference. A reliable "sensing" effect is thereby obtained, and the direction of arrival of the radio waves may be determined without 180° ambiguity.

The hunt will be approx. 3.5 km (air distance) and 4 individual foxes will be used. All competitors will be allowed to leave Mariholtet at 0955, and the first fox will start transmission at 1000. The time is counted until you return to Mariholtet.

The foxes will transmit with the following codes:

Fox 1:	MOE	MOE	MOE	DE LA5QQ
Fox 2:	MOI	MOI	MOI	DE LA2GJ
Fox 3:	MOS	MOS	MOS	DE LA4LN
Fox 4:	MOH	MOH	MOH	DE LA7XJ

The foxes will transmit according to the following plan:

Fox 1:	1000—1002, 1010—1012 etc. till 1230—1232
Fox 2:	1002—1004, 1012—1014 etc. till 1232—1234
Fox 3:	1004—1006, 1014—1016 etc. till 1234—1236
Fox 4:	1006—1008, 1016—1018 etc. till 1236—1238

A fox may be visited no later than 2 minutes after its last transmission period (e.g. at 1234 for Fox 1).

A pair of punching pliers will be found near each fox. Punch a hole in your control card at each fox.

The foxes may be visited in the order you yourself have chosen. The fox frequency is 3566 kHz. A "homing" fox at Mariholtet will commence transmitting Ts at 1240, two minutes after fox No. 4 has completed its last transmission period.

The scale of the map is 1:10,000 and the equidistance is 5 meters. Good luck!

Committee of IARU Region 1 Division, shall be chairman) and a minimum of or from the organizing society (who two representatives from other

participating societies, shall be set up prior to the start of the competition. The jury shall have the final decision in the event of disputes and the decision shall be without appeal. The chairman shall have the casting vote. Members of the jury shall not take part in any of the competitions.

Recommendations

1) If team competitions are to be included in the championships, each nation may not later than one hour before the competition commences announce the names of two participants to form a team. The two results will then be added to give a time total. Additionally other participants may start out in the competition within the capacity of the Championship Organization.

2) If possible, a maximum difference of 200-meters altitude should be allowed in the competition area.

3) A list of frequencies, transmission times, transmission texts and a map (1:50,000 or better is recommended), or a good and correctly scaled photograph of a map will be given to every competitor about 15 minutes before the start.

Compass, watch, direction-finding gear and pencils will be provided by the competitor himself. Compasses may be of any type, including non-magnetic.

4) A receiver, which causes severe interference in another competitor's receiver at a distance of 10 meters or more must not be used. If possible, a check will be made on the day before the start.

5) Competitors should not cause damage to any property or private ground, and competitors should be organized with a view to avoiding cause for complaint.

6) It is important to check that every competitor comes back from the hunt.

The foregoing rules were prepared as guidelines to cover a wide variety of situations and levels of expertise. The specific form a given hunt is to take is usually put on an instruction sheet, which is given to all participants. It will include calls, frequencies, starting time, and all necessary details. Usually a topographical map is included with the starting and finishing points marked if the finish is other than a return to the start. See illustrations for an example of a typical instruction sheet.

Part 2, giving details of foxhunting equipment, will appear in a subsequent issue.

QST

Footnotes

¹ Holter, "Introduction to Scout Radio Orienteering (Foxhunting)." 130-page, bound volume, published 1975 by the author, \$5.00, P. O. Box 58, Oppsal, Oslo 6, Norway.

² Dornbuck, "Radio Direction-Finding Techniques," *QST* for August, 1975.

Put the Ham in the Closet

Can One Man's Family coexist under a single roof with a ham? Can green specks be removed from a U.S. map? Stay tuned for more exciting episodes. . . .

By Jerry Woods,* WN5POQ

The FCC gods had finally smiled upon me. My Novice ticket arrived. I beamed with pride while looking into the mirror and told myself, "You are now a HAM" (wonder where that word comes from).

Anyway, a corner of my garage workshop became the nerve center of my electronic activity. Those early months of autumn were nice out there in the garage. I worked with a borrowed rig (thanks, Bob) and inverted dipole (thanks, Bob). An added benefit of the garage was that, with the doors raised, people walking by could see and hear me doing miraculous feats at 7 wpm. If the neighbors made the mistake of stopping by, they were immediately swept into the laboratory to watch Jekyll (or was it Hyde?) explain every detail of radio communications — rig tuning, low-SWR reading, and all that good stuff people want to know.

But one day a funny thing happened: November arrived. People no longer beat upon my now-closed garage door. My right hand tingled when I beat it against the desk to restore circulation. My code speed dropped all the way from eight wpm to six and one-half. I began drinking more coffee but enjoy-

ing it less, since I had to break off QSOs to go to the bathroom. My wife, vaguely remembering me from days prior to my license, suggested I shut down my toy and come into the house. After rubbing my hands and face with snow to restore circulation via Sergeant Preston of the Yukon, Donna — oops, my XYL — said I could have a shack in the house.

Now, to the task of picking just the right spot. The den was nice and cozy, but that would necessitate moving the XYL's television to the garage. Our bedroom would serve, but I decided that dahdidahdit dahdahdidah at 11 P.M. (0500 UTC) might strain what was left of my love life. I thought of putting my two boys in the same room — one sleeping on the floor since there wasn't room for two beds. I gave up this idea when they demonstrated how well a twelve and a five-year-old can get along (seems they both wanted the floor).

Have you ever noticed that in a six-room house there are not too many places to put a desk, radio gear, coax, meters and coffee pot? One convenient thing about a shack in the bathroom would be that I wouldn't have to break off QSOs. Finally, with a magnanimous gesture, my wife bequeathed the entrance-hall closet to me, but she quickly

added that I would have to find a place for those "perfectly good" clothes she had saved for years. That accomplished (I threw them away while she was shopping), I moved in my desk (an old sewing-machine cabinet with cover over the hole), rig, map of the United States marked into zones — complete with stick pins to show the eight confirmed states — 24-hour digital clock (built from kit for \$9.95), coax through the ceiling, and chair from dinette set. Everything was operational when my XYL returned, told me to take it all out, and paint the closet. She was not going to let any of *her* friends see the dingy walls of *my* radio shack. Well, I put my foot down and told her to paint it if she didn't like it. She did — dark green!

That's where we are today; I've still got to install a light fixture because I'm having trouble seeing the rig. Just thought your readers would like to know that a family and a ham *can* coexist in the same house. If I may, I have two questions for the readers. What is wrong with a digital clock that jumps several hours when the transmitter is keyed, and what will remove green paint specks from a map of the United States?

QST

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Strays

□ The University of Pennsylvania Amateur Radio Club is setting up an alumni net. Any interested amateur who is an alumnus or who attended the university should send his name, address, school, year of graduation and call to: Alumni, U of P Amateur Radio Club — W3ABT, The Moore School of Electrical Engineering, Philadelphia, PA 19174.

□ Nine members of the Jayhawk Amateur Radio Society, Kansas City, KS, supplied communications for the recent annual March of Dimes Walk-a-thon. Using two-meter fm simplex, the amateurs were stationed at various check points along the 24-mile route, relaying messages for March of Dimes officials and Disaster Service teams of the Wyandotte County Red Cross. Partici-

pating in the event were W0MCH, WA0s BJN and TPR; WB0s GAC, IBZ, ICA, MRO, NSQ and RWY. — **WB0NSQ**

□ The San Raphael High School Radio Club is sponsoring a Novice All-American Award for Novices who work one station in each of the ten call areas. The award is also open to more advanced amateurs who work a Novice in each of the ten areas. To apply, send one dollar and a detailed list of contacts to William Pearson, WB6QBJ, Awards Manager — NAAA, 25 Rudnick Avenue, Novato, CA 94947.

The Value of Special-Events Stations

As fall sets in each year, more than 6,000 amateur stations around the world combine with Scout organizations for a mass demonstration of goodwill through amateur radio.

By Lowell G. Croysdale,* W5UCY

At the 25th World Scout Conference delegates from 86 countries voted unanimously to support amateur radio's efforts to retain its frequency allocations. The resolution (see QST for December, 1975, page 63) proposed by New Zealand and seconded by Jordan and many other delegations, requests cooperation with the Amateur Radio Service from all member organizations.

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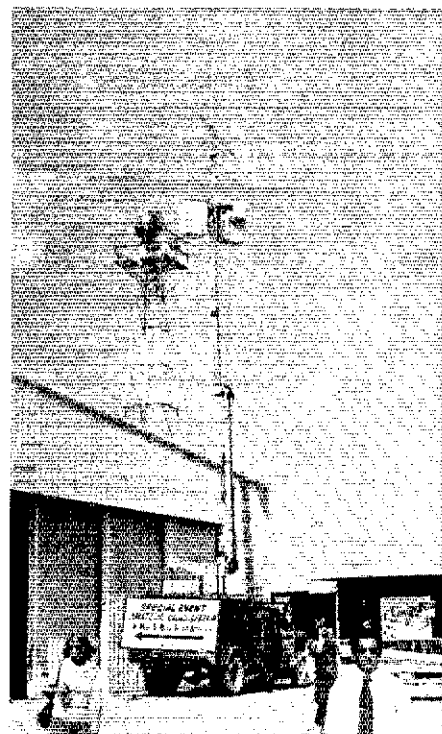


No amount of words can beat firsthand experience at the mic. At base-station operation, Scouts spoke with amateurs in 37 continental states, as well as with several DX stations.

There is in man a spirit which seeks to reach beyond physical limitations. Icarus experienced this as he stood atop a cliff ready to test his feather wings in flight. Though technological sophistication has pushed us far beyond these primitive steps, such a spirit still permeates mankind. Thus, when amateur radio — which puts the far corners of the world at the reach of the average citizen's fingertips — teamed up with an air demonstration at the Explorer Air Show in Pascagoula, MS, the attending Boy Scouts and general public alike witnessed a double feat of modern technology.

Special-events station KM5BSA aired CQ Jamboree in both voice and code. Not a contest, Jamboree-on-the-Air (JOTA) annually involves over 100,000 Scouts exchanging friendship and ideas with their counterparts in 70 or more countries. The intended purpose of the special-events setup was to demonstrate communication as a vital link in air traffic today. Using radio equipment from an active operating station, a control unit, worked from a large flat-bed truck, was powered by a small gasoline-driven generator. Thus, all radio-equipped planes were able to communicate with the tower and the dispatchers were able to insure the degree of safety necessary. Keeping the entire airport under control, mobile units stood by to be deployed as conditions required.

While no real emergency arose, one incident underscored the value of mobile communication. In a rush to exit at the near conclusion of the show, several cars succeeded in getting on



As special-events station KM5BSA, amateur radio coupled with the Fifth Annual Explorer Air Show at the Jackson County Airport in Pascagoula, MS, to demonstrate to Scouts present how, today, communication is vital in air traffic.

operating and open runways. Through the control tower, the mobile unit advised a sheriff's patrol, and a car filled with children was escorted from the runway prior to any accident.

At the base-station operation, boys spoke with amateurs in 37 continental states, as well as several DX stations.

Like Icarus they experienced personal satisfaction gained from overcoming the shackles of one's own physical limitation. Furthermore, through special-events station KM5BSA, tomorrow's leaders witnessed firsthand not just an amateur station in operation, but the

value and necessity of radio communication in today's world. The words of E. L. Tolbert, Scout Executive, best express the success of the event: "In all my years in the Scouting profession, never have I seen such a performance as was demonstrated Saturday. You are

certainly to be commended for the outstanding service rendered in setting up the KM5BSA radio station. . . ." Scout leaders further expressed hope that this year will see actual licensed Scouts as part of the operating staff during Jamboree-on-the-Air. **QST**

Strays

□ During my few years in the world of ham radio there have been frequent allusions to the "Wouff Hong," and there have even been pictures of it in *QST* magazines. Now, I know that some of you have been searching for the true origin of the species, having gone to the four corners of the globe on so-called DXpeditions, when in reality your main interest was in trying to find where this object actually grows.

Gentlemen, put your minds at ease! I have found the elusive place where the Mother Tree prospers — right here in nearby New Portland, ME, beside Rte. 16.

My first attention was drawn to her by an odd RFI on the car radio when passing by the area. Finally, one day I spotted her; the Mother Tree stood there majestically in this remote marshland like a giant hand of authority. It was then I knew that something big had happened.

As I stood staring at her a strange feeling of fraternal affection overcame me; I was drawn to her as though a giant magnet pulled me across the wet ground. Upon close examination I found what appears to be a new bud



The long-sought Mother Wouff Hong points skyward off Rte. 16, New Portland, ME.

emerging from her bosom. I shall watch it closely and notify you promptly if it continues to grow and produces another rare Wouff Hong. — **W4IIWV**

□ Every so often it gets cold up in Yellowknife, N.W.T., but Ed Brogden, VE8EJ, who is assistant crown attorney for the Territory, manages to stay warm by keeping active — he travels throughout the Canadian arctic with the Circuit Courts, which provides the opportunity to operate various M.O.T. club stations in addition to his own.

Ed reports that he once held the world's first 9M8, then operated 2-meter fm from his light twin airplane while flying between VE3 and the Bahamas, and worked as VE3EMF/VP7 from Andros Island, the Bahamas' largest. QSLs, he says, have always been 100 percent and still are.



VE8EJ, an assistant crown attorney, operates at Coral Harbour, N.W.T., with the assistance of the court clerk and the court's Eskimo interpreter.

BEDPAN SPECIAL

□ To help relieve the boredom of a recent period of hospitalization, the XYL brought in my 220 xcvr and a mobile antenna. Chances of successful portable operation seemed poor as my



WA3UDS works his "Can-Tenna."

room was both on the first floor and faced an inner court enclosed by three- to seven-story brick buildings. I found, however, that I could key up the three repeaters within ten miles if I placed the 5/8 vertical over several 1/4 radials.

To see if a more extensive ground plane would improve performance, I mounted the vertical on a stainless steel bedpan. With this antenna system I was able to work through six repeaters and about eight miles on simplex. All the repeaters, except the most distant one twenty-four miles away, could be worked using one watt. Since my vertical was mounted on the inner edge of the "rear" section of the bedpan and inclined slightly forward, I expected the system to exhibit directivity. None was observed, however.

The Bedpan Special did cause a pronounced fluctuation in signal strength and a full-quieting signal might become inaudible within half-a-minute. Continuous good copy was obtained by rotating the bedpan to maintain maximum S-meter readings. Similar fluctuations were caused by lateral movement of the antenna system.

Word of the antenna elicited numerous comments and suggestions for further tests. Included were using stacked bedpans, testing occupied versus unoccupied operating modes, testing full versus empty operating modes, and the unkindest suggestion of all — renaming the system "The Can-Tenna."

Ultimate recognition of the Bedpan Special occurred when I was visited by the hospital's PR director and a photographer who recorded it for posterity. — **WA3UDS**

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE
MEETING
No. 357
June 12, 1976

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at Dunfee's Royal Coach Motor Hotel, Atlanta, Georgia, at 8:05 A.M., June 12, 1976. Present: President Harry J. Dannels, W2TUK, in the Chair; First Vice President Victor C. Clark, W4KFC; Directors Roy L. Albright, W5EYB, Max Arnold, W4WHN, John R. Griggs, W6KW, and Robert B. Thurston, W7PGY; and General Manager Richard L. Baldwin, W1RU. A number of other officers and directors of the League and the president of The ARRL Foundation, Inc., Larry J. Shima, W0PAN, were also present.

On motion of Mr. Albright, affiliation was unanimously GRANTED to the following societies: Acadia Naval Radio Amateurs, Winter Harbor, Maine; Alamance Repeater Association, Inc., Burlington, North Carolina; Alameda County Radio Club, San Leandro, California; Amateur Radio Club of the Ozarks, West Plains, Missouri; Alvin Community College Radio Club, Alvin, Texas; Anthracite Repeater Association, Hazleton, Pennsylvania; Barnesville Area Amateur Radio Club, Barnesville, Ohio; Bayonne Civil Defense Amateur Radio Club, Bayonne, New Jersey; Blue River Valley Amateur Radio Society, Shelbyville, Indiana; Cary Amateur Radio Club, Inc., Cary, North Carolina; Catawba Valley Technical Institute Amateur Radio Club, Hickory, North Carolina; Central Illinois Radio Club of Bloomington, Illinois; Clark County Amateur Radio Club, Inc., Vancouver, Washington; Computer and Amateur Radio Club, Honea Path, South Carolina; Coney Island Amateur Radio Club, Brooklyn, New York; Connecticut Amateur Radio Society, Canton, Connecticut; Cumberland Valley Amateur Radio Club, Inc., Corbin, Kentucky; Cumberland College Amateur Radio Club, Williamsburg, Kentucky; Davis Amateur Radio Club, Davis, California; DeFiance County Amateur Radio Club, DeFiance, Ohio; Drumlins Amateur Radio Club, Newark, New York; Dublin Amateur Radio Club, Dublin, Georgia; Durango Amateur Radio Club, Durango, Colorado; El Dorado Amateur Radio Club, Pollock Pines, California; Emergency Amateur Repeater System, McComb, Mississippi; Goodrich High School Amateur Radio Club, Fond du Lac, Wisconsin; Hampshire College Amateur Radio Club, Amherst, Massachusetts; Idaho Society of Radio Amateurs, Boise, Idaho; Indianapolis Hamfest Association, Indianapolis, Indiana; Iolani School Radio Club, Honolulu, Hawaii; Jackson County Amateur Radio Club, Pascagoula, Mississippi; Jonesboro Amateur Radio Club, Jonesboro, Arkansas; Lafayette Middle School Amateur Radio Club, Chatham, New Jersey; La Mirada High School Radio Club, La Mirada, California; Laurel-Jones County Amateur Radio Club and Repeater Club, Laurel, Mississippi; Lexington Amateur Radio Club, Lexington, Massachusetts; Livonia Amateur Radio Club, Detroit, Michigan; Medina Two Meters Group, Inc., Medina, Ohio; Mitchell Radio Communications Club, Mitchell, South Dakota; Mountain Amateur Radio Club, Cresaptown, Maryland; Naval Training Center Great Lakes Amateur Radio Club, Great Lakes, Illinois; Nicolet Scientific Corp. Amateur Radio Club, Northvale, New Jersey; Northern Lakes Amateur Radio Club, Grand Rapids, Minnesota; Old Post Amateur Radio Society, Vincennes, Indiana; Pace (University) Amateur Radio Association, New York, New York; Petaluma DX and Experimenter Society, Petaluma, California; Plateau Amateur Radio Club, Crossville, Tennessee; Pleasanton Jr. High

School Amateur Radio Club, Pleasanton, Texas; Portsmouth Amateur Radio Club, Portsmouth, Virginia; Righetti Radio Club, Santa Maria, California; Ringgold Wireless Radio Association, Beaconsfield, Iowa; Rip Van Winkle Amateur Radio Society, Claverack, New York; Sante Fe Amateur Radio Society, Gainesville, Florida; Schuykill Amateur Repeater Association, Tamaqua, Pennsylvania; Soo-Land Repeater Association, Sioux City, Iowa; South Central Kansas Amateur Radio Club, Pratt, Kansas; South Quad Radio Club, Ann Arbor, Michigan; Southeastern Louisiana University Amateur Radio Club, Hammond, Louisiana; Southern California Amateur Transmitting Society, Diamond Bar, California; Sulphur Mountain Repeater Association, Ventura, California; State Line Radio Club of New York and New Jersey, Hillsdale, New Jersey; Sumpter Area Amateur Radio Repeater Association, Sumpter, South Carolina; Surry Community College Amateur Radio Society, Dobson, North Carolina; Sweetwater Amateur Radio Club, Rock Springs, Wyoming; Trident Amateur Radio Club, Charleston Heights, South Carolina; Trojans Colby Community College Amateur Radio Club, Colby, Kansas; Twin Base Amateur Radio Club, Gunter AFS, Alabama; University of Miami Amateur Radio Society, Coral Gables, Florida; Washington Amateur Communications, Washington, Pennsylvania; Wildcat Amateur Radio Society of Wawona Jr. High, Fresno, California; Weirton Area Repeater Association, Steubenville, Ohio; Wilmar Area Emergency Amateur Radio, Wilmar, Minnesota; Wood County Amateur Radio Club, Bowling, Ohio; Worcester Central Amateur Radio Club, Worcester, New York.

On motion of Mr. Arnold, unanimously VOTED to grant approval for the holding of a North Florida Section Convention in Jacksonville, FL., on April 10-11, 1976, a Dakota Division Convention in St. Paul, Mn., on October 1-3, 1976, a Tennessee State Convention in Memphis, Tn., on October 2-3, 1976, a South Florida Section Convention in Clearwater, FL., on November 6-7, 1976, a Southwestern Division Convention in Santa Maria, Ca., on October 7-9, 1977, a Midwest Division Convention in Wichita, Ks., on October 7-9, 1977 (changed from original date - October 14-16 - hotel not available as originally scheduled), a Southeastern Division Convention in Orlando, FL., on February 12-13, 1977, a New England Division Convention in Hartford, Ct., on September 24-25, 1977, and a Midwest Division Convention in Kansas City, Mo., on October 6-8, 1978.

On motion of Mr. Clark, Life Membership was unanimously GRANTED to the following applicants: Juan L. Alfaro Abreu; Thomas M. Acree, KL7DVE; David L. Aldridge, WB0PEM; Norman P. Alexander, W4QQN; Jean Alliaume, FSJA; Ralph V. Anderson, K0NL; Raymond E. Anderson, K8RD1; L. Scott Andrews, WB4VMB; David M. Aronovitz, K1LPI; Wayne C. Ashwell, K0OHB; Steven Back, WB2OGY; Frederic S. Bacon, Jr., K1FSU; Michael S. Badolato, Jr., W5MYA; Harold Balitski; Joseph Banasiak, WA2QEB; John B. Bandy, WA0UTT; Anthony J. Banek, Jr., WA8GDU; Lawrence S. Baranyi, WA3GSC; Kenneth B. Barber, W2DTC; Ruth J. Barber, K1HIF; David A. Barker, WA9NQD; Albert T. Barnett, WB4ZCH; Andrew Bartilucci, W2NKC; Arthur R. Bartlett, WA1KRM; Curtis Behrens, WA6JQC; Vance J. Belliston, WA6KHA; Joseph A. Benesh, K4AI; Thomas M. Berry, K9ZVE; Joseph M. Black, WB5HWM; Kenneth E. Blair, WA3WMW; Robert D. Bliss, Jr., WB0MPE; Henry A. Blodgett, W2UTH/W2FRL; William Blust, WB8HWB; Thomas E. Bobbitt, W4HV; Charles J. Bollig,

WB0IKO; William A. Borgstrom, WB9DRS; Vernon E. Bosworth, WA9RGL; Thomas J. Boyd, Jr., W5QVZ; James D. Braden, WA4YPM; Robert G. Bradshaw, W5CSN; Kenneth P. Branning, K9RSE; Donald E. Bridgewater, K5IMR; Michael D. Brooks, K6YYR; Marcia W. Brown, WB2VYK; Michael T. Brown, WA7JLL; William G. Brown, WN2JIF; Samuel W. Brown, WB8DHH; James Buongiovanni, W8KWD; Arthur J. Burgh, W7KEQ; Joseph W. Burke, WA8OGS; Merriel Burkhead, WB8AIV; Michael G. Byrne, WA6HPN; Harry W. Callaway, K5ASW; C.H. Campbell, WB9OML; Lawrence Campi, WA5TRX; Robert F. Carry, WB2FIT; William G. Carter, W6VCY; Stuart D. Casper, W2PDM; J. Craig Caston, WA6PXY; Brent A. Cater, W5FRG/WB8NVT; Jerry Cavalier, WB8URA; John M. Ceranski, WA8ALQ; Kenneth F. Chaffee, WA1QXR; William E. Chambers, W7BYK; James W. Chandler, Jr., WA4LAF; Author H. Charette, WA6CXX; Clyde E. Charles, WB2TUA; Joe Cherry, WA4AGR; Leslie H. Childers, WB4NSH; Robert E. Ciesla, WA2AKN; Salvatore A. Citrano, K2OZR; James D. Clark, K4LZU; Victor E. Clarke, W4OTR; Theodore J. Cohen, W4UMF; Robert R. Cooney, W1TUH; James C. Corbett, W8RVD; Bois R. Council, K0ATZ; Scott H. Cowling, WA2DEF; Mickey D. Cox, WA5VQE; Albert R. Crocker, W2HOS; Charles F. Cromwell, Jr., WB0JTU; Charles R. Crowley, WA4EDW; Myer L. Crumb, WB6RCM; Howard G. Cunningham, Jr., WA9VRU; Layrd T. Cunningham, WN8STF; Thomas E. Dannels, WA2FEW; Martin Davidoff, K2UBC/WA3VCI; Donald J. Davis, WA7TQV; James G. Dean, VE3CMV; Lemuel A. Decker, W5FFP; Frederick E. Deeg, K6AEH; Andrew J. Demland, Jr., K8DCM; Robert I. Dodge, Jr., K3DBH; Robert W. Donovan, KH6AHZ; W.E. Douglass, K6BAZ; Heinz Drawing, WB2SMQ; William E. Dudley, WA4IBM; Floyd A. Dunlap, WA5TWF; Paul H. Durand, WB4WEQ; Ronald C. Earl, WA6WVX; Wayne E. Eberhard, K17HKZ; John A. Eckert, WB6HJO; William C. Edler, WG6JCE; John M. Efrid, WB4WIS; Bruce A. Eggers, WA9NEW; Charles L. Erickson, WB0EXD; Floyd B. Erickson, WB0EXC; William Erickson, WA9TPQ; Theodore H. Ertl, WA2HKS; Larry L. Essary, WA5WWH; Larry Fain, K4RUC; JoDavid B. Farris, W5PBW; John W. Ferrel, W0YDV; Donald E. Ferris, Jr., WB8JYX; George D. Fisher, WA0LHR; Garth R. Flournoy, W0TMI; James R. Floyd, WA5JTB; Harvey C. Follmer, Jr., WA3BZO; Earl D. Fortner, K4KAY; Julian F. Franke, W9TQA; Floyd A. Franklin, WA4CGX; John J. Gaffey, K1ULI; Frank M. Gager, W3LSI/W8FDH; Francis P. Galinas, K8EEW; Alfred R. Gavenas, WN6IQD; Edgar D. Geiman, WA8HMG; H.A. Gilbert, W4WLW; C.E. Glover, WA2VUO; Wilbur E. Gull, W0DEL; Helen L. Grauer; John W. Green, W9CJX; Ervin N. Greene, W7EU; John P. Greenwalt; John D. Greer, KL7EQQ; Peter H. Grillo, W6RTT; Richard W. Haire, WA3LHP; Marshall D. Hall, K6MEF; Roger D. Halstead, K8ZKF; James R. Hammack, WB5JAZ; John H. Hampton, III, W2VUS; William J. Harbaugh, WA8PBF; Soter Harbolis, W3BRG; Edwin R. Hardin, K5ZIM; Andrew D. Harris, W4EBD; David L. Hays, W0FCL; Paul S. Hendricks, W3IO; Maurice O. Hevey; William A. Hickey, III, WA5FXE; Warren E. Hill, WA3UW; William F. Hiller, W7OPX; Louis A. Hodges, W9LMI; Joseph A. Hoffmann, W2DIJ; Alfred J. Hoff, WA2YLT; Charles D. Hoover, W3HXX; Ted H. Huddle, W4CID; J.R. Hudelson, WA5TNX/PA9AGM; Henry Huey, WB2HES; Jeffrey L. Hunziker, W1ZPMN; Russell B. Huss; William R. Jackson, Jr., W3SDW; Christine E. James, WN5LQK; Theodore R. Jefferies, WA3TKP; Orlin D. Jenkins, WA0WYP; Dale M. Jensen, WA0DYO; Wesley R. Johnson, W0ZXX; David A. Jones, WB8MON; George B. Jones, K4IQC; Millard C. Jones, W7VME; Louis D. Joseph, W2LYL; Myron J. Kaufman, K2GAT; Larry M. Keeran, K9ORP; Richard A. Keller, W7TWU; Paul C. Kemmerly, WB4SYS; Randall K. Kirschman, K6HEP; John M. Korns, W0USL/K9WGN; A.T. Knudson, Jr., WA8OVL; Stanley W. Krueger, K5AS; Masato Kunishige, KH6GNC; Donald Lacy, W4UEK; Gilbert M. De la Laing, W6BJI; Stephen M. Lawrence, WB6RSE; Clifford E. Leavstrom, WN1SRL; Donald R. Lee, WB9HGG; George W. Lee, WB5CKH; Robert E. Lee, WA8IHZ/6;

William F. Lee; Eugene R.P. Leman, WA6JZN; Clarence G. Leonard, W5HDR; Lance B. Lickteig, WB0HZZ; Harry Linzer, WB2DCS; Robert K. Little, W1WLE; Richard C. Loveless, WB5GOH; John A. Lyeon, WB8TIZ; W. Aubrey Madaris, K4ENI; Howard F. Mann, VE1RC; Jon R. di Marco, WB4NVR; Larry E. Marks, WB5DUC; Warren A. Marquez, K6EWS; Kevin J. Martin, WB8MJJ; Raymond R. Martin, WB2LNR; Charles A. Mason, K2JQB; Charles W. Mathias, W8KGD; William M. Matsukado, WA7JBE; Robert D. May, Jr., K2GCL; Dennis B. McAlpine, W2EVS; Gary E. McCabe, WA8VOG; George E. McCarty, WA1TF; T.R. McCollough, K7SPL; Rae E. McCornaghy; Steve McCown; G. Andy McLellan, VE1ASJ; Jene H. Melton, WA0DEM; Alan C. Merrill, W1FYR; William B. Milham, WA6WKG; Peter S. Miller; Roger F. Miller, WB0IQS; Roger D. Moates, W3EZR; Rickey L. Mobley, WB5FDP; Roger Modeen, W7UQU; Robert Modricin, W0LEY; Christopher A. Moore; Stephen F. Moore, W0QFK; William S. Morgan, W7ONS; Dorothy S. Morris, WB8LAI; James F. Morrison, K0CVY; Lloyd C. Morse, WA7YJF; George H. Morton, W3HUR; Harrison V. Mosser, K3ZAP; Del R. Muckenfuhs, WB8EDG; Ernest E. Musgrave, K4ZBL; Robert W. Myers, WA2JZX; Kenneth Napier, WB4IDW; Stanley R. Nelson, WA0KQD; Orval V. Nemitz, Jr., W7JIC; Diego Arturo L. de Ortigosa, XE1EX; Ronald L. Ott, WA6PAD; Guy L. Ottinger, K6CN; Max R. Otto, W0LEF; James E. Palmer, K8HQT; John L. Parson, K5DOI; Charles R. Perilli, W3HDN; Leo J. Perrin, K1CJ; Ronald E. Peters, WB9EXL; Larry R. Peterson, WB9KMW; Van N. Peterson, K4QFK; Terry G. Petrash, WA4BYK; Earl G. Phillips, W9MHX; Rodney E. Phillips, WA3ABC; Jim C. Pickett, K5LAD; David L. Pier, WA0WRN; Armand R. Pilotte, WA7IIM; Steven L. Pinner, WB6PVV; Thomas P. Poole, WA5RRA; Michael Povlich, WB9HGS; Nelson C. Pratt, Jr., K1GLB; James E. Price, WB6WFP; J. Michael Price, WA2EZW; James T. Rafferty, WA9UCE; Michael W. Ramalia; James E. Ray, WB5HIH; Kenneth L. Rehse, WN8SWX; Arthur B. Reis, WA8AWJ; Melvin M. Rensberger, K0FVZ; Eugene F. Reuman, WA8VMD/WB4NJA; Stephen Reynolds, WA1PWS; Richard R. Riegert, K0YIP; Vernard Riportella, WB0GAJ; James D. Rivers, Jr., W5TBO; B.L. Roach, ON8UE; Charles Robbins, WN6GUH; Gordon L. Roberts, W6SLQ; Muriel F. Robinson, Jr., W8QOE; Robert S. Roman, WA2MOI; Arthur R. Ross, W5KR; J.G. Rowland, K2SML; Samuel L. Sachs, WB2DBA; George Salinas, WB5IBA; Carlos E. Santos, HK3AOL; George H. Saum, Jr., W0JPI; Philip A. Schechter, WA3UTO; Theodore E.A. Schmidt, Jr., WA9FXJ; Herman R. Schmitt, WA9TNQ; John J. Schultz, K4KF; Rex M. Schwartz, WN0QWH; Michael Sedore, W3KTM; William T. Seib, WB0FRQ; Xavier F. Servel, W7UKH; Harold D. Sexton, WA0OLT; Philip Shafer, W7BM; Al Shabo, HK3DEU; Randy L. Shaul, WB8SFX; Jarold E. Shields, K8NXN; Clarence Shirai; Hampton W. Shiner, W0RZF; Martin L. Shulman, WA2FBI; Philip B. Shuman, KV4HZ; Donald J. Simon, W6PQS; Ernest A. Sivesind, W0KMP; Paul J. Skinner, W9QXR; Donald J. Smith, W6NKF; Ernest G. Smith, Jr., K4HJT; Larry D. Smith, WA8AGD; Robin L. Smith, KL7HMN; Rodney C. Smith, WB4JGY; Stephen H. Smith, WA8LMP; Patrick A. Sonnier, W5WMU; Clarence J. Spector, W2QOV; Stewart M. Spies, WA6YEQ; Robert W. Stankus, W1GEY; Joseph B. Stevens,

WA4JZX; John A. Storie, W7KPA; John F. Stratfull, 3B8CV/G3JIS; Nadine R. Stueve, K0UHF; Frederick Swanson, K2MIM; Lee Swanson, WA9LEY; William H. Syll, Jr., WASQW; Benjamin H. Taylor, WA4LAW; Thomas V. Perry, W5NOT; Wilmer J. Thaeemert, WA0RCY; Kenneth W. Thomson, WB0FQM; William T. Thompson, W0NYG; Yigal Tropp, WA2BZV; Roger C. Troy, WB8WHS; Roy T. Tucker, K6UZB; Claude S. Turner, Jr., WB4YXN; James D. Van Kirk, W0JN; Gerald Van Loh, WA0JCV; Leslie H. Varnicle, WA3QLW; Harold Vial, WB0LZW; Anthony H. Visco, Jr., WA3ZTE; Henry R. Volker, K2GZB; R. Ash Waigh, VE4UL; George P. Waldren, WB5JKM; Richard J. Wallace, WA3KEW/WA2CWC; Werner R. Werner; Robert K. Whitman, WB8OAD; David C. Williamson; Charles P. Wilson, Jr., K4CAV; Daniel P. Wilt, WB6FLL; Richard D. Winne, WB2MRX; Benjamin D. Wyse, Jr., K4YDE; T. David Yarnes, W5RMC; Fred Yearian, K7GIJ; Roy E. Ziff, WB2BDC.

On motion of Mr. Arnold, after discussion, unanimously VOTED to authorize the General Manager to proceed with the architectural work necessary to develop detailed plans and a firm cost estimate for construction of an addition to the existing Headquarters building, and to receive bids for such construction.

On motion of Mr. Thurston, unanimously VOTED to authorize the General Manager to expend \$34,000 to construct additional parking facilities at the Headquarters site.

On motion of Mr. Clark, unanimously VOTED to support the admission of the Radio Society of Swaziland to membership in the International Amateur Radio Union.

On motion of Mr. Thurston, unanimously VOTED to authorize Assistant Secretary Harold M. Steinman to sign checks on League depositories on behalf of the General Manager.

On motion of Mr. Arnold, unanimously VOTED to revise rule 4 of the Communications Department Rules and Regulations to read as follows: Any candidate for the office of Section Communications Manager must have been both a member of the League for a continuous term of at least two years and a licensed amateur of General class (Canadian Advanced Amateur certificate) or higher for at least two years immediately preceding receipt of his petition of nomination.

On motion of Mr. Albright, unanimously VOTED to revise rule 5 of the Communications Department Rules and Regulations to read as follows: Each section communications manager shall be elected for a two-year term of office in accordance with the following procedure:

a) On any date not later than noon of the tenth day of March, June, September and December of each year, nominating petitions signed by five or more full members of specified sections and naming a full member of each such section as candidate for section communications manager may be filed with the communications manager. The communications manager shall solicit such petitions in two appropriate issues of QST to insure completion of the election on or before June 30, September 30, December 31 and March 31 respectively. The solicitation shall show the name, call and term ending date of the incumbent in each section solicited, and give full instructions for filing.

b) If there be but one eligible nominee on the appropriate listed closing date for receipt of petitions, the communications manager shall declare him elected without balloting. If there be more than one eligible nominee, then

on or before April 1, July 1, October 1 or January 1 respectively the communications manager shall send by mail to every person who on the tenth of March, June, September or December respectively of that year was a full member of the League in the section in which the election is being held, a ballot listing the candidates, soliciting a vote for one name. The ballot shall be accompanied by information on the amateur radio background of each candidate.

c) Ballots to be counted shall reach the communications manager not later than noon of the 20th of May, August, November and February respectively and shall be counted under the supervision of the communications manager. The candidate receiving the greatest number of votes in each case shall be declared elected. He shall be notified by mail and results of election for section communications manager terms beginning July 1, October 1, January 1 or April 1 respectively will appear in the first available issue of QST.

d) If there be no eligible nominee, the procedure in 5a, b and c will be repeated in three months, the term of office of any section communications manager elected under this repeat procedure being shortened by three months thereby. If there again be no eligible nominee, the person holding office shall continue in office until the next regular election established by these rules for his section.

e) Vacancies in the office of section communications manager occurring between elections shall be filled by appointment by the communications manager.

The Committee was in recess from 9:52 to 10:13 A.M.

On motion of Mr. Baldwin, unanimously VOTED to purchase 200 prints of the film, *Moving Up to Amateur Radio*, produced by Dave Bell, W6HVN.

The Committee was in recess from 12:20 to 1:40 P.M.

On motion of Mr. Griggs, unanimously VOTED to direct the General Manager to implement a program for increased Headquarters involvement in the amateur satellite program.

On motion of Mr. Thurston, unanimously VOTED to petition the Federal Communications Commission for reconsideration of that portion of the First Report and Order in Docket 20282 related to an increase in the power permitted to Novice licensees and a decrease in the power permitted to other licensees operating in the "Novice bands."

During the course of the meeting the Committee discussed, without formal action, a possible filing requesting amateur privileges in the 160-200 kHz band; Regional Emergency Coordinators in California; the implications of the loss of non-profit mailing privileges by the National Rifle Association; increasing municipal restrictions on amateur radio operating; the CB threat to 220 MHz; the experimental program for Novice licensing; the FCC Personal Use Radio Advisory Committee; the AKRL filings in Dockets 20654 (ignition interference) and 20120 (changes in Class D CB); insurance coverage for amateur mobile equipment; the dates of future Executive Committee meetings, and radio-frequency interference problems.

There being no further business, the Committee adjourned at 3:30 P.M.

Respectfully submitted,
RICHARD L. BALDWIN, W1RU
Secretary

Strays



□ Taken from auto in Harrisburg, PA. Regency HR-2A, Serial No. 04-07989. K3NVO 495-38-8556 engraved on chassis. Ronald Kaullen, K3NVO, 6326 Blue Flag Ave., Harrisburg, PA 17112.

□ Stolen from auto on evening of June 6-7 in Kettering, OH. Regency HR 440, Serial No. 181-A00038 and Regency scanner Model ACT-R10H/L/U, Serial No. 204-C39203. George E. Hoadley, W8MTJ/portable 8.

□ ICOM IC230, Serial No. 2835; TPL model 1002, Serial No. 0426; Regency model 10HLU, Serial No. 185A88279. Stolen from Mission Valley area of San Diego, CA, on May 17. Advise San Diego Police Dept., case no. 76-33350 or Zane Sprague, K6WK.

I would like to get in touch with . . .

□ Others in an Explorer Post who would like to start a net. Also need a station from Hawaii for WAS. — WN3AAL

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1FPS, Raymond N. Flood, Brattleboro, VT
W1KM, Thomas H. Ford, Pinehurst, MA
W1OEO, Maurice G. St. Pierre, N. Attleboro, MA
W1WU, Frank E. England, Lakeville, MA
W2AWG, John Leonard, Elizabeth, NJ
W2BPT, Edward C. Ayres, Jr., Pennsauken, NJ
WB2CCQ, Terry L. Fleischmann, Hornell, NY
K2EHI, Louis Kehoe, Pawling, NY
W2EPQ, James V. Cosman, Dover, NJ
W2POB, Leonard Chamberlain, Branchville, NJ
K2UQG, Louis I. Danielski, Brooklyn, NY
W3ATI, Norman D. Steedle, Allentown, PA
WA3CSG, D. Lloyd Reichard, Waynesboro, PA
WA3DME, William S. Shemeld, Newcomb, MD
W3LSH, Otis Brady, Smithfield, PA
W3MED, Kenneth L. Milks, Erie, PA
W4AAM, Edward J. Jones, Port Richey, FL
W4ALA, William H. Kilgore, Ensley, AL
W4CCU, Joseph L. Mullinax, Greenville, SC
W4CTZ, Loris N. Whitfield, Louisville, KY
K4DVT, Burton C. Weidenhamer, St. Petersburg, FL
W4EEJ, Charles B. Mauldin, Greenville, SC
W4GYV, Henry N. Fones, Memphis, TN
K4HPH, George E. Zimmerly, Largo, FL
W5BAB, Chauncey F. Darling, Siloam Springs, AR
K5BLW, Dr. Cyril F. Sherman, Temple, TX
K5DGL, Daniel J. Wiggs, Ripley, MS
W5EVR, Gaines C. Batson, New Orleans, LA
Ex-W5FDQ/Ex-W6GSS, L. M. Swift, Palo Alto, CA
W5RVQ, Robert E. Seamont, Maitland, FL
W6CDZ, Chester E. Lipman, Los Angeles, CA
K6DIO, Ernest L. Griffin, Loma Linda, CA
WA6FYM, Richard B. Tiffin, Whittier, CA
K6IZI, Richard C. Rhoades, Jr., Chula Vista, CA
K6JRY, Arthur L. Rice, Yucaipa, CA
W6MGG, Harold E. Huntington, Ontario, CA
Ex-W6NTA, Verl E. Buck, Sunnyvale, CA
W6OB, John H. Flinspach, Elsinore, CA
W6SSG, James M. Howden, Redlands, CA
W6UCD, Francis C. Lyons, San Diego, CA
W6UGO, Elza A. Potts, Castro Valley, CA
W6WZZ, Murray E. Sanford, San Diego, CA
W7TEQ, George A. Walker, Tucson, AZ
K7VGP, William W. McDonald, Phoenix, AZ
K7ZYE, Albert R. Kyle, Veneta, OR
WA8BTS, Adrian C. Luginbill, Columbus Grove, OH
WA8CWY, George L. Buck, New Richmond, OH
WA8GJM, James R. Hitchcock, Detroit, MI
K8JGS, Earl A. Tiefenthal, Kalamazoo, MI
W8KWL, Paul N. Brown, Morgantown, WV
W8MIS, Guy Haymond, Grafton, WV
W8NCV, Carl J. Dettmar, Cincinnati, OH
WA8SIO, James Squillo, Detroit, MI
W8SNT, Frank L. Grover, Huntington, WV
W8VPE, Harold P. Mort, Hopkins, MI
K8YCV, Robert E. Dann, Owosso, MI
W8YPP, Everett F. Long, Cheshire, OH
WB9CIW, Robert F. Phinney, Marion, IN
W9EAE, Cecil E. Tucker, Sullivan, IN
K9FVC, Leslie A. Galloway, Lafayette, IN
W9NEA, John Gracie, Ellenton, FL
W9RFU, John H. Stewart, Belleville, IL
W9RGY, Thomas Connor, Lafayette, IN
W9VEY, Daniel A. Hoover, Hillsboro, IL
W9CAU, Willard T. Martin, Warsaw, MO
W9GKY, Charles E. Holstrom, Fairbury, NE
K9HCX, Harold D. Spriggs, Creston, IA
W9IRJ, Jean Fingarson, Little Falls, MN
W9JBI, Floyd C. Whipple, Lafayette, CO
WN9OAP, Lester M. Cooley, Denver, CO
K9TBO, Norwood W. Christensen, Cherokee, IA
VE3BRT, W. T. Cox, Bowmanville, ON
VE3DMO, Harold F. Olsen, Brampton, ON
VE3GTU, John Bellersen, Thornhill, ON
VE6FK, Don A. Sutherland, Calgary, AB
VE7NE, R. B. Watson, Coquitlam, BC

(Note: When reporting the passing of an amateur, please include his name with call to ARRL, Newington, CT 06111.)

Strays

A GREAT IDEA!

□ Want to do something worthwhile for your community and do some good public-relations work for your club at the same time? How about donating ARRL books to your local library like the Sterling Rockfalls (IL) Amateur Radio Society recently did? The books help patrons of the library and a little sticker or rubber stamp imprint inside the front cover indicating that the book

was donated by your club will keep new blood flowing into your organization. — K9EEH

□ After a recent unsuccessful attempt to enlist the aid of the Maryland State Police in tracking down a Massachusetts ham passing through WA3SKO has a suggestion: The state police will cooperate in such cases if the initiating agency (in this case the Massachusetts Red Cross) first notifies their local state police. The message will then travel by teletype to the appropriate jurisdictions, where it will be treated as an official request. The Maryland police told WA3SKO they were wary of practical jokesters.

50 Years Ago

August, 1926

□ The Ross Sea Whaling Expedition tried 2,000 meters for communication on earlier Antarctic trips, with little result, but a switch to short-waves and ham contacts made the latest one a resounding success.

□ Although now with Burgess (batteries), Schnell hasn't forgotten ham radio or QST — he presents a novel shielded wavemeter design. And an associate, W. A. Hoffman, shows us an unusual gadget now commonly known as the grid-dip meter.

□ B eliminators get rid of some of the receiver's wet-cell batteries, but the filament problem is only recently being tackled; one solution is a high-wattage resistor feeding the filaments from the high-voltage supply (with adequate

rectifier capacity, of course!)

□ The beautiful glow of a mercury arc rectifier to power your transmitter is tricky to keep alive, but 3AB has a number of hints which achieved success at various Washington, D.C., stations — including W3CDQ.

□ Crystal control rigs are expensive and restricted as to power, so Technical Editor Kruse has collected a number of ideas on improving stability in "regular" Hartley, Meissner and Armstrong circuits.

□ Paul Mueller explains why we have so much trouble with tracking in a single-dial multiple-circuit receiver — "ignored factors" such as distributed capacity of different coils, tube input capacitance, etc. Design of variable condenser rotor plates can help solve the problem.

□ Rufus Turner "keys" his antenna across a tuned circuit and despite having zero power, is heard on his neighbor's receiver.

25 Years Ago

August, 1951

□ The Good brothers (W3NPS/LQE) bring us up to date on radio control developments; "proportional" control is still in infancy, and contest winners to-date mostly use a full deflection escapement.

□ Staffer Richard Baldwin, W1IKE, has designed a simple receiver to get the Novice started — a 6SJ7 oscillating detector plus a two-stage 6SN7 audio amplifier.

□ Mobile activity is covered with several features: W1JEL has a 10-meter job with remotely tuned VFO. W1BDV uses a slider to tune his center-loaded whip for 75 meters. W5AJG finds lots of 30-40 Mc. commercial gear in surplus, ideal for conversion to 28 and 50 Mc.

And W3CDL warns us of limitations on power capability of standard car equipment (battery and generator), outlining good procedures to follow.

□ The Army is going on extensive summer maneuvers, and with complete amateur cooperation (through ARRL) is going to make temporary use of a chunk of our 80-meter band.

□ W1JEQ presents a 30-watt band-switching exciter covering 3.5 to 50 Mc., and at modest cost, too.

□ Improvement in TV-receiver front ends not only alleviates the interference problem a bit, but also sometimes provides us with some new and more efficient tubes such as the 6BQ7, ideal for 420 Mc. ham use.

□ The Editor remarks that Field Day operation seems to have been a factor in a distinct rise in the general level and efficiency of phone operating procedures. — W1RW

Happenings

Conducted By Perry F. Williams, W1UEJ

Novices, "Experimenters" for Canada?

First it was one voice, then four, then sixteen, then sixty-four . . . "Why shouldn't there be a Novice license here in Canada?" "Why can't we have a codeless license, at least for vhf/uhf, like the Aussies and the English?"

All right - why not? Or why? The Department of Communications has now asked the question publicly in a proposal dated June 2 for a new "Experimenter Amateur Radio Operator's Certificate" and a new "Novice Amateur Radio Operator's Certificate."

The first would be "of particular concern to persons interested in experimentation," the department said. "This certificate would require an in-depth knowledge of radio and electronic theory, but no code proficiency. Although experimenters would, no doubt, be active on those bands that are not now fully exploited, it is proposed to grant phone privileges in the hf bands after gaining experience on the vhf bands to make the proposal more attractive."

The department recognizes that there would be a problem with worldwide regulations in respect to hf privileges: "Although Article 41, Number 1563, of the International Telecommunication Union Radio Regulations states, in part, that any person operating the apparatus of an amateur station shall have proved that he is able to send correctly by hand, and to receive correctly by ear, texts in Morse code signals; insofar as the above noted proposal for an 'Experimenter Amateur Radio

Operator's Certificate' is concerned, action will be taken to add a footnote to Article 41 on behalf of Canada."

On the other hand, for the communication-oriented person, the department proposes a new Novice certificate to permit aspiring amateurs to gain "on-the-air" experience thus making it easier for them to qualify for a higher class of certificate. The Morse code requirement would be five words per minute and phone operation would not be permitted. The certificate would be valid for a maximum of two years and would be non-renewable. The use of equipment capable of ninety-watts output power would be permitted in portions of the 80, 40, 15 and 10 meter bands:

3.675-3.725 MHz

7.100-7.150 MHz

21.100-21.150 MHz

28.150-28.200 MHz

Maximum *de input* power to the anode or collector circuit of the transmitter amplifier stage supplying rf energy to the antenna would be 100 watts.

Though the text of the government paper mentions, for the proposed Experimenter, "phone privileges in the hf bands," after experience has been gained above 50 MHz, Schedule A attached to it shows A1 and F1 modes and frequencies as well. A department spokesman said that an Experimenter might well want to conduct experiments using A1 emissions though he would not be expected

to communicate in the mode, at least not at first.

The DOC has allowed until October 31, 1976, for comments. However, League members should convey their views to Bill Loucks, VE3AR, 155 Brentwood Road North, Toronto, Ontario M8X 2C8, by September 30 so that the comments of the Canadian Division can be prepared. (Also, see the separate item about Bill in this column.)

Loucks New Director

Ron Hesler, VE1SH, whose term as director or from the Canadian Division began January 1, has resigned from the post for personal reasons, effective July 18, 1976. For this short term, Ron has made a lasting impression of tireless energy. We'll miss him from the "official family."

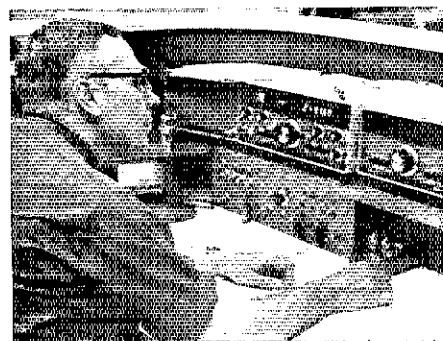
William W. Loucks, VE3AR, who has been vice director since the Canadian election was completed on January 8, automatically becomes director for the remainder of the term ending at noon, January 1, 1978. Bill is manager of the IBM Computer Centre for Ontario Hydro. VE3AR is immediate past president and a director of Radio Society of Toronto, Ontario delegate to the Canadian Amateur Radio Federation, and has held "all the chairs" at the West Side Radio Club of Toronto, ending up also as an honorary member. Welcome aboard, Bill, and as noted in the previous item, we're putting you right to work as director!

BEHIND THE DIAMOND

"Calling all radio amateurs. This is W1AW, in Newington, Connecticut." Perhaps it's not the most original way of opening this episode of "Behind the Diamond," but it's certainly the most fitting. That voice you hear at the start of each of W1AW's phone bulletins is that of none other than Mr. W1AW himself, Charles R. Bender, W1WPR, better known to all as Chuck.

Chuck, as his call indicates, is a Western Pennsylvania Refugee, hailing from Pittsburgh, PA. There, as W3ODU, he was very

* Assistant Secretary, ARRL



active in Western PA net operations. Chuck is a graduate of Grove City College. He enlisted in the army during World War II and saw service in the artillery corps in Germany. He came to the ARRL in September of 1952 to work at W1AW. Shortly after the retirement of Murray Powell, W1QIS, in 1972, Chuck became assistant communications manager and the new "Chief Op" of W1AW. He now leads a crew of two "Junior Ops" who help keep the Maxim memorial station operating and open to visitors 75 hours per week. This is no small responsibility: How many hams do you know who got started copying code from W1AW? Where do you go to get the latest Oscar orbital parameters? Where do you hear the latest amateur news the same day it happens? And last, but certainly not least, what visit to ARRL hq. would be complete without operating W1AW?

Chuck's outside interests include reading, stamp collecting, chess, baseball and football (he spends his weekends watching - I don't think he's played since high school!). He loves bowling, and bowls in a regular Tuesday night league along with some others on the Hq. staff. His average score is 155.

Last month we told of one League romance; now we bring you another. Chuck was what you might call a confirmed bachelor. At least, he was until 1968. At that time he married Arline Lyhne, who was, and still is, a

communications assistant in the administrative branch of the Communications Department. She's the gal who handles SCM elections, official appointments, etc. Not only did Chuck lose his bachelorhood, but since Arline had two children by a previous marriage, he became an instant parent. Quite a shock, I suppose. Arline says he's a fine father to Susan - 22, and Steve - 28.

Another story that bears retelling is that Chuck and Arline scheduled their wedding for Field Day weekend, 1968! Would you believe that there was at least one on the Hq. staff who could not attend the wedding because of Field Day activities? We won't tell you who because it's really no joking matter.

The conclusion of this romantic tale is that Arline is now WN1VMC, and is working hard toward her General ticket. - K1FHN

ARRL ELECTIONS

It is time for ARRL Full Members in the Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern and West Gulf Divisions to begin picking a director and a vice director in each division for the two-year term which will begin January 1, 1977. From now until September 10, at noon, nominations will be accepted at League Headquarters bearing the

signatures of ten (or preferably more) Full Members of a division naming a Full Member of the division as a candidate for director or vice director. The nominee must be the holder of at least a General class amateur license, or a Canadian Advanced Amateur Certificate, must be at least 21 years of age, and must have been licensed and a Full Member of the League for a continuous term of at least four years at the time of the election. No person is eligible who is commercially engaged in the manufacture, sale or rental of radio apparatus capable of being used in radio communication. Neither is a person eligible who is commercially or governmentally engaged in frequency-allocation planning or implementation. Finally, no one can run who is commercially engaged in the publication of radio literature intended in whole or in part for consumption by radio amateurs. The idea behind these rules is to insure lasting interest in amateur radio and the League, legal capacity to make decisions for ARRL, and freedom from conflicts of interest.

Balloting Later

Wherever there is more than one candidate for either office, ballots will be sent to all Full Members of the League in that division who were in good standing on September 10. The ballots will be mailed not later than October 1 and, to be valid, must be returned to Headquarters by noon, November 20. A group of nominators can name a candidate for director, for vice director, or both, but there are no "slates" as such — each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he wishes.

Since all the powers of the director are transferred to the vice director in the event of the director's death, resignation, removal outside the division, or inability to serve, careful selection of candidates for vice director is just as important as for director.

Nominating Form

The following form for nomination is suggested; it may be copied onto any paper, or a blank following this form can be obtained from Headquarters on request:



Affiliations between local radio clubs and the League help to keep both of them strong. Here Ken Ransom, W4UKB, president of St. Clair (Alabama) Amateur Radio Club receives the ARRL charter from SCM Jim Brashear, WB4EKJ, left. Shirley Ransom, WN4UJK, is at right. (St. Clair Observer photo)

*Executive Committee,
The American Radio Relay League,
Newington, CT 06111.*

We, the undersigned Full Members of the ARRL residing in the . . . Division, hereby nominate . . . of . . . as a candidate for director; and we also nominate . . . of . . . as a candidate for vice director from this division for the 1977-1978 term.

(Signature . . . Call . . . City . . . Zip . . . Date)

Nominees or, indeed, any member, may obtain a copy of the Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials.

"Absentee Ballots"

All ARRL members who are licensed by FCC or DOC but are temporarily residing outside the U.S. or Canada are now eligible for Full Membership. These members overseas who arrange to be listed as Full Members in an appropriate division prior to September 10 will be able to vote this year where elections are being held.

Even within the U.S., Full Members temporarily residing outside the ARRL division they consider home may now notify the secretary prior to September 10, giving the current QST address and the reason why another division is considered home (as for instance, holding an amateur call appropriate to the division). So if your home division is the Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern or West Gulf Division, but your QST goes elsewhere, please let the secretary know, as soon as possible but no later than September 10, so you'll receive a ballot for your home division.

The Incumbents

Presently these persons hold the office of director and vice director in the divisions conducting elections this year: *Central* — Philip E. Haller, W9HPG, and Edmond A. Metzger, W9PRN; *Hudson* — Stan Zak, K2SJO, and George A. Diehl, W2IHA; *New England* — John C. Sullivan, W1HHR, and John F. Lindholm, W1DGL; *Northwestern* — Robert B. Thurston, W7PGY, and Dale T. Justice, K7WWR; *Roanoke* — L. Phil Wicker, W4ACY, and Donald B. Morris, W8JM; *Rocky Mountain* — Charles M. Cotterell, W0SIN, and Maurice O. Carpenter, K0HRZ; *Southwestern* — John R. Griggs, W6KW, and Jay A. Holladay, W6EJJ; *West Gulf* — Roy L. Albright, W5EYB, and Jack D. Gant, W5GM.

In summary: Petitions need ten or more signatures of Full Members and are due at Headquarters by noon, September 10. If there is only one candidate for an office, he'll be declared elected by the Executive Committee; otherwise, ballots will be mailed not later than October 1 to Full Members of record September 10. To be valid, ballots must reach Headquarters before noon, November 20. The new term will begin at noon, January 1, 1977.

For the Board of Directors:
June 1, 1976

*R. L. Baldwin, W1RU
Secretary*

DOCKET DEADLINE: 20777

An extension in time for filing, requested by the League was granted in the bandwidth

docket, 20777, and it has "snuck up" on us — August 4. Replies to the comments of others may be filed until September 3.

For more details, see this column in the June and July issues of QST or send a stamped self-addressed envelope to "20777," ARRL, Newington, CT 06111.

NEW EXAMINATION POINTS

The Federal Communications Commission has released a new edition of its information bulletin, FO-28, covering July 1, 1976, through June 30, 1977.

Some cities have been added to the schedule: FCC examinations will be given in Burlington, Vermont, in October and April; in Casper, Wyoming, during November and May; in Wilkes Barre, Pennsylvania, replacing Williamsport, in September and March; and in Rock Island, Illinois, during August, November, February and May, replacing Davenport, Iowa. Guam will have examinations during July, September, November, January, March and May.

In other respects, traditional examination patterns continue as on previous lists. A limited number of copies of the bulletin are available from Hq.; an s.a.s.e. will help speed a reply.

RESTRUCTURING, DOCKET 20282

A separate story in this issue gives details on the First Report and Order, Docket 20282, FCC's proposal of December 1974 for a new look in amateur radio. Most of the points in the first report, however, are relatively non-controversial.

KENTUCKY AMATEURS WIN, ON LICENSE PLATES

The constitutionality of the law which provided call-letter license plates to amateurs (and incidentally, to members of the general assembly of the state) in Kentucky was called to question before the Kentucky Supreme Court. At issue was a portion of the constitution of Kentucky which read:

"All men, when they form a social compact, are equal; and no grant of exclusive, separate public emoluments or privileges shall be made to any man or set of men, except in consideration of public services . . ."

The court . . . is of the opinion that the statutes do not, in fact, grant to amateur radio operators or members of the general assembly emoluments or privileges. Certainly there is no pecuniary gain bestowed on the licensee, nor is the state any the poorer. It is unimaginable that the license plate could enhance the economic prestige of the licensee. The licensee pays not only the usual registration fee but also \$10 which presumably covers any additional expense to the state . . ."

Congratulations to Ted Huddle, W4CID, section communications manager for Kentucky and an official party to the case, and to all the amateurs who took part in the battle.

Coming Conventions

September 3-5
Pacific Division, San Jose, CA
September 10-12
New England Division, Boston, MA
October 1-3
Dakota Division, St. Paul, MN
October 2-3
Tennessee State, Memphis, TN
October 8-10
Midwest Division, Omaha, NE
November 6-7
South Florida Section, Clearwater, FL
November 13-14
Hudson Division, McAfee, NJ

PACIFIC DIVISION CONVENTION

September 4-6, 1976, San Jose, California

The Associated Radio Clubs of San Jose are hosting the 1976 ARRL Pacific Division Convention at the San Jose Hyatt House Mediterranean Center over the Labor Day weekend. The convention is part of the celebration of America's Bicentennial and the 200th anniversary of California's oldest city, San Jose.

Activities will include an outstanding technical program with something of interest for the old-timer, newcomer, experimenter, DXer or contest. There will be informative exhibits and forums; a great display of the latest equipment, and some of the oldest; plenty of swap tables full of goodies, and a delightful and entertaining ladies program. All this, plus fun for all at the new \$50 million Marriott "Great America" theme park.

Technical programs and forums begin on Saturday morning at 9:00 A.M. and will cover many facets of amateur radio. Concurrent with the technical program, there will be a continuous showing of films and slides of many interesting DXpeditions through the courtesy of the Northern California DX Foundation. Exhibit spaces will be open and swap tables will be in full operation.

The ladies program gets off to a big start with a coffee klatch in the ladies' hospitality suite followed by a tour through the world

famous Rosicrucian's Egyptian Gardens and Museum, a wine-tasting visit to the Paul Masson champagne cellars, and a visit to the "Factory" for more fun and a delicious luncheon. For the family, there's fun at the Hyatt House patio pool or trips to the nearby Great America park.

Saturday night attend one of the several group dinners or have an evening on the town. Sunday morning will begin with several group breakfasts and more technical programs, including an in-depth DX seminar hosted by the Northern California DX Club. In the afternoon attend the FCC and ARRL Forums. Sunday evening relax at the no-host cocktail party and then enjoy a fine dinner at the gala banquet, complete with all those surprises that are a tradition at a San Jose ham convention. Monday is a holiday - stay and enjoy a leisurely day pool side or visit the Great America park.

Arrangements have been made with the Hyatt House to provide adequate parking space adjacent to the Mediterranean Center for campers or RVs. Sorry, no hookups available. If you fly in to San Jose Municipal Airport, there's free Hyatt House transportation available for hotel guests. We'll be monitoring 146.52 and 146.94 simplex or check in through the WR6ADE repeater on 146.16/146.76.

Advance registration through August 15 is \$15.00 single or \$26.00 double, including the banquet. If you wish to attend only the technical sessions, the cost is \$5.00. After August 15 full registration is \$17.00 single and \$28.00 double. Technical sessions only, remains \$5.00. Send registrations to Associated Radio Clubs of San Jose, P. O. Box 6, San Jose, California 95103.

Hotel rates at the San Jose Hyatt House, 1740 N. First St., San Jose, California are \$19.00 single and \$24.00 double. Make hotel reservations directly with the San Jose Hyatt House. Be sure to specify ARRL Pacific Division Convention to get those reduced rates.

NEW ENGLAND DIVISION CONVENTION

September 10-12, 1976, Boston, Massachusetts

This year's big New England ARRL Convention has moved back to Boston and will be held September 10, 11 and 12 at the Statler Hilton Hotel. Featuring a bicentennial theme the convention will cater to the whole ham family, with many committee wives in authentic period costumes helping direct the

dozens of special bicentennial events featured in Boston for 1976. The city is extending the welcome mat with special features and exhibits that can only be seen during 1976.

Friday's activities are informal and will enable the ham to relax and "do his or her own thing." Saturday and Sunday are crammed with activities from dawn to dusk. FCC exams for General, Advanced and Extra will be given Saturday *by appointment only*. Application must be made three weeks in advance on FCC Form 610 (available from the Boston office of FCC) accompanied by a check made payable to FCC for \$4. Both check and Form 610 must be sent to exam chairman Michael Goldberg, K1LJN, 40 Isabella Street, Melrose, Massachusetts 02176, *not to the FCC*. Applicants will be notified by mail of their exam time.

The New England Convention this year will have an emphasis on computer technology and how it affects ham radio. There will be a formal computer seminar on Friday and Saturday, a running computer display by DEC, and forums on computer technology. The ARRL and the FCC, as well as leading manufacturers and distributors of ham gear will have booths. A banquet, show and dinner dance will feature the presentation of the Ham of the Year on Saturday night.

Special YL activities include a bicentennial fashion show featuring period costumes, hospitality suite, and a bus tour of historic Boston (OMs welcome too!). A duplicate bridge tournament will also be a new feature this year.

The extensive speakers' program will feature top ARRL personalities, plus antennae experts such as Walt Maxwell, W2DU of RCA, Jerry Sevic, W2FMI of Bell Labs, inventor of the strobe light Harold Edgerton of MIT (currently seeking the Loch Ness Monster in Europe), SSTV and computer designer Robert Suding, W0LMD, plus special guest speaker on 2-meter fm, DX, SSTV, MARS, an FCC Forum, and of course the ARRL Forum. There will be net meetings, talks on solid state, and a special program by Fr. Daniel Linehan, W1HWK, director of the Westford College Observatory.

A most popular event is the Flea Market - this year it will be indoors so weather will not dampen the spirits or the equipment!

Early birds can register for \$3 (required of all OMs 12 and over), at the door \$4. Banquet tickets including show and dancing are \$12. Send check made payable to F.E.M.A.R.A. and s.a.s.e. to ticket chairman George Stevart, W1ZQQ, 17 Barnes Avenue, East Boston, Massachusetts 02128 before September 1st.

Hamfest Calendar

Alabama: The 1976 North Alabama Hamfest is August 14-15 at the Mall shopping center in Huntsville. The Saturday night dutch dinner with entertainment provided by Margaret Ann and Dann Whitsett, W4BRE. Reservations requested. Sunday registration

starts at 9 A.M. A ladies' and men's flea market. Contest for the men and bingo for the ladies. Also, a ladies' handcraft contest. QCWA and MARS meetings on Sunday. Write: North Alabama Hamfest Assoc., P.O. Box 423, Huntsville, AL 35804.

British Columbia: The British Columbia DX Club's hosting the 1976 Pacific Northwest DX Convention August 7 and 8 at the Hotel Georgia in Vancouver. Registration \$20 includes the DX Banquet and DX breakfast on Sunday morning. An excellent DX oriented program is assured. Advance registration and further info write VE7BVH, 7110 - 232 St., Langley, B.C.

Connecticut: The Eastern Connecticut Amateur Radio Assoc. Flea Market and

Auction is September 19, 10 A.M. to 5 P.M. at the Rocking "D" Camp Ground, Snake Meadow Rd., S. Killingly. Dealers invited. Call Bob 203-774-1465 days; Mike 203-774-8255 nights.

Delaware: The Delmarva Hamfest August 15 at 8 A.M. at Wilmington College New Castle (jct. U.S. Rtes. 13, 40 & Del 14 - 3 miles south of Wilmington). Easy to get to from I-95. Talk-in on 13/73, 94/9, 147.75/15 and 3905. Ladies program, reasonable food and beverages available. Tickets \$1.75 in advance, \$2.50 at gate. Tailgating \$2.50. Inside tables \$5. Write John Low, K3YHR, 11 Scottfield Dr., Newark, DE 19713 with s.a.s.e.

Hawaii: SAROC second Hawaiian conven-

tion, August 28. Info from Len Norman, Box 945, Boulder City, NV 89005.

Illinois: The Fox River Radio League (W9CEQ) Hamfest is August 22 at Phillips Park, east edge of Aurora, U.S. Rt. 30. Talk-in on 146.94. All day family fun, picnic, zoo, land, flowers. Same old price \$1 advanced with s.a.s.e. to F.R.R.L., P.O. Box 443, Aurora, IL 60507.

Illinois: Bel-Rock Hamfest is Sunday, August 29 starting at 9 A.M. at the Boone County Fairgrounds, north of Belvidere on Rt. 76. Talk-in frequency 146.94. Refreshments available. Camping permitted Saturday night. Free coffee and donuts 9:30-10 A.M. Tickets \$2 at door, advance tickets \$1.50, P.O. Box 1744, Rockford, IL 61110.

Indiana: The combined La Porte County Amateur Radio Clubs' fall hamfest is Sunday, August 29, at the La Porte County Fairgrounds in La Porte beginning at 7 A.M. Chicago time. Overnight camping available. Indoors in case of rain. No table or setup charge. Paved midway, good food and drink. \$2 donation at gate. Write P. O. Box 30, La Porte, IN 46350. Talk-in on 01/61 or .94 simplex.

Kansas*: The Boothill Amateur Radio Club's hamfest is in Dodge City on August 15 at the Hoover Pavilion, Wright Park. Home brew contest, 75 meter mobile hunt. Registration 10:30 A.M. Ladies Welcome.

Louisiana: The Central Louisiana Amateur Radio Club's hamfest/swapfest is Sunday, August 15, at the Harold Miles Park on LA Hwy. 1 North. All day Sunday. Talk-in on 34/94. More info contact Tom Gates, WB5MAH, 318-466-5220.

Michigan: Straits Area Radio Club Swap and Shop, 8 A.M.-4 P.M., August 14 at Emmet County Fairgrounds on U.S. 31, 1/2-mile west of southern jct. of U.S. 31 and U.S. 131, in Petoskey. All amateurs, CBers, SWLs \$1. \$5.00 per table, lunch counter, free parking. Talk-in on 3.920 MHz, 146.52 MHz.

Michigan: The Jewish Community Center of Metropolitan Detroit Amateur Radio Club's Fourth Annual Swap n' Shop will be in August. For more info contact W8DGR at 6600 W. Maple Rd., W. Bloomfield, MI 48033.

Minnesota: The St. Cloud Radio Club Annual Hamfest is August 8, Sunday from 10 A.M. 'til closing, at the Sauk Rapids Municipal Park. Free parking and overnight parking. Hot dogs and pop available. Swapfest and ham gear sale. Talk-in on 34/94 and 3925. Write: WA0OTO, St. Cloud Radio Club, P. O. Box 752, St. Cloud, MN 56301.

Missouri: The St. Charles Amateur Radio Club's first hamfest is August 22 at Diermann Lake. (Located about 15 miles to the south-

west of St. Charles on State Hwy. K, between I-70 and US 40/61 all about 20 miles west of metropolitan St. Louis area.) Admission charge \$1 per carload; large flea market free; good food reasonable prices; bingo for XYLs. Talk-in 146.52. Adjacent fishing lakes. Write: SCARC c/o 3032 Mockingbird Dr., St. Charles, MO 63301.

Missouri: The Southwest Missouri Amateur Radio Club's Annual Hamfest, swap meet and family picnic is on August 29 at Lake Springfield Park. For info write: James A. Crooke, 1601 South Kimbrough Ave., Springfield, MO 65807.

Nevada: The Nevada Amateur Radio Assoc.'s "Sierra Nevada Hamfest" is August 28 at the California Bldg., Idlewild Park, Reno. Pre-registration \$10, until August 21. Write P. O. Box 2534, Reno, NV 89505.

New Jersey: The Knight Raiders VHF Club's auction and flea market is Saturday, August 14 at St. Joseph's Church of East Rutherford. Free admission. Free parking; refreshments available. Talk-in 146.52. Doors open 10 A.M. Flea market tables: \$6 for a full table, \$3.50 half table. Reserve your tables in advance. Write: The Knight Raiders VHF Club, K2DEL, P. O. Box 1054, Passaic, NJ 07055.

New Jersey: In Atlantic City, the nation's first trade show dealing exclusively with personal computers is August 28-29. "Personal Computing '76" is sponsored by the Southern Counties Amateur Radio Assoc.; much of the show deals with amateur radio applications of these devices, including AMSAT, RTTY, cw automated, station control and automatic logging. All top manufacturers of personal computing equipment represented at the show in the air-conditioned Shelburne Hotel/Motel on the resort city's famed boardwalk. Also, a series of seminars is scheduled to deal with practical applications for the amateur and hobbyist. Write: David Jones, WA2AML, 503 West New Jersey Ave., Somers Point, NJ 08244. Tel: 609-927-6950.

North Carolina: The Shelby NC Hamfest sponsored by Shelby Radio Club is celebrating their 20th Anniversary of this hamfest September 4, 5. Camping facilities with hook-up. Barbecue and chicken Saturday night dance and supper. Write: Bill G. Bridges, K4WHQ, 904 E. Main St., Shelby, NC. Tel: 704-482-1239.

Ohio*: The Warren Amateur Radio Assn.'s hamfest is in Warren in the Trumbull Co. Expo Center on August 22.

Oklahoma*: The Central Oklahoma Radio Clubs' Hamfest is in Oklahoma City at the Southgate Inn on August 7 and 8. Pre-registration \$3; \$4 at gate. This "Ham Holiday" and State ARRL Convention features

the largest flea market in the Southwest, special programs, technical seminars, equipment displays and unique activities for the ladies. Write: Oklahoma Ham Holiday, P. O. Box 20567, Oklahoma City, OK 73120.

Pennsylvania: The Mt. Airy VHF Radio Club (The Pack Rats) annual family picnic is in the Flourtown area of the Fort Washington State Park on Sunday, August 8 (rain date 15 August). Talk-in via W3CCX/3 on 52.525, 146.52 and 222.98/224.58 MHz.

Pennsylvania: The 21st Annual York County Hamfest is September 5 rain or shine. (10 miles west of York, 1/2-mile west of York Airport turn south off Rte. 30 to Elicker Grove.) Registration begins at 9 A.M. Fee \$3, all adults and amateurs are expected to register; free to XYLs and children. A limited number of flea market tables is available inside by advance registration only. Contact Hamfest Committee: \$5 charge for electric power. Write K3POR, LeRoy Frey, 170 S. Albemarle St., York, PA 17403, or phone 854-1203.

Texas: The Golden Spread Hamfest is at the Quality Inn Motel, Amarillo, on August 14, 15. Technical sessions, swapping, commercial exhibits. Write 4408 Mesa Circle, Amarillo, TX 79109.

Texas*: The 1976 El Paso-ARRL Hamfest is Labor Day weekend September 4-5. Held in the elegant Vista Motor Inn. Features include seminars on Oscar, solar power, ATV, exotic modes, QCWA breakfast, ARRL forum, banquet, flea market, evening at Juarez, Mexico racetrack. Write P. O. Box 24050, El Paso, TX 79914.

Vermont: The Burlington International Hamfest replays at the Old Lantern Campground, Charlotte, the weekend of August 14-15. FCC exams Saturday; hospitality Saturday evening; flea market, hidden-transmitter hunt, awarding of prizes Sunday. Meet ARRL Director John Sullivan, WIHHR and Perry Williams, W1UED of Hq. More info: Skip Sharp, WA1REL, RFD 2, Sand Hill Road, Essex Junction, VT 05452.

Washington*: The Radio Club of Tacoma (W7DK) presents Hamfair-76 Saturday and Sunday, August 21, 22, at the Pierce County Fairgrounds 11 miles south of Puyallup. Technical seminars, women's and children's activities, contests, flea market; Saturday evening dinner and entertainment; Sunday morning loggers breakfast, and free camping with electrical hookups. Write: Bill Morgan, W7GPR, or tel. 531-3821.

West Virginia: The Bluefield WV Hamfest is August 29. Big flea market. Free space. Write: K8ZDY, Otho, 1401 Woodland Ave., Bluefield, WV 24701.

*ARRL Hamfests

QST

Strays

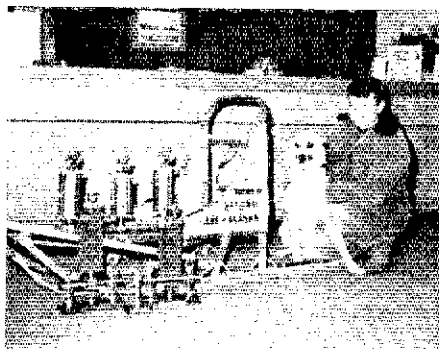
QST Congratulates . . .

After a 30-year delay, the Republic of China has awarded Capt. Carl L. Smith, W0BWJ, the China War Memorial Medal for service in the China-Burma-India Theater during WWII. The order for the medal was lost at the end of the war and only recently found.

STOLEN EQUIPMENT

Stolen from auto in Orlando, FL on June 1. Drake TR-22C, Serial No. 120960. Contact Orange County Sheriff's Dept, case no. 76J040069 or James W. Sullivan, K4TSC, Orlando, FL.

Taken from car parked at Fayerweather Yacht Club in Bridgeport, CT on May 14. Sonar Model No. 3601, Serial No. 1405. Larry Soughan, WA1RUC, 119 Catherine Terrace, Fairfield, CT 06430; tel. no. 203-255-4308.



The former vice president of the Montana Creek Sled Dog Club, a confirmed musher, is Jay Mead, KL7IEN, of Anchorage, AK. Shown here with his lead dog, Foxy, he hauls dogs with a truck equipped with a two-meter fm rig and carries a hand-held rig while training them in case of unforeseen difficulties. Alaska SCM, Roy Davie, KL7CUK, is also a musher and past president of the Sled Dog Club, which provided some of the trophies at left.



This historic edifice was among the sights taken in by W1AX on a recent vacation trip to Richmond, VA.

Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

FB COPY!

□ "Your Radio Signal - Short May it Wave" (QST, June, 1976) refreshes old-timers' memories and helps would-be Novices get a simple grasp of the basics they must know. I'm sure that more such articles would be welcomed by all hams, both old and new. — *Harvey F. Kerr, W3IXZ, Media, PA*

□ Last night, my husband, WA2WKQ/5, and I read "Odyssey" by Linda Cleveland, WB4CJR, (QST, June, 1976) and laughed till we hurt.

It could have been us except that he used reverse psychology on me. "You're just a dumb ol' girl, girls can't learn electronics." After 10 months as a Novice, with two months off for moving, I can now copy around 20 wpm and, similarly, her statement about "the resonant resistance of a reactor..." sounded reasonable to me.

After many false starts at home study for a General class, I started looking around for other Novices. There were none — not one, in our area. So I conned the OM into starting a Novice class and next fall we will have our General class with at least seven new New Mexico Novices.

Our thanks to Linda for a very entertaining article and my special thanks for the encouragement I needed to dig out the books and keep plugging. — *Lynda Baxter, WN2AZH/5, Belen, NM*

□ I am new to amateur radio and cramming for my first ticket. After joining the ARRL, my first copy of QST had "Home for Sweepstakes???" (QST, May, 1976). It's terrific!

My wife heard me laughing out loud and thought I was coming off my spool. I'm struggling with the code and that makes it all the funnier. I'll be looking forward to more of your articles. — *Fred Pate, Cleveland, OH*

□ I was very pleased to see the new "Washington Mailbox" column and read every word with great interest since I do a lot of phone patching. I would maintain my membership for this information alone. — *Robert M. Kuthe, WB0GGO, Crestwood, MO*

□ The ARRL is one organization where quality and integrity have not deteriorated. Your new feature, "Washington Mailbox," is a great idea. This service can be of help to many hams. — *Don Fetzer, W8KEV, Toledo, OH*

□ "Washington Mailbox" is an excellent addition to QST. — *Keith Collins, K1BTD, Central Village, CT*

PONDER THE PARTICIPATION

□ This refers to Contests versus Emergencies (QST, June, 1976).

What happens when it pours rain during a ball game? Do the players stand around out there and argue?

They usually know enough to come in out of the rain. — *Paul Schmidt, W9IDP, Bloomfield, IN*

□ For kids playing ball in the street to become so enthusiastic in their game as to stop cars going to and from a shopping center is bad, but to stop or slow down an ambulance or fire truck is completely a wrong set of priorities. Yes, kids. I use this analogy

because children often place their personal pleasures ahead of common sense.

Amateurs handling emergency traffic also become irrational and often infringe on the "rights" of others. In my mind, this is more justified; not right, mind you, but more acceptable than the same infraction by a contestant.

There should be fully flexible but established special emergency frequencies that are not only well known to all, but could be monitored to insure fast response. Maybe they should not be "clear" channels, but carefully thought-out frequencies that could be used and respected on a world wide basis.

If the street is full of cars, you can't play ball. — *R. O. Thornburg, WB6JPI, Studio City, CA*

□ I became aware of the problem when trying to meet schedules and handle traffic on the American 20-meter phone band. On week-ends, it is very difficult and on contest days, impossible.

Contests are great fun, but they are games. Emergencies are for real. It seems unbelievable that we could equate a game with the safety and welfare of human beings. Since, like WINJM states, calling off a contest is impossible once it gets rolling, my proposal is that some tiny subbands be set aside as calling and distress channels.

Practical or impossible? I do not know, but I am sure something must be done to preserve amateur radio capacity to handle traffic, especially in an emergency. I think this capacity is now imperiled.

Congratulations to WINJM for bringing the problem to the attention of all. — *Michel Lavallee, VE2MJ, Quebec, PQ*

□ I would like to remind readers of the regulation providing that operators use minimum power to establish communication. From Portugal I can work reliably into almost any U.S. area with 180 watts PEP.

However, many times I have heard "local" work on 20 meters with a kW PEP or more. Portuguese regulations prohibit such contacts on 20 meters within 50 km and similarly on most of 15 and 10 meters. Even if a fortunate ham has "got it," courtesy sometimes demands he not flaunt it. — *Dave Williams, CT4DQI/WB8WGE, APO, NY*

BANDWIDTH DEREGULATION

□ In reference to your June editorial ("Onward and Upward"), it certainly is provocative. I disagree that 220 and 420 MHz are overcrowded. 144-146 MHz is empty except for activity on the calling frequencies, nets, and Oscar. Let's open 144-145 MHz to Technicians. I have called CQ on 220 and for hours in New York without a QSO except for some repeaters.

Experimentation in ATV will lead us into 1215 and above. We still need more activity on 220 and 420 — 1 GHz and up is too expensive for the average amateur. — *Henry Wener, WB2ALW, East Hills, NY*

□ I'm glad to see that the ARRL is concerned about Docket 20777. We just got rid of heterodynes in the phone band by going to ssb, thus providing more stations per kilohertz. The SSTV is terrible QRM on 20 phone and wipes out a band of DX stations. But, to

have it, A0, and other garbage thrown in already crowded phone bands is ridiculous.

Can you imagine the FCC police 350-hertz A2 bandwidths when they have total control over malicious interference, profanity, and bootleggers in both the Amateur and Citizens Radio Services? — *Marvin Smith, W6OBH, Vista, CA*

□ Now that we are confronted by the loss of 75-meter a-m, the Medicare Net boys are discussing the values, merits and so on. All the net members are retired, 65 or more, and all practically dyed-in-the-wool a-m hams. After working mini-power in MARS for so long, a little power goes a long way if you have a clear channel. I am happy now when I open my 4-125s and they all tell me how fine my signal is.

I am still trying to find some of my k spark set which I left in Pittsburgh. It had one of the best rotary spark gaps you ever saw. — *John A. Robertson, W1DVM, Bedford, NH*

CULTURAL EXCHANGE

□ What's going on? Doug DeMaw writes about VFO design in June *Ham Radio* while Jim Fisk writes about helical resonators in June QST. In a world where very little goes on, I think this kind of thing is to be encouraged. Both of these articles should be classics and put both in excellent company. I'm thinking of Kruse, Reinartz, Lamb, and whole two to three generations of men who were listened to.

QST is improving a great deal, mostly the last year. You even have Straight K Nights.

If this keeps up, I just might find out how those keyers with the word-spacing work. They look like fancy wallpaper to me now but I'm getting there. — *J. K. Bach, Walder, NY*

ONE MORE LOOK AT CB

□ CBers go ham? Sure, they can be good hams — maybe better than some. To get the potential good hams we must let them know what we're all about. So, to get the "good" ones we must have good PR and then some. I got some when I was putting a ground plane 20 feet up in a well-trimmed tree. Let's elude and back up Box 1020 in Gettysburg, PA with ham mail. — *Tom Moulton, WA2BA, Newton, NJ*

□ I, for one, am not going to cease my operating when I receive an amateur license. I enjoy both and will continue to. When I plug in my \$500 totally synthesized "communications appliance" I'll think about some of the garbage I hear on the local two-meter repeaters.

Maybe we all ought to think about cleaning up our houses and stop slinging short-sighted mud. The future of both mediums rests with the active operators. — *William J. McPartland, Milford, CT*

□ I was greatly alarmed by the *Dun's Review* article (May, 1976) about major manufacturers entering the CB market. The potential influence on FCC and Congress frequency allocations may be more than amateurs have the resources to deal with. It is doubtful that additional CB bands will be carved from those "silent" government bands.

We have a big fight on our hands to save our existing allocations, let alone secure new ones. The more people on our side, then I am those who have need for CB radio. concerted training effort is one of our best defense lines. — *John Orwick, WB6GLZ, Monte, CA*

International News

Conducted By David Sumner,* K1ZND

Report from Cyprus: Amateur Radio Alive and Well

Amateur radio in Cyprus has had a difficult history in recent years. From 1964 until 1972 the Cypriot government issued no licenses, except for an occasional Field Day activity, because of an uncertain political situation. The only stations which were on the air during this period were operated from British military bases under British auspices. Yet today, just four years after the reintroduction of licensing for Cypriot citizens and three years after the reactivation of the Cyprus Amateur Radio Society (CARS), amateur radio is flourishing. There is a fine two-meter repeater providing coverage of most of the island, CARS enjoys very favorable relations with the government, and there are about 80 stations licensed with an expectation of there being more than 100 by the end of the year. Furthermore, unlike many countries its size, Cyprus' amateur population is made up almost exclusively of Cypriot citizens. Amateurs from other countries are welcome and may obtain licenses, but with one exception the nucleus of CARS and all of its officers are Cypriot.

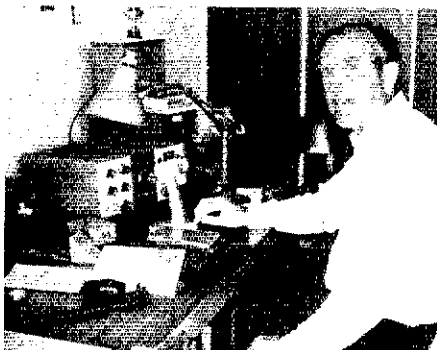
How was so much accomplished for amateur radio in such a short time, in a war-torn country with a population of just a half-million? Also, how can the successes of the CARS be applied in other countries where amateur radio has yet to gain a firm foothold? These questions were not prompted by mere idle curiosity: If we amateurs are to be successful at the 1979 World Administrative Radio Conference and at subsequent conferences which will determine our future frequency allocations, we must have the support of many countries which do not now have a significant indigenous amateur population. Anything we can learn about how successful amateur radio organizations can be established in these countries is invaluable. Reading the CARS newsletter and corresponding with its officers provided only part of the answer. Therefore, when I (K1ZND) found that I would be traveling in that part of the world in late May, I added Cyprus to the itinerary in order to see the situation there firsthand. Although I was in the country for less than 48 hours, my Cypriot hosts went to great lengths to ensure that my education would be complete.

The original order suspending amateur

*Assistant Secretary, ARRL



CARS Immediate Past President 5B4KP, President 5B4EJ, K1ZND, and Vice-President 5B4AP.



Roland Whiting, 5B4WR, is credited with laying the groundwork for a well-organized society.

radio was issued during a tense political confrontation in August 1964, when the government feared that radio equipment held in private hands might be seized by anti-government forces and used for clandestine communication. Therefore, all amateur equipment was confiscated by the government. In spite of the support of some sympathetic officials, it took eight years of patient effort to overcome this objection and resume amateur activity. The breakthrough came in early 1972 with the licensing of a club station, 5B4ES, at the English School in Nicosia. Individual licensing resumed a few months later.

The CARS members give much of the credit for the revitalization of the society to Roland Whiting, 5B4WR, chief engineer at the BBC relay station and the last non-Cypriot to hold an office in the society. At the time of my visit, Roland was serving the last couple of weeks of his term as secretary before retiring in favor of a Cypriot. (Without his knowledge, I was shown a beautiful, engraved silver bowl which was to be presented to him in appreciation for his work.) Cypriot radio engineers employed at the BBC facility and at the Radio Monte Carlo relay station formed the nucleus of the society. Knowing that they need a broader membership base, the club members have concentrated on interesting the influential people in the community in amateur radio by three methods: Personal invitation to the shacks of various amateurs with encouragement to join in, lectures and discussions with civic groups, and above all by personal contact. In Roland's words, "This concentration on personal contact with people of standing is an essential first step in establishing amateur radio in any country."

The amateur population in Cyprus is located in four widely separated towns: Limassol, Nicosia, Larnaca and Paphos. The island's terrain is mountainous, making vhf communication difficult between some points. To facilitate communication, a two-meter repeater built from retired Motorola commercial equipment has been installed on Mt. Troodos, about 6000 feet above sea level.

As a result, home stations throughout the island can communicate easily on two meters, and mobile operation is possible through the repeater from most points. It's even possible to work through the repeater from Haifa, Israel! The repeater has been an important unifying force for the island's amateurs.

Another important step was the formation, with government approval, of the Cyprus Amateur Emergency Net (CAEN). Membership in CAEN entitles an amateur to operate mobile, a privilege which is not otherwise available. Members of CAEN demonstrated their abilities by providing communication for an around-Cyprus car rally in March, using two-meter fm exclusively.

I could not help but be impressed by the enthusiasm of the CARS members. They were well informed about the implications of WARC-79 and had a number of useful ideas on how to gain government support for the amateur position. They have a wide range of interests: 5B4 stations are active on the Oscar satellites and on slow-scan television, beacon stations are maintained on both 28 and 144 MHz for propagation research, and in spite of the remoteness of the location some interesting work is being done on 144 MHz, comparing the effectiveness of ssb and fm over the Cyprus-Israel path. Best of all, the 5B4 hams are deeply committed to bringing more and more people into their hobby.

Present officers of CARS include Dr. Edwin Josephides, 5B4EJ, president; Totos Theodossiou, 5B4AP, vice president; Andreas Nissiphorou, 5B4BL, secretary; Andreas Pavlides, 5B4AC, QSL manager; Neoclis Kyriazis, 5B4AZ, vhf manager; and Adolfo Kanneis, 5B4CP, public relations. The Immediate Past President, Charles Pandehis, 5B4KP, hopes to be able to spend a week at ARRL/IARU hq. later this summer to review WARC strategy and planning. It will be a pleasure to have the opportunity to return his exceptional hospitality. My thanks also go to 5B4s AH AN CI CR SP and WR, all of whom went out of their way to make my short visit to their beautiful country informative and enjoyable.

QST



The English School Radio Club, 5B4ES, is manned by several fine young operators and is one of the most active stations on the island.

YL News and Views

Conducted By Louise Moreau,* W3WRE



Mark the Calendar

Summer vacations and leisure all end this month, and the 1976-77 fall-winter schedules are full of planned activities for YLs beginning with the annual CLARA Day Contest, September 11, that is open to OMs as well as YLs. The following weekend will be YLRL Howdy Days, a casual QSO-type planned as a get-acquainted activity to meet the new YLs on the air.

October, of course, is known in YL circles as Floridora month, a time span when these gals are on the air all month to give contacts towards the Floridora Certificate. October 19-20 is also the cw portion of the YLRL Anniversary Party.

November begins with the Ontario Trilliums sponsoring the annual Trillium Weekend open to all amateurs. Both CLARA and TOT are excellent opportunities to acquire needed contacts for their certificates — or even to work WAVE all YL. November is also the YLRL AP windup with the phone portion

scheduled November 9-10. The holiday season takes over and we have two months' rest from specially planned YL activities that gives us time for SET before we start in again in 1977. Then in February we have the phone portion of the popular YL-OM on the 19th-20th. In March it concludes with the cw contest on March 15-16.

YLRL has moved its DX-YL to Stateside-YL contest from January to April in 1977, beginning April 12-13 for cw, and ending April 26-27 with phone. These new dates were made with hope of assuring the gals better conditions.

May is always the YLISB QSO Party for System members, and in June we have the YLISB Convention. June ends our activity year except for conventions and hamfests. In 1977, June will mark the ARRL National Convention in Toronto, and CLARA, TOTS and the Maritime Sparkettes plan a very special program for YLs.



Ed Kelley, VP9GE, and Claire Medcalf, WA1USW/VP9. Claire, a math and science teacher, is now studying for her Extra Class license. (W1UQ photo)

BRYLA AWARDS

Therezinha Felix Cardozo, PY1FI, custodian of the new Brazilian YL Award, announces that the award has been issued to PY5YC, the first OM to qualify, and that the first DX YL was Renata, F5RC. This award has proved to be quite popular with many qualifications in South America, as well as other countries.

A BRYLA net is activated on Wednesdays at 2000 UTC, on 14.250 MHz. There is also a special "Standby BRYLA Net" on Fridays at 1800 UTC on 21.365 MHz that will be looking for operators from the United States.

HOWDY DAYS MAILING ADDRESS

Beth Newlin, WA7FFG, YLRL vice president and contest custodian, has requested that

*YL Editor, QST. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.



Active member of CLARA, Ontario Trilliums, and YLISB, "Bubbles" Timlick, VE4ST, has been active since 1953 operating in all the VE YL-sponsored contests.

those gals who will be submitting logs of the Howdy Days Contest mail them to her temporary address so that there will be no delay in forwarding them. Her temporary summer address for this contest only will be, Beth Newlin, WA7FFG/9, 109 W Street, Rosedale, Indiana 47874. Beth will be back at her permanent address for the other YLRL contests.

1976-77 ONTARIO TRILLIUM OFFICERS

The TOT officers for the year June 1, 1976, through June 1, 1977, are President Thelma Woodhouse, VE3CLT; Vice President Eva Colleck, VE3EVA; Secretary Audrey McDermott, VE3CCO; Treasurer Doris Cody, VE3BBO; Publicity Manager Ruth Burritt, VE3GVQ; Membership Convener Irene Simpson, VE3FQK; Editor, *TOT Topics*, Barbara Newman, VE3BFN. Trillium Nets: Phone, Saturdays 14.140 MHz, at 1600 UTC (summer); 1700 UTC (winter); 3.770 MHz, 2000 UTC (summer); 2100 UTC (winter).

The club is the VE3 ARRL QSL Bureau; address is The Ontario Trilliums, P.O. Box 157, Downsview, Ontario, M3M 3A3.

1976 CLARA AC-DC CONTEST

The annual CLARA Day Contest, September 11, at 1800 UTC ends September 12 at 1800 UTC. Suggested frequencies are: Phone, 14.160, 14.280, 21.300, 7.200, 3.775, 3.900; cw, 14.035, 21.035, 7.035, 3.690, all frequencies MHz. Each station can be worked twice (one phone, one cw, or on two different bands). Non-CLARA members score one point for each CLARA station worked, three points for each "bonus" station worked, multiply by number of Canadian call areas. CLARA members score one point each con-

tact. Prizes will be awarded to non-CLARA and CLARA members. Send logs to Marjorie Karl, VE6LC, Box 191, Foremost Alberta, T0K 0X0.



Louise Evans, WB6AUK, was caught in the licensing foul-up and after waiting for months called FCC and received verbal permission to operate from W3DXA of FCC. She is now active on the air from Palm Springs, CA.

FM Repeater News

Conducted By Lew McCoy,* W1ICP/WR1ABH

450-MHz Band Plan—New York Style

The Tri-State Repeater Council (TSARC) which covers New York City, Long Island, northern New Jersey, and parts of Connecticut, has come up with a modified 450-MHz band plan which they are putting in operation. Here is the plan as related by Duke Harrison, K2QPF, frequency coordinator for TSARC.

"TSARC is in the middle of the 450-MHz band-plan problem. To the north, New England is almost solid low in/hi out. To the south, Philadelphia is almost solidly high in/low out. ARRL has chosen to specify high in/low out. Our TSARC area is about evenly divided between the two. There are many solid arguments for either system. If the evidence was overwhelmingly in favor of one, there would be no band-plan conflict.

The New York area TSARC has run out of time. We must resolve the problem of low in or high in now. Accordingly, we have decided that repeaters desiring to follow the present band plan (high in) will be placed on the .050

and .100 frequencies. Repeaters that want to go low in will be placed on the .025 and .075 frequencies. Adjacent channel problems will be minimized by distance spacing. All present hi-in repeaters on .025 and .075 may stay there but are encouraged to move to the TSARC plan where possible. Repeaters low in will be urged to move to the .025 or .075 to minimize interference with co-channel repeaters in adjacent areas. Conversely, to minimize interference with co-channel, adjacent area repeaters are requested to slide 25 kHz to comply.

There is no question that the old Motorola T-44, 450 gear and other commonly used wide-band stuff are going to have a hard time, and will be impossible to use in some instances. The super wide-band receivers with afc can be cheaply semi-narrowbanded by installing an old TU-145 or 540W filter from a narrow-band T-41 or T-43. This will probably suffice in most mobiles, but the repeaters will have to go with more modern and stable rigs

that can separate out the 25-kHz channels.

Repeaters that are in our frequency-coordinated area have been reserved a 25-kHz channel adjacent to their current operating frequency, if they are already low in. I am composing a letter explaining the problem and requesting the repeater operators to choose:

1) If they want to stay low in, slide 25 kHz.

2) If they want to stay on a .050 or .100 pair, invert to go high in.

Obviously, we in the TSARC are not in a small cubicle wherein what we do has no effect on our adjacent areas. I believe this plan can be accepted politically as each faction gets its way, even if they have to slide a little bit. Technically, it is working on a few spot frequencies. It requires distance spacing to keep the adjacent channel problems minimized. It meets the ARRL band plan as presently constructed. It has been submitted to VRAC for adoption."

EASY IN — EASY OUT

"Dear Lew,

Enclosed is the photo showing my rig mounting you asked for at the Rochester Hamfest. I hope you can eventually use it. I don't recall mentioning at the time, but the magnets are not my idea. Carl Brittain, WA2OLW, is the budding genius in this particular case. He has mounted several pieces of gear using this type of magnet with a good deal of success, gear such as a KLM amplifier, a D.A.R.T. tone-pad enclosure, a GLB Channelizer, and a Standard 826A. He removed the headliner from the cab of his pickup, mounted everything overhead, and nothing has ever fallen. I have mounted the Heathkit HW-202 to the fridge at home, and to the file cabinet at work, and never had any problems.

"Do the magnets affect the rig's performance? No, not so far as I can tell. The transmit signal does not vary whether they are

on the rig or not. One word of caution: I wouldn't recommend setting your wristwatch on the rig. A so-called 'keeper' of sorts is not apparently necessary, as the magnets have been 'nekkid' for a couple of years now, and have suffered no ill effects.

"In the 'nuts and bolts department,' the magnets are arranged in checkerboard fashion, with opposite poles facing up. For example:
N S N S N S
S N S N S N
N S N S N S
etc.

This system seems to provide the best holding ability and the least problem in placement. Once in a while, an individual magnet won't behave according to theory. It just doesn't want to go into place. Throw it away and pick another. The magnets are secured to the case with double-faced packing tape. I know that someone is going to suggest epoxy or some other compound. Fine, if that's what they want. The idea behind the tape was to avoid defacing the rig.

"Lew, I hope that this about covers it for you. Please be certain, though, to give credit to Carl for the original idea. It should make him feel good, especially after all those people laughed at his magnets! 73, Chuck Jackson, WA2CEH."

NEW FREQUENCY COORDINATOR

Dave Barquist, K9PAK, 448 Hartwood Lane, Hartland, WI 53029, has accepted the position of frequency coordinator for the Wisconsin Association of Repeater Operators. Dave replaces John LeFeber, W9VAT, who did an outstanding job for the state.

SYNTHESIZER FOR MOTOROLA HT-220

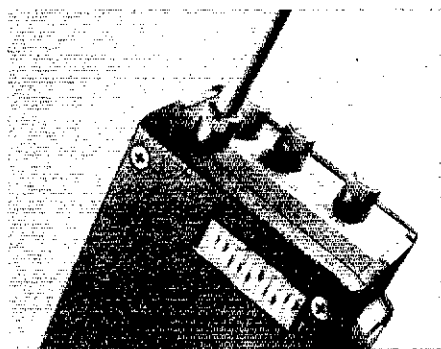
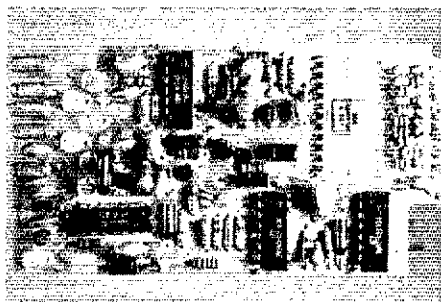
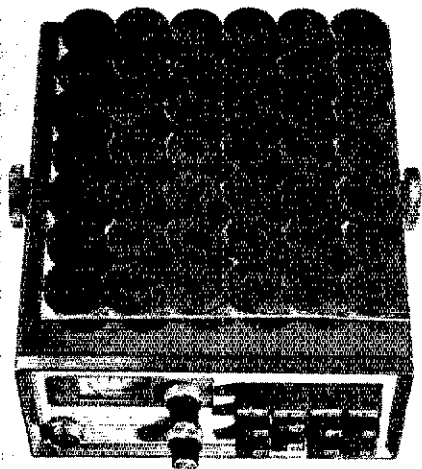
We always knew that someday, someone, somewhere, would design a frequency synthesizer that would fit inside an HT case. Well, WA4DSY has done just that. As you can see from the photos, the complete circuit is mounted on a double-sided circuit board which fits inside the 220 case. The synthesizer uses CMOS devices and total current drain is

only 29 mA. Frequency coverage is from 146.000 to 147.995 MHz in 5-kHz steps. Both plus or minus 600-kHz transmit offset can be used (or simplex).

The frequency stability is .002 percent and all spurious outputs are 45 dB below the carrier. The VCO frequency range is 16 MHz.

Dale Heatherington, WA4DSY, 3126 Flamingo Dr., Decatur, GA 30033, has written an excellent set of construction plans and he will provide the double-sided etched and drilled circuit board and the plans for \$15.00, postpaid. Dale does not sell the parts but the synthesizer can be built for less than \$125.00 without having a junk box. You can write him for more details.

QST



How's DX?



Conducted By Rod Newkirk,* W9BRD

DXers Join Yearly Joust with Murphy

Amateur radio clubs, no matter what their specialty — DX, vhf, mobile or what have you — usually become Field Day clubs when your League's annual FD rolls around. No other organized ham activity holds such wide appeal. No exception, Western Washington DX Club once more gave it their mosquito-bitten best. WA1KKM/7 and WA7UQG poetically commemorated this year's event in WWDXC's monthly *Totem Tabloid*:

'Twas the Night Before Field Day

'Twas the night before FD when all through the lands

The bottom fell out of the amateur bands.

The dipoles were strung from the towers with care

In hopes that ol' Murphy would not appear there.

We were hauling on ropes with arms heavy as lead

While visions of victory danced in our heads.

When Rush, on the tower inspecting a trap, Grabbed hold of a feed line and got a good zap!

Down in the shack there arose such a clatter We ran to the tent to see what was the matter. One of the finals let loose a blue flash,

Tore open the cabinet and blew out some trash.

We put out the fire and went back to work, Wading to towers through the muddiest murk, When what to our wondering eyes should appear

But a ten-element quad atop Mt. Rainier! Visibility zero, the rain was so thick

We knew in a moment the quad was a trick. Our heads they were spinning, our legs felt quite lame,

As Rush whistled and shouted and called us by name.

"To the tops of the towers, to the ends of the booms!

Now lash away, lash away! Get moving, you goons!"

Up, up the towers the beams they all went With most of the elements broken or bent.

When we finished the job we knew we could boast

That we had the best signal out on the East Coast.

We sprang to our rigs, in our mics gave a whistle

And away the watts flew like the down of a thistle.

A tune across twenty soon gave us to know

That our station was working and ready to go. Since now we were done we had nothing to lose

By crawling in bed to catch a quick snooze. And I heard Chip exclaim as he turned out the light,

"Happy Field Day to all and to all a good fight!"

And another good scrap it was. See you next year, Murph. You may win a few battles, you dirty OM, but you'll never win the war.



4X4HT, Tehniyon ARC club station, has an impressive skywire view of historic Haifa. Visitor WB2GSW stands beneath a TA33 at your QTH of the month.

FROM QST'S DX MAILBAG

OCEANIA: VR3AK has an FT101E and two-element tribander going on Washington Island, mostly 14 MHz. John says the local power plant runs from 0430 to 0800 UTC Tuesday through Saturday, 0430 to 0900 UTC on Sundays and Mondays, DXing restricted accordingly. (KH6AHZ) . . . I'm looking for 10-10 Club info and would appreciate chapter data through my QSL

*c/o ARRL, 225 Main St., Newington, CT 06111



3A0HL (DL7SP) concentrated on 40 and 80 meters in April, joined by 3A0HK (DL7RT) for a total of 1350 contacts in five days. Holger and Wolfgang encountered the usual surrounding mountain fringe and outdated hotel quarters that frustrate most DXpeditioners to Monaco.

manager, WB5GZI. I anticipate a two-year stay in Australia. (VK5CRG) . . . KS6FF's fine ham spirit, courtesy and general operating ability should easily rate Mike DXer of the Year. (I2YAE) . . . Excellent contacts with HP9XEM/m aboard *Misty* en route Tahiti. I'm interested in QSOing other hams on distant sailing cruises. Amateur activity on Tinian and Rota seems at low ebb these days. Used to hear many more signals from those isles. (W7HPI) . . . After averaging ten on-the-air hours per day at each stop for a grand total of 42,500 contacts we suspended our Pacific junket in June for urgent Stateside affairs. At least four and as many as eight kiloQSOs were tallied from each session as VRs 1Z 8B, 3D2KG, C21NI, FK0KG and YJ8KG, a DXpeditionary tour begun last December. We intend to renew the Yasmie Foundation effort a few months hence and will welcome all suggestions and encouragement. (W6s KG DOD) . . . More Oceania-grams via the literary DX grapevine: Popular ARRL Veep W5NW participated in NZART golden anniversary doings down under. . . . VK0DA volunteers Macquarie Isle on 20 and 40. . . . ZK1DX knocks off from Rarotonga shortly for return to ZL3DX. . . . VR4AA vacations in the U.K. till October. . . . Tuvalu may go silent on DX bands when VR8A shuts down for New Zealand in a couple of months. . . . ZL1BKL still points for the Kermadecs in October. . . . VR3AH wants to spread Christmas cheer through next February. . . . 'Tis said that ex-VS5MC will swap Scotland for rarer Brunei once more.

ASIA: In recent contest work from Panama as JE1OMO/HP7 it was a delight to find 47 JAs among my many contacts. I became WB2EPV in April, working 85 countries in the next three weeks. (JE1OMO) . . . After avoiding strenuous DXing for years I got sucked into a 14,023-kHz 9V1SH pileup. Don surprisingly answered my 160 watts and ground plane so I may yet be inspired to hit the 200-country mark. (WSBZK) . . . Tehran's communications ministry authorized me to sign EQ21TU

in May. (EP2OD-K4OD) . . . Terminated my HS2AIG-HS3AIG tour with 225/219 countries worked/confirmed. (KA6DX) . . . Eastern addenda courtesy the DX fourth estate: A hardy team of JARL DXpeditioners fired up Okino Tori-shima for worldwide consumption in May and June, conquering tricky tides, a menacing typhoon and lonespheric obstacles. Inactive for fifteen years you may recall the place as Parece Vela or Douglas reef. . . . HS5AWK does missionary duties in Chiang Mai some 400 miles north of Bangkok. . . . OE5GML/YK relieves OE6DK/YK on 20 sideband at 1500-1900 UTC. . . . JY9CS is said to be moving on to Qatar. . . . WB7ABK collected a logful of QSOs from 9N1MM, mostly cw, then headed Statesward to lick an acquired virus infection. . . . YL FP2EA is especially interested in VE7 contacts on 20 cw around 0300 UTC (WCDXB) . . . Burmese amateurs are allowed to maintain their licenses but do not expect on-the-air authorization in the near future. Old XZ2s AD KN SY and TH are eager to rejoin the game. . . . WAMA, Worked All Malaysia, is a challenging project sponsored by MARTS for sufficient 9M2-6-8, VS5 and 9V1 contacts. . . . South East Asia Net's annual convention is all go for November 12th-14th at Djakarta, a series increasingly well attended.

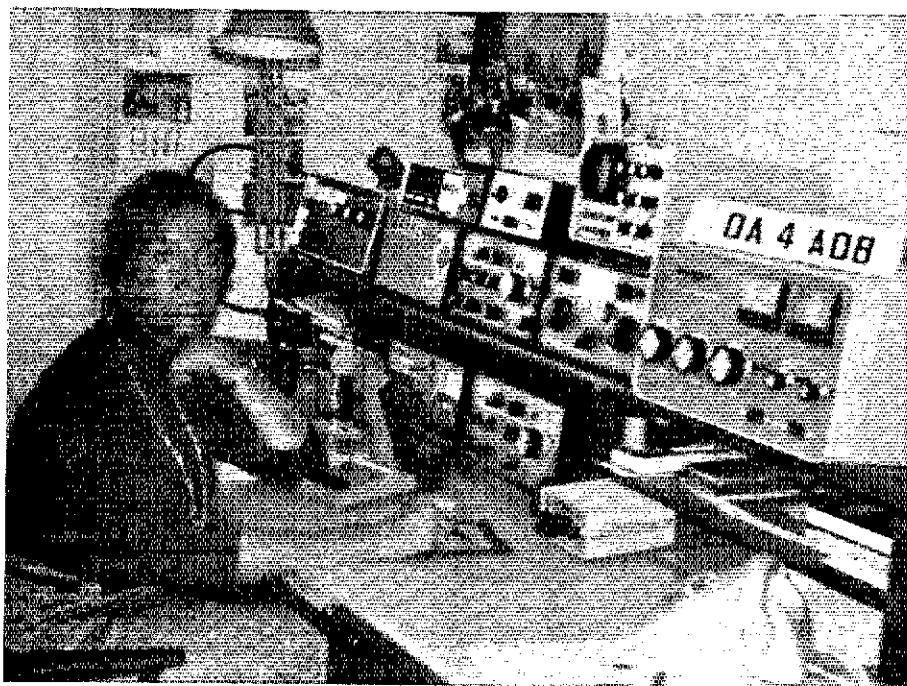
AFRICA: TL8AR's English is improving with USA contacts near 14,225 kHz at 1700 UTC 12s YAE and YDX assisting. John should be more available when a licensing matter is resolved. (I2YAE) . . . 5U7BA, a slow-but-sure cw type, likes the low edge of 20. Carlo's friend Paul, 5U7AW, also offers Niger on the band. (W0EFK) . . . ZD7HH keeps St. Helena workable these 20-meter evenings, sst preferred. (K2PAY) . . . From DX periodicals of clubs, groups and individuals: Working ten QSOs since 1960 may qualify you for Diploma of Zaire Republic certification. Ship self-addressed stamped envelope to Q95Q for full DZR details. . . . JA0BXU expects to

sign SU1JA in Suez for a year or so. . . . VE1APY/SU, 14,212 kHz from 2300 UTC, promises to stick around. . . . 9L1JM & Co. managed 400 Banana Isle contacts as 9L3SL in early May. An inverted-V didn't pan out properly but an 18AVT plugged into salt water saved the day. They hope to hit Turtle Island as 9L4SL come fall. . . . 5R8AL contributes Malagasy near 14,337 kHz at 1700 UTC, or 21,170 at 1600. . . . 5H3JR remains a Tanzania temptation, 14-MHz ssb at 0700 and 2000 UTC. . . . WB7ABK of recent Oceania and Asia DXpeditionary endeavors intends to try his luck from rarish African regions.

EUROPE: At long last Greece has 80 meters! As of May 6, 1976, SVs may radiate A1, A3 and A3j emissions from 3500 to 3600 kHz. I'm usually on the low cw edge at 0100-0300 UTC, also occasionally tuning up to 3535 kHz. Fifteen sure nosedived here lately. Thanks to ARRL and all the gang for CW-DXCC No. 68. (SV0WTT) . . . Keep those rigs handy. I have DXpeditionary plans for the summer months. (F6BBJ) . . . I2CBM's multiband IE9CBM thing in May and June transpired from Ustica island. (I2YDX) . . . Researched the British side of the Battle of Saratoga for some W/K Bicentennial festivities. Wonder how they turned out. Our Royal Signals ARS *Mercury* goes out to more than 1150 members. (G3DPS) . . . Great 20-cw sport on the shores of Lake Constance with my trusty Argonaut. (W8IRT/HB) . . . I'll have C31CA on RTTY the first week of this month with an SB101. Watch 14,090, 21,090 and 28,200 kHz. (F2PY) . . . We're busily documenting a brand new European country possibility for the world to shoot at. Be alert! (DL7RT & Co.) . . . For data on the Danubian DX award for HA7 contacts consult PRA Sz., P.O. Box 36, Budapest H1387, Hungary, with s.a.s.e. Likewise re Budapest Amateur Radio League's diploma for sufficient QSOs with HA5 stations to HA5HA c/o BRAL, P.O. Box 2, Budapest H1553, Hungary. Continental comment in the farflung DX press: ZB30ANV was a May special commemorating Gibraltar ARS's 30th founding anniversary. Multiband operation featured SSTV and Oscar. . . . JW5NM goes back to LA5NM after some 7500 contacts with 243 countries. . . . OH2NM clubbers gave Aland a May whirl on several bands as OH0AC. . . . VERON DXpress editor PA0TO took time off from his typewriter for summer vacation as F0BAK. . . . Faeros ARC reports that fourteen fresh candidates for OY calls have passed their tests.

SOUTH AMERICA: HC1XG/HC8 with K4ERO rolled up some 2300 QSOs on 160 through 10 meters, mostly on cw with HW8 QRP fun thrown in. They were 1.8-MHz country No. 129 for W1BB, No. 96 for W4BRB. Four or five customers caught 'em on all six bands. (W4BRB) . . . The call sign of the University of Chile club station mentioned in your May pages is CE3AOX. One of its YL ops has studied in Minnesota. (W0EFK) . . . Over the past sixteen years some thirty thousand hams have received my QSLs. (CE6EZ) . . . Maine, Delaware and the Dakotas will complete WAS for ZP5AQ who is active on 21,060-21,080 or 21,270-21,320 kHz from 1630 to 1830 UTC. CX2CS also likes 15, especially for QRS cw contacts with the Stateside WN gang. (WA8FIO) . . . More from the far south via the vine: The HK0AA/s Serrana Bank quickie in May by SM0AGD & Co. generated a 1200-QSO appetizer before Erik, K6AHV and HK0BKX delivered their Bajo Nuevo main course. Navigational nuisances, birds and crabs profusely attended. . . . CE0AE may visit Juan Fernandez this month, hamming intentions unspecified. . . . PY1RO plans to enroll Fernando de Noronha in October contest action. . . . VP8OT shifted operations from Alexander Island to South Georgia where VP8MS also holds forth near 3795 kHz at 0100 UTC.

NORTH AMERICA: WB2VKO and I will have PJ8s MS and AA radiating Sint Maarten on the 4th-18th of this month. (W2BBK) . . . Mid-April was a peak DX period here. Big Asian signals and five new countries logged. (WB0CGI) . . . First quarter of '76 brought me new ones on 80 through 15 with 20 meters most productive. EL2T surely drew heavy North American fire during the ARRL



OA4AOB often gives our 15-meter Novices their first YL DX. Carmen prefers radiotelegraphy with this interesting Lima layout. (OA4AKE photo)

Test. (WA6ARP) . . . Still find enough stuff on 14 and 21 MHz to keep me interested. (K7ZLO) . . . The recent 1975-76 1.8-MHz season appeared to supply more countries but fewer DX stations. Europeans were noticeably less plentiful. Popularity of the inverted-L antenna increases on 160, very simple and effective with good grounding. (W1BB) . . . VP2ABC's visit to my QTH triggered a DXfest attended by Wis EBC WR, W2s HHC NIN, K2s BT TXC, WA2s FUV and LTQ, four of the visitors named Dave. (WA2FUV) . . . Worked 28 countries and 28 states in my first month on the air, all continents but Africa. I'm thirteen. (WN4JKP) . . . Traffic work is my usual thing with DXing sessions interspersed. (VE1BDT) . . . New job with General Electric will move my DX efforts to old Milwaukee. CR6IK's QSL confirmed No. 100 at last. (WA8YTL) . . . ZS1XR on 15 was a real thrill, my first DX. AJ8EHP mystifies the gang with his weird Puerto Rican Bicentennial prefix. (WN4JUV) . . . Since Christmas I've collected 82 countries on 75-meter ssb with an FT101E and 40-foot-high inverted-V. (W3OJS) . . . Started ham life as WA2OFA back in '60, then QRT'd for college. Now I'm back in the fun with an old BC348 and 75-watt ARCUS rigs on several bands. (WA1NRO) . . . K2OQJ on May 20th was my 12,000th AJ3AA contact this Bicentennial year. Pileups of European stations on 20 cw help keep the total climbing, often around 125 QSOs daily. (KV4AA) . . . Made about 800 contacts as ZF1JH in late April with my two-watt Ten-Tec including a one-hour run of sixty QSOs on 15 sideband. The radiator was an 18AVT jammed into beach sand. Next will come sessions as PJ8JH and then possibly FS7 work. (WA6VNR) . . . Let's all try to work 10 and 15 meters as much as possible during the sunspot minimum. (W7VCB, ex-EL4A) . . . KZ5RQ, only fourteen, is a crackerjack cw man. (W4LVP) . . . I should have PJ9CDC cooking through the 5th of this month, mostly cw on 80 through 10. (W1CDC) . . . National Capitol DX Association expects a large turnout for DXPO-76 with a gala program on the 25th-26th of next month at the Ramada Inn near McLean, Virginia. Rush attendance inquiries to WA3NGS. (NCDXA) . . . FM7AU strives to complete radioteletype WAS and soon will try RTTY via Oscar. (J2YAE) . . . Forty cw does its best to back up faltering 20 with such recent goodies as FK8CJ, HC1XG/HC8, HK0BKX, OX3ER, VR4CW and ZL3JB of

the Chathams. (W7YF) . . . Agreed, 7-MHz cw keeps things interesting enough, also 80 and 75 ssb. (WA3SWF) . . . VE3DXV/W6 completed an eight-issue stint as editor of our *DXer* amid cries of encore, encore! (NCDXC) . . . VE3s BGX EGS and GUJ plot an autumnal visit to VY0-land. (DXNS) . . . *West Coast DX Bulletin*, WA6AUD proprietor, disseminated 1200 copies of its 418th issue beginning a ninth publication year. Therein we note that WBSCFI and other medics activated YN8KMA this summer on 80 through 10, and that Northern California DX Foundation continues to work closely with such prominent DXpeditioners as K6AHV, WB7ABK, OH2BH and SM0AGD with more juicy DXCC targets on the multi-band horizon. . . . St. Pierre & Miquelon Radio Club officers are F2Bs HL pres., ML v.p., FU secy, and MX public relations chief. . . . "How's DX?" and its readers, for much of the preceding advices, gratefully acknowledge QRO input from Canadian DX Association *Long Skip* (VE1AL/3), Columbus Amateur Radio Association *CARAScope* (W8ZCQ), *DX News-Sheet* (G. Watts, 62 Belmore Rd., Norwich, NR7 0PU, England), Japan DX Radio Club *Bulletin* (JR3BHW), Newark News Radio Club *Bulletin* (M. Witkowski, Rt. 6, Box 255, Stevens Point, Wisconsin, 54481), Northern California DX Club *DXer* (VE3DXV/W6), North Florida DX Association *News* (WA4UFW), Southern California DX Club *Bulletin* (WA6KZD), VERON's *DXpress* (PA0TO), *West Coast DX Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (WA7JCB). More!

DXCC NOTES

In the May, 1976, issue of *QST*, page 49, announcement was made of the addition to the ARRL Countries List of Okino Tori-shima effective as of the time operation by the JARL DXpedition station (7J1RL) was activated. Advice from JARL indicates the first contact with 7J1RL was made at 0012 UTC on May 30, 1976.

Confirmations for contacts with Okino Tori-shima, made May 30, 1976, or later, may be submitted for DXCC credit starting September 1, 1976. Contacts that may have been made with Okino Tori-shima prior to May 30, 1976, will continue to be creditable toward the Ogasawara listing on the ARRL Countries List.

DX Century Club Awards

Administered by R. L. White, W1CW

The following listings show DXCC Awards issued by Headquarters during the period from May 1, through May 31, 1976.

New Members

CW/F

236 W0NGJ	144 JA7UIQ	W1JHU 115 HB9ANM	G3EZZ WB4CQC	K5TSQ 106 YU3FOP	W4LBT WA9FXJ YU3DR	VP2MJR 101 WB4YFC	VE3DXO WA1AH1 WA1SCV
231 SM7DMN	131 W4BYM	111 WA5YFQ	108 W0LNZ	105 K9KES	103 WB2SJJ	100 WA9QQM	W7YF WA7URW
168 W3JSX	118 109		107 JA2ALS	102 VE3HLC			

Radiotelephone

295 K7NEQ	143 I2ARQ	121 DA2KD	113 VE3AKG	DJ8TP EA3XA	105 W5SZJ	102 G3OBX	100 I1G1J
272 PY2BU	137 WA6FZ1	117 IC8FHC	112 K2LQL	WB6OMF	104 G4BHY	110 I1DWH	JA3BNT
200 W0NGJ	131 I3MMM	115 I3LDP	108	106 WA5YFQ	101 WA1RY	101 WB2FDQ	K6CFJ W2MPI W3JSX WA4VCC

CW

140 OZ7BW		107 DK5JK		101 I0ZMI		W7LZF	
110 W1YG		105 K9UKM		W4EDB WA6TLA		100 DL1EV EA8CR WB4TDH	

5BDXCC

#490 W4VJH	#491 HB9AOU	#492 W2EQK	#493 W9TDR	#494 VE3DXV /W6	#495 K6MA	#496 DJ9ZB	#497 W1OR
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Endorsements

In the endorsement listing shown, totals from 120 through the 240 level are given in increments of 20, from 250 through 300 in increments of 10, and above 300 in increments of 5. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

CW/F

355 ZL1HY	330 K8DYZ	W9OW 315 K8MFO	VK6HD WA4DRU	W5KHP 270 DJ5JH	K5LMG K6DG	WA7UWO	YU3TFB
350 W9JUV	320 W2GK	W4OEL	W8QXQ	220 DL1KS	W7GYP	W8111	140 HB9ASL
4X4DK	W6EJ	WB6UDC	290 JA2IOD	220 PY8JO	W0AZT	XE1FR	180 OK3JV
345 K2BK	325 JA8AA	OE1UZ	W4JMP	IT9AZS			180 VE3AKG
W5NMA	K2LE	PY2ELV	W4KNW	OH2BMG			180 W1GME
340 OK3MM	K4TWK	WB4KZG	280 DJ4AX	DL2AA/W1			180 WA4UUV
W4EO	W6FW	305 K6JR	W4CXK	W4FLA			180 WB4TBO
W6HYG	320 DJ2AA	K7NEQ	W5KFN	200 DK3PL			180 W6ETR
335 W4EEO	K6AO	YV5AK	250 W5LW	250 VE3BZ			180 W6TPR
W0BK	W2LL	ZS6RM	240	VO1HH			180 WA6HCI
		300		WA2DHF			120 KP4DLC
				WA3TZZ			120 WB2SXT
							120 WA9FUD

Radiotelephone

350 4X4DK	W6HYG	310 G3WW	ZS6RM	260 DK3HL	K6DG	WA3TZZ	140 G4BYX
340 W5JWM	320 G3UML	KV4FZ	290 K2BK	200 F6BHF	200 CX7BF	W7AE	120 K2GAT
335 W5LZW	W5RNG	W6ABA	W6MBV	VK6HD	K4AJR	160 18ACB	120 WB4VNG
W5NMA	W6FW	305 K6JR	W9KB	W5SZV	DL2AA/W1	180 IC8EGO	120 W7ISG
330 EA2HZ	315 W4QAW	280 JA1HWK	250 K6AO	W6EJ	W6MFC	120 OZ7OP	120 I0ZTG
W2GK	W6UDC	300 JA1BWT	240	K6AO	WA7UWO	120 VE3DU	120 K7DS
	W9KRU	W3COR		240	DK3PL	180 W8SDV	120 WA9YDO
							120 ZL1BD

CW

140 K1AGB		OZ7BW		120 K2TQC		K6EBH	
OE1ZGA		W8ZCQ				W1AB	

In the June, 1976, issue, W2AZX was incorrectly shown as W2AEX at 320 CW/F.

THE ARRL DX QSL BUREAU SYSTEM

The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 x 7-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp, unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL HQ.

W1, K1, WA1, WN1* - Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

W2, K2, WA2, WB2, WN2* - North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.

W3, K3, WA3, WN3* - Jesse Bieberman W3KT, Rt. 1, Box 66, Valley Hill Rd. Malvern, PA 19355.

W4, K4 - National Capitol DX Assn., Box 10, Boyce, VA 22620.

W4A, WB4, WN4 - Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.

W5, K5, WA5, WB5, WN5* - ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.

W6, K6, WA6, WB6, WN6* - ARRL W6 QSL Bureau, 2814 Empire Avenue, Burbank, CA 91504.

W7, K7, WA7, WN7* - Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.

W8, K8, WA8, WB8, WN8 - Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

W9, K9, WA9, WN9 - Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

W0 K0 WA0 WB0 WN0 - W0 QSL Bureau Ak-Sar-Ben Radio Club, P. O. Box 297, Omaha, NE 68101.

KP4, WP4* - Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.

KV4 - Graciano Berlarido, P. O. Box 57, Christiansted, St. Croix, VI 00820.

KZ5* - KZ5 QSL Bureau, KZ5OD, Box 407, Balboa, CZ.

KH6, WH6* - John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.

KL7, WL7 - Alaska QSL Bureau, State Route, Box 2401, Wasilla, AK 99687.

VE1* - L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS.

VE2 - A. G. Daemen, VE2IJ, 2960 Douglass Avenue, Montreal, Quebec H3R 2E3.

VE3 - The Ontario Trilliums, P. O. Box 157, Downsview, ON, Canada M3M 3A3.

VE4 - D. E. McVittie, VE4OX, 64 Academy Road, Winnipeg, MB R3N 0E8.

VE5* - A. Lloyd Jones, VE5JL, 232 Grant Road, Regina, SK S4S 5E3.

VE6* - D. C. Davidson, VE6TK, 110 Trafford Dr., N. W., Calgary 47, AB.

VE7 - Howard Martin, VE7AFY, N. 45-9960 Wilson Road, Ruskin, BC V0M 1R0.

VE8* - Al Sturko, VE8NS, P. O. Box 7 Fort Smith, NWT X0E 0P0.

VO1 - William Coffey, VO1KM, P. O. Box 6, St. John's, NF.

VO2* - Stan L. Parsons, VO2AS, P. O. Box 232, Goose Bay, LB.

SWL - Leroy Waite, 39 Hannum St. Ballston Spa, NY 12020.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

QSL bureaus for other areas can be found in the December, 1975, issue of QST, page 64.

Strays

Word comes from K9FHI that NB9EAA will be operating from the Experimental Aircraft Association in Oshkosh, Wisconsin, July 21 to August 9. QSL via WA9GJU and include s.a.s.e.

Amateur radio's many facets were on display recently at a hobby exposition in Massapequa, NY. Members of the LIMARC ATV

technical group gave an on-the-air demonstration of amateur television two-way transmission between W2WLS/2 and W2NIP. Color TV transmissions, a complete solid-state ATV transmitter developed by W2TRP, slow-scan TV, repeater operation, and a setup of a precision radio-controlled boat built by WB2AQM, rounded out the diverse field of exhibits. Outside, from a mobile van, WB2AMX and K2REC manned an Oscar demonstration. The cooperative efforts of many local amateurs and other radio groups combined with LIMARC to make the show a successful, well-attended affair.



The World Above 50 MHz

Conducted By
William A. Tynan,* W3KMV



Getting Started on VHF?

Judging from the mail, a number of people are intrigued by the world above 50 MHz, but many have questions which indicate that they are relatively uninformed about vhf and higher bands. They ask such questions as "Shall I get on 6 or 2?", "Shall I use fm, a-m, ssb or cw?", "How much power do I need?", and "What sort of antenna is best and what polarization should it have?" As anyone who has been around for a short while can appreciate, these are difficult questions to answer without writing a book. To be sure, the best place to start getting some answers is in books. Any recent edition of *The Radio Amateur's Handbook* contains a wealth of information on equipment and propagation applicable to the frequencies above 50 MHz. *The Radio Amateur's VHF Manual* is another good source. Notwithstanding these two fine repositories of vhf/uhf dope, we will attempt to respond to some of the more direct questions in the paragraphs to follow. Please bear in mind that these comments must, of necessity, be the opinions of this conductor and are not necessarily held by the League or anyone else on the Headquarters staff.

First, what band should one start on? The answer depends a lot on where in the country the prospective vhf'er lives, and particularly on local activity patterns. A "feel" for these can be gained by reading this column and especially by following the references to local activity, nets, etc. Generally speaking, except for the more-populated areas, 6 meters offers more chance for contacts than does 2 when it comes to a-m, ssb and cw operation. The recent rash of 2-meter transceivers incorporating ssb and cw is changing this picture drastically, however. In and near the population centers, particularly along the East Coast and in California, there is probably now more activity on 2 than on 6, if one considers the entire year. Six-meter activity tends to peak during the warmer months as this is when long-distance contacts via Sporadic E, or Es,

are more prevalent. The relative frequency of Es openings is another reason why 6 is a better choice for a new vhf'er residing in relatively isolated locations. It may be that no one is on within normal ground-wave range but many QSOs and a lot of fun can be had, nevertheless, via extended-range propagation modes such as Es and aurora. Operation on the higher bands, such as 1-1/4 meters (220 MHz) or 70 cm (420 to 450 MHz), and on the microwave bands would probably best be left until one is well established on 6 or 2 and is familiar with the techniques involved. One aspect which is making operation on 70 cm more interesting for a lot of fellows, however, is the outstanding performance of the Oscar-7 Mode-B transponder which accepts signals on 432.125 to 432.175 and retransmits them back to earth on 2 meters at 145.925 to 145.975 MHz. Also, the recent advent of a commercial transceiver for 70-cm ssb and cw operation, as well as a ready-to-go transmitting mixer, has made operation on this band considerably easier than heretofore.

Attempting to answer the question of fm or other modes is bound to elicit some spirited responses, but here goes. Fm has been a great boon in bringing widespread activity to the vhf bands, very important in these times of challenges to our frequencies. It has also, principally through the use of repeaters, provided us with really good, reliable, local communication which we have sorely needed in times of emergency. In addition, since fm is channelized and the activity is so great, the popular fm frequencies make a fine band-opening warning. On the other hand, the fact that so many stations are operating on only a few frequencies makes for massive pile-ups when the band is open. In addition, it is an engineering fact that fm requires greater signal level to afford communication than do a-m, ssb, and especially cw. Of the voice modes, ssb is probably the most efficient in terms of

the amount of power needed to establish communication with a-m falling somewhere between ssb and fm. Therefore, my advice to the new vhf'er would be to use ssb if he can afford it, but don't give up if he can't. In either case, be prepared with cw when the copy is poor. If your interest, pocketbook or other circumstances dictate the use of fm, by all means use it but do not expect to be able to work DX as consistently as the fellows using the other modes. In any case, an fm receiver parked on a popular frequency is often a great help in spotting band openings.

What about an antenna? The old adage "the bigger and higher, the better" certainly applies but don't give up if your particular situation mitigates against an optimum system. A lot of fun can be had with simple antennas, but consistent workable range and probability of being successful on DX do decrease as antennas become smaller and lower just as they do on any band. Generally speaking, horizontal polarization is used on ssb, a-m and cw, while almost all fm work is accomplished with vertical antennas. It is best to check with the gang in your local area on this, however. Operation with antennas which are cross-polarized to one another can result in severely diminished signal strengths.

The question of power is difficult to answer and controversial. Many say, "Run the legal limit." Others are turned on by using the lowest power that will put out a signal. Indeed, the little 3-watt hand-held transceivers for 6 and 2 are producing good contacts, as are the numerous 10-watt units. In my opinion, somewhere in the 50- to 100-watt output range is a good place to be for the new vhf'er. At this power level, long-haul contacts can frequently be made even when conditions are not particularly good. When conditions are good, essentially full advantage can be taken of opportunity.

Go to it, new vhf'er, and let us know from time to time how you're doing.

LATEST WA6LET MOONBOUNCE TESTS

Vic Frank, WB6KAP, reports that the May 23 EME tests from the SRI 150-foot dish were a big success as far as the 70-cm part of the operation was concerned. All together, 53 stations were worked, in 14 countries and 10 states, 5 of them on ssb. But the most important statistic is that 28 of the stations QSOed had not been worked by WA6LET in prior tests, and undoubtedly most had never worked moonbounce before. Once again, the value of the "big station" in introducing people to the EME ranks proved its worth. Among the new stations (we all hope they will become regulars soon) are WA5MFZ NM, WA6FLS/KL7, VE3ONT and OK1KIR. The sad note was the lack of success on 1-1/4 meters. This was despite the fact that a lot of work went into the set-up prior to the tests. Tropo tests with Los Angeles area 222-MHz

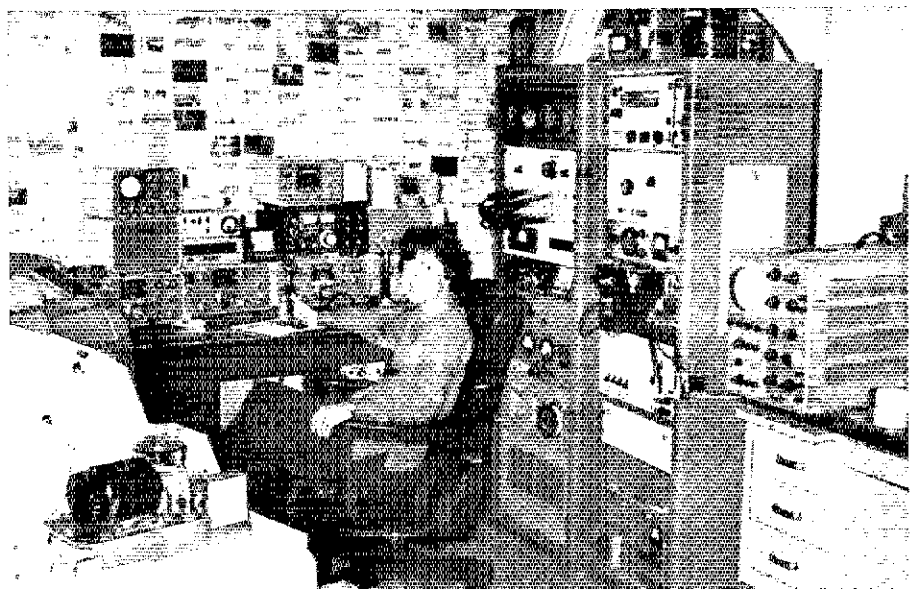
stations with the dish on the horizon indicated that things were working up-to-snuff, but no echoes were heard and no QSOs were made. Vic feels that the feed was probably not optimally illuminating the dish. We can hope for better things next time.

ON THE BANDS

6 Meters - As this is being written in mid-June, the Es season is in full swing and it's hard to find time to pound the mill amongst all the openings. The season started off slowly here but made up for lost time about the first of June. Apparently, things were better in other parts of the country during May. In a contact with W5SEW June 1, Phil said that there had been openings into Amarillo every day for the past three weeks. The WA5IYX-compilation lists significant Es activity on 19 days during May. Pat says that the 29th and 31st were the best days and brought the month's average up considerably. Beginning the 1st of June, the stations-worked reports picked up considerably both in terms of number of QSOs and also with respect to rarity of the station on the other

end. A sampling includes the following: On June 2, WA1OUB worked VP2LAW and on the 6th, Bob added PJ2DW for country number 12. The latter was worked by a number of Florida stations, including AB4OSN and WB4LMQ and also WA1IWK. Yours truly heard and called him but was not so lucky. WB5CHW snagged ZF1XW (alias WB4PXW) on the 8th. Bob made a lot of East Coast fellows happy with QSOs on the 11th. Another station adding spice to the old band in the same part of the world is CO2KK who is on a-m but can copy ssb. From the Pacific Northwest come some tantalizing tidbits in the form of KH6 and KL7 QSOs. WA7RTA OR reports that he, WA7UFS, and WA7ECY worked KH6EQ1 at about 1700 PDT on the 8th. This makes 50 states for WA7RTA and WA7ECY. On June 1, K7ZCB had a QSO with KL7HLE with S9 signals both ways. On June 10, VE7AFL got in touch with KL7IBG. Swaway's 20 watts and apartment QTH in Vancouver are not the best combination for 6-meter DXing but he's having fun anyway. Speaking of low power, the little IC 502 ssb/cw rigs have been showing up on the

*Send reports to Bill Tynan, W3KMV, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.



Mary, WA0CSL, much-sought-after North Dakota 50-MHz contact.

openings with surprising signals for their 3 watts. WA3WUL, Wilmington, DE, has been running one of these rigs into a 40-meter dipole and has worked a lot of stations, including some double hop into New Mexico. Of course it doesn't hurt to be in Delaware! The a-m gang is having its fun, too, although WA9RXX, Alta, IA, is somewhat disappointed that there seem to be fewer a-m signals on than ssb, even during the better openings. How about some of you with 6-meter a-m equipment taking advantage of the good conditions?

2 Meters — Ssb activity is growing by leaps and bounds, thanks to a large extent to the availability of commercial equipment. Then, too, some of the gang are getting their old gear out of moth balls, dusting it off and going back on the band. A few of the new fellows are taking the homebrew approach and are rolling something of their own to join in on the fun. Thus we see how activity begets activity. Here are just a few samples of the 2-meter reports that we have received from various areas. From Clemson, SC, WB4EFZ tells of a local net which meets Monday, Wednesday and Friday evenings at 2215 local time on 145.025. Regulars number about 8 stations so far. A new net, formed originally in the Washington/Baltimore area by K5DZF/4, WB3AME and a few others, finds itself serving a far wider range than at first anticipated. Thus, it has been dubbed "The Mid-Atlantic 2-Meter SSB Activity Net." The group meets at 2100 local time on Wednesday evenings. Frequency is 145.025. By the second meeting, 15 check-ins were present. The SWOT (Sidewinders on Two) has decided that, in the interest of getting memberships at a distance from its Dallas/Fort Worth headquarters, it will admit stations in other areas without the requirement of working two members. Those interested in more information should send an a.s.e. to WSJTA, 1704 Glenn Dr., Fort Worth, TX 76131.

K1FJM/4 is in there looking for tropo contacts from the coastal area of North Carolina with 100 watts and an array at 30 feet. A kW should be on by the time you read this. He asks that stations willing to schedule him write Pete Hines, c/o Coast Guard Air Station, Elizabeth City, NC 27909, or call 919-338-1284. Another station looking for company on 2 meters is WB5MAC/4, Pensacola, FL. Mike runs an Echo II to a 9-element beam at 30 feet and operates around 145.025 about 2100 local time most evenings. Two-meter tropo activity continues on the increase in California according to an OVS report filed by W6DPD of Fresno. Charlie notes that most evenings produce good tropo openings to the Bay Area and down the coast to Los Angeles and San Diego.

VE3DSS says that activity is picking up north of the border, too. Dana urges more

Oscar users to try out their equipment on terrestrial work, as well as chasing the "bird" around the sky. Speaking of activity, how about this tidbit from the *UBA Echo*, the bulletin of the Belgium IARU society. ONSQW has worked 902 different stations in 25 countries on 2 meters using cw and ssb on tropo, m.s. and aurora. We have to go some in order to catch up with those Europeans! Other DX-activity notes include one from KG6IFT on Guam. Bill, whose stateside call is K2IRT, says that he has 500 watts on with a 10-element vertically polarized beam. He monitors the JA/DX calling frequency of 144.1 MHz 24-hours-per-day but has yet to hear anything. He reports that some of the gang on the island are active on Oscar. One who might provide KG6IFT with his first off-Guam 144-MHz contact is JA1VOK. Hatsuo, who is well known for his 6-meter accomplishments, is operational on 2 meters also. He normally operates between 144.09 and 144.3 MHz on cw and ssb.

In the nearby DX department, it is reported in the minutes of the Jamaica Amateur Radio Association meeting held April 14 (passed along by VE3CJ) that 6Y5FB made 10 contacts on 2 meters with stations in Barranquilla, Colombia, on April 13. It was not stated if this was on fm and if repeaters were used. This is an over-water path of about 500 miles. More 2-meter activity in that part of the world would certainly make life interesting. For example, along our own Gulf Coast, WB5OVF, Hattiesburg, MS, reports working KAUGA, Ft. Myers, FL, on fm simplex on May 26.

During the aurora which occurred at the beginning of April, WA7KYZ near Seattle, tells of observing better than 20 dB of noise coming from an aurora cloud. Using his EME array, which boasts a gain of 23 dB, Jerry found that the place from which the noise peaked was not the direction from which the signals were strongest. Only the most southerly 6 degrees of the aurora cloud appeared to be a good reflector.

70 Cm — In addition to the activity centered on the WA6LET tests, 70-cm EME work continued at a healthy pace during May, according to the monthly newsletter put out by K2UYH and VE7BBG. Although Faraday rotation was much in evidence and hampered quite a few skeds, two-ways were completed between LX1DB and K2UYH, W1JAA and W3CCX. 15MSH worked W4ZXI on a CO. After a year of trying, W1JAA and SM5LE made the grade. Other reported QSOs include those between 15MSH and SM5LE, as well as K2UYH and WA7BBM, who had just expanded his antenna to 16 Yagis and was looking for a check.

The Pack Rats' EME DXpedition to HK-land should be getting under way about the time you read this. We will have results of this

ambitious trip as soon as possible. Check "League Lines" for early results. The March column contained a note that I4BER had made an EME contact with SK6AB while using part of the Northern Cross radio telescope at Bologna. The 44-dB gain of the array enabled them to make the grade with RST 559 signals, even though I4BER was running only 100-watts output. Since then, I4BER has worked SM5LE as well. It is hoped that more tests can be scheduled from this fine Italian facility before too long. A new station on 70-cm EME is ON4DY who is using a 20-foot dish with an f/d ratio of 0.6, a K2RIW-type final and a BFR-91 preamp. K2CBA is presently using a 28-foot dish aimed at Greenwich Hour angle (GHA) of 75 degrees. This gives him a 30-minute duration window whenever the moon is at a declination of +16 degrees or higher. Jud will call CQ during times when the moon is within his window. Progress is being made at K2CBA toward getting the 60-foot dish mounted. Plans are to arrange it so that a window of 5 hours can be achieved when the moon is at +20 degrees declination. As the moon goes farther south, the available time will be reduced.

WA4IPI Louisville, KY, reports that he, with the assistance of W4GSH, WB4GZK and WA4JW, is making attempts to get on 70-cm EME. Steve's present set-up consists of 300 watts to 8 K2RIW Yagis, but plans are afoot to go to 16. I am sure that Kentucky will be a welcome addition to the 70-cm EME scene.

23 Cm and Down — On a recent trip to the West Coast, I had the opportunity to visit Paul Shuch, WA6UAM, well known for his work on vhf and higher frequencies and proprietor of Microcomm. It was a real pleasure to meet with Paul and witness the high level of vhf/uhf activity prevalent in the Bay Area. The high spot of the evening for me was participation in a 1296-MHz ssb QSO with K6UOH. Bill's signals sounded as rock-stable as 75 meters and playback of our transmissions via 2 meters displayed the solid signal we had at Bill's QTH, despite the fact that Paul was running only 10 milliwatts output at the time. This demonstration convinced me of the potential of our microwave bands.

Three of the gang in the Richmond, VA area, WB4NTV, WA4CVA and K4MSG, have formed the Virginia Microwave Society. The club's first project will be the construction of 3.3-GHz polyplexer-type rigs. We will be interested in following the progress of this forward-looking group.

70-Cm Standing

Figures are states, call areas and best DX in miles.

K1PXE	19 8	2600	K4IXC	5 2	8
K1HTV	17 5	610	K4COW	4 4	20
W1AJH	16 5	680	W4AWS	4 2	7
W1JAA	17 8	2670	W5RCI	19 6	12
W1SL	11 7	2600	W5ORH	15 5	14
W1MUG*	15 6	740	W5AJG	11 5	14
K3EAV/I	14 6	700	W5LOA	8 1	14
K1BFA	13 5	710	W5LOV	7 2	9
K1JIX	13 5	620	W5GVE	7 3	9
W1FFO	13 5	470	K5LL	6 2	8
W1JTK	11 4	715	K5UEQ	6 2	8
W1HDQ	11 4	380	K5UGM	5 2	9
K2UYH	31 9	10000	W5SKD	5 2	8
K2ACQ	24 8	925	W5HXW	6 4	75
W2AZL	21 7	1000	W6DQJ	4 2	3
K2CBA	20 8	2670	K7ICW	4 2	9
W2BLV	20 6	812	W7JRG	2 4	4
W2CLL	20 6	790	K8UEO	24 8	7
K2HJG	20 0	2600	K8UQA	26 8	65
K2VDK	18 6	750	W8YIO	22 7	6
W2CMS	18 6	725	W8VXV	19 7	6
W2EMB	18 6	720	W8CVQ	13 7	6
W2FGK	17 6	745	W8MNT	13 7	6
K2ARO	17 6	710	W8RQI	10 6	4
W2WV	16 4	710	W8BHG	10 6	4
K2OVS	15 5	734	W8QOB	8 5	5
K2YCO	15 6	675	W8WFF	8 5	4
K2LGJ	14 7	650	W9WCD	22 9	17
W2CNS	14 6	525	K9HMB	21 8	8
K2BFE	12 4	325	W9HUV	19 7	7
W2AEUS	10 4	690	K9UIF	16 7	5
W3RUE	21 7	850	W9JY	15 6	5
K3IUV	18 5	720	W9AAG	15 5	8
W3HMU	16 5	700	K9AAJ	12 5	4
W3TMZ	16 6	2410	W9DRL	24 9	14
W3DMY	11 7	850	K9TLM	23 6	12
W3CJX	10 5	450	W9LER	18 6	10
W3JUG	9 3	400	W9SAH	15 5	13
K4QIF	23 7	1065	W9LCN	13 4	5
W4NUS	22 8	2400	W9Y25	9 4	80
W4EFJ	22 7	945	W9DKW	8 3	3
K4EJQ	20 7	800	VE3PWW	19 7	6
W4HJ2	15 6	560	VE3PWW	12 6	5
K4SUM	15 5	462	VE3ONT*	11 7	7
W4VHH	15 4	750	VE3SAH	9 5	8
K4GL	12 5	720	VE3E2C	7 5	1
K4NTD	9 2	963	VF7BBG	12	

*Club station

Public Service

Conducted By Robert J. Halprin,* WA1WEM

SET Soliloquy, Part II

Space limitations forced us to leave a good deal of the lead material for last month's SET-results article on the cutting room floor. Here are a few of the points that we wanted to expound upon.

Local activity was outstanding — participation was way up and contact with the media and served agencies increased. The important facet of emergency-power-capability also increased. Most of the local activity as well as most emergency gear is on two meters. Simplex and repeaters continue to play the feature role in SET. To provide incentive for even more use of the machines (and room for improvement is there), how about allocating points for each repeater used during SET exercises and bonus points for each repeater that can operate without commercial power?

Low frequency traffic nets sang the blues during SET, as their bondage to the low sunspot cycle took its toll. However, though statistics were down, as compared to last year, more net reports were received this year, representing more states/provinces. It was just that net managers had less to write home about. Keep in mind that moving to two meters or 160 meters whenever possible would prevent these wash-outs. In a soapbox comment (that we didn't have room to use) Western Massachusetts Route Manager WIDVW remarked that conditions were nearly QNP the evening of January 24, but the Western Massachusetts Net did have liaison with three area repeaters.

Long skip handcuffed even some of the higher level National Traffic System nets. The accompanying overload problem caused the NTS "business as usual" (extra or extended sessions at the discretion of the net manager) plan to come under scrutiny. This is what WA1FCM, now section emergency coordinator for Maine, had to say on this subject:

"As usual, there was enough traffic to keep the phone ops busy, too busy in many cases. Apparently DEAN bogged down hopelessly. Too often cw chaps were sitting on their thumbs with little to do even though the cw mode would have been much more efficient at the time . . . One of two things should be done for another year: Either three cycles proposed — cw in the morning, phone in the afternoon, cw in the evening; or cw and phone nets run concurrently in the afternoon and evening (rightly or wrongly, cw here refers to NTSe and phone to NTSd). After all, we used to have several levels of cw nets running concurrently; why should two concurrent cycles be strange? The versatile ops then have a choice of two routes for more efficient handling of their traffic with NTS." Your ideas on this matter would be appreciated.

Several AREC groups around the country reported successful coordination with citizens-band operators during SET. Besides improving local coverage, this apparently resulted in attracting some prospective hams. Emergency coordinators might well consider recruiting among these ranks, for this twofold purpose.

Now on to more mundane matters. First of all there is no such thing as a *Test Routine* message, even though a lot of traffic came through bearing this designation. Routine traffic is routine traffic, no matter what. The text of the message, as well as the use of HXB, will distinguish routine SET traffic from routine traffic unrelated to SET.

Even though the March 15 deadline was well publicized, including being printed on both the EC and net summary sheet, a surprising number of reports came in late. QST is the official record of an event; your report tucked away in a file marked LATE

doesn't really accomplish much. In fact, it contributes nothing to the public service record of amateur radio. And this goes for all activities, whether it be a rundown of your performance during an emergency or a monthly net report. The most meaningful reports are the timely reports.

Unlike previous years, the SET-results article was totally a one-man job. Under the circumstances, the writer will plead *nolo contendere* to any errors contained therein. Our thanks to section emergency coordinators such as WIDGL, WB5FXA, W8MPD and K4KZP who provided a summary of their section's activities, thereby making our job much easier. We'll be waiting for your overall analysis of SET '76 and your suggestions for SET '77. All in all, it appears that more and more amateurs are enjoying the challenge of emergency preparedness.



WA2UPC is shown here operating VE2UN, the McGill University club station in Montreal. The VE2UN group is extremely public-service oriented and WA2UPC himself is a former member of the Transcontinental Corps of NTS. (WA2UPC photo)

PUBLIC SERVICE DIARY

- Antwerp, Belgium — January 3-15. Many dikes collapsed as the result of a severe storm, flooding numerous villages. A Red Cross emergency net was quickly opened using the ONQAN repeater. Approximately fifty amateurs provided communications for the Red Cross, civil defense, police and the army. (ON4ZN)
- Woodstock, New Brunswick — April 3-4. When the St. John River flooded its banks, the Charlton County ARC provided emergency communications through local repeaters VE1PD and VE1KMT. (VE1OC, SCM Mar/NFId)
- Cincinnati, OH — April 25. K4TVI observed a massive auto accident on Interstate 71 in the Cincinnati area. He contacted W8YML/8 who notified authorities. (K4MZE)
- Pima Co., AZ — April. RACES and AREC mobile units provided a message service for a section of suburban Tucson which was without telephone communications for a period of approximately 16 hours. (W7DQS, SCM AZ)
- Birmingham, AL & Vicinity — May 5-28. The Birmingham ARC took part in eleven formal weather emergencies. W4CUE, the

*Communications Assistant, ARRL

BARC club station, acted as NCS for nine of these sessions. Amateurs provided communications on hf and vhf for c.d., Red Cross and the National Weather Service. (WB4CXD)

□ Milford, MI — May 10. While attempting to apprehend three belligerent suspects, off-duty park ranger AB8MWR needed to call for assistance, but found the local police frequencies useless. He then tried two meters. W8SWD relayed the information to state police. (AB8MWR)

□ Louisville, KY — May 13-15. The sixth district AREC activated their weather watch when tornados moved through the area. (WA4AGH, EC 6th District)

□ Portsmouth, VA — May 20. Members of the Hampton Roads Radio Association (WR4ACN) supplied communications for a search for two runaway teenage girls in an area filled with quicksand just south of Norfolk Navy Shipyard. (WA4MMP)

□ Topeka, KS — May 24. WA0FNX used the "Spirit of '76" repeater to report a car on fire at the side of the road. (WB0KDE)

□ Dallas, TX — May 26. During rush hour, a huge tornado struck at the heart of northwest Dallas. Fortunately, Dallas County RACES mobile units operating as part of the SKY-WARN program, spotted the twister over an

hour before it touched ground. Because of this early alert, only minor injuries were suffered, although 124 residences and a children's home were severely damaged. Within minutes after the storm's strike, Northern Texas SEC W5DWL was on site, coordinating search-and-rescue operations for the Dallas County c.d. W5ABY and .52 simplex were utilized to provide liaison between police, fire and street maintenance departments. RACES members also provided vehicles to transport badly needed supplies. (W5DWL, SEC NTex)

□ Tres Ritos, NM — May 30. WSALR, SEC NM, alerted the AREC for a successful search and rescue of two boys lost in the Pecos Wilderness. The Los Alamos and Albuquerque repeaters were used, along with operations on the NM emergency frequency, 3940 kHz. (W5QNR)

□ Fairfax, VA — June 7. W4PVA/mobile witnessed a multiple-injury accident and called it in via the WR4ADZ repeater. Help was on the way in four minutes. (W4PVA)

□ For the month of May, 35 SEC reports were received, showing a total AREC membership of 11,773. Last year at this time, 40 SEC reports were submitted, listing a membership of 14,238. Sections reporting were: Alaska, Alta, Ariz, Ark, Colo, Conn, Del, EBay, ENY, EMass, Ind, Ky, Me, Mich, Miss,

NLI, NC, NFla, NNJ, Ohio, Org, Pac, SDgo, SBar, SCV, Sask, SFla, SNJ, STex, Utah, Va, Wash, WV, WMass, WPa.

NATIONAL TRAFFIC SYSTEM

Special skeds set up by RN6 manager W6INH resulted in the clearing of large amounts of priority traffic from Guam. WB9KTR has been appointed manager of 9RN following the resignation of WB9KPX. DTWN is now meeting at 2230 UTC. The late session of 4RNd has shifted to 7240 kHz; they need more representation from the Georgia section. Certificate qualifiers: 2RN - WA2APV K2TTG K2UYK WB2VRJ WA2WKH WA2ZJP, 2nd annual - W2HVA, 7th annual - WB2VPR; 2RNd - W2PZL WA2TPC WA2ZGR; 3RNd - WA3NDG WA3YJG WA3ZEE; 4RN - WB4ARJ WB4IGX; 4RNd - K4EZH WA4KPK; 8RN - W7KQU/8. WB4EKJ is now at the helm of CAnd.

May Reports

1	2	3	4	5	6
EAN	31	1659	53.5	1.274	97.3
DEAN	61	565	9.2	.526	88.2
CAN	31	1009	32.6	.812	100.0
DCAN	55	139	2.5	.150	81.1
PAN	31	1425	46.0	1.046	99.4
DPAN	46	104	2.2	.435	66.6
CTN	31	259	8.3	.348	98.9
1RN	62	584	9.4	.533	95.9
1RNd	29	94	3.2	.223	64.0
2RN	93	663	7.1	.651	93.5
2RNd	61	255	4.1	.374	78.0
3RN	62	682	11.0	.563	95.6
3RNd	31	199	6.4	.461	97.8
4RN	62	735	11.8	.418	98.7
4RNd	60	181	3.0	.196	49.3
5RN	62	698	11.3	.388	94.4
5RNd	60	851	14.1	.290	96.7
6RN	31	177	5.7	.198	93.5
6RNd	61	398	6.5	.446	91.2
7RN	17	33	2.0	.124	20.6
7RNd	50	277	5.5	.313	74.0
8RN	31	68	2.1	.287	84.9
8RNd	56	379	6.7	.324	77.4
9RN	31	103	3.3	.246	91.1
9RNd	54	302	5.6	.302	59.3
TEN	31	126	4.0	.207	41.5
DTRN	62	402	6.4	.480	93.0
ECN	62	467	7.5	.341	94.2
TWN	22	44	2.0	.091	54.8
TCC					
Eastern	961	595			
Central	891	500			
Pacific	1111	912			
Section2	4124	15391	3.7		
Summary	5500	24642	4.4		
Record	5310	29677	18.4		
1 - NET			4 - AVG.		
2 - SESSIONS			5 - RATE		
3 - TRAFFIC			6 - %REP.		

1TCC functions not counted as net sessions.
2Section and local nets reporting (117): APSN (AB), MTN (MB), OPN (ON), WQV/UHF (PQ), AENB AEND AENJ AENM AENR AENW (AL), ASN (AK), ATEN HARC (AZ), AMB APN ARN OZK (AR), NCN NEN SCN (CA), CN CPN NVTN (CT), DEPN DTN (DE), FAST FMTN GN NFPN QFN SRN TPTN (FL), GSBN (GA), IMN MTN (ID,MT), ILN (IL), TLCN (IA), KPN KWN QKS (KS), KNTN KTN KYN (KY), LAN LRN LSN LTN (LA), PTN SGN (ME), MDCTN MDD (MD), WMN WMPN (MA), MACS MNN M16MN QMN WSBN (MI), MWX MSN MSPN MSSN PAW (MN), MSBN MSN MTN (MS), MON MOSSBN MOSSN PHDN (MO), WNN (NE), BARTEN NJN NJPN NJSN (NJ), SWN (NM), NLI NLS NYPN NYR NYS (NY), CFARS CN CNN GCEN NCSSBN PX SCSSBN THEN (NC,SC), BRTN COAREC-10 OSSBN (OH), OAN OFON OLZ OTWN STN (OK), OSN (OR), EPA EPAEP&TN WPA (PA), TN TPN (TN), TEX TTN (TX), BUN UCN (UT), VSBN VSN (VA), NSN (WA), WVMN WVN WVPN (WV), BWN WIN WNN WSBN (WI).

Transcontinental Corps

W5GHP reports that May was the best month the Central Area has had since the first of the

year, even though conditions were generally bad. TCC-Eastern certificates went to K2HI/VE2 (first time) and WA2DSA, WA2ICB and WA8HGH (all second annuals).

1	2	3	4	5
Eastern	124	91.4	1668	595
Central	93	95.7	1022	500
Pacific	124	89.5	1874	912
Summary	341	92.2	4564	2007
1 - AREA			4 - TRAFFIC	
2 - FUNCTIONS			5 - OUT-OF-NET	
3 - %SUCCESSFUL			TRAFFIC	

The TCC roster (May): Eastern Area (W2FR, Dir.) - W1s NJM QYY, K1s EIR GMW, WA1s MSK WEM, W2s FR GKZ, K2HI/VE2, WA2s DSA ICB PJL UWA, WB2s PYM RKK UBW, W3EML, K3MVO, WA3VBM, W4UQ, K4KPN, W8s LTA PMJ, K8KMQ, WA8HGH, WB8ITT, VE3s GOL SB, Central Area (W5GHP, Dir.) - K4KPI, WB4s DXN SKI, W5s GHP M1 RB UGE UJJ, K5TTC, WA5IQU, W9s CXY DND NXG, WA5EED, WB9NOZ, W9s HH HI INH LCX QMY, K6CVD, WA6TNM, WB6HSP, Pacific Area (K5MAT, Dir.) - W5RE, K5MAT, WB5KSS, W6s BGF EOT MLF TYM VZT, K6s AQ HW, WA6DEI, W7s OZX GHT, K7s IWD NHL QFG, WA7WXY, W8s IW LQ, K6DRL, WA6KKR/7, WB8s DJY HCK QOT, VE7ZK.

Independent Net Reports (May)

1	2	3	4
Central Gulf Coast			
Hurricane	31	54	1906
Clearing House	31	204	468
Hit & Bounce	62	1131	508
Hit & Bounce Slow	19	71	206
IMRA	27	359	992
Milke Farad	26	37	203
North American SSB	26	236	363
Washington Region PON	14	28	216
7290 Traffic	40	277	1683
1 - NET		3 - TRAFFIC	
2 - SESSIONS		4 - CHECK-INS	

Public Service Honor Roll May 1976

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points



This is one of the many hams who provided emergency communications during severe flooding in Belgium. See Public Service Diary. (ON4ZN photo)

in the following nine categories (as reported to their SCM). Please note maximum point for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

763	59	49	WB5EKL
KH61QU	WA3QOZ	W1RWG	WA5JYH
142	WA3YJG	WB2EMU	WB5LBF
KH6CKJ	WA4EPJ	WA3OGM	WA5VQK
84	56	WB4DXN	W6BGF
KH6GQW	WA1FCM	WB4EKJ	WB6CWE
80	WA2DSA	K5TTC	W7LG
KG6JFE	W2MLC	WB6PVH	K7UJV
73	WA2UYK	W6RFF	W9NXG
WA0GLI	WA2VPA	W7GHT	K6EVH
71	WA4ND	K7NHL	VE3DV
K6JZR	WA5YEA	W9MFG	VE3FQZ
WA1UGJ	W6RNL	K9ZTV	VE3GOL
68	WA6KKR/7	K9CVD	VE3SB
WB5KGP	VE3GJG	K8MRI	43
67	K1PAD	W9OTF	W1ERW
WB0HOX	WA2PJL	KL7JDO	W4OGG
KH6BZF	54	VE3DPO	W4WXX
65	WB5NUM	VE3FRG	WB5KPL
WB2RUZ	WA6DEI	48	W6JXK
64	53	WB2GRJ	42
WB2VTT	WB2YKG	WB8NCD	WA3UK
WB5NKD	AA3QIA	47	WA4EUI
63	WA3UXU	VE1AAO	WB5MDI
WA5RKU	WB4TPR	VE4UL	WB5OA
62	WB5PVL	46	WA6LBO
WA4FBI	K5MAT	WA1VMV/3	WB7AJR
W5UGE	WA6TVA	WB3VBM	WB0RW
61	51	WB5FHA	41
WA1MSK	K3YHR	WA6BMV	WA1TBY
W2MTA	WB4OXT	45	WA2AZI
WB2PYM	WA5PRI	WA1MJE	WB2FLN
WB2WRT	WA7MEL	KH6IAC/1	WB2RKL
WB4OBZ	50	VE3GT	WB2VVS
W5GHP	WB2OYV	44	K9TKE
WA5IQU	WB2WKH	W1BVR	WB0OEF
WB5RLR	WB5FMA	WA1UQU	40
WA5ZZA	W5KLV	WA2ZJR	K4YFC
W7OCX	WA5VBM	K3KAJ	W5UJJ
WB0HBM	W7VSE	WA3WPY	WB9KPK
WA0OAG	AA3YKK	K4FLR	
VE3GFN	WB4GHU		

Brass Pounders League May 1976

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and deliveries points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

Winners of BPL Certificates for May Traffic

1	2	3	4	5	6
W3CUL	468	1457	1361	46	333
KH61QU	65	933	865	30	189
W0WYX	51	847	439	408	174
WA1UAX	324	351	339	344	135
K9CPM	0	337	40	481	85
W3VR	251	299	247	10	80
AB0HOX	50	332	308	20	71
WB6PKA	0	310	307	3	62
WA4EPJ	5	277	281	37	60
K6JZR	32	290	253	23	59
WB5NKD	16	245	260	34	55
WA0GLI	1	261	51	236	54
K4TH	25	240	137	132	53
W5TI	7	241	88	190	52
W5DAD	260	0	0	260	52
WA3YJG	131	109	200	67	50

BPL for 100 or more originations-plus-deliveries.

K0YFK	214
WA3ATQ	209
WA5VBM	208
WA4ECY	106

1 - CALL	4 - SENT
2 - ORIG.	5 - DEL.
3 - RECD.	6 - TOTAL

Frequency Measuring Test

May 8 Results

By Ellen White,* W1YL

The second FMT of the year took place amid the usual conditions (of late). In one word — *poor!* In spite of static crashes, poor conditions, the usual apparently deliberate QRM, etc., 137 of the faithful submitted 2,331 measurements, 38 achieving Honor Roll standing. The umpire readings for the early run were: 14081.196, 7092.096 and 3531.194 kHz. The late run measured at 7052.553 and 3535.256 kHz. Right you are, the late 20 reading was impossible — in fact, nonexistent!

The next Frequency Measuring Test is scheduled for September 5, rules in full in this issue ("Operating Events").

Honor Roll

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to Doppler (and other unavoidable factors), we accredit as of equal merit all those reports computing 4/10ths parts per million (or better) accuracy. Please note that a participant must submit a minimum of 2 measurements to qualify for this listing. Again, the following are of equal merit, and are most conveniently shown in an alphabetical listing by call area. K1DQV K2EK WA2VPA W3BFF K3WIK K4BE K4FUP WB4MWC W4NTO W4VWS K5EVK W5FMO W5IJW K5LAZ W5QIV WA5QMI WA5UJW WB6AAL K6BE K6KA W6KT WB6MZW W6OQI W6RQ WA7FBO ex-7HM K7ISL W8CUJ W8HVX W8OK WB8PGK WA8TIC K9EUT W9MNY W9ZTK W0IHI W0MDL Ireland.

Better Than 35 Parts Per Million

(.5) W1PLJ W4RHZ, (.6) WA1MSK, (.7) W1DDO K2JFJ K7EGA, (.8) W3FYK WA4LWO, (.9) WA6VPJ, (1.0) W1FCC/3 WB4KCL/4, (1.2) W4JWG, (1.4) WB2NYK K9WMP, (1.6) W0OO, (1.9) WB2DHG, (2.0) W9HPG, (2.1) WA6MWG, (2.7) W4QN, (2.9) W2IAM, (3.3) K5MUK, (3.6) W6CBX, (4.1) KH6CZ, (4.2) AC3KEK K4MZK, (4.3) W9REC, (4.7) WB2WQA, (5.2) K6EC, (5.4) WB4KCL W8OW Sara Breese, (5.6) WB8STQ, (5.8) K4RTA, (6.0)

W0NEE, (6.1) Dick Bingham, (6.8) Bill Bingham, (7.0) K4QG, (7.3) WA5NOM, (7.9) WA7DUY WN0PTB, (8.0) K3EQ, (8.7) WB8BGY W9PBI, (8.8) W2JDC, (9.0) Andi Bingham, (10.0) K9GSC, (12.8) W6NAL, (13.0) W7JMS, (14.0) W3ZW, (14.1) W5PW W6TAT, (15.7) WB5FMA, (16.1) VE6MJ, (16.5) WB4GIB, (17.3) WA3KOC, (17.5) W3ADE, (17.6) W3KVS, (17.7) WA9ITB, (18.1) K4NE, (18.3) WA7LQV, (18.5) K6ASK, (22.7) W0KL, (25.3) W9IQI, (25.9) W6RNU, (26.6) W3PLI, (28.0) WA6WXH, (28.5) WB6SNQ, (29.3) W0UTT, (32.2) W9TGN, (32.3) K4JQY, (34.1) W6CBF, (34.5) K6QPG.

Better Than 179 Parts Per Million

(36.3) K5DEG, (37.0) W1EEF, (41.7) AB2TFH, (51.3) W9SZR/3, (54.6) W1QV, (56.9) W6JQR, (57.4) W4LGM, (58.7) W2WSS, (59.4) Erik Thoresen, (61.9) E. Sauerman, (72.0) WB8CND, (76.2) W7BUN, (78.2) W5FFW, (95.8) W0OZX, (108.9) K2HXG, (142.3) K4HMD, (155.0) W6SSB.

QRGe

Equipment: R4B and calibrated eyeballs. — W9SZR/3. I'd like to see an article on this kind of activity (hear this, you Honor Roll types!). Also, is it possible to have more of these contests? — W6JQR. [Anything is possible but the degree of activity doesn't presage an increase. — Ed.] This was a real test of my equipment. I forgot about the FMT until about an hour beforehand so the BC221 had almost no warmup! — W0OZX. [Sidelight: Dave's report written on the stationery of Hamline University! Ed.] Excellent signal on 80 during the early run and much QRN on 80 during the late run. I guess summer is near. — K2JFJ. Measurements made on a 75S-1 receiver by measuring the frequency difference between the signal and receiver calibrator, with the external 400-Hz zero beat signal, on a homemade counter reading out to the nearest 10 Hz. — WB2DHG. Poor propagation and heavy QRM took their toll. — K6EC. For this test I used my new digital phase locked loop VFO with the least significant thumb wheel switch

changing the frequency in 50-Hz steps. Therefore, I feel I can measure frequencies ± 25 Hz plus the stability of the reference crystal which is a highly stable 3.2768 MHz unit. — K3EQ. Measurements were made with a drifting BC-221F. Calibration for 7 MHz was achieved through the use of the 68th subharmonic of 15 MHz and the 59th subharmonic of 13 MHz. These are both above and below the unknown 7-MHz transmission, as related by the 32nd harmonic at 220.388 kHz. The 3.5-MHz run was measured similarly, except that calibration was achieved from the 95th subharmonic of 21 MHz and the 86 subharmonic of 19 MHz, related to the unknown by the 16th harmonic of 220.952 kHz. For this method of measurement, the frequency meter is operating in the low frequency mode. — W3ZW. A lot of tuner-uppers were heard when the test first started, but when the time for measuring commenced they were not a problem. — WB5FMA. Two days prior to the test the counter time base was checked against a Tracor rubidium standard and found to be 1.7 Hz high. The HW-101 carrier oscillators were checked to see how much should be subtracted from the measured frequency to compensate for zero beating the carrier; the difference was found to be 983.5 Hz. Since the audio circuits have about a 200-Hz cutoff on the low end I connected the scope to the product detector output where I could see the difference frequency down to a few Hz. This was only effective when the detected signal was about 3 dB above the noise. The actual measurements were made by zero beating W1AW and then switching the rig to the Antenna and keying the TX with very low power. The TX frequency was measured over two ten-second gates of the counter to 0.1-Hz resolution, then switched back to the antenna and the receiver zero beat again and the process repeated. — WB4GIB. My first crack at an FMT. — WA3KOC. I'm painfully aware of the weaknesses of the BC-221, however, and am reminded that I simply must complete the digital counter I've under construction! — W0KL. Used my own designed counter, hope it works! — W6RNU. [Q57]

*Deputy Communications Manager, ARRL.

Results, 29th ARRL VHF Sweepstakes

Happy New Year!

By Jim Cain,* WA9AUM

Next January will mark the 30th anniversary of ARRL's VHF Sweepstakes contest; the 1976 version (held January 3 and 4) will be a tough one to top. 640 participants reported activity this year, up about ten percent from the past few.

When we printed the all-time VHF SS division record holder listing two years ago, we didn't figure it would be outdated so soon; two records were broken last year . . . WA6JUD/6 (Pacific Division single-op) and W4BFB/4 (Roanoke Division multi-op). This year, though, we're printing the entire box, because *twelve* records were broken, seven multi and five single operator.

First impression might be that most of the records, many holdovers from the sunspot days of '58 and '59, are now being broken by virtue of gobs of 2-meter fm contacts. For the most part,

that just isn't true. Take WA1NGR, for example. Ron now holds all three New England Division records, in the SS and both June and September QSO Parties. His band breakdown of contacts is 6 meters (229), 2 meters (140), 220 MHz (9) and 432 MHz (7), for a contact total of 385. W1HDQ's 1958 record (which lasted fully 18 years) of 297 contacts was made up of a not dissimilar percentage of contacts on 6 and 2. Only difference was in 1958 the 144-MHz contacts were on a-m instead of fm!

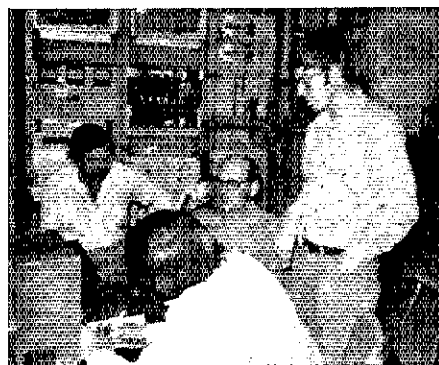
Performances like WA6JUD's (another new Pacific record) do, of course, have to depend more on 2-meter fm, since lack of propagation on 6 kept section multipliers down somewhat. Carl's farthest contact was with Nebraska, and there are a lot of multipliers east of that.

The 1976 VHF SS proved something else, too: the activity is pretty much self-sustaining. In our struggle to get the January *QST* into print in its historic

new size, we inadvertently left out the vhf rules from the December issue. To compound matters, by the time the error was discovered it was too late to squeeze the full rules into January. Wouldn't have done much good, anyhow, since the contest was the first weekend of January and we all know the problems with *QST* and the postal "service." We *are* trying to save some space by boiling all contest rules down some, but not as much as we had to boil them down to fit a tiny space in the "World Above" column in January *QST*. That activity was *up* this year and log returns were healthy says something both for the contest and for the participants themselves. It was an "experiment" we don't intend to try again, though!

Although the VHF SS has always followed, to some extent, the format of the November Sweepstakes, feeling have been running high that a change over to rules more befitting vhf is

*Asst. Communications Mgr., ARRL

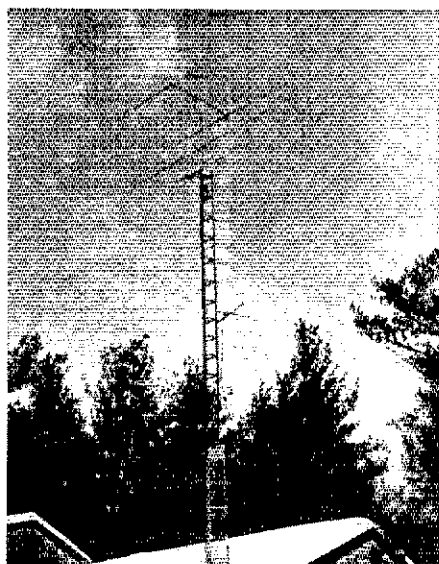
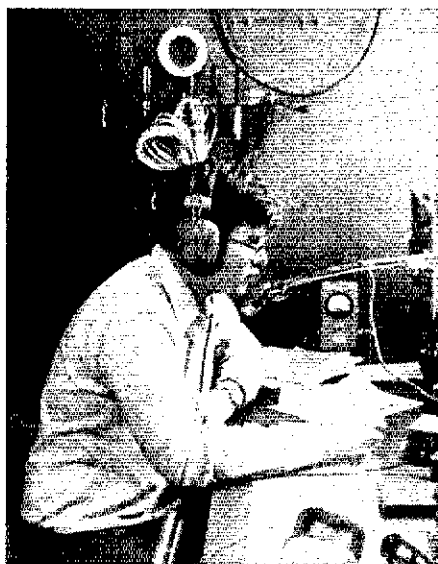
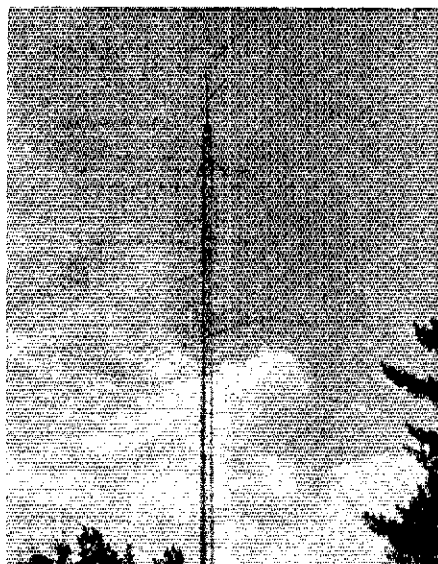


Vhf contesting from Nebraska involves much time waiting for 6 meters to open; here half of the WA0TRO/0 group does just that. Visible in back is some of the Channel 3 TV gear on-site (they borrowed the site, not the gear!).

Affiliated Club Scores

CLUB-SCORE-ENTRIES-WINNER

Mt. Airy VHF Radio Club Inc. (PACKRATS) (Pa.)	538,085	70	W3HQT
Rochester VHF Group (N.Y.)	369,973	139	K2YCO
South Jersey Radio Association	179,584	35	W2BV
Potomac Area VHF Society (Va.)	68,625	14	WA3NZL
Mobile Sixers Radio Club (Pa.)	65,281	25	WB3ELF
Northern California Contest Club	44,384	3	WA6JUD/6
Suburban Amateur Radio Club Inc (Pa.)	43,664	10	WA3NVO
Hampden County Amateur Radio Assn. (Mass.)	42,771	10	K1ZGB
West Jersey Radio Amateurs	41,924	18	W2FPY
Dutchess County VHF Society (N.Y.)	26,988	8	W2AWX
York Radio Club (Ill.)	24,778	16	WA9NRI
6 Meter Club of Chicago	20,746	10	WA9FIH
Central Michigan Amateur Radio Club	17,836	5	WB8E1Y
Dayton Amateur Radio Assn. (Ohio)	16,085	7	WA8BOB
Associated Mountain Toppers (Calif.)	14,168	3	K6YNB
Rancocas Valley Amateur Assn. (N.J.)	7762	4	WB2PZF
RCA Amateur Radio Club (Ind.)	6900	4	AB9CEP
Department of State Amateur Radio Club (D.C.)	6558	5	AA1FEO/3
Gloucester County Amateur Radio Club (N.J.)	5604	4	WB2FJE
Greater Pittsburgh VHF Society Inc. (Pa.)	5248	4	AC3BWU
Southern California VHF Radio Club	5180	4	WB6IMV



This is Tom, W1FMF himself, operating 6; his crew put together a new New England Division multi-operator record. The antennas on the left are stacked 6-element Yagis on 6 and an 8-element Yagi and 20-

element collinear for 2. On the right are, top to bottom, 144, 220, 432 and 144 MHz Yagis.

overdue. Consequently, the ARRL Contest Advisory Committee, under the vhf leadership of K6YNB, is investigating several possible changes. Two of them involve the VHF SS in particular and one will affect the QSO Parties as well. We invite you to read the following discussion and then write to the CAC, via ARRL headquarters, expressing your opinions. If enough response is received quickly, the changes may take effect on a trial basis in January, 1977.

The first proposal is to change the SS exchange to (1) number, (2) signal report, and (3) ARRL section. This would eliminate the power designator (precedence) and would replace the year first licensed (check) with a signal report. The power indicator is anachronistic when applied to vhf these days, and the check would be replaced by a much

Top Ten

SINGLE

W3HQT	41,400
K8LEE	41,080
WA1NGR	33,100
WA3AXV	31,450
K3MWV	31,239
W3ZD	27,000
WA6JUD/6	23,868
WB2OTK	23,460
W2BV	22,540
K3EOD	22,100

MULTI

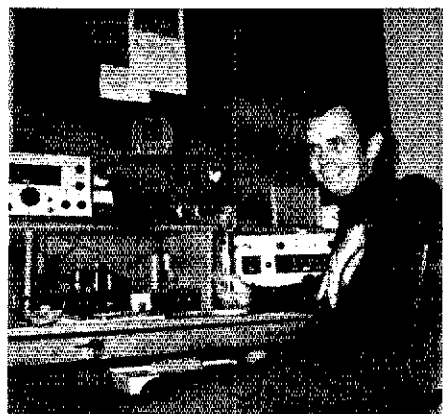
K2OWR	65,562
WB8IGY	60,320
W1FMF	46,440
W8CCI	41,440
WA2SNA/2	39,235
W3KKN	38,304
K3DUA	26,208
W2FCL/2	21,980
W4BFB/4	21,880
W2PAU	21,545

more meaningful signal report.

The other VHF SS proposed change is to allow multipliers *per band*, not just once. This is to encourage activity on

more bands (see WIRU's editorial in June *QST*) among other things. Yes, such a change would make comparisons with past VHF Sweepstakes meaningless, and yes, such a change would make comparisons between populous and nonpopulous parts of the country also meaningless. But . . . it would add spice to the activity, and comparisons between widely separated parts of the U.S. have always meant little, if anything, regardless of the contest format and even regardless of whether the contest is hf or vhf. The competition is sectional and divisional, *not* national.

The third trial change is already in effect . . . the new rule regarding channelized fm contacts. It has been tried in the June QSO Party and will be tried again in the September event. The CAC will welcome your comments on



Number-two man in Michigan, WA8EUU, emphasizes this shot was taken *before* the VHF SS.

All-Time Division Leaders

SINGLE OPERATOR

CALL	SCORE	YEAR	DIVISION
W3MFY	52,910	68	Atlantic
K9HMB	20,746	73	Central
WA0CSL/0	8190	76	Dakota
K5HUW	9680	60	Delta
K8LEE	41,080	76	Great Lakes
K2OWR	32,830	72	Hudson
K9ECV/0	12,690	68	Midwest
WA1NGR	33,110	76	New England
K7AAD	7650	58	Northwestern
WA6JUD/6	23,868	76	Pacific
WA4GPM	15,456	76	Roanoke
K7UFO	5320	68	Rocky Mountain
W4GDS	26,400	73	Southeastern
K6YNB	12,300	70	Southwestern
K5TKR	13,640	60	West Gulf
VE3ZZZ	12,896	72	Canadian

MULTIOPERATOR

CALL	SCORE	YEAR
W3KKN	38,304	76
K9DZK	26,520	68
WB0PIV	3640	76
WB4HEL/4	8880	73
WB8IGY	60,320	76
K2OWR	65,562	76
K0VUY	14,196	76
W1FMF	46,440	76
K7BBO/7	5642	63
K6TJL/6	13,248	61
W4BFB/4	21,880	76
WA0PHZ/0	8062	68
W4TOE	6042	61
W6FNE/6	20,352	63
K5STI	12,804	59
VE3ASO	7800	74

San Francisco WA6BMV/6 4500-150- 5-AB	W8YOK/B(WA8s TMP WOQ YUZ WB8OTA) 5328-111-14-ABD	W8BHW/8s ZUQ KMH AJZ WB8s ILW RDD 7540-145-16-AB	K9DK1 352- 16- 1-B W9HPG 308- 14- 1-B W9KUC 288- 13- 1-B AA9NEJ 264- 12- 1-B K9ONA/M 264- 11- 2-B WA9FHM/9 176- 8- 1-B WB9HJM 154- 7- 1-B WB9ODF/9 22- 1- 1-B AD9YHB/9(WA9s EJD TMC K7RBM WB9s QMM GXB) 630-158- 8-AB K9ONA(K9ZWM K9ZVW) 792- 36- 1-ABCD	Iowa K9MST 5520- 92-20-AB	Minnesota WA8SBZ 4402- 71-21-AB WB9PIV(+K1WVE/Q) 3640- 91-10-AB	
San Joaquin Valley W6YKM/6 6040-151-10-ABCD K830W/6 1350- 37-15-A W6DPD 168- 5- 4-AB	Ohio K8LEE 41,080-316-55-ABD WASCLN 12,760-169-30-AB K8GQB 9940-142-25-A WB8AMI 5472-114-14-AB WABSTX 3944-116- 7-AB W8SQX 3484- 67-16-A WABBOB 3020- 76-10-AB WBKPT 2704-104- 3-B WB8RV 172- 41-11-A WABHPY 1407- 34-11-A WABTLZ 1384- 31-12-AB WABKUR 1152- 48- 2-B WB8STQ 1122- 51- 1-B WABZHE 1008- 42- 2-B K8UQA 900- 30- 5-ABCD WB8QXF 826- 32- 4-AB AA8TYE 812- 29- 4-A WABRQK 806- 31- 3-AB WBKSE 648- 27- 2-B WB8JRN 544- 17- 6-A WB8PW 506- 23- 1-B WABJL 444- 19- 2-B AB8ILW 432- 18- 2-B WB8UAF 286- 11- 3-AB K8DEN 264- 12- 1-B K8XKD 190- 9- 1-B WB8QV 22- 1- 1-B WB8IGY(+WA8NJR WA8ONQ) 60,320-580-42-AB W8CC(W8ULC W8TCR WA8s LVJ WXT WQC QMH TVF WB8s EEX CLE GEX) 41,400-460-35-AB	West Virginia WB8HAX 3952- 76-16-AB	Illinois K9HDE 17,589-222-31-AB AA9FEF 9568-150-22-AB WA9FIH 7728-184-11-ABD W9KOR 2740- 82-25-AB WA9NRI 6412-123-12-AB WA8RIJ 5400-135-10-AB WA8LEF 4136- 94-12-AB W9RVG 3458- 91- 3-AB W9YF 3040- 30- 2-AB AD9GHR 2866-119- 2-ABC WB9NHV 2760- 94- 5-B AD9DTB 2736- 76- 8-AB WB8JZ 2592- 81- 6-B WABCIJ 2240- 56-10-AB W9JVC 2160- 90- 2-B K9ZWM 2088- 87- 2-ABCD K9ZVW 2088- 87- 2-ABCD W9MLL 1900- 50- 9-AB W9G 1760- 85- 6-B K9YJQ 1560- 65- 2-B K9ENZ/m 1224- 51- 2-AB W9MTS 1120- 35- 6-B W8GUE 968- 44- 1-B W9IVI 864- 36- 2-B WB9MAI 748- 34- 1-B W8AVE 396- 18- 1-B W9QKE 356- 18- 3-B	Indiana W9NFE 7992-111-26-A K9UJ 7595-123-21-ABD WA9PKL 2889- 56-17-AB AB9CEP 1617- 39-11-AB K9DZS 1156- 34- 7-AB AD9ZNK 896- 32- 4-B WA2JM/9 242- 11- 1-B AC9CGI(+WA9SHF) 4887- 91-17-AB	Missouri WA8TXV 3900- 75-16-ABD WABNS 868- 31- 4-AB K9VUY(+WA8s UYJITZ WB8HDI K9CRA WB9CLN) 14,196-169-32-AB	Nebraska K8BL 2430- 45-17-AB WABMRH 2241- 41-17-A WB8s ORA CBJ CLP WN8s OUU OWZ) 3922- 53-27-AB
Arizona K9DKW/7 7099-116-21-AB W7KMW 1980- 45-12-AB W7IRC 1480- 37-10-AB	Oregon WA7BJU 4080-120- 7-AB K7ZCH 572- 22- 3-AB W7ECY 364- 14- 3-AB	Washington W7KFS 1540- 55- 4-AB	Michigan WB8EIJ 7047-122-19-AB WABEUJ 5589-104-17-AB AB8TY 312- 69-14-AB W8QK 660- 30- 1-B K8AJC 462- 21- 1-AB WABABN(+K8VKT) 6359-103-21-AB	Wisconsin WB9FZU 3462- 65-17-A W9KGG 1239- 30-11-AB K9OXY 660- 22- 5-AB	North Dakota WABCSL/8 8190-105-29-AB	
8						
Michigan WB8EIJ 7047-122-19-AB WABEUJ 5589-104-17-AB AB8TY 312- 69-14-AB W8QK 660- 30- 1-B K8AJC 462- 21- 1-AB WABABN(+K8VKT) 6359-103-21-AB				Check Logs WA1PRU, W1BDM, WA3UDS/3, K4LJQ, W1KGL, W1ALL/M, K9ZWM, K9ZWM/M, K9YJQ/M, KH6J.		

how well it is working out. A couple of problem areas have already been uncovered, and will be dealt with in a revised rule. Additional comments from contesters will also be taken into account before any "final" rule is written.

Club Competition

Look at the scores from eastern Pennsylvania and it's easy to guess that the Pack Rats won again. They, along with the Rochester VHF Group, deserve special recognition this year for their concerted efforts to "get out the word" about the VHF SS, after our previously mentioned QST bungle. Thanks, people.

We hate that word "people," but it sounds better than "persons."

Rochester, under the leadership of W2ECH, has the answer for getting the troops out. Ed sends ARRL log sheets to all members, with his name and address at the bottom. Club members return their logs to him, he makes up the club list, then sends the whole package in. There are so many WNY scores within a few contacts of each other because every club member worked every other club member (more or less). The only reason we can think of offhand for the Pack Rats' performance each year is that they're like a steam roller: Impossible to stop. **[QST]**

Division Leaders

SINGLE OP	DIVISION	MULTIOP
W3HQT	Atlantic	W3KKN*
K9HDE	Central	AD9YHB/9
WA0CSL/Q*	Dakota	WB0PIV*
WA5UUD	Delta	—
K8LEE*	Great Lakes	WB8IGY*
WB2OTK	Hudson	K2OWR*
K0MST	Midwest	K0VUY*
WA1NGR*	New England	W1FMF*
WA7BJU	Northwestern	—
WA6JUD/6*	Pacific	WA6VEF
WA4GPM*	Roanoke	W4FB/4*
WA8GUB/0	Rocky Mtn.	—
AB4OSN	Southeastern	—
K9DKW/7	Southwestern	WB6RIV
WB5NCN	West Gulf	—
VE2DFO	Canadian	—

*New Record

Strays

□ There is still nearly a half a year remaining to qualify for the Massachusetts Bicentennial Award, issued for contact with Massachusetts amateurs during the calendar years 1975-76.

Each contact is worth two points, with stations in cities and towns of historical interest or bearing the name of a Revolutionary-era personage worth four points. Massachusetts amateurs need 200 points, and the rest of the U.S. needs 100. DX (including KH6 and KL7) and vhf outside the first U.S. call area need 50 points. Additional rules: Contacts through repeaters are acceptable, but stations may be worked only once (twice if one is mobile). QSL cards are not required. Only log data, including station worked, time, date, band and mode and city or town, are necessary. Indicate points claimed for each contact.

There is no charge for the certificates, but the applicant must provide sufficient postage on a self-addressed envelope. Applications should be submitted to William Holliday, WA1EZA, 22 Trudy Terrace, Canton, MA 02021.

□ The Moorestown Amateur Astronomy Association is sponsoring a New Jersey Bicentennial Award for contacting amateurs in New Jersey. Applicants should send a G.C.R. list and one dollar to Moorestown Amateur Astronomy Association, c/o Gene Bond, WB2UVB, 15 East Camden Ave., Moorestown, NJ 08057.

When applied for with the award, AOM/B endorsements are free; otherwise they cost ten cents apiece, plus a s.a.s.e.

AMATEURS PARTICIPATE IN IEEE ELECTRO-76 TECHNICAL SESSION

□ The IEEE ELECTRO-76 Professional Program at Boston for May of 1976 was complemented by an all-amateur presentation, Session 20. The event marked the third such contribution by amateurs to the IEEE annual program. Previous sessions were given at IEEE INTERCON in New York City.

This year's amateur program was entitled, "Trends in Communications

Equipment Design." Session 20 placed 8th in the 34 sessions, respective to attendance. Some 300 attendees were noted at the peak period of the amateur program.

Session organizer and moderator was Doug DeMaw, W1CER. The program was opened and closed by New England ARRL Director Sullivan, W1HHR. Excellent papers were given by Hayward, W7ZOL, Sevik, W2FMI, McMullen, W1SL, and Reisert, W1JAA. Special thanks go to John Golembeski, K2EOB, of Bell Labs. His help and encouragement as vice chairman of the ELECTRO-76 professional program committee aided in getting our session accepted.

An interesting variation adopted for this year's IEEE conclave was the display of antique radio equipment. The ARRL was honored to be among the displays. Our booth was dutifully attended by Chuck Watts, WA6GVC, of the ARRL hq. staff. We are looking forward to bidding for session acceptance in 1977. The IEEE convention will be held in New York City. Late word indicates that Boston and New York will be the future sites for the IEEE shows on a yearly alternating basis. — W1CER

VHF-QSO Party

Request your log sheets (38 QSOs per sheet) now for the September QSO Party. Please note the mailing deadline for entries of October 4. Good Luck! — *WA1STN*

Rules

1) The 1976 September VHF QSO Party begins at 1900 UTC, Saturday, September 11, and ends at 0600 UTC, Monday, September 13. Entrants may operate no more than 28 out of the 35 hours. The seven hours of off-time must be taken in increments of 30 minutes or more. Listening time counts as operating time. All contacts must be made on amateur bands above 50 MHz using authorized modes of emission.

2) Name-of-section exchanges must be acknowledged by both operators before either may claim contact point(s). A one-way exchange does not count.

3) Fixed, portable or mobile operation under one call, from one location only, is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC).

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e. able to communicate over at least a mile).

Contacts made by retransmitting either or both stations do not count for contest purposes. When using fm, only simplex operation with both stations transmitting and receiving within 15 kHz of each other is permitted. *No frequency normally used as either the input or output of a repeater within 150 miles may be used for contest contacts, even if the repeater is turned off at the time.* The 15-kHz frequency conformity requirement does not apply above 1200 MHz.

4) Scoring: 1 point for completed two-way exchanges on 50 or 144 MHz; 2 points for such exchanges on 220 or 420 MHz; 3 points for such exchanges on the higher uhf bands. The sum of these points will be multiplied by the number of different ARRL sections worked per band. Crossband work does not count. Aircraft mobile stations cannot be counted for section multipliers.

5) Foreign entries: All contacts with foreign countries count for score. All foreign countries are grouped together, and a multiplier of no more than one

per band may be claimed for contacts with all foreign stations worked. Foreign stations may only work stations in ARRL sections for contest credit and will give their country name.

6) A contact per band may be counted for each station worked. Example: W2EIF (SNJ) works K1YON (Conn) on 50, 144 and 220 MHz for complete exchanges. This gives W2EIF 4 points (1 - 1 - 2) and also 3 section multiplier credits. (If W2EIF contacts other Connecticut stations on these bands, they do not add to his section multiplier but they do pay off in additional contact points.)

7) Each section multiplier requires a complete exchange with at least one station. The same section can provide another multiplier point only when contacted on a new vhf band.

8) Awards: Entries must be posted marked no later than October 4, 1976. A certificate will be awarded to the high-scoring single-operator station in each ARRL section. In addition, the high-scoring multi-operator station will receive a certificate in each section from which three or more valid multiple operator entries are received.

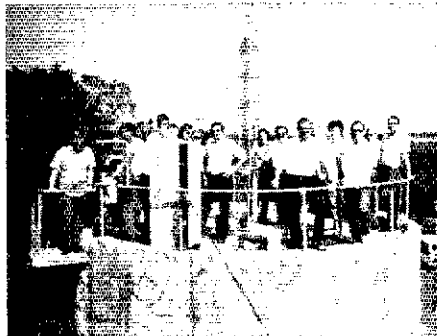
9) Disqualifications: See January 1976, *QST*, p. 73.

QST

Strays



W6BVG, right, who has been sightless from birth, examines a model of Amsat/Oscar 8 built by K6PGX, left, who spoke on "Hams in Space" at the May meeting of the South Pasadena Amateur Radio Club (SPARC).



The Texas Intercity Relay System planning and engineering group inspects the antenna and repeater atop a water tower at the ranch of WA5JEC near Blanco, TX. This repeater automatically links San Antonio with Austin.



From the left: Jack Mason, W5NSQ, chairman, VRAC; Bob Wolters, W5TPF, chief, TIRS engineering group; Joe Jarrett, K5FOG president, Texas VHF FM Society.

Operating News

Conducted by George Hart, *W1NJM

What is Field Day?

Did you go out? If you didn't, you missed a basic and unique amateur radio activity. Shame on you! You mean to say you let trivial matters like graduation, weddings (even your own), vacations, family commitments, Dominion Day, or just plain old-age infirmities keep you from it? Tch, tch!

This is being written prior to the event, to be read after the event, but before it is written up in *QST*. This sort of straddles the fence between anticipation and regret. Right now we feel mostly the former; no doubt by the time this appears, many of us who went out will be wondering why — again. But never mind, by next spring we'll be champing at the bit again!

What, you may well ask, is so great about leaving your comfortable home to go out to some unaccustomed (godforsaken?) spot with a big load of radio gear to hassle getting it set up, to sweat, to wrestle with Mr. Murphy, to get drenched by the inevitable rain, to get eaten alive by mosquitoes or black flies or other sanguinary insect life, to lose sleep, eat hamburger and beans, get filthy dirty — only, after 24 or 27 hours of this misery, to pull it all down, pile it back in the car or cars and wearily wend homeward, where it still has all to be unloaded and restored to its usual status until *next* time the madness strikes. What's so great about that? Why should we do it?

Well, the answers to those questions aren't easy to rattle off: We are a pretty spoiled society, used to hot and cold running water, inside plumbing, unlimited electric power, extra heat or extra cool on demand, color TV, soft beds, etc. Maybe this is one of the answers — to effect a change, just for a short time, all the better to appreciate and not take for granted all the luxuries we enjoy.

But there is more than one answer to the question "why?" and they pretty much revolve around individual motivations, of which there are a great many. The glory of FD as an amateur radio operating exercise is that it has enough features to attract so many different kinds of people and get them all together to do the same thing for so many different reasons. So let's discuss a few of them and see if we can do some rationalizing. Just what is Field Day, anyway?

1) An emergency-preparedness exercise. The original FD was designated as "a test of portables." In those days (1930s) portable operation was rare, because equipment was a bit more bulky than it is today, so a rig that could be readily carried about and was self-contained was a novelty and usually of very low power. Although the value of such a rig in

an emergency situation was obvious, the novelty of it and the challenge of using it under field conditions was an even greater consideration. Not until the second or third FD was emergency communication, as such, mentioned. It is obvious that emergency preparedness is a desirable primary objective of FD, but just as obvious that if this were the *only* objective we wouldn't get half the turnout we now get. So, while emergency preparedness is basic, there are many other aspects of FD that attract participants.

2) A contest. It certainly is one of the most competitive activities the League sponsors. In many particulars, of course, contest objectives and emergency preparedness objectives don't coincide, and many have been the conflicts in rulemaking resulting from this. The Contest Advisory Committee submitted most of the rules recommendations, and naturally these rules reflected and emphasized contest aspects. The Emergency Communications Advisory Committee is now also contributing. Yes, FD is a contest, no doubt about it. But *only* a contest?

3) No, it's also a summer picnic. Maybe this was not in the original intention, but many groups go out on FD at least partially for this reason. Yes, the kiddies come along, and often the not-too-little ones can be useful. The wives do the cooking, so the OMs can string antennas, set up and tinker with rigs, heave the generator, etc. You say some of the gals do these things too? Okay, okay....

4) A group effort. Most of our activities are on an individual basis. For many years, FD was about the only group competitive activity we had. It has been so popular that group competitions are getting more important in other contests as well, but none of them has the multiple appeal of FD. Clubs can test the effectiveness of their organization as against other clubs, and special-purpose groups can set up specifically for the purpose on a one-for-all all-for-one basis.

5) But most of all, we think FD is a challenge to amateur ingenuity, inventiveness and determination in just about any amateur radio field of interest. Are you technically inclined? You can be a valuable addition to any FD group whether you are a good operator or not, because there are many unique technical problems to be solved that you don't come across in daily amateur pursuits. Space-minded? A special bonus is provided for Oscar contacts. RTTY? Contacts count same as any other, and what fun setting up for it under field conditions! QRPP? A special class available for QRPPers to compete

with others of the same ilk.

Then there are the many special features, some of which are a "pain in the neck" to some operators, a source of additional challenge to others. How about, for example, the no-commercial-power bonus? In addition to foregoing commercial power for receivers and transmitters, you forego it *altogether* at the FD site, truly simulating a power failure. If, in addition, you go into the battery ten-watt class, you won't even have generator power and will have to use gas or oil lamps or candles for lighting. How about the no-setting-up bonus of three hours operating? Organize your FD so that you don't start setting up until the starting whistle blows and you get up to 27 hours to operate instead of 24. How long does it take to get your FD operation in full swing? Some groups start setting up days in advance, operate only 24 hours. Well-organized groups can get set up from scratch in less than an hour, have the benefit of more operating time.

Yes, Field Day is the event of the year in the ARRL Operating Calendar. If you didn't go out this year, be sure not to miss it next year. You don't have to belong to or join a club. Get an "invite" or organize your own group. You don't have to win. Just be out there, be on the air, let the public see you and hear you in action. You'll be proud to be able to say, "Sure I was out. Weren't you?" It's all part of the fun and glory of being a ham.



HAL Communications Corp. recently donated a DS-3000 KSR video display terminal to W1AW. In addition to use as part of the W1AW teletype position, the new gear will see extensive use in the preparation of code practice and cw and RTTY bulletin tapes. Here W1WPR, chief operator at W1AW, uses the DS-3000 to make up and edit an official bulletin tape.

W1AW OPERATING SCHEDULE

Operating-visiting hours are Monday through Friday 1 P.M. to 1 A.M., Saturday 7 P.M. to 1 A.M. and Sunday 3 P.M. to 11 P.M. (all local Eastern time). The station address is 225 Main

St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street details and the general contact schedule are available upon request. All frequencies shown are approximate. If you wish to operate, you must have your original operator's license with you. Please note that the station will be closed Sept. 6. *Staff:* Chief Operator/ARRL

Asst. Communications Mgr. C. R. Bender, W1WPR; Alan Bloom, WA3JSU; Chris Schenck, WB2SEZ.

Code Practice

Approximate frequencies: 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz.

For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references. Details on Qualifying Runs appear monthly in *QST* Operating News. The 0130Z practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period.

Speeds	EDST	UTC
5-7 1/2-10-13-20-25		
	9 A.M. MWF	1300Z MWF
	9:30 P.M. TThSSu	0130Z MWFS
10-13-15	4 P.M. M-F	2000Z M-F
	7:30 P.M. Dy	2330Z Dy
35-30-25-20-15		
	9:30 P.M. MWF	0130Z TThS
	9 A.M. TTh	1300Z TTh

To improve your fist by sending in step with WIAW (but not over the air!) and to allow checking the accuracy of your copy on certain tapes, note the UTC dates and QST text to be sent in the 0130Z practice from the June issue of *QST*.

8/9 It Seems to Us 8/24 Public Service
8/12 Correspondence 8/27 World Above
8/18 League Lines 8/30 YL News

Bulletins

Columns indicate times in EDST-PDST-UTC(Z).

Phone Bulletins (1.82 3.99 7.29 14.29 21.39 28.59 50.19 145.588 MHz):

2100 Dy	1800 Dy	0100Z Dy
2330 M-S	2030 M-S	0330Z T-Su

CW Bulletins at 18 wpm (1.805 3.58 7.08 14.08 21.08 28.08 50.08 145.588 MHz):

1630 M-F	1330 M-F	2030Z M-F
2000 Dy	1700 Dy	0000Z Dy

CW Bulletins at 10 wpm (same frequencies as above):

0000 M-S	2100 M-S	0400Z T-Su
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RTTY Bulletins at 170-Hz shift are repeated at 850-Hz shift when time permits (3.625 7.095 14.095 21.095 28.095 MHz):

1730 M-F	1430 M-F	2130Z M-F
2300 M-S	2000 M-S	0300Z T-Su

Oscar Bulletins (18 wpm on cw frequencies):

0840 M-F	0540 M-F	1240Z M-F
1400 M-F	1100 M-F	1800Z M-F
1600 Su	1300 Su	2000Z Su

Oscar RTTY:

1700 Su	1400 Su	2100Z Su
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In a communications emergency monitor WIAW for special bulletins as follows (times in UTC):

Phone: On the hour.
RTTY: At 15 minutes past the hour.
CW: On the half hour.

NEW A-I OPERATORS

K1ALP K2GT W4GOG W4VDH W4ZEB
W8WAK W9CMT W9DLF W9ENU W9HUF
W9OAD K9RPZ DK5TI DL3MQ.

SCM ELECTION NOTICE

To all ARRL members in the sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the section concerned are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to receipt of petition at Headquarters. Petitions must be received on

or before 4:30 P.M. Eastern local time on the closing date specified. In cases where no valid nominating petitions were received in response to previous notices, the closing date was set ahead to the dates given herewith. The complete name, address, zip code of the candidate and signers should be included with the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order. The following nominating form is suggested. (Signers should be sure to give city, street address and zip code.)
Communications Manager, ARRL

(Place and date)
225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office.

You are urged to take the initiative and file nominating petitions immediately.
George Hart, WINJM
Communications Manager

SECTION CLOSING DATE
CURRENT SCM PRESENT TERM ENDS

WY* 8/20/76
J. P. Ernst, W7VB 6/26/76

*Repeat solicitations

SCM ELECTION RESULTS

Valid petitions nominating a single candidate were filed by members in the following sections completing their elections in accordance with applicable rules, each term of office starting on the date given.

Orange	W. E. Heitritter, WB6AKR	9/12/76
Que.	L. P. Dobby, VE2YU	6/1/76
Sask.	P. A. Crosthwaite, VE5RP	6/22/76

Operating Events

AUGUST

5: West Coast Qualifying Run, W6OWP prime, W6ZRI alternate, 10-35 wpm at 0400Z (Universal Coordinated Time, abbreviated UTC, Z used as a designator), on approximately 3590/7090 kHz. This is 2100 PDST the night of August 4. Please note that dates are always shown at least two months in advance and times are always the same local "clock time," i.e., 9 P.M. local Pacific time. Underline one minute of the highest speed copied, certify copy made without aid, and send to ARRL for grading. Please include your full name, call (if any) and complete mailing address. A legal-size stamped addressed envelope (s.a.s.e.) will help to expedite your award.

6-12: N6V Operation, p. 87 July.

7-8: CP Contest, YO DX Contest, Ten-Ten Net Summer QSO Party, p. 87 July.

13: WIAW Qualifying Run, 10-35 wpm at 0130 UTC transmitted simultaneously on 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. This is 2130 EDST (9:30 P.M. local Eastern time) the night of August 12. Underline one minute of the top speed you copied, certify copy made without aid (type-writers OK), and send to ARRL for grading. Please include your full name, call (if any)

and complete mailing address. A large s.a.s.e. will help to expedite your award/endorsements.

14-15: European DX Contest cw, p. 87 July.

21-22: SARTG Worldwide RTTY Contest, p. 88 July. SEANET Contest, sponsored by the Organization of Amateur Radio Indonesia (ORARI), celebrating the 31st anniversary of Indonesian Independence Day and the Nov. 14 SEANET Convention in Jakarta. The contest will be held the full 48-hour UTC period starting at 0001Z Aug. 21, ending 2359Z Aug. 22; phone or cw (no crossmode or mixed mode permitted), 160 through 10 meters. Classifications are single band single operator, multiband single operator, multiband multioperator. Transmit a report plus serial starting with 001. Contacts between stations in your own country do not count. Stations outside SEANET count points as follows: 10 points for each contact on 160 and 20 points with each YB station, 5 points for each contact on 80/40 and 10 points for each YB, 2 points for each QSO on 20/15/10 and 4 points with each YB. Count 3 points for each country multiplier. Final score equals sum of QSO points times the sum of the country multipliers. Usual log format. Send entries to reach the sponsor by Oct. 30: SEANET Committee, Ismail Razak "Eshee"

9M2FK, 281C, Jalan Pekeliling, Bukit Glugor Penang, Malaysia.

21-23: New Jersey QSO Party, p. 88 July.

28-29: All-Asian DX Contest cw, Arizona QSO Party, p. 88 July. Kentucky QSO Party sponsored by the Bluegrass Amateur Radio Club, from 0000Z Aug. 28 through 2359Z Aug. 29. KY stations send RS(T), county and consecutive QSO no., other stations substitute state, country or province for county. Score point per QSO. Multipliers for KY stations are states, counties, provinces worked. Non-KY stations use KY counties for multiplier. A final multiplier of 1.5 for inputs of 250 watts or less. You may work a station once on cw and once on another mode; 6- and 2-meter operation on simplex only. Suggested frequencies are the lower edges of the General class hf and phone bands, also Novice frequencies. Send logs by Oct. 1 to: Robert H. van Oute WB4YQ, 285 Hillsboro Ave., Lexington, KY 40505. Awards.

31-Sept. 15: N6V Operation, p. 87 and 88 July.

SEPTEMBER

4-5: Savaria C.C.S. Contest (HA), sponsored by the Claudius FC of Hungary, on 1500-2300Z Sep. 4, hf 0000-1400Z Sep. 5. Open to all, 80-10 cw, 144 and 432 cw and phone. Call CQ CCS. Exchange report plus QSO no. starting with 001. Three points per QSO with an hf station, a mult. of one for each of the 10 HA call areas. Score for each band will be the no. of mults. times no. of points; for all-band score use the sum of mults. for all bands. Usual log info. (separate logs for separate bands), include declaration. Categories: Single op. all band, single o single band, multiop. all band (club stations

this last category). Awards. Logs must be postmarked by Nov. 30 and sent to the Claudius RC, 9701 Szombathely, P.O. Box 145, Hungary.

4-6: Four-Land QSO Party, sponsored by the Fourth Call District AR Assn. The same station may be worked on each band and/or mode fixed, and repeated again if operated portable or mobile, and from each different county. Stations within the 4th call area may work each other, 4s count 1 point for W/VE QSOs, 3 points for DX (including KH6/KL7). Final score computed by multiplying total points times states and provinces. States and provinces count once only. All others score 2 points for each QSO times the total of 4th district states and 4th district counties. Count each state and county once only. Suggested frequencies: Cw 3575 7060 14060 21090 28090 (plus/minus 10 kHz), phone 3940 7260 14340 21360, Novice 3710 7110 21110 28110 (plus/minus 10 kHz). Awards. Mail logs within 30 days to Bob Knapp, W4QMW, 105 Dupont Circle, Greenville, NC 27834 (please enclose an s.a.s.e. for results).

5: Frequency Measuring Test, open to all, begins with a callup at 0130 and 0430 UTC September 5. (Remember, this is the evening before - local time!) The periods for measurement start at 0137 (20 meters), 0145 (40 meters), and 0153 (80 meters); for the late run, 0437, 0445 and 0453, respectively. Each measuring period lasts five minutes. Submit your averages for each 5-minute period which will be compared with the umpire's averages during the same period. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are: 14,070, 7050 and 3548 kHz; late-run frequencies 14,080 7060 and 3540 kHz. Your report must be received by September 16 to qualify for the December QST report of the competition. WIAW will start transmitting the official results in a special bulletin September 17. LZ DX Contest, the full 24-hour period, UTC. Look for LZ 3520-3750, 7010-7090, 14020-14300, 21020-21300, 28020-28500 kHz. Call CQ LZ, cw and ssb. Send report plus serial starting with 001. LZs will send a report plus a two-digit number signifying their administrative district. Phone and cw are separate, categories: Single op., multiop. (both individual and club stations), SWLs. Each contact with one's own continent earns one point, with another continent 3 points. Contacts with LZs earn 6 points for non-EUs. Contact a station only once per band, no crossband or crossmode contacts. Multipliers are 1 plus the no. of LZ administrative districts worked on all bands. Maximum multiplier: 28 districts X 5 bands = 140 plus 1 = 141. Awards. Logs by mid-October to BFRA (Bulgarian Federal of Radio Amateurs), Box 830, Sofia, Bulgaria.

8: West Coast Qualifying Run (+ 40 wpm!). 11-12: VHF QSO Party, rules this issue. WAE Contest, phone, p. 87 July. Washington State QSO Party, sponsored by the Boeing Employees' Amateur Radio Society, 11th annual, starts 1600Z Sept. 11 and ends 2400Z Sept. 12, open to all. All bands and modes may be used, stations may be worked once each band and mode for contacts points and more than once if they are additional multipliers. WA stations score 1 point per QSO (including other Washington stations). All others score 2 points for each contact with a Washington station. WA stations multiply contact points by the total of different states, VE provinces and other countries worked. All others use total of different WA counties worked (maximum of 39). There will be an extra multiplier of one for each group of 8 contacts with the same WA county for all non-WA stations. Send RST, QSO no., and county (for WA); others send state, province or country. Suggested freqs.: Cw 1805 3560 7060 14060 21060 28160, phone 1815 3935 7260 14310 21380 28660, Novice 3735 7125 21150 28160. Usual complete logs with declaration. S.a.s.e. not required. Postmark entries by Oct. 11, and send to Boeing Employees' Amateur Radio Society, c/o Contest Committee, Willis D. Propst, K7RSB, 18415 38th Avenue South, Seattle, WA 98188. CLARA DAY Contest, sponsored by the Canadian Ladies' Amateur Radio Assn., 1800Z Sept. 11 to 1800Z Sept. 12; 80-40-20-15. Suggested phone freqs. 14160 14280 21300 7200 3775 3900; cw 14035 21035 7035 3690. Exchange report plus QTH and name. Each station maybe worked just twice, either once on cw and once on phone or on 2 different bands. Non-CLARA members score one point for each CLARA member worked, 3 points for each bonus station worked; multiplied by the total of VE call areas, e.g., 40 stations worked, 3 bonus stations each worked on 2 different bands plus 40 plus 18 times 6 or 348 points. CLARA members score 1 point per QSO. Bonus stations are VE1AMB VE2JZ VE3COH VE4ST VE5HO VE6BDA VE7JB. Send full log and summary promptly to Marjorie Karl, VE6LC, Box 191, Foremost, Alberta T0K 0X0, Canada. Pennsylvania QSO Party, sponsored by the Nittany Amateur Radio Club from 1600Z Sept. 11 to 0500Z Sept. 12 and 1300-2400Z Sept. 12. Transmit usual QSO no., and RS(T) plus county (for PA) or ARRL section. Suggested freqs.: Phone 1815 3980 7280 14315 21380 28560, cw 1810 3550 7050 14050 21050 28050, Novice 3715 7160 21115 28115. PA stations score 3 points per out-of-state QSO, 1 point for PA. Multiply by no. of ARRL sections (including E. Pa. and W. Pa.). One mult. may be counted for DX QSOs, only 1 regardless of the no. of different stations/countries worked. Non-PA stations score 1 point per QSO times the no. of PA counties worked. Stations may be worked once on each cw and once on each phone band. Usual log, info., soapbox, summary, etc. Mail by Oct. 15 and send to Douglas R. Maddox, W3HDH, 1187 S. Garner St., State College, PA 16801 (do not include s.a.s.e.).

14: WIAW Qualifying Run.

16-18: YLRL "Howdy Days," starts 1800Z Sept. 16, ends 1800Z Sept. 18, only contacts between women operators permitted; all bands/modes. No crossband operation. Net contacts do not count. Only one contact with each station. Score 2 points for each YLRL member worked and one point for each non-YLRL operator worked. No multipliers. Logs must be received by October 18. Send to: Beth Newlin, W4FFG, 826 W. Prince Rd. - 06, Tucson, AZ 85705.

18-19: Scandinavian Activity Contest cw, (SAC), from 1400Z Sept. 18 through 1800Z Sept. 19 (phone a week later). Call CQ SAC on cw, call CQ Scandinavia on phone; Scandinavians will call CQ test; 80-40-20-15-10-meter operation. Non-Scandinavians will try to work as many Scandinavian stations as possible. The same station may be worked once on each band during the contest. No crossmode QSOs permitted. Prefixes to look for: LA JW JX OH OHØ (Market Reef) OHØ (Åland Islands) OX OY OZ and SM/SK/SL. Classes: Single op, multiop, single transmitter and multioperator multitransmitter. Club stations are multioperator.

Multi-mults must use a separate series of serial numbers for each band. Transmit report plus serial starting with 001. One point for each complete QSO. Maximum of 10 multipliers per band per prefixes noted. Final score is the sum of complete contacts multiplied by the sum of multipliers (only multiband competition). Awards. Usual complete logs with declaration. Report promptly to the SSA Contest Mgr., SMØDJZ, Box 3036, S-195 03 Maersta, Sweden.

20: High Speed Code Test. Semi-annual code test, sponsored by the Connecticut Wireless Assn., starts 0115 UTC Mon. Sept. 20 (note, this is Sun. Sept. 19 if you are using local time!) with WINJM doing the honors on 3636 and 7085 kHz, and hopefully K6DYX on 3690 and 7025 kHz. Copy important instructions starting at 0130. Transmission as follows: 60 wpm at 0150; 55 wpm at 0200; 50 wpm at 0210; 45 wpm at 0220; 40 wpm at 0230 UTC. Plain English text, copy any one minute without error of any five-minute transmission for certifications. Copy to WINJM, 66 Highland St., Newington, CT 06111, by Sept. 30. Send s.a.s.e., no other charge. Good luck!

25-26: SAC phone, see Sept. 18-19 listing.

25-27: Delta QSO Party, 7th annual, sponsored by the Delta Division of ARRL; open to all from 2000Z Sept. 25 to 0200Z Sept. 27; no time or power restrictions. Amateurs outside of the Delta Division will attempt to contact as many Delta amateurs as possible (Arkansas, Louisiana, Mississippi and Tennessee comprise the Delta Division). Delta amateurs work stations in and outside of the division. Exchange RST and QSO no., plus QTH (ARRL section for non-Delta amateurs; county/state for Delta amateurs). Usual log info. Stations may be worked on each band and mode. Portables and mobiles may be reworked on the same band/mode if they change counties. Suggested frequencies: Cw 3550 7050 15050 21050 28050, ssb 3990 7290 14290 21390 28590, Novice 3725 7125 21125 28125. Scoring: Delta division, no. of QSOs times no. of ARRL sections (max. 75); non-Delta division multiply no. of QSOs times no. of counties worked (maximum of 316). DX stations may be worked but they do not count as multipliers. Any station disrupting a working Delta traffic net or whose log exhibits obvious irregularities will be disqualified from award consideration. Call CQ Test or CQ Delta on cw, CQ Delta on phone. Logs must be postmarked by Oct. 21 and sent to: Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, MS 39180.

OCTOBER

2-3: VK/ZL/Oceania Jubilee DX Contest, phone.

3: ATV Contest by the Tu-Boro RC.

7: West Coast Qualifying Run.

9-10: VK/ZL/Oceania Jubilee DX Contest, cw. RSGB 21/28 MHz Contest.

13: WIAW Qualifying Run.

13-14: WAE RTTY Contest.

16-17: Scouts Jamboree-on-the-Air. RSGB 7 MHz Contest.

17-18: Manitoba QSO Party.

19-20: YL-AP, cw.

25: WIAW Special Qualifying Run.

30: CQ World Wide Contest, phone.

Nov. 6-7: SS, cw.

Nov. 20-21: SS, phone.

Nov. 27-28: CQ WW, cw.

Strays

Amateur radio's many facets were on display recently at a hobby exposition in Massapequa, NY. Members of the LIMARC ATV technical group gave an on-the-air demonstra-

tion of amateur television two-way transmission between W2WLS/2 and W2NIP. Color TV transmissions, a complete solid-state ATV transmitter developed by W2TRP, slow-scan

TV, repeater operation, and a setup of a precision radio-controlled boat built by WB2AQM, rounded out the diverse field of exhibits. Outside, from a mobile van, WB2AMX and K2REC manned an Oscar demonstration. The cooperative efforts of many local amateurs and other radio groups combined with LIMARC to make the show a successful, well-attended affair.

me do a good job for you. Congrats to new hams Don Beaulieu and WN2CIG. Also WA2EHZ General Class first try. WA2YOB passed his Advanced Class exam. W2OGZ has a new 2M rig. K2KA moved and worked 10 countries at his new location. W2ZLJ's antenna shorts. W2SD retires from RCA and plans to move to FL. W2EA also retired from RCA and plans to hike west. WN2DWX has TVI trouble. W2MX worked 20 countries Field Day. W2EKB and 20 Cherry Hill hams are helping the police with their 2-meter fm net. WA2JWL has WAS No. 78. W2EGH eyeball QSO'd W4FRF. W2IL bought a new Transverter. 40 to 80 hams have a month 11:30 luncheon 4th Wed. of month at Kenney's Suburban on rte 70 and all are welcome. The Old Barney Radio Club heard an interesting talk by Dr. Nichols on shock at their meeting. Pine Barrens Radio Club new officers are WA2YNT, pres.; WN2DQD, vice-pres.; W2LFX, secy.; K2AXQ, treas.; WN2DPS, act. mgr. Gloucester County Radio Club's W2TDS reports a program wherein WB2BZY and WB2TRS will introduce you to the wonders of facsimile. PSHR: WA2AZU 41. Traffic: WA2AZU 40, WB2LCC 34, W2FPY 6.

WESTERN NEW YORK: SCM, Joseph M. Hood, K2YAH - Asst. SCM: W. D. Thompson, W2MTA. SEC: WB2EOT. Rochester Hamfest was a big success with more than five thousand attending despite poor weather. WB2NSD named Amateur of the Year for his untiring efforts as instructor at RaRa code and theory classes. W2TUK made the presentation to WB2NSD at the hamfest. Also over 150 passed various examinations given at the Hamfest by K3CT of the Philadelphia FCC office who did his usual outstanding job. The exam effort was coordinated by W2BLU. W2EWO renewed as Tioga County EC. Welcome to WN2EVD who's first QSO was with 1 watt with WN4IUK. WA2SFT has a new TA-33 as well as a new QVA appointment. Congratulations to WA2ECC and WA2ZJP on passing their Advanced as well as their new ORS appointments. W2TFL demonstrated his new accu-keyer for the Walton ARA. New RAGS officers for next year: WA2LUF, pres.; WB2FTC, vice-pres.; WN2WBT, 2nd vice-pres.; WA2PUU, secy.; WB2NCK, treas. W2RQF continues his good work as QO. WA2QMN going to Scotland with US Navy in early July. ARAT's was active for FD at W2SEX/2 with WB2QZC coordinating the effort. W2VCI WN2CJL WB2QCK WB2UWH are new ARAT's directors. WB2UYI moving to Dallas. Congrats to RaRa High School seniors WB2HDI and WA2DRG; WB2HDI accepted at the US Coast Guard Academy and WA2DRG, valedictorian of his class, was accepted at MIT. W2VVC is working on methods to reduce ssb voice bandwidths by a factor of 3 or 4 to one and is interested in talking with anyone with experience in this area. AWA Museum in East Bloomfield has a new display of TV camera tubes and an exhibition of telephone equipment celebrating the 100th anniversary of the telephone. Hours 2-5 Sun and 7-9 Wed. Admission free. Large groups contact K2WW W2QY or W2ICE. GRAM held their annual dinner meeting in Batavia June 19. Thanks to them for their invitation to speak at their meeting. Pleased to be getting all the info from clubs and stations outside the Rochester area. Don want the column to become overburdened with local news and your reports assure this won't happen. Keep them coming. Some stations are sending traffic reports too late for inclusion. Please mail them in time to get them here before the 8th of the month. Local stations receiving reports off the air are requested to hold them for telephone delivery until the 8th of the month. Traffic: WA2YUK 284, W2MTA 203, WB2VND 191, W2RUR 143, W2QOE 123, W2PZL 56, WB2VND 46, WA2TPC 43, W2ZFZ 36, WB2QIX 33, WA2ZJP 33, W2RUT 31, W2RQF 26, WA2AIV 25, W2HYM 19.

WESTERN PENNSYLVANIA: SCM, Donald J. Mystowski, K3CHD. SEC: W3ZUH. Asst. SEC: K3SMB WA3LJW. RMs: W2KAT/3 W3NEM W3LOS W3KUN. Net kHz Time/Days
WPA CW Traffic 3585.0 7:00 PM Dy
Pa. Phone 3960.0 9:00 PM M-F
WPA RACES 3960.5 9:00 AM Su
New appointments: W3BAGB and WB3AGB QBSS. The annual WPA picnic will be held at Cook's Forest on Sept. 12. Contact W2KAT/3 or myself for details. It is with deep regret to announce the Silent Key of K3YDD. K3LVO took first place for WPA in the VT QSO Party. WA3JIP has moved to FL and is now WA4OKY. The Foxthills ARC had a fine Hamfest Radio display at the Great Lakes Mall. W3TEN upgraded to General Class along with WA3PSL and WA3WOY to Extra Class. Get well wishes for K3MQW. The Crawford Amateur Radio Society awarded the Distinguished Member Award to WN3ZCA. W3GSI has erected a new beam. W3HDI is back in the area after a stint with the Bicentennial Wagon Train. The WPA CW Traffic Net had 33 sessions and handled 131 messages with 337 QNI. W3SN had perfect QNI for May. PSHR credits WA3VBM 46. Traffic: W2KAT/3 260, WA3VBM 237, K3MIY 83, WA3AHP 36, K3SMB 33, W3KUN 31, W3SAY 29, WA3SWF 21, K3CHD 16, WA3ZAO 16, W3SN 14, W3EGJ 13, W3UT 10, W3IDO 8, K3VQV 8, W3YD 7.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN - Asst. SCM: Harry J. Studer, W9RYU. SEC: W9AES. PAM: WA9KFK. RM: K9ZTV. Cook County EC: W9HPG. Net Freq. GMT Days Tfc
ILN 3690 2330/0300 Dy 216
Ill Phone 3915 2245 Dy 161
NCNP 3915 1200/1700 M-S 171
IEN 3940 1400 Su No report
W9HPG, W9PRN and W4KFC received awards at the Starved Rock Radio Club's repeater dedication ceremonies. K9UIY was appointed to succeed W9LT on the ARRL Contest Advisory Committee. WN9TNL WN9TNN WN9TNN WN9TNN WN9TPQ WN9TPR and WN9TPS are new Novice graduates from the Wheaton Community Radio Amateurs club. K9ZAV and W9NXG passed their Extra Class exams. K9DPA is the proud father of a new baby boy. A new memorial net in honor of Dan Hoover, W9VEY meets on Sat. evenings at 3915 immediately following the North Central Phone Net. WB9KUP's new QTH is Schaumburg. The Knox County Amateur Radio Club is a new club in the area with 20 members. WB9AJZ W9BKIO and W9ZPL are the newly elected officers of the Radio Amateur Megacycle Society (RAMS) of Chicago. The Northwest Amateur Radio Club's officers for the coming season are WB9EBZ, WA9YQP, WB9NFH and W9NMO. Radio Expo '76 will be held on Sept. 18 and 19 at the Lake County Fairgrounds at Grayslake, IL. The Sangamon Valley Radio Club will sponsor their first Hamfest at the New Berlin fairgrounds on Sun. Sept. 26. WB9RWL is the permanent net control station for the

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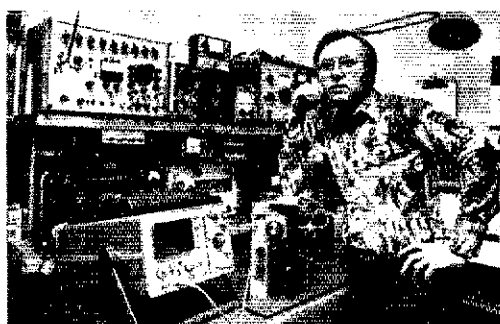
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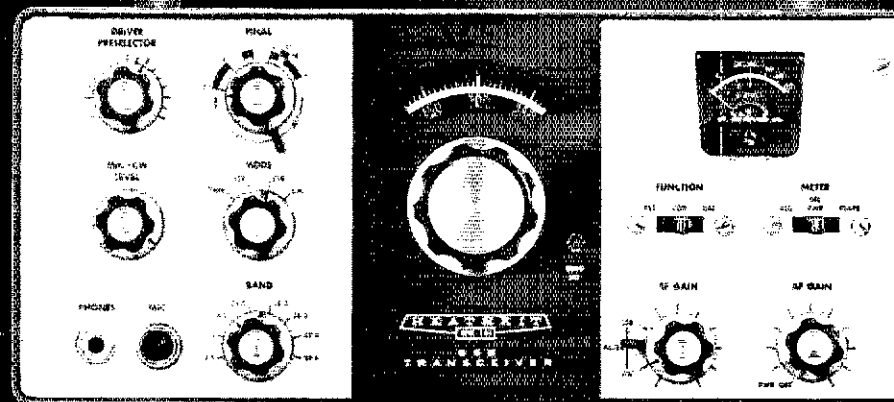
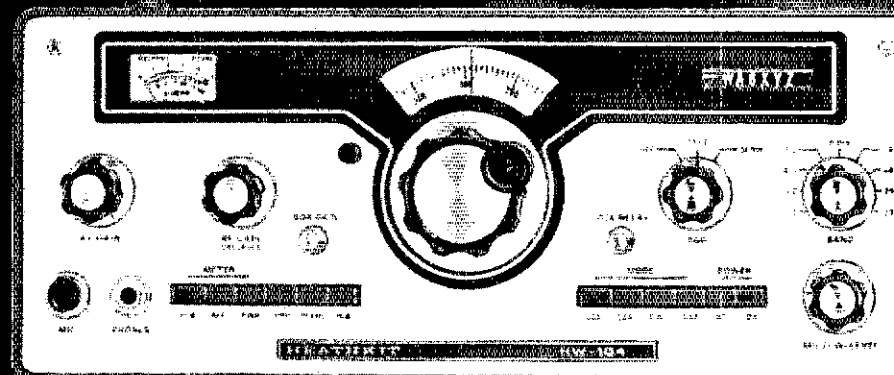
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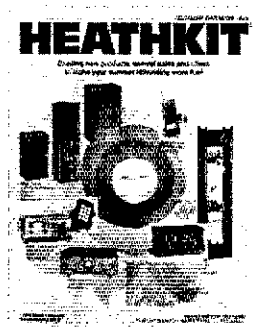
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CFMC Information net, and he invites everyone to check in on the first Wed. night of each month at 8:00 PM over WR9ABY, 146.16/76. The Lamoine Emergency Amateur Radio Club's (Macomb) call letters just received are WB9TEA. K9MWA reports that the traffic count for May for the Independent 20-meter Interstate Sideband net was 215. Traffic: W9NKG 314, W9HOT 180, WB9TWT 85, W9NUP 153, K9ZTV 149, WA9VGV 88, WA9KFK 90, W9JXV 59, WA9JJE 60, K9KHI 60, W9LNQ 56, WB9NOZ 53, WB9SNA 48, WA9AQN 46, AB9DED 26, W9KR 23, W9OVL 22, W9PRN 22, K9WMP 6, WB9NIO 2.

INDIANA: SCM, M. P. Hunter, WA9EED - SEC: W9UMH. I received a note from W9EJ/YB who says he is still trying to obtain a license. He also reports that it is difficult to hear QIN from YB. K9SJJ played host to PY8ZAI during the latter's visit to Indpls. QIN reports an all time record QNI of 635 for May. W9NTHY reports he has discovered the fun of traffic and wishes other Novices would give it a try. AA9UXP is now on 2-meter ssb with a YS700A. Many groups are reporting Field Day preparations are reaching a peak including W9KTP crew which operated from the water tower at Dunes Park. W9JU reports a large influx of CB on ten meters - several other locations reporting the same thing. (Notify your local intruder watch station WB9CH reports that Lake Co. AREC now has 43 active members. Station activity reports are on the rise. Glad to see them and thanks to each for your help. Look for WB9NJA to show soon from his new assignment in KH6. AD4WAH continues to show with WB9IHH at the Kay. Nets: QIN 249; Hoos. VHF 10; ITN 421. Traffic: W9IOH 253, WA9TJS 195, W9QLW 159, WB9KTR 148, WB9WV 120, K9DCY 112, WB9SUM 111, WB9IHR 103, W9HUF 100, WB9FOT 95, K9TKE 76, W9LTU 75, W9GGW 74, W9UEM 70, WA9QCF 60, AB9MDS 56, WB9OMX 45, WB9NAQ 36, WB9SKA 33, WA9OLM 32, WA9OKK 28, W9KRT 27, W9KWB 22, WA9OHX 22, W9PMT 21, WB9DIX 18, K9RZ 17, K9YBM 16, WA9BVS 16, K9FZX 16, WB9HCH 16, W9DLC 15, K9HMC 13, W9NQE 12, W9DKP 11, W9ENU 11, W9CMT 9, WB9KGR 8, W9FWH 8, WB9HGS 5, K9QJY 5, K9RGF 5, W9NTHY 4, W9DZC 3, W9LE 3, K9LZN 3, K9WWJ 3, AA9UXP 2, W9BDP 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI - SEC: K9PKQ. PAMS: W9AYK WA9LRW K9UTQ. RMs: WB9ICH W9MFG K9KSA K9LGU. Nets, Freq. TimeZ QNI, QTC, Mgr. BWN, 3985, 1145Z M-S, 501, 388, W9AYK; BEN 3985, 1700Z Dy; 667, 95, (Apr.) 690, 140 (May); WA9LRW, WNN 375, Dy, 77, 36, WB9ICH; W9BN 3985, 2330Z Dy, 1084, 216, K9UTQ; WINE, 3662Z Dy, 233, 140, W9MFG; WIN-L, 3662, 0300Z Dy, 227, 139, K9LGU; W9N 3662, 2330Z M-W-F, summer vacation, K9KSA. WI EXPO net, 3925, 1701Z M-F, 586, 32, WA9NIX. W9MMP/9 managed BEN for month of May. W9BN BEN BWN. W9NTHY, wife of W9NTHY, passed General. Mancorad club 30 years old. W9GL 76 years young in July Mancorad club Banquet was well attended. WB9RRV EC Marinette Co. K9DID putting up TH6DX. K9DAF needs 15 states for 5BWAS. I regret to report W9BKD and WB9CWL Silent Keys. FARC Hamfest well attended. Mark May 21, 1977, on your calendar for next years Hamfest. OPS to WB9RRV. N9ITU licensed to K9GSC made just over 1000 QSOs during ITU week, 50 countries, 46 states over 70 US prefixes not counting special prefixes. New Novice in Grafton W9NUIJ. WA9IVI moving to Logan UT. K9CPM made BPL. New ham in Baraboo W9UIP. New Novices Stevens Point W9UIU. W9NUIP, W9NUIK, W9KPKX, hams, hams, hams. WI participated in Bike-A-Thon for handicapped, hams provided 2-meter communications. K9CPM W9ZGQ received PSA from National Weather Service, congrats. Midwest Novice Net meets 2130Z, will go back to 2230Z when time changes. Oshkosh ARC officers (W9ZHI, pres.; WA9GUS, vice-pres.; W9JIF, secy.; WB9JSW, treas.) will give advice classes. Madison Swapfest Sun. Sept. 19. WINE cert. to W9SFL. Traffic: (May) K9CPM 558, W9SFL 229, WB9KPK 187, K9MZO 163, W9PVE 134, W9NDN 126, WB9ICH 120, K9FHI 79, K9LGU 77, W9AYK 68, W9MFG 67, W9IEM 61, K9JPS 48, WB9JSW 47, WB9NME 40, W9AGV 40, W9GQT 36, W9IHW 29, WB9RRV 25, WB9HLS 24, W9N9WZ 24, WB9TSH 21, WB9LKG 20, K9ANV 15, W9SHL 15, WB9PYG 13, W9ZBD 11, W9CFS 10, W9BIDU 7, W9YTT 7, (Apr.) W9YT 15.

DAKOTA DIVISION

MINNESOTA: SCM, Frank Leppa, K0XZE - SEC: WA9OFZ. PAMS: K0ZBI WA9GLI WA9YVT AB9HOX. RMs: K9CVD WB9OAG WB9OFQ. The 76 Dakota Division Convention is officially Oct. 1, 2 and 3 at the St. Paul Civic Center. The St. Paul club sees this is to be the best MN convention ever. Write W9MGI for an application flyer. FCC exams will be given at the convention but examinees must file Form 610 in advance with the FCC in St. Paul. Exams will be written Fri. Oct. 1 at 3 PM. Novices can take code and written exams the same day. The Mankato ARC has 24 people enrolled in novice and upgrading classes. The American Assn. of Retired People of MN is sponsoring with amateurs. Local AARP chapter presidents are Bloomington WB9MKI, Edina WB9NZZ, Richfield; K0ZZR, plus W9NZT and W9QXL AARP members. Thanks go to K9RYU, retiring MSSN RM, for his excellent efforts in building MSSN. Congratulations to WB9OFQ, new MSSN RM. The Twin Ports FM Club swapfest in Duluth was an unqualified success. W9LER presented an informative satellite communication program at VARS in Waseca. Congrats to new Novices W9QSN W9NBTB W9NTHR W9NTHW; Cond. WB9SGR; General, WB9PTB; Advanced WB9SKU, who is JF1RYU from Tokyo, Japan. MSSN NCS are K9S CVD PIZ RYU ZXE, WA9GLI, WB9LDO, DW CAC and OCT. Thanks for doing your part. St. Paul ARC has elected new officers: W9FCO, pres.; K9PML, vice-pres.; K9MIG, secy.; WA9WPN, treas. BPL: WA9GLI AB9HOX. Traffic: AB9HOX 710, WA9GLI 549, K9CVD 199, WB9OAG 193, K0XZE 117, W9QMI 108, WB9PKG 97, K9CSE 75, WB9WOC 72, W9MMD 70, WB9MMD 70, AB9LDW 51, WB9OFQ 46, K9PIZ 35, WA9URW 42, W9HZU 35, WA9TFC 35, K0ZBI 35, WB9JJA 30, WB9QCV 27, WA9WOV 27, WB9CPC 26, WB9OCT 25, WB9TGM 22, WB9NZB 21, WB9JYT 20, WB9RIL 20, WB9PMZ 17, WA9IAW 16, WA9JPR 14, WB9BN 13, WB9LJH 8, WA9ADX 7, K9FLT 3, W9RIZ 2.

NORTH DAKOTA: SCM, Mark J. Worchester, WA9WLP - ORS: K9PVG. K0ATK moving, off the air until end of July. W9GB has Geneva on two meters. Newly elected officers Forx ARC: WA9DBL, pres.; WB9RNW, vice-pres.; K9OSL, secy-treas.; WA9BN, mgr.; WA9BN, secy. rel.; WA9PY, WB9RNW, repeater; WB9ODY, moved to Portland. WB9QEA is going to PA for graduate work, will be gone for at least two years. W9NNEK took his



Drake is pleased to announce a significant new 2-meter FM design, successor to the Drake TR-22 series:

The New TR-33C FM Portable

is significant because in it, Drake brings to 12-channel FM portables:

- **SCPC* Frequency Control**
- **Lower Receiver Battery Drain**
- **Expanded Portable Antenna Choice**

*Single Crystal Per Channel



FEATURES

- 12 Channels—only one crystal per channel provides simplex OR repeater operation on ANY channel. 2 channels supplied. 5 transmit offset positions, 3 supplied.
- All FET front-end, crystal filter for superb receiver intermod rejection.
- Small convenient microphone included.
- New lower power drain circuit on squelched receive.
- Nicad rechargeable batteries supplied.
- Built-in battery charger.
- Ac and dc power cords supplied.
- Telescoping screw-on antenna supplied, rubber helix optional.
- Channel indicator light when using external dc supply.
- Carry strap supplied.
- Meter Indicates receive strength, xmit output, or battery voltage.
- External speaker jack on rear panel.
- Auxiliary jack on rear panel—may be used for tone-pad connections, etc.
- Traditional R. L. Drake service backup.

SPECIFICATIONS TR-33C

GENERAL

• Frequency Coverage: 146-148 MHz, 12 channels (2 supplied: 146.52 and 146.94). Crystal determines receive frequency. • Transmit frequency offset for repeater operation determined by 5-position switch: Simplex, +600 kHz, and - 600 kHz supplied; any two additional offsets available with accessory crystals. • Power requirements: 13.0 Volts dc $\pm$ 15% external supply OR internal battery supply. • Current Drain (Batteries): Squelched receive: 30 mA; transmit: 400 mA. External supply: above plus 45 mA for channel switch indicator lamp. • Antenna: 50 ohm external antenna through SO-239 connector OR screw-on telescoping whip antenna supplied, may be replaced with rubber helix antenna. • Dimensions: 5.45" (138mm) x 2.78" (58mm) x 8.5" (216mm). • Weight: 4.4 lbs (2kg).

RECEIVER

• Sensitivity: less than .5 μ V for 20 dB noise quieting. • Selectivity: $\pm$ 30 kHz adjacent channel rejection greater than 75 dB. • Modulation acceptance: at least $\pm$ 7 kHz. • Inter modulation Rejection: 70 dB referenced to sensitivity level. • First i-f: 10.7 MHz with monolithic crystal filter. • Second i-f: 455 kHz with ceramic filter. • Audio Output: nominal 1 watt at less than 10% distortion into 8 ohm built-in speaker or external speaker.

TRANSMITTER

• Rf Output Power: 1.5 watts nominal with 13.0 volts dc supply. • Frequency Deviation: Direct frequency modulation adjustable to at least $\pm$ 7 kHz deviation, factory set at $\pm$ 5 kHz. • Separate microphone gain and deviation adjustments.

ACCESSORIES

- **Model AA-10 Power Amplifier:** Use with TR-22C, TR-33C, or any transceiver up to 1.8 watts output. 10 dB power increase. At least 10 watts output at 13.8 V-dc. Automatic transmit/receive switching\$49.95
- **Model AC-10 Power Supply.** Powers the AA-10, TR-22C, TR-33C and TR-72. Simultaneously can charge the TR-22C/33C nicads. Supplies 13.8 volts up to 3 amps from 120 V-ac 60 Hz input\$49.95
- **Accessory Crystals** each \$6.30
- **Model MMK-33 Mobile Mount**\$12.95

Now at your dealer. For more details please contact:

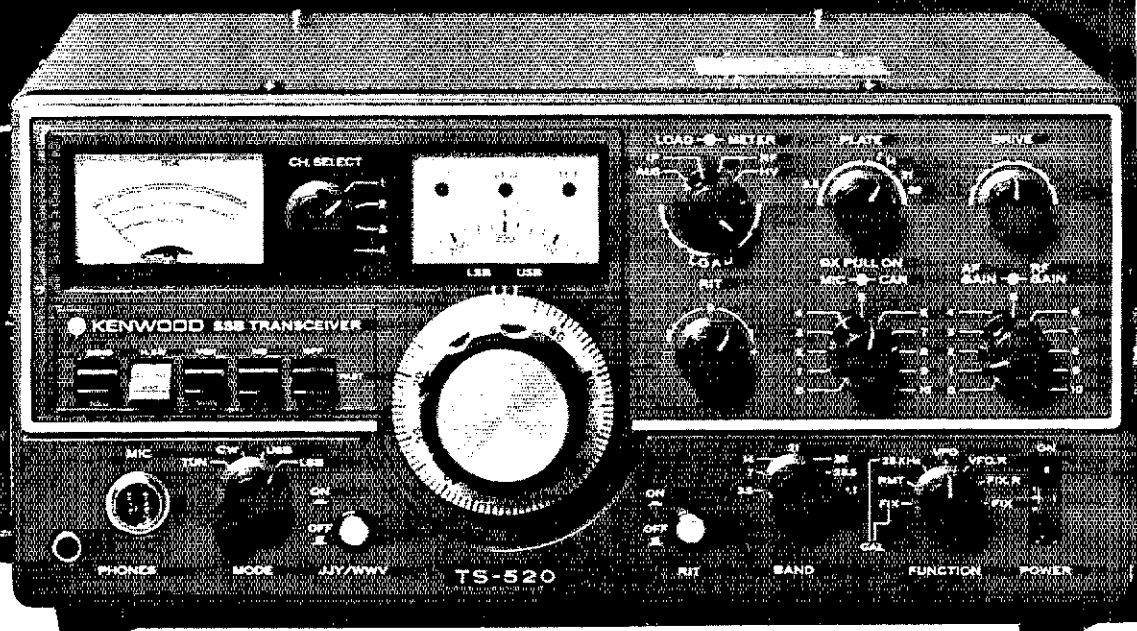
R. L. DRAKE COMPANY



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Phone: (513) 866-2421 • Telex: 288-017

KENWOOD'S TS-520

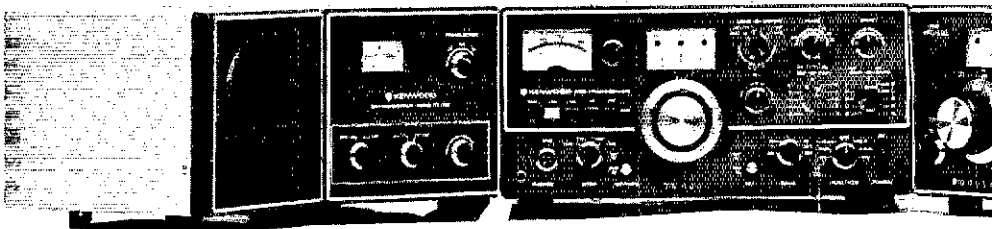
...worth waiting for!



Why wait any longer for a rig that offers top performance, dependability and versatility... the TS-520 has proven itself in the shacks of thousands of discriminating amateurs, in field day sites, in DX and contest stations, and in countless mobile installations. Superb craftsmanship is evident throughout... in its engineering concepts as well as its construction and styling... craftsmanship that is a Kenwood hallmark.

Maybe the Kenwood TS-520 is the one you have been waiting for.

Kenwood offers accessories guaranteed to add to the pleasure of owning the TS-520. The TV-502 transverter puts you on 2-meters the easy way. (It's completely compatible with the TS-520.) Simply plug it in and you're on the air. Two more units designed to match the TS-520 are the VFO-520 external VFO and the model SP-520 external speaker. All with Kenwood quality built in.



TS-520 Specifications

MODES: USB, LSB, CW
POWER: 200 watts PEP input on SSB, 100 W DC input on CW
ANTENNA IMPEDANCE: 50-75 Ohms, unbalanced
CARRIER SUPPRESSION: Better than -40 dB
UNWANTED SIDEBAND SUPPRESSION: Better than -40 dB
HARMONIC RADIATION: Better than -40 dB
AF RESPONSE: 400 to 2600 Hz (-6 dB)
AUDIO INPUT SENSITIVITY: 0.25 μ V for 10 dB S+N/N
SELECTIVITY: SSB 2.4 kHz (-6 dB), 4.0 kHz (-60 dB) CW 0.5 kHz (-6 dB), 1.5 kHz (-60 dB) (with accessory filter)
FREQUENCY STABILITY: 100 Hz per 30 minutes after warmup
IMAGE RATIO: Better than 50 dB
REJECTION: Better than 50 dB
TUBE & SEMICONDUCTOR COMPLEMENT: 3 tubes (2 x 6146B, 12BY7A), 1 IC, 1 FET, 44 transistors, 84 diodes
DIMENSIONS: 13.1" W x 6.9" H x 13.2" D
WEIGHT: 35.2 lbs.
SUGGESTED PRICE: \$629.00

VFO-520

Provides high stability with precision gear. Function switch provides any combination of the TS-520. Both are equipped with VFO dials showing at a glance which VFO is used. Connects with a single cable and draws its power from the TS-520. Suggested price: \$115.00.

SP-520

Although the TS-520 has a built-in speaker, the SP-520 provides improved sound quality. A perfect match in both design and performance. Suggested price: \$22.95.

TV-502

TRANSMITTING/RECEIVING FREQUENCY: 144-145.7 MHz, 145.0-146.0 MHz (145.0-146.0 MHz)
INPUT/OUTPUT IF FREQUENCY: 28.0-28.5 MHz
TYPE OF EMISSION: SSB (A3J), CW (A1)
RATED OUTPUT: 8W (AC operation)
ANTENNA INPUT/OUTPUT IMPEDANCE: 50 Ohms
UNWANTED RADIATION: Less than -60 dB
RECEIVING SENSITIVITY: More than 1 μ V for 10 dB S+N
IMAGE RATIO: More than 60 dB
REJECTION: More than 60 dB
FREQUENCY STABILITY: Less than ± 2 Hz during 1.60 min after power switch and within 150 Hz (per 30 min) thereafter
POWER CONSUMPTION: AC 220/120V, 16W (standard voltage 13.8V)
SEMI-CONDUCTOR: FE1 5, Transistor 1 Diode 10
DIMENSIONS: 6 1/4" W x 6" H x 1 3/4" D
WEIGHT: 11.5 lbs.
SUGGESTED PRICE: \$249.00

CW-520
500 Hz CW Crystal Filter: \$45.00.

Prices subject to change without notice.

When you get tired of compromises...

TS-700A Specifications

TRANSMIT/RECEIVE FREQUENCY RANGE:
144-148 MHz
MODE: SSB, FM, CW, AM
RF OUTPUT: CW, FM: more than 10W output.
AM: more than 3W output, SSB: more
than 20W DC input.
ANTENNA IMPEDANCE: 50Ω (unbalanced)
CARRIER SUPPRESSION: Better than 40 dB
SIDE BAND SUPPRESSION: Better than 40 dB
SPURIOUS RADIATION: Less than -60 dB



KENWOOD'S TS-700A finally fulfills the promise of 2-meters... more channels, more versatility, tunable VFO, SSB-CW and, best of all, the type of quality that has placed the Kenwood name out front.

- Operates all modes: SSB (upper & lower), FM, AM, and CW
- Completely solid state circuitry provides stable, long lasting, trouble-free operation
- AC and DC capability. Can operate from your car, boat, or as a base station through its built-in power supply
- 4 MHz band coverage (144 to 148 MHz) instead of the usual 2
- Automatically switches transmit frequency 600 KHz for repeater operation. Just dial in your receive frequency and the radio does the rest... Simplex repeater reverse
- Or do the same thing by plugging a single crystal into one of the 11 crystal positions for

- your favorite channel
- Outstanding frequency stability provided through the use of FET-VFO
- Zero center discriminator meter
- Transmit/Receive capability on 44 channels with 11 crystals
- Complete with microphone and built-in speaker
- The TS-700A has been thoroughly field-tested. Thousands of units are in operation throughout Japan and Europe

The TS-700A is available at select Kenwood dealers throughout the U.S. For the name of your nearest dealer, please write.

MAX. FREQUENCY DEVIATION (FM): ± 5 kHz
REPEATER FREQUENCY SHIFT WIDTH:
600 kHz
TONE BURST TIME: 0.5-1.0 sec.
MODULATION: Balanced modulation for SSB
Variable reactance frequency shift for FM.
Low power modulation for AM.
MICROPHONE: Dynamic microphone, 500Ω
AUDIO FREQUENCY RESPONSE: 400-2600 Hz,
within ± 9 dB
RECEIVING SYSTEM: SSB, CW, AM: Single-
superheterodyne, FM: Double-
superheterodyne
INTERMEDIATE FREQUENCY: SSB, CW, AM:
10.7 MHz, FM: 1st IF: 10.7 MHz, 2nd IF:
455 kHz
RECEIVING SENSITIVITY: SSB, CW, AM: 10
dB or better at 0.25μV, 20 dB noise
quieting = Less than 0.4μV, AM: S/N =
10 dB or better at 1μV
IMAGE RATIO: Better than 60 dB
IF REJECTION: Better than 60dB
PASS-BANDWIDTH: SSB, CW, AM: More than
2.4 kHz at -6 dB, FM: More than 12 kHz at
-6 dB
RECEIVER SELECTIVITY: SSB, CW, AM: Less
than 4.8 kHz at -60 dB, FM: Less than
2.4 kHz at -60 dB
SQUELCH SENSITIVITY: 0.25μV
AUDIO OUTPUT: More than 2W at 8Ω load
(10% distortion)
RECEIVER LOAD IMPEDANCE: 8Ω
FREQUENCY STABILITY: Within ± 2 kHz during
one hour after one minute of warm-up,
and within 150 Hz during any 30 minute
period thereafter.
POWER CONSUMPTION: Transmit mode: 95W
(AC 120/220V), 4A (DC 13.8V), max.
Receive mode (no signal): 45W (AC 120/
220V), 0.8A (DC 13.8V).
POWER REQUIREMENTS: AC 120/220V,
50/60 Hz, DC 12-16V (13.8V as reference).
DIMENSIONS: 278 (W) x 124 (H) x 320 (D) mm
WEIGHT: 11 kg
SUGGESTED PRICE: \$700.00

Prices subject to change without notice



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...pacesetter in amateur radio



Wilson Electronics Corp. **SUMMER SPECIALS**

SUPER FINE - 2 METER MOBILE . . . 24 CHANNEL • 10 WATT

PRIORITY CHANNEL "CALL BUTTON" • MODULAR CONSTRUCTION

10 DAY MONEY BACK GUARANTEE



MODEL WE-224 144 - 148 MHz

Only **\$199⁹⁵**

thru Sept. 30, 1976

- * 10 POWER ADJUSTABLE: 0-5 WATTS
- * TYPICALLY .3 μ V SENSITIVITY FOR 20 dB QUIETING
- * BUILT-IN ADJUSTABLE TONE BURST w/FRONT PANEL SWITCH
- * TRIMMER CAPS FOR BOTH RECEIVE AND TRANSMIT XTALS
- * USES SAME XTALS AS THE HAND HELD UNITS
- * MOSFET FRONT END - HELICAL RESONATOR
- * HIGH VSWR & REVERSE B+ PROTECTION CIRCUITS
- * BUILT-IN SPEAKER WITH EXTERNAL MINI PHONE JACK
- * FILTERS: 10.7 MONOLITHIC & 455 kHz CERAMIC
- * 10 FEET OF FUSED POWER CABLE WITH LIGHTER ADAPTER
- * EXTRA FUSES, MOUNTING HARDWARE, BRACKET, 500 OHM MIKE, DIDDLE STICK, & 34 PAGE MANUAL
- * SIZE: 8.8 x 2.5 x 9.5 in. * WEIGHT: 5.5 lbs
2.5 x .98 x 3.7 cm * 2.5 kg
- * CURRENT @ 13.6 VDC RECEIVE: 45 mA
 TRANSMIT: 750 mA @ 1 WATT, 2.5A @ 10 WATTS
- * 90 DAY WARRANTY & 10 DAY MONEY BACK GUARANTEE
- * COMES COMPLETE, READY TO OPERATE ON 148.52 SIMPLEX
- * YOU CAN PURCHASE EXTRA XTALS (TX or RX) FOR \$3.75 ea.
- * FOR \$7.50 EXTRA, WE'LL PUT ALL THE XTALS ON FREQUENCY!

220 and 450 HAND HELDS

- SWITCHABLE 1 - 2.5 WATT (1 & 1.8W ON 450)
- 6 CHANNEL - ALL PLUG-IN XTALS WITH TRIMMERS ON BOTH TX & RX CRYSTALS
- 12 kHz CERAMIC FILTERS • BATTERY INDICATOR
- HAS .3 μ V SENSITIVITY FOR 20 dB QUIETING
- 10.7 & 455 kHz IF ON 220 (21.4 & 455 kHz ON 450)
- CURRENT: 14 mA RX, 500 mA TX ON BOTH MODELS @ 12.0 VDC
- MICROSWITCH PTT BUTTON
- WEIGHT IS LESS THAN 22 OUNCES (w/o NI-CADS)
- SIZE IS 8.9" x 1.7" x 2.9"
- UNBREAKABLE LEXAN® CASE
- BOTH UNITS USE THE SAME ACCESSORIES AS THE 2-METER 1402 & 1405 HAND HELDS
- OPTIONAL 12 BUTTON TOUCH-TONE PAD AVAILABLE
- COMES COMPLETE w/RUBBER DUCKIE, NI-CAD CASE, (223.50 INSTALLED OR 446.00 ON THE 450)

★ 220 mHz MODEL 2202SM - \$239.95

★ 450 mHz MODEL 4502SM - \$279.95



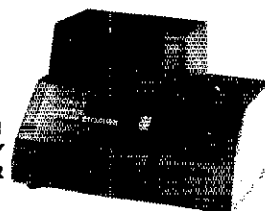
90 DAY
WARRANTY

10 DAY MONEY BACK
GUARANTEE

ACCESSORIES AVAILABLE

DESCRIPTION	SPECIAL PRICE
BC1 BATTERY CHARGER	\$34.95
BPI 10 EA. AA GOULD NICAD BATTERIES	14.95
BT1 EXTRA BATTERY TRAY	6.00
LC1 LEATHER CASE 1402	9.95
LC2 LEATHER CASE 1405, 2202, 4502	9.95
SM1 SPEAKER MIKE FOR EARLY MODEL 1402 9 PIN CONNECTOR	24.95
SM2 SPEAKER MIKE FOR ALL NEW HAND HELDS WITH ROUND 6 PIN CONNECTOR	24.95
TE-1 SUB-AUDIBLE TONE ENCODER	34.95
YTP TOUCH-TONE PAD	49.95
INSTALLATION AT TIME OF RADIO PURCHASE	FREE
INSTALLATION AT LATER DATE, ADD	15.00
XF-1 10.7 KC MONOLITHIC XTAL FILTER	9.95
CRYSTALS TX or RX (Common Frequency Only)	3.75

BC-1
BATTERY
CHARGER



Wilson Electronics Corp. **SUMMER SPECIALS**



2.5 and 5 WATT 2 METER

6 CHANNEL HAND HELD TRANSCEIVERS

- * .3 μ V RECEIVERS - 12 kHz CERAMIC FILTERS
- * OPTIONAL 12 BUTTON PAD AVAILABLE FOR ANY HAND HELD FACTORY INSTALLED
- * AVAILABLE FOR MARS OR CAP • 10 DAY MONEY BACK GUARANTEE
- * 90 DAY WARRANTY • INCLUDES 52 SIMPLEX and "DUCKIE" ANTENNA



- TRIMMER CAPS ON RX & TX
- ALL PLUG-IN CRYSTALS (Same as WE-224 Mobile)
- 10.7 and 455 kHz IF
- .3 μ V SENSITIVITY FOR 20dB QUIETING

CURRENT DRAIN @ 12 VDC

MODEL 1402SM:

RCVR: 14 MA - XMTR: 500 MA

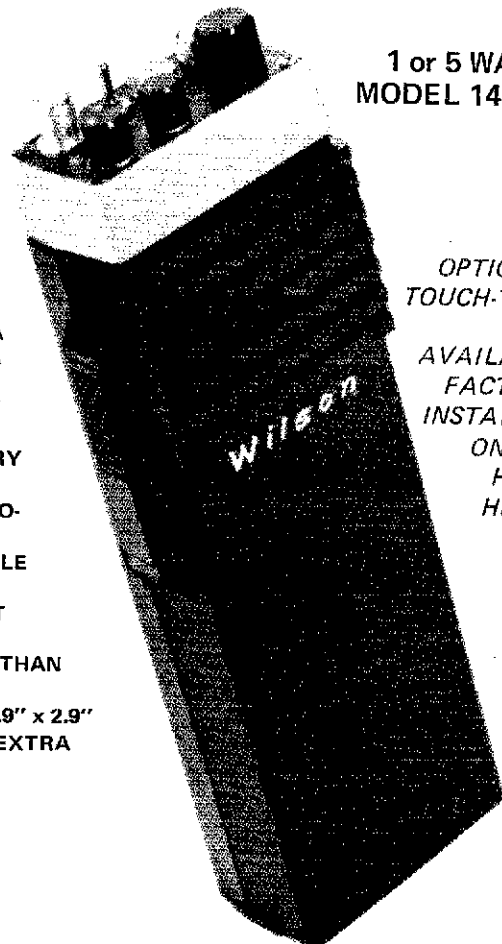
MODEL 1405SM:

RCVR: 140 MA - TX @ 1W: 400 MA

TX @ 5W: 900 MA

- 1402 HAS S METER & BATTERY INDICATOR
- 1405 HAS A SENSITIVE BATTERY INDICATOR
- BOTH MODELS FEATURE MICRO-SWITCH PTT
- THE 1405 CASE IS UNBREAKABLE LEXAN®
- THE 1402 CASE IS HIGH IMPACT ABS PLASTIC
- WEIGHT (w/o NI-CADS) IS LESS THAN 22 OUNCES
- OVERALL MEASURE IS 8.9" x 1.9" x 2.9"
- 10 NI-CADS (ORDER BP-1) ARE EXTRA @ \$14.95

2.5 WATT
MODEL
1402SM



1 or 5 WATT
MODEL 1405SM

OPTIONAL
TOUCH-TONE
PAD
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| ____ 1402SM @ \$164.95 | ____ TTP @ \$49.95 |
| ____ 1405SM @ \$239.95 | ____ XF1 @ \$9.95 |
| ____ WE224 @ \$199.95 | ____ EXTRA CRYSTALS @ \$3.75 ea. |
| ____ 2202SM @ \$239.95 | ____ PLEASE PUT ALL INSTALLED |
| ____ 4502SM @ \$279.95 | XTALS ON FREQ. (\$7.50 Extra |
| ____ BC1 @ \$34.95 | per Radio) |
| ____ BP1 @ \$14.95 | INSTALL THESE CRYSTALS |
| ____ BT1 @ \$6.00 | |
| ____ LC1 @ \$9.95 | |
| ____ LC2 @ \$9.95 | |
| ____ SM1 @ \$24.95 | |
| ____ SM2 @ \$24.95 | |
| ____ TE1 @ \$34.95 | |

	TX	RX	TX	RX
A.	52	52	G.	
B.			H.	
C.			I.	
D.			J.	
E.			K.	
F.			L.	

Specify Freq. on Tone Encoder TE-1 _____ Hz

Argonaut 509

Tired of push-button QSOs? Then the excitement of Argonauting is for you! A challenge? Of course. The test of an operator? Perhaps. But above all it is the thrill of working the world with five watts. The club is exclusive but if you enjoy the spirit of conquering distance with lower power, you are "in". There are no dues — just \$329.00, the price of an Argonaut. Join more than two thousand fellow members with Argo-fun. Your membership awaits you at most ham dealers.

Argonaut 509 \$329.00

REFERENCES

Five bands, 1.5-30 MHz.
SSB and CW modes. Fully solid
state. Permeability tuning.
Instant break-in. Instant band
change. Built-in SWR bridge.
3-Meter, 100WV. Internal speaker.
Direct frequency readout.
Receiver offset tuning. Five
wax input. Automatic sideband
selection. Plug-in circuit boards.
15 uV receiver sensitivity.
12-14 VDC or AC peak power.
Weight 4 pounds. Size HWD:
4 1/2" x 13" x 7".

ACCESSORIES:

Model 205—Antenna Tuner	\$ 9.95
Model 208—100 kHz Crystal	
Calibrator	\$26.95
Model 208—CW Filter	\$29.00
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Supply	\$27.50
Model 215P—Ceramic	
Microphone	\$29.50
Model KR5-A—Keyer	\$38.50

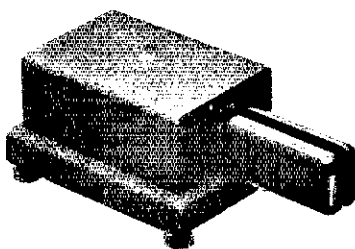
For further information, write:



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Fast, comfortable, easy... and fun!



Extra-long, form-fitting molded paddles give you maximum operating flexibility! Adjustable spring tension and contact spacing. Knife-edge bearings! Heavy die cast base with non-skid feet. It's stable!

Model SSK-1 (shown) \$23.95
Model SSK-3 has sub-base to hold any
Nye Viking standard SPEED-X key \$26.95
(Prices subject to change)



Available at your favorite dealer, or write to

WM. M. NYE COMPANY, INC. 1614 130th N.E., Bellevue, WA 98005

Conditional, WN0QAS will be in Iowa. W0DM gave four Novice tests at the end of classes. W0RWM received first place in an Explorer Scout Safe Driving Road Rally, Two meter DX back up again between G.F., Devils Lake, Fargo and Grafton, Two meter activity in western part of State also doing well.

Net - kHz	CDT/Days	Sess.	QNI QTC
Manager			
DATA - 3996.5	2300 S-S	31	156 66
WA0SUF			
Traffic: WA0SUF 87,	W0DM 15,	W0MXF 6,	
W0BMM 5, WA0JPT 2,			

SOUTH DAKOTA: SCM, Edward C. Gray, WA0CPX
— WN0TDF, WN0TDG, WN0TDH and WN0TDI are
new Novices from Waco, TX. Please help these fellows
get used to the radio air and with operating procedure.
Helping them with getting their license is only the first
step. Stop by and see them every few days. Let your
SCM know who the new Novices are so we can
recognize them in this section of QST. WA0CPX was
the SD winner in the QSO Party sponsored by the
ARRL. He has been working hard to get back into
Prairie Dog ARC with 784 QSO's in the last year. The
Twin Cities DX Club has had success in the challenge of a
QSO party where you have to make contacts with all
SD DXers to compete in the CQ World Wide
DX CW Contest this fall. The group winning the
contest in the single transmitter, multi-op category
from our ARRL Division will receive a traveling
trophy sponsored by the MN group. Any SD DXer
interested should contact Gary L. Knutson—WA9UN,
Centerville, SD. Net reports: Morning—30 calls
and 33 formal; Noon—28 calls and 30 formal;
Evening net, 04 check-ins and 23 formal. No SDN
CW rpt. Traffic: WA9VRE 60, W0HJO 64, WB0VEU
36, W0IG 33, WB0EY 3.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UJU - SEC
W5VNV. PAMS: W5POH W5ZWZ. RM: W5MYZ
Welcome to ham radio WB5\$ SGD SLB SPB SPC SPD
SPE GPU. WB5\$ SGO SGG SGG SMS SMZ SIQ SIT
SOL SOV SOW SOX SOY.

SOE	SUV	SOW	SOX	SUY		
Net	-	Freq.		Time(GMT)/Day	QNI	QT
Manager						
QZK-	3760			0000 Dy	149	4
WSMYZ						
APN-	3937			1100 M-S	774	3
WSPOH						
M-Bird	3928			2130 M-F	407	1
WASZWZ						
QRN-	3995			2330 Dy	201	1

PSHR: W5POH 39, W5UUA 21. Traffic: WASHNN
127, W5MYZ 37, K5AO 22, W5POH 22, W5GWU
19, W5UUA 17, W5BED 10, W5GQH 5.

LOUISIANA: SCM, Robert P. Schmidt, W5GHP
Asst. SCM: John Soule, W5ANV, Sec. W5BQIC
RM: W5HNP, Delta W5BKU, VHF PAM: W5VBX
As noted above, our new SEC is W5BQIC. The
Hurricane season is on us again, and all those who wish
to help, should become members of AREC by sending
information to John. We do need ECs for many
Parishes. W5ANV is new net mgr. for the slow
net LSN, and W5BQIC is net mgr. for the traffic
net. K5MYM, vice-pres.; W5RKR, sec.; W5JFE
treas. New Extra licensees are K5TTC W5BIQU and
W5NVNB. K5TTC also passed the First Class Phone
Exam. The Jefferson Club planning an enlarged
Hamfest for Oct. 30 and 31 in New Orleans.
K5SVD, new member of ARA Committee. W5BEV
is inactive active on 1.RN, RTTY net. W5NSP
passed General. W5BNAQ received Advanced ticket.
Many thanks to W5BIQU for his work in having the
LA Council inc. Also best wishes to W5BQIC who

leaves us to join ARRL HQ.	Net - Freq.	Time/Days	QNI	QTC
Manager				
LAN - 3615	7 & 10 Dy	395	152	
WA5PRI				
LTN - 3910	6:45 P.M. Dy	235	41	
WB5EKU				
LSN - 3703	8:30 P.M. M-F	87	5	
WA5ANV				
PR 5 - 3687.5	7:00 P.M. Su	12	6	

Traffic: W5GHP 401, WA5ZZA 199, WA51QU 17,
K5TTC 184, W5MI 120, WA5VQE 86, WA5TQA 6,
WA5PRI 60, K5TFG 44, WB5EJU 29, WB5NVB 1,
WB5I BR 14, W5YN 12, WB5FHU 6.

MISSISSIPPI: SCM, W. L. Appleby, WB5DCY -			
Net - Freq.	Time(Z)/Days	GLC	
Manager			
MSBN - 3987.5	2315 Dy	82	109
WA5ZLX			
MTN - 3665	2345 Dy	75	19
WB5FHA			
CCN - 3935	0100 Dy	54	190
WA4ZYJ			
MSN - 3733	2300 MWF	2	
WB5MTQ			

WB5NDE now Advanced, WB5OHN General.
WB5DYH active on Oscar. Vicksburg ARC selected
one of the 25 clubs in US to test new ARRL Novice
Instruction & Licensing Program. WB5QJQ now Tech
W5DT asst. Net Mgr. CGCHN, W5JUN & W5JTL
on vhf-tv. V. Yulmer attempt. Welcome new M5
teams WB5S SEA SHX SLO SKI SKS SLN SCG SJ
WN5S SHA SML SLL SMU SDZ SCR SPD. Heard
MTN WB5S HAS EIN W5EWP. W5Y1N out of hospital
while K5EXG went in. W5EDT W5VW
continue to carry the sections of the
K5K1K K5A33 permanently on the Coast
6-meter activity on 52.525 in Hburg. New Net
Biloxi repeater is W5RALB. Don't forget Thur. nite
5.0 night on MTN 10 to 14 wpm. W55QCB active
6 meters 50.4 and W5BKR W5BKK have n
6-meter fm rig. WB5QVF involved in
DXing. M5VW. Single-use promotion for
at Hburg Radio Days June 15-30, 1976. Interf
for our club nets & 2-meter facilities is really be
accomplished. WB5OHN active with Army MAF
W5AMPL active with NaMcM MARS. Traffic: WB5F5
131, K5OAJ 49, 108, W5EDT 104, W5B5K 1
WB5DCY 49, W5B5G 14, W5B5C 14, W55CZ
W5B5C 14, W5B5G 14, W5B5N 10, W5B5JZ
WB5BHY 4, W5B5NS 4, W5B5W 7, W5B5NPM 6, W5
1, W5B5MTQ 2, W5B5AS 1.

TENNESSEE: SCM, O. D. Deaton, WA4GLS - S
WB4DYJ. PAMS: WB4PRF K4LSP, RM: WB4DJU
Net - Freq. Time(2)/Days Sess. QNI Q
Manager
1PN - 3980 1040 M-F 78 3412
WA4EWW
W4PER 1145 M-F



Great cost cutting ideas we've rejected for 20 years

Unplated hardware. We use a nickel-chrome plating that defies corrosion.

Cheaper stainless steel.

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Take a close look at the

SPECIFICATIONS

Range	Accuracy	Input Impedance	Resolution	Max Cont Overload	Resistance	Measuring Current
DC Volts					1K	1 mA
1V	0.3%±1 Digit	10Mohm	1 mV	250V	10K	100 µA
10V	0.5%±1 Digit	10Mohm	10 mV	1000V	100K	10 µA
100V	0.5%±1 Digit	10Mohm	100 mV	1000V	1000K	1 µA
1000V	0.5%±1 Digit	10Mohm	1 V	1000V	10,000K	1 µA
AC Volts			Frequency Range	Max Overload	OPERATION	
1V	0.7%±2 Digits	10 Mohm/40pF	20Hz-1kHz	200V	Power:	
10V	1.0%±2 Digits	10 Mohm/40pF	20Hz-1kHz	500V	Internal battery or AC-DC converter. (Converter can charge battery.)	
100V	1.0%±2 Digits	10 Mohm/40pF	20Hz-1kHz	500V	Input Terminals:	
1000V	1.0%±2 Digits	10 Mohm/40pF	20Hz-1kHz	500V	A positive voltage to the red terminal with respect to the black one will give a positive reading.	
DC Current			Resolution		Function	
1mA	0.5%±1 Digit	1 Kohm	1 µA	1A (Fused)	The MM 200 will measure AC and DC volts, AC and DC current and resistance. Ensure correct function selection before connecting input.	
10mA	0.5%±1 Digit	100 ohm	10 µA	1A (Fused)	Range:	
100mA	0.5%±1 Digit	10 ohm	100 µA	1A (Fused)	The four range multipliers 1, 10, 100 and 1000 are selected by pressing the appropriate button—the decimal point will be automatically positioned. In the 10,000K resistance range, all the range buttons are released.	
1000mA	1.0%±1 Digit	1 ohm	1 mA	1A (Fused)		
AC Current			Frequency Range			
1mA	1.0%±2 Digits		20Hz-1kHz			
10mA	1.0%±2 Digits		20Hz-1kHz			
100mA	1.0%±2 Digits		20Hz-1kHz			
1000mA	1.5%±2 Digits		20Hz-1kHz			



\$99.95 LSI DMM.

Readout Height:
0.3"

Reading:
2 1/2 per second DC and K Ω

Temperature Coefficients:
DC ranges 0.03% per °C
AC ranges 0.05% per °C
Resistance ranges 0.05% per °C

Operating Temperature Ranges:
0° to +50°C

Power Consumption:
100 mA approximately

Size:
Height 3.4" 8.64cm
Width 10.0" 25.4cm
Depth 12.0" 30.48cm
including knobs, feet, and handle
extended.

Weight:
3.2 lbs. w/battery 1.45Kg
2.35 lbs. without battery 1.07Kg

When you get all that performance in a reliable, low cost DMM, it's no fluke. It's LSI, the most advanced technology, and the capabilities/cost combination spells doomsday for analog meters and the lesser DMMs. AC/DC converter powers the unit or charges its battery (optional) for more than 8 hours independent operation. Full year free replacement for any reason. And 10 days return option if for any reason you're not completely satisfied. Call or send the coupon for immediate shipment. De Forest Electronics, a subsidiary of DuMont Oscilloscope Laboratories, 40 Fairfield Place, West Caldwell, New Jersey 07006. In New Jersey call (201) 575-8670. Toll free 800-631-1043.

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State _____ Zip _____

Enclosed is my check or money order for \$_____

Charge to my credit card account:

☐ American Express ☐ Master Charge

Acct. No. _____

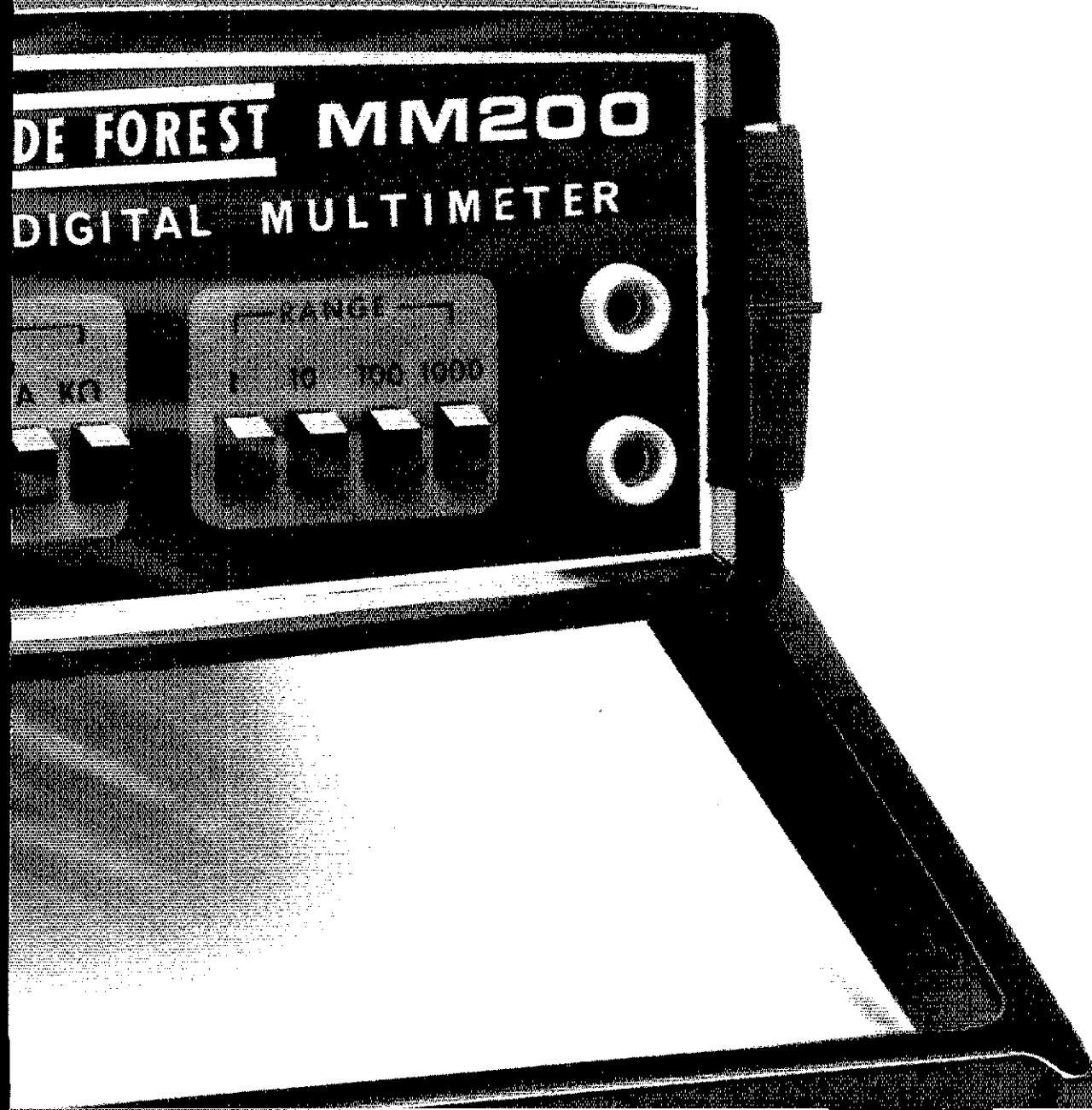
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Signature _____

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Toroidal Cores	Size	Size	Price
Size	Price	FT-50-61	.35
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T-80-3	.40	Ferrite Shielding Beads	
T-80-2	.40		
T-68-2	.35	Size	Price
T-68-6	.35	FB-73-101	\$1.00 Doz.
T-50-2	.30	FB-43-101	1.00 Doz.
T-50-6	.30	FB-73-801	1.50 Doz.
T-37-2	.25	FB-43-801	1.50 Doz.
T-37-6	.25		

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ETVHFN — 50.4 1900 MWF 13 96 1
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ETVHFN — 145.2 1900 TTh 9 50 2
WB4DZG
MTTMN — 28.8 0100 TF 10 77 0
W4EAY
WTVHFN 2000 S 12 353 51
146.97 0130 F
WA4VXX
Winners of the TN QSO party are Mobile W4OQG and WA4DEP tied 1st. place; K4LYA 1st. portable; K5WTA 3rd. mobile; K4AMC 1st. home station; WA4KKP 1st. out-of-state; all time records 105 TN logs were reported and 91 of the 95 TN counties reported. Cedars of Lebanon Hamfest coming up Aug. 29, everyone make plans to attend. The Music City Hamfest will be Sept. 5 in Nashville make your plans to attend. Your SCM is interested in forming a Frequency Coordinating Committee to handle the repeater recommendations. I would like to hear from repeater groups in this section. This is to remind all appointees that you are expected to report your activities to the SCM monthly. We want to commend both the Humboldt and Knoxville ARCs for the fine Hamfest just past. Traffic: K4CNY 267, WB4ZS2 143, K4VFC 137, W4CYL 108, WB4GZF 66, WA4AKF 43, WB4RRF 42, W4OGG 30, WB4YPO 30, K4JFS 29, WA4KBN 26, W4RUW 26, WB4MPJ 22, WA4GLS 20, W4TVV 20, WB4BKF 18, WB4FGT 13, WB4GBI 13, WB4GTW 13, K4UWV 11, WB4LCR 8, W4SGI 8, K4WWQ 8, K4AMC 4, K4MZE 2.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID -- SEC
WA4GHQ. May net reports:
Net QNI QTC Net QNI QTC
KRN 212 26 KYN 231 8
MKPN 1029 77 KNTN 195 5
KTN 1296 192 KPON 63 5
60AREC 104 5

The call letter license plate issue now settled! On May 28 the KY Supreme Court decided in our favor so the plates are OK from now on in KY. Make application at your county clerk's office as in the past. Sad to report WA4VZZ and W4CTZ as Silent Keys. Both were very active in our nets and will be sadly missed. The 61st district AREC Net conducted 3 weather watches during May. The Lexington Hamfest will be Oct. 3 at Country World. The BGARC recently held an "Elmer" nite as the theme for its club meeting. W4RHZ made the Honor Roll in the last FMT. Traffic: K4TXJ 136, W4BAZ 112, K4HRF 62, WN4CAR 59, WN4SAC 58, K4FLUM 57, WB4ZML 55, WB4AUN 54, W4CID 46, K4JFM 41, K4JNW 38, WA4AGH 27, W4CDA 21, K4TRT 17, WB4SS4 17, W4RHZ 17, WA4FAV 12, WA4AVV 14, W4IQZ 14, K4HOE 13, WA4JAV 12, K4HFD 9.

MICHIGAN: SCM, A. L. Baker, WB7ZT -- SEC
W4BPD. Rms. WB4YA K8KMQ WB4YQ. PAMS
K8LNE WB8JUX. VHF PAM: WA8WV
Net - Freq. Time/Days QNI Tfc Sess.
QMN — 3663 2200/0200 Dy 693 362 62
MACS — 3953 1500 Dy 932 247 35
BRMEN — 3930 2130 Dy 662 171 31
W8BN — 3930 2301 Dy 601 129 31
VHF PAM Report
GLETN — 3932 0030 Dy 529 76 27
UPEN — 3922 2230 Dy 544 48 32
MNN — 3720 2130 Dy 201 43 29
M16M — 50.7 2300 Dy 247 31 28
MAREC 3932 2200 S 98 5
Has anyone noticed the monthly net tabulation is b
QTC Apr. appointments: ECs: WA8ZVO WA8PS
WB8FBN; OPS: WB8LOE WB8TXM, Michig
Repeater Council elections: A8ZCO, chmn
WB8EIV, vice-chmn. Chippewa Hills High AR
elections: WN8UJZ, pres.; WN8PPQ, secy.; WB8LO
treas. Blossomland AREC tops in SS duels per QTC
L'Anse Creuse emerged victorious in SS duel with
Saginaw Valley. K8SWW made Bicentennial WAS
hard way — all Novices. WB8WGE now in Portuga
Look for CT4DQ on 20M 18-2100 UTC. WB8UF
wins ARRL membership in QLF contest at SEMAR
Congratulations twinkle toes. WB8AAA to operate
G4M proving grounds for M1clic relationships. Ne
licensees: Novices: WN8S ZSB ZCU ZCD ZJE
General: WB8S RMS WAJ QXG; Advanced: K8ME
K8BVV W8KPU WB8WFF WB8KKZ WB8YOB. Co
gratulations. W8CUP was invited to demonstrate Ha
Radio in Harbor Beach High School. 3932 kHz h
been selected as the M1 calling and emergency fr
quency. SEC W8MPD asks your help. Monitor 393
Regretfully report: K8SAZ K8YCV W8VP
WA8YAY and WB8BKF are Silent Keys. Traffic
(May) WB8DKQ 268, WB8ITT 248, WB8YA 16
K8LNE 157, WB8POL 148, W8MO 134, WTKQU
122, K8DYI 105, WA8OIE 97, WB8WZF 75, WB8Y
67, WB8BVV 65, K8VOA 57, WB8RJ 55, WB8C
53, WB8GBR 48, WB8ZZ 47, WB8JUX 46, WB8GLC 4
W8OW 44, W8NOH 42, W8IHX 35, K8JED 3
WB8BZF 30, W8IUC 24, WB8RVG 23, WB8FEG 2
WB8LOE 22, WA8TBL 22, WN8VOM 18, WB8D
17, WB8EUV 16, W8DTL 14, WB8DB 14, K8DTG 1
WA8WV 11, WB8EYM 9, W8CUP 8, WB8QE
WB8LWV 7, W8TBL 7, K8JUL 7, K8JHA 6, WB8K
6, K8XW 6, WB8YV 5, WB8SHO 5, K8AMU
WB8JAX 4, W8JLD 4, W8LOU 4, WB8TXM 4, WB8C
3, W8FZL 3, WB8IMI 3, W8JUP 3, K8GXV 2. (Ap
K8KMQ 311, W8MO 131, WB8C 97, WB8GLC 9
WB8WRF 94, W8JLD 2.

OHIO: SCM, Hank Graeb, AC8CHT — Asst. SCM
William K. Shaeffer, W8MCR. SEC: W8KPN. RM
K8IKD WB8JGW WA8WAK. PAMS: W8DIL WA8SS
Net - Freq. Time(2) Sess. QNI Q
OSBN — 3.9725 1430/2000/ 93 2555 8
2345
QNN — 3.708 2230 11 57
Q6N — 50.16 0100 30 253
BNR — 3.605 2200 31 110 1
QSN — 3.577 2210 29 132
BN — 3.577 0200/2245
Silent Key: W8EQA. Medina 2-meter group provid
communications for antique power show, May 3
Congrats to W8TYF on Ph.D. in Mechanic
Engineering from U. of Cincinnati. W8SKP appoint
EC for Geauga County. WA8UXP qualified for
Novices in Findlay. Apricot Net provided communica
tions for Cleveland Loyalty Day parade, May 1, a
World Trade Week parade May 25. W8KC and K8D
are collaborating on Ham Radio presentations at
Cleveland Area High Schools. W8LJ licensed sin
1912, was honored as Patriot for the Day, and f
Outstanding Volunteer in Berea. WB8OGB was
featured on NBC-TV for work during Italian enter

INTER MOD?

SELECTIVITY?

NUMBER OF CHANNELS?

Virtually None!

Really Super!

1 to 22

The GTX-202 is Adaptable Anywhere
—at Half of the Price of Synthesis—
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and Add Crystals Later as You Want
or Need Them



Check these outstanding Features:

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Same Circuitry as used in Genave's famous Land Mobile transceivers . . . Manufactured in America by the same Government-Inspected facility that produces high quality reliable communications and navigations for marine and aircraft industries.



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SPECIAL**
\$239⁹⁵
GTX-202 2-Meter FM
22 Channels

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☐ Ringo Ranger ARX-2 6 db 2-M Base Antenna @ \$29.95 \$ _____

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☐ TE-II Tone Encoder Pad for installation on most Hand-Helds @ \$49.95 \$ _____

☐ PS-1 AC Power Supply for use with all makes of transceivers 14 VDC-6 amps @ \$69.95 \$ _____

and the following standard crystals @ \$4.50 each \$ _____
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Payment by:

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☐ C.O.D. Include 20% Down

Note: Orders accompanied by personal checks will require about two weeks to process.

20% Down Payment Enclosed. Charge Balance To:

☐ BankAmericard # _____ Expires _____

☐ Master Charge # _____ Expires _____

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IN residents add 4% sales tax: \$ _____

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All orders shipped post-paid within Continental U.S.
(allow 8 weeks delivery.)

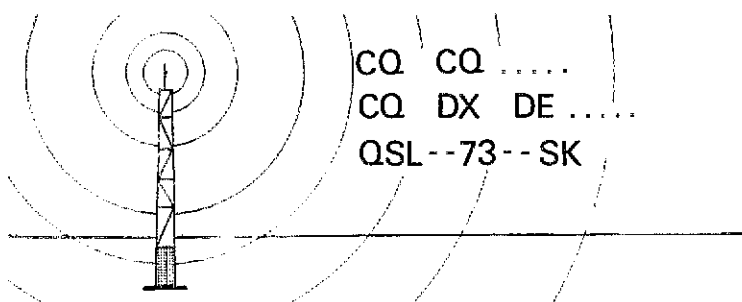
Add \$4 per Radio for Shipping,
Handling, and Crystal Netting.

QST 8

CLIP OUT AND ORDER NOW

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Send and receive QSL cards in a reusable mailer.

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Quick Return Covers completely shield QSL cards. No addresses, stamps, postal off-sets, or cancellations will deface your QSL collection.

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Return QSL's go directly to you. Your address and call are correctly printed on every Quick Return Cover, avoiding errors and lost cards.

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You no longer need an exact address on your QSL cards. Don't buy new cards when you move, just order new, less expensive mailing sleeves.

● DX Returns Simplified

The best way to receive a QSL card from that rare DX or hard to get state is to provide return postage. Quick Return Covers make it easy to send International Reply Coupons or stamps for a prompt reply.

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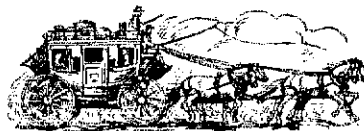
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quake. WB8U is recuperating from stroke. WB8X reports more church work — less time for ham radio. K8TUT reports eight sporadic-E and aurora openings on 6 meters during May, with 5 different states worked. Central Ohio AREC aided 3500 bicyclists during Tour of Scioto Valley, May 8 & 9, with 65 members participating, using three repeaters. Ottawa County AREC aided Heart Association Bike Hike May 8. Traffic: W8PMJ 409, W8MCR 384, W8HGH 217, W8DIL 151, W8BOMQ 151, W8BKW 114, W8BJGW 106, W8BUIN 104, W8BKKI 98, W8LTA 83, K8BYR 69, W8BML 66, W8OE 63, W8KAJ 61, W8BWH 57, W8JD 51, AC8BX 45, W8BPIY 37, W8BSI 34, K8LGA 28, W8BSE 28, AC8CHT 23, K8CMA 23, W8BMRU 22, W8BVL 21, AD8MLQ 18, W8UQY 18, W8LZE 17, W8BGR 16, W8GCU 16, W8FGD 14, W8KPN 14, W8GZK 14, W8ARW 13, K8CKY 13, W8BTE 13, W8BIF 13, K8BNL 12, A8BROV 12, W8BMO 12, W8WEG 12, W8BCJU 11, W8BROQ 10, K8VMI 10, W8BAYC 9, K8BPX 9, W8JSW 8, AC8MI 7, W8BPN 7, W8BUL 6, AC8MI 5, W8BMAZ 5, W8QXQ 5, K8BHL 3, W8DCX 3, W8BTSX 3, W8BONY 2, K8QYR 2, W8BWEK, W8BDWL 1.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Gary J. Ferdinand, W2PIL — SEC: K2AYQ, RMS: K2OYG (RTTY), W2IXW (CW), PAM: W2QEI. New appointments: K2DW, QO, W2WZL, DRS, OPS. Congrats to new Generals W2WFH, W2YGL and W2ZFF and to AA2YXY a new Advanced. QVS W2CXC reports being on 432 MHz with an Echo 1 and sixteen element beam. DXers: W2 28 MHz this summer — beacons DL4IG, 28.195 and GB35X, 28.180 are good indicators. W2BRUZ happy to report his pet mouse had puppies. K2HNW back on the phone nets after trip to England. Accepted for summer studies at Hampshire College is W2TGL. K2DW participated in the May FMT. Sunspot numbers expected to continue to decline over the rest of the year. RTTY repeater directory available to members free upon receipt of a s.a.s.e. (6 x 9 with 46 cents postage or 24 cents third class). Schenectady elections held: W2ILC, pres. W2IR, vice-pres.; W2FW, secy.; W2CPC, treas. W2NYM, W2NQN, W2FVA, W2ODC, dir. Maple Hill HS demonstrated local and DX QSOs to Kiwanis clubs and emphasized CB/Ham differences. Get some recruits! The New Rochelle has all but complete plans to use the local repeater for a crime alert — limited auto patch direct to police Hq. Albany club reports that W2KLWTS900 got pinched. Report on "good buys" to him. RM K2OYG reports that NYN now becomes RTN (RTTY Traffic Net) meeting on 3612 kHz at 7:30 PM local time. Many thanks go to K2DN and K2OYG for their continued leadership efforts in RTTY traffic handling. Net totals: CHN: QNI 468, QSP 204; ENYVHF: QNI 20; NYPON: QN 459, QSP 79; NYR: QNI 131, QSP 47; NYS: QN 844, QSP 300. PSHR to: W2BRUZ, W2BEM, W2ARKI, W2BVS, W2AFJ traffic: (MAY) W2PIL 277, W2BEM 259, W2BVS 212, W2PIL 103, W2BRUZ 93, W2TGL 54, W2UYL 50, W2ARKI 43, K2OYG 35, W2BVS 33, W2YJR 30, W2SS 25, AA2YXY 21, W2PAU 17, W2BEM 15, W2BWA 9, W2CNE 6, W2WFH 5, K2HNW 3, W2ELA 3. (Apr.) W2WBO 38.

NEW YORK CITY — LONG ISLAND: SCM, John H. Smale, W2CHY — Asst. SCM: Art Malatzky, W2WJFJ. SEC: K2HTX. RM: W2LZN. PAM: W2PYM. The following are traffic nets in and around the section.

Net	KHz	Time/Day	Manager
NLI*	3630	1900/2200	W2LZN
NLI Phone*	3928	1730 Dy	W2PYM
NLS*	3730	1830 Dy	W2BWR
Clear House	3925	1100 Dy	W2DDP
All Svc	3928	1300	W2ODC
Mic FARAD	3925	1300	W2OE

ESS	3590	1800 Dy	K2UIR
NYSTPEN	3925	1800 Dy	W2RSR

*Denotes section net, all times are local. For those that can't check into the HF nets, WYN, W2PCZ will be monitoring 146.56 from 1730 to 1900 local for any stations who have traffic to pass. WYN will relay this traffic into the HF nets. Don't forget the annual NLI picnic Aug. 28th. There will be the annual Hudson Division Directors Trophy softball game with the NLI "All Stars" taking on all challengers. I'm also getting near for Hudson Division Convention dates Nov. 13 and 14. It will be held at the Great Gorge in Northern NJ room prices about the same as the convention. The Memorial Day 10M Nassau Bunn Hunt won by W2SUH. W2PF helped his son W2IV install a new tower and 20M beam; IVA was eligible for membership in the QCWA in July 76. It is with deep regret that we list K2JQK as a Silent K. W2YVCI now runs 13 watts on 2m am. With a new surplus 522 transmitter and receiver, Jim also has new Q scope and grid dip meter and is settling up for Oscar. W2TUK's nr. 2 son ex-WN2TL now W2FEW. W2FEZ has his tower with rotator (new) and four-element Hy Gain up at 35' in his new QTH in Miller Place. He would like a sk on UHF with anyone anywhere, he would also like get a club started in the Pt Jeff area, anybody with any info, his address is Harry Lersner 4 Wadgewood Ct, Miller Place NY 11764. K2PAY now holding a practice on the L1MARC machine every Tue. at Thur. starting at 2130 local. The Wadsworth ARC was selected by participants in the pilot program of the League's license course; the ten week course started June 17th; the club also did an introduction Ham Radio at the Library Apr. 26th, an intensive publicity program by the librarian helped to make a nice turnout. Participating were W2DQP, W2NEN, W2AMQ and other members of the club. An amazing how with the new scoring system for FD 1 cw op, who in past years always had to take a back seat to the fone ops, is now considered to be a "prime" operator at many stations. The fact should encourage many to start practicing again, and when you're practicing, why not try checking in to NLS and NLI cw Nets, you'll always find a welcome there. Traffic: (May) W2BWR 200, W2EC 183, W2AZ 136, W2MLC 77, W2YKG 74, W2PYM 7, W2CZY 54, W2VPA 49, W2FLN 38, AB2OY 33, W2HXT 30, K2GCE 17, W2JZX 14, W2PF 1, W2ZPV 10, W2YEI 9, W2ECO 7, K2JFC (Apr.) W2ZJR 58.

NORTHERN NEW JERSEY: Acting SCM, Louis Amoroso, W2ZZ —

Net — Freq.	Time(PM)/Days	Sess.	QNI	Q
Manager				
NJN — 3695	7:00 Dy	31	411	1
W2LCV				
NJN — 3695	10:00 Dy	31	217	1
W2LCV				
NJPN — 3950	6:00 Dy	31	580	3
W2VTT				

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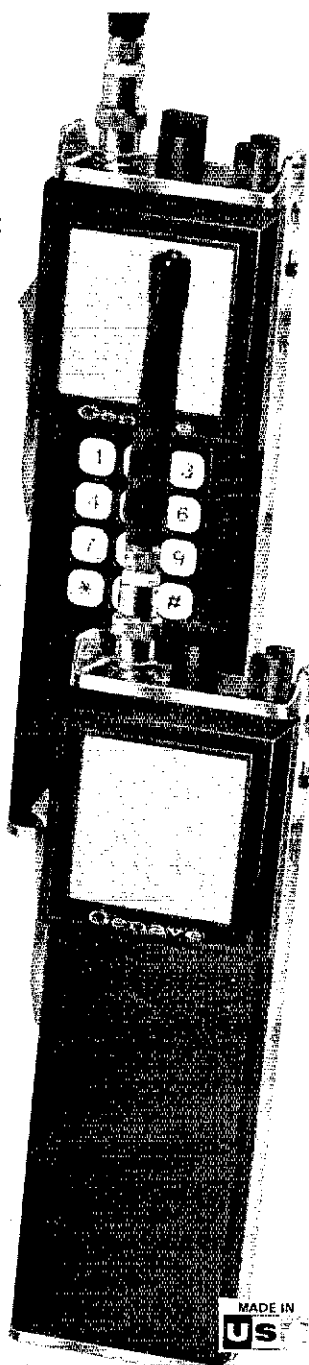
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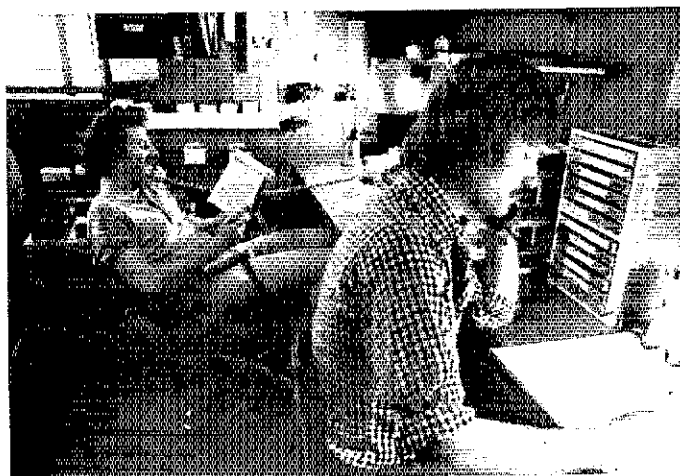
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SEC: WB2PBO. PAMS: WA2OPY (VHF) and WB2VTT. RM: WA2WIW. Most of you should know by now that WB2RKK is now our ex-SCM. Under Doctor's orders he was told to slow down and cut out most of the activities including the SCM post. On behalf of everyone in the Section we say Thank you Bill for an FB job. We hope to hear you in there real soon. This old ex-SCM is taking this post on an acting basis until we can find someone who will do the job. We had it for over six years and believe that the job needs new blood. Rcvd OO reports from W2TPJ K2EK and WB2CST. We welcome WN2ELI a new ham in Colombia. One of his first QSTs was with a KH6 on 40. Lets hear from you often. AA2GEZ has his DXCC total up to 172. New club officers for the K2MFF group are WB2RMK, pres.; WB2VCI, vice-pres.; WN2DUF, treas.; WN2DGI, corr. secy.; WB2PVB, rec. secy. Congratulations to K2UHM and WA2EZW on passing the Extra Class and to K2KDK who passed the Advanced. K2EK missed the FMT reading by ONE Hz. W2CVW moved to Eatontown. WA2QHN has his HW-7 working and reports the WR2AHV group have their antenna at 850 ft. above sea level. Some Oscar DXCC totals are WB2XA at 72, W2LV at 62 and K2QBW at 52. K2BHL, located in 1/56, and K2SLand, K2IEF is again rebuilding his Quad antenna. W2TPJ and W2ZZZ all rec'd their Bi-Cen WAS. Please try to get your reports to me by the 5th of the month. I would like to hear from any group who plan to conduct code and or theory classes. We will give it publicity and can satisfy those who write for this info. Traffic: WB2VTT 234, WA2PJA 237, WA2VXN 129, AB2ASD 136, AB2CLW 118, WA2WIW 90, AB2CST 87, AA2SZW 80, W2SWE 43, WB2HSG 42, WB2RMK 37, WA2DIW 31, W2BLM 26, WB2AEH 20, AA2SLF 20, WA2PCF 17, AA2CCF 15, WA2FUI 14, W2WHB 14, WB2KNS 14, WN2DLZ 8, WA2UDJ 2, WB2YJV 7, W2ZEP 7, WA2QJU 5, W2CU 4, W2ODV 3, W2CVW 1, K2QBW 1, W2ZZ 1.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, W0LFF - SEC: W0IYW. PAM/HF: W0AVW. PAM/VHF: K0LKH. The Ft. Dodge repeater 31/91 has a new duplexer. The Iowa Novice Net doing well at new time, and also more NCS. W0LFX home from the hospital following heart attack. Cedar Valley ARC provided communications for a 100 mile bike ride. AF0AEH was kept hot by W0IUG W0GGO W0MMT W0QUP W0IZW W0EVO K0YQU K0EGA W0NMU W0BPH W0BJW W0SVU K0FLY and W0BDEI. After 17 yrs for General, and 3 for Advanced, congrats to W0MCK for reaching his goal. AF0AEH repeater committee consists of K0VQM, chmn, and W0MMT W0NMU K0OKZ and W0LIJ. K0CKX has new Icom-202. W0PXX moved to San Antonio. New ECs: W0QIC WA0FCK WA0FZO WA0SYM W0SGP and WA0YYL. W0GAA and WA0CAE are new Asst. ECs. New on Net in Ringgold Co. at 21,450 at 9 P.M. Welcome to W0NSGX in Mt. Airy area. He has Collins 5-line with 30L and F101EE ready to go when he becomes General. W0EIT has new TS020. WA0DXZ has 33 states via Oscar. W0NSKP and W0SGP sharing newly acquired NCK-3. K0ZWB has new Atlas. Iowa 75M picnic at Marshalltown Aug. 28th. Net - Freq. Time/Days Sess. QNI QTC
Iowa 75M - 3970 1730 M-S 26 1628 96
WA0VZH
Iowa 75M - 3970 2300 M-S 26 1013 30
WA0ACK
Tail Corn - 3560 2330 Py 62 374 110
K0AZJ
IA Novice - 3710 0130 M-S 26 32 9
W0RWN
Traffic: (May) WA0AUX 322, K0AZJ 118, K0EVH 86, W0RWN 51, W0M20 20, W0LFF 14, W0MOQ 9, W0BW 6. (Apr.) W0LCX 36.

KANSAS: SCM, Robert M. Summers, K0BXF - RM: K0MRI. PAMS: WA0SEV W0BCL VHF PAM: WA0EDA. The KS Slow Speed Net (KKS-SS) mgr. WA0WXY meets daily on 37.35 kHz at 8 M. CDT. The net welcomes all, especially the novice operator. Training in traffic nets could be the greatest help to you and or your community some day. Anyone desiring more info contact Clem or your SCM or better yet, check into the net. Four Zone AREC net reports received this month. ECs: a report is due each month, please, until a new SEC is named make your reports to me by the 7th of the month. K5BN 31 sessions, QNI 957, QTC 76, K5N 14 sessions, QNI 84, QTC 4, K5N QNI 540, QTC 175, H5N QNI 239, QTC 13, CSTN QNI 658, QTC 50 for Apr. and QNI 831, QTC 55 May. QKS (cw) QNI 440 QTC 151. Hiawatha gang has repeater fever again! A fine hearty KS welcome to WA2VFN/A. Traffic: (May) W0BPH 185, W0HI 132, W0PB 96, W0INH 88, W0FIR 85, K0MRI 75, W0CHJ 68, W0LKA 52, W0MLE 52, K0BXF 47, W0YH 46, WA0SEV 41, W0NYG 34, W0GCI 33, K0PC 27, W0BLI 21, W0RBO 18, WA0KVP 17, W0POCK 13, W0GVR 11, W0FDJ 10, W0BKDE 10, W0KL 9, W0MRO 8, W0ERQ 8, WA0WH 5, W0JX 3. (Apr.) W0HI 187, K0PC 38, W0NYG 9. (Mar.) K0PC 9.

MISSOURI: SCM, L. G. Wilson, K0RWL - Asst. SCM: Joe Flowers, W0OTF. SEC: W0BCL. New appointments: WA0CUL as GCS. WA0CUL passed his Advanced Class exam after being off the air for 10 years. Congratulations to W0NRUT W0NSDO W0NSEY W0NSFY W0NSII W0NSIJ W0NSNA W0NSOO W0NSOR W0NSQS W0NSTY W0NTDZ and W0NTEA upon receiving new tickets. Congratulations to W0DQ and WA0SCH for receiving Outstanding Service Merit Awards to Amateur Radio from Midwest Director, W0FIR. The PHD Club has been chosen pilot club for Novice classes which will begin around June 30 and run for about 10 weeks. It is with regret that we acknowledge the passing of W0NMYE to the ranks of the Silent Key.
Net QNI QTC Net QNI QTC
MOSSN 1130 94 SCEN 56 4
MON I 174 88 MON Z 111 33
MSN 154 60 PHD 67 7
Good to see W0HH back after a one month vacation. He was especially missed by all of the cw net members. Thanks to W0OTF for being the net manager for acting as assistant net managers of the MSN in the absence of K0ONK. K0ONK will be back on the air shortly with possibly a new rig. W0GS has been ill recently but now is recovering nicely. WA0EZY is sporting a new rig and antenna. Must be nice to have all that money and an antenna farm, too. A combined group of CB and ham operators in the St. Louis area is pooling their resources with the National Weather Service to form Operation Skywarn, a new severe

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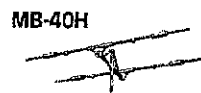
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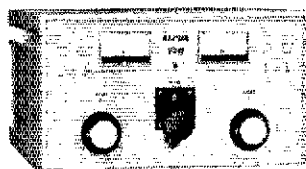
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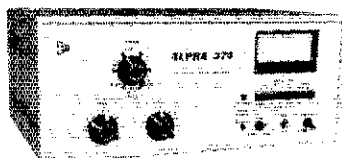
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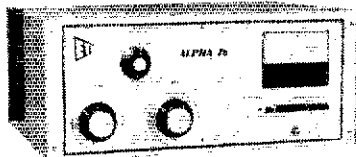


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Worcester called by Dir. Sullivan, W1LHR, W1WQW
working overseas with RCA on air as VQ9EA.
W1AHMJ now Extra and going in the Coast Guard.
EMRIPN had 337 QNL, 204 QTC. HHTN had 328
QNL, 94 QTC. Faffie: (May) W1WJG 402, WIPEX
389, WA1MSK 255, W1UX 174, K1PAD 138,
W1WJG 389, W1HJH 88, W1WQW 82, W1FJN 15,
W1DMS 61, W1W1 5, W1EYF 30, W1WJG 30,
W1DMH 14, W1ATWD 13, W1AEE 11, W1A0AM 8,
W1PL 7, W1AQKD 5, W1E 4, W1MNK 3, W1ATCP
2. (Apr.) W1ATBY 90, W1ATWD 5.

MAINE: SC6M, Ed Bristol, WA1MUX _____ SEC;
WA1FCM, RM: WIRWG, PAM: K1GUP, Renewed QO
KITEV, Nets: PTN QNI 139, QTC 113; MSGN QNI
960, QTC 153; MSSN QNI 27; QIC 4. PSHR:
WIERW, WIRWG, WA1MC, KH6IAC1, New in
Maine: WA1WHIG, WN1F, WWY, W1JH, W1ZB,
W1ZK, W1ZL, W1ZM, W1ZT, W1ZU, W1ZV reports
the Annual Hostraders Tailgate Harvest set
\$206.70 to March of Dimes, I-B guys. PAM has set 1st
Thur. monthly, as Open Forum nite on MSGN.
Aroostook Am. Rad. Assn now organized, WH1JZ,
netter: K1CQ, tech: K1JBY, thrs.: WA1ACT,
secy: K1TFX. Tech info come down: came from
monetary proceeds of code & theory classes taught in
the local school Adult Ed. program. Might be a good
bet for more clubs. Yankee ARC bursting with public
service ideas including more service to GD, and
increasing community involvement. Plans to take
note next meeting to organize a club in northern
Penobscot is in the offing. EC RTTY Net is on 3605, 8
PM ET. Want to talk about the League! Invite the
SCM to a club meeting. AARA in June was great!
1992, toward Eilisworth in July. Affice: WA1FCM
1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000,
WA1MUOY 42, K1GDI 21, W1GU 17, WA1JC 10,
WA1MUX 9, K1JCX 8, WA1RDX 2, W1CTR 1.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1SWX SEC. K1RSC, R1L, WA1GCE, RAH; K1YSD. Welcome to new hams WN1WYU WN1WYU WN1WYT WN1WXX WN1KWR WN1WR WN1WYQ WN1WYP WN1WYS. See on NH license plate W6RVZ. The NHEPN report from W1EHT shows 133 check-ins, 4 traffic. K1LMS building a new shack in the cellar. The GSPN report from K1APQ shows 488 check-ins, 30 traffic. W1EER was in the recent FMT and was a 350 traffic man. W1EER was a 350 traffic man. W1APVN has been doing NCS duty in the GSPN. K1MFQ & WA1PGW are on 2-meter fm. K1DXB has moved his tower to a new location for better DXing. W1BYS back from FL. Yours truly will be at the Volvo International Tennis tournament Aug. 2nd thru 5th. Hope to see more hams there like last year. News is short, but evened out. Goodbye to the outdoor. Have a nice summer. Traffic: K1BSC 247, W1APVN 56, K1LMS 45, AD1ACL 36, K1PQP 33, W1EHT 3, W1SWX 3, W1BYS 2.

VERMONT: SGM, J. Brookstone, WA1PSK SEC;
W5SA, Net W-5SB, 3909 M-5 2200, 1230(Z) SEC;
WA1JZ, W-5 RF, 1200, 1909 K1CBQ, V;
Phone, 3932 SU-1400, W1KKM, Green Mtn., 3932
M-5 2130, W1JLZ, Carrier, M-5U 3935, 1330Z
W2DSK, Welcome new amateurs W1N1WB W1N1WV
W1N1WZ W1N1WWP. Tnx to W1ALP (SCME Mass)
for info on our new amateurs. WA1HSG novice class
has passed the written exam, new license
exams - all have passed code test, awaiting written
exam. W1DQO has a recently resurrected HW-12A and
is giving out VU QSOs on the Bicentennial W5A Net
on 3904 late, late at night. FCC will have an examiner
in Burlington during Oct.; those who missed out at the
Charlotte station should have a new exam.
WA1KAH, an engineer for VT ETV, gave a talk to the
Electronics class at the St. Albans Correctional
Facility. Good work, Paul!

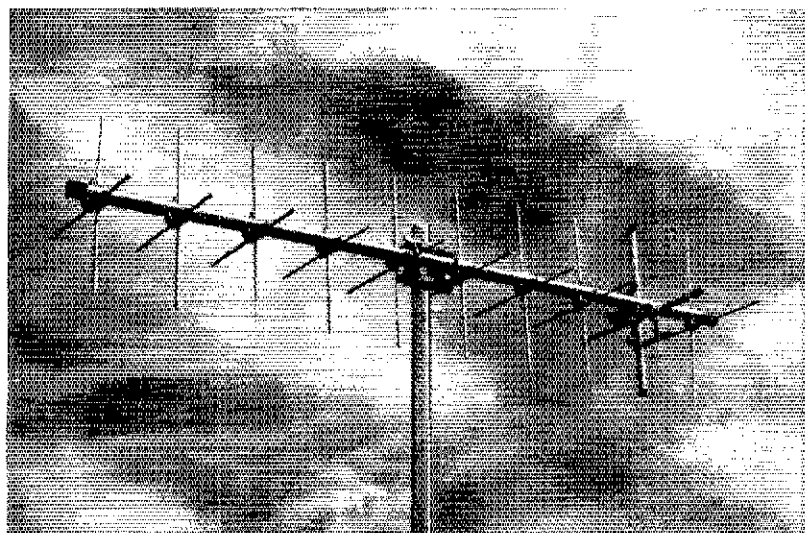
WESTERN MASSACHUSETTS: SCM, Percy C. Noble,
W1BVR -- HCRA has obtained the call W1NY in
memory of Hank Baier. F8I W1KK is trustee. The NE
DXCC banquet will be held Oct. 2 at the Waltham,
MA Holiday Inn. Info from W1JFL New officers of
the W1KX club are: President, J. T. Tuohy, Vice-pres.
WAZCZY, W1AJWG, Treas. WIN1WXY, Secy. YK
operated during the Junior Port Country Fair. W1IBZ
has a Johnson Kw Amp. W1GQP was acting EC is
now EC. Endorsements: EC: K1RGQ, ORS: W1BVR
W1ALP, W1FBE, W1JKZ, W1YV, W1RQ, W1MAM,
W1WZ, OZ: O1FB, W1GRQF, QVS: W1KZS.
PAM: AA1MJ reports for WMPN (Mon-Fri), 3935 at
4:30 PM. 21 sessions, QNI 205, traffic 21. Top five
in attendance: AA1MJE K1RGQ W1BVR W1PLR W1UKR/
W1AYL K1ZOC CW HR W1WVW reports for WMPN
(daily) 722-7000, 1 session, QNI 144, traffic 44.
Top five in attendance: W1BVR WIUD W1TM
W1DGV W1DQW SEC WA1DNB reports for WMEN
(Sun 3935 8:30 AM) 5 sessions, QNI 140 (including
65 thru liaison from Z-meter repeaters). Controls were
W1BVR W1WVW W1WZ W1WVW W1WVW W1WVW W1WVW W1WVW
W1ALPS reports for WMAREC 21 sessions with total
of 19 stations for QNI 92. UHF/VHF PAM W1KZS
reports for Berk Co. AREC (Sun 2:00 PM Port
Greylock) 4 sessions with QNI 53, K1JJZ 4 sessions
with QNI 53, W1WVW 4 sessions, W1WVW 4 sessions,
W1TM 209, AA1MJE 144, W1BVR 51, W1DWB 48,
W1KK 36, K1RGQ 17, WALFN 4.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davis, KL7CUE -- KL7HAY was instrumental in the rescue of a vessel 1000 miles south of Kodiak. A story will be forthcoming on this and KL7HND, a new RM for Anchorage area. Also, South Central Alaska's 75WMC/7.7 MHz, 3VS Anchorage, KL7HOV PAM reports ASN had 31 sessions, 705 check-ins with considerable PP and mssg. KL7HIX working on a new emergency plan for Kodiak. KL7JDO very busy, reports the 28/88 rpttr will be on soon. KL7HMH and KL7HJM are watch dogs on 2 meters for emergencies and traffic. KL7HDX going to sea again which helps his traffic totals. KL7IS and the Anchorage gang are working on the new repeater to connect Fairbanks and Anchorage. The repeater will be at Lake Minchumina and will use Mt. McKinley to bounce the signal back and forth. KL7AG and XYL made a long bike trip from Fairbanks around the old highway thence to the new Parks Highway and back to Fairbanks a total of about 500 miles. Traffic: (May) KL7JDO 12, KL7MHK 1. (Apr) KL7JDO 14.

Net	Time/Days	Sess.	GNI	QTC
FARM - 3.935	0200 Dy	30	1226	26
W7VOH				
IMN - 3.635	0300 M-F	22		
W7GHT				
RACES - 3.99	1415 M-F	22	667	5
W7KDB				

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A147-20T

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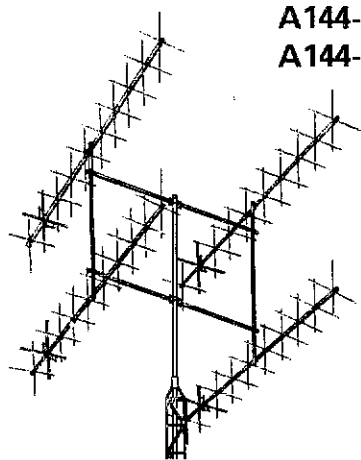
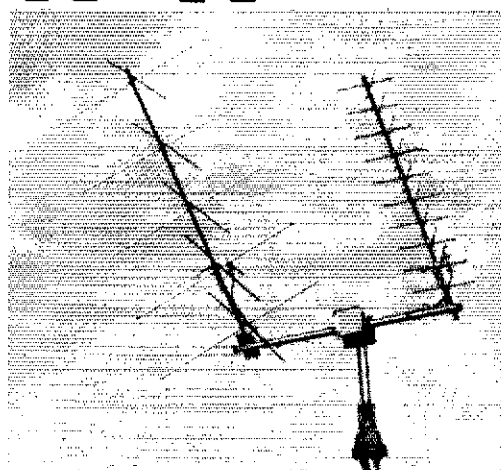
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A432-20T \$45.00

A144-20T \$47.50

A14T-MB \$13.95



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	SPECIFICATIONS			
Model	A147-20T	A144-10T	A144-20T	A432-20T
Center Freq. (MHz)	144.5/146.5	145.9	145.9	432
No. Elements	10/10	10	20	20
Weight (lbs.)	6	3.5	6	3.5
Wind Surf. Area (ft. ²)	1.42	.74	1.42	.37
Mounting	Center	Rear	Center	Rear
Dimensions (Inches)	40x40x140	40x40x70	40x40x140	14x14x57

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Amateur Net



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Magic valley Chapter-Idaho Society of Radio Amateurs has elected new officers. WB7B is pres., W7KAT, vice-pres. W7NJU, secy.-treas. WB7MS has been appointed Asst. Vice Dir. of the Northwestern Division, WB7BJ7 WB7MS WB7NE K7CQG K7DCV W4DNNK W4DNNM W7GCX W7GDA K7HYJ K7IAR W4I7MT W7NGA W7NJU W7OGT W7GZU and W47TDG provided communications for the twin towers of Mt. Washington. W47BZ W7EJW W7FZB W7HHK W7KKV and WA7VHO are new members of Quarter Century Wireless Assn. WB7CUJ has been offered a job with a radio station in Hastings, NE. WA9KKR/7 is A.N.C. for Pacific Area Net. W7FIS just completed a three week vacation in Hawaii. Traffic: WA9KKR/7 308, W7GHT 227, W4BQ8/31.

MONTANA: SCM, Harry A. Roylance, W7RZY -
Asst. SCM: Bertha A. Roylance, K7CHA. SEC:
WA7IZR. PAM: WA7PZO. Only reports received this
month are IMN with 21 sessions, QNI 189, QTC 101
and Montana Traffic Net 682 check-ins, 19 sessions
and 48 traffic. Traffic: W7LBK 17, WA7QBH 2.

OREGON: SCM, Dwight J. Albright, W7HLP -- Asst.
SCM: Daniel T. O'Connell, WA7IDZ. SEC: WA7UHC.
PAM: K7RQX. RM: K7DUF.

Net - Freq.	Time(Z)	QNI	QTC	5654
Manager				
SSN - 3908	0130			
WA7MHP				
NSN - 3701	0300	411	128	
WA7UJO				
OSN - 3585	0245			
AREC - 147.06	0315 WF	79	4	8
WA7TAE				
AREC-PDX - 146.04/64	0330			
K7WWR				
AREC - 3993.5	0300	242	5	31

WA7NEQJ will air a good report of Armed forces day action. CPI AIR-WAR-NPG very strong signals. Joint meeting of Legation club and Mid WARC Dinner FB with trip via PIX(slide) to Republic of China Farns. Roseburg Hams constructing end table several prospective hams. Several messages to 44um via MARS & AREC via confusion net on 20 meters. USN continuing to build up a presence in the Pacific. USN procedures to Novices. Heard WTS50 may be coming back to the OSN at Corvallis. WA7NEQJ has a new tower up. WA7UJO going for OPS. WA7RKN OPS can sure hear the planes even if he cant see [blind] then reports on JC-AREC liaison to CAP. Clubs contact SEC WA7UHC he may have something for you. Traffic: W7VSE 218, K7QFG 14, W7UO 700, W7VTV 47, W7VMP 47, WA7UW 43, K7UJY 39, WA7QDC 27, W7LI 14, W7WEN 8, WA7ZAP 8.

WASHINGTON: SCM, Mary E. Lewis, W7QGP -
PAM: K7YRQ. VHF PAM: K7GWE. RM: K7OZA.
Ext. EC: WATERH W7PWP. F. K7VAG.

Net - Freq.	Time	QNI	QTC	Sess.
NSN - 3702	0200Z	336	1	30

NWSSR — 3945	18:30	754	115	30
W7VDR				
NTN — 3970	11:30	1473	80	30
W7PWP				
WARTS — 3970	18:00	1893	73	20
W7QGP				
WSN — 3590	0230Z	144	134	31

W7LG reports Victoria, BC with assistance from Pt. Angeles did a super job on Swiftsure Race. W7AIB's station closed for May for extended traveling vacation. W7PI has sold or is selling complete station and antennas. WA7BDD has a new "Country Cousin" coaxial inverted Vee antenna for 75/80 meters, Joan reports it works great. W7EGR, Ellensburg, answered a call for emergency help from W7FM Wenatchee, who is being held by 97.67 repeater. A false alarm call to the hospital and they were advised of the defective bell system in W7PFM's room. MINOW's held their annual meeting at W7DK's club house in Tacoma, a good turn out of gals. Don't forget "Hamfair '76" at Pierce County Fairgrounds, Graham, WA Aug. 21 & 22 and Walla Walla Hamfest Sept. 25 & 26 at Milton Freewater Community Bldg. Reports are that we have 3 new 6-meter repeaters in Seattle area. Traffic: W7DZ 487, W7DQ 14, WB7R 85, W7CJ 10, W7CZ 10, W7DQ 17, W7CF 55, WA7BD 44, W7APS 42, W7PWP 35, WBUN 24, WKEL 19, WA7GV 3, W7ADKA 3, (Abn.) W7KEI 13.

PACIFIC DIVISION

EAST BAY: SCM, Charles Breeding, K6UWR Asst.
SEC: Ronald D. Martin W6ZF. SEC: W6IHL. Asst.
SEC: WB6DSI. The Section has two new appointments. WB6H has taken over the duties of SEC QTH
2128 San Remo Ct. San Leandro, CA 94578.
WAGVEJ has been appointed the new C.E. at
the same address as above. W6ZLW has moved from
radio station NPG at Sikeage Island once again took
first place on Armed Forces Day. This makes the fifth
straight year. For their fine work on the N. Calif. Net,
Net certificates have been issued to W6TMY K6PMG
WB6JK and W6JKX. The following were listed as
honorary members: W6ABM W6VW W6JUI W6JXX
K6JZR K6PMG W6BTMY W6TMY W6BUZX and
WB6VEW. To top things off K6JZR made SPL
and PSHR this month. A very big congrats to all who work
so hard on NCN. CCRCR lists the following new calls in
this section: W6LIN WN6HN WN6HW WN6HV
WA6RW W6GF W6F5 W6F4 and WN6US.
WAGENP/W6 gave a fine talk on 40-meter wire beams
at the May meeting of the N. CA Contest Club. The
time is drawing near for the Pacific Division Con-
vention. Hope to see all of you in San Jose on Labor Day
weekend. Traffic: K6CZB 13, K6JUL 48, WB6VF
209, W6DQ 122, WB6JK 79, WB6VCF
13, W6ABMW 11, W6SCMZ 13.

PACIFIC: SCM, Pat Corrigan, KH6GQW SEC: KH6GMP, EC-Guam: KG6JAH Good plus for when KH6GQW says to go to Pahrash from Gov. Milligan of MI. This month will see SAROC-Hawaii on 28th at Kuliima. All possible kudos to all sta in Pac. involved with disaster assistance for Guam. Special thanks and recognition to KG6JCM, KH6KJ3 (EC-Hong) and KG6JAH (EC-Guam), who with SEC, KH6GMP, did a damn good job. The last time I heard that was termed one of the smoothest operations ever. KK6LPE, EC, Marshall Isl. KH6BZF says he heard WA6LET work K2UYH, moonbounce. EARG hopes to have new rpt on for Oahu this tall. 14637.97. KH6HRG on with new 2m gear. KH6BZF cranked up to big trial run. KH6BZF has been tripping bad. KH6B and KH6KEQ had mainland sojourns. KH6JAU (RM, Pac) managing West Pac Tlc Net while KG6JQ rebuilds after losing

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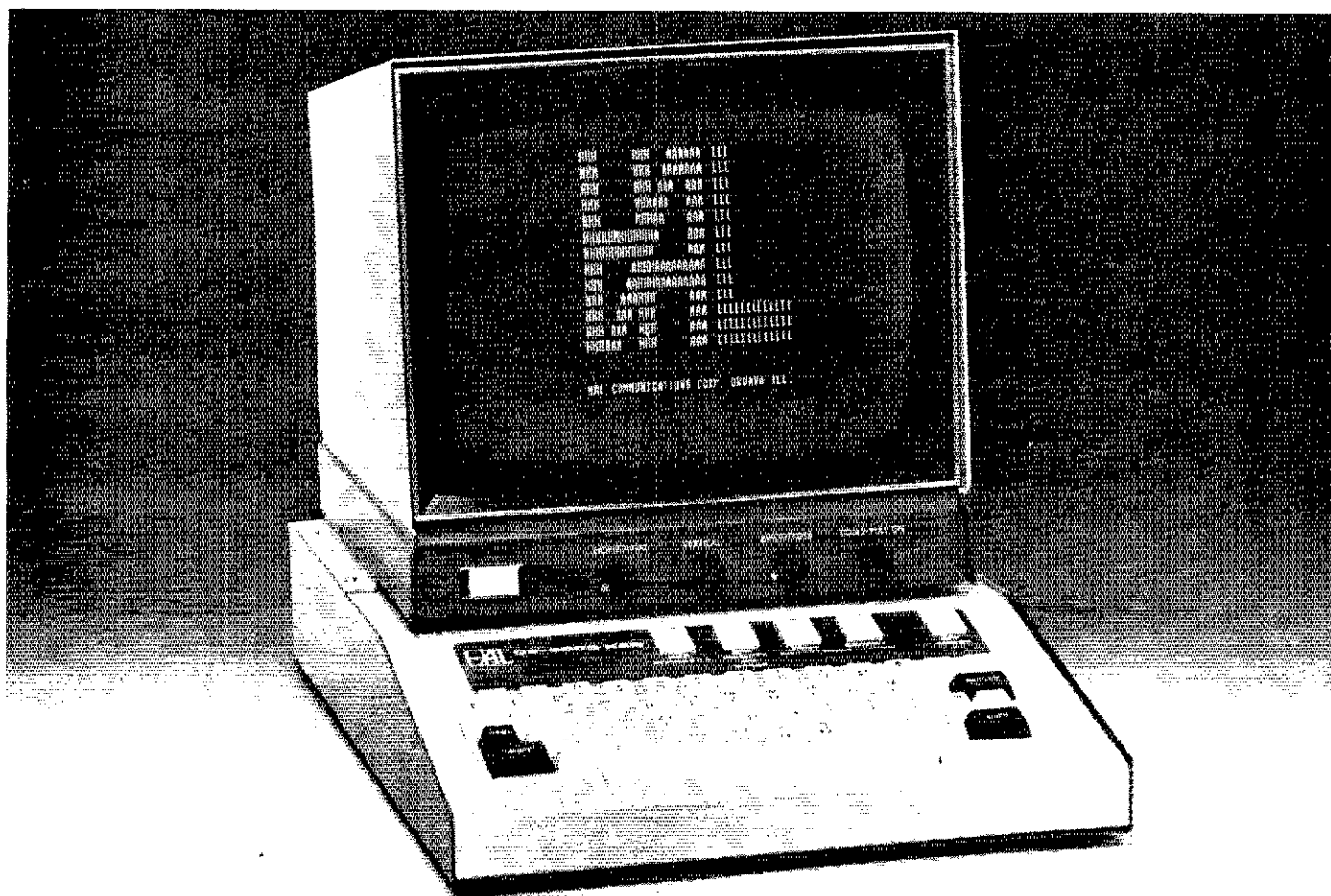
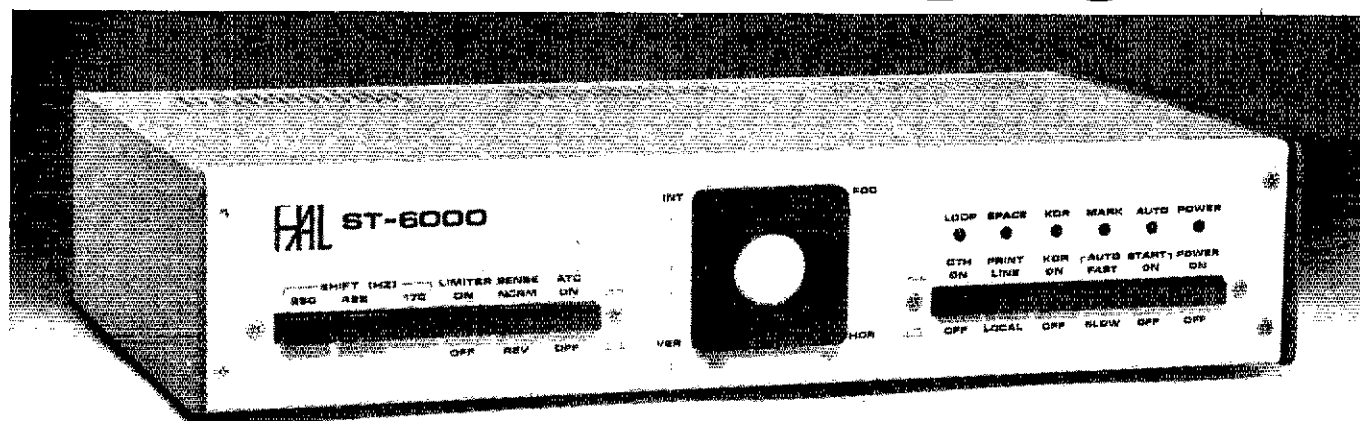
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lishing different tone pairs. You can select AM or hard-limiting FM modes of operation to accommodate different operating conditions. An internal monitor scope (shown on model above) allows fast, accurate tuning. The ST-6000 has an outstandingly high dynamic range of operation. Data I/O can be RS-232C, MIL-188C or current loop.

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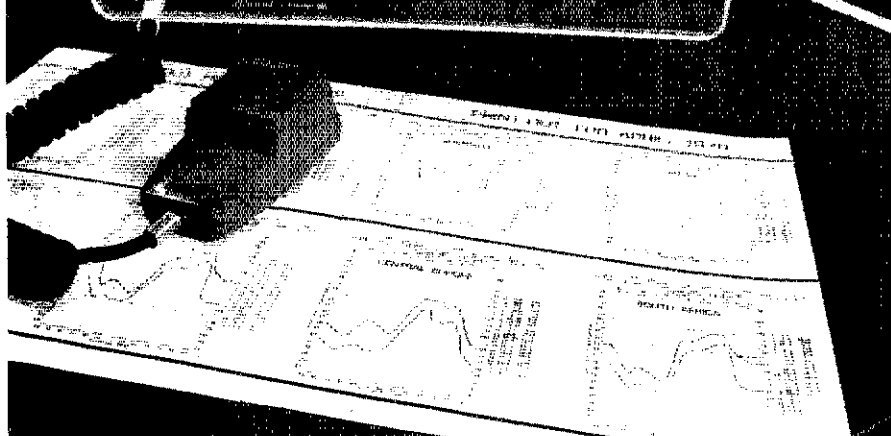
of codes, including Baudot, ASCII and Morse. The powerful, programmable 8080A microprocessor is included in the circuitry to assure maximum flexibility for your present needs—and for the future. The KSR models offer you full editing capability. The video display is a convenient 16-line format, of 72 characters per line.

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 1898, KH6GOW 141, KH6BZF 131, KH6CKJ 110...
 K6JFE 80.

SACRAMENTO VALLEY: SCM, Norman Wilson...
 AAEJVD — SEC: W6SMU. The newly organized...
 Tahoe ARA elected WA6VKL as their first pres...
 W7KJU, vice-pres.; WA6EWW, secy-treas. The 4th...
 Annual Sacramento Valley Ham Swap, sponsored by...
 the North Hills ARC, was a successful attendees...
 gathering on May 22, W6TEE, representing the John L...
 Sabin Pioneer RC, organized a preliminary meeting of...
 the proposed Sacramento Area Council of RCs...
 WA6OIX presented a talk on Emergency Life Support...
 before the Golden Empire ARS in Chico. WA6NYV...
 transferred to VA. W6KMA a new ham...
 Sacramento. W6DEF having trouble finding sources of...
 traffic to originate. A special thanks to W6FRE who...
 made a presentation before the State Transportation...
 Committee as they considered a hike in ham license...
 plates costs. The revised bill excludes ham plates...
 K6VT received a note of thanks from Guatemala...
 First Lady for his earthquake communications work...
 A well organized assault was made on K6SS's wine...
 cellar as the Northern CA Contest Club had their...
 annual picnic at his QTH. CA QSO Party (OCT. 2,3)...
 Plan ahead. Traffic: W6DEF 19, WA6ORW 10...
 K6RPN 2.

SAN FRANCISCO: SCM, Charles K. Epps, W6OAT...
 Assembly Bill 4271, reported in this column last...
 month, has been amended by Assemblyman Michael...
 Wornum so as to exempt amateur call letter license...
 plates from an increase in fees. Special thanks to...
 MARC for its work directly with Mr. Wornum, and to...
 all who wrote letters to legislators urging adoption of...
 this amendment. Kudos to 70-year-old W6GWD who...
 upon receipt of his Novice license, a course entitled...
 "Basic Ham Radio Operation" will be offered as part...
 of the summer school program for 9th to 12th graders...
 at San Rafael High School. WB6UPV now sports a new...
 fourteen element beam for 2m. W6KQG reports QSO...
 with 14 states on 6m during May. Our "Old Faithful"...
 WA6AAL is now completing for completion of...
 8 years of weekly publication of the West Coast DX...
 Bulletin — that's 418 consecutive issues without...
 single miss! Carpetbagger WIARR/6 has relocated to...
 this side of the Bay, welcome, Bob. WB6AIN WB6IL...
 WIARR/6 and W6OAT were the SF contingent sent to...
 at the NCCC's picnic at W6SG's Carmichael QTH...
 With sadness we note the passing of K6ICE who...
 became a Silent Key on May 2 Traffic: W6RNL 246...
 K6TP 165, W6LPL 135, W6NL 87, WB6UPV 16...
 W6OAT 4.

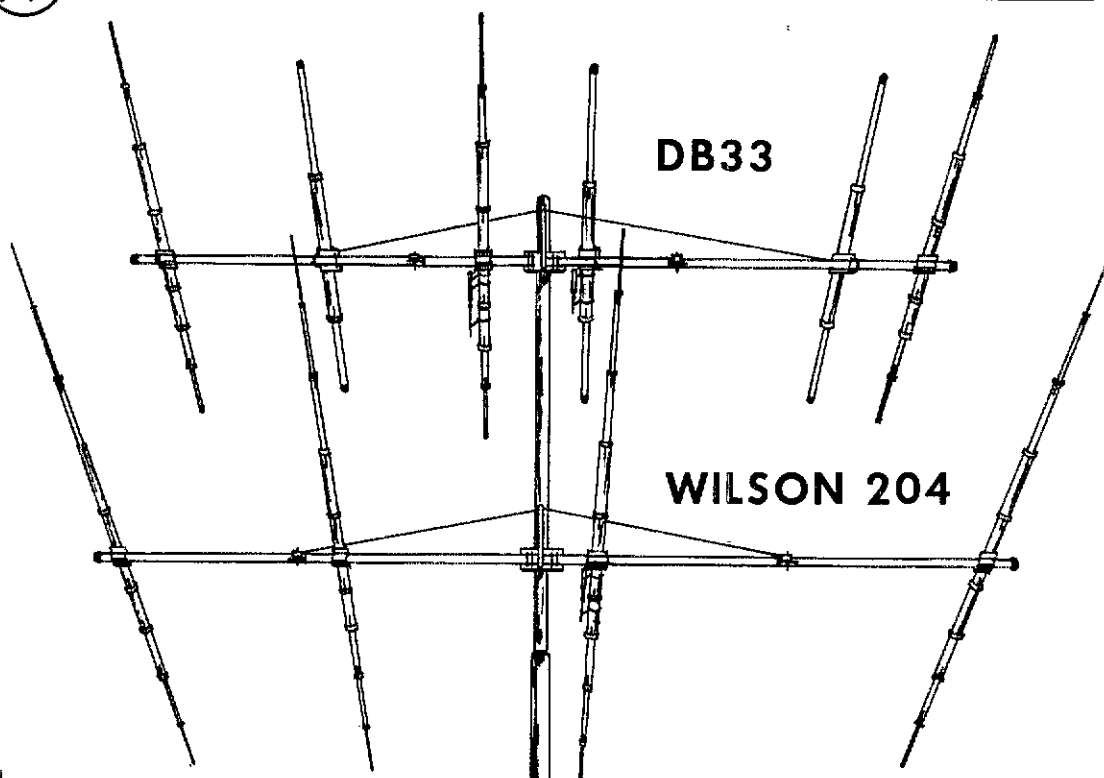
SAN JOAQUIN VALLEY: SCM, Ralph Saroyan...
 W6JPU. The 27th International DX convention was...
 held here in Fresno on May 15-16, 1976 with around...
 340 in attendance. Among those present were W6B...
 K6HTM W6KUT W6HYG W6SPQ A56GQI W6LKL...
 W6KOE WA6ONZ WB6QND and W6JPU. WB6KUD...
 won the 2-meter transceiver. WA6RXI has a three...
 element Quad antenna. WB6ZWG teaching Novice...
 and out turned 19, this year. WB6OSI...
 gave a talk on Amateur Radio at the Kings Canyon J...
 High School. W7HCT now in Mariposa. W6LT...
 WB6NON WB6WRS are on 2 meters. W6NRD has...
 2.6-meter amp. WB6EHH has an FT101. W6KZ...
 now an Extra Class licensee. WA6QYR is now an...
 Advanced Class licensee. WA6QYR is now an...
 has an IC230 as does WB6NSZ. WB6ETR heard on...
 meters. WA6YKR is on 2 xsb with a Gonset Side...
 winder. W6NGXL now an Advanced Class Amateur...
 WA6YAR has a TR22C. WB6TUR had an unfortunate...
 automobile accident and is now recuperating very...
 nicely. WA6SBM and WB6GUK supplied a 2-meter...
 repeater to be used in Guam after the Typhoon...
 Stockton area amateurs have changed their RTTY...
 67 wpm for vhf work. Traffic: WA6RXI 63.

SANTA CLARA VALLEY: SCM, Jim Maxwell, K6A...
 — SEC: WA6RCE. M6WFF WB6WFF W6QW...
 W6RFF met at RHR. Welcome to 61TL, newly...
 appointed ARRL Regional Emergency Coordinator...
 (REC) for the CA Sections within the Pacific Division...
 Altho "Knock", our REC, resides within SCV, his...
 responsibilities transcend Section lines. More on his...
 activities will be reported shortly. 432 SSB interest has...
 picked up locally due to reception of K6JQUY of...
 W6IWR WB6MYC WB6GIW W6BWB and WA6YOK...
 W6BWB worked into the LA area (WB6IMV) with...
 both cw and sbl WB6JNN expects to have a noise...
 figure under 4.5db on 1296 snon, courtesy of a new...
 preamp now being completed. New editor of the...
 popular "Voice of 76" (W6RADE) newsletter...
 WB6CDN. WB6FLD nearly GVP using a GRP r...
 crammed into a tuna tin! Also, remember the ol...
 Signal "Sniffer"? WB6HBL is sawing away with or...
 into a 14AVQ while brother WA6NDN is off to...
 ZL-Land for a surfing expedition. Congrats to the We...
 Valley ARA (W6PIV) for supporting communications...
 at recent Regional Wheel Chair Games. Active, under...
 the guidance of K6LU were WB6AHC WB6ES...
 WN6EQS WA6WTX K6SSD K6KZ WB6CDY WB6SF...
 WB6BYD WB6HBS WB6ZPW W6AQA WA6LMM...
 and WA6PWT. The Santa Clara Co. Gang, ECCARA...
 recently graduated WN6s KTY KWZ KUC LEF and...
 WN6KTX from their Novice class. The Palo Alto Gar...
 (PARA) worked a March 20 March 21 March 22...
 walkathon, with K6YT WA6NCX K6SEM W6AI...
 WB6JFH WB6GRZ WA6WZB WB6JB WA6L...
 W6OCP WB6LSN WA6FXP and W6KMW. The sta...
 quest net meets on the first Sun. of each month...
 1900Z on 14.280 MHz, reports W6LOO. The sta...
 quest group plans to assemble and man a state-of-the...
 listening post for the purpose of searching for ext...
 terrestrial signals. All systems GO for Sept. 4-5-6-7...
 Pacific Division Convention is expecting YOU at the...
 Hyatt House in San Jose over Labor Day weekend...
 Traffic: W6BYV 355, W6RFF 139, W6KZJ 7...
 W6AUC 62, W6NW 43, W6OII 21, WB6JGS 20, K6A...
 14, W6BVB 12, W6ZRJ 5, WB6FLD 3.

ROANOKE DIVISION

NORTH CAROLINA: SCM, C. H. Brydges, W4WXZ...
 SEC: W4EHF. PAM: W5QFO. VHF: PAM: K4GHI...
 SEC: K4MCC. K4MCC of K4MCC, one of the...
 "holidays" covering Robeson County so if you live ne...
 there get in touch. CNN (Carroll's Novice Net) has...
 QNI 190, QTC 46, QTR 911 for May. Look for CN...
 on 3718 khz daily at 5:30 EDT and NCS WN4UK...
 WB4TNB still OOs a little and plays with 551...
 WB4CES reports new 2M emergency net on Charlott...
 4/94 daily at 0100Z. W4GVA passed Extra. NCS...
 on THEN and acts as trustee/advisor for newly form...
 Catawba Valley Tech Inst ARC. He is helped i...
 WA4EGP and WB4AVG, congrats all. Daytime Four

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The Wilson 204 is the best and most economical antenna of its type on the market. Four elements on a 26' boom plus a Gamma Match (no balun required) make for high performance on CW & phone across the entire 20 meter band. The 204 Monobander is built rugged at the high stress points. Using taper swaged slotted tubing permits larger diameter tubing where it counts, for maximum strength with minimum wind loading.

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	Boom Length (ft)	Number Elements	Turning Radius (ft)	Surface Area (sq ft)	Wind load at 30 MPH (lbs)	Assembled Weight (lbs)	Shipping Weight (lbs)	Price
M520	40	5	27'0"	5.0	125	90	96	269.00
M204	26	4	22'6"	3.9	100	46	49	139.00
M156	26	5	18'0"	3.7	93	41	44	139.00
M154	20	4	15'9"	3.0	75	30	32	89.00
M108	31	6	16'1"	2.9	73	34	36	99.00
DB54(20)	40	6	27'0"	7.9	198	105	119	299.00
DB43(15)	19	4	15'8"	4.3	108	38	38	119.00
DB33(15)	17	3	12'2"	3.8	95	31	33	89.00

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MODEL KR50

- SUPERLATIVE "FEEL"
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- AUTOMATIC OR MANUAL WEIGHTING
- DIT AND DAH MEMORIES WITH SEPARATE DEFEATS
- "STRAIGHT KEY" OVERRIDE FOR QRS OR TUNE-UP
- GUARANTEED FOR LIFE BEARING PIVOTS

A sparkling new keyer with a host of exciting features. A powerful aid to cleaner, more articulate CW that is relaxing to use and a joy to copy.

The paddle assembly will delight the CW purist as well as the recent graduate from a bug or hand key. The superlative "feel" is attained by a magnetic return force, instantly adjustable to exactly the right touch for you.

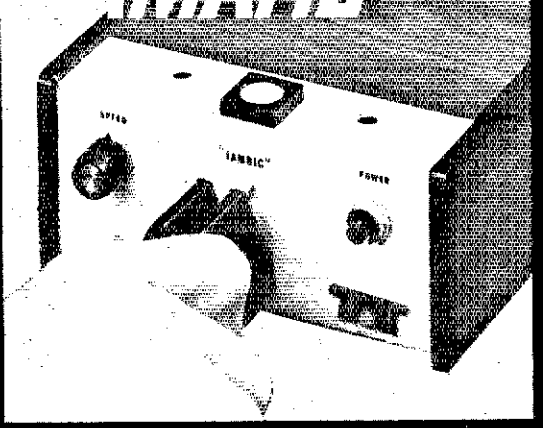
Weighting, the ratio of dit and dah (bits) lengths to the spacing between them, is either automatically or manually varied. In the automatic position, it is programmed to lengthen the bits at slow speed for enhanced smoothness and decrease them as you advance the speed, for highest articulation. Or, it can be adjusted to a constant value.

The KR50 is versatile. Dit and dah memories are provided for full iambic (squeeze) keying. Either dit or dah, or both, may be turned off for operation as a conventional type keyer. Self-completing characters at all times.

A convenient "Straight key" is built-in for QRS sending or tune-up. Also an internal side-tone and 115VAC/12VDC operation is provided.

The KR50 is designed to have a permanent place in your shack for the years, perhaps decades, ahead. An investment in the enjoyment of CW.

PRICE \$110.00



KR20-A

Paddle has unique principle with excellent feel for rhythmic CW. Characters are self-completing. Bit weighting is optimized for normal speeds. Manual key button conveniently located for hand sending. Side tone signal. Reed relay. Plug-in circuit boards. 115VAC or 6 to 14 VDC. HWD 2 1/2" x 4 1/2" x 8 1/4". Wt. 2 1/2 lbs.

PRICE \$67.50

KR5-A

Similar to the KR20A but without monitor signal and AC power supply. A great value. For 6-14 VDC operation. Size HWD 2" x 4" x 6". Weight: 1 1/2 lbs.

PRICE \$38.50

KR1-A

This is the paddle mechanism used in the KR50. Requires 6-14 VDC for adjustable electromagnetic paddle return force. Adjustable contact spacing. For iambic or conventional keyers. "Straight key" button. Housed in an attractive metal case with cream front panel, walnut vinyl top. Size: 2" x 4" x 5". Wt. 1 1/2 lbs.

PRICE \$25.00

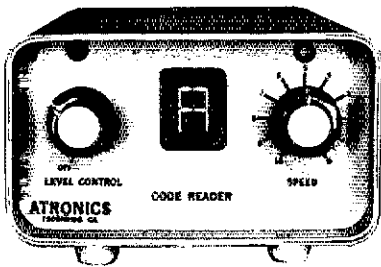
KR2-A

The paddle used in the KR20A. Single paddle for non-iambic keyers. "Straight key" button conveniently located, cream aluminum case with walnut vinyl top. Size: 2" x 4" x 5". Weight: 1 1/2 lbs.

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Regional Net (D4RN) activities are on the upswing and center around 7240 kHz at 1700Z & 2000Z. contact D4RN mgr. WA9NEW/4, daily. WB4ERO is new call for Scotland County ARS. K4BCE continues to score nicely in FMT (Frequency Measuring Test) and do a little OO. The Alamance Repeater Assn. WA4AKY had a Ladies Day Picnic and the men did the cooking for their gals. Nice newsletters were rec'd from Brightleaf ARC, Forsyth ARC, Carolinas-Va Repeater Assn., Mecklenburg ARC, Alamance Repeater Assn. and Cape Fear ARS. Thanks to all. Forsyth ARC has passed 30 in Novice code with written exams to follow, congrats to W4YJG for pushing the cw, and congrats to WB4JGZ W4IRE & W4DBT for running classes. Many NC clubs are reporting new amateurs in their ranks. What hurts is the ones we lose. Sympathy to those close to W4CP/Winston-Salem. WA4HIB/Hickory and WA4CMX/Yadkinville, now Silent Keys. Traffic: (May) K4GCN 175, W4FMN 114, K4FTB 102, W4OFO 101, K4MC 78, WA9NEW/4 54, W4WXZ 46, WB4MXG 44, WA4KSO 40, WA4CBB 32, WB4RGS 32, WB4OXT 30, W4PCN 20, W4WWR 20, W4EHF 10, K4EZH 8, WB4GV 8, W4VSRD 8, W4VX 8, K4TTN 4, WB4ES 3, WB4TNB 3, WA9NEW/4 111, K4MC 46, W4ACY 22, K4FBG 14, WB4FFX 10.

SOUTH CAROLINA: SCM, R. H. Miller, WA4ECJ - SEC: W4ZMZ. Chief RM: WB4OBZ. PAM: WA4DZG. By the time you read this, a new SCM will have assumed his duties and responsibilities. He deserves the support of all loyal League members. Please keep in mind that WA4DAX has been elected to administer all Section-level League operating programs, including NTS. Nets may be designated by him as "Official" if they are organized under SCM auspices, - but not if they are ruled by independent committees incompatible with the League Field Organization. The Palmetto Traffic Exchange wishes to express its appreciation for Tom's affirmation of full support in its endeavors as an Official NTS Section Net, and pledges its loyalty to the new administrator of League activities in South Carolina. The Spartanburg Club has about doubled in size as a result of recent code classes. Nets: CNE, Mecklenburg 177, 178, 179, 180 (2 sessions) unreported; CNN, check-ins 212, tlc 22 (one session) unreported; CNN, check-ins 190, tlc 46, Blue Ridge 2-meter net; check-ins 886, tlc 31, 35BN; check-ins 584, tlc 85, PX; check-ins 243, tlc 133, Anderson RC Net; check-ins 419, tlc 8. Traffic: WB4OBZ 313, WB4ARJ 313, W4NTO 185, WB4CAK 92, WA4DZG 43, WA4ANK 40, W4FMZ 36, W4ECG 36, WB4CKL 22, WB4TZW 13, WB4HNQ 8, WA4BDG 3, WB4NBK 2.

VIRGINIA: SCM, Robert L. Follmar, W4QDY - SEC: WB4DTG. PAM: WB4KKM. Just: PAM: K4VWK. RM: K4IAF. VNI: W4EPJ. VSN: W4SHJ. ARN, BU, letins & Club papers rec'd from HRRR, Carolinas-Va Rptr Assn. Tidewater Radio Conventions Inc. AMARD; Lynchburg ARC; Portsmouth ARC & National Capitol DX Assn. On June 2nd our SCM presented diplomas to a class of 52 Novice licensees at the Norfolk Technical College. The school deserves full credit for its work with these newcomers to ham radio. Clubs take notice: Once a year, a club may request a complete printout, on labels, of all the ARRL members in the club area, for the expressed purpose of a membership solicitation. These labels will be provided without charge to the last of the East Coast Independent Traffic Net is being held 8 PM EDT on 3605 kHz; W4U3U is Net Mgr. VHF station WA4MMP; K4MSG; WB4NTV & K4MSG all reporting nice band openings on 6 meters. QOS WB4KCI. WA4PRP W4HU busy with violators. WA4GPS new EC in Prince William Co. is setting up his group. Good luck! The SC along the Potomac River is new VSN Mgr. W4EPJ & ARN Mgr. W4SHJ spent an enjoyable day at the Manassas Hamfest on June 6th. K4GR sez new job keeping him hoppin'. W4YZ reports W4DBK passed General. Ole "Ed" W4ZM gave a "Spark" talk & demo to VARRA Richmond. Ed's sons W4HJW from Ashland and W4HJW from W4ASMR & K4PIV operated radio station NAR on Armed Forces Day. WB4ZNB EC keeps his AREA group busy with PTA fair; K4SPS K4SDS WB4MNJ & WB4NTV took part & received newspaper write-up. W4NPI handled 20 tone patches, participated in Azalea Festival Air Show; Orig 80 mps & WA1ME made amateur Extra. FBI WA4PBG spent 2 days at ARRL discussing ECA & general emergency. WB4FDT worked his 1st Asia for WAC from VA QTH! K4GTS reports direct contact with officials of Foreign Admins re post 1979 amateur radio on at least 9 days. WA4AJF bought Heath SB400/SB301. WB4FJK got his low band antennas back up & will again be active. W2TPV/4 ran 13 tone catches. Slow month on radio & busy otherwise reports WB4WUX. N41SC special events station of Israeli Showcase in Richmond, May 16-23. 137 mps & patches to and from Israel & Ham Radio shown to about 40K general public reports WB4LEK. K4FEL closed for summer. Student W4N4OB of W4TMM passed his General 3 weeks after his arrival. W4HU among others taking part in Armed Forces Day. WB4DRC back on air with 2-meter FM144. W4JUJ still Co. hunting. Traffic (May) WA4EPJ 600, K4KNN 205, K4GR 194, W4UJ 177, WA4JVO 141, K4MLC 119, WB4FLT 118, W4YZC 118, W4SHJ 89, W4QDY 79, WB4YKM 53, WA4VU 53, W4ZMZ 47, W4PBG 40, WB4KJ 37, WB4TNB 36, W4ACL 34, W4NPT 34, K4BK 33, W4SUS 33, W4APBG 32, WB4FDT 31, K4GT 29, W4YVQ 28, W4AKP 24, K4VWK 24, W4LGN 18, W4AJF 16, WB4FJK 13, W2TPV/4 12, K4K 12, WB4WUX 11, W4ZAU 10, WB4LEK 6, WA4AN 5, W4MK 5, W4GEG 4, K4FEL 4, W4LXB 3, W4ZNB 1, (Apr.) K4PIV 30, W4GEG 8, W4JUJ 1. (Mar. W4GEG 10.

WEST VIRGINIA: SCM, K. C. Anderson, W8DUV - TARA Hamfest in Huntington was biggest and best ever - over 800 paid attendance. W4LAS/W4FA from Norfolk won a miniature still for traveling the longest distance to attend. TARA members starting Tuna Net on 40 cw using QRP transmitters built in tuna cans (as shown in QST). W8CKX back from vacation down South. W8HZA built QRP rig and using it on nets as well as for QSOs. K8LOU about to give up bachelorhood, introduced fiancée Carolyn a the Huntington hamfest. W8BAGH repeater's auto patch went out of line until later this month. Hopely, it will soon be repaired (I just got my own touch pad installed and can't wait to try it out).
Net - Freq. Time Sess. QNI QT
WVN - 3570 7 P.M. 30 142 5
Fone - 3990 6 P.M. 31 887 15
Midday - 3990 12 noon 31 647 10
Novice - 3990 5 P.M. 2 882
Traffic: WB8DQX 80, W8HZA 59, W8CKX 2, W8EUE 24, W8TDA 24, W8HII 13, W8FZP 1, K8GEW 9, W8DUV 8, K8ZDY 7, W8BSAW 7, W8LFW 5, W8QYN 5, W8RUZ 5, W8CCN 4, W8JM 3.

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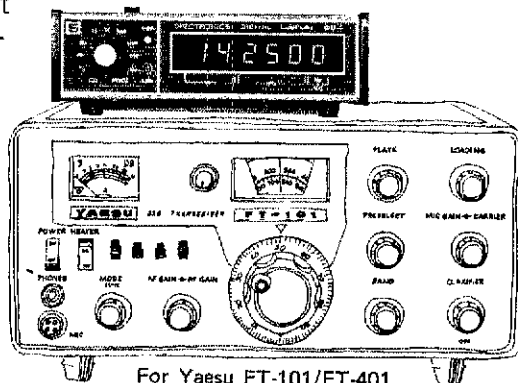
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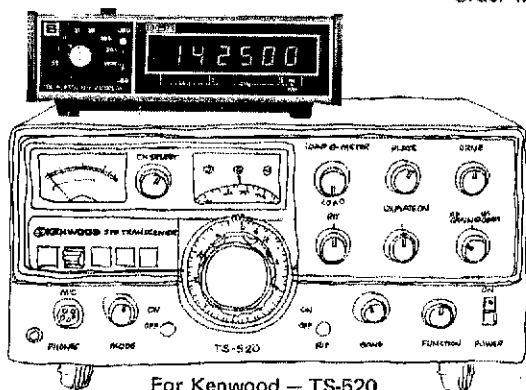
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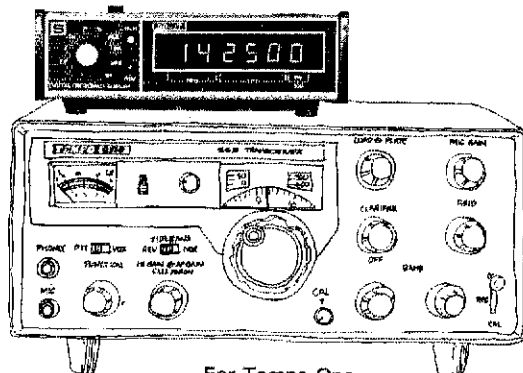
Until now, direct digital frequency read-out was incredibly expensive. But no more. So order the Spectronics unit that's right for your rig now. The Prices? Incredibly right. No matter how you count 'em.



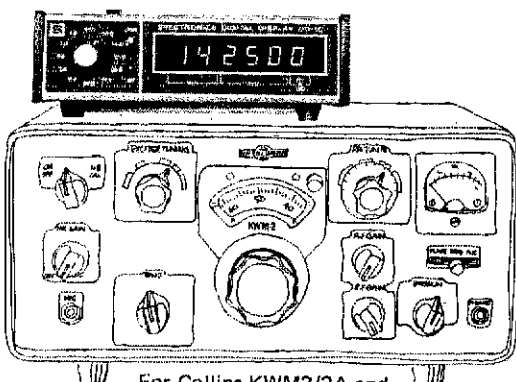
For Yaesu FT-101/FT-401
—Order Model DD-1—\$169.95



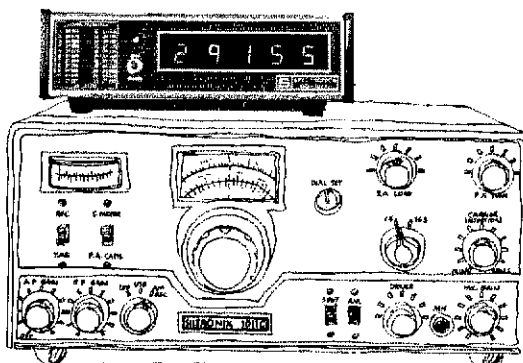
For Kenwood — TS-520
—Order Model DD-1-K—\$169.95



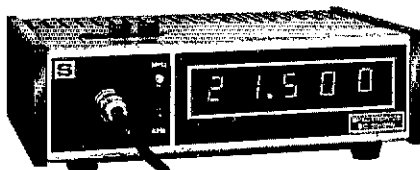
For Tempo One
—Order Model DD-1T—\$169.95



For Collins KWM2/2A and
75S series—Order Model DD-1C—\$169.95



For Siltronix Model 1011
—Order Model DD-10/11—\$149.95



Model SC-30 Counter
5 Hz—30 MHz—\$169.95
Model SC-250, 5 Hz—250 MHz—\$219.95

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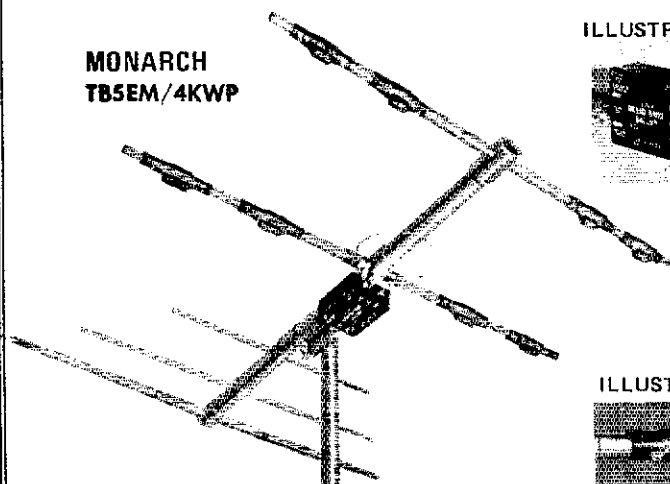


ILLUSTRATION BALUN



ILLUSTRATION TRAP



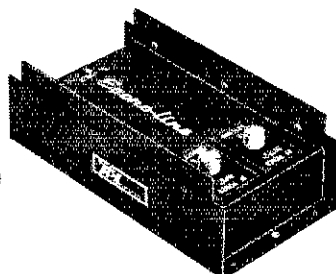
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ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Clyde G. Penney, WAWHLQ - SEC. - K9VLA. RM: W5BHC. PAMS: K0CNU. WAWYGO Co. ten-ten chapter of ten-ten international now has 74 local members and 159 out-of-state members, for a total of 233. WAWYNG has been appointed Editor of 10-X Chapter News, and Asst. Editor of 10-X Quarterly Bulletin. Ski Country ARC reports they have a new repeater, W0BUE which will begin operation within 30 days. Everyone is welcome to use this repeater. Congratulations to K9RQF who participated actively in an emergency situation on Apr. 13, 1976, in which quick action by a group of Amateurs, including K9RQF, was credited with saving the life of a seaman, stricken with a severe heart attack, aboard a vessel in the Atlantic 550 miles East of the Delaware Breakwater. It is with deepest regret that we add the call of W0QJBI to the list of Silent Keys. Net Tfc. for May: Columbine QNN 1161, QTC 196, Informals 326, 1536 min. Late Net Tfc.: SSN QNN (Mar.) 117, QTC 18, 289 min.; SSN (Apr.) QNN 55, QTC 16, 179 min. Traffic: (May) WAWYX 1745, W0QQT 489, K9YF 428, W0QMTA 414, W0W 178, W0HXB 126, WAWYNG 112, W0ACNA 87, AD0QIX 84, W0B0AL 72, W0DGN 72, W0BOEF 72, W0BPVT 70, W0B0NHA 61, K0TIV 60, WAWYGO 44, W0INS 31, W0TMA 29, W0LAE 27, W0DFM 20, W0BIZO 20, W0MYB 14, W0EELD 8, WAWYED 5, W0LEFQ 4, K0SPR 4, K0STX 4, W0HLQ 3, W0QMR 3, W0GW 2, W0OWP 2, (Apr.) W0LQ 75, WAWYNG 11, W0ETT 29, (Mar.) W0ETT 50.

NEW MEXICO: SCM, Edward Hart, Jr., W5RE - Asst. SCM: Joe T. Knight, W5PDY. SEC: W5ALR. PAMS: W5PNY W5DMG. RM: K5KPS. New ORS: W0PSL/5. SSN meets daily at 1915 MDST on 385 kHz and the month reports ttc 201 with a total station turn out of 222. Any help will be appreciated since this is the usual summer doldrums. New Mexico Road Runner Net meets daily at 1800 MDST on 3940 kHz. W5DJT coordinated a joint Ham-CB operation setting up a coffee stop on I-10 west of Las Cruces for the three-day holiday. The ham-CB boys involved were K5RY, W5ALX, W5FTT, W5LQH, W5VCJ, K5HTS and W5VQK. W5TNG and W5NUI have been doing considerable monitoring between 27.260 and 28.000 MHz for strayed CB operators. There were two boys lost in the Pecos wilderness, and largely due to the efforts of W5ALR, W5PDY, W5BPHC, K5GIR, W5DPO, W5SMV, W5JRG and W5QJR they were found and returned home in good shape. Traffic: W5DAD 520, W5UH 330, K5KPS 238, W5JOV 238, K5MAT 215, W5KSS 196, W5ENI 157, W5PDY 82, W5RE 50, W5NUI 21, W0PSL/5 16, W5QNG 14, W5MIY 7.

UTAH: SCM, Ervin Greene, W7EU - Thanks to the Net Migs., W7OXC and W7MEL for their fine work running the most active nets in the state. UCI recently moved to the Novice portion of 80 and looking for more participation from Novices. UT is in charge of WIMU this year and plan many new and interesting activities. Plan on attending. For info contact W7OXC. W7OXC has a 702X, has turned from school for the summer and heard on the air again. W7JRC had a nice but too short vacation with his son in St. Paul recently. UARTS new repeater call has been received and is W7AIG. If you'd like something more rewarding and interesting on vhf than just phone, contact one of the UARTS members and get on the air on a repeat RTTY. Contact W7OXC. W7ALUW, W7KHV or W7UQW for a start. Anyone will be glad to get you started. W5SCV awarded BUN certificate No. 119, K7ALA qualified for No. 120. Congrats guys. Traffic: K7HLR 194, W7ATME 109, W7TEH 59, W7JRC 45, W7OXC 26, W7DK 21, W7OAU 21, W7BE 12, W7EU 8, W7UTM 7.

WYOMING: SCM, Joe Ernst, W7VB - Not only staging the 176 WY Hamfest, but getting a two meter repeater on the air in one year is no small task. It was due to the efforts of Cody amateurs, including K7KH and W7PT who are to be congratulated on their fine job. The successful Hamfest was held at Meadowlark in the Big Horn Mountains. The two meter repeater operates from Cedar Mountain near Cody on 25.85. The beautiful Mile Hi City, Denver staged the 1976 ARRL Convention. Congrats to the ARRL amateurs who did such a splendid job with coverage and help during the Teton Flood. Hundreds of Health and Welfare messages were handled. I am sure all well be proud of the job they did. Look for more complete stories of their efforts in QST. Traffic: K7VWA 523, W7TZK 306.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Jim Brashear, WB4EKJ - C. W4DGH. PAM: W4TXM. RM: WB4EKJ. Congratulations to WN4MDG for receiving the outstanding nursing student of the year at Calhoun Jr. College. New officers for the Calhoun ARC are WA4QJ pres., WA4QLB, vice-pres.; K4CIP, secy-treas. The 10/70 repeater is back on the air. There were 38 at the Eat-in-Meetin at the Hickory House in Ma. WB4CXD, EC Jefferson Co reports 6-meter weather RTTY on 52.9737 provides hard copy weather in during weather watches to counties without TW from weather service. W4HJM, EC Calhoun Co, reports the Mt Cheaha repeater was activated for a weather watch on June 1 at 3:15 PM CDT and closed at 9:15 PM CDT (5 hours and 45 mins.), with WA4OJK, NCS. 17 counties were represented including 3 G. counties. He also reports the Golden Gabbars had record check-in for one day when 31 checked in. Appointed WA4QJ as EC. Endorsed W4RGS as O and ORS. The Huntsville ARC provided communications for the diabetes Bike-A-Thon in May. Join in either or all our Section Traffic Nets: AENM 3:55, 2415Z; AEND 3:25, 2230Z; AENB 3:55, 0000. Times are one hour later (in Zulu time) during period of CST. Traffic: (May) W4EKJ 269, W4RGS 20, K4AOZ 110, WN4JDH 93, W4EUD 65, WN4RN 63, W4RCP 24, W4MLK 12, W4ATMG 12, W4TVY 2, (Apr.) WN4JDH 215, W4ELC 22.

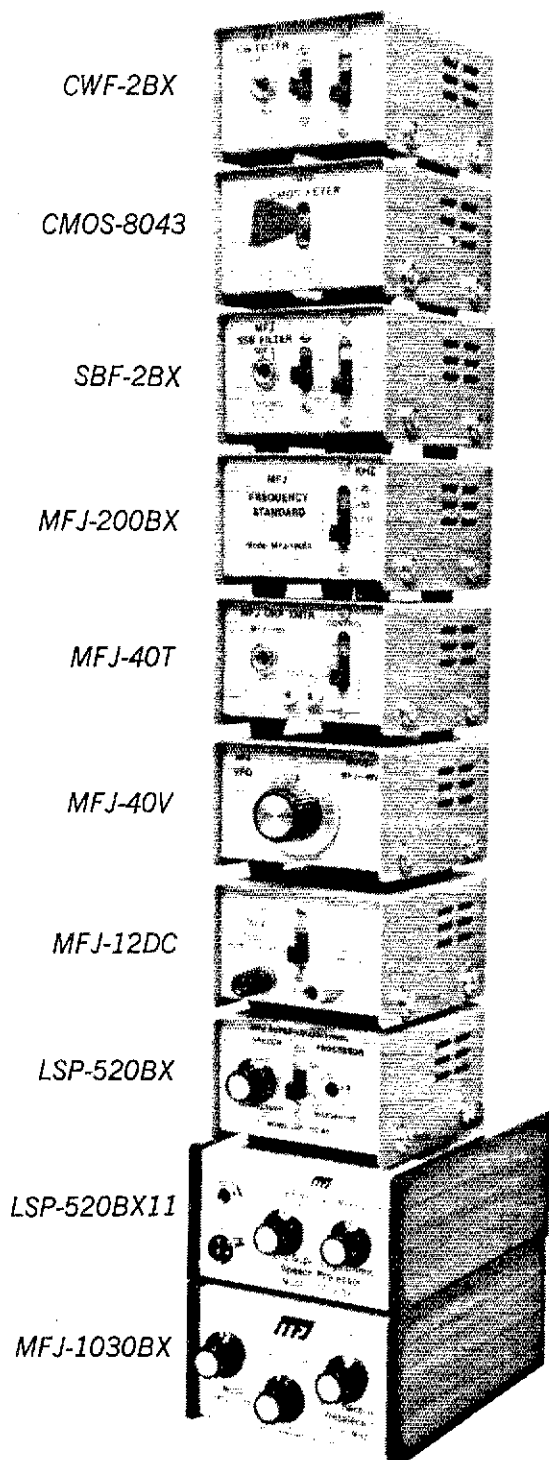
CANAL ZONE: SCM, Roderick J. Isler, K25PI (Apr.) late report. K25ST headed up field activities this year. The CZAAC Club expected a huge turn out and hope we exceeded last year's result. K25AS reported this year's Panama Hamfest was huge success and those who attended had a wonderful time. More are getting the two meter habit and a communicator net is a huge success. A new CZC book is now published and also new rules, each should receive his in the mail soon.

GEORGIA: SCM, A. H. Stakely, K4WC - Net - Freq. Time (Z)/Meet QNN G CVEN 1 - 3.950 1:30 Su 82 CVEN 2 - 146.94 0200 Su 87 SSN 3.595 2300/0200 Dy 89 GSN 3.975 2330 Dy 1853

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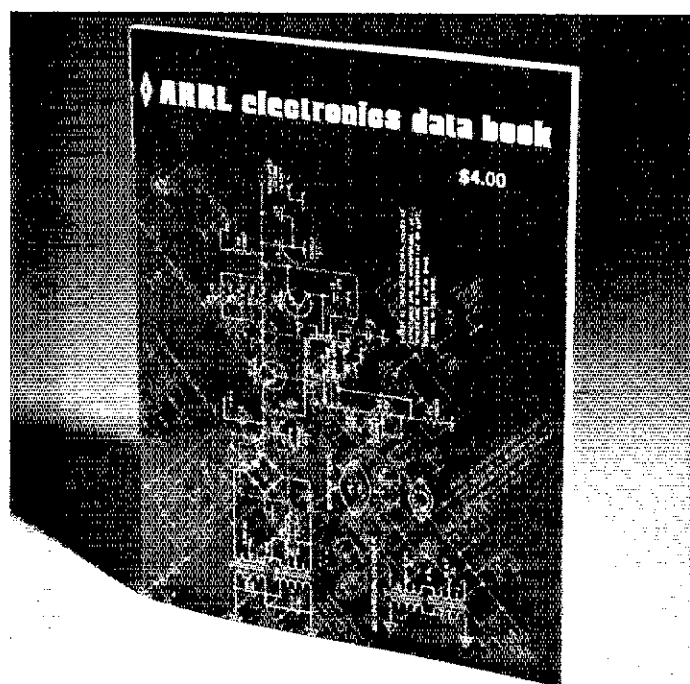


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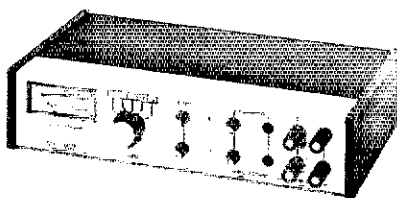
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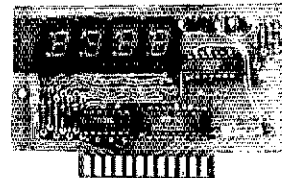


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SEC: K4YRL. PAM: K4JNL. RM: K4FLR. Sincere thanks to K4KZP for serving as SEC, and to K4VHC for his stint as RM. Your support of K4YRL as SEC and K4FLR as RM will assure GA the top spot it enjoys. Congrats to K4FLE for his advancement to W4FOE on Daytime 4RN net certificate; and W4VDH new A1 op. Welcome back K4YM. W4WXA new 4RN rep. Kentucky's gain is our loss as WB4IGX/4 moves. W4NET calls his new phone patch a "handline interface." Hi! W44LHH active on 2. WB4AEG says 6 good during May. Wonder if his new homebrew steam engine the report. WB4MZQ transmitting bulletins. W4JIM has Bient, WAS No. 371. Alford Memorial RC (Stone Mtn. rpt) officers: K4ZYK, pres.; W4SSU, veep; W4GVJ, secy.-treas. SEDX visitor, VE3MJ (VX9A & VY9A). W44IY now Silent Key. K4JJQ now known as K4SF. K4FLR makes PSR. WB4IGX/4 07, K4FLR 13, W44FBI 291, 14, W44LLI 14, K4FERM 10, K4JJQ 10, K4WC 6, K4SF 4, W4SHL 4, AD4BA1 2.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RKI. SEC: W4WBM. RM: W4FBI. PAM: WB4VDM/75, WB4BSZ/VHF.

Net	Freq.	Time(Z)/Days	Manager
NFPN	3950 kHz	2230/0300 Dy	WB4VDM
QFN	3651 kHz	2300/0200 Dy	W4MEE
QFNS	3715 kHz	0100 Dy	WB4GHU

Sorry to report W4FBI a Silent Key. W4MIG new EC of Walton Co. WB4VDM reelects NM of NFPN. E. Coast RTTY Net, 8:00 P.M. EDT on 3605 kHz, needs FL QNI; W43UXU is NM. SNCs earned by W4WNY on Gator Net and by WB4CDQ W4EYV W44GYR K4HPE W44QNY WB4RVV on NFPN. WB4GHU W44QQG worked FL QSO Party from Flagler Co. QQG got Advanced ticket. W4VQZ one of top winners in V-L-QM Contest. New Lake-Summer Rptr. Assn. officials are W4EYV, pres.; W44HZZ, vice-pres.; WB4RVV, secy.-treas. Meetings 2nd Tue. at 7:30 P.M. W4EAT had 42 QSOs in Apr. via Oscar 6 & 7. K4UTE winner of NOFARS pile-up contest. W44UPW W44NID had top scores in last 55 contest. RANGIE voted more upgraded program. W44QIM W44IHY recruiting hams for Duval Co. Sheriff's posse. WB4SWV handling comm. for Jax. area rock-fests. W4VLK upgraded to Extra; WB4DAD to Advanced. W44TNC upgraded from Novice to Advanced and active on traffic nets from Lake City. W4VMO doing FB job at Editor of TARC newsletter. W44WCG received nice ham radio for handling Italian earthquake traffic. W44BII and XYL WB4QFR active on 2m fm from Bonifay. Bunny hunts on 2m fm revived in Playground area. K4IUH won Swapfest main prize. W44WKL & XYL assisting WB4JHQ with W4JC News. W4ZGO has new quad; WB4BNT new tower. Traffic: (May) WB4GHI 318, W44FBI 291, W4WNY 223, W44ECV 217, WB4DXN 130 WB4HKP 127, WB4TPR 127, W44LDM 107, W44NID 93, K4BS5/4 87, W44WBM 81, W44NMU 66, W4EYV 60, WB5VDM 59, WB4DTS 54, W44BAX 48, WB4WYX 44, W44EYJ 41, W4KIX 40, W44KH 40, WB4NJI 38, W44LE 34, W44RVV 28, W44TXM 19, W44CBI 11, W44HRG 11, WB4GHI 9, K4RNS 9, WB4VAP 5, K4IEK 4, WB4FJY 2, WB4VMP 2, (Apr.) W44TXM 33, WB4FJY 25, WB4NMU 25, W44HRG 18, W44IA 11.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL. SEC: W4WYR. RM: K4EBE. W4MEE. PAM: W44NBE. W4OGX. New appointments this month: K4SCL EC Pinellas County. W4WYR, asst. SEC. W4GPL, asst. EC Pinellas County. W44LGT now working lots of DX since resigning as EBN mgr. and turning it over to W44JVP. K4DAS received DXCC award. W44UVG had antennas torn down by tornado May 23. He is close to making Bi-Centennial WAS on new club station W44GJJ. WB4ARZ K4FCW W4GPL W4IRA W44KCR W44MJT and W44WDM furnished communications as requested for Disaster Drill held by Pinellas County and City of St. Petersburg on May 13th. Pinellas County AREC has started 2 new nets, one on 147.66/147.06 at 8 PM Sun. and one on 28.715 MHz at 9 PM Sun. May 4th was St. Petersburg hamfest with good attendance in spite of threatening weather. W4CZS and K4NAN won the two IC-22A main door prizes. Congrats to W44ORX new Tech. on 2 meters in Largo. W44JFP is expecting his Extra any day. WB4AID on recent vacation to Nicaragua became licensed as YN1AID. QFN net management is scheduled to shift to Southern FL Section on July 1, so by the time this is published W4MEE should be mgr. WB4ALH reports a revised Emergency Communications Plan for Southern FL Section is about ready for publication. Traffic: (May) K4TH 534, K4SCL 320, W4MEE 240, W44BBI 200, W44H 231, W4WYR 158, W445CK 148, K45JH 138, W44JVP 135, WB4ALH 79, K4CFV 77, W4DVO 66, WB4WYG 49, W4IRA 45, W44LGT 45, K4YSN 44, K4EUK 43, W44HDI 43, W44EIC 37, W44LE 37, W44EK 34, K4BLM 32, WB4AID 27, W44GOG 26, W44GDK 25, W44GM 25, K44GYF 23, W44TE 20, W44SMK 10, W44JF 8, W44KIX 7, W44OGX 7, W44ATF 5, K4DRH 6, W44UVG 6, W44K 4, (Apr.) W4DVO 61, W44GDK 34.

WEST INDIES: SCM, David Novoa, KP4BDL. New appointments: KP4ACQ EC San Juan District; KP4EIJ QVS. KP4E EGO and EIC working a lot of DX with their new Kenwood TS-520s. KP4DBR has a new Henry 2K linear. KP4EBQ operated as VP2VCN from his summer QTH in Tortola BV. KP4DPN very active thru the satellites. KP4HG and EQL are DX SWLers. KD4BRI is acting NCS of the RCPR 40-meter net on Sun. KP4KE active on 75. KP4BAJ is now retired and again DXing. KP4BBS very active on 75. KP4BBS of the RCPR. KP4DMI has a new QTH. Traffic: KP4EGF 42, KP4HG 29, KP4BSQ 16, KP4AST 3.

SOUTHWESTERN DIVISION

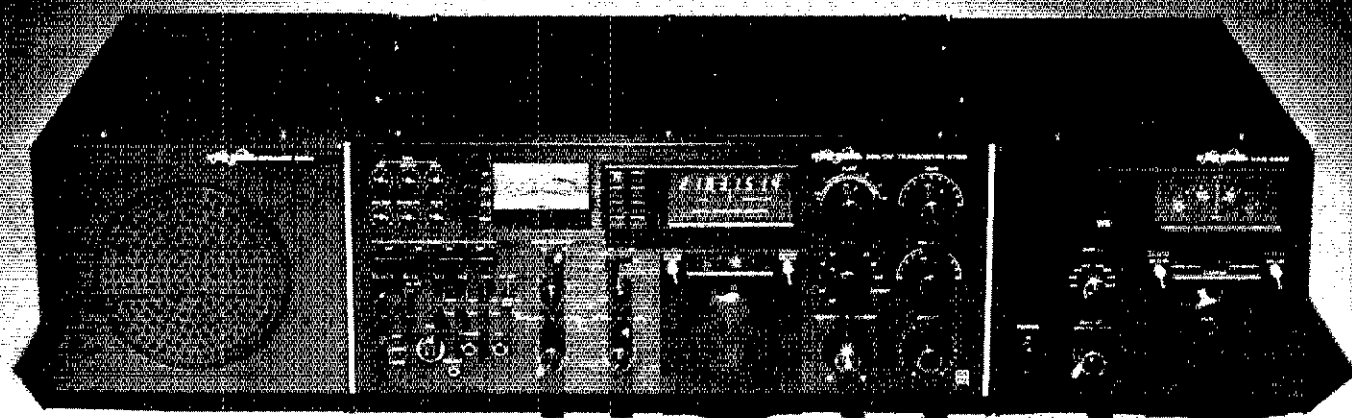
ARIZONA: SCM, Marshall Lincoln, W7DQS. PAMs: W47KQE W7UQQ. RM: K7NHL. K7ZMA reports amateur radio operators provided primary coordination for the Navy parachute team show at Riverside when the Navy radio system failed! W7CJG is working on a 145.015-147.47 net patch for Sierra Vista. The Western AZ Radio Club is a new club at Bullhead City. W47UDV is pres. W47WEB has received a WAC award. W7YS recently administered four Novice exams, and has five or more to go. W47PDW reports the Central AZ DX Club has found exchanging DX information on 2 m a great time saver. Do you wish there was more news here? Then send some to our SCMI Cactus Net: QNI 1051, QTC 246; ATEN: QNI 551, QTC 50, certificates to W7RQ, W47JCK, K7NTG; SWN: QNI 222, QTC 201. Traffic: K7NHL 205, W7UQQ 85, K7NTG 50, W7CAG 38, W7DQS 30, K7UXB 29, W47KQE 26, W47KM 14, W47TM 13, W7CAI 2, W47PDW 9, K7CC 7, K7LV 7, W7CZL 7, W47WEB 5, W47JCK 4, W7UXZ 4, K7NMQ 1, W7RQ 1.

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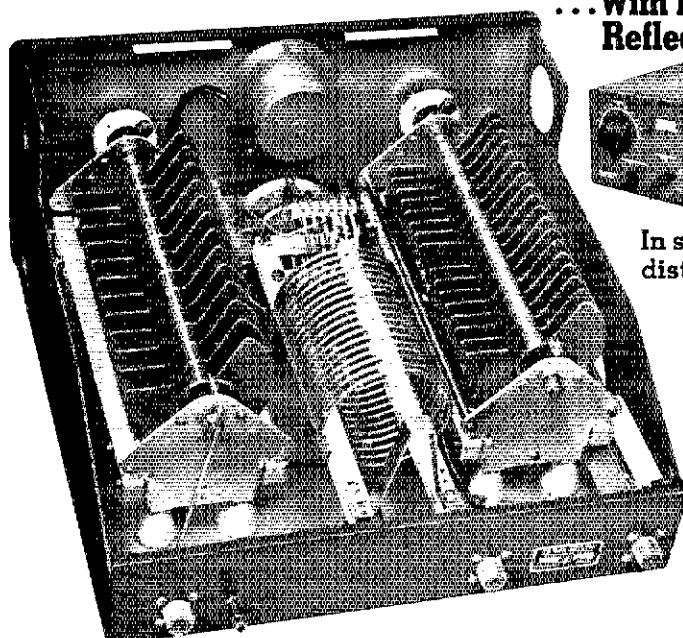
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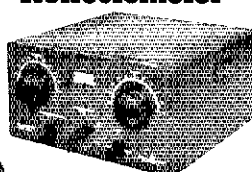
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LOS ANGELES: SCM, Eugene H. Violino, W6INH - Asst. SCM, Kevin A. Bessy, W6BOYN, RMS W6BZCV W6BPKA and K6UJYK, Act. SEC W6SPK. The LERC Hamfest was a success as usual but didn't get the number of attendances from Bill Welsh. There were several new displays this year and the swap table are improving with each succeeding fest. The QCWV had their spring banquet at the Yamashiro up in the hills overlooking Hollywood, with a 18 members and their XYLs present. W6ETB report traffic total for last months Metro Tfc Net as 23 pieces of traffic with 588 check-ins. Let me remind those who work the high bands that, the Metro net is very active if you're interested, drop a line to W6BETB 11408 Buell St., Santa Springs, CA. 90670. The Ramonito RC recently had W6HHW demonstrate how to load RF, anything from a wet string to a ion wire for their program. They are also remodeling the club house. Received a bulletin from the Southern Counties Amateur Teletype Society: its a new one and done very nicely. You RTTY buffs should get in touch with K6PXA regarding activities and participation. The Southern CA Net had a nice get together with ne members up in the mountains last month. Over 2 members and family attended W6BZCV's retreat. The SCWP group had a luncheon at Brotherlons with over 80 members and their XYLs attending. W6VH was master of ceremonies and did a wonderful job. The Region six tfc net helped during recent typhoon which struck the island of Guam. Heavy participation by W6BPKA K6HW W6TYM W6YBV K6JZR W6HU W6AMBZ W6OEO and W6INH. Traffic was routed via 7 and 14 MHz through K6H1QU, who seemed to be there when we came up with messages. The storm left the island without power and antenna towers, but emergency facilities kept us moving messages of an emergency nature, with Health and Welfare filling the empty spots. W6DIG reports he is studying for his Extra Class ticket and has it about made. I recently received the latest MWRA newsletter and boy was it good. Traffic: W6BPKA 20, W6INH 200, W6OEO 246, W6VH 10, W6BETB 69, W6BGMV 48, AB6AIT 40, W6EPS 17, K6CL 15, K6EA 15, W6BR 14, W6USY 11, W6OLD 9, W6EWY 7, W6EPS 6, W6JFD 6, W6NKE 6, W6ZKJ 2.

ORANGE: SCM, William L. Weise, W6CPB - Asst. SCM, Dick Birbeck, K6CID, SEC, W6ATV, RM/PAM: W6AKR, W6BUBK says still trying to check in on DRN6 but band conditions are very bad. W6BAM copies OBS direct when band conditions are favorable. Listen for Shelly and get into earliest. For all who read this column your new SCM, effectively Sept. 12 will be William E. Heitritter, W6AKR, P.O. Box 524, Hemet, CA. 92343. All reports, etc., should be sent to Bill after Sept. 1, or you can send your report via message on SCM. Sorry to hear W6AUW has resigned as pres. of Desert RATS club. If you missed the League Officials meeting at Riverside on June 1 you missed a great opportunity to air your preferences, re: rule changes, with your Dir. A very informative meeting. The band conditions are not improving. Many traffic, AREC nets, etc., are having trouble making contacts with members and outlying areas. The Guam typhoon points up the need for coordinated traffic moving exercises and establishment of adequate systems during emergency situations. When all commercial power and telephone system collapse do you have emergency plan so that you will be ready when the emergency comes. PSRR: W6ATVA 32. Traffic: W6WRJ 33, W6ATVA 18, W6CPB 4, K6LJA 4, W6QBD 3, W6QIE 1.

SAN DIEGO: SCM, Arthur R. Smith, W6INI - SEC W6GBF. Report serial numbers of stolen gear to W6TZV, phone 223-9925, for exchange with other areas. K6VRS new EC for Imperial Co. Thanks to W6BRMG for his fine service. League Officials meeting in Riverside attended by K6CD W6DEY W6NHG W6INI W6PZL W6USY. Upgraded W6AEZ W6BCBG W6JVA. Vista Cbers saw amateur radio demonstration by W6BWI W6DEY at Brangli Park. All equipment operated from emergency power provided by W6AEZ W6BLL W6ACNI W6DEY W6BDFY W6AKR W6OZS W6OZT. Amateur Radio Control Center set up in Silverado Park, Mar 30, operated by W6BCL W6EHN K6HLU W6INI W6ODQ W6QVH K6SCY W6TZV. New club: The Amateur Club in La Mesa with W6LEC, pres. License plate bill, AB 4271, withdrawn after strong amateur protest. W6JVA reports family of hams, W6NEE son, W6GGRH sister, W6GPP brother-in-law. ARC El Cajon has net on 28.6 MHz each Sat at 2000. Club are requested to put the SCM on newsletter mailing list. Addr page 8 of Q51. Mobile ham shack/motor home now being enjoyed by W6HXB and W6GBF. Traffic: (May) W6BHC 383, W6BPHV 264, W6BGI 235, W6PZU 49, K6JES 30, W6DEY 27, W6BCT 9, W6UJY 1, (Apr.) W6GBF 177, W6BCT 12, W6IHK 1.

SANTA BARBARA: SCM, D. Paul Gagnon, W6ADE - SEC: W6BHW. PAMS: K6YX W6KPS. RM: K6QPH. W6CWE appointed ORS, K6YNB QVS. Wayne is a member of the Contest Advisory Committee and monitors 3815 TUE at 1930. He also publishes a news letter on VHF/UHF prior to contest and is working on his third EME antenna system to 144 MHz. W6AEF should be on 220 shortly with new station master. K6QPH completed construction of an SB104 for W6KYW. W6WYD handled 134 rigs on Navy MARS. W6BHW ready with a new tribander on a mountain top at 100 feet to take on all comers in the contest. W6BGB brother-in-law 1/3 watt cv rig for 40. W6EQB (ex-W4EEZ) moved into Simi from NC and has been busy with the new Simi Valley Settlers ARC. W6BITZ and W6FYP gave an antique radio demo at the Ventura Co. ARC. W6AOC (31/31) Gibraltar Repeater Assn. held a picnic in Santa Barbara. Concert gave a presentation at the Pointsettia ARC in Ventura and Radio son W6TCH to talk to the Santa Barbara ARC. WICH from ARRL was guest at special meetings at Santa Barbara and Morro Bay. W6BRDV talked on FM and Repeaters and particularly W6ANW at SBARC. W6BHW W6GRW W6KPS W6PNM W6ADEI and W6BRDV represented the contest at the LC meeting in Riverside. PSRR: W6VBS 44, W6BOW 44, W6LBO 42, W6ADEI 54. Traffic: (May) W6CWE 145, W6MBZ 123, W6VBS 114, W6LBO 96, W6ADEI 62, K6QPH 8. (Apr.) K6QPH 22.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, L. L. Harrison, W6LR - Asst. SCM: Frank E. Sewell, W5IZU, SEC: W5DWL. PAM: W5GSN. W5GSN acting RM for NoTex. Park hamnet ARC pts 3-5 included revisions 1178-96 W5PEO. Chat was chm. Family get-together plus cookout June 26 YMCA campsite SW Amarillo. Swapfest Aug. 14/15 tickets now on sale at \$1.50 each.

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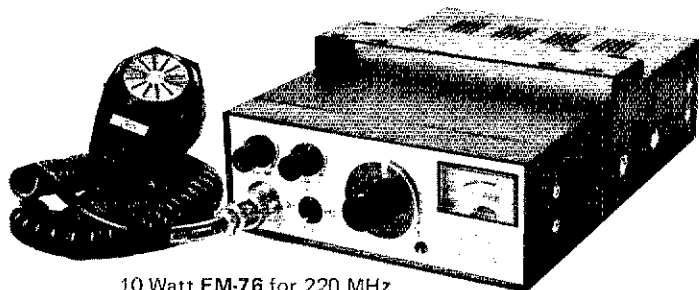
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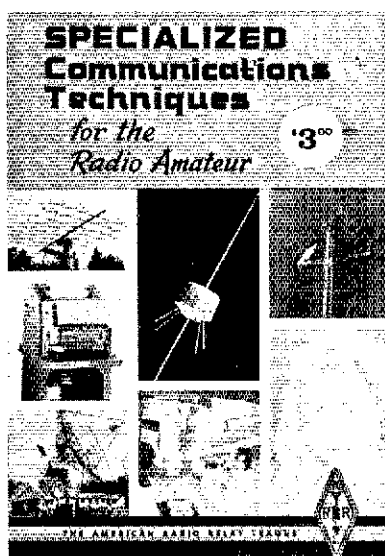
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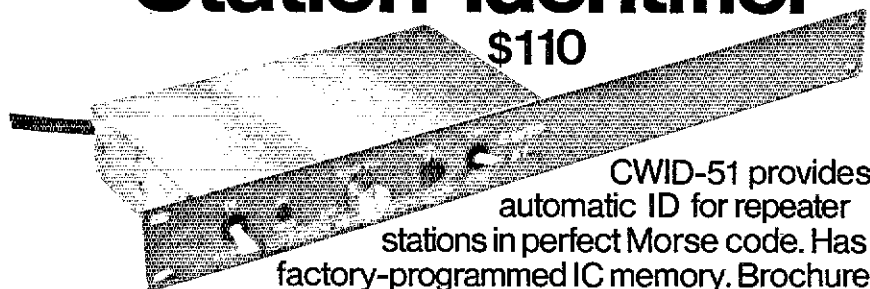
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pre-registration. Tyler QCWA announces joint mtg with Dallas-Rosegarden deal. Disaster Emcy Svcs Austin rpts RACES conf. May 29/30. Arlington ARC rpts 6 Flags demonstration area. Many CBers contacted, also lotsa former "hams" plus ex club members. The publicity given by Channel V was terrific. K5ZGA suggests all get-together after club mtg at "Gallagher's Submarine Sandwich Shop", for eyeball. Novice class started May 20th. RWK May rpts Ellers White, W1YL DpttyComMarLgqe 7:30 PM SWBT Bldg 10 June. W1YL rpts slight Aurora for small period May 2. Troop up of late W6PMN slightly readable in Glenn's QTH. KC Club F.Worth rpts W5BJB's XYL passed away last month. Please accept our condolences. OM. K5ASZ lost his mother. W5UXP made Advanced Bob Lord CD Director. Tarrant Co. retired this month. He was a marvelous asset to RACES. W5MBR appointed OBS for Ellers Co. Congratulations OM. Irving ARC meets monthly. New license classes conducted by WASPCF. W5IT, former McKinney/Dallas ham and OT at that has plenty "junk" for sale. Giveaway. Call him 372/4298 550 E Ann Arbor Dallas. Early is originator of Famous Dallas TVI plan. He has Hewlett/General Radio etc. Temple ARC meets 1st Thur. monthly. W5AMK CD Ham and professional Engineer gave \$500 to the establishment of a Temple Repeater. This per Mr. Edison's requirements states that such shall be transistorized. W5DWL Notex SEC was appointed as Dir. of the Dallas Amateur Radio Club. He relieved W5FFP who resigned due to other commitments. W5ARY left for four months cruise trip and including Brazil and Argentina. W5KLV RNS rpts 7290 kHz average sessions 6-16 31 sessions, QTC 191. fte time .26. Traffic: (May) W5TI 526, W5AKO 21, K5SOR 12, W5INJ/5 10, W5LR 10, W5YK 10, W5MTN 6. (Mar.) W5SHN 364.

OKLAHOMA: SCM, Leonard Hollar, W5FSN — The Tulsa Tower Ordinance has finally been passed. 60-ft limit on height, plus other minor restrictions. Most Tulsa people feel they can get along with it, more details later. New Bartlesville ARC officers: W5DBG pres.; K5JZL, vice-pres.; K5QXP, secy. Tri-City Club at Holdenville reports class of 15 new amateurs just finishing, with another class same size ready to start. Altus group recently gave 6 Tech. and 1 Novice test. Congrats to W5FELG W5FW W5SKGP W5NKD and W5SUD on perfect attendance in May representing OK on DKN-5. Congrats to W5FFW and W5PVL for Bicentennial. W5AS, W5RLE, new W5RLR, W5NGMF, W5KLG, W5SRXZ, W5SUC, new ops in OKla. City. Enid Club did another fine job helping with Annual Tri-State Band Parade and with an All Show this past month. The OK Ham Picnic and Flea Day will be history by press time. I expect a fine turnout for both. Remember Ham Holiday Aug. 7-8 in Oklahoma City. Traffic: W5BNKD 565, W5KGF 242, W5NKD 22, W5REC 139, W5RB 136, W5RLR 68, W5OYU 58, W5PVL 56, W5FKL 47, W5PML 31, W5AZS 28, W5QVZ 24, W5FSN 23, W5SELG 17, W5SUG 17, K5ZDB 14, W5JJ 4, W5NMZ 2.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — SEC: W5TQP, RM: W5UGE, PAM: W5SAMN. OO reporting this month: W5FMA W5LTQ W5NGW K5DAE. OVS reporting W5QCP, W5SKPL upgraded to Extra, is going to Honduras in July as communications op for Los Amigos de las Americas; he reports W5OTS has upgraded to Advanced. OVS W5AYR employing new TR200A. OPS W5VBM made BPL with 208 originations plus deliveries! New STEC officers: K5BDO, NCS; W5ARNL, alternate NCS. W5TTW, 2nd alternate NCS; W5KLV, secy. treas. EC. W5FMA rpts W5LHX has new TS700 and K5FRK having a ball with new code reader. W5HNS gathering parts for power supply to put two-meter rig on the air. W5SOOW operating portable in KS and North N. during summer vacation, he'll be an Aggie at W5AC in Sept. OPS W5BWW rpts W5AC has new tri-bander and fm twist. EC W5TFW rpts continuing heavy activity in code classes. From Houston ARC HARC News: Gulf Coast Amateur Radio Operators Regional Council is newly formed group for gathering and disseminating information on all area clubs. At W5RTB is in charge of collecting information. Houston area amateurs requested to send any amateur activity information to him. Huntsville has new repeater on 146.317.91. From Corpus Christi ARC Bulletin: W5BYJ has new boat! W5YAO purchased "very large" river boat! CCARC has 2 meter rig on each repeater in the area. Traffic: (May) W5VBM 377, W5UGE 280, K5H2R 279, W5KLV 244, W5JJ 161, W5RKKU 128, W5SKPL 114, W5FMA 91, W5BNUM 77, W5AYEA 64, W5TQP 43, W5BGE 32, W5JYH 32, K5ZSI 23, W5QO 19, W5BHO 12, W5TFW 12, W5BWW 11, W5HWS 8, W5SOOW 5, W5HNS 4, K5ROZ 4, W5YXS 4, W5CBT 2. (Apr.) W5BGZG 6, W5AIR 5.



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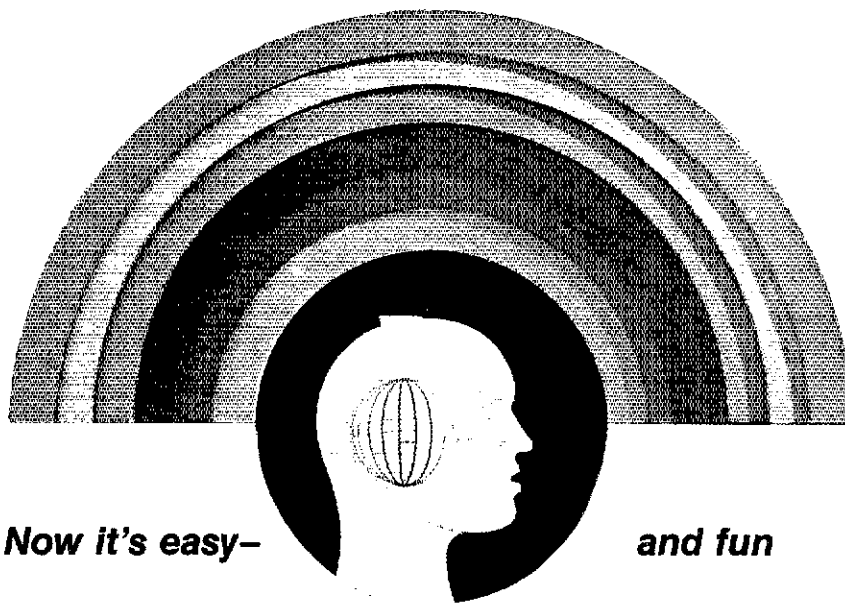
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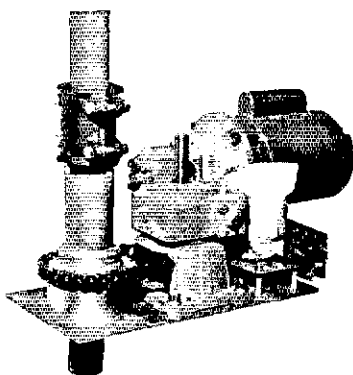


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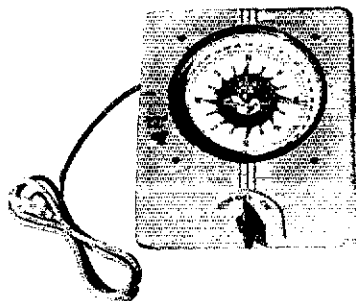
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Line/Load Reg. 11.7 x 19.0 x 14.00 cm
Size 4.3 kg
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Price



Model #109 R

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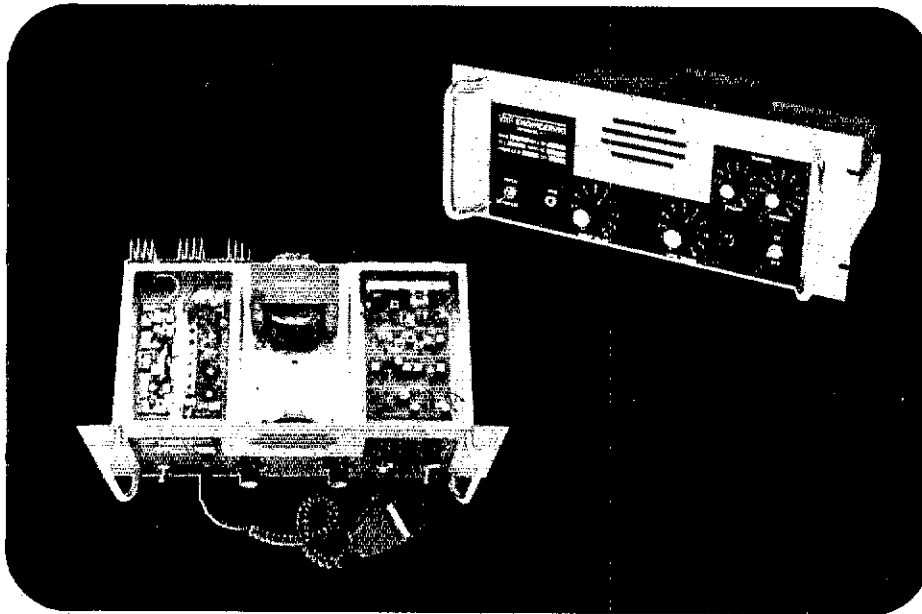


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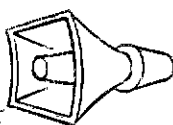
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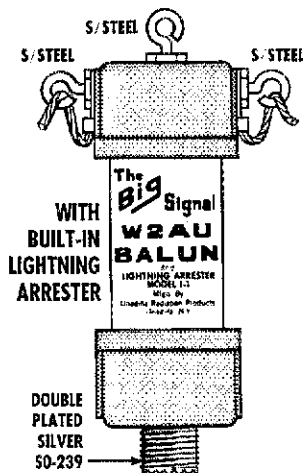
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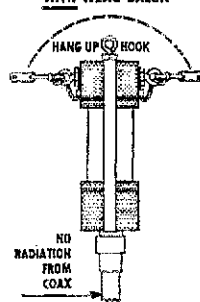
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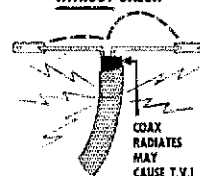
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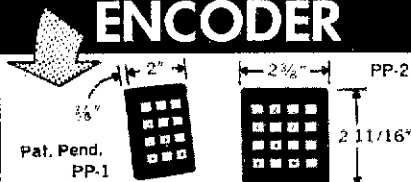
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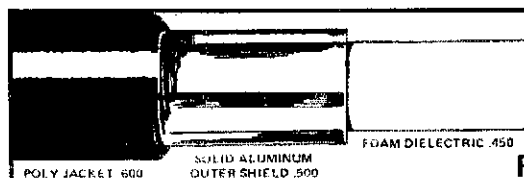
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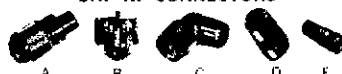
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TV-42-LP
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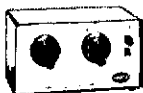
TV-3300-LP
1000 watts max below 30 MHz Attenuation better than 80 dB above 41 MHz \$19.95

TV-300-HP High Pass Filter
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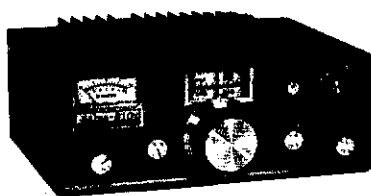
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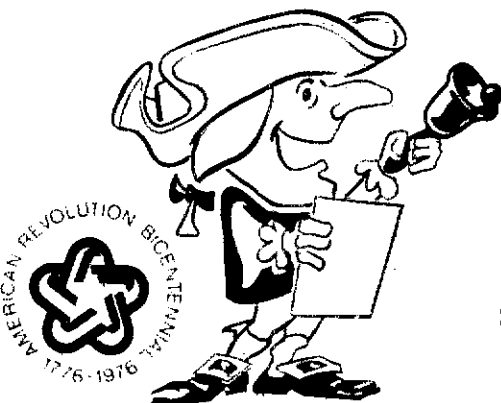
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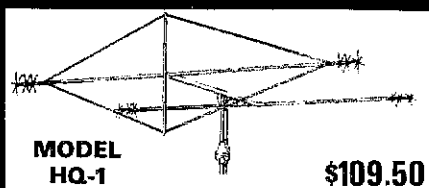
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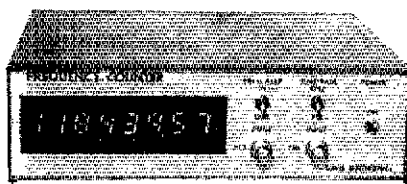
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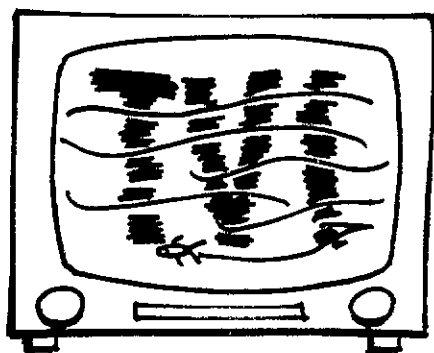
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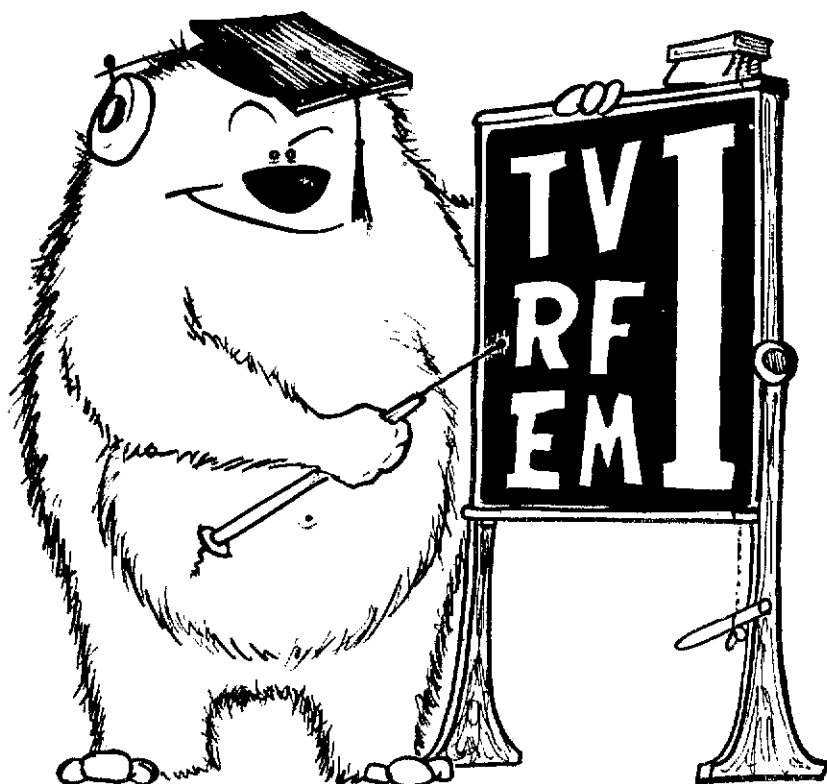


A properly designed filter can tame the beast...

Whatever you call it, the common denominator is "I" for Interference.

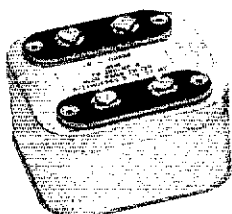
The study of interference to consumer products such as TV sets, hi-fis, and the like from radio transmitters is a complex subject. For a primer, see p. 11, "QST Magazine" for March, 1976. We do know that radiation interference can be greatly reduced and perhaps eliminated by the use of a well-engineered, quality-built TVI filter. The low-pass type for the transmitter is at times not enough...a high-pass type for the TV set may also be required. But, here's the rub! If a filter is not properly designed and engineered, it may not work like a filter at all. At the R. L. Drake Company, we've been designing and building filters for over 30 years...since before the days of "Uncle Miltie." And, these are real filters...not toys.

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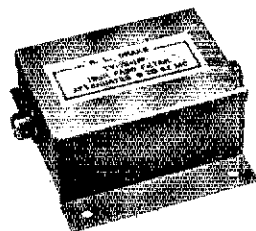


High Pass Filters for TV Sets...

provide more than 40 dB attenuation at 52 MC and lower. Protect the TV set from amateur transmitters 6-160 meters.



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For 300 ohm twin lead

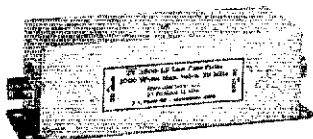


TV-75-HP
For 75 ohm coaxial cable

DRAKE

Low Pass Filters for Transmitters

have four pi sections for sharp cut off below channel 2, and to attenuate transmitter harmonics falling in any TV channel and FM band. 52 ohm, SO-239 connectors built in.



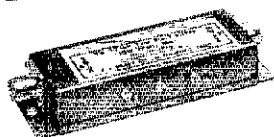
TV-3300-LP

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TV-5200-LP

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP.



TV-42-LP

is a four section filter designed with 43.2 MC cut-off and extremely high attenuation in all TV channels for transmitters operating at 30 MHz and lower. Rated 100 watts input.

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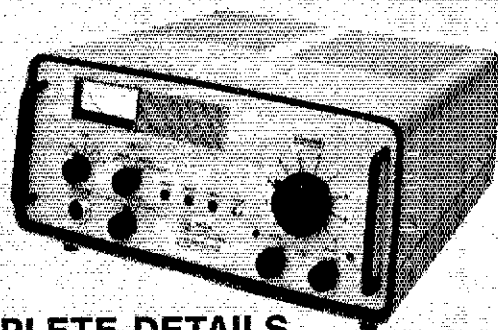
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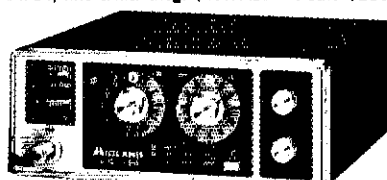
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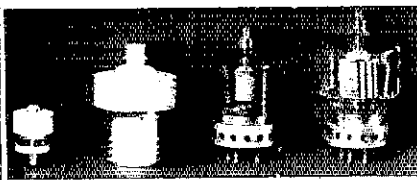
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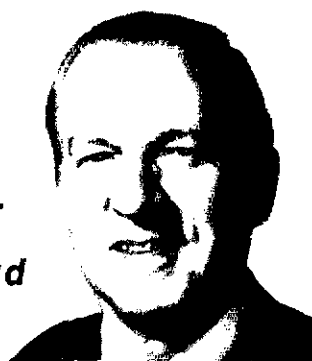
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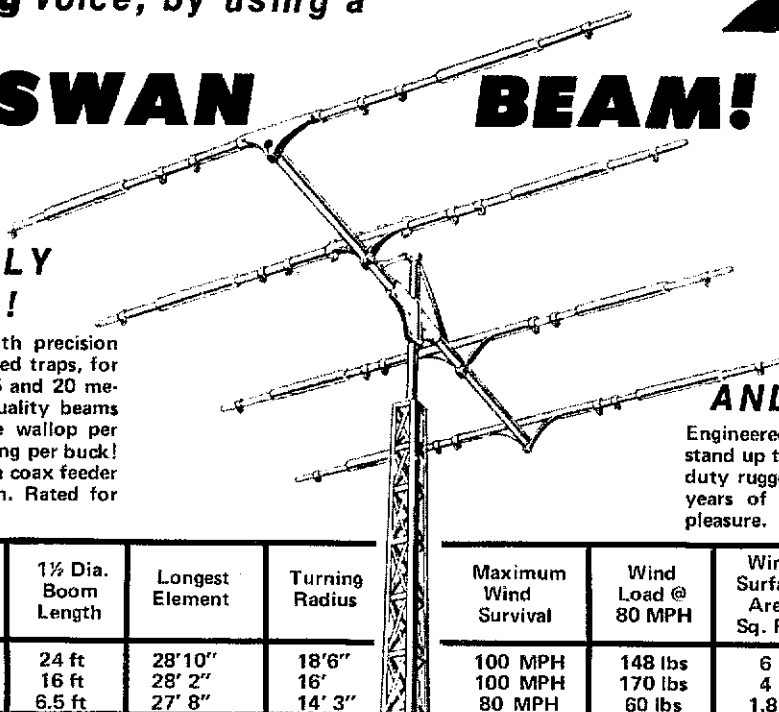


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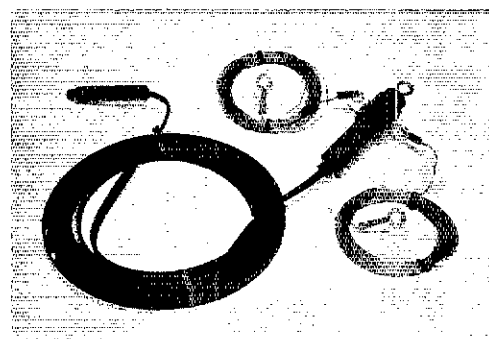
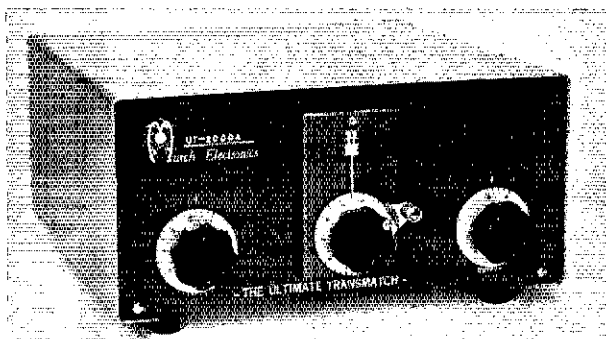
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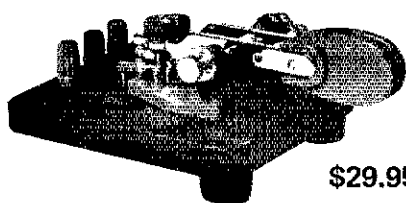
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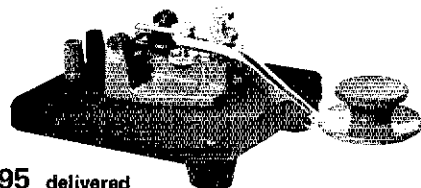
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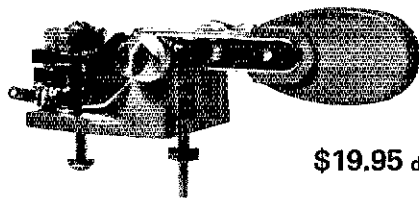
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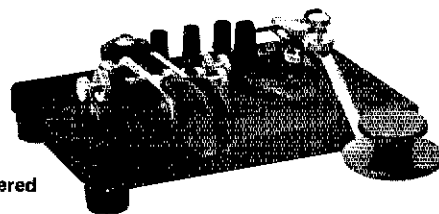
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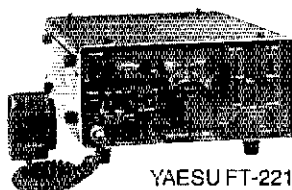
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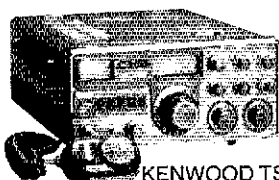
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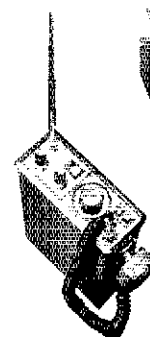
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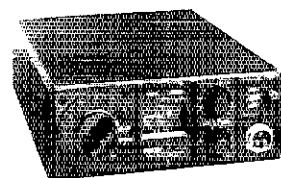
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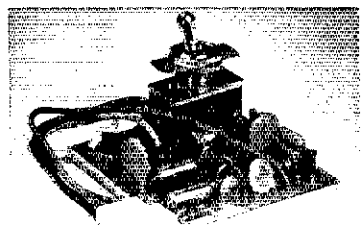
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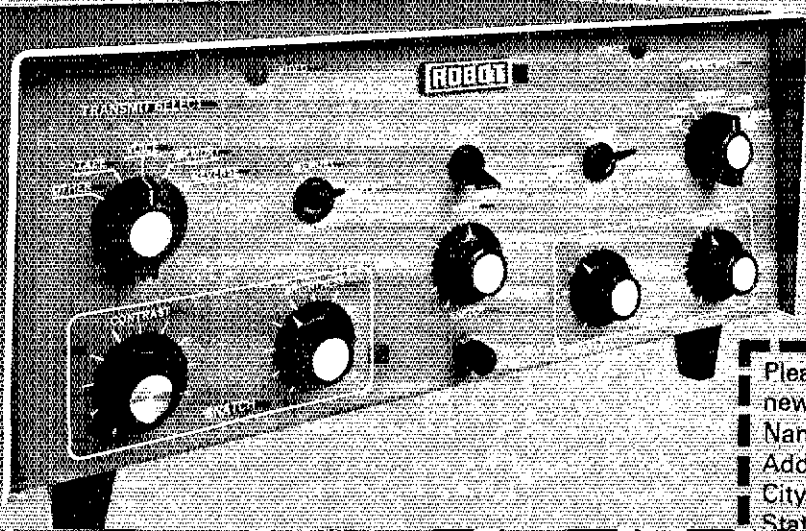
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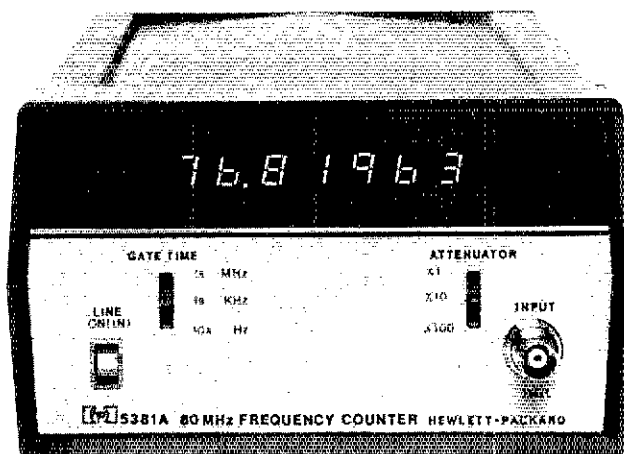
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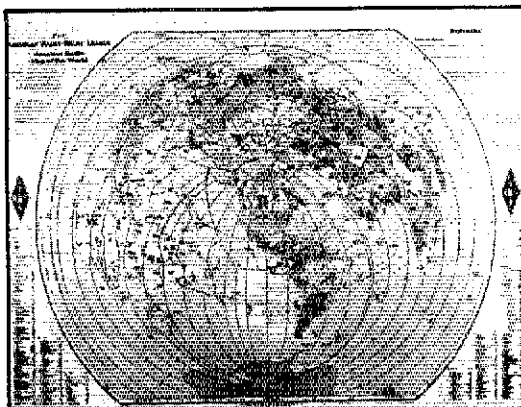
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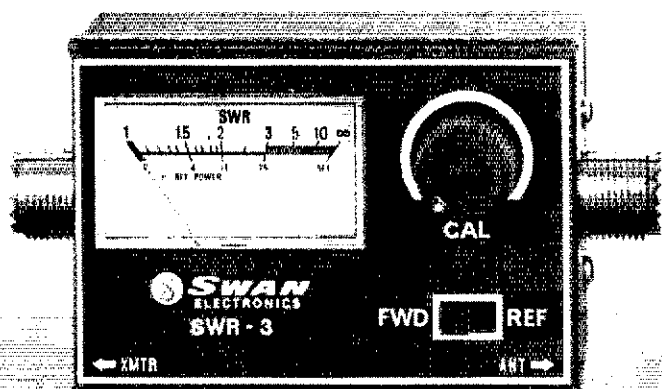
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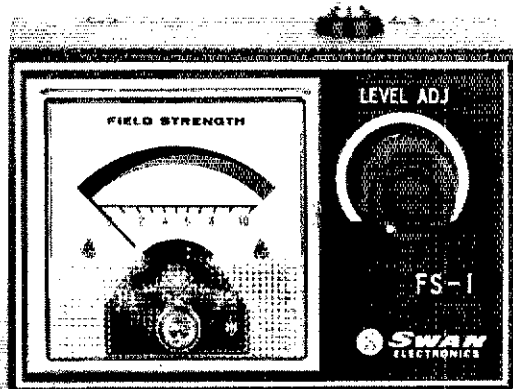
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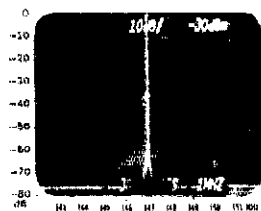
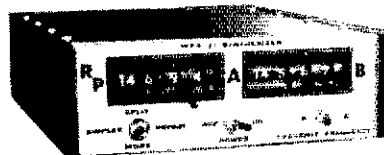
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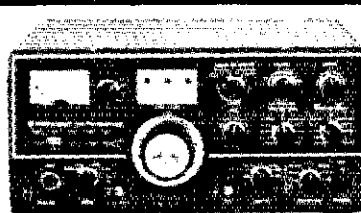
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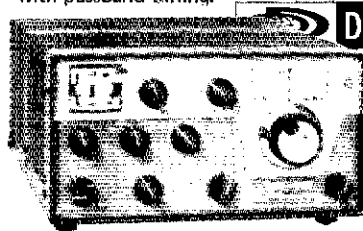
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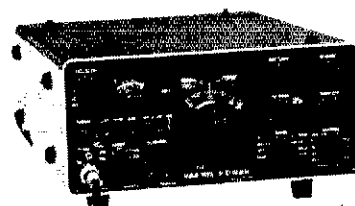
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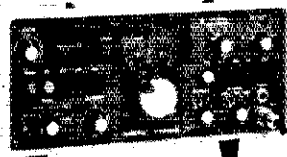
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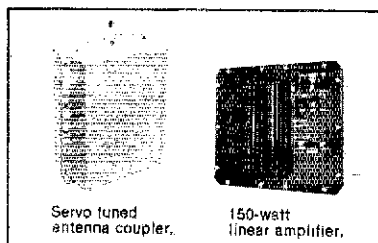
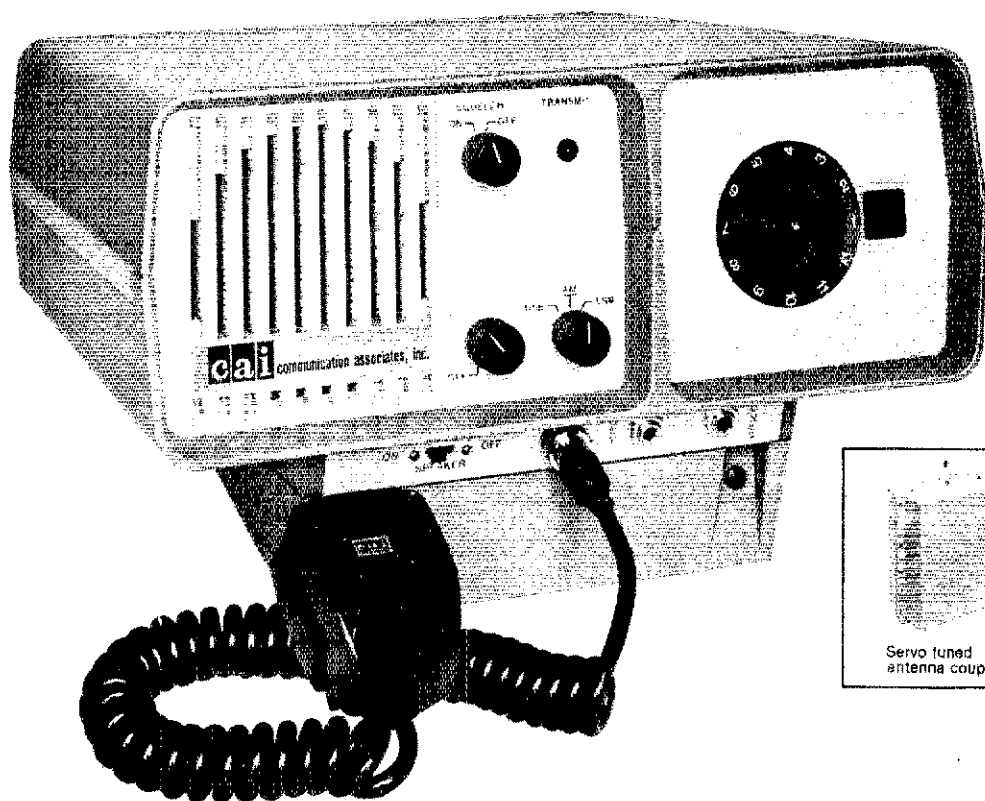
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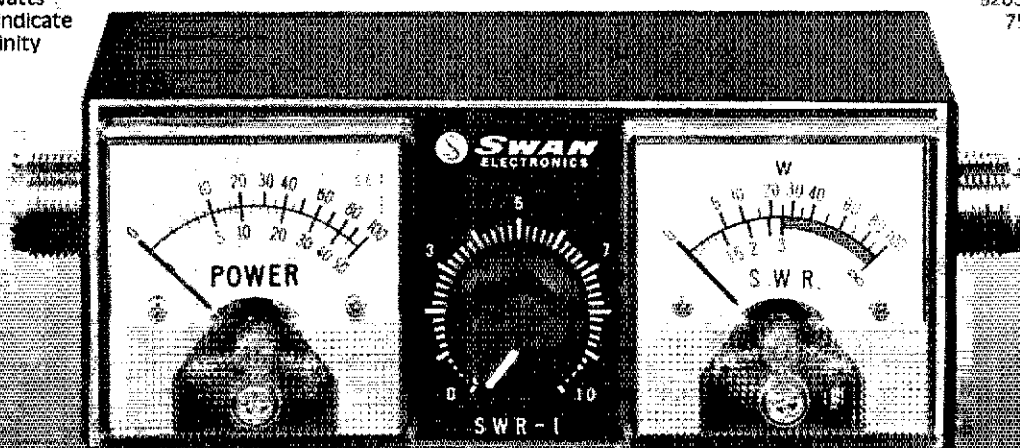
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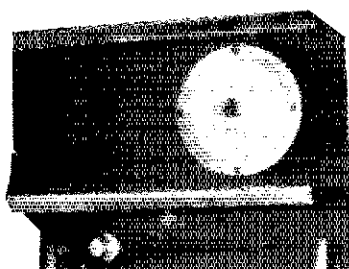
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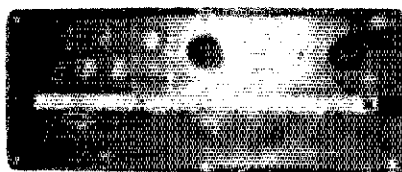


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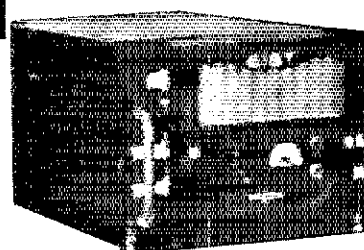


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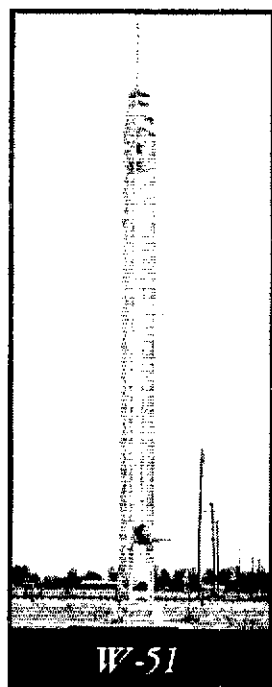
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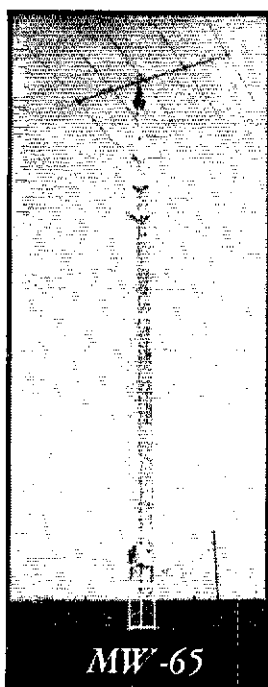
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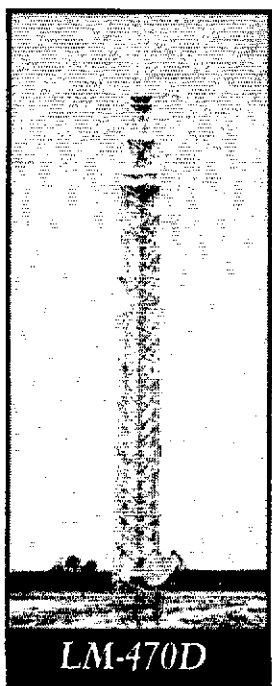
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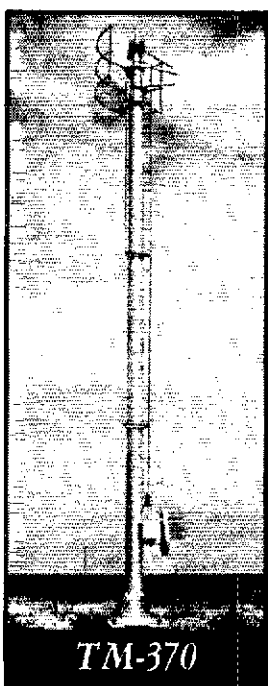
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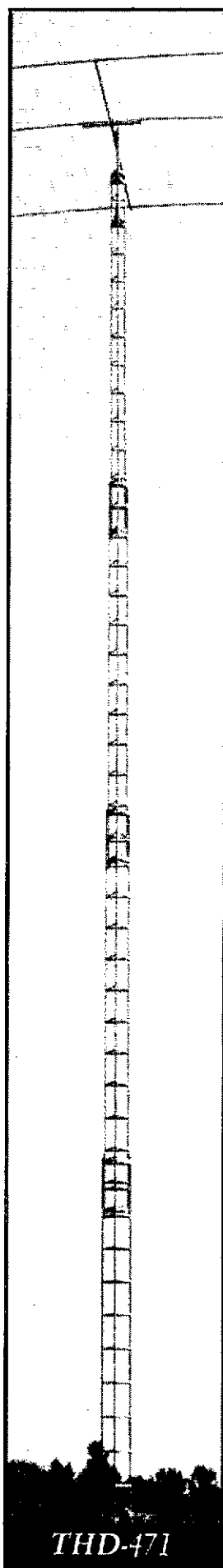
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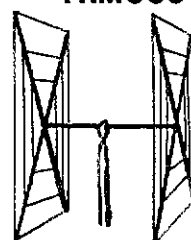
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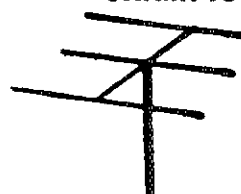
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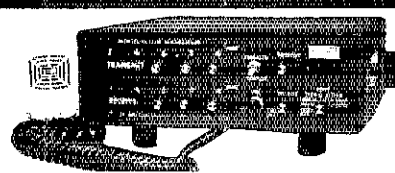
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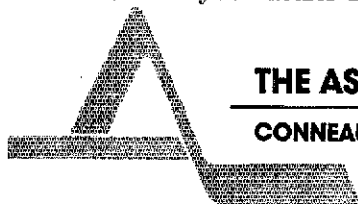
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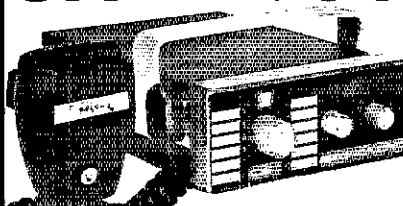
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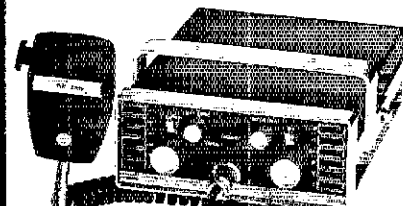
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2N3876, 2N3877, 2N3878, 2N3879, 2N3880, 2N3881, 2N3882, 2N3883, 2N3884, 2N3885, 2N3886, 2N3887, 2N3888, 2N3889, 2N3890, 2N3891, 2N3892, 2N3893, 2N3894, 2N3895, 2N3896, 2N3897, 2N3898, 2N3899, 2N3900, 2N3901, 2N3902, 2N3903, 2N3904, 2N3905, 2N3906, 2N3907, 2N3908, 2N3909, 2N3910, 2N3911, 2N3912, 2N3913, 2N3914, 2N3915, 2N3916, 2N3917, 2N3918, 2N3919, 2N3920, 2N3921, 2N3922, 2N3923, 2N3924, 2N3925, 2N3926, 2N3927, 2N3928, 2N3929, 2N3930, 2N3931, 2N3932, 2N3933, 2N3934, 2N3935, 2N3936, 2N3937, 2N3938, 2N3939, 2N3940, 2N3941, 2N3942, 2N3943, 2N3944, 2N3945, 2N3946, 2N3947, 2N3948, 2N3949, 2N3950, 2N3951, 2N3952, 2N3953, 2N3954, 2N3955, 2N3956, 2N3957, 2N3958, 2N3959, 2N3960, 2N3961, 2N3962, 2N3963, 2N3964, 2N3965, 2N3966, 2N3967, 2N3968, 2N3969, 2N3970, 2N3971, 2N3972, 2N3973, 2N3974, 2N3975, 2N3976, 2N3977, 2N3978, 2N3979, 2N3980, 2N3981, 2N3982, 2N3983, 2N3984, 2N3985, 2N3986, 2N3987, 2N3988, 2N3989, 2N3990, 2N3991, 2N3992, 2N3993, 2N3994, 2N3995, 2N3996, 2N3997, 2N3998, 2N3999, 2N4000, 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6-DIGIT ALARM CLOCK

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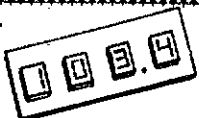
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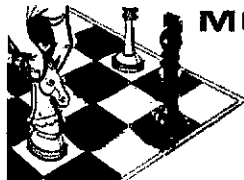
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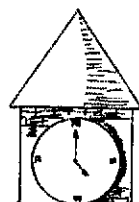
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6 sec. = 10th of RPM
60 sec. = full revolution



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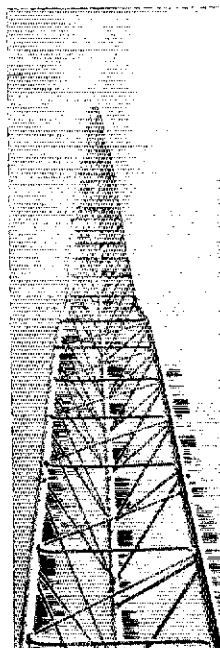
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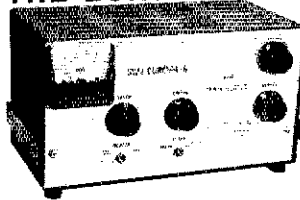
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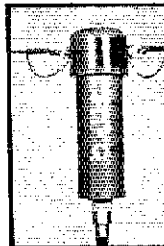
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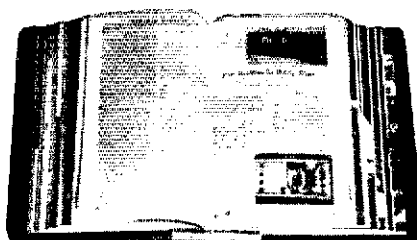


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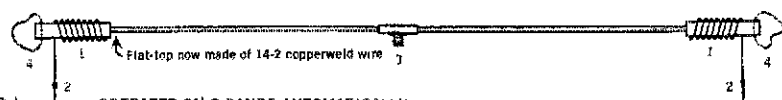
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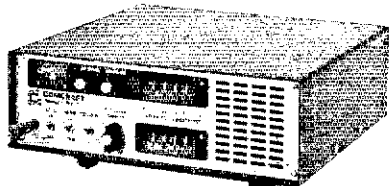


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WARREN, Ohio Hamfest, August 22, 1976. Moved to Trumbull Expo Center, north of city, bigger flea market, plenty of close-in parking. Displays, talk-in, \$2 door registration. Family recreation, nearby State Park. Arrowsign lead from Interstates 80, 90, Ohio Rtes 5, 13, 305. Details? QSL WARA, Box 809, Warren OH 44482.

ELMIRA, NY Hamfest, Sept. 25, 1976. Chemung County Fairgrounds. Flea market, dealer displays, technical talks. Talk-in 10/70 - 146.52. \$2.00 advance sale - \$2.50 at gate. For further information, WA2SMM, 320 W. Ave., Elmira, NY 14904.

DODGE CITY, Kansas Hamfest, Aug. 15, 1976. Hoover Pavilion, Wright Park. Boot Hill Amateur Radio Club, ARRL approved. 75 meter mobile hunt, homebrew contest, swap table. Registration 10:30 A.M. Ladies welcome.

21ST Annual York County Hamfest Sept. 5. Rain or shine, 10 miles west of York. Pa. 1/2-mile west of York airport, turn south off Rte. 30 to Ellicker's Grove. Talk-ins 146.04-64 & 28.88 and 52.52. Registration begins at 9:00 A.M. Fee \$3. All adults and amateurs are expected to register KYLs and children free. A limit number of flea market tables are available inside by advance reservations only. Contact Hamfest committee. There will be a \$5. charge for electric power. For information write or phone K3POR, LeRoy Frey, 170 S. Albemarle St., York PA 17403. Phone 854-1203.

EASTERN Conn. Amateur Radio Assoc. will be holding a flea market and auction Sept. 19, 1976. Starting at 10:00 A.M. and running to 5:00 P.M. at the Rocking 'd' Campground, Snake Meadow Rd., S. Killingly CT. For more info call Bob, 203-774-1465 Days or Mike 203-774-8254 Nights. Dealers invited.

RADIO EXPO '76, Sept. 18, 19, Lake County, Illinois, Fairgrounds, Routes 45 and 20, west of Waukegon, Illinois. Forums featuring FCC's John Johnston, ARRL's Lew McCoy, ATV, OSCAR, Synthesizing HT's and much more. Giant indoor/outdoor flea market opens Friday night. Campers welcome, overnight parking available with electric on grounds. Prizes, dozens of exhibits by manufacturers, distributors. Full service cafeteria for breakfast, lunch. Make overnight reservations at Holiday Inn, Mundelme. Advance tickets, \$1.50 Box 1014, Arlington Heights IL 60006.

CINCINNATI Hamfest: 40th Anniversary Hamfest - Sunday, September 19, 1976 at the New Improved Cincinnati's Grove on State Route 128, one mile west of Ross (Venice) Ohio. Flea Market, exhibits, contests, model aircraft flying, food and beverages all day. Advance ticket sales \$7. - tickets at the gate \$8. - covers everything. For further information: Lillian Abbott, 1424 Main Street, Cincinnati OH 45210.

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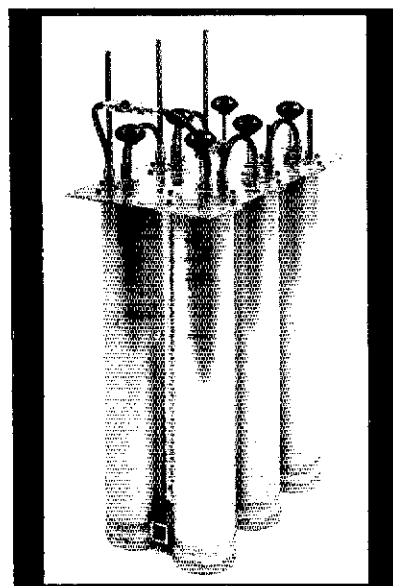
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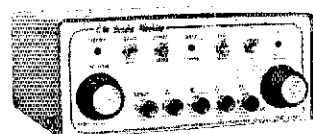
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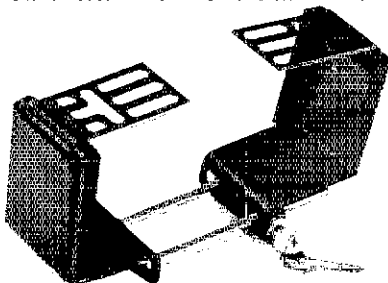
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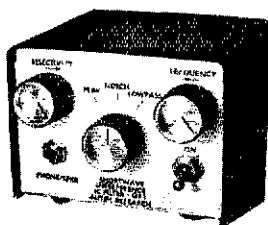
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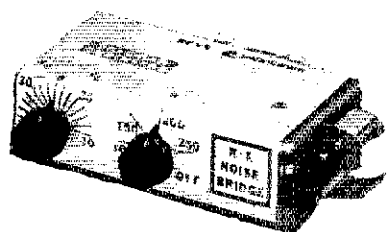
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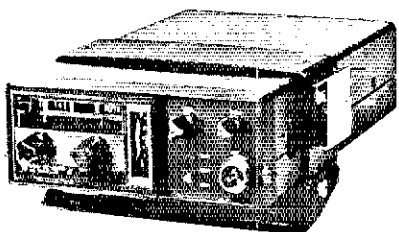
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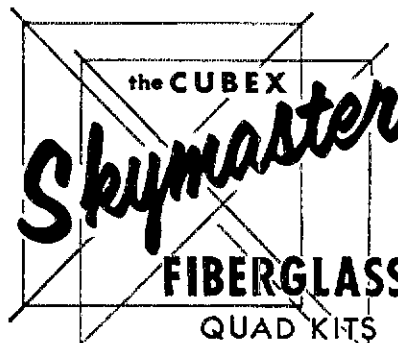
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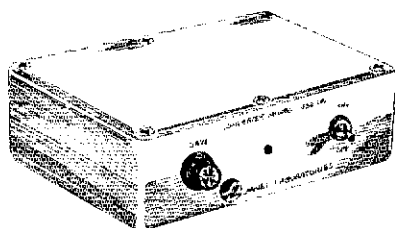
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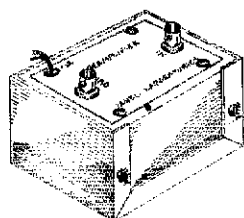
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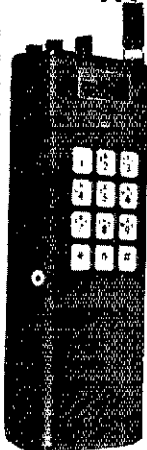
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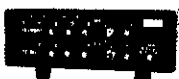
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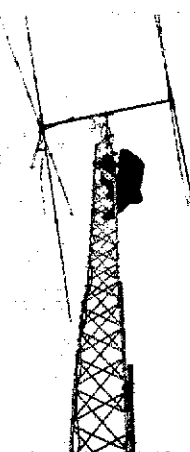
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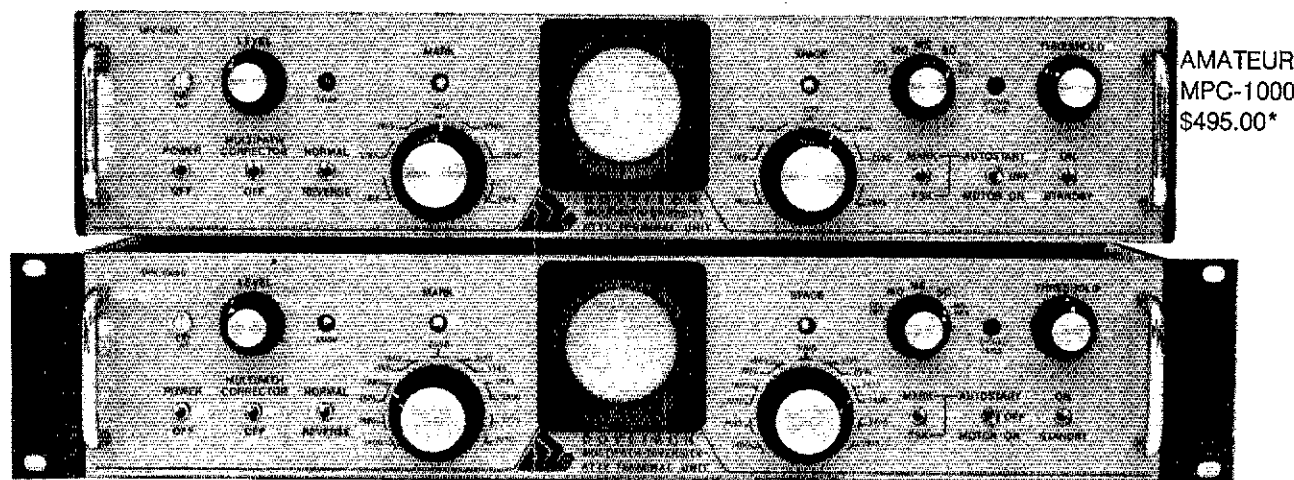
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Index of Advertisers

Adva Electronics: 159
Aldelen: 144
Altal Electronics: 153
Altec Communications: 150
Alltronics-Howard Co.: 158
Amateur Electronic Supply: 88, 89, 134, 136, 142, 144, 145, 150, 151, 152, 153, 161
Amateur License Instruction: 154
Amateur Wholesale Electronics: 108, 109
Amidon Associates: 104
Antenna Specialists: 99
Astatic Corp.: 149
Atlas Radio Inc.: 125
Atronics: 116
American Telephone & Telegraph Co.: 127
Autek Research: 157
Barry Electronics: 148
Bowmar: 142
Burghardt Amateur Center: 164
Buyers & Sellers: 106
Caddell Coil Corp.: 136
Clegg Communications Corp.: 123
Cleveland Institute of Electronics: 138
Collins Radio: 2
Command Productions: 137
Communication Associates Inc.: 145
Control Signal Company: 124
Cubex Co.: 158
Curtis Electro Devices: 134
Cushcraft: 111
CW Sendin' Machine: 156
Dames, Ted: 134, 144, 146
Davis Electronics: 132
DeForest Electronics: 100, 101
Dentron Radio Co.: 4
Dovetron: 163
Drake, R. L.: 93, 133
Egis Mailers: 104
Ehrhorn: 110
Electronic Distributors Inc.: 161
El Paso, T X Hamfest: 130
Emel Electronics: 136
Fair Radio Sales: 138
General Aviation: 103, 105
Giffers: 158
GIB Electronics: 132
Golden Spread Hamfest: 160
Gotham: 148
Greene: 130
Hal Communications: 113
Ham Radio Center: 137
Ham Radio Outlet: 138
Hamtronics: 141
Harrison Radio: 135
Heath Co.: 90, 91
Heights Manufacturing: 154
Hempill, G. W.: 144
Henry Radio: Cov. II, I
Hewlett-Packard Co.: 140
Hy-Gain: 121
ICOM: 5
International Crystal Mfg.: 7
Jan Crystal: 155
Janel Laboratories: 160
Kaufman Industries: 144
Kensco Communications Inc.: 134
Kintetsu International Express, Inc.: 102
Larsen Electronics Inc.: 92
Lattin Radio: 84
Lm Corp.: 108
Link: 142
Main Electronics: 114
Marsh Devices: 148
MEI Enterprises: 119
MidCom Electronics: 122
Mid-Continent Communications Co.: 120
Millen Mfg Co., Inc., James: 122
Mini-Products: 132
Murch Electronics: 136
National Radio Institute: 143, 148
Norley, Richard: 164
North Shore R. F. Tech.: 156
Nye Co., Inc., William M.: 98
Pacific Division ARRL Convention: 132
Palomar Engineers: 150, 157, 158, 159
Pekering Codemaster: 146
Piezo Technology, Inc.: 159
Pipo Communications: 130
Poly Pak: 151
Pruitt Enterprises: 156
PTI Division: 134
Radio Amateur Callbook: 136
Regency Electronics, Inc.: 112
Rexcom Electronics: 161
R. F. Communications: 106
Robot Research: 139
R. P. Electronics: 142
Kusprint: 112, 114
Sandlin Electronics Engineering: 132
Scientific Radio Systems: 134
Shelale Radio Laboratories: 155
Skylane Products: 150
Solid State Modules: 154
Space Electronics: 154
Specialty Communications Systems: 128
Spectrum: 117
Star-Tronics: 145
Swan Electronics: 107, 142, 146
Telatron Corp.: 156
Telrex Labs: 118, 128
Ten-Tec Inc.: 98, 116
Theta Labs: 138
TPI Communications Inc.: 118
Tri-Ex Tower Corp.: 147
Trio Kenwood: 6, 94, 95
Tuffs Radio: 131
Unadilla Radiation Products: 130
Unique Products: 140
Universal Radio Co.: 150
Van Gordon Engineering: 154
Van Sickle Radio: 154
Varian, Fimac Division: Cov. IV
VHF Engineering: 129
Vintage Radio: 162
W3KT QSL Service: 154
Webster Radio: 144
Whitehouse & Co., G. R.: 102
Wilson Electronics: 96, 97, 115
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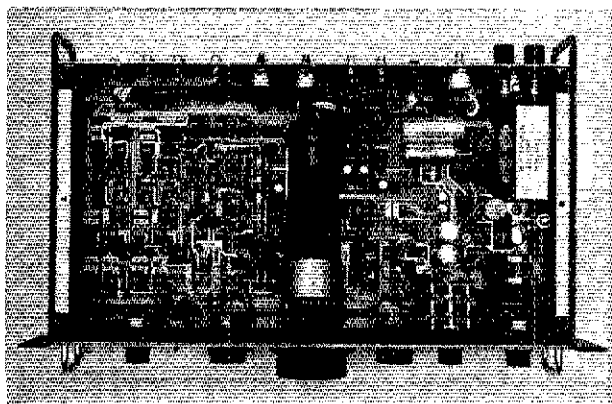
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DEAR OM: If you're in the market for a NEW RIG — whether it be a new all-band SSB Transceiver, a VHF unit, or whatever — you've no doubt "DECIDED" (at the least) by now that it's no cut & dry affair!! In fact, when you start comparing all the specs & features available on the wide variety of makes & models today, and take into account such important factors as price, performance, quality, resale value and SERVICE-ABILITY — chances are, more often than not, you'll wind up right back where you started — either scratchin' your head or ready to flip a coin!!

Now, we at BURGHARDT AMATEUR CENTER in Watertown, South Dakota — of all places!! — don't claim to have "all the answers" — but we DO HAVE most of these new models IN STOCK for IMMEDIATE DELIVERY, and we'll be more than happy to assist you in whatever way possible to help take some of the guesswork out of buying your new station. We're ALWAYS willing to furnish you (at NO CHARGE) up-to-date specs on any or all of the new models, and offer you whatever FIRST-HAND information we have that will "EASE YOUR MIND" and insure that your ultimate "DECISION" will indeed be the RIGHT ONE for YOU!!



In addition, when you've finally narrowed the field down a bit, we'll be ready with our TOP-DOLLAR trade allowance for your used gear — YES!! WE DO TAKE TRADE-INS!! — and give you a SQUARE DEAL that will include FAST DELIVERY, DEPENDABLE SERVICE and GUARANTEED SATISFACTION — all at NO EXTRA CHARGE!! We'll even give your new gear a COMPLETE CHECK-OUT prior to shipment and install any optional accessories you may have chosen — thus insuring that it will meet factory specs in all modes of operation when you're ready to put it on the air!! And, in most cases, we'll have it rolling along to you the SAME DAY your order reaches our desk.



That's just the way we handle things here at BURGHARDT AMATEUR CENTER — when you deal with us, you ALWAYS receive our prompt PERSONAL ATTENTION and INDIVIDUAL CONCERN, and you will always find us ready to COOPERATE with you to the limit!! We don't pretend to be BIG OPERATORS or WHEELER DEALERS, but choose instead to offer FRIENDSHIP, PERSONAL SERVICE and RELIABILITY to those who realize that there is MORE to a "GOOD DEAL" than just the lowest price — that in the final analysis, it's the reputation of the dealer standing behind their purchase that's worth as much or more than the quality of the product itself.



We KNOW that Watertown "ain't exactly the cornerstone of civilization" — but we are ON THE MAP, and we'll go a LONG-LONG way to take VERY GOOD CARE of YOU!! Remember, OM, we're STRICTLY engaged in the "HAM" radio business, and our only aim is to give YOU the kind of SERVICE you deserve—AND YOU GET!!—as a member of the amateur fraternity investing your hard-earned dollars on sophisticated radio equipment with "AMERICA'S MOST RELIABLE AMATEUR DEALER"!! We ARE FOR REAL, and we look forward to SERVING YOU soon.



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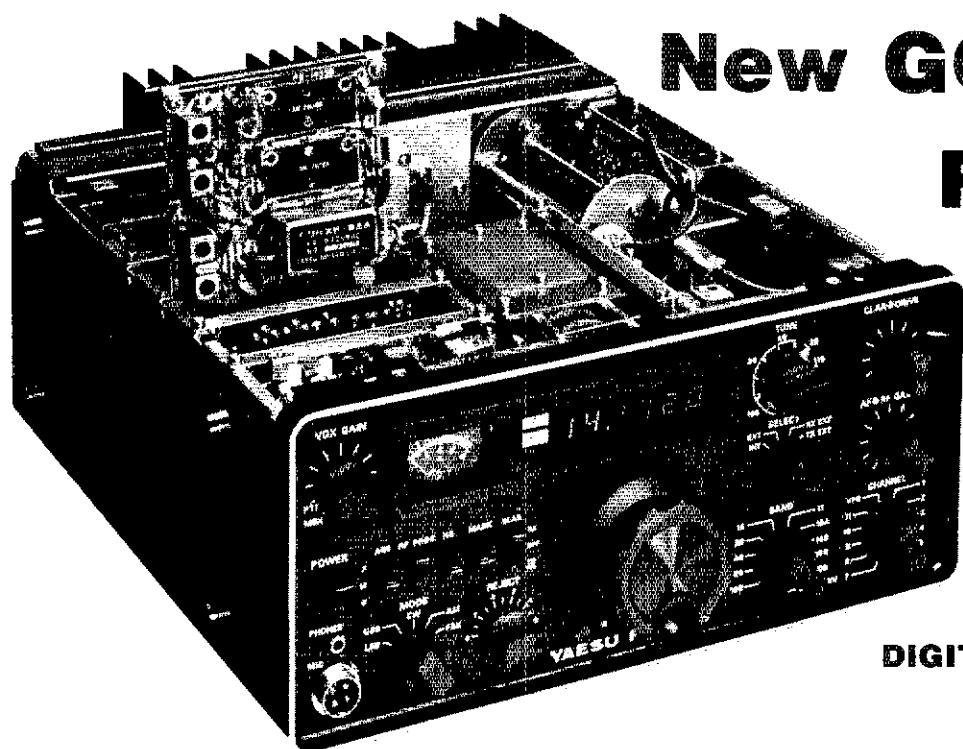
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The Model FT-301D is a precision-built, all solid-state, compact high performance transceiver of advanced design. All circuits are fully transistorized with ICs and FETs for reliability. A wide-band tuning system with preset pass band tuning combined with wide-band amplifier eliminates final amplifier tuning for band change. Also available as an option is an automatic CW identifier (programmable).

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ing the 3-500Z, 8873, 4CX250B and 3CX100A5. And there's plenty of information about design and construction of transmitting equipment using EIMAC power tubes in both handbooks.

For tube information, contact Varian, EIMAC Division, 301 Industrial Way, San Carlos, California 94070. Or contact any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.

